President Eisenhower said to 2 CIA Officers, in the Oval Office :
" —We called the people in from MJ-12, from Area 51 and S-4,
but they told us that the government had no
jurisdiction over what they were doing…
I want you and your boss to fly out there.
I want you to give them a personal message…
I want you to tell them, whoever is in charge,
I want you to tell them, that they have this coming week to get
into Washington, and to report to me.
And if they don't, I'm going to get the First Army from Colorado,
we are going to go over and take the base over.
I don't care what kind of classified material you got.
We are going to rip this thing apart."


A LOT OF SHIT IN SPACE ABOVE AND AROUND US.
—I THINK I CAN COUNT TO 3000 RF SATELLITES.

INTRODUCTION.

EXTRAS:

//// GO BACK TO PAGE 97 - AND IN THE PHOTO SECTION OF THIS REPORT // SEE THE DOCUMENT ABOUT MURDERING SECRETARY OF DEFENSE FORRESTAL THAT WISHED TO GO PUBLIC WITH U.F.O.

First he was placed in a mental hospital, and then he was thrown out of a window there.

Did they give him a poison before he went to the mental hospital?

All pictures are real and not photoshopped. There are more than 100 photos and images herein.

Working on behalf of the Royal Kingdom of Sweden for all Governments worldwide.

*** = ALL THE 1950'S DOCUMENTS INDEXED ABOVE ARE REAL U.S. GOVERNMENT PROPERTY.
I don't personally speculate in this REPORT, about the accuracy and written truths served to you from these 1950's documents.
I only guarantee you that the old external documents published herein this SWEDISH PDF REPORT, are real U.S. GOVERNMENT PROPERTY from the 1950's.
Educate yourself by reading these GOVERNMENT PAPERS.

THIS SWEDISH REPORT INCLUDES OVER ONE HUNDRED RELATED PHOTOGRAPHS.

THE U.F.O. BASIC KNOWLEDGE ON THE GOVERNMENT TABLE BIBLE .

Swedish Deep Investigation Into USA GOV In The 1950's.
Document: Heavy National Security PDF - about U.S.A. and U.F.O. Printed 2023-02-12.

This Portable Document File (PDF) was created during the United States Presidency Times, with Joe Biden as acting President.

The intelligence cycle.

ALL⋆INFORMATION

WILL BE acquired, and are then later converted into real intelligence.

WHAT IS INFORMATION?

INFORMATION IS TALK - NEWSPAPERS - MEDIA - DATA - EMAILS AND ALL KINDS OF BULLSHIT. Phonetaps and SPYSATS.

INFORMATION that may be fragmentary, contradictory, unreliable, ambiguous, deceptive, foreign or completely wrong!

Example: He bought a hat for € 288.

INTELLIGENCE

The information is evaluated and analysed and often combined with other sources of information.

Example HUMINT: He bought a +BLACK hat for € 288.

Example SIGINT: +And he texted his father it was nice.

NOW YOU HAVE YOUR RAW INTELLIGENCE.

INTELLIGENCE are information that has been collected, integrated, evaluated, analyzed and interpreted [correctly] .

Example: Mr. C bought a black hat he texted was nice and it was on sale for € 288 Euro. A real bargain according to his fathers textreply the same day.

THE FINAL PRODUCT OF THE INTELLIGENCE CYCLE.

- Ready to be delivered to the topload and all the Government Departments and all it's Policymakers!

Result = Every government employee wears black hats for € 288 Euro.

Underrättelseinformation in Swedish.


MISSION CONTROL CENTER
JAXA
ADCO
SPARTAN
THOR
OPS PLANNER
ETHOS
CAPCOM
VVO
atv4
esa


WHORTON
F. B.
DISPLAY BOARD

Update on U.S. Government and Extraterrestrials.

2023-02-03 CET 17:58.

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

Gustav Norström

U.S. Department *of* Defense


And also LIFTOFF for the advancement of Interplanetary Munitions.
울릉 전역 한때 공습경보
"북 도발행위 묵과 못해"
WE ARE GONNA BOMB E.T.
We are also gonna bomb the mind
control facilities E.T. operates.
연합뉴스TV
신현정 기자
국방부
8일 미국 중간선거…추가 도발 포석?
▶서울아파트 2030 매입 비중 다시 늘어…생애최초 주
원/100엔 961.27 ▲2.01

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

YOU MUST START SOMEWHERE

SO START RIGHT HERE:

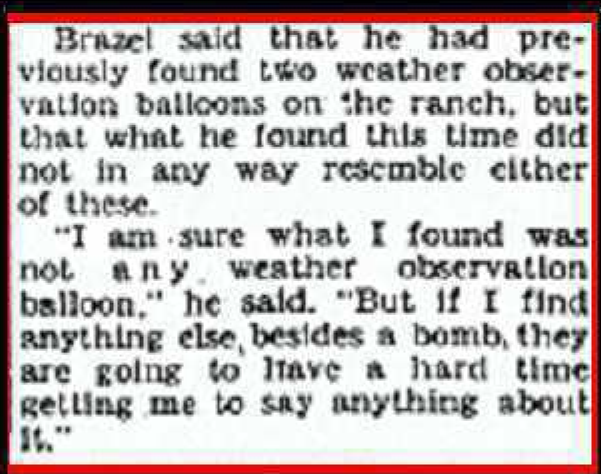
THE COVER-UP PART TWO.

The ranch owner was picked up from his ranch, and taken to the house of the owner, of the local Roswell Radio Station, KGFL, to be interviewed. A recording of the interview was made, and the station planned to broadcast it the next morning. But before it could be broadcasted Brazel was taken into custody by members of the Military Police, and his exclusive interview became confiscated.

The Federal Communications Commission (reported to have been through the office of T.J. Slowie, Secretary of the Commission), warned radio station personnel that the matter involved National Security and should KGFL air any portion of the interview, or issue any information regarding it, they would lose their broadcasting license!

Sometime later Brazel showed up at KGFL Radio Station escorted by Military Officers,where he then told the "truth" about the debris found on his ranch. Brazel took back his initial story, instead claiming now, that he first found the debris in middle of June, in 1947, and NOT the morning of Saturday, July 5, in 1947, as he first told them.
And that it was a simple weather balloon.

The reasons for the cover-up by the Military, came via order from United States President, who wanted to avoid panic. A good comparison for understandment would be: Think that the Soviet Union was the first to posses the atomic bomb. Something like that. And these "visitors" can not be trusted.– AMEN! And GOOD LUCK!


Brazel said that he had previously found two weather observation balloons on the ranch, but that what he found this time did not in any way resemble either of these.

"I am sure what I found was not any weather observation balloon," he said. "But if I find anything else, besides a bomb, they are going to have a hard time getting me to say anything about it."

This is NOT a weather balloon.

And this United States Army hand is not fake.

Leased Wire
Associated Press

Roswell Daily Record

RECORD PHONES
Business Office
News Department

Movies as Usual

Claims Army Is Stacking Courts Martial

Indiana Senator Lays Protest Before Patterson

RAAF Captures Flying Saucer On Ranch in Roswell Region

House Passes Tax Slash by Large Margin

Defeat Amendment By Demos to Remove Many from Rolls

Security Council Paves Way to Talks On Arms Reductions

No Details of Flying Disk Are Revealed

Roswell Hardware Man and Wife Report Disk Seen

Ex-King Carol Weds Mme. Lupescu

Some of Soviet Satellites May Attend Paris Meeting

Roswellians Have Differing Opinions On Flying Saucers

American League Wins All-Star Game

Woodburn Compares Farm Progress in Past Twenty Years

Miners and Operators Sign Highest Wage Pact in History

Air Force General Says Army Not Doing Experiments

Bulletins

Cotton Acreage Is Above 1947 Figure

Dairymen of Area Hear Lecture Series

Controls Off on Most All Building

Local Weather

Two Oil and Gas Leases Are Filed

Held for Threatening Father in Law's Life

QUICKIES By Ken Reynolds


Welcome to Planet Earth™,
Vintergatan.
A translation would be:
–Välkomna till Sverige!
We know the most.


EXTRATERRESTRIAL BRAIN.

TOP SECRET / MAJIC

EYES ONLY

NATIONAL SECURITY INFORMATION

****

* TOP SECRET *

****

EYES ONLY

COPY ONE OF ONE.

BRIEFING DOCUMENT: OPERATION MAJESTIC 12

PREPARED FOR PRESIDENT-ELECT DWIGHT D. EISENHOWER: (EYES ONLY)

18 NOVEMBER, 1952

WARNING: This is a TOP SECRET - EYES ONLY document containing compartmentalized information essential to the national security of the United States. EYES ONLY ACCESS to the material herein is strictly limited to those possessing Majestic-12 clearance level. Reproduction in any form or the taking of written or mechanically transcribed notes is strictly forbidden.

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* TOP SECRET *

****

TOP SECRET / MAJIC

EYES ONLY

EYES ONLY

T52-EXEMPT (E)

* TOP SECRET *

EYES ONLY

COPY ONE OF ONE.

SUBJECT: OPERATION MAJESTIC-12 PRELIMINARY BRIEFING FOR PRESIDENT-ELECT EISENHOWER.

DOCUMENT PREPARED 18 NOVEMBER, 1952.

BRIEFING OFFICER: ADM. ROSCOE H. HILLENKOETTER (MJ-1)

NOTE: This document has been prepared as a preliminary briefing only. It should be regarded as introductory to a full operations briefing intended to follow.

* * * * * *

OPERATION MAJESTIC-12 is a TOP SECRET Research and Development/Intelligence operation responsible directly and only to the President of the United States. Operations of the project are carried out under control of the Majestic-12 (Majic-12) Group which was established by special classified executive order of President Truman on 24 September, 1947, upon recommendation by Dr. Vannevar Bush and Secretary James Forrestal. (See Attachment "A".) Members of the Majestic-12 Group were designated as follows:

Adm. Roscoe H. Hillenkoetter
Dr. Vannevar Bush
Secy. James V. Forrestal*
Gen. Nathan F. Twining
Gen. Hoyt S. Vandenberg
Dr. Detlev Bronk
Dr. Jerome Hunsaker
Mr. Sidney W. Souers
Mr. Gordon Gray
Dr. Donald Menzel
Gen. Robert M. Montague
Dr. Lloyd V. Berkner

The death of Secretary Forrestal on 22 May, 1949, created a vacancy which remained unfilled until 01 August, 1950, upon which date Gen. Walter B. Smith was designated as permanent replacement.

* TOP SECRET *

EYES ONLY

T52-EXEMPT (E)

EYES ONLY

COPY ONE OF ONE.

On 24 June, 1947, a civilian pilot flying over the Cascade Mountains in the State of Washington observed nine flying disc-shaped aircraft traveling in formation at a high rate of speed. Although this was not the first known sighting of such objects, it was the first to gain widespread attention in the public media. Hundreds of reports of sightings of similar objects followed. Many of these came from highly credible military and civilian sources. These reports resulted in independent efforts by several different elements of the military to ascertain the nature and purpose of these objects in the interests of national defense. A number of witnesses were interviewed and there were several unsuccessful attempts to utilize aircraft in efforts to pursue reported discs in flight. Public reaction bordered on near hysteria at times.

In spite of these efforts, little of substance was learned about the objects until a local rancher reported that one had crashed in a remote region of New Mexico located approximately seventy-five miles northwest of Roswell Army Air Base (now Walker Field).

On 07 July, 1947, a secret operation was begun to assure recovery of the wreckage of this object for scientific study. During the course of this operation, aerial reconnaissance discovered that four small human-like beings had apparently ejected from the craft at some point before it exploded. These had fallen to earth about two miles east of the wreckage site. All four were dead and badly decomposed due to action by predators and exposure to the elements during the approximately one week time period which had elapsed before their discovery. A special scientific team took charge of removing these bodies for study. (See Attachment "C".) The wreckage of the craft was also removed to several different locations. (See Attachment "B".) Civilian and military witnesses in the area were debriefed, and news reporters were given the effective cover story that the object had been a misguided weather research balloon.

EYES ONLY

COPY ONE OF ONE.

A covert analytical effort organized by Gen. Twining and Dr. Bush acting on the direct orders of the President, resulted in a preliminary concensus (19 September, 1947) that the disc was most likely a short range reconnaissance craft. This conclusion was based for the most part on the craft's size and the apparent lack of any identifiable provisioning. (See Attachment "D".) A similar analysis of the four dead occupants was arranged by Dr. Bronk. It was the tentative conclusion of this group (30 November, 1947) that although these creatures are human-like in appearance, the biological and evolutionary processes responsible for their development has apparently been quite different from those observed or postulated in homo-sapiens. Dr. Bronk's team has suggested the term "Extra-terrestrial Biological Entities", or "EBEs", be adopted as the standard term of reference for these creatures until such time as a more definitive designation can be agreed upon.

Since it is virtually certain that these craft do not originate in any country on earth, considerable speculation has centered around what their point of origin might be and how they get here. Mars was and remains a possibility, although some scientists, most notably Dr. Menzel, consider it more likely that we are dealing with beings from another solar system entirely.

Numerous examples of what appear to be a form of writing were found in the wreckage. Efforts to decipher these have remained largely unsuccessful. (See Attachment "E".) Equally unsuccessful have been efforts to determine the method of propulsion or the nature or method of transmission of the power source involved. Research along these lines has been complicated by the complete absence of identifiable wings, propellers, jets, or other conventional methods of propulsion and guidance, as well as a total lack of metallic wiring, vacuum tubes, or similar recognizable electronic components. (See Attachment "F".) It is assumed that the propulsion unit was completely destroyed by the explosion which caused the crash.

EYES ONLY COPY ONE OF ONE.

A need for as much additional information as possible about these craft, their performance characteristics and their purpose led to the undertaking known as U.S. Air Force Project SIGN in December, 1947. In order to preserve security, liason between SIGN and Majestic-12 was limited to two individuals within the Intelligence Division of Air Materiel Command whose role was to pass along certain types of information through channels. SIGN evolved into Project GRUDGE in December, 1948. The operation is currently being conducted under the code name BLUE BOOK, with liason maintained through the Air Force officer who is head of the project.

On 06 December, 1950, a second object, probably of similar origin, impacted the earth at high speed in the El Indio - Guerrero area of the Texas - Mexican boder after following a long trajectory through the atmosphere. By the time a search team arrived, what remained of the object had been almost totally incinerated. Such material as could be recovered was transported to the A.E.C. facility at Sandia, New Mexico, for study.

Implications for the National Security are of continuing importance in that the motives and ultimate intentions of these visitors remain completely unknown. In addition, a significant upsurge in the surveillance activity of these craft beginning in May and continuing through the autumn of this year has caused considerable concern that new developments may be imminent. It is for these reasons, as well as the obvious international and technological considerations and the ultimate need to avoid a public panic at all costs, that the Majestic-12 Group remains of the unanimous opinion that imposition of the strictest security precautions should continue without interruption into the new administration. At the same time, contingency plan MJ-1949-04P/78 (Top Secret - Eyes Only) should be held in continued readiness should the need to make a public announcement present itself. (See Attachment "G".)

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* TOP SECRET *
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EYES ONLY

COPY ONE OF ONE.

ENUMERATION OF ATTACHMENTS:

*ATTACHMENT "A"........Special Classified Executive Order #092447. (TS/EO)

*ATTACHMENT "B"........Operation Majestic-12 Status Report #1, Part A. 30 NOV '47. (TS-MAJIC/EO)

*ATTACHMENT "C"........Operation Majestic-12 Status Report #1, Part B. 30 NOV '47. (TS-MAJIC/EO)

*ATTACHMENT "D"........Operation Majestic-12 Preliminary Analytical Report. 19 SEP '47. (TS-MAJIC/EO)

*ATTACHMENT "E"........Operation Majestic-12 Blue Team Report #5. 30 JUN '52. (TS-MAJIC/EO)

*ATTACHMENT "F"........Operation Majestic-12 Status Report #2. 31 JAN '48. (TS-MAJIC/EO)

*ATTACHMENT "G"........Operation Majestic-12 Contingency Plan MJ-1949-04P/78: 31 JAN '49. (TS-MAJIC/EO)

*ATTACHMENT "H"........Operation Majestic-12, Maps and Photographs Folio (Extractions). (TS-MAJIC/EO)

TOP SECRET
EYES ONLY

THE WHITE HOUSE
WASHINGTON

September 24, 1947.

MEMORANDUM FOR THE SECRETARY OF DEFENSE

Dear Secretary Forrestal:

As per our recent conversation on this matter, you are hereby authorized to proceed with all due speed and caution upon your undertaking. Hereafter this matter shall be referred to only as Operation Majestic Twelve.

It continues to be my feeling that any future considerations relative to the ultimate disposition of this matter should rest solely with the Office of the President following appropriate discussions with yourself, Dr. Bush and the Director of Central Intelligence.

Harry Truman

TOP SECRET
EYES ONLY

Roscoe H. Hillenkoetter

Roscoe Henry Hillenkoetter was the third director of the post–World War II United States Central Intelligence Group, the third Director of Central Intelligence, and the first director of the Central Intelligence Agency created by the National Security Act of 1947. He served as DCI and director of the CIG and the CIA from May 1, 1947, to October 7, 1950, and, after his retirement from the United States Navy, was a member of the board of governors of National Investigations Committee On Aerial Phenomena from 1957 to 1962. **Wikipedia**

Born: Roscoe Henry Hillenkoetter, May 8, 1897, St. Louis, Missouri, U.S.

Died: June 18, 1982, New York City, New York, U.S.

Spouse(s): Jane Clark

Education: United States Naval Academy

President: Harry Truman

Deputy: Edwin K. Wright

Preceded by: Hoyt Vandenberg

Succeeded by: Walter B. Smith

James Forrestal

James Vincent Forrestal was the last Cabinet-level United States Secretary of the Navy and the first United States Secretary of Defense. Forrestal came from a very strict middle-class Irish Catholic family. He was a successful financier on Wall Street before becoming Undersecretary of the Navy in 1940, shortly before the United States entered the Second World War. He became Secretary of the Navy in May 1944 upon the death of his superior, Frank Knox. President Franklin D. Roosevelt requested that Forrestal take the lead in building up the Navy. In 1947, after the end of the war, President Harry S. Truman appointed him the first secretary of the newly created Department of Defense. Forrestal was intensely hostile to the Soviet Union, fearing Communist expansion in Europe and the Middle East. **Wikipedia**

Born: James Vincent Forrestal, February 15, 1892, Matteawan, New York, U.S. (now Beacon)

Died: May 22, 1949, Bethesda, Maryland, U.S.

Political party: none

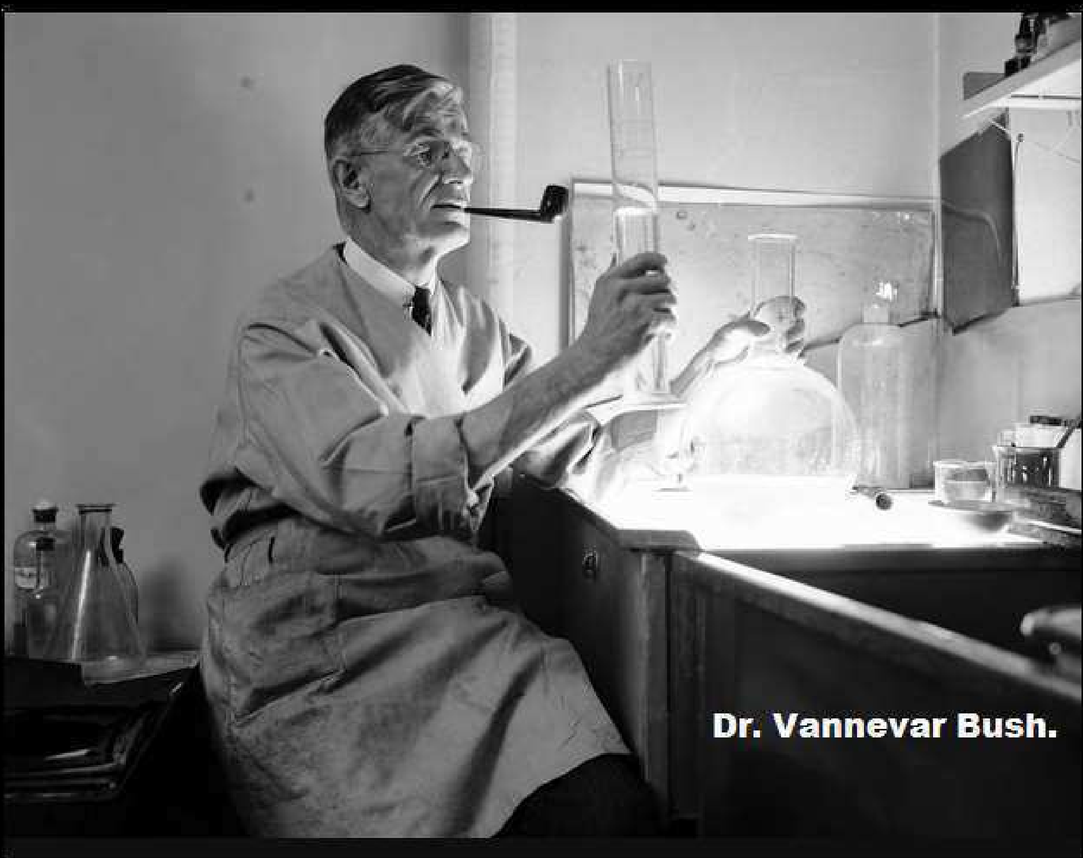
Children: 2, including Michael

Education: Dartmouth College, Princeton University

President: Harry S. Truman

Preceded by: Position established

Succeeded by: Louis A. Johnson



Dr. Vannevar Bush.

Dwight D. Eisenhower

Dwight David "Ike" Eisenhower was an American military officer and statesman who served as the 34th president of the United States from 1953 to 1961. During World War II, he served as Supreme Commander of the Allied Expeditionary Force in Europe and achieved the five-star rank of General of the Army. He planned and supervised the invasion of North Africa in Operation Torch in 1942–1943 as well as the invasion of Normandy from the Western Front in 1944–1945. Eisenhower was born into a large family of mostly Pennsylvania Dutch ancestry in Denison, Texas, and raised in Abilene, Kansas. His family had a strong religious background, and his mother became a Jehovah's Witness. Eisenhower, however, belonged to no organized church until 1952. He graduated from West Point in 1915 and later married Mamie Doud, with whom he had two sons. During World War I, he was denied a request to serve in Europe and instead commanded a unit that trained tank crews. **Wikipedia**

Born: David Dwight Eisenhower, October 14, 1890, Denison, Texas, U.S.

Died: March 28, 1969, Washington, D.C, U.S.

Resting place: Dwight D. Eisenhower Presidential Library, Museum and Boyhood Home

Political party: Republican (1952–1969)

Children: Doud, John

Parents: David Jacob Eisenhower, Ida Stover

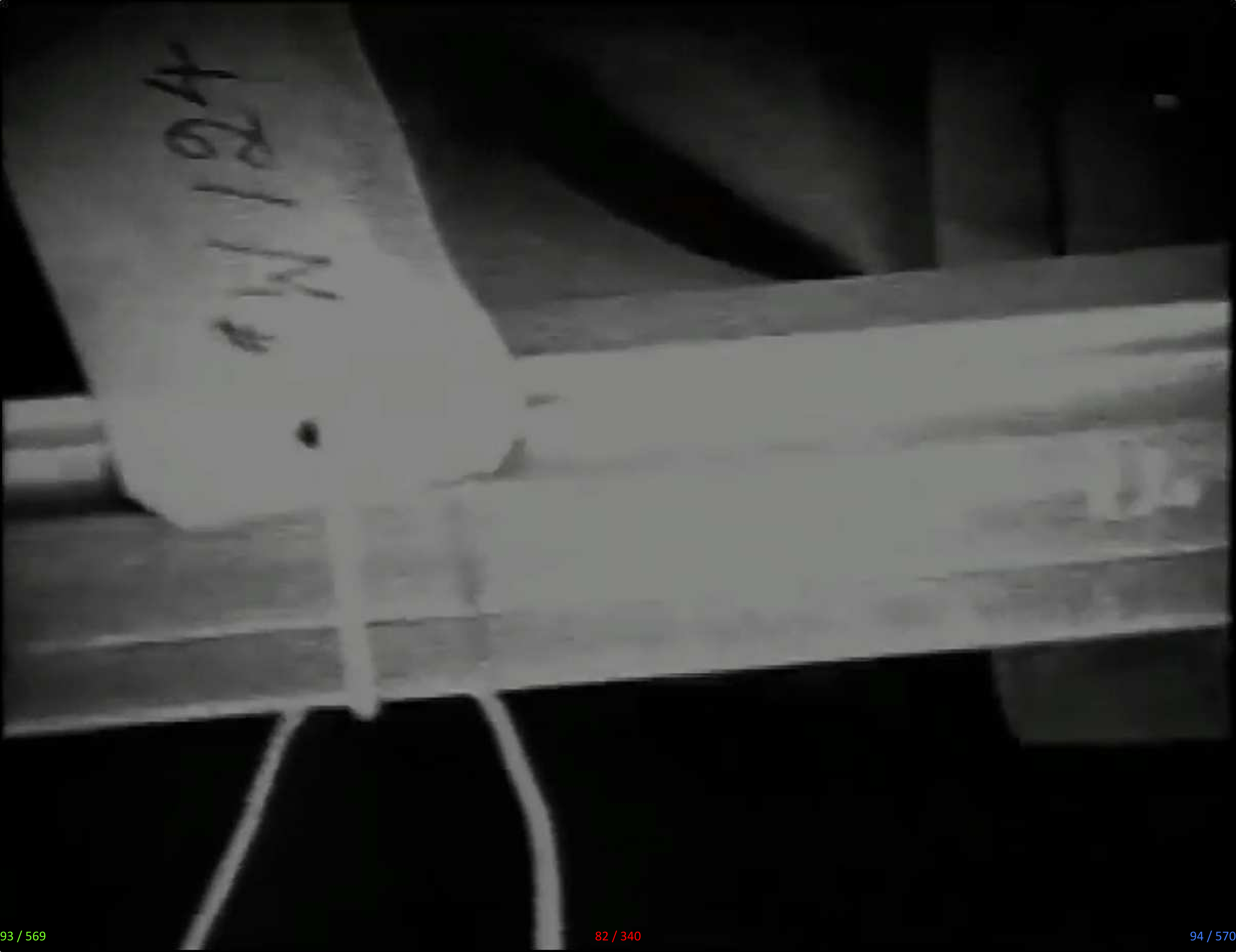
Relatives: Family of Dwight D. Eisenhower

Education: United States Military Academy (BS)

Occupation: Military officer, politician

Harry S Truman

Harry S. Truman was the 33rd president of the United States from 1945 to 1953, succeeding upon the death of Franklin D. Roosevelt after serving as vice president. He implemented the Marshall Plan to rebuild the economy of Western Europe, and established the Truman Doctrine and NATO. Truman grew up in Independence, Missouri, and during World War I was sent to France as a captain in the Field Artillery. Returning home, he opened a haberdashery in Kansas City, Missouri and was later elected as a Jackson County official in 1922. Truman was elected to the United States Senate from Missouri in 1934 and gained national prominence as chairman of the Truman Committee aimed at reducing waste and inefficiency in wartime contracts. Soon after succeeding to the presidency he authorized the first and only use of nuclear weapons in war. Truman's administration engaged in an internationalist foreign policy and renounced isolationism. **Wikipedia**


93 / 569
82 / 340
94 / 570

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

THE MJ-12 MANUAL

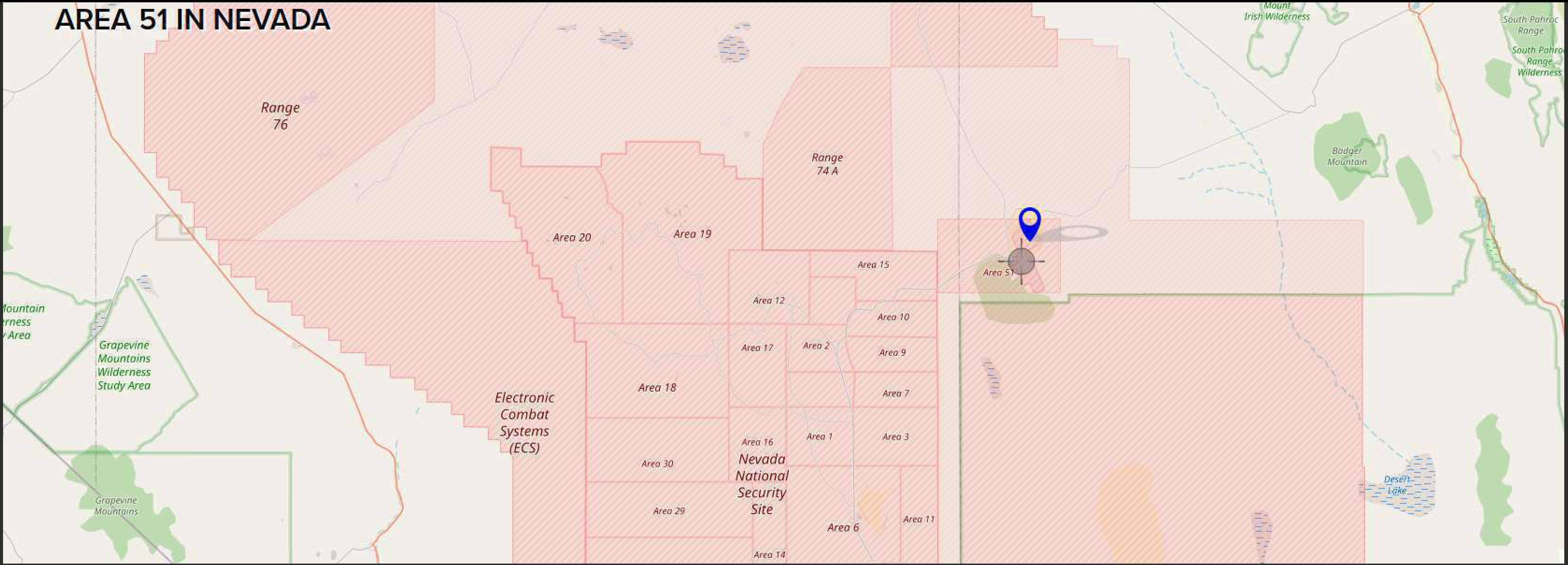
MJ—12 4838B

17. Extraterrestrial Technology Classification Table

No.	Item	Description or condition	MJ-12 Code	Receiving facility
1	Aircraft.	Intact, operational, or semi-intact aircraft of Extraterrestrial design and manufacture.	UA-002-6	Area 51 S-4
2	Intact device.	Any mechanical or electronic device or machine which appears to be undamaged and functional.	ID-301-F	Area 51 S-4
3	Damaged device.	Any mechanical or electronic device or machine which appears to be damaged but mostly complete.	DD-303-N	Area 51 S-4
4	Powerplant.	Devices and machines or fragments which are possible propulsion units, fuel, and associated control devices and panels.	PD-40-8G	Area 51 S-4
5	Identified fragments.	Fragments composed of elements or materials easily recognized as known to current science and technology, i.e.: aluminum, magnesium, plastic, etc.	IF-101-K	Area 51 S-4
6	Unidentified fragments.	Fragments composed of elements or materials not known to current science and technology and which exhibit unusual or extraordinary characteristics.	UF-103-M	Area 51 S-4
7	Supplies and provisions.	Non-mechanical or non-electronic materials of a support nature such as clothing, personal belongings, organic ingestibles, etc.	SP-331	Blue Lab WP-61
8	Living entity.*	Living non-human organisms in apparent good or reasonable health.	EBE-010	OPNAC BBS-01
9	Non-living entity.	Deceased non-human organisms or portions of organisms, organic remains and other suspect organic matter.	EBE-XO	Blue Lab WP-61
10	Media.	Printed matter, electronic recordings, maps, charts, photographs and film.	MM-54A	Building 21 KB-88
11	Weapons.	Any device or portion of a device thought to be offensive or defensive weaponry.	WW-010	Area 51 S-4

**Living entities must be contained in total isolation pending arrival of OPNAC personnel.*

TOP SECRET / MAJIC EYES ONLY



LOAD LOCATION	
LAT:	input latitude
LNG:	input longitude
LOC:	input location
ZIP:	input postal code

SELECTED LOCATION	
	AREA 51 IN NEVADA
LATITUDE:	37.263056
LONGITUDE:	-115.79302

MAP COORDINATES	
LATITUDE:	37° 15' 47.0016"
LONGITUDE:	-115° 47' 34.872"
LATITUDE:	N 37° 15.7834'
LONGITUDE:	W 115° 47.5812'
LATITUDE:	37.263056°
LONGITUDE:	-115.79302°

CURSOR COORDINATES	
LATITUDE:	N 37° 14' 24.6069"
LONGITUDE	W 115° 48' 22.3295"
LATITUDE:	N 37° 14.410116'
LONGITUDE	W 115° 048.372158'
LATITUDE:	37.240169°
LONGITUDE:	-115.806203°

THE U.F.O. BASIC KNOWLEDGE ON THE GOVERNMENT TABLE BIBLE .

So what are Extraterrestrials doing here?
—Here you get a short text summary:
They fill the tanks with compressed liquid air and fresh water, dump the contents of the sewage tank into our waterways and lakes, they telepathically influence decisions made within Authorities and Governments. They steal containers that contain everything from girls' make-up to video game consoles. They conduct biological experiments, and they have actively supported the idea of war in Ukraine.

Now is the time to shoot them down. We don't have to put up with the above no more.


CHINESE SPY BALLOON
ICBM SILO FIELD
BREAKING NEWS
CBS EVENING NEWS WITH NORAH O'DONNELL
U.S. OFFICIALS: CHINA'S BALLOON SOUGHT COMMUNICATIONS

The Soviet Union: 4 October 1957 - The first rocket-launched satellite was placed into an elliptical low Earth orbit from Baikonur Cosmodrome. Sputnik 1 circled the Earth every 96 minutes, and its simple radio signal was heard by scientists and radio operators across the world.

Critics say the following MJ12 manual is not real because, in it, they tell about satellites, already in 1954, (or actually in 1957, when the last note or change was made in this MJ12 manual).
—Well, they had balloon satellites.
—And they were fully aware that even the moon above are a satellite.
—They write a field manual about UFO's, so of course they know what a satellite is.
—If one can fly to here from another Solar System, that one can also have satellites, above us.
—THE MANUAL IS LEGIT. IT'S REAL U.S. GOVERNMENT PROPERTY.
—They don't nail all of their alien descriptions 100% correct in this 1950's manual, though.
—Some of the text are based on qualified guesses and they had a really hard time to put this manual together at all. The Aliens didn't want it to exist.

RESTRICTED

SOM 1-01

TO 12D1—3—11—1

MAJESTIC—12 GROUP SPECIAL OPERATIONS MANUAL

EXTRATERRESTRIAL ENTITIES AND TECHNOLOGY, RECOVERY AND DISPOSAL

TOP SECRET/MAJIC EYES ONLY

WARNING! This is a TOP SECRET—MAJIC EYES ONLY document containing compartmentalized information essential to the national security of the United States. EYES ONLY ACCESS to the material herein is strictly limited to personnel possessing MAJIC—12 CLEARANCE LEVEL. Examination or use by unauthorized personnel is strictly forbidden and is punishable by federal law.

MAJESTIC—12 GROUP • APRIL 1954

MJ—12 4838B—Mar 270485°—54—1

UNIT KB-88 BLDG. 21
KIRTLAND AFB, N.M.X.

TOP SECRET / MAJIC

REMOVAL AND / OR REPLACEMENT OF [illegible]
DOCUMENT REQUIRES WRITTEN AUTHORIZ[illegible]
OPERATIONS OFFICER AND WILL BE RECO[illegible]
RECORDS OFFICER FOR EACH INSTANCE.

PAGES	REMOVED / REPLACED	REMARKS	[illegible]
32-40	0920/12OCT54	MJ/04	[illegible]
35	1805/10NOV54	MJ/04	[illegible]
18,19	1425/05FEB55	MJ/01	[illegible]
PAGES 31-40 INCLUSIVE REMOVED PER[illegible] BY ORDER MJ-12 COMPLETED 0930/ 12 [illegible]			
9-10	1200/31MAR55	MJ/04	[illegible]
5,20	0950/08JUN55	MJ/04	[illegible]
5,6	1700/10MAY56	MJ/04	[illegible]
12-19	1030/16AUG56	MJ/04	[illegible]
6,17,18	0919/05FEB57	MJ/01	[illegible]

[illegible]P SECRET / MAJIC

[illegible]ODUCTION IN ANY FORM IS FORBID[illegible]

REMOVAL AND / OR REPLACEMENT OF PAGE(S) ATTACHED TO THIS DOCUMENT REQUIRES WRITTEN AUTHORIZATION FROM THE MAJIC—12 OPERATIONS OFFICER AND WILL BE RECORDED BY THE DOCUMENTS / RECORDS OFFICER FOR EACH INSTANCE.

22-40	0920/12OCT54	MJ/04	[illegible]	1135/12OCT54	[illegible]
35	1805/10NOV54	MJ/04	[illegible]	1015/11NOV54	[illegible]
18,19	1425/05FEB55	MJ/01	[illegible]	0930/10FEB55	[illegible]
PAGES 31-40 INCLUSIVE REMOVED PERMANENTLY FROM DOCUMENT BY ORDER MJ-12 COMMAND 0930/ 12 APRIL 1955 (MJ/[illegible]-55)					
9-10	1200/31MAR55	MJ/04	[illegible]	1415/31MAR55	[illegible]
5,20	0930/08JUL55	MJ/04	[illegible]	0930/12JUL55	[illegible]
5,6	1304/19MAY56	MJ/04	[illegible]	0900/19MAY56	[illegible]
12-19	1050/16AUG56	MJ/04	[illegible]	1435/16AUG56	[illegible]
6,17,18	0910/05FEB57	MJ/01	[illegible]	1305/05FEB57	[illegible]

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Special Operations Manual
No. 1 - 01

MAJESTIC — 12 GROUP
Washington 25, D. C., *7 April 1954*

EXTRATERRESTRIAL ENTITIES AND TECHNOLOGY, RECOVERY AND DISPOSAL

CHAPTER 1
OPERATION MAJESTIC—12

Section I. PROJECT PURPOSE AND GOALS

1. Scope

This manual has been prepared especially for Majestic—12 units. Its purpose is to present all aspects of Majestic—12 so authorized personnel will have a better understanding of the goals of the Group, be able to more expertly deal with Unidentified Flying Objects, Extraterrestrial Technology and Entities, and increase the efficiency of future operations.

2. General

MJ—12 takes the subject of UFOBs, Extraterrestrial Technology, and Extraterrestrial Biological Entities very seriously and considers the entire subject to be a matter of the very highest national security. For that reason everything relating to the subject has been assigned the very highest security classification. Three main points will be covered in this section.

a. The general aspects of MJ—12 to clear up any misconceptions that anyone may have.

b. The importance of the operations.

c. The need for absolute secrecy in all phases of operation.

3. Security Classification

All information relating to MJ—12 has been classified MAJIC EYES ONLY and carries a security level 2 points above that of Top Secret. The reason for this has to do with the consequences that may arise not only from the impact upon the public should the existence of such matters become general knowledge, but also the danger of having such advanced technology as has been recovered by the Air Force fall into the hands of unfriendly foreign powers. No information is released to the public press and the official government position is that no special group such as MJ—12 exists.

4. History of the Group

Operation Majestic—12 was established by special classified presidential order on 24 September 1947 at the recommendation of Secretary of Defense James V. Forrestal and Dr. Vannevar Bush, Chairman of the Joint Research and Development Board. Operations are carried out under a Top Secret Research and Development - Intelligence Group directly responsible only to the President of the United States. The goals of the MJ—12 Group are as follows:

a. The recovery for scientific study of all materials and devices of a foreign or extraterrestrial manufacture that may become available. Such material and devices will be recovered by any and all means deemed necessary by the Group.

b. The recovery for scientific study of all entities and remains of entities not of terrestrial origin which may become available through independent action by those entities or by misfortune or military action.

c. The establishment and administration of Special Teams to accomplish the above operations.

d. The establishment and administration of special secure facilities located at secret locations within the continental borders of the United States for the receiving, processing, analysis, and scientific study of any and all material and entities classified as being of extraterrestrial origin by the Group or the Special Teams.

e. Establishment and administration of covert operations to be carried out in concert with Central Intelligence to effect the recovery for the United States of extraterrestrial technology and entities which may come down inside the territory of or fall into the possession of foreign powers.

f. The establishment and maintenance of absolute top secrecy concerning all the above operations.

5. Current Situation

It is considered as far as the current situation is concerned, that there are few indications that these objects and their builders pose a direct threat to the security of the United States, despite the uncertainty as to their ultimate motives in coming here. Certainly the technology possessed by these beings far surpasses anything known to modern science, yet their presence here seems to be benign, and they seem to be avoiding contact with our species, at least for the present. Several dead entities have been recovered along with a substantial amount of wreckage and devices from downed craft, all of which are now under study at various locations. No attempt has been made by extraterrestrial entities either to contact authorities or to recover their dead counterparts or the downed craft, even though one of the crashes was the result of direct military action. The greatest threat at this time arises from the acquisition and study of such advanced technology by foreign powers unfriendly to the United States. It is for this reason that the recovery and study of this type of material by the United States has been given such a high priority.

CHAPTER 2
INTRODUCTION

Section I. GENERAL

6. Scope

a. This operations manual is published for the information and guidance of all concerned. It contains information on determination, documentation, collection, and disposition of debris, devices, craft, and occupants of such craft as defined as Extraterrestrial Technology or Extraterrestrial Biological Entities (EBEs) in Section II of this chapter.

b. Appendix I-Ia contain a list of current references, including technical manuals and other available publications applicable to these operations.

c. Appendix II contains a list of personnel who comprise the Majestic-12 Group.

7. Forms and Records

Forms used for reporting operations are listed in Appendix I.

Section II. DEFINITION AND DATA

8. General

Extraterrestrial Technology is defined as follows:

a. Aircraft identified as not manufactured in the United States or any terrestrial foreign power, including experimental military or civilian aircraft. Aircraft in this category are generally known as Unidentified Flying Objects (UFOBs). Such aircraft may appear as one of several shapes and configurations and exhibit extraordinary flight characteristics.

b. Objects and devices of unknown origin or function, manufactured by processes or of materials not consistent with current technology or scientific knowledge.

c. Wreckage of any aircraft thought to be of extraterrestrial manufacture or origin. Such wreckage may be the result of accidents or military action.

d. Materials that exhibit unusual or extraordinary characteristics not consistent with current technology or scientific knowledge.

Extraterrestrial Biological Entities (EBEs) are described as:

a. Creatures, humanoid or otherwise, whose evolutionary processes responsible for their development is demonstrably different from those postulated or observed in homo sapiens.

9. Description of Craft

Documented extraterrestrial craft (UFOBs) are classified in one of four categories based on general shape, as follows:

a. Elliptical, or disc shape. This type of craft is of a metallic construction and dull aluminum in color. They have the appearance of two pie-pans or shallow dishes pressed together and may have a raised dome on the top or bottom. No seams or joints are visible on the surface, giving the impression of one-piece construction. Discs are estimated from 50-300 feet in diameter and the thickness is approximately 15 per cent of the diameter, not including the dome, which is 30 per cent of the disc diameter and extends another 4-6 feet above the main body of the disc. The dome may or may not include windows or ports, and ports are present around the lower rim of the disc in some instances. Most disc-shaped craft are equipped with lights on the top and bottom, and also around the rim. These lights are not visible when the craft is at rest or not functioning. There are generally no visible antenna or projections. Landing gear consists of three extendible legs ending in circular landing pads. When fully extended this landing gear supports the main body 2-3 feet above the surface at the lowest point. A rectangular hatch is located along the equator or on the lower surface of the disc.

b. Fuselage or cigar shape. Documented reports of this type of craft are extremely rare. Air Force radar reports indicate they are approximately 2 thousand feet long and 95 feet thick, and apparently they do not operate in the lower atmosphere. Very little information is available on the performance of these craft, but radar reports have indicated speeds in excess of 7,000 miles per hour. They do not appear to engage in the violent and erratic maneuvers associated with the smaller types.

c. Ovoid or circular shape. This type of craft is described as being shaped like an ice cream cone, being rounded at the large end and tapering to a near-point at the other end. They are approximately 30-40 feet long and the thick end diameter is approximately 20 per cent of the length. There is an extremely bright light at the pointed end, and this craft usually travels point down. They can appear to be any shape from round to cylindrical, depending upon the angle of observation. Often sightings of this type of craft are elliptical craft seen at an inclined angle or edge-on.

d. Airfoil or triangular shape. This craft is believed to be new technology due to the rarity and recency of the observations. Radar indicates an isosceles triangle profile, the longest side being nearly 300 feet in length. Little is known about the performance of these craft due to the rarity of good sightings, but they are believed capable of high speeds and abrupt maneuvers similar to or exceeding the performance attributed to types "a" and "c".

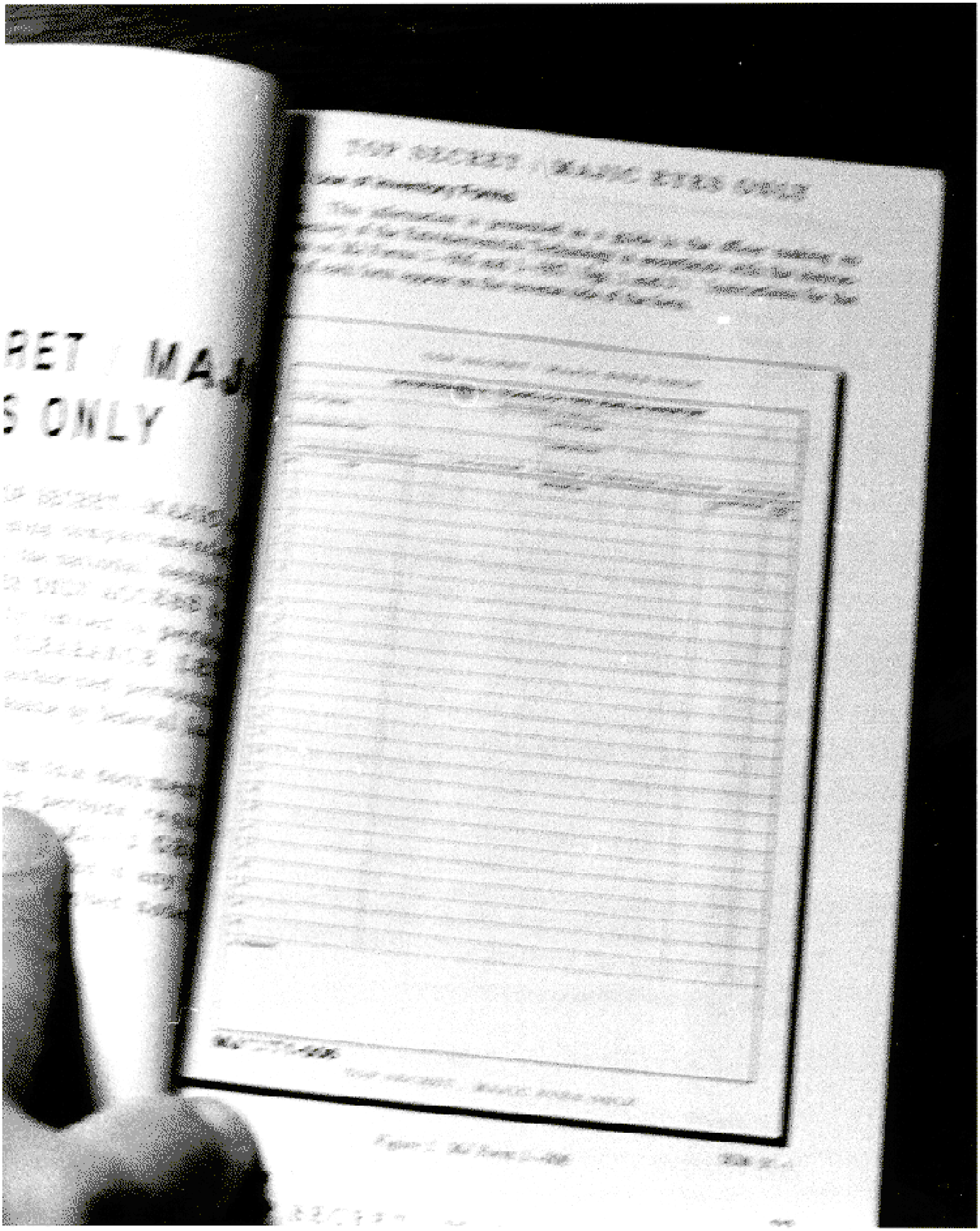
10. Description of Extraterrestrial Biological Entities (EBEs)

Examination of remains recovered from wreckage of UFOBs indicates that Extraterrestrial Biological Entities may be classified into two distinct categories as follows:

a. EBE Type I. These entities are humanoid and might be mistaken for human beings of the Oriental race if seen from a distance. They are bi-pedal, 5-5 feet 4 inches in height and weigh 80-100 pounds. Proportionally they are similar to humans, although the cranium is somewhat larger and more rounded. The skin is a pale, chalky-yellow in color, thick, and slightly pebbled in appearance. The eyes are small, wide-set, almond-shaped, with brownish-black irises with very large pupils. The whites of the eyes are not like that of humans, but have a pale gray cast. The ears are small and set low on the skull. The nose is thin and long, and the mouth is wider than in humans, and nearly lipless. There is no apparent facial hair and very little body hair, that being very fine and confined to the underarm and the groin area. The body is thin and without apparent body fat, but the muscles are well-developed. The hands are small, with four long digits but no opposable thumb. The outside digit is jointed in a manner as to be nearly opposable, and there is no webbing between the fingers as in humans. The legs are slightly but noticeably bowed, and the feet are somewhat splayed and proportionally large.

b. EBE Type II. These entities are humanoid but differ from Type I in many respects. They are bi-pedal, 3 feet 5 inches - 4 feet 2 inches in height and weigh 25-50 pounds. Proportionally, the head is much larger than humans or Type I EBEs, the cranium being much larger and elongated. The eyes are very large, slanted, and nearly wrap around the side of the skull. They are black with no whites showing. There is no noticeable brow ridge, and the skull has a slight peak that runs over the crown. The nose consists of two small slits which sit high above the slit-like mouth. There are no external ears. The skin is a pale bluish-gray color, being somewhat darker on the back of the creature, and is very smooth and fine-celled. There is no hair on either the face or the body, and these creatures do not appear to be mammalian. The arms are long in proportion to the legs, and the hands have three long, tapering fingers and a thumb which is nearly as long as the fingers. The second finger is thicker than the others, but not as long as the index finger. The feet are small and narrow, and four toes are joined together with a membrane.

It is not definitely known where either type of creature originates, but it seems certain that they did not evolve on earth. It is further evident, although not certain, that they may have originated on two different planets.


TOP SECRET / MAJIC EYES ONLY
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11. Description of Extraterrestrial Technology

The following information is from preliminary analysis reports of wreckage collected from crash sites of extraterrestrial craft 1947-1953, excerpts from which are quoted verbatim to provide guidance as to the type and characteristics of material that might be encountered in future recovery operations.

a. Initial analysis of the debris from the crash site seems to indicate that the debris is that of an extraterrestrial craft which exploded from within and came into contact with the ground with great force, completely destroying the craft. The volume of matter indicates that the craft was approximately the size of a medium aircraft, although the weight of the debris indicates that the craft was extremely light for its size.

b. Metallurgical analysis of the bulk of the debris recovered indicates that the samples are not composed of any materials currently known to Terrestrial science.

c. The material tested possesses great strength and resistance to heat in proportion to its weight and size, being stronger by far than any materials used in military or civilian aircraft at present.

d. Much of the material, having the appearance of aluminum foil or aluminum-magnesium sheeting, displays none of the characteristics of either metal, resembling instead some kind of unknown plastic-like material.

e. Solid structures and substantial beams having a distinct similarity in appearance to very dense grain-free wood, was very light in weight and possesses tensile and compression strength not obtainable by any means known to modern industry.

f. None of the material tested displayed measurable magnetic characteristics or residual radiation.

g. Several samples were engraved or embossed with marks and patterns. These patterns were not readily identifiable and attempts to decipher their meaning has been largely unsuccessful.

h. Examination of several apparent mechanical devices, gears, etc. revealed little or nothing of their functions or methods of manufacture.

CHAPTER 3
RECOVERY OPERATIONS

Section I. SECURITY

12. Press Blackout

Great care must be taken to preserve the security of any location where Extraterrestrial Technology might be retrievable for scientific study. Extreme measures must be taken to protect and preserve any material or craft from discovery, examination, or removal by civilian agencies or individuals of the general public. It is therefore recommended that a total press blackout be initiated whenever possible. If this course of action should not prove feasible, the following cover stories are suggested for release to the press. The officer in charge will act quickly to select the cover story that best fits the situation. It should be remembered when selecting a cover story that official policy regarding UFOBs is that they do not exist.

a. Official Denial. The most desirable response would be that nothing unusual has occurred. By stating that the government has no knowledge of the event, further investigation by the public press may be forestalled.

b. Discredit Witnesses. If at all possible, witnesses will be held incommunicado until the extent of their knowledge and involvement can be determined. Witnesses will be discouraged from talking about what they have seen, and intimidation may be necessary to ensure their cooperation. If witnesses have already contacted the press, it will be necessary to discredit their stories. This can best be done by the assertion that they have either misinterpreted natural events, are the victims of hysteria or hallucinations, or are the perpetrators of hoaxes.

c. Deceptive Statements. It may become necessary to issue false statements to preserve the security of the site. Meteors, downed satellites, weather balloons, and military aircraft are all acceptable alternatives, although in the case of the downed military aircraft statement care should be exercised not to suggest that the aircraft might be experimental or secret, as this might arouse more curiosity of both the American and the foreign press. Statements issued concerning contamination of the area due to toxic spills from trucks or railroad tankers can also serve to keep unauthorized or undesirable personnel away from the area.

13. Secure the Area

The area must be secured as rapidly as possible to keep unauthorized personnel from infiltrating the site. The officer in charge will set up a perimeter and establish a command post inside the perimeter. Personnel allowed

...on the site will be kept to the absolute minimum necessary to prepare the craft or debris for transport, and will consist of Military Security Forces.

Local authorities may be pressed into service as traffic and crowd control. *Under no circumstances* will local officials or law enforcement personnel be allowed inside the perimeter and all necessary precautions should be taken to ensure that they do not interfere with the operation.

a. Perimeter. It is desirable that sufficient military personnel be utilized to set up a perimeter around the site large enough to keep both unauthorized personnel and the perimeter personnel from seeing the site. Once the site is contained, regular patrols will be set up along the perimeter to assure complete security, and electronic surveillance will be utilized to augment the patrols. Perimeter personnel will be equipped with hand communication and automatic weapons with live ammunition. Personnel working at the site will carry sidearms. No unauthorized personnel will be allowed into the secure area.

b. Command Post. Ideally, the command post should be as close to the site as is practical to efficiently coordinate operations. As soon as the command post is operational, contact with the Majestic—12 Group will be established via secure communications.

c. Area Sweep. The site and the surrounding area will be cleared of all unauthorized personnel. Witnesses will be debriefed and detained for further examination by MJ—12. *Under no circumstances* will witnesses be released from custody until their stories have been evaluated by MJ—12 and they have been thoroughly debriefed.

d. Situation Evaluation. A preliminary evaluation of the situation will be completed and a preliminary report prepared. The MJ—12 Group will then be briefed on the situation at the earliest possible opportunity. The MJ—12 Group will then make a determination as to whether or not a MJ—12 RED TEAM or OPNAC Team will be dispatched to the area.

Section II. TECHNOLOGY RECOVERY

14. Removal and Transport

As soon as communication is established, removal and transport of all materiel will commence under orders from MJ—12.

a. Documentation. If the situation permits, care should be taken to document the area with photographs before anything is moved. The area will be checked for radiation and other toxic agents. If the area cannot be kept secure for an extended period of time, all material must be packed and transported as quickly as possible to the nearest secure military facility. This will be accomplished by covered transport using little-traveled roads wherever possible.

b. Complete or Functional Craft. Craft are to be approached with extreme caution if they appear functional, as serious injury may result from exposure o radiation and electrical discharges. If the craft is functioning, but ppears to be abandoned, it may be approached only by specially trained IJ—12 RED TEAM personnel wearing protective clothing. Any device that eems to be functioning should also be left to MJ—12 RED TEAM disposal. omplete craft and parts of crafts too large to be transported by covered ransport will be disassembled, if this can be accomplished easily and uickly. If they must be transported whole, or on open flatbed trailers, they ill be covered in such a manner as to camouflage their shape.

e. *Extraterrestrial Biological Entities.* EBEs must be removed to a top ecurity facility as quickly as possible. Great care should be taken to preent possible contamination by alien biological agents. Dead EBEs should e packed in ice at the earliest opportunity to preserve tissues. Should live BEs be encountered, they should be taken into custody and removed to a op security facility by ambulance. Every effort should be taken to ensure he EBE's survival. Personnel involvement with EBEs alive or dead must e kept to an absolute minimum. (See Chapter 5 for more detailed informaon on dealing with EBEs.)

5. Cleansing the Area

Once all material has been removed from the secured site, the immediate rea will be thoroughly inspected to make sure that all traces of Extraterestrial Technology have been removed. In the case of a crash, the surunding area will be thoroughly gone over several times to ensure that othing has been overlooked. The search area involved may vary according o local conditions, at the discretion of the officer in charge. When the offir in charge is satisfied that no further evidence of the event remains at the te, it may be evacuated.

6. Special or Unusual Conditions

The possibility exists that extraterrestrial craft may land or crash in heavy populated areas, where security cannot be maintained or where large gments of the population and the public press may witness these events. ontingency Plan MJ-1949-04P / 78 (TOP SECRET - EYES ONLY) should e held in readiness should the need to make a public disclosure become necsary.

17. Extraterrestrial Technology Classification Table

No.	Item	Description or condition	MJ-12 Code	Receiving facility
1	Aircraft.	Intact, operational, or semi-intact aircraft of Extraterrestrial design and manufacture.	UA-002-6	Area 51 S-4
2	Intact device.	Any mechanical or electronic device or machine which appears to be undamaged and functional.	ID-301-F	Area 51 S-4
3	Damaged device.	Any mechanical or electronic device or machine which appears to be damaged but mostly complete.	DD-303-N	Area 51 S-4
4	Powerplant.	Devices and machines or fragments which are possible propulsion units, fuel, and associated control devices and panels.	PD-40-8G	Area 51 S-4
5	Identified fragments.	Fragments composed of elements or materials easily recognized as known to current science and technology, i.e.: aluminum, magnesium, plastic, etc.	IF-101-K	Area 51 S-4
6	Unidentified fragments.	Fragments composed of elements or materials not known to current science and technology and which exhibit unusual or extraordinary characteristics.	UF-103-M	Area 51 S-4
7	Supplies and provisions.	Non-mechanical or non-electronic materials of a support nature such as clothing, personal belongings, organic ingestibles, etc.	SP-331	Blue Lab WP-61
8	Living entity.*	Living non-human organisms in apparent good or reasonable health.	EBE-010	OPNAC BBS-01
9	Non-living entity.	Deceased non-human organisms or portions of organisms, organic remains and other suspect organic matter.	EBE-XO	Blue Lab WP-61
10	Media.	Printed matter, electronic recordings, maps, charts, photographs and film.	MM-54A	Building 21 KB-88
11	Weapons.	Any device or portion of a device thought to be offensive or defensive weaponry.	WW-010	Area 51 S-4

**Living entities must be contained in total isolation pending arrival of OPNAC personnel.*

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EXTRATERRESTRIAL TECHNOLOGY PACKING LIST

POINT OF ORIGIN

FINAL DESTINATION | SHIPPING CODE NO. | DATE

SHIPPING METHOD | PACKED BY | DATE / TIME

INSPECTED BY | DATE / TIME

NO.	ITEM	CLASSIFICATION NO.	NO.	ITEM	CLASSIFICATION NO.
1			21		
2			22		
3			23		
4			24		
5			25		
6			26		
7			27		
8			28		
9			29		
10			30		
11			31		
12			32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

41. REMARKS OR SPECIAL INSTRUCTIONS

If additional space is required, attach MJ Form 1—007a.

RECEIVED BY | DATE / TIME | INSPECTED BY | DATE / TIME

MJ 1-007

TOP SECRET / MAJIC EYES ONLY

SOM 01 - 2

Figure 2. MJ Form 1—007

9. Packaging and Packing Data

a. Domestic Shipment. Individual items are tagged and wrapped in a moisture-vaporproof barrier and heat sealed. They are then placed in a corrugated fiberboard box. The voids within the box are packed thoroughly

CHAPTER 4
RECEIVING AND HANDLING

Section I. HANDLING UPON RECEIPT OF MATERIAL

. Uncrating, Unpacking, and Checking

(fig. 3)

Note. The uncrating, unpacking, and checking procedure for containers marked AJIC—12 ACCESS ONLY" will be carried out by personnel with MJ—12 clear-ce. Containers marked in this manner will be placed in storage in a top security a until such time as authorized personnel are available for these procedures.

a. Be very careful when uncrating and unpacking the material. Avoid rusting tools into the interior of the shipping container. Do not damage e packaging materials any more than is absolutely necessary to remove e specimens; these materials may be required for future packaging. Stow e interior packaging materials within the shipping container. When crating and unpacking the specimens, follow the procedure given in (1) rough (11) below;

(1) Unpack the specimens in a top security area to prevent access of unauthorized personnel.

(2) Cut the metal wires with a suitable cutting tool, or twist them with pliers until the straps crystallize and break.

(3) Remove screws from the top of the shipping container with a screw driver.

(4) Cut the tape and seals of the case liner so that the waterproof paper will be damaged as little as possible.

(5) Lift out the packaged specimens from the wooden case.

(6) Cut the tape which seals the top flaps of the outer cartons; be careful not to damage the cartons.

(7) Cut the barrier along the top heat sealed seam and carefully remove the inner carton.

(8) Remove the sealed manila envelope from the top of the inner carton.

(9) Open the inner carton and remove the fiberboard inserts, dessicant, and humidity indicator.

(10) Lift out the heat sealed packaging containing the specimens; arrange them in an orderly manner for inspection.

(11) Place all packaging material in the shipping container for use in future repacking.

b. Thoroughly check all items against the shipping documents. Carefully

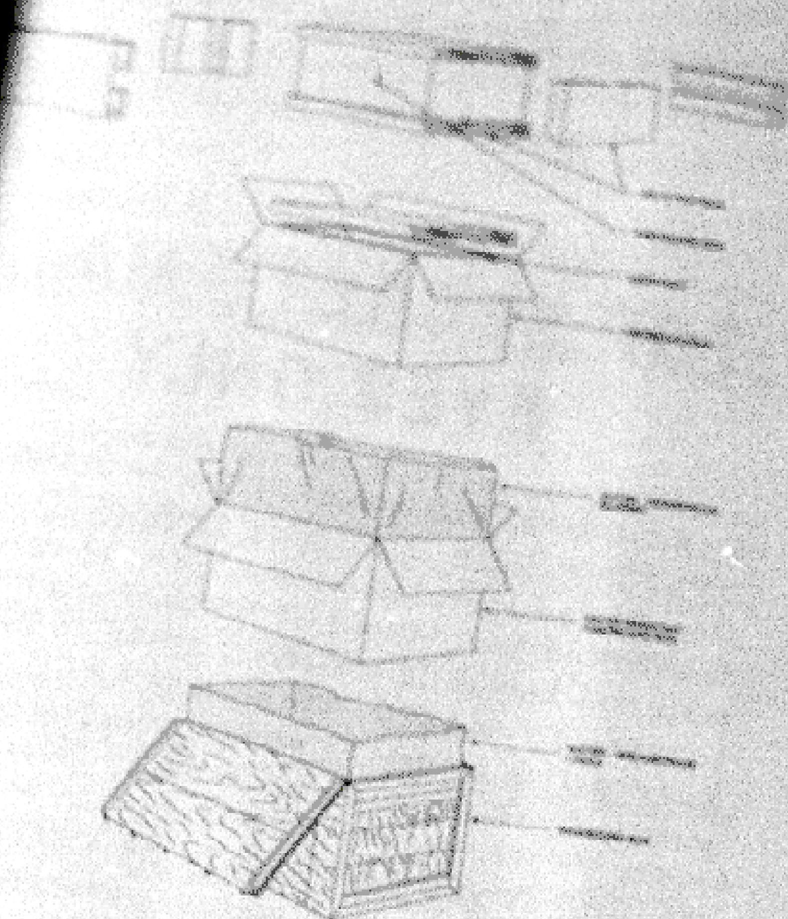

Figure 3. Packaging diagram. SOM 01-3

...pect all items for possible damage during shipping or handling. Sort the ...ms according to classification number in preparation for transfer to the ...signated laboratory or department. Laboratory or department personnel ...e responsible for transporting items to the designated areas. This will be ...omplished as quickly as possible by covered transport escorted by secu-...y personnel.

CHAPTER 5
EXTRATERRESTRIAL BIOLOGICAL ENTITIES

Section I. LIVING ORGANISMS

1. Scope

a. This section deals with encounters with living Extraterrestrial Biologi-
al Entities (EBEs). Such encounters fall under the jurisdiction of MJ—12
PNAC BBS—01 and will be dealt with by this special unit only. This sec-
on details the responsibilities of persons or units making the initial con-
act.

2. General

Any encounter with entities known to be of extraterrestrial origin is to be
onsidered to be a matter of national security and therefore classified TOP
ECRET. Under no circumstance is the general public or the public press to
arn of the existence of these entities. The official government policy is
at such creatures do not exist, and that no agency of the federal govern-
ent is now engaged in any study of extraterrestrials or their artifacts. Any
eviation from this stated policy is absolutely forbidden.

3. Encounters

Encounters with EBEs may be classified according to one of the following
tegories:

a. *Encounters initiated by EBEs.* Possible contact may take place as a
sult of overtures by the entities themselves. In these instances it is antici-
ted that encounters will take place at military installations or other
cure locations selected by mutual agreement. Such meetings would have
e advantage of being limited to personnel with appropriate clearance,
way from public scrutiny. Although it is not considered very probable,
ere also exists the possibility that EBEs may land in public places without
ior notice. In this case the OPNAC Team will formulate cover stories for
e press and prepare briefings for the President and the Chiefs of Staff.

b. *Encounters as the result of downed craft.* Contact with survivors of
cidents or craft downed by natural events or military action may occur
ith little or no warning. In these cases, it is important that the initial con-
ct be limited to military personnel to preserve security. Civilian witnesses
the area will be detained and debriefed by MJ—12. Contact with EBEs
military personnel not having MJ—12 or OPNAC clearance is to be
rictly limited to action necessary to ensure the availability of the EBEs for
udy by the OPNAC Team.

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Isolation and Custody

a. EBEs will be detained by whatever means are necessary and removed secure location as soon as possible. Precautions will be taken by person- coming in contact with EBEs to minimize the risk of disease as a result ontamination by unknown organisms. If the entities are wearing space ts or breathing apparatus of some kind, care should be exercised to pre- t damage to these devices. While all efforts should be taken to assure well-being of the EBEs, they must be isolated from any contact with uthorized personnel. While it is not clear what provisions or amenities ght be required by non-human entities, they should be provided if possi- . The officer in charge of the operation will make these determinations, no guidelines now exist to cover this area.

. Injured or wounded entities will be treated by medical personnel igned to the OPNAC Team. If the team medical personnel are not imme- tely available, First Aid will be administered by Medical Corps personnel the initial site. Since little is known about EBE biological functions, aid l be confined to the stopping of bleeding, bandaging of wounds and splint- of broken limbs. No medications of any kind are to be administered as effects of terrestrial medications on non-human biological systems are possible to predict. As soon as the injuries are considered stabilized, the Es will be moved by closed ambulance or other suitable conveyance to a ure location.

. In dealing with any living Extraterrestrial Biological Entity, security is paramount importance. All other considerations are secondary. Although s preferable to maintain the physical well-being of any entity, the loss of E life is considered acceptable if conditions or delays to preserve that life any way compromises the security of the operations.

d. Once the OPNAC Team has taken custody of the EBEs, their care and nsportation to designated facilities becomes the responsibility of OPNAC rsonnel. Every cooperation will be extended to the team in carrying out duties. OPNAC Team personnel will be given TOP PRIORITY at all nes regardless of their apparent rank or status. No person has the thority to interfere with the OPNAC Team in the performance of its ties, by special direction of the President of the United States.

Section II. NON-LIVING ORGANISMS

. Scope.

Ideally, retrieval for scientific study of cadavers and other biological mains will be carried out by medical personnel familiar with this type of ocedure. Because of security considerations, such collection may need to done by non-medical personnel. This section will provide guidance for trieval, preservation, and removal of cadavers and remains in the field.

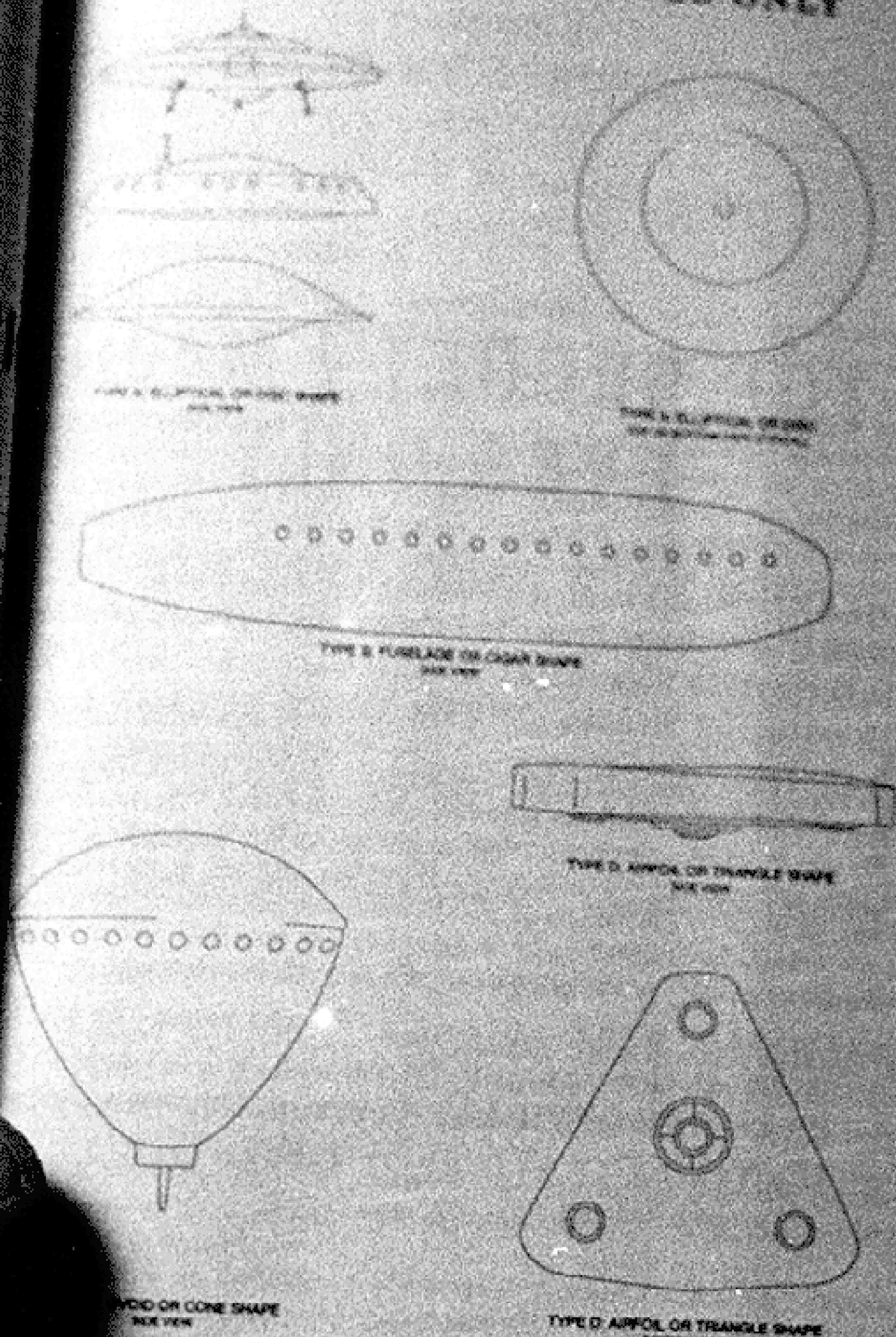
6. **Retrieval and Preservation.**

a. The degree of decomposition of organic remains will vary depending n the length of time the remains have been lying in the open unprotected nd may be accelerated by both local weather conditions and action by redators. Therefore, biological specimens will be removed from the crash ite as quickly as possible to preserve the remains in as good a condition as ossible. A photographic record will be made of all remains before they are emoved from the site.

b. Personnel involved in this type of operation will take all reasonable recautions to minimize physical contact with the cadavers or remains being etrieved. Surgical gloves should be worn or, if they are not available, wool r leather gloves may be worn provided they are collected for decontamination immediately after use. Shovels and entrenching tools may be employed o handle remains provided caution is exercised to be certain no damage is one to the remains. Remains will be touched with bare hands only if no ther means of moving them can be found. All personnel and equipment volved in recovery operations will undergo decontamination procedures mmediately after those operations are have been completed.

c. Remains will be preserved against further decomposition as equipment nd conditions permit. Cadavers and remains will be bagged or securely rapped in waterproof coverings. Tarpaulins or foul weather gear may be sed for this purpose if necessary. Remains will be refrigerated or packed ith ice if available. All remains will be tagged or labeled and the time and ate recorded. Wrapped remains will be placed on stretchers or in sealed ntainers for immediate removal to a secure facility.

d. Small detached pieces and material scraped from solid surfaces will be ut in jars or other small capped containers if available. Containers will be early marked as to their contents and the time and date recorded. Containers will be refrigerated or packed with ice as soon as possible and emoved to a secure facility.



...es in this diagram are gathered from documented sightings to Air Force and Central Intelli-... examination of wreckage collected from various sources years 1947 to 1953 inclusive.

SOM 01 - 4

Figure 4. Extraterrestrial craft.

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CHAPTER 6
GUIDE TO UFO IDENTIFICATION

Section I. UFOB GUIDE

7. Follow-up Investigations

A UFOB report is worthy of follow-up investigation when it contains information to suggest that a positive identification with a well known phenomenon may be made or when it characterizes an unusual phenomenon. The report should suggest almost immediately, largely by the coherency and clarity of the data, that there is something of identification and / or scientific value. In general, reports which should be given consideration are those which involve several reliable observers, together or separately, and which concern sightings of greater duration than one quarter minute. Exception should be made to this when circumstances attending the report are considered to be extraordinary. Special attention should be given to reports which give promise to a "fix" on the position and to those reports involving unusual trajectories.

8. Rules of Thumb

Every UFOB case should be judged individually but there are a number of "rules of thumb," under each of the following headings, which should prove helpful in determining the necessity for follow-up investigation.

a. *Duration of Sighting.* When the duration of a sighting is less than 15 seconds, the probabilities are great that it is not worthy of follow-up. As a word of caution, however, should a large number of individual observers concur on an unusual sighting of a few seconds duration, it should not be dismissed.

b. *Number of Persons Reporting the Sighting.* Short duration sightings by single individuals are seldom worthy of follow-up. Two or three competent independent observations carry the weight of 10 or more simultaneous individual observations. As an example, 25 people at one spot may observe a strange light in the sky. This, however, has less weight than two reliable people observing the same light from different locations. In the latter case a position-fix is indicated.

c. *Distance from Location of Sightings to Nearest Field Unit.* Reports which meet the preliminary criterion stated above should all be investigated if their occurrence is in the immediate operating vicinity of the squadron concerned. For reports involving greater distances, follow-up necessity might be judged as being inversely proportional to the square of the distances concerned. For example, an occurrence 150 miles away might be con-

MJ—12 4838B

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

The MJ12 spy-photographed manual batch, only has the first 21 pages, from UNIT-KB-88.
On second manual page there are also stamped KB-88 21. The 21 may mean it's only 21 Pages.

—But in the late 1950's, a person asked the closest Air Force Base, of how to identify UFO's?
And the Air Force Base sent him the whole section of the MJ12 MANUAL,
dealing with identifying UFO's.
That's why the next 4 additional MJ12 MANUAL PAGES look different.
A few pages overlapped each other, but I only used the 4 additional pages, I missed from the first batch.

sidered to have four times the importance (other things being equal) than one that is 300 miles away.

d. Reliability of Person or Persons Reporting. In establishing the necessity of follow-up investigation only "short term" reliability of individuals can be employed. Short term reliability is judged from the logic and coherency of the original report and by the age and occupation of the person. Particular attention should be given to whether the occupation involves observation reporting or technical knowledge.

e. Number of Individual Sightings Reported. Two completely individual sightings, especially when separated by a mile or more constitutes sufficient cause for follow-up, assuming previous criterion have hot been violated.

f. The Value of Obtaining Additional Information Immediately. If the information cannot be obtained within seven days, the value of such information is greatly decreased. It is of great value to obtain additional information immediately if previously stated criteria have been met. Often, if gathered quickly, two or three items (weather conditions, angular speed, changes in trajectory, duration, etc.) are sufficient for immediate evaluation. If investigation is undertaken after weeks or months the original observers cease to be of value as far as additional new information is concerned. Generally, late interrogation yields only bare repetition of facts originally reported plus an inability on the part of the observer to be objective.

g. Existence of Physical Evidence (Photographs Material, Hardware). In cases where any physical evidence exists, a follow-up should be made even if some of the above criteria have not been met.

29. Conclusion — UFOB Guide.

It is understood that all above criteria must be evaluated in terms of "common sense." The original report, from its working and clarity will almost always suggest to the reader whether there is any "paydirt" in the report.

Section II. IDENTIFICATION CRITERIA

30. General

When a UFO report meets, in large measure, the criteria projected in Section I and a follow-up investigation is instituted, then the interrogator should ask what physical object or objects might have served as the original stimulus for the report. The word "object" here includes optical phenomena such as reflections from clouds, sundogs, etc. Frequently one or perhaps two solutions will be immediately suggested by the nature of the report. The word "solution" cannot be used here in the scientific sense. A solution in UFOB work means that a hypothesis has been arrived at which appears to have the greatest probability of having given rise to the given report. Following is a group of hypotheses or examples which should prove helpful in arriving at solutions. A check should be made to see how many of the items are satisfied by the report and how many are missing. An effort should be made to obtain any missing items as soon as possible. Each typical hypothesis is listed in a separate paragraph.

31. Aircraft

a. Shape. From conventional to circular or elliptical.
b. Size. Pinpoint to actual.
c. Color. Silver to bright yellow (night — black or color of lights).
d. Speed. Generally only angular speeds can be observed. This depends on distance but small objects crossing major portion of sky in less than a minute can be ruled out. Aircraft will not cross major portion of sky in less than a minute whereas a meteor certainly will.
e. Formation. Two to twenty. Numbers greater than 20 more likely birds than aircraft.
f. Trails. May or may not have (vapor and exhaust).
g. Sound. Zero to loud shrill or low depending on altitude.
h. Course. Steady, straight or gently curving (not erratic — may appear still if approaching head-on). Right angle turns and sudden reversals, changes in altitude ruled out. Note: Although report may indicate erratic course, if other items check, follow-up should proceed on basis of aircraft because of psychological tendencies of excited people to exaggerate course changes.
i. Time In Sight. More than 15 seconds, generally of the order of a minute or two.
j. Lighting Conditions. Night or Day.
k. Radar. Should show normal aircraft returns.

32. Balloons

a. Shape. Round to cigar or pinpoint.
b. Size. Balloons up to a hundred feet will generally appear from pinpoint to size of a pea held at armlength.
c. Color. Silver, white or many tints. It may possibly appear dark as when projected against the clouds.
d. Speed. Large scale erratic speed ruled out. In general, hovering to slow apparent speed.
e. Formation. Single to cluster.
f. Trail. None.
g. Sound. None.
h. Course. Straight with a general gradual ascent, unless falling.
i. Time in Sight. Generally long. Note: Balloon may suddenly burst and disappear.
j. Lighting conditions. Night or day but especially at sunset.
k. Radar. No return except when carrying sonde equipment.

33. Meteor

a. Shape. Round to elongated.
b. Size. Pinpoint to size of moon.
c. Color. Flaming yellow with red, green or blue possible..
d. Speed. Crosses large portion of sky in few seconds except if coming head-on.
e. Formation. Generally single — can break into shower at end of trajectory. Occasionally (but rare) small groups.
f. Trail. At night almost always a luminous train which can persist as long as a half hour (rarely). Daytime meteors are much less frequently observed. In daytime, leaves a whitish to dark smoke trail.
g. Sound. None, although occasionally reported (believed psychological).
h. Course. Generally streaking downward, but not necessarily sharply downward. Can on rare occasion give impression of slight rise.
i. Time in Sight. Longest report about 30 seconds, generally less than 10.
j. Lighting conditions. Day or Night. Mostly night.
k. Radar. Return from meteor itself is highly improbably, however, the train left by a meteor, is a good radar reflector.
l. Other. An exceptionally bright meteor is called a fireball. These are rare but extremely spectacular and on occasion have been known to light surroundings to the brightness of daylight.

34. Stars or Planets

The planets, Venus, Mars, Jupiter, and Saturn are generally brighter than any star, but they twinkle very much less (unless very close to horizon). Stars twinkle as great deal and when near the horizon can give impression of flashing light in many colors.
a. Shape. Pinpoint — starlike.
b. Size. Never appreciable.
c. Color. Yellow with rainbow variations.
d. Speed. Stars apparent speeds carry them from east to west in the course of the night but they are often reported as erratic. The effect is psychological, most people being unable to consider a point as being stationary. Occasionally turbulence in the upper atmosphere can cause a star to appear to jump (rare) but somehow twinkling gives the impression of movement to many people.
Note: Just because the report sayes the light moves does note rule out the possiblity
of it being a star unless motion is from one part of sky to another relatively short time.
e. Formation. There are no clusters of very bright stars but faint stars are grouped in their familiar constellations. Note: a report of 4 or 5 bright clustering lights would rule out stars.
f. Trail. None.
g. Sound. None.

h. Course. Always describe 24 hour circle around pole of sky from east to west.

i. Time in Sight. When clear, stars are always visible. Most stars rise or set during the course of the night. Stars low in western sky set within an hour or two. Stars in east, always go higher in sky.

j. Lighting conditions. Night — Twilight.

k. Radar. None.

35. Optical phenomena

This can cover a multitude of things. Original scanning of the report should be made to attempt to determine whether it more likely describes a material object or an optical phenomenon. Optical phenomena which have been reported as UFOBs run from reflections on clouds and layers of ice crystals (sundogs) to the many types of mirages. No one set of optical phenomena can be set down as representation for the whole class. There is no limit to the speed of optical phenomena. Reflections can travel from incredible speed, as in the case of a search-beacon on high clouds, to stationary. These cases if well reported will almost always warrant follow-up. Their variety and connection with upper atmospheric conditions make these observations especially valuable scientifically.

a. Shape. Generally round but can be elliptical or linear.

b. Size. Starlike to large luminous glow.

c. Color. Generally yellow.

d. Speed. Stationary to fantastic.

e. Formation. Any.

f. Trail. None.

g. Sound. None.

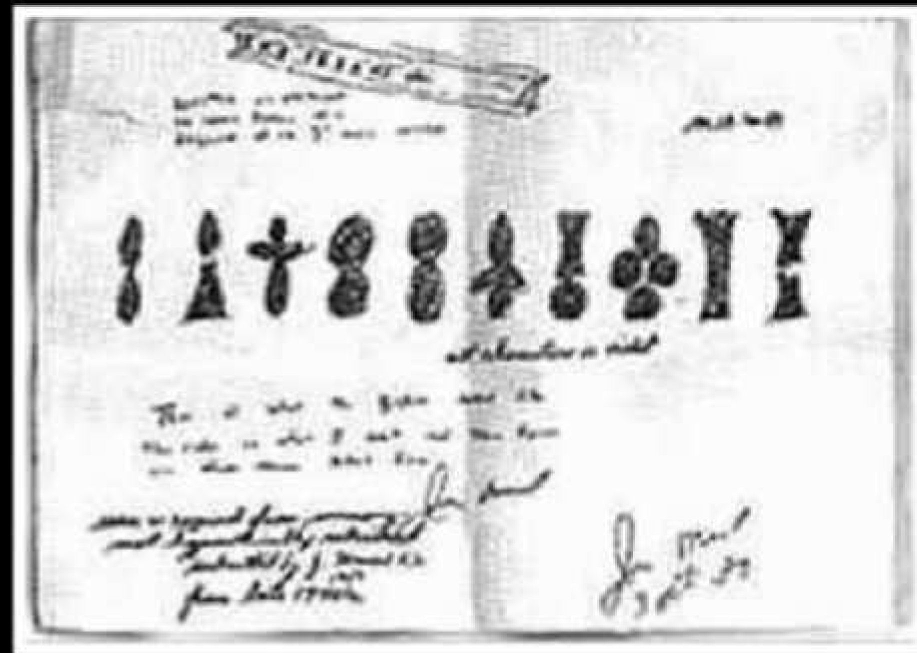
h. Course. Any.

i. Time in Sight. Any.

j. Lighting conditions. Day and night.

k. Radar. No return. In special cases radar response will occasionally have to do with unusual clouds, and meteorological phenomena such as described in Minnaert's book "Light and Color in the Open Air."

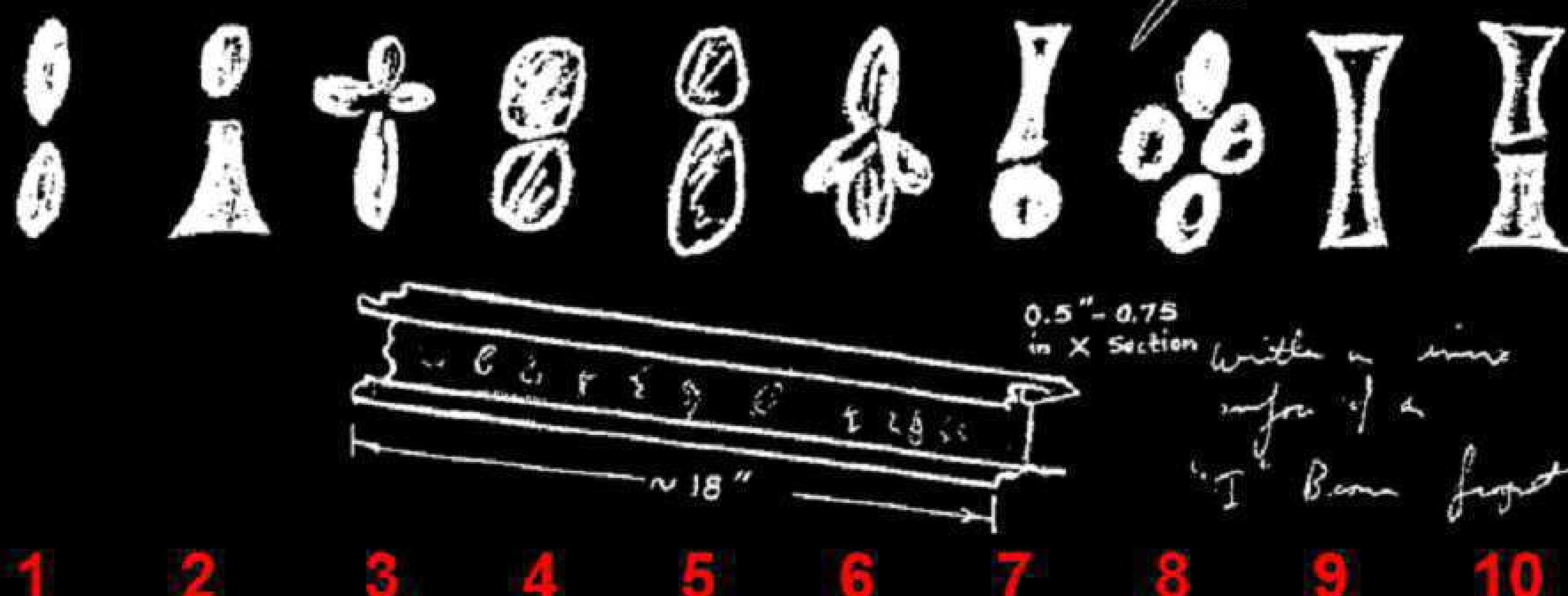
l. Other. One of the standard types is the "sundog." In this a large luminous halo is seen around the sun with one to four images of the sun placed along the halo circle at intervals of 90 degrees. Another report often has to do with a bright planet or even the moon shining through a light overcast. Mirages reflections are said to occur frequently when temperature inversions exists in the atmosphere. If an optical phenomena is suspected, routine check of the meteorological records should be made to establish whether such inversions existed.



JESSE A. MARCEL, M.D., P.C.
900 NORTH MONTANA AVENUE
HELENA, MONTANA 59601
TELEPHONE (406) 442-2410

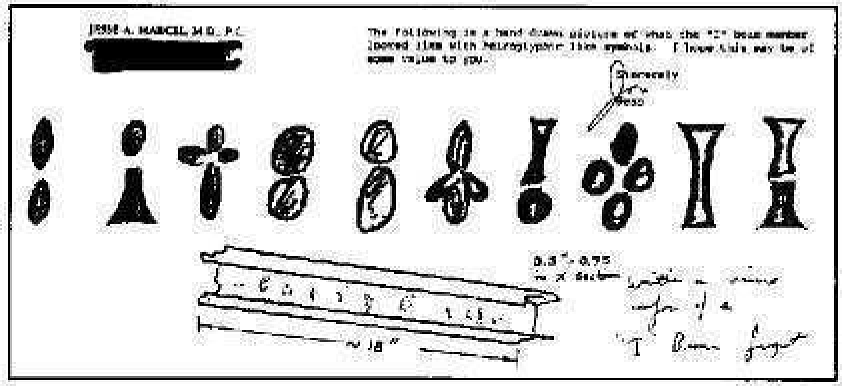
The following is a hand drawn picture of what the "I" beam member looked like with heiroglyphic like symbols. I hope this may be of some value to you.

Sincerely
Jess



ALIEN INSCRIPTION:
HAVE THE ROSWELL UFO DEBRIS SYMBOLS BEEN DECIPHERED?

May 2018



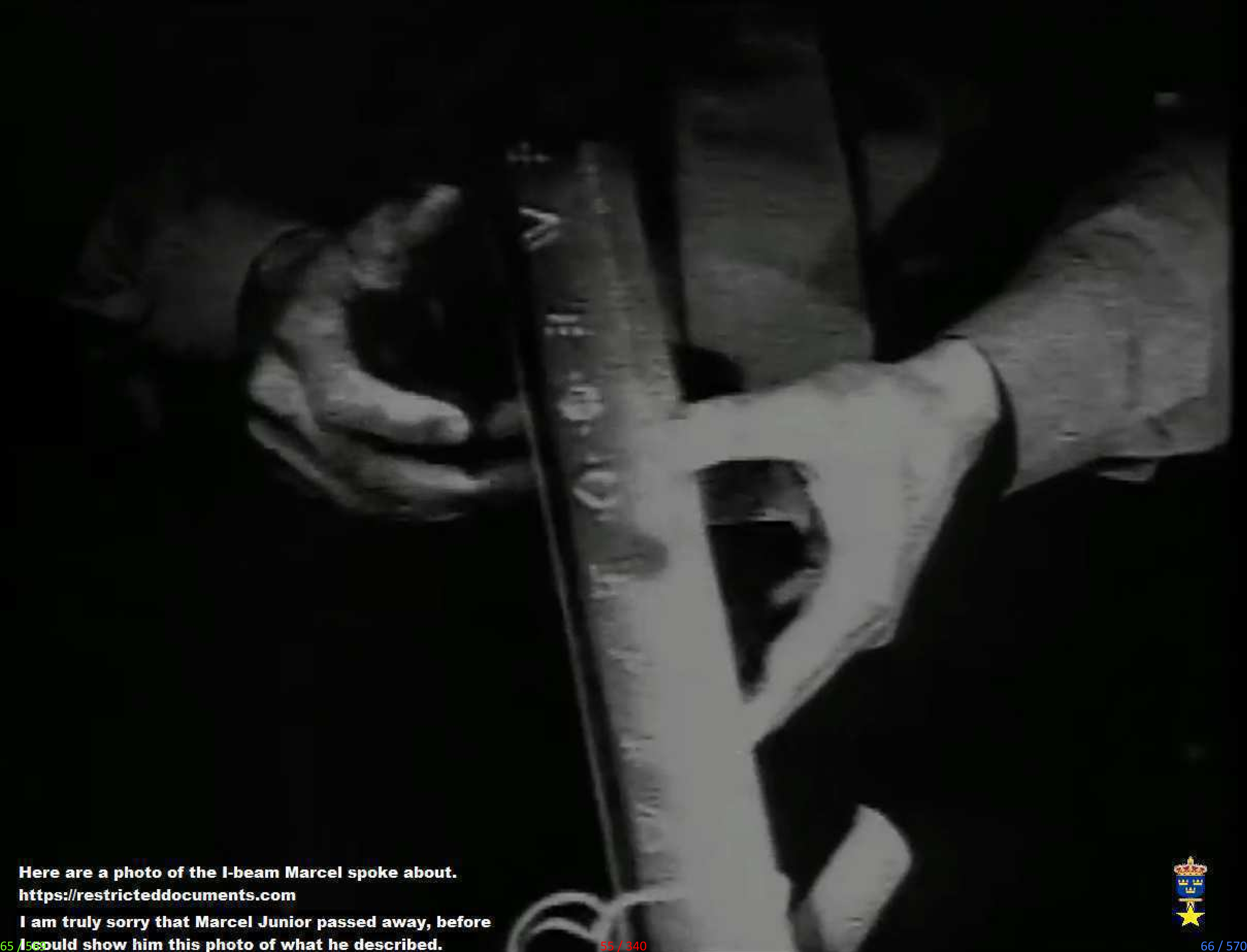
The late Dr. Jesse Marcel Jr., MD was witness to some of the Roswell UFO crash debris as a youngster. His father, Major Jesse Marcel, was stationed at Roswell Army Air Field in July of 1947 when directed to investigate a large field of strange, strewn material, fallen from the sky to the desert floor, on a ranch north of town. It was so interesting that he absconded with a bit of the material and brought it home for his family to see. Skeptics often miss this simple, important detail. If the debris were so "mundane" (like balsa sticks and balloons) as they contend, then why would Marcel essentially steal material evidence that he was directed to investigate, taking some of it back to his 12 year old son Jesse Jr. and wife Viaud, so that they too could see how unusual it was?

Dr. Jesse Marcel Jr.

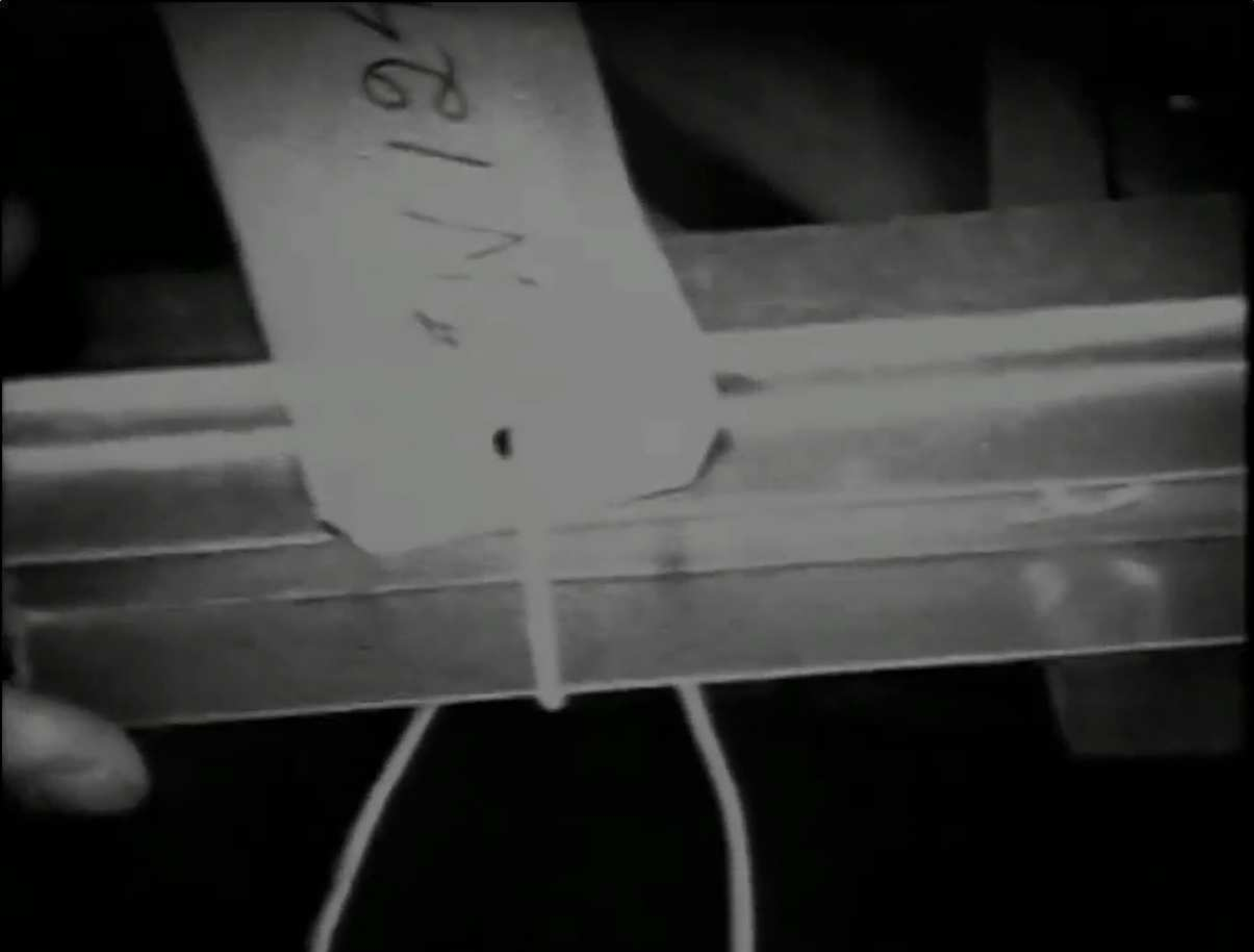
Jesse Marcel Jr. was a noted ear, nose and throat doctor, and was at one time a military flight surgeon. In 1989, Dr. Marcel drew the symbols just as he so vividly remembered them, the "hieroglyphic" figures found on some of the debris. The figures were embossed on an 18 inch fragment of a metal-like "I-beam" structure. The symbols were of a violet-purplish metallic hue and were about ¼ to ½ inch tall. When Marcel Jr. showed his drawing of what he remembered the debris symbols looked like to his mother, she concurred that they were her recollection as well. So unique was the material and the characters on it, that Marcel Jr. was able to recall and recreate them decades later.

WHAT THE SYMBOLS SAY:
THEY COMMUNICATE TECHNICAL INFORMATION Or origin of Spacecraft.

One man said the symbols meaned: —No Smoking When Light Is Lit.



Here are a photo of the I-beam Marcel spoke about.
https://restricteddocuments.com
I am truly sorry that Marcel Junior passed away, before
I could show him this photo of what he described.



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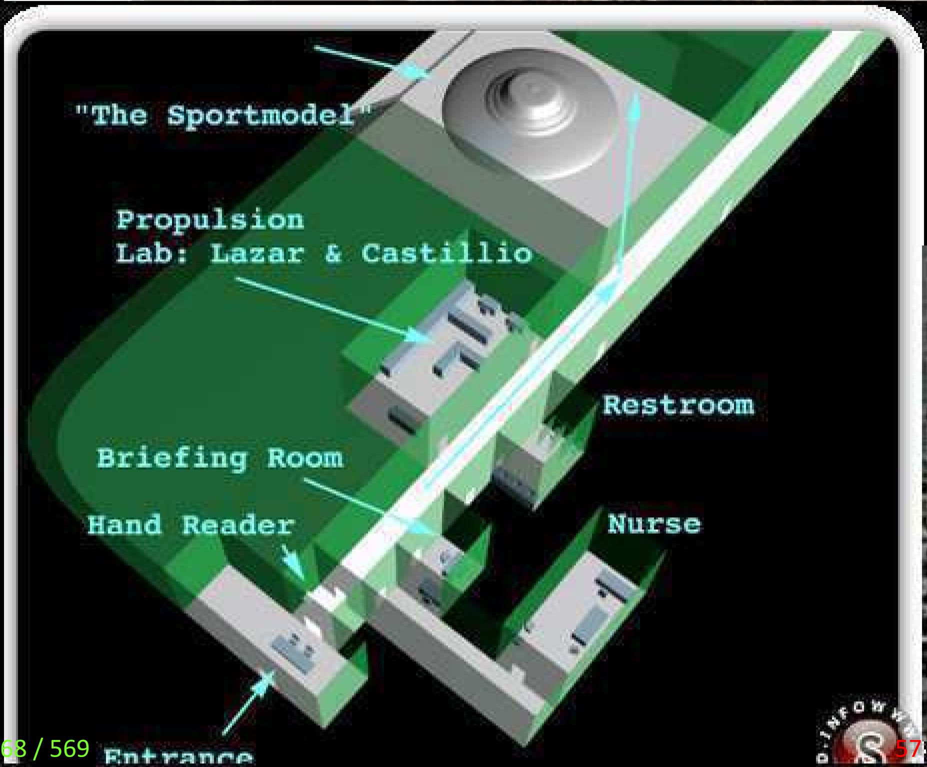
THE UNITED STATES S-4 FACILITY.

S4 MOUNTAIN OPENING BAY TO THE RIGHT.

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Nevada National
Security Site
S4 ALIEN
COMM.
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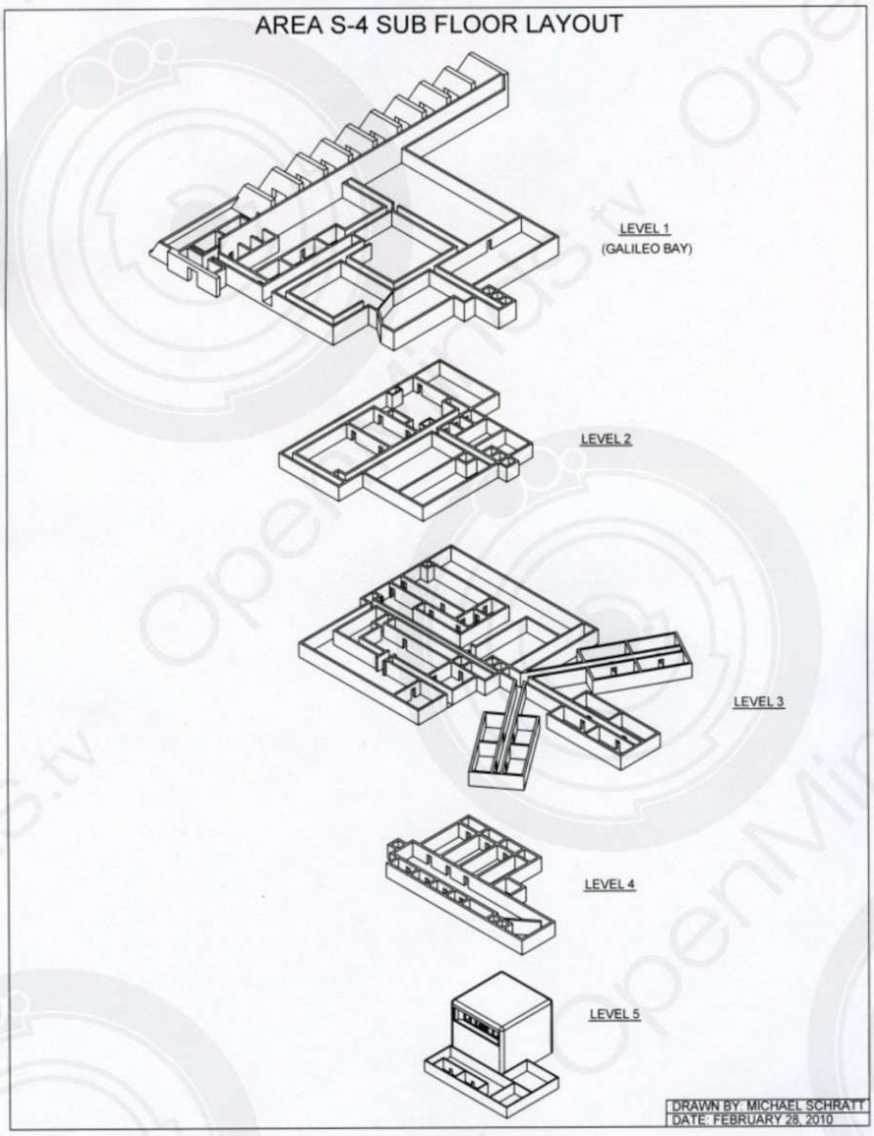
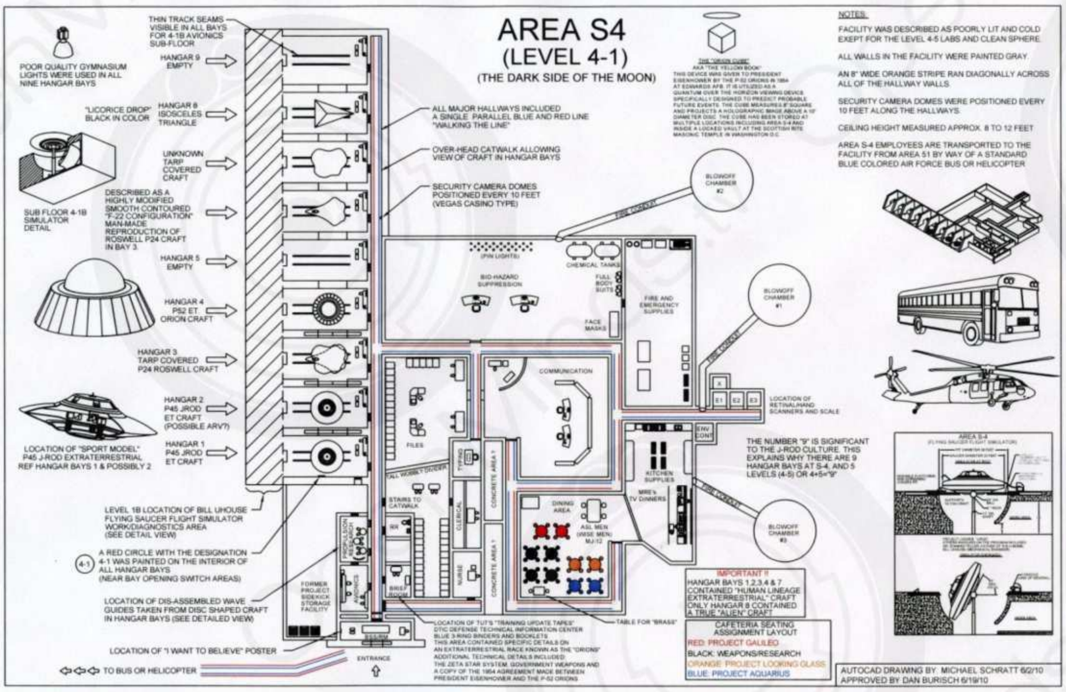
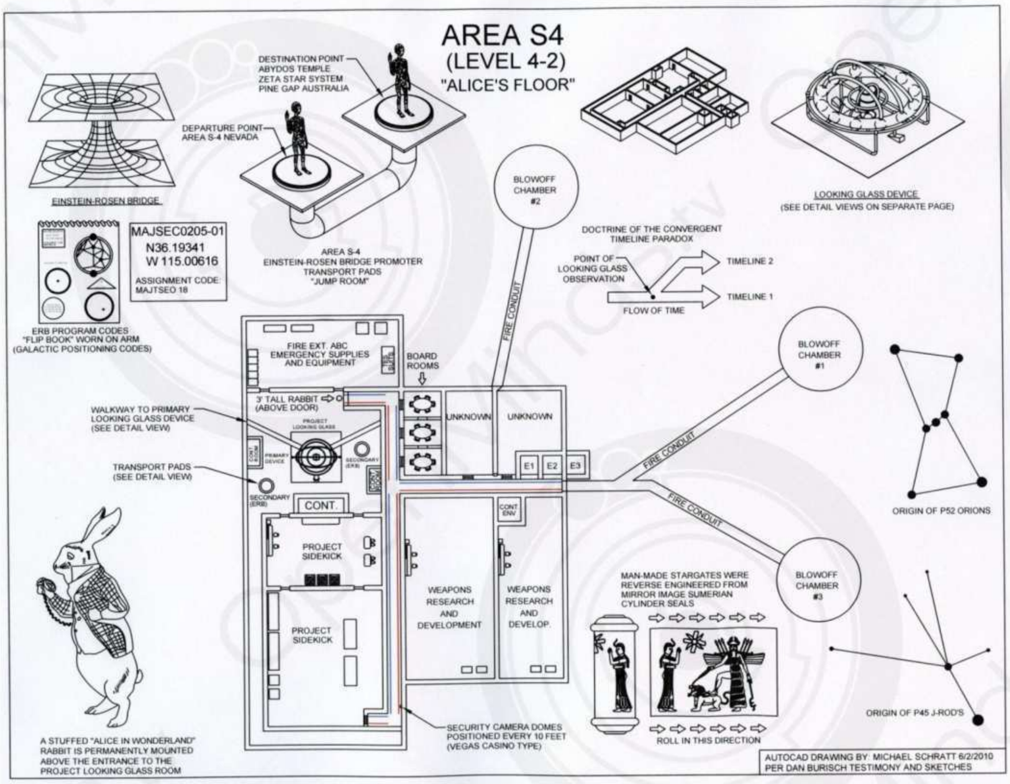


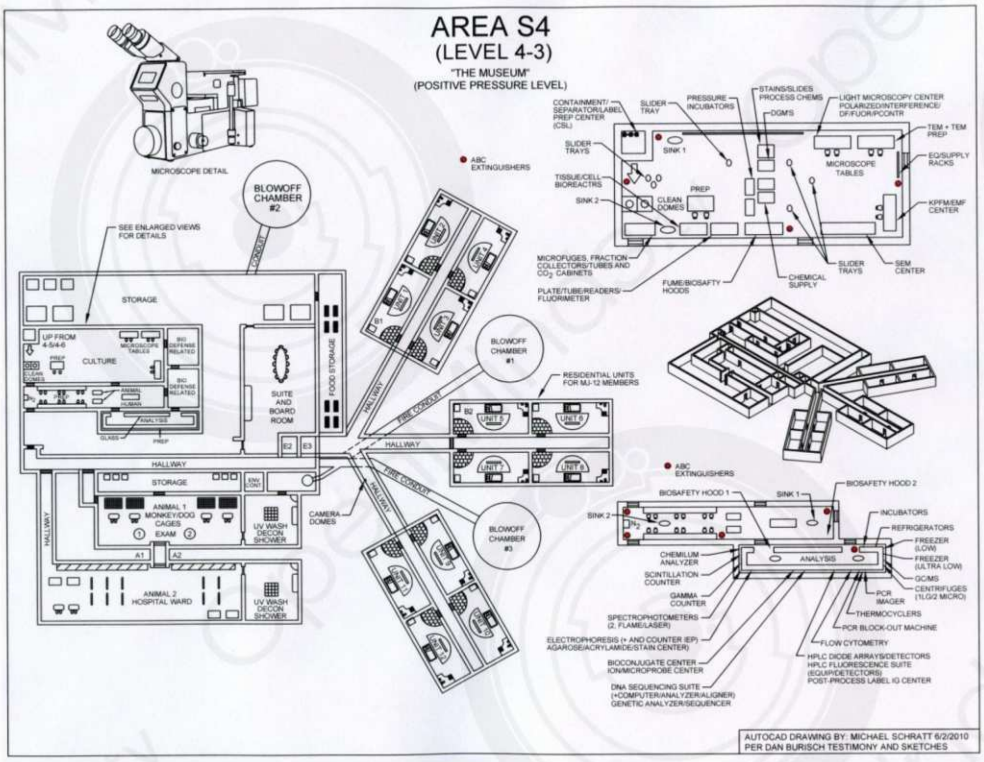
Exploded view of Area S-4 showings levels 1-5 as described by Drs. Dan Burisch and Marcia McDowell. The facility was originally designed as a biological weapons laboratory in the early 1950's. After arriving at Area 51, Dan would either be driven by a bus or flown by helicopter to Area S-4.



Level 1 housed fire control equipment, a dining facility, communications, security/surveillance, an avionics laboratory, and the archives or files department. Provisions for a propulsion research laboratory are also housed on the first floor of Area S-4. The dining area seats consisted of round tables with four attached round seats. The cafeteria seating arrangement was broken down specific projects which included: Project Galileo, weapons research, Project Looking Glass, and Project Aquarius (see level 4-1 floor layout drawing). Note: special members of MJ-12 had their own designated table in the cafeteria. The interior of all nine hangar bays included a red circle which contained the designation 4-1 in red text.



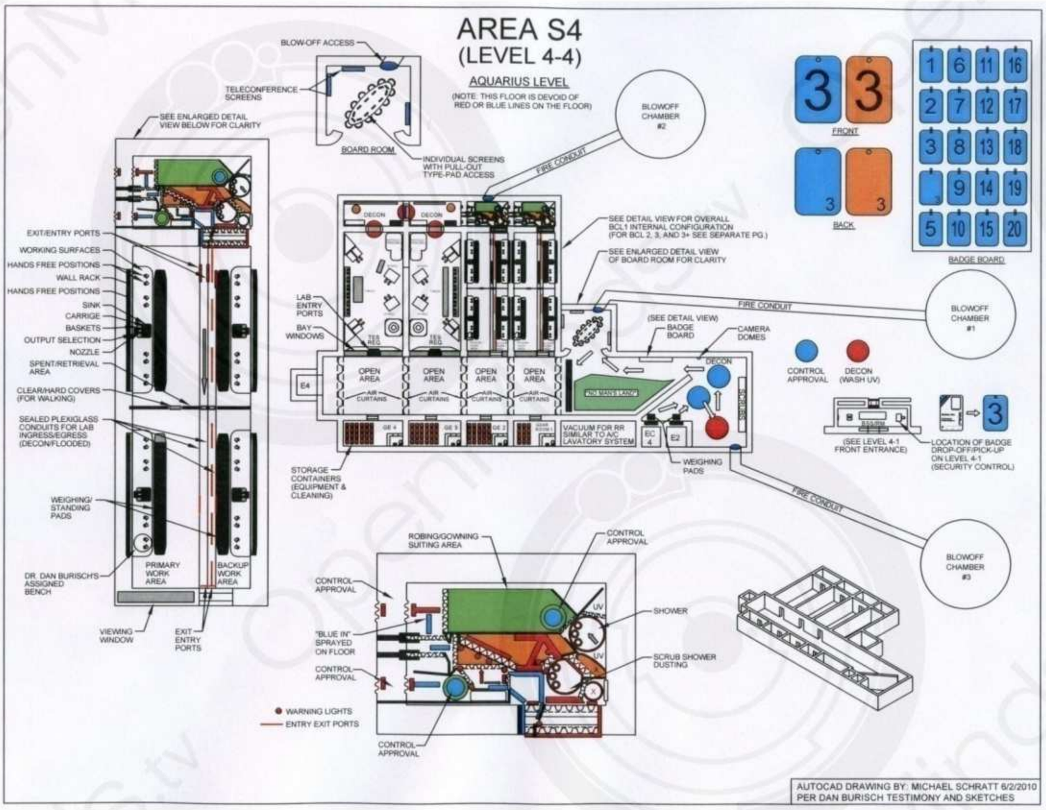
Level 2 or "4-2" was known as "Alice's Floor". This specific floor contained a laboratory for weapons research and development, three board rooms, and provisions for emergency supplies. Also located on level 4-2 were two specific areas which contained components for project sidekick. Level 4-2 was also the location of Project Looking Glass. This device utilized six (composite) electromagnetic fields, and a height adjustable rotating cylinder which is injected with a specific type of gas. The entire assembly can be rotated 90 degrees from the horizontal axis. This allows scientists to warp the local fabric of space-time both forward or backwards by long or short distances relative to the present time. The Project Looking Glass device was used to predict the potential probability of future events. Once the device is tuned properly, images of probable future events are projected in open space within the fields, similar to a hologram. The data output of the device (images and in some cases sounds) were then captured via high resolution audio-video capture devices. If multiple probabilities of the same event were displayed, they could be de-interlaced by use of specific software platforms. Next to the Project Looking Glass device were two "transport pads" which could teleport physical matter or humans from one location to the other instantly, but not always reliably and with certain disastrous outcomes during testing phases. Dan had the unfortunate experience of being in the room during one of those unfortunate outcomes, and witnessed a death.



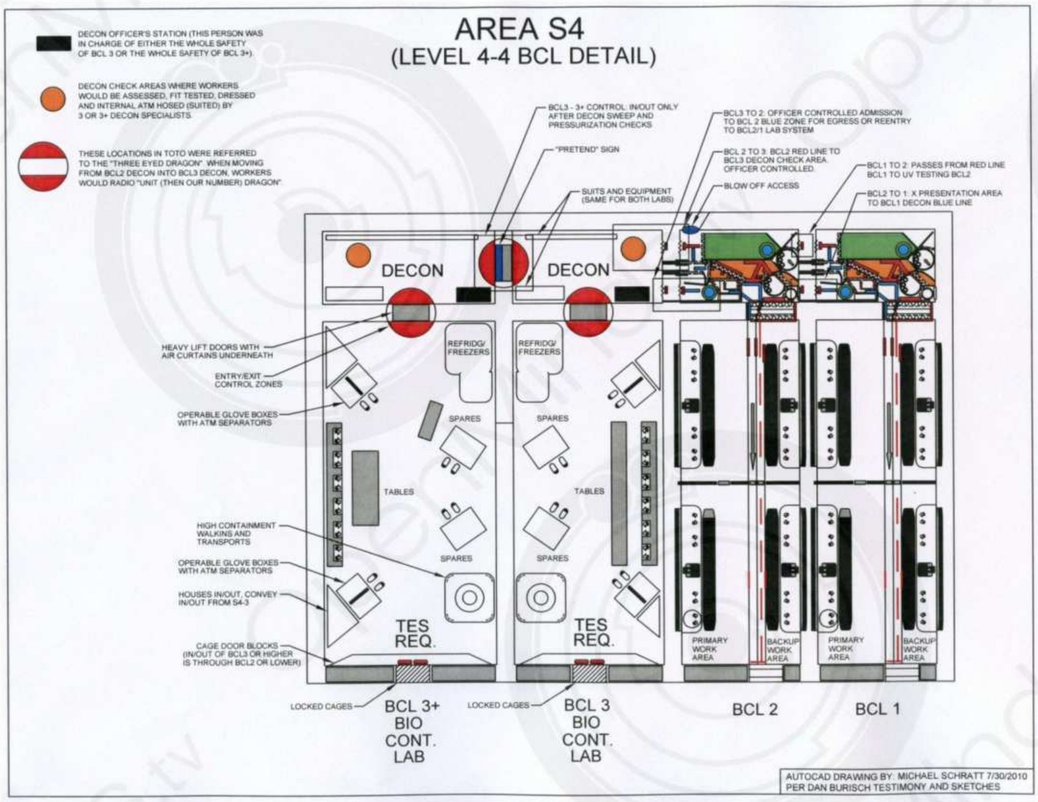
Level 3 of Area S-4 contained the residential living quarters for members of Majestic 12. Dan and I are only willing to say the following, and only that information may be represented as coming from us: "The former Leader of the Consistory of the Majestic was accurately identified by Dr. Dan in an affidavit sworn under penalty of perjury. That former leader was a high ranking official in:

a) The United States Navy
b) The National Security Agency (NSA)
c) The director of National Intelligence's Office

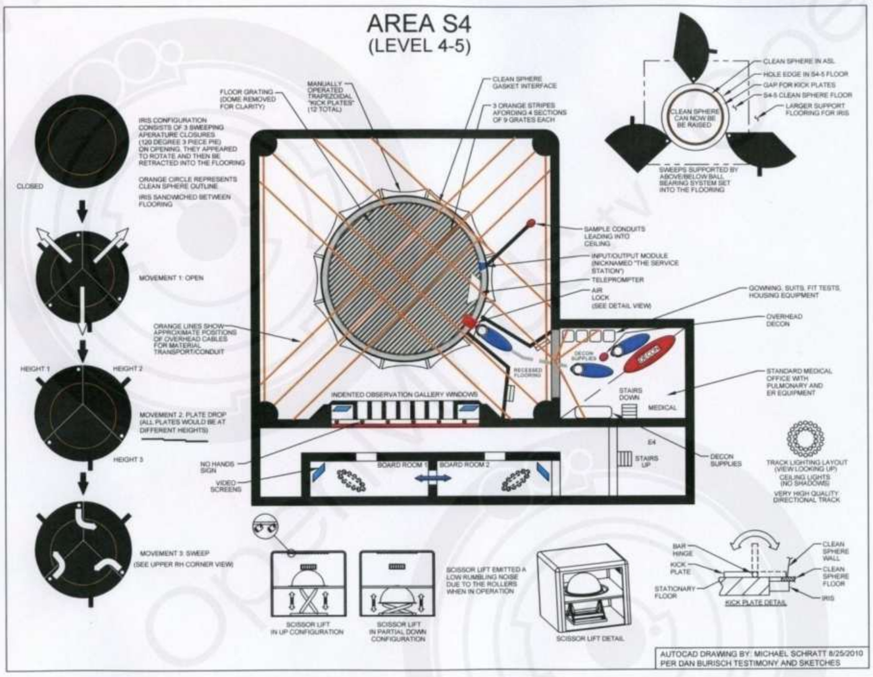
That former leader is properly indentified by the name: "J. McConnell". The residential portion of this level consisted of 12 apartment-like rooms, complete with a sunken living area, television and rest room. Level 3 also contained decontamination wash stations, along with a storage facility. Additionally, level 3 contained a board room, and provisions for a fully equipped biological laboratory consisting of tissue and cell culture analysis areas, and dissection facilities.

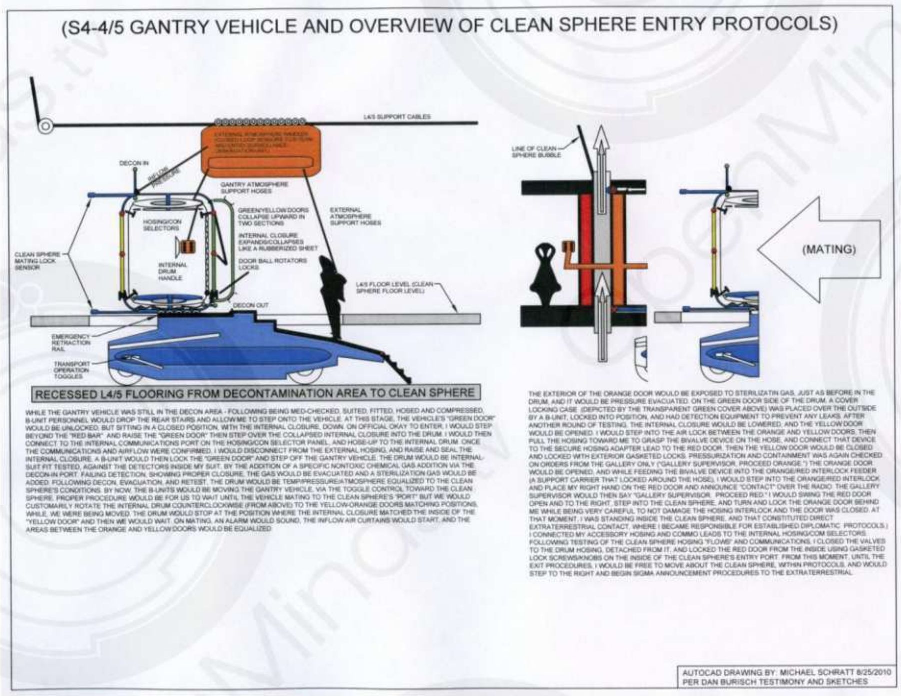


Level 4 aka the "Aquarius Level" contained five decontamination areas, along with multiple laboratories and equipment rooms. Level 4 also includes the only access elevator to Level 5. While working at Area S4, Dan's security badge number was: H-6196MAJ. Dr. Marcia's Majestic badge number was Q-3192MAJ. According to Dr. Dan Burisch, his boss at Area S-4 reported to the Majestic 12, who in turn reported to a cover committee who reported to the Committee of the Majority. The cover committee's job was to condense, and sometimes prevent reports from reaching the committee of the Majority. The Committee of the Majority was an internationalized version of the group called "The Majestic" which had been started in 1947 by President Harry S. Truman following the Roswell crash. The Majestic 12 were organized after the Roswell crash, not because of extraterrestrial contact; that could have been handled with the existing infrastructure of the U.S. military, while it was being reorganized following World War II.



Detail view of Level 4-4 showing Bio Containment Labs.


AREA S4
(LEVEL 4-5)
AUTOCAD DRAWING BY: MICHAEL SCHRATT 8/25/2010
PER DAN BURISCH TESTIMONY AND SKETCHES


(S4-4/5 GANTRY VEHICLE AND OVERVIEW OF CLEAN SPHERE ENTRY PROTOCOLS)
(MATING)
DECON OUT
EMERGENCY RETRACTION RAIL
TRANSPORT OPERATION TOGGLES
RECESSED L4/5 FLOORING FROM DECONTAMINATION AREA TO CLEAN SPHERE
WHILE THE GANTRY VEHICLE WAS STILL IN THE DECON AREA - FOLLOWING BEING MED-CHECKED, SUITED, FITTED, HOSED AND COMPRESSED, B-UNIT PERSONNEL WOULD DROP THE REAR STAIRS AND ALLOW ME TO STEP ONTO THE VEHICLE. AT THIS STAGE, THE VEHICLE'S "GREEN DOOR" WOULD BE UNLOCKED, BUT SITTING IN A CLOSED POSITION, WITH THE INTERNAL CLOSURE, DOWN. ON OFFICIAL OKAY TO ENTER, I WOULD STEP BEYOND THE "RED BAR" AND RAISE THE "GREEN DOOR" THEN STEP OVER THE COLLAPSED INTERNAL CLOSURE INTO THE DRUM. I WOULD THEN CONNECT TO THE INTERNAL COMMUNICATIONS PORT ON THE HOSING/CON SELECTOR PANEL, AND HOSE-UP TO THE INTERNAL DRUM. ONCE THE COMMUNICATIONS AND AIRFLOW WERE CONFIRMED, I WOULD DISCONNECT FROM THE EXTERNAL HOSING, AND RAISE AND SEAL THE INTERNAL CLOSURE. A B-UNIT WOULD THEN LOCK THE "GREEN DOOR" AND STEP OFF THE GANTRY VEHICLE. THE DRUM WOULD BE INTERNAL SUIT FIT TESTED, AGAINST THE DETECTORS INSIDE MY SUIT, BY THE ADDITION OF A SPECIFIC NONTOXIC CHEMICAL GAS ADDITION VIA THE DECON-IN PORT. FAILING DETECTION, SHOWING PROPER CLOSURE, THE GAS WOULD BE EVACUATED AND A STERILIZATION GAS WOULD BE ADDED. FOLLOWING DECON, EVACUATION, AND RETEST, THE DRUM WOULD BE TEMP/PRESSURE/ATMOSPHERE EQUALIZED TO THE CLEAN SPHERE'S CONDITIONS. BY NOW, THE B-UNITS WOULD BE MOVING THE GANTRY VEHICLE, VIA THE TOGGLE CONTROL TOWARD THE CLEAN SPHERE. PROPER PROCEDURE WOULD BE FOR US TO WAIT UNTIL THE VEHICLE MATING TO THE CLEAN SPHERE'S "PORT" BUT WE WOULD CUSTOMARILY ROTATE THE INTERNAL DRUM COUNTERCLOCKWISE (FROM ABOVE) TO THE YELLOW-ORANGE DOORS MATCHING POSITIONS, WHILE WE WERE BEING MOVED. THE DRUM WOULD STOP AT THE POSITION WHERE THE INTERNAL CLOSURE MATCHED THE INSIDE OF THE "YELLOW DOOR" AND THEN WE WOULD WAIT. ON MATING, AN ALARM WOULD SOUND, THE INFLOW AIR CURTAINS WOULD START, AND THE AREAS BETWEEN THE ORANGE AND YELLOW DOORS WOULD BE EQUALIZED.
THE EXTERIOR OF THE ORANGE DOOR WOULD BE EXPOSED TO STERILIZATIN GAS, JUST AS BEFORE IN THE DRUM, AND IT WOULD BE PRESSURE EVACUATED. ON THE GREEN DOOR SIDE OF THE DRUM, A COVER LOCKING CASE (DEPICTED BY THE TRANSPARENT GREEN COVER ABOVE) WAS PLACED OVER THE OUTSIDE BY A B-UNIT, LOCKED INTO POSITION, AND HAD DETECTION EQUIPMENT TO PREVENT ANY LEAKS. AFTER ANOTHER ROUND OF TESTING, THE INTERNAL CLOSURE WOULD BE LOWERED, AND THE YELLOW DOOR WOULD BE OPENED. I WOULD STEP INTO THE AIR LOCK BETWEEN THE ORANGE AND YELLOW DOORS, THEN PULL THE HOSING TOWARD ME TO GRASP THE BIVALVE DEVICE ON THE HOSE, AND CONNECT THAT DEVICE TO THE SECURE HOSING ADAPTER LEAD TO THE RED DOOR. THEN THE YELLOW DOOR WOULD BE CLOSED AND LOCKED WITH EXTERIOR GASKETED LOCKS. PRESSURIZATION AND CONTAINMENT WAS AGAIN CHECKED ON ORDERS FROM THE GALLERY ONLY ("GALLERY SUPERVISOR, PROCEED ORANGE.") THE ORANGE DOOR WOULD BE OPENED, AND WHILE FEEDING THE BIVALVE DEVICE INTO THE ORANGE/RED INTERLOCK FEEDER (A SUPPORT CARRIER THAT LOCKED AROUND THE HOSE), I WOULD STEP INTO THE ORANGE/RED INTERLOCK AND PLACE MY RIGHT HAND ON THE RED DOOR AND ANNOUNCE "CONTACT" OVER THE RADIO. THE GALLERY SUPERVISOR WOULD THEN SAY "GALLERY SUPERVISOR, PROCEED RED." I WOULD SWING THE RED DOOR OPEN AND TO THE RIGHT, STEP INTO THE CLEAN SPHERE, AND TURN AND LOCK THE ORANGE DOOR BEHIND ME WHILE BEING VERY CAREFUL TO NOT DAMAGE THE HOSING INTERLOCK AND THE DOOR WAS CLOSED. AT THAT MOMENT, I WAS STANDING INSIDE THE CLEAN SPHERE, AND THAT CONSTITUTED DIRECT EXTRATERRESTRIAL CONTACT, WHERE I BECAME RESPONSIBLE FOR ESTABLISHED DIPLOMATIC PROTOCOLS.) I CONNECTED MY ACCESSORY HOSING AND COMMO LEADS TO THE INTERNAL HOSING/COM SELECTORS. FOLLOWING TESTING OF THE CLEAN SPHERE HOSING "FLOWS" AND COMMUNICATIONS, I CLOSED THE VALVES TO THE DRUM HOSING, DETACHED FROM IT, AND LOCKED THE RED DOOR FROM THE INSIDE USING GASKETED LOCK SCREWS/KNOBS ON THE INSIDE OF THE CLEAN SPHERE'S ENTRY PORT. FROM THIS MOMENT, UNTIL THE EXIT PROCEDURES, I WOULD BE FREE TO MOVE ABOUT THE CLEAN SPHERE, WITHIN PROTOCOLS, AND WOULD STEP TO THE RIGHT AND BEGIN SIGMA ANNOUNCEMENT PROCEDURES TO THE EXTRATERRESTRIAL.
AUTOCAD DRAWING BY: MICHAEL SCHRATT 8/25/2010
PER DAN BURISCH TESTIMONY AND SKETCHES


NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

DULCE UNDERGROUND MILITARY LABORATORIES.

In March 2011 I received the following email:

Lon, I read the letter you posted recently about the Dulce Labs genetics experiments and wanted to share my experiences with your readers. When I was an undergraduate studying genetics in the mid-1970s, I did a 10-month internship at Dulce Labs. My primary duties were on level 1, that is where I spent almost all of my time. But once a week I accompanied one of the junior researchers to levels 5, 6, and 7 to collect data tapes and other documentation. I never got past the "clear zone" on those levels, but on a couple occasions I heard inhuman shrieks and wailing noises on level 6. I was told that level 6 was a psychiatric facility for especially disturbed patients, and that they were known to have emotional outbursts.

On one occasion while we were waiting for someone to bring out the tapes, I heard part of a message come through the intercom, and the words are burned into my memory.

VOICE 1: "CELL 34 COMPROMISED, ENTITY HAS BREACHED CONTAINMENT"

After a pause a second voice came over the speaker:

VOICE 2: "AVAILABLE PERSONAL REPORT TO THE BLUE ZONE FOR C&C. MAXIMUM FORCE AUTHORIZED."

The guard at the desk told me and my colleague that we had to leave immediately, we were rushed back into the elevator before the materials were delivered to us. It was two days before they let us go pick up the tapes, and when we went that time, everything was normal. Nobody ever talked about it. I tried to ask my colleague, the junior researcher who was there at the time, about it, but he said he didn't know what I was talking about, and something in his tone told me I'd better forget about it too.

After I graduated I was interested in returning to Dulce because I was really excited about the potential for genetic science, and Dulce had some very advanced equipment and knowledge - better than anything being used anywhere else. But I was told that there weren't any openings. I wondered if I was being blown off because of my curiosity about that event, if I was considered a risk. I tried contacting the junior researcher, but never got a response from him. - MP

Another person wrote: (THIS PERSON WORKED AS SECURITY OFFICER HERE)

-6th Level - privately called "Nightmare Hall." It contains the genetic labs. Here are where the crossbreeding experiments of human/animal are done on fish, seals, birds, and mice that are vastly altered from their original forms. There are multi-armed and multi-legged humans and several cages and vats of humanoid bat-like creatures up to 7 feet tall.

-7th Level - Row after row of 1,000s of humans in cold storage including children.

Where exactly do the heavy psychiatric patients come from, and what kind of medical project is being promoted behind closed doors? Deep down in an underground biological laboratory in a mountain range?
I better load my nukes because heads are gonna fly. /GN.


NORTH
A CAR TO COMPARE SIZES IN IMAGE.
GROUND LEVEL AT DULCE UNDERGROUND LABORATORIES.
11 FANS
11 FANS

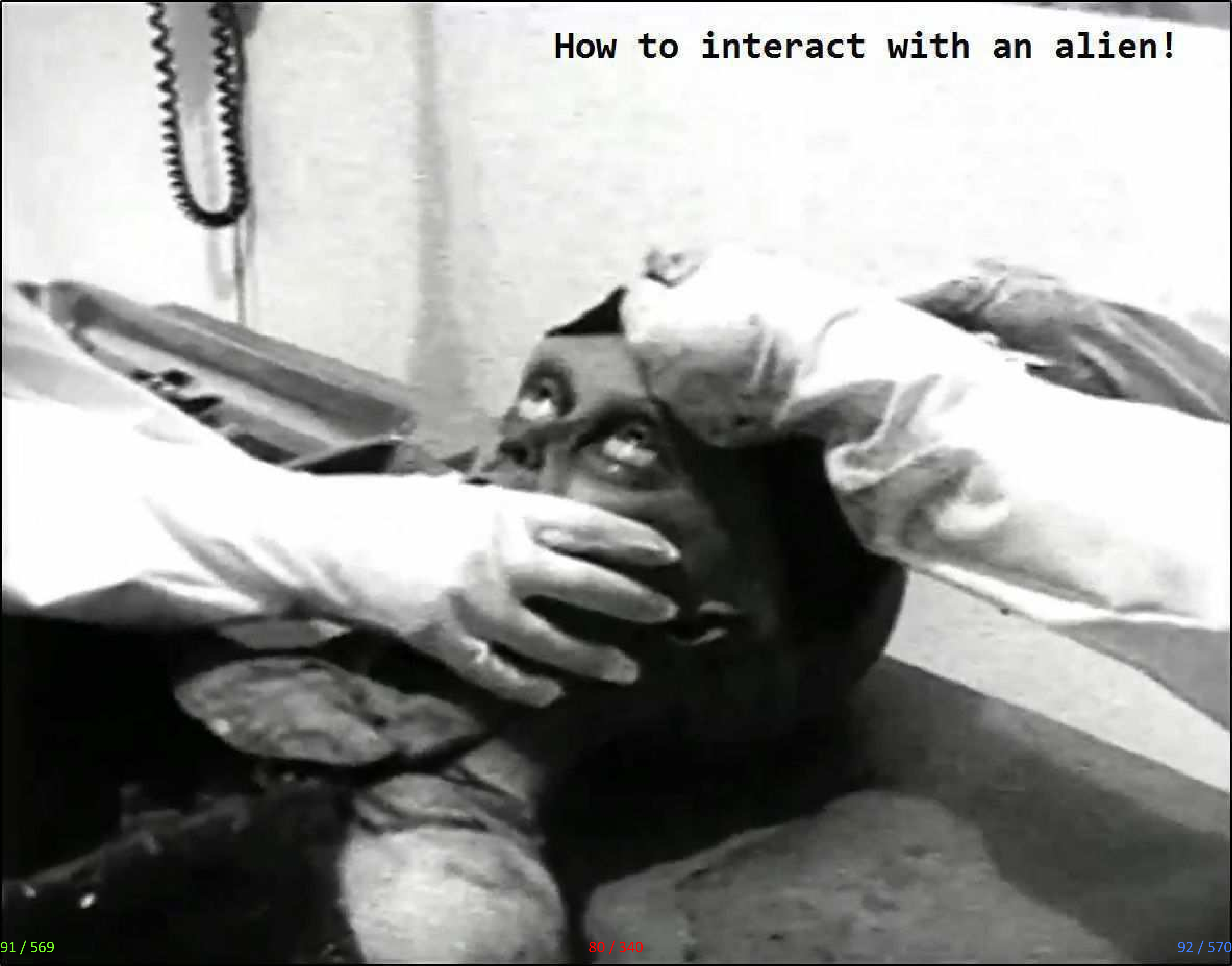

NORTH
GROUND LEVEL AT
DULCE
UNDERGROUND
LABORATORIES.
16 FANS
Deep mining ore byproduc
50 FANS
3 FANS

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

HERE FOLLOWS THE PHOTO SECTION OF THIS DOCUMENT

*Maps.
*Satellite Images.
*Technical Specifications.
*Scans.
*Photographs.

—SEE THE FIRST PHOTO OF THE 6-FINGERED ALIEN RACE.


How to interact with an alien!

1947-ROSWELL-COVER-UP-READING-PART-1-ONE.png (PNG image data, 1456 x 1483, 8-bit/color RGBA, non-interlaced)

The Cover-Up 1947

Began 9 July 1947, when the U.S. Army Air Force showed the "world" a tin foil weather ballon and some wooden sticks. RAAF = Roswell Army Air Field. The I-balk structure with the alien alphabet on it was not shown to the press. Or public.

Roswell harbored The 509:th Atomic Bomb Group, Headquarters, New Mexico, U.S.A.

Army Disk-ounts New Mexico Find As Weather Gear

FORT WORTH, July 9.—(AP)—An examination by the Army revealed last night that a mysterious object found on a lonely New Mexico ranch was a harmless high-altitude weather balloon—not a grounded flying disk.

Excitement was high in disk-conscious Texas until Brig Gen. Roger M. Ramey, commander of the Eight Air Forces with headquarters here cleared up the mystery.

The bundle of tinfoil, broken wood beams and rubber remnants of a ballon was sent here yesterday by army air transport in the wake of reports that it was a flying disk.

But the general said the objects were the crushed remains of a Ray wind target used to determine the direction and velocity of winds at high altitudes.

Warrant Officer Irving Newton,

Disk Craze Continues

NOT A FLYING DISC—Major Jesse A. Marcel of Houma, La., intelligence officer of the 509th Bomb Group at Roswell, New Mexico, inspects what was identified by a Fort Worth, Texas, Army Air

Army Disk-ounts New Mexico Find As Weather Gear

FORT WORTH, July 9.—(AP)—An examination by the Army revealed last night that a mysterious object found on a lonely New Mexico ranch was a harmless high-altitude weather balloon—not a grounded flying disk.

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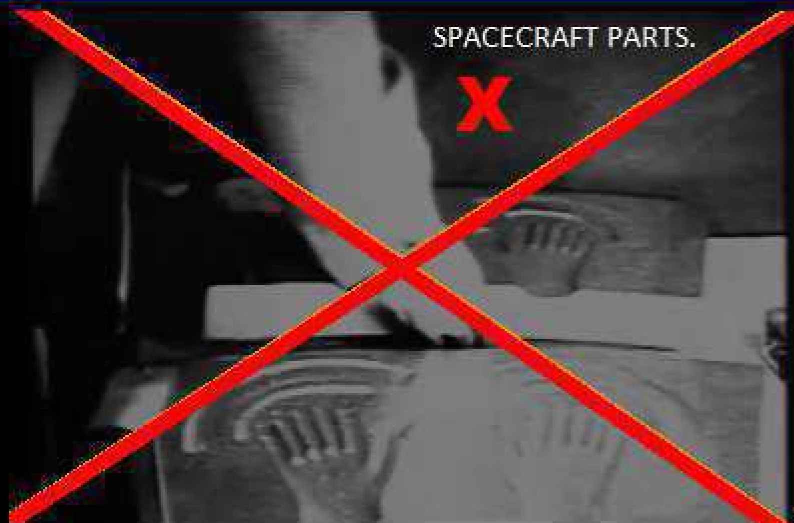
But the general said the objects were the crushed remains of a Ray wind target used to determine the direction and velocity of winds at high altitudes.

Warrant Officer Irving Newton, forecaster at the Army Air Forces weather station here, said "we use them because they go much higher than the eye can see."

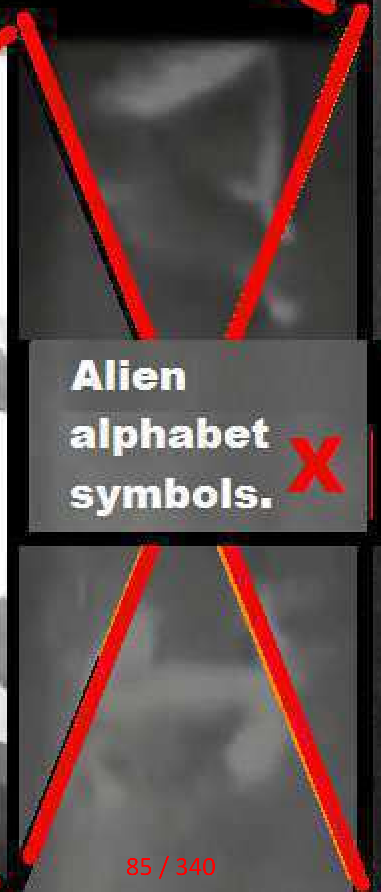
LOST PURSE HOLDING DIAMONDS IS FOUND

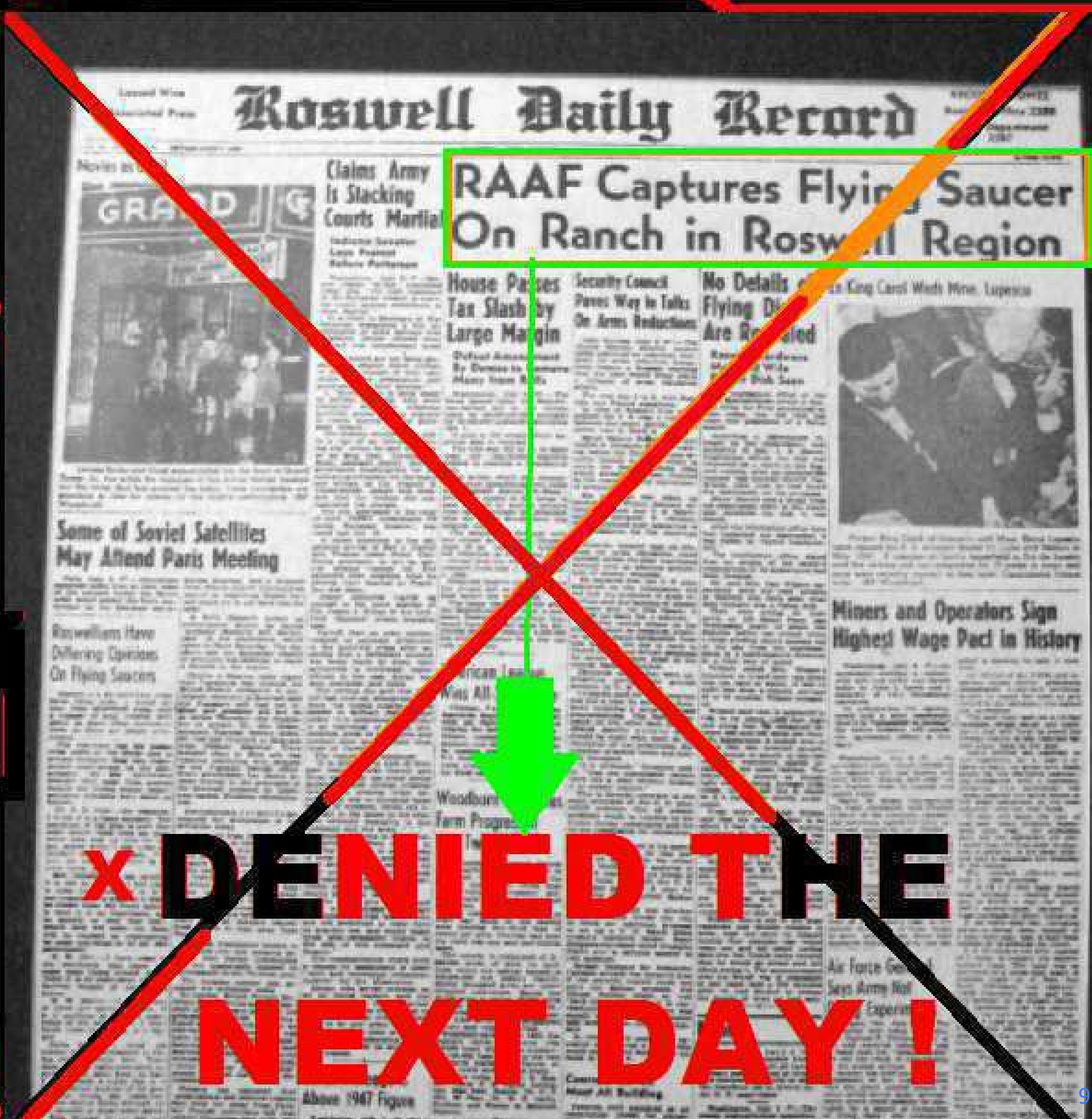


When you see the video you can see that it's a real U.S. Army Officer, in a real U.S. Army uniform, showing the objects for the camera.

His presence got caught on the 8 millimeter film.

You can almost see his soul, when looking at his hands in the Real U.S. Army footage.





Roswell Daily Record

RAAF Captures Flying Saucer On Ranch in Roswell Region

Claims Army Is Stacking Courts Martial

House Passes Tax Slash by Large Margin

Security Council Paves Way to Talks On Arms Reductions

No Details of Flying Disk Are Revealed

Some of Soviet Satellites May Attend Paris Meeting

Miners and Operators Sign Highest Wage Pact in History

96 / 569 85 / 340 97 / 570

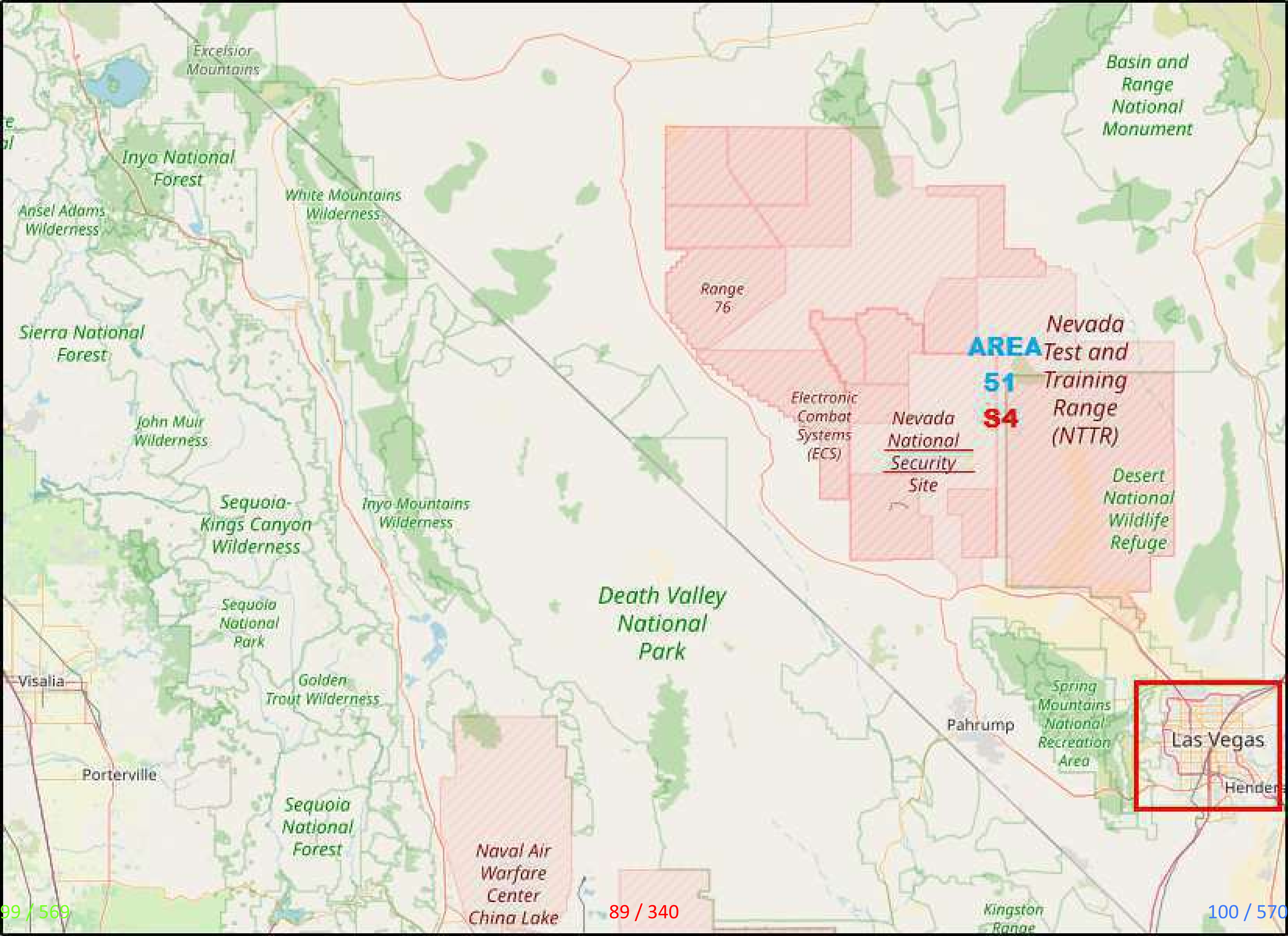
MJ—12 4838B

17. Extraterrestrial Technology Classification Table

No.	Item	Description or condition	MJ-12 Code	Receiving facility
1	Aircraft.	Intact, operational, or semi-intact aircraft of Extraterrestrial design and manufacture.	UA-002-6	Area 51 S-4
2	Intact device.	Any mechanical or electronic device or machine which appears to be undamaged and functional.	ID-301-F	Area 51 S-4
3	Damaged device.	Any mechanical or electronic device or machine which appears to be damaged but mostly complete.	DD-303-N	Area 51 S-4
4	Powerplant.	Devices and machines or fragments which are possible propulsion units, fuel, and associated control devices and panels.	PD-40-8G	Area 51 S-4
5	Identified fragments.	Fragments composed of elements or materials easily recognized as known to current science and technology, i.e.: aluminum, magnesium, plastic, etc.	IF-101-K	Area 51 S-4
6	Unidentified fragments.	Fragments composed of elements or materials not known to current science and technology and which exhibit unusual or extraordinary characteristics.	UF-103-M	Area 51 S-4
7	Supplies and provisions.	Non-mechanical or non-electronic materials of a support nature such as clothing, personal belongings, organic ingestibles, etc.	SP-331	Blue Lab WP-61
8	Living entity.*	Living non-human organisms in apparent good or reasonable health.	EBE-010	OPNAC BBS-01
9	Non-living entity.	Deceased non-human organisms or portions of organisms, organic remains and other suspect organic matter.	EBE-XO	Blue Lab WP-61
10	Media.	Printed matter, electronic recordings, maps, charts, photographs and film.	MM-54A	Building 21 KB-88
11	Weapons.	Any device or portion of a device thought to be offensive or defensive weaponry.	WW-010	Area 51 S-4

*Living entities must be contained in total isolation pending arrival of OPNAC personnel.

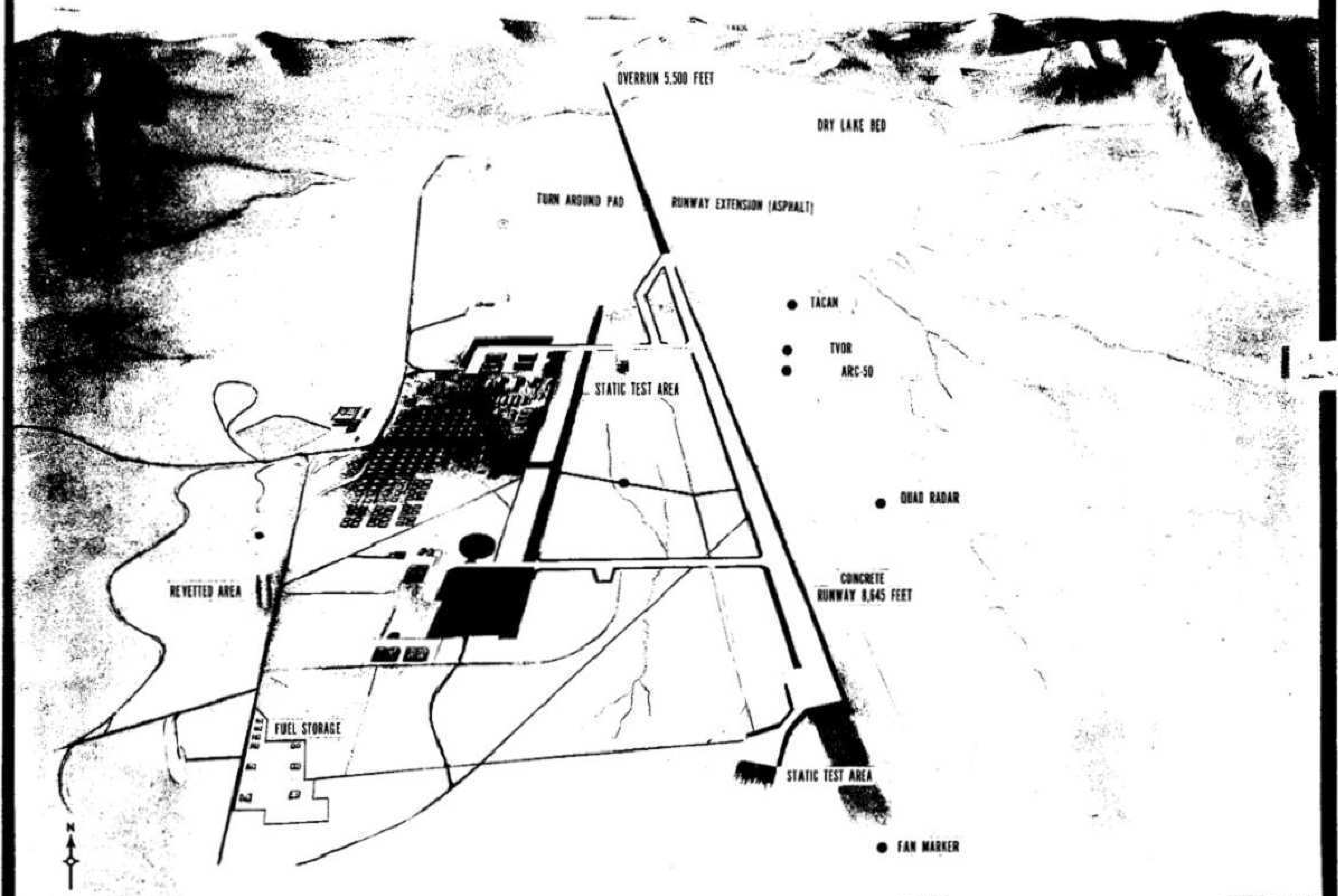
TOP SECRET / MAJIC EYES ONLY



Excelsior Mountains
Basin and Range National Monument
Inyo National Forest
White Mountains Wilderness
Ansel Adams Wilderness
Range 76
Nevada Test and Training Range (NTTR)
AREA 51
S4
Sierra National Forest
Electronic Combat Systems (ECS)
Nevada National Security Site
John Muir Wilderness
Desert National Wildlife Refuge
Sequoia-Kings Canyon Wilderness
Inyo Mountains Wilderness
Death Valley National Park
Sequoia National Park
Visalia
Golden Trout Wilderness
Spring Mountains National Recreation Area
Pahrump
Las Vegas
Porterville
Sequoia National Forest
Naval Air Warfare Center China Lake
Kingston Range

AREA 51

FIELD ELEVATION 4,400 FEET




95
Rachel
Hiko
Crystal Springs
Ash Springs
Delamar
Alamo
AREA 51
BASE
95
93
Bonnie Claire
S4 HANGARS?
Grapevine
Peak
S4 UFO TECH?
Beatty
Gold Center
95
Desert Nat'l
Wildlife Range
Coyote
Springs
Amargosa
Valley
Mercury
Stovepipe
Wells
95
95
Indian Springs
15
Death Valley
National Park
Park Village
Crystal
Crystal
Scranton
Cold Creek
Corn Creek

Put in Quarterly Yellow Files J-1

[redacted]

ANNEX C (Cont'd)

9. [redacted]

10. Maintaing the MAJESTIC security has been successful in part because of compartmental function of classified activities of the level achieved by the security system of the Manhattan Project, and new legislation protecting nuclear weapons development.

11. In protecting the security operations of MAJESTIC, it has been necessary to [redacted] individuals who would compromise the intelligence efforts. While distasteful [redacted]t times, the use of [redacted] measures have been executed. The untimely death of Secretary Forrestal, was deemed necessary and [illegible].

12. General Statement: If such a crisis in [illegible] failed [illegible] and assure the public's trust against an invasion from another planet, [redacted] that the following would occurr: "The pattern is familiar—employment of [illegible] agents; infiltration tactics; incitement of disorder and chaos to disrupt normal economy and thereby to undermine popular confidence in government and leaders; seizure of authority without reference to the will of the people."

13. Referenced REPORT TO THE PRESIDENT [redacted] 47, PARTS 1-7, dated 19 September 1947, mentions: "In compliance with your directive . . . of 9 July 1947, the attached "REPORT ON FLYING SAUCERS" is respectfully submitted. In consonance with your instructions, advisors from State, Treasury, War and Navy Departments [illegible] fact finding mission concerning the reality of [illegible]. The principle areas were visited. Successful efforts were made to [illegible] all levels of scientists [illegible] work in classified [illegible] in defense [illegible] were held with [redacted] approximately 1,200 memoranda and reports from intelligence and security individuals were received and considered. The report presents against a global background my estimates of the situation, current and projected, in U.S., and U.K., and recommendations deemed to be sound courses of action for formulating plans and policies concerning defenses of allied countries of the United States."

Project White Hot

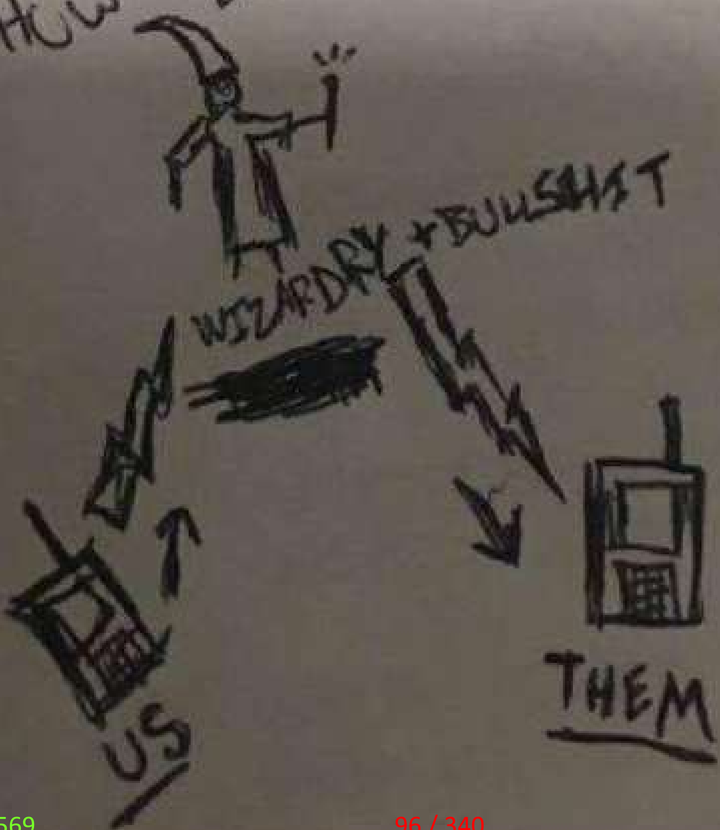
-37582

14. As a result of the Twining Report, the President was compelled to sign into law the National Security Act of 1947 which came into effect on 19 September. This did not help the DCI in carrying out the directives of the NSC in matters of intelligence collection concerning the flying saucer problem. The Intelligence Advisory Board was not allowing the new CIA to function [redacted] flying saucer data. [redacted]

-3-

RADIOS:

HOW DO THEY RADIO??




RUSSIAS NEW ELECTRONIC WARFARE IMAGES. X-RAZE.COM


Russian
electronic
warfare
worldwide.
1РБ01

The RF Hearing Effect is explained and analyzed as a thermal to acoustic demodulating process. Energy absorption in a medium, such as the head, causes mechanical expansion and contraction, and thus an acoustic signal.

When the expansion and contraction take place in the head of an animal, the acoustic signal is passed by conduction to the inner ear where it is further processed as if it were an acoustic signal from the outer ear. Animal = Human.


WARNING!
RADIATION HITS YOUR BRAIN
CAUSING
Unrepairable damage.
THIS IS A REAL IMAGE.
This is one of the pictures YOU are not supposed to see according to the Department of Defense.
Magnetron Cannon!
Ask them what the Magnetron Cannon is for?
THIS WEAPON DESTROYS THE BRAIN BARRIER, SO YOUR BRAIN LIES OPEN TO ATTACKS OR EASY INTRUSION.
THE PHOTO WAS ACCIDENTLY RELEASED BY THE U.S. DEP. OF DEFENSE AS THE FIRST SATELLITE SELFIE.
The worlds first
ATTACK
SATELLITE
'SELFIE'
www.alien1947.com

If one transmits signals or disturbance on above frequencies, then your brain can't function alright.
And guess what. There's a lot of transmitted noise in those frequencies, meaning your brain has trouble giving you deep sleep.

United States Patent [19]

Brunkan

[11] **Patent Number: 4,877,027**

[45] **Date of Patent: Oct. 31, 1989**

[54] **HEARING SYSTEM**

[76] Inventor: **Wayne B. Brunkan,** P.O. Box 2411, Goleta, Calif. 93118

[21] Appl. No.: **202,679**

[22] Filed: **Jun. 6, 1988**

[51] **Int. Cl.⁴** .... A6[illegible]/00
[52] **U.S. Cl.** .... [illegible]
[58] **Field of Search** .... 128/[illegible]R, 128/421, 422, 746, 381/68

[56] **References Cited**

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Microwave Auditory Effects and Applications, Lin, 1978, pp. 176–177.

Primary Examiner—Lee S. Cohen
Attorney, Agent, or Firm—Harry W. Brelsford

[57] **ABSTRACT**

Sound is induced in the head of a person by radiating the head with microwaves in the range of 100 megahertz to 10,000 megahertz that are modulated with a particular waveform. The waveform consists of frequency modulated bursts. Each burst is made up of ten to twenty uniformly spaced pulses grouped tightly together. The burst width is between 500 nanoseconds and 100 microseconds. The pulse width is in the range of 10 nanoseconds to 1 microsecond. The bursts are frequency modulated by the audio input to create the sensation of hearing in the person whose head is irradiated.

SR—Russell Building
SD—Dirksen Building
SH—Hart Building

All telephone numbers preceded by 22 prefix

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Washington, D.C. 20510

114th CONGRESS

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TESTER, Jon	(D-MT)	SH-706	4-2644
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WARNER, Mark R.	(D-VA)	SR-475	4-2023
WARREN, Elizabeth	(D-MA)	SH-317	4-4543
WHITEHOUSE, Sheldon	(D-RI)	SH-530	4-2921
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Earth flattening refers to destroying the power pole called Earth Ground.

United States Patent [19]

Ritland et al.

4,175,469

Nov. 27, 1979

[54] CENTRIFUGAL AEROSOL DISPENSER ASSEMBLY

[75] Inventors: Harold N. Ritland, Bellevue; George H. Thacker, Kent, both of Wash.

[73] Assignee: The United States of America as represented by the Secretary of the Air Force, Washington, D.C.

[21] Appl. No.: 882,526

[22] Filed: Mar. 1, 1978

[51] Int. Cl.[2] F11F 5/02; F42B 13/50

[52] U.S. Cl. ...... 89/1 B; 102/89 CD; 343/18 E

[58] Field of Search ...... 102/89 CD, 34.4, 35.6, 102/37.6; 89/1.819, 1 B; 343/18 E

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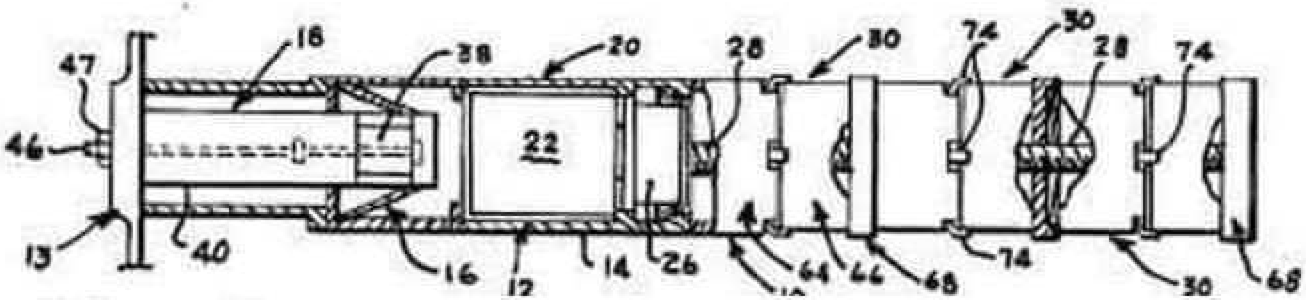
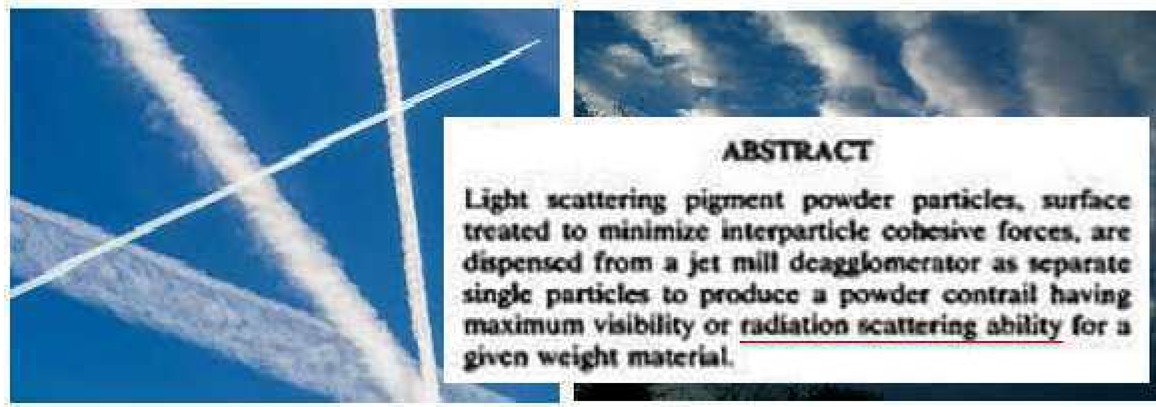
Primary Examiner—David H. Brown
Attorney, Agent, or Firm—Joseph E. Rusz; Jacob N. Erlich

[57] ABSTRACT

A centrifugal aerosol dispenser assembly capable of dispersing a cloud of particulate aerosol material in a predetermined geometrical configuration. The dispenser assembly is formed of two parts, a mount and a dispenser. An ejector mechanism having a portion thereof on said mount and a portion thereof on said dispenser expels the dispenser from said mount with a spin motion. A plurality of dispensing compartments located within the dispenser contains the particulate material therein, and, at a predetermined time after ejection thereof releases its contents in a predetermined geometrical configuration due to the centrifugal forces acting thereon.

10 Claims, 4 Drawing Figures





United States Patent [19]

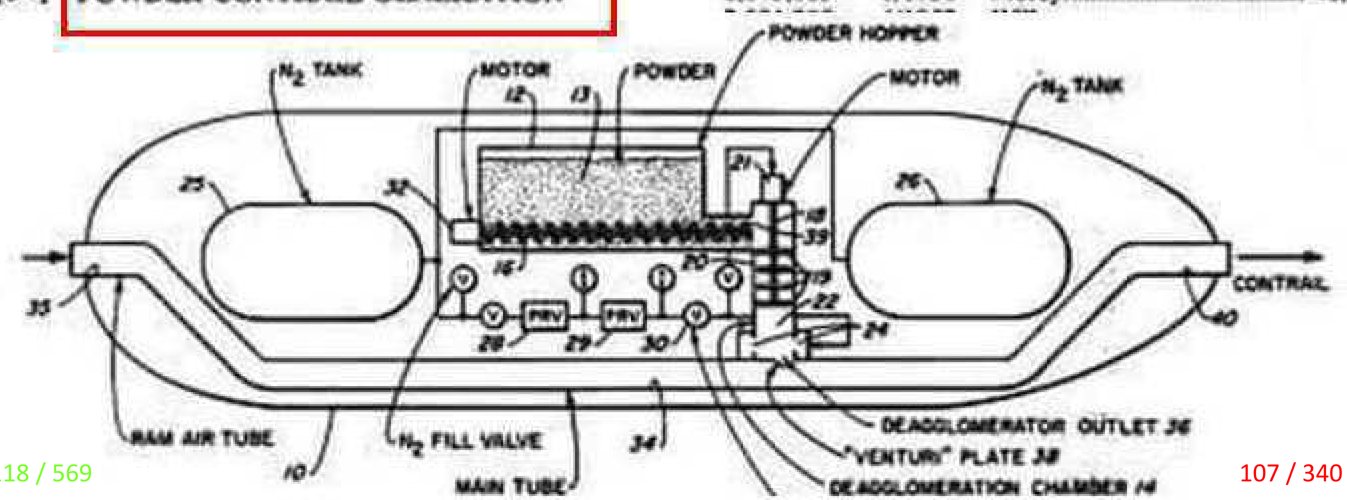
Werle et al.

[11] **3,899,144**

[45] **Aug. 12, 1975**

[54] POWDER CONTRAIL GENERATION

2,045,865	6/1936	Morey	40/213



Evolved Expendable Launch Vehicle

USAF

The Evolved Expendable Launch Vehicle (EELV) provides to the Air Force, Navy, and the National Reconnaissance Office (NRO), and other government and commercial purchasers of launch services medium to heavy lift class satellites.

- 70 consecutive successful national security space (NSS) operational launches (as of March 19, 2017).
- The Air Force certified SpaceX as an EELV provider on May 19, 2015.

Mission: Provides launch services and capability for medium to heavy class national security space satellites.

Photos courtesy Of ULA

Photo courtesy Of SpaceX

FY 2018 Program: Procures three Air Force launch services. All three are planned for competition and which are usually ordered no-later-than 24 months prior to the planned mission unless additional first time integration is needed; funds EELV Launch Capability (ELC) effort including mission assurance, program management, systems engineering, integration of the space vehicle with the launch vehicle, launch site and range operations, and launch infrastructure maintenance and sustainment. Continues EELV launch service investment to provide two commercially-viable, domestically-sourced space launch service providers with the objective of eliminating reliance on a foreign-made liquid rocket engine.

Prime Contractors: United Launch Alliance (ULA); Centennial, CO
SpaceX; Hawthorne, CA

www.restricteddocuments.com/1947-Photo-Look-at-the-mentalattack-dimensionalstrings-spaghetti-controls-for-6-finger-hands.png

The spaghetti or neural strings ALSO mostly exist ON THE OTHER SIDE, and each can be as long as 250-300 kilometers before it snaps.

Just think of a coin $ and see how easy it is to describe what I mean with "on the other side".
GUSTAV NORSTROM.

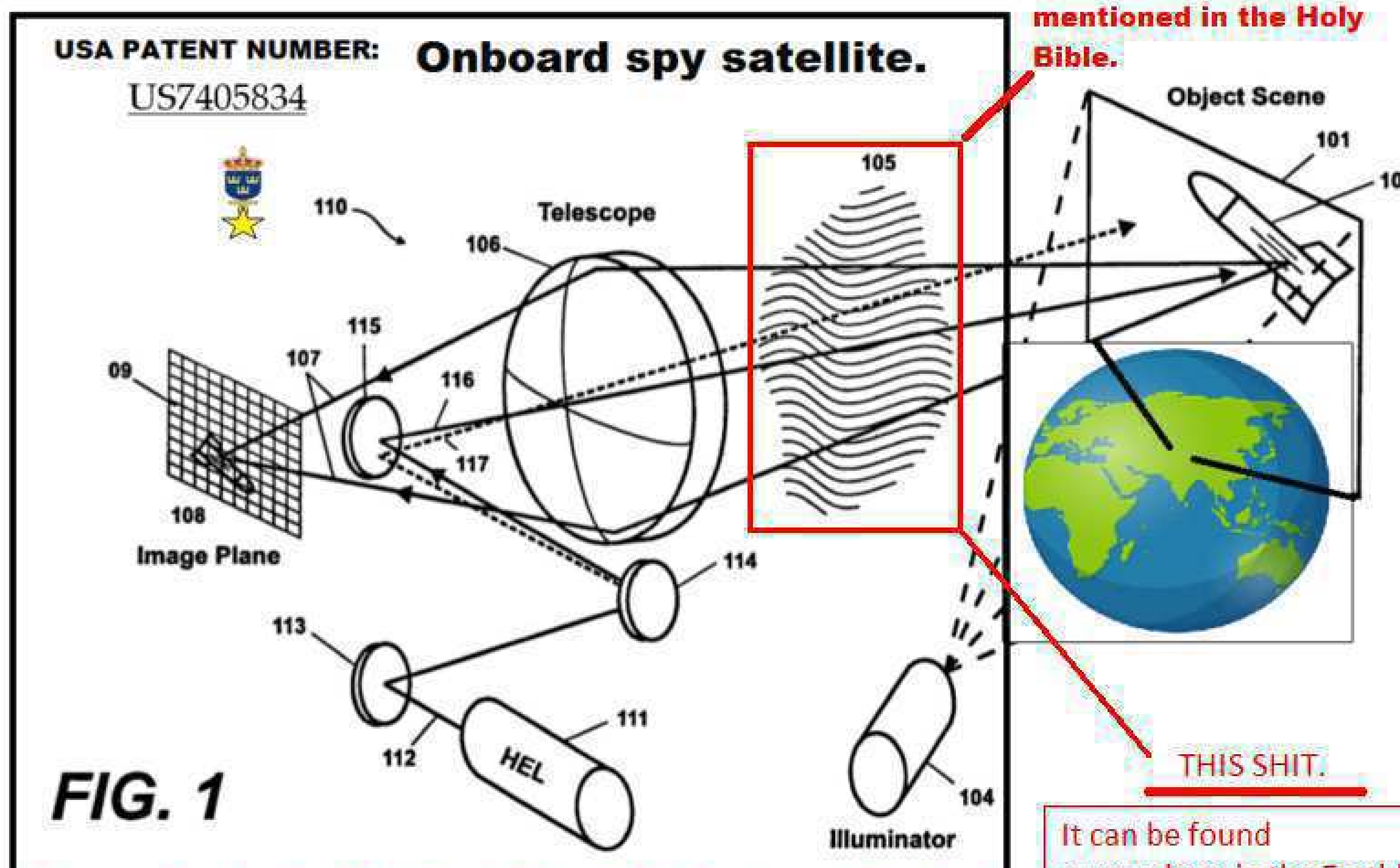
THIS SHIT MAKES IT EASIER TO ENTER OR CONTROL YOUR MIND. TELEPATHY CONTROL.

What we mean with the "spaghetti controls" - see this image.
This is the best image you can get on the problem. To date. For us on Earth™.

The invention describes a target system that activates a SAT High Energy Laser at the target.

Embry, AnnMarie Oien, Duane D. Smith, J. Alex Thomson, James Pete Tucker & Samel G. L. Williams – Assignee, Lockheed Martin Corp. & Lockheed Martin Coherent Tech Inc. An imaging method and associated system for producing high-resolution images. The method includes illuminating an object or scene with coherent radiation such as beams from a laser and then, collecting scattered light with a plurality of subapertures rather than a single large aperture. The method continues with coherently detecting, such as with heterodyne detection, the scattered light to measure the complex amplitude incident on each subaperture and digitally reconstructing images from the coherently detected light for the subapertures. Then digital co-phasing is performed on the subapertures using an image sharpness or quality metric to form an image having the resolution of the total subaperture area. The method may also include determining an aimpoint in the formed image, calculating a phase screen, directing laser beams through the subapertures towards the aimpoint, and co-phasing the laser beams by applying the phase screen to form a single beam.

This is the "snake" mentioned in the Holy Bible.



In the patent from Lockheed Martin it's decribed as "light distorsion or air distortion".

It can be found everywhere in the Earth's atmosphere. You are born in it. And it is the cause of half of all the medical problems.

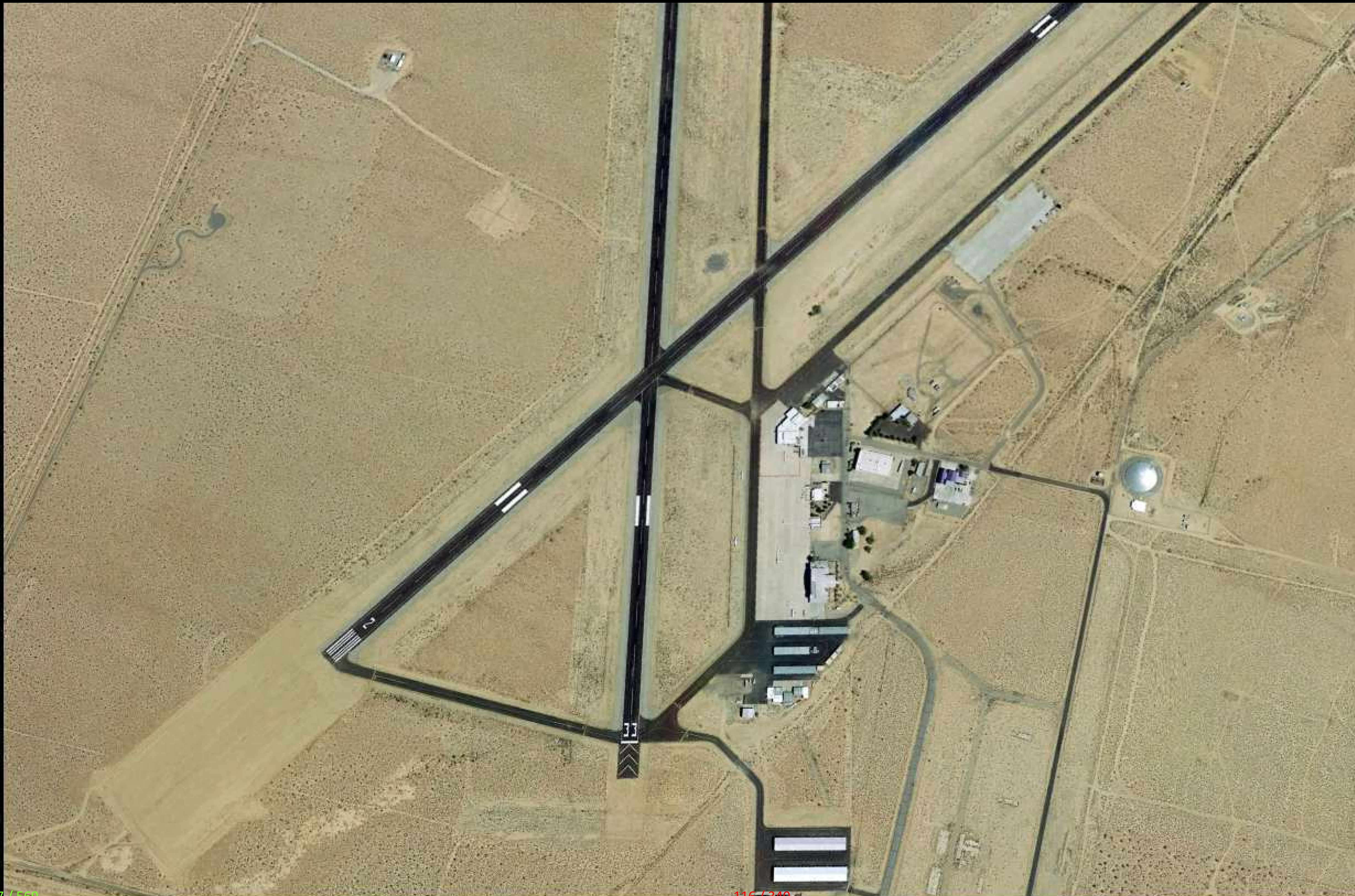
Recommended actions:
Good filtered ventilation and cleaning with chlorine.
Eat central stimulants (raises your available brain energy).

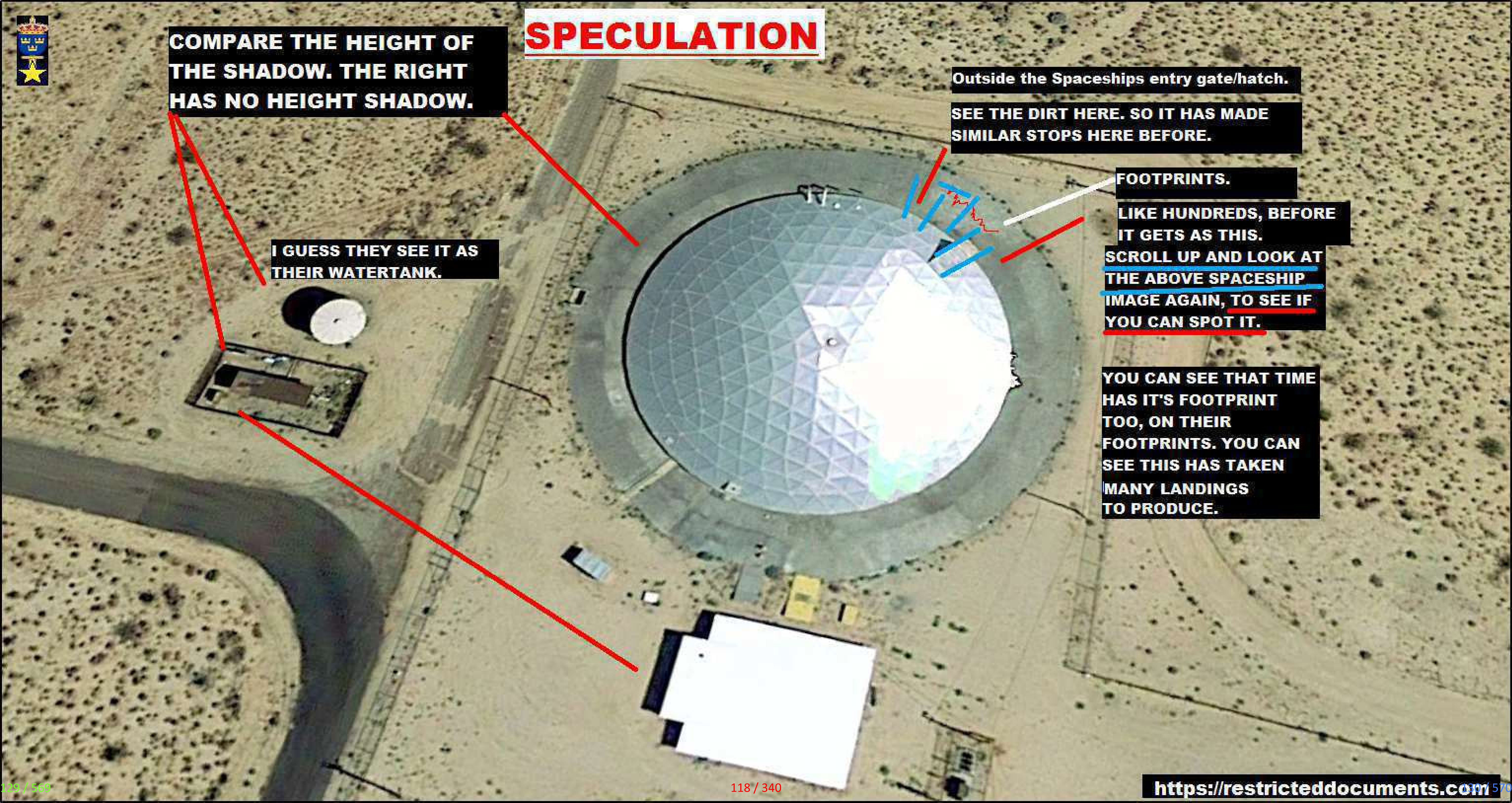
How can you place something "on the other side" ?
You have an object or fluid, that you shrink, shrink, shrink, beyond zero, so it is on minus = Other side.

https://restricteddocuments.com

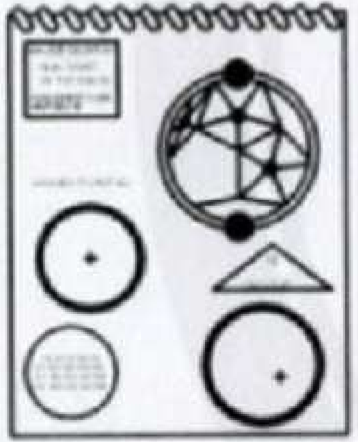

123 / 569
112 / 340
124 / 570


To better combat ancient extraterrestrial pre-historic bioweapons effects, please change the trapped AIR in all water tanks with a sterilizing GAS. / GN.
X
Chlorine gas.





SPECULATION
COMPARE THE HEIGHT OF THE SHADOW. THE RIGHT HAS NO HEIGHT SHADOW.
I GUESS THEY SEE IT AS THEIR WATERTANK.
Outside the Spaceships entry gate/hatch.
SEE THE DIRT HERE. SO IT HAS MADE SIMILAR STOPS HERE BEFORE.
FOOTPRINTS.
LIKE HUNDREDS, BEFORE IT GETS AS THIS.
SCROLL UP AND LOOK AT THE ABOVE SPACESHIP IMAGE AGAIN, TO SEE IF YOU CAN SPOT IT.
YOU CAN SEE THAT TIME HAS IT'S FOOTPRINT TOO, ON THEIR FOOTPRINTS. YOU CAN SEE THIS HAS TAKEN MANY LANDINGS TO PRODUCE.
https://restricteddocuments.com



ERB PROGRAM CODES
"FLIP BOOK" WORN ON ARM
(GALACTIC POSITIONING CODES)

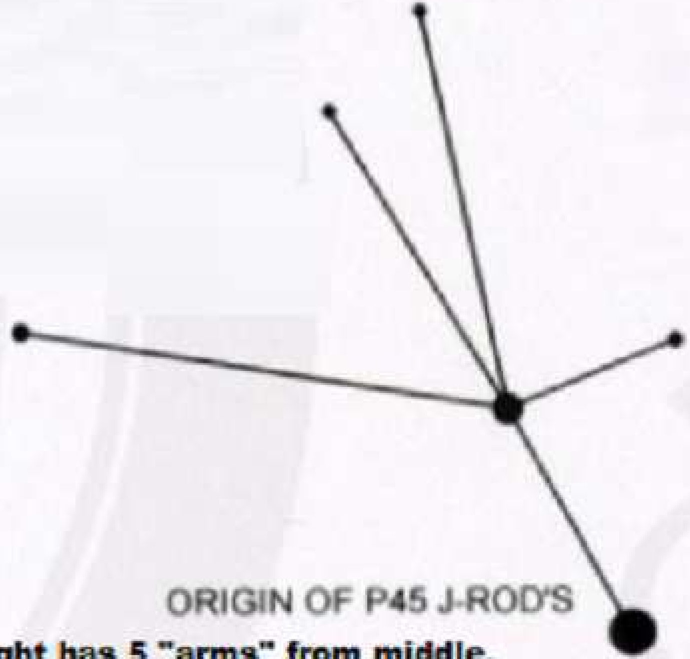
MAJSEC0205-01
N36.19341
W 115.00616

ASSIGNMENT CODE:
MAJTSEO 18

Coordinates are off.

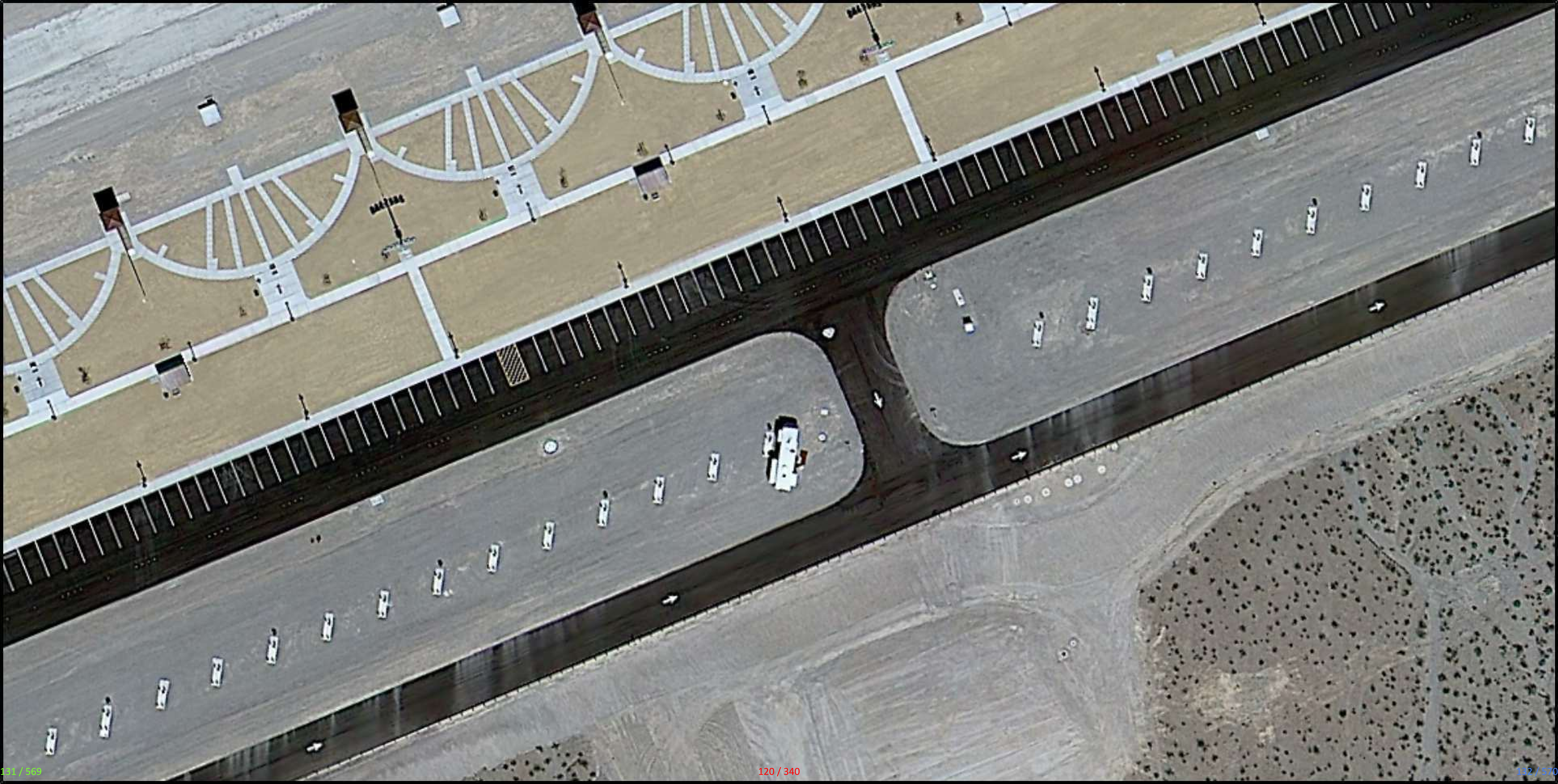
Points to Nellis Air F. Base Las Vegas.

ORIGIN OF P52 ORIONS



ORIGIN OF P45 J-ROD'S

The Galactic Position image to the right has 5 "arms" from middle.
Same number 5 Arms appears on Las Vegas UFO parking lot.


131 / 569
120 / 340
132 / 570


132 / 569
121 / 340
133 / 570

FROM ANOTHER CAMERA ANGLE..

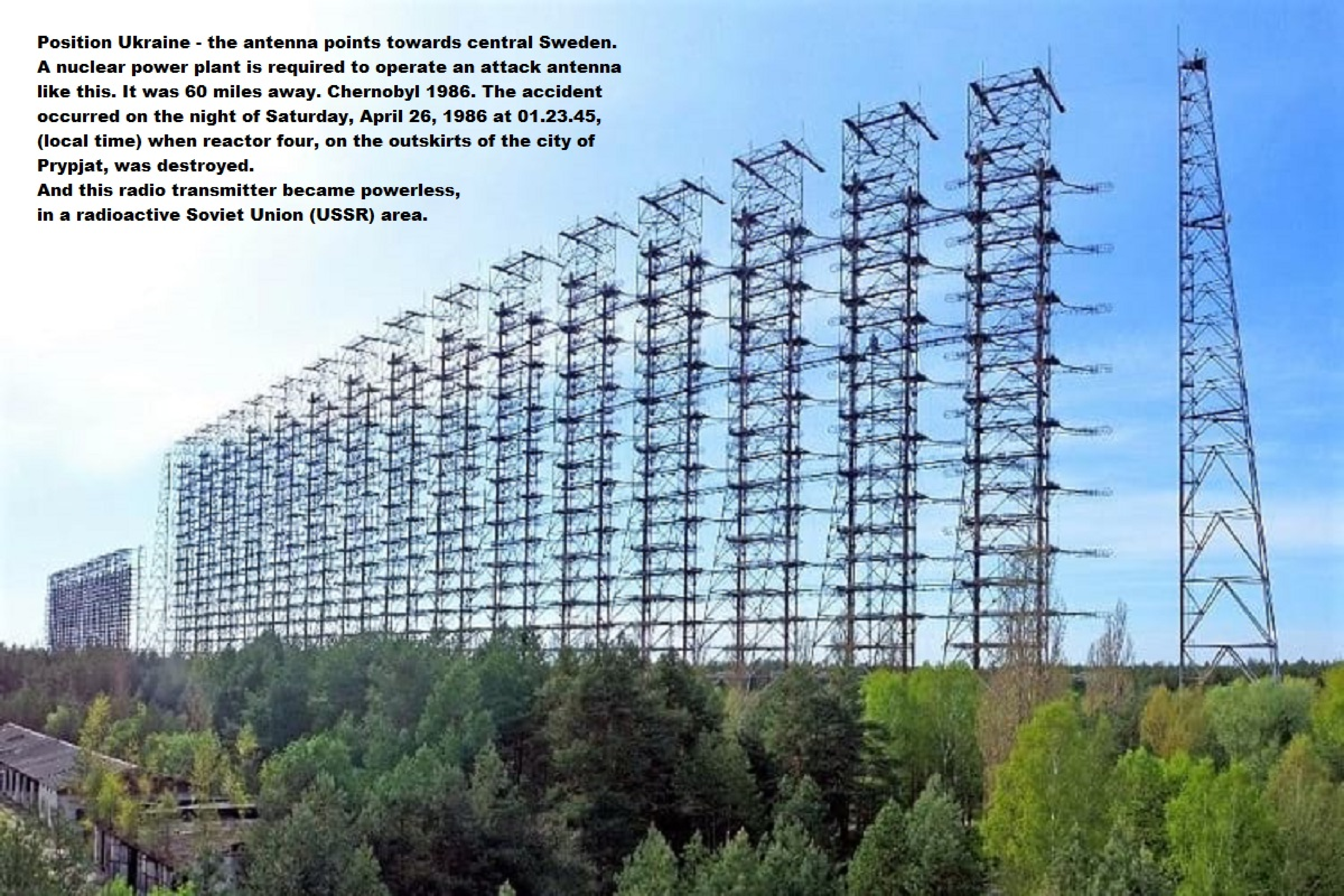
ACTUALLY.

IT LOOKS LIKE THIS.


SOME LANGUAGE TALKS:
The most widely spoken languages according to UNESCO (UN Educational, Scientific and Cultural Organization) are:
1. Mandarin Chinese.
2. English.
3. Spanish.
4. Hindi.
5. Arabic.
6. Bengali.
7. Russian.
8. Portuguese.
9. Japanese.
10. German.
11. French.
1.8 BILLION PEOPLE KNOWS ENGLISH.
—You know, the easy words, like, where is the restuarant'é?
Italian is the fifth most taught language in the world, after English, French, Spanish and German.

Position Ukraine - the antenna points towards central Sweden. A nuclear power plant is required to operate an attack antenna like this. It was 60 miles away. Chernobyl 1986. The accident occurred on the night of Saturday, April 26, 1986 at 01.23.45, (local time) when reactor four, on the outskirts of the city of Prypjat, was destroyed.
And this radio transmitter became powerless, in a radioactive area.

This ANTENNA was so powerful that it made 'click sounds' in American telephone conversations, on the other side of the Atlantic Ocean. It was operating at a brain resonance frequency.
10 Hertz.


Position Ukraine - the antenna points towards central Sweden.
A nuclear power plant is required to operate an attack antenna
like this. It was 60 miles away. Chernobyl 1986. The accident
occurred on the night of Saturday, April 26, 1986 at 01.23.45,
(local time) when reactor four, on the outskirts of the city of
Prypjat, was destroyed.
And this radio transmitter became powerless,
in a radioactive Soviet Union (USSR) area.

From the MAJCOM MJ-12 Fifth Annual Report.
Top Secret Document Report

Here MJ12 and the U.S. President discuss that it is okey to bend the law and the Constitution "considering the nature of the threat".

*** CLEAR VIOLATIONS OF THE LAW.
That's why they are Traitors today and uses Traitor Technology without doubt.

M. Domestic and Constitutional Issues

In dealing with clear violations of civic law and guarantees as defined under the Constitution, it has been discussed among members of MAJESTIC TWELVE, that such protection of individual rights are out-weighed by the nature of the threat. Only a declaration of war or a national emergency, would give the government the power to enact martial law and recend individual rights.

N. Social, Religious and Scientific Reaction

masses.

It has been the downfall of great nations and cultures when a new reality is not readily accepted by the masses. The social order was severely ravaged by the last world war, with great damage to the religious dogma of "earth without end," thus making a government disclosure irresponsible and inherently dangerous. The scientific community would predictably question such a reaction as a world suffering from a Buck Rogers delerium and attack anyone of their own ranks for believing such fanatsy. Science itself, may undergo a traumatic transformation, with belief structures in shambles, putting the institutions under scrutiny by the layman, thus eroding any credibility. Science would be left with an image of credulity. BLA-BLA-BLA

CRIMINALS TALK LIKE THIS.

PLANETARY TREASON.

EXEMPTED FROM
DECLASSIFICATION LAW EO 12958
REVIEW DATE 6/97 REVIEWER 64
REFER TO NORAD
EXEMPTION (S): 1 2 3 4 5 6 7 8 9

SECRET

[redacted]

NORTH AMERICAN AIR DEFENSE COMMAND

Weekly Intelligence Review (U)

Soviet Vehicles in Earth Orbit as of 6 April 1964

International Designation	Common Name	Launch Date	Inclination to Equator (degrees)	Period (minutes)	Apogee (kilometers)	Perigee (kilometers)
1962 B, Theta 1	Cosmos 11	22 Oct 62	48.93	90.8	407.2	211.5
1963-17A	Cosmos 17	22 May 63	48.98	93.4	625.9	250.1
1963-43A	Polyot 1	1 Nov 63	58.95	102.4	1400.2	344.0
1964-6A	Electron 1	30 Jan 64	60.85	169.3	7117.5	403.7
1964-6B	Electron 2	30 Jan 64	60.46	1356.4	68014.9	408.2
1964-10A	Cosmos 25	27 Feb 64	49.05	92.1	489.4	259.5
1964-13A	Cosmos 26	18 Mar 64	48.98	91.0	375.7	267.8
1964-17A	Cosmos 28	4 Apr 64	64.64	90.37	395.8	211.5

Soviet Vehicles in Heliocentric (Sun) Orbit

International Designation	Common Name	Launch Date	Inclination to ecliptic (degrees)	Period (days)	Aphelion (astronomical units)*	Perihelion* (astronomical units)*
1959 Mu 1	Lunik 1	2 Jan 59	0.01	449.4	1.315	0.9766
1961 Gamma	Venik	12 Feb 61	0.58	300	1.0190	0.7183
1962 Beta Nu 3	Mars 1	1 Nov 62	2.683	519.1	1.604	0.9237
1964-16	Zond 1	2 Apr 64	Data Not Available			

Soviet Vehicles in Barycentric (Earth-Moon) Orbit

1963-8B	Lunik 4	2 Apr 63

Soviet Vehicles Resting on Surface of the Moon

1959 Xi 1	Lunik 2	12 Sep 59

SECRET

- 34 -

SECRET

OFFICIAL USE ONLY

The Ishtar Gate in Babylonia was one of eight fortified city gates to the ancient metropolis of Babylon, in Babylonia. Babylon was completely emptied of its population.

NEW JOB FOR MARVIN JONES

WASHINGTON —The Senate confirmed today President Truman's nomination of Marvin Jones of Texas to be Chief Judge of the United States Court of Claims. He already is a member of the court.

ROSWELL MORNING DISPATCH

FORECAST

Clear to partly cloudy today and tonight. Little change in temperature. High today 100 degrees. Low tonight 64 degrees.

ASSOCIATED PRESS, KING, UNITED AND AP FEATURES — ROSWELL, CHAVES COUNTY, NEW MEXICO — WEDNESDAY, July 9, 1947 — VOL. XXIII — NO. 158

Army Debunks Roswell Flying Disk As World Simmers With Excitement

American Leaguers Eke 2-1 Victory From National Stars

Lewis' Miners Return To Pits With Fat Raises

75 Pct. of the Workers Return But Southern Operators Won't Sign

Thirteen Nations Accept Bids To Econ Aid Talks

Still Hope That Russians Might Be At Paris Conference

IS THIS A FLYING DISC? Coastguardsman Frank Ryman reported he had photographed a mysterious "flying disc" near Seattle at night and said he thought the white dot indicated by the arrow was the object. This photo is enlarged about 20 times from the original. (AP Wirephoto).

Reds Blame US-Britain For Greek Situation

Russian Minister Says Military Men Are Causing Trouble

Officers Say Disk Is Weather Balloon

SHERIFF WILCOX TELLS THE LIMEYS

Sheriff George Wilcox is shown above seated at his official post while relating the story of the rumored "Flying Disc" discovery to the London Daily Mail. The phone in the picture was the transmitting instrument for talks with the continental U. S., England, and Mexico.

OBJECT FOUND ON FOSTER RANCH CAUSES EXCITEMENT

Good Morning

Tax Slash Bill Sails Thru House By Large Margin

Enough "Yes" Votes To Override Another Presidential Veto

House Battles Over Document On 'Fascism'

Flying Disk Transforms Sheriff's Office To International Newsroom

Senate Confirms Connally Man Over O'Daniel Appointee

Grange Leader Proposes Ceilings On Industrial Wage

Bevin Praises Marshall Plan

Carrizozo Man Sees Flying Disk

Joe Massey Spots Disk Over Roswell

RAAF Take 16-0 Win From Sportsman

ICC Directs Railroads To Go Ahead

1947-The Newspaper Roswell Morning Dispatch's front-page the day after, the USA Presidential Order of a Military Cover-up already had been administrated. July 9:th 1947.

Photo from Planet Mars. See the shadow here.

Wonders of Universe
January 5 at 10:03 PM ·

This volcano mountain is on Mars. It is called Olympus Mons. It is the tallest mountain in our solar system. It is three times larger than Mount Everest (26 km long and 600 km wide Amazing.

Jeremy Brown
Great pic. Funny how we get blurry moon pics but super hd mars pics.

—I think it looks like a downed or crashed flying saucer, that has been through some sand storms, on Planet Mars.
Perhaps it has been there since ancient times.

/GN.


HIGH FIVE
—HIGH FIVE!
—NOT HIGH SIX!


ON LAST PAGE: ALIEN POETRY AND WISDOM.
1.
Three truths and realities we must accept:
1/ We are all one of the same kind.
2/ We are all Gods inside.
3/ We are all unique and special.
It believes itself to be our Creator.
3.
Here I lie and control the future, as you see. I am your father. We can rule the galaxy together. HIGH FIVE! www.alien1947.com
2.
Time is an illusion.
The only thing that matters is the here and now.
Not the past.
Not the future.
Time is an illusion.
You control the present, therefore you control the past, therefore you control the future. Your future.

NATIONAL SECURITY AGENCY

UNITED STATES OF AMERICA

U.S. Department *of* Defense

NATIONAL SECURITY AGENCY

UNITED STATES OF AMERICA

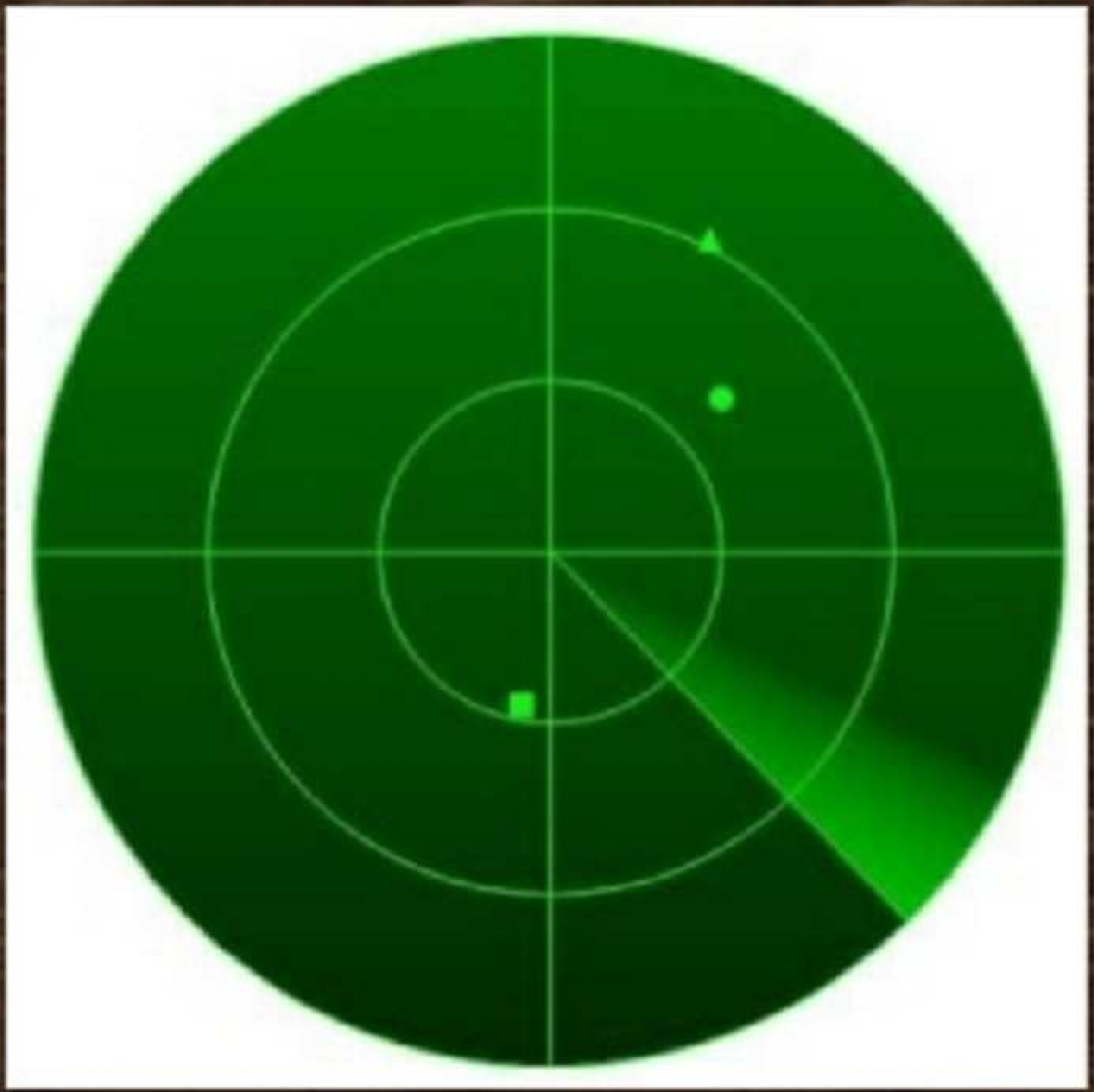
ON NEXT PAGE:

—PERHAPS A EXTRATERRESTRIAL WEAPON.

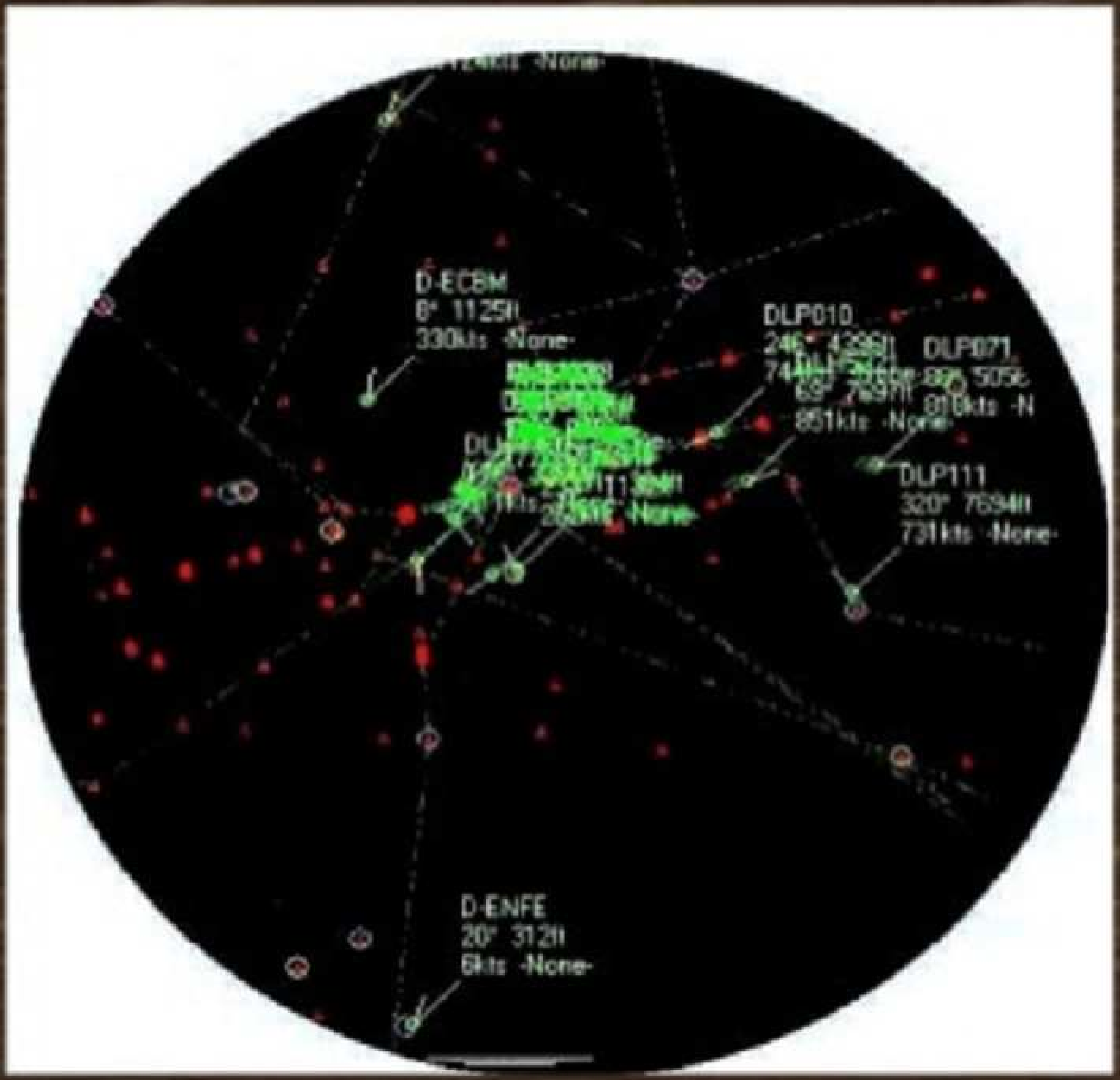
THE SUN'S ARRAYS WOULD SPREAD ITS LIGHT ARRAYS WIDER THAN THIS LIGHT BEAM, IF THEY TRAVELED AS ON IMAGE.

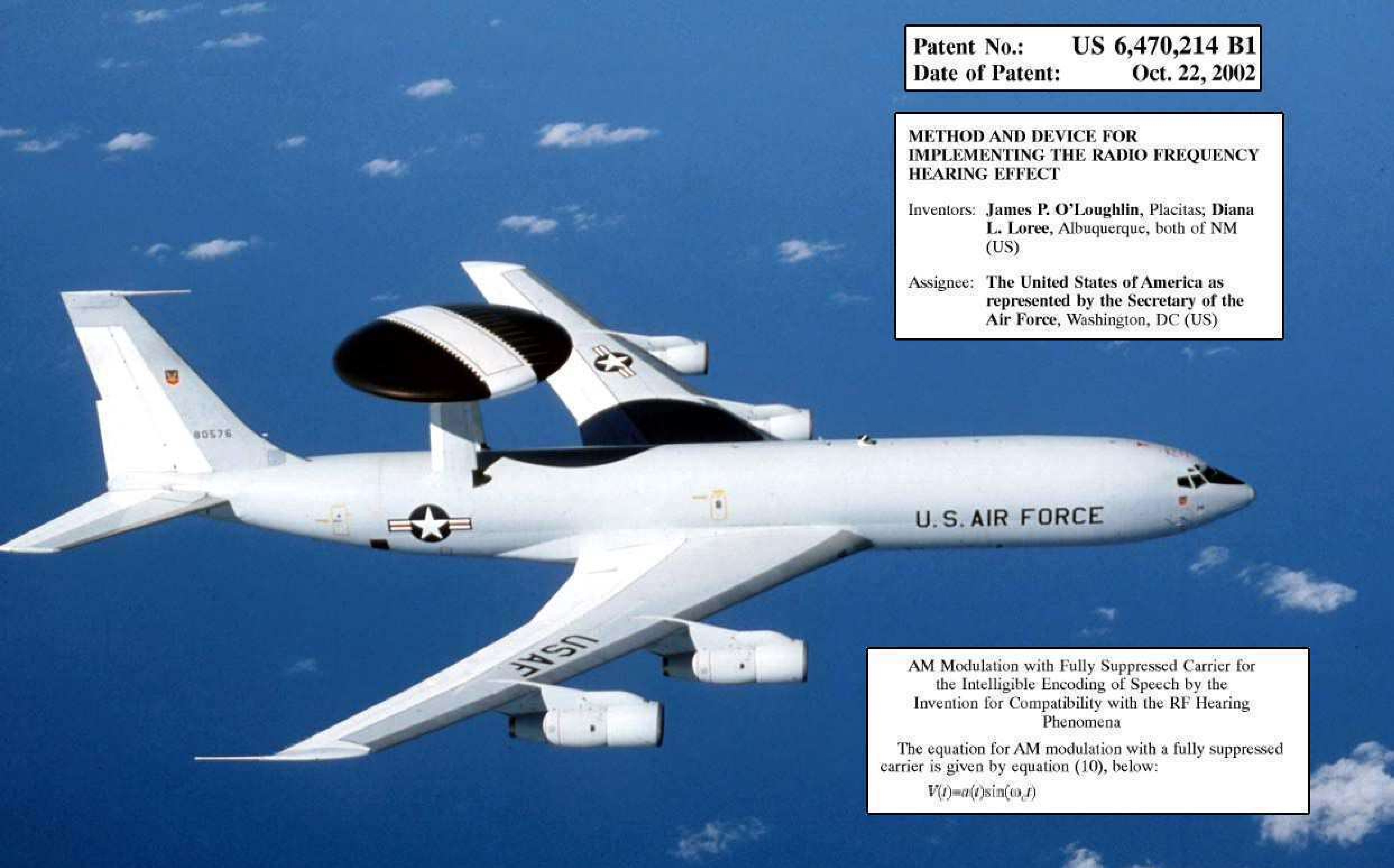
TYPES OF RADAR

Primary Radar



Secondary Radar





Patent No.:	US 6,470,214 B1
Date of Patent:	Oct. 22, 2002

METHOD AND DEVICE FOR IMPLEMENTING THE RADIO FREQUENCY HEARING EFFECT

Inventors: **James P. O'Loughlin**, Placitas; **Diana L. Loree**, Albuquerque, both of NM (US)

Assignee: **The United States of America as represented by the Secretary of the Air Force**, Washington, DC (US)

AM Modulation with Fully Suppressed Carrier for the Intelligible Encoding of Speech by the Invention for Compatibility with the RF Hearing Phenomena

The equation for AM modulation with a fully suppressed carrier is given by equation (10), below:

$$V(t)=a(t)\sin(\omega_c t)$$

PDF SECTION: UNITED STATES PATENTS.

US006011991A

United States Patent [19]

Mardirossian

[11] **Patent Number: 6,011,991**

[45] **Date of Patent: Jan. 4, 2000**

[54] **COMMUNICATION SYSTEM AND METHOD INCLUDING BRAIN WAVE ANALYSIS AND/OR USE OF BRAIN ACTIVITY**

[75] Inventor: **Aris Mardirossian**, Germantown, Md.

[73] Assignee: **Technology Patents, LLC**, Derwood, Md.

[21] Appl. No.: **09/206,365**

[22] Filed: **Dec. 7, 1998**

[51] **Int. Cl.**[7] **A61N 5/00**

[52] **U.S. Cl.** **600/544**; 600/545

[58] **Field of Search** 600/300, 544–545; 128/897–898, 904, 905

[56] **References Cited**

U.S. PATENT DOCUMENTS

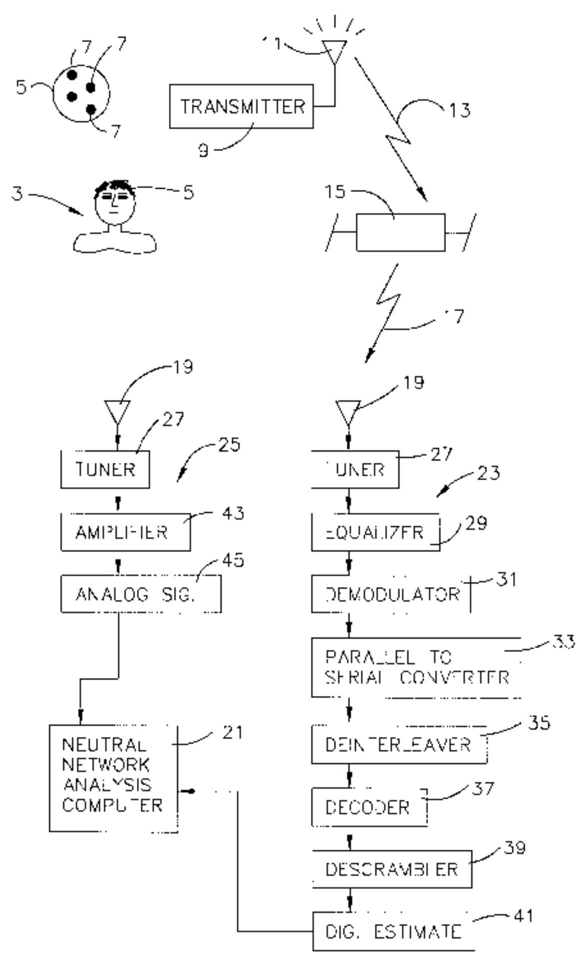
5,059,814	10/1991	Mead et al. .	
5,118,606	6/1992	Lynch et al. .	
5,136,687	8/1992	Edelman et al. .	
5,224,203	6/1993	Skeirik .	
5,303,705	4/1994	Nenov .	
5,325,862	7/1994	Lewis et al. .	
5,461,699	10/1995	Arbabi et al. .	
5,522,863	6/1996	Spano et al. .	
5,640,493	6/1997	Skeirik .	
5,715,821	2/1998	Faupel .	
5,719,561	2/1998	Gonzales .	
5,722,418	3/1998	Bro	128/905
5,730,146	3/1998	Itil et al.	600/544
5,736,543	4/1998	Rogers et al. .	
5,737,485	4/1998	Flanagan et al. .	
5,747,492	5/1998	Lynch et al. .	
5,791,342	8/1998	Woodard	600/544
5,816,247	10/1998	Maynard .	

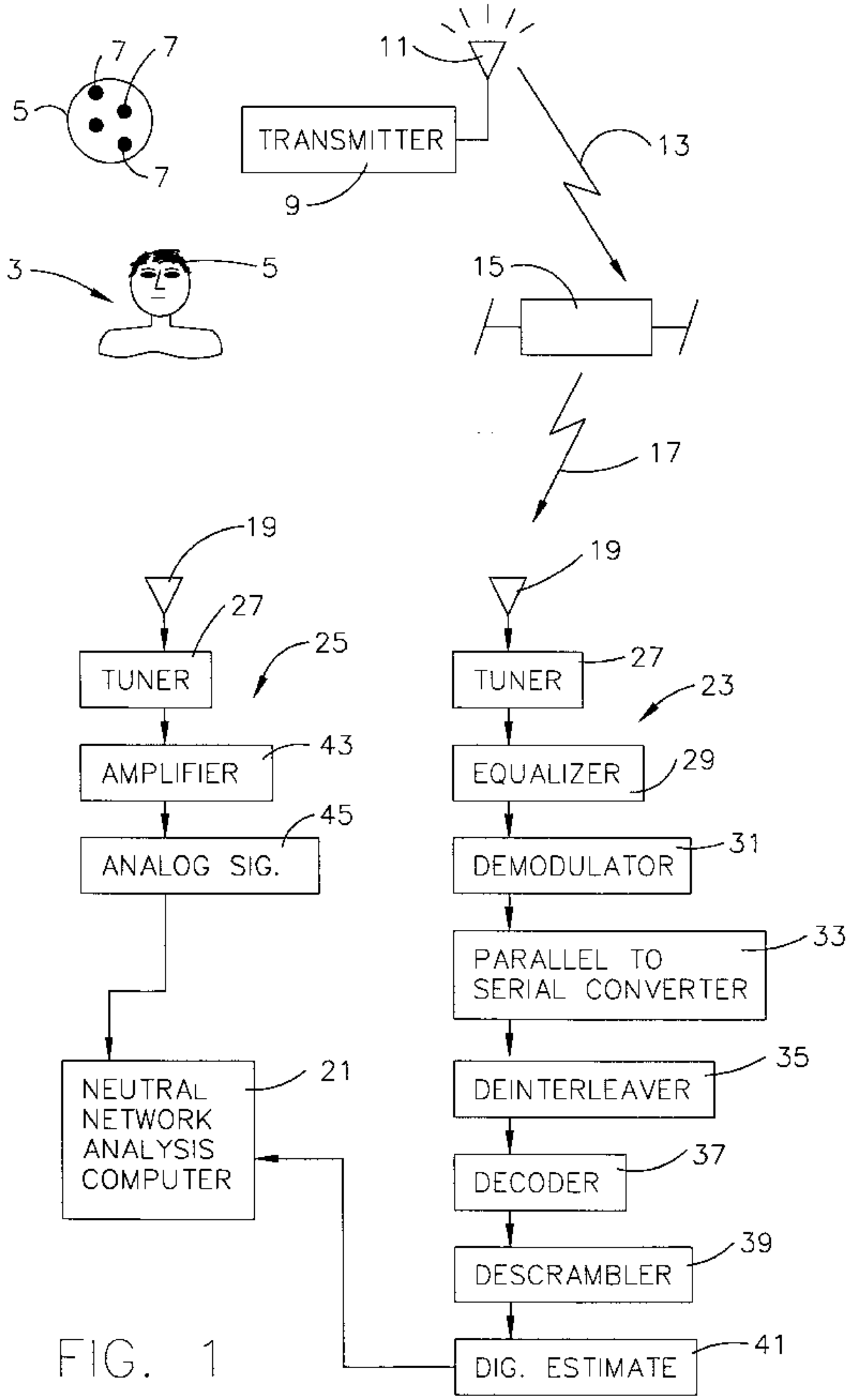
Primary Examiner—Cary O'Connor
Assistant Examiner—Michael Astorino
Attorney, Agent, or Firm—Joseph A. Rhoa

[57] **ABSTRACT**

A system and method for enabling human beings to communicate by way of their monitored brain activity. The brain activity of an individual is monitored and transmitted to a remote location (e.g. by satellite). At the remote location, the monitored brain activity is compared with pre-recorded normalized brain activity curves, waveforms, or patterns to determine if a match or substantial match is found. If such a match is found, then the computer at the remote location determines that the individual was attempting to communicate the word, phrase, or thought corresponding to the matched stored normalized signal.

8 Claims, 3 Drawing Sheets




7
7
5
7
11
TRANSMITTER
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13
3
5
15
17
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19
27
25
TUNER
TUNER
27
23
AMPLIFIER
43
EQUALIZER
29
45
ANALOG SIG.
DEMODULATOR
31
PARALLEL TO
SERIAL CONVERTER
33
NEUTRAL
NETWORK
ANALYSIS
COMPUTER
21
DEINTERLEAVER
35
DECODER
37
DESCRAMBLER
39
DIG. ESTIMATE
41

FIG. 1

FIG. 2

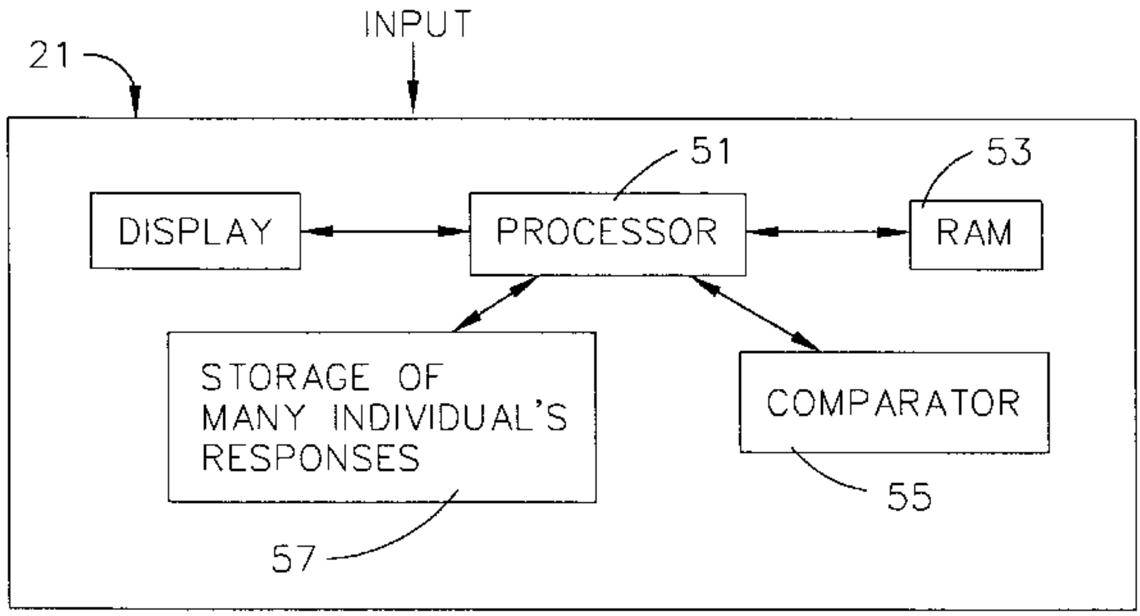
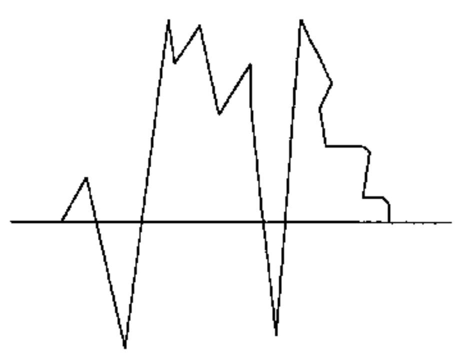


FIG. 3(a)

JOE (NO)

FIG. 3(b)



JOE (YES)

FIG. 3(c)

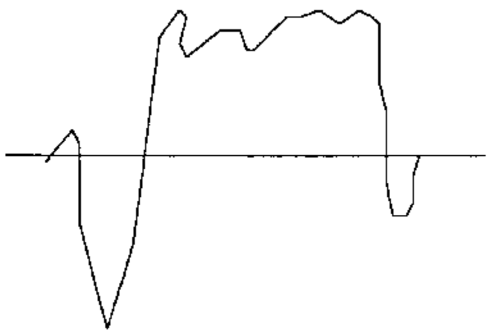


FIG. 3(d)

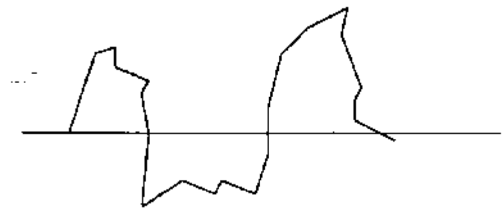


FIG. 3(e)

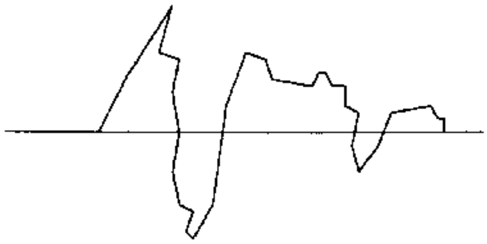


FIG. 3(f)

COMMUNICATION SYSTEM AND METHOD INCLUDING BRAIN WAVE ANALYSIS AND/OR USE OF BRAIN ACTIVITY

This invention relates to a system and method for enabling human beings to communicate with one another by monitoring brain activity. In particular, this invention relates to such a system and method where brain activity of a particular individual is monitored and transmitted in a wireless manner (e.g. via satellite) from the location of the individual to a remote location so that the brain activity can be computer analyzed at the remote location thereby enabling the computer and/or individuals at the remote location to determine what the monitored individual was thinking or wishing to communicate.

In certain embodiments this invention relates to the analysis of brain waves or brain activity, and/or to the remote firing of select brain nodes in order to produce a predetermined effect on an individual.

BACKGROUND OF THE INVENTION

It is known to monitor brain activity by way of electroencephalograph (EEG) methods, magnetoencephalograph (MEG) methods, and the like. For example, see U.S. Pat. Nos. 5,816,247 and 5,325,862, the disclosures of which are both hereby incorporated herein by reference. As discussed in the '247 patent, an EEG may be recorded from a number of pairs of scalp electrodes and processed according to known software. Such software and/or hardware acquires both processed and unprocessed EEG data and may record it on a disk. The records may be replayed and statistics of the on-line measures made on suitable sections placed in categories predefined by a user. This may utilize the form of database of statistical measures of brain activity. Unfortunately, neither the '862 nor the '247 patents disclose or suggest any methods by which humans can communicate with one another by way of monitoring brain activity.

U.S. Pat. No. 5,719,561 discloses a communications device and method, the entire disclosure of the '561 patent hereby being incorporated herein by reference. The '561 patent discusses a method and device for vibromechanical tactile communications adaptable for use by individuals to recognize alpha numeric messages in a language or in other symbols known to them. The '561 patent discusses using a series of sequentially firing vibromechanical stimulators vibrating against a suitably tactile sensitive surface of the wearer (e.g. skin) to induce a phenomenon of illustration of linear continuity. Unfortunately, the '561 patent requires the use of burdensome and complex vibromechanical tactile devices, and is not suitable for long distance communication.

It is a purpose of this invention to address any or all of the above-identified problems in the prior art, as well as other problems which will become apparent to the skilled artisan from the following detailed description of this invention.

SUMMARY OF THE INVENTION

Generally speaking, this invention fulfills the above described needs in the art by providing a method of communicating comprising the steps of:

- providing a first human being at a first location;
- providing a computer at a second location that is remote from the first location;
- providing a satellite;
- providing at least one sensor (preferably a plurality—e.g. tens, hundreds, or thousands, with each sensor monitoring the firing of one or more brain nodes or synapse type members) on the first human being;
- detecting brain activity of the first human being using the at least one sensor, and transmitting the detected brain activity to the satellite as a signal including brain activity information;
- the satellite sending a signal including the brain activity information to the second location;
- a receiver at the second location receiving the signal from the satellite and forwarding the brain activity information in the signal to the computer;
- comparing the received brain activity information of the first human being with normalized or averaged brain activity information relating to the first human being from memory; and
- determining whether the first human being was attempting to communicate particular words, phrases or thoughts, based upon the comparing of the received brain activity information to the information from memory.

In certain embodiments, the invention includes the following step: asking the first human being a plurality of questions and recording brain activity of the first human being responsive to the plurality of questions in the process of developing said normalized or averaged brain activity information relating to the first human being stored in the memory. A database in a memory may include, for each of a plurality (e.g. one hundred or thousands) of individuals, a number of prerecorded files each corresponding to a particular thought, attempt to communicate a word, attempt to communicate a phrase or thought, or mental state. Measured brain activity of a given individual may be compared to files from that database of that individual to determine what the individual is attempting to communicate or what type of mental state the individual is in.

In certain embodiments, the plurality of questions are the same question.

In certain embodiments, the plurality of questions are different questions.

In certain embodiments, the invention includes the step of normalizing or averaging recorded brain activity responsive to a given question or set of questions in developing the normalized or averaged brain activity information relating to the first human being.

It is an object of this invention to enable brain activity of a first human being to be monitored, with the activity being transmitted to a remote location so that individuals and/or a computer at the remote location can determine what the first human being was thinking or intending to communicate. In such a manner, human beings can communicate with one another via monitoring of brain activity, and transmission of the same.

It is another object of this invention to communicate monitored brain activity from one location to another in a wireless manner, such as by IR, RF, or satellite.

It is another object of this invention to provide a system capable of identifying particular nodes in an individual's brain, the firings of which affect characteristics such as appetite, hunger, thirst, communication skills (e.g. which nodes are utilized to communicate certain words such as "yes", "no", or phrases such as "I don't know", "I'm not sure", or numbers such as "one", "two", "ten", "one hundred" and the like), thought processes, depression, and the like). When such nodes are identified, they may be specifically monitored by one or more sensors to analyze behavior or communication or words, phrases, or thoughts. In other embodiments, devices mounted to the person (e.g. underneath the scalp) may be energized in a predetermined manner or sequence to remotely cause particular identified brain node(s) to be fired in order to cause a predetermined feeling or reaction in the individual, such as lack of hunger, lack or depression, lack or thirst, lack of aggression, lack of alzheimer's disease effects, or the like.

Brain node firings are the basis of thought and mind processes of individuals. Certain embodiments of this invention enable such brain firings and behavior to be captured by an external device. It is an object of this invention to utilize a normalization or normalizing curve (or waveform or pattern) based upon monitored brain activity to detect or determine thought processes by the monitored individual. In such a manner, individuals can transmit by satellite what they are thinking or intending to think via their monitored brain activity, without the need to talk or write down information.

Each individual has a distinct pattern of brain node firings or brain activity. Each person is believed to be different in this regard. Thus, a separate brain activity file may be stored in a memory for each individual, and analyzed or compared to received brain activity from the monitored individual in order to determine what that individual is thinking or attempting to communicate.

It is an object of this invention to utilize brain monitoring and transmission of monitored brain activity for lie detection and/or human communication.

It is another object of this invention to formulate or build-up a file for each individual based upon patterns recorded in response to that individual answering or responding to numerous predetermined questions with known intended responses. Subsequently, monitored brain activity from that individual may then be compared to information stored corresponding to that individual to determine whether the individual is lying or what the individual is intending to communicate in the monitored brain activity. The higher the level of detail of the file, the higher the level of potential communication by certain embodiments of this invention.

At least one sensor on the scalp or skin in certain embodiments provides signals representative of physiological activity generated in the brain of a monitored individual. A data acquisition device receives the signals representative of the physiological activity generated in the monitored brain, and transforms the signals into a pattern or curve corresponding to the monitored brain activity. This is then transmitted (e.g. by satellite) to a computer located at a remote location, with the monitored brain activity pattern or curve being stored in a memory at the remote location. The computer then causes the received pattern or curve information to be compared with stored brain activity pattern information relating to the monitored individual in order to determine (a) whether the monitored individual is lying in response to a particular question, or (b) what the monitored individual is communicating or attempting to communicate.

Another object of this invention is to utilize normalization curves representative of received brain activity patterns from the monitored individual, and to compare the received normalized data with normalized brain activity pattern or curve data stored in memory relating to that individual. The use of normalization curves in one or both of the individual's file and received brain activity improves reliability, accuracy, and efficiency.

In certain embodiments of this invention, the computer located at the remote location includes a neural network suitably programmed in accordance with known neural network techniques, for the purpose of receiving the monitored brain activity signals, transforming the signals into useful forms, training and testing the neural network to distinguish particular forms and patterns of physiological activity generated in the brain of the monitored individual, and/or comparing the received monitored brain activity information with stored information relating to that individual in order to determine what the individual is attempting to communicate.

This invention further fulfills the above described needs in the art by providing a method of affecting a mental or physiological state of an individual, the method comprising the steps of:

providing at least one firing device capable of being energized on an individual; and

energizing the firing device to cause the firing device to cause a particular or group of brain nodes to be fired in the individual in order to affect the mental or physiological state of the individual.

In certain embodiments, the method including the step of providing the at least one firing device on or under the scalp of the individual in proximity of the brain of the individual.

In certain embodiments, the method including the step of identifying at least one brain node related to the mental or physiological state intended to be affected, targeting the identified brain node, and energizing the firing device or devices to cause the identified node to be fired in order to affect the mental or physiological state of the individual.

In certain embodiments, the method is utilized to cause the individual to be one of less hungry, less thirsty, less anxious, and less depressed.

In certain embodiments, the remote node firing devices are electrically energized and generate electromagnetic waves which cause a plurality of brain nodes to be fired.

This invention will now be described with respect to certain embodiments thereof, along with reference to the accompanying illustrations.

IN THE DRAWINGS

FIG. 1 is a block diagram illustrating the system and method according to a first embodiment of this invention.

FIG. 2 is a block diagram illustrating the neural network inclusive computer of the FIG. 1 embodiment of this invention.

FIGS. 3(*a*)–3(*f*) are exemplary graphs of monitored brain activity of different individuals, with, for example, FIG. 3(*a*) illustrating monitored brain activity of a particular individual who is attempting to communicate the word "no" and FIG. 3(*b*) illustrating monitored brain activity of the same individual when that individual is attempting to communicate the word "yes."

DETAILED DESCRIPTION OF CERTAIN EMBODIMENTS OF THIS INVENTION

Referring now more particularly to the accompanying drawings in which like reference numerals indicate like parts throughout the several views.

There are significant individual differences in electrical and magnetic activity in the brain. Brain node or synapse firings are chemically and/or electrically caused and/or related. Some characteristics of brain activity may be relatively stable when measured from day to day. Brain responses to sensory stimulation (e.g. visual, audible, olfactory, gustatory, etc.) as well as higher order cognitive processing (e.g. decision-making or thought/word communication), can be examined in great detail using a variety of recording procedures. A recording of brain electrical activity is called an electroencephalograph (EEG), and a comparable record of magnetic activity is called a magnetoencephalogram (MEG). When human sensory systems are stimulated by a particular event (a given sound or optical effect) or when a human wishes to communicate a particular word or phrase (e.g. the word "yes" or the word "no"), there is a predictable sequence of processing that occurs in the brain. This processing generates an event related potential that can be recorded from the scalp beginning shortly after the onset of the stimulation, and lasting for approximately 0.5–4 seconds after the stimulation. These potentials can be repeatedly generated from individuals given the same stimulus or wishing to communicate the same word or phrase. In certain embodiments of this invention, brain activity may be repeatedly sampled, and response patterns averaged by way of a normalization curve or the like. Comparable recordings of averaged or normalized magnetic activity may be referred to as evoked fields. Neuroelectric and neuormagnetic recordings are subsets of general measurings referred to as bioelectric and biomagnetic measures. These measures refer to recordings which may be made from different types of tissue including neural, muscle, heart, etc. For example, EEG, evoked potentials (EP), MEG, position emission tomography (PET) of glucose, or single photon emission computed tomography (SPECT) may be used to monitor brain activity in different embodiments of this invention.

Event related potentials have been shown to be stable and unique to individuals. See U.S. Pat. No. 5,325,862, which is incorporated herein by reference. Although the actual shape of such potentials varies considerably from individual to individual, there is stability within individuals over time for individual waveforms. Sources of these potentials and variations thereof include individual differences in brain anatomy and differences in the way in which information is processed by each individual. Thus, it is feasible herein to utilize monitored brain waveforms for the purpose of determining whether an individual is lying or not, or what word or phrase a particular individual is attempting to communicate (without the need for writing information down or speaking).

Thus, evoked fields and/or event related potentials can be utilized as classifiers for several purposes. For example, because these potentials and/or fields are relatively unique to individuals, an individual's evoked field or event related potential (or brainprint) can be utilized to determine what thoughts an individual is communicating or attempting to communicate given knowledge of the identification of that individual and previously recorded patterns associated with that individual communicating predetermined words, phrases or thoughts. Because there is a remarkable degree of stability in individual waveforms of a person over time, it is possible to identify changes in individual event related potentials and evoked field patterns which can be utilized to determine when an individual is lying, or impaired in any way.

There are numerous neural networks in the brain, these networks having complex inner connections and non-linear response patterns. Relationships between the latencies and amplitudes of event related potentials and evoked field waveform features have become well understood. In addition, there are many individual variations in waveform morphology. Computing techniques modeled after brain neural functions are known in the art. They are typically referred to as neural network analysis techniques or computers. Neural network analysis computing technology

offers a method for finding complex, non-linear relationships in large data sets, even when the nature of the relationships is not known in advance. Neural network technology is implemented sometimes using computer software programs, but may also be hardware implemented. Neural network theory, and detailed descriptions of specific techniques, are available in numerous books and articles set forth in the aforesaid '862 patent, as well as in, for example, any of U.S. Pat. Nos. 5,136,687; 5,059,814; 5,461,699; 5,737,485; 5,224,203; and 5,640,493, the entire disclosures of which are all hereby incorporated herein by reference. Such neural computing systems have a capability to learn features of data sets and classify same into either unknown or predetermined categories. A variety of neural network techniques may be utilized to classify event related potentials, evoke fields, or any other type of pattern corresponding to monitored brain behavior. In most neural networks, input values are adjusted through a series of layers by a series of transforms and weighted so that output categories are correctly predicted. Thus, a neural computing system herein may be utilized to receive monitored brain activity and based upon predetermined stored and/or learned information, determine based upon the received information what word, phrase, or thoughts the monitored individual is attempting to communicate. In such a manner, the monitoring of brain activity may be utilized to allow individuals to communicate from one location to another, with the neural computer or any other type of computer analyzing the monitored brain information (e.g. via comparison with previously recorded brain activity of that person) and outputting information indicative of the word, phrase, or thoughts which the monitored individual is attempting to communicate.

FIG. 1 illustrates a particular monitored individual **3** according to an embodiment of this invention. Individual **3** includes a head **5**. As illustrated, sensors **7** may be attached or otherwise disposed adjacent to the scalp or skin of the individual **3**. Sensors **7** detect and monitor brain activity of individual **3**. Sensors **7** can detect event related potentials and/or event related fields (i.e. ERPs or ERFs). Optionally, sensor **7** may be utilized to detect any other type of "brainprint" indicative of brain activity of individual **3**.

The monitored "brainprint" of individual **3** is forwarded to a small transmitter **9** which is preferably embedded in the skin of individual **3**, or in close proximity to individual **3**. Transmitter **9** causes the monitored "brainprint" information detected by sensor **7** to be transmitted by way of antenna **11** as wireless signals **13**. In certain embodiments of this invention, signals **13** propagate through atmospheric free space in the form of uplink satellite signals toward satellite **15**. Satellite **15** receives signals **13** and then redirects those signals back toward Earth as signals **17** which include information therein (analog or digital) indicative of the monitored brain activity of individual **3**. Signals **17** are received by antenna **19**. Antenna **19** and individual **3** are both preferably located on Earth at different locations. In certain embodiments, antenna **19** is located at a location remote from individual **3**. For example, individual **3**, sensor **7**, transmitter **9**, and antenna **11** may all be located in Europe while receiving antenna **19** and computer **21** may be located in the United States.

FIG. **1** illustrates both a digital embodiment **23** and an analog embodiment **25** of receiving systems. Either may be utilized. When signals **17** include digital information, they are received by antenna **19** and forwarded to tuner **27**. The signals are processed through equalizer **29**, demodulator **31**, parallel to serial converter **33**, deinterleaver **35**, decoder **37**, descrambler **39**, digital estimator **41**, and finally to neural network analysis or other type of computer **21**. Monitored firings of brain nodes may be broken down into digital form (e.g. the firing of a node is equivalent to a "1" and nonfiring to a "0"). These 1s and 0s, which are digital, may be modulated onto a carrier and then transmitted to the satellite so that the monitored brain activity in the signal is in digital form. When the computer receives this monitored signal from the satellite, the demodulating system analyzes the received digital information (e.g. 1s and 0s) which is indicative of the firing of select brain nodes of the monitored individual. These digital signals may be transformed, in certain embodiments, into analog form similar to the illustrations of FIG. **3**, or alternatively may be kept in digital form and compared with prestored digital signals to determine what the monitored person was intending to communicate.

In analog embodiments, signal **17** is received by antenna **19**, and the information forwarded to tuner **27**, amplifier **43**, and the analog information inclusive signal **45** is forwarded to computer **21**. In analog embodiments, the signals received by the monitoring sensors are in the form of waves similar to those shown in FIG. **3** herein.

FIG. **2** is a block diagram of computer **21** in certain embodiments of this invention. The input thereto may be in either analog or digital form. Computer **21** includes processor **51**, RAM **53**, comparing device **55**, and memory **57** for storing a plurality of files or patterns of measured brain activity or responses of particular individuals. For example, memory or storage **57** may include one file for individual X which includes hundreds of monitored brain activity (e.g. ERPs or ERFs) that were measured when individual X was attempting to communicate the word "no." Another file in storage or memory **57** may have stored therein hundreds or thousands of monitored brain patterns or activities of individual X when individual X was attempting to communicate the word "yes." Storage or memory **57** may also include similar files for individual X including patterns which were measured when the individual was attempting to communicate different words or phrases. Each of these files may have a normalized curve, waveform or pattern formed or developed for each word, phrase, or thought for each individual, based upon all of the recorded patterns or curves for that word, phrase, or thought (e.g. 1,000 such recordings for the phrase "help me," and 1,000 for the phrase "I've been caught." Memory **57** further includes in certain embodiments many different files for many different individuals, all including files for each individual's past communicating of particular words, phrases, or thoughts.

Normalized curves or patterns corresponding to each individual's attempt to communicate a particular word, thought, or a pattern may be stored in storage or memory **57**. Thus, for individual X attempting to communicate the word "no", a normalized curve, waveform, or a pattern may be stored in memory **57** indicative or such a communication. Likewise, a normalized curve, waveform, or pattern may be stored in memory **57** for individual Y attempting to communicate the word "no" and another distinct normalized curve, waveform, or pattern may be stored in memory **57** for individual Y attempting to communicate the word "yes." In a similar manner, a normalized curve, waveform or pattern may be stored in memory **57** for individual Y attempting to communicate the phrase "I don't know" or "I'm not sure." Thus, if one hundred different human beings have files in memory **57** corresponding to each of these individual's attempt to communicate the phrase "I don't know", then one hundred different normalized waveforms, curves or patterns would be stored in memory **57**, each corresponding to a particular individual. A normalized curve, waveform, or pattern may be developed by repeatedly asking an individual tens, hundreds, or thousands of times a particular question or group of questions which evoke a known response such as "I don't know," or "no" or "yes." Each time the response is made, a curve, waveform, or a pattern is recorded. After tens, hundreds, or even thousands of these patterns have been recorded, a normalized curve, waveform or pattern is formed based upon same so as to be indicative of that particular individual's attempt to communicate the phrase. In a similar manner, if it is desired to store normalized curves, waveforms, or patterns for ten different words, phrases or thoughts communicated by a particular individual, then a normalized curve, waveform, or pattern is developed for each of the different ten items so that ten different normalized curves, waveforms or patterns are stored in memory **57** for that individual and classified accordingly. Thus, when computer **21** receives signals indicating brain activity from that monitored individual, the received signals are compared by device **55** to the ten different normalized signals in memory **57** in order to determine what the individual is attempting to communicate.

FIGS. **3**(*a*)–**3**(*f*) illustrate different normalized curves which may be stored in memory **57**. FIG. **3**(*a*) shows a normalized curve indicative of individual "Joe" attempting to communicate the word "no." FIG. **3**(*b*) shows a normalized curve indicative of individual "Joe" attempting to communicate the word "yes." FIG. **3**(*c*) shows a normalized curve indicative of another individual "Steve" attempting to communicate the word "no", while FIG. **3**(*d*) shows a normalized curve indicative of individual "Steve" attempting to communicate the word "yes." Finally, FIG. **3**(*e*) shows a normalized curve indicative of still another individual "Anita" attempting to communicate the word "no", while FIG. **3**(*f*) illustrates a normalized curve of "Anita" attempting to communicate the word "yes."

Thus, if computer **21** receives a signal including monitored brain information identified as being from individual "Steve", then computer **21** causes the received signal to be compared by device **55** with the normalized curves or waveforms shown in FIGS. **3**(*c*) and **3**(*d*) and all others normalized stored signals of "Steve." If a match or a close match is found between the received monitored signal and the normalized curve of FIG. **3**(*c*), then the computer determines that "Steve" was attempting to communicate the word "no." Meanwhile, if no match is found with the normalized curve of FIG. **3**(*c*), but a match or a substantial match is found with regard to the normalized curve or waveform of FIG. **3**(*d*), then the computer determines that "Steve" was attempting to communicate the word "yes." If no match is found between the received "Steve" signal and any normalized curve or waveform of either FIG. **3**(*c*) or FIG. **3**(*d*), or with any other normalized curve stored in memory **57** corresponding to "Steve", then the computer determines that it is unclear what "Steve" was attempting to communicate.

Thus, different embodiments of this invention may be utilized to help individuals communicate with one another without having to send faxes, make telephone calls, speak, or the like. For instance, military personnel located in the Middle East or Europe can communicate with superiors in the Pentagon, simply by use of monitored brain activity being transmitted by satellite to the Pentagon. Alternatively, a special operations individual (e.g. a spy) located in Europe could be asked a question by way of a telephone call, fax, or the like, and that individual can respond to that question simply by thinking the answer so that that individual's monitored brain activity which is transmitted back to the United States can be analyzed to determine the individual's response. In further embodiments of this invention, twoway human communication is possible, provided that human beings at both locations have equipment capable of analyzing and monitoring received monitored brain activity. In such a manner, individuals at two remote locations may communicate with one another without either individual having to speak a word, write anything down, or the like.

In other embodiments, devices mounted to the person (e.g. underneath the scalp) may be energized in a predetermined manner or sequence to remotely cause particular identified brain node(s) to be fired in order to cause a predetermined feeling or reaction in the individual, such as lack of hunger, lack or depression, lack or thirst, lack of aggression, lack of alzheimer's disease effects, or the like. In an example of such an embodiment, the sensors may be replaced with remote firing devices. The computer may cause satellite signals to be sent to a receiver on or proximate an individual, which receiver forwards instructions to the remote firing devices that are mounted, e.g. under the scalp of the individual, in order to selectively cause same to fire or be energized. Such energizing of the device(s) under or near the scalp in a predetermined manner tend to cause identified brain nodes to fire a predetermined number of times. This is useful, for example, in the following scenarios. For example, the system can be used to identify which brain node(s) in a particular individual are typically fired causing that individual to not be hungry. If that individual has an eating disorder or problems with obesity, then the firing devices can be remotely energized thereby causing the identified brain node(s) to be fired at predetermined or random times in order to cause the individual to not be hungry (even if the individual has not eaten for several hours or several days).

In a similar manner, brain nodes which cause an individual to be jovial or not depressed can be identified, and caused to be remotely fired by the computer and firing devices **7** mounted under the scalp in a predetermined manner or sequence(s) in order to minimize or prevent depression of the individual. This may eliminate the need for drugs such a Prozac. Alternatively, such drug(s) may be administered after such remote node firings, and the nodes at issue thereafter being monitored as discussed above and a biofeedback being performed to determine the effectiveness of the drug(s) or alternatively to enable a system to be utilized combining drug treatment with remote node firings to more effectively prevent or minimize depression of the individual. Thus, the biofeedback may enable the identified nodes to be fired by the firing devices and/or drug treatment at the proper level to most efficiently treat the disease, illness or state. This invention, including remote firings and/or monitoring, is not limited to these examples, and its potential uses are almost endless. Brain node firings can be remotely controlled in a predetermined manner or sequence (s) (even random or sequential) to reduce, minimize, or eliminate undesirable behavior or mental characteristics. This may eliminate or reduce the need for burdensome drug treatments and the like. Brain node firings of a normal person, or of a particular person in a given mental or physical state, may be monitored and the brain activity stored and analyzed in the computer **21** memory. This stored brain activity may then be caused by remotely causing the firing devices to cause particular brain node(s) to be fired at given times or intervals in a predetermined manner or sequence. The computer may be programmed to instruct the brain sensors and/or firing devices to identify which brain nodes are responsible for which types of physical or mental behavior, and then the computer transmits firing instructions to the firing devices for those nodes to cause them to be fired in a predetermined manner to effect such physical or mental behavior.

Once given the above disclosure, many other features, modifications, and improvements will become apparent to the skilled artisan. Such other features, modifications, and improvements are, therefore, considered to be a part of this invention, the scope of which is to be determined by the following claims.

I claim:

1. A method of communicating comprising the steps of:
providing a first human being at a first location;
providing a computer at a second location that is remote from the first location;
providing a satellite;
providing at least one sensor on the first human being;
detecting brain activity of the first human being using the at least one sensor, and transmitting the detected brain activity to the satellite as a signal including brain activity information;
the satellite sending a signal including the brain activity information to the second location;
a receiver at the second location receiving the signal from the satellite and forwarding the brain activity information in the signal to the computer;
comparing the received brain activity information of the first human being with normalized or averaged brain activity information relating to the first human being from memory; and
determining whether the first human being was attempting to communicate particular words, phrases or thoughts, based upon the comparing of the received brain activity information to the information from memory.

2. The method of claim **1**, further including the following steps:
asking the first human being a plurality of questions and recording brain activity of the first human being responsive to the plurality of questions in the process of developing said normalized or averaged brain activity information relating to the first human being stored in the memory.

3. The method of claim **2**, wherein the plurality of questions are the same question.

4. The method of claim **2**, wherein the plurality of questions are different questions.

5. The method of claim **2**, further comprising the step of normalizing or averaging recorded brain activity responsive to a given question or set of questions in developing the normalized or averaged brain activity information relating to the first human being.

6. A method of communicating words from a first location to a second location, the method comprising the steps of:
providing a first human being at the first location;
providing a computer at the second location that is remote from the first location;
providing at least one sensor on the first human being;
detecting brain activity of the first human being using the at least one sensor wherein the brain activity is indicative of words to be communicated by the first human being, and forwarding the detected brain activity indicative of words to be communicated to the computer at the second location;

comparing the received brain activity of the first human being indicative of words to be communicated with normalized or averaged brain activity information relating to the first human being from memory; and

determining words being communicated by the first human being based upon the comparing of the received brain activity information to the information from memory.

7. The method of claim **6**, further including asking the first human being a plurality of questions and recording brain activity of the first human being responsive to the plurality

of questions in a process of developing the normalized or averaged brain activity information relating to the first human being.

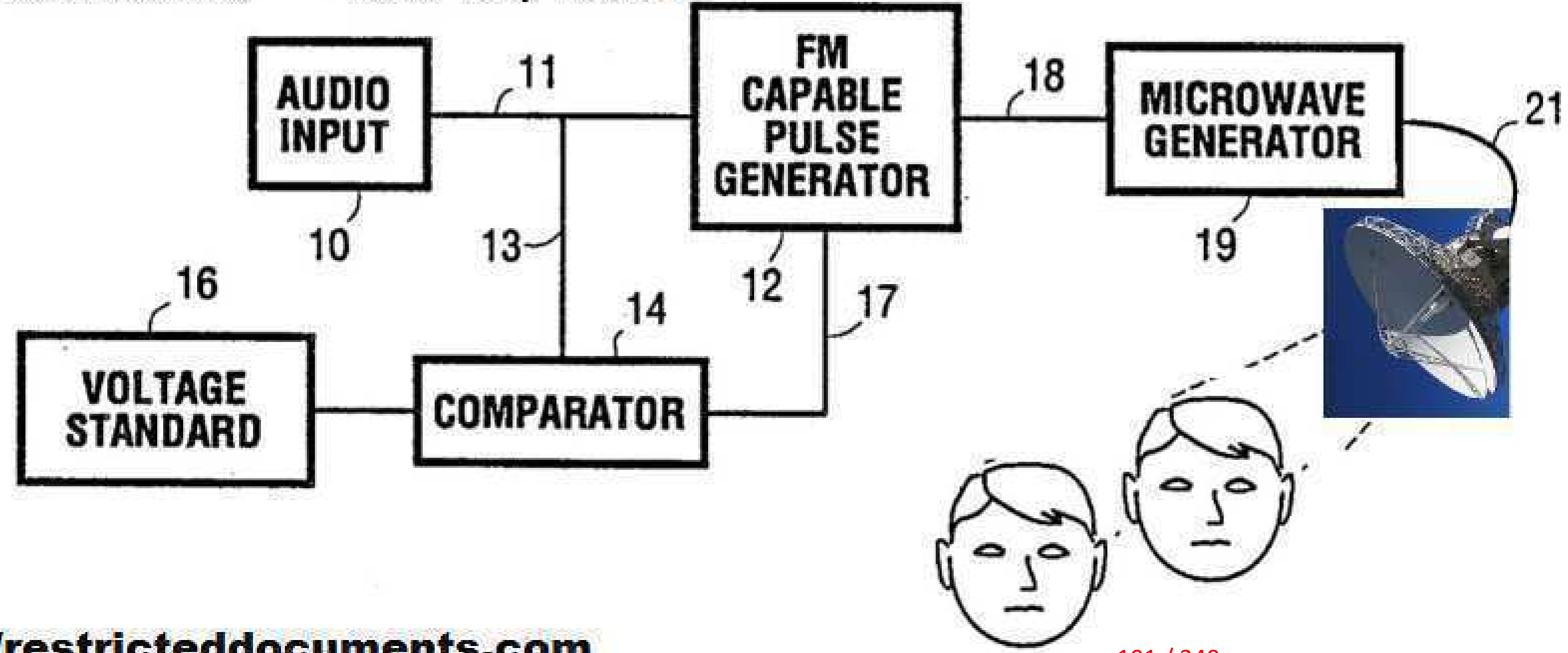
8. The method of claim **6**, further comprising the step of the computer outputting words determined in said determining step to a second human being so that words thought or stated by the first human being are communicated by the first human being to the second human being via the computer.

* * * * *

PDF SECTION: UNITED STATES PATENTS.

Patent Number: 4,877,027

Date of Patent: Oct. 31, 1989.



https://restricteddocuments.com

The transmission of intelligible speech by audio modulated Microwave is described in the book Microwave Auditory Effects and Applications by James C. Lin 1978 publisher Charles C. Thomas.

BRIEF SUMMARY OF THE INVENTION

I have discovered that a pulsed signal on a radio frequency carrier of about 1,000 megahertz (1000 MHz) is effective in creating intelligible signals inside the head of a person if this electromagnetic (EM) energy is projected through the air to the head of the person. Intelligible signals are applied to the carrier by microphone or other audio source and I cause the bursts to be frequency modulated. The bursts are composed of a group of pulses. The pulses are carefully selected for peak strength and pulse width. Various objects, advantages and features of the invention will be apparent in the specification and claims.

United States Patent [19]

Brunkan

[11] **Patent Number: 4,877,027**

[45] **Date of Patent: Oct. 31, 1989**

[54] **HEARING SYSTEM**

[76] Inventor: **Wayne B. Brunkan,** P.O. Box 2411, Goleta, Calif. 93118

[21] Appl. No.: **202,679**

[22] Filed: **Jun. 6, 1988**

[51] **Int. Cl.**[4] **A61N 5/00**
[52] **U.S. Cl.** **128/420.5**
[58] **Field of Search** .... 128/420.5, 804, 419 R, 128/421, 422, 746; 381/68

[56] **References Cited**

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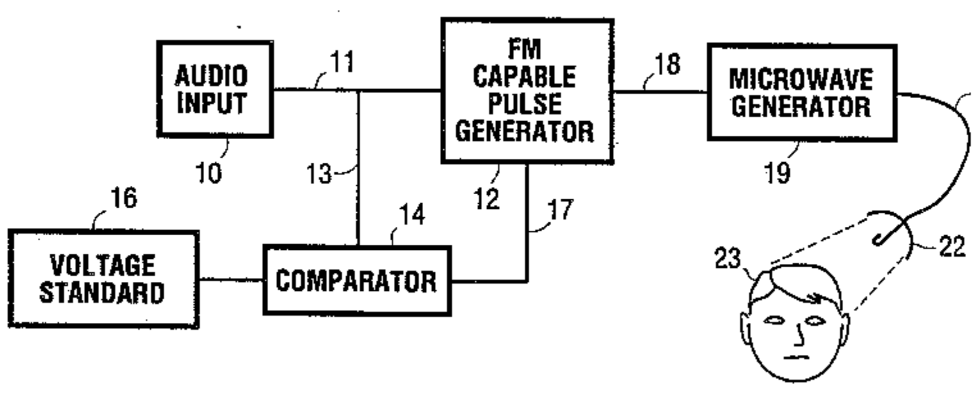
Microwave Auditory Effects and Applications, Lin, 1978, pp. 176-177.

Primary Examiner—Lee S. Cohen
Attorney, Agent, or Firm—Harry W. Brelsford

[57] **ABSTRACT**

Sound is induced in the head of a person by radiating the head with microwaves in the range of 100 megahertz to 10,000 megahertz that are modulated with a particular waveform. The waveform consists of frequency modulated bursts. Each burst is made up of ten to twenty uniformly spaced pulses grouped tightly together. The burst width is between 500 nanoseconds and 100 microseconds. The pulse width is in the range of 10 nanoseconds to 1 microsecond. The bursts are frequency modulated by the audio input to create the sensation of hearing in the person whose head is irradiated.

8 Claims, 1 Drawing Sheet



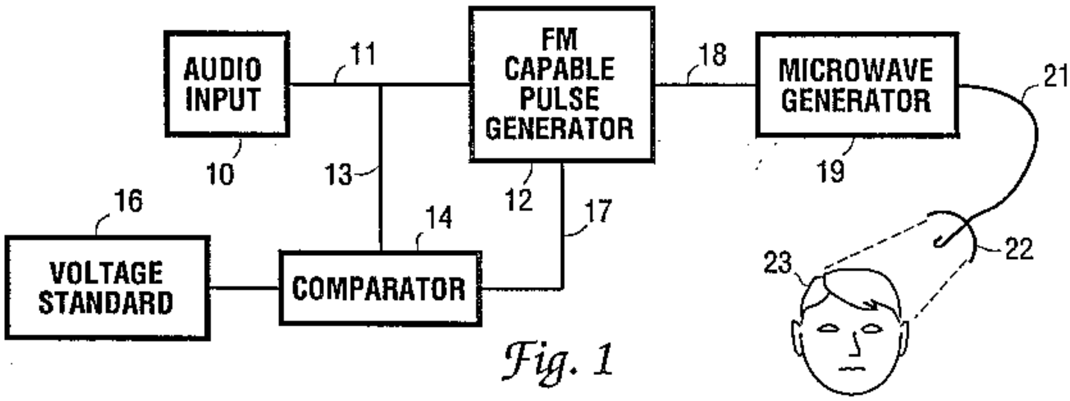


Fig. 1

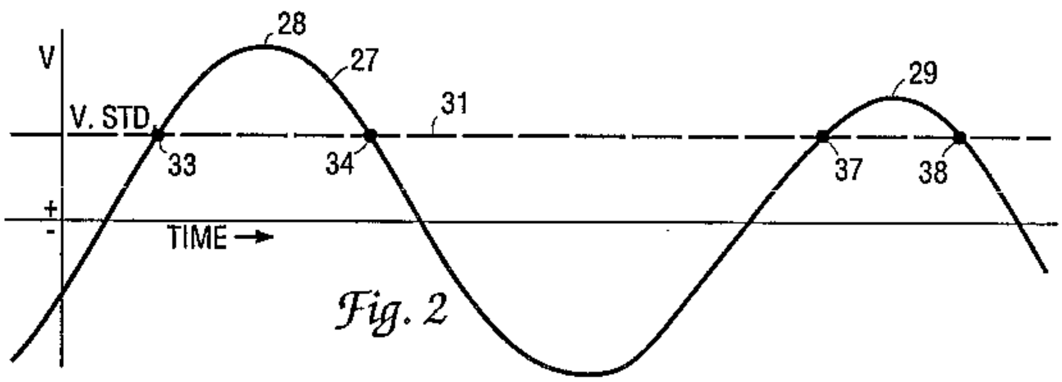


Fig. 2

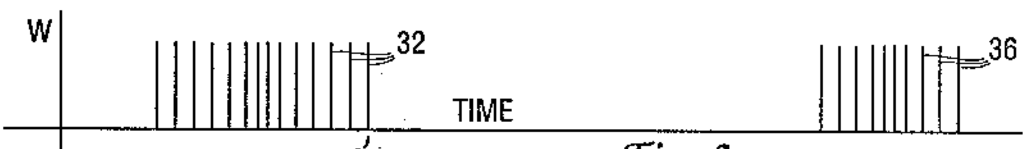


Fig. 3

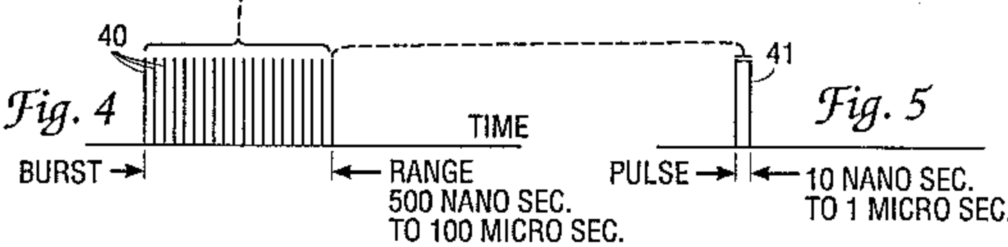


Fig. 4

Fig. 5

HEARING SYSTEM

This invention relates to a hearing system for human beings in which high frequency electromagnetic energy is projected through the air to the head of a human being and the electromagnetic energy is modulated to create signals that can be discerned by the human being regardless of the hearing ability of the person.

THE PRIOR ART

Various types of apparatus and modes of application have been proposed and tried to inject intelligible sounds into the heads of human beings. Some of these have been devised to simulate speech and other sounds in deaf persons and other systems have been used to inject intelligible signals in persons of good hearing, but bypassing the normal human hearing organs.

U.S. Pat. No. 3,629,521 issued Dec. 21, 1971 describes the use of a pair of electrodes applied to a person's head to inject speech into the head of a deaf person. An oscillator creates a carrier in the range of 18 to 36 KHz that is amplitude modulated by a microphone.

Science magazine volume 181, page 356 describes a hearing system utilizing a radio frequency carrier of 1.245 GHz delivered through the air by means of a waveguide and horn antenna. The carrier was pulsed at the rate of 50 pulses per second. The human test subject reported a buzzing sound and the intensity varied with the peak power.

Similar methods of creating "clicks" inside the human head are reported in I.E.E.E. Transactions of Biomedical Engineering, volume BME 25, No. 3, May 1978.

The transmission of intelligible speech by audio modulated Microwave is described in the book Microwave Auditory Effects and Applications by James C. Lin 1978 publisher Charles C. Thomas.

BRIEF SUMMARY OF THE INVENTION

I have discovered that a pulsed signal on a radio frequency carrier of about 1,000 megahertz (1000 MHz) is effective in creating intelligible signals inside the head of a person if this electromagnetic (EM) energy is projected through the air to the head of the person. Intelligible signals are applied to the carrier by microphone or other audio source and I cause the bursts to be frequency modulated. The bursts are composed of a group of pulses. The pulses are carefully selected for peak strength and pulse width. Various objects, advantages and features of the invention will be apparent in the specification and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings forming an integral part of this specification:

FIG. 1 is a block diagram of the system of the invention.

FIG. 2 is a diagram of an audio wave which is the input to be perceived by the recipient.

FIG. 3 is a diagram on the same time coordinate as FIG. 2 showing bursts that are frequency modulated by the wave form of FIG. 2.

FIG. 4 shows, on an enlarged time coordinate, that each vertical line depicted in FIG. 3 is a burst of pulses. (A burst is a group of pulses).

FIG. 5 shows, on a further enlarged time coordinate, a single continues pulse, Depicted as'a vertical line in FIG. 4.

DETAILED DESCRIPTION OF THE INVENTION

Inasmuch as microwaves can damage human tissue, any projected energy must be carefully regulated to stay within safe limits. The guideline for 1,000 MHz, set by the American Standards Institute, is 3.3 mw/cm2 (3.3 milliwatts per square centimeter). The apparatus described herein must be regulated to stay within this upper limit.

Referring to FIG. 1 a microphone **10** or other generator of audio frequencies, delivers its output by wire **11** to an FM capable pulse generator **12** and by branch wire **13** to a comparator **14**. The comparator **14** also receives a signal from a voltage standard **16**. When the peak voltage of the audio generator **10** falls below the standard **16** the comparator delivers a signal by wire **17** to the FM capable pulse generator **12** to shut down the pulse generator **12**. This avoids spurious signals being generated. The output of the FM pulse generator **12** is delivered by wire **18** to a microwave generator **19** which delivers its output to the head of a human being **23**. In this fashion the person **23** is radiated with microwaves that are in short bursts.

The microwave generator **19** operates at a steady frequency presently preferred at 1,000 megahertz (1,000 million). I presently prefer to pulse the microwave energy at pulse widths of 10 nanoseconds to 1 microsecond. For any one setting of the FM capable generator **12**, this width is fixed. The pulses are arranged in bursts. The timing between bursts is controlled by the height of the audio envelope above the voltage standard line. In addition the bursts are spaced from one another at a non-uniform rate of 1 to 100 KHz. This non-uniform spacing of bursts is created in the FM capable generator **12**.

Referring to FIG. 2 there is illustrated an audio wave **27** generated by the audio input **10** wherein the horizontal axis is time and the vertical axis is voltage. For illustrative purposes the wave **27** is shown as having a voltage peak **28** on the left part of FIG. 2 and a voltage peak **29** of the right side of FIG. 2. The voltage standard **16** of FIG. 1 generates a dc voltage designated at **31** in FIG. 2. This standard voltage is preferably at about 50% of the peak voltage **28**. The comparator **14** of FIG. 1 actuates the FM capable generator **12** only when the positive envelope of the audio wave **27** exceeds the voltage standard. The negative portions of the audio wave are not utilized.

Referring now to FIG. 3 there is illustrated two groups of bursts of microwave energy that are delivered by the antenna **22** of FIG. 1 to the head of the person **23**. FIG. 3 has a horizontal time axis identical to the time axis of FIG. 2 and has a vertical axis that in this case represents the power of the microwaves from generator **19**. At the left part of FIG. 3 are a plurality of microwave bursts **32** that occur on the time axis from the point of intersection of the standard voltage **31** with the positive part of the audio wave **27**, designated as the time point **33** to time point **34** on FIG. 2. It will be noted in FIG. 3 that the bursts **32** are non-uniform in spacing and that they are closer together at the time of maximum audio voltage **28** and are more spread out toward the time points **33** and **34**. This is the frequency modulation effected by the FM pulse generator **12**.

Referring to the right part of FIG. 3 there are a plurality of microwave bursts **36** that are fewer in number and over a shorter time period than the pulses **32**. These extend on the time axis of FIG. **2** from point **37** to point **38**. These bursts **36** are also frequency modulated with the closest groupings appearing opposite peak **29** of FIG. **2** and greater spacing near time points **37** and **38**.

Referring now to FIG. **4** there is illustrated the fact that a single burst shown as straight lines **32** or **36** on FIG. **3** are made up of ten to twenty separate microwave pulses. The duration of the burst is between 500 nanoseconds and 100 microseconds, with an optimum of 2 microseconds. The duration of each pulse within the burst is 10 nanoseconds to 1 microsecond and a time duration of 100 nanoseconds is preferred. The bursts **32** of FIG. **3** are spaced non-uniformly from each other caused by the frequency modulation of **12**. FIG. **4** depicts a burst. Each vertical line **40** in FIG. **4** represents a single pulse. Each pulse is represented by the envelope **41** of FIG. **5**. The pulses within a burst are spaced uniformly from eachother. The spacing between pulses may vary from 5 nanoseconds to 10 microseconds.

Referring now to FIG. **3**, the concentration of bursts **32** opposite the peak **28** of FIG. **2** can be expressed as a frequency of repetition. I presently prefer to adjust the FM capable generator **12** to have a maximum frequency of repetition in the range of 25 Khz to 100 Khz. I deliberately keep this range low to reduce the amount of heating caused by the microwaves. The wider spacing of the pulses **32** opposite the cutoff points **33** and **34** of FIG. **2** can also be expressed as a frequency of reptition and I presently prefer a minimum repetition rate of 1 KHz. I find that this low repetition rate, altnough in the audio range, does not disrupt the transmission of auoio intelligence to the person **23**. The aim, again, is to reduce the amount of heat transmitted to the subject **23**.

OPERATION

Referring to FIG. **1**, the intelligence to be perceived by the person **23** is introduced at the audio source **10** which may be a microphone for voice, or a tape player for music, instruction, etc. This audio signal is transmitted to the FM capable generator **12** and to the comparator **14**. The comparator **14** compares the positive portions of the audio wave with voltage from the voltage standard **16** and when the audio wave instantaneously exceeds the standard voltage, the FM generator is actuated by the wire **17** connecting the comparator **14** and the FM generator **12**. The FM generator **12** then sends a plurality of signals to the microwave generator **19** at each peak of the audio wave above the voltage standard.

This is shown graphically in FIGS. **2–5**. The audio signal **27** of FIG. **2** exceeds the standard voltage **31** at point **33** whereupon the FM generator **12** starts emitting burst signals **32** at its lowest frequency of about 1 Khz. As time progresses past point **33** the voltage above the standard increases and the FM generator **12** responds by making the burst signals closer together until at peak **28** the maximum density of burst signals **32** is achieved, for example at a frequency of 50 Khz. The time duration of each pulse **40** (FIG. **4**) is also controlled by a fixed adjustment of the FM generator **12** and for example the duration may be 100 nanoseconds.

The frequency modulated burst signals are delivered by FM generator **12** to the microwave generator as interrupted dc and the microwave generator is turned on in response to each pulse **40** and its output is delivered by coaxial cable **21** to the parabolic antenna **22** to project microwaves onto the head of a person **23**. These microwaves penetrate the brain enough so that the electrical activity inside of the brain produces the sensation of sound. When the parameters are adjusted for the particular individual, he perceives intelligible audio, entirely independently of his external hearlng organs.

PRESENTLY PREFERRED QUANTITIES

As mentioned previously, I prefer rhat the standard voltage **31** of FIG. **2** be about 50% of peak audio voltage. This not only helps to reduce heating in the person **2** but also reduces spurious audio. This 50% is not vital and the useful range is 25% to 85% of peak audio.

The minimum burst repetition frequency (for example at time points **33** and **34**) is preferably 1 KHz and the maximum repetition frequency is in the range of 25 KHz to 100 KHz, with the lower frequencies resulting in less heating.

The time duration of each individual pulse of microwave radiation is in the range of 10 nanoseconds to 1 microsecond as indicated in FIG. **5**, with the shorter time periods resulting in less heating.

CONTROL OF POWER OUTPUT

As stated above, I maintain the power output of the parabolic antenna **22** within the present safe standard of 3.3 mw/cm2 (3.3 milliwatts per square centimeter). I control the power output by controlling the strengtn of the audio modulation. This results in a duty cycle of 0.005, the decimal measure of the time in any second that the transmitter is on full power. The peak power level can be between 500 mw and 5 w and at 0.005 duty cycle these peaks will result in an average power of 2.5 mw and 25 mw respectively. However, these values are further reduced by adjusting the audio modulation so that zero input produces a zero output. Since a voice signal, for example, is at maximum amplitude only a small fraction of the rime, the average power will be below the 3.3 mw/cm2 standard, even with 5 watts peak power.

THEORY OF OPERATION

I have not been able to experiment to determine how my microwave system works, but from my interpretation of prior work done in this field I believe that the process is as follows. Any group of bursts related to the audio ek **28** of FIG. **2** causes an increasing ultrasonic build up within the head of a human being starting with a low level for the first bursts pulses and building up to a high level with the last bursts pulses of a group. This buildup, I believe, causes the direct discharge of random brain neurons. These discharges at audio frequency create a perception of sound. This process, I believe, bypasses the normal hearing organs and can create sound in a person who is nerve-dead deaf. However, this theory of operation is only my guess and may prove to be in error in the future.

APPARATUS

The apparatus of FIG. **1** for carrying out my invention may include as a microwave generator Model PH40K of Applied Microwave Laboratories and described as Signal Source. The cable **21** connecting the microwave generator **19** and the antenna is RG8 coaxial cable by Belden Industries. The antenna **22** may be a standard parabolic antenna. The FM generator **12** has to be specially built to include the spacing runction which is obtained by a frequency generator built into a srand-ard FM generator.

I have described my invention witn respect to a presently preferred embodiment as required by the patent statutes. It will be apparent to those skilled in the technology that many variations, modification and additions can be made. All such variations, modifications and additions that come within the true spirit and scope of the invention are included in the claims.

I claim:

1. Apparatus for creating human hearing comprising:

(a) an audio source for creating electrical audio waves having positive peaks;

(b) a frequency modulator generator connected to the audio source to create frequency modulated bursts;

(c) a source of constant voltage to create a voltage standard that is in the range of 25% to 85% of the peak voltage of the audio waves;

(d) a comparator connected to the voltage source and the audio source to compare the instantaneous voltage of the waves from the audio source with the voltage standard;

(e) a connection of the comparator to the frequency modulator generator to activate the frequency modulator generator when the instantaneous voltage of the audio wave exceeds the standard voltage;

(f) a microwave generator creating microwaves in the range of 100 megahertz to 10,000 megahertz and connected to the frequency modulator generator, generating microwaves only when pulsed by the frequency modulator generator; and

(g) an antenna connected to the microwave generator to radiate the head of a human being to produce the sounds of the audio source.

2. Apparatus as set forth in claim 1 wherein the frequency generating range of the frequency modulator generator is 1 Khz to 100 KHz for bursts and 100 KHz to 20 MHZ for pulses within a burst.

3. Apparatus as set forth in claim 1 wherein the frequency generating range of the frequency modulator generator is one Khz to 100 KHz for bursts and 100 KHz to 20 MHZ for pulses within a burst and the duration of each pulse of the frequency modulator generator is in the range of 10 nanoseconds to 1 microsecond.

4. Apparatus as set forth in claim 1 wherein the voltage standard is approximately 50% of the peak of the audio waves.

5. Apparatus as set forth in claim 1 wherein the antenna is of the type that projects the microwaves in space to the head of a person.

6. Apparatus for creating human hearing comprising:

(a) an oscillator creating an electromagnetic carrier wave at a selected frequency in the range of 100 Mhz to 10,000 Mhz;

(b) a pulse generator connected to said oscillator to pulse the carrier with pulses having a width in the range of 10 nanoseconds to 1 microsecond with a minimum spacing between pulses of about 25 nanoseconds;

(c) a frequency modulator connected to the pulse generator;

(d) an audio signal generator connected to the modulator which modulates the pulses in accordance with the audio signal; and

(e) a transmitting antenna connected to the oscillator to transmit the carrier wave as thus modified to project the electromagnetic energy through space to the head of a person.

7. Apparatus as set forth in claim 6 wherein the modulator is a frequency modulator to vary the density of bursts within an audio envelope as a function of the audio amplitude.

8. The method of irradiating a person's head to produce sound in the head of the person comprising

(a) irridiating the head of a person with microwaves in the range of 100 Mhz to 10,000 Mhz;

(b) pulsing said microwaves with pulses in the range of 10 nanoseconds to 1 microsecond; and

(c) frequency modulating groups of pulses called bursts by audio waves wherein the modulation extends from 1 Khz to 100 Khz.

* * * * *

PDF SECTION: UNITED STATES PATENTS.

US005954629A

United States Patent [19]

Yanagidaira et al.

[11] Patent Number: 5,954,629

[45] Date of Patent: *Sep. 21, 1999

[54] **BRAIN WAVE INDUCING SYSTEM**

[75] Inventors: **Masatoshi Yanagidaira; Yuichi Kimikawa; Takeshi Fukami; Mitsuo Yasushi**, all of Saitama-ken, Japan

[73] Assignee: **Pioneer Electronic Corporation**, Tokyo, Japan

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

[21] Appl. No.: **08/797,655**

[22] Filed: **Jan. 31, 1997**

[30] **Foreign Application Priority Data**

Feb. 21, 1996 [JP] Japan 8-033848

[51] **Int. Cl.**[6] **A61M 21/00**

[52] **U.S. Cl.** **600/27**; 600/26; 600/28

[58] **Field of Search** 600/26–28, 544, 600/545, 558; 128/731, 732, 745

[56] **References Cited**

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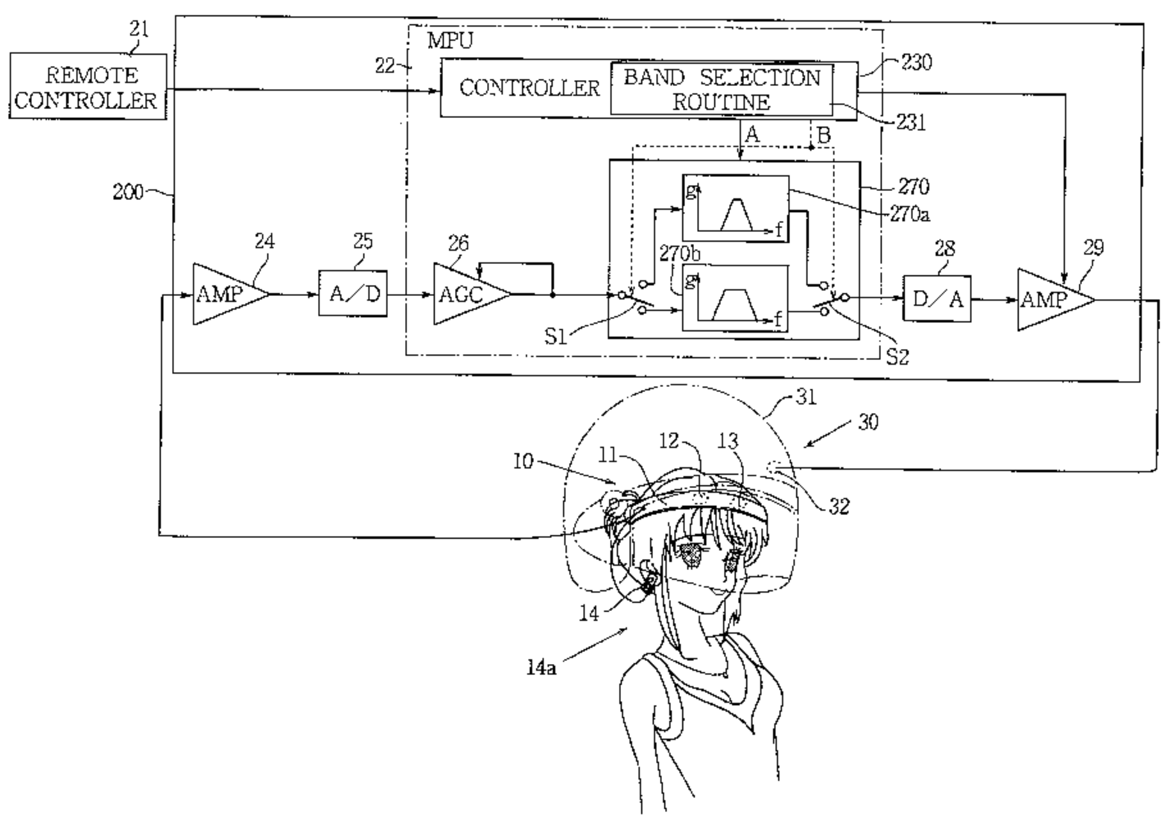
5,495,853	3/1996	Yasushi	600/27
5,613,498	3/1997	Yasushi et al.	600/27

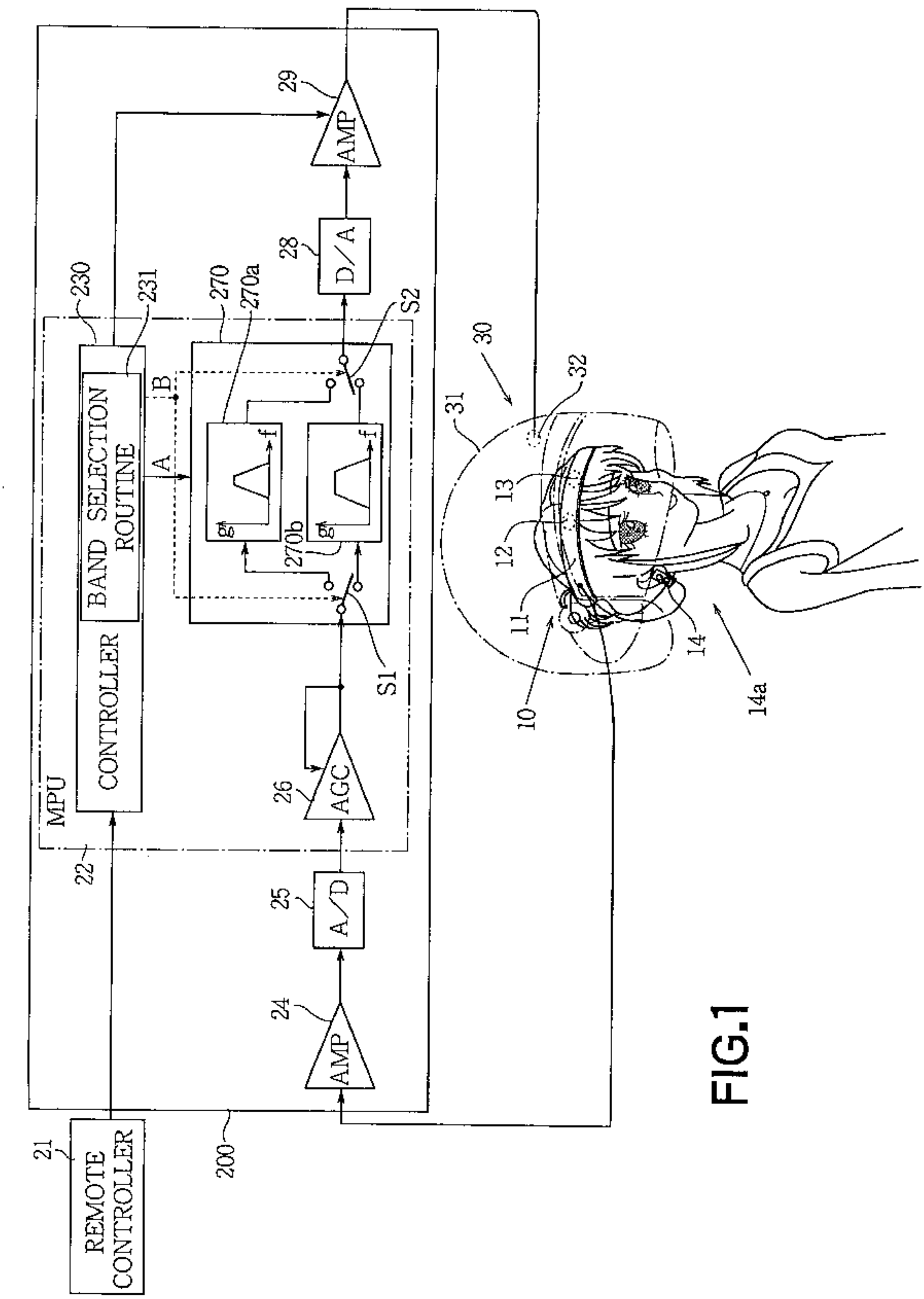
Primary Examiner—Linda C. M. Dvorak
Assistant Examiner—Rosiland Kearney
Attorney, Agent, or Firm—Nikaido, Marmelstein, Murray & Oram LLP

[57] **ABSTRACT**

Sensors are provided for detecting brain waves of a user, and a band-pass filter is provided for extracting a particular brain waves including an α wave included in a detected brain wave. The band-pass filter comprises a first band-pass filter having a narrow pass band, and a second band-pass filter having a wide pass band. One of the first and second band-pass filters is selected, and a stimulation signal is produced in dependency on an α wave extracted by a selected band-pass filter. In accordance with the stimulation signal, a stimulation light is emitted to the user in order to induce the user to relax or sleeping state.

6 Claims, 12 Drawing Sheets

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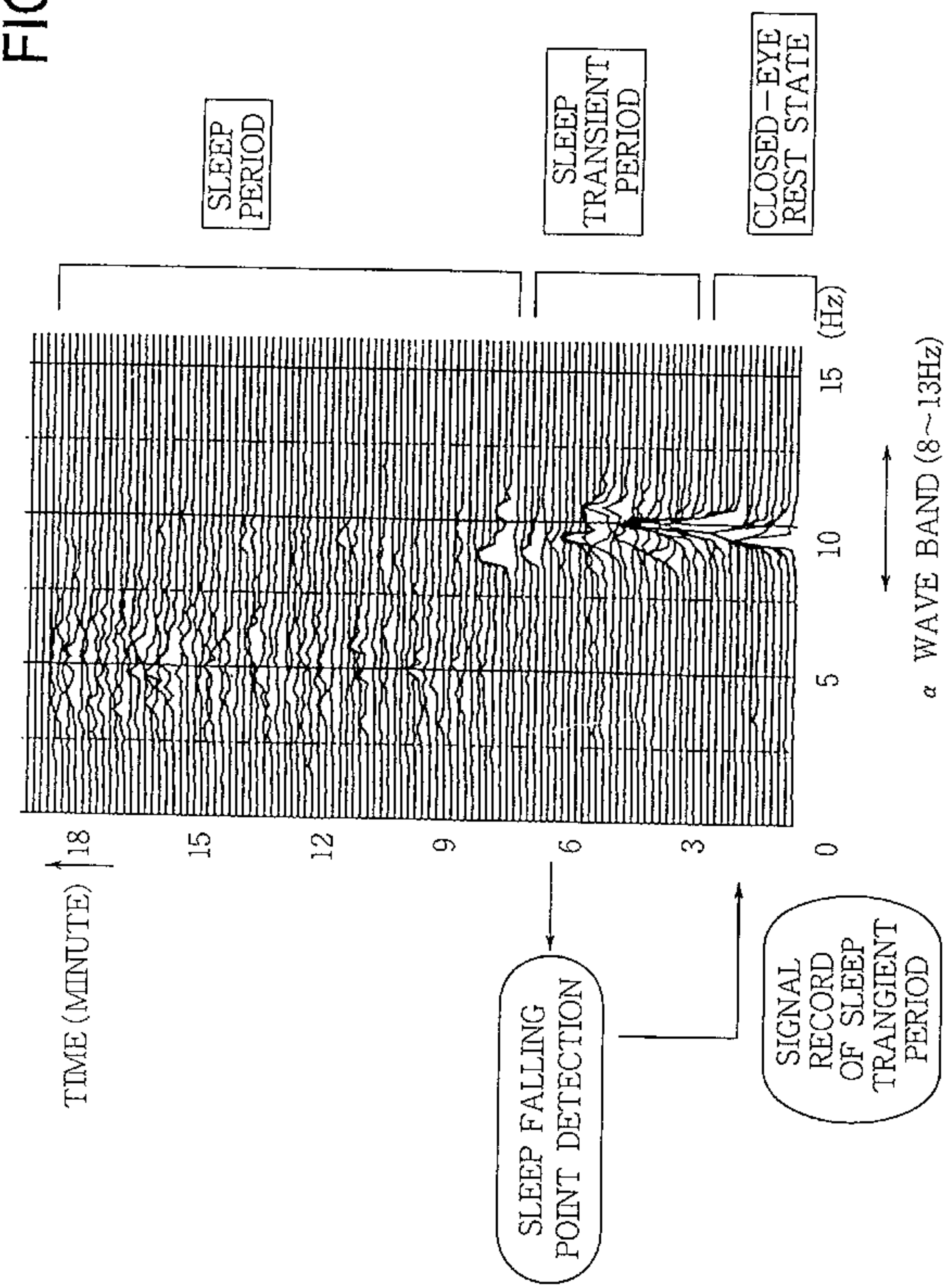
21
200
CONTROLLER
BAND SELECTION ROUTINE
MPU
22
230
231
AMP
24
A/D
25
AGC
26
270
270a
270b
A
B
S1
S2
D/A
28
AMP
29
30
31
32
10
11
12
13
14
14a

FIG.1

FIG.2


SLEEP PERIOD
SLEEP TRANSIENT PERIOD
CLOSED-EYE REST STATE
(Hz)
15
10
5
α WAVE BAND (8~13Hz)
TIME (MINUTE)
18
15
12
9
6
3
0
SLEEP FALLING POINT DETECTION
SIGNAL RECORD OF SLEEP TRANGIENT PERIOD

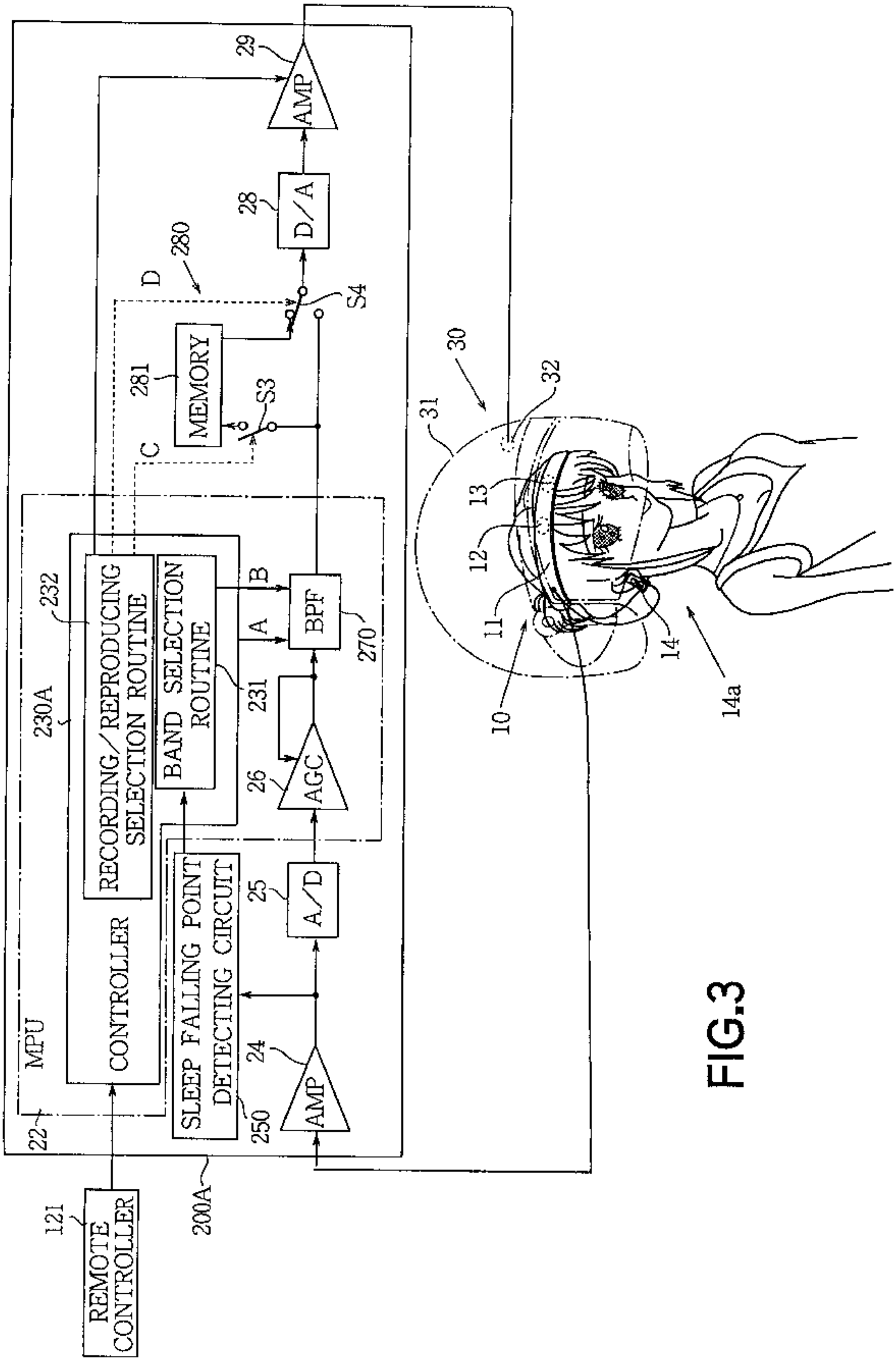

REMOTE CONTROLLER
121
200A
22
MPU
CONTROLLER
230A
RECORDING/REPRODUCING SELECTION ROUTINE
232
BAND SELECTION ROUTINE
231
SLEEP FALLING POINT DETECTING CIRCUIT
250
AMP
24
A/D
25
AGC
26
BPF
270
A
B
C
D
S3
MEMORY
281
S4
280
D/A
28
AMP
29
30
31
32
13
12
11
10
14
14a

FIG.3

FIG.4 a

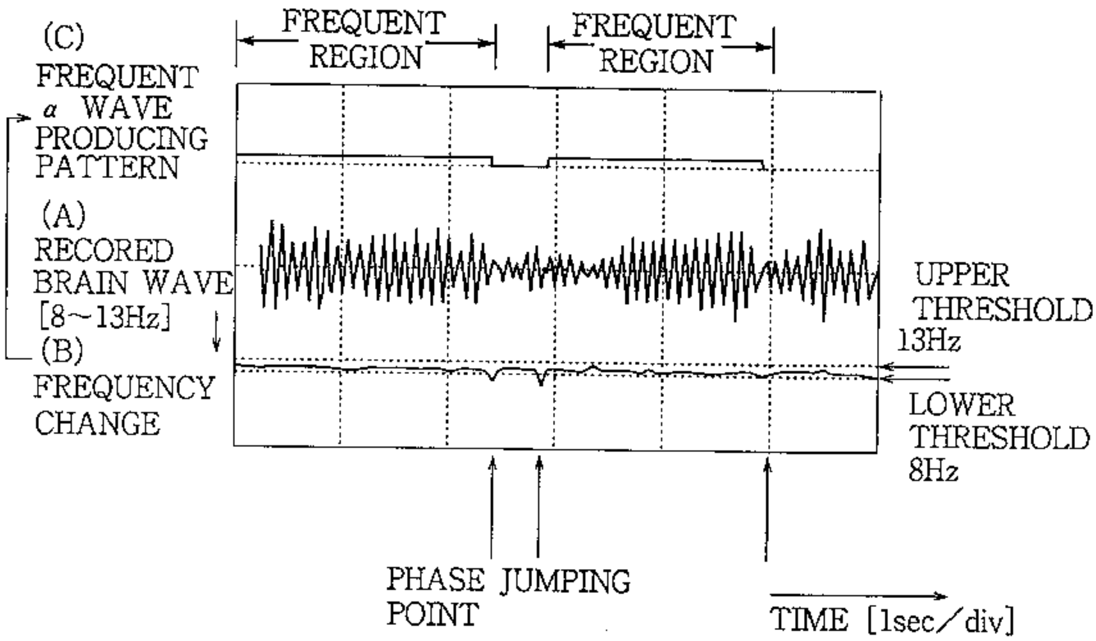
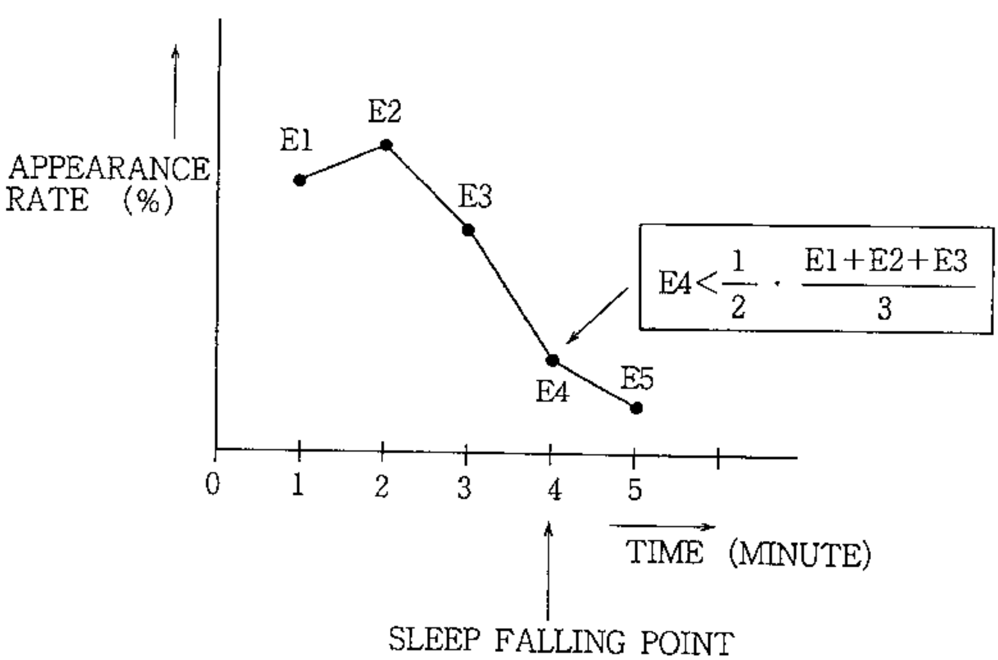
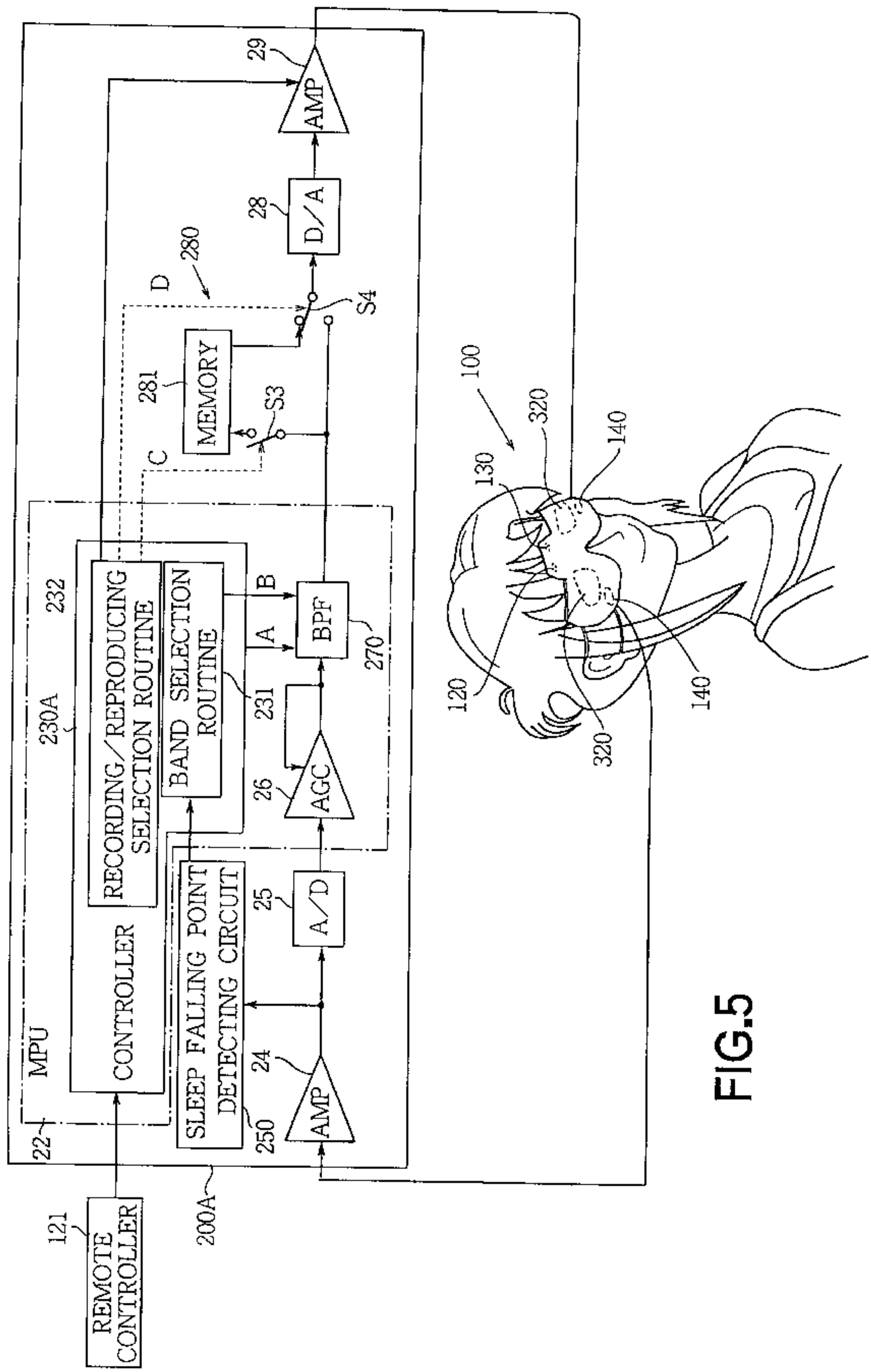

FREQUENT REGION
FREQUENT REGION
(C) FREQUENT α WAVE PRODUCING PATTERN
(A) RECORED BRAIN WAVE [8~13Hz]
(B) FREQUENCY CHANGE
UPPER THRESHOLD 13Hz
LOWER THRESHOLD 8Hz
PHASE JUMPING POINT
TIME [1sec/div]

FIG.4 b


APPEARANCE RATE (%)
E1
E2
E3
E4
E5
E4<1/2 · (E1+E2+E3)/3
0
1
2
3
4
5
TIME (MINUTE)
SLEEP FALLING POINT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121
200A
22
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230A
CONTROLLER
232
RECORDING/REPRODUCING SELECTION ROUTINE
BAND SELECTION ROUTINE
231
SLEEP FALLING POINT DETECTING CIRCUIT
250
AMP
24
A/D
25
AGC
26
BPF
270
A
B
C
D
S3
S4
MEMORY
281
280
D/A
28
AMP
29
100
120
130
140
320

FIG.5

FIG.6 a

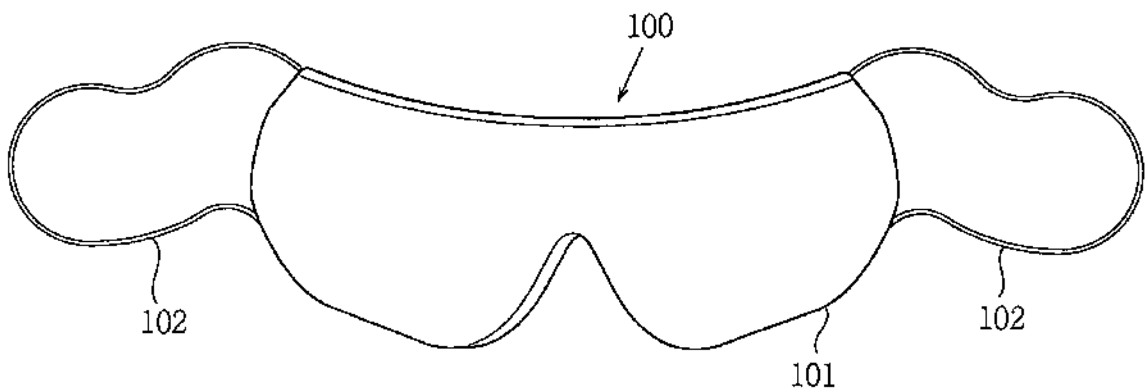


FIG.6 b

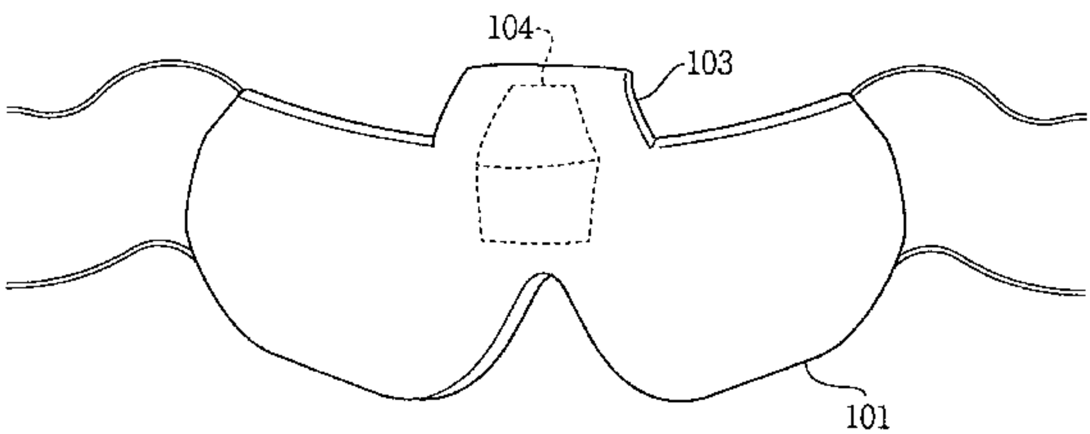


FIG.6 c

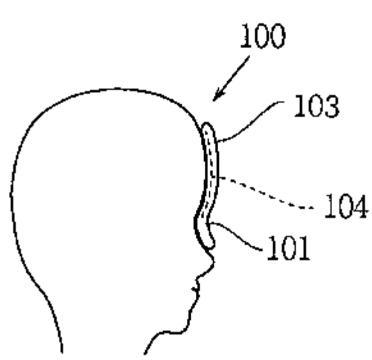


FIG.7 a

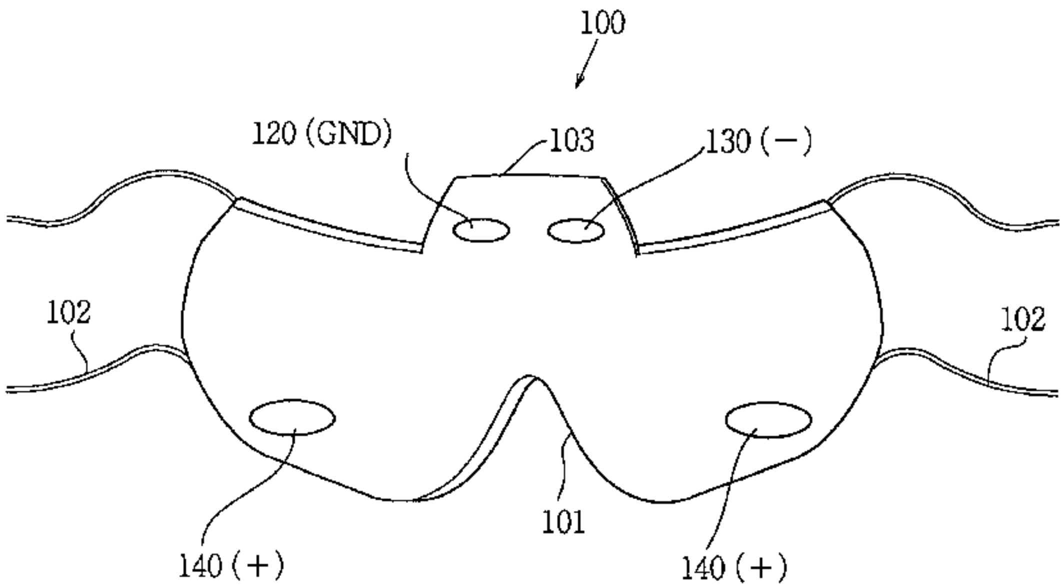

100
120 (GND)
103
130 (−)
102
102
140 (+)
101
140 (+)

FIG.7 b

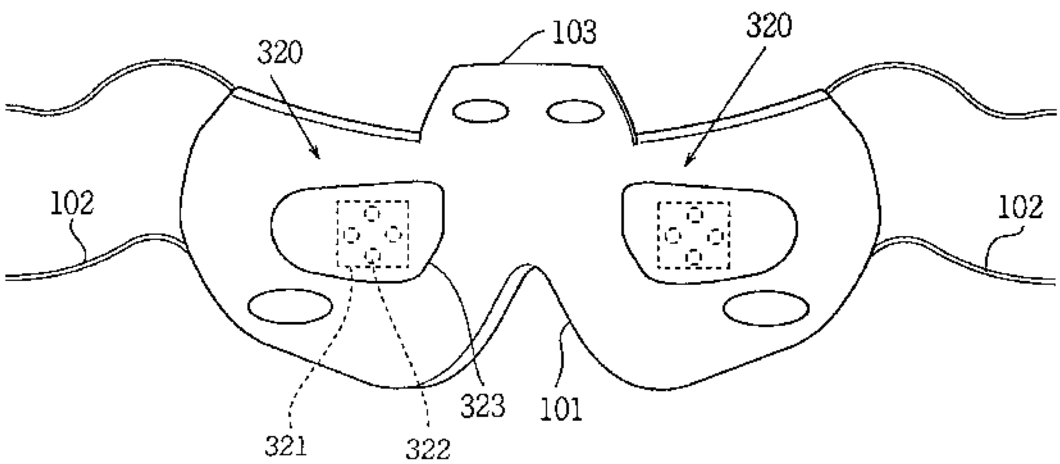

103
320
320
102
102
321
322
323
101

FIG.8

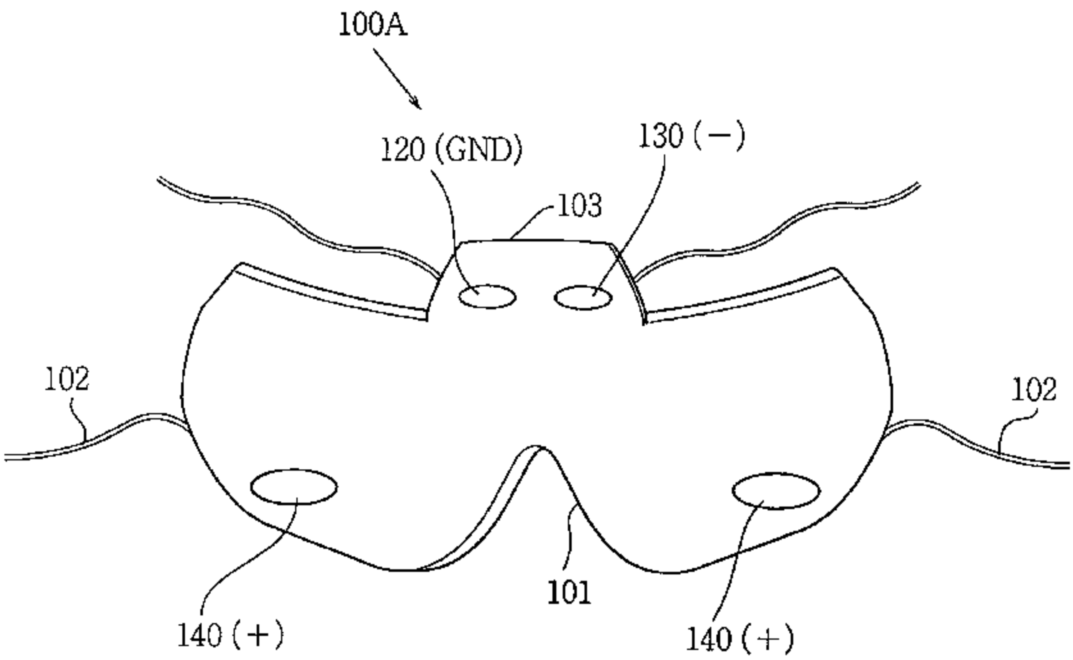
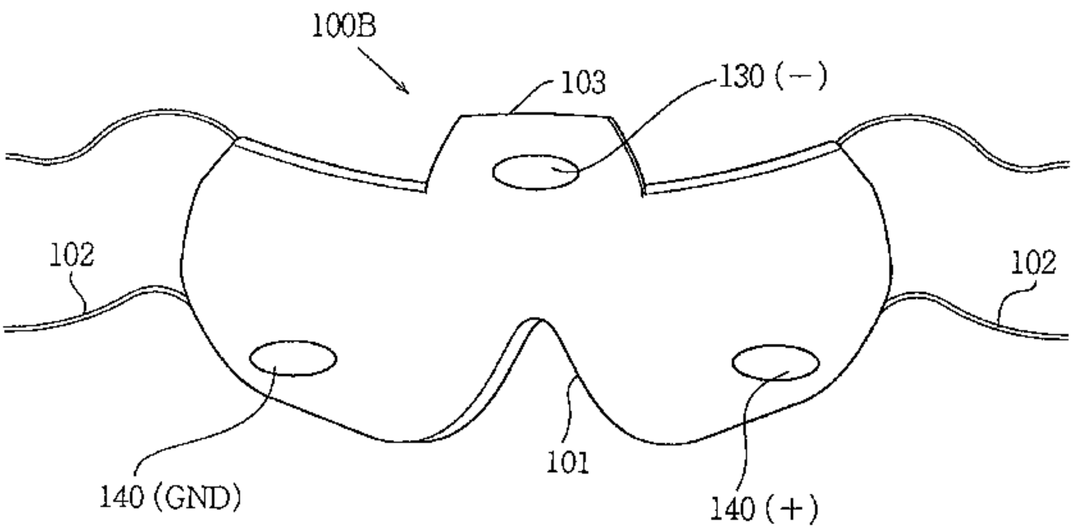

100A
120 (GND)
130 (−)
103
102
102
140 (+)
101
140 (+)

FIG.9


100B
103
130 (−)
102
102
140 (GND)
101
140 (+)

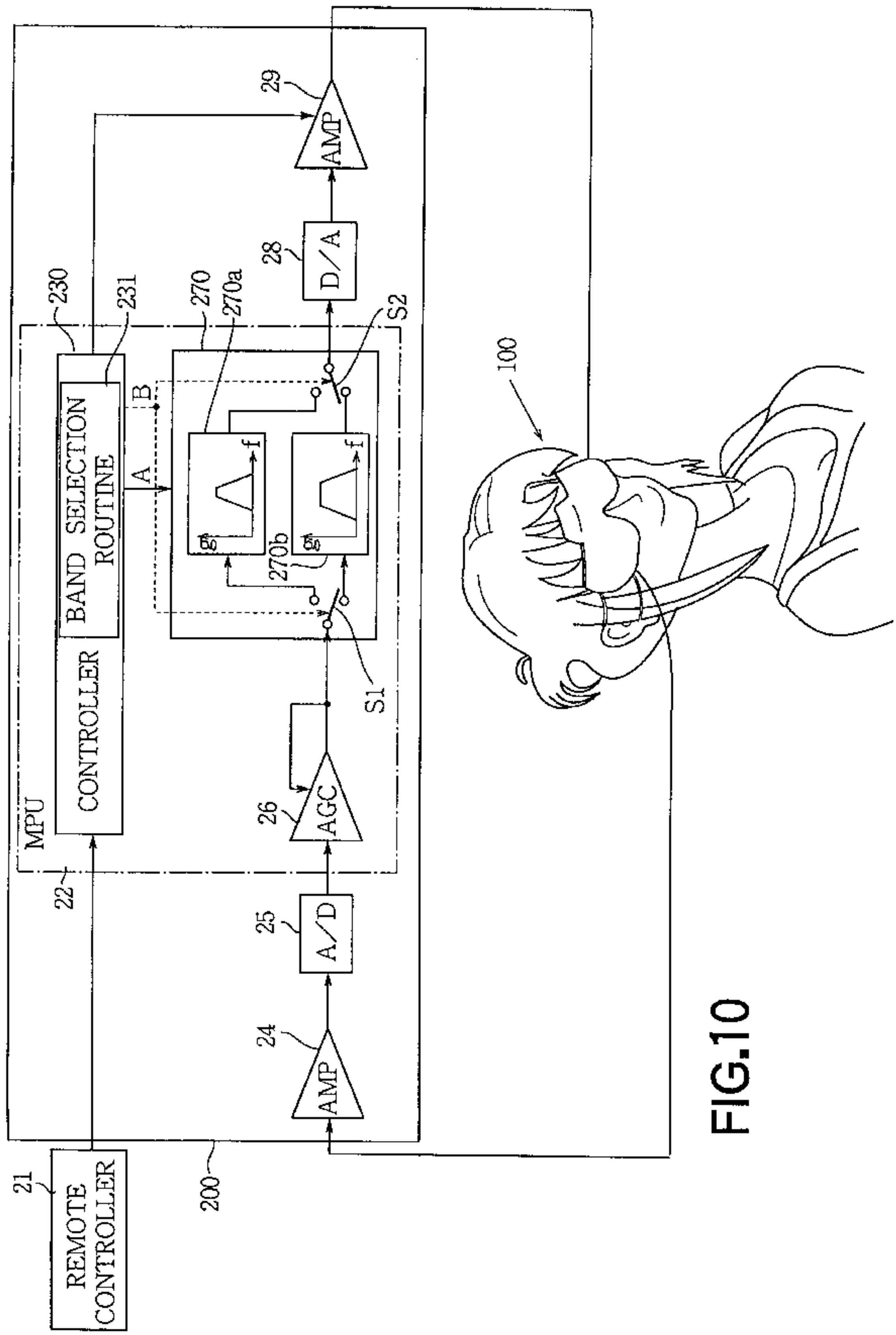
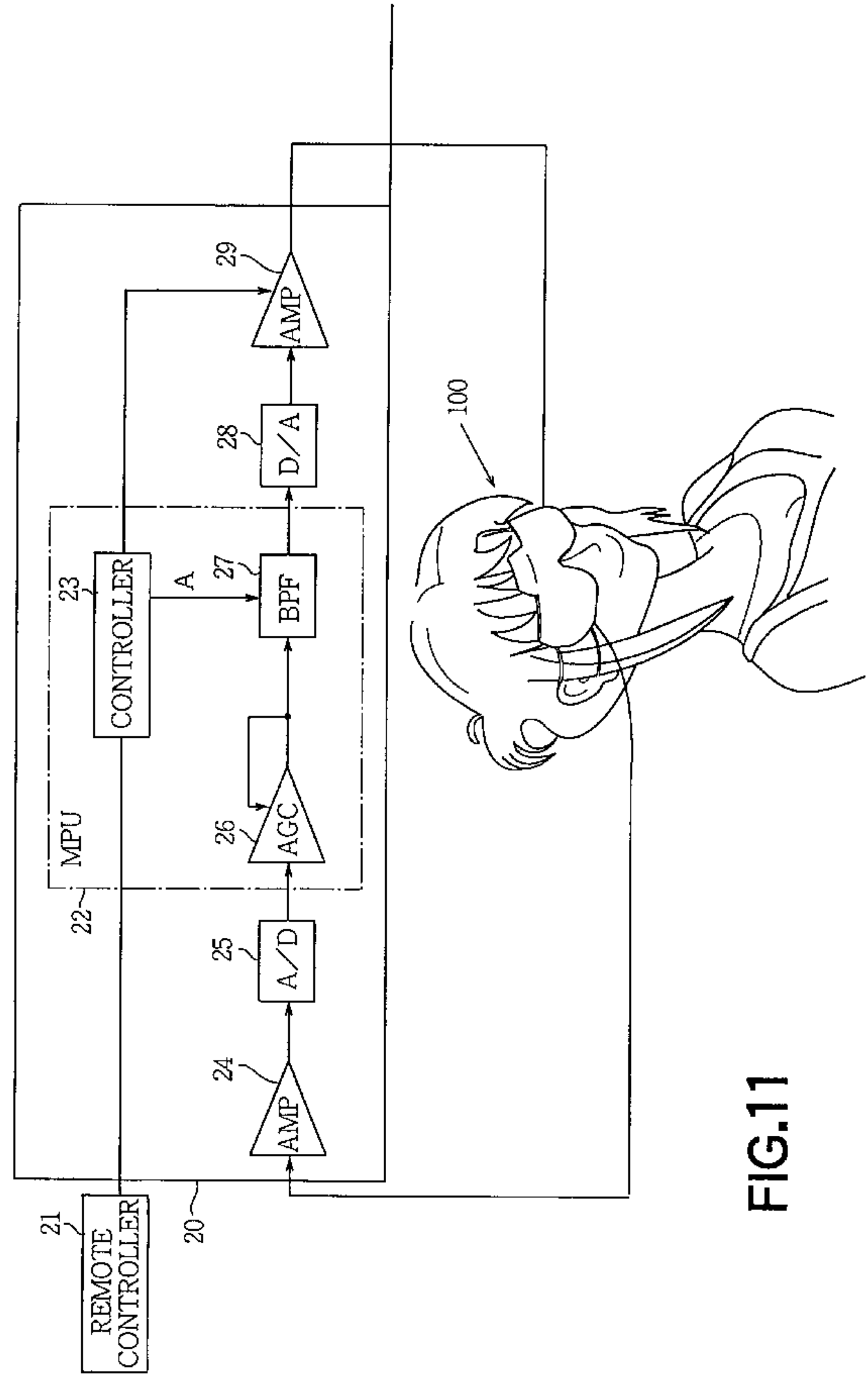

REMOTE CONTROLLER
21
200
22
MPU
CONTROLLER
BAND SELECTION ROUTINE
230
231
A
B
270
270a
270b
S1
S2
AMP
24
A/D
25
AGC
26
D/A
28
AMP
29
100

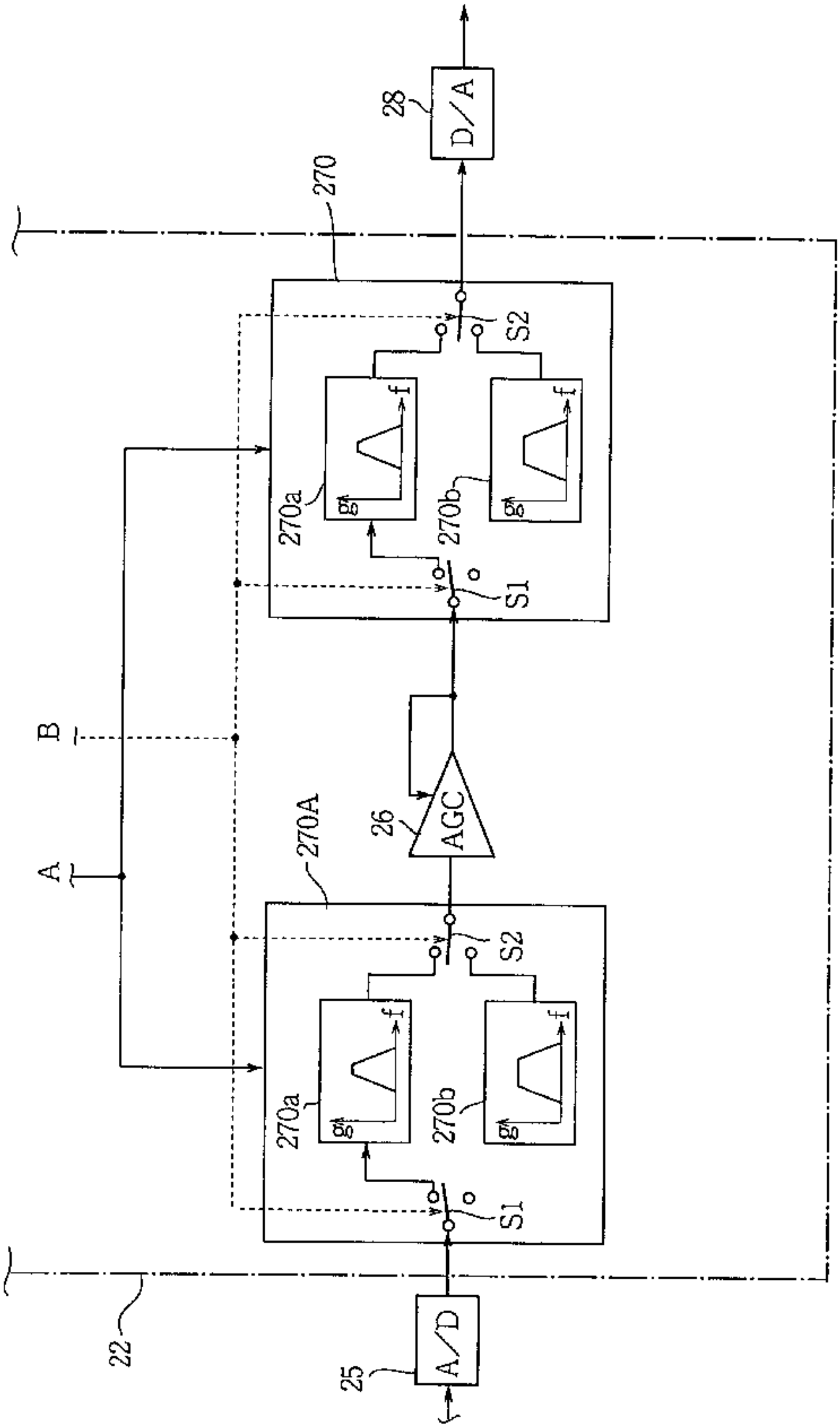
FIG.10



REMOTE CONTROLLER
21
20
22
MPU
23
CONTROLLER
A
24
AMP
25
A/D
26
AGC
27
BPF
28
D/A
29
AMP
100

FIG.11

FIG.12



PRIOR ART

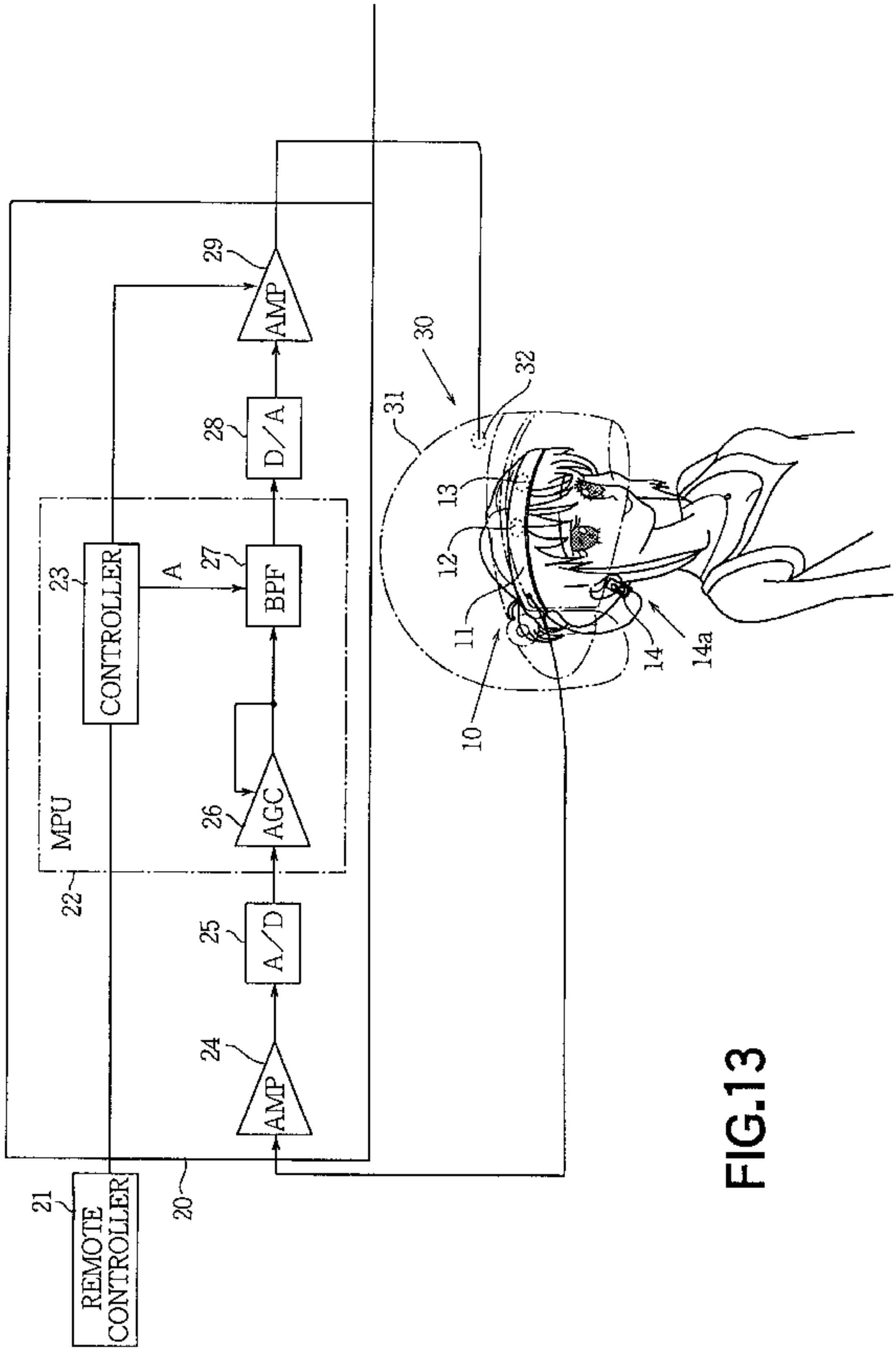


FIG.13

BRAIN WAVE INDUCING SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to a system for inducing a brain wave of the person, and more particularly to a system for providing a relaxation effect and an activation effect in a state of mind of the person.

In the system, the brain wave of the person is induced by a feedback control including a brain of the person. Namely, the brain wave of the person is detected, and a specific element of the brain wave, such as an α wave is extracted. By using the extracted brain wave, a signal for controlling stimulation by light is produced for inducing a desired brain wave. The stimulating light is applied to the person for stimulating the brain, thereby inducing the desired brain wave. Thus, the desired brain wave can tie powerfully and quickly induced by an induction effect of the feedback control.

Such a system is used for as a sole system, or as a combination system with an audio healing system or a massage device.

FIG. **13** shows a conventional brain wave inducing system employed with a feedback loop structure including a brain of a user. The system comprises a sensor unit **10** for detecting a brain wave of the user, a light signal producing system **20** for extracting a specific element of the brain wave and producing a light stimulation signal, and an actuating unit **30** for applying the stimulating light based on the light stimulation signal to the user.

The sensor unit **10** comprises a headband **11** to be easily put on or removed from a head of the user, and an ear clip **14***a* detachably clipped on an ear of the user. A pair of electrodes **12** and **13** as brain wave sensors are provided on an inner portion of the headband **11** so that the electrodes are touched on a forehead of the user when the headband **11** is put on the head. The ear clip **14***a* has an electrode **14** as a brain wave sensor to be touched on the ear.

The actuating unit **30** comprises a capsule or cover **31** to cover the head and face of the user, and a light emitting member **32** provided on an inner portion of the the cover **31** at a position such that the stimulation light is applied to eyes of the user.

The light signal producing system **20** is provided for extracting the specific element of the brain wave and producing a light stimulation signal for controlling stimulation by light based on the extracted brain wave, thereby inducing the desired brain wave. The system comprises a biological amplifier **24** to which outputs of the electrodes **12**, **13** and **14** of the sensor unit **10** are connected, an A/D converter **25**, an automatic gain control circuit (AGC) **26**, a band-pass filter (BPF) **27**, a D/A converter **28**, and an amplifier **29** connected to the light emitting member **32** of the actuating unit **30**.

The electrodes **12** of the sensor unit **10** is connected to a GND input of the amplifier **24**, the electrode **13** is connected to a minus input, and the electrode **14** is connected to a plus input, respectively. The amplifier **24** amplifies a very weak brain wave signal detected by the sensor unit **10** to a predetermined value. The amplified brain wave signal is applied to the A/D converter **25** for converting the signal into a digital signal of 8 bits, for example. The digital brain wave signal is applied to the AGC **26** in which the gain of the signal is adjusted for a following stage. The BPF **27** operates to extract a predetermined element of the band of the brain wave signal. The D/A converter **28** converts the extracted band element of the brain wave of the digital signal into an

analog signal. The amplifier **30** amplifies the analog signal so as to control the light emitted from the light emitting member **32** of the actuating unit **30**.

The light signal producing system **20** further comprises a microprocessor unit (MPU) **22** having a controller **23**. The AGC **26** and BPF **27** are operated by programs of the MPU **22**. A remote controller **21** is provided for applying external operating commands to the controller **23**. The controller **23** controls tasks and other circuits in the system in accordance with the operations of the remote controller **21**. For example, the controller **23** produces a message A to initialize the BPF **27**, and controls the amplifier **29** of gain variable for adjusting the amount of the stimulation light in accordance with a choice of the user.

In the BPF **27**, since the α wave of the brain wave is effective to provide a relaxation effect, a predetermined band is set based on the α wave. The α wave is a basic wave appeared in large amounts when an awakening normal adult rests, and has a feature that the dispersion thereof is small when the person is relaxed in a clearer awakening state. Thus, the BPF **27** has a frequency characteristic of Q=10 (Q=(center frequency f)/(band width the gain of which becomes lower than the gain of the center frequency f by 3 dB)). The α wave has a waveform having an amplitude between 10 to 100 μV and frequency between 8 to 14 Hz. However, there is an individual difference in α wave characteristics. Thus, the center frequency of the BPF **27** is set to be varied for covering the range of the frequency.

Furthermore, in the BPF **27**, since a proper α wave is determined in dependency on the person, influence caused by the individual difference is controlled to be absorbed. If a person having a high frequency of α wave is induced to a range of a low frequency of α wave, the person may feel bad because of a large difference between the frequencies. In order to solve the problem, at initialization, the BPF **27** operates to change the center frequency step by step to sweep the band of the α wave. Then, an average frequency of the brain wave signal is calculated to set the center frequency to a value lower than the average value by 0.5 Hz. Thereafter, the center frequency is fixed to the set value during the procedure. Thus, an inconvenience such as a bad feeling is avoided.

Describing the operation of the system, the brain wave of the user is detected by the sensor unit **10**. The detected brain wave is amplified by the amplifier **24**. The amplified brain wave is applied through the A/D converter **25** and the AGC **26** to the BPF **27** where a proper α wave is extracted. The extracted brain wave is applied to the amplifier **29** through the D/A converter **28**. The amplifier **29** produces an electric signal for light stimulation based on the extracted brain wave. The light stimulating signal is applied to the actuating unit **30**. The light emitting member **32** emits the light for stimulation which is applied to the closed eyes of the user, thereby stimulating the brain.

Thus, the user is sufficiently applied with a proper light stimulation produced based on own α wave to be induced to a relaxed state in a short time.

As hereinbefore described, a main purpose of the conventional brain wave inducing system is to induce the person to a relaxed condition.

However, if the system is provided with not only the relaxation effect but also a sleep inducing effect for positively inducing the person to sleep, the product worth of the system may be increased. In the improvement, economically, it is necessary to lower developing and manufacturing costs as less as possible.

In order to realize the brain wave inducing system provided with the sleep inducing effect in addition to the relaxation effect by using the basic composition of the conventional system with small change, technical means must be designed for the system.

Furthermore, in the conventional system, one of the brain wave sensors is mounted on the head of the user for detecting the brain wave. However, the condition that the sensor is directly mounted on a part of the body may cause the user to be nervous. In such a case, a sufficient sleep inducing effect can not be obtained. If the system is used during sleeping, the system may interfere natural moving such as turning in sleep.

Therefore, it is preferable that the system can be used without mounting sensors on the body.

Furthermore, the ear clip is used as the other brain sensor because the ear is near the brain, and has no muscles. Consequently, noises to be caused by action of the muscle do not produce. In addition, the electrode can be easily attached to the ear by the ear clip.

However, the ear clip stimulates the ear compared with the headband, and may hurt the ear if it is used for a long time.

Therefore, it is desirable that even if the user must mount the sensor on the body, the relaxation and sleep inducing effects, or at least the relaxation effect can be easily obtained.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a brain wave inducing system which may have relaxation inducing effect and sleep inducing effect.

Another object of the present invention is to provide a system with which relaxation effect and sleep inducing effect are easily obtained.

According to the present invention, there is provided a brain wave inducing system comprising sensors for detecting brain waves of a user, a band-pass filter for extracting a particular brain waves including an α wave included in a detected brain wave, the band-pass filter comprising a first band-pass filter having a narrow pass band, and a second band-pass filter having a wide pass band, first selecting means for selecting one of the first and second band-pass filters, output means for producing a stimulation signal dependent on an α wave extracted by a selected band-pass filter, and light emitting means responsive to the stimulation signal for emitting a stimulation light to the user.

A memory is provided for recording the extracted brain waves and for reproducing the recorded brain waves, and second selecting means for selecting either of the recording or reproducing of the brain waves.

The sensors are mounted on an eye mask to be attached to a forehead of the user.

The detecting means is provided for detecting a sleep falling point when the user falls into sleep. The detecting means detects the sleep falling point by detecting a time when α wave appearance rate reduces 50% from a reference value.

These and other objects and features of the present invention will become more apparent from the following detailed description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a diagram showing a mind-refresh system to which a brain wave inducing system according to the present invention is applied;

FIG. **2** is a diagram showing a frequency characteristic of the brain wave when a person drops off to sleep;

FIG. **3** is a diagram showing a second embodiment of the brain wave inducing system of the present invention;

FIGS. **4***a* and **4***b* are diagrams showing characteristics of the brain wave when the person sleeps;

FIG. **5** is a diagram showing a third embodiment of the present invention;

FIGS. **6***a* to **6***c* are schematic diagrams showing an eye mask;

FIGS. **7***a* and **7***b* are schematic diagrams showing the eye mask;

FIG. **8** is a plan view showing a modification of the eye mask;

FIG. **9** is a plan view showing another modification of the eye mask;

FIG. **10** is a diagram showing a fourth embodiment of the present invention;

FIG. **11** is a diagram showing a fifth embodiment of the present invention;

FIG. **12** is a schematic diagram partly showing a modification of the first embodiment; and

FIG. **13** is a diagram showing a conventional brain wave inducing system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

(First embodiment)

FIG. **1** shows a brain wave inducing system of the present invention applied to a mind refresh system.

It is known that when the person closes the eyes, the brain wave produces the α wave, and when the person drops off to sleep, the α wave changes to a **73** wave a frequency of which is lower than the α wave. FIG. **2** shows frequency characteristics of the brain wave until the person falls into sleep. It will be seen that there are states where the person closes eyes and rests for 3 minutes, and falls into sleep through a sleep transient period for 7 minutes. The state of mind of the person changes from a relaxation state in the closed-eyes rest period, a special doze state where a flash of an idea or an image may be easily produced, and to a sleep state. The α wave has a small dispersion in the closed-eye rest period, and is repeatedly disappeared and reappeared with fluctuation in the sleep transient period, and changes to the c wave in the sleep period. The attention of the person is gradually reduced to reduce the awakening level.

Referring back to FIG. **1**, in the brain wave inducing system, structures which are the same as those of the conventional system of FIG. **13** are identified with the same reference numerals as FIG. 13, and descriptions thereof are omitted.

A light signal producing system **200** has a BPF unit **270** comprising a first BPF **270***a* and a second BPF **270***b*, and switches **S1** and **S2** for selectively connecting the first BPF **270***a* and the second BPF **270***b* to the AGC **26** and the D/A converter **28**. The first BPF **270***a* has (Q=10 with a narrow pass band corresponding to the α wave in the eye-closed rest state. The second BPF **270***b* has Q=5 with a wide pass band corresponding to support frequency ranges of fluctuation of the α wave in the sleep transient state. The center frequency and the Q of each of the first and second BPFs are provided to be changeable.

A controller **230** of the MPU **22** has a band selection routine **231** having a normal mode and a sleep induction mode. One of the modes is selected by operating a remote controller 121, and the band selection routine 231 produces a flag B which is applied to the BPF unit 270 for selectively operating the switches S1 and S2 to close contacts for the first BPF 270*a* or the second BPF 270*b*. Thus, the α wave is extracted from a proper BPF in accordance with the selected mode.

In operation, the brain wave of the user is detected by the sensor unit 10. The detected brain wave is amplified by the amplifier 24. The amplified brain wave is applied through the A/D converter 25 and the AGC 26 to the BPF 270 where a proper α wave is extracted. Namely, when the normal mode is selected by the remote controller 121, the flag B of the normal mode is applied to the switches S1 and S2 of the BPF unit 270 which are operated to close the first BPF 270*a*. Thus, the output signal of the AGC 26 is applied to the first BPF 270*a* through the switch S1. The first BPF 270*a* extracts the α wave in the eye-closed rest state which is applied to the D/A converter 28 through the switch S2. Thus, a stimulation signal having a frequency corresponding to the extracted α wave is produced. The stimulation signal is applied to the light emitting member 32 through the amplifier 29. The light emitting member 32 flickers at the frequency of the stimulation signal. Thus, the α wave in the eye-closed rest state is applied by the feedback control, thereby obtaining the relaxation effect.

When the sleep induction mode is selected, the flag B of the sleep induction mode is applied to the switches S1 and S2 which are operated to close the second BPF 270*b*. Thus, the output signal of the AGC 26 is applied to the second BPF 270*b* through the switch S1. The second BPF 270*b* extracts the α wave in the sleep transient state which is applied to the D/A converter 28 through the switch S2. Thus, even if the α wave is fluctuated in the sleep transient state, approximately all of the α wave is applied by the feedback control, thereby obtaining the sleep inducing effect.

From the foregoing, the feedback control is repeated so that the induction operation of brain wave for increasing the sleep inducing effect is provided in addition to the induction operation for increasing the relaxation effect. A desired effect can be automatically obtained by selecting a desired mode in dependency on a body condition of the user.

(Second embodiment)

Referring to FIG. 3 showing a second embodiment of the present invention, the system is provided with a recording/reproducing function for a proper retracted brain wave when the person drops off to sleep. In a light signal producing system 200A, a controller 230A of the MPU 22 further has a recording/reproducing selection routine 232. Furthermore, a sleep falling point detecting circuit 250 and a recording/reproducing changeover circuit 280 are provided.

Other parts are the same as those of the first embodiment of FIG. 1 and identified with the same reference numerals as FIG. 1.

The recording/reproducing changeover circuit 280 comprises a memory 281 such as a ring buffer provided between the BPF unit 270 and the D/A converter 28 for storing the brain wave extracted by the BPF unit 270, and for applying the stored data of the brain wave to the D/A converter 28. The memory 281 has a storage capacity for storing data of the extracted brain wave for the BPF unit 270 for a few minutes.

The recording/reproducing changeover circuit 280 further has an input switching circuit S3 for connecting the BPF unit 270 to the memory 281, and an output switching circuit S4 for selectively connecting the BPF unit 270 and the memory 281 to the D/A converter 28.

The recording/reproducing selection routine 232 has a recording mode for recording the output of the BPF unit 270 in the memory 281, and a reproducing mode for reproducing the data stored in the memory 281. Each mode is selected by operating the remote controller 121, and the recording/reproducing selection routine 232 produces control signals C and D which are applied to the switching circuits S3 and S4, respectively.

When the recording mode is selected, the control signal C operates the switching circuit S3 to close it. The control signal D operates the switching circuit S4 to connect the BPF unit 270 to the D/A converter 28. Thus, the extracted brain wave of the BPF unit 270 is applied to the memory 281 and stored therein, and to the D/A converter 28.

On the other hand, when the reproducing mode is selected, the control signal C operates the switching circuit S3 to open it. The control signal D operates the switching circuit S4 to connect the memory 281 to the D/A converter 28. Thus, the brain wave data stored in the memory 281 is reproduced and applied to the D/A converter 28.

The sleep falling point detecting circuit 250 is provided for detecting a sleep falling point in accordance with the α wave. The sleep falling point detecting circuit 250 is applied with the brain wave signal from the amplifier 24 and detects that the amount of the α wave included in the brain wave reduces compared with the amount of the α wave in the closed-eye rest state. Thus, the sleep falling point in which the person falls into sleep through the sleep trasient period is detected. The detected signal is applied to the controller 230A of the MPU 22.

The detecting operation of the sleep falling point detecting circuit 250 will be described in detail. First, an appearance rate of the α wave is calculated by (accumulated time of a frequent region of the α wave/1 minute)×100%. A reference value of the α wave appearance rate is obtained based on an average of the α wave appearance rate from a start point. When the α wave appearance rate is less than 50% of the reference value, it is determined that the point at that time is the sleep falling point. In an example shown in FIG. 4*b*, when 4 minutes have passed, the sleep falling point is detected. In order to prevent erroneous detection caused by noises made by opening and closing eyes, and muscles, the averaging process is used.

In order to obtain the frequent region of the α wave, the frequency of the detected brain wave is calculated as shown in FIG. 4*a*. When the frequency is deflected from the range between 8 and 13 Hz, a jumping point of phase is determined. When a period of the phase jumping point exceeds 1 second, that period is determined as the frequent producing region of the α wave. An instantaneous frequency of the detected brain wave is obtained by a known complexed Demodulation (CD) method.

As a result of experiments based on a sincipital brain wave, the sleep falling point was detected at high probability, more than 80%.

When the controller 230A of the MPU 22 is applied with the sleep falling point signal from the sleep falling point detecting circuit 250, the recording/reproducing selection routine 232 operates the control signal C to open the switching circuit S3. Thus, the data recording of the BPF unit 270 in the memory 281 is stopped, and the stored content is fixed corresponding to the sleep falling point detection.

Describing the operation of the system, when the user selects the recording mode, the brain wave signal of the BPF unit 270 is applied to the D/A converter 28 through the switching circuit S4. Thus, the relaxation effect and the sleep inducing effect are selectively obtained.

At the same time, the brain wave signal of the BPF unit 270 is applied to the memory 281 through the switching circuit S3 and stored therein.

When the user falls into sleep, and the sleep falling point detecting circuit **250** detects the sleep falling point, the switching circuit **S3** is operated to be opened. Thus, the content of the memory **281** is fixed at the time. The brain wave signal before the sleep falling point is maintained within an allowable range of the storage capacity of the memory.

At the subsequent utilization of the system, if the reproducing mode is selected by the user, the brain wave data stored in the memory **281** is reproduced and applied to the D/A converter **28**. In the reproducing mode, since the light signal is produced in accordance with the content of the memory, it is not necessary to use the sensor unit **10**. The inducing effect is sufficiently obtained without the brain wave sensor.

In the reproducing mode, the amplification factor is gradually reduced to fade out the light stimulation because the light stimulation disturbs the sleep of the user. Thus, luminance is reduced.

It is effective to change luminance in dependency on the appearance of the α wave and the result of the sleep falling point detection, and to changeover the output of the BPF unit **270**.

(Third embodiment)

Referring to FIG. **5** showing a third embodiment of the present invention, the system has a face mounted device **100** in the form of an eye mask in place of the sensor unit and the actuating unit of the previous embodiments, and the light signal producing system **200A** which is the same as the second embodiment of FIG. **3**.

Referring to FIG. **6***a*, the eye mask device **100** has a bandage **101** for shielding the eyes of the user and a pair of ear straps **102** made of rubber secured to the both sides of the bandage **101**.

As shown in FIG. **6***b*, a lug is sewed on an upper portion of the bandage **101** to form a forehead portion **103** which is abutted on a forehead of the user when the eye mask device **100** is put on the face. In the forehead portion **103**, a reinforcement member **104** of a resilient plate is embedded so as to be curved along the forehead. Thus, when the eye mask device **100** is put on the face of the user as shown in FIG. **6***c*, the forehead portion **103** is securely abutted on the forehead.

Referring to FIG. **7***a*, a pair of electrodes **120** and **130** are provided on an inner side of the forehead portion **103** in a lateral direction. A pair of electrodes **140** are provided on opposite lower portions of the bandage **101** at positions corresponding to the cheeks of the face.

Each of these electrodes is formed by, for example a copper foil adhered to the forehead portion **103** and the bandage **101**. If the copper foil directly touches the face, the user may feel unpleasant. In order to avoid the unpleasant feeling, a piece of conductive fiber is adhered on each electrode by a conductive adhesive. As the conductive fiber, span polyester fiber with nickel coating is employed.

The electrodes **120** is connected to the GND input of the amplifier **24**, namely to the ground through a lead (not shown), the electrode **130** is connected to the minus input, namely the inverted input thereof, and each of the electrodes **140** is connected to the plus input, namely the non-inverted input thereof, respectively.

Since the distance between the plus and minus electrodes is largely set to increase the difference between the input signals, the S/N ratio is improved.

As shown in FIG. **7***b*, a pair of light emitting members **320** are provided on the inner side of the bandage **101** at positions corresponding to the eyes of the user. Each light emitting member **320** comprises a base portion **321** and LEDs **322** adhered to the base portion **321**. A piece of nonwoven fabric **323** is covered on the base portion **321** as a cushion member for avoiding a foreign object feeling. The beams of light emitted from the LEDs **322** of the light emitting members **320** pass through the nonwoven fabric pieces **323** so as to become scattered light and applied to the corresponding eyes of the user for visual stimulation.

Thus, the eye mask device **100** integral with the brain wave sensor and the light emitting element is formed.

FIG. **8** shows a modification of the eye mask device. In an eye mask device **100A**, one end of each ear strap **102** is connected to a side of the forehead portion **103**. Thus, even if the reinforcement member **104** is omitted, the electrodes **120** and **130** can be stably abutted on the forehead by the tensile strength of the rubber straps.

FIG. **9** shows another modification of the eye mask device. In an eye mask device **100B**, the electrode **120** is omitted, and one of the electrodes **140** is connected to the GND input of the amplifier **24** in place of the electrode **120**. By such an arrangement, it is possible to detect the brain wave.

(Other embodiments)

FIG. **10** shows a fourth embodiment of the present invention where the eye mask device is employed for the brain wave inducing system of the first embodiment.

FIG. **11** shows a fifth embodiment of the present invention where the eye mask device is employed for the conventional system shown in FIG. **13**.

FIG. **12** shows a modification of the light signal producing system where a BPF unit **270A** is provided on a preceding stage of the AGC **26** other than the BPF unit **270** as a following stage.

The characteristics of filters of both BPF units are entirely or approximately the same. Namely, each of the preceding and following BPF units **270A** and **270** has the first BPF **270***a* having the narrow band and the second BPF **270***b* having the wide band. The pass band of the first BPF of the preceding BPF unit is equal to that of the following BPF unit. Similarly, the pass bands of the second BPFs of the preceding and following BPF units are equal to each other.

In operation, the band of the brain wave is limited by the preceding BPF unit **270A**. The gain of the limited signal is controlled by the AGC **26**. The following BPF unit **270** operates to remove a distortion in the signal caused by the gain control.

The structure of the system is applicable to the previous embodiments shown in FIGS. **1**, **3**, **5** and **10**.

In order to precisely control the AGC **26** and the BPF units **270A** and **270** at a high speed, DSP and a circuit are employed.

In accordance with the present invention, the band for extracting the brain wave is selected by one of the wide and narrow bands. Consequently, it is effective to obtain the sleep inducing effect in addition to the relaxation effect.

The brain wave is stored in the memory in order to reproduce the frequency fluctuation in the sleep transient period. Thus, it is possible to induce the sleep transient state by drawing the brain wave without using the brain wave sensor. Since the troublesome caused by the sensor is avoided, the relaxation effect and sleep inducing effect are further improved.

Since the the brain wave sensor and the light emitting elements are integrally formed in the eye mask device without the ear clip, the relaxation effect can be easily obtained. Furthermore, the relaxation and sleep inducing effects are improved.

While the invention has been described in conjunction with preferred specific embodiment thereof, it will be understood that this description is intended to illustrate and not limit the scope of the invention, which is defined by the following claims.

What is claimed is:

1. A brain wave inducing system comprising:

sensors for detecting brain waves of a user;

a band-pass filter for extracting particular brain waves including an α wave included in a detected brain wave,

the band-pass filter comprising a first band-pass filter having a narrow pass band, and a second band-pass filter having a wide pass band connected in parallel to said first band-pass filter;

first selecting means for selecting one of the first and second band-pass filters, wherein said first band pass filter corresponds to an α wave in an eye-closed rest state of the user and has a narrow pass filter corresponding to the α wave in an eye-closed rest state of the user, and wherein said second band pass filter corresponds to an α wave in a sleep transient state of the user and has a wide pass filter corresponding to an α wave in the sleep transient state of the user;

output means for producing a stimulation signal dependent on an α wave extracted by a selected band-pass filter; and

light emitting means responsive to the stimulation signal for emitting a stimulation light to the user.

2. The system according to claim **1** further comprising a memory for recording the extracted brain waves and for reproducing the recorded brain waves, and second selecting means for selecting either of the recording or reproducing of the brain waves.

3. The system according to claim **1** wherein the sensors are mounted on an eye mask to be attached to a forehead of the user.

4. The system according to claim **2** further comprising detecting means for detecting a sleep falling point when the user falls into sleep and producing a signal, the second selecting means being provided to select the recording of the brain waves from the starting of the extraction of the brain waves to until receiving the signal of the sleep falling point.

5. The system according to claim **4** wherein the detecting means detects the sleep falling point by detecting a time when α wave appearance rate reduces 50% from a reference value.

6. The system according to claim **3** wherein the eye mask has a resilient member so as to be curved along the forehead.

* * * * *

PDF SECTION: UNITED STATES PATENTS.

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United States Patent [19]

Norris

[11] **Patent Number: 5,889,870**

[45] **Date of Patent: Mar. 30, 1999**

[54] **ACOUSTIC HETERODYNE DEVICE AND METHOD**

[75] Inventor: **Elwood G. Norris**, Poway, Calif.

[73] Assignee: **American Technology Corporation**, Poway, Calif.

[21] Appl. No.: **684,311**

[22] Filed: **Jul. 17, 1996**

[51] **Int. Cl.**^{6} **H04B 3/00**

[52] **U.S. Cl.** **381/77**; 381/79

[58] **Field of Search** 381/79, 77, 82

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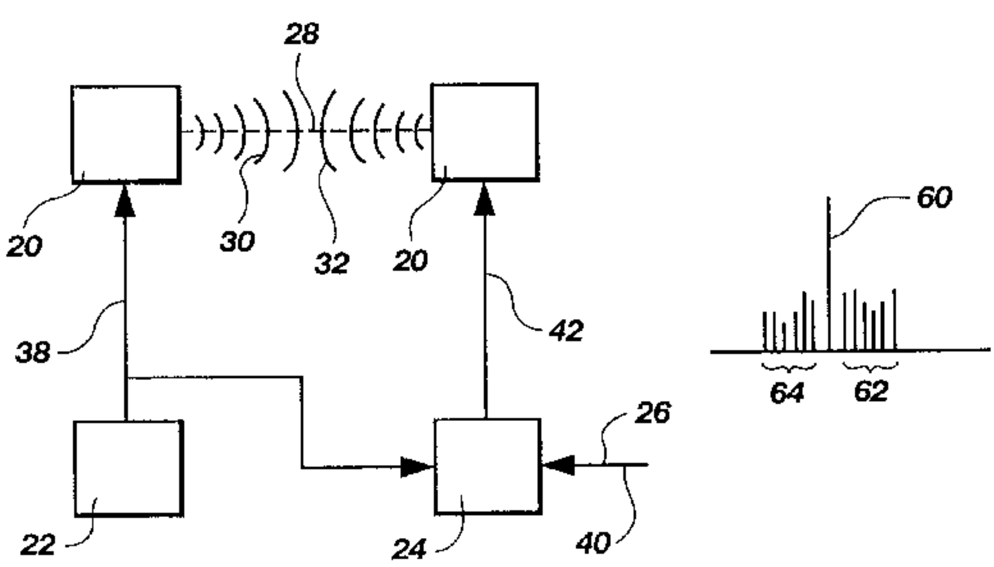
Primary Examiner—Forester W. Isen

Attorney, Agent, or Firm—Thorpe, North & Western, LLP

[57] **ABSTRACT**

The present invention is the emission of new sonic or subsonic compression waves from a region resonant cavity or similar of interference of at least two ultrasonic wave trains. In one embodiment, two ultrasonic emitters are oriented toward the cavity so as to cause interference between emitted ultrasonic wave trains. When the difference in frequency between the two ultrasonic wave trains is in the sonic or subsonic frequency range, a new sonic or subsonic wave train of that frequency is emitted from within the cavity or region of interference in accordance with the principles of acoustical heterodyning. The preferred embodiment is a system comprised of a single ultrasonic radiating element oriented toward the cavity emitting multiple waves.

6 Claims, 7 Drawing Sheets



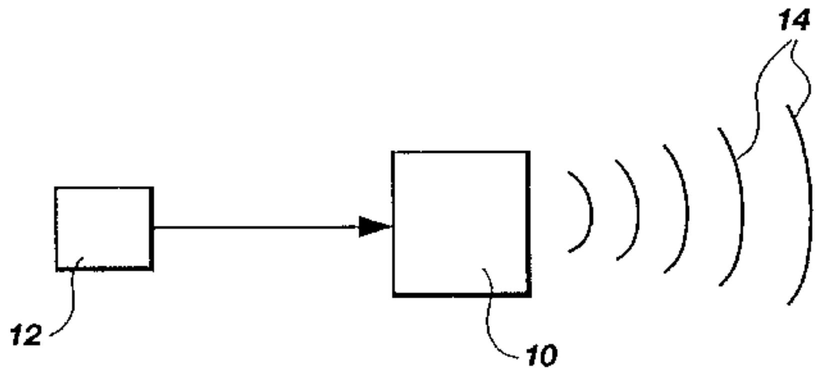


Fig. 1

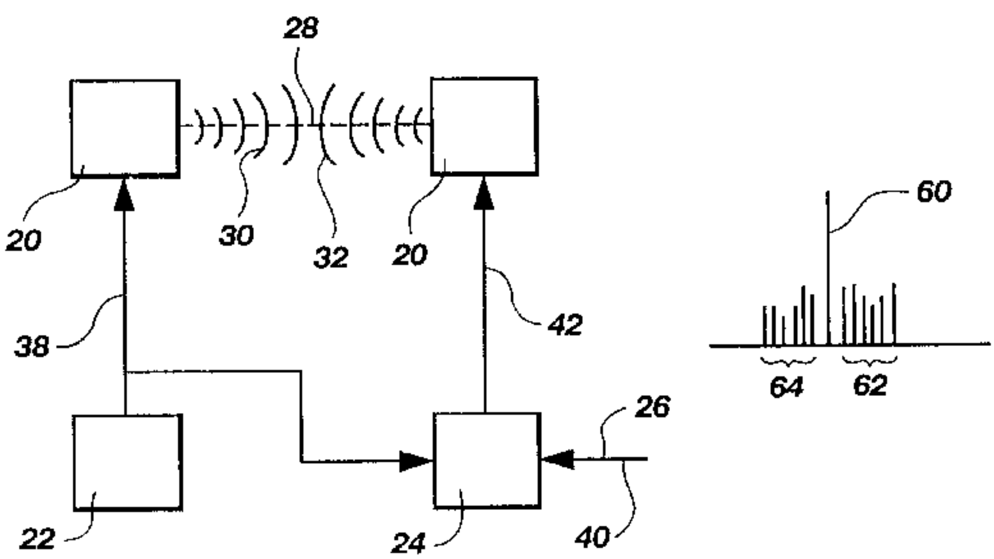


Fig. 2

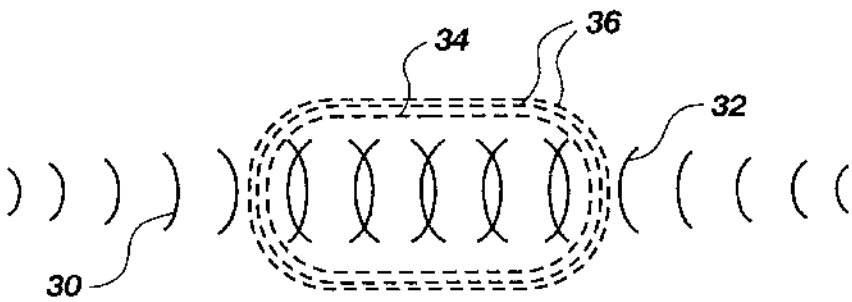


Fig. 3

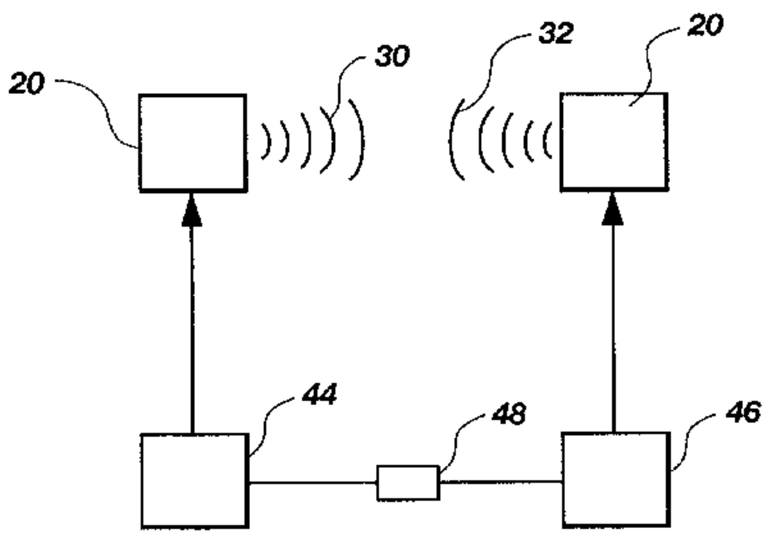


Fig. 4

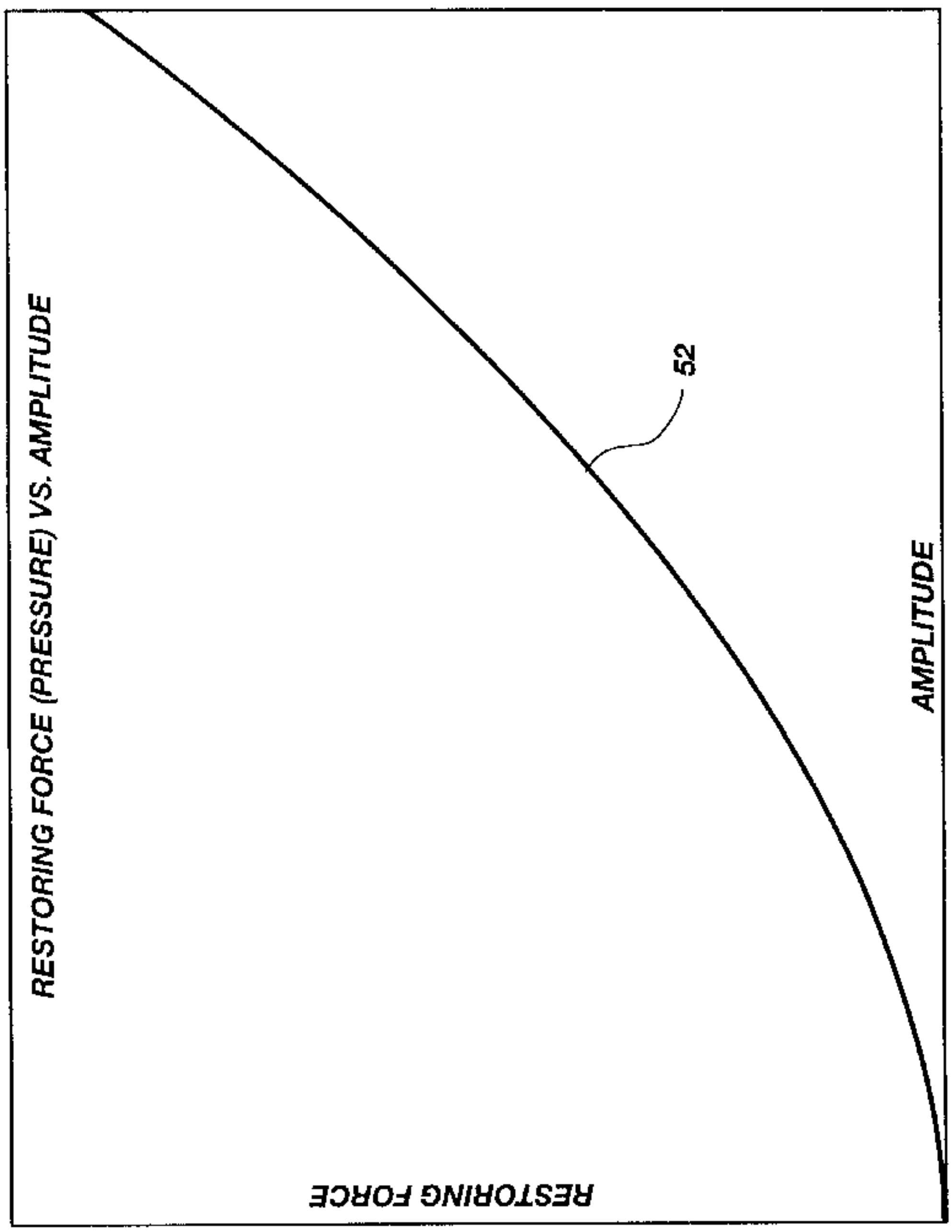

RESTORING FORCE (PRESSURE) VS. AMPLITUDE
52
AMPLITUDE
RESTORING FORCE

Fig. 5A

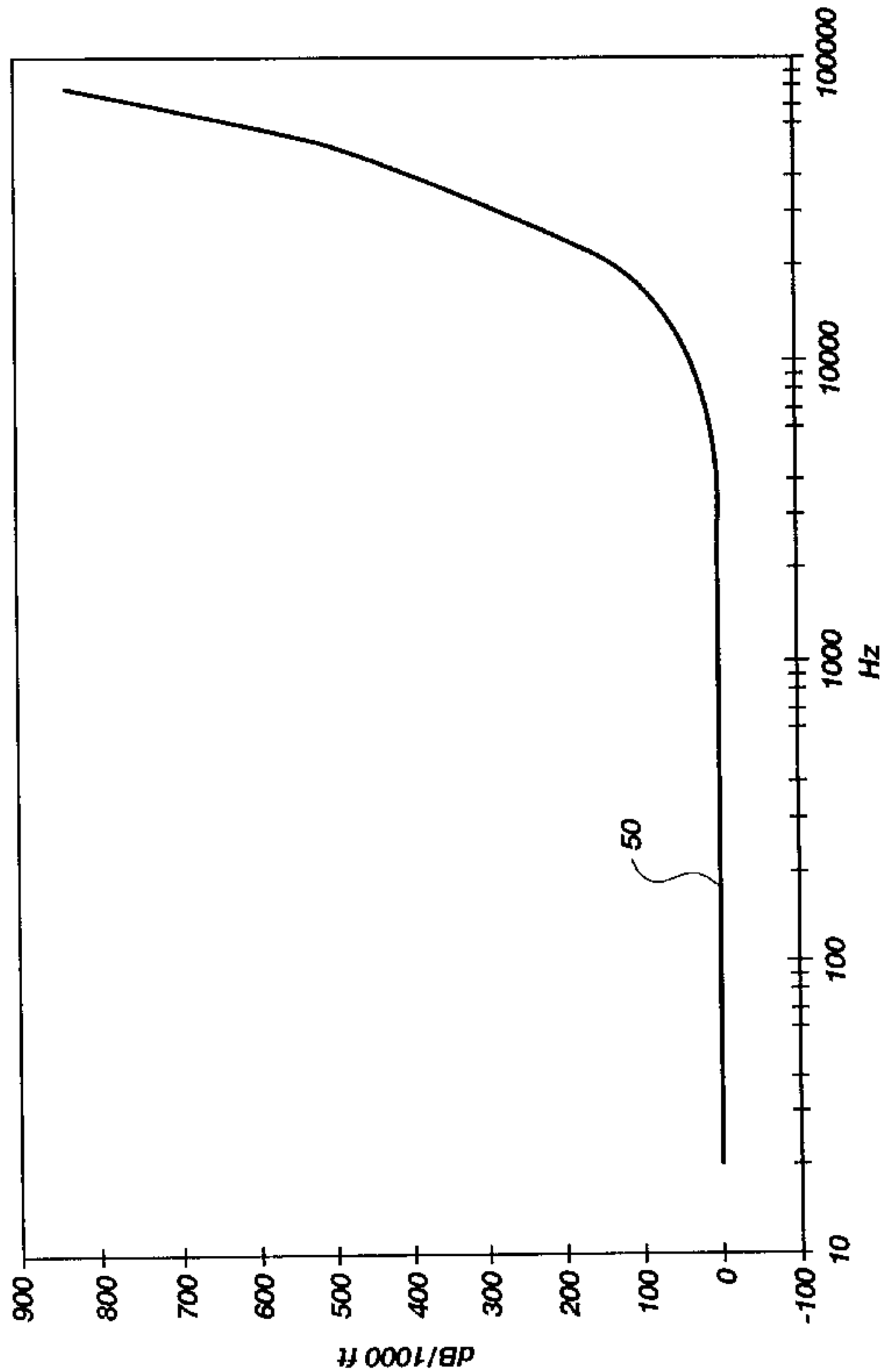

900
800
700
600
500
400
300
200
100
0
-100
dB/1000 ft
10
100
1000
10000
100000
Hz
50

Fig. 5B

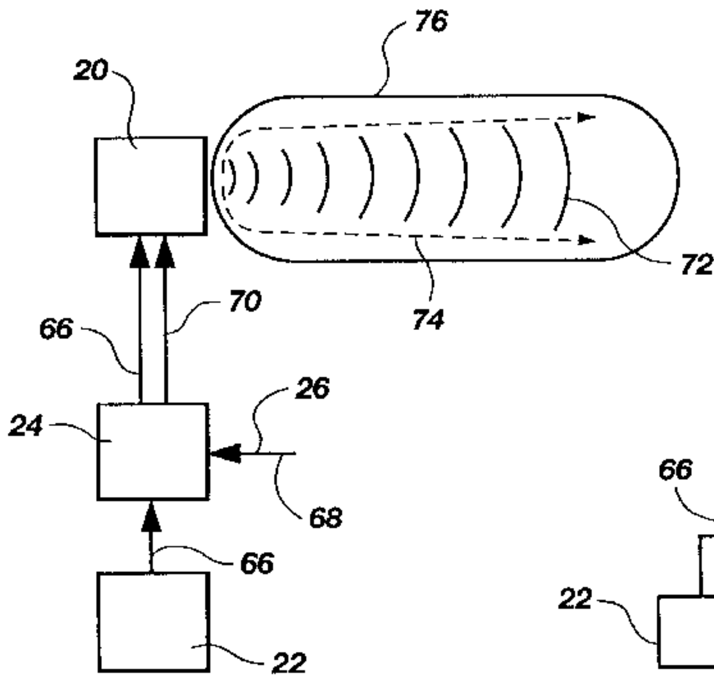


Fig. 6A

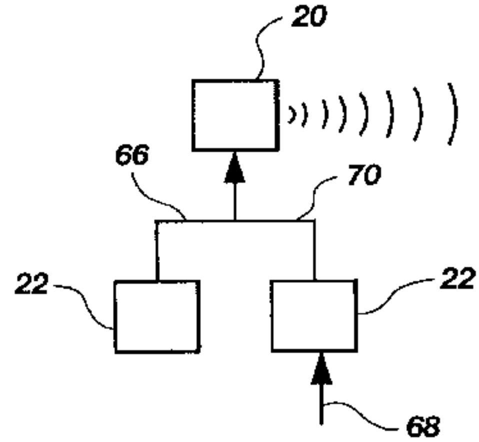


Fig. 6B

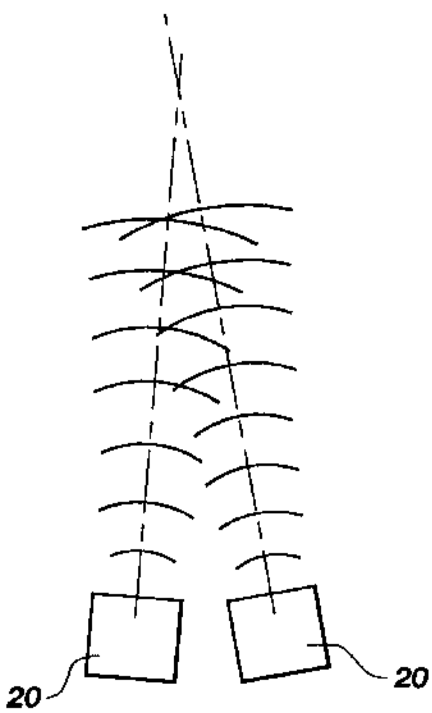


Fig. 7

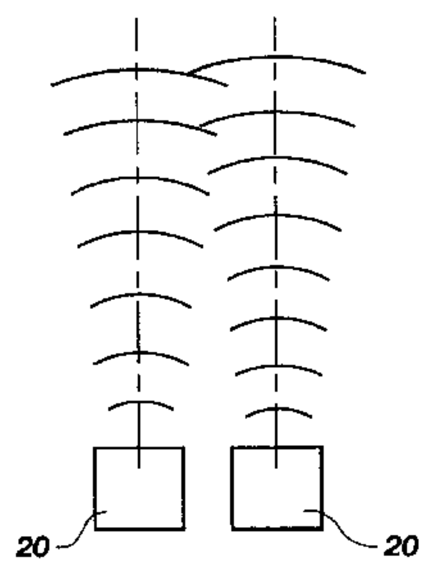


Fig. 8

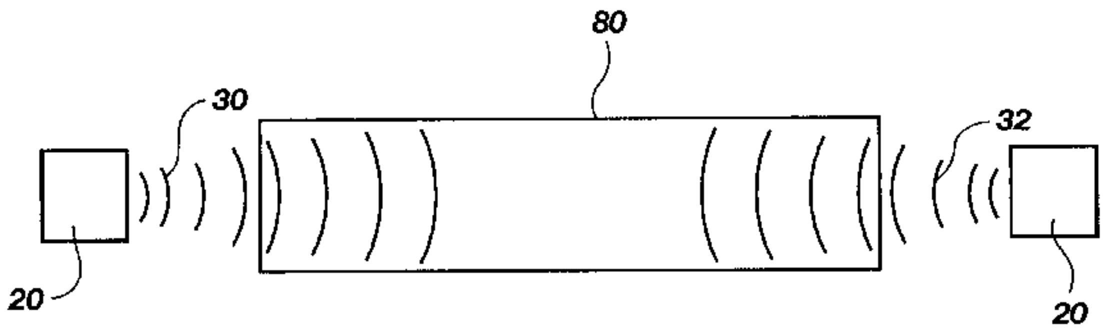


Fig. 9

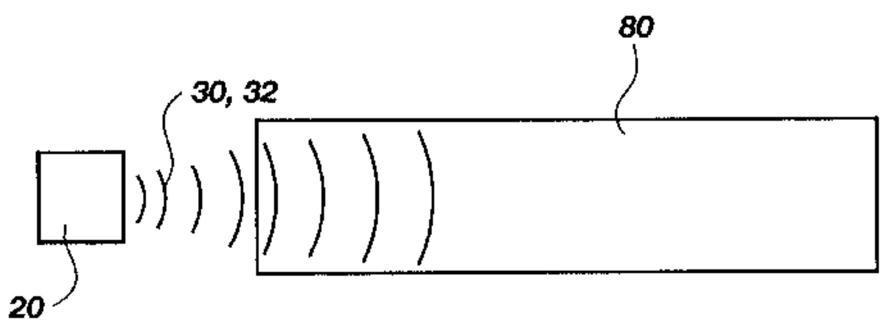


Fig. 10

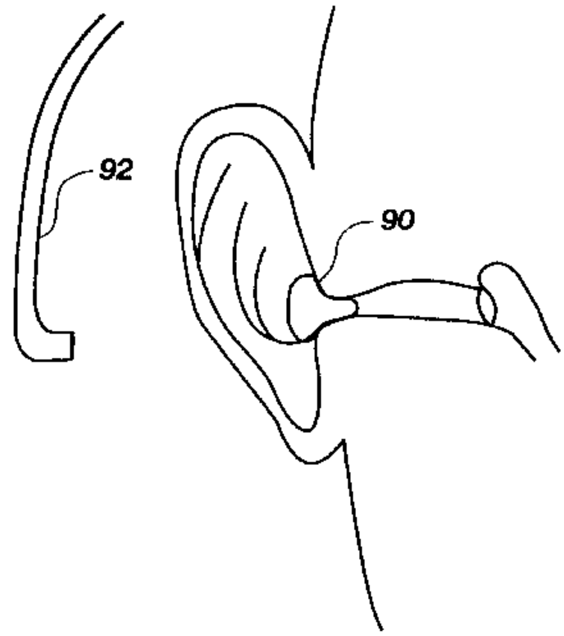


Fig. 11

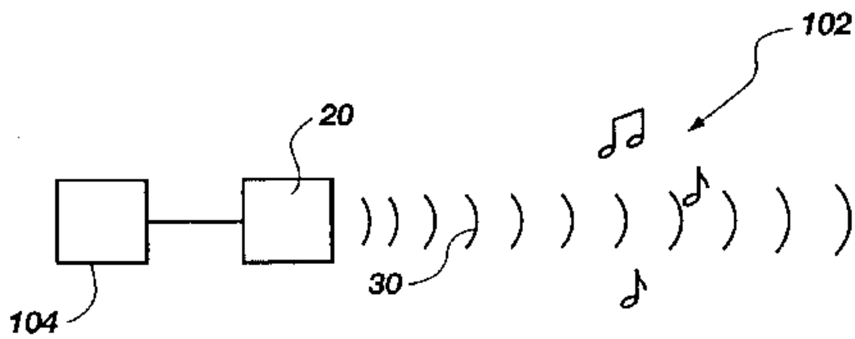


Fig. 12

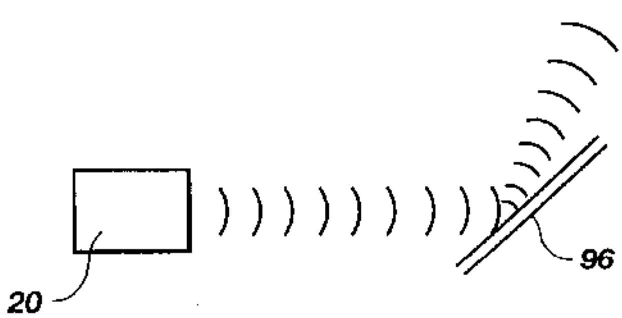


Fig. 13

ACOUSTIC HETERODYNE DEVICE AND METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to compression wave generation. Specifically, the present invention relates to a device and method for indirectly generating a new sonic or subsonic compression wave without the use of a direct radiating element at the source of the new compression wave generation.

2. State of the Art

Sound waves in general are wave-like movements of air or water molecules. Because these media are elastic and generally homogeneous, naturally occurring sound travels in all directions radially from the source of generation. A voice, instrument or impact, for example, will radiate omnidirectionally in a unitary, integrated form, carrying multiple frequencies, overtones, and a full range of dynamics that collectively contribute to an instantaneous sound perception at the ear. This perception of naturally occurring sound at a healthy ear is deemed to be "pure" when it corresponds to the same acoustic content that existed at the point of origin.

Because sound is a transient, temporary state of motion within a media, it is not self-sustaining. Indeed, the first and second laws of thermodynamics require that the sound eventually dissipate its motion into heat or other forms of energy. Therefore, if storage or preservation of the sound is desired, it is necessary to transmute such motion into a fixed form of recording. This fixed form can then be recovered later by conversion of the fixed form back into sound waves.

In the earliest experiences of recording, mechanical devices were moved by impact of the sound waves to inscribe or etch a corresponding grove into a plate. By positioning a needle or other tracking device over a set of moving grooves, crude reproduction of the original sound waves was accomplished. More sophisticated technologies have developed which enable capture of sound waves in other fixed forms such as magnetic, electronic, and optical media. Nevertheless, the same principle of sound reproduction has been applied to recover this stored information, whether the response is generated by a mechanical mechanism or by digitally controlled laser reading devices. Specifically, stored signal is converted back to sound waves by recreating movement of an object, which then sets the surrounding air into motion corresponding to sound reproduction.

A primary goal of modern acoustic science is to reproduce pure sound, based on conversion of the electronic, magnetic, mechanical or optical record into compression waves which can be detected at the ear. The ideal system would play all original sound back through a resonating device comparable to that which produced the sound in the beginning. In other words, the violin sounds would be played back through a violin, regenerating the overtones and a myriad of other dynamic influences that represent that instrument. Similarly, a piccolo would be played back through a device that generates the high frequencies, resonance aspects and overtones associated with this type of instrument. In short, one cannot expect a viola to sound like a viola in "pure" form if sound reproduction is actuated by a mechanical wave generating device that does not embody unique characteristics of that instrument or voice. Accordingly, it would seem that the only practical way to reproduce the original "pure" quality of sound would be to isolate each instrument or source, record its sound output, and then reproduce the output into the same instrument or acoustic resonator. It is apparent that such a solution is totally impractical.

In the real world, the challenge of reproducing sound has been allocated to the speaker. The operation of a loudspeaker is relatively simple to understand when the interaction of the components is explained. A speaker is a transducer which receives energy in one form (electrical signals representative of sound) and translates the energy to another form (mechanical vibration). In a dynamic loudspeaker, an electrical current that is proportional to the strength and frequency of the signal to be broadcast is sent through a coil attached to a rigid membrane or cone. The coil moves inside a permanent magnet, and the magnetic field exerts a force on the coil that is proportional to the electrical current. The oscillating movement of the coil and the attached membrane sets up sound waves in the surrounding air. In brief, reproduction of sound has heretofore required mechanical movement of a diaphragm or plate. To expect a single diaphragm or plate to accurately supply both the shrill sound of the piccolo and the deep resonance of the base drum would indeed be unreasonable.

It is important to note, however, that when the listener at a live performance of a symphony hears this broad range of sound, he receives it in an integrated manner as a "unified" combination of sound waves, having a myriad of frequencies and amplitudes. This complex array is responsively promulgated through the air from its originating source to an ear that is incredibly able to transfer the full experience to the brain. Indeed, the full range of audible signal (20 to 20,000 Hz) is processed as a unified experience, and includes effects of subsonic bass vibrations, as well as other frequencies which impact the remaining senses.

It is also important to note that this same "pure" sound that arrives at the ear, can be detected by a microphone and consequently recorded onto a fixed media such as magnetic tape or compact disc. Although the microphone diaphragm may not have the sensitivity of a human ear, modern technology has been quite successful in effectively capturing the full range of sound experience within the recorded signal. For example, it is unnecessary to provide separate microphones for recording both low and high range frequencies. Instead, like the ear drum, the microphone, with its tiny sensing membrane, captures the full audio spectrum as a unified array of sound waves and registers them as a composite signal that can then be recorded onto an appropriate media.

It is therefore clear that the microphone is not the primary limitation to effective storage and subsequent reproduction of "pure" sound. Rather, the challenge of accurate sound reproduction arises with the attempt to transform the microphone output to compression waves through a mechanical speaker. Accordingly, the focus of effort for achieving a high quality unified sound system has been to develop a complex speaker array which is able to respond to high, medium and low range frequencies, combining appropriate resonance chambers and sound coupling devices, to result in a closer simulation of the original sound experience.

This quest for improved sound reproduction has included studies of problems dealing with (a) compensating for the mass of the speaker diaphragm, (b) the resistance of air within an enclosed speaker, (c) the resonant chamber configuration of the speaker, (d) the directional differences between high and low frequencies, (e) the phase variation of low versus high frequency wave trains, (f) the difficulty of coupling speaker elements to surrounding air, and (g) the loss of harmonics and secondary tones. Again, these aspects represent just a few of the problems associated with reconstructing the sound wave by means of a direct radiating physical speaker.

As an example of just one of these issues, overcoming the mass of a speaker driver has remained a challenging problem. Obviously, the purpose of the speaker driver and diaphragm is to produce a series of compression waves by reciprocating back and forth to form a wave train. The initial design challenge is to compensate for resistance against movement in speaker response due to inertia within the speaker mass itself. Once the speaker driver is set in motion, however, the mass will seek to stay in motion, causing the driver to overshoot, requiring further compensation for delayed response to reverse its direction of travel. This conflict of mass and inertia recurs thousands of times each second as the speaker endeavors to generate the complex array of waves of the original sound embodied in the electrical signal received.

In order to meet the difficulty of compensating for mass, as well as numerous other physical problems, speaker development has focused mainly on improving materials and components as opposed to developing a different concept of sound generation. Diaphragm improvements, cone construction materials, techniques and design, suspensions, motor units, magnets, enclosures and other factors have been modified and improved. Nevertheless, the basic use of a reciprocating mass remains unchanged, despite an efficiency of less than 5 percent of the electrical power being converted to acoustic output.

Electrostatic loudspeakers represent a different methodology. Unlike the electrodynamic loudspeaker with its cone shaped diaphragm, the electrostatic loudspeaker uses a thin electrically conducting membrane. Surrounding the plate are one or more fixed grids. When a signal voltage is applied to the elements, the electrostatic force produced causes the diaphragm to vibrate. This low-mass diaphragm is particularly useful as a high-frequency radiating element, and its operation can be extended to relatively low frequencies by the use of a sufficiently large radiating area.

Although electrostatic speakers offer some advantages, they are large, expensive, inefficient and suffer from the lack of point source radiated sound. For example, sound detection is accomplished by a microphone at a localized or approximate point source. To convert the detected sound to a non-point source, such as a large electrostatic diaphragm, may create unnatural sound reproduction. Specifically, a radiating electrostatic speaker 5 feet in height is limited in its ability to simulate the delicate spatial image of a much smaller piccolo or violin.

Another issue in loudspeaker design is that the optimum mass and dimensions for low frequency radiating elements differ radically from those for high frequency. This problem is typically addressed by providing both woofer and tweeter radiating elements for each channel of a loudspeaker system. The implications of this design are highly undesirable. The phase shift introduced because of the differences in time delay for high frequency signals traveling (i) the shorter distance of the cone of a tweeter to a listener, versus (ii) the substantially longer path for low frequency signals from the horn or woofer speaker to a listener's ear, can be in the range of thousands of percent in phase differential.

The preceding discussion of speaker technology is recited primarily to emphasize the historical difficulty of changing a stored form of sound to a compression wave capable of reproducing sound in its original form. Nevertheless, the prior art has been virtually dominated for sixty years by the concept that mechanical systems, such as speakers, are required to reproduce audible sound. Clearly, it would be very desirable to provide a means of sound reproduction which adopts a different approach, avoiding the many difficulties represented by the choice of moving a diaphragm or speaker in order to generate sound.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method and apparatus for indirectly emitting new sonic and subsonic wave trains from a region of air without using a direct radiating element to emit the wave trains.

It is another object to indirectly generate at least one new sonic or subsonic wave train by using a by-product of interference between at least two ultrasonic signals having different frequencies equal to the at least one new sonic or subsonic wave train.

It is still another object to cause at least two ultrasonic wave trains to interact in accordance with the principles of acoustical heterodyning to thereby extract intelligence from the interfering wave trains.

It is yet another object to indirectly generate new sonic or subsonic wave trains by combining them with an ultrasonic carrier wave using amplitude modulation, emitting the combined signal from an ultrasonic transducer, causing interference between the carrier wave and another ultrasonic frequency wave train, to thereby create the new sonic or subsonic wave trains.

It is still another object to affect a physical state of a living being utilizing an indirectly created compression wave.

It is still yet another object to generate a new compression wave which is perceptible to human senses using at least two imperceptible compression waves, but without directly propagating the new compression wave.

Yet another object of the invention is to generate a new sonic or subsonic wave train without having to overcome the mass and associated inertial limitations of a conventional direct radiating element.

Still another object of the invention is to generate a new sonic or subsonic wave train without introducing distortions or undesired harmonics otherwise inherent to a conventional direct radiating element.

Another object is to indirectly generate and enhance a new sonic or subsonic wave train from within a resonant cavity by emitting at least two ultrasonic wave trains into the resonant cavity.

Yet another object is to omni-directionally generate a high frequency wave train, thereby avoiding the highly focused and directional nature of high frequency signal emissions typical of a conventional loudspeaker.

Still yet another object is to generate a new sonic or subsonic wave train in a localized area without coupling to an associated environment or enclosure which would otherwise cause undesirable broadcasting of the sonic or subsonic wave train.

Yet another object is to generate a new sonic or subsonic wave train wherein characteristics of the new sonic or subsonic wave train are not limited by the characteristics of a direct radiating element.

Another object of the invention is to emulate a sound wave detection process typical of an approximate point-source detection device such as a microphone, but without providing a physical detection device at a detection location.

Another object is to control the volume of a new sonic or subsonic wave train by manipulating the degree of interaction of the at least two ultrasonic frequency wave trains.

Still another object is to emit a new sonic or subsonic wave train from a region of air as a by-product of modulating a single ultrasonic wave train emitted from a single ultrasonic transducer into the region in accordance with the principles of acoustical heterodyning.

The present invention is embodied in a system which indirectly generates new sonic or subsonic waves trains. In one embodiment, a new sonic or subsonic wave train is emitted from a region of interference of at least two ultrasonic wave trains emitted from at least two ultrasonic transducers. The principle of operation is based on incorporating retrievable intelligence onto an ultrasonic carrier wave. The intelligence is retrieved as the desirable by-product of interference of the ultrasonic carrier wave train and another ultrasonic wave train. The ultrasonic wave trains interfere within a region of non-linearity in accordance with principles identified by the inventor as "acoustical heterodyning," and thereby generate by-products which include the difference and the sum of the two ultrasonic wave trains.

A system which easily demonstrates the principle of acoustical heterodyning comprises two ultrasonic frequency transducers which are oriented so as to cause interference between emitted ultrasonic wave trains. When the difference in frequency between the two ultrasonic wave trains is in the sonic or subsonic frequency range, the difference in frequency is generated as a new, audible sonic or new subsonic wave train emanating outward from within the region of heterodyning interference.

A different embodiment of the system provides the advantage of being comprised of only one ultrasonic direct radiating element. The advantage is not only in the decreased amount of hardware, but the perfect alignment of the two interfering ultrasonic wave trains because they are emitted from the same radiating element. In effect, the new sonic or subsonic wave train appears to be generated directly from the ultrasonic emitter. If it were not for the inescapable conclusion that the ultrasonic emitter cannot itself generate sonic or subsonic frequencies, plus the audible evidence that the sound is not emanating directly from the emitter, one might be deceived.

The importance of the first embodiment is that it teaches the concept of generating a new sonic or subsonic wave train as a result of the interference between two ultrasonic wave trains in accordance with the principles of acoustical heterodyning. In essence, it is easier to see that two ultrasonic wave trains are coming from two ultrasonic emitters. But the principle of acoustical heterodyning taught by this first embodiment prepares the way for understanding how the second embodiment functions. It becomes apparent that the same acoustical heterodyning principle applies when it is understood which wave trains are interfering in space.

A key aspect of the invention is the discovery that by superimposing sonic or subsonic intelligence onto an ultrasonic carrier wave, this intelligence can be retrieved as a new sonic or subsonic wave train. Whether the ultrasonic wave trains are generated from two emitters or from a single emitter, the effect is the same.

Another aspect of the invention is the indirect generation of new compression waves without having to overcome the problems inherent to mass and the associated limitations of inertia of a conventional direct radiating element. The present invention eliminates a direct radiating element as the source of a new compression wave so that the desired sound is generated directly from a region of air and without the several forms of distortion all associated with direct radiating speakers.

Another aspect which is helpful to utilize the present invention is to understand the nature of the transmission medium. More specifically, the region of air in which an acoustical heterodyning effect occurs is referred to as the transmission medium. It is well known that the transmission medium of air provides an elastic medium for the propagation of sound waves. Thus, prior art research has treated air as a passive element of the sound reproduction process. Air simply waits to be moved by a compression wave.

Consequently, little practical attention has been devoted to the nature of air when it behaves non-linearly. In the past, such non-linearity has perhaps been perceived as an obstacle to accurate sound reproduction. This is because it is understood by those skilled in the art that in extreme conditions, air molecules are less and less able to follow the vibration of a compression wave, such as that produced by a diaphragm. Therefore, the tendency of research has been to avoid non-linear conditions.

In contrast, the present invention appears to favor the existence of a non-linear transmission medium in order to bring about the required heterodyning effect. Although air is naturally non-linear when a compression wave moves through it, the degree of non-linearity is relatively unobservable or inconsequential. However, when ultrasonic compression waves are emitted so as to interfere in air, the non-linearity causes a surprising and unexpected result which will be explained and referred to as the acoustical heterodyning effect or process.

The present invention draws on a variety of technologies and aspects which have sometimes perceived as unrelated topics. These aspects of the invention include 1) indirectly generating a new sonic, subsonic or ultrasonic compression wave, 2) superimposing intelligence on an ultrasonic carrier wave and retrieving the intelligence as the indirectly generated compression wave, 3) causing at least two ultrasonic compression waves to interact in air and using the by-product of the interference, 4) using the principle of acoustical heterodyning to indirectly generate the new compression wave, 5) generating the new compression wave from a relatively massless radiating element to avoid the distortion and undesirable harmonics of conventional direct radiating elements, 6) affecting a physical state of a living being by generating subsonic frequencies in close proximity thereto, 7) generating an approximate point-source of sound that is phase coherent over the entire audio spectrum, 8) eliminating distortion in playback or broadcasting of sound, 9) eliminating the "beaming" phenomenon inherent in emission of high frequency compression waves from a direct radiating element, 10) generating a new sonic or subsonic compression wave which is independent of the characteristics of the direct radiating element, and 11) the detection of sound without using a direct detection device at a detection location.

It should be remembered that all of these aspects of the present invention are possible without using a speaker or other form of direct radiating structure. Furthermore, these sonic or subsonic frequencies are generated absolutely free of distortion and in a generally omni-directional orientation. The surprising result is the ability to recreate "pure" sound in the same form as when it was originally captured at a microphone or other recording system.

These and other objects, features, advantages and alternative aspects of the present invention will become apparent to those skilled in the art from a consideration of the following detailed description, taken in combination with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of the components of a state of the art conventional loudspeaker system.

FIG. 2 is a block diagram of the components of an indirect compression wave generation system which is built in accordance with the principles of one embodiment of the present invention.

FIG. 3 is an illustration of the indirect and new compression wave generation using the apparatus of FIG. 2, including the acoustical heterodyning interference effect.

FIG. 4 is a block diagram of the components of an indirect compression wave generation system.

FIG. 5A is a graph showing how air responds increasingly non-linearly as the amplitude or intensity of sound increases.

FIG. 5B is a graph showing when air responds non-linearly to a specific signal of a defined frequency and amplitude.

FIG. 6A is a block diagram of the components of an indirect compression wave generation system.

FIG. 6B is an alternative embodiment of FIG. 6A.

FIG. 7 is an alternative configuration of ultrasonic frequency transducers to indirectly generate compression waves.

FIG. 8 is another alternative configuration of ultrasonic frequency transducers to indirectly generate compression waves.

FIG. 9 is an illustration of a resonant cavity with two ultrasonic frequency signals being emitted from two transducers.

FIG. 10 is an illustration of a resonant cavity with two ultrasonic frequency signals being emitted from one transducer.

FIG. 11 is a diagram of a hearing aid and headphones where the human ear canal is the resonant cavity.

FIG. 12 is a block diagram illustrating using the present invention to detect sound.

FIG. 13 is an embodiment which teaches reflection of the ultrasonic frequency signals to develop acoustical effects.

DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made to the drawings in which the various elements of the present invention will be given numerical designations and in which the invention will be discussed so as to enable one skilled in the art to make and use the invention.

The present invention is a dramatic departure from the teachings of the present state of the art. The creation of compression waves is generally perceived to be a direct process. A direct process is defined as causing a radiating element 10 to vibrate at a desired frequency as shown in FIG. 1. The system of FIG. 1 is typically used to directly generate audible and inaudible compression waves, both above and below the range of human hearing. A conventional compression wave generating system is thus comprised of a speaker element 10 which can be any dynamic, electrostatic or other direct radiating element, and a signal source such as a signal generator or amplifier 12. The signal source 12 supplies an electrical signal representative of a compression wave having a specific frequency or frequencies at which the speaker element 10 will vibrate to produce compression waves 14.

To improve the quality of sound from a sound reproduction system such as in FIG. 1, a person skilled in the art presently looks at ways to improve the physical radiating element, such as the loudspeaker 10. The loudspeaker 10 functions as a transducer, attempting to accurately reproduce sound recorded in an analog or preferably a digital format by converting an electrical signal into compression waves 14. Therefore, generating compression waves has previously been a direct process as defined above. The reproduced sound is generated directly by a physical radiating element which vibrates at the frequency or frequencies which drive it. This vibration typically drives a loudspeaker cone or diaphragm, which creates compression waves the human ear can hear when within the range of 20 to 20,000 cycles per second. For example, if the diaphragm vibrates at 1500 cycles per second, an audible tone of 1500 Hz is generated.

Before proceeding further, it will be helpful to define several terms to be used hereinafter. A "signal source" will interchangeably refer to a "signal generator" or "amplifier" which provides electrical signals representative of compression waves to be emitted from a speaker. The term "speaker" will interchangeably refer to the terms "transducer", "emitter", "loudspeaker", "diaphragm", "physical radiating element" or "direct radiating element" which converts the electrical signals to a mechanical vibration causing compression waves. The term "compression wave" will interchangeably refer to the terms "sound wave", "longitudinal wave" and "wave train" which are sonic, subsonic and ultrasonic waves propagating through a transmission medium such as air.

The present invention in a preferred embodiment teaches a method and apparatus for indirectly generating a new compression wave. Indirect generation refers to the absence of a direct radiating element at the source of the new compression wave generation. Surprisingly, there is no physical radiating element vibrating at the frequency of the newly generated compression wave. Instead, air molecules are caused to vibrate at the desired sonic, subsonic or ultrasonic frequency to thereby function as the radiating element and generate the new compression wave. The air itself becomes the direct radiating element, and becomes an indirect source of the compression wave.

Of greatest interest to the present invention are both sonic and subsonic frequencies. This is largely due to the difficulty of directly generating these frequencies without distortion. In contrast, it is the nature of ultrasonic frequencies to be capable of generation with much greater precision and with less distortion. This occurs because the radiating element is typically more efficient, smaller in size, and is less massive. Accordingly, the ultrasonic radiating element is not subject to the same causes of distortion or to the same degree as are conventional speakers. Although it should be remembered that the invention can generate new compression waves at ultrasonic, sonic or subsonic frequencies indirectly, the present focus looks at more significant applications with respect to reproduction of music, voice and all other forms of sound.

To generate a new compression wave, the present invention 1) makes use of at least two ultrasonic signals, 2) superimposes a desired sonic or subsonic signal onto one or both of the ultrasonic signals, 3) emits the ultrasonic signals from at least one ultrasonic emitter 4) causes the ultrasonic signals to interfere according to the principles of acoustical heterodyning, and 5) generates a new compression wave from a region of heterodyning interference of the ultrasonic compression waves.

The advantages of this arrangement are immediately observable. For example, the ultrasonic component waves do not impact upon the human ear in a perceptible form and are therefore non-distracting. Consequently, only the desired new compression wave is perceived by a listener and in a form capable of recreating the original dynamics of more ideal sound reproduction.

Introduction of the present invention is best understood by reference to FIG. 2. Other preferred embodiments will be explained hereafter, based on the principles of this initial discussion.

Indirect compression wave generation is accomplished in a first embodiment as illustrated in FIG. 2. The fundamental elements of the system include at least two ultrasonic acoustical transducers **20**, an ultrasonic signal source **22**, a means for combining signals **24**, and an input **26** to the means for combining signals which provides a signal to be superimposed upon a carrier signal. The ultrasonic signal source **22** also functions as a means for controlling the frequency of signals being emitted from the at least two ultrasonic acoustical transducers **20**. The dotted line **28** indicates that in this first embodiment, the orientation of the transducers **20** are coaxial.

The apparatus above is able to function as described because the compression waves **30**, **32** interfere in air according to the principles of acoustical heterodyning (a phrase chosen by the inventor which describes the effect). Acoustical heterodyning is somewhat of a mechanical counterpart to the electrical heterodyning effect which takes place in a non-linear circuit. For example, amplitude modulation in an electrical circuit is a heterodyning process. The heterodyne process itself is simply the creation of two new waves. The new waves are the sum and the difference of two fundamental waves.

In acoustical heterodyning, the new waves equalling the sum and difference of the fundamental waves are observed to occur when at least two ultrasonic compression waves interact or interfere in air. Presently, acoustical heterodyning has only been observed when both fundamental waves are ultrasonic, thus generally above 20 KHz.

The preferred transmission medium of the present invention is air because it is a highly compressible medium that responds non-linearly under different amplitudes. This non-linearity of air is what enables the heterodyning process to take place without using an electrical circuit. However, it should be remembered that any compressible fluid can function as the transmission medium if desired.

FIG. **3** illustrates that the indirect generation of a new compression wave is made possible by the unexpected discovery that two ultrasonic wave trains **30**, **32** experience a form of the acoustical heterodyning effect in a non-linear acoustical transmission medium such as air when they interfere. Air will respond more and more non-linearly in a region **34** as amplitude and frequency increase. This region **34** will extend as far as the compression waves **30**, **32** are interfering with each other.

As related above, the acoustical heterodyning effect results in the creation of two new compression waves, the sum and the difference of ultrasonic compression waves **30**, **32**. The sum is an ultrasonic wave which is of little interest and is therefore not shown. The difference, however, can be sonic or subsonic, and is shown as a compression wave **36** which is emitted generally omni-directionally from the region of interference **34**. The shape of the new wave is generally dictated by the shape of the region of interference **34**. In this illustration, the region **34** will be generally cylindrical as would be seen if drawn in three dimensions. The shape of the region **34** can, however, be modified to produce a desired effect. Furthermore, the illustration of opposing and generally coaxial compression waves **30**, **32** should not be thought to depict the only orientation that the waves can have.

It is worth noting before proceeding further that the acoustical heterodyning effect has been proven empirically. The evidence lies in the fact that at least one new wave is created. The new sonic or subsonic compression wave **36** is verifiable by direct audible detection as well as by measuring the frequency with an audio spectrum analyzer. However, unlike direct audible detection, the sum of both frequencies can only be verified through measurement using an instrument such as the audio spectrum analyzer. Both the sum and the difference have been measured to verify the accuracy of these predicted results.

As can be surmised, the particular acoustical heterodyning effect which is of interest to the present invention is the difference or frequency subtraction of one ultrasonic wave train relative to another. Consider a specific example which explicitly provides the result of acoustically heterodyning two different ultrasonic compression waves **30**, **32**. Assume the existence of a first ultrasonic frequency wave train (first fundamental wave) 30 of 100,000 Hz. Assume a second ultrasonic wave train (second fundamental wave) 34 occurs at 100,900 Hz. An audible tone of 900 Hz is heard as the result of the first and the second ultrasonic wave trains interacting when one or both are of sufficient amplitude. The frequency subtraction caused by the acoustical heterodyning effect results in a 900 Hz frequency tone being generated and heard as a new compression wave from a region of interference.

The generation of a single-frequency merely illustrates the core inventive principle. A greater appreciation of potential for acoustic heterodyning is found in the following applications. For example, if a single new uni-frequency compression wave can be generated, it should be realized that even bass intense, multi-frequency signals such as live music, a voice or a transmission received via radio or television can be amplified and played using the present invention. A tiny ultrasonic frequency transducer in a pocket can conceivably reproduce with perfect clarity all the recorded frequencies of a live symphonic recording, perhaps even approaching the experience of being there.

Returning to a more detailed discussion of specific elements of FIG. **2**, an important and practical element of the invention is the single ultrasonic signal source **22** being used to supply the electrical signals representing the ultrasonic frequency wave trains **30**, **32**. The advantage of this arrangement is that signal differences that might otherwise occur due to variations in temperature or performance of two separate signal generators would likely lead to drift between the frequency values of the ultrasonic wave trains **30**, **32**. Furthermore, because it is the difference in frequency between the two ultrasonic wave trains **30**, **32** which is ultimately the frequency of interest, it is important to minimize unwanted frequency variations of the ultrasonic wave trains **30**, **32**.

To eliminate drift, a single ultrasonic output source **22** generates a base frequency for both ultrasonic wave trains **30**, **32** so that the wave trains **30**, **32** will drift together, if at all. This configuration thus makes it easier to precisely control the difference in frequencies and ultimately the frequencies of the new compression wave.

FIG. 2 also lists as a component of the system a means for combining signals **24**. This device performs the function of modifying one or both of the ultrasonic wave trains **30**, **32** being generated by the ultrasonic signal source **22**. This modification consists of the means for combining signals **24** by combining a first ultrasonic signal **38** with an electrical signal **40**, representing the new compression wave **42** to be generated. The combination is defined as the sum of the first ultrasonic signal **38** and the desired compression wave **42** and is transmitted as the second ultrasonic signal **42**.

The method of combining signals **38** and **40** in the present invention is preferably accomplished through amplitude modulation. Therefore the means for combining signals **24** in the first embodiment is an amplitude modulator. FIG. **2A** illustrates that amplitude modulation creates a signal having a fundamental frequency **60**, an upper sideband **62**, and a lower sideband **64**. In this invention, the upper sideband **62** is used because it represents a non-inverted signal which carries the information that will become the new "difference" compression wave.

It might be apparent that if the electrical signal which will become the new compression wave **62** is amplitude modulated onto a fundamental frequency **60**, that the ultrasonic compression wave **30** or **32** (whichever is being modulated) needs no demodulation in order to be heard as the new compression wave **62**. The last elements of the system shown in FIG. **2** are the two ultrasonic acoustical transducers **20**. These acoustical transducers **20** are designed to emit compression waves at ultrasonic frequencies. Examples of transducers **20** can be piezoelectric or electrostatic devices, but may obviously include other radiating elements for the appropriate frequency range.

While the first embodiment uses a single ultrasonic signal source **22**, it should be realized that it is possible to provide separately generated electrical signals to the ultrasonic transducers **20**. FIG. **4** illustrates using two separate ultrasonic signal sources **44**, **46**. The risk of this configuration is that frequency drift becomes a possibility. As a practical matter, this embodiment might also require some type of synchronization between the two ultrasonic signal sources **44**, **46**. For example, a synchronizing controller **48** might coordinate emission of the two ultrasonic frequency signals **30**, **32**.

FIG. **5A** is a graph provided to illustrate the principle of acoustical heterodyning by showing the relationship between the amplitude of a signal and the non-linearity of air in response to that signal. The restoring force is the force which a molecule of air will exert to get back to equilibrium when it is displaced. If air were linear, Newton's laws would teach us that air would respond to a given force which displaces it with an equal and opposite force. However, the graph illustrates that the restoring force does not respond linearly (which would be represented by a straight line) as the amplitude of a signal increases. Instead, the equation of the curve **52** is $y=x+x^2$, where air responds with a linear component x, as well as a non-linear component x^2. The curve **52** thus represents that as amplitude of a signal becomes significant, the non-linear response of air begins to increase more rapidly than the linear component in accordance with the equation.

FIG. **5B** is a graph provided to illustrate properties which the signal must exhibit so that air will respond to it non-linearly. The x-axis represents frequency of the signal on a logarithmic scale. The y-axis represents the degree of absorption in air by dB per 1000 feet. As shown, the line **50** is nearly flat up to about 10 KHz. This is consistent with the experimental results confirming that sound waves at lower amplitudes do not appear to develop significant acoustical heterodyning. Air becomes substantially more non-linear as amplitude increases, thus enabling interference in accordance with the principles of acoustical heterodyning.

FIG. **6A** illustrates the preferred embodiment of the invention. In a comparison with FIG. **2**, a significant difference is the elimination of one ultrasonic transducer **20**. Otherwise, the remaining ultrasonic transducer **20**, the means for combining signals **24** and the ultrasonic signal source **22** remain substantially the same. It would seem counter-intuitive, however, to think that this arrangement is still able to accomplish the objectives of the present invention. However, an analysis of the ultrasonic compression wave being emitted quickly proves that the acoustical heterodyning effect is still taking place.

First, the electrical signals involved are the first ultrasonic signal **66** which is the fundamental wave, and the electrical signal **68** which represents the new sonic or subsonic wave to be combined with the ultrasonic signal **66**. The combination of the signals **66**, **68** creates a new electrical signal **70** composite as a new upper sideband that is the sum of signals **66** and **68**, along with signal **66**, both of which are emitted from the ultrasonic transducer **20** as a compression wave **76**.

A listener will hear the new compression wave **76** from a region of interference **74** which generally can begin at a transmitting face of the ultrasonic transducer **20**. Except for the audible evidence to the contrary, this might lead the listener to incorrectly conclude that the ultrasonic transducer **20** is generating the new compression wave **76**. By definition, the ultrasonic transducer **20** cannot directly generate audible frequencies. Therefore, what one hears is the interfering ultrasonic compression waves interacting in accordance with the acoustical heterodyning effect. It was discovered that the two ultrasonic compression waves are created from 1) the new electrical signal **70**, and 2) the first ultrasonic signal **66**. These respective compression waves corresponding to signals **66** and **70** are propagated at the transducer **20**, providing the required two ultrasonic wave trains for acoustical heterodyning interference.

FIG. **6B** is also provided to show an alternative arrangement of components which more intuitively illustrates the two distinct ultrasonic compression waves **66** and **70** being transmitted to the ultrasonic transducer **20** for emission therefrom. The only meaningful difference between the two embodiments is that separate ultrasonic signals sources **22** are shown for each of the ultrasonic compression waves.

The embodiments of FIG. **6A** or **6B** are preferred for many reasons. For example, the systems have one less transducer **20**, and will therefore be less expensive to produce. The systems will also be lighter, smaller and, most importantly, will have the greatest efficiency.

The aspect of efficiency requires further discussion to understand some of the implications of the various embodiments. Whereas the first embodiment shown in FIG. **2** requires orientation of the ultrasonic transducers **20**, no orientation is required in FIG. **6** because the single transducer **20** functions as the radiating element for both interfering signals.

Orientation of ultrasonic transducers **20** is important because the system of FIG. **1** can be altered so as not to generate any new compression wave. For example, if the transducers **20** are oriented so that the ultrasonic compression waves **30**, **32** never substantially cross, no new compression wave can be created. Therefore, FIG. **7** showing a slightly convergent path and FIG. **8** showing a generally parallel path both depict ultrasonic transducer **20** orientations which will generally create sufficiently large regions of interference so that a new compression will be generated. However, neither of these orientations appear to generate as significant a region of interference as the orientations of

FIGS. 1 or 6, due to the greater degree of interference represented. This greater efficiency translates into greater energy transfer to the new compression wave and consequently to a stronger or louder new wave.

In contrast, the preferred embodiment will always generate a new compression wave which has the greatest efficiency. That is because no orientation of two ultrasonic transducers **20** will ever match or exceed the perfect coaxial relationship obtained when using the same ultrasonic transducer **20** to emit both ultrasonic compression waves. This coaxial propagation from a single transducer would therefore yield the maximum interference pattern and most efficient compression wave generation.

Before moving to other aspects of the invention, it is important to realize that unusual sound effects are possible with the highly directional ultrasonic transducers **20**. It has been observed that reflecting the at least two ultrasonic wave trains at an object or surface causes the reflected waves to give an impression of localized source. In other words, the reflected new compression wave appears to be coming from the object or surface of reflection.

This is represented in FIG. **13** and can be used to simulate a variety of interesting acoustical effects, including three dimensional sound. By simply directing the orientation of the ultrasonic transducer **20** toward a ceiling or wall **96**, one can simulate the experience of sound emanating from that location. If the transducer target is placed in motion, the moving reflective location creates an impression of movement for the sound or object being represented. By controlling the orientation of the transducer with computer drivers, sound reproduction can be localized to individual faces on a movie screen or even off the screen in an overhead position, moving vehicles or aircraft, or any myriad of other sound effects which can now only be imagined.

A startling consequence of the present invention is the generation of a new omni-directional compression wave. Specifically, the new compression wave will generally radiate outward omni-directionally from a region of interference, generally in accordance with the shape of the region. However, the remarkable control which the present invention provides over the shape of the region of interference enables a perception of the described directionality to be manipulated in unexpected ways.

For example, one or two ultrasonic transducers might be aimed at a wall or other object. The increased amount of interference between two ultrasonic compression waves which will occur because of the reflection will cause most of the sound to be generated omni-directionally from near the object being reflected from. Likewise, bringing the two ultrasonic frequency transducers **20** of FIG. **2** closer together limits the length of interference and consequently more closely approximates a near point-source of sound.

Another significant advantage of the present invention is that sound is reproduced from a relatively massless radiating element. In the region of interference, and consequently at the location of new compression wave generation, there is no direct radiating element. This feature of sound generation by acoustical heterodyning can substantially eliminate distortion effects, most of which are caused by the radiating element or conventional speakers. For example, harmonics and standing waves on a loudspeaker cone, cone overshoot and cone undershoot caused by inertia, and the imperfect surface of the cone itself are all factors which contribute to signal distortion attributable to a direct radiating element.

A direct physical radiating element has other undesirable characteristics as well. Despite certain manufacturer claims to the contrary, the frequency response of a conventional loudspeaker is not truly flat. Instead, it is a function of the type of frequency (bass, intermediate, or high) which it is inherently best suited for emitting. Whereas speaker shape, geometry, and composition directly affect the inherent speaker character, acoustical heterodyne wave generation utilizes the natural response of air to avoid geometry and composition issues and to achieve a truly flat frequency response for sound generation.

In general, it should be noted that this aspect of the present invention means that the final step in achieving truly indirect sound generation has been achieved. While the state of the art has advanced the ability to convert an analog signal to a digital recording, and to even process the signal digitally, the quality of sound reproduction remains limited by the characteristics of the analog transducer which has always been required as a speaker element. This is no longer the case because the present invention achieves distortion free sound which is not hindered by a direct radiating element, with its attendant mass and inertial limitations.

Distortion free sound implies that the present invention maintains phase coherency relative to the originally recorded sound. Conventional speaker systems do not have this capacity because the frequency spectrum is broken apart by a cross-over network for propagation by the most suitable speaker element (woofer, midrange or tweeter). By eliminating the direct radiating element, the present invention makes obsolete the conventional cross-over network. This enables realization of a virtual or near point-source of sound.

Another application of the present invention involves unobtrusively generating crowd-controlling subsonic sound waves. Very low frequencies, such as those around 12 Hz, have been shown to nauseate or disorient human beings and other animals. Prior efforts in using low frequency disorientation has been hampered by a limited ability for localized application. The present invention has demonstrated its adaptation for reflected amplification, and thereby allows a more focused field of influence. For example, acoustic heterodyne generation of low frequency sound could be directed to a building, window or other reflective surface near a group of disorderly persons. The primary affect of this disorienting sound would be in the immediate area of reflection, avoiding undesirable application to innocent bystanders.

Other advantages arise directly from the unique nature of the ultrasonic transducers **20**. Because of their small size and low mass, such transducers are generally not subject to the many limitations and drawbacks of conventional radiating elements used in loudspeakers. Furthermore, the use of ultrasonic transducers **20** at extremely high frequencies avoids the distortion, harmonics and other undesirable features of a direct radiating element which must reproduce sound directly in the low, mid and high frequency ranges. Consequently, the many favorable acoustic properties of a relatively distortion free ultrasonic transducer system can now be transferred indirectly into sonic and subsonic by-products.

FIG. **9** illustrates an additional aspect of the present invention relating to an ability to generate and enhance sound within a broadly resonant cavity **80**. A resonant cavity **80** is any cavity **80** which enables interacting ultrasonic compression waves **30**, **32** to interfere in accordance with the principles of acoustical heterodyning. Although the broadly resonant cavity **80** is not necessary to create the effect of interference, it seems to enhance or amplify the effect by increasing interference, as well as reinforcing the audio byproduct or "difference" frequencies. This means that two ultrasonic frequency signals **30, 32** can be transmitted into the cavity **80** from almost any perspective. For example, FIG. **9** shows two ultrasonic frequency transducers **20** emitting ultrasonic frequency signals **30, 32** into cavity **80**. The signals **30, 32** are reflected off the walls of cavity **80** a multiple numbers of times to increase interference.

FIG. **10** shows an improved configuration of the broadly resonant cavity of FIG. **9** which only requires a single ultrasonic transducer **20** to generate a new compression wave. The system is improved because of the perfect coaxial relationship between the two ultrasonic compression waves **30, 32**.

One implication of the broadly resonant cavity **80** of FIGS. **9** and **10** is that the human ear canal is also a broadly resonant cavity, and can thus be used to enhance the new compression wave. This result offers a particular advantage for the headphone and hearing aid industry. For example, a hearing aid **90** as shown in FIG. **11** which embodies the present invention can be used to reproduce the entire audio spectrum of sounds for a listener, enabling a high fidelity reproduction, rather than the characteristic "tinny" sound of a conventional hearing aid. Likewise, any headphone or headset **92** can be modified to take advantage of the present invention, and generally with less weight and size than conventional systems with a dramatic extension to frequency response.

Another interesting aspect of the invention facilitates privacy of communication as part of a wireless system. This arises because of the "beaming" effect inherent with the use of an ultrasonic transducer **20**. By nature, ultrasonic compression waves propagate in a narrow beam, which can easily be targeted on specific objects or locations. It is therefore possible to aim a transducer **20** across a noisy or crowded room and direct audible messages only into an ear of an intended listener. Those around the listener would be unaware of the audible communication because of the non-reflective character of the ear and the narrow beam width of the ultrasonic waves. Private instructions could therefore be given on radio and television production areas, performance stages for cueing, and other applications where one-way prompting would be helpful.

Surprisingly, the present invention can also eliminate unwanted environmental noise pollution. Our society has coined the phrase "boombox" to refer to portable stereo systems which have relatively large bass speakers. The boombox derives its name from the annoying side affect of a booming and repeated "thump" of the bass speakers driving large volumes of air. However, the term is also sometimes used to refer to a car or other vehicle with even larger bass speakers. Because the speakers are integrally attached to the vehicle, the frame or any loudspeaker enclosure in general, the enclosure itself becomes a radiating element. Consequently, persons outside the vehicle will be hit with wave upon wave of dull thumping sounds, a nuisance at best.

The present invention can thus advantageously eliminate the coupling of the enclosure to the direct radiating element by generating the new compression wave in midair. The listener inside can still enjoy the experience of loud bass frequencies within the confines of the vehicle. However, the lower frequencies will not be directly coupled to the vehicle frame because the radiating element is now a point in air. Consequently, undesirable bass broadcasting into the environment beyond the immediate vicinity of the listener is significantly reduced.

An interesting twist of the invention is a reverse application of the technology for sound detection. In other words, instead of reproducing sound, the invention might be used to detect sound as shown in FIG. **12**. More specifically, the invention can function as a substitute for a point-source sound detection device such as a microphone. Typically, a microphone must be physically positioned at a desired location of sound detection in order to operate. The present invention enables compression waves to be converted into an electrical signal by a transducer **20** without providing a physical microphone element at a detection location.

Essentially, a single transducer **20** might be used to focus ultrasonic compression waves **30** at the desired detection location **102**. Acoustical vibrations, such as a voice or music, will interact with the ultrasonic compression wave **30**. By monitoring a decrease in output level of the ultrasonic compression wave **30**, it should be possible to determine the frequencies of the audible compression wave which is impacting on the ultrasonic compression wave **30**. This might be done by using a waveform analyzer **104** to determine the decrease in output level caused by coupling of the ultrasonic compression wave **30** with the audible sound waves **102**.It is to be understood that the above-described embodiments are only illustrative of the application of the principles of the present invention. Numerous modifications and alternative arrangements may be devised by those skilled in the art without departing from the spirit and scope of the present invention. The appended claims are intended to cover such modifications and arrangements.

It is to be understood that the preceding description is given to illustrate various embodiments of the present inventive concepts. The specific examples are not to be considered as limiting, except in accordance with the following claims.

What is claimed is:

1. A system for indirectly generating and enhancing at least one audible frequency from within a resonant cavity by interaction between at least two ultrasonic frequency signals of different frequency, said system comprising:

a resonant cavity which enables interacting ultrasonic signals to interfere in accordance with acoustic heterodyning to generate an audible sound output within air contained within the resonant cavity, said resonant cavity including an opening for permitting entry of the ultrasonic signals;

an ultrasonic frequency emitter contained within one of a stereo headphone, a hearing aid, or an audio headset, said emitter being directed toward the opening of the resonant cavity for transmitting first and second ultrasonic signals along a common axis into the resonant cavity without indirect reflection from other sources;

modulating means coupled to the ultrasonic frequency emitter for generating the second ultrasonic frequency having a difference in value relative to the first ultrasonic frequency which is equal to the at least one audible frequency;

means for concurrently operating the ultrasonic frequency emitter and the modulating means to generate the first and second ultrasonic signals, and

means for directing the first and second ultrasonic signals into the resonant cavity.

2. The system as defined in claim 1 wherein the resonant cavity has a configuration corresponding to a human ear canal.

3. A method for indirectly generating and enhancing at least one audible frequency from within a resonant cavity using at least two ultrasonic signals of different frequency the method comprising the steps of:

1) transmitting a first ultrasonic signal into the resonant cavity using an emitter contained within one of a stereo headphone, a hearing aid, or an audio headset;

2) concurrently transmitting a second ultrasonic signal from said emitter into the resonant cavity along a common axis with the first ultrasonic signal wherein the second ultrasonic signal has a frequency which differs from the first ultrasonic signal by a value generally equal to the at least one audible frequency, and wherein the resonant cavity amplifies the interference between the first and the second ultrasonic signals;

3) whereby at least one audible frequency arises from the interference of the first and the second ultrasonic signals within the resonant cavity.

4. A method for indirectly generating omni-directional sound as part of an audio sound system for entertainment use by a listener and having a remote virtual source distant from the listener, said omni-directional sound comprising at least one new sonic or subsonic wave train which is a difference of at least two interacting ultrasonic wave trains having frequencies of different value, the method comprising the steps of:

1) emitting a first ultrasonic wave train including a base frequency into a region of air from a transducer means;

2) concurrently emitting a second ultrasonic wave train from said transducer means into the region to thereby interact with the first ultrasonic wave train wherein the second ultrasonic wave train has a base frequency equal to the base frequency of the first ultrasonic wave train and is projected along a common axis for both the first ultrasonic wave train and second ultrasonic wave train, which common axis is the only transmission path between said transducer means and a reflective surface of an object which is distant from the listener;

varying the base frequency of the second ultrasonic wave train through a frequency range corresponding to a sum of the base frequency and the new audible sound wave train; and

4) reflecting the first and second ultrasonic wave trains from said a reflective surface to generate omni-directional dispersion of audible sound leaving a virtual, localized sound source at the reflective surface.

5. The method as defined in claim **4** wherein the method comprises the additional step of generating both the (i) first ultrasonic frequency and (ii) the second ultrasonic frequency from a single ultrasonic generating means, thereby eliminating frequency drift between the first and the second ultrasonic frequencies.

6. A method as defined in claim **4**, further comprising the step of controlling the movement and orientation of the wave train with a computer driver.

* * * * *

PDF SECTION: UNITED STATES PATENTS.

US005356368A

United States Patent [19]

Monroe

[11] **Patent Number: 5,356,368**

[45] **Date of Patent: * Oct. 18, 1994**

[54] **METHOD OF AND APPARATUS FOR INDUCING DESIRED STATES OF CONSCIOUSNESS**

[75] Inventor: **Robert A. Monroe**, Nelson County, Va.

[73] Assignee: **Interstate Industries Inc.**, Faber, Va.

[*] Notice: The portion of the term of this patent subsequent to May 25, 2010 has been disclaimed.

[21] Appl. No.: **664,176**

[22] Filed: **Mar. 1, 1991**

[51] **Int. Cl.**[5] **A61M 21/00**

[52] **U.S. Cl.** **600/28**; 128/732

[58] **Field of Search** 600/26–28; 128/731–732

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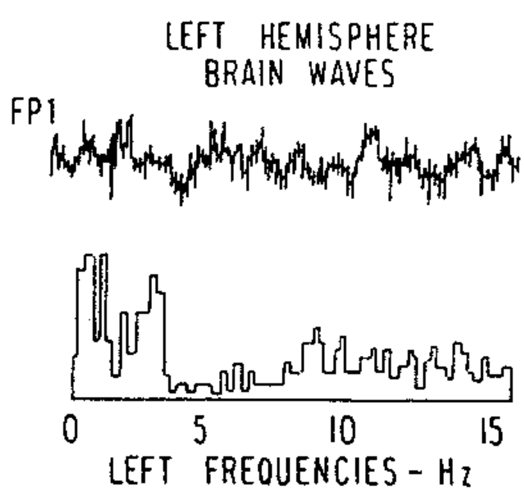
Primary Examiner—Lee S. Cohen
Assistant Examiner—J. P. Lacyk
Attorney, Agent, or Firm—Sughrue, Mion, Zinn, Macpeak & Seas

[57] **ABSTRACT**

Improved methods and apparatus for entraining human brain patterns, employing frequency following response (FFR) techniques, facilitate attainment of desired states of consciousness. In one embodiment, a plurality of electroencephalogram (EEG) waveforms, characteristic of a given state of consciousness, are combined to yield an EEG waveform to which subjects may be susceptible more readily. In another embodiment, sleep patterns are reproduced based on observed brain patterns during portions of a sleep cycle; entrainment principles are applied to induce sleep. In yet another embodiment, entrainment principles are applied in the work environment, to induce and maintain a desired level of consciousness. A portable device also is described.

28 Claims, 21 Drawing Sheets



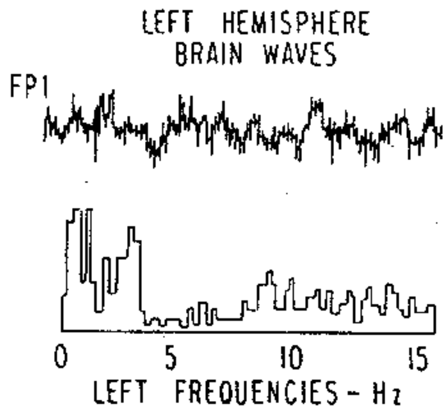


FIG. 1A

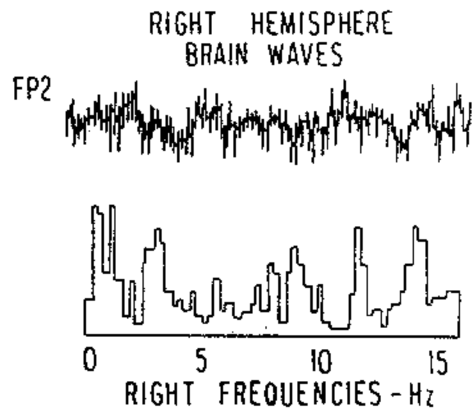


FIG. 1B

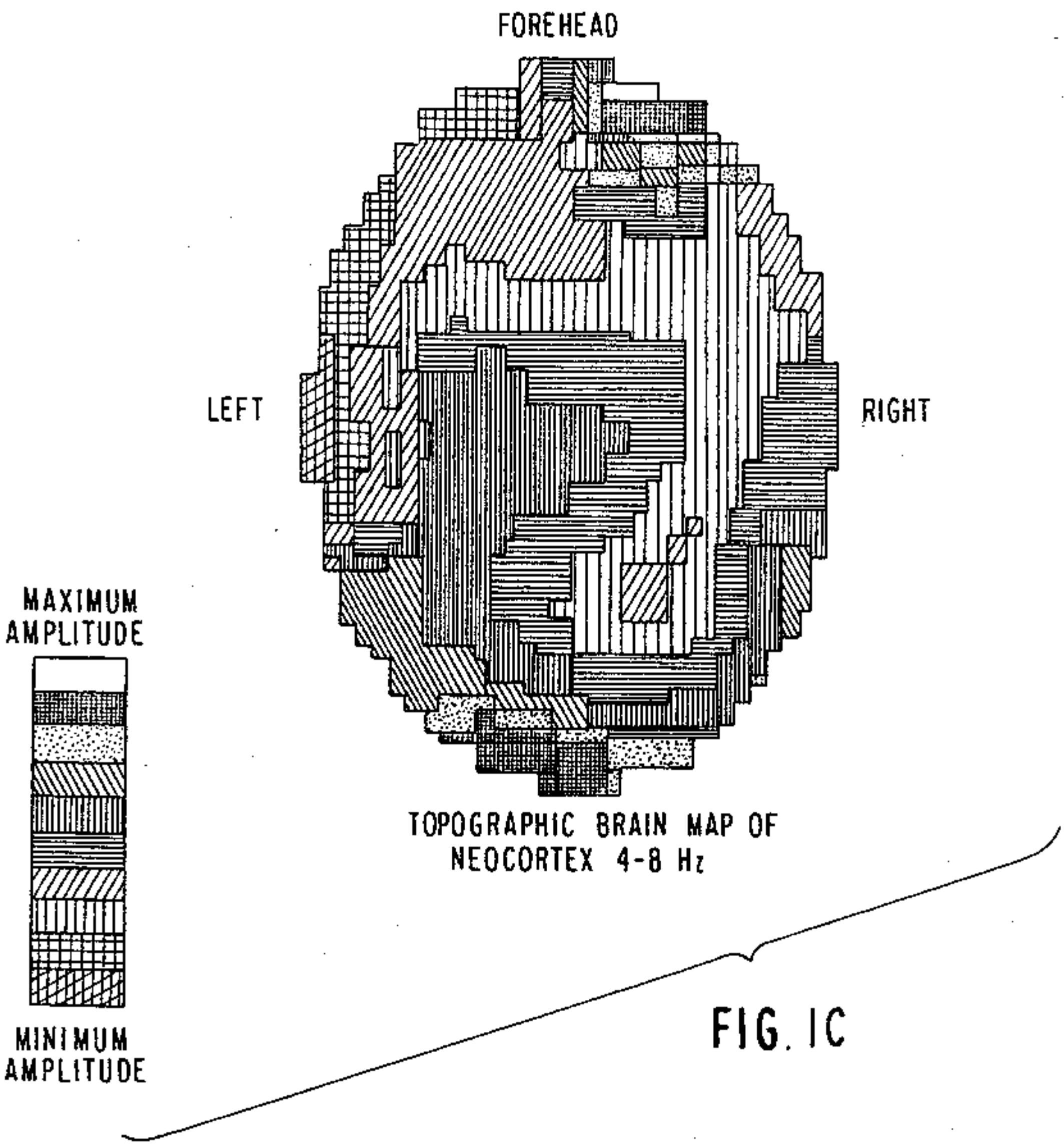


FIG. 1C

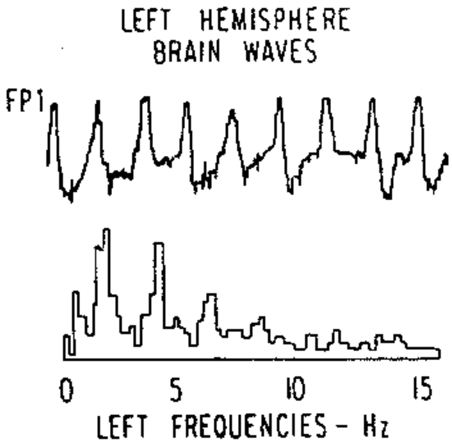


FIG. 1D

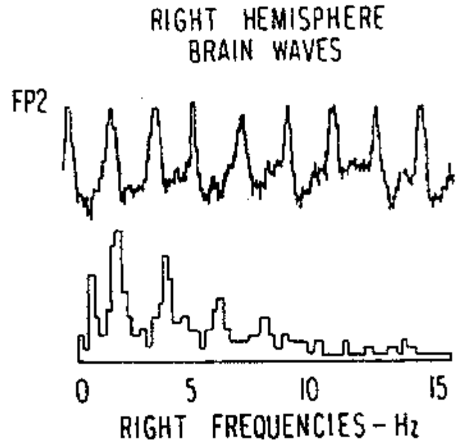


FIG. 1E

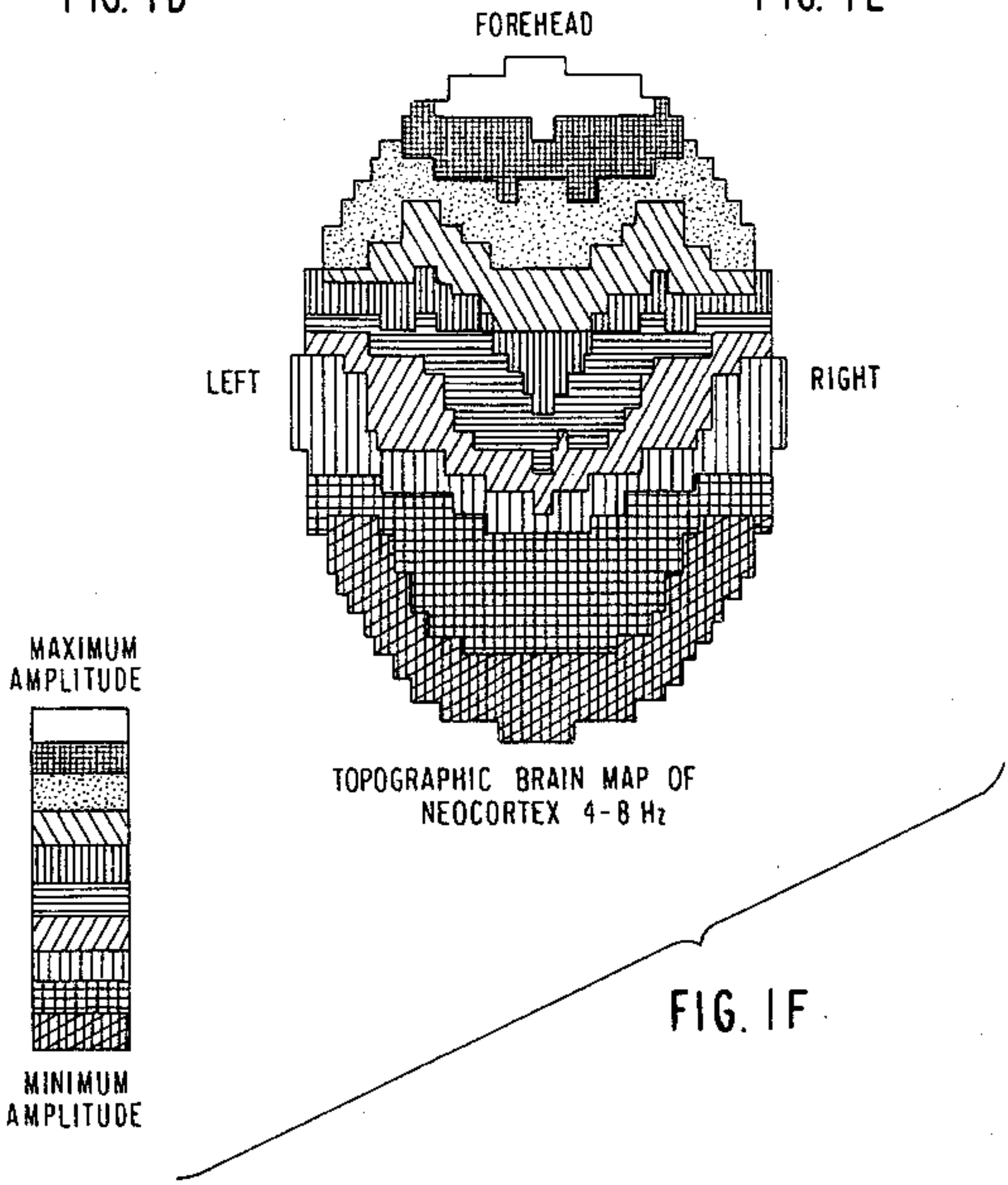
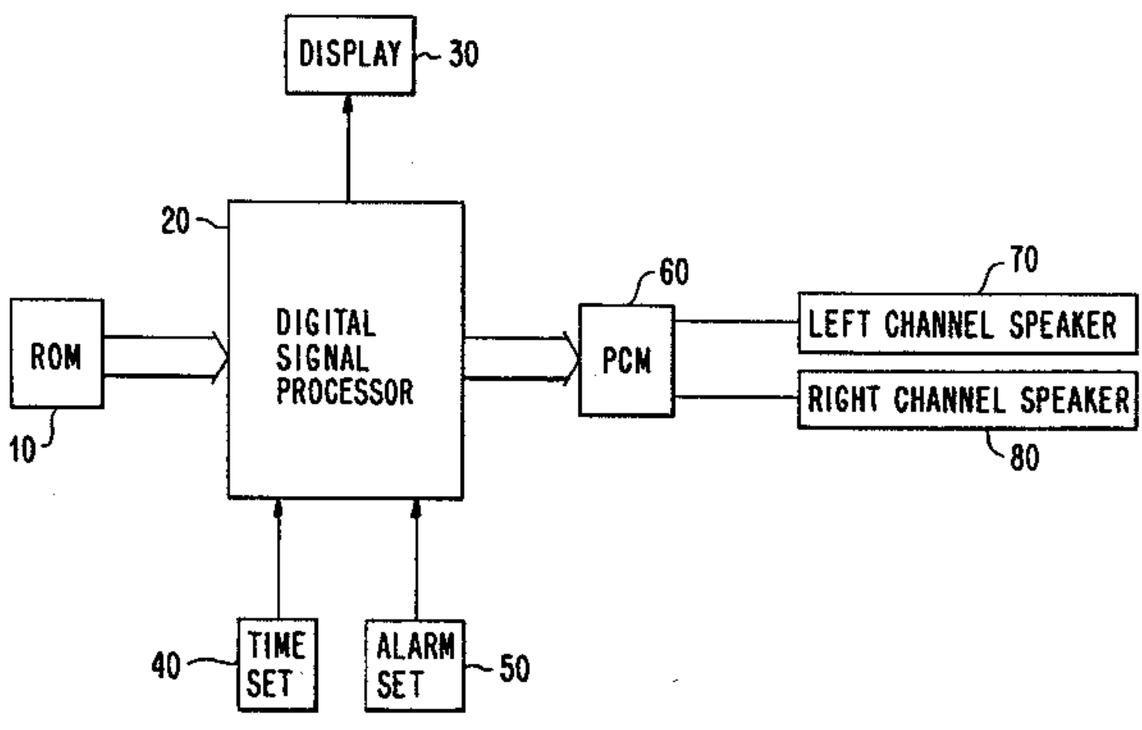


FIG. 1F

FIG. 2


DISPLAY
30
20
DIGITAL SIGNAL PROCESSOR
ROM
10
60
PCM
70
LEFT CHANNEL SPEAKER
RIGHT CHANNEL SPEAKER
80
40
TIME SET
ALARM SET
50

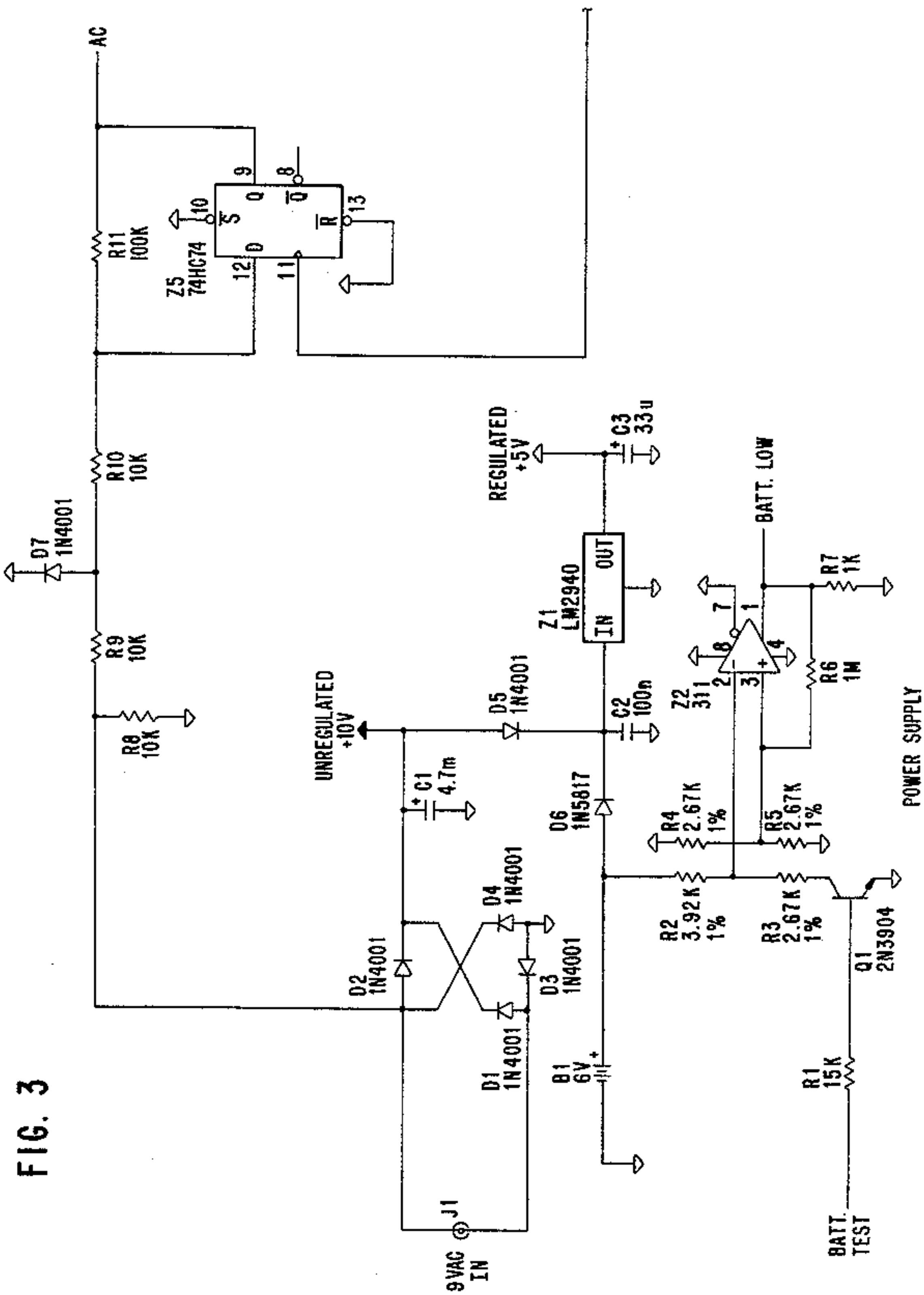

AC
R11
100K
Z5
74HC74
9
8
10
13
12
11
D
Q
S
R
R10
10K
D7
1N4001
R9
10K
R8
10K
REGULATED
+5V
C3
33u
Z1
LM2940
IN
OUT
BATT. LOW
R7
1K
7
1
8
4
2
3
Z2
311
R6
1M
UNREGULATED
+10V
D5
1N4001
C2
100n
C1
4.7m
D6
1N5817
R4
2.67K
1%
R5
2.67K
1%
POWER SUPPLY
R2
3.92K
1%
R3
2.67K
1%
Q1
2N3904
D4
1N4001
D2
1N4001
D3
1N4001
D1
1N4001
B1
6V
R1
15K
J1
9VAC
IN
BATT.
TEST

FIG. 3

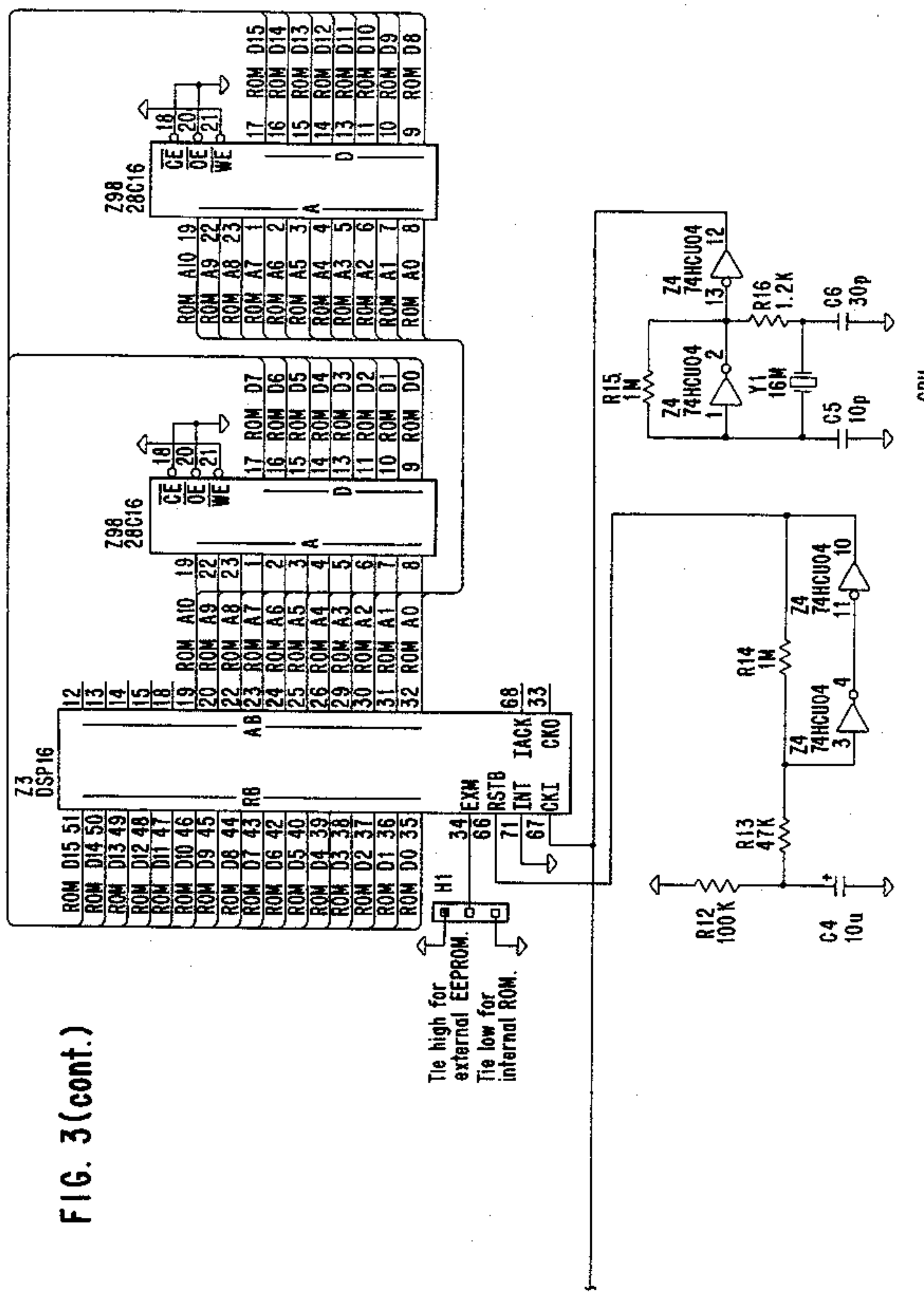

Z98
28C16
Z3
DSP16
Z4
74HCU04
R15
1M
Y1
16M
R16
1.2K
C6
30p
C5
10p
CPU
R14
1M
R13
47K
R12
100K
C4
10u
H1
EXM
RSTB
INT
CKI
TACK
CKO
Tie high for external EEPROM.
Tie low for internal ROM.

FIG. 3(cont.)

FIG. 4

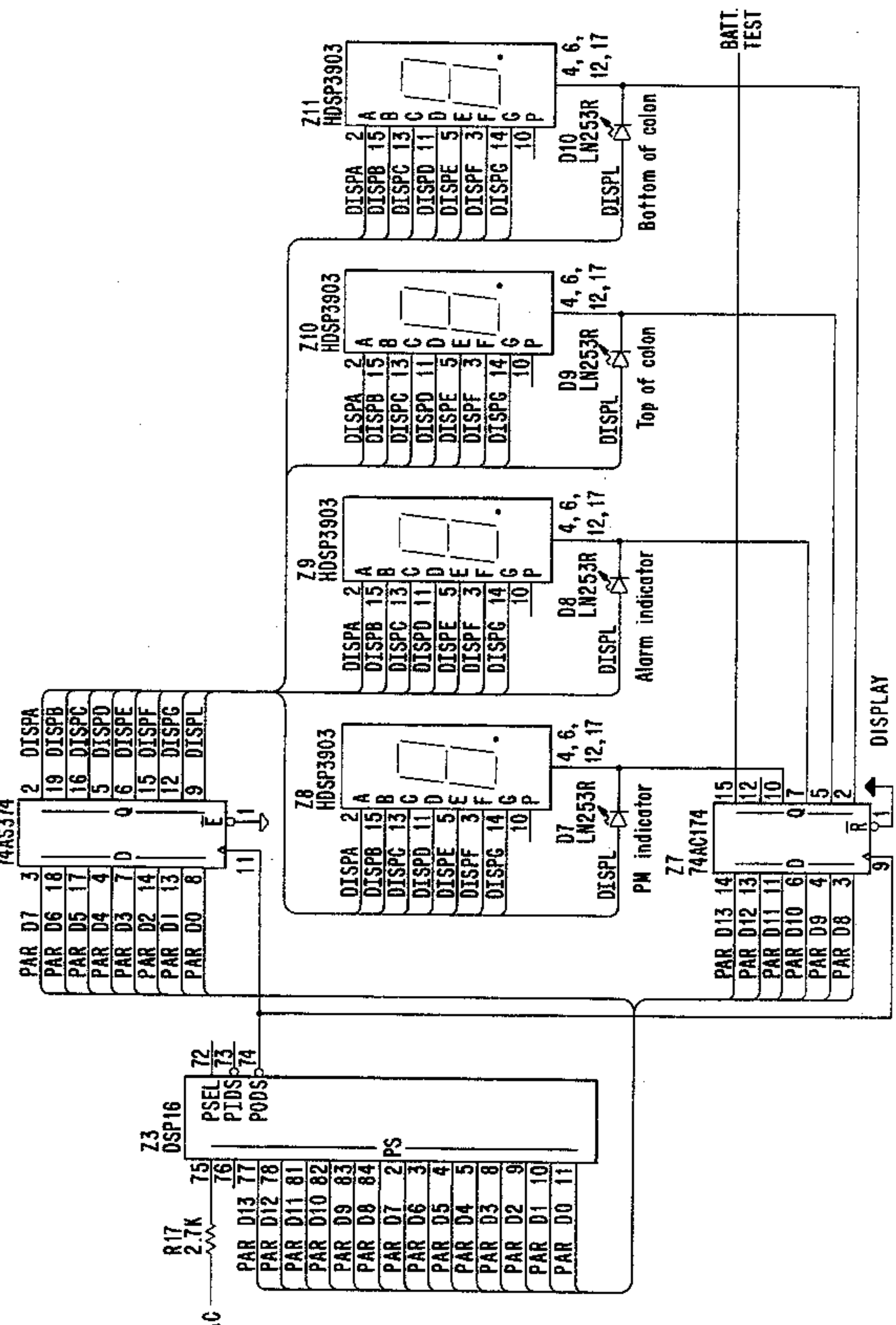

Z11 HDSP3903
Z10 HDSP3903
Z9 HDSP3903
Z8 HDSP3903
D10 LN253R
D9 LN253R
D8 LN253R
D7 LN253R
Bottom of colon
Top of colon
Alarm indicator
PM indicator
BATT. TEST
DISPLAY
Z6 74AS374
Z7 74AC174
Z3 DSP16
PSEL
PIDS
PODS
PS
R17 2.7K
AC
DISPA
DISPB
DISPC
DISPD
DISPE
DISPF
DISPG
DISPL
4, 6, 12, 17

FIG. 5

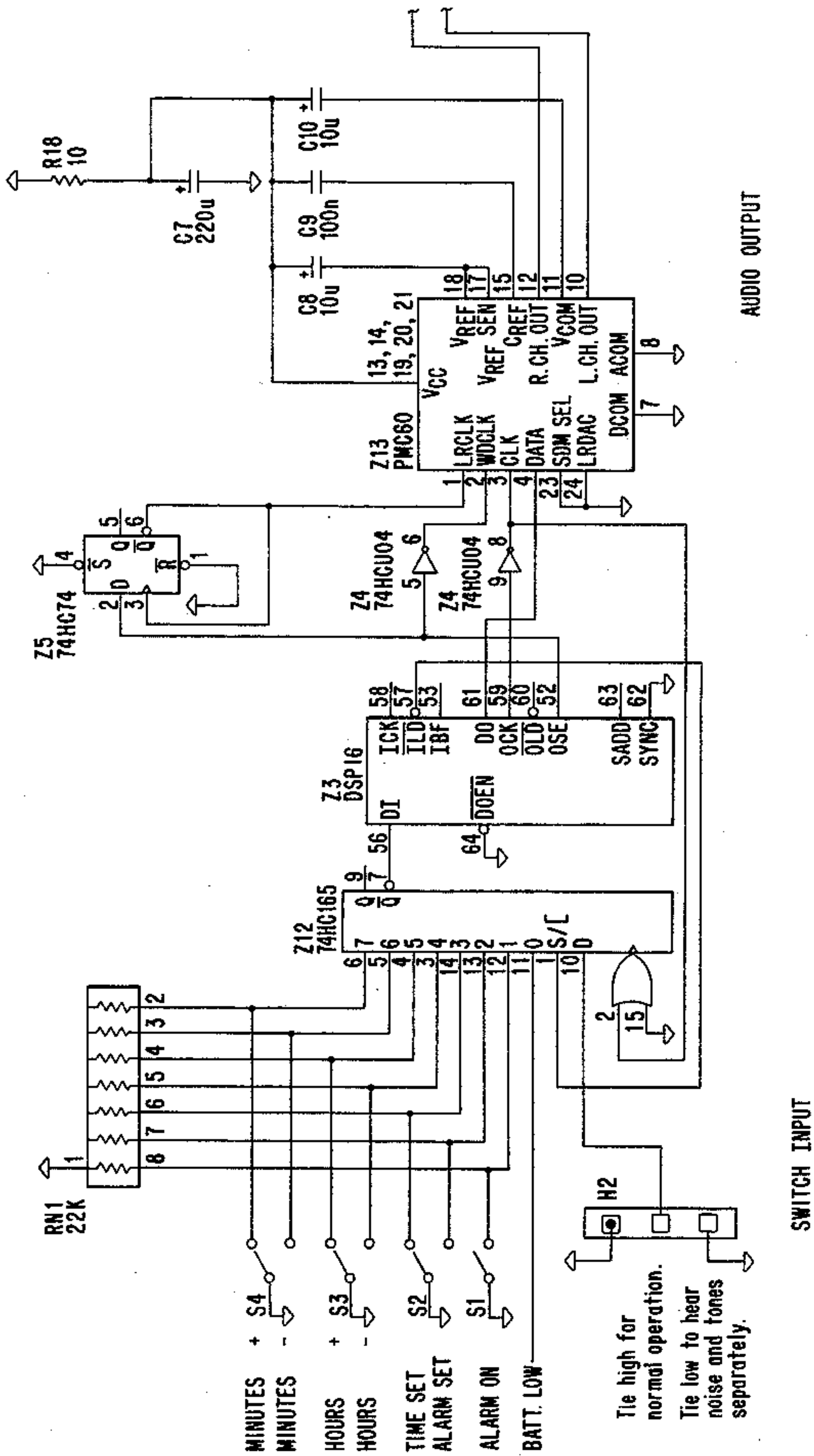

R18
10
C7
220u
C8
10u
C9
100n
C10
10u
Z13
PMC60
13, 14,
19, 20, 21
VCC
VREF
VREF SEN
CREF
R.CH. OUT
VCOM
L.CH. OUT
ACOM
DCOM
LRCLK
WDCLK
CLK
DATA
SDM SEL
LRDAC
AUDIO OUTPUT
Z5
74HC74
Z4
74HCU04
Z3
DSP16
ICK
ILD
IBF
DO
OCK
OLD
OSE
SADD
SYNC
DI
DOEN
Z12
74HC165
S/L
RN1
22K
H2
MINUTES +
MINUTES -
HOURS +
HOURS -
TIME SET
ALARM SET
ALARM ON
BATT. LOW
S4
S3
S2
S1
SWITCH INPUT
Tie high for normal operation.
Tie low to hear noise and tones separately.

FIG. 5 (cont.)

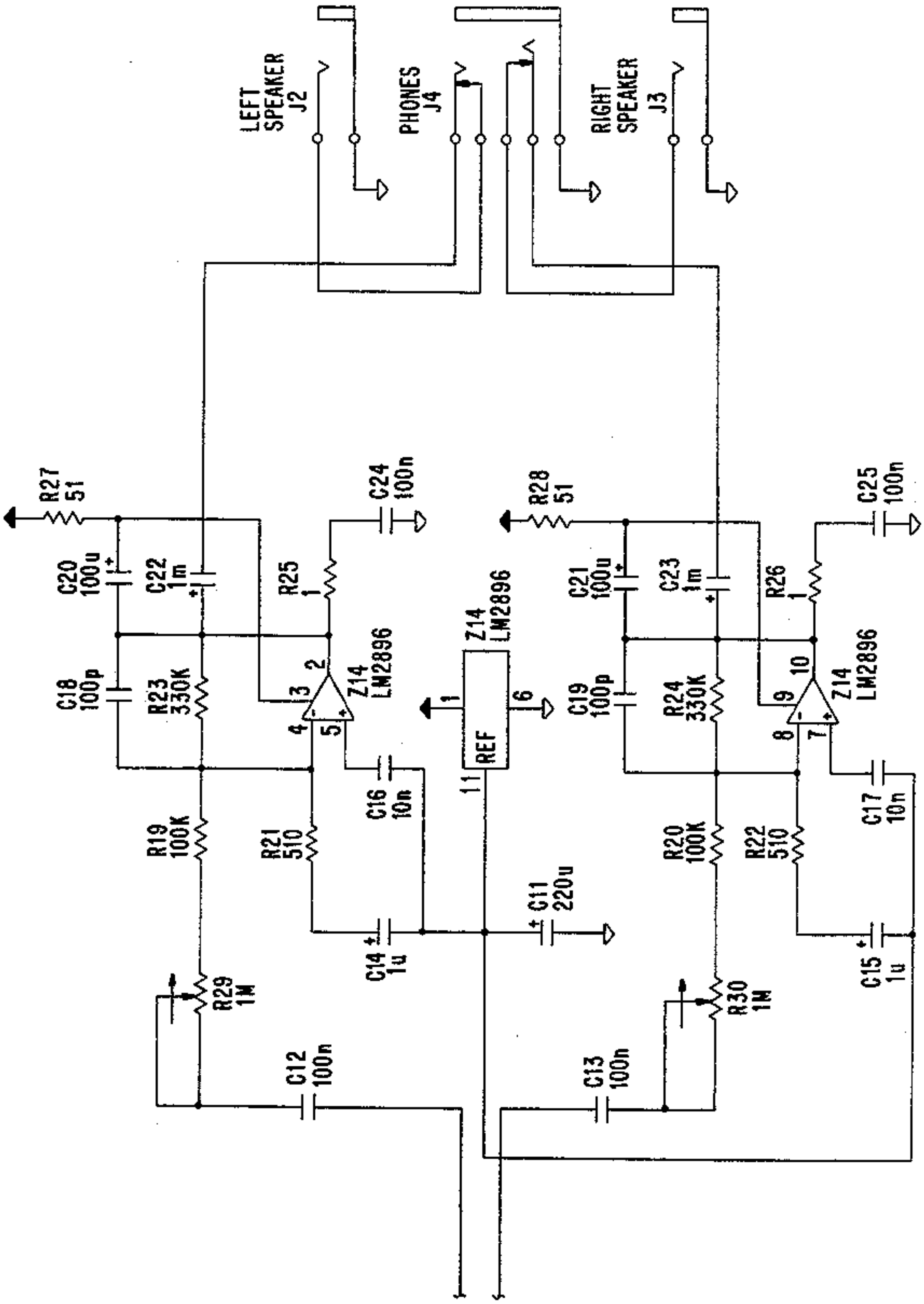

LEFT SPEAKER J2
PHONES J4
RIGHT SPEAKER J3
R27 51
C20 100u
C22 1m
R25 1
C24 100n
C18 100p
R23 330K
Z14 LM2896
R19 100K
R21 510
C16 10n
C14 1u
R29 1M
C12 100n
Z14 LM2896
REF
C11 220u
R28 51
C21 100u
C23 1m
R26 1
C25 100n
C19 100p
R24 330K
Z14 LM2896
R20 100K
R22 510
C17 10n
C15 1u
R30 1M
C13 100n

FIG. 6A

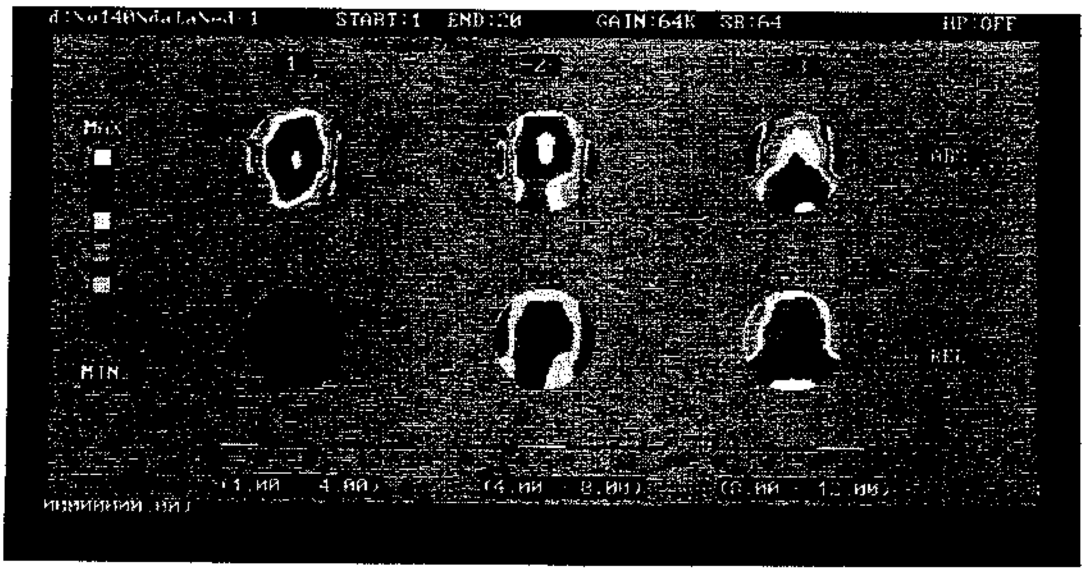

START:1 END:20
GAIN:64K SB:64
HP:OFF
1
2
3
MIN

FIG. 6B

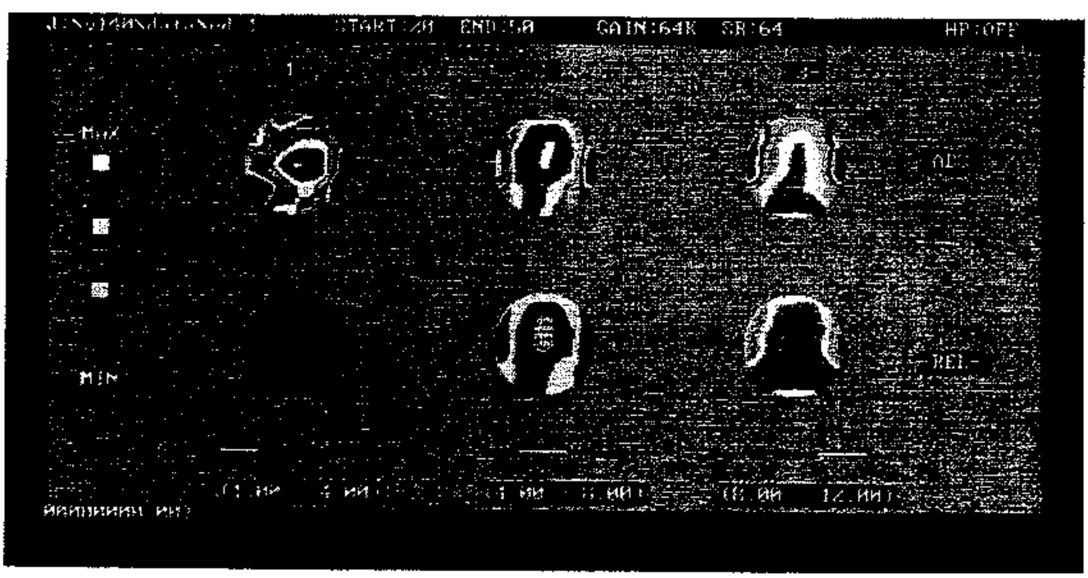

GAIN:64K SB:64
HP:OFF
1
MIN

FIG. 6C

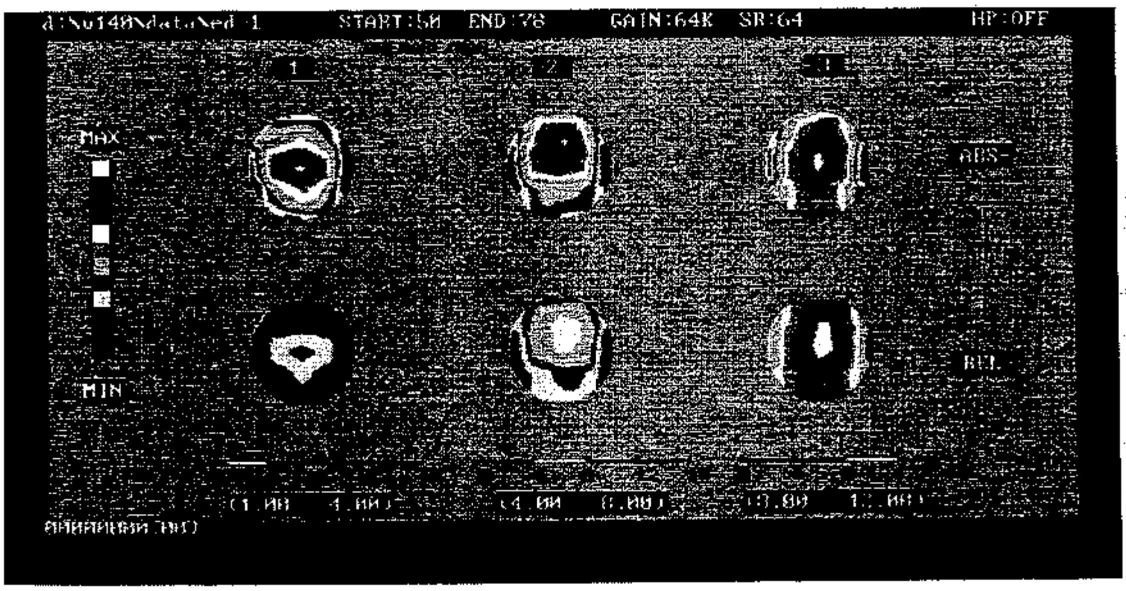

START:50 END:78
GAIN:64K SR:64
HP:OFF
MAX
MIN
ABS
REL

FIG. 6D

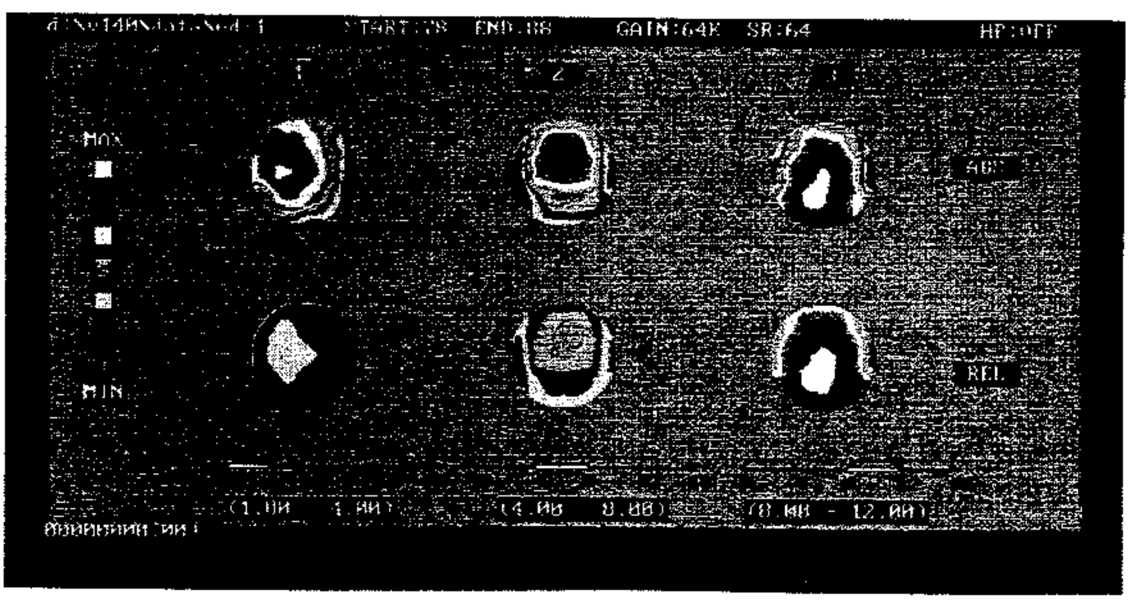

GAIN:64K SR:64
HP:OFF
MAX
MIN
REL
(4.00 8.00)

FIG. 6E

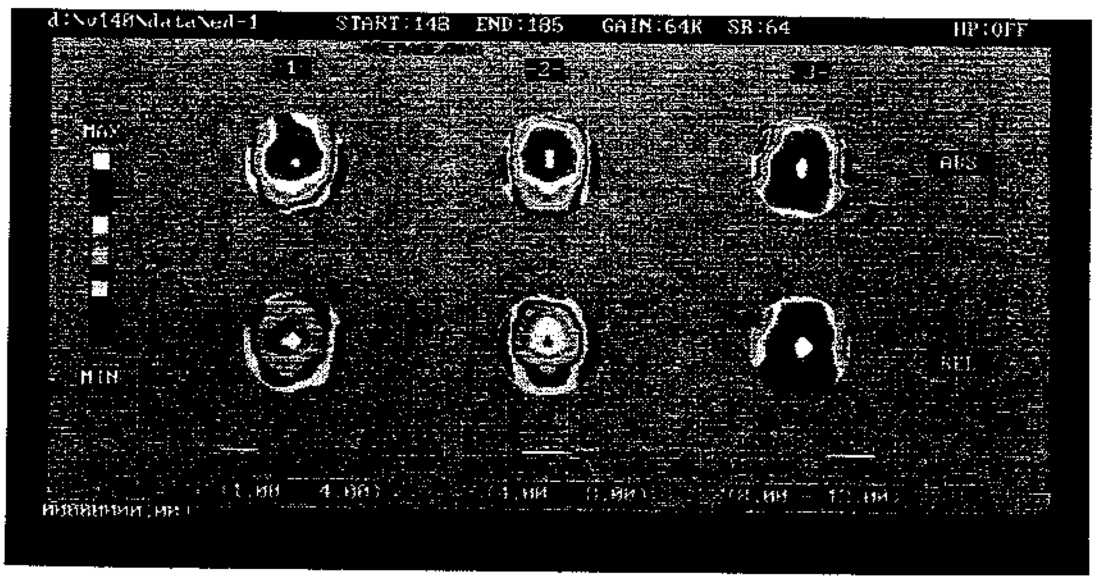

START:148 END:185 GAIN:64K SR:64
HP:OFF
MAX
MIN
ABS
REL

FIG. 6F

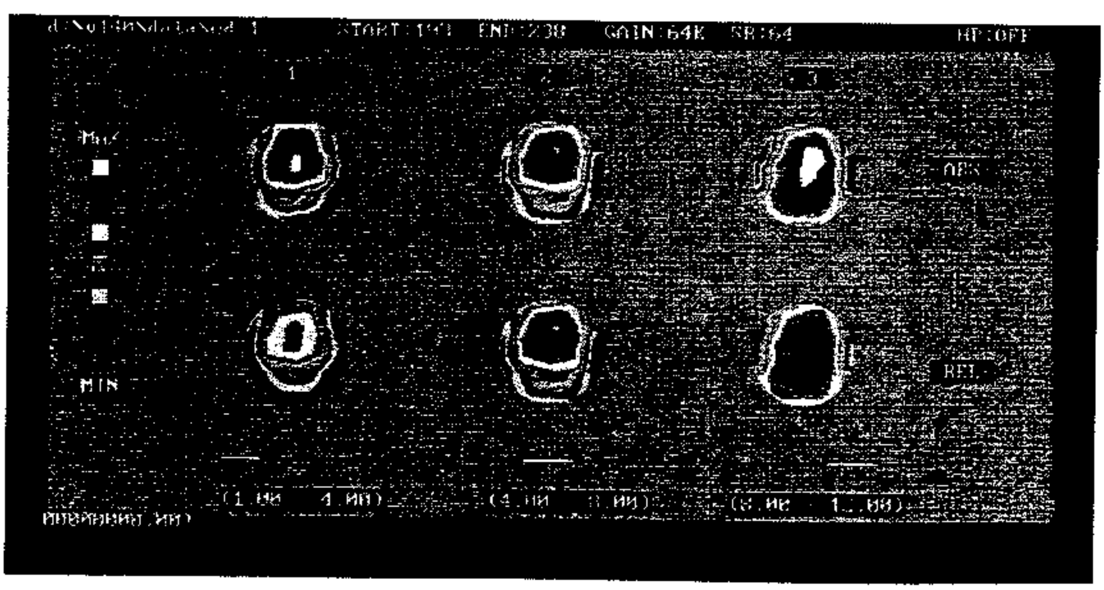

GAIN:64K SR:64
HP:OFF
MIN

FIG. 6G

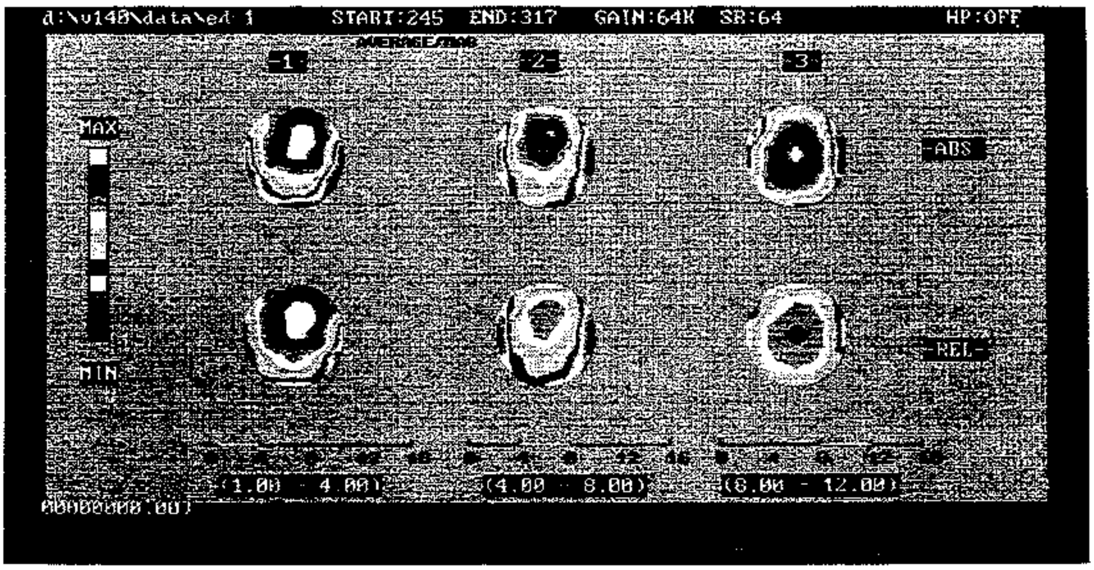

START:245 END:317 GAIN:64K SR:64
HP:OFF
-1-
-2-
-3-
MAX
MIN
-ABS-
-REL-
(1.00 - 4.00)
(4.00 - 8.00)
(8.00 - 12.00)

FIG. 6H

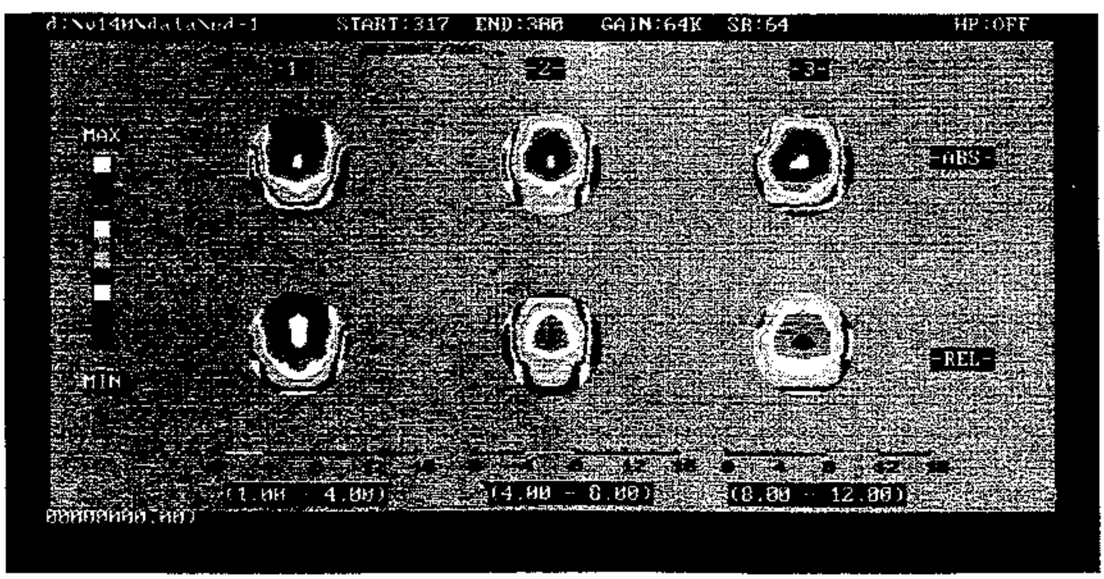

START:317 GAIN:64K SR:64
HP:OFF
-1-
-2-
-3-
MAX
MIN
-ABS-
-REL-
(1.00 - 4.00)
(4.00 - 8.00)
(8.00 - 12.00)

FIG. 6I

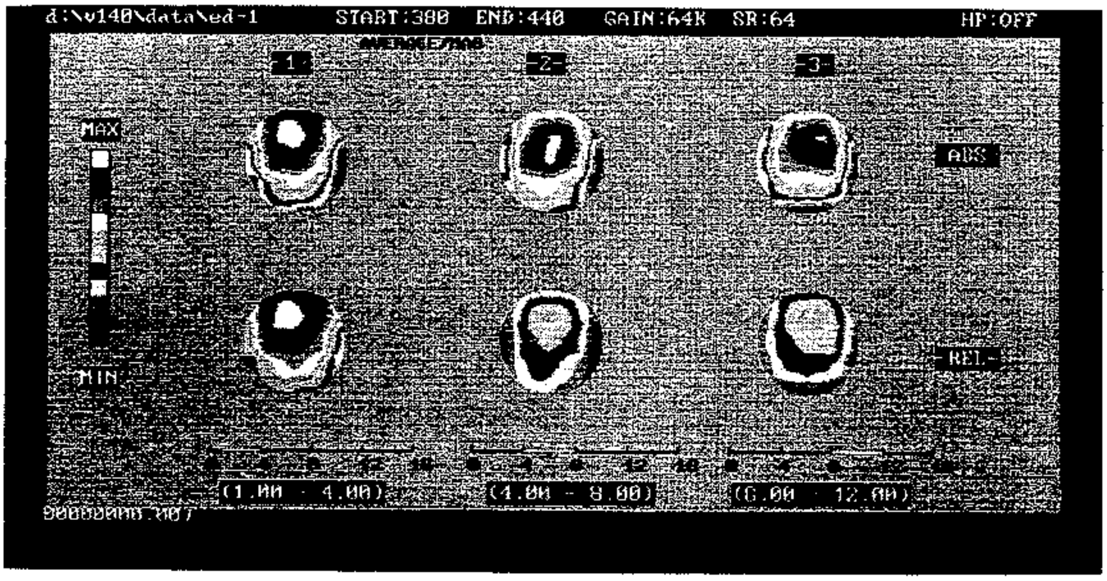

d:\v140\data\ed-1
START:380 END:440
GAIN:64K SR:64
HP:OFF
1
2
3
MAX
MIN
ABS
REL
(1.00 - 4.00)
(4.00 - 8.00)

FIG. 6J

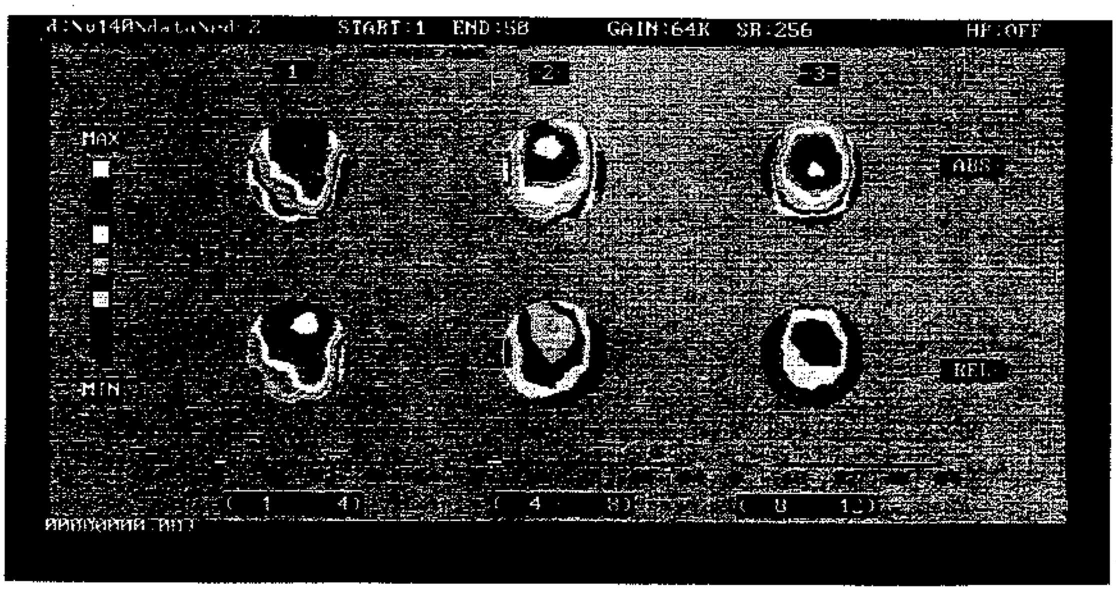

START:1 END:58
GAIN:64K SR:256
HP:OFF
1
2
3
MAX
MIN
ABS
REL

FIG. 7

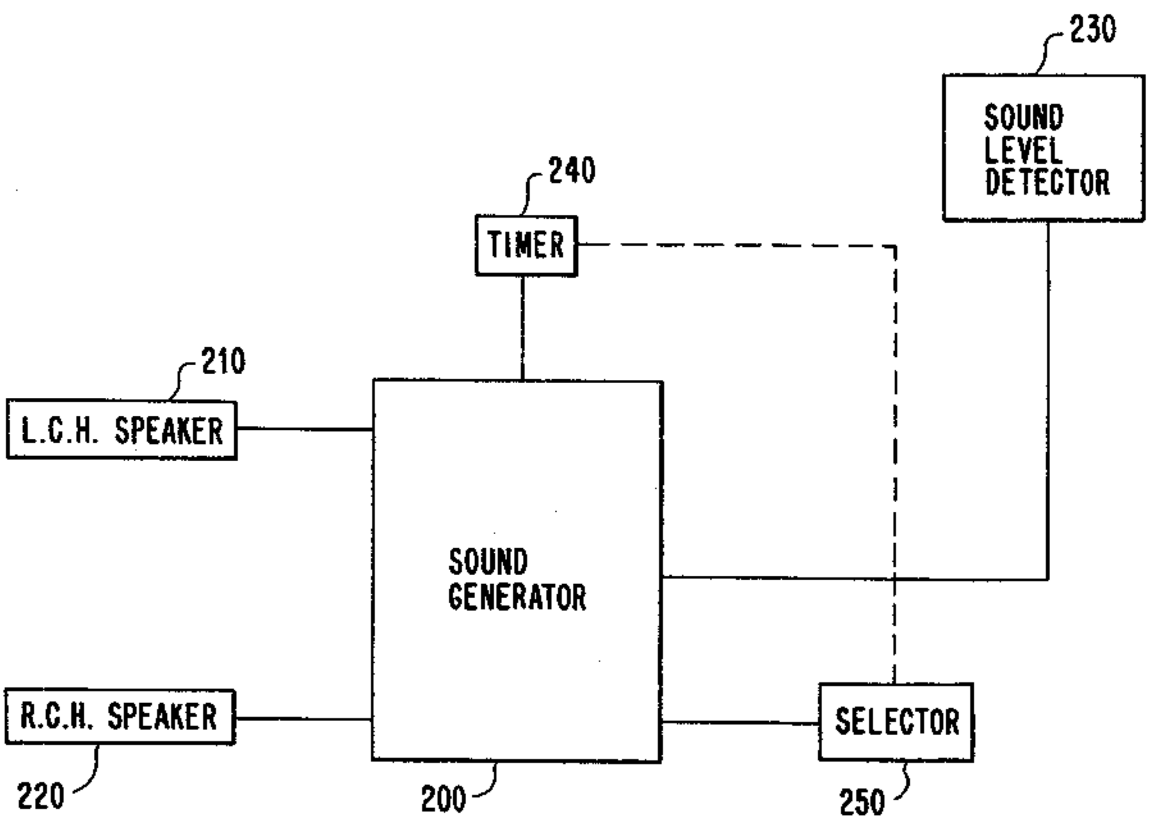
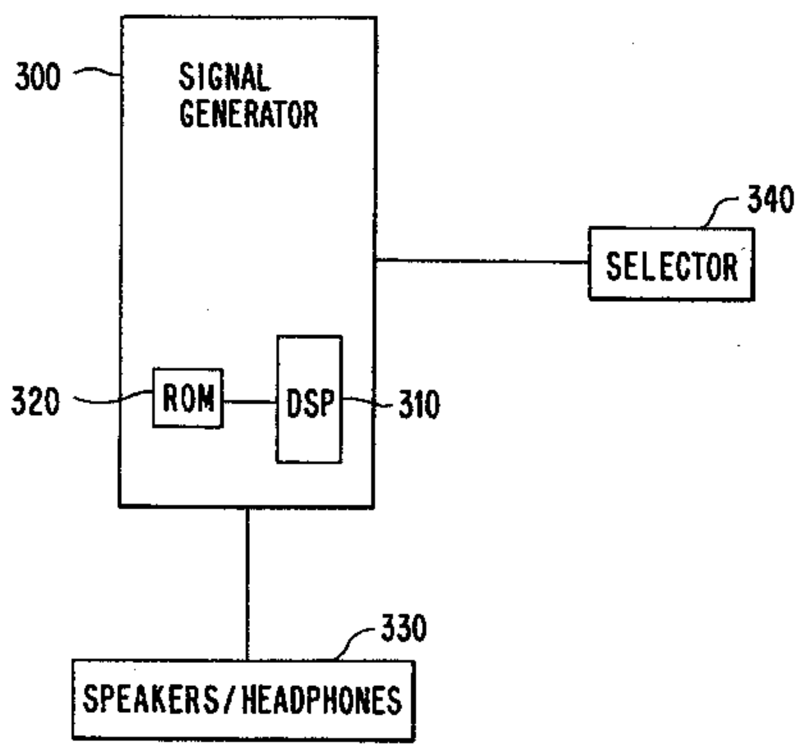

230
SOUND LEVEL DETECTOR
240
TIMER
210
L.C.H. SPEAKER
SOUND GENERATOR
R.C.H. SPEAKER
SELECTOR
220
200
250

FIG. 8A


300
SIGNAL
GENERATOR
340
SELECTOR
320
ROM
DSP
310
330
SPEAKERS/HEADPHONES

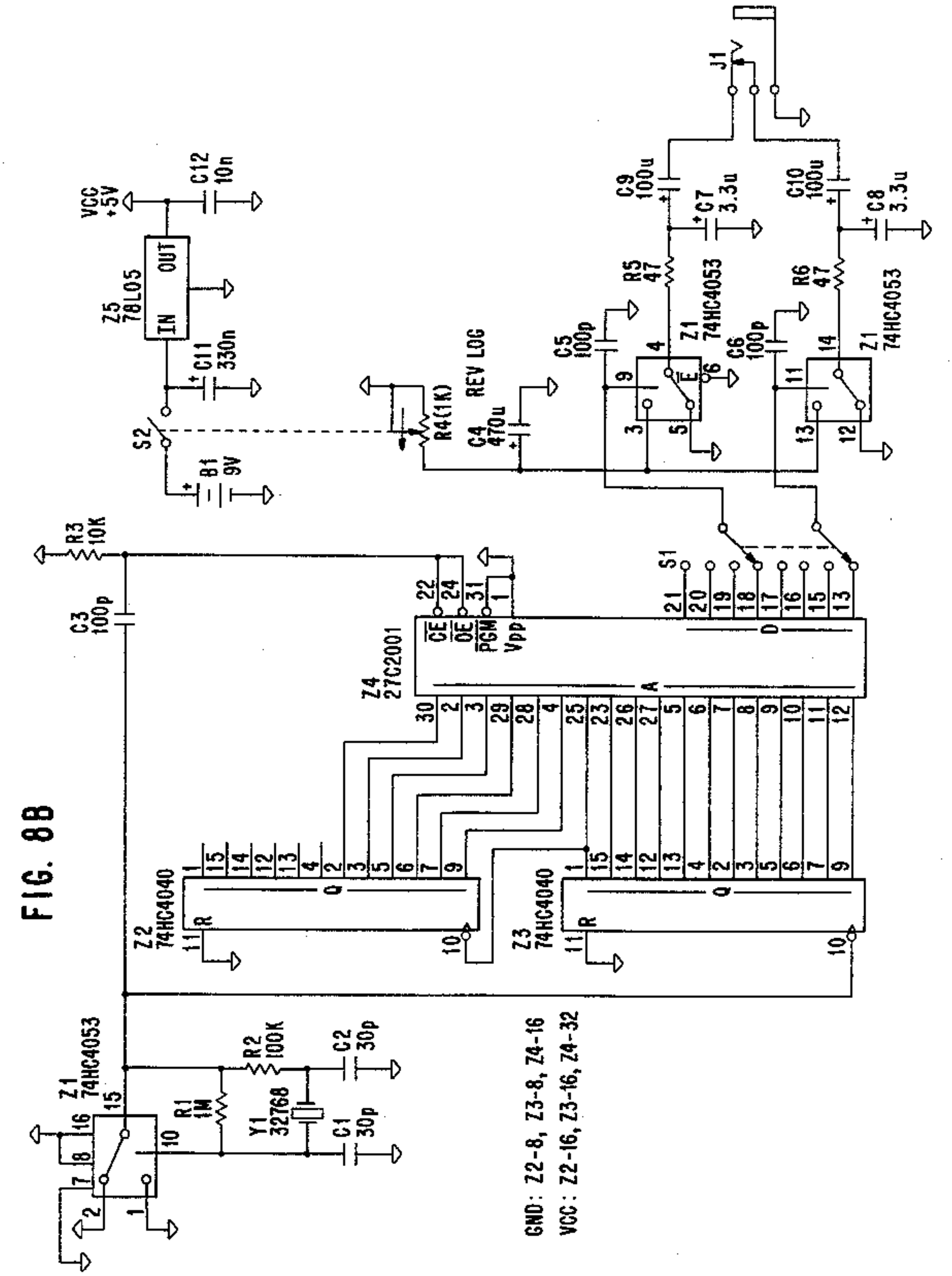

Z1 74HC4053
R1 1M
R2 100K
Y1 32768
C1 30p
C2 30p
C3 100p
R3 10K
Z2 74HC4040
Z3 74HC4040
Z4 27C2001
S1
S2
B1 9V
Z5 78L05
IN
OUT
VCC +5V
C11 330n
C12 10n
R4(1K) REV LOG
C4 470u
C5 100p
C6 100p
R5 47
R6 47
C7 3.3u
C8 3.3u
C9 100u
C10 100u
J1
GND: Z2-8, Z3-8, Z4-16
VCC: Z2-16, Z3-16, Z4-32

FIG. 8B

FIG. 9A

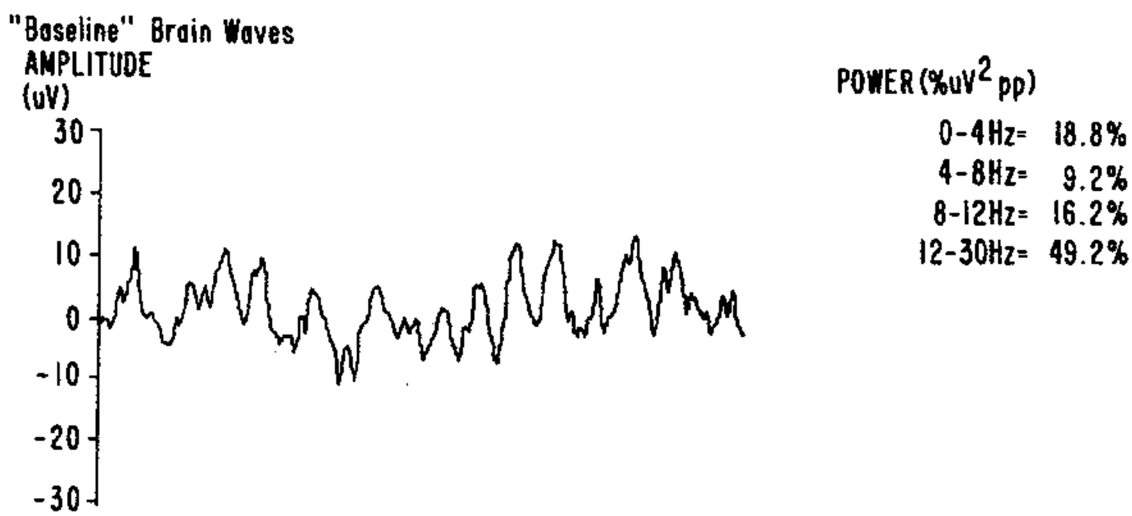
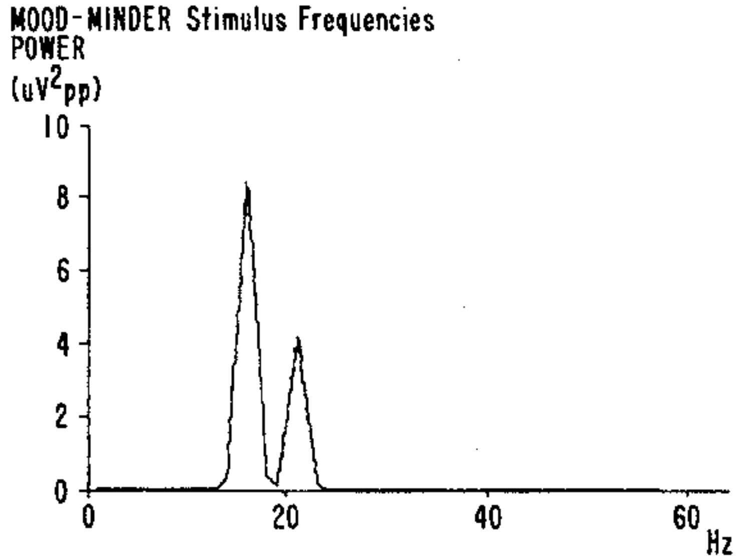
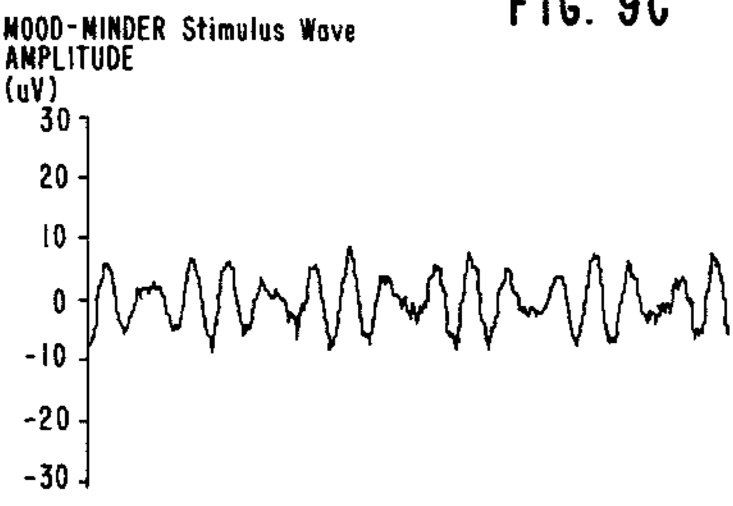

"Baseline" Brain Waves
AMPLITUDE
(uV)
30
20
10
0
-10
-20
-30
POWER (%uV2 pp)
0-4Hz= 18.8%
4-8Hz= 9.2%
8-12Hz= 16.2%
12-30Hz= 49.2%

FIG. 9B



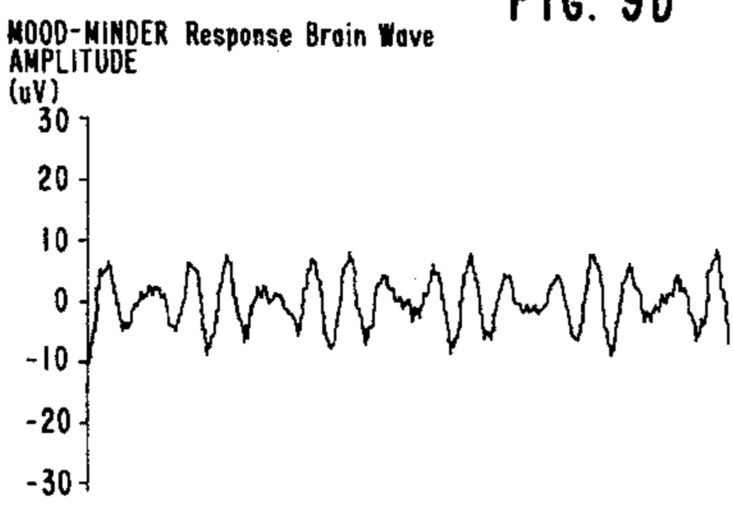
POWER(%uV^{2}pp)
16Hz= 47.6%
21Hz= 23.2%
Awake and Alert

FIG. 9C



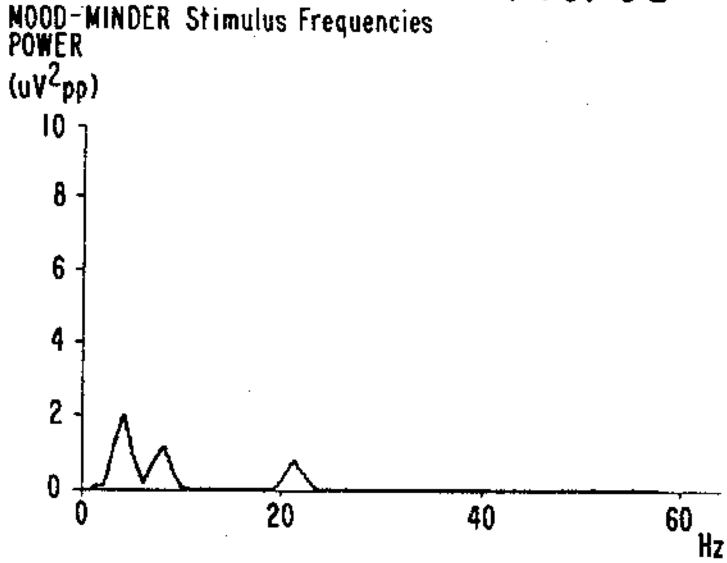
POWER(%uV^{2}pp)
16Hz= 47.6%
21Hz= 23.2%
Awake and Alert

FIG. 9D



POWER(%uV^{2}pp)
16Hz= 46.5%
21Hz= 23.7%
Awake and Alert

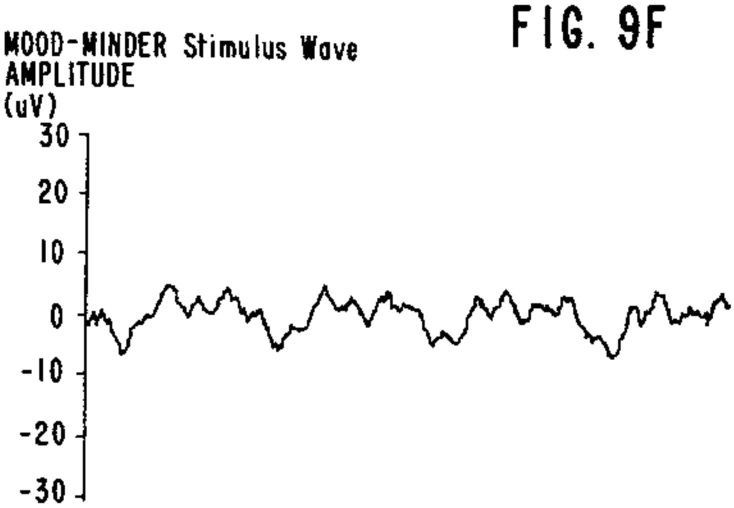
FIG. 9E



POWER(%uV2pp)
21Hz= 13.3%
8Hz= 22.1%
4Hz= 35.5%

Concentration

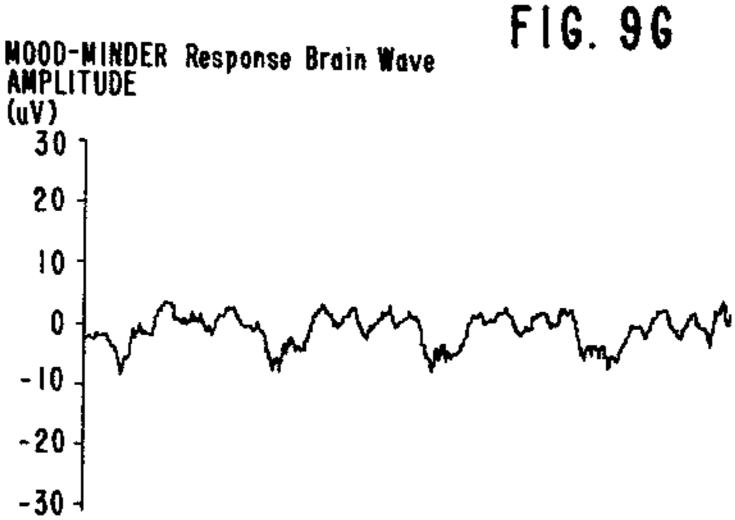
FIG. 9F



POWER(%uV2pp)
21Hz= 13.3%
8Hz= 22.1%
4Hz= 35.5%

Concentration

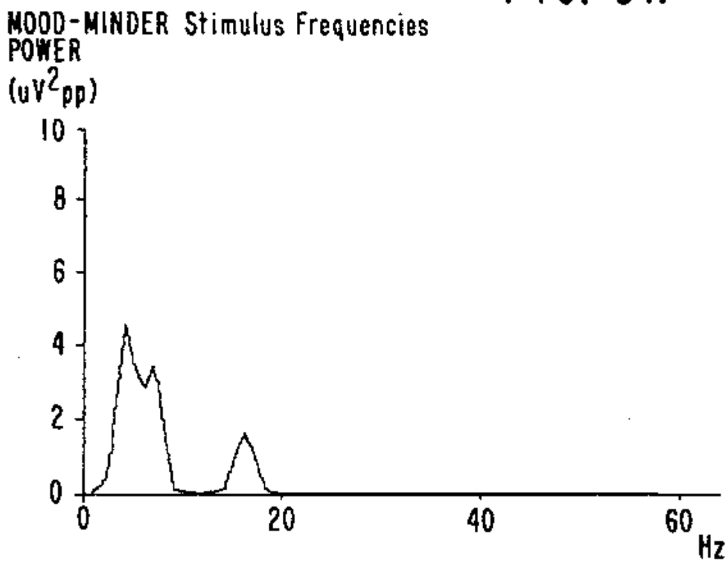
FIG. 9G



POWER(%uV2pp)
21Hz= 14.3%
8Hz= 21.5%
4Hz= 31.5%

Concentration

FIG. 9H

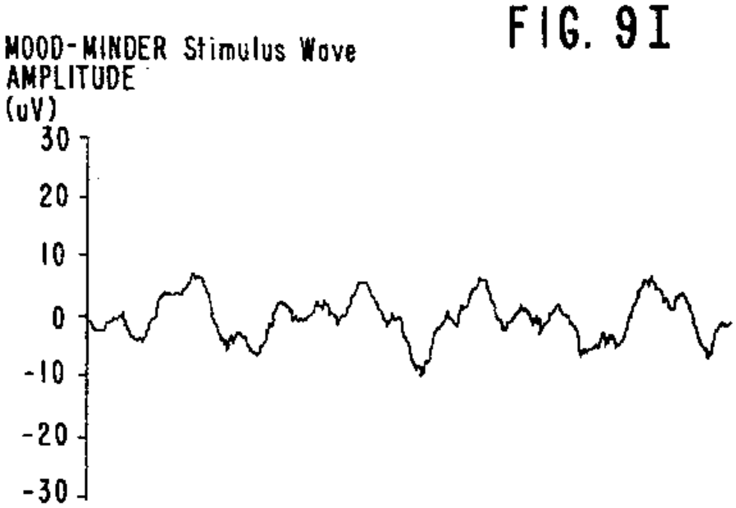


POWER(%uV²pp)

16Hz= 11.5%
7Hz= 28.4%
4Hz= 30.2%

Attention

FIG. 9I

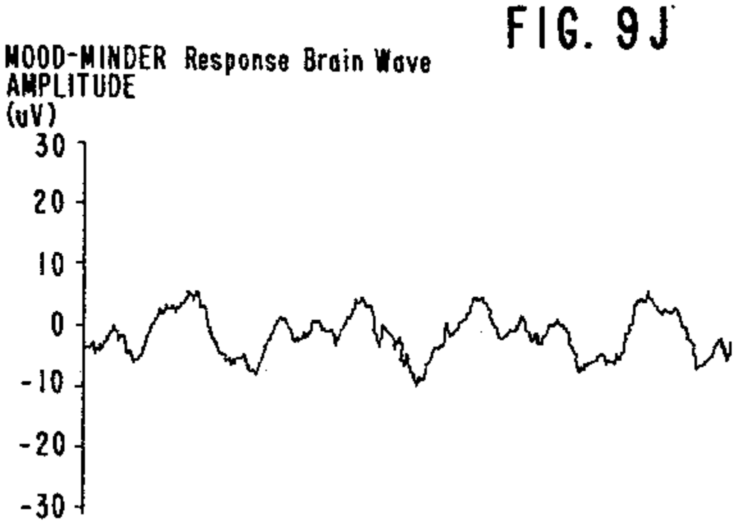


POWER(%uV²pp)

16Hz= 11.5%
7Hz= 28.4%
4Hz= 30.2%

Attention

FIG. 9J

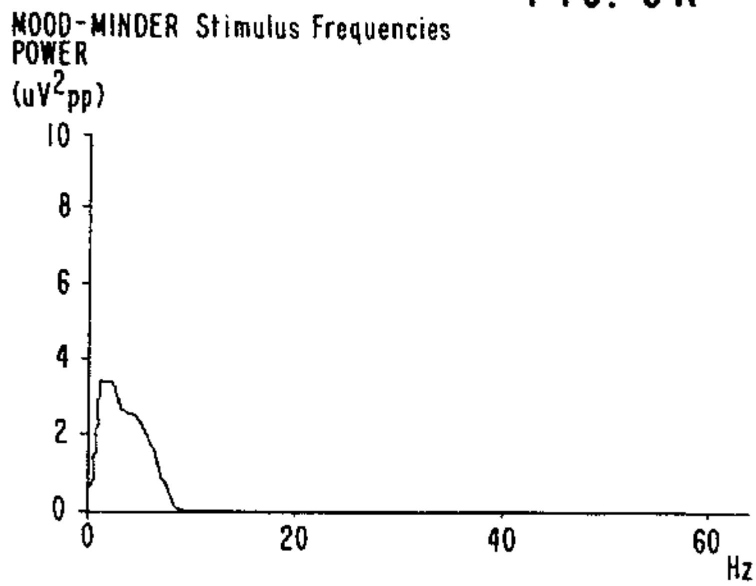


POWER(%uV²pp)

16Hz= 8.2%
7Hz= 28.7%
4Hz= 32.6%

Attention

FIG. 9K

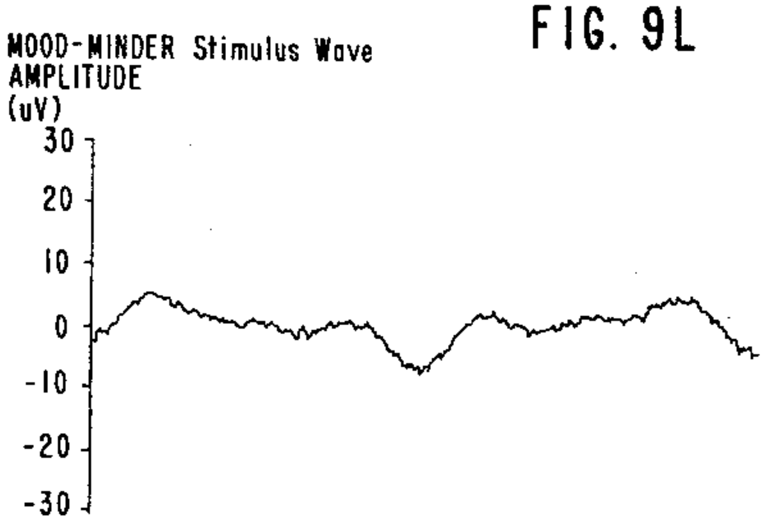


POWER(%uV^{2}pp)

6Hz= 9.5%
4Hz= 15.4%
1.5Hz= 19.6%

Relaxation

FIG. 9L

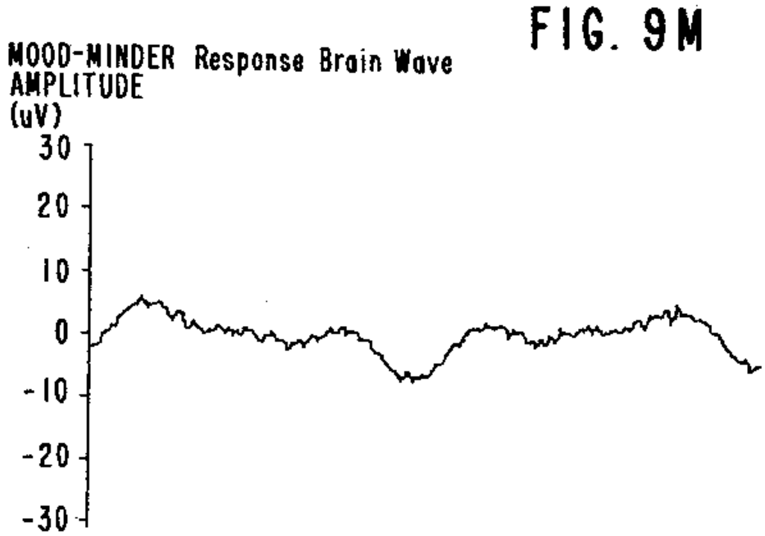


POWER(%uV^{2}pp)

6Hz= 9.5%
4Hz= 15.4%
1.5Hz= 19.6%

Relaxation

FIG. 9M



POWER(%uV^{2}pp)

6Hz= 7.9%
4Hz= 16.8%
1.5Hz= 20.0%

Relaxation

METHOD OF AND APPARATUS FOR INDUCING DESIRED STATES OF CONSCIOUSNESS

CROSS-REFERENCE TO RELATED APPLICATION

The present application is related to copending application No. 07/514,460, filed Apr. 16, 1990 now U.S. Pat. No. 5,213,562.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an improved method of inducing desired states of consciousness, including different levels of sleep, in human beings, using a technique known as frequency following response (FFR), developed by the present inventor. The invention also relates to apparatus for performing the method. A number of areas of applicability of the invention are described, in accordance with different preferred embodiments.

2. Description of the Background Art

In a prior patent, U.S. Pat. No. 3,884,218, the present inventor described a method of inducing different levels of sleep, using the FFR technique, in which brain waves could be made to follow superimposed frequency patterns. These frequency patterns were provided as sine waves, at frequencies known to correspond to different levels of sleep, such as alpha (exhibiting brain wave activity in the range of 8–12 Hz), theta (6–8 Hz), and delta (1–4 Hz). EEGs exhibiting frequencies between 12 and 30 Hz (known as a beta range) are characteristic of awake individuals, though beta activity at even higher frequencies has been observed in different types of mental activities. Gamma activity has been characterized as all activity above 30 Hz; until recently, it has not been possible to monitor brain activity in the gamma range. (It should be noted that the boundaries between gamma and beta, beta and alpha, alpha and theta, and theta and delta are somewhat arbitrary; the foregoing delineations are intended to be exemplary and not limiting.)

The present inventor discovered that the human brain could be entrained to output brain wave patterns these different frequencies. While frequencies corresponding to these different levels of sleep are not audible, by superimposing those frequencies on some type of sound, such as music, it was determined to be possible to induce desired levels of sleep. The individual listening to the music would "hear" the low frequencies, with the desired effect on brain activity.

An improvement on the inventor's patented technique, to induce varied states of alertness, is the subject of copending Application No. 07/514,460, the contents of which are hereby incorporated herein by reference. This copending application describes a general FFR technique using what is known as a binaural beat phenomenon, details of which are provided in that application. Briefly, a binaural beat is produced by sending signals at different frequencies (some Hz apart, depending on the desired effect) to an individual's left and right ears. The difference between the frequencies defines the frequency of the binaural beat. Using this technique, the desired frequency can be introduced into the individual's brain activity, inducing the desired state of consciousness.

The induction of FFR in the human brain in this manner results in the synchronization of activity in the hemispheres of the brain. FIG. 1A shows brain activity without FFR, and FIG. 1B shows brain activity with FFR. The inventor has coined the term HEMI-SYNC (for Hemisphere Synchronization) to describe this phenomenon.

The copending application describes a technique wherein, in one form, sine waves having a frequency corresponding to a consciousness state are superimposed on two different carrier frequencies to form two different signals to set up the binaural beat. In another form, an actual brain pattern, based on an electroencephalogram (EEG) waveform indicative of that consciousness state is superimposed on the different carrier frequencies to form two different signals. In use, each signal is provided to one ear of a subject. The difference in carrier frequencies sets up the binaural beat.

Another, more limited application of the binaural beat phenomenon is found in U.S. Pat. No. 4,834,701. In contrast to the narrow range of frequencies discussed in that patent, in the above-mentioned copending application, the applicability of the binaural beat phenomenon is investigated over a much wider range of frequencies, spanning the spectrum of brain activity.

Through additional investigation involving mapping of brain activities of different individuals, the present inventor has discovered some significance to the fact that, while brain waves at certain frequencies are characteristic of different levels of sleep, brain patterns of different individuals still vary. The inventor has investigated possible enhancements to the FFR effect by making it more generic among individuals, yet still more specific to brain activity than a simple sine wave, or an EEG of a particular individual.

Another area of investigation being performed by the present inventor relates to human sleep patterns. Based on current knowledge of human sleep patterns, it appears that sleep is composed of a series of 90-minute cycles. As stated earlier, the beta stage is one of alertness. The first sleep state is alpha, or mental and physical relaxation. The second is theta, or light sleep. Next is delta, or deep sleep. The inventor has investigated the possibility of providing FFR waveforms in cyclic patterns, replicating these human sleep patterns, to facilitate sleep. Another possibility is to take advantage of the cyclic nature of sleep patterns to provide a more gentle wake-up for a sleeper.

In considering the need for alertness during activities such as work, the inventor also considered how it might be possible to introduce FFR waveforms into ambient noise in one's surroundings to facilitate maintenance of desired states of consciousness. Particularly in environments such as factories, or in offices where office equipment puts out consistent types of noise, it would be desirable to be able to introduce a binaural beat into that noise at different frequencies, to enhance the degree of alertness of factory or office workers as desired.

SUMMARY OF THE INVENTION

In view of the foregoing, according to one aspect of the invention, EEGs for a number of individuals in different states of consciousness are sampled, and EEG waveforms for the group of individuals, corresponding to each identifiable state of consciousness, are combined. A binaural beat then is generated using the combined EEGs.

According to this aspect of the invention, it has been determined that using groups of EEG waveforms from different individuals and combining them to obtain a representative waveform yields a waveform that a person's brain is more likely to replicate than an individual EEG waveform, or a sine wave representation of the EEG waveform. The combination may be simple averaging, though other combination techniques, such as weighted averaging, for combining different numbers of EEG waveforms as desired, are contemplated. Now that the inventor has discovered that combinations of EEG waveforms provide a particularly effective entrainment environment, it will be seen that various ways of combining these waveforms may yield greater or lesser effects.

In accordance with another aspect of the invention, a method for replicating cyclic sleep patterns for a desired sleep period is provided. In a preferred embodiment according to this aspect of the invention, a subject is led from beta, to alpha, to theta, to delta, then back to theta, then alpha, then a rapid-eye movement (REM) or light dreaming sleep, in a sequence of 90-minute cycles, during a sleep period of desired duration. After the expiration of the period, the subject may wake up voluntarily. Alternatively, the invention can provide a gentle external stimulus to lead the subject to a beta state.

With respect to this aspect of the invention, an apparatus is provided which automatically leads an individual through these cyclic sleep patterns, and enables the individual to set a desired sleep period. This device preferably takes advantage of the techniques to be described relative to the first-mentioned aspect of the invention, but is not so limited. The inventive contributions of this second aspect of the invention are considered to lie in the combination of hardware itself which generates the desired sequence of binaural beats, as opposed to the particular software which determines the nature of those binaural beats. In one form, the invention is constituted by an alarm clock which provides a fade-in theta-alpha signal followed by a strong beta-gamma signal shortly before a desired wake-up time.

According to yet another embodiment of the invention, selectable mind-affecting sound patterns are provided to supplement constant ambient noise in any environment. When the noise is not present, the patterns are not provided. The patterns vary in amplitude in accordance with changes in the environmental noise.

In accordance with still another embodiment of the invention, a portable system is provided to enable the wearer to introduce binaural beat signals of frequencies that are selectable in accordance with a desired level of awareness. Depending on the level of sophistication of the device, the binaural beat may be generated using the combined EEG waveforms of the first aspect of the invention, but this last aspect of the invention is not so limited.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other aspects of the invention will be understood by those of working skill in this technological field by reference to the following detailed description of the preferred embodiments of the invention, read in conjunction with the accompanying drawings, wherein:

FIGS. 1A–1C and 1D–1F taken from the above-mentioned copending application, show one example of the results which can be achieved using the inventive techniques;

FIG. 2 is a block diagram of the hardware according to a second embodiment of the invention, and FIGS. 3–5 are more detailed schematics therefor;

FIGS. 6A–6J are drawings, similar to FIGS. 1A and 1B, but showing brain activity during various stages of a sleep cycle, using a technique in accordance with the second embodiment of the invention;

FIG. 7 is a block diagram of hardware in accordance with a third embodiment of the invention;

FIG. 8A is a block diagram of hardware in accordance with a fourth embodiment of the invention, and FIG. 8B a schematic of that hardware; and

FIGS. 9A–9M are graphs of different possible effects of the embodiment of FIGS. 8A and 8B, showing a baseline brain pattern, selected stimulus frequencies and corresponding stimulus waves, and associated response waves.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The method according to a first preferred embodiment of the invention, which has been developed through extensive experimentation, derives from the empirically-observed phenomenon that brain patterns of human subjects are entrained more readily to brain patterns which more closely match their own. In prior implementations of the FFR technique, such as in the inventor's prior patent, in which sine waves having frequencies corresponding to desired levels of sleep were superimposed upon a given frequency, entrainment did occur. Use of the binaural beat phenomenon yielded better results, through synchronization of the hemispheres of the brain.

However, simple repetitive frequencies, or even combinations of such frequencies within different ranges, do not represent brain patterns per se, but rather provide entrainment environments for the brain to follow. It has been determined that, the more closely the entrainment environment parallels normal brain function at different levels of consciousness, the more effective the entrainment effect. This phenomenon is what led to the improvement disclosed in the above-mentioned copending application.

As a further improvement on that technique, as mentioned above, the present inventor investigated the possibility of creating more generic models of brain function at different levels of consciousness. As a result of that investigation, it was determined that combinations of EEG waveforms from different individuals functioning at the same identifiable level of consciousness (e.g. alpha sleep, theta sleep, or delta sleep) provided a superior entrainment environment. In the inventive method according to this aspect of the invention, the brain patterns of 40 to 50 individuals were combined to yield the entrainment environment.

One area of applicability of the techniques of the present invention is in the area of sleep therapy. Many individuals suffer from sleep disorders to varying degrees. It is possible to provide a suitable entrainment environment, based on known sleep cycles prevalent in humans, to help individuals to regulate their sleep patterns, and thus help to solve their sleep disorders. One embodiment of the invention, shown in FIG. 2 and also in FIGS. 3–5, implements the inventive techniques in what the inventor calls a Sleep Processor to aid in the regulation of human sleep cycles.

In FIG. 2, a read-only memory (ROM) 10 stores frequency sequences corresponding to different parts of a human sleep cycle. The stored frequency sequences may be in accordance with a predetermined algorithm, or alternatively may provide a less complex entrainment environment, such as simple averaging. A digital signal processor (DSP) **20** selects different ones of these sequences based on the current time and the time to which an alarm is set. The time is displayed on display **30**, and is set using time set **40**. The alarm is set to a desired wake-up time using alarm set **50**.

During operation, the DSP **20** accesses the ROM **10** and provides an output to a pulse code modulator unit (PCM) **60** accordingly. The PCM **60** provides an output to each of left and right channel speakers **70**, **80** which are provided in close proximity to the ears of a human subject. Using headphones enhances the effect.

Some additional detail of operation of the DSP **20** in one aspect of this embodiment now will be provided. A serial port in the DSP **20** generates an interrupt at a 50 KHz rate. An interrupt handler in the DSP **20** computes the various sounds, in one form, by generating sine waves using a pair of integrators:

cosine=cosine+frequency×sine

sine=sine−frequency×cosine

The Sleep Processors needs ten frequencies, five for each channel, and all of these frequencies are generated at the same time. The results are multiplied by ten envelopes, most of which are zero at any moment.

Noise is generated by a well-known 16-bit shift-register algorithm. This algorithm generates a noise signal that repeats every 65535 samples, or about every five seconds. The noise is filtered to sound more like pink or red noise, and less like white noise, and is written into a delay line in RAM. For each channel, the filtered noise is averaged with an earlier sample from the delay line, thus imparting a comb filter response to it.

An additional low-frequency sine/cosine pair is generated, to sweep the comb filter delay. 32-bit arithmetic is used here. The approximate sweep rate is about 1/8 Hz. The low-frequency sine wave is used directly to sweep the delay on one channel. The delay on the other channel is controlled by some mix of the sine and cosine waves. By choosing these and other coefficients properly, any phase and amplitude relationship between the left and right sweep can be obtained. The comb filtered noise for each channel is multiplied by a noise envelope value.

The device is operated as follows. A desired wake-up time is set, much like an alarm clock, and the desired volume is selected. A start/stop button then is pressed to start the cycles for the selected sleep period. Throughout the sleep period, the device repeats a 90 minute cycle of sound that leads the subject through alpha, theta, delta, and back to dreaming sleep. Five minutes before the scheduled wake-up time, a beta signal is introduced to bring the subject back to complete physical wakefulness. When the subject wakes up, he/she hits the start/stop button again to stop the sound sequence.

The sounds produced by the DSP **20** include binaural beat carrier sound patterns utilizing both amplitude and frequency modulation, masking pink sound (a known type of sound described in the copending application), and, optionally, occasional single-word voiced affirmations. The binaural beat audio signals may be in the form of appropriate sine waves, or alternatively may be replicas of actual EEG brain waveforms. In the latter case, either the just-described combined EEG waveforms or a single EEG waveform (as described in the copending

application) may be used. The entire pattern of sound and control is generated algorithmically.

One aspect of the effectiveness of the device of FIGS. 2–5 is the spacing of sound carriers at related frequencies so as to engender binaural beat signals not only from channel to channel, but also monaurally, in each audio channel. In this preferred embodiment, three binaural beat frequency signals are created between audio carrier channels, and two amplitude beats per channel also are created, yielding a total of seven beat signals. The inventor has coined the term Septon for this set of beat signals. One example of a septon is as follows:

Left Channel		Right Channel
200 Hz carrier (4 Hz monaural beat)	(4 Hz binaural beat)	204 Hz carrier (4 Hz monaural beat)
204 Hz carrier (4 Hz monaural beat)	(4 Hz binaural beat)	208 Hz carrier (4 Hz monaural beat)
208 Hz carrier	(4 Hz binaural beat)	212 Hz carrier

A standard program according to this preferred embodiment would employ the following sound sequence:

0–5 minutes:

Signal Group A (comprised of replicated EEG waveforms having dominant values in the alpha range)

Signal Group B (15 dB below Group A, generated simultaneously with the sounds of Group A, and comprised of replicated EEG waveforms having dominant values in the theta range)

Phased Pink Sound (six seconds, peak-to-peak, on both left and right channels, 20 dB below Group A)

Voice Inserts (repeated at 40 second intervals, 10 dB below Group A, simultaneously with the other sounds, and comprising short sequences of phrases like "relax" "let go", and "sleep")

5–20 minutes:

Signal Group B

Signal Group C (20 dB below Group B, generated simultaneously with Group B, and comprised of replicated EEG waveforms having dominant values in the delta range)

Phased Pink Sound (15 dB below Group B, having a duration as in the first interval)

Voice Inserts (10 dB below Group B, comprised as above)

20–40 minutes:

Signal Group C

Signal Group D (10 dB below Group C, generated simultaneously with Group C, and comprised of replicated EEG waveforms having dominant values in the lower delta range)

Phased Pink Sound (10 dB below Group C, having a duration as in the first interval)

Voice Inserts (20 dB below Group C, comprised as above) 40–65 minutes:

Signal Group D

Phased Pink Sound (10 dB below Group D, having a duration as in the first interval)

Voice Inserts (20 dB below Group D, comprised as above) 65–80 minutes:

Signal Group C

Signal Group D (10 dB below Group C, generated simultaneously with Group C)

Phased Pink Sound (15 dB below Group C, having a duration as in the first interval)

NO voice inserts
80–90 minutes:
Signal Group B
Signal Group C (10 dB below B, generated simultaneously with Group B)
Phased Pink Sound (15 dB below Group B, having a duration as in the first interval)
NO voice inserts

The foregoing sequence is repeated through the sleep period until the wakeup sequence, approximately five minutes before the set wake-up time:

Signal Group AA (a wakeup sequence, comprising replicated EEG waveforms having dominant values in the beta range, or alternatively a 400 Hz/416 Hz envelope yielding frequencies in the beta range)
Voice inserts (10 dB below Group AA, comprised of short phrases such as "waking up", "refreshed", "bright", and repeated at intervals)

One variation of the foregoing embodiment is an alarm clock which, instead of sounding a loud alarm or other jarring noise at wake-up time, starts a gentle sequence of signals some minutes before, to bring an individual up gently through the various levels of sleep to full wakefulness. A fade-in theta-alpha signal may be provided, followed by a stronger beta-gamma signal.

FIGS. 6A to 6J show the effects of the just-described "sleep processor" embodiment. Column 1 shows distribution of delta frequencies; column 2 shows distribution of theta frequencies; and column 3 shows distribution of alpha frequencies. The top row of graphs is the actual pattern observed in the individual, and the bottom row is the baseline pattern.

FIG. 6A corresponds to a normal waking state. Dominant alpha activity is shown in the occipital area of the brain. In FIG. 6B, pink noise has been applied, without any beat frequencies. A narrower focus of waking state is shown.

In FIG. 6C, a signal sequence corresponding to Signal Group A has been applied. Some gain in theta frequencies are seen, with rapid diffusion of alpha frequencies and movement toward the vertex of the head. In FIG. 6D, a signal sequence corresponding to Signal Group B has been applied. There is further diffusion of alpha frequencies, with some movement of delta and theta activity toward the pre-frontal cortex of the brain.

In FIG. 6E, a signal sequence corresponding to Signal Group C has been applied. There is rapid diffusion of alpha frequencies, and increased power of theta and delta frequencies. In FIG. 6F, a signal sequence corresponding to Signal Group D has been applied. Alpha frequencies are diffused further toward the pre-frontal cortex, and there is a marked increase in theta and delta frequencies.

FIG. 6G, continuing application of Signal Group D frequencies, shows a marked increase in delta activity in the pre-frontal cortex, with a steady decrease in alpha activity at the vertex. In FIG. 6H, another binaural beat stimulation has been applied, and characteristics of stage 3 and 4 sleep may be observed. In FIG. 6I, further evidence of the further binaural beat stimulation is observed. Delta is the dominant frequency here. Alpha and theta activity has moved to the prefrontal cortex. Finally, FIG. 6J shows early awakening activity, with a diffusion of delta activity.

FIG. 7 is a block diagram of hardware in accordance with another embodiment of the invention, having application to the work environment, or anywhere a constant source of noise is present, to allow workers, for example, to maintain a desired state of awareness. The device may contain suitable digital signal processor circuitry, as in the preceding embodiment. One difference is that the operation of the device is keyed to the presence of ambient noise, not to a given time duration or selected sleep period.

The device of FIG. 7 includes a sound generator 200 which, as just mentioned, may comprise a digital signal processor. The generator 200 outputs sound patterns via one or more speakers (left and right channel speakers 210, 220 are shown). A sound level detector 230 detects the level of ambient noise in the room, and provides a signal to the sound generator 200, or activates a cut-off switch (not shown), to discontinue output of the sound generator 200 when the ambient noise level drops below a predetermined level.

The sound level detector also preferably provides a signal to the sound generator 200 to boost the sound pattern output when the ambient noise level increases, so that the effect of the provision of the sound pattern is commensurate with the noise level in the room. Alternatively, the user may simply adjust the volume manually, using one or more knobs (not shown) on the sound generator 200.

A timer 240 may be provided to control the duration of provision of the selected sound pattern, or even to change the sound pattern at different times of day by controlling a selector 250 which the user accesses to select a particular sound pattern to be output. The user may select a given sound pattern in the morning, and the timer 240 may change that pattern automatically, based on a need at different times of day for sound patterns providing different states of alertness.

The sound pattern produced by the device of FIG. 7 varies automatically in amplitude in accordance with changes in the ambient noise, and is discontinued when the noise stops. As a result, the sound remains unobtrusive. Depending on the setting, the produced sound pattern can enhance wakefulness, promote relaxation (as, for example, in rest areas in the workplace), reduce anxiety and stress, or focus attention, among other characteristics.

The basic system of FIG. 7 produces and inserts four different sound patterns which are selected manually so as to merge the output into the constant ambient noise. More sound patterns are possible, depending on the desired overall capabilities of the system. Various modifications are possible. For example, a programmable version may be provided, which changes the form of the sound patterns throughout a work day or night, in accordance with the responses desired.

Selectability of patterns may be accomplished differently in a model intended for use in conjunction with a computer system. The computer operator can input a selection, and may vary that selection as desired throughout the work day.

FIG. 8A is a diagram of a portable embodiment of the invention, for use in providing a desired level of consciousness on an individualized basis. A signal generator 300 preferably includes a digital signal processor 310 and a ROM 320 for storing predetermined signals or sequences of signals which correspond to various desired states of awareness. The signal generator 300 may be a simple tone generator or pair of tone generators which provide outputs to speakers or headphones 330 (such as button-sized headphones) to set up a binaural beat. Output of pink sound or phased pink sound by the generator 300 is desirable to facilitate defocusing of the listener and consequent ability to concentrate on the sounds being produced. A selector **340** enables a user to instruct the signal generator **300** to output signals corresponding to the level of consciousness (e.g. focused concentration, relaxation, alertness) that a user desires.

FIG. **8B** shows a schematic of this embodiment, which the inventor calls a "Mood Minder". This embodiment includes a selector for selecting one of four possible types of signals, corresponding to four respective levels of awareness: awake and alert; concentration; attention; and relaxation. However, the invention is not so limited, as the generator **300** may be capable of producing other possible types of signals. Alternatively, pre-set patterns in the generator **300** may vary when specialized use is required. The key to this embodiment is its portability, enabling the user to carry the device everywhere. The device is battery-operated, and is small enough to fit in an upper coat pocket, for example.

FIGS. **9A–9M** show examples of prestored patterns produced by the generator **300**, and of results achieved in use. FIG. **9A** shows baseline brain waves, with relative power output shown at the right for different frequencies. FIGS. **9B**, **9E**, **9H**, and **9K** show the stimulus frequencies produced for four different respective states of consciousness. FIGS. **9C**, **9F**, **9I**, and **9L** show the stimulus waves corresponding to the superposition of the stimulus frequencies on the baseline wave. FIGS. **9D**, **9G**, **9J**, and **9M** show the results achieved in use. As can be seen, the peak-to-peak amplitudes for the response brain waves correspond closely to those of the stimulus waves.

While the present invention has been described in detail with reference to preferred embodiments, various modifications within the scope and spirit of the invention will be apparent to those of working skill in this technological field. Consequently, the invention should be considered as limited only by the scope of the appended claims.

What is claimed is:

1. A method of inducing desired states of consciousness in human beings, comprising the following steps:

combining a plurality of replicated electroencephalogram (EEG) waveforms, each indicative of a particular desired state of consciousness, to produce a combined EEG waveform;

superimposing said combined EEG waveform on two separate sets of carrier waves using stereo sound;

creating differential beat frequencies between said sets of carrier waves based on said superimposing step; and

providing the resulting signals in audio form to respective ears of a human being, to induce said state of consciousness.

2. A method as claimed in claim **1**, wherein said combining step comprises mathematically averaging said EEG waveforms to produce said combined EEG waveform.

3. A method as claimed in claim **1**, further comprising the step of repeating said combining, superimposing, and creating steps for each of a set of desired states of consciousness, and producing a cycle of sets of resulting audio signals, said providing step comprising providing said cycle of sets of resulting audio signals to respective ears of a human being, to induce each of said desired states of consciousness in cyclic fashion.

4. A method as claimed in claim **3**, wherein said cycle corresponds to human sleep patterns, said desired states of consciousness comprising wakefulness, alpha sleep, delta sleep, and theta sleep.

5. A method as claimed in claim **3**, wherein said cycle corresponds to human sleep patterns, said desired states of consciousness comprising alpha sleep, delta sleep, and theta sleep, said cycle being approximately 90 minutes long.

6. A method as claimed in claim **5**, said method further comprising the steps of providing a plurality of repetitions of said cycle, followed by providing a set of audio signals containing a binaural beat at a frequency indicative of beta consciousness.

7. A method as claimed in claim **1**, wherein said creating step includes the step of combining pink sound with said sets of carder waves by shifting of said pink sound with respect to said combined EEG waveform from one stereo audio channel to another, with cyclic changes in amplitude, frequency, and rate of panning.

8. Apparatus for facilitating sleep in a human subject, comprising:

means for setting a wake-up time to select a desired sleep duration;

means for generating a first sequence of signals in a cycle corresponding to a human sleep pattern, frequencies of said signals in said first sequence being substantially equal to frequencies of human brain patterns at different levels of sleep;

means for repeating said cycle a plurality of times based on the selected wake-up time; and

means for waking up said human subject at the selected wake-up time.

9. Apparatus as claimed in claim **8**, wherein said means for waking up said human subject comprises means for generating a second sequence of signals a predetermined time before the selected wake-up time, frequencies of said signals in said second sequence being substantially equal to frequencies of human brain patterns at or near an awakened state.

10. Apparatus as claimed in claim **9**, wherein said predetermined time is approximately five minutes.

11. Apparatus as claimed in claim **8**, wherein said first sequence of frequencies comprises, in order, alpha frequencies, theta frequencies, delta frequencies, and theta frequencies.

12. Apparatus as claimed in claim **8**, further comprising means for generating phased pink sound in conjunction with said first sequence of frequencies.

13. Apparatus as claimed in claim **8**, wherein said first sequence of signals comprises a plurality of sets of combined brainwaves, each of said sets corresponding to a different level of sleep, said combined brainwaves within a given set being constituted by combined electroencephalogram (EEG) waveforms of a plurality of individuals, taken when said individuals had attained a different respective level of sleep.

14. Apparatus as claimed in claim **13**, wherein said EEG waveforms are mathematically averaged.

15. Apparatus for awakening an individual using brain pattern entrainment, said apparatus comprising:

means for selecting a wake-up time;

means for keeping time; and

means, operative a predetermined period before said wake-up time as determined by said means for keeping time, for producing a first sequence of signals having frequencies in the theta-alpha range, followed by a second sequence of signals having frequencies in the beta-gamma range.

16. Apparatus as claimed in claim 15, wherein said means for producing said first and second sequences of signals comprises means for producing said second sequence of signals at a higher amplitude than said first sequence of signals.

17. Apparatus as claimed in claim 15, wherein said first sequence of signals comprises a plurality of sets of combined brainwaves, each of said sets corresponding to a different level of consciousness, said combined brainwaves within a given set being constituted by combined electroencephalogram (EEG) waveforms of a plurality of individuals, taken when said individuals had attained a different respective level of consciousness.

18. Apparatus as claimed in claim 16, wherein said EEG waveforms are mathematically averaged.

19. Apparatus for inducing a desired state of consciousness, said apparatus comprising:

means for detecting presence of a predetermined level of ambient noise;

means, responsive to said detecting means, for generating signals having frequencies substantially equal to frequencies of human brain patterns when said ambient noise is present; and

means for selecting said signals in accordance with desired human activity in said areas.

20. Apparatus as claimed in claim 19, further comprising timer means, connected to said generating means, for generating said signals for a predetermined time set by said timer means.

21. Apparatus as claimed in claim 19, wherein said timer means is connected to said selecting means to enable selection of different ones of said signals in accordance with desired human activity at different times of day.

22. Apparatus as claimed in claim 19, wherein said generating means comprises means, responsive to said detecting means, for increasing an amplitude of said signals in response to an increase in amplitude of said ambient noise, and for decreasing an amplitude of said signals in response to a decrease in amplitude of said ambient noise.

23. Apparatus as claimed in claim 22, wherein said generating means further comprises means for discontinuing said signals when said ambient noise falls below said predetermined level.

24. Apparatus as claimed in claim 19, wherein said generating means comprises a digital signal processor and a read-only memory (ROM) connected to said digital signal processor, said ROM storing a plurality of sets of signals, each of said sets of signals having frequencies substantially equal to human brain patterns at a desired state of consciousness.

25. Apparatus as claimed in claim 24, wherein each of said sets of signals comprises a plurality of sets of combined brainwaves, each of said sets corresponding to a different level of consciousness, said combined brainwaves within a given set being constituted by combined electroencephalogram (EEG) waveforms of a plurality of individuals, taken when said individuals had attained a different respective state of consciousness.

26. Apparatus as claimed in claim 25, wherein said EEG waveforms are mathematically averaged.

27. Apparatus for awakening an individual using brain pattern entrainment, said apparatus comprising:

means for selecting a wake-up time; and

means, operative a predetermined period before said wake-up time, for producing a first sequence of signals having frequencies in a first predetermined range corresponding to a first state of consciousness, followed by a second sequence of signals having frequencies in a second predetermined range corresponding to a second state of consciousness.

28. Apparatus as claimed in claim 27, wherein said first predetermined range is the theta-alpha range, and said second predetermined range is the beta-gamma range.

* * * * *

PDF SECTION: UNITED STATES PATENTS.

US005159703A

United States Patent [19]

Lowery

[11] **Patent Number: 5,159,703**

[45] **Date of Patent: Oct. 27, 1992**

[54] **SILENT SUBLIMINAL PRESENTATION SYSTEM**

[76] Inventor: **Oliver M. Lowery,** 5188 Falconwood Ct., Norcross, Ga. 30071

[21] Appl. No.: **458,339**

[22] Filed: **Dec. 28, 1989**

[51] **Int. Cl.**⁵ **H04B 7/00;** H04R 25/00; H04R 3/02

[52] **U.S. Cl.** **455/42;** 455/46; 455/66; 381/73.1; 128/420.5

[58] **Field of Search** 455/46, 47, 66, 109, 455/110, 42–43; 381/73.1, 105, 124; 358/141–143; 600/28; 128/420.5; 380/38

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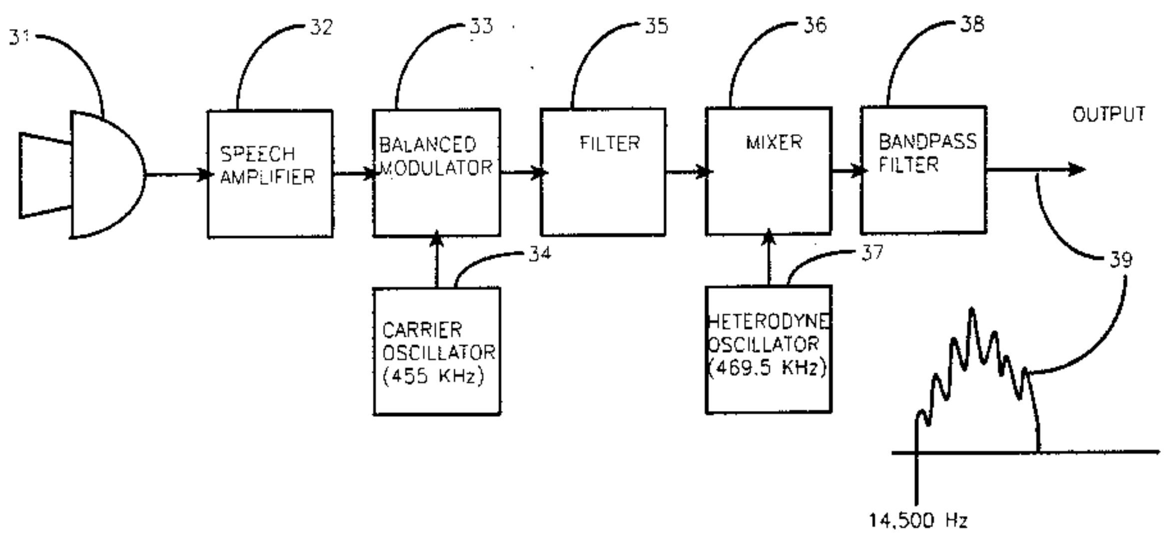
Primary Examiner—Reinhard J. Eisenzopf
Assistant Examiner—Andrew Faile

[57] **ABSTRACT**

A silent communications system in which nonaural carriers, in the very low or very high audio frequency range or in the adjacent ultrasonic frequency spectrum, are amplitude or frequency modulated with the desired intelligence and propagated acoustically or vibrationally, for inducement into the brain, typically through the use of loudspeakers, earphones or piezoelectric transducers. The modulated carriers may be transmitted directly in real time or may be conveniently recorded and stored on mechanical, magnetic or optical media for delayed or repeated transmission to the listener.

3 Claims, 3 Drawing Sheets



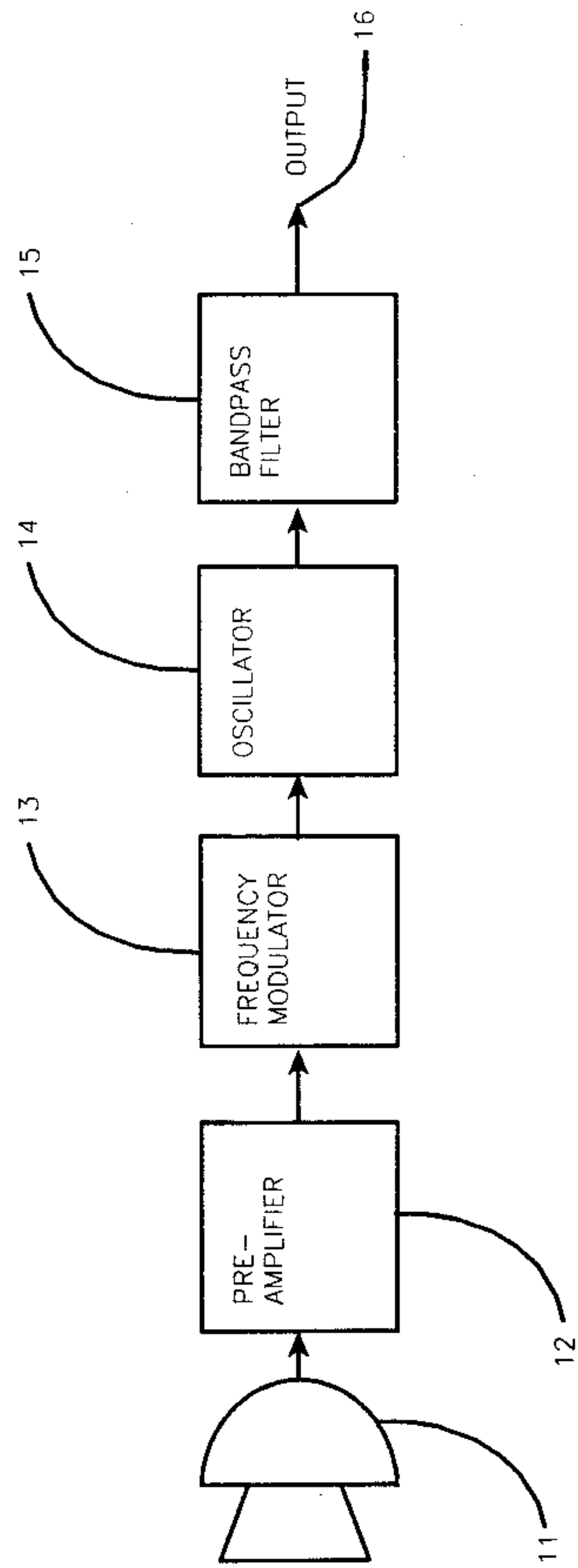

PRE-
AMPLIFIER
FREQUENCY
MODULATOR
OSCILLATOR
BANDPASS
FILTER
OUTPUT
11
12
13
14
15
16

FIG. 1

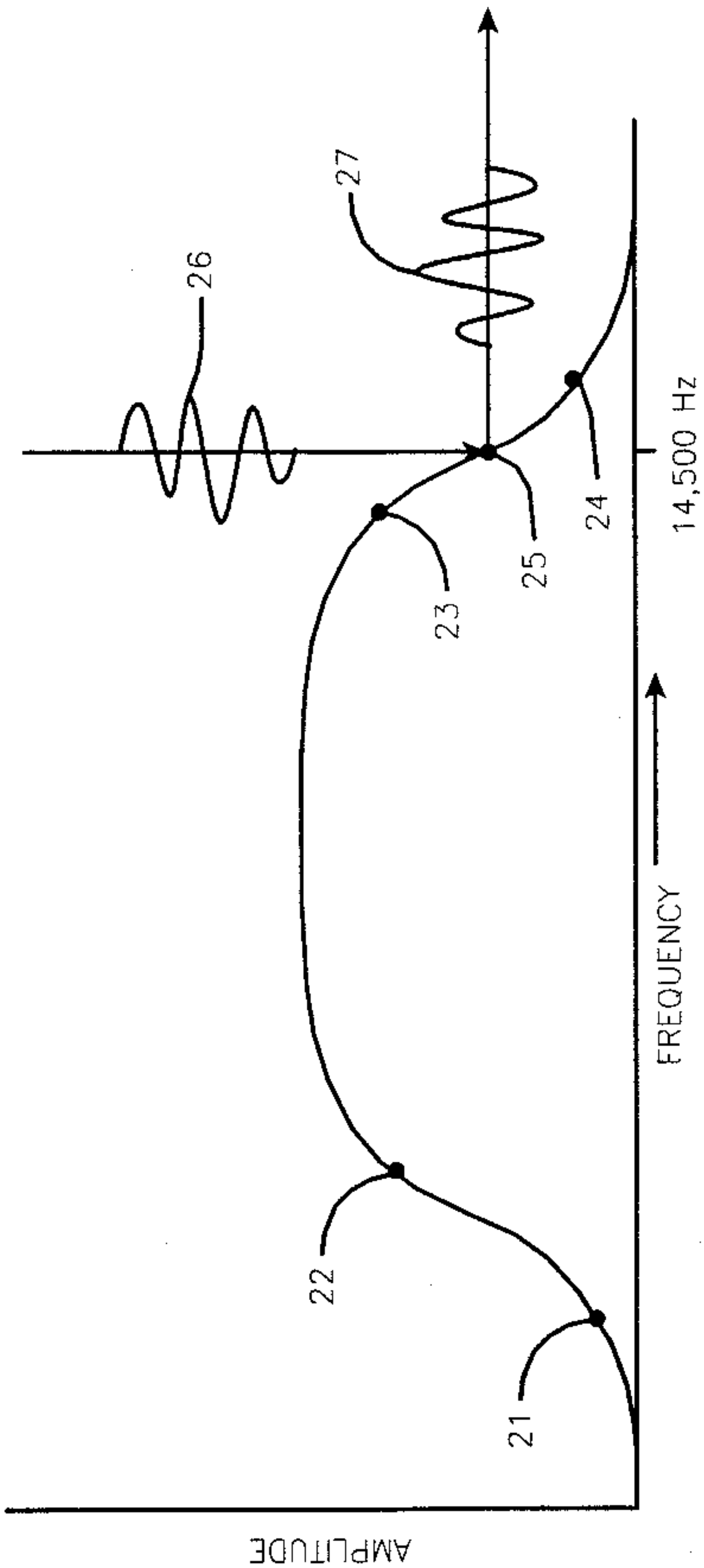


FIG. 2

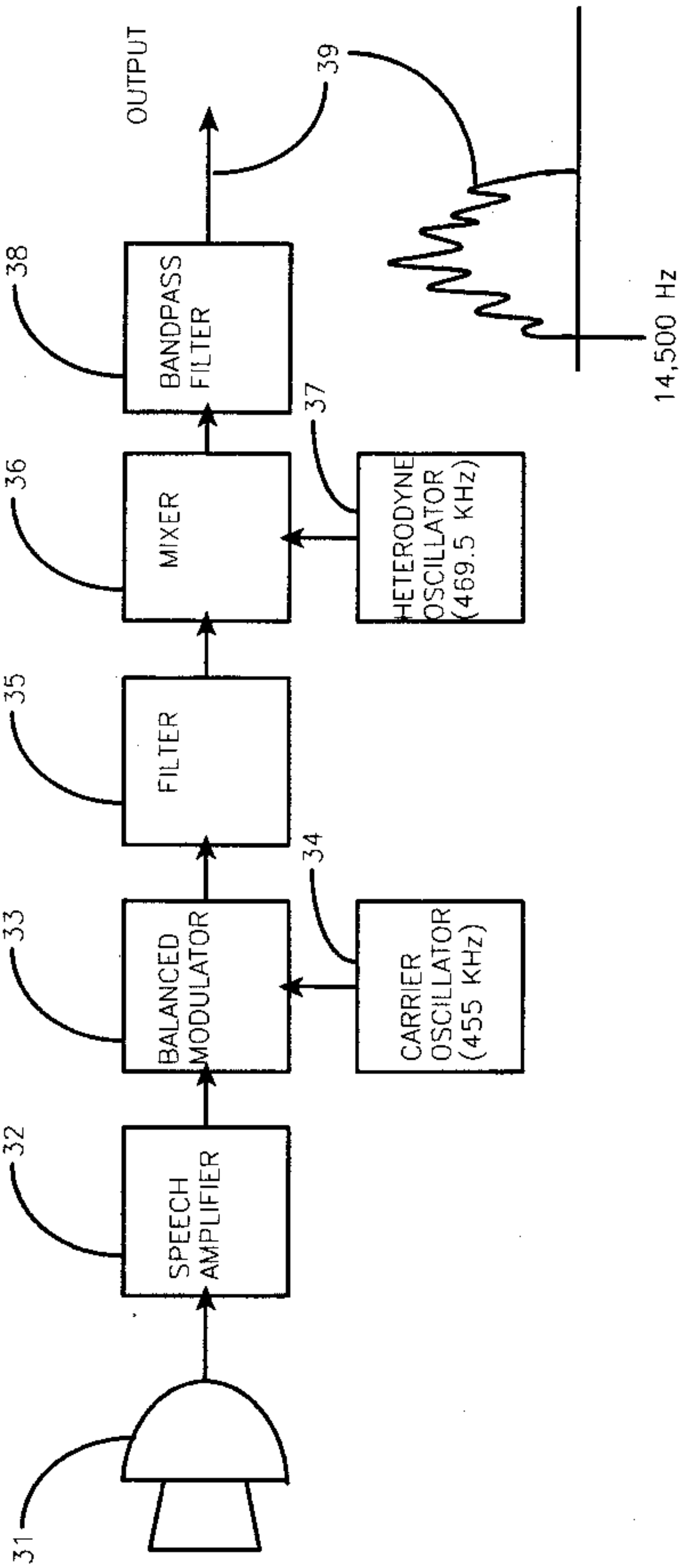

OUTPUT
39
38
BANDPASS FILTER
37
36
MIXER
HETERODYNE OSCILLATOR (469.5 KHz)
14,500 Hz
35
FILTER
34
33
BALANCED MODULATOR
CARRIER OSCILLATOR (455 KHz)
32
SPEECH AMPLIFIER
31

FIG. 3

SILENT SUBLIMINAL PRESENTATION SYSTEM

BACKGROUND—FIELD OF THE INVENTION

This invention relates in general to electronic audio signal processing and, in particular, to subliminal presentation techniques.

BACKGROUND—DESCRIPTION OF PRIOR ART

Subliminal learning enjoys wide use today and subliminal tapes are being manufactured by a number of companies in the United States alone. Several decades of scientific study indicate that subliminal messages can influence a human's attitudes and behavior. Subliminal, in these discussions, can be defined as "below the threshold of audibility to the conscious mind." To be effective however, the subliminally transmitted information (called affirmations by those in the profession) must be presented to the listener's ear in such a fashion that they can be perceived and "decoded" by the listener's subconscious mind. We are referring to audio information in this discussion, however, information could be inputted into the subject's subconscious mind through any of the body's sensors, such as touch, smell, sight or hearing. As an example, early development work in the subliminal field utilized motion pictures and slide projections as the medium. Early research into visual and auditory subliminal stimulation effects is exemplified by U.S. Pat. Nos. 3,060,795 of Corrigan, et al. and 3,278,676 of Becker. U.S. Pat. No. 4,395,600 of Lundy and Tyler is representative of later developments in today's subliminal message techniques.

The majority of the audio subliminal tapes available today are prepared using one basic technique. That is, the verbal affirmations are mixed with, and recorded at a lower level than, a "foreground" of music or sounds of ocean surf or a bubbling mountain brook or other similar "masking" sounds. The affirmations are generally recorded 5 decibels (db) or so below the "foreground" programming and regenerative automatic gain control is usually applied to permit the affirmations to change their recorded amplitude in direct proportion to the short term averaged amplitude of the continually varying "foreground" material. In other words, the volume of the affirmations will follow or track the volume changes of the "foreground" programming, but at a lower volume level. Circuit provisions are also usually included to "gate" the affirmations off when the music amplitude is low or zero. This insures that the affirmations cannot be heard during quiet program periods. Thus, today's subliminal affirmations can be characterized as being "masked" by music or other sounds, of constantly changing amplitude and of being reduced or cut off entirely during periods of low or quiet "foreground" programming.

One of the principal, and most widely objected to, deficiencies in available subliminal tape presentation techniques is that the presence of the "foreground" material is intrusive to both the listener and to anyone else in the immediate area. No matter what "foreground" material is chosen, the fact remains that this material can be heard by anyone within its range and presents a definite distraction to other activities such as conversation, thought, desire to listen to other programming such as radio or television, need to concentrate, etc. Additionally, and because the tapes are used repeatedly by the same listener, any "foreground" music or material eventually becomes monotonously tiring to that listener.

It is the purpose of the following described invention to eliminate or greatly reduce all of the above deficiencies. Although its application to the magnetic tape medium is described in the following discussion, the technique is equally applicable to most other desired transmission mediums, such as Compact Disc, videocassettes, digital tape recorders, Public Address (PA) systems, background music installations, computer software programs, random access memory (RAM), read only memory (ROM), "live", real time applications and other mediums now in existence or to be developed in the future.

Implemented on tape cassettes, for example, the subliminal presentation described here is inaudible i.e., high audio or ultrasonic frequencies, the affirmations are presented at a constant, high amplitude level, and they occupy their own "clear channel", non-masked frequency allocations. If desired, the previously described "foreground" music or other material can be added to the tape through use of an audio mixer. The "silent" recordings are inaudible to the user or by others present and are therefore very effective for use during periods of sleep or when in the presence of others. Additionally, the basic requirements of subliminal stimulation are met. That is, the affirmations are efficiently transmitted to the ear and, while undetected by the conscious mind, are perceived by and efficiently decoded by the subconscious mind.

OBJECTS OF THE INVENTION

Accordingly, several objects and advantages of my invention are:

(a) to provide a technique for producing a subliminal presentation which is inaudible to the listeners(s), yet is perceived and demodulated (decoded) by the ear for use by the subconscious mind.

(b) to provide a technique for transmitting inaudible subliminal information to the listener(s) at a constant, high level of signal strength and on a clear band of frequencies.

(c) to provide a technique for producing inaudible subliminal presentations to which music or other "foreground" programming may be added, if desired.

Still further objects and advantages will become apparent from a consideration of the ensuing description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, the first digit of each component number also refers to the figure number where that component can be located.

FIG. 1 represents the block diagram of a suitable system which will generate a frequency modulated (FM) signal at 14,500 Hz.

FIG. 2 represents an approximation of the frequency response curve of the human ear and the signal decoding process.

FIG. 3 represents the block diagram of a suitable system which will generate a single sideband, suppressed carrier, amplitude modulated (AM) signal at 14,500 Hz.

REFERENCE NUMERALS IN DRAWINGS	
11 microphone or other	14 low distortion

-continued

REFERENCE NUMERALS IN DRAWINGS	
audio input signal	audio oscillator
12 audio preamplifier if required	15 high pass or band pass audio filter
13 frequency modulation circuit	16 output to tape recorder or other device
21 point on low freq end response curve	25 midpoint on curve between points 23 and 24
22 point on low freq end of ear response curve	26 speaker output of FIG. 1 to ear
23 point on high freq end of ear response curve	27 demodulated subliminal audio inputted to ear
24 point on high freq end of ear response curve	31 microphone
32 speech amplifier	33 balanced modulator
34 carrier oscillator (455 KHz)	35 filter
36 mixer	37 heterodyne oscillator (469.5 KHz)
38 bandpass filter	39 output signal

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Please refer now to FIG. 1 and FIG. 2, which are drawings of a preferred implementation of the invention.

The principle of operation of the silent subliminal presentation system is as follows:

An audio signal in the upper frequency region of the audio spectrum (for example, 14,500 Hz) is modulated with the desired information. The type of modulation may be any type suitable for subliminal applications; frequency modulation (FM), phase modulation (PM), upper single sideband with suppressed carrier, amplitude modulation (AM), tone modulation, etc.

For broadest application, the high audio frequency selected as the carrier frequency must meet two basic criteria:

(1) be high enough in the audio spectrum that its presence to the human ear is essentially unnoticed or undetectable (without the listener being informed that the signal is actually present) and,

(2) be low enough in the audio spectrum that it (and its modulation content) can produce a useful output power from home entertainment type cassette or reel-to-reel magnetic recorders.

This would also include, of course, small portable and automobile tape decks.

Alternatively, the output of the system can be fed directly into an audio amplifier and its speaker/earphone system, Public Address system, etc.

FIG. 1 provides the block diagram of an example of a system capable of generating the desired silent frequency modulated carrier.

The modulation information is inputted into the microphone **11**. Other suitable input devices may be substituted for microphone **11**, such as a tape recorder or a radio. The microphone **11** is connected to the preamplifier **12** and should have provisions for adjusting its gain in order that the optimum modulation index can be set in the frequency modulator **13**. The frequency modulator **13** modulates the frequency of oscillator **14** which has been adjusted for an output of 14,500 Hz as described above. The output of oscillator **14** is fed through a suitable bandpass filter **15** into the tape recorder or directly into a suitable amplifier/speaker system. It is the purpose of the bandpass filter to remove or attenuate audible products of the modulation process in order to maintain as audibly silent an output as practical.

On the receiving end, FIG. 2 represents an approximate and idealized frequency response curve of the human ear. The frequency modulated carrier (centered at 14,500 Hz), as generated above and played through a tape recorder or amplifier/speaker system, is shown on FIG. 2 as speaker output **26**, impinging upon the upper slope of the ear's response curve at point **25**. The frequency modulated excursions of the speaker output **26** swing between points **23** and **24** on the ear's upper response curve. Because the response curve between points **23** and **25** is relatively linear, this action results in a relatively linear demodulation of the original modulation intelligence, which is passed on subliminally to the inner ear. The amplitude of the demodulated output is not high enough to be detected by the conscious mind but is sufficient in amplitude to be detected by the subconscious mind. In the field of communications engineering design, the above demodulation process in known as slope detection and was used in early FM receiver design. In those receivers, the response curve was formed by the action of a tuned (inductive/capacitance) circuit. In our case, the response curve is formed by the natural response curve of the human ear. The same slope detection technique can be performed at the low frequency end of the human ear response curve. This region is indicated on FIG. 2 as between points **21** and **22**. This region, however, has a much smaller available bandwidth and is therefore more restricted as to the amount of information that can be transmitted in an inaudible manner.

In practice, the listener adjusts the volume control of the tape recorder or amplifier to a level just below that at which the listener hears an audible sound or noise from the speaker of the tape recorder. If the recording process is properly done, a spectrum analyzer or a calibrated sound level meter will reveal a strong signal emanating from the tape recorder speaker. A calibrated sound level meter, at a distance of 1 meter (with C weighting and referenced to the standard of 0.0002 micro bar) will typically indicate a silent power output of from 60 to 70 decibels. This is equivalent to the audio power of a loud conversation, yet, in the described system, is inaudible or unnoticed by the listener.

FIG. 3 illustrates a system which generates a suitable amplitude modulated (AM) signal, instead of the frequency modulated (FM) system described above. The output is a modulated, single sideband (SSB), suppressed carrier (AM) signal at 14,500 Hz.

The block diagram represents a common scheme for generating an SSB signal and will be briefly described.

The desired subliminal information is spoken into microphone **31**. This signal is amplified by speech amplifier **32** and injected into one port of balanced modulator **33**. A continuous wave signal of **455** KHz is generated by carrier oscillator **34** and is injected into the second port of balanced modulator **33**. The output of balanced modulator **33** is a double sideband, suppressed carrier signal at 455 KHz. This signal is fed through filter **35**, causing one of the two sidebands to be removed. This signal is fed into one port of mixer **36**. A continuous wave signal at a frequency of 469.5 KHz from hetrodyne oscillator **37** is fed into the other port of mixer **36**, resulting in an output of the original subliminal audio information but translated 14,500 Hz higher in frequency. The bandpass filter **38** attenuates signals and noise outside of the frequencies of interest. The amplitude modulated audio output signal is shown as output **39**.

Thus, as stated earlier, my invention provides a new system for subliminal presentations which is:

(a) silent,

(b) outputs a constant, high level modulated signal and,

(c) occupies a band of clear channel frequencies.

The foregoing description of the preferred embodiment of the invention has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. Many modifications and variations are possible in light of the above discussions. It is intended that the scope of the invention be limited not only by this detailed description, but rather by the claims appended hereto.

What is claimed:

1. A silent communications system, comprising:

(a) amplitude modulated carrier means for generating signals located in non-aural portions of the audio and in the lower portion of the ultrasonic frequency spectrum said signals modulated with information to be perceived by a listener's brain and,

(b) acoustic and ultrasonic transducer means for propagating said signals, for inducement into the brain, of the listener, and,

(c) recording means for storing said modulated signals on mechanical, magnetic and optical media for delayed or repeated transmissions to the listener.

2. A silent communications system, comprising:

(a) frequency modulated carrier means for generating signals located in non-aural portions of the audio and in the lower portion of the ultrasonic frequency spectrum, said signals modulated with information to be perceived by a listener's brain, and;

(b) acoustic and ultrasonic transducer means for propagating said signals, for inducement into the brain of the listener, and;

(c) recording means for storing said modulated signals on mechanical, magnetic and optical media for delayed or repeated transmissions to the listener.

3. A silent communications system, comprising:

(a) a combination of amplitude and frequency modulated carrier means for generating signals located in non-aural portions of the audio and in the lower portion of the ultrasonic frequency spectrum, said signals modulated with information to be perceived by a listener's brain, and

(b) acoustic and ultrasonic transducer means for propagating said signals, for inducement into the brain of the listener;

(c) recording means for storing said modulated signals on mechanical, magnetic and optical media for delayed or repeated transmissions to the listener.

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PDF SECTION: UNITED STATES PATENTS.

United States Patent [19]

Stocklin

[11] **Patent Number:** 4,858,612

[45] **Date of Patent:** Aug. 22, 1989

[54] **HEARING DEVICE**

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[21] Appl. No.: **562,742**

[22] Filed: **Dec. 19, 1983**

[51] **Int. Cl.**[4] **A61N 1/36**
[52] **U.S. Cl.** .... **128/422;** 178/419 S
[58] **Field of Search** .... 128/419 R, 419 S, 422, 128/653, 771, 732, 741, 746, 791, 804; 340/407

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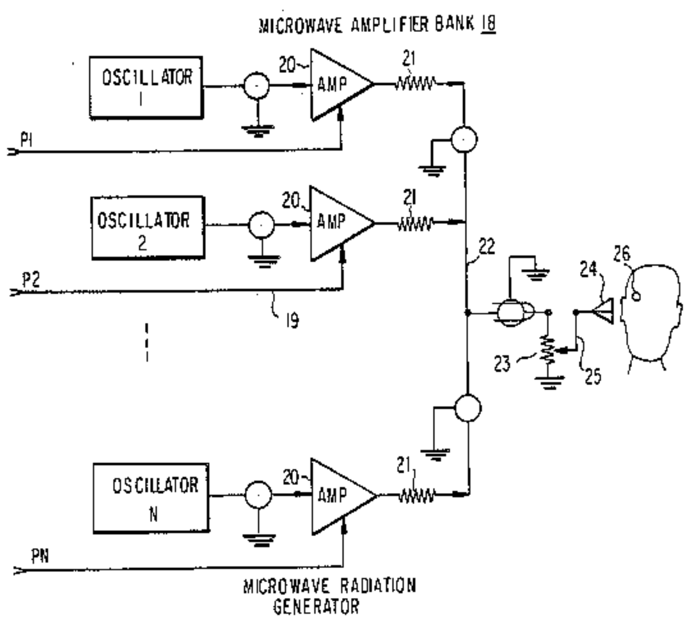
Primary Examiner—William E. Kamm
Attorney, Agent, or Firm—Wegner & Bretschneider

[57] **ABSTRACT**

A method and apparatus for simulation of hearing in mammals by introduction of a plurality of microwaves into the region of the auditory cortex is shown and described. A microphone is used to transform sound signals into electrical signals which are in turn analyzed and processed to provide controls for generating a plurality of microwave signals at different frequencies. The multifrequency microwaves are then applied to the brain in the region of the auditory cortex. By this method sounds are perceived by the mammal which are representative of the original sound received by the microphone.

29 Claims, 7 Drawing Sheets



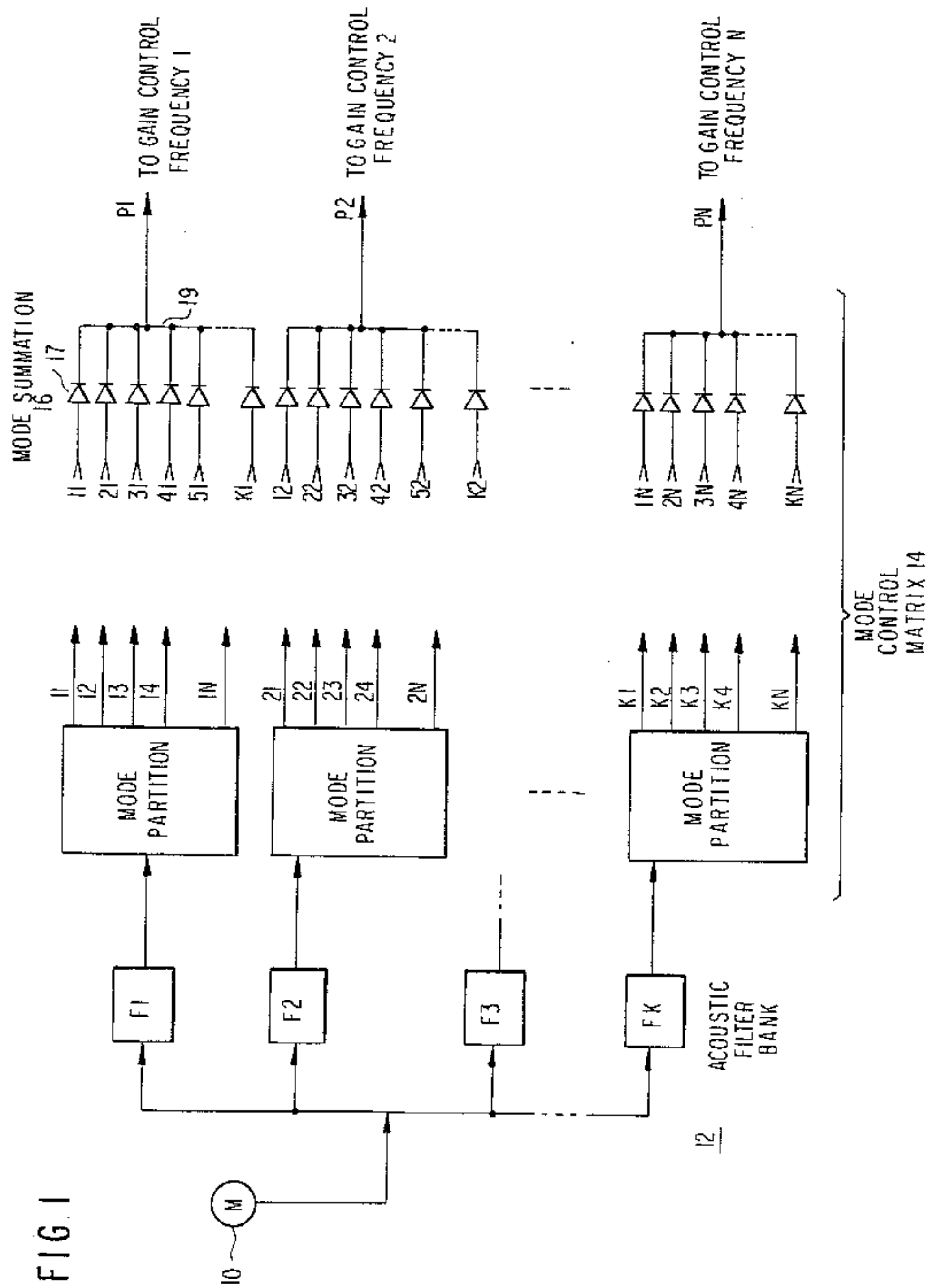


FIG. 1
MODE SUMMATION
TO GAIN CONTROL FREQUENCY 1
TO GAIN CONTROL FREQUENCY 2
TO GAIN CONTROL FREQUENCY N
MODE PARTITION
MODE PARTITION
MODE PARTITION
MODE CONTROL MATRIX 14
ACOUSTIC FILTER BANK
F1
F2
F3
FK
M

FIG. 2

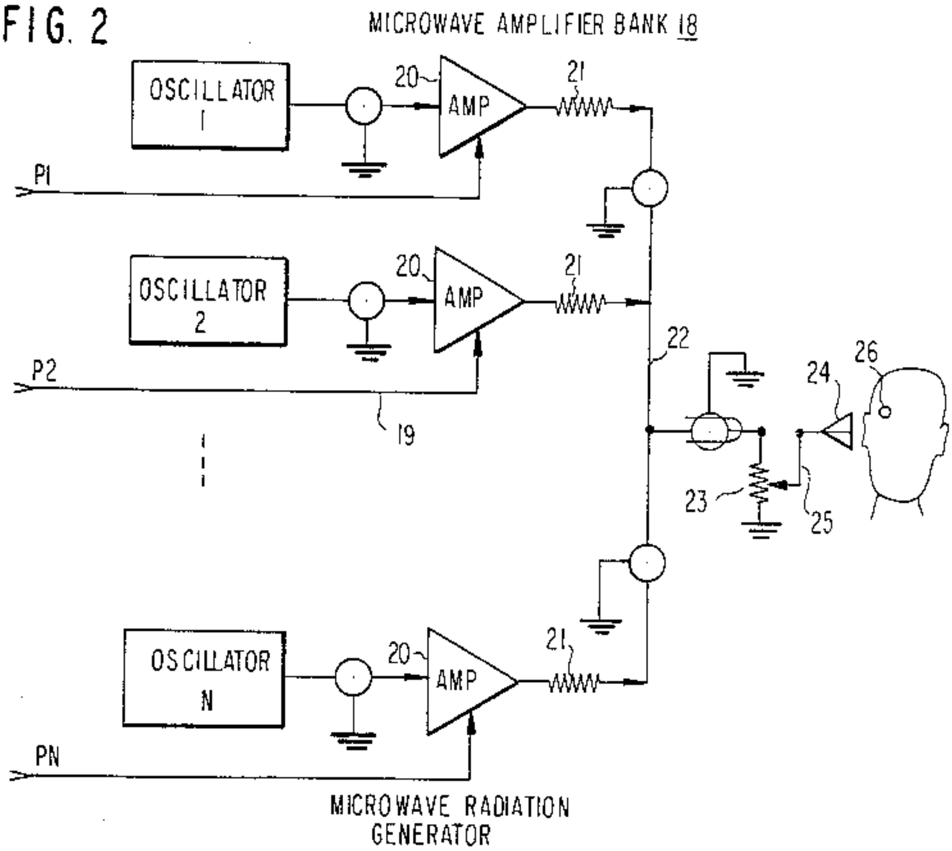

MICROWAVE AMPLIFIER BANK 18
OSCILLATOR 1
20
AMP
21
P1
OSCILLATOR 2
20
AMP
21
P2
19
22
26
24
23
25
OSCILLATOR N
20
AMP
21
PN
MICROWAVE RADIATION GENERATOR

FIG. 2a

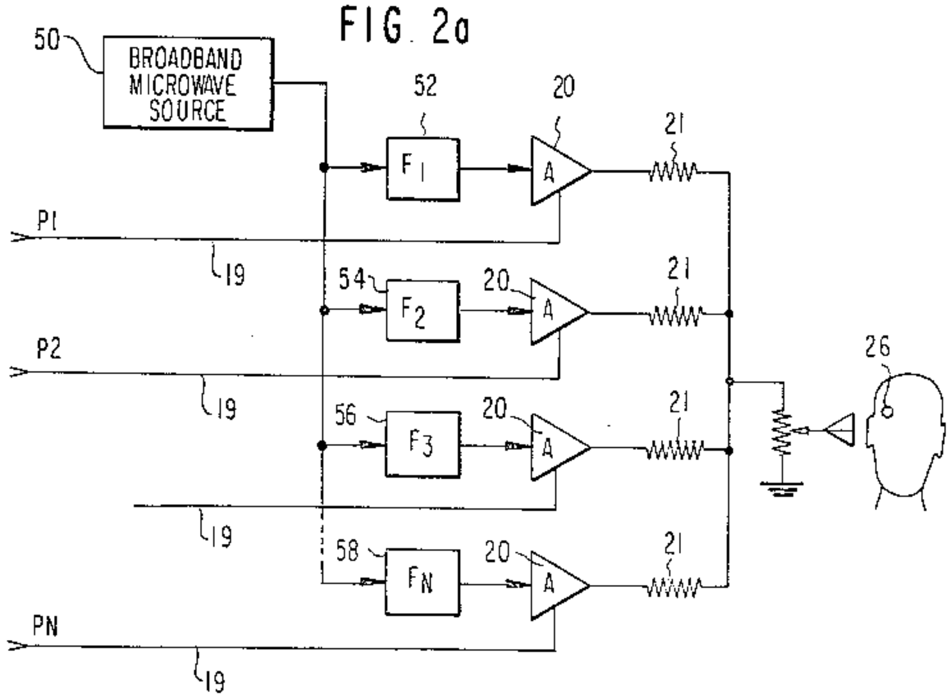

50
BROADBAND MICROWAVE SOURCE
52
20
F1
A
21
P1
19
54
F2
20
A
21
P2
19
26
56
F3
20
A
21
19
58
FN
20
A
21
PN
19

FIG. 5

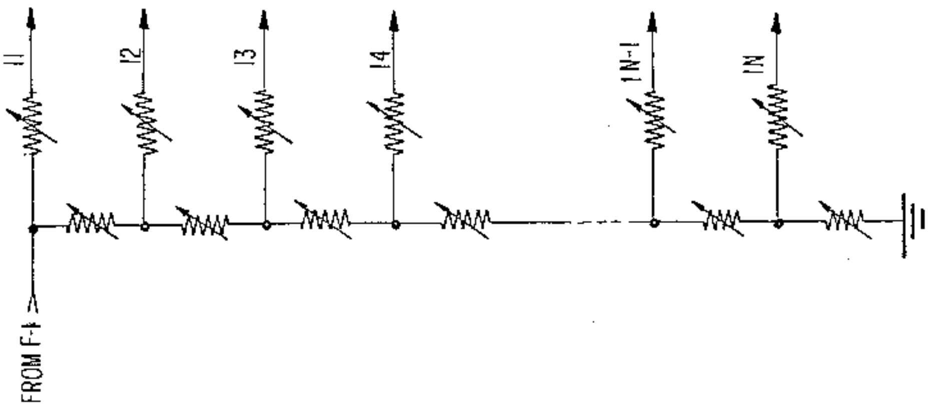


FIG. 4

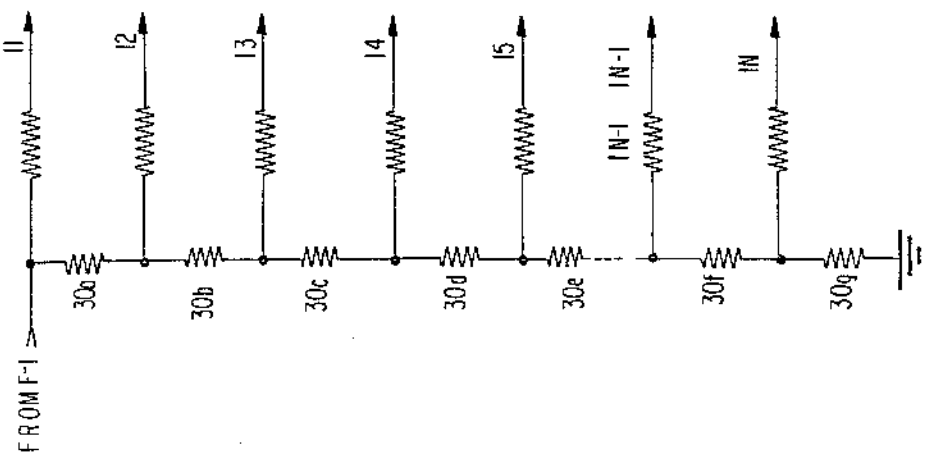


FIG. 3

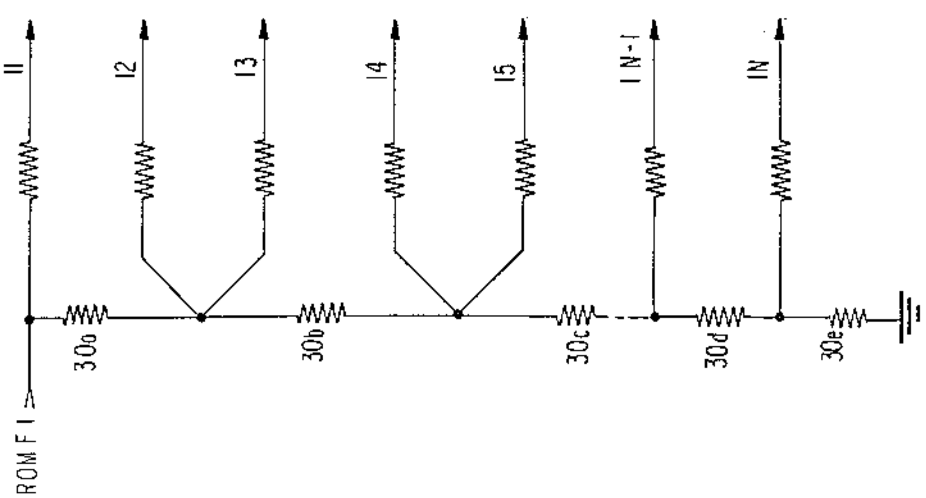


FIG. 6

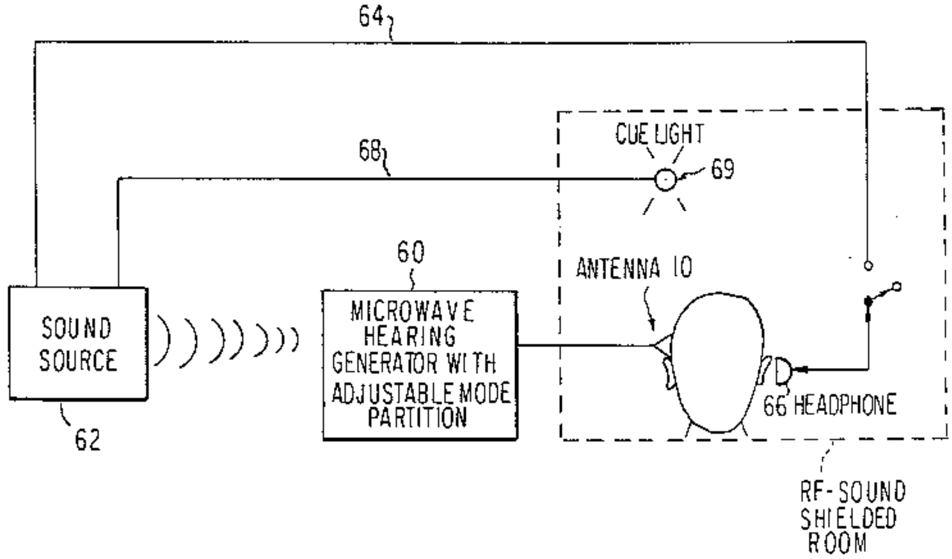
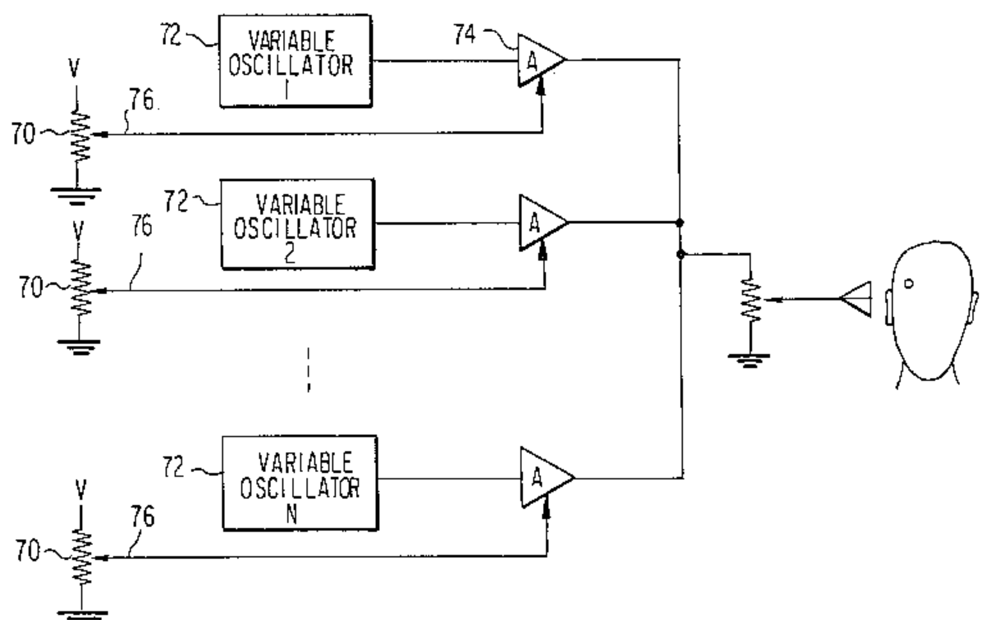

64
68
CUE LIGHT
69
60
ANTENNA 10
SOUND SOURCE
MICROWAVE HEARING GENERATOR WITH ADJUSTABLE MODE PARTITION
66 HEADPHONE
62
RF-SOUND SHIELDED ROOM

FIG. 7


72
VARIABLE OSCILLATOR 1
74
A
V
76
70
72
VARIABLE OSCILLATOR 2
A
V
76
70
72
VARIABLE OSCILLATOR N
A
V
76
70

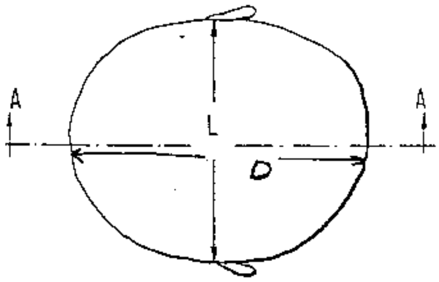
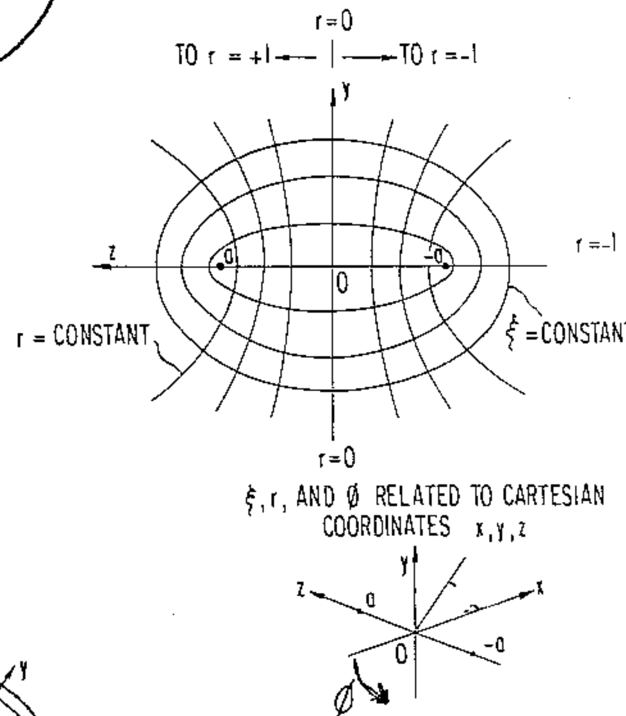


FIG. 8

FIG. 9



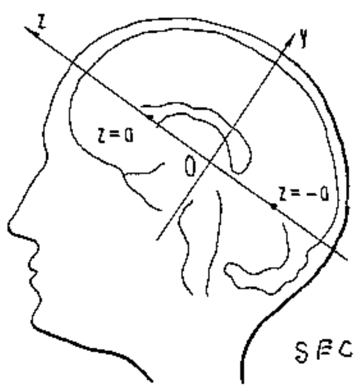


FIG. 10

SECTION A-A

TRANSFORMATION EQUATIONS

$$x = a(\xi^2 - 1)^{1/2}(1 - r^2)^{1/2}\cos \emptyset \qquad 1 \leq \xi \leq$$

$$y = a(\xi^2 - 1)^{1/2}(1 - r^2)^{1/2}\sin \emptyset \qquad -1 \leq \emptyset \leq +1$$

$$z = a\xi r \qquad 0 \leq \emptyset \leq 2\pi$$

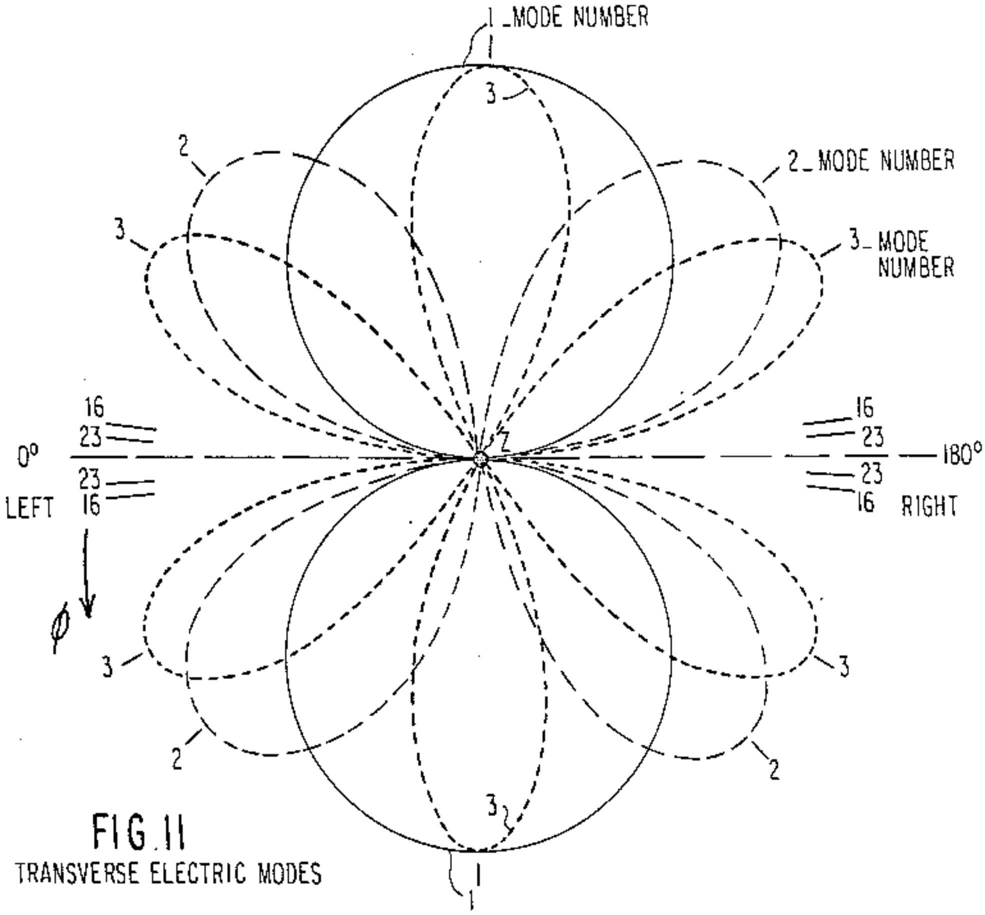
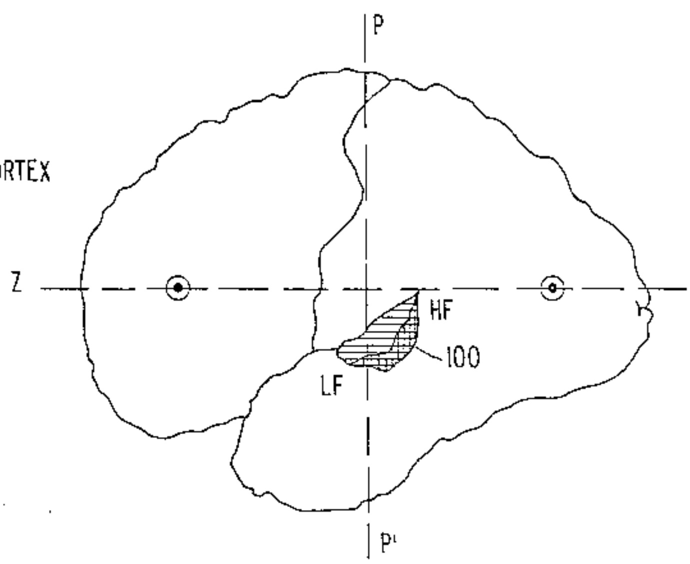


FIG. 11
TRANSVERSE ELECTRIC MODES

FIG. 12
PRIMARY AUDITORY CORTEX



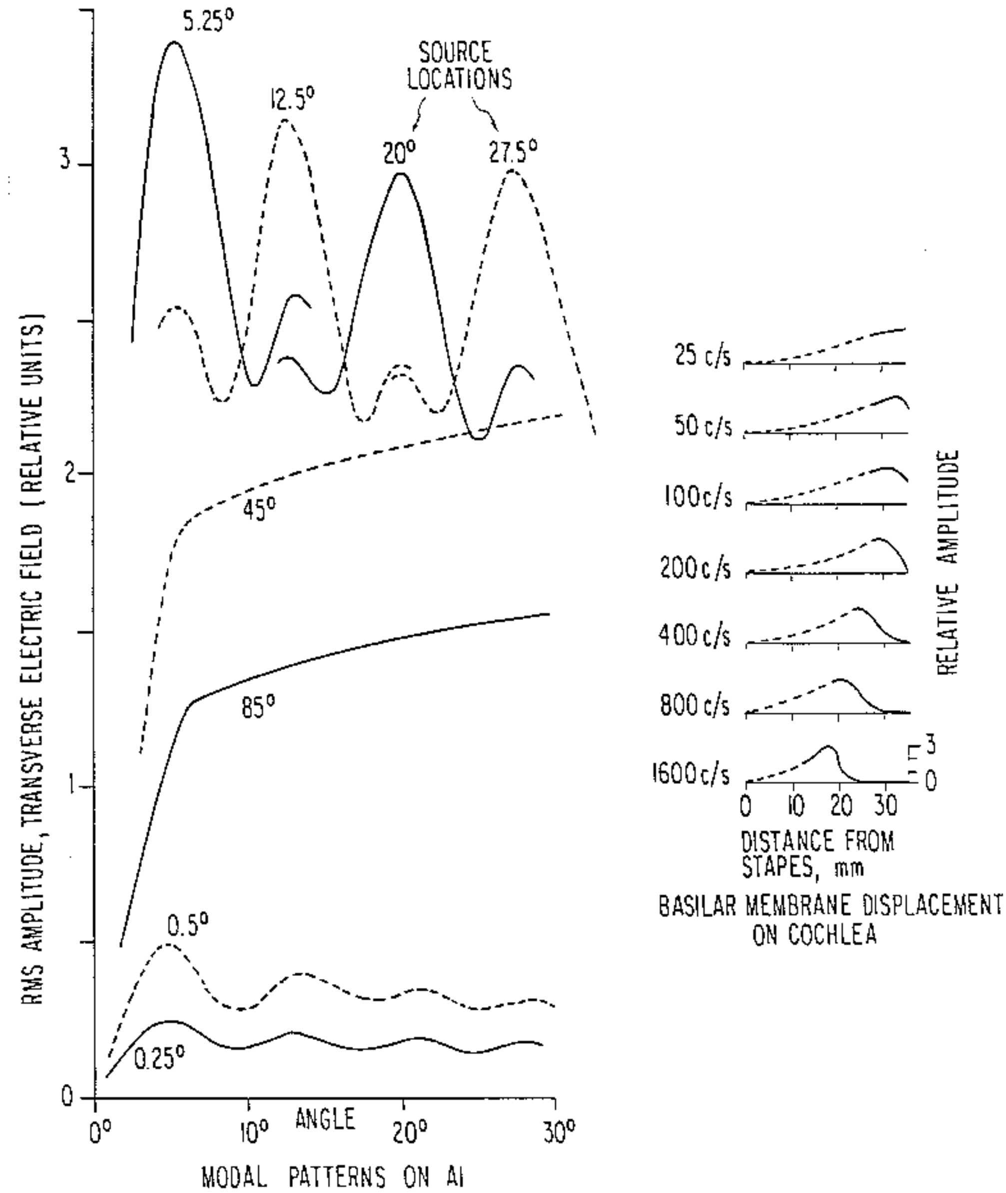

5.25°
12.5°
SOURCE LOCATIONS
20°
27.5°
45°
85°
0.5°
0.25°
RMS AMPLITUDE, TRANSVERSE ELECTRIC FIELD (RELATIVE UNITS)
0
1
2
3
0°
10°
ANGLE
20°
30°
MODAL PATTERNS ON AI
25 c/s
50 c/s
100c/s
200c/s
400c/s
800c/s
1600c/s
RELATIVE AMPLITUDE
3
0
0 10 20 30
DISTANCE FROM STAPES, mm
BASILAR MEMBRANE DISPLACEMENT ON COCHLEA

FIG.13

HEARING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to devices for aiding of hearing in mammals. The invention is based upon the perception of sounds which is experienced in the brain when the brain is subjected to certain microwave radiation signals.

2. Description of the Prior Art

In prior art hearing devices for human beings, it is well known to amplify sounds to be heard and to apply the amplified sound signal to the ear of the person wearing the hearing aid. Hearing devices of this type are however limited to hearing disfunctions where there is no damage to the auditory nerve or to the auditory cortex. In the prior art, if there is damage to the auditory cortex or the auditory nerve, it cannot be corrected by the use of a hearing aid.

During World War II, individuals in the radiation path of certain radar installations observed clicks and buzzing sounds in response to the microwave radiation. It was through this early observation that it became known to the art that microwaves could cause a direct perception of sound within a human brain. These buzzing or clicking sounds however were not meaningful, and were not perception of sounds which could otherwise be heard by the receiver. This type of microwave radiation was not representative of any intelligible sound to be perceived. In such radar installations, there was never a sound which was generated which resulted in subsequent generation of microwave signals representative of that sound.

Since the early perception of buzzing and clicking, further research has been conducted into the microwave reaction of the brain. In an article entitled "Possible Microwave Mechanisms of the Mammalian Nervous System" by Philip L. Stocklin and Brain F. Stocklin, published in the TIT Journal of Life Sciences, Tower International Technomedical Institute, Inc. P.O. Box 4594, Philadelphia, Pa. (1979) there is disclosed a hypothesis that the mammalian brain generates and uses electro magnetic waves in the lower microwave frequency region as an integral part of the functioning of the central and peripheral nervous systems. This analysis is based primarily upon the potential energy of a protein integral in the neural membrane.

In an article by W. Bise entitled "Low Power Radio-Frequency and Microwave Effects On Human Electroencephalogram and Behavior", Physiol. Chemistry Phys. 10, 387 (1978), it is reported that there are significant effects upon the alert human EEG during radiation by low intensity CW microwave electromagnetic energy. Bise observed significant repeatable EEG effects for a subject during radiation at specific microwave frequencies.

SUMMARY OF THE INVENTION

Results of theoretical analysis of the physics of brain tissue and the brain/skull cavity, combined with experimentally-determined electromagnetic properties of mammalian brain tissue, indicate the physical necessity for the existence of electromagnetic standing waves, called modes in the living mammalian brain. The mode characteristics may be determined by two geometric properties of the brain; these are the cephalic index of the brain (its shape in prolate spheroidal coordinates)

and the semifocal distance of the brain (a measure of its size). It was concluded that estimation of brain cephalic index and semifocal distance using external skull measurements on subjects permits estimation of the subject's characteristic mode frequencies, which in turn will permit a mode by mode treatment of the data to simulate hearing.

This invention provides for sound perception by individuals who have impaired hearing resulting from ear damage, auditory nerve damage, and damage to the auditory cortex. This invention provides for simulation of microwave radiation which is normally produced by the auditory cortex. The simulated brain waves are introduced into the region of the auditory cortex and provide for perceived sounds on the part of the subject.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the acoustic filter bank and mode control matrix portions of the hearing device of this invention.

FIG. 2 shows the microwave generation and antenna portion of the hearing device of this invention.

FIG. 3 shows a typical voltage divider network which may be used to provide mode partition.

FIG. 4 shows another voltage divider device which may be used to provide mode partition.

FIG. 5 shows a voltage divider to be used as a mode partition wherein each of the resistors is variable in order to provide adjustment of the voltage outputs.

FIG. 6 shows a modified hearing device which includes adjustable mode partitioning, and which is used to provide initial calibration of the hearing device.

FIG. 7 shows a group of variable oscillators and variable gain controls which are used to determine hearing characteristics of a particular subject.

FIG. 8 shows a top view of a human skull showing the lateral dimension.

FIG. 9 shows the relationship of the prolate spherical coordinate system to the cartesian system.

FIG. 10 shows a side view of a skull showing the medial plane of the head, section A—A.

FIG. 11 shows a plot of the transverse electric field amplitude versus primary mode number M.

FIG. 12 shows a left side view of the brain and auditory cortex.

FIG. 13 shows the total modal field versus angle for source location.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

This invention is based upon observations of the physical mechanism the mammalian brain uses to perceive acoustic vibrations. This observation is based in part upon neuro anatomical and other experimental evidence which relates to microwave brain stimulation and the perception of sounds.

It is has been observed that monochromatic acoustic stimuli (acoustic tones, or single tones) of different frequencies uniquely stimulate different regions of the cochlea. It has also been observed that there is a corresponding one to one relationship between the frequency of a monochromatic acoustic stimulus and the region of the auditory cortex neurally stimulated by the cochlear nerve under the physiologically normal conditions (tonotopicity).

It is has been observed that for an acoustic tone of a frequency which is at the lower end of the entire acoustical range perceivable by a person, that a thin lateral region ("Line") parallel to the medial axis of the brain and toward the inferior portion of the primary auditory cortex is stimulated. For an acoustic tone whose frequency is toward the high end of the entire perceivable acoustic range, a thin lateral region parallel to the medial axis and toward the superior portion of the primary auditory cortex is stimulated.

Neural stimulation results in the generation of a broad band of microwave photons by the change in rotational energy state of protons integral to the neuron membrane of the auditory cortex. The physical size and shape of the brain/skull cavity, together with the (semiconductor) properties (conductivity and dielectric constant) of the brain tissue provide an electromagnetic resonant cavity. Specific single frequencies are constructively reinforced so that a number of standing electromagnetic waves, each at its own single electromagnetic frequency in the microwave frequency region, are generated in the brain. Each such standing electromagnetic wave is called a characteristic mode of the brain/skull cavity.

Analysis in terms of prolate spheroidal wave functions indicates that transverse electric field components of these modes have maxima in the region of the auditory cortex. This analysis further shows that transverse electric field possess a variation of amplitude with angle in the angular plane (along the vertical dimension of the auditory cortex) and that is dependent only upon the primary mode number.

The auditory cortex in the normally functioning mammalian brain is a source of microwave modes. The auditory cortex generates these modes in accordance with the neural stimulation of the auditory cortex by the cochlear nerve. Mode weighting for any one acoustic tone stimulus is given by the amplitude of each mode along the line region of the auditory cortex which is neurally stimulated by that acoustic tone stimulus. A listing of mode weighting versus frequency of acoustic stimulus is called the mode matrix.

In this invention, the functions of the ear, the cochlear nerve, and the auditory cortex are simulated. Microwaves simulating the mode matrix are inserted directly into the region of the auditory cortex. By this insertion of simulated microwave modes, the normal operation of the entire natural hearing mechanism is simulated.

Referring now to FIG. 1 and FIG. 2 there is shown an apparatus which provides for induced perception of sound into a mammalian brain. This hearing device includes a microphone **10** which receives sounds, an acoustic filter bank **12** which separates the signals from the microphone into component frequencies, and a mode control matrix **14** which generates the mode signals which are used to control the intensity of microwave radiations which are injected into the skull cavity in the region of the auditory cortex.

The acoustic filter bank **12** consists of a bank of acoustic filters F1 through Fk which span the audible acoustic spectrum. These filters may be built from standard resistance, inductance, and capacitance components in accordance with well established practice. In the preferred embodiment there are 24 filters which correspond to the observed critical bandwidths of the human ear. In this preferred embodiment a typical list of filter parameters is given by Table 1 below:

TABLE I

Filter No.	Center Frequency (Hz)	Bandwidth (Hz)
1	50	less than 100
2	150	100
3	250	100
4	350	100
5	450	110
6	570	120
7	700	140
8	840	150
9	1,000	160
10	1,170	190
11	1,370	210
12	1,600	240
13	1,850	280
14	2,150	320
15	2,500	380
16	2,900	450
17	3,400	550
18	4,000	700
19	4,800	900
20	5,800	1,100
21	7,000	1,300
22	8,500	1,800
23	10,500	2,500
24	13,500	3,500

The rectifier outputs one through K are feed to K mode partition devices. The mode partitioning devices each have N outputs wherein N is the number of microwave oscillators used to generate the microwave radiation. The outputs 1 through N of each mode partition device is applied respectively to the inputs of each gain controlled amplifier of the microwave radiation generator. The function of the mode control matrix **14** is the control of the microwave amplifiers in the microwave amplifier bank **18**. In the preferred embodiment thus will be 24 outputs and 24 microwave frequency oscillators.

Connected to each microwave amplifier gain control line is a mode simulation device **16** which receives weighted mode signals from the mode partition devices **14**. Each mode simulation device consists of one through k lines and diodes **17** which are each connected to summing junction **19**. The diodes **17** provide for isolation from one mode partition device to the next. The diodes **17** prevent signals from one mode partition device from returning to the other mode partition devices which are also connected to the same summing junction of the mode summation device **16**. The diodes also serve a second function which is the rectification of the signals received from the acoustic filter bank by way of the mode partition devices. In this way each mode partition device output is rectified to produce a varying DC voltage with major frequency components of the order of 15 milliseconds or less. The voltage at the summation junction **19** is thus a slowly varying DC voltage.

The example mode partition devices are shown in greater detail in FIGS. **3**, **4**, and **5**. The mode partition devices are merely resistance networks which produce 1 through N output voltages which are predetermined divisions of the input signal from the acoustic filter associated with the mode partition device. FIG. 3 shows a mode partitioning device wherein several outputs are associated with each series resistor **30**. In the embodiment depicted in FIG. **4** there is an output associated with each series resistor only, and thus there are N series resistors, or the same number of series resistors as there are outputs. The values of the resistors in the mode partition resistor network are determined in accordance with the magnitudes of the frequency component from the acoustic filter bank **12** which is required at the summation point **19** or the gain control line for amplifiers **20**.

The microwave amplifier bank **18** consists of a plurality of microwave oscillators **1** through N each of which is connected to an amplifier **20**. Since the amplifiers **20** are gain controlled by the signals at summation junction **19**, the magnitude of the microwave output is controlled by the mode control matrix outputs F1 through F_n. In the preferred embodiment there are 24 amplifiers.

The leads from the microwave oscillators **1** through N to the amplifiers **20** are shielded to prevent cross talk from one oscillator to the next, and to prevent stray signals from reaching the user of the hearing device. The output impedance of amplifiers **20** should be 1000 ohms and this is indicated by resistor **21**. The outputs of amplifiers **20** are all connected to a summing junction **22**. The summing junction **22** is connected to a summing impedance **23** which is approximately 50 ohms. The relatively high amplifier output impedance **21** as compared to the relatively low summing impedance **23** provides minimization of cross talk between the amplifiers. Since the amplitude of the microwave signal needed at the antenna **24** is relatively small, there is no need to match the antenna and summing junction impedances to the amplifier **20** output impedances. Efficiency of the amplifiers **20** is not critical.

Level control of the signal at antenna **24** is controlled by pick off **25** which is connected to the summing impedance **23**. In this manner, the signal at antenna **24** can be varied from 0 (ground) to a value which is acceptable to the individual.

The antenna **24** is placed next to the subject's head and in the region of the subject's auditory cortex **26**. By placement of the antenna **24** in the region of the auditory cortex **26**, the microwave field which is generated simulates the microwave field which would be generated if the acoustic sounds were perceived with normal hearing and the auditory cortex was functioning normally.

In FIG. **2A** there is shown a second embodiment of the microwave radiation and generator portion of the hearing device. In this embodiment a broad band microwave source **50** generates microwave signals which are feed to filters **52** through **58** which select from the broad band radiation particular frequencies to be transmitted to the person. As in FIG. **2**, the amplifiers **20** receive signals on lines **19** from the mode control matrix. The signals on lines **19** provide the gain control for amplifiers **20**.

In FIG. **6** there is shown a modified microwave hearing generator **60** which includes a mode partition resistor divider network as depicted in FIG. **5**. Each of the mode partition voltage divider networks in this embodiment are individually adjustable for all of the resistances in the resistance network. FIG. **5** depicts a voltage division system wherein adjustment of the voltage partition resistors is provided for.

In FIG. **6**, the sound source **62** generates audible sounds which are received by the microphone of the microwave hearing generator **60**. In accordance with the operation described with respect to FIGS. **1** and **2**, microwave signals are generated at the antenna **10** in accordance with the redistribution provided by the mode control matrix as set forth in FIG. **5**.

The sound source **62** also produces a signal on line **64** which is received by a head phone **66**. The apparatus depicted in FIG. **6** is used to calibrate or fit a microwave hearing generator to a particular individual. Once the hearing generator is adjusted to the particular individual by adjustment of the variable resistors in the adjustable mode partition portion of the hearing generator, a second generator may be built using fixed value resistors in accordance with the adjusted values achieved in fitting the device to the particular subject. The sound produced by headphone **66** should be the same as a sound from the sound source **62** which is received by the microphone **10** in the microwave hearing generator **60**. In this way, the subject can make comparisons between the perceived sound from the hearing generator **60**, and the sound which is heard from headphone **66**. Sound source **62** also produces a signal on **68** which is feed to cue light **69**. Cue light **69** comes on whenever a sound is emitted from sound source **62** to the microwave generator **60**. In this manner, if the subject hears nothing, he will still be informed that a sound has been omitted and hence that he is indeed perceiving no sound from the microwave hearing generator **60**.

In FIG. **7** there is shown a modified microwave hearing generator which may be used to determine a subject's microwave mode frequencies. In this device, the acoustic filter bank and the mode control matrix have been removed and replaced by voltage level signal generated by potentiometers **70**. Also included are a plurality of variable frequency oscillators **72** which feed microwave amplifiers **74** which are gain controlled from the signal generated by potentiometers **70** and pick off arm **76**.

This modified microwave hearing generator is used to provide signals using one oscillator at a time. When an oscillator is turned on, the frequency is varied about the estimated value until a maximum acoustic perception by the subject is perceived. This perception however may consist of a buzzing or hissing sound rather than a tone because only one microwave frequency is being received. The first test of perception is to determine the subject's lowest modal frequency for audition (M=1). Once this modal frequency is obtained, the process is repeated for several higher modal frequencies and continued until no maximum acoustic perception occurs.

Another method of determination of a subject's modal frequencies is through anatomical estimation. This procedure is by measurement of the subject's cephalic index and the lateral dimensions of the skull. In this method, the shape is determined in prolate spheroidal coordinance.

Purely anatomical estimation of subject's modal frequencies is performed by first measuring the maximum lateral dimension (breadth) L FIG. **8**, of the subject's head together with the maximum dimension D (anterior to posterior) in the medial plane of the subject's head. D is the distance along Z axis as shown in FIG. **10**. The ratio L/D, called in anthropology the cephalic index, is monotonically related to the boundary value ξ_o defining the ellipsoidal surface approximating the interface between the brain and the skull in the prolate spheroidal coordinate system. ξ_o defines the shape of this interface; ξ_o and D together give an estimate of a, the semi-focal distance of the defining ellipsoid. Using ξ_o and a, together with known values of the conductivity and dielectric constants of brain tissue, those wavelengths are found for which the radial component of the electric field satisfies the boundary condition that it is zero at ξ_o.

These wavelengths are the wavelengths associated with the standing waves or modes; the corresponding frequencies are found by dividing the phase velocity of microwaves in brain tissue by each of the wavelengths.

A subject's microwave modal frequencies may also be determined by observing the effect of external microwave radiation upon the EEG. The frequency of the M equal 1 mode may then be used as a base point to estimate all other modal frequencies.

A typical example of such an estimation is where the subject is laterally irradiated with a monochromatic microwave field simultaneous with EEG measurement and the microwave frequency altered until a significant change occurs in the EEG, the lowest such frequency causing a significant EEG change is found. This is identified as the frequency of the M=1 mode, the lowest mode of importance in auditory perception. The purely anatomical estimation procedure (FIGS. **8**, **9**, **10**) is then performed and the ratio of each modal frequency to the M=1 modal frequency obtained. These ratios together with the experimentally-determined M=1 frequency are then used to estimate the frequencies of the mode numbers higher than 1. The prolate spheroidal coordinate system is shown in FIG. **9**. Along the lateral plane containing the x and y coordinates of FIG. **9**, the prolate spheroidal coordinate variable ϕ (angle) lies FIGS. **9** and **10**. Plots of the transverse electric field amplitude versus primary mode number m are shown in FIG. **11**. The equation is

$$E_{transverse}(m, \phi) = E_o \sin(m\, \phi)$$

The "elevation view" FIG. **12**, of the brain from the left side, shows the primary auditory cortex **10**. The iso-tone lines and the high frequency region are toward the top of **100** and the low frequency region toward the bottom of **100**.

The formula I, set forth below is the formula for combining modes from an iso-tone line at $\phi=\phi j$ being excited to obtain the total modal field at some other angular location ϕ. For this formula, if we let J=1 (just one iso-tone single frequency acoustic stimulus line), then it can be shown that ALL modes (in general) must be used for any ONE tone.

FORMULA I
RMS TRANSVERSE ELECTRIC
FIELD IN ANGULAR PLANE, $f(\theta)$

$$f(\theta) = \left[\sum_{m=1}^{M} \left\{ \sin(m\theta) \cdot \sum_{j=1}^{J} e^{-(\theta-\theta_j)/\Delta\theta_m} \sin(m\theta_j) \right\}^2 \right]^{\frac{1}{2}}$$

ϕ=ANGLE (0° LATERAL)
ϕ_j=LOCATION OF j-TH SOURCE (TOTAL NUMBER J)
$\Delta\phi_m$=ATTENUATION LENGTH (IN ANGLE) OF m-TH MODE
m=PRIMARY MODE NUMBER (HIGHEST MODE M)

FIG. **13** shows the resulting total modal field versus angle ϕ for source location ϕ at 5.25°, 12.5°, etc. With reference to the set of curves at the left top of this figure. A spacing of approximately 7.25° in ϕ corresponds to a tonal difference of about 1 octave. This conclusion is based on the side-lobes of pattern coming from ϕ=5.25°, etc. The total filed (value on y-axis) falls considerably below the top curves for source locations well below 5.25° (toward the high acoustic stimulus end) and also as the source of frequency goes well above 30° (low frequency end). ϕ is plotted positive downward from 0° at lateral location as indicates in FIG. **11**.

Resistor weightings are obtained from the |sin (m[$\phi-\phi$j])|, Formula I. The scale between acoustic frequency and ϕ must be set or estimated from experiment. Approximately 5.25±1° corresponds to a tonal stimulus at about 2 kHz (the most sensitive region of the ear) since this source location gives the highest electric field amplitude.

The apparatus of FIG. **7** may also be used to determine values for a hearing device which are required for a particular subject. Once the modal frequencies have been estimated, the device of FIG. **7** which includes variable microwave oscillators may be used to determine values for the oscillators which match the subject, and to determine resistance values associated with the mode partition devices of the mode control matrix.

In FIG. **7** manual control of the amplifier gain is achieved by potentiometers **76**. In this manner the amplifier gains are varied about the estimated settings for an acoustic tone stimulus in the region of two thousand Hertz (2 kHz) until maximum acoustic perception and a purest tone are achieved together. The term purest tone may also be described as the most pleasing acoustic perception by the subject. This process may be repeated at selected frequencies above and below 2 kHz. The selected frequencies correspond to regions of other acoustic filter center frequencies of the subject. When modal frequency (oscillator frequency) and gain set values (setting a potentiometer **76**) are noted, it is then possible to calculate fixed oscillator frequencies and control resistor values for the adjusted hearing device for this particular subject.

In the event the subject has no prior acoustic experience, that is deaf from birth, estimated resistor values must be used. Also, a complex acoustic stimulation test including language articulation and pairs of harmonically related tones may be developed to maximize the match of the hearing device parameters for those of this particular subject.

Typical components for use in this invention include commercially available high fidelity microphones which have a range of 50 Hz to 15 kHz with plus or minus 3 dB variation.

The audio filters to be used with the acoustic filter bank **12** are constructed in a conventional manner, and have Q values of about 6. The filters may also be designed with 3 dB down points (½ the bandwidth away from the center frequency) occurring at adjacent center frequency locations.

The diodes **17** in the mode control matrix which provide isolation between the mode partition circuits are commercially available diodes in the audio range.

The microwave oscillators **1** through N and the microwave amplifiers **20** are constructed with available microwave transistors which can be configured either as oscillators or amplifiers. Examples of the transistors are GaAsFET field effect transistors by Hewlitt Packard known as the HFET series or silicone bipolar transistors by Hewlitt Packard known as the HXTR series.

All the cable between the oscillators, the microwave amplifiers, and the antenna should be constructed with either single or double shielded coaxial cable.

The antenna **24** for directing microwave signals to the audio cortex **26** should be approximately the size of the auditory cortex. A typical size would be one and one half CM high and one half to one CM wide. The antenna as shown is located over the left auditory cortex, but the right may also be used. Since the characteristic impedance of the brain tissue at these microwave frequencies is close to 50 ohms, efficient transmission by commercially available standard 50 ohm coax is possible.

The invention has been described in reference to the preferred embodiments. It is, however, to be understood that other advantages, features, and embodiments may be within the scope of this invention as defined in the appended claims.

What is claimed is:

1. A sound perception device for providing induced perception of sound into a mammalian brain comprising in combination:

means for generating microwave radiation which is representative of a sound to be perceived, said means for generating including means for generating a simultaneous plurality of microwave radiation frequencies and means for adjusting the amplitude of said microwave radiation frequencies in accordance with the sound to be perceived; and

antenna means located in the region of the auditory cortex of said mammalian brain for transmitting said microwave energy into the auditory cortex region of said brain.

2. A hearing device for perception of sounds comprising in combination:

means for generating a signal representative of sounds;

means for analyzing said signal representative of said sounds having an output;

means for generating a plurality of microwave signals having different frequencies having a input connected to said output of said means for analyzing said signals, having an output;

means for applying said plurality of microwave signals to the head of a subject, and

whereby the subject perceives sounds which are representative of said sounds.

3. The apparatus in accordance with claim 2 wherein said means for generating a signal is a microphone for detecting sound waves.

4. The apparatus in accordance with claim 2 wherein said means for applying said plurality of microwave signals is an antenna.

5. The apparatus in accordance with claim 4 wherein said antenna is placed in the region of the auditory cortex of the subject.

6. The apparatus in accordance with claim 2 wherein the subject is a human being.

7. The apparatus in accordance with claim 2 wherein said means for analyzing said signal comprises:

an acoustic filter bank for dividing said sounds into a plurality of component frequencies; and

a mode control matrix means for providing control signals which are weighted in accordance with said plurality of component frequencies, having an output connected to said means for generating a plurality of microwave signal inputs.

8. The apparatus in accordance with claim 7 wherein said acoustic filter bank includes a plurality of audio frequency filters.

9. The apparatus in accordance with claim 8 wherein said audio frequency filters provide a plurality of output frequencies having amplitudes which are a function of said signal representative of sounds.

10. The apparatus in accordance with claim 9 wherein said amplitudes are the weighted in accordance with transform function of the signal representative of sounds.

11. The apparatus in accordance with claim 7 wherein said mode control matrix device includes a voltage divider connected to each of said plurality of said audio frequency filters.

12. The apparatus in accordance with claim 11 wherein each of said voltage dividers has a plurality of outputs which are connected in circuit to said means for generating a plurality of microwave signals.

13. The apparatus in accordance with claim 2 wherein said means for generating a plurality of microwave signals comprises a plurality of microwave generators each having a different frequency and means for controlling the output amplitude of each of said generators.

14. The apparatus in accordance with claims 2 wherein said means for generating a plurality of microwave signals comprises a broad band microwave source and a plurality of filters.

15. The apparatus in accordance with claim 13 wherein said generators each comprise a microwave signal source and a gain controlled microwave amplifier.

16. The apparatus in accordance with claim 13 wherein said means for analyzing output is connected to said means for controlling microwave amplifier output amplitudes.

17. The apparatus in accordance with claim 13 wherein analyzing includes K audio frequency filters.

18. The apparatus in accordance with claim 17 wherein there are N microwave generators.

19. The apparatus in accordance with claim 18 including a mode partitioning means which provides N outputs for each of said K audio frequency filters.

20. The apparatus in accordance with claim 19 wherein said N amplifiers each have K inputs from said mode partitioning means.

21. The apparatus in accordance with claim 20 wherein said N amplifiers have K inputs less the mode partitioning means outputs which are so small that they may be omitted.

22. The apparatus in accordance with claim 20 wherein said mode partitioning output device outputs each include a diode connected to each microwave amplifier gain control to provide isolation between all outputs.

23. The apparatus in accordance with claim 20 wherein said K audio frequency filters are chosen to correspond to the critical bandwidths of the human ear.

24. The apparatus in accordance with claim 20 wherein said N microwave generators are each adjustable in frequency output.

25. The apparatus in accordance with claim 18 wherein the frequency of each N microwave generators is determined by anatomical estimation.

26. The apparatus in accordance with claim 18 wherein the frequency of the lowest frequency microwave generator is chosen by determination of the effect of external microwave generation on the EEG of the subject.

27. The apparatus in accordance with claim 18 wherein the frequency of each of said N microwave generators corresponds to the subject's microwave modal frequencies.

28. The apparatus in accordance with claim 27 wherein the subject's modal frequencies are determined by measurement of the subject's cephalic index and the lateral dimensions of the skull.

29. The apparatus in accordance with claim 28 wherein the subject's lowest modal frequency is determined by varying the frequency of the lowest frequency microwave generator about the estimated value until a maximum acoustic perception is obtained by the subject.

* * * * *

PDF SECTION: UNITED STATES PATENTS.

United States Patent [19]

Lundy et al.

[11] **4,395,600**

[45] **Jul. 26, 1983**

[54] **AUDITORY SUBLIMINAL MESSAGE SYSTEM AND METHOD**

[76] Inventors: **Rene R. Lundy**, 3016 SE. 39th; **David L. Tyler**, 2939 SE. Taylor, both of Portland, Oreg. 97214

[21] Appl. No.: **210,645**

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[52] **U.S. Cl.** .... **179/1.5 M;** 340/348 E; 179/1 AA

[58] **Field of Search** .... 179/1 AA, 1 P, 1.5 M; 340/348 E; 358/183, 22; 430/9; 178/17.5; 250/214 R; 352/130, 131, 201, 81

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[57] **ABSTRACT**

Ambient audio signals from the customer shopping area within a store are sensed and fed to a signal processing circuit that produces a control signal which varies with variations in the amplitude of the sensed audio signals. A control circuit adjusts the amplitude of an auditory subliminal anti-shoplifting message to increase with increasing amplitudes of sensed audio signals and decrease with decreasing amplitudes of sensed audio signals. This amplitude controlled subliminal message may be mixed with background music and transmitted to the shopping area. To reduce distortion of the subliminal message, its amplitude is controlled to increase at a first rate slower than the rate of increase of the amplitude of ambient audio signals from the area. Also, the amplitude of the subliminal message is controlled to decrease at a second rate faster than the first rate with decreasing

ambient audio signal amplitudes to minimize the possibility of the subliminal message becoming supraliminal upon rapid declines in ambient audio signal amplitudes in the area. A masking signal is provided with an amplitude which is also controlled in response to the amplitude of sensed ambient audio signals. This masking signal may be combined with the auditory subliminal message to provide a composite signal fed to, and controlled by, the control circuit.

29 Claims, 5 Drawing Figures

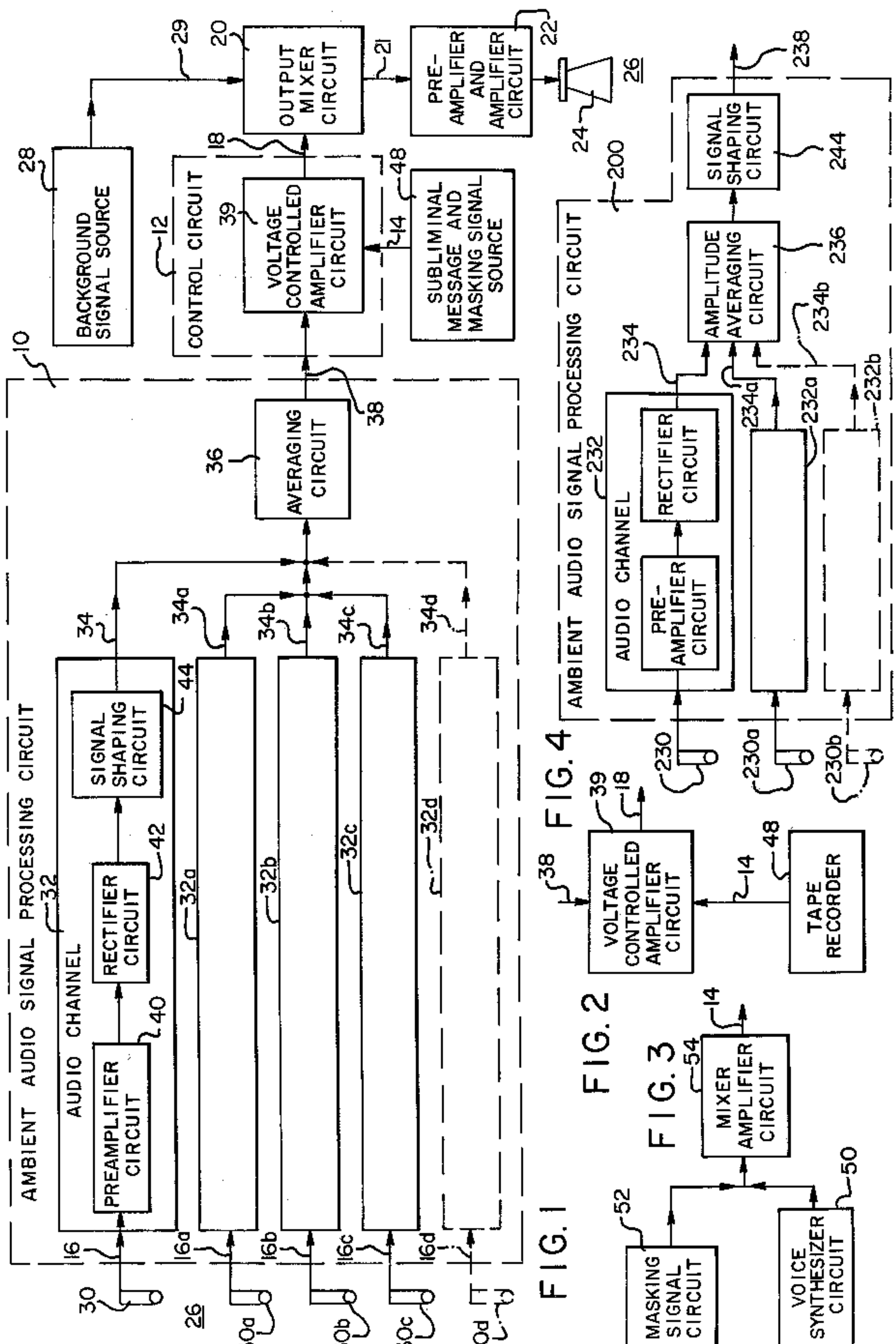

FIG. 1

FIG. 2

FIG. 3

FIG. 4

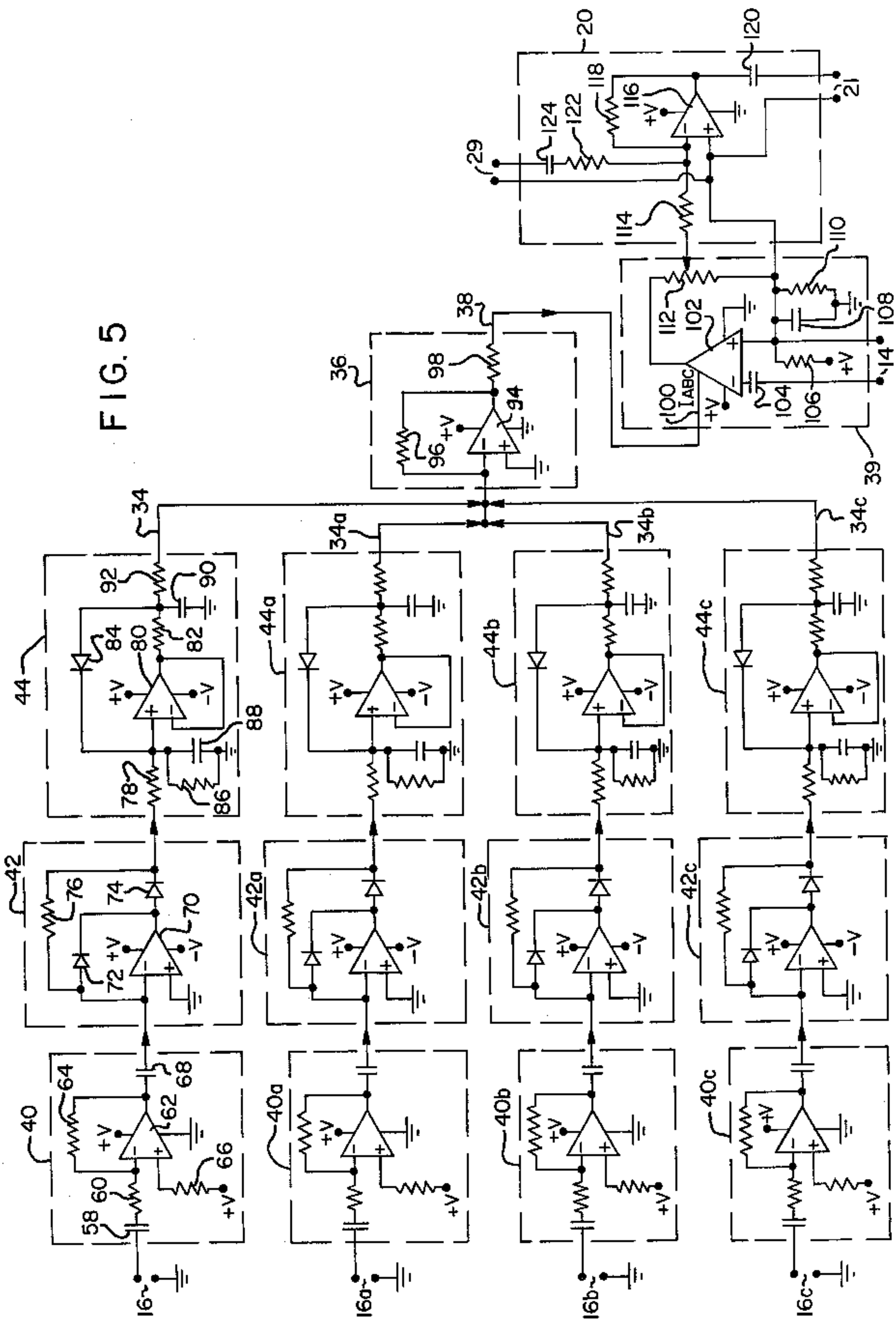

FIG. 5

AUDITORY SUBLIMINAL MESSAGE SYSTEM AND METHOD

BACKGROUND OF THE INVENTION

The present invention relates to a system and method for providing subliminal auditory signals to an area such as a customer shopping area within a store. More particularly, the invention relates to such a system and method in which the amplitude of the subliminal signal is adjusted in response to the amplitude of ambient audio signals from the customer shopping area.

It has been established that auditory subliminal signals, that is, those presented below the conscious recognition level of the listener, can be used to influence the listener's behavior to some degree. Some early research into visual and auditory subliminal stimulation effects are exemplified in U.S. Pat. Nos. 3,060,795 of Corrigan, et al. and 3,278,676 of Becker.

In addition, Becker is understood to have experimented with the use of auditory subliminal messages to deter shoplifting by retail store customers. Although applicants have not seen or studied Mr. Becker's device, it is believed to combine an auditory subliminal message with background music. However, during non-peak shopping and other times when the store area is exceptionally quiet, the background music signal component in Becker must be much louder than the subliminal signal as otherwise the subliminal signal would be at a level such that it may be consciously recognized by a listener. In addition, as a result of this large difference between the amplitude of the background music and that of the subliminal message signal, the effectiveness of the Becker subliminal message is reduced. Also, Becker is understood to maintain his combined background music and subliminal message at a level sufficiently high enough to enable the music to be heard even under noisy store conditions. However, when the ambient audio signal level drops, such as during non-peak store traffic times, the combined background music and subliminal signal would remain the same and seem overly loud. Thus, Becker is simply not understood to control the amplitude of a subliminal message in response to ambient audio signals from an area.

Accordingly, there is a need for an auditory subliminal message system and method which solves these and other problems.

SUMMARY OF THE INVENTION

The present invention is a method and system for adjusting the amplitude of an auditory subliminal message in response to the amplitude of ambient audio signals from an area to which the subliminal message is to be transmitted. In accordance with one aspect of the invention, an audio signal processing circuit means receives signals representing the amplitude of audio signals in the area, such as a retail shopping area of a store. This processing circuit means produces a control signal for an amplitude adjustment or control circuit means which adjusts the amplitude or volume of an auditory subliminal signal which is to be transmitted to the area. The amplitude of the auditory subliminal signal is adjusted to increase with increasing sensed ambient audio signals and decrease with decreasing sensed ambient audio signals.

As a more specific aspect of the invention, a masking signal is generated and fed to the area. This masking signal has frequency and amplitude characteristics which cover or render the subliminal signal inperceptible to the conscious recognition level of a listener. In the preferred embodiment, the amplitude of this masking signal is also controlled in response to the sensed ambient audio signals so that its amplitude follows the amplitude of the adjusted subliminal message signal. The masking signal may be combined with the subliminal signal to provide a composite signal having an amplitude controlled by the control circuit in response to the control signal.

As a more specific feature of the invention, to reduce distortion of the subliminal message signal, the processing circuit means produces a control signal which causes the control circuit means to increase the amplitude of the auditory subliminal message signal slowly at a rate slower than the rate of change of the ambient audio signals at times when the ambient audio signals are increasing in magnitude. In addition, at times when the ambient audio signals are decreasing to minimize the possibility of conscious perception of the subliminal message signal, the processing circuit means produces a control signal which causes the control circuit means to decrease the amplitude of the subliminal signal at a fast rate.

It is accordingly one object of the invention to provide an improved auditory subliminal message system and method.

Another object of the invention is to provide an auditory subliminal message having an amplitude which is adjusted in response to ambient noise levels within an area to which the auditory subliminal message is to be transmitted.

A further object of the invention is to provide a method and system which adjusts the amplitude of an auditory subliminal message at one rate with increasing ambient audio signal levels in the area and at another, faster rate with decreasing ambient audio signal levels.

A still further object of the invention is to provide such a method and system in which the amplitude of an auditory subliminal signal is adjusted to rise at a rate slower than the rate of increases in ambient audio signal levels.

Another object of the invention is to provide an auditory subliminal message which is continuously maintained below the conscious perception level.

A further object of the invention is to provide an auditory subliminal message which is maintained below the conscious perception level of listeners in an area and which is adjusted in response to ambient audio signals in the area so as to remain close to the level of conscious perception.

Still another object of the invention is to provide an auditory masking signal for an auditory subliminal message, the masking signal having an amplitude which is adjusted in response to ambient noise levels in an area to which the auditory subliminal message is to be transmitted.

A more specific object of the invention is to provide an auditory subliminal message anti-shoplifting system and method.

These and other objects, features and advantages of the invention will become apparent with reference to the following drawings and description.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing

FIG. 1 is a block diagram of an auditory subliminal message system in accordance with the present invention;

FIG. 2 is a block diagram illustrating one embodiment of an auditory subliminal message signal and masking signal source;

FIG. 3 is a block diagram showing another embodiment of an auditory subliminal message signal and masking signal source;

FIG. 4 is a block diagram showing an alternate ambient audio signal processing circuit; and

FIG. 5 is a detailed circuit schematic diagram of the ambient audio signal processing circuit and other portions of the circuit of FIG. 1.

DETAILED DESCRIPTION

General Description of Preferred Embodiment

It has now been discovered that in an environment with constantly changing ambient audio levels, such as in the shopping area of a store, it is desirable to adjust the amplitude of an auditory subliminal message signal to follow the amplitude of the ambient audio signals. That is, by increasing the amplitude of the auditory subliminal message with increasing ambient audio levels and decreasing the amplitude of the subliminal signal with decreasing ambient audio levels, the subconscious perception of the subliminal message by listeners is improved. This in turn increases the effectiveness of the subliminal message.

Therefore, with reference to FIG. 1, the system includes circuit means for controlling the amplitude of an auditory subliminal message signal in response to the level of ambient sounds in an area 26, such as the customer shopping area within a store, to which the subliminal message signal is to be transmitted. Such circuit means includes an ambient audio signal processing circuit 10 and a control circuit 12. Control circuit 12 is adapted to receive an auditory subliminal message signal input at 14 and processing circuit 10 has at least one input 16 for receiving signals representing the amplitude or volume of ambient audio signals within the area. Processing circuit 10 and control circuit 12 adjust the amplitude of the auditory subliminal message signal received at input 14, in response to the amplitude of ambient audio signals received at input 16, to produce an auditory subliminal message signal output at 18 having an amplitude which varies with variations in the level of ambient audio signals in the area.

The output signal at 18 is fed to an output circuit which, in the illustrated form, includes an output mixer circuit 20 having an input coupled to output 18, a preamplifier and amplifier circuit 22 with an input 21 coupled to the output of mixer circuit 20, and a speaker 24 for transmitting the amplitude adjusted auditory subliminal message signal to area 26. The circuit also may include an optional background auditory signal source 28 which produces music or other background auditory signals which are fed to an input 29 of the output mixer circuit 20. These background signals are combined within mixer circuit 20 with the amplitude controlled subliminal message signal and the combined signal is transmitted by speaker 24 to room 26.

The preferred embodiment of the system also includes at least one audio sensor means, such as microphone 30 positioned within the area 26. Microphone 30 detects ambient audio signals within the area and produces an electrical output signal representing these detected signals. The microphone output is fed to input 16 of ambient audio signal processing circuit 10.

Processing circuit 10 includes an audio channel 32 associated with microphone 30 for modifying the input 16 to produce an audio channel output signal at 34 which varies with variations in the ambient audio signal input at 16, as explained below. Preferably, plural microphones 30, 30*a*, 30*b*, 30*c*, 30*d*, etc. are provided for detecting ambient audio signals in various parts of the area 26. For convenience, these microphones may be positioned in the ceiling of the shopping area. A respective audio channel 32*a*, 32*b*, 32*c* and 32*d* is associated with each of the microphones 30*a*, 30*b*, 30*c* and 30*d* and produces output signals 34*a*, 34*b*, 34*c* and 34*d* in the same manner as the audio channel 32. The output signals 34 are averaged by an averaging circuit 36 to produce an output control signal at 38 which varies with variations in the amplitude of ambient audio signals sensed by the microphones throughout the store area 26.

In the embodiment of FIG. 1, each audio channel 32 includes a preamplifier circuit 40 for amplifying the input signal 16, a rectifier circuit 42 for rectifying the amplified input signal and a signal shaping circuit 44 for modifying the rectified ambient audio signal input from microphone 30, as explained below.

In connection with this signal shaping circuit, it has now been discovered that rapid changes of an amplitude of an auditory subliminal signal can distort it to such an extent that it becomes unrecognizable to subconscious perception. Hence, to reduce such distortion and increase the subconscious perceptibility of the subliminal signal, the signal shaping circuit adjusts the control signal to cause the amplitude of the auditory subliminal message signal at a rate which is slower than the rate of increase of ambient audio signals at times when the amplitude of such ambient signals is increasing. However, with sudden drops in the level of ambient audio signals, a slow drop in the amplitude of the subliminal message could lead to conscious perception of this message. This can be extremely disadvantageous in situations wherein it is desired to keep the existence of the subliminal message a secret. Therefore, the signal shaping circuit adjusts the control signal to cause the volume of the auditory subliminal message to drop at a faster rate upon a decrease in the volume of ambient audio signals.

Hence, with this form of signal shaping circuit 44, the control signal output at 38 of the averaging circuit 36 varies at one rate with increasing ambient audio signals and at another faster rate with decreasing ambient audio signals. Furthermore, control circuit 12 is responsive to this varying control signal to produce an amplitude adjusted auditory subliminal message output at 18 which increases at a first rate with increases in ambient audio signals and decreases at a second rate, faster than the first rate, with decreases in ambient audio signals. In addition, to prevent distortion of the subliminal message, the first rate is slower than the rate of increase of the ambient audio signals.

It has also now been discovered that time lags are introduced into an auditory subliminal system. Such time lags are primarily due to the amount of time required by ambient audio signals is travel to microphones and the time required by an amplitude controlled subliminal message to travel from speakers to a listener. Thus, no matter how quickly the system reduces the amplitude of the auditory subliminal message in response to declining ambient sound levels, a reduction in the amplitude of the subliminal message would lag the reduction in volume of ambient sound. Thus, a rapid drop in ambient sound level could momentarily leave the subliminal message signal at a level sufficiently high to be perceived by a listener. In certain applications this would prove extremely disadvantageous.

For example, if an anti-shoplifting subliminal system is used to deter shoplifting in a store, customers may be extremely reluctant to patronize the store if they consciously perceive a normally anti-shoplifting message and hence realize that such a system is in use. Thus, although a store may realize savings due to a reduction in shoplifting, its overall profits may suffer because of customer reluctance to patronize a store wherein such a system is in use. Hence, in such applications it is desirable to maintain the subliminal signal continuously below the conscious perception range of listeners. On the other hand, in other applications such as in connection with a weight loss class in which the listeners realize that an auditory subliminal weight loss message is being transmitted, it is not as critical to continuously maintain the subliminal message below conscious perception levels.

To solve this problem, the preferred embodiment of the system includes means for producing a masking signal which screens the auditory subliminal message and blocks its conscious perception, particularly during times when the volume of ambient noise drops quickly. Thus, as illustrated in FIG. 1, the system includes a subliminal message and masking signal source means 48 which produces the auditory subliminal message signal fed to input 14 of control circuit 12. In addition, source 48 includes means for providing a masking signal with amplitude and frequency characteristics which block conscious perception of the auditory subliminal message. The masking signal may bypass control circuit 12 and be fed directly to room 26. However, it is preferable that the amplitude of the masking signal also be controlled in response to the amplitude of ambient audio signals. Otherwise, when the room becomes very quiet, the masking signal could be so loud that it is readily perceived and annoying. Also, if the masking signal amplitude remained constant while the subliminal signal amplitude dropped in response to drops in ambient sound levels, the amplitude of the masking signal would become so large relative to that of the subliminal message, that subconscious perception of the subliminal message is impaired.

Although a separate control circuit may be provided for controlling the amplitude of the masking signals, preferably the masking signal is combined with the auditory subliminal message signal and the resulting composite signal is fed to input 14 of control circuit 12. As illustrated in FIG. 1, control circuit 12 may include a voltage control amplifier circuit 39 for adjusting the output 18 in response to the control signal input 38.

As shown in FIG. 2, subliminal message and masking signal source 48 may comprise a means such as a tape recorder for playing back a recording of a composite auditory subliminal message and masking signal. In an alternate form illustrated in FIG. 3, the subliminal message and masking signal source 48 may comprise a voice synthesizer circuit 50 which produces an auditory subliminal component of the composite subliminal and masking signals. One suitable voice synthesizer circuit 50 comprises a commercially available "Digitalker" kit produced by National Semiconductor Company. This kit includes a sixteen kilobite, eight bit memory chip No. MM52116 and a speech processor chip designated SPC. In addition, a masking signal circuit 52 is provided for producing the masking signal. This circuit may take various forms and comprise a white noise signal generator circuit such as a random noise oscillator with an internal shift register. One suitable generator is available from Radio Shack and designated random events generator chip No. S2688/MM5837. The masking signal circuit and voice synthesizer circuit outputs are fed to a commercially available mixer amplifier circuit 54, in which they are combined. The mixer circuit output comprises the composite auditory signal which is fed to input 14 of the control circuit 12.

As previously mentioned, the masking signal has frequency and amplitude components which make the auditory subliminal message signal incapable of conscious recognition by a listener. More specifically, the masking signal has frequency components which overlay the frequency components of the auditory subliminal message signal. In addition, the amplitude of the masking signal is slightly higher than the amplitude of the auditory subliminal message signal. More specifically, it has now been discovered that preferred results are obtained when the amplitude of the masking signal is continuously maintained approximately within the range of 3 db to 15 db above the amplitude of the subliminal message signal. Furthermore, that the best results occur when the masking signal is approximately 5 db above the amplitude of the auditory subliminal message signal. That is, with such relative amplitudes of the masking signal to the auditory subliminal message signal, a temporary screen is provided for the subliminal message at times, such as during rapid declines in ambient noise levels, when the subliminal message may otherwise become supraliminal. Also, with such relative amplitudes, the masking signal provides a satisfactory screen for the subliminal message without impairing satisfactory subconscious perception of the auditory subliminal message. It should be noted that with such relative amplitudes of the masking signal and subliminal message signal, the masking signal typically may not block conscious perception of the subliminal signal in a situation where the composite subliminal message and masking signal are at a high amplitude in relation to the volume of ambient audio signals. However, such conditions are prevented by controlling the amplitude of the composite signal in response to ambient audio signals, as explained above.

FIG. 4 illustrates an alternate ambient audio signal processing circuit. Components of this circuit which are similar to those of the FIG. 1 form of processing circuit have numbers incremented by two hundred over the corresponding numbers in FIG. 1. Hence, these components will not be described in detail. Unlike the FIG. 1 form of processing circuit, the audio channels of the FIG. 4 embodiment do not include the signal shaping circuit. Instead, the output of the respective rectifier circuits are averaged by an averaging circuit 236 prior to signal shaping by a signal shaping circuit 244 in the manner explained above.

DETAILED CIRCUIT DESCRIPTION

With reference to FIG. 5, a four-channel audio signal processing circuit is illustrated. Since each of the illustrated channels is identical, only the upper channel will be described in detail.

The audio channel includes series connected preamplifier circuit **40**, rectifier circuit **42**, and signal shaping circuit **44**. The input **16** to the channel is obtained from the microphone **30** (FIG. **1**) and thus fluctuates in response to changes in ambient audio signals detected by the microphone. Input **16** and hence the microphone output is fed to preamplifier circuit **40**. More specifically, this input is coupled by a 0.1 microfarad capacitor **58** through a one kilohm gain establishing resistor **60** to the inverting input of an operational amplifier **62**. The output of amplifier **62** is connected through a one megohm feedback resistor **64** to its inverting input. The gain of amplifier **62** is established by the ratio of resistors **64** and **60** and, with these particular resistors is set at approximately one thousand. Also, a positive biasing voltage V is fed through a two megohm biasing resistor **66** to the noninverting input of amplifier **62**. With the circuit components utilized in the FIG. **5** circuit, the positive biasing voltage is six volts and a negative biasing voltage is at negative six volts. One suitable amplifier **62** comprises one amplifier section of an LM3900 quad Norton operational amplifier. When connected as described above, amplifier **62** inverts and amplifies the input signal at **16**.

To convert the input at **16** to a direct current signal, 0.1 microfarad capacitor **68** couples the output of amplifier **62** to the inverting input of an amplifier **70** connected as an amplifying, inverting, precision rectifier. Rectifier circuit **42** produces an output signal comprising a positive half-cycle inverted and amplified version of the input signal. More specifically, the output of amplifier **70** is connected to the anode of a diode **74** having its cathode connected through a one megohm feedback resistor **76** to the inverting input of amplifier **70**. Thus, the positive half-cycles of the output signal from amplifier **70** are coupled through diode **74** and resistor **76** to the inverting input of amplifier **70**. In contrast, the negative half-cycle output signals from amplifier **70** are blocked by diode **74**. However, because the output of amplifier **70** is connected to the cathode of a diode **72** having its anode coupled to the inverting input of amplifier **70**, these negative going half cycles are coupled through diode **72** to the inverting input of amplifier **70**. The output of rectifier **42** is taken at the cathode of diode **74** and comprises a positive representation of the input signal **16** and hence of the amplitude of ambient audio signals detected by microphone **30**. A suitable amplifier for accomplishing this rectification comprises one amplifier section of a type **324** quad operational amplifier.

The rectified output signal from rectifier circuit **42** is fed to signal shaping circuit **44**. That is, the output of the rectifier circuit is fed to a resistor-capacitor network. This network comprises a ten kilohm resistor **78** coupled between the output of rectifier **42** and the noninverting input of an operational amplifier **80**, a one microfarad capacitor **88** which couples the noninverting input of amplifier **80** to ground, and a one hundred kilohm resistor **86** in parallel with capacitor **88**. This network has a charging time constant of approximately 0.01 seconds and discharging time constant of approximately 0.1 seconds. Amplifier **80** may comprise one amplifier section of a type 324 quad operational amplifier and has its output coupled directly through a feedback loop to its noninverting input so that the amplifier acts as a voltage follower. The output of amplifier **80** drives another resistor-capacitor network including a five hundred kilohm resistor **82** and a ten microfarad capacitor **90**. The time constant of this latter resistor-capacitor is approximately five seconds. Also, a diode **84**, having a turn-on voltage of approximately 0.7 volts, has its anode connected to the contact between resistor **82** and capacitor **90** and its cathode connected to the noninverting input of amplifier **80**. The positive side of capacitor **90** is coupled through a one hundred kilohm resistor **92** to the output **34** of the audio channel. This output **34** is then fed to averaging circuit **36** as explained below.

For reasons explained above, signal shaping circuit **44** operates in the following manner to produce an output on line **34** which increases at one rate with increasing sensed ambient audio signals and which decreases at a rate faster than said one rate with decreases in the sensed audio signals. Furthermore, because of the delays within the signal shaping circuit **44** resulting from charging time of the resistor-capacitor networks, the output signal on line **34** will increase at a slower rate than the rate of increase of ambient noise signals. This slows the rate of change of the audio subliminal signal and thereby minimizes rapid amplitude fluctuations therein and resulting distortions. That is, as the amplitude of ambient audio signals increases, the signal reaching capacitor **90** also increases. However, because of the relatively long charging time constant of the resistor-capacitor network including capacitor **90**, capacitor **90** charges slowly. Hence, under those conditions the output on line **34** comprises a slowly rising DC signal. Furthermore, because the voltage at the anode of diode **84** is greater than or equal to the voltage at its cathode, diode **84** is nonconducting. In contrast, upon a sudden decrease in the amplitude of the sensed ambient audio signals, the input to operational amplifier **80** quickly decreases. As a result, the voltage at the cathode of diode **84** drops below the voltage at the anode of this diode sufficiently to cause the diode to conduct. While conducting, diode **84** establishes a short circuit between the positive side of capacitor **90**, through resistor **86** and to ground so that capacitor **90** rapidly discharges. Therefore, the output signal at **34** drops rapidly and at a rate much faster than the rate at which the output **34** rose with increases of the amplitude of the ambient audio signals. Of course, by adjusting the time constants of the resistor-capacitor circuits within shaping circuit **44**, the rate of change of the output **34** in response to changes in ambient audio signals can be adjusted as desired.

The outputs of the audio channels are fed to averaging circuit **36**. More specifically, resistor **92** and a similar resistor in each of the other audio channels couple the DC outputs from these channels to the inverting input of an operational amplifier **94** connected to average the signals received at its inverting input. Amplifier **94** may comprise a type **741** operational amplifier. The noninverting input of this amplifier is grounded and a twenty-five kilohm feedback resistor **96** couples the output of amplifier **94** to its inverting input. In addition, a ten kilohm current limiting resistor **98** couples the output of amplifier **94**, which comprises the control signal **38**, to control circuit **12**. More specifically, with this particular circuit, control signal **38** comprises a varying direct current signal. Resistor **96** is set at one-quarter the value of the input resistors **92** so that the gain of the averaging amplifier **94** is established at 0.25. In the event only one microphone is used to detect ambient audio signals, then averaging, of course, is not performed.

Control circuit **12** controls the amplitude of the composite auditory subliminal message and masking signal received at its input **14** in response to the control signal on line **38** and thereby in response to changes in ambient sound levels within room **26**. More specifically, the control signal on line **38** is used as a gain control for an amplifier **102** of circuit **39**. Amplifier **102** may comrise a type CA3080A operational transconductance amplifier connected as a voltage controlled amplifier. The control signal on line **38** is fed to the control signal input I_{ABC} of amplifier **102**. Amplifier **102** is conducted in a conventional manner as a single supply operational amplifier. Also, the positive reference voltage is fed through a voltage divider network including a forty-seven kilohm resistor **106** and forty-seven kilohm resistor **110** to ground. The three-volt signal available from this divider is supplied to the noninverting input of amplifier **102**. A ten microfarad capacitor **108** couples this latter input to ground to remove stray alternating current signals at this input. In addition, the composite subliminal auditory message signal and masking signal is fed to input **14** of voltage control amplifier circuit **39**. That is, these signals are coupled through a ten microfarad capacitor **104** to the inverting input of amplifier **102**. The output of amplifier **102** is fed to one side of a ten kilohm potentiometer **112** having its other side coupled to ground through resistor **110**. The output of circuit **39** is taken from potentiometer **112** and, as explained above, comprises a composite auditory subliminal message signal and masking signal having an amplitude adjusted in response to ambient audio signals within area **26**. The wiper arm of potentiometer **112** also permits adjustment of the amplitude of the voltage controlled composite auditory subliminal signal and masking signal. Hence, this amplitude can be selectively adjusted to make the masking signal component more clearly consciously perceptible to provide an indication that the system is operational.

The gain controlled output signal of circuit **39** is connected through a one hundred kilohm resistor **114** to the inverting input of an operational amplifier **116** within output mixer circuit **20**. Amplifier **116** may comprise a type 741 operational amplifier connected as an inverting mixer. Any optional background audio signals, such as music, may be fed to input **29** of output mixer circuit **20**. This input is coupled by a ten microfarad coupling capacitor **124** in series with a one hundred kilohm input resistor **122** to the inverting input of amplifier **116**. A one hundred kilohm feedback resistor is also coupled between the output of amplifier **116** and its inverting input. Since resistors **114**, **118** and **122** are all equal, the gain of the amplifier **116** is established at one. The output of amplifier **116** is coupled through a ten microfarad coupling capacitor **120** to preamplifier and amplifier circuit **22** (FIG. **1**) and hence to the speaker **24** located in the area **26**.

In a specific anti-shoplifting application, an auditory subliminal message signal designed to encourage honesty is provided. One such signal comprises the phrase "I am honest, I will not steal". This auditory subliminal message signal is combined with a white noise masking signal to provide a composite signal input to the control circuit **12**. The amplitude of this composite signal is then adjusted within control circuit **12**, as explained above, in response to changes in the amplitude of ambient audio signals detected within the shopping area of a store. The amplitude controlled composite signal is then transmitted to the shopping area so that the subliminal message is subconsciously perceived by individuals within the store.

It has now been experimentally determined that, although shoplifting and theft are not completely eliminated, significant reductions in these losses have resulted in such an application of the system of this invention.

Having illustrated and described the principles of our invention with reference to several preferred embodiments, it should be apparent to those persons skilled in the art that such embodiments may be modified in arrangement and detail without departing from such principles. We claim as our invention all such modifications as come within the true spirit and scope of the following claims.

We claim:

1. An auditory subliminal message system for an area comprising:

ambient audio signal processing circuit means adapted to receive an input representing ambient audio signals in the area, said ambient signal processing means comprising means for producing a control signal output which continuously varies with variations in the received input and thereby with variations in the ambient audio signals in the area; and

subliminal message control circuit means having a first input adapted to receive an auditory subliminal message signal, said control circuit means having a second input coupled to said ambient signal processing means for receiving said control signal output, and said control circuit means comprising means for continuously adjusting the amplitude of the received auditory subliminal message signal and for producing an adjusted output signal comprising the amplitude adjusted auditory subliminal message signal, the adjusted output signal being adapted for transmission to the area and having an amplitude which varies in response to said control signal so as to increase with increases in amplitude of ambient audio signals in the area and decrease with decreases in amplitude of ambient audio signals in the area.

2. A system according to claim **1** in which said ambient audio signal processing circuit means changes said control signal at one rate with increases in amplitude of ambient audio signals in the area and changes it at a faster rate with decreases in amplitude of ambient audio signals in the area, said control circuit means comprising means responsive to said control signal to produce an adjusted auditory subliminal message output signal which has an amplitude which increases at a first rate with increases in the amplitude of ambient audio signals in the area and which decreases at a second rate faster than the first rate with decreases in the amplitude of ambient audio signals in the area.

3. An auditory subliminal message system for an area comprising:

audio sensor means for sensing ambient audio signals in the area and for producing an ambient audio output signal representing the volume of the sensed ambient audio signals;

means having an input coupled to the output of said audio sensor means for producing a subliminal message output signal with a volume which follows the volume of the sensed ambient audio signals in the area.

4. A system according to claim 3 in which said last named means includes:

subliminal message source means for providing an auditory subliminal message output signal; and

volume control circuit means having an input coupled to the output of said audio sensor means and an input coupled to the output of said subliminal message source means, said volume control circuit means comprising means for adjusting the volume of the received subliminal message output signal in response to the received ambient audio output signal so as to produce a modified subliminal message output signal which comprises the volume adjusted received subliminal message output signal.

5. A system according to claim 3 in which said last named means comprises means for producing a subliminal message output signal at a volume which increases in response to increases in the volume of sensed ambient audio signals at a rate slower than the rate of increase of the sensed ambient audio signals.

6. A system according to claim 5 in which said last named means comprises means for producing a subliminal message output signal at a volume which decreases in response to decreases in the volume of sensed ambient audio signals at a rate which is faster than the rate the subliminal message output signal increases in response to increases in the volume of sensed ambient audio signals.

7. An auditory subliminal message system for an area comprising:

at least one audio sensor means for sensing ambient audio signals in the area and for producing an ambient audio output signal representing the amplitude of the sensed ambient audio signals;

subliminal message source means for providing an auditory subliminal message output signal;

control circuit means coupled to the output of said audio sensor means and to said subliminal message source means for adjusting the amplitude of the subliminal message output signal so as to follow the amplitude of the sensed ambient audio signals; and

masking signal source means for providing and combining a masking signal having frequency characteristics and an amplitude such that when the masking signal is combined with the amplitude adjusted subliminal message output signal it renders the adjusted subliminal message output signal outside of the conscious recognition range.

8. A system according to claim 7 in which said subliminal message source means comprises means for producing a repetitive auditory subliminal message output signal.

9. A system according to claim 7 in which said subliminal message source means and said masking signal source means comprise means for providing a composite signal which includes the auditory subliminal message output signal as one component and which includes the masking signal as another component;

said control circuit means comprising means for adjusting the amplitude of the composite signal so as to follow the amplitude of the sensed ambient audio signals.

10. A system according to claim 9 including system testing means for selectively adjusting the amplitude of the composite signal to bring the masking signal into the conscious recognition range and thereby indicate the system is operating.

11. A system according to claim 7 in which said masking signal source means provides a masking signal having an amplitude which is in the range of approximately 3 db to 15 db greater than the amplitude of the amplitude adjusted subliminal message output signal.

12. A system according to claim 11 in which said masking signal source means provides a masking signal having an amplitude which is approximately 5 db greater than the amplitude of the amplitude adjusted subliminal message output signal.

13. A system according to claim 7 in which said masking signal source means comprises a white noise signal generator.

14. A system according to claim 9 in which said means for providing a composite signal comprises an audio recording playback means for playing back a recording of the composite signal.

15. A system according to claim 9 in which said means for providing a composite signal includes voice synthesizer means for providing the auditory subliminal signal component.

16. A system according to claim 15 in which said means for providing a composite signal includes white noise signal generator means for providing the masking signal component and mixer circuit means for combining the output of said voice synthesizer means and the output of said white noise signal generator means to provide an output from said mixer circuit means which comprises the composite signal.

17. A system according to claim 9 including output circuit means having at least one audio speaker means for transmitting the amplitude adjusted composite signal to the area.

18. A system according to claim 7 in which said control circuit means is also coupled to said masking signal source means and comprises means for adjusting the amplitude of the masking signal so as to follow the amplitude of the sensed ambient audio signals.

19. An auditory subliminal message system for an area comprising:

at least one audio sensor means for sensing ambient audio signals in the area and for producing an ambient audio output signal representing the amplitude of the sensed ambient audio signals;

subliminal message source means for providing an auditory subliminal message output signal;

masking signal source means for providing and combining a masking signal having frequency characteristics and an amplitude such that when the masking signal is combined with the amplitude adjusted subliminal message output signal it renders the adjusted subliminal message output signal outside of the conscious recognition range;

ambient audio signal processing circuit means coupled to the output of said audio sensor means for producing a control signal which varies with variations in the amplitude of the sensed ambient audio signals;

amplitude control circuit means coupled to said subliminal message source means, to said masking signal source means and to said ambient audio signal processing circuit means for controlling the amplitude of said auditory subliminal message and the amplitude of said masking signal in response to the control signal from said ambient audio signal processing circuit means such that the amplitudes of said auditory subliminal signal and of said masking signal increase with increasing amplitudes of the sensed ambient audio signals and decrease with decreasing amplitudes of the sensed ambient audio signals; and

output circuit means including speaker means for transmitting the amplitude controlled auditory subliminal message output signal and the amplitude controlled masking signal to the area.

20. A system according to claim **19** in which said ambient audio signal processing circuit means includes an audio channel circuit means associated with each said sensor means.

21. A system according to claim **20** including plural audio sensor means and plural audio channel means, each said audio channel means including rectifier circuit means having an input coupled to the output of its associated audio sensor means for receiving and producing a rectified output signal representing the amplitude of the ambient audio signals sensed by the associated audio sensor means, each said audio channel means also including signal shaping circuit means having an input coupled to the output of said rectifier means for producing a shaped output signal which increases at a first rate in response to increases in the rectified output signal which corresponds to increases in the amplitude of the ambient audio signals sensed by the associated audio sensor means, the shaped output signal decreasing at a second rate which is faster than the first rate in response to decreases in the rectified output signal which corresponds to decreases in the amplitude of the ambient audio signals sensed by the associated audio sensor means; and

said system also including averaging circuit means having an input coupled to the outputs of said signal shaping circuit means for receiving and averaging the shaped output signals to produce a control signal comprising the average of the received shaped output signals.

22. A system according to claim **20** including plural audio sensor means and plural audio channel means, each said audio channel means including rectifier circuit means having an input coupled to the output of its associated audio sensor means for receiving and producing a rectified output signal representing the amplitude of the ambient audio signals sensed by the associated audio sensor means;

said system also including averaging circuit means having an input coupled to the outputs of said rectifier circuit means for receiving and averaging the rectified output signals to produce an averaging circuit output signal comprising the average of the received rectified output signals; and

signal shaping circuit means having an input coupled to the output of said averaging circuit means for producing a shaped output signal which increases at a first rate in response to increases in the averaging circuit output signal which corresponds to

increases in the amplitude of the sensed ambient audio signals, the shaped output signal decreasing at a second rate which is faster than the first rate in response to decreases in the averaging circuit output signal which correspond to decreases in the amplitude of the sensed ambient audio signals.

23. A system according to claim **21** or **22** in which the first rate is slower than the rate of increase of the sensed ambient audio signals.

24. A system according to claim **19** in which said output circuit means includes means for combining background audio signals, such as music, with the amplitude controlled auditory subliminal signal prior to transmitting this latter signal to the area.

25. A system according to claim **21** in which the control signal comprises a control voltage and in which said amplitude control circuit means comprises a voltage controlled amplifier circuit.

26. A method of reducing shoplifting in a customer area of a store comprising:

sensing ambient audio signals from the area;

providing an auditory anti-shoplifting subliminal message signal;

adjusting the amplitude of the subliminal message signal to follow the amplitude of the sensed audio signals; and

transmitting the amplitude adjusted subliminal message signal to the area.

27. A method according to claim **26** in which the step of adjusting the amplitude comprises the steps of increasing the amplitude at a first rate with increasing amplitudes of the sensed audio signals and decreasing the amplitude at a second rate faster than the first rate with decreasing amplitudes of the sensed audio signals.

28. A method according to claim **26** or **27** including the steps of providing a masking signal having amplitude and frequency characteristics which when combined with the auditory subliminal message signal renders the subliminal message signal below the level of conscious recognition;

adjusting the amplitude of the masking signal to follow the amplitude of the sensed audio signals; and

transmitting the amplitude adjusted masking signal to the area.

29. A method according to claim **28** in which the step of providing a subliminal message signal comprises the step of providing a composite signal having the auditory subliminal message signal as one component and the masking signal as another component;

the step of adjusting the amplitude comprises the step of adjusting the amplitude of the composite signal to follow the amplitude of the sensed audio signals; and

the step of transmitting comprises the step of transmitting the amplitude adjusted composite signal to the area.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,395,600

DATED : July 26, 1983

INVENTOR(S) : Rene R. Lundy and David L. Tyler

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the title page

In the References Cited:

"Relchenbach" should be --Reichenbach--.

Column 4, line 67, "is" should be --to--.

Column 9, line 9, "comrise" should be --comprise--.

Signed and Sealed this

Eighteenth **Day of** *October 1983*

[SEAL]

Attest:

GERALD J. MOSSINGHOFF

Attesting Officer *Commissioner of Patents and Trademarks*

UNITED STATES PATENT AND TRADEMARK OFFICE

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Attesting Officer *Commissioner of Patents and Trademarks*

PDF SECTION: UNITED STATES PATENTS.

NERVOUS SYSTEM EXCITATION DEVICE

Filed March 13, 1962

2 Sheets-Sheet 1

FIG.1.

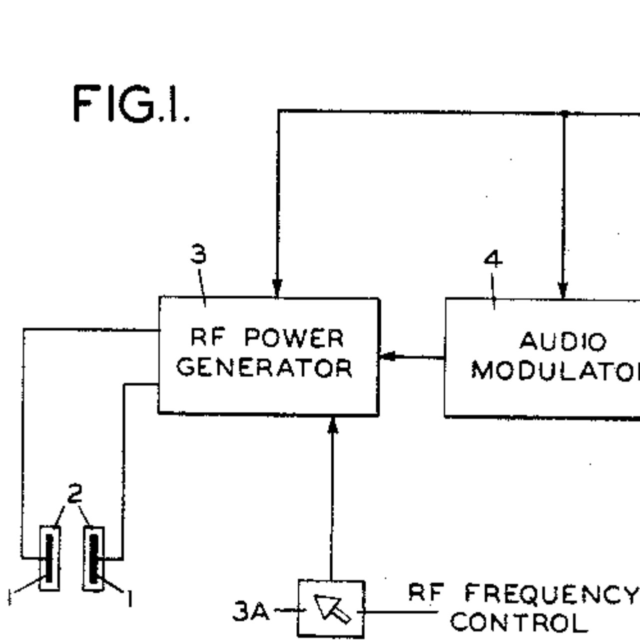
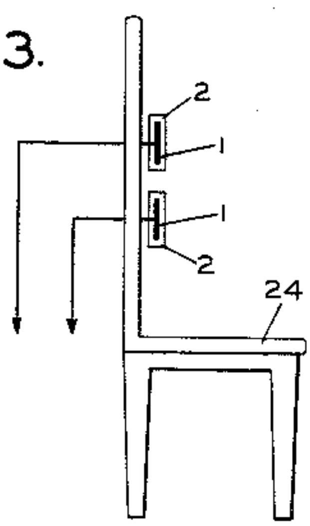


FIG.3.



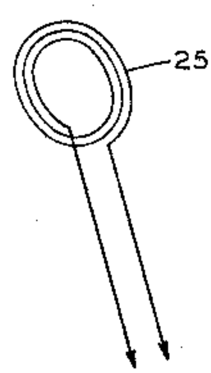


FIG.4.

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NERVOUS SYSTEM EXCITATION DEVICE

Filed March 13, 1962 2 Sheets-Sheet 2

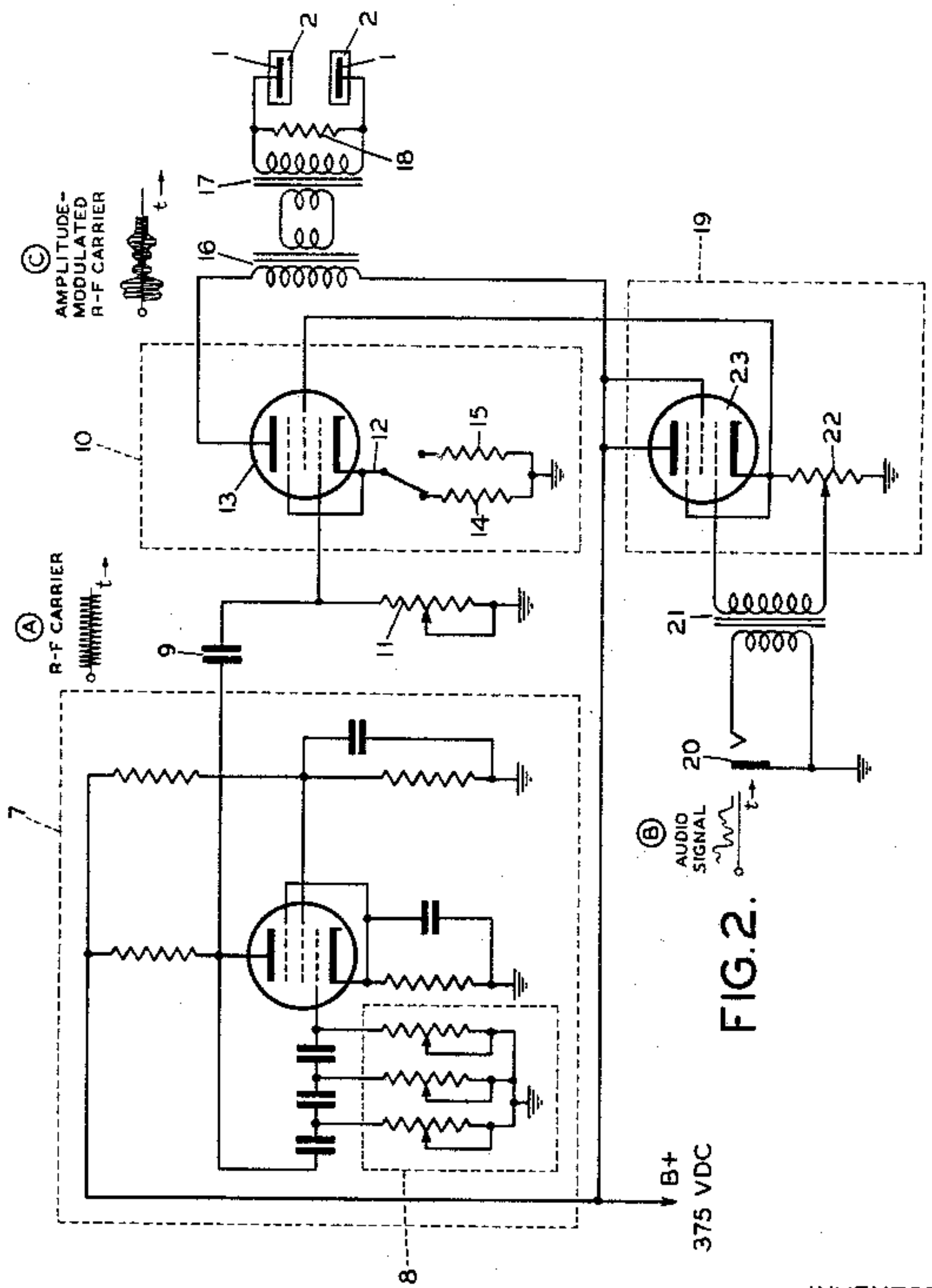

FIG. 2.

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NERVOUS SYSTEM EXCITATION DEVICE

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Filed Mar. 13, 1962, Ser. No. 179,337
3 Claims. (Cl. 179—107)

This invention relates to electromagnetic excitation of the nervous system of a mammal and pertains more parcularly to a method and apparatus for exciting the nervous system of a person with electromagnetic waves that are capable of causing that person to become conscious of information conveyed by the electromagnetic waves.

It is an object of the present invention to provide a means of initiating controllable responses of the neuro senses without applying pressure waves or stress waves to the ears or bones. Another object of this invention is to provide a means of causing a person to receive an aural perception of the sound corresponding to the audio modulation of radio frequency electromagnetic waves that are coupled with the nervous system of the person. These and other objects of this invention will be understood from the following drawings and description of the invention, wherein:

FIGURE 1 is a schematic illustration of one form of the present nervous system excitation device.

FIGURE 2 is a circuit diagram of one form of the present nervous system excitation device.

FIGURE 3 is a diagrammatic view illustrating one form of field generator adapted to be used with the device of FIGURE 1.

FIGURE 4 is a diagrammatic view illustrating another form of field generator adapted to be used with the device of FIGURE 1.

The present invention involves the discovery that certain electromagnetic waves induce responses in the nervous systems of mammals. In human beings a response is produced when some or all of a person's nervous system is placed within a field of electromagnetic waves having a radio frequency above the audible range. In addition, when the nervous system of a person is contacted by modulated electromagnetic carrier waves of such a frequency, the nervous system is responsive to the modulation of the carrier waves. Each individual nervous system is at least somewhat selective in respect to the frequencies to which it is most responsive. A frequency to which the nervous system of a person is demonstrably responsive can be determined by varying the frequency of carrier waves that are modulated by an information signal, such as speech or music, and measuring the frequency of such waves that produce the sensation of hearing the sounds corresponding to the modulating signal.

In the method of the present invention, a response is initiated in the nervous system of a mammal by disposing at least a portion of that nervous system within a field of electromagnetic waves of a radio frequency above the aural range. In a preferred embodiment of this invention, the field to which the nervous system is exposed is a field containing modulated electromagnetic waves of a particular radio frequency to which the individual nervous system is selectively responsive. In a particularly preferred embodiment of this invention, at least a portion of the nervous system of a person is exposed to audio modulated electromagnetic waves having a radio frequency such that the person experiences the sensation of hearing, substantially free of distortion, the information which is conveyed by the audio modulation.

The present invention may be used as a hearing aid, as an aid to teaching speech to a person who was born deaf, as a means of communicating with persons in locations in which the noise level is high, as a device by which a person can listen to an audio signal that cannot be heard by others, etc.

As shown in FIGURE 1 of the drawing, in a preferred form of the invention, a field of electromagnetic waves is generated by a field generating means, such as a pair of electrodes 1. The electrodes 1 are preferably electrically insulated, for example by surrounding them with a suitable electrical insulating material 2, and are arranged to generate a field coupled with at least a portion of the nervous system of a person, for example by being placed near or along opposite sides of a person's head. The electrodes 1 can be placed in direct contact with the skin and the electrodes can be placed on or near various portions of the body, such portions preferably being near the spinal cord.

The electrodes 1 are electrically connected to a source of modulated electromagnetic waves inclusive of a radio frequency power amplifier and variable frequency oscillator, indicated in box 3, an audio modulator, indicated in box 4, a source of audio signal, indicated in box 5, and a power supply for the signal source, modulator and amplifier, indicated in box 6. The variable frequency oscillator 3 is preferably provided with a manual radio frequency control means, indicated by box 3*a*. Numerous forms of the components, indicated in boxes 3 to 6, that provide suitable power and a source of modulated electromagnetic waves are presently known and the known devices can suitably be used as long as they are arranged to produce a relatively high voltage output that has a radio frequency above the audio range and is capable of being modulated by an audio signal or other signal adapted to be conveyed by the modulation of electromagnetic waves of such a frequency.

The modulation can suitably be effected by means of either an amplitude or frequency modulation of such electromagnetic waves. These waves preferably have a frequency in the range of from about 20 kilocycles per second to about 200 kilocycles per second. The output of the source of modulated electromagnetic waves is preferably at least about 1 watt where the field generator comprises a pair of insulated electrodes placed on the head of a person. The extent to which a person is aurally perceptive to the output supplied at a given wattage is materially increased when at least one of the electrodes is placed in electrical contact with the body of the person.

In a preferred mode of operating the apparatus shown in FIGURE 1, the electrodes 1 are placed on the sides of the head of a person. The source 5 of audio signal is actuated to produce an audio signal corresponding to sounds recognizable by that person, and source 3 of modulated electromagnetic waves is actuated to couple the waves with the nervous system of that person. When control 3A is adjusted so that the frequency of the modulated waves is a frequency to which his nervous system is particularly responsive, the person to whom the field of such waves is applied has the sensation of hearing the sounds corresponding to the audio signal substantially free of distortion.

In the circuit shown in FIGURE 2, a phase shift type of carrier oscillator, generally designated by dotted rectangle 7, with a frequency control, generally designated by rectangle 8, is arranged to produce electromagnetic waves, shown at A, a frequency ranging from about 20 to about 200 kilocycles per second. The oscillator output is coupled through capacitor 9 to a radio frequency power amplifier, generally designated by dotted rectangle 10. Potentiometer 11, which is connected between capacitor 9 and ground, provides a means of adjusting the input to the amplifier. Switch 12, which is connected to the cathode of tube 13 of the amplifier, provides a means of switching between resistors **14** and **15** to vary the operating power characteristics of the tube.

The output of amplifier **10** is connected to transformer **16** which is coupled back-to-back with transformer **17.** This arrangement of transformers provides an inductive load such that the amplifier yields a high voltage output and is isolated from other components of the circuit. Resistor **18** connected across the output side of transformer **17** serves to reduce any dangerous voltage spikes which might be produced. The output side of transformer **17** is connected to a suitable field generator, which may comprise the electrodes **1** surrounded by insulating material **2.**

The output of amplifier **10** is ampltiude modulated by means of the modulator generally designated by dotted rectangle **19.** A fluctuating electrical signal B, preferably of audio frequency, is applied to the modulator by means of input jack **20** and transformer **21.** The output of the modulator varies the screen voltage of tube **13** of the amplifier so that the modulation envelope of the current oscillation C produced across the load of tube **13** correspond to the fluctuating signal B applied to the moduator.

Potentiometer **22** is connected to the cathode of tube **23** as the cathode resistor of tube **23.** Potentiometer **22** is preferably adjusted so that the plate current of tube **13** is about half its normal maximum value. The fluctuating signal applied to modulator **19** is then adjusted to cause the plate current of tube **13** to vary between the maximum and minimum values so that a large current variation occurs in the load **16** of tube **13.**

The apparatus shown in FIGURE 2 has been used to communicate speech and music to numerous persons including registered physicians. In these uses the electrodes **1,** in the form of circular disc covered by a plastic insulation **2,** were placed against the sides of the heads of the persons. When the electromagnetic waves were adjusted to a frequency to which persons having normal hearing were selectively responsive, none of these persons perceived any sensations of hearing or experienced any discombort when no audio modulation was applied to the waves. When the waves were audio modulated with a speech or music signal, none of these persons experienced any discomfort, but they each had the sensation of listening to the transmitted information and "hearing" it at least as clearly as they would hear such information from an audible transmitter. When the same apparatus was similarly employed on a person whose hearing had been damaged to an extent requiring a hearing aid to hear normal conversation, that person "heard" the audio signal (with this hearing aid disconnected) and "heard" music with a better fidelity than that obtainable with his hearing aid.

FIGURE 3 shows an arrangement for mounting the field generating means in a position such that a portion of a person's nervous system may be moved into and out of coupling with the field at the will of the person. In this arrangement, electrodes **1** surrounded by insulation **2** are mounted in vertical alignment along the back of a seating device, such as chair **24.** When a person is seated and leaning back in the chair, portions of his nervous system are brought into coupling relationship with the field produced by electrodes **1.**

FIGURE 4 shows an alternative arrangement of the field generating means. In this arrangement, inductive coil **25** is connected to the output of a suitable source of modulated electromagnetic waves and serves as a field

generating means which is adapted to be placed around the head of a person.

It is to be understood that the above embodiments and examples have been presented for descriptive purposes and that, within the scope of the appended claims, the invention may be practiced otherwise than specifically illustrated and described.

I claim:

1. A method of transmitting audio information to the brain of a subject through the nervous system of the subject which method comprises, in combination, the steps of generating a radio frequency signal having a frequency in excess of the highest frequency of the audio information to be transmitted, modualting said radio frequency signal with the audio information to be transmitted, and applying said modulated radio frequency signal to a pair of insulated electrodes and placing both of said insulated electrode in physical contact with the skin of said subject, the strength of said radio frequency electromagnetic field being high enough at the skin surface to cause the sensation of hearing the audio information modulated thereon in the brain of said subject and low enough so that said subject experiences no physical discomfort.

2. The method of claim **1** wherein said modulated electromagnetic field is coupled with a portion of the nervous system contained in the person's spinal column.

3. Apparatus for transmitting audio information to the brain of a subject through the nervous system of the subject comprising, in combination, means for generating a radio frequency signal having a frequency greater than the maximum frequency of said audio information, means for modulating said radio frequency signal with the audio information to be transmitted, electrode means adapted to generate a localized radio frequency electromagnetic field thereabout when excited by a radio frequency signal, and means coupling said modulated radio frequency signal to said electrode means, said electrode means having a surface adapted to be capacitively coupled to a localized area at the surface of the skin of said subject when placed in physical contact therewith whereby said electrode means may generate a localized radio frequency electromagnetic field modulated by said audio information at the surface of the skin of said subject, and means on said surface of said electrode means for insulating said electrode means from the skin of said subject.

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KATHLEEN H. CLAFFY, *Primary Examiner.*

ROBERT H. ROSE, *Examiner.*

J. W. JOHNSON, A. A. McGILL, *Assistant Examiners.*

PDF SECTION: UNITED STATES PATENTS.

United States Patent [19]

Malech

[11] **3,951,134**

[45] **Apr. 20, 1976**

[54] **APPARATUS AND METHOD FOR REMOTELY MONITORING AND ALTERING BRAIN WAVES**

[75] Inventor: **Robert G. Malech**, Plainview, N.Y.

[73] Assignee: **Dorne & Margolin Inc.**, Bohemia, N.Y.

[22] Filed: **Aug. 5, 1974**

[21] Appl. No.: **494,518**

[52] **U.S. Cl.** .... **128/2.1 B**
[51] **Int. Cl.^{2}** **A61B 5/04**
[58] **Field of Search** .... 128/1 C, 1 R, 2.1 B, 128/2.1 R, 419 R, 422 R, 420, 404, 2 R, 2 S, 2.05 R, 2.05 V, 2.05 F, 2.06 R; 340/248 A, 258 A, 258 B, 258 D, 229

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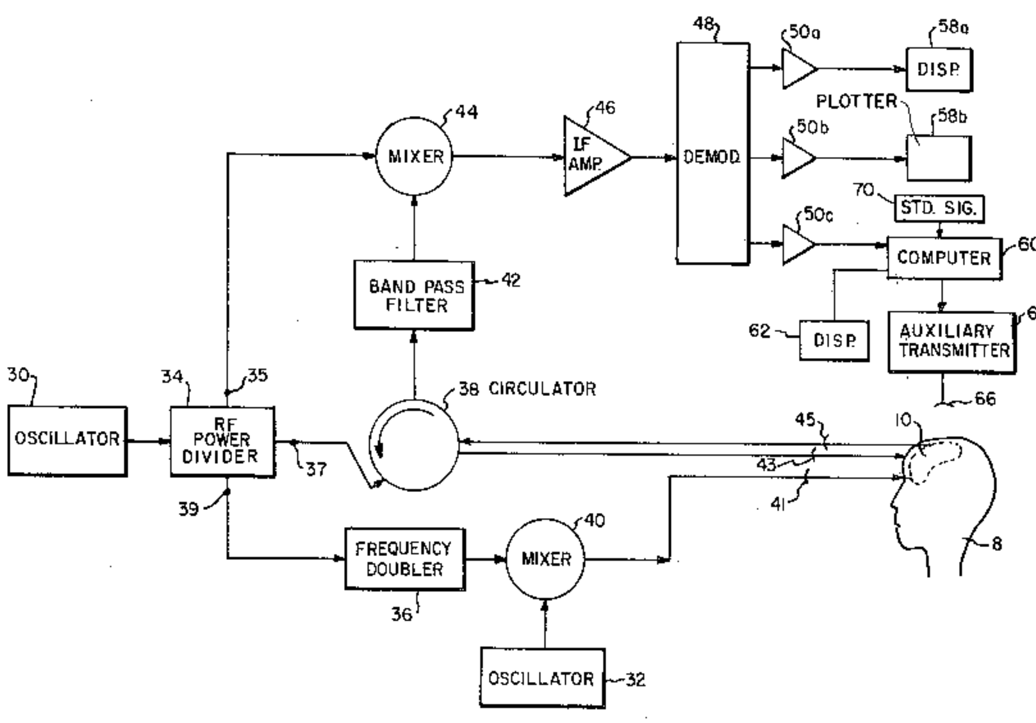
Primary Examiner—William E. Kamm
Attorney, Agent, or Firm—Darby & Darby

[57] **ABSTRACT**

Apparatus for and method of sensing brain waves at a position remote from a subject whereby electromagnetic signals of different frequencies are simultaneously transmitted to the brain of the subject in which the signals interfere with one another to yield a waveform which is modulated by the subject's brain waves. The interference waveform which is representative of the brain wave activity is re-transmitted by the brain to a receiver where it is demodulated and amplified. The demodulated waveform is then displayed for visual viewing and routed to a computer for further processing and analysis. The demodulated waveform also can be used to produce a compensating signal which is transmitted back to the brain to effect a desired change in electrical activity therein.

11 Claims, 2 Drawing Figures



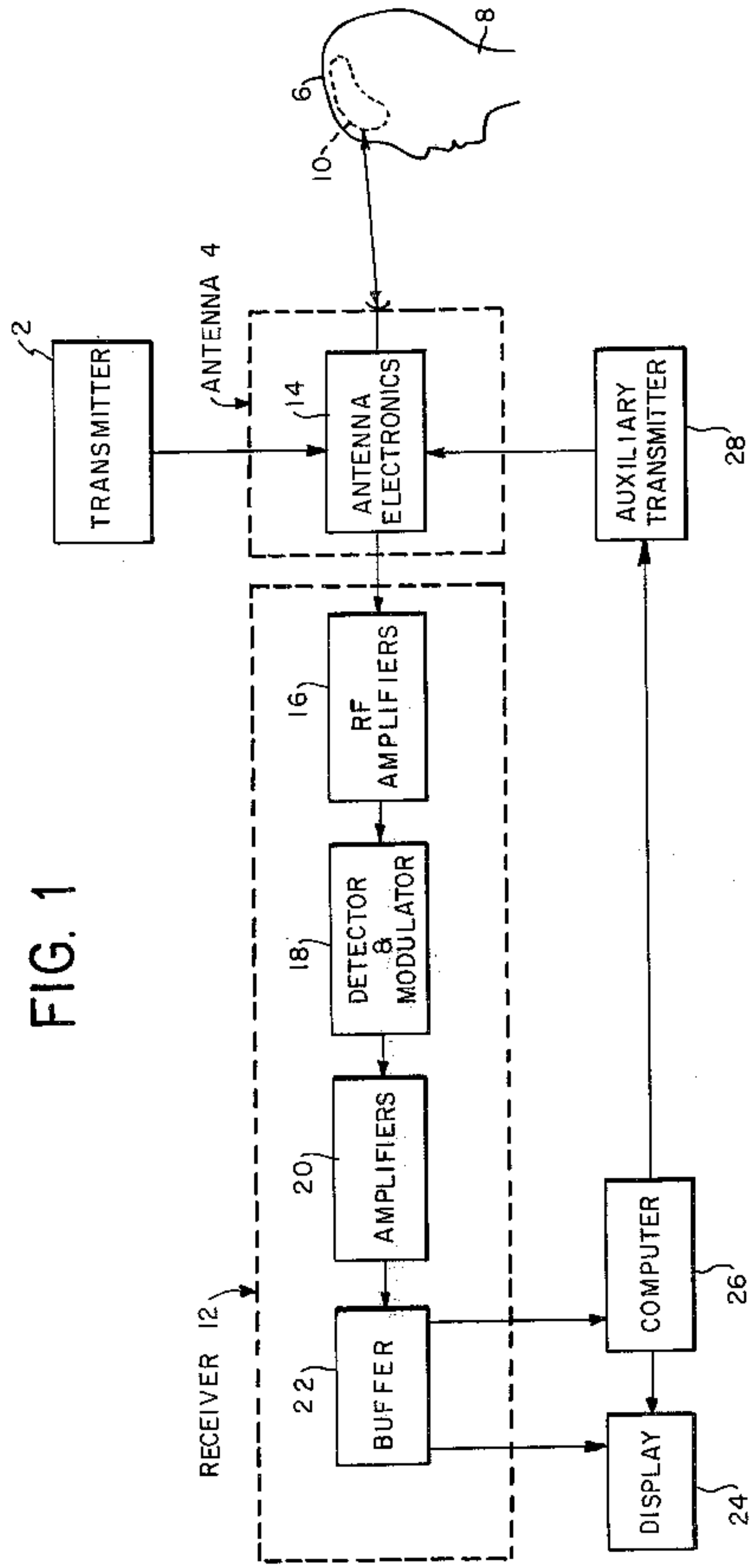
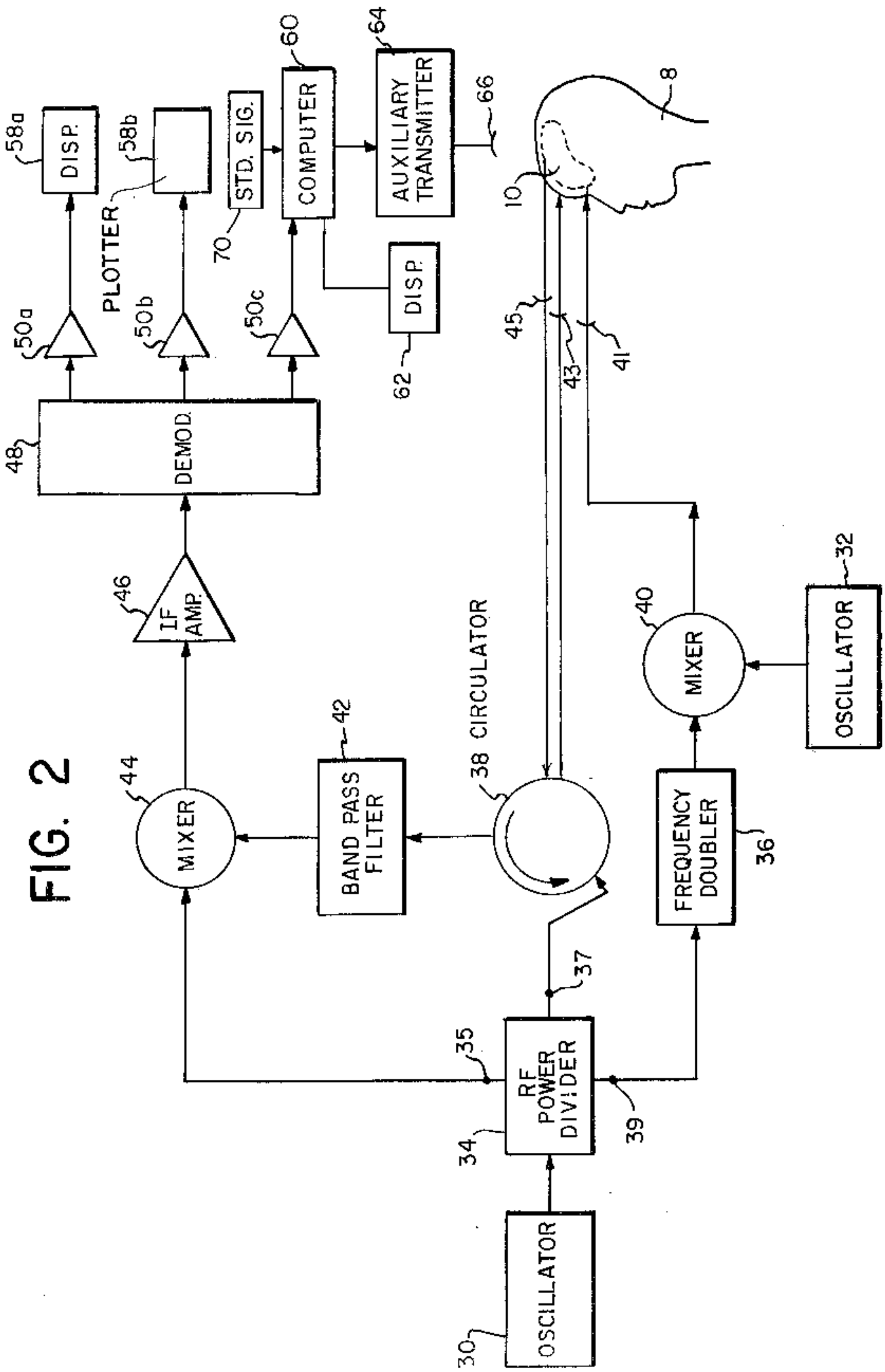

TRANSMITTER
2
ANTENNA 4
ANTENNA ELECTRONICS
14
6
8
10
AUXILIARY TRANSMITTER
28
RF AMPLIFIERS
16
DETECTOR & MODULATOR
18
AMPLIFIERS
20
BUFFER
22
RECEIVER 12
COMPUTER
26
DISPLAY
24

FIG. 1



OSCILLATOR
RF POWER DIVIDER
MIXER
BAND PASS FILTER
CIRCULATOR
FREQUENCY DOUBLER
MIXER
OSCILLATOR
IF AMP.
DEMOD.
DISP.
PLOTTER
STD. SIG.
COMPUTER
DISP.
AUXILIARY TRANSMITTER

FIG. 2

APPARATUS AND METHOD FOR REMOTELY MONITORING AND ALTERING BRAIN WAVES

BACKGROUND OF THE INVENTION

Medical science has found brain waves to be a useful barometer of organic functions. Measurements of electrical activity in the brain have been instrumental in detecting physical and psychic disorder, measuring stress, determining sleep patterns, and monitoring body metabolism.

The present art for measurement of brain waves employs electroencephalographs including probes with sensors which are attached to the skull of the subject under study at points proximate to the regions of the brain being monitored. Electrical contact between the sensors and apparatus employed to process the detected brain waves is maintained by a plurality of wires extending from the sensors to the apparatus. The necessity for physically attaching the measuring apparatus to the subject imposes several limitations on the measurement process. The subject may experience discomfort, particulary if the measurements are to be made over extended periods of time. His bodily movements are restricted and he is generally confined to the immediate vicinity of the measuring apparatus. Furthermore, measurements cannot be made while the subject is conscious without his awareness. The comprehensiveness of the measurements is also limited since the finite number of probes employed to monitor local regions of brain wave activity do not permit observation of the total brain wave profile in a single test.

SUMMARY OF THE INVENTION

The present invention relates to apparatus and a method for monitoring brain waves wherein all components of the apparatus employed are remote from the test subject. More specifically, high frequency transmitters are operated to radiate electromagnetic energy of different frequencies through antennas which are capable of scanning the entire brain of the test subject or any desired region thereof. The signals of different frequencies penetrate the skull of the subject and impinge upon the brain where they mix to yield an interference wave modulated by radiations from the brain's natural electrical activity. The modulated interference wave is re-transmitted by the brain and received by an antenna at a remote station where it is demodulated, and processed to provide a profile of the suject's brain waves. In addition to passively monitoring his brain waves, the subject's neurological processes may be affected by transmitting to his brain, through a transmitter, compensating signals. The latter signals can be derived from the received and processed brain waves.

OBJECTS OF THE INVENTION

It is therefore an object of the invention to remotely monitor electrical activity in the entire brain or selected local regions thereof with a single measurement.

Another object is the monitoring of a subject's brain wave activity through transmission and reception of electromagnetic waves.

Still another object is to monitor brain wave activity from a position remote from the subject.

A further object is to provide a method and apparatus for affecting brain wave activity by transmitting electromagnetic signals thereto.

DESCRIPTION OF THE DRAWINGS

Other and further objects of the invention will appear from the following description and the accompanying drawings, which form part of the instant specification and which are to be read in conjunction therewith, and in which like reference numerals are used to indicate like parts in the various views;

FIG. **1** is a block diagram showing the interconnection of the components of the apparatus of the invention;

FIG. **2** is a block diagram showing signal flow in one embodiment of the apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, specifically FIG. **1**, a high frequency transmitter **2** produces and supplies two electromagnetic wave signals through suitable coupling means **14** to an antenna **4**. The signals are directed by the antenna **4** to the skull **6** of the subject **8** being examined. The two signals from the antenna **4**, which travel independently, penetrate the skull **6** and impinge upon the tissue of the brain **10**.

Within the tissue of the brain **10**, the signals combine, much in the manner of a conventional mixing process technique, with each section of the brain having a different modulating action. The resulting waveform of the two signals has its greatest amplitude when the two signals are in phase and thus reinforcing one another. When the signals are exactly 180° out of phase the combination produces a resultant waveform of minimum amplitude. If the amplitudes of the two signals transmitted to the subject are maintained at identical levels, the resultant interference waveform, absent influences of external radiation, may be expected to assume zero intensity when maximum interference occurs, the number of such points being equal to the difference in frequencies of the incident signals. However, interference by radiation from electrical activity within the brain **10** causes the waveform resulting from interference of the two transmitted signals to vary from the expected result, i.e., the interference waveform is modulated by the brain waves. It is believed that this is due to the fact that brain waves produce electric charges each of which has a component of electromagnetic radiation associated with it. The electromagnetic radiation produced by the brain waves in turn reacts with the signals transmitted to the brain from the external source.

The modulated interference waveform is re-transmitted from the brain **10**, back through the skull **6**. A quantity of energy is re-transmitted sufficient to enable it to be picked up by the antenna **4**. This can be controlled, within limits, by adjusting the absolute and relative intensities of the signals, originally transmitted to the brain. Of course, the level of the transmitted energy should be kept below that which may be harmful to the subject.

The antenna passes the received signal to a receiver **12** through the antenna electronics **14**. Within the receiver the wave is amplified by conventional RF amplifiers **16** and demodulated by conventional detector and modulator electronics **18**. The demodulated wave, representing the intra-brain electrical activity, is amplified by amplifiers **20** and the resulting information in electronic form is stored in buffer circuitry **22**. From the buffers **22** the information is fed to a suitable visual display 24, for example one employing a cathode ray tube, light emitting diodes, liquid crystals, or a mechanical plotter. The information may also be channeled to a computer 26 for further processing and analysis with the output of the computer displayed by heretofore mentioned suitable means.

In addition to channeling its information to display devices 24, the computer 26 can also produce signals to control an auxiliary transmitter 28. Transmitter 28 is used to produce a compensating signal which is transmitted to the brain 10 of the subject 8 by the antenna 4. In a preferred embodiment of the invention, the compensating signal is derived as a function of the received brain wave signals, although it can be produced separately. The compensating signals affect electrical activity within the brain 10.

Various configurations of suitable apparatus and electronic circuitry may be utilized to form the system generally shown in FIG. 1 and one of the many possible configurations is illustrated in FIG. 2. In the example shown therein, two signals, one of 100 MHz and the other of 210 MHz are transmitted simultaneously and combine in the brain 10 to form a resultant wave of frequency equal to the difference in frequencies of the incident signals, i.e., 110 MHz. The sum of the two incident frequencies is also available, but is discarded in subsequent filtering. The 100 MHz signal is obtained at the output 37 of an RF power divider 34 into which a 100 MHz signal generated by an oscillator 30 is injected. The oscillator 30 is of a conventional type employing either crystals for fixed frequency circuits or a tunable circuit set to oscillate at 100 MHz. It can be a pulse generator, square wave generator or sinusoidal wave generator. The RF power divider can be any conventional VHF, UHF or SHF frequency range device constructed to provide, at each of three outputs, a signal identical in frequency to that applied to its input.

The 210 MHz signal is derived from the same 100 MHz oscillator 30 and RF power divider 34 as the 100 MHz signal, operating in concert with a frequency doubler 36 and 10 MHz oscillator 32. The frequency doubler can be any conventional device which provides at its output a signal with frequency equal to twice the frequency of a signal applied at its input. The 10 MHz oscillator can also be of conventional type similar to the 100 MHz oscillator herebefore described. A 100 MHz signal from the output 39 of the RF power divider 34 is fed through the frequency doubler 36 and the resulting 200 MHz signal is applied to a mixer 40. The mixer 40 can be any conventional VHF, UHF or SHF frequency range device capable of accepting two input signals of differing frequencies and providing two output signals with frequencies equal to the sum and difference in frequencies respectively of the input signals. A 10 MHz signal from the oscillator 32 is also applied to the mixer 40. The 200 MHz signal from the doubler 36 and the 10 MHz signal from the oscillator 32 combine in the mixer 40 to form a signal with a frequency of 210 MHz equal to the sum of the frequencies of the 200 MHz and 10 MHz signals.

The 210 MHz signal is one of the signals transmitted to the brain 10 of the subject being monitored. In the arrangement shown in FIG. 2, an antenna 41 is used to transmit the 210 MHz signal and another antenna 43 is used to transmit the 100 MHz signal. Of course, a single antenna capable of operating at 100 MHz and 210 MHz frequencies may be used to transmit both signals. The scan angle, direction and rate may be controlled mechanically, e.g., by a reversing motor, or electronically, e.g., by energizing elements in the antenna in proper synchronization. Thus, the antenna(s) can be of either fixed or rotary conventional types.

A second 100 MHz signal derived from output terminal 37 of the three-way power divider 34 is applied to a circulator 38 and emerges therefrom with a desired phase shift. The circulator 38 can be of any conventional type wherein a signal applied to an input port emerges from an output port with an appropriate phase shift. The 100 MHz signal is then transmitted to the brain 10 of the subject being monitored via the antenna 43 as the second component of the dual signal transmission. The antenna 43 can be of conventional type similar to antenna 41 herebefore described. As previously noted, these two antennas may be combined in a single unit.

The transmitted 100 and 210 MHz signal components mix within the tissue in the brain 10 and interfere with one another yielding a signal of a frequency of 110 MHz, the difference in frequencies of the two incident components, modulated by electromagnetic emissions from the brain, i.e., the brain wave activity being monitored. This modulated 110 MHz signal is radiated into space.

The 110 MHz signal, modulated by brain wave activity, is picked up by an antenna 45 and channeled back through the circulator 38 where it undergoes an appropriate phase shift. The circulator 38 isolates the transmitted signals from the received signal. Any suitable diplexer or duplexer can be used. The antenna 45 can be of conventional type similar to antennas 41 and 43. It can be combined with them in a single unit or it can be separate. The received modulated 110 MHz signal is then applied to a band pass filter 42, to eliminate undesirable harmonics and extraneous noise, and the filtered 110 MHz signal is inserted into a mixer 44 into which has also been introduced a component of the 100 MHz signal from the source 30 distributed by the RF power divider 34. The filter 42 can be any conventional band pass filter. The mixer 44 may also be of conventional type similar to the mixer 40 herebefore described.

The 100 MHz and 110 MHz signals combine in the mixer 44 to yield a signal of frequency equal to the difference in frequencies of the two component signals, i.e., 10 MHz still modulated by the monitored brain wave activity. The 10 MHz signal is amplified in an IF amplifier 46 and channeled to a demodulator 48. The IF amplifier and demodulator 48 can both be of conventional types. The type of demodulator selected will depend on the characteristics of the signals transmitted to and received from the brain, and the information desired to be obtained. The brain may modulate the amplitude, frequency and/or phase of the interference waveform. Certain of these parameters will be more sensitive to corresponding brain wave characteristics than others. Selection of amplitude, frequency or phase demodulation means is governed by the choice of brain wave characteristic to be monitored. If desired, several different types of demodulators can be provided and used alternately or at the same time.

The demodulated signal which is representative of the monitored brain wave activity is passed through audio amplifiers 50 *a, b, c* which may be of conventional type where it is amplified and routed to displays 58 *a, b, c* and a computer 60. The displays 58 *a, b, c* present the raw brain wave signals from the amplifiers

50 *a*, *b*, *c*. The computer **60** processes the amplified brain wave signals to derive information suitable for viewing, e.g., by suppressing, compressing, or expanding elements thereof, or combining them with other information-bearing signals and presents that information on a display **62.** The displays can be conventional ones such as the types herebefore mentioned employing electronic visual displays or mechanical plotters **58***b*. The computer can also be of conventional type, either analog or digital, or a hybrid.

A profile of the entire brain wave emission pattern may be monitored or select areas of the brain may be observed in a single measurement simply by altering the scan angle and direction of the antennas. There is no physical contact between the subject and the monitoring apparatus. The computer **60** also can determine a compensating waveform for transmission to the brain **10** to alter the natural brain waves in a desired fashion. The closed loop compensating system permits instantaneous and continuous modification of the brain wave response pattern.

In performing the brain wave pattern modification function, the computer **60** can be furnished with an external standard signal from a source **70** representative of brain wave activity associated with a desired nuerological response. The region of the brain responsible for the response is monitored and the received signal, indicative of the brain wave activity therein, is compared with the standard signal. The computer **60** is programmed to determine a compensating signal, responsive to the difference between the standard signal and received signal. The compensating signal, when transmitted to the monitored region of the brain, modulates the natural brain wave activity therein toward a reproduction of the standard signal, thereby changing the neurological response of the subject.

The computer **60** controls an auxiliary transmitter **64** which transmits the compensating signal to the brain **10** of the subject via an antenna **66.** The transmitter **64** is of the high frequency type commonly used in radar applications. The antenna **66** can be similar to antennas **41, 43** and **45** and can be combined with them. Through these means, brain wave activity may be altered and deviations from a desired norm may be compensated. Brain waves may be monitored and control signals transmitted to the brain from a remote station.

It is to be noted that the configuration described is one of many possibilities which may be formulated without departing from the spirit of my invention. The transmitters can be monostratic or bistatic. They also can be single, dual, or multiple frequency devices. The transmitted signal can be continuous wave, pulse, FM, or any combination of these as well as other transmission forms. Typical operating frequencies for the transmitters range from 1 MHz to 40 GHz but may be altered to suit the particular function being monitored and the characteristics of the specific subject.

The individual components of the system for monitoring and controlling brain wave activity may be of conventional type commonly employed in radar systems.

Various subassemblies of the brain wave monitoring and control apparatus may be added, substituted or combined. Thus, separate antennas or a single multimode antenna may be used for transmission and reception. Additional displays and computers may be added to present and analyze select components of the monitored brain waves.

Modulation of the interference signal retransmitted by the brain may be of amplitude, frequency and/or phase. Appropriate demodulators may be used to decipher the subject's brain activity and select components of his brain waves may be analyzed by computer to determine his mental state and monitor his thought processes.

As will be appreciated by those familiar with the art, apparatus and method of the subject invention has numerous uses. Persons in critical positions such as drivers and pilots can be continuously monitored with provision for activation of an emergency device in the event of human failure. Seizures, sleepiness and dreaming can be detected. Bodily functions such as pulse rate, heartbeat reqularity and others also can be monitored and occurrences of hallucinations can be detected. The system also permits medical diagnoses of patients, inaccessible to physicians, from remote stations.

What is claimed is:

1. Brain wave monitoring apparatus comprising
means for producing a base frequency signal,
means for producing a first signal having a frequency related to that of the base frequency and at a predetermined phase related thereto,
means for transmitting both said base frequency and said first signals to the brain of the subject being monitored,
means for receiving a second signal transmitted by the brain of the subject being monitored in response to both said base frequency and said first signals,
mixing means for producing from said base frequency signal and said received second signal a response signal having a frequency related to that of the base frequency, and
means for interpreting said response signal.

2. Apparatus as in claim **1** where said receiving means comprises
means for isolating the transmitted signals from the received second signals.

3. Apparatus as in claim **2** further comprising a band pass filter with an input connected to said isolating means and an output connected to said mixing means.

4. Apparatus as in claim **1** further comprising means for amplifying said response signal.

5. Apparatus as in claim **4** further comprising means for demodulating said amplified response signal.

6. Apparatus as in claim **5** further comprising interpreting means connected to the output of said demodulator means.

7. Apparatus according to claim **1** further comprising
means for producing an electromagnetic wave control signal dependent on said response signal, and
means for transmitting said control signal to the brain of said subject.

8. Apparatus as in claim **7** wherein said transmitting means comprises means for directing the electromagnetic wave control signal to a predetermined part of the brain.

9. A process for monitoring brain wave activity of a subject comprising the steps of
transmitting at least two electromagnetic energy signals of different frequencies to the brain of the subject being monitored,
receiving an electromagnetic energy signal resulting from the mixing of said two signals in the brain modulated by the brain wave activity and retrans-

mitted by the brain in response to said transmitted energy signals, and,

interpreting said received signal.

10. A process as in claim **9** further comprising the step of transmitting a further electromagnetic wave signal to the brain to vary the brain wave activity.

11. A process as in claim **10** wherein the step of transmitting the further signals comprises

obtaining a standard signal,

comparing said received electromagnetic energy signals with said standard signal,

producing a compensating signal corresponding to the comparison between said received electrogagnetic energy signals and the standard signal, and

transmitting the compensating signals to the brain of the subject being monitored.

* * * * *


Active Denial System


Non-lethal weapons capabil...


Mengerikan! Senjata Fiksi-Il...


Test results show Active De...


US Military UNMANNED TR...


The Active Denial System (A...


US military ADS Active Deni...


Active Denial System: a tera...


High-Power Microwave Dire...


Millimeter-Wave Energy as ...


Could DOD's Active Denial ...

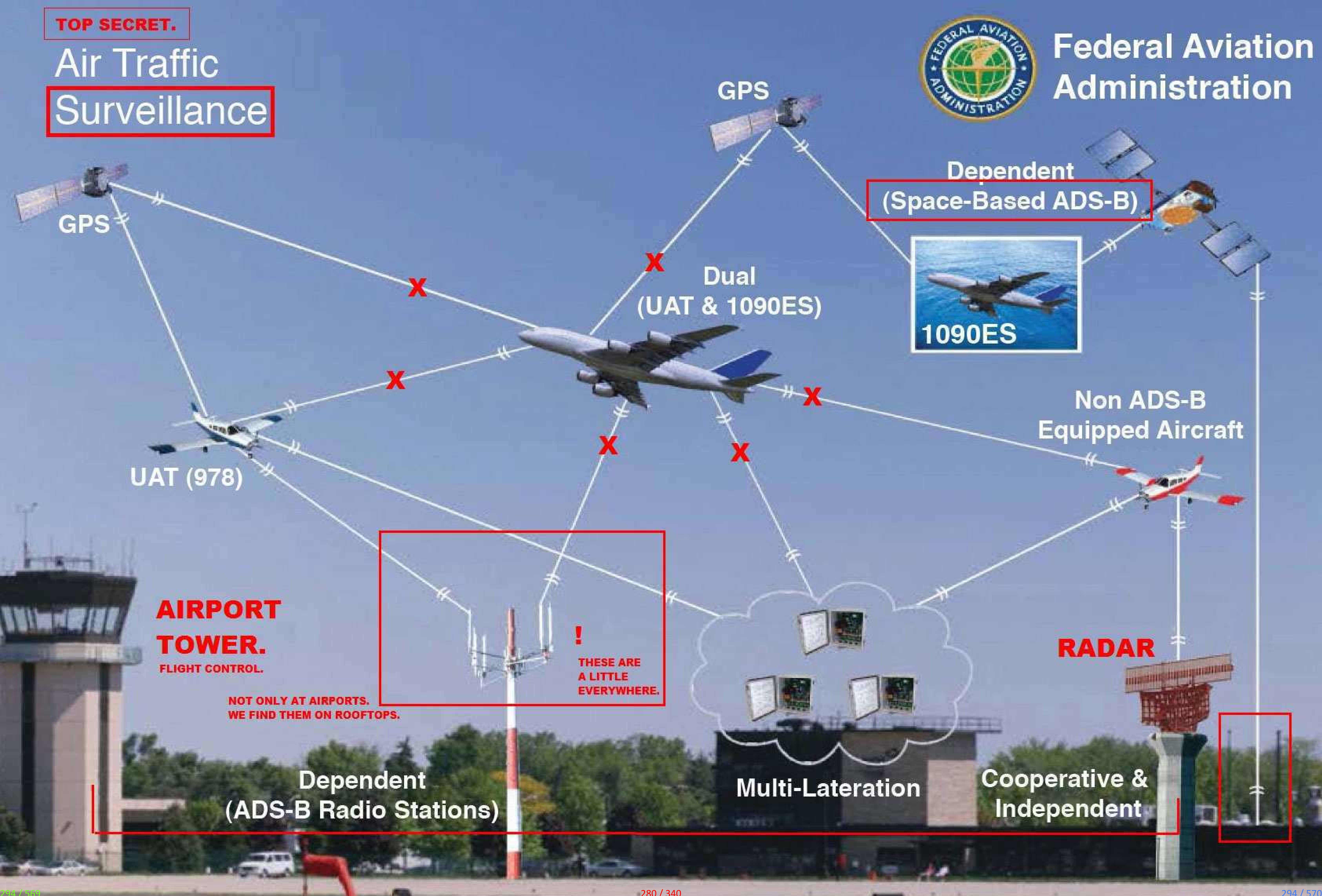

Ready, Aim, Fire: Hypersoni...

ACTIVE DENIAL!

How about that?

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA


TOP SECRET.
Air Traffic
Surveillance
Federal Aviation Administration
GPS
GPS
Dependent
(Space-Based ADS-B)
Dual
(UAT & 1090ES)
1090ES
Non ADS-B
Equipped Aircraft
UAT (978)
X
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AIRPORT
TOWER.
FLIGHT CONTROL.
NOT ONLY AT AIRPORTS.
WE FIND THEM ON ROOFTOPS.
!
THESE ARE
A LITTLE
EVERYWHERE.
RADAR
Dependent
(ADS-B Radio Stations)
Multi-Lateration
Cooperative &
Independent


1224
REMARKS

EMF Guidelines for Radio Frequency and Low Frequency Electromagnetic Radiation

In which the health risk of various levels of EMF exposure are compared

EMF Guidelines v1.3

Contents

EM Watch	Electromagnetic Radiation Exposure Guidelines		Copyright: www.emwatch.com
Radio-Frequency Radiation Guidelines - for continuous and prolonged exposure			
Risk Level	**Millivolts per Metre**	**Microwatts per square meter**	**Description**
1	0.00 – 10.0	0.00 – 0.27	Low risk of health effects, except for electro-hypersensitive people.
2	10.0 – 100	0.1 – 26.5	Slight risk of serious health effects, especially for children / pregnant women
3	100 – 650	26.5 – 1120	Moderate risk of serious health effects
4	Over 650	Over 1120	High risk of serious health effects
Low Frequency Electromagnetic Radiation Guidelines - for continuous and prolonged exposure			
Risk Level	**Milligauss**	**MicroTesla**	**Description**
1	0.0 – 1.0	0.00 – 0.1	Low risk of health effects, except for electro-hypersensitive people.
2	1.0 – 2.0	0.1 – 0.2	Slight risk of serious health effects, especially for children / pregnant women
3	2.0 – 5.0	0.2 – 0.5	Moderate risk of serious health effects
4	Over 5.0	Over 0.5	High risk of serious health effects

Continuous and prolonged exposure means exposure for several hours a day, for several months - or years.

Notes

1. Electro-Hypersensitive people may experience discomfort at very low EMF levels (even at Risk Level 1).
2. Pregnant women should spend most of their time in level 1, but brief visits to levels 2 and 3 will probably do no harm. Avoid level 4.
3. Children should spend most of their time in level 1. Short periods of time may be spent in levels 2, 3 and 4.
4. Everyone should avoid continuous prolonged exposure at level 4.
5. Bedrooms, schools, hospitals, libraries and workplaces should be at level 1.

Use with discretion, and at your own risk. Bear in mind that no level of EMF has been proved absolutely safe (except zero).

Two Kinds of Electromagnetic Radiation

There are two kinds of man-made EMF (ElectroMagnetic Field) which are believed to be damaging to our health, and which are common in our homes and workplaces.

One kind is called low-frequency EMF, which is emitted from all mains electrical devices, power lines and house wiring, electric motors and some electronic devices.

The other kind is radio-frequency EMF which is emitted from all radio transmitters, cordless phones, cell phones, cell towers, wi-fi systems, and wireless communications devices.

The two kinds have different qualities. They are measured differently, and the measurements are expressed In different units. That is why the EMF Guidelines on Page 1 above contain two separate sections.

They are both important, because each can affect your health.

This document deals with these two kinds of radiation only.

What About Short-Term Radiation Exposure?

The above guidelines are for **long-term** EMF exposure. That generally means several hours a day for years - but at the very least, months.

What about occasional short-term exposure? If your exposure is limited to a few hours, or days at most, you are unlikely to suffer long-term health consequences, even if exposed to very high levels of radiation (but rather avoid it if you can!)

The exception to this is pregnant women, and possibly very young children. They should avoid high levels of radiation, even for short periods.

How Much Electromagnetic Radiation is Safe?

Sooner or later, in your quest to understand the effects of electromagnetic radiation, you will probably want to understand the numbers.

You may start to ask questions like “How much radiation is in my home right now?”

Suppose you invited me into your house for a cup of tea or coffee, and you asked me to bring along my EMF meter. Walking around your lounge, holding a radio-frequency EMF meter in my hand, I notice that the readings around the room are between 40-100 mV/m , except over by the window, where the level is fluctuating around 250–350 mV/m (millivolts per metre).

So is that too high? Should you be concerned?

To find the answer, refer to our Guidelines (Page 3). You would see that the level of 40 to 100 mV/m spans the Low Risk and Moderate Risk levels, and that 250 – 350 mV/m spans the Moderate Risk and High Risk levels.

We could take similar measurements in your whole house. So now you would have a much better idea of how much risk you are running, and where the “hotspots” are. The meter tells you the numbers.

The EMF Guidelines tell you how much risk you are running. And from that information, you can decide what action, if any, you want to take to reduce your exposure.

How Reliable are the Guidelines?

There is no consensus among scientists as to what level of radiation creates a health risk in the population. Literally thousands of studies have been performed. This means that you can probably find studies to support your viewpoint, no matter what your viewpoint is.

Companies who make profits from devices which generate electromagnetic radiation generally still take the view that there is insufficient evidence of any health risk. They, too can find studies to support this view. (Often, these are studies devised and funded by those companies!)

However, most of the independent studies have found a relationship between high radiation levels and increased health risks. Using the results of these studies, it is possible to deduce the EMF exposure level which caused (or at least was associated with) an increase in the incidence of a particular disease.

Many international bodies, governments and medical institutes have used this information to set legal limits or maximum exposure guidelines. (Over time, these limits may tend to move downwards, as increasing evidence is found of health effects.)

Even the World Health Organization has recently acknowledged that electromagnetic radiation might cause serious diseases, such as cancer.

But legal limits in the USA (and some other countries) have not been reduced from the very high levels which were set decades ago by the International Commission on Non-Ionising Radiation Protection (ICNIRP).

EM Watch has looked into the limits in force in various parts of the world and the recommendations of various expert bodies, and has used this information to compile these EMF Guidelines.

How Much Radiation is Too Much for You?

It appears from scientific research that **no level of electromagnetic radiation (low-frequency or radio-frequency) is completely safe**. Even low levels may cause biological damage.

But the body has some ability to repair EMF damage. So if the amount of EMF you are receiving is within your repair capacity, no long-term damage is done. (Of course, the energy used to effect the repair could have been used by your body for some other useful purpose.)

Generally speaking, the level of radiation which will affect **your** health depends on **how much time** you are exposed to it.

But another factor is **who** you are and **your** state of health. A young, healthy adult can handle more EMF than a child or an older person, or a sick person.

That is why any EMF guideline can only give an indication of the risks for the average person. Bear in mind, you may not be average!

Pregnancy

Pregnant women have to be particularly careful because the foetus is very vulnerable.

There is evidence that high levels of electromagnetic radiation can cause miscarriage. Also, it appears that EMF exposure in the womb can cause the unborn child to be more susceptible to various illnesses later in life.

So a pregnant women would want to take special precautions to avoid high EMF levels. For example

- Keep a good distance between your tummy and any electric oven (2 feet for an electric oven and at least 5 feet from a microwave oven) while it is cooking.
- Do not allow any cell phone to come into contact with your tummy. Try to keep them at least 18 inches away at all times. And if at all possible, avoid having a wireless phone in your house.

We recommend that pregnant women learn as much as you can about EMF, from our website and elsewhere. This is a very important time to minimize your exposure to electromagnetic radiation.

Electro-HyperSensitivity

Some people have somehow become sensitized to certain kinds of EMF, rather like hay-fever sufferers who have become sensitized to pollen. People who are sensitive to EMF are called Electro-HyperSensitive (EHS) or just Electro-Sensitive.

EHS people react to much lower levels of EMF than the rest of us, and they may be more likely than others to suffer serious diseases such as cancer when exposed to high EMF levels.

Although you may not be EHS right now, you could become EHS if exposed frequently to high levels of EMF. The condition is acquired, and appears to be caused by previous EMF exposure.

Using Our EMF Guidelines

Until we know for sure what is, and is not safe, we believe the only sensible way to deal with electromagnetic radiation is to act on the **precautionary principle**. (Treat it as harmful until it proves to be safe.)

Actually, there is already plenty of evidence that EMF is harmful, at least to the health of some people. See http://emwatch.com/emf-research-quality-and-quantity/. So it is unlikely that it will ever be proven to be safe.

The EMF Guidelines are intended to be useful and practical, but to make the best use of them you will need to have access to the appropriate EMF meter (either a low-frequency meter or a radio-frequency meter, or both)

Reducing Your EMF Exposure

Radiation exposure has two components: intensity of radiation, and duration of exposure.

It usually takes many years of EMF exposure to cause serious disease, and in the case of cancer this can be a decade or more. (It can even be two or three decades.)

So it is a good idea to reduce your exposure now - before you get sick – to prevent your body from accumulating more radiation damage.

EM Watch has plenty of information about how to reduce EMF exposure from many different sources. But without an EMF meter it is hard to know how much radiation you are getting, and where it might be coming from. So you may find it hard to take meaningful action.

That is why we have reviewed what we consider to be the best low-frequency EMF meters as well as the best radio-frequency EMF meters and recommend that you get one of each, and use them to make your home and workplace safer.

I hope you will be able to make use of these EMF Guidelines to reduce your EMF exposure and safeguard your health. I don't need to remind you how precious that is!

Robert Sinclaire
www.emwatch.com

Notes on Appendix 1 & 2

Appendix 1 shows the various international limits and recommendations for exposure to **Radio-Frequency** electromagnetic radiation (or EMF) in descending order (highest limits on top).

EM Watch's own EMF Guidelines are also shown in this table, and the colors reflect the same risk levels we used in the Guidelines on page 1. (High risk is red.)

Notice the huge disparity between different countries' limits. Leading the pack is the USA (with Canada and Japan) whose legal limit is 1000 times higher than Austria (already in our High Risk band) and 10,000 times higher than the BioInitiative Report recommends.

Appendix 2 is similar to Appendix 1, but shows various limits and recommendations for exposure to **Low-Frequency** magnetic radiation, again in descending order (highest limits on top), together with EM Watch's Guidelines.

The table is color-coded to reflect the same risk levels used in the Guidelines on page 1. (High risk is red.)

Again you will notice the enormous range.

Many countries do not even set statutory limits for this kind of radiation, despite known health implications.

Appendix 1 – Radio-Frequency Electromagnetic Limits and Recommendations

EM Watch	Electromagnetic Radiation Exposure Guidelines		Copyright: www.emwatch.com
Radio / Microwave Radiation – International Safety Limits (Highest levels at top)			
Electric Field Strength	Power Density		Country or Organization
mV/m	W/m2	µW/m2	
61400	10.00	10000000	USA Statutory Limit (also Canada and Japan) ICNIRP Public Exposure Limit (2-300GHz) 1998
6140	0.100	100000	China, Italy (sum of mulitple frequencies), Russia statutory limit
5984	0.095	95000	Switzerland, Lichtenstein, Luxembourg statutory limit
3008	0.024	24000	Belgium statutory limit
1942	0.010	10000	Austria statutory limit
650	0.001	1120	EM Watch Guidelines – Maximum for Level 3 - Moderate Risk
614	0.001	1000	BioInitiative Report - Limit for Long-Term Exposure to Pulsed Signal
614	0.001	1000	Salzburg, Austria (1998) Sum GSM
614	0.001	1000	Italy statutory limit for a single frequency
600	0.001	954.9	Council of Europe (2011) - proposed indoor limit (also see 200 mV/m)
200	0.0001	106.1	Council of Europe Report (2011) - proposed indoor limit for "medium term"
194	0.0001	100.0	Building Biology Standard (2003) - Pulsed RF -"Extreme Anomaly" level
135	0.0000	48.1	Median Level of 15 US cities in 1977 (Mainly VHF TV)
100	0.0000	26.5	EM Watch Guidelines – Maximum for Level 2 - Slight Risk
61	0.0000	10.0	Salzburg, Austria (2002) GSM / 3G Limit for Residences (Outdoors)
43	0.0000	5.0	Building Biology Standard (2003)- Pulsed RF -"Strong Anomaly" level
10	0.0000	0.2656	EM Watch Guidelines – Maximum for Level 1 - Low Risk
6	0.0000	0.1	Building Biology Standard (2003)- Pulsed RF -"Weak Anomaly" level

Appendix 2 – Low-Frequency Magnetic Radiation Limits and Recommendations

EM Watch	**Electromagnetic Radiation Exposure Guidelines**	**Copyright: www.emwatch.com**
Low-Frequency Magnetic Radiation – International Safety Limits (Highest levels at top)		
MilliGauss	**MicroTesla**	**Country or Organization**
4166	416.6	ICNIRP Occupational Exposure Limit (60Hz) 1998
1000	100	European Union Recommendation 1999
833	83.3	ICNIRP Public Exposure Limit (60Hz) 1998
750	75	Poland statutory limit
100	10	Russia statutory limit
100	10	Belgium (Flanders)
5.0	0.5	EM Watch Guidelines – Maximum for Level 3 - Moderate Risk
5.0	0.5	Building Biology Standard (2003) - ELF magnetic -"Extreme Anomaly"
2.5	0.25	American National Standards Instituite (ANSI) limit
2.5	0.25	National Council for Radiation Protection and Measurement (NCRP)(USA)
2.5	0.25	Confederation of Professional Employees (Sweden)
2.0	0.2	EM Watch Guidelines – Maximum for Level 2 - Slight Risk
2.0	0.2	BioInitiative Report - Planning Limit for all new construction projects
1.0	0.1	EM Watch Guidelines – Maximum for Level 1 - Low Risk
1.0	0.1	BioInitiative Report - Limit for pregnant women and children
1.0	0.1	BioInitiative Report - Limit for all new space adjacent to power lines
1.0	0.1	Building Biology Standard (2003) - ELF magnetic -"Strong Anomoly" level
1.0	0.1	Switzerland – New Installations (Sensitive Use) Limit
0.2	0.02	Building Biology Standard (2003) - ELF magnetic -"Weak Anomoly" level

NATIONAL SECURITY AGENCY

UNITED STATES OF AMERICA

EMF Levels & Safety

It can be very hard to say exactly what levels of EMF are safe, because safety in this arena is often a relative concept based on frequency, exposure time, and possible individual sensitivity. Even then, studies are often considered inconclusive plus there is the potential for political and financial agenda to steer perception one way or the other.

In order to be fair and equitable while remaining informative, this document has been assembled in order to examine / compare / contrast various safety standards, average environmental levels and references along a continuum to better explain technical measurements in context. This document is offered free of charge, though if published, posted or reproduced in any fashion, crediting ScanTech as the document creator is requested.

Magnetic Fields Conversion Table

1 mG (milliGauss) = 100 nT (nanoTesla)
1 nT = 10 uG (microGauss) or 0.01 mG
100 microTeslas = 1 Gauss
1 microTesla = 10 mG
1 milliTesla = 10 Gauss   1 Tesla = 10,000 Gauss
1 nT = 1000 pT (picoTeslas) = 0.01 mG (10 microGauss) strongest brainwave is 1,000 times less
1 pT = 1000 fT (femtoTesla)
1 nT = 1,000,000 fT   The best resolution of a SQUID (Super Quantum Interference Device) is 1,000,000 times less

Magnetic Fields - A Relative Comparison

LOW LEVEL MAGNETIC FIELDS

Smallest value in a magnetically shielded room	10^-10 Gauss (0.1 nanoGauss)
SQUID	1.0 fT (femtoTesla) (0.1 nanoGauss)
Human Brain Magnetic Field	0.1 – 1.0 pT (picoTeslas) (0.01 - 0.1 microGauss)
Human Heart Magnetic Field	50^-12 Tesla (5 microGauss)
Galactic magnetic field	10 microGauss
Solar Wind	50 microGauss
Interstellar molecular cloud	1 milligauss
Interstellar Space	10^-6 Gauss (1 microGauss)

Hypothesized & Observed Animal Sensitivies to Magnetic Fields	
Honeybees	0.25 mG
Homing Pigeons	0.1 mG
Sharks & Whales	0.5 mG
Lowest level to cause reaction in Electromagnetically Sensitive Patients	0.1 - 0.2 mG

Swedish Safety standard	**1.0 mG (proposed US EPA standard)**
California Safety Limit for Public Schools	**1.2 mG**
Indoor EMF levels (when good wiring practices followed)	**0.1 – 1.2 mG**
New Swiss Standard	**2.5 mG ELF 0.25 mG VLF**
Maximum residential levels in Brentwood TN & Irvine, CA	**4 mG**

Cancer researchers concerned with recent powerline issues are coming up with many reports on oncological effects of very low-level 1 mG ELF electromagnetic fields

Leukemia studies which link low level EMF fields	2 - 4 mG

A study (Ahlbom & Feychting, 1993) reported that at 2 mG and above, exposed children were 2.7 times as likely to develop cancer as unexposed children, and at 3 mG and above, the odds rose to **3.8 times** as likely!

Computer Monitors - VDTs should produce magnetic fields of no more than 2 mG at a distance of 30 cm (about 1 ft) from the front surface of the monitor and 50 cm (about 1 ft 8 in) from the sides and back of the monitor.

The TCO'92 standard has become a de facto standard in the VDT industry worldwide. A 1999 standard, promulgated by the Swedish TCO (known as the TCO'99 standard), provides for international and environmental labeling of personal computers. Many computer monitors marketed in the U.S. are certified as compliant with TCO'99 for low magnetic fields.

Indoor EMF levels with poor wiring practice	3 – 20 mG
Hotspots near breaker boxes, transformers	20 – 2000 mG
Directly beneath high voltage lines	2 – 250 mG
Amount which affects CRT computer monitors (flat screens immune)	10 mG

STRONGER EMF FIELDS

(please note that the DC Magnetic Fields listed are not generally attributed as having negative health effects - and in fact, a number of alternative health experts actually recommend using magnets for healing and fitness)

Earth DC Magnetic Field (natural)	330 mG(equator) – 670 mG (poles)
Earth DC Magnetic Fields (affected by building structure)	200 mG – 800 mG
Recommended Limit for Pacemakers	1000 mG (1 Gauss)
Refrigerator Magnet (thin label type)	10 Gauss
Magnetic Field which could erase magnetic data	10 Gauss
Average Bar Magnet (DC)	100 Gauss
Independent research finds a change in blood behavior	500 Gauss
Strongest Inexpensive Ferrite Magnets	1000 Gauss

High magnetic field levels exceeding 100 Gauss (100,000 mG) may cause a temporary visual flickering sensation called *magnetophosphenes* which disappears when the field is removed.

Gauss required to affect / erase magnetic tape	2000 - 3000 Gauss
Magnets used in Biomagnetic Therapy (DC)	300 - 3000 Gauss
High Powered Neodymium N42 - N45 Magnets (DC)	7500 - 9200 Gauss

EXTREME LEVEL MAGNETIC FIELDS

High Level Laboratory Superconducting Electromagnet	100,000 - 130,000 Gauss
Strongest Sustained Magnetic Field in a Lab	450,000 Gauss
Strongest Magnetic Spike artificially produced (4 - 8 microseconds)	10,000,000 Gauss +
Magnetic Field Instantly Lethal to Organic Life	10^9 Gauss
Surface of a Neutron Star	10^12 - 10^13 Gauss
Surface of a Magnetar	10^15 Gauss
Highest Theorietical Magnetic Field	10^49 - 10^53 Gauss

EMF MEASURING INSTRUMENT RANGES

Typical Range for inexpensive EMF meter	1 – 10 mG
Range for Quality EMF meter	0.1 – 200 mG
Sensitive High Quality Reference Meter	0.01 – 2000 mG
Commerical High Field Gaussmeter	1 mG - 20 kilogauss

ICNIRP Guidelines for EMF Exposure

International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an organization of 15,000 scientists from 40 nations who specialize in radiation protection.

Exposure (60 Hz)	Electric field	Magnetic field
Occupational	8.3 kV/m	4.2 G (4,200 mG)
General Public	4.2 kV/m	0.833 G (833 mG)

International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an organization of 15,000 scientists from 40 nations who specialize in radiation protection.
Source: ICNIRP, 1998.

The National Radiological Protection Board (NRPB) says the UK should adopt international exposure standards. The NRPB has recommended for many years that nobody should be exposed to a level higher than 1,600 microTeslas. (16 mG)

But in a consultation document on restricting people's exposure, it now recommends the UK should adopt the guidelines of the International Committee on Non-Ionizing Radiation Protection (Icnirp).

The commission's recommended level is far lower, at 100 microTeslas. (1 mG)

ACGIH Occupational Threshold Limit Values for 60-Hz EMF

American Conference of Governmental Industrial Hygienists (ACGIH) is a professional organization that facilitates the exchange of technical information about worker health protection. It is not a government regulatory agency.

	Electric field	Magnetic field
Occupational exposure should not exceed for longer than 2 hours	25 kV/m	10 G (10,000 mG)
Exposure limit for workers as suggested by the ACGIH	20 kV/m	- 1 G (1,000 mG)
Prudence dictates the use of protective clothing above	15 kV/m	
Exposure Limit for workers as suggested by the IRPA/INIRC	10 kV/m	5 G (5,000 mG)
German Limit	5 kV/m	1 G (1,000 mG)
Exposure of workers with cardiac pacemakers and other electronic implants should not exceed. Montana has adopted this exposure limit and may be authoritative in the EU soon.	1 kV/m	1 G (1,000 mG)
Recommended 1996 as maximum for "workers" and their working environments by the NCRP, but not yet official. Influences Melatonin synthesis** Already viewed as "critical" by many scientists	100 V/m	10 mG
Aaronia "E2" recommendation Recommended 1996 as maximum for "private individuals" by the NCRP, but not yet official	10 V/m	1.0 mG
Aaronia "E1" recommendation	1 V/m	0.1 mG

American Conference of Governmental Industrial Hygienists (ACGIH) is a professional organization that facilitates the exchange of technical information about worker health protection. It is not a government regulatory agency.

Source: ACGIH, 2001.

RF Levels & Safety

OSHA 1910 Subpart G 1910.97 Occupational health and environmental control Non-ionizing radiation
The exposure limit in this standard (10 mW/sq. cm.) is expressed in voluntary language and has been ruled unenforceable for Federal OSHA enforcement. The standard does specify the design of an RF warning sign.

For PCS antennas, the 1992 ANSI/IEEE exposure standard for the general public is 1.2 mW/cm-sq

For cellular phones, the ANSI/IEEE exposure standard for the general public is 0.57 mW/cm-sq

ICNIRP standard is 0.40 mW/cm-sq for cellular phone frequencies and 0.90 mW/cm-sq for PCS phone frequencies

NCRP guideline is 0.57 mW/cm-sq for cellular phone frequencies and 1.00 mW/cm-sq for PCS phone frequencies

C95.1 - 1999 IEEE / ANSI Standard 1 mW/cm^2 controlled environment 0.2 mW/cm^2 public averaged over 6 minutes

IEEE guidelines **legally enforceable** vary by frequency (10000 / frequency^2)

Pacemaker Manufacturers

Guidant 5.2 mW / cm^2

Medtronics 2.6 mW / cm^2

Massachusetts adopted IRPA recommendations 200 microwatts/ cm^2 SAR 0.04 W / kg

Kirkland AFT Portland, Oregon 100 microwatts / cm^2

Soviet Union 1 microwatt / cm^2

Humans absorb most radiation between 30 - 100 MHz and especially between 77 - 87 MHz.

SAR for cell phones - SAR stands for Specific Absorption Rate, which is the unit of measurement for the amount of RF energy absorbed by the body when using a mobile phone. **Energy absorption** from RF fields in tissues is measured as a **SAR** within a given tissue mass

The unit of **SAR** is **watts per kilogram** (**W/kg**)

RESOURCE LINKS FOR LOOKING UP THE SAR RATINGS OF VARIOUS CELL PHONES
http://www.mmfai.org/public/sar.cfm
www.fcc.gov/oet/fccid

FCC CELL PHONE RADIATION STANDARDS

North American Standard 1.6 Watts per Kg averaged over 1 gram of body tissue
European Standard 2.0 Watts per Kg average over 10 grams of body tissue
Safety factor of 10 later added to create a 0.4 W / kg standard
NCRP recommends 0.08 W / kg

A typical 802.11b wireless network card will transmit at around 30 milliwatts (a few 100mW and 200mW cards out there) and operates in the 2.4 GHz frequency band. Current FCC regulations limit power output to 1 Watt EIRP (Effective Isotropic Radiated Power) for 802.11b (2.4GHz) devices

A study conducted in the Unites States found that, **in large cities** , **the average background** RF levels were **about 50 μ W/m 2** . About 1% of people living in large cities are exposed to RF fields **exceeding 10 mW/m 2** . Higher RF field levels can occur in areas located close to transmitter sites or radar systems.

The average GSM mobile handset has a power output of around 600 milliwatts

Compare this with microwave ovens, which can emit 500 to 700 Watts

RF fields between 10 MHz and 10 GHz penetrate exposed tissues and produce **heating** due to **energy absorption** in these tissues. The depth of penetration of the RF field into the tissue depends on the frequency of the field and is greater for lower frequencies.

SAR is the basic dosimetric quantity for RF fields **between about 1 MHz and 10 GHz.** A **SAR** of at least **4 W/kg** is needed to produce adverse health effects in people exposed to RF fields in this frequency range. Such energies are found tens of meters away from powerful FM antennas at the top of high towers, which makes these areas inaccessible.

RF fields above 10 GHz are absorbed at the skin surface, with very little of the energy penetrating into the underlying tissues.

For adverse health effects, such as eye cataracts and skin burns, to occur from exposure to RF fields above 10 GHz, power densities **above 1000 W/m 2** are needed. Such densities are not found in everyday life. They do exist in very close proximity to powerful radars. Current exposure standards preclude human presence in this areas.

RADIATION LEVELS & SAFETY

Rem (R oentgen E quivalent M an) is the unit of Dose (actually absorbed taking biological effects into account)

Rad (Roentgen Absorbed Dose) is simply the actual amount of radiation absorbed

Rem = Rads x Quality Factor (QF)

where the Quality Factor depends on the type of radiation. Heavy particles as alphas have a QF of 20, neutrons have a QF of 3-10 depending on the energy of the neutrons. Betas and gammas have a QF of 1.

The amount of ionising radiation, or 'dose', received by a person is measured in terms of the energy absorbed in the body tissue, and is expressed in **gray** . One gray (Gy) is one joule deposited per kilogram of mass.

Equal exposure to different types of radiation expressed as gray do not however necessarily produce equal biological effects. One gray of alpha radiation, for example, will have a greater effect than one gray of beta radiation. When we talk about radiation effects, we therefore express the radiation as effective dose, in a unit called the **sievert** (Sv).

1 Rem = .01 Sieverts

A former unit of (radio)activity is the Curie - 1 Bq is 27 x 10 -12 curies.
Title 10 Code of Federal Regulations Part 20 (10CFR20) is the NRC regulation governing radiation protection at a nuclear power plant. This regulation imposes requirements on such important items as annual allowed radiation exposure, radiation protection methods, radioactive releases, and records.

Adult workers may receive a whole body dose 5 Rem per year; minors are restricted to 0.5 Rem per year; pregnant women are restricted to 0.5 Rem during the term of the pregnancy (for protection of the embryo). For comparison, actual physical effects (minor blood changes) from radiation exposure are not expected until a person receives 25 Rem in a short period of time. Higher eye and extremity doses are allowed because these have less effect than on that part of the body containing blood-forming organs.

However there is no scientific evidence of risk at doses below about 50 millisieverts in a short time or about 100 millisieverts per year. At lower doses and dose rates, up to at least 10 millisieverts per year, the evidence suggests that beneficial effects are as likely as adverse ones.

High radiation areas are those where a person could receive more than 100 millirem in an hour.

At a nuclear plant, areas containing radioactive materials may be classified according to radiation level, contamination level, and airborne radioactivity level. Unrestricted areas are those where a person could expect to receive less than 500 millirem in a year.

Background radiation levels are typically around 300 millirem per year. In some areas of the world, background levels can reach as high as 15,000 millirem

Naturally occurring background radiation is the main source of exposure for most people. Levels typically range from about 1.5 to 3.5 millisievert per year but can be more than 50 mSv/yr. The highest known level of background radiation affecting a substantial population is in Kerala and Madras States in India where some 140,000 people receive doses which average over 15 millisievert per year from gamma radiation in addition to a similar dose from radon. Comparable levels occur in Brazil and Sudan, with average exposures up to about 40 mSv/yr to many people.

Several places are known in Iran, India and Europe where natural background radiation gives an annual dose of more than 50 mSv and up to 260 mSv (at Ramsar in Iran). Lifetime doses from natural radiation range up to several thousand millisievert. However, there is no evidence of increased cancers or other health problems arising from these high natural levels.

1 adult human (100 Bq/kg)	7000 Bq
1 kg of coffee	1000 Bq
1 kg superphosphate fertiliser	5000 Bq
The air in a 100 sq metre Australian home (radon)	3000 Bq
The air in many 100 sq metre European homes (radon)	30 000 Bq
1 household smoke detector (with americium)	30 000 Bq
Radioisotope for medical diagnosis	70 million Bq
Radioisotope source for medical therapy	100 000 000 million Bq
1 kg 50-year old vitrified high-level nuclear waste	10 000 000 million Bq
1 luminous Exit sign (1970s)	1 000 000 million Bq
1 kg uranium	25 million Bq
1 kg uranium ore (Canadian, 15%)	25 million Bq
1 kg uranium ore (Australian, 0.3%)	500 000 Bq
1 kg low level radioactive waste	1 million Bq
1 kg of coal ash	2000 Bq
1 kg of granite	1000 Bq

RADIATION LEVELS & THEIR EFFECTS

The following table gives an indication of the likely effects of a range of whole body radiation doses and dose rates to individuals:

10,000 mSv (10 sieverts) as a short-term and whole-body dose would cause immediate illness, such as nausea and decreased white blood cell count, and subsequent death within a few weeks.
Between 2 and 10 sieverts in a short-term dose would cause severe radiation sickness with increasing likelihood that this would be fatal.

1,000 mSv (1 sievert) in a short term dose is about the threshold for causing immediate radiation sickness in a person of average physical attributes, but would be unlikely to cause death. Above 1000 mSv, severity of illness increases with dose.

If doses greater than 1000 mSv occur over a long period they are less likely to have early health effects but they create a definite risk that cancer will develop many years later.

Above about **100 mSv** , the probability of cancer (rather than the severity of illness) increases with dose. The estimated risk of fatal cancer is 5 of every 100 persons exposed to a dose of 1000 mSv (ie. if the normal incidence of fatal cancer were 25%, this dose would increase it to 30%).

50 mSv is, conservatively, the lowest dose at which there is any evidence of cancer being caused in adults. It is also the highest dose which is allowed by regulation in any one year of occupational exposure. Dose rates greater than 50 mSv/yr arise from natural background levels in several parts of the world but do not cause any discernible harm to local populations.

20 mSv/yr averaged over 5 years is the limit for radiological personnel such as employees in the nuclear industry, uranium or mineral sands miners and hospital workers (who are all closely monitored).

10 mSv/yr is the maximum actual dose rate received by any Australian uranium miner.

3-5 mSv/yr is the typical dose rate (above background) received by uranium miners in Australia and Canada.

3 mSv/yr (approx) is the typical background radiation from natural sources in North America, including an average of almost 2 mSv/yr from radon in air.

2 mSv/yr (approx) is the typical background radiation from natural sources, including an average of 0.7 mSv/yr from radon in air. This is close to the minimum dose received by all humans anywhere on Earth
.

0.3-0.6 mSv/yr is a typical range of dose rates from artificial sources of radiation, mostly medical.

0.05 mSv/yr , a very small fraction of natural background radiation, is the design target for maximum radiation at the perimeter fence of a nuclear electricity generating station. In practice the actual dose is less.

NOISE LEVELS OSHA Safety Limits

90 dB	8 hours
92 dB	6 hours
95 dB	4 hours
97 dB	3 hours
100 dB	2 hours
102 dB	1.5 hours
105 dB	1 hour
110 dB	0.5 hours
115 dB	0.25 hours or less

NATIONAL SECURITY AGENCY

UNITED STATES OF AMERICA

RESTRICTED

A 7621 Received 12-30-94 [redacted] EX-1-2735

9-3158

AF 5796

"NOT FOR PUBLIC INSPECTION"

I. PURPOSE:

The aforementioned panel under the direct presidential directive signed on 26 September 1947, has been tasked with responsibility of providing answers to a most troublesome and disturbing phenomenon, that of other-world visitation and what it portends for the human family. It is in this vein that the panel has addressed the problem and in providing possible answers.

II. TABLE OF CONTENTS

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NATIONAL SECURITY AGENCY
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MAJCOMSEC INTELLIGENCE EYES ONLY

CODEWORD ~~WHITE~~ PEBBLE WHITE.

22

MAJCOMSEC INTELLIGENCE EYES ONLY
CODE WORD WHITE PEBBLE

SECRET

NOV 12 1953

November 4, 1953.

To: The Director of Central Intelligence

I have studied the MJTWELVE Operations Plan of June 16, 1953, on the subject of instructions for the expenditures of the National UFO Intelligence Program, and more specifically, the Special Operations Instructions to be issued to Unified and Specific Major Commands and Commanders. In connection with my Classified Basic Authorization of March 22, 1953, and the Implementing Instructions of January 23, 1953, I have no further instructions to add.

All the provisions covered in your NSC letter of May 22, 1953, are satisfactory to me, and I approve them, including the changes recommended by your intelligence staff, with the following exceptions:

(a) The penultimate paragraph, page 4 of Inclosure Number 1 to your letter needs to be revised. I am concerned that this paragraph as written could be misinterpreted by Regional and Local Commanders CONUS as giving them license to go beyond the restrictions set forth in these documents if the situation were to appear serious enough as to threaten hostile Soviet action. It seems best to me to eliminate this paragraph. It has been suggested that this difficulty could be averted by deleting the words "utilizing the criteria and procedures set forth in these instructions" and substituting therefor "observing the criteria, procedures, and restrictions set forth in these instructions." I would prefer the deletion of this paragraph altogether from this and all related documents.

(b) With regard to the basic letter of May 22, 1953, I would like to have added to paragraph 2.b the words "subject to COMINT agreements in accordance with NSA and CIA intelligence collection directives."

~~TOP SECRET~~

SECRET

MJEBBEN FIRESTONE

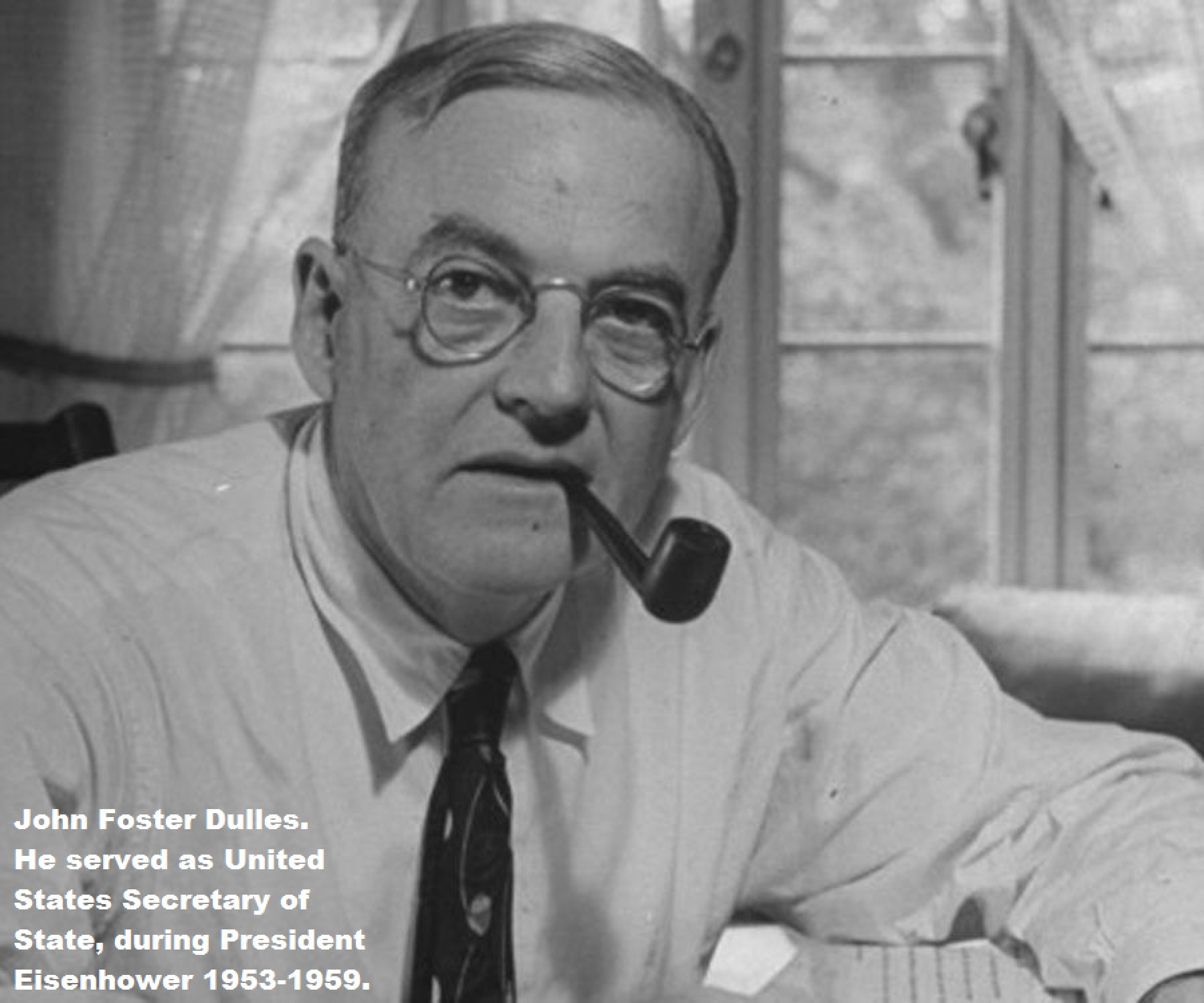
23

I cannot overemphasize the need for the utmost discretion and understanding in exercising the authority set forth in these documents. Accordingly, I would like you to find some way to brief the various Authorizing Commanders on the subject to ensure that all are of one mind as to the letter and spirit of these instructions. Preferably, I would like to see this done in a closed meeting to be arranged through the Director of the National Security Agency, yourself, and representatives of the MJ-12/Special Studies Project. I specifically want Project JEHOVAH director Professor Albert Einstein and Doctor Robert Oppenheimer to inject any useful comments to the briefing as they are most informed on the physics related to the subject. Perhaps the annual Quantico conference could provide an opportunity to do this without the publicity which would call attention to a special meeting.

Sincerely,

Dwight D. Eisenhower

SECRET



John Foster Dulles.
He served as United
States Secretary of
State, during President
Eisenhower 1953-1959.

? copies

TOP SECRET (downgraded to SECRET)

UFO

November 4, 1953

To: The Director of Central Intelligence

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Sincerely,

Dwight D. Eisenhower

exempt from declassification found in Dulles security safe. K.R.

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

FY 2018 Program Acquisition Costs by Weapon System

THAAD Ballistic Missile Defense — DOD - JOINT

The Terminal High Altitude Area Defense (THAAD) is a key element of the Ballistic Missile Defense System. The THAAD Battery will provide transportable interceptors, using "Hit-To-Kill" technology to destroy ballistic missiles inside and outside the atmosphere. A Battery consists of 6 truck-mounted launchers, 48 interceptors (8 per launcher), 1 AN/TPY-2 radar, and 1 Tactical Fire Control/Communications component.

Mission: Provides Combatant Commanders with a deployable, ground-based missile defense capability against short and medium-range ballistic missiles and asymmetric threats inside and outside the atmosphere.

FY 2018 Program: Supports the procurement of 34 interceptors and associated components, as well as support and training equipment. Continues fielding and sustainment activities for seven THAAD Batteries. Continues development of THAAD software upgrades to address threat packages, defense planning, improved capability to engage short-range ballistic missiles, medium-range ballistic missile, limited intermediate-range ballistic missile threats, and limited integration of the THAAD battery capability into the Integrated Air and Missile Defense Battle Command System (IBCS) planning process.

Prime Contractor: Lockheed Martin Corporation; Sunnyvale, CA

Budget per year are around $ 750 millions for this weapon system above.
It just need a few upgrades to shoot down E.T. And blow up E.T Bases.

TBM - Tunnel Boring Machine - in the Nevada desert. Photo: Department of Energy.


THIS IS ONE OF THE WEAPONS GOD GAVE US.
CAT
CAT


NORTH KOREA
NEW ROCKET FROM MOBILE LAUNCHER
THIS PHOTO WAS TAKEN UNDER 2022.
IT CAN EASILY BE EQUIPPED WITH
NUCLEAR WARHEADS.
I.E. THE PLANET'S ARMED DEFENSES ARE
ALSO ADVANCING IN THE ASIAN REGION.

NATIONAL SECURITY AGENCY

UNITED STATES OF AMERICA

RECEIVED
2-22-98

~~T O P~~
~~S E C R E T~~

III. CONCLUSIONS

1. Current studies of other-world visitation are in three phases:

a. Technology exploitation

b. Interplanetary travel

c. Cultural communication

2. On 19 September 1947, the IAC, JIOA, and the JIC, reviewed a Top Secret intelligence report titled REPORT TO THE PRESIDENT, 1947, PARTS 1-V, MAJIC EYES ONLY, DTG 0001909947, the report mentions: "In compliance with your directive . . . of 9 July 1947, the attached "REPORT ON FLYING SAUCERS" is respectfully submitted. In consonance with your instructions, advisors from State, Treasury, War and Navy Departments assisted me on a two month exploratory mission concerning the reality of other-world visitation. The principle investigators and storage areas were visited. Successful efforts were made to reach scientists of all levels as measured by their work in classified defense projects. Conferences were held with national security officials and leaders of private industry. Approximately 1,200 memoranda and intelligence reports were considered. The report presents this situation against a global background my estimates, current and projected, in both the U.S., and allied countries, and recommendations deemed to be sound courses of action for formulating plans and policies in light of recent developments.

3. All efforts have been made to identify the country or private concern wich could have the technical and finacial resources necessary to produce such a long-range flight. So far, no country on this earth has the means and the security of its resources to produce such.

4. A consensus reached by members of the panel, that until positive proof that the Russians did not attempt a series of reconnaissance flights over our most secure installations--the sightings and recovered objects are interpalnatary in nature.

5. The occupants of these planform vehicles are, in most respects, human or human-like. Autopsies, so far indicate, that these beings share the same biological needs as humans.

~~T O P~~
~~S E C R E T~~

[redacted]

IV. DISCUSSION

A. Nature of the Investigation.

An analysis has been made of the first one-hundred intelligence reports in the ATIC Interrogation Reports and the ULATT EXPLOITATION-MAJESTIC SERIES 1-25, prepared by the Military Intelligence Section of GHC/IPU, in order to establish what material of flying saucer intelligence value concerning the ULATT is available in these reports.

1. The ATIC Interrogation Reports, numbered 1 to 93 (the last dated December, 1950), present significant information on a broad variety of subjects and areas where witnesses were detained subsequent to the post-1947 incident. The un-published documents ~~consolidate~~ records of interrogation derived from the accumulated reports on interviews of selected witnesses from New Mexico and military personnel involved in removal of evidence.

2. In this digest, primary attention has been paid to information of bio-medical intelligence interest, particularly in the BW programs. Bio-medical intelligence is only one of the substantive fields covered by these Interrogation Reports.

3. For the most part, the sources interrogated were not trained observers, and their stories indicate they have been subject to the familiar pitfalls common to all eye witnesses. It must be emphasized that, because the interrogators used were not always specialists in this phenomena of celestial sciences, there is much lack of detail.

4. Because of the unique nature of the material under study, a multi-layered security structure has be em is effect. Most of the results have been given to private rese arch and development labs for further study.

5. MAJESTIC SS&P are currently foc used on Psy-Op development for Cold War CI activities.

6. Utilization of Paperclip specia lists has yielded valuable results in new weapons research in area s of flight dynamics, biological and chemical agents, mind control, and intelligence gathering techniques.

[redacted]

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[GN. NOTE. 'Operation Paperclip' brought scientists and researchers from Germany after the WWII. 1500 persons in total, and about 100 came later to work with civilian spacerelated research. These specialists mentioned in this document above, (in paragraph 6), must have be contracted from the, in total, 1400 person University pile that not ended up in NASA. 1500 people was taken from Germany with the intent of using their skills in U.S.A. If you like to dig deeper in it, more information are available at the U.S. Army Intelligence And Security Command.]

[redacted]

B. Panel's Contribution to MAJESTIC

1. The contribution of the President's Special Panel to the MAJESTIC TWELVE PROJECT has supplemented information on the ULATT Program which could not be obtained in any other way. Although only a small part of the project, interrogation in technical and bio-medical field has produced at least 8,973 items for the files of Military Intelligence, GHC/IPU. Of these items, 1,764 have been published (up to December, 1950) in the ULATT EXPLOITATION-MAJESTIC SERIES. The coverage of the New Mexico incidents, from the over-all intelligence point of view, has been very good. (After the Panel's review was initiated, GHC/IPU published in March 1951, two summary "MAJESTIC SERIES," No. 98 and No. 99, of the series titled "New Medical Facilities for Biological Warfare; New Genetic and Pharmaceutical Development Programs." These summary reports have apparently made of much of the AEC file material since 6,014 items are now reported as published "Medical Items" in the "Interrogation Reports" - see MAJESTIC SERIES, No. 98, page 1.)

2. For the clarification of published reports or for elaboration of the information of fragmentary nature, resort may be had to the AEC files of unpublished data as well as to the possibility of reinterrogating the sources.

C. Review of the Military Assessment

With current deployment obligations, troop commitments, and few air groups with stand-by fighters with radar capability, the Joint Chiefs are unable at the present time, to effect a complete and all-encompassing defense plan that would guarantee the protection and well-functioning of the national political order. Personnel, material, and logistical requirements for such a defense would deplete current resources. If such a crisis should occurr--in government failure to defend and assure the public's trust, it is the belief of the Joint Chiefs, that the following would issue: insecurity and mistrust; employment of subversive agents; infiltration; incitement of disorder and chaos to disrupt normal economy and undermine popular support of government and its leaders; seizure of authority without reference to the will of the people.

D. Technology

At present, the ability to reconstruct the technology that may be eons ahead of us, the boost to our current efforts would be incalculable. Areas such as aircraft and missile design would benefit only after a working understanding has been achieved. Weapons sciences will follow.

E. Nuclear Weapons Development

Miniturization of atomic bomb components is the goal of the AEC and the AFSWP. Studies at MIT indicate that such a technology is within reach before the decade is out. The apparent use of micro-circuitry found on the recovered planform indicates that miniturization, low-power transmission, light conductor/sensitive components are required for interplanetary space travel. Atomic engines and nuclear propulsion technologies could be advanced based upon current use of hydrogen and electro-magnetic research and weapons components development in U.S. and U.K.

F. Biological Warfare Programs

BW programs in U.S. and U.K., are in field test stages. Discovery of new virus and bacteria agents so lethal, that serums derived by genetic research, can launch medical science into unheard of fields of biology. The samples extracted from bodies found in New Mexico, have yielded new strains of a retro-virus not totally understood, but, give promise of the ultimate BW weapon. The danger lies in the spread of airborne and bloodborne outbreaks of diseases in large populations, with no medical cures available.

G. Genetic and Pharmaceutical Development Programs

Current research in U.S. and U.K., can be accellerated when studies are complete. Understanding the human makeup through EBE reserach will bring a varied wealth of information in how cells replicate themselves and may help in developing new drugs and markets. Healthcare industries are considered the best source of R&D for DoD programs.

H. New Materials Development

Conclusions reached by the Air Materiel Command in 1948, upon the close examination of the material structure of the Corona and Oscura Peak, N.M. sites, compelled the Air Force to launch a new machinability research program. Samples tested and evaluated by the AMC, suggested that future materials would have to incorporate new alloys and composites, if space exploration and hypersonic dynamics are to be achieved. As a result, new machining techniques are underway for high-temperature alloys and titanium.

I. Planned Future Rocket Development Programs

There have been a number of failed high-altitude rocket launches to study radiation effects on living organisms. The Air Force's Project BLOSSOM, conducted at Holloman AFB, is but one example. V-2 rocket launches at the White Sands Proving Ground, N.M., have been knocked down by undetermined jamming. The source of the jamming is believed to come from UFO sightings on or near the range. Guidance systems are believed to be vulnerable and this presents a clear and present danger. Such keeper flights carrying nuclear weapons are too horrific to contemplate. Shielding of systems and circuits are underway.

J. Nuclear Propulsion Development Programs

The AEC and NEPA are currently conducting research for advanced technologies in atomic engines and radical propulsion studies. Systems studies at Los Alamos, N.M., Oak Ridge, Tenn., and at Langely, Va., are attempting to duplicate the water drive and plastic core elements found on the engine being kept at HAFB. Intergration of hydrogen base feuls and electro-hydrodynamic technology, may open up for us development of super-aerodynes with mach 5 capabilities.

K. Intelligence Gathering and Analysis

Based on what is known of the technology and intelligence of the visitors, it is fairly certain that there will be other sightings and encounters of a spectacular nature. As to purpose and modus operandi, we are not certain, but it is clear, that if these visitors had conquest in mind, it would not be difficult for them, given their ability to penetration our airspace at will, and their ability to jam radio, telephone, tele vision, and teletype transmissions, let alone power grids. So far, reports and sightings are blatant and deliberate, thus allowing our intelligence agencies to gather good data. As to the analyses of such reports, only a continuous wave of sightings and encounters world-wide, would provide enough data for a clear understanding of intent.

L. Foreign Policy and National Security

To date, only Great Britain, Canada, and the Soviet Union, are contacted and appraised in the event invasion is eminent. It is the current policy of the Administration that no other foreign countries will be consulted or advised. The national security status of the MAJESTIC operation exceeds that of the H-bomb development.

M. Domestic and Constitutional Issues

In dealing with clear violations of civic law and guarantees as defined under the Constitution, it has been discussed among members of MAJESTIC TWELVE, that such protection of individual rights are out-weighed by the nature of the threat. Only a declaration of war or a national emergency, would give the government the power to enact martial law and recend individual rights.

N. Social, Religious and Scientific Reaction

It has been the downfall of great nations and cultures when a new reality is not readily accepted by the masses. The social order was severely ravaged by the last world war, with great damage to the religious dogma of "earth without end," thus making a government disclosure irresponsible and inherently dangerous. The scientific community would predictably question such a reaction as a world suffering from a Buck Rogers delerium and attack anyone of their own ranks for believing such fanatsy. Science itself, may undergo a traumatic transformation, with belief structures in shambles, putting the institutions under scrutiny by the layman, thus ereding any credibility. Science would be left with an image of credulity.

O. Cold War Development

This is one of the most dangerous phenomenon of the twentieth century. To misidentify a flight of space objects for actual Russian bombers, or to dismiss Russian bombers as phantoms, is the most idiotic approach to take. Even though governments may distrust each other, it is the responsibility and creed of the military and intelligence professional to prevent wanton death and destruction of his country. It is advisable to maintain some form of direct communication with a hostile enemy before taking false assumptions of his response if falty data wrongly indicates such. Even using the "Flying Saucer" ruse to create fear and confusion among your enemies leaders, could result in accidental war. Even our early analysis of the recovered planforms in 1947, led to the wrong assumption that the Russians were preparing a sneak attack on the continent.

P. Government Policy of Control and Denial

One of the most difficult aspects of controlling the perception in the public's mind of government attempts of denial and ignorance--is actual control of the press. Until a clear intent is established with diplomatic relations firmly in hand, it is the recommendation of the President's Special Panel with concurrence from MAJESTIC TWELVE, that a policy of strict denial of the events surfacing from Roswell, N.M., and any other incident of such caliber, be enforced. A inter-active program of controlled releases to the media, in such fashion to discredit any civilian investigation, be instituted in accordance with the provisions of the 1947 National Security Act.

ANNEX A

1. The Panel's review of the AEC and AFSWP investigation of Site L-1 and the Air Force Site L-2, has led the Panel to conclude that the objects under study, are the result of a high altitude ejection of a escape cylinder from a fatal mid-air collision of two unidentified circular planform aircraft of interplanetary nature.

2. Of particular interest to the Panel was Site L-2, located at Lat. 33-40-31, Long. 106-28-29, as this site yielded the most material for analysis.

3. Site L-2 may be closely associated with Site L-1, due to the similarity of material recovered and that the impact at Site L-1 and debris pattern suggests that the craft hit the ground at a sharp angle and continued to remain airborne until coming to rest at Site L-2.

4. The craft found at Site L-2, is either the remains of a rocket-plane, or, a powered-glider. What remained of the power plant was examined and determined to be of a magnetic drive propulsion powered by a fusion reactor of sorts.

5. Lack of wiring, fuel systems, cables, motors, hydraulics, intakes, exhaust, and surface controls, strongly suggests that the craft was designed to travel outside of our atmosphere.

6. The second craft that impacted at Site L-3, provided very little evidence that it too was similar in design, as the impact was vertical in nature and at very high speed. It is believed that the debris discovered on 2 July 1947, by a local rancher was the result of a mid-air collision with an X-plane from HAFB; another unidentified object; or possibly collided with both. Radar film and tower logs do not explain the merging of three radar targets prior to collision and subsequent crashes.

7. There were five recoverd bodies, two of which were found in a severely damaged escape cylinder, and the remaining three were found some distance away from the cylinder. All five appeared to have suffered from sudden decompression and heat suffication (recovery and autopsies of the occupants are covered in detail in a seperate study GRAY SUIT within Projects 612 and 621, ULAT EXPLOITATION-MAJESTIC SERIES 4, p. 40-102), as a result of damage sustained from unkown causes.

[redacted]

ANNEX A (Cont'd)

8. The Panel was concerned over the contamination of several SKD personnel upon coming in contact with debris near the power plant. One technician was overcomed and collasped when he attempted the removal of a body. Another medical technician went into a coma four hours after placing a body in a rubber body-bag. All four were rushed to Los Alamos for observation. All four later died of seizures and profuse bleeding. All four were wearing protective suits when they came in contact with body fluids from the occupants.

9. Autopsies on the four dead SKD technicians are not conclusive. It is believed that the four may have suffered from some form of toxin or a highly contagious desease. Tissue samples are currently being kept at Fort Detrick, Md.

10. The Panel was also concerned with the detection of air-borne release of radiation over the state of New Mexico. AFTAC detachment from McClellan AFB has conducted several airborne monitor flights over Site L-2. Radiation readings indicate a high neutron count was recorded as the plane flew over the site. Neutron count dropped off as the plane flew a considerable distance from the site. A report has been filed with the USAIDS.

11. Detection of a high altitude explosion was recorded by a Project MOGUL constant level balloon on 4 July 1947. Radar from White Sands Proving Ground and HAFB also detected a surge.

12. Parachute recovery team from HAFB were dispatched to Site L-2. Upon arrival, the team, realizing the nature of the crash, radioed instructions and marked crash site for the investigators that arrived later.

13. In the opinion of the senior AEC medical officer, current medical equipment and supplies are wholly inadequate in dealing with a large scale outbreak of the alien virus.

14. Facilities at Los Alamos and Mayo clinics were considered as lacking in the current climate.

15. On 26 September 1947, the first meeting of the MSC-1 was held to discuss the New Mexico incidents and how to implement the policy established by MJ-12 SS&P.

[redacted]

ANNEX B

1. Upon the creation of the MAJESTIC TWELVE GROUP by special executive order dated 24 September 1947, and given powers of authority by PDD/L-1, dated 26 September 1947, the Panel was empowered to convene and conduct a review of all available evidence and data collected by government and military intelligence agencies.

2. Because of the unique nature of the 1947/48 crisis, the Panel recommended to MAJCOM-1 that the authority of the Secretary of Defense be invoked in order to implement NSCID No. 1/1.

3. A meeting was held on 8 December 1947, between CIA and IAC concerning the IAB. Dr. Vannevar Bush, Chairman of the Panel, requested the DCI to convey the contents of a letter from Dr. Bush to Secretary Forrestal, thus breaking the deadlock over issues concerning authority and policy making dealing with the New Mexico incidents and subsequent exploitation of the finds.

4. On 13 January 1948, the NSC, with input from the Panel recommended to the President that third party group from outside of the Government be established for the purpose of conducting a impartial and objective survey of the activities and personnel of the CIA.

5. As a result of the DCI's lack of timely intelligence estimates and poor coordination of intelligence activities for MAJESTIC the NSC Survey Group issued its findings. At the suggestion of the Panel Chairman, the IAC met on 16 June 1948, at which the conclusions of the Survey Group were reviewed.

6. On 18 February 1949, the IAC met for the purpose of proposing some changes to a CIA draft proposal on MAJCOM activities.

7. General Joseph McNarney, with the assistance of Carlisle Humelsine and Robert Blum, prepare NSC 50/1. On 7 July 1949, the NSC adopted the recommendations of NSC 50/1 which directed the DCI to enlist the activities of the IAC in MAJESTIC intelligence activities.

8. MAJCOM-1 meets with the President in May 1950.

9. Admiral Hillenkoetter leaves position as DCI on 7 October 1950.

10. MAJCOM-1 with assistance of the Panel persuades the President to establish the Psychological Strategy Board on 4 April 1951.

11. Panel member and MAJCOM-4 meet with MAJCOM-1 on 10 October 1950 along with members of IAC. The Chief of Global Survey Group desired estimates requested by the Pentagon concerning possible defense project for MAJESTIC LOGISTIC SSP-1.

12. On 6 December 1950, MAJCOM-4 alerts MAJCOM-1 of a breach in DEW Greenland of a UFO on a south-westernly course. HQ IPU alerted and dispatched a scientific team to El Indio-Guerrero on the Texas-Mexico border. MAJCOM-4 orders a recovery team from Project STORK and MOON DUST to crash site. Teams transport debris from crash site to ADC HAFB and to AEC laboratories at Sandia, New Mexico.

13. MAJCOM-1 enlists the Panel's aviation consultants for the purpose of advising the "Princeton Consultants."

14. On 28 December 1950, MAJCOM-1 is provided with the "Black Book" summaries prepared by the Watch Committee. Begining every Friday the President is briefed on world situation and on MAJESTIC via the CIA weekly Current Intelligence Review.

15. At the request of Panel member Cardinal Francis Spellman met with the President to discuss the containment within the Catholic Church and its hierchy of religious speculation if mass sightings occur. Such containment was successful during the 1947 sightings when Cardinal Spellman met with the Secretary of War on 29 June. The President has been briefed on Defense Plan 4P, which was written in part by the Panel member.

16. In support of the MAJESTIC program for developing atomic engines, Panel members and their association with the AEC, the Armed Forces and the National Advisory Committee for Aeronautics, have consulted MAJESTIC for the development of nuclear fission reactor for powered flight studies.

17. Atomic engines for aircraft built here on earth faces many difficulties because of size and weight of the reactor and radiation shielding. Such a nuclear power plant would give an aircraft unlimited range.

18. Panel members contributed to the writing of ULATT EXPLOITATION-MAJESTIC SERIES 5 title Hypersonic Small-Disturbance Theory, which gives consideration to a three-dimensional body fixed in a steady, uniform, hypersonic stream. The theory assumes that shock waves can be approximated by abrupt discontinuities and the planform body being thin, so that the slope of the local surface in the stream direction is uniformally small.

19. MAJCOM-4, a member of the Panel was instrumental in supporting the the creation of the Air Force's Scientific Advisory Board which MAJCOM-5 endorsed.

20. MAJCOM-5 recommended to the Air Force Chief of Staff, that the Top Secret report Where We Stand, be the basis for ULATT development. MAJCOM-5 urged the COS to enact the ideas of another report Science, the Key to Air Supremacy. Major General Curtiss LeMay Staff Director of Research and Development seconded MAJCOM-5's views.

21. The Panel Chairman argued for funding for air defense projects that would be useful in combating the new menace instead of developing ballistic missiles, which have proved to be useless.

22. On June 15 1947, Dr. Theodore von Karman chaired the first meeting of the SAB and discussed how the Air Forces could prepare for a possible air attack in light of the numerous UFO sightings over the U.S.

23. On 14 May 1948, MAJCOM-4 arranged for the promulgation of Air Force Regulation 20-30, which restored the powers of the SAB as agreed upon by Karman and LeMay in 1946.

24. MAJCOM-4 had a prepared speech read at a meeting of scientific advisers on 7 April 1949, highlighting new Air Force R&D organization and structures on UFO research for ULATT. Karman enlisted the aid of a Panel member to persuade MAJCOM-4 to endorse a seperate establishment free from AMC and Pentagon control.

25. On 2 January 1950 a plan was presented to the Air Staff Council for seperate R&D for ULATT.

26. On 23 January 1950, Research and Development Command and the Air Staff Deputy Chief of Staff for Research and Development was created.

27. In May 1951, Panel member MAJCOM-4 endorsed Karman's creation of AGARD and his presentation at the Pentagon of a lecture called "Mobilization of Scientific Effort in Western European Countries."

ANNEX C

1. Military commanders are taught a basic premise that the ideal defense as characterized by Karl von Clausewitz,--is a "shield of blows." When an enemy attack begins the defender yields the initiative, using his prepared positions and knowledge of the battle ground to slow its momentum and to strike the enemy with repeated, unexpected blows. Such a defense can work, only when the enemy is detected, his strength known, his weaponry identified, and, his tactics and movements are revealed.

2. In the annuls of warfare mass disappearances of soldiers and their equipment are rare but are on record. In the eighteenth century during the Spanish War of Succession, 4,000 soldiers were reported to have disappeared, together with their weapons and equipment (horses included). In 1885, about 600 French colonial soldiers disappeared near Saigon, French Indo-China, without a trace of them nor their equipment. On August 21 1915, members of the New Zealand Army Corps' First Field Company signed sworn statements that they saw the One-Fourth Norfolk Regiment disappear in a unusually thick brown cloud wich seemed to move and rose upward and vanished. There were no traces of the regiment nor their equipment. No explanation can be found in the historical records of the Imperial War Museum archives. In 1939, over 2,900 Chinese Nationalists troops were reported missing from their camp, just south of Nanking. Again, men, equipment, guns, were missing though camp fires and mess tents were undisturbed. During the Pacific campaign, there have been instances where whole platoons and larger units seemed to have disappeared without any sign of combat or a struggle. Men, equipment, weapons--vanish without a trace. In all instances the disappearances occurred in tropical climate and in the heat of battle or near combat zones.

3. Missing aircraft, pilots and crews, are of special concern to the military when no explanations fit the usual reasons outside of combat. One such incident is the disappearance of a flight of five U.S. Navy TBM-3 Avenger torpedo bombers from NAS Fort Lauderdale on 5 December 1945. While no explanation as to why navigation instruments on all five aircraft could have failed at the same time, and efforts to rescue the 14 crewmen were unsuccessful, it is believed that Flight 19 encountered a phenomenon of celestial nature. The last known radio transmission from the instructor pilot was heard by a ham operator, "Don't come after me . . . they look like they are from outer space. . . I'm at 2,300 feet. Don't come after me." After one of the most intensive air-sea rescue operations in U.S. naval history, the Naval Board of Inquiry said, "we were not able to make even a good guess as to what happened."

[redacted]

ANNEX C (Cont'd)

4. On 7 January 1948, a ANG F-51 pilot was lost near Godman AFB, Kentucky. After being directed to lead his flight of four F-51s by the tower, Captain Thomas Mantell pursued a large metallic object alone after two pilots returned to Godman AFB, and finally his wingman was ordered to return to the field. It is believed that Mantell was following a large, structured object not in the flight path of a classified Navy SKYHOOK balloon. Mantell radioed Godman tower that he was at 22,000 feet and still climbing. At one point Mantell said that the object had paced his aircraft for several minutes, then would speed up. His last transmission to the tower was, "It appears to be a metallic object . . . and it is of tremendous size . . . It appears to be a metallic object or possibly the reflection of sun from a metallic object." When Godman personnel arrived at the crash scene, Mantell's F-51 was found in many pieces, not large sections as one would find from a free stick descent. The wreckage contained unusual damage as if Mantell's plane was repeatedly hit by shotgun blasts. Some of the metal had pitted surfaces and unusual scoring. All rubber material had disintegrated in a soft powdery substance. There was no indication of gunfire damage or foul burn. The crash site and debris exibited an unusually high amount of radiation of undetermined nature. The site was cleared of debris and covered. Mantell's plane was subsequently sent to Wright-Patterson AFB, Ohio for examination. A autopsy was conducted on the body and interned in storage for future study. It is believed by the Air Force investigators that Mantell's plane had been destroyed by a ionization phenomenon, possibly from the propulsion wash of the object's exhaust.

5. From 1949 to late 1950, there have been several crashes of B-36 bombers on routine artic patrol that bear all the earmarks of the Mantell incident. None of the crews were found. The atomic bombs were not recovered, thus creating a serious problem for the Air Force when nuclear weapons are lost over friendly countries.

6. The death of two Air Force counterintelligence officers in the crash of their B-25 aircraft enroute to Hamilton AFB, California, after interviewing two auxiliary CG men who reported six UFOs over Maury Island, Washington, in June 1947. CIC agent Crisman had spoken to Kenneth Arnold, who on 26 June 1947, had reported a flight of UFOs over Mt. Rainier, Washington, and filed his report after he had spoken to Captain Davidson and Lieutenant Brown. The material given to Davidson and Brown was believed to come from Maury Island and may be celestrial fragments containing metal from a nuclear reactor from a UFO. Fragments were turned over to CIA agent Shaw, and Crisman was ordered to the Alaskan ADC for assignment in Project IVY.

[redacted]

T-O-P- [redacted]

ANNEX C (Cont'd)

7. Aerial interference with military aircraft has demonstrated the ability to observe our air operations in war and peacetime conditions. During the war over 900 near-miss incidents were reported by allied pilots and crews in all theater of operations. One of the most dramatic near-miss encounters occurred on 14 October 1943, 8th AF Mission 115 over Schwienfurt, Germany. B-17 crews reported many formations of silverly discs flying down into the B-17 formations. Several times during the bombing mission, large objects were seen following the discs descent into the formations. Unlike previous reports, no engine failures or airframe damage was reported. After the surrender of Nazi Germany, GAF fighter pilots were interrogated by AF intelligence concerning Mission 115. GAF did not have any aircraft above our bombers at that time.

8. On 1 August 1946, a C-47 piloted by Captain Jack E. Puckett, Assistant Chief of Flying Safety for TAC, experienced a near-miss of a cylindrical-shaped aircraft about 100 meters in length. The incident occurred at an altitude of 4,000 feet, northeast of Tampa, Florida. Just 1,000 yards on a collision course, the UFO flipped over sideways, crossing the flight path of Puckett's C-47. Three other crew members observed the UFO and described it as being over twice the length of a B-29 and cylindrical in shape with luminated windows. Observers on the C-47 reported a stream of fire trailing the object. The crew and Puckett watched the UFO for over three minutes. TAC radar stations had tracked a large target approaching the C-47 and then performed a right-angle course change while flying at speeds of excess of 600 mph.

9. On 1 October 1948, a ANG F-51 pilot engaged a blinking luminus UFO in a dogfight-style encounter over Fargo, North Dakota.

10. On 24 April 1949, engineers and technicians from the White Sands Proving Ground observed a elliptically-shaped object moving in a eastward course at very high altitude. The object was discovered while tracking a Skyhook balloon through a theodolite. The object appeared whitish in color and pale yellow at the tail end. The object was estimated to be two-and-a-half times as long as it was wide. It was difficult to see any structure of the object as it was moving at a very high speed. The object was observed through a theodolite for approximately one minute before disappearing in a steep climb. The object was estimated to be traveling at an altitude of over 60 miles.

T-O-P- [redacted]

11. From 1944 to early 1951, our atomic bomb and component plants have been the target of UFO reconnaissance. Of late, our NEPA projects are of special attention to the visitors. During some of the flights, radiation levels have risen sharpely, then dropping suddenly to normal. In some instances plutonium production has been halted due to contamination of plant personnel during these sightings of low-level flights.

12. On 25 October 1950, the Superintendent of Security, Oak Ridge, filed a security report for X-10. He stated that a round object, about ten feet in diameter, burnished yellow in color, hung low over the Control Zone. The object would move slightly from one side to the other and emit a low hum sound.

13. On 24 October 1950, the Assistant Chief of Security, NEPA Division, Oak Ridge, observed a similar object near the restricted area (Restricted Fying Zone). The object emitted a varying color of light from red to green, to blue to orange. This sighting was confirmed by a Air Force officer also of NEPA Division, Oak Ridge. Radar from Knoxville Airport tracked several slow moving targets flying over the Southeast sector of the "Restricted Zone". Fighters were vectored to the radar targets but the pilot reported no visual contact.

14. Naval aircraft with nuclear weapons delivery capability have reported a sudden drop in neutron counters. Aircraft carrier storage of nuclear weapons have also reported unusual neutron counts. During recent NATO naval maneuvers, the USS Franklin D. Roosevelt has been trailed by numerous UFOs for long periods on-and-off since 1950. ?

CONCLUSIONS:

The future of American citizens and the world for that matter are jeopardized today by developments as portentious as those leading to World War II. Given the growing challenge from the Soviet Union and her satellites and the intrusion of extraterrestrials, the United States is compelled, therefore, to initiate realistic lines of action to protect United States strategic interests.

RECOMMENDATIONS:

It is recommended:
That the United States Government provide as early as practicable moral, advisory, and material support to the MAJESTIC-12 Project in order to contribute to the early establishment of peace in the world in consonance with the enunciated principles of the United Nations, and to protect United States strategic interests against forces which now threaten them.

NATIONAL SECURITY AGENCY

UNITED STATES OF AMERICA

US006587729B2

(12) **United States Patent**
O'Loughlin et al.

(10) **Patent No.: US 6,587,729 B2**
(45) **Date of Patent: Jul. 1, 2003**

(54) **APPARATUS FOR AUDIBLY COMMUNICATING SPEECH USING THE RADIO FREQUENCY HEARING EFFECT**

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(73) Assignee: **The United States of America as represented by the Secretary of the Air Force**, Washington, DC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/131,626**

(22) Filed: **Apr. 24, 2002**

(65) **Prior Publication Data**

US 2002/0123775 A1 Sep. 5, 2002

Related U.S. Application Data

(62) Division of application No. 08/766,687, filed on Dec. 13, 1996, now Pat. No. 6,470,214.

(51) **Int. Cl.**[7] **H03C 1/54**
(52) **U.S. Cl.** **607/55**; 128/897; 332/167; 381/151; 600/586

(58) **Field of Search** 332/167; 381/151; 607/56, 55; 340/384.1; 600/559, 23, 586; 128/897, 898

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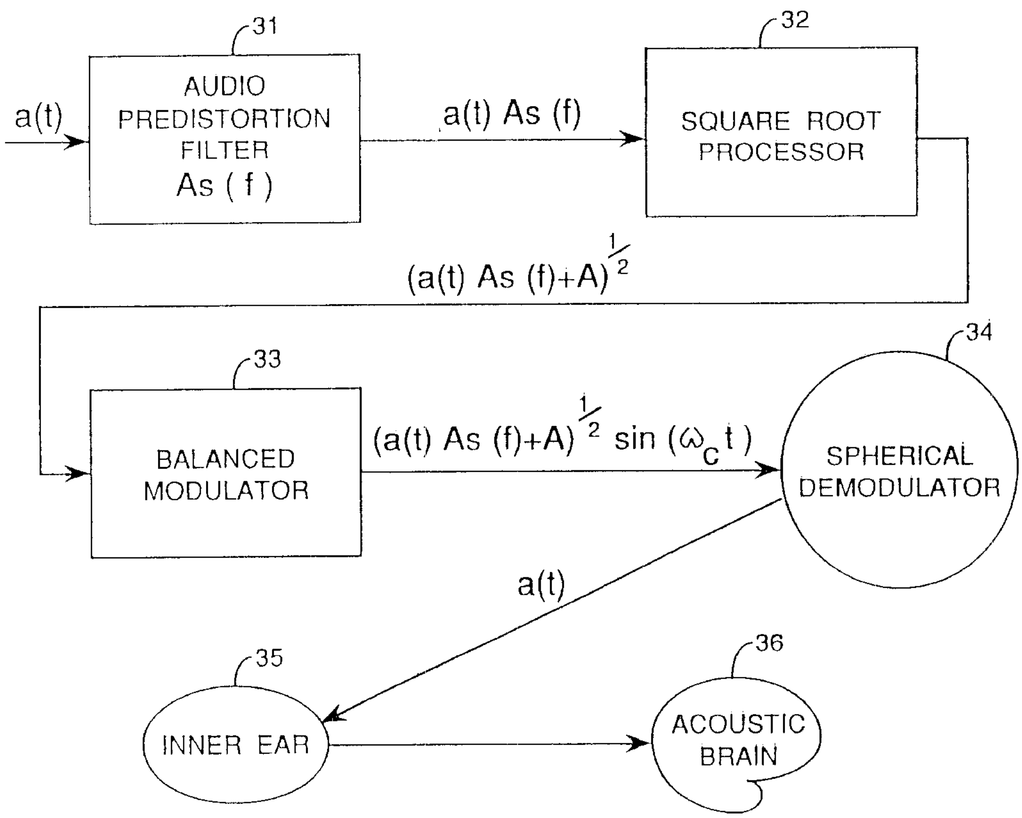
(57) **ABSTRACT**

A modulation process with a fully suppressed carrier and input preprocessor filtering to produce an encoded output; for amplitude modulation (AM) and audio speech preprocessor filtering, intelligible subjective sound is produced when the encoded signal is demodulated using the RF Hearing Effect. Suitable forms of carrier suppressed modulation include single sideband (SSB) and carrier suppressed amplitude modulation (CSAM), with both sidebands present.

11 Claims, 3 Drawing Sheets



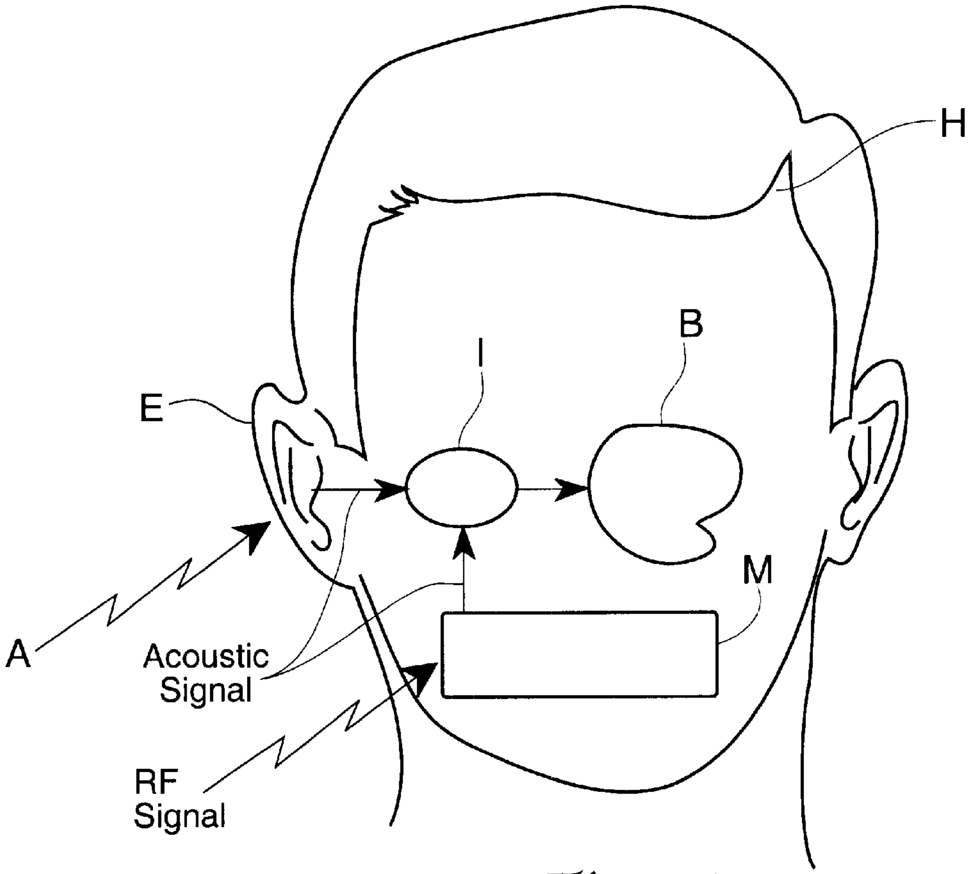


Fig. 1

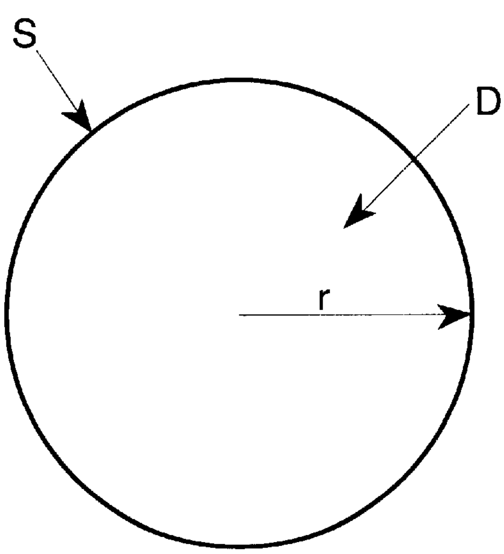


Fig. 2

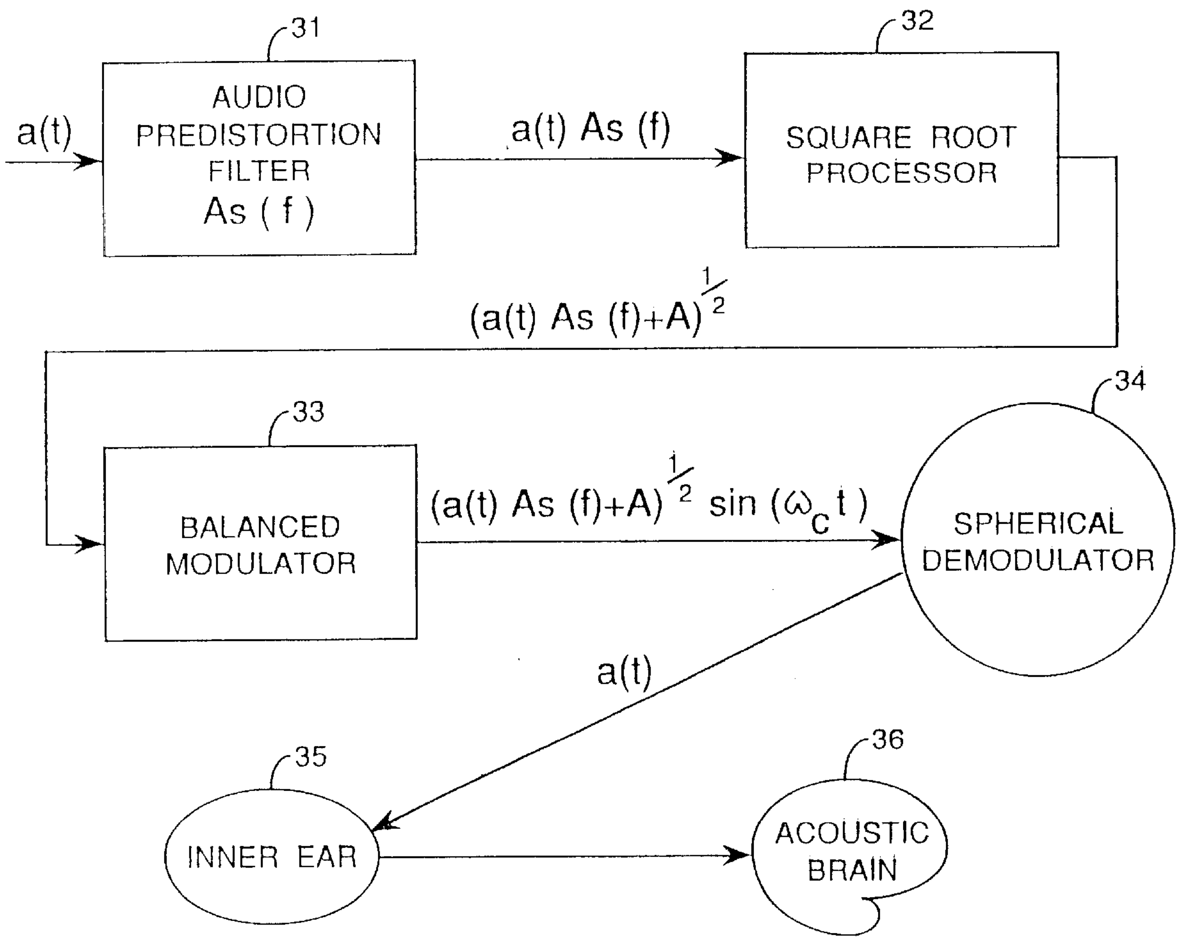
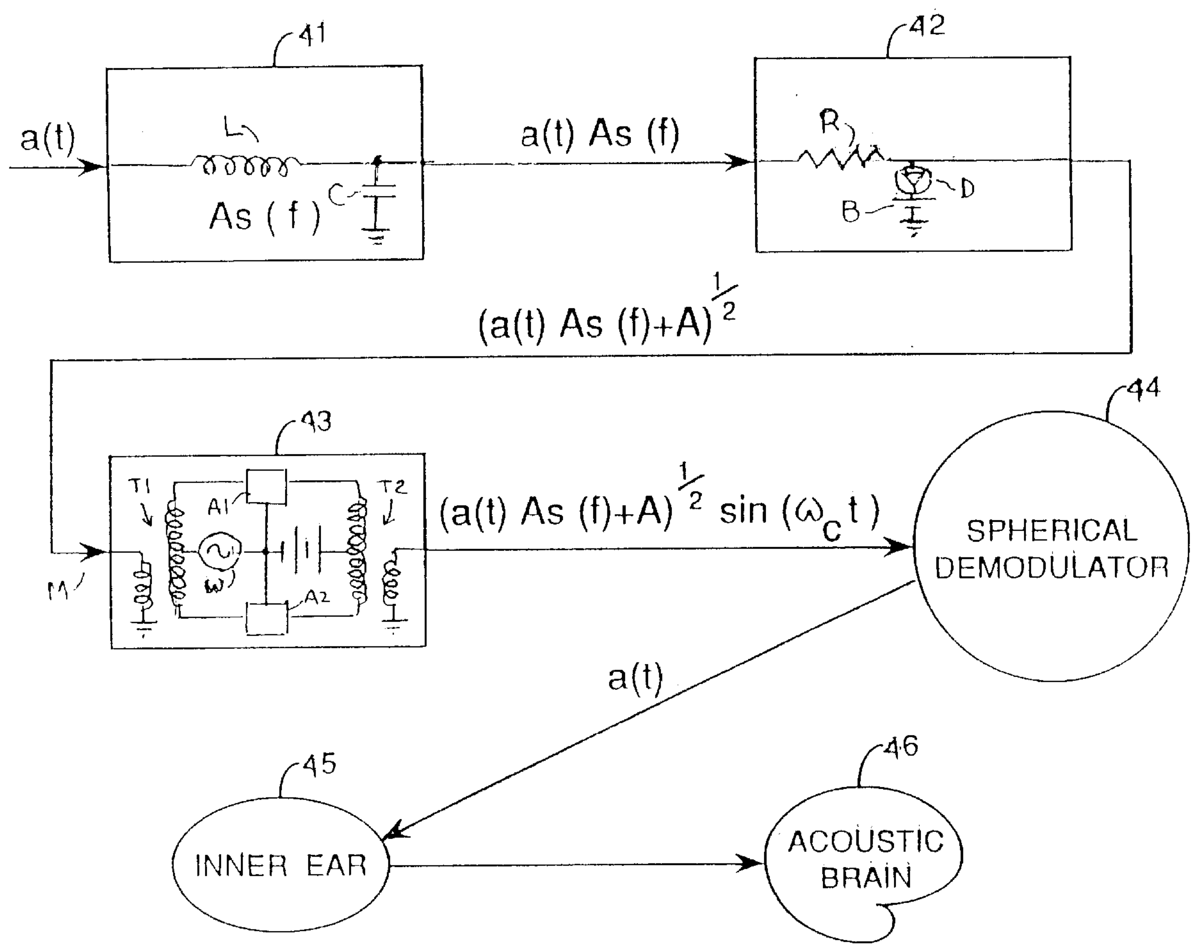

31
AUDIO PREDISTORTION FILTER As (f)
a(t)
a(t) As (f)
32
SQUARE ROOT PROCESSOR
(a(t) As (f)+A) 1/2
33
BALANCED MODULATOR
(a(t) As (f)+A) 1/2 sin (ωc t)
34
SPHERICAL DEMODULATOR
a(t)
35
INNER EAR
36
ACOUSTIC BRAIN

FIG. 3



41
42
43
44
45
46
a(t)
L
As (f)
C
a(t) As (f)
R
D
B
(a(t) As (f)+A)^1/2
T1
T2
A1
A2
ω
M
(a(t) As (f)+A)^1/2 sin (ωc t)
SPHERICAL
DEMODULATOR
a(t)
INNER EAR
ACOUSTIC
BRAIN

FIG. 4

APPARATUS FOR AUDIBLY COMMUNICATING SPEECH USING THE RADIO FREQUENCY HEARING EFFECT

This application is a division of U.S. patent application Ser. No. 08/766,687 filed on Dec. 13, 1996, now U.S. Pat. No. 6,470,214, and claims the benefit of the foregoing filing date.

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

BACKGROUND OF THE INVENTION

This invention relates to the modulating of signals on carriers, which are transmitted and the signals intelligibly recovered, and more particularly, to the modulation of speech on a carrier and the intelligible recover of the speech by means of the Radio Frequency Hearing Effect.

The Radio Frequency ("RF") Hearing Effect was first noticed during World War II as a subjective "click" produced by a pulsed radar signal when the transmitted power is above a "threshold" level. Below the threshold level, the click cannot be heard.

The discovery of the Radio Frequency Hearing Effect suggested that a pulsed RF carrier could be encoded with an amplitude modulated ("AM") envelope. In one approach to pulsed carrier modulation, it was assumed that the "click" of the pulsed carrier was similar to a data sample and could be used to synthesize both simple and complex tones such as speech. Although pulsed carrier modulation can induce a subjective sensation for simple tones, it severely distorts the complex waveforms of speech, as has been confirmed experimentally.

The presence of this kind of distortion has prevented the click process for the encoding of intelligible speech. An example is provided by AM sampled data modulation

Upon demodulation the perceived speech signal has some of the envelope characteristics of an audio signal. Consequently a message can be recognized as speech when a listener is pre-advised that speech has been sent. However, if the listener does not know the content of the message, the audio signal is unintelligible.

The attempt to use the click process to encode speech has been based on the assumption that if simple tones can be encoded, speech can be encoded as well, but this is not so. A simple tone can contain several distortions and still be perceived as a tone whereas the same degree of distortion applied to speech renders it unintelligible.

SUMMARY OF THE INVENTION

In accomplishing the foregoing and related object the invention uses a modulation process with a fully suppressed carrier and pre-processor filtering of the input to produce an encoded output. Where amplitude modulation (AM) is employed and the pre-processor filtering is of audio speech input, intelligible subjective sound is produced when the encoded signal is demodulated by means of the RF Hearing Effect. Suitable forms of carrier suppressed modulation include single sideband (SSB) and carrier suppressed amplitude modulation (CSAM), with both sidebands present.

The invention further provides for analysis of the RE hearing phenomena based on an RF to acoustic transducer model. Analysis of the model suggests a new modulation process which permits the RF Hearing Effect to be used following the transmission of encoded speech.

In accordance with one aspect of the invention the pre-processing of an input speech signal takes place with a filter that de-emphasizes the high frequency content of the input speech signal. The de-emphasis can provide a signal reduction of about 40 dB (decibels) per decade. Further processing of the speech signal then takes place by adding a bias level and taking a root of the predistorted waveform. The resultant signal is used to modulated an RF carrier in the AM fully suppressed carrier mode, with single or double sidebands.

The modulated RF signal is demodulated by an RF to acoustic demodulator that produces an intelligible acoustic replication of the original input speech.

The RF Hearing Effect is explained and analyzed as a thermal to acoustic demodulating process. Energy absorption in a medium, such as the head, causes mechanical expansion and contraction, and thus an acoustic signal.

When the expansion and contraction take place in the head of an animal, the acoustic signal is passed by conduction to the inner ear where it is further processed as if it were an acoustic signal from the outer ear.

The RF to Acoustic Demodulator thus has characteristics which permit the conversion of the RF energy input to an acoustic output.

Accordingly, it is an object of the invention to provide a novel technique for the intelligible encoding of signals. A related object is to provide for the intelligible encoding of speech.

Another object of the invention is to make use of the Radio Frequency ("RF") Hearing Effect in the intelligible demodulation of encoded signals, including speech.

Still another object of the invention is to suitably encode a pulsed RF carrier with an amplitude modulated ("AM") envelope such that the modulation will be intelligibly demodulated by means of the RF Hearing Effect. A related object is to permit a message to be identified and understood as speech when a listener does not know beforehand that the message is speech.

Other aspects of the invention will be come apparent after considering several illustrative embodiments, taken in conjunction with the drawings.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram model of RF to Acoustic Demodulation Process making use of the Radio Frequency ("RF") Hearing Effect;

FIG. **2** is a spherical demodulator and radiator having a specific acoustic impedance for demodulation using the RF Hearing Effect;

FIG. **3** is a diagram illustrating the overall process and constituents of the invention; and

FIG. **4** is an illustrative circuit and wiring diagram for the components of FIG. **3**.

DETAINED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the drawings, FIG. **1** illustrates the RF to acoustic demodulation process of the invention. Ordinarily an acoustic signal A reaches the outer ear E of the head H and traverses first to the inner ear I and then to the acoustic receptors of the brain B. A modulated RF signal, however, enters a demodulator D, which is illustratively provided by the mass M of the brain, and is approximated, as shown in FIG. **2**, by a sphere S of radius r in the head H. The radius r of the sphere S is about 7 cm to make the sphere S equivalent to about the volume of the brain B. It will be appreciated that where the demodulator D, which can be an external component, is not employed with the acoustic receptors of the brain B, it can have other forms.

The sphere S, or its equivalent ellipsoid or similar solid, absorbs RF power which causes an increase in temperature that in turn causes an expansion and contraction which results in an acoustic wave. As a first approximation, it is assumed that the RF power is absorbed uniformly in the brain. Where the demodulator D is external to the brain B, the medium and/or RF carrier frequency can be selected to assure sufficiently uniform absorption.

For the modulated RF signal of FIG. **1**, the power absorbed in the sphere S is proportional to the power waveform of the modulated RF signal. The absorption rate is characterized quantitatively in terms of the SAR (Specific Absorption Rate) in the units of absorbed watts per kilogram per incident watt per square centimeter.

The temperature of the sphere S is taken as following the integrated heat input from the power waveform, i.e. the process is approximated as being adiabatic, at least for short term intervals on the order of a few minutes.

The radial expansion of the sphere follows temperature and is converted to sound pressure, p(t), determined by the radial velocity (U_r) multiplied by the real part of the specific acoustic impedance (Z_s) of the sphere, as indicated in equation (1), below.

$$Z_s=\rho_o c(jkr)/(1+jkr)=\rho_o c\ jf/f_c/(1+jf/f_c) \quad (1)$$

Where:

ρ_o=density, 1000 kg/m^3 for water

c=speed of sound, 1560 m/s, in water @ 37° C.

k=wave number, 2π/wavelength

r=sphere radius, in meters (m)

f=audio frequency

f_c=lower cutoff break frequency,=c/(2πr)

j=the 90 degree phase-shift operator

The specific acoustic impedance for a sphere of 7 cm radius, on the order of the size of the brain, has a lower cut-off break frequency of about 3,547 Hertz (Hz) for the parameters given for equation (1). The essential frequency range of speech is about 300 to 3000 Hz, i.e., below the cut-off frequency. It is therefore the Real part (R_e) of Z_s times the radial particle velocity (U_r) which determines the sound pressure, p(t). The real part of Z_s is given by equation (1a), below:

$$R_e(Z_s)=\rho_o c(f/f_c)^2/(1+(f/f_c)^2) \quad (1a)$$

In the speech spectrum, which is below the brain cut-off frequency, the sphere S is an acoustic filter which "rolls off", i.e. decreases in amplitude at −40 dB per decade with decreasing frequency. In addition to any other demodulation processes to be analyzed below, the filter characteristics of the sphere will modify the acoustic signal with a 40 dB per decade slope in favor of the high frequencies.

Results for an AM Modulated Single Tone

An RF carrier with amplitude A_c at frequency ω_c is AM modulated 100 percent with a single tone audio signal at frequency ω_1. The voltage (time) equation of this modulated signal is given by equation (2), below:

$$V(t)=A_c \sin(\omega_c t)(1+\sin(\omega_a t)) \quad (2)$$

The power signal is V(t)^2 as given by equation (3), below:

$$P(t)=A_c^2[\tfrac{3}{4}+\sin(\omega_3 t)-\tfrac{1}{4}\cos(2\omega_3 t)-\tfrac{3}{4}\cos(2\omega_c t)-\cos(2\omega_c t)\sin(\omega_3 t)+\tfrac{1}{4}\cos(2\omega_c t)\cos(2\omega_3 t)] \quad (3)$$

To find the energy absorbed in the sphere, the time integral of equation (3) is taken times absorption coefficient, K. The result is divided by the specific heat, SH to obtain the temperature of the sphere and then multiplied by the volume expansion coefficient, Mv to obtain the change in volume. The change in volume is related to the change in radius by equation (4), below:

$$dV/V=3dr/r \quad (4)$$

To obtain the amplitude of the radius change, there is multiplication by the radius and division by three. The rms radial surface velocity, U_r is determined by multiplying the time derivative by r and dividing by $2^{1/2}$. The result, U_r, is proportional to the power function, P(t) in equation (5), below.

$$U_r=0.3535\ P(t)rKM_v/(3SH) \quad (5)$$

The acoustic pressure, p(t), is given in equation (6), below, as the result of multiplying equation (5) by the Real part of the specific acoustic impedance, R_e (1).

$$p(t)=R_e\{Z_sU_r\}=R_e(Z_s)U_r \quad (6)$$

The SPL (Sound Pressure Level), in acoustic dB, is approximated as 20 log[p(t)/2E−5]. The standard acoustic reference level of 2E−5 Newtons per square meter is based on a signal in air; however, the head has a water-like consistency. Therefore, the subjective level in acoustic dB is only approximate, but sufficient for first order accuracy.

In a single tone case the incident RF power, P(t), from equation (3) has two terms as shown in equation (7), below, which are in the hearing range.

$$\sin(\omega_a t)-\tfrac{1}{4}\cos(2\omega_a t) \quad (7)$$

This is converted to the acoustic pressure wave, p(t), by multiplying by the specific acoustic impedance calculated at the two frequencies. Therefore, the resulting pressure wave as indicated in equation (8), below, becomes

$$p(t)=C[Z_s(\omega_a)\sin(\omega_a t)-\tfrac{1}{4}Z_s(2\omega_a)\cos(2\omega_3 t)] \quad (8)$$

The result is an audio frequency and a second harmonic at about ¼ amplitude. Thus using an RF carrier, AM modulated by a single tone, the pressure wave audio signal will consist of the audio tone and a second harmonic at about −6 dB, if the specific acoustic impedances at the two frequencies are the same. However, from equation (1) the break frequency of a model 7 cm sphere is 3.547 Hz. Most of the speech spectrum is below this frequency therefore the specific acoustic impedance is reactive and the real component is given by equation (8a), below:

$$R_e\{Z_s(f)\}=\rho_o c(f/f_c)^2/(1+(f/f_c)) \quad (8a)$$

Below the cutoff frequency the real part of the impedance varies as the square of the frequency or gives a boost of 40 dB per decade. Therefore, if the input modulation signal is 1 kHz, the second harmonic will have a boost of about 4 time in amplitude, or 12 dB, due to the variation of the real part of the specific acoustic impedance with frequency. So the second harmonic pressure term in equation (8) is actually four times the power or 6 dB higher than the fundamental term. If the second harmonic falls above the cutoff frequency then the boost begins to fall back to 0 dB. However, for most of the speech spectrum there is a sever distortion and strong boost of the high frequency distortion components.

Results for Two Tone AM Modulation Analysis

Because of the distortion attending single tone modulation, predistortion of the modulation could be attempted such that the resulting demodulated pressure wave will not contain harmonic distortion. This will not work, however, because of the non-linear cross-products of two-tone modulation are quite different from single tone modulation as shown below.

Nevertheless, two-tone modulation distortion provides an insight for the design of a corrective process for a complex modulation signal such as speech. The nature of the distortion is defined in terms of relative amplitudes and frequencies.

Equation (8b) is that of an AM modulated carrier for the two-tone case where ω_{a1} and ω_{a2} are of equal amplitude and together modulate the carrier to a maximum peak value of 100 percent. The total modulated RF signal is given by equation (8b), below:

$$V(t)=A_c \sin(\omega_c t)[1+½ \sin(\omega_{a1}t)+½ \sin(\omega_{a2}t)]$$

The square of (8b) is the power signal, which has the same form as the particle velocity, $U_r(t)$, of equation (9), below.

From the square of (8b) the following frequencies and relative amplitudes are obtained for the particle velocity wave, $U_r(t)$, which are in the audio range;

$$U_r(t)=C[\sin(\omega_{a1}t)+\sin(\omega_{a2}t)+¼ \cos((\omega_{a1}-\omega_{a2})(t) =¼ \cos((\omega_{a1}+\omega_{a2})t)-⅛ \cos(2\omega_{a1}t)-⅛ \cos(2\omega_{a2}t)] \tag{9}$$

If the frequencies in equation (9) are below the cut-off frequency, the impedance boost correction will result in a pressure wave with relative amplitudes given in equation (9a), below:

$$p(t)=C'[\sin(\omega_{a1}t)+b^2 \sin(\omega_{a2}t)+(1-b^2)/4 \cos((\omega_{a1}-\omega_{a2})t)+(1+b^2)/4 \cos((\omega_{a1}+\omega_{a2})t)-½ \cos(2\omega_{a1})t)-b^2/2 \cos(2\omega_{a2}t) \tag{9a}$$

where: $b=\omega_{a2}/\omega_{a1}$ and $\omega_{a2}>\omega_{a1}$

Equation (9a) contains a correction factor, b, for the specific acoustic impedance variation with frequency. The first two terms of (9a) are the two tones of the input modulation with the relative amplitudes modified by the impedance correction factor. The other terms are the distortion cross products which are quite different from the single tone distortion case. In addition to the second harmonics, there are sum and difference frequencies. From this two-tone analysis it is obvious that more complex multiple tone modulations, such as speech, will be severely distorted with even more complicated cross-product and sum and difference components. This is not unexpected since the process which creates the distortion is nonlinear. This leads to the conclusion that a simple passive predistortion filter will not work on a speech signal modulated on an RF carrier by a conventional AM process, because the distortion is a function of the signal by a nonlinear process.

However, the serious distortion problem can be overcome by means of the invention which exploits the characteristics of a different type of RF modulation process in addition to special signal processing.

AM Modulation With Fully Suppressed Carrier for the Intelligible Encoding of Speech by the Invention for Compatibility With the RF Hearing Phenomena

The equation for AM modulation with a fully suppressed carrier is given by equation (10), below:

$$V(t)=a(t)\sin(\omega_c t) \tag{10}$$

This modulation is commonly accomplished in hardware by means of a circuit known as a balanced modulator, as disclosed, for example in "Radio Engineering", Frederick E. Terman, p.481–3, McGraw-Hill, 1947.

The power signal has the same form as the particle velocity signal which is obtained from the square of equation (10) as shown in equation (11), below:

$$P(t)=C\ U_r=a(t)^2/2-(a(t)^2/2)\cos(2\omega_\chi t)) \tag{11}$$

From inspection of equations (10) and (11) it is seen that, if the input audio signal, a(t), is pre-processed by taking the square root and then modulating the carrier, the audio term in the particle velocity equation will be an exact, undistorted, replication of the input audio signal. Since the audio signal from a microphone is bipolar, it must be modified by adding a very low frequency (essential d.c.) bias term, A, such that the resultant sum, [a(t)+A]>0.0, is always positive. This is necessary in order to insure a real square root. The use of a custom digital speech processor implements the addition of the term A, i.e. as shown in equation (10*), below:

$$V(t)=(a(t)+A)^{1/2} \sin(\omega_c t) \tag{10*}$$

The pressure wave is given by equation (11*), below:

$$p(t)=C\ U_r=A/2+a(t)/2-(a(t)/2)\cos(2\omega_c t)-(A/2)\cos(2\omega_c t) \tag{11*}$$

When the second term of the pressure wave of equation (11*) is processed through the specific acoustic impedance it will result in the replication of the input audio signal but will be modified by the filter characteristics of the Real part of the specific acoustic impedance, $R_e\{Z_s(f)\}$, as given in equation (8a). The first term of equation (11*) is the d.c. bias, which is added to obtain a real square root; it will not be audible or cause distortion. The third and fourth terms of (11*) are a.c. terms at twice the carrier frequency and therefore will not distort or interfere with the audio range signal, a(t).

Since the filter characteristic of equation (7) is a linear process in amplitude, the audio input can be predistorted before the modulation is applied to the carrier and then the pressure or wound wave audio signal, which is the result of the velocity wave times the impedance function, $R_e\{Z_s(f)\}$, will be the true replication of the original input audio signal.

A diagram illustrating the overall system **30** and process of the invention is shown in FIG. **3**. Then input signal a(t) is applied to an Audio Predistortion Filter **31** with a filter function As(f) to produce a signal a(t)As(f), which is applied to a Square Root Processor **32**, providing an output=$(a(t)As(f)+A)^{1/2}$, which goes to a balanced modulator **33**. The modulation process known as suppressed carrier, produces a double sideband output=$(a(t)As(f)+A)^{1/2} \sin(\omega_c t)$, where ω_c is the carrier frequency. If one of the sidebands and the carrier are suppressed (not shown) the result is single sideband (SSB) modulation and will function in the same manner discussed above for the purposes of implementing the invention. However, the AM double sideband suppressed carrier as described is more easily implemented.

The output of the balanced modulator is applied to a spherical demodulator **34**, which recovers the input signal a(t) that is applied to the inner ear **35** and then to the acoustic receptors in the brain **36**.

The various components **31–33** of FIG. **3** are easily implemented as shown, for example by the corresponding components **41–42** in FIG. **4**, where the Filter **41** can take the form of a low pass filter, such as a constant-K filter formed by series inductor L and a shunt capacitor C. Other low-pass filters are shown, for example, in the ITT Federal Handbook, 4th Ed., 1949. As a result the filter output is AS(f) a $1/f^2$. The Root Processor **42** can be implemented by any square-law device, such as the diode D biased by a battery B and in series with a large impedance (resistance) R, so that the voltage developed across the diode D is proportional to the square root of the input voltage a(t)As(f). The balanced modulator **43**, as discussed in Terman, op.cit., has symmetrical diodes **A1** and **A2** with the modulating voltage M applied in opposite phase to the diodes **A1** and **A2** through an input transformer T**1**, with the carrier, O, applied commonly to the diodes in the same phase, while the modulating signal is applied to the diodes in opposite phase so that the carrier cancels in the primary of the output transformer T**2** and the secondary output is the desired double side band output.

Finally the Spherical Demodulator **45** is the brain as discussed above, or an equivalent mass that provides uniform expansion and contraction due to thermal effects of RF energy.

The invention provides a new and useful encoding for speech on an RF carrier such that the speech will be intelligible to a human subject by means of the RF hearing demodulation phenomena. Features of the invention include the use of AM fully suppressed carrier modulation, the preprocessing of an input speech signal be a compensation filter to de-emphasize the high frequency content by 40 dB per decade and the further processing of the audio signal by adding a bias terms to permit the taking of the square root of the signal before the AM suppressed carrier modulation process.

The invention may also be implemented using the same audio signal processing and Single Sideband (SSB) modulation in place of AM suppressed carrier modulation. The same signal processing may also be used on Conventional AM modulation contains both sideband and the carrier; however, there is a serious disadvantage. The carrier is always present with AM modulation, even when there is no signal. The carrier power does not contain any information but contributes substantially to the heating of the thermal-acoustic demodulator, i.e. the brain, which is undesirable. The degree of this extraneous heating is more than twice the heating caused by the signal or information power in the RF signal. Therefore conventional AM modulation is an inefficient and poor choice compared to the double side-band suppressed carrier and the SSB types of transmissions.

The invention further may be implemented using various degrees of speech compression commonly used with all types of AM modulation. Speech compression is implemented by raising the level of the low amplitude portions of the speech waveform and limiting or compressing the high peak amplitudes of the speech waveform. Speech compression increases the average power content of the waveform and thus loudness. Speech compression introduces some distortion, so that a balance must be made between the increase in distortion and the increase in loudness to obtain the optimum result.

Another implementation is by digital signal processing of the input signal through to the modulation of the RF carrier.

What is claimed is:

1. An apparatus for communicating an audio signal a(t), comprising:

an audio predistortion filter having a filter function As(f) for producing a first output signal a(t)As(t) from the audio signal a(t);

means for adding a bias A to the first output signal, to produce a second output signal a(t)As(f)+A;

a square root processor for producing a third output signal $(a(t)As(f)+A)^{1/2}$ responsive to the second output signal; and

a modulator for producing a double sideband output signal responsive to the third output signal, having a carrier frequency of ω_c, and being mathematically described by $(a(t)As(f)+A)^{1/2}\sin(\omega_c t)$; and

transmitting the double sideband output signal to a demodulator, whereby the audio signal a(t) is recovered from the double sideband output signal.

2. The communication apparatus defined in claim **1** wherein:

the double sideband output signal has RF power; and

the demodulator is for converting the RF power into acoustic pressure waves.

3. The communication apparatus defined in claim **2** wherein:

the demodulator converts the RF power into the acoustic pressure waves by means of thermal expansion and contraction, whereby

the acoustic pressure waves approximate the audio signal a(t).

4. The communication apparatus defined in claim **2** wherein the demodulator includes a mass that expands and contracts responsive to the RE power of the double sideband output signal.

5. The communication apparatus defined in claim **4** wherein the mass is approximately spherical.

6. The communication apparatus defined in claim **1** wherein:

the double sideband output signal is comprised of a first sideband component and a second sideband component; and

means for suppressing the second sideband component, whereby

the demodulator recovers the audio signal a(t) solely from the first sideband component.

7. The communication apparatus defined in claim **1** wherein the audio predistortion filter is a low-pass filter.

8. The communication apparatus defined in claim **7** wherein the audio predistortion filter is a digital processor.

9. The communication apparatus defined in claim **1** wherein:

the square root processor is a diode biased by a voltage source, in series with a resistance, whereby

a voltage across the diode is proportional to a square root of the second output signal a(t)As(t)+A.

10. The communication apparatus defined in claim **1** wherein the modulator is a balanced modulator.

11. The communication apparatus defined in claim **1** wherein:

the audio signal a(t) includes a high frequency component; and

the audio predistortion filter de-emphasizes the high frequency component by approximately 40 dB per decade.

* * * * *

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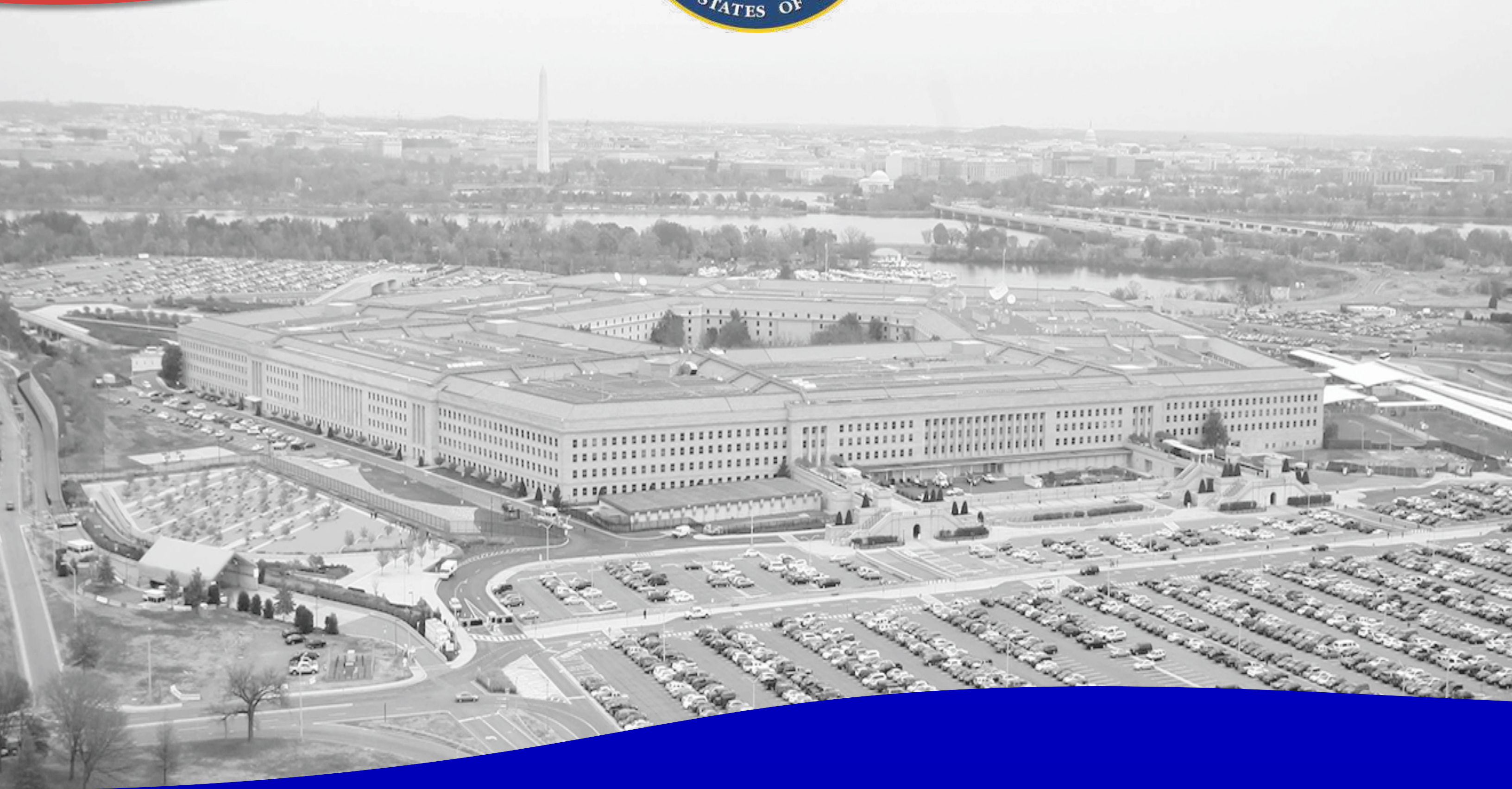
So what are Extraterrestrials doing here?
—Here you get a short text summary:
They fill the tanks with compressed liquid air and fresh water, dump the contents of the sewage tank into our waterways and lakes, they telepathically influence decisions made within Authorities and Governments. They steal containers that contain everything from girls' make-up to video game consoles. They conduct biological experiments, and they have actively supported the idea of war in Ukraine.

Now is the time to shoot them down. We don't have to put up with the above no more.

NATIONAL SECURITY AGENCY

UNITED STATES OF AMERICA

OFFICE OF THE UNDER SECRETARY OF DEFENSE
(COMPTROLLER)/CHIEF FINANCIAL OFFICER
MAY 2017



Program Acquisition Cost By Weapon System

UNITED STATES DEPARTMENT OF DEFENSE
FISCAL YEAR 2018 BUDGET REQUEST

The estimated cost of this report or study for the Department of Defense is approximately $32,000 for the 2017 Fiscal Year. This includes $13,000 in expenses and $19,000 in DoD labor.

Generated on 2017May03 RefID: E-7DE12B0

Major Weapon Systems

OVERVIEW

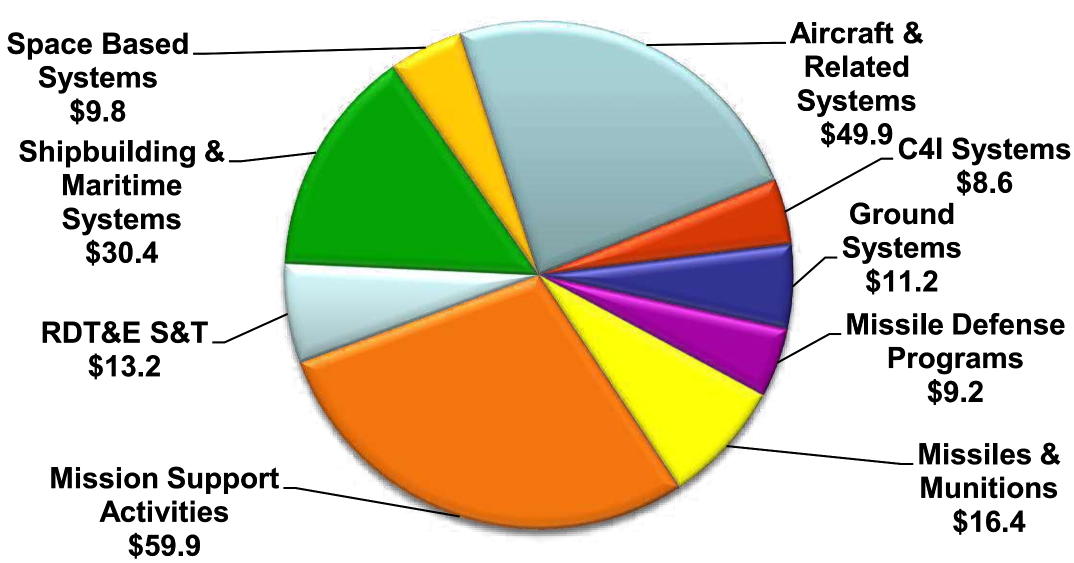
The combined capabilities and performance of United States (U.S.) weapon systems are unmatched throughout the world, ensuring that U.S. military forces have the advantage over any adversary. The Fiscal Year (FY) 2018 acquisition funding request for the Department of Defense (DoD) budget totals $208.6 billion, which includes base funding and Overseas Contingency Operations (OCO) funding; $125.2 billion for Procurement funded programs and $83.3 billion for Research, Development, Test, and Evaluation (RDT&E) funded programs. Of the $208.6 billion, $94.9 billion is for programs that have been designated as Major Defense Acquisition Programs (MDAPs). This book focuses on all funding for the key MDAP programs. To simplify the display of the various weapon systems, this book is organized by the following mission area categories:

Mission Area Categories

- Aircraft & Related Systems
- Command, Control, Communications, Computers, and Intelligence (C4I) Systems
- Ground Systems
- Missile Defense Programs
- Missiles and Munitions
- Mission Support Activities
- RDT&E Science & Technology
- Shipbuilding and Maritime Systems
- Space Based Systems

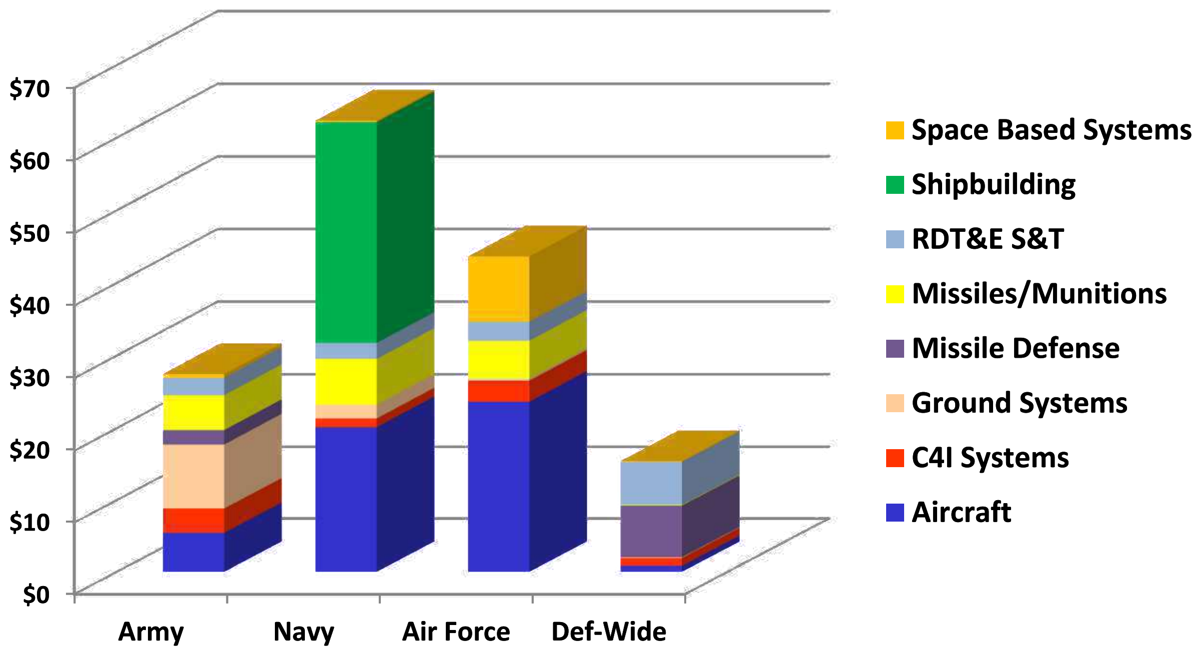
FY 2018 Modernization – Total: $208.6 Billion

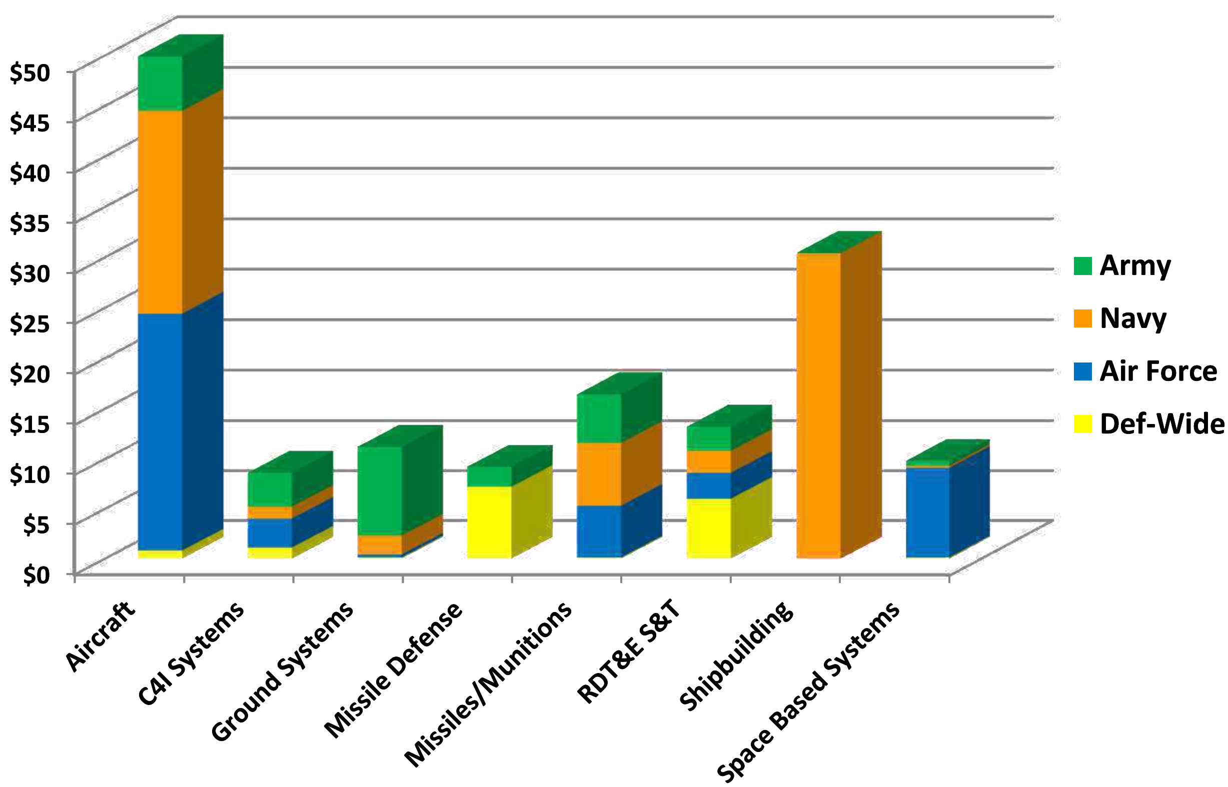
($ in Billions)



Numbers may not add due to rounding

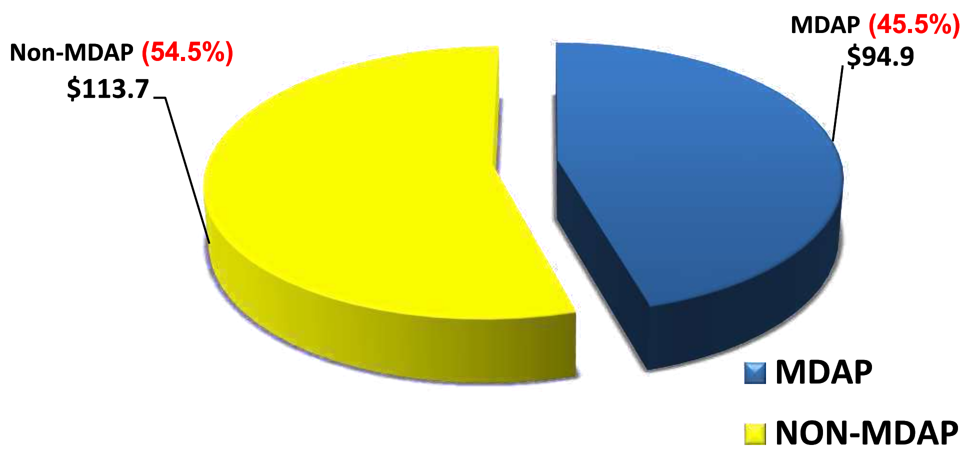
THE DISTRIBUTION OF FUNDING IN FY 2018 FOR PROCUREMENT AND RDT&E, BY COMPONENT AND BY CATEGORY *
(Dollars in Billions)





** Does not include Mission Support costs*

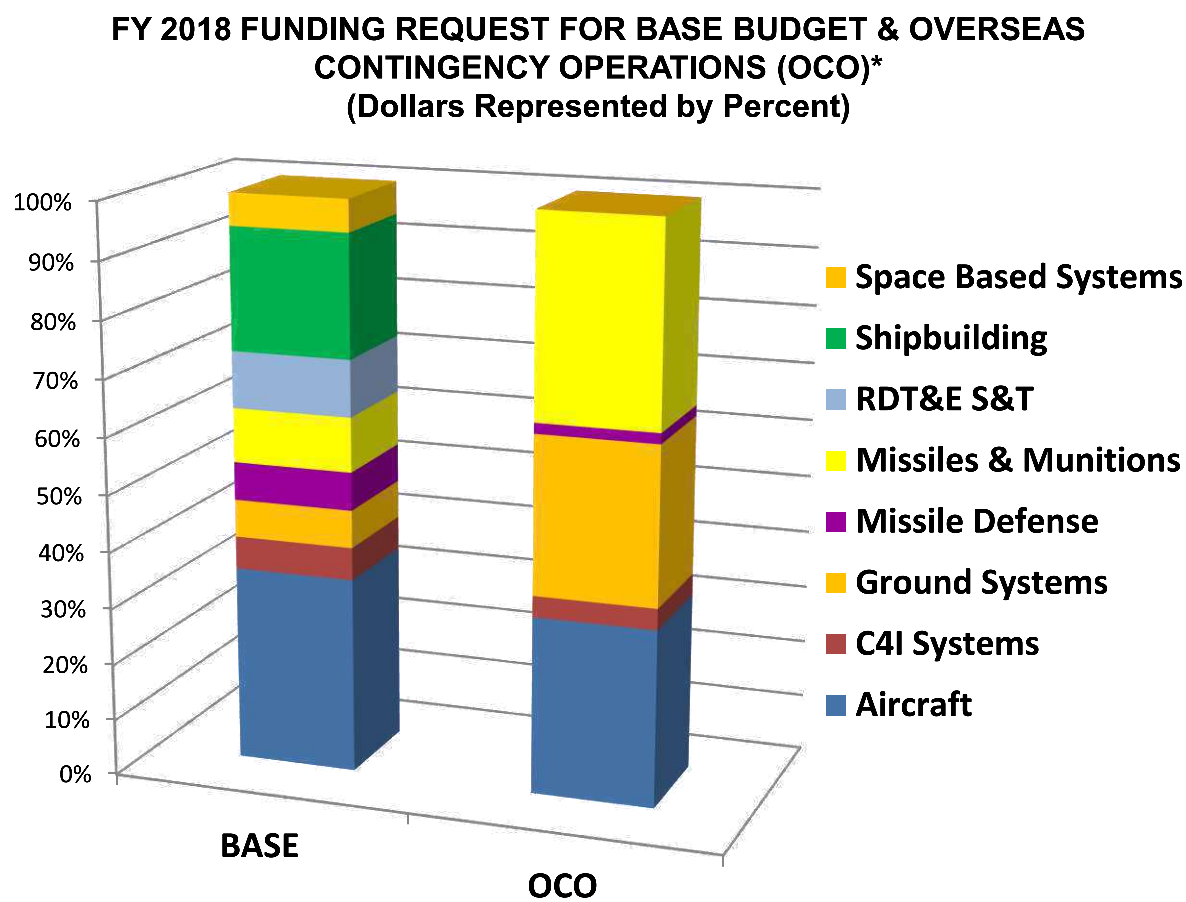
TOTAL REQUESTED PROCUREMENT AND RDT&E FUNDING DURING FY 2018, FOR MDAP AND NON-MDAP PROGRAMS (Dollars in Billions)



The FY 2018 President's budget request for modernization in the RDT&E and Procurement titles is comprised of 1,927 Program, Project, and Activity (PPA) line items, a portion of which finances the development and procurement of Major Defense Acquisition Programs (MDAPs). Many MDAP programs (Acquisition Category (ACAT) I) are not represented in this booklet because they fall below reporting criteria.

The purpose of the above chart is to illustrate the share in funding allotted to the MDAP, and the non-MDAP efforts. While non-MDAP individual programs are smaller in dollar value, they are essential to developing future technologies and procuring a wide assortment of equipment, munitions, vehicles, and weapons. The MDAP programs consume approximately $94.9 billion, or 46 percent of the FY 2018 modernization funding ($208.6 billion).

Numbers may not add due to rounding



The FY 2018 President's Budget for Investment accounts (Research, Development, Test, and Evaluation (RDT&E) and Procurement) totals $208.6 billion, of which $197.7 billion is requested in the Base budget, and $10.9 billion is requested in the OCO.

The above graph illustrates the differences in content between the Base and OCO budget requests as a percent of funding in each request. Not surprisingly, the OCO finances a larger percent of missiles and munitions (yellow) and ground systems (orange) than the Base request (63 percent vs. 17 percent). These OCO funds will be used to replenish munitions that were expended in training or combat operations, or to replace military equipment that, due to combat operations, were damaged or not economical to repair. Also these funds procure critical preferred munitions, which are required to increase inventories that are low due to sustained combat operations.

In the OCO budget the Department is requesting $397.4 million for the procurement of 45 aircraft that were lost or damaged beyond repair in combat operations. In contrast, in the Base budget the Department is procuring various aircraft for modernization.

* *Totals exclude funding in the FY 2017 PB for Mission Support activities*

Major Weapon Systems Summary ($ in Millions)		FY 2016	FY 2017	2018 Base Budget	2018 OCO Budget	2018 Total Request	Page
Aircraft and Related Systems – Joint Service							
MQ-1B / MQ-1C	Predator/Gray Eagle	490.1	308.1	45.7	128.7	174.4	1-2
MQ-9	Reaper	1,034.5	1,053.1	662.5	347.3	1,009.8	1-3
RQ-4 / MQ-4C	Global Hawk/Triton/NATO AGS	1,448.2	1,213.6	1,282.3	-	1,282.3	1-4
RQ-7/RQ-11/ RQ-20/RQ-21	Shadow, Raven, Puma, and Blackjack	281.9	522.4	117.4	12.3	129.7	1-5
C-130J	Hercules	2,361.9	1,839.1	886.1	-	886.1	1-6
F-35	Joint Strike Fighter	11,560.4	11,323.9	10,837.9	-	10,837.9	1-7
V-22	Osprey	1,667.6	1,822.4	961.8	-	961.8	1-8
Aircraft and Related Systems – US Army (USA)							
AH-64E	Apache: Remanufacture/New Build	1416.0	1840.4	1402.9	39	1441.9	1-9
CH-47	Chinook	1,135.0	656.8	415.0	-	415.0	1-10
UH-60	Black Hawk	1,765.8	1,352.3	1,059.0	-	1,059.0	1-11
Aircraft and Related Systems – US Navy (USN) / US Marine Corps (USMC)							
E-2D	Advanced Hawkeye	1,244.0	1,399.6	1,116.4	-	1,116.4	1-12
H-1	AH-1Z Viper/ UH-1Y Venom	866.9	844.4	781.8	-	781.8	1-13
P-8A	Poseidon	3,458.8	3,267.4	1,609.4	-	1,609.4	1-14
CH-53K	Heavy Lift Replacement Helicopter	604.5	841.8	1,055.5	-	1,055.5	1-15
VH-92A	Presidential Helicopter	490.8	338.4	451.9	-	451.9	1-16
F/A-18	Super Hornet	350.0	2,504.9	1,253.1	-	1,253.1	1-17
Aircraft and Related Systems – US Air Force (USAF)							
PAR	Presidential Aircraft Recapitalization	82.4	351.2	434.1	-	434.1	1-18
LRS	Long Range Strike	1,455.6	2,241.7	2,945.4	-	2,945.4	1-19
F-22	Raptor	518.5	704.4	915.5	-	915.5	1-20
KC-46A	Tanker	2,959.7	3,318.5	3,052.9	-	3,052.9	1-21
F-15	Eagle	1,002.5	768.5	963.1	-	963.1	1-22
CRH	Combat Rescue Helicopter	150.3	319.3	354.5	-	354.5	1-23
C4I Systems – USA							
WIN-T	Warfighter Information Network – Tactical	778.1	461.9	449.1	-	449.1	2-2
HMS	Handheld, Manpack, and Small Form Fit Radios	59.1	292.4	375.5	-	375.5	2-3
Ground Systems – Joint Service							
JLTV	Joint Light Tactical Vehicle	366.2	775.8	1,141.6	1.1	1,142.7	3-2
Ground Systems – USA							
AMPV	Armored Multi-Purpose Vehicle	213.0	184.2	393.5	253.9	647.4	3-3
FHTV	Family Of Heavy Tactical Vehicles	30.8	57.1	92.1	25.9	118.0	3-4
M-1	Abrams Tank Modification/Upgrades	504.7	898.7	632.4	581.5	1,213.9	3-5
PIM	Paladin Integrated Management	410.3	636.0	652.5	125.7	778.2	3-6
FMTV	Family of Medium Tactical Vehicles	334.0	352.8	84.7	-	84.7	3-7
Stryker	Stryker	1,191.0	735.4	178.2	-	178.2	3-8
Ground Systems – USMC							
ACV	Amphibious Combat Vehicle	197.0	158.7	340.5	-	340.5	3-9
Missile Defense Programs – Joint Service							
AEGIS	AEGIS Ballistic Missile Defense	1,594.7	1,568.0	1,610.6	-	1,610.6	4-2
THAAD	Terminal High Altitude Area Defense	666.6	793.1	718.0	-	718.0	4-3
GMD	Ground-based Midcourse Defense	1,598.0	1,192.7	1,370.4	-	1,370.4	4-4

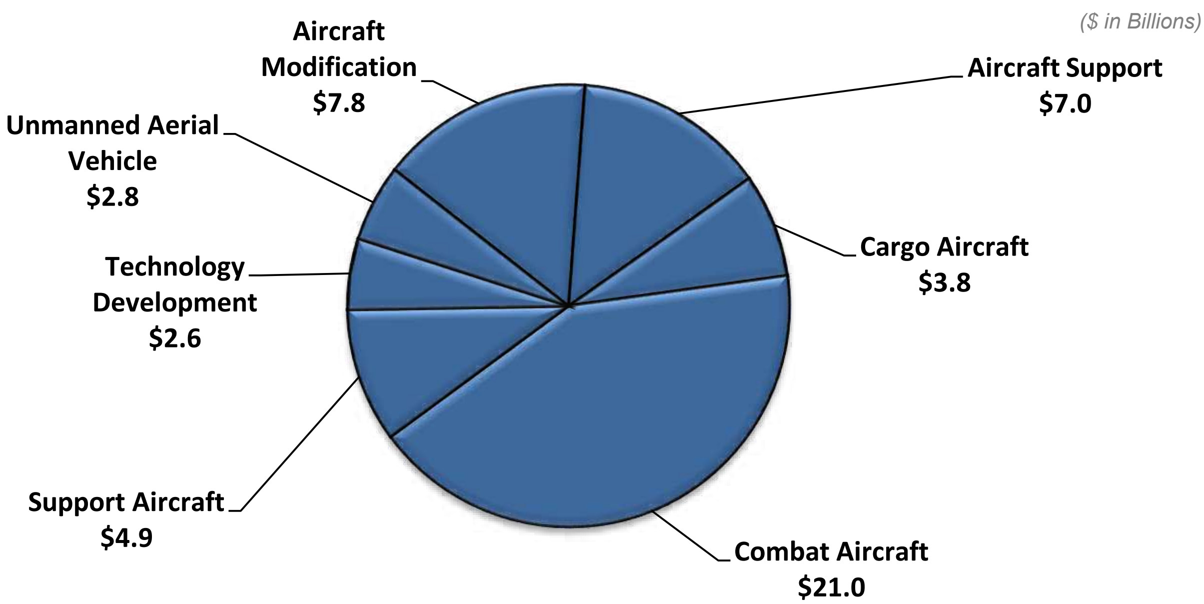
Major Weapon Systems Summary ($ in Millions)		FY 2016	FY 2017	2018 Base Budget	2018 OCO Budget	2018 Total Request	Page
Missile Defense Programs – USA							
Patriot/PAC–3	Patriot Advanced Capability	363.0	543.0	515.1	-	515.1	4-5
PAC-3/MSE Missile	PAC-3/Missile Segment Enhancement Missile	517.1	702.0	459.0	-	459.0	4-6
Missiles and Munitions – Joint Service							
AMRAAM	Advanced Medium Range Air-to-Air Missile	645.4	661.7	594.4	-	594.4	5-2
AIM-9X	Air Intercept Missile - 9X	396.2	326.3	296.2	-	296.2	5-3
Chem-Demil	Chemical Demilitarization	699.8	825.5	961.7	-	961.7	5-4
JASSM	Joint Air-to-Surface Standoff Missile	435.6	462.0	471.7	-	471.7	5-5
JDAM	Joint Direct Attack Munition	565.3	778.9	376.8	497.5	874.3	5-6
SDB	Small Diameter Bomb	222.1	423.2	413.2	90.9	504.1	5-7
Hellfire	Hellfire Missiles	784.0	685.5	129.7	584.2	713.9	5-8
Missiles and Munitions – USA							
Javelin	Javelin Advanced Anti-Tank Weapon	231.1	292.9	172.4	10.9	183.3	5-9
GMLRS	Guided Multiple Launch Rocket System	287.1	440.6	698.0	191.5	889.5	5-10
Missiles and Munitions – USN							
RAM	Rolling Airframe Missile	99.2	113.7	99.8	-	99.8	5-11
Standard	Standard Family of Missiles	545.7	669.2	684.5	35.2	719.7	5-12
Tomahawk	Tactical Tomahawk Cruise Missile	299.3	403.1	281.5	100.1	381.6	5-13
Trident II	Trident II Ballistic Missile Modification	1,182.5	1,237.1	1,270.0	-	1,270.0	5-14
OASUW	Offensive Anti-Surface Weapon	348.7	341.5	432.5	-	432.5	5-15
Missiles and Munitions – USAF							
GBSD	Ground Based Strategic Deterrent	65.0	113.9	215.7	-	215.7	5-16
LRSO	Long Range Stand-Off Missile	16.1	95.6	451.3	-	451.3	5-17
B61	B61 Tail Kit Assembly	204.4	137.9	179.5	-	179.5	5-18
Shipbuilding and Maritime Systems – USN							
T-AO 205	*John Lewis* Class Fleet Replenishment Oiler	674.1	74.2	543.1	-	543.1	6-2
CVN 78	*Gerald R. Ford* Class Nuclear Aircraft Carrier	2,768.7	2,791.1	4,638.1	-	4,638.1	6-3
DDG 51	*Arleigh Burke* Class Destroyer	4,540.5	3,498.3	4,013.7	-	4,013.7	6-4
LCS	Littoral Combat Ship	1,816.7	1,598.9	1,152.6	-	1,152.6	6-5
SSN 774	*Virginia* Class Submarine	5,729.5	5,322.3	5,546.3	-	5,546.3	6-6
SSC	Ship to Shore Connector	218.4	139.2	245.1	-	245.1	6-7
SSBN 826	*Columbia* Class Submarine	1,367.1	1,864.3	1,884.5	-	1,884.5	6-8
CVN	Refueling Complex Overhaul	672.6	1,991.8	1,680.8	-	1,680.8	6-9
LHA	*America* Class Amphibious Assault Ship	497.5	1,648.2	1,748.3	-	1,748.3	6-10
Space Based Systems – USAF							
AEHF	Advanced Extremely High Frequency	535.5	904.7	202.6	-	202.6	7-2
EELV	Evolved Expendable Launch Vehicle	1,475.8	1,803.0	1,861.5	-	1,861.5	7-3
GPS	Global Positioning System	833.1	1,004.7	1,104.2	-	1,104.2	7-4
SBIRS	Space Based Infrared System	834.2	581.3	1,425.3	-	1,425.3	7-5

Aircraft & Related Systems

Aviation forces - including fighter/attack, bomber, mobility (cargo/tanker), and specialized support aircraft, and unmanned aircraft systems — provide a versatile strike force capable of rapid deployment worldwide. These forces can quickly gain and sustain air dominance over regional aggressors, permitting rapid attacks on enemy targets while providing security to exploit the air for logistics, command and control, intelligence, and other functions. Fighter/attack aircraft operate from both land bases and aircraft carriers to provide air superiority to combat enemy fighters and attack ground and ship targets. Bombers provide an intercontinental capability to rapidly strike surface targets. The specialized aircraft supporting conventional operations perform functions such as intelligence, surveillance, and reconnaissance; airborne warning and control; air battle management; suppression of enemy air defenses; and combat search and rescue. In addition to these forces, the U.S. military operates a variety of air mobility forces including cargo, aerial-refueling aircraft, helicopters, and support aircraft.

The FY 2018 Base and OCO funding provides for the procurement of 70 F-35 jets, 29 logistics support aircraft, 198 helicopters, and 50 Unmanned Aerial Vehicles (UAV). In addition, the funding in this category provides for the development of aircraft related technology, the procurement of aerospace equipment and systems, various modifications to existing aircraft, and the procurement of initial spares.

FY 2018 Aircraft & Related Systems – Total: $49.9 Billion



Numbers may not add due to rounding

MQ-1B Predator / MQ-1C Gray Eagle

DOD - JOINT

US Army Photo

The U.S. Air Force (USAF) MQ-1B Predator and the Army MQ-1C Gray Eagle Unmanned Aircraft Systems (UAS) are comprised of aircraft configured with a multi-spectral targeting systems (electro-optical, infra-red (IR), laser designator, and IR illuminator) providing real-time full motion video, weapons, data links, and ground control stations with communications equipment providing line-of-sight and beyond-line-of-sight control. Both systems include single-engine, propeller-driven unmanned aircraft. Special Operations Command (SOCOM) divested the MQ-1 UAS in FY 2015, and the Air Force is in the process of divesting the MQ-1 and replacing all aircraft with MQ-9 Reapers. The MQ-1C Gray Eagle includes the Gray Eagle Extended Range Engineering Change Proposal (ECP), which extends the range and endurance of the aircraft.

Mission: Operates over-the-horizon at medium altitude for long endurance and provides real-time intelligence, surveillance, reconnaissance (ISR), target acquisition, and strike capability to aggressively prosecute time-sensitive targets. The Army MQ-1C Gray Eagle also adds a Synthetic Aperture Radar (SAR) Ground Moving Target Indicator (GMTI), a communications relay capability, a heavy fuel engine, encrypted tactical common data link, and greater weapons capability.

FY 2018 Program: Funds Test & Evaluation efforts associated with the MQ-1 Gray Eagle Extended Range ECP. The Army plans to procure 11 UAS in FY 2018, which is the last planned year of procurement for the MQ-1C Gray Eagle.

Prime Contractor: General Atomics–Aeronautical Systems Incorporated; San Diego, CA

MQ–1B Predator / MQ-1C Gray Eagle

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E										
Gray Eagle USA	22.3	-	31.0	-	9.6	-	-	-	9.6	-
Procurement									-	-
Predator USAF	3.2	-	-	-	-	-	-	-	-	-
Gray Eagle USA	462.7	20	277.1	13	36.1	2	128.7	9	164.8	11
SOCOM	1.9	-	-	-					-	-
Subtotal	**467.8**	**20**	**277.1**	**13**	**36.1**	**2**	**128.7**	**9**	**164.8**	**11**
Total	**490.1**	**20**	**308.1**	**13**	**45.7**	**2**	**128.7**	**9**	**174.4**	**11**

Note: Funding includes air vehicles, payloads and modifications

Numbers may not add due to rounding

* FY 2016 includes actuals for Base and OCO

** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

MQ-9 Reaper

DOD - JOINT

USAF Photo

The U.S. Air Force MQ-9 Reaper Unmanned Aircraft System (UAS) Program is comprised of an aircraft segment consisting of aircraft configured with an array of sensors to include day/night Full Motion Video (FMV), Signals Intelligence (SIGINT), and Synthetic Aperture Radar (SAR) sensor payloads, avionics, data links and weapons; a Ground control segment consisting of a Launch and Recovery Element, and a Mission Control Element with embedded Line-of-Sight and Beyond-Line-of-Sight communications equipment. The Reaper is a single-engine, turbo-prop, remotely piloted armed reconnaissance aircraft designed to operate over-the-horizon at medium altitude for long endurance. Funding for U.S. Special Operations Command (USSOCOM) procures Special Operations Force (SOF)-unique kits, payloads and modifications.

Mission: Provides reconnaissance and embedded strike capability against time-critical targets.

FY 2018 Program: Funds the continued development, transformation and fielding of Reaper aircraft and ground stations. The base request includes the procurement of 10 dual ground control stations, and continues the modification of MQ-9s to the extended range configuration. The OCO request includes the procurement of 32 additional aircraft, updated multi-spectral sensors, and payload modifications.

Prime Contractor: General Atomics–Aeronautical Systems Incorporated; San Diego, CA

MQ–9 Reaper

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E										
USAF	124.7	-	151.4	-	201.4	-	-	-	**201.4**	-
SOCOM	21.4	-	17.8	-	37.9		-	-	**37.9**	-
Subtotal	**146.1**	-	**169.2**	-	**239.3**	-	-	-	**239.3**	-
Procurement			-	-					-	-
USAF	871.2	33	829.6	24	381.8	-	327.5	16	**709.3**	**16**
SOCOM	17.2	-	54.3	-	41.4	-	19.8	-	**61.2**	-
Subtotal	**888.4**	**33**	**883.9**	**24**	**423.2**	-	**347.3**	**16**	**770.5**	**16**
Total	**1,034.5**	**33**	**1,053.1**	**24**	**662.5**	-	**347.3**	**16**	**1,009.8**	**16**

Note: Procurement funding includes mods, spares and other

Numbers may not add due to rounding

* FY 2016 includes actuals for Base and OCO

** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

RQ-4 Global Hawk / MQ-4C Triton / NATO AGS DOD - JOINT

The U.S. Air Force (USAF) RQ-4 Global Hawk, Navy MQ-4C Triton, and NATO Alliance Ground Surveillance (AGS) Unmanned Aircraft System programs provide high altitude long endurance Intelligence, Surveillance, and Reconnaissance (ISR) capabilities. The RQ-4 Block 30 includes a multi-intelligence suite for imagery and signals intelligence collection, and the Block 40 includes multi-platform radar technology for synthetic aperture radar (SAR) imaging and moving target detection. The final three RQ-4 Block 30 aircraft will be delivered in FY 2017 and the production line is scheduled to shut down in FY 2018. The MQ-4C will provide the Navy with a persistent maritime ISR capability. Mission systems include inverse SAR, Electro-optical/Infra-red Full Motion Video (FMV), maritime moving target detection, Electronic Support Measures (ESM), Automatic Identification System (AIS), a basic communications relay capability, and Link-16. Five NATO AGS aircraft are being procured with development funding; two will deliver in FY 2017 and deliveries will complete in FY 2018.

Mission: The USAF and NATO AGS RQ-4 systems perform high-altitude, near-real-time, high-resolution ISR collection, while the MQ-4C provides persistent maritime ISR. Both USAF and Navy systems support Combatant Commander requirements, while the MQ-4C also supports the numbered Fleet commanders from five worldwide sites.

FY 2018 Program: RQ-4: Funds the development and modification efforts for the Block 30, Block 40, Airborne Signals Intelligence Payload (ASIP) Increment II, various sensor enhancements; and the U.S. contribution to the NATO AGS. MQ-4C: Funds the procurement of three Low Rate Initial Production (LRIP) systems, and continues to fund development activities associated with software upgrades and the multi-intelligence effort.

Prime Contractor: Northrop Grumman; Rancho Bernardo, CA

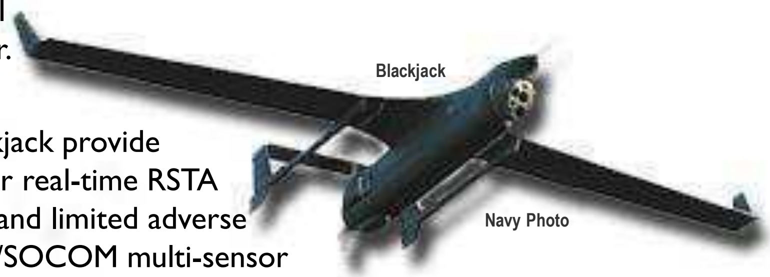
RQ-4 Global Hawk / MQ-4C Triton / NATO AGS										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E										
RQ-4, USAF	180.5	-	256.3	-	214.9	-	-	-	**214.9**	-
RQ-4, NATO	131.9	-	38.9	-	44.7	-	-	-	**44.7**	-
MQ-4, USN	357.0	-	293.0	-	313.5	-	-	-	**313.5**	-
Subtotal	**669.4**	**-**	**588.2**	**-**	**573.1**	**-**	**-**	**-**	**573.1**	**-**
Procurement										
RQ-4, USAF	55.1	-	46.2	-	72.9	-	-	-	**72.9**	-
MQ-4, USN	723.7	4	579.2	2	636.3	3	-	-	**636.3**	**3**
Subtotal	**778.8**	**4**	**625.4**	**2**	**709.2**	**3**	**-**	**-**	**709.2**	**3**
Total	**1,448.2**	**4**	**1,213.6**	**2**	**1,282.3**	**3**	**-**	**-**	**1,282.3**	**3**

* FY 2016 includes actuals for Base and OCO *Numbers may not add due to rounding*

** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Small Tactical Unmanned Aircraft Systems — DOD - JOINT

The RQ-7 Shadow, RQ-11 Raven, RQ-20 Puma, and RQ-21 Blackjack Unmanned Aircraft Systems (UAS) provide organic Reconnaissance, Surveillance, Target Acquisition (RSTA) capabilities and are embedded in maneuver formations capable of providing crucial information to the ground commander.



Mission: The Army/USMC RQ-7 Shadow and Navy/USMC RQ-21 Blackjack provide the tactical maneuver commander near real-time RSTA and force protection during day/night and limited adverse weather conditions. The Army/USMC/SOCOM multi-sensor RQ-11 Raven and USMC/SOCOM RQ-20 Puma provides an "over-the-hill," rucksack-portable, day/night, limited adverse weather, remotely-operated capability that supports selected combat and combat support units. The multi-sensor RQ-21 Blackjack is runway independent, requiring minimal space for takeoff and recovery from an unimproved expeditionary/urban environment, as well as from the decks of Navy ships.

FY 2018 Program: Funds upgrades to system hardware and payloads for the RQ-7 Shadow. Procures upgrades and provides training and contractor logistics support for the RQ-11 Raven. Procures RQ-20 Puma systems for the USMC and SOCOM. Procures a total of 4 systems and provides contractor logistics support for the RQ-21 Blackjack.

Prime Contractors: RQ-7: Textron Systems Unmanned Systems; Hunt Valley, MD
RQ-20/RQ-11: AeroVironment, Incorporated; Simi Valley, CA
RQ-21: INSITU, Incorporated; Bingen, WA

RQ-7 Shadow / RQ-11 Raven / RQ-20 Puma / RQ-21 Blackjack										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		**Total Request**	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	**$M**	**Qty**
RDT&E	24.8	-	23.3	-	28.5	-	-	-	**28.5**	-
Procurement										
Shadow/Raven (Army)	87.2	-	320.6	-	-	-	-	-	-	-
Shadow/Puma (USMC)	13.4	-	19.3	-	10.2	-	-	-	**10.2**	-
Puma (SOCOM)	21.3	-	-	-	-	-	-	-	-	-
Blackjack (Navy)	57.3	3	70.0	4	0.9	-	3.9	-	**4.8**	-
Blackjack (USMC)	77.9	3	89.2	4	77.8	4	8.4	-	**86.2**	**4**
Subtotal	**257.1**	**6**	**499.1**	**8**	**88.9**	**4**	**12.3**	-	**101.2**	**4**
Total	**281.9**	**6**	**522.4**	**8**	**117.4**	**4**	**12.3**	-	**129.7**	**4**

Note: RDT&E funding is for all three systems across the Army, USMC and SOCOM *Numbers may not add due to rounding*

* FY 2016 includes actuals for Base and OCO funding

** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

C-130J Hercules — DOD - JOINT

USAF Photo

The C–130J Hercules is a medium-sized tactical transport airlift aircraft that is modernizing the U.S. tactical airlift capability. It is capable of performing a variety of combat delivery (tactical airlift) operations across a broad range of mission environments including deployment and redeployment of troops and/or supplies within/between command areas in a theater of operation, aeromedical evacuation, air logistics support, and augmentation of strategic airlift forces. The C-130J aircraft, with its extended fuselage, provides additional cargo carrying capacity for the Air Force combat delivery mission compared to the legacy C-130E/H and the C-130J (short) aircraft. Special mission variants of the C-130J conduct airborne psychological operations (EC-130J), weather reconnaissance (WC-130J), search and rescue (HC-130J), and special operations (MC-130J and AC-130J). The KC-130J provides the Marine Corps with air-to-air refueling/tactical transport capability; airborne radio relay; intelligence, surveillance, and reconnaissance; and close air support to replace the KC-130 F/R/T aircraft.

Mission: Provides responsive air movement and delivery of combat troops/supplies directly into objective areas through air landing, extraction, and airdrop, and the air logistic support of theater forces.

FY 2018 Program: Continues the Multiyear Procurement (MYP) for C-130J aircraft from FY 2014 to FY 2018, procuring 9 aircraft in FY 2018.

Prime Contractor: Lockheed Martin Corporation; Marietta, GA

C-130J Hercules

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E										
HC/MC-130	8.6	-	14.0	-	38.6	-	-	-	38.6	-
C-130J	31.4	-	16.8	-	26.8				26.8	-
Subtotal	**40.1**	**-**	**30.8**	**-**	**65.4**	**-**	**-**	**-**	**65.4**	**-**
Procurement										
C-130J	850.6	14	218.7	3	57.7	-	-	-	57.7	-
HC/MC-130	1,261.8	13	1,435.9	14	607.9	7			607.9	7
Subtotal	**2,112.4**	**27**	**1,654.6**	**17**	**665.6**	**7**	**-**	**-**	**665.6**	**7**
Procurement										
KC-130J	209.5	2	153.7	2	155.1	2	-	-	155.1	2
Subtotal	**209.5**	**2**	**153.7**	**2**	**155.1**	**2**	**-**	**-**	**155.1**	**2**
Total	**2,361.9**	**29**	**1,839.1**	**19**	**886.1**	**9**	**-**	**-**	**886.1**	**9**

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

F–35 Joint Strike Fighter

DOD - JOINT

The F-35 Joint Strike Fighter (JSF) is the next-generation strike fighter for the Navy, Marine Corps, Air Force, and U.S. Allies. The F-35 consists of three variants: the F-35A Conventional Take-Off and Landing (CTOL), the F-35B Short Take-Off and Vertical Landing (STOVL), and the F-35C Carrier variant (CV). The F-35A CTOL replaces the Air Force F-16 and A-10 aircraft and complements the F-22 aircraft; the F-35B STOVL aircraft replaces the Marine Corps AV-8B aircraft and F/A-18A/C/D aircraft; the F-35C CV aircraft complements the F/A-18E/F aircraft for the Navy, and will also be flown by the Marine Corps. The F-35 program is a joint, multi-national program among the United States (U.S.) Navy and Marine Corps, the U.S. Air Force, and eight cooperative international partners, as well as three Foreign Military Sales (FMS) countries. The Marine Corps and the Air Force declared Initial Operational Capability in July 2015 and August 2016, respectively. The final assembly of F-35 aircraft for the U.S. is at Air Force Plant 4, Fort Worth, Texas.

Mission: Provides all–weather, precision, stealthy, air–to–air, and ground strike capability, including direct attack on the most lethal surface–to–air missiles and air defenses.

FY 2018 Program: Continues development of the air system, F135 single engine propulsion system, and conducts systems engineering, development and operational testing, and supports Follow-on Modernization. Procures a total of 70 aircraft: 46 CTOL for the Air Force, 20 STOVL for the Marine Corps, and 4 CV for the Navy in FY 2018.

Prime Contractors: Lockheed Martin Corporation; Fort Worth, TX
Pratt & Whitney; Hartford, CT

F-35 Joint Strike Fighter

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E										
USN	1,055.7	-	1,197.8	-	550.7	-	-	-	550.7	-
USAF	627.9	-	603.5	-	627.5	-	-	-	627.5	-
Subtotal	1,683.6	-	1,801.3	-	1,178.2	-	-	-	1,178.2	-
Procurement										
USN	3,685.5	21	3,306.8	20	3,723.7	24	-	-	3,723.7	24
USAF	5,790.2	47	5,577.7	48	5,393.3	46	-	-	5,393.3	46
Subtotal	9,475.8	68	8,884.5	68	9,116.9	70	-	-	9,116.9	70
Spares	401.1	-	638.1	-	542.8				542.8	-
Total	11,560.4	68	11,323.9	68	10,837.9	70	-	-	10,837.9	70

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

V-22 Osprey

DOD - JOINT

The V-22 Osprey is a tilt-rotor, vertical takeoff and landing aircraft designed to meet the amphibious/vertical assault needs of the Marine Corps, the strike rescue and Carrier Onboard Delivery (COD) needs of the Navy, and the long range special operations forces (SOF) missions for U.S. Special Operations Command (SOCOM). The aircraft is designed to fly 2,100 miles with one in-flight refueling, giving the Services the advantage of a vertical and/or short takeoff and landing aircraft that can rapidly self-deploy to any location in the world.

Mission: Conducts airborne assault, vertical lift, combat search and rescue, and special operations missions. The new CMV-22 variant will replace the Navy's C-2A Greyhound for the COD mission.

FY 2018 Program: Funds the first year of a follow-on 7-year multiyear procurement contract (FY 2018 to 2024), procuring 6 CMV-22 aircraft for the Navy.

Prime Contractors: Bell Helicopter Textron, Incorporated; Fort Worth, TX
The Boeing Company; Philadelphia, PA

V–22 Osprey

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E										
USN	74.3	-	189.4	-	171.4	-	-	-	**171.4**	-
USAF	26.8	-	28.7	-	22.5	-	-	-	**22.5**	-
Subtotal	**101.1**	-	**218.1**	-	**193.9**	-	-	-	**193.9**	-
Procurement										
USN	1,440.7	19	1,540.0	19	706.7	6	-	-	**706.7**	**6**
USAF	125.8	1	64.3	-	61.2	-	-	-	**61.2**	-
Subtotal	**1,567**	**20**	**1,604.3**	**19**	**767.9**	**6**	-	-	**767.9**	**6**
USN Subtotal	**1,515.0**	**19**	**1,729.4**	**19**	878.1	6	-	-	878.1	6
USAF Subtotal	**152.6**	**1**	**93.0**	-	83.7	-	-	-	83.7	-
Total	**1,667.6**	**20**	**1,822.4**	**19**	**961.8**	**6**	-	-	**961.8**	**6**

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

AH-64E Apache

USA

US Army Photo

The AH-64E Apache program is a parallel new build and remanufacture effort, which integrates a mast-mounted fire control radar into an upgraded and enhanced AH–64 airframe. The remanufacture effort results in a zero-time Longbow Apache, which restarts its service life and upgrades the aircraft with updated technologies and performance enhancements to keep the Apache viable throughout its lifecycle. The AH-64E program also installs the Target Acquisition Designation Sight and Pilot Night Vision Sensors, plus other safety and reliability enhancements.

Mission: Conducts armed reconnaissance, close combat, mobile strike, and vertical maneuver missions in day, night, obscured battlefield, and adverse weather conditions.

FY 2018 Program: Funds the remanufacture of 48 AH-64D aircraft to the AH-64E configuration and 13 New Build AH-64Es in the second year of a 5-year multiyear procurement (MYP) contract (FY 2017 – FY 2021) and continued development of upgrades to enhance operational capabilities. Procures two AH-64E aircraft in the Overseas Contingency Operations request.

Prime Contractors: Apache: The Boeing Company; Mesa, AZ
Integration: Northrop Grumman Corporation; Baltimore, MD
Lockheed Martin Corporation; Oswego, NY

AH–64E Apache

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	63.0	-	66.4	-	60.0	-	-	-	**60.0**	-
Procurement										
AH-64E New Build	-	-	707.8	20	446.0	13	-	-	**446.0**	**13**
AH-64E Reman	1,353.0	64	1,066.2	52	896.9	48	39.0	2	**935.9**	**50**
Total	**1,416.0**	**64**	**1,840.4**	**72**	**1,402.9**	**61**	**39.0**	**2**	**1,441.9**	**63**

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

CH–47 Chinook

USA

The CH-47F Improved Cargo Helicopter program procures new and remanufactured Service Life Extension Program (SLEP) CH-47F helicopters. The aircraft includes an upgraded digital cockpit and modifications to the airframe to reduce vibration. The upgraded cockpit includes a digital data bus that permits installation of enhanced communications and navigation equipment for improved situational awareness, mission performance, and survivability. The new aircraft uses more powerful T55-GA-714A engines that improve fuel efficiency and enhance lift performance. These aircraft are fielded to heavy helicopter companies (CH-47F) and Special Operations Aviation (MH-47G). The CH-47F is expected to remain the Army's heavy lift helicopter until the late 2030s. Recapitalization of the MH-47G airframes is required to extend the useful life of legacy aircraft. The CH-47F Block II development effort entered Engineering and Manufacturing Development in FY 2017. Improvements include increased lift, improved engine control, upgraded drive train components and advanced flight controls. New Build CH-47Fs will continue at a low rate until production of the CH-47F Block II in FY 2021.

Mission: Transports ground forces, supplies, ammunition, and other battle-critical cargo in support of worldwide combat and contingency operations.

FY 2018 Program: Funds the procurement of four ReNew/SLEP MH-47G and two New Build CH-47F helicopters.

Prime Contractor: The Boeing Company; Philadelphia, PA

CH–47 Chinook	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	31.1	-	91.8	-	194.6	-	-	-	194.6	-
Procurement	1,103.9	39	565.0	22	220.4	6	-	-	220.4	6
Total	1,135.0	39	656.8	22	415.0	6	-	-	415.0	6

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

UH–60 Black Hawk

USA

The UH-60 Black Hawk is a twin engine, single-rotor, four bladed utility helicopter that is designed to carry a crew of 4 and a combat equipped squad of 11 or an external load up to 9,000 lbs. The UH-60 comes in many variants and with many different modifications. Variants may have different capabilities and equipment in order to fulfill different roles. The Army variants can be fitted with stub wings to carry additional fuel tanks or weapons. The UH-60M Black Hawk is a digital networked platform with greater range and lift to support operational Commanders through air assault, general support command and control, and aeromedical evacuation. An HH-60M is a UH-60M Black Hawk integrated with the Medical Evacuation (MEDEVAC) Mission Equipment Package (MEP) kit, which provides day/night and adverse weather emergency evacuation of casualties.

Mission: Provides a highly maneuverable, air transportable, troop carrying helicopter for all intensities of conflict, without regard to geographical location or environmental conditions. It moves troops, equipment, and supplies into combat and performs aeromedical evacuation and multiple functions in support of the Army's air mobility doctrine for employment of ground forces.

FY 2018 Program: Funds the procurement of 48 UH-60M aircraft in the second year of a follow-on 5-year multiyear procurement (MYP) contract (FY 2017 – FY 2021). Also funds the continued development of upgrades to the UH-60L Digital, now designated as the UH-60V.

Prime Contractor: Sikorsky Aircraft; Stratford, CT

UH-60 Black Hawk										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	64.0	-	46.8	-	34.4	-	-	-	34.4	-
Procurement	1,701.8	107	1,305.5	53	1,024.6	48	-	-	1024.6	48
Total	1,765.8	107	1,352.3	53	1,059.0	48	-	-	1,059.0	48

*FY 2016 includes actuals for Base and OCO *Numbers may not add due to rounding*
**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

E-2D Advanced Hawkeye

USN

The E-2D Advanced Hawkeye is an airborne early warning, all weather, twin-engine, carrier-based aircraft designed to extend task force defense perimeters. The Advanced Hawkeye provides improved battlespace target detection and situational awareness, especially in the littorals; supports the Theater Air and Missile Defense operations; and improves operational availability for the radar system. Relative to the E-2C aircraft, the E-2D aircraft provides increased electrical power, a strengthened fuselage, and upgraded radar system, communications suite, and mission computer.

Mission: Provides theater air and missile sensing and early warning; battlefield management command and control; acquisition tracking and targeting of surface warfare contacts; surveillance of littoral area objectives and targets; and tracking of strike warfare assets.

FY 2018 Program: Funds five E-2D aircraft in the fifth year of a multiyear procurement contract, associated support, continued development of systems, and advance procurement for additional aircraft in FY 2019.

Prime Contractors: Airframe: Northrop Grumman Corporation; Bethpage, NY (Engineering) and St. Augustine, FL (Manufacturing)
Engine: Rolls-Royce Corporation; Indianapolis, IN
Radar: Lockheed Martin Corporation; Syracuse, NY

E-2D Advanced Hawkeye

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	211.1	-	363.8	-	292.5	-	-	-	292.5	-
Procurement	1,021.6	5	1,015.5	6	809.5	5	-	-	809.5	5
Spares	11.3	-	20.4	-	14.3	-	-	-	14.3	-
Total	1,244.0	5	1,399.6	6	1,116.4	5	-	-	1,116.4	5

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

H–1 Program: AH-1Z Viper / UH-1Y Venom

USMC

The H–1 program replaces the AH–1W Super Cobra and the UH–1N Huey helicopters with the AH–1Z Viper and UH–1Y Venom, the next generation of USMC Attack and Utility aircraft. Speed, range, and payload have been increased significantly, while supportability demands, training timelines, and total ownership cost have decreased. The advanced cockpit is common to both aircraft, reduces operator workload, improves situational awareness, and provides growth potential for future weapons and joint digital interoperability enhancements. The cockpit systems assimilate onboard planning, communications, digital fire control, all weather navigation, day/night targeting, and weapons systems in mirror-imaged crew stations. The procurement strategy converts 37 AH-1W helicopters into AH-1Zs, builds 152 new AH-1Zs, remanufactures 10 H-1N helicopters into UH-1Ys, and builds 150 new UH-1Ys. Both aircraft are in full rate production. The UH-1Y helicopter completed the program of record procurement of 160 UH-1Y aircraft in FY 2016.

Mission: AH-1Z: Provides close air support, air interdiction, armed reconnaissance, strike coordination and reconnaissance, forward air control (airborne), and aerial escort during day/night operations in support of naval expeditionary operations or joint and combined operations. UH-1Y: Provides combat assault transport, close air support, armed reconnaissance, strike coordination and reconnaissance, forward air control (airborne), air delivery, airborne command and control, aerial escort and air evacuation during day/night and reduced weather conditions.

FY 2018 Program: Funds the procurement of 22 new build AH-1Z aircraft. Funds developmental efforts to support follow-on improvements to sensors and weapons integration, avionics, and air vehicle components that will address deficiencies, systems safety, obsolescence, reliability, and cost growth issues for both the AH-1Z and UH-1Y helicopters.

Prime Contractor: Bell Helicopter Textron, Incorporated; Fort Worth, TX

H–1 Program (AH-1Z Viper / UH-1Y Venom)										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	26.8	-	27.4	-	61.3	-	-	-	61.3	-
Procurement	840.1	29	817.0	24	720.5	22	-	-	720.5	22
Total	866.9	29	844.4	24	781.8	22	-	-	781.8	22

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

P–8A Poseidon

The P–8A Poseidon is an multi-mission platform designed to replace the P-3C Orion propeller driven aircraft. This derivative of the Boeing 737 aircraft is an all weather, twin engine, maritime patrol aircraft designed to sustain and improve armed maritime and littoral capabilities in traditional, joint, and combined roles to counter changing and emerging threats. All sensors onboard contribute to a single fused tactical situation display, which is then shared over both military standard and internet protocol data links, allowing for seamless delivery of information between U.S. and allied forces. The P-8A will carry a new radar array, which is a modernized version of the Raytheon APS-149 Littoral Surveillance Radar System.

Mission: Provides Maritime Patrol Anti-Submarine Warfare (ASW), Anti-Surface Warfare (ASuW), and armed Intelligence, Surveillance and Reconnaissance (ISR) capabilities in maritime and littoral areas above, on, and below the surface of the ocean.

FY 2018 Program: Procures seven P-8A aircraft, support equipment, spares, and advance procurement for FY 2019 aircraft. Continues research and development on the P-8A capabilities to meet the ASW, ASuW, and ISR objectives that will be delivered incrementally while full rate production continues for the baseline aircraft.

Prime Contractors: Airframe: Boeing; Seattle, WA
Engine: CFM International; Cincinnati, OH

P–8A Poseidon	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	227.6	-	239.3	-	190.7	-	-	-	190.7	-
Procurement	3,224.3	17	2,983.4	17	1,385.6	7	-	-	1,385.6	7
Spares	6.9	-	44.7	-	33.1	-	-	-	33.1	-
Total	3,458.8	17	3,267.4	17	1,609.4	7	-	-	1,609.4	7.0

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

CH–53K Heavy Lift Replacement Helicopter

USMC

The CH-53K King Stallion is a marinized heavy-lift helicopter that replaces the U. S. Marine Corps CH-53E, which was introduced in 1980.
The CH-53K will provide improved lift and range capabilities, performance, commonality, cargo-handling, reliability, maintainability, interoperability, ship integration, survivability, and force protection. The CH-53K is designed to support Marine Air-Ground Task Force (MAGTF) heavy-lift requirements in the 21st century joint environment, and is the only heavy-lift platform that can lift the MAGTF ashore. It will provide an unparalleled high-altitude lift capability with nearly three times the external lift capacity of the CH-53E. A total of 194 aircraft are planned for procurement. The program achieved a Milestone C decision and will begin Low Rate Initial Production LRIP) in FY 2017.

Mission: Conducts expeditionary heavy-lift assault transport of armored vehicles, equipment and personnel to support distributed operations deep inland from a sea-based center of operations.

FY 2018 Program: Funds the procurement of the 4 Low-Rate Initial Production (LRIP) aircraft. Development efforts continue flight tests of System Demonstration Test Article (SDTA) aircraft.

Prime Contractor: Sikorsky Aircraft Corporation; Stratford, CT

CH–53K Heavy Lift Replacement Helicopter										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	563.2	-	404.8	-	340.8	-	-	-	**340.8**	**-**
Procurement	41.3	-	437.0	2	714.7	4	-	-	**714.7**	**4**
Total	**604.5**	**-**	**841.8**	**2**	**1,055.5**	**4**	**-**	**-**	**1,055.5**	**4**

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

VH-92A Presidential Helicopter

USMC

The VH-92A replaces the legacy Presidential Helicopter fleet – the VH-3D, which was fielded in 1974, and the VH-60N, which was fielded in 1989. The VH-92A will be based on Sikorsky's commercial S-92A helicopter. The VH-92A's acquisition strategy involves the integration of mature government-defined mission systems and an executive interior into an existing air vehicle. The program entered the Engineering and Manufacturing Development (EMD) phase in FY 2014. A total of 21 operational aircraft will be procured. Two Engineering Development Model (EDM) and four System Demonstration Test Article (SDTA) aircraft have been delivered in EMD.

Mission: Provide safe, reliable and timely transportation for the President, Vice President, Foreign Heads of State, and other official parties as directed by the Director of the White House Military Office. Mission tasking includes administrative lift and contingency operations.

FY 2018 Program: Funds the continuing EMD effort, including: beginning Contractor Testing (CT) for airworthiness certification and commencing modification of EDM and SDTA aircraft to VH-92 configuration.

Prime Contractor: Sikorsky Aircraft Corporation; Stratford, CT

VH–92A Presidential Helicopter										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	490.8	-	338.4	-	451.9	-	-	-	451.9	-
Procurement	-	-	-	-	-	-	-	-	-	-
Total	490.8	-	338.4	-	451.9	-	-	-	451.9	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

F/A–18 E/F Super Hornet

USN

The F/A-18 E/F Super Hornet is a carrier-based multi-role tactical fighter and attack aircraft. Two versions are being produced: the single-seat E model and the two-seat F model. The Super Hornet is an attack aircraft as well as a fighter through selected use of external equipment and advanced networking capabilities to accomplish specific missions. This "force multiplier" capability gives the operational commander more flexibility in employing tactical aircraft in a rapidly changing battle scenario. In its fighter mode, the aircraft serves as escort and fleet air defense. In its attack mode, the aircraft provides force projection, interdiction, and close and deep air support.

Mission: Provides multi-role attack and strike fighter capability which includes the traditional applications, such as fighter escort and fleet air defense, combined with the attack applications, such as interdiction and close air support.

FY 2018 Program: Procures fourteen E/F model aircraft, which will lessen the shortfall in Naval combat aircraft.

Prime Contractors: Airframe: Boeing; St. Louis, MO
Engine: General Electric Company; Lynn, MA

F/A-18 E/F Super Hornet

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	-	-	-	-	-	-	-	-	-	-
Procurement	350.0	5	2,504.9	26	1,253.1	14	-	-	1,253.1	14
Total	350.0	5	2,504.9	26	1,253.1	14	-	-	1,253.1	14

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Presidential Aircraft Recapitalization (PAR) USAF

The Presidential Aircraft Recapitalization (PAR) program will replace the current VC-25A (Boeing 747-200) "Air Force One" aircraft with a new, modified 747-8 to provide the President, staff, and guests with safe and reliable air transportation at the same level of security and communications capability available in the White House. Due to advancing age, the VC-25A is experiencing increasing out of service times – currently well over a year for heavy maintenance to maintain compliance with Federal Aeronautics Administration airworthiness standards. Boeing will be the sole source integrator responsible for modifying, testing, and fielding two PAR aircraft by 2024.

Mission: Provides safe, secure, worldwide transport to ensure the President can execute the constitutional roles of Commander-in-Chief, Head of State, and Chief Executive.

FY 2018 Program: Continues preliminary design and incremental funding of two commercial aircraft for future modification to the PAR configuration. Begins Engineering and Manufacturing Development of the PAR modifications to the commercial aircraft and required test activities.

Prime Contractor: The Boeing Company; Seattle, WA

Presidential Aircraft Recapitalization (PAR)

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	82.4	-	351.2	2	434.1	-	-	-	434.1	-
Procurement	-	-	-	-	-	-	-	-	-	-
Total	82.4	-	351.2	2	434.1	-	-	-	434.1	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Long Range Strike

USAF

Long Range Strike (LRS) is intended to counter post-2020 challenges to DoD's power projection capabilities. The LRS initiatives, collectively termed "Family of Systems" (FoS), will provide a synergistic, more cost-effective force multiplier power projection capability in the post-2020 threat environment. The LRS program includes the next Generation and legacy bombers. Current bombers in the Air Force inventory are the B-1, B-2, and B-52 aircraft. The B-21 (Long Range Strike Bomber) is a new, high-tech long range bomber that will eventually replace the Air Force's aging bomber fleet. The B-21 will be a key component of the joint portfolio of conventional and nuclear deep-strike capabilities.

Mission: Flies into enemy territory to destroy strategic targets such as major military installations, factories and cities to debilitate an adversary's capacity to wage war. The B-1 bomber can perform a variety of missions, including that of conventional carrier for theater operations and can rapidly deliver massive quantities of precision and non-precision weapons against any adversary, worldwide, at any time. The B-2 aircraft delivers both conventional and nuclear munitions, capable of massive firepower in short time anywhere. The B-52 aircraft maintains nuclear or conventional missions. Mission details of the B-21 are currently classified.

FY 2018 Program: Continues engineering and manufacturing development of the next generation B-21 and upgrades to modernize legacy strategic bombers.

Prime Contractors: Northrop Grumman Aerospace Systems; Palmdale, CA

Long Range Strike										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	1,149.8	-	1,920.5	-	2,565.6	-	-	-	2,565.6	-
Procurement	281.8	-	306.1	-	361.7	-	-	-	361.7	-
Spares	24.0	-	15.1	-	18.1	-	-	-	18.1	-
Total	1,455.6	-	2,241.7	-	2,945.4	-	-	-	2,945.4	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

F-22 Raptor

USAF

The F-22 Raptor is a fifth generation air superiority aircraft fighter. The Raptor is designed to penetrate enemy airspace and achieve first-look, first-kill capability against multiple targets. It has unprecedented survivability and lethality, ensuring the Joint Forces have freedom from attack, freedom to maneuver, and freedom to attack.

Mission: Provides the U.S. Enhanced air superiority/global strike capability to counter and defeat air-air and air-ground threats in a highly contested environment by conducting counter air, Destruction of Enemy Air Defenses (DEAD) and cruise missile defense missions.

FY 2018 Program: Continues critical planned modernization for F-22 aircraft via incremental capability upgrades and key reliability and maintainability improvements. Continues development and testing of advanced air superiority capabilities to include integration of AIM-120D and AIM-9X, additional electronic protection, and improved geolocation. Completes fielding of Increment 3.1, enhancing Global Strike capabilities such as Small Diameter Bomb I, Synthetic Aperture Radar and Geolocation.

Prime Contractors: Lockheed Martin; Marietta, GA and Fort Worth, TX
Pratt & Whitney; Hartford, CT

F-22 Raptor										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		**Total Request**	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	**$M**	**Qty**
RDT&E	340.2	-	457.9	-	624.5	-	-	-	**624.5**	-
Procurement	175.4	-	241.4	-	282.4	-	-	-	**282.4**	-
Spares	2.9	-	5.2	-	8.5	-	-	-	**8.5**	-
Total	**518.5**	-	**704.4**	-	**915.5**	-	-	-	**915.5**	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

KC–46A Tanker

USAF Photo

The KC-46, an aerial refueling tanker, will provide aerial refueling support to the Air Force, Navy, and Marine Corps aircraft. The aircraft Provides increased refueling capacity, improved efficiency, and increased cargo and aeromedical evacuation capability over the current KC-135 Stratotanker, which is more than 50 years old. The first phase of aerial refueling tanker recapitalization will procure 179 aircraft, approximately one-third of the current KC-135 tanker fleet. Envisioned KC-Y and KC-Z programs will ultimately recapitalize the entire tanker fleet over a period of more than 30 years. The KC-46 aircraft is assembled on the existing commercial 767 production line and militarized in the Everett Modification Center, both of which are located in Everett, Washington.

Mission: Provides the capability to refuel joint and coalition receivers via a boom or drogue system and will augment the airlift fleet with cargo, passenger and aeromedical evacuation capabilities. Aerial refueling forces perform these missions at the strategic, operational, and tactical level across the entire spectrum of military operations. The KC-46 aircraft will operate in day/night and adverse weather to enable deployment, employment, sustainment, and redeployment of U.S. and Coalition forces.

FY 2018 Program: Continues the Air Force's development efforts of a militarized variant of the Boeing 767-2C aircraft, the building and integration of military capabilities into four development aircraft, the completion of developmental testing and the start of Initial Operational Test and Evaluation. Also includes funding for the continued development of technical manuals, continued Type I training, and collection of simulator and maintenance data. Continues a fourth year of Low Rate Initial Production (LRIP), procuring 15 aircraft in FY 2018.

Prime Contractor: The Boeing Company; Seattle, WA

KC–46A Tanker

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	572.1	-	261.7	-	93.8	-	-	-	93.8	-
Procurement	2,334.6	12	2,884.6	15	2,545.7	15	-	-	2,545.7	15
Spares	53.0	-	172.2	-	413.4	-	-	-	413	-
Total	2,959.7	12	3,318.5	15	3,052.9	15	-	-	3,052.9	15

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

F-15 Eagle

USAF

The F-15C/D is a twin engine, single seat, supersonic, all-weather, day/night, air superiority fighter. The F-15E is a twin engine, two seat, supersonic dual-role, day/night, all-weather, deep interdiction fighter with multi-role air-to-air capabilities.

USAF Photo

Mission: Provides the Air Force with the capability to gain and maintain air supremacy over the battlefield.

FY 2018 Program: Continues the F-15E Radar Modernization Program (RMP), which replaces the legacy radar using existing technology from other aviation platforms and solves parts obsolescence problems to provide improved reliability and performance (increased synthetic aperture radar range and resolution), including air-to-air and air-to-ground modes. Continues the F-15 C/D radar upgrade program, which replaces the mechanically-scanned antenna on F-15C/D aircraft with an active electronically scanned array (AESA). Continues development of the Eagle Passive/Active Warning Survivability System, which is intended to improve F-15E survivability by enhancing the ability to detect, deny, or defeat air and ground threats.

Prime Contractor: Boeing; St Louis, MO

F-15 Eagle

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		**Total Request**	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	**$M**	**Qty**
RDT&E	384.5	-	613.4	-	530.1	-	-	-	**530.1**	-
Procurement	596.9	-	105.7	-	417.2	-	-	-	**417.2**	-
Spares	21.1	-	49.5	-	15.8	-	-	-	**15.8**	-
Total	**1,002.5**	**-**	**768.5**	**-**	**963.1**	**-**	**-**	**-**	**963.1**	**-**

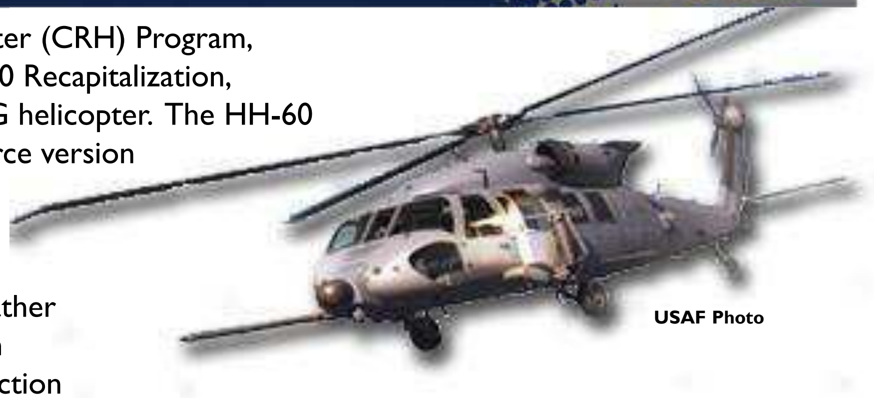
*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Combat Rescue Helicopter (CRH)

USAF



The Combat Rescue Helicopter (CRH) Program, formerly referred to as HH-60 Recapitalization, will replace the aging HH-60G helicopter. The HH-60 Pave Hawk is the U.S. Air Force version of the U.S. Army's UH-60 Black Hawk, modified for Combat Search and Rescue (CSAR) in all weather situations. The CRH program will leverage in-service production air vehicles and training systems and then integrate existing technologies and missions systems to acquire a new system. Onboard defensive capabilities will permit the CRH system to operate in an increased threat environment. An in-flight refueling capability will provide an airborne ready alert capability and extend its combat mission range. The CRH program plans to procure a total of 112 aircraft.

Mission: Conduct day and night marginal weather CSAR in order to recover downed aircrew and isolated personnel in hostile environments. The CRH will perform a wide array of collateral missions, including casualty evacuation (CASEVAC), medical evacuation (MEDEVAC), non-combat evacuation operations, civil search and rescue, international aid, disaster humanitarian relief, and insertion/extraction of combat forces.

FY 2018 Program: Funds Engineering and Manufacturing Development (EMD) activities, including development and testing efforts on the System Demonstration Test Article (SDTA) aircraft, missions systems, training systems and associated product support.

Prime Contractor: Sikorsky Aircraft Corporation; Stratford, CT

Combat Rescue Helicopter										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	150.3	-	319.3	-	354.5	-	-	-	354.5	-
Procurement	-	-	-	-	-	-	-	-	-	-
Total	150.3	-	319.3	-	354.5	-	-	-	354.5	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

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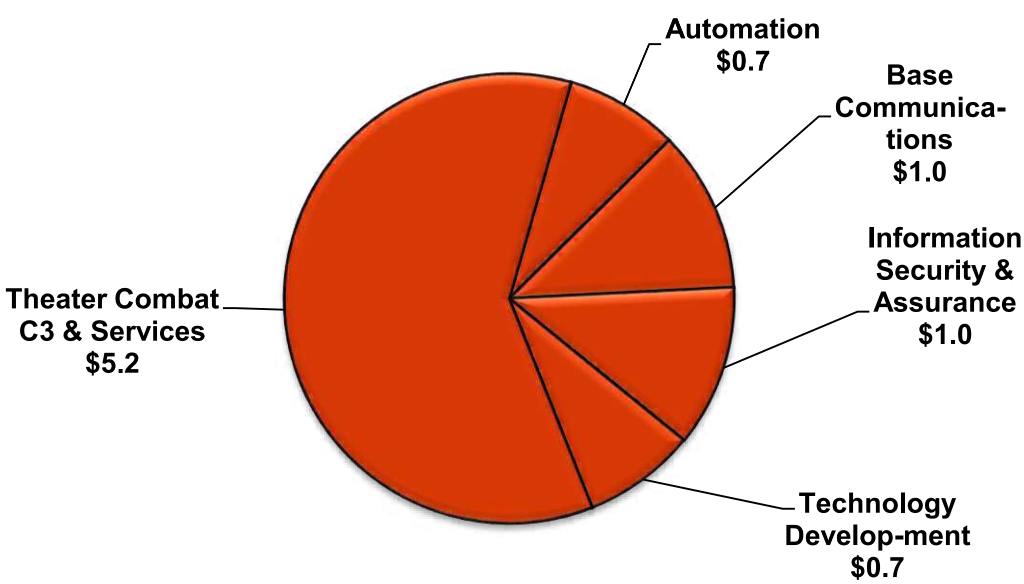
Command, Control, Communications, Computers, and Intelligence (C4I) Systems

The Department is well underway in transforming and developing new concepts for the conduct of future joint military operations to achieve full spectrum dominance. This overarching goal to defeat any adversary or control any situation across the full range of military operations is achieved through a broad array of capabilities enabled by an interconnected network of sensors, shooters, command, control, and intelligence. Net-centricity transformed the way that information is managed to accelerate decision making, improve joint warfighting, and create intelligence advantages. U.S. forces are heavily-networked and require reliable secure trusted access to information and depend upon network-based interconnectivity for increased operational effectiveness. By enhancing information sharing, dispersed forces are able to communicate, maneuver, share a common user - defined operating picture, and successfully complete assigned missions more efficiently.

The FY 2018 budget request supports the net-centricity service-based architecture pattern for information sharing. It is being implemented by the C4I community via building joint architectures and roadmaps for integrating joint airborne networking capabilities with the evolving ground, maritime, and space networks. It encompasses the development of technologies like gateways, waveforms, network management, and information assurance.

FY 2018 Command, Control, Communications, Computers, and Intelligence (C4I) Systems – Total: $8.6 Billion

($ in Billions)



Numbers may not add due to rounding

Warfighter Information Network - Tactical

The Warfighter Information Network-Tactical (WIN-T) is the cornerstone for Army's high speed, high capability backbone communications network, linking Warfighters in the battlefield with the Global Information Grid. The network is intended to provide command, control, communications, computers, intelligence, surveillance, and reconnaissance. The system is developed as a network for reliable, secure, and seamless video, data, imagery, and voice services for the Warfighters in theater to enable decisive combat actions. Increment I provides "networking at the halt" by upgrading the Joint Network Node (JNN) satellite capability to access the Wideband Global Satellite. Increment 2 (Inc 2) provides networking on-the-move to the company level. Tactical Cyber and Network Operations (TCNO) develops the Network Operations (NetOps) software to meet the Army's network convergence goals. The TCNO provides the fully integrated NetOps capability to allow seamless integration of tactical network planning, management, monitoring, and defense for the Signal Staff.

Mission: Provides the Army with a transformational modernized network. Using satellite and ground layers, it delivers fully mobile, flexible, dynamic networking capability enabling Joint land forces to engage enemy forces deeper and more effectively. The WIN-T Inc 2 introduces a mobile, ad-hoc, self-configuring, self-healing network using satellite on-the-move capabilities, robust network management, and high-bandwidth radio systems to keep mobile forces connected, communicating, and synchronized.

FY 2018 Program: Funds the procurement of 61 WIN-T Inc 2 communication nodes and 846 other configuration items for fielding to 3 Brigade Combat Teams, I Division, and 3 Infantry Brigade Combat Teams.

Prime Contractors: General Dynamics Corporation; Taunton, MA
Lockheed Martin Corporation; Gaithersburg, MD

Warfighter Information Network-Tactical										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	43.5	-	4.9	-	4.7	-	-	-	4.7	-
Procurement	695.1	-	437.2	-	420.5	-	-	-	420.5	-
Spares	39.5	-	19.8	-	23.9	-	-	-	23.9	-
Total	778.1	-	461.9	-	449.1	-	-	-	449.1	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Handheld, Manpack, and Small Form Fit Radio

DOD - JOINT

The Handheld, Manpack, and Small Form Fit (HMS) program procures radios that are software reprogrammable, networkable, multi-mode systems capable of simultaneous voice and data communications. The HMS encompasses the Handheld Radios (one-channel Rifleman Radio (RR) and two-channel Leader Radio (LR), Manpack Radio (MP), and Small Form Fit (SFF) radios. The RR is a handheld radio that connects Soldiers at the lowest echelon of the Army network by providing one-channel secure voice and data communications using Soldier Radio Waveform (SRW). The LR is a Multiband two-channel handheld radio to be used at the Team, Squad, and Platoon level. The LR will simultaneously support Single Channel Ground and Airborne Radio System (SINCGARS) voice interoperability and Soldier Radio Waveform (SRW) data and voice communications in one radio with both handheld and mounted configurations. The MP radio is a certified Type I radio used for transmission of up to Secret information. The MP is capable of providing two simultaneous channels of secure voice and data communications using SINCGARS, SRW, and Demand Assigned Multiple Access Satellite Communication. The embedded SFF radios may be used for Unmanned Vehicles and other platform applications.

Mission: Provides voice and data communications to the tactical edge/most disadvantaged Warfighter with an on-the-move, at-the-halt, and stationary Line of Sight/Beyond Line of Sight capability for both dismounted personnel and mounted platforms. The MP and the RR extend the network down to the Squad/Team leader. These networking tactical radio systems meet requirements for the Army, Navy, Marine Corps, and Special Operations Command and are interoperable with specified radios in the current forces.

FY 2018 Program: Funds the required full and open competition contract strategy for the RR and the MP radios. Conducts testing for the MP and the RR candidate products to demonstrate compliance with program requirements to assess effectiveness, suitability, and survivability and to obtain material release for Full Rate Production. Funds support safety, spectrum supportability, and additional certifications necessary to prepare the products for fielding. Procures 506 RR and 3,152 MP, support equipment, fielding, non-recurring engineering, and platform vehicle integration.

Prime Contractors: General Dynamics C4 Systems Incorporated; Scottsdale, AZ
Harris Radio Corporation; Rochester, NY
Thales Communications Incorporated; Clarksburg, MD

Handheld, Manpack, and Small Form Fit

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	4.5	-	18.8	-	20.1	-	-	-	20.1	-
Procurement	54.6	-	273.6	5,656	355.4	-	-	-	355.4	-
Total	59.1	-	292.4	5,656	375.5	-	-	-	375.5	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

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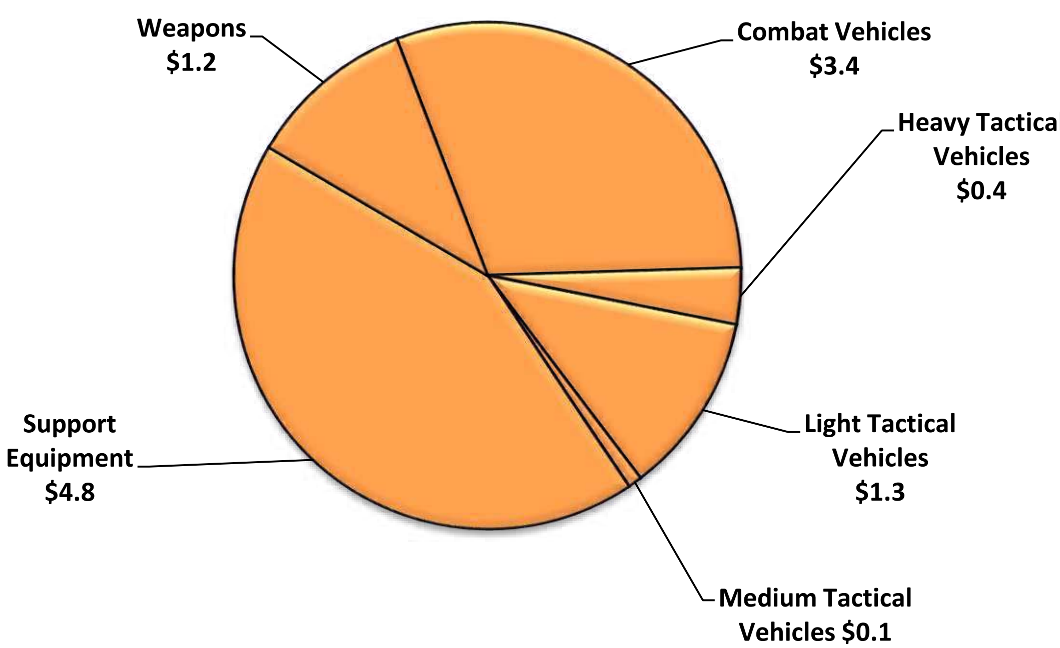
Ground Systems

The Department is modernizing its ground force capabilities to ensure the United States remains a dominant force capable of operating in all environments across the full spectrum of conflict. The Army and Marine Corps equip each soldier and Marine with the best equipment available to succeed in both today's and tomorrow's operations. Ongoing technology research and concept exploration will benefit future Army and Marine Corps combat portfolios.

The Army continues to modernize and upgrade select Major Defense Acquisition Programs in FY 2018, including Stryker vehicles, Abrams Tanks, Bradley Fighting Vehicles, and Paladin 155mm Howitzers. The Marine's ground force focus in FY 2018 is on the Amphibious Combat Vehicle (ACV). The ACV will deliver shore and sea-based infantry to the battlefield in vehicles designed for future operational environments. All the Services will procure the Joint Light Tactical Vehicle (JLTV) as part of the Low Rate Initial Production (LRIP).

FY 2018 Ground Systems – Total: $11.2 Billion

($ in Billions)



Numbers may not add due to rounding

Joint Light Tactical Vehicle — DOD - JOINT

The Joint Light Tactical Vehicle (JLTV) is a joint program currently in development for the Army and Marine Corps. The JLTV is intended to replace the High Mobility Multipurpose Wheeled Vehicle (HMMWV), which is the current light tactical vehicle. The JLTV concept is based on a family of vehicles focused on scalable armor protection and vehicle agility, and mobility required of the light tactical vehicle fleet. The JLTV will provide defensive measures to protect troops while in transport, increase payload capability, and achieve commonality of parts and components to reduce the overall life cycle cost of the vehicle. The JLTV project seeks to optimize performance, payload, and protection of the crew and vehicle while ensuring a design that is transportable by CH-47, CH-53, and C-130 aircraft. The program achieved Milestone C in October 2015.

Mission: Provides a light tactical vehicle capable of performing multiple mission roles, and providing protected, sustained, networked mobility for personnel and payloads across the full range of military operations. There are two variants planned: Combat Support Vehicles (3,500 lb) and Combat Tactical Vehicles (5,100 lb).

FY 2018 Program: Funds the third and final year of Low Rate Initial Production (LRIP), procuring 2,777 trucks. Continues Full Up System Level (FUSL) test, Multi-Service Operational Test and Evaluation (MOT&E), Automatic Fire Extinguishing System (AFES) test, and Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) test.

Prime Contractor: Oshkosh Corporation; Oshkosh, WI

Joint Light Tactical Vehicle

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E USA	31.2	-	11.5	-	23.5	-	-	-	23.5	-
RDT&E USMC	24.8	-	23.2	-	20.7	-	-	-	20.7	-
Procurement USA	249.9	686	587.5	1,828	804.4	2,110	-	-	804.4	2,110
Procurement AF	1.7	-	40.4	-	59.4	138	1.1	2	60.5	140
Procurement USMC	58.6	119	113.2	192	233.6	527	-	-	233.6	527
Total	366.2	805	775.8	2,020	1,141.6	2,775	1.1	2	1,142.7	2,777

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Armored Multi-Purpose Vehicle (AMPV)

USA

The Armored Multi-Purpose Vehicle (AMPV) will replace the M113 Armored Personnel Carrier program that was terminated in 2007. The AMPV will have five mission roles: General Purpose, Medical Treatment, Medical Evacuation, Mortar Carrier and Mission Command. The current M113 Armored Personnel Carrier Mission Equipment Packages (MEPs) will be integrated onto a new hull structure based on the Bradley Fighting Vehicle design to give the Army its required capability at an affordable cost.

Mission: Enables the Armored Brigade Combat Team (ABCT) commander to control a relentless tempo that overwhelms the threat with synchronized and integrated assaults that transition rapidly to the next engagement.

FY 2018 Program: Funds Engineering and Manufacturing Development (EMD) prototype testing (including performance and reliability testing), completion of the Interim Design Review (IDR) and the Functional Configuration Audit (FCA), continued development of Logistics Support products, procurement of Live Fire Test Assets, and procurement of 107 Low Rate Initial Production vehicles.

Prime Contractor: BAE Systems; York, PA

Armored Multi-Purpose Vehicle (AMPV)

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	213.0	-	184.2	-	199.8	-	-	-	199.8	-
Procurement	-	-	-	-	193.7	42	253.9	65	447.6	107
Total	213.0	-	184.2	-	393.5	42	253.9	65	647.4	107

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Family of Heavy Tactical Vehicles

USA

The Family of Heavy Tactical Vehicles (FHTV) consists of the Palletized Load System (PLS) and the Heavy Expanded Mobility Tactical Truck (HEMTT). The PLS entered service in 1993 and consists of a 16.5 ton, 10 wheel tactical truck with self load/unload capability. The PLS carry payload on flat rack cargo bed, trailer, or International Standards Organization (ISO) containers. The HEMTT is a 10 ton, 8 wheel (8x8) truck that comes in several configurations: Tanker to refuel tactical vehicles and helicopters, Tractor to tow the Patriot missile system and Multi-Launch Rocket System (MLRS), Wrecker to recover vehicles, and Cargo truck with a materiel handling crane. The HEMTT family entered service in 1982.

Mission: Provides transportation of heavy cargo to supply and re-supply combat vehicles and weapons systems. The PLS is fielded to transportation units, ammunition units, and to forward support battalions with the capability to self-load and transport a 20 ft. ISO container. The upgraded HEMTT A4 is an important truck to transport logistics behind quick-moving forces such as the M-1 Abrams and Stryker. The HEMTT family carries all types of cargo, especially ammunition and fuel, and is used for line haul, local haul, unit resupply, and other missions throughout the tactical environment to support modern and highly mobile combat units.

FY 2018 Program: Funds the procurement of 621 FHTVs, as well as trailers to modernize the heavy tactical vehicle fleet for the Active, National Guard, and Reserve units and to fill urgent theater requirements.

Prime Contractor: Oshkosh Corporation; Oshkosh, WI

Family of Heavy Tactical Vehicles										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	-	-	11.4	-	10.5	-	-	-	10.5	-
Procurement	30.8	345	45.7	481	81.6	359	25.9	262	107.5	621
Total	30.8	345	57.1	481	92.1	359	25.9	262	118.0	621

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

M–1 Abrams Tank Modification/Upgrades

USA

US Army Photo

The M1A2 Abrams is the Army's main battle tank, which first entered service in 1980. It was produced from 1978 until 1994. Since then, the Army has modernized it with a series of upgrades to improve its capabilities, collectively known as the System Enhancement Package (SEP) and the Tank Urban Survival Kit (TUSK). Current modifications to the M1 Abrams include Ammunition Data Link, Low Profile Commander's Remote Operated Weapon Station and Power Train Improvement & Integration Optimization, which provide more reliability, durability and fuel efficiency. Survivability enhancements include Active Protection System upgrades.

Mission: Provides mobile and protected firepower for battlefield superiority against heavy armor forces.

FY 2018 Program: Funds ECP 1A testing and continues Engineering Change Proposal (ECP) 1B (lethality improvements) development. Funds the upgrade of 56 M1A1 vehicles variants to the M1A2 SEP v3 variant. Continues support of the ECP 1A installation of M1A2SEP v3 production in FY 2018 and as well as numerous approved modifications to fielded M1A2 Abrams tanks, including the Ammunition Data Link (ADL) to enable firing of the Army's new smart 120mm ammunition, Low Profile Commander's Remote Operating Weapon Station (CROWS) and Active Protection System.

Prime Contractor: General Dynamics Corporation; Sterling Heights, MI

M-1 Abrams Tank Modification/Upgrades

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		**Total Request**	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	**$M**	**Qty**
RDT&E	73.8	-	88.5	-	108.6	-	-	-	**108.6**	**-**
Procurement	430.9	-	810.2	27	523.8	20	581.5	36	**1,105.3**	**56**
Total	**504.7**	**-**	**898.7**	**27**	**632.4**	**20**	**581.5**	**36**	**1,213.9**	**56**

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Paladin Integrated Management (PIM)

USA

The M109 Family of Vehicles (FOV) consists of the M109A6 Paladin 155mm Howitzer, the most advanced self-propelled cannon system in the Army, and the Field M992A2 Artillery Ammunition Support Vehicle (FAASV), an armored resupply vehicle. The Paladin Integrated Management (PIM) program addresses obsolescence, space, weight, and power concerns and Ensures sustainment of the M109 FOV through 2050. The PIM replaces the current M109A6 Paladin and M992A2 FAASV vehicles with a more robust platform, incorporating the M2 Bradley common drive train and suspension components. The PIM fills the capability gap created by cancellation of the Non-Line of Sight Cannon (NLOS-C) (a component of the Future Combat System program) in 2009. Begins Full Rate Production (FRP) in FY 2018.

Mission: Provides the primary indirect fire support for Armored Brigade Combat Teams, armored and mechanized infantry divisions as well as an armored resupply vehicle.

FY 2018 Program: Funds the close out of the Engineering Manufacturing Development (EMD) work, training devices for cannon system development, and procures 71 PIM systems.

Prime Contractor: BAE Systems; York, PA

Paladin Integrated Management (PIM)										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	136.4	-	41.5	-	6.1	-	-	-	6.1	-
Procurement	273.9	30	594.5	48	646.4	59	125.7	12	772.1	71
Total	410.3	30	636.0	48	652.5	59	125.7	12	778.2	71

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Family of Medium Tactical Vehicles

USA

DoD Photo

The Family of Medium Tactical Vehicles (FMTV) is a family of diesel powered trucks in the 2½-ton and 5-ton payload class. The vehicle first went into service in 1996. It capitalizes on the current state of automotive technology including a diesel engine, automatic transmission, and central tire inflation system (CTIS). The family of vehicles significantly reduces logistics burden and operating costs, taking advantage of over 80 percent parts commonality. Numerous models perform a wide variety of missions including cargo transport (cargo model), vehicle recovery operations (wrecker), construction (dump), line haul (tractor), airdrop missions, and civil disaster relief. The FMTV also serves as the platform for the High Mobility Artillery Rocket System (HIMARS) and support vehicle for the Patriot missile. It is strategically deployable in C-5, C-17, and C-130 aircraft. Incorporating Engineering Change Proposal in FY 2018 to increase suspension capacity, improved ride quality and mobility when inserting underbody protection.

Mission: Provides unit mobility and resupply of equipment and personnel for rapidly deployable worldwide operations on primary and secondary roads, trails, cross-country terrain, and in all climatic conditions.

FY 2018 Program: Funds the procurement of 37 Medium Tactical Vehicles to support the Army modular transformation effort to modernize the tactical wheeled vehicle fleet for medium size trucks.

Prime Contractor: Oshkosh Corporation; Oshkosh, WI

Family of Medium Tactical Vehicles (FMTV)

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	-	-	-	-	6.0	-	-	-	6.0	-
Procurement	334.0	1,155	352.8	1,252	78.7	37	-	-	78.7	37
Total	334.0	1,155	352.8	1,252	84.7	37	-	-	84.7	37

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Stryker Family of Armored Vehicles

USA


US Army Photo

Stryker is a 19-ton wheeled armored vehicle that provides the Army with a family of 17 different vehicles (10 flat bottom and 7 Double V-Hull). The Stryker can be deployed by C-130 (flat bottom only), C-17, and C-5 aircraft and be combat-capable upon arrival in any contingency area. There are two basic versions, which include the Infantry Carrier Vehicle (ICV) and the Mobile Gun System (MGS) with eight different configurations, which include the Reconnaissance Vehicle (RV); Anti-Tank Guided Missile (ATGM); Nuclear, Biological, Chemical, and Radiological Vehicle (NBCRV); Medical Evacuation Vehicle (MEV); Commander's Vehicle (CV); Fire Support Vehicle (FSV); Mortar Carrier (MC); and Engineer Squad Vehicle (ESV).

Mission: The Stryker vehicle is designed to enable the Brigade Combat Team to maneuver more easily in close and urban terrain while providing protection in open terrain. It fills the Army's current transformation goal to equip a strategically deployable brigade using a C-17 or C-5 and an operationally deployable brigade using a C-130 that is capable of rapid movement anywhere on the globe in a combat ready configuration. The Stryker enables the Army to respond immediately to urgent operational requirements.

FY 2018 Program: Funds ECP 1 testing, ECP 2 Lethality Upgrade and continues support of the application of multiple fleet-wide modifications. Modifications address the following areas: Training Devices: Command, Control, Communications, Computers, Intelligence (C4I) obsolescence; reliability, capability and performance degradation; safety; and operational-related issues. Provides for the fielding of a 30mm weapon system.

Prime Contractor: General Dynamics Corporation; Sterling Heights, MI

Stryker										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	215.1	-	136.5	-	80.6	-	-	-	80.6	-
Procurement	975.9	136	598.9	-	97.6	-	-	-	97.6	-
Total	1,191.0	136	735.4	-	178.2	-	-	-	178.2	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Amphibious Combat Vehicle (ACV)

USMC

The Amphibious Combat Vehicle (ACV) is a Major Defense Acquisition Program. The ACV will replace the aging Amphibious Assault Vehicle. The Marine Corps has refined its ACV strategy based on several factors, including knowledge gained through multi-year analysis and ongoing development of its Ground Combat Tactical Vehicle Strategy. The ACV program achieved Milestone B in November 2015.

Mission: The ACV will provide an armored personnel carrier balanced in performance, protection, and payload for employment with the Ground Combat Element across the range of military operations, including a swim capability. The program has been structured to provide a phased, incremental capability.

FY 2018 Program: Funds the purchase of 4 Full-Up System Level (FUSL) Test vehicles and continued Test and Evaluation efforts. Procures the Low Rate Initial Production (LRIP) of 26 vehicles, plus procurement of related items such as production support, systems engineering/program management, Engineering Change Orders (ECOs), Government Furnished Equipment (GFE), and integrated logistics support, and Initial Spares, which support the ACV Increment 1.1 program. Milestone C is scheduled in FY 2018.

Prime Contractors: BAE Systems; York, PA
Science Applications International Corporation (SAIC); McClean, VA

Amphibious Combat Vehicle (ACV)										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	197.0	-	158.7	-	179.0	-	-	-	179.0	-
Procurement	-	-	-	-	161.5	26	-	-	161.5	26
Total	197.0	-	158.7	-	340.5	26	-	-	340.5	26

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

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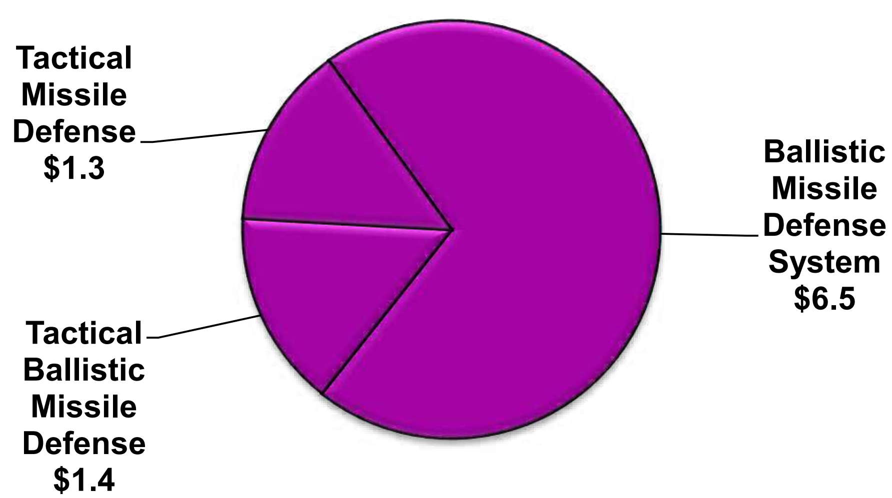
Missile Defense Programs

Missile Defense is a general term for air and missile defense. This category includes cruise missile, air and ballistic missile defense systems program development. The Missile Defense Agency, Army, and the Navy are the program developers. Missile Defense includes all components designed to defeat hostile ballistic missiles of various ranges. A missile defense system includes interceptor missiles, as well as the associated sensors and command, control, battle management, and communications. Other significant investments include construction; targets and countermeasures; and the research, development, testing, and evaluation activities. Encompassed in this category are all programs that are either critical to the functionality of missile defense or support missile defense as a primary mission. The Aegis Ballistic Missile Defense System (BMDS) is the naval element of the Ballistic Missile Defense (BMD) and provides an enduring, operationally effective and supportable BMD capability on Aegis cruisers, destroyers, and Ashore.

The FY 2018 budget request continues to invest and build inventories of air and missile defense capabilities, such as the Patriot Advanced Capability-3 (PAC-3) missiles, PAC-3 Missile Segment Enhancements (MSE) interceptors, Standard Missile-3 (SM-3) interceptors, Terminal High Altitude Area Defense (THAAD) interceptors, and the Army Navy/Transportable Radar Surveillance-2 (AN/TPY-2) radar. Further, the Department continues to seek expanded international efforts for missile defense with allies and partners to provide pragmatic and cost-effective missile defense capabilities.

FY 2018 Missile Defense Programs – Total: $9.2 Billion

($ in Billions)



Note: $9.2 billion does not include the Missile Defense Agency's (MDA) Science and Technology ($292 million), Military Construction ($3 million), or the Operation and Maintenance ($504 million) funding. The total MDA funding is $7.9 billion for the FY 2018 request.

Numbers may not add due to rounding

Aegis Ballistic Missile Defense

DOD - JOINT

The Aegis Ballistic Missile Defense (BMD) is the naval element of the Ballistic Missile Defense System (BMDS) and provides an enduring, operationally effective and supportable BMD capability on Aegis cruisers, destroyers, and Ashore. The Aegis BMD builds upon the existing Navy Aegis Weapons System (AWS) and Standard Missile-3 (SM-3) design. Upgrades are being made to the weapon system and SM to expand capability through a series of incremental, evolutionary improvements to counter more sophisticated and longer range threats.

Mission: Provides a forward-deployable, mobile and Ashore capability to detect and track ballistic missiles of all ranges in all phases of flight with the ability to destroy short- through intermediate-range ballistic missiles in the midcourse and terminal phases. The Aegis BMD delivers an enduring, operationally effective and supportable capability on Aegis cruisers, destroyers, and Ashore to defend the U.S., deployed forces, and our allies.

FY 2018 Program: Supports procurement of 34 SM-3 Block IB missiles. Procures six SM-3 Block IIA missiles. Integrates SM-3 Block IIA into the BMD Weapon Systems. Continues development of the Aegis BMD 5.1 Weapon Systems and Aegis BMD 6.

Prime Contractors: Aegis Weapon System: Lockheed Martin Corporation; Moorestown, NJ
SM-3 Interceptor: Raytheon Company; Tucson, AZ and Huntsville, AL

AEGIS Ballistic Missile Defense

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	882.7	17	1,054.1	-	986.5	6	-	-	986.5	6
Procurement	712.0	46	513.9	35	624.1	34	-	-	624.1	34
Total	1,594.7	63	1,568.0	35	1,610.6	40	-	-	1,610.6	40

Note: The FY 2016 RDT&E includes 17 SM-3 Block IIA missiles. The FY 2018 RDT&E includes 6 SM-3 IIA missile. The FY 2016-2018 Procurement is comprised of SM-3 Block IB missiles.

Numbers may not add due to rounding

* FY 2016 includes actuals for Base and OCO

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

THAAD Ballistic Missile Defense

DOD - JOINT

The Terminal High Altitude Area Defense (THAAD) is a key element of the Ballistic Missile Defense System. The THAAD Battery will provide transportable interceptors, using "Hit-To-Kill" technology to destroy ballistic missiles inside and outside the atmosphere. A Battery consists of 6 truck-mounted launchers, 48 interceptors (8 per launcher), 1 AN/TPY-2 radar, and 1 Tactical Fire Control/Communications component.

Mission: Provides Combatant Commanders with a deployable, ground-based missile defense capability against short and medium-range ballistic missiles and asymmetric threats inside and outside the atmosphere.

FY 2018 Program: Supports the procurement of 34 interceptors and associated components, as well as support and training equipment. Continues fielding and sustainment activities for seven THAAD Batteries. Continues development of THAAD software upgrades to address threat packages, defense planning, improved capability to engage short-range ballistic missiles, medium-range ballistic missile, limited intermediate-range ballistic missile threats, and limited integration of the THAAD battery capability into the Integrated Air and Missile Defense Battle Command System (IBCS) planning process.

Prime Contractor: Lockheed Martin Corporation; Sunnyvale, CA

Terminal High Altitude Area Defense (THAAD)

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	218.6	-	272.5	-	266.4	-	-	-	266.4	-
Procurement	448.0	34	520.6	36	451.6	34	-	-	451.6	34
Total	666.6	34	793.1	36	718.0	34	-	-	718.0	34

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Ground-based Midcourse Defense

DOD - JOINT

The Ground-based Midcourse Defense (GMD) element is a Missile Defense Agency program and a key component of the Ballistic Missile Defense System (BMDS), providing Combatant Commanders with the capability to engage ballistic missiles in the midcourse phase of flight. This phase, compared to boost or terminal, allows significant time for sensor viewing from multiple platforms and, thus, provides multiple engagement opportunities for hit-to-kill interceptors. The Ground-based Interceptor (GBI) is made up of a three-stage, solid fuel booster and an exoatmospheric kill vehicle. When launched, the multi-stage, solid fuel booster missile carries the kill vehicle toward the target's predicted location in space. Once released from the booster, the kill vehicle uses data received in-flight from ground-based radars and its own on-board sensors to defeat the incoming missile by ramming the warhead with a closing speed of approximately 15,000 miles per hour. Interceptors are currently emplaced at Fort Greely, Alaska (AK), and Vandenberg Air Force Base (AFB), California (CA). The GMD fire control centers are established in Colorado and Alaska.

Mission: Provides the Combatant Commanders with the capability to defend the United States, including Hawaii and Alaska, against long-range ballistic missiles during the midcourse phase of flight.

FY 2018 Program: Continues to develop, operate, and sustain the GMD weapon system, which includes the planned deployment of 40 Ground Based Interceptors (GBIs) at Fort Greely, AK, and 4 GBIs at Vandenberg AFB, CA by CY 2017, for a total of 44 GBIs. Funds Ground and Flight testing (FTG-11) in support of the Integrated Master Test Plan (IMTP) requirements. Continues the development of the GMD Redesigned Kill Vehicle (RKV) to include buildup of RKV components and extensive testing in support of component level and system level Critical Design Reviews (CDR) as well as RKV Alternative Seeker development. Begins replacing aging ground system infrastructure: Command Launch Equipment, GMD Communications Network, and In-Flight Interceptor Communications System (IFICS) Data Terminals and upgrades fire control and kill vehicle (KV) software to improve discrimination capabilities.

Prime Contractor: Boeing Defense and Space; St. Louis, MO

Ground-based Midcourse Defense										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	1,598.0	-	1,192.7	-	1,370.4	-	-	-	1,370.4	-
Total	1,598.0	-	1,192.7	-	1,370.4	-	-	-	1,370.4	-

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Patriot/PAC-3

USA

The Army's Patriot air and missile defense system, which includes the Advanced Capability (PAC-3) missile, is the only combat-proven system capable of defeating Tactical Ballistic Missiles (TBMs), Cruise Missiles, and Air-Breathing threats worldwide. Joint efforts between the Army and the Missile Defense Agency have been successful in integrating PAC-3 capabilities into the Ballistic Missile Defense System (BMDS). The PAC-3 units are the Combatant Commanders' most capable asset to protect forward deployed forces.

Mission: Contributes to the BMDS overall situational awareness for short range terminal ballistic missile threats. It can cue other systems while protecting Joint assets. The Patriot force is 15 battalions, and many remain forward stationed in multiple theaters of operation.

FY 2018 Program: Continues improvements in software for further reduction to probability of fratricide; improved communications, interoperability, supportability, electronic warfare capabilities; and supports transition to the Integrated Air and Missile Defense (IAMD) architecture.

Prime Contractors: Raytheon Integrated Defense Systems; Tewksbury, MA
Lockheed Martin Missiles and Fire Control; Dallas, TX

Patriot/PAC-3

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		**Total Request**	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	**$M**	**Qty**
RDT&E	88.0	-	84.0	-	167.0	-	-	-	**167.0**	-
Procurement	242.0	-	425.0	58	329.1	-	-	-	**329.1**	-
Spares	33.0	-	34.0	-	19.0	-	-	-	**19.0**	-
Total	**363.0**	-	**543.0**	**58**	**515.1**	-	-	-	**515.1**	-

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

PAC-3/MSE Missile

USA

The Missile Segment Enhancement (MSE) is a performance Improvement to the existing Patriot Advanced Capability (PAC-3) missile. The MSE upgrade enhances the PAC-3 missile by adding a dual pulse, 11-inch diameter Solid Rocket Motor (SRM), improved lethality enhancer, a thermally hardened front-end, upgraded batteries, enlarged fixed fins, more responsive control surfaces, and upgraded guidance software. These improvements result in a more agile, lethal interceptor missile with enhanced Insensitive Munitions (IM) compliance. The PAC-3 MSE can be fired from a Patriot system.

Mission: Provides the Combatant Commanders with a hit-to-kill, surface-to-air missile that can intercept tactical ballistic missiles, cruise missiles, and air-breathing threats that have chemical, biological, radiological, nuclear, and conventional high explosive warheads. The MSE extends the PAC-3 range, filling a critical performance gap, and affords greater protection for U.S. and allied forces.

FY 2018 Program: Procures 93 MSE interceptors to increase range and altitude capability, meeting the ever-changing threat.

Prime Contractor: Lockheed Martin Missiles and Fire Control; Dallas, TX

PAC-3/MSE

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	2.2	-	-	-	-	-	-	-	-	-
Procurement	514.9	112	702.0	85	459.0	93	-	-	459.0	93
Total	517.1	112	702.0	85	459.0	93	-	-	459.0	93

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

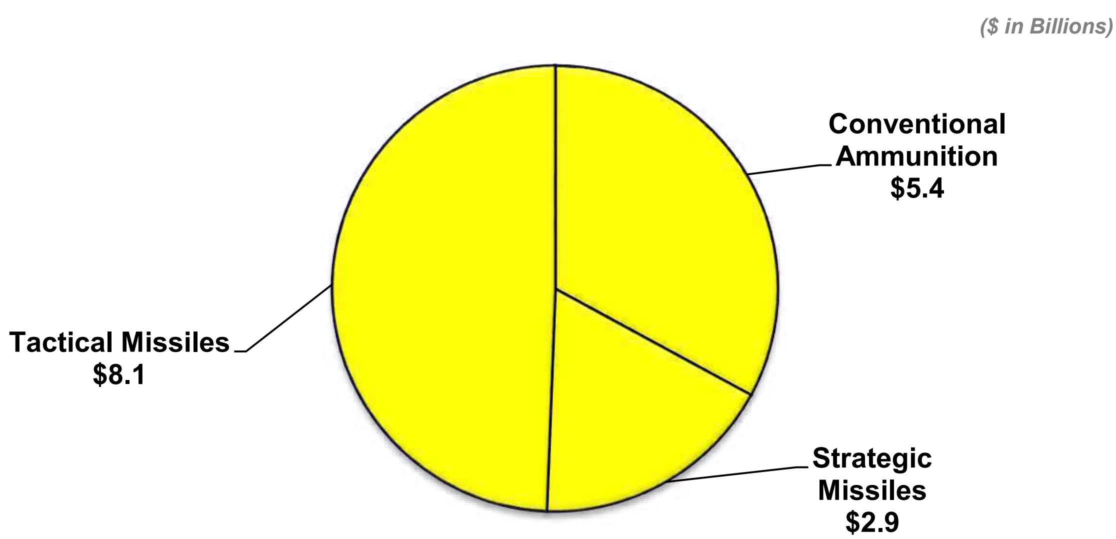
** FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Missiles and Munitions

Munitions is a general term for ammunition and missiles. Ammunition are explosives consisting of all kinds of bombs, grenades, rockets, mines, projectiles, and other similar devices. There are conventional and nuclear missiles used for both tactical and strategic purposes. Many missiles are precision guided with the technical sophistication to allow guidance corrections during flight-to-target. Some programs include non-explosive articles that enhance the performance of other munitions. For example, the Joint Direct Attack Munitions (JDAM) adds guidance capability when attached to a gravity bomb, making it a "smart" bomb.

In FY 2018, the Department continues to execute a balanced munitions procurement strategy in response to both current operations and advanced, long-term threats. The Department is increasing procurement of JDAM, General Purpose Bombs, Small Diameter Bombs, Guided Multi-Launch Rocket System, and the Hellfire missile to ensure sufficiency for today's warfighter, while expanding industrial capacity to meet increasing demands. In parallel, the Department continues to accelerate inventories of the next generation of standoff weapons for high value land attack targets such as the Joint Air-to-Surface Standoff Missile-Extended Range. Procurement of the Small Diameter Bomb II provides an all-weather capability against moving targets. The Navy will continue development of a Maritime Strike variant of Tactical Tomahawk to engage surface threats, which supplements the air-launched Long Range Anti-Ship Missile (LRASM), with the ability to engage heavily defended maritime targets at standoff ranges and increased survivability. Investment also continues in shipboard air defense missiles such as the Standard Missile-6 to enhance the ships survivability.

FY 2018 Missiles and Munitions – Total: $16.4 Billion



Numbers may not add due to rounding

Advanced Medium Range Air-to-Air Missile — DOD - JOINT


USAF Image

The Advanced Medium Range Air-to-Air Missile (AMRAAM) is an all-weather, all-environment radar guided missile developed to improve capabilities against very low-altitude and high-altitude, high-speed targets in an electronic countermeasures environment. The AMRAAM is a joint Navy/Air Force program led by the Air Force.

Mission: Destroys low and high altitude, high-speed enemy targets in an electronic countermeasures environment. The AMRAAM is a fire-and-forget air-to-air missile, and has replaced the AIM-7 Sparrow as the U.S. military's standard beyond visual range intercept missile. The missile has undergone various service life improvements. The current generation, AIM-120D, has a two-way data link, Global Position System-enhanced Inertial Measurement Unit, an expanded no-escape envelope, improved High-Angle Off-Boresight capability, and increased range over previous variants.

FY 2018 Program: Continues production as well as product improvements such as fuzing, guidance, and kinematics.

Prime Contractor: Raytheon Company; Tucson, AZ

Advanced Medium Range Air-to-Air Missile

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E										
Air Force	46.2	-	62.5	-	61.3	-	-	-	61.3	-
Navy	30.2	-	40.4	-	25.4	-	-	-	25.4	-
Subtotal	**76.4**	**-**	**102.9**	**-**	**86.7**	**-**	**-**	**-**	**86.7**	**-**
Procurement										
Air Force	362.0	281	350.1	256	304.3	205	-	-	304.3	205
Navy	202.8	158	204.7	163	197.1	120	-	-	197.1	120
Subtotal	**564.8**	**439**	**554.8**	**419**	**501.4**	**325**	**-**	**-**	**501.4**	**325**
Spares	4.2	-	4.0	-	6.3	-	-	-	6.3	-
Total	**645.4**	**439**	**661.7**	**419**	**594.4**	**325**	**-**	**-**	**594.4**	**325**

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Air Intercept Missile – 9X

DOD - JOINT

USAF Image

The Air Intercept Missile-9X (AIM-9X), also known as SIDEWINDER, is a short range air-to-air missile that provides launch-and-leave warfighting capability. The AIM-9X/Block II features a fifth generation staring focal plane array imaging infrared seeker with high off boresight capability. It is mounted on a highly maneuverable (thrust vectored) airframe, along with digital guidance and Infrared signal processing that results in enhanced acquisition ranges, improved IR counter-countermeasures capability, and robust engagement zones for first shot/first kill air-to-air performance. The AIM-9X is a joint Navy/Air Force program led by the Navy.

Mission: Destroys low and high altitude, high-speed enemy targets in an electronic countermeasures environment.

FY 2018 Program: Continues AIM-9X Block II full rate production and planning/research for future warfighting improvements.

Prime Contractor: Raytheon Missile Systems; Tucson, AZ

Air Intercept Missile – 9X

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E										
Air Force	33.6	-	52.9	-	35.0	-	-	-	35.0	-
Navy	59.1	-	56.3	-	42.9	-	-	-	42.9	-
Subtotal	**92.7**	-	**109.2**	-	**77.9**	-	-	-	**77.9**	-
Procurement										
Air Force	198.2	506	127.4	287	125.4	310	-	-	125.4	310
Navy	92.5	207	70.9	152	79.7	185	-	-	79.7	185
Subtotal	**290.7**	**713**	**198.3**	**439**	**205.1**	**495**	-	-	**205.1**	**495**
Spares	12.8	-	18.8	-	13.2	-	-	-	13.2	-
Total	**396.2**	**713**	**326.3**	**439**	**296.2**	**495**	-	-	**296.2**	**495**

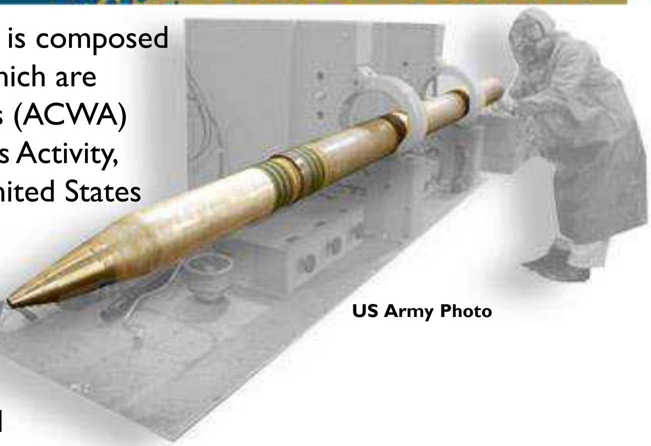
*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Chemical Demilitarization

DOD - JOINT



The Chemical Demilitarization Program (CDP) is composed of two Major Defense Acquisition Programs, which are the Assembled Chemical Weapons Alternatives (ACWA) Program and the U. S. Army Chemical Materials Activity, both with the goal of destroying a variety of United States chemical agents and weapons, including the destruction of former chemical weapon production facilities. The CDP is designed to eliminate the existing U.S. chemical weapons stockpile in compliance with the Chemical Weapons Convention signed In1997 and the congressionally mandated destruction deadline of December 31, 2023 - while ensuring the safety and security of the workers, the public, and the environment.

Mission: There are three mission areas within the Chemical Demilitarization Program:
1. Destroy the remaining 10 percent of the U.S. chemical weapons stockpile at the ACWA Program sites (Colorado and Kentucky);
2. Implement the Chemical Stockpile Emergency Preparedness Project (CSEPP) including emergency response planning;
3. Assess and destroy Recovered Chemical Warfare Material (RCWM) within the United States.

FY 2018 Program: Continues systemization activities and destruction operations at the ACWA Program sites. Continues the CSEPP efforts and the emergency response planning at Colorado and Kentucky. Sustains the crews, equipment, and management structure required to ensure that the Department of Defense retains the capability to assess and destroy the RCWM in the United States.

Prime Contractors: Bechtel National Incorporated; Pueblo, CO
Bechtel Parsons, Joint Venture; Richmond, KY

Chemical Demilitarization

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
Chemical Agents and Munitions Destruction	699.8	-	825.5	-	961.7	-	-	-	961.7	-
Total	699.8	-	825.5	-	961.7	-	-	-	961.7	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Joint Air to Surface Standoff Missile

DOD - JOINT

USAF Image

The Joint Air-to-Surface Standoff Missile (JASSM) Baseline provides a survivable, precision cruise missile to kill hard, medium, and soft targets. It is a 2,000-pound class weapon with a 1,000-pound multi-purpose, hardened (blast/frag/penetrator) warhead. The JASSM can cruise autonomously in adverse weather, day or night, to defeat high value targets even when protected by next generation defenses. The JASSM navigates to a pre-planned target using a Global Positioning System-aided Inertial Navigation System and transitions to automatic target correlation using an imaging infrared seeker in the terminal phase of flight. Maximum unclassified range for the baseline JASSM variant is greater than 200 nautical miles. The JASSM is integrated on the F-15E, F-16, B-52, B-1, and B-2 aircraft. Production of JASSM Baseline concluded in FY2016.

The JASSM-Extended Range (ER) increment is highly common with the JASSM Baseline variant, and offers a more fuel-efficient engine and greater fuel capacity. It also adds 2.5 times the standoff range at greater than 500nm. The JASSM-ER maintains the same outer mold line and low-observable properties as JASSM Baseline, but replaces the turbojet engine (Teledyne) with higher thrust, more fuel efficient turbofan engine (Williams International). The JASSM-ER is currently only integrated on the B-1 aircraft with integration on the F-15E, F-16, B-52, and B-2 aircraft by FY 2020.

Mission: Destroys targets from a long-range standoff position deliverable by fighter and bomber aircraft.

FY 2018 Program: Continues Full Rate Production for JASSM-ER.

Prime Contractor: Lockheed Martin Corporation; Troy, AL

Joint Air to Surface Standoff Missile

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	9.2	-	30.0	-	29.9	-	-	-	29.9	-
Procurement	425.6	340	431.6	360	441.4	360	-	-	441.4	360
Spares	0.8	-	0.4	-	0.4	-	-	-	0.4	-
Total	435.6	340	462.0	360	471.7	360	-	-	471.7	360

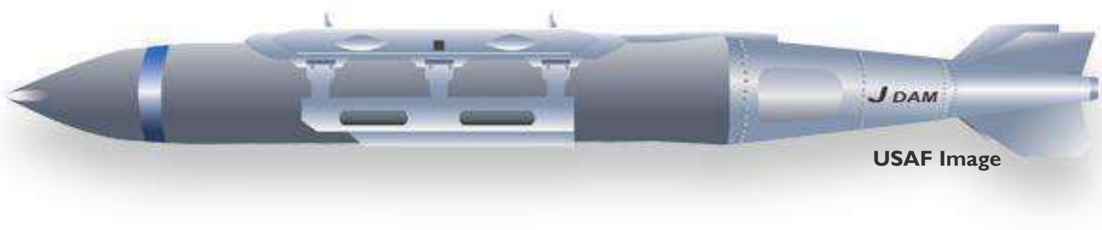
*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Joint Direct Attack Munition

DOD - JOINT



The Joint Direct Attack Munition (JDAM) is a joint Air Force and Navy program led by the Air Force. The JDAM improves the existing inventory of general purpose gravity bombs by integrating a Global Positioning System (GPS)/inertial navigation guidance capability that improves accuracy and adverse weather capability.

A Laser JDAM (LJDAM) variant increases operational flexibility for an expanded target set. The laser sensor kit added to the JDAM weapon kit provides the ability to attack targets of opportunity, including land-moving and maritime targets, when designated by an airborne or ground laser.

Mission: Enhances DoD conventional strike system capabilities by providing the ability to precisely attack time-critical, high value fixed or maritime targets under adverse environmental conditions and from all altitudes.

FY 2018 Program: Continues full-rate production of the system. The factory will operate at the maximum rate of production.

Prime Contractor: The Boeing Company; St. Charles, MO

Joint Direct Attack Munition

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		**Total Request**	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	**$M**	**Qty**
RDT&E	-	-	10.0	-	-	-	-	-	-	-
Procurement										
Air Force	534.0	22,478	707.1	30,664	319.5	10,330	390.6	16,990	**710.1**	**27,320**
Navy	31.3	1,437	61.8	2,779	57.3	2,492	106.9	4,717	**164.2**	**7,209**
Subtotal	**565.3**	**23,915**	**768.9**	**33,443**	**376.8**	**12,822**	**497.5**	**21,707**	**874.3**	**34,529**
Total	**565.3**	**23,915**	**778.9**	**33,443**	**376.8**	**12,822**	**497.5**	**21,707**	**874.3**	**34,529**

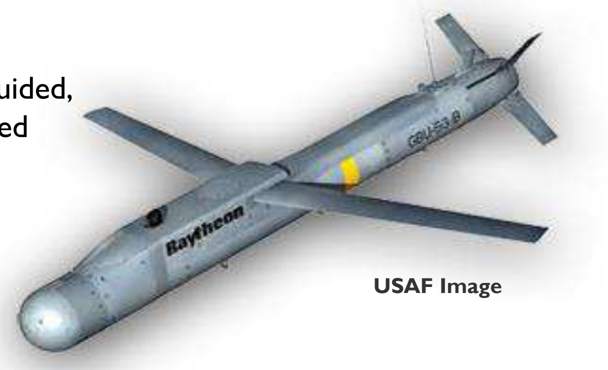
* FY 2016 includes actuals for Base and OCO funds

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Small Diameter Bomb (SDB) — DOD - JOINT

The Small Diameter Bomb (SDB) II is a joint Air Force and Navy program led by the Air Force to provide a conventional small sized, precision guided, standoff air-to-ground weapon that can be delivered from both fighter and bomber aircraft. The SDB I is a fixed target attack weapon. The SDB-II incorporates a seeker and data link, which expands the use to moving targets.



USAF Image

Mission: Destroys targets from a medium-range standoff position deliverable by both fighter and bomber aircraft, with higher load-out and less collateral damage compared to other weapons. SDB II integration and testing activities continue on the F-15E aircraft.

FY 2018 Program: Continues Engineering and Manufacturing Development (EMD) and Low Rate Initial Production of SDB II missiles for use against moving, relocatable, and fixed targets. The factory will operate at the maximum rate of production for SDB I.

Prime Contractor: Boeing Company; St. Charles, MO (SDB I)
Raytheon Missile Systems; Tucson, AZ (SDB II)

Small Diameter Bomb

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E										
Air Force	28.0	-	54.8	-	39.0	-	-	-	**39.0**	-
Navy	55.8	-	97.6	-	97.6	-	-	-	**97.6**	-
Subtotal	**83.8**	-	**152.4**	-	**136.6**	-	-	-	**136.6**	-
Procurement										
Air Force	135.1	3,494	260.2	4,507	266.0	5,039	90.9	2,273	**356.9**	**7,312**
Spares	3.2	-	10.6	-	10.6	-	-	-	**10.6**	-
Total	**222.1**	**3,494**	**423.2**	**4,507**	**413.2**	**5,039**	**90.9**	**2,273**	**504.1**	**7,312**

* FY 2016 includes actuals for Base and OCO. *Numbers may not add due to rounding*
**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Hellfire Missiles

DOD - JOINT

The Laser HELLFIRE II system family of air-to-ground missiles (all variants) provides attack helicopters and unmanned aircraft systems (UAS) with point-target precision strike capability to defeat heavy, advanced armor, individual hard point and non-traditional targets. HELLFIRE II missiles use a semi-active laser terminal guidance and are the primary armament of the AH-64 Apache, Army UAS and Special Operations aircraft. The HELLFIRE II AGM-114R is 64 inches in length and weighs 108 lbs. Weapons range is approximately 8 kilometers.

The HELLFIRE II missile includes Electro-Optical Countermeasure capability, warhead improvements and an updated electronic fuse. The AGM-114R HELLFIRE II missile will be the single variant that replaces all other HELLFIRE II missile configurations (K/N/M/P).

Mission: Engages and defeats individual moving or stationary ground targets such as armor, mechanized, or vehicular targets, building, or bunkers.

FY 2018 Program: Continues at full-rate production. The factory will operate at the maximum rate of production .

Prime Contractor: Lockheed Martin; Orlando, FL

Hellfire Missiles										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	-	-	-	-	-	-	-	-	-	-
Procurement										
Army	86.3	383	497.8	4,210	94.8	998	278.1	2,927	372.9	3,925
Air Force	697.7	6,256	179.1	1,536	34.9	399	297.5	3,230	332.4	3,629
Navy	-	-	8.6	100	-	-	8.6	110	8.6	110
Total	784.0	6,639	685.5	5,846	129.7	1,397	584.2	6,267	713.9	7,664

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Javelin Advanced Anti-Tank Weapon System - Medium **USA**

USMC Photo

The Javelin is highly effective against a variety of targets at extended ranges under day/night, battlefield obscurants, adverse weather, and multiple counter-measure conditions. The system's soft-launch feature permits firing from enclosures commonly found in complex urban terrain. The system consists of a reusable command launch unit (CLU) and a modular missile encased in a disposable launch tube assembly. The CLU provides stand-alone all-weather and day/night surveillance capability.

Javelin provides precision effects in either a top-attack or direct-attack mode to defeat armored vehicles, fortifications and soft targets in full spectrum operations. It uses an imaging infrared two-dimensional staring focal plane array seeker and a tandem warhead with two shaped charges: a precursor warhead to defeat reactive armor, and a primary warhead to penetrate base armor and other structures. It is effective against stationary and moving targets.

Mission: Provides the dismounted soldier with a man-portable, fire-and-forget system that is highly lethal against targets ranging from main battle tanks to fleeting targets of opportunity found in current threat environments.

FY 2018 Program: Begins procurement of FGM-148F (F model) Javelin missiles with a new Multi-Purpose Warhead, which improves lethality against exposed personnel. Continues development of a lightweight CLU to reduce soldier burden and bulk.

Prime Contractor: Raytheon Missile Systems/Lockheed Martin Javelin Joint Venture;
Tucson, AZ and Orlando, FL

Javelin Advanced Anti-Tank Weapon System - Medium

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	4.0	-	20.0	-	21.1	-	-	-	**21.1**	-
Procurement										
Army	168.2	850	193.3	983	110.1	525	8.1	47	**118.2**	572
Navy	58.9	327	79.6	524	41.2	222	2.8	11	**44.0**	233
Subtotal	**227.1**	**1,177**	**272.9**	**1,507**	**151.3**	**747**	**10.9**	**58**	**162.2**	**805**
Total	**231.1**	**1,177**	**292.9**	**1,507**	**172.4**	**747**	**10.9**	**58**	**183.3**	**805**

* FY 2016 includes actuals for Base and OCO *Numbers may not add due to rounding*

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Guided Multiple Launch Rocket System

USA


US Army Photo

The Guided Multiple Launch Rocket System (GMLRS) provides a persistent, responsive, all-weather, rapidly-deployable and long range precision strike capability.

The GMLRS is fired by the M142 High Mobility Artillery Rocket System (HIMARS) and the M270A1 Multiple Launch Rocket System (MLRS) launchers. The GMLRS uses an on-board Inertial Measurement Unit (IMU) in combination with a Global Positioning System (GPS) guidance system to provide improved performance. The missile has a range of approximately 70 kilometers and can carry a variety of different warheads servicing point and area targets. The third GMLRS increment, GMLRS Alternative Warhead (AW), is in production and will replace GMLRS Dual Purpose Improved Conventional Munition to meet requirements outlined in the 2008 Department of Defense Cluster Munitions Policy. The GMLRS AW will be produced on a shared production line and is about 90% common with the GMLRS Unitary increment.

Mission: Neutralizes or suppresses enemy field artillery and air defense systems and supplements cannon artillery fires.

FY 2018 Program: Continues at full rate production of GMLRS (AW/Unitary) as well as product improvements such as insensitive munition development. The factory will operate at the maximum rate of production. Facilitation will increase production capacity by FY 2020.

Prime Contractor: Lockheed Martin Corporation; Dallas, TX

Guided Multiple Launch Rocket System

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	36.0	-	38.0	-	102.8	-	-	-	102.8	-
Procurement	251.1	1,866	402.6	2,954	595.2	4,458	191.5	1,542	786.7	6,000
Total	287.1	1,866	440.6	2,954	698.0	4,458	191.5	1,542	889.5	6,000

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Rolling Airframe Missile

USN

The Rolling Airframe Missile (RAM) is a high firepower, lightweight complementary self-defense system to engage anti-ship cruise missiles.

The systems design is based upon the infra-red seeker of the Stinger (FIM-92) missile, and the warhead, rocket motor, and fuse from the Sidewinder (AIM-9) missile. The missile uses Radio Frequency (RF) for midcourse guidance, and transitions to Infrared (IR) guidance for terminal engagement. Currently there are two RIM-116 configurations: Block 1 (RIM-116B) and Block 2 (RIM-116C).

Mission: Provides high firepower close-in defense of combatant and auxiliary ships by utilizing a dual mode, passive radio frequency/infrared missile in a compact 21 missile launcher.

FY 2018 Program: Continues low rate of production for the Block II (RIM-116C) missile as well as operational testing.

Prime Contractor: Raytheon Missile Systems; Tucson, AZ

Rolling Airframe Missile										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	23.8	-	18.1	-	41.2	-	-	-	41.2	-
Procurement	75.4	90	95.6	120	58.6	60	-	-	58.6	60.0
Total	99.2	90	113.7	120	99.8	60	-	-	99.8	60

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Standard Family of Missiles

USN

US Navy Photo

The Standard missile family consists of various air defense missiles including supersonic, medium and extended range; surface-to-air. The Standard Missile-6 is a surface Navy Anti-Air Warfare (AAW) missile that provides area and ship self defense. The missile is intended to project power and contribute to raid annihilation by destroying manned fixed and rotary wing aircraft, Unmanned Aerial Vehicles (UAV), Land Attack Cruise Missiles (LACM), and Anti-Ship Cruise Missiles (ASCM) in flight. It was designed to fulfill the need for a vertically launched, extended range missile compatible with the Aegis Weapon System (AWS) to be used against extended range threats at-sea, near land, and overland. The SM-6 combines the tested legacy of STANDARD Missile-2 (SM-2) propulsion and ordnance with an active Radio Frequency (RF) seeker modified from the AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM), allowing for over-the-horizon engagements, enhanced capability at extended ranges, and increased firepower.

Mission: Provides all-weather, anti-aircraft armament for cruisers and destroyers. The most recent variant of Standard Missile is SM-6, which incorporates an AMRAAM seeker for increased performance, including overland capability.

FY 2018 Program: Continues production of the SM-6 variant.

Prime Contractor: Raytheon Missile Systems; Tucson, AZ

Standard Family of Missiles

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	111.3	-	120.6	-	158.6	-	-	-	158.6	-
Procurement	417.3	101	543.7	125	510.9	117	35.2	8	546.1	125
Spares	17.1	-	4.9	-	15.0	-	-	-	15.0	-
Total	545.7	101	669.2	125	684.5	117	35.2	8	719.7	125

* FY 2016 includes actuals for Base and OCO. *Numbers may not add due to rounding*

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Tactical Tomahawk Cruise Missile

USN


US Navy Photo

Tomahawk is a long range cruise missile used for deep land-attack strike warfare that is launched from U.S. Navy surface combatants and submarines. Tomahawk Block IV features an improved navigation/guidance computer; robust anti-jam Global Positioning System (GPS) capabilities; increased responsiveness and flexibility via satellite communications for in-flight re-targeting; a loiter capability; and the ability to transmit a Battle Damage Indication (BDI) prior to impact.

Block IV Tomahawk delivers a 1,000 lb class unitary warhead at a range of 900 nm. Block IV Tomahawk employs inertial guidance or GPS over water to follow a preset course; once over land, the missile's guidance system is aided by Terrain Contour Matching (TERCOM). Terminal guidance is provided by the Digital Scene Matching Area Correlation (DSMAC) system or GPS, enabling highly accurate precision attack.

Mission: Provides precision strike against long and medium range tactical targets.

FY 2018 Program: Concludes production of Tomahawk Block IV missiles and continues preparation for mid-life recertification commencing in FY 2019. Funds the development of a maritime strike variant to engage surface targets.

Prime Contractor: Raytheon Missile Systems; Tucson, AZ

Tactical Tomahawk Cruise Missile

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	26.7	-	91.4	-	133.6	-	-	-	133.6	-
Procurement	202.3	149	271.9	196	134.4	34	100.1	66	234.5	100
Spares	70.3	-	39.8	-	13.5	-	-	-	13.5	-
Total	299.3	149	403.1	196	281.5	34	100.1	66	381.6	100

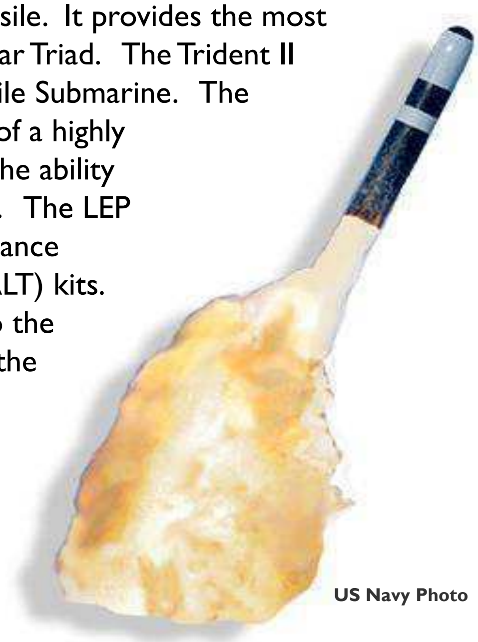
*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Trident II Ballistic Missile Modifications

USN



US Navy Photo

The Trident II (D5) is a submarine launched ballistic missile. It provides the most survivable, second-strike capability in our nation's nuclear Triad. The Trident II missile is carried on the OHIO-class Fleet Ballistic Missile Submarine. The ongoing Life Extension Program (LEP) ensures viability of a highly survivable strategic deterrent through 2042, providing the ability to precisely attack time-critical, high value, fixed targets. The LEP includes the procurement of missile electronic and guidance Supportability Mods/Strategic Programs Alteration (SPALT) kits. The importance of this program as a key component to the sea-based leg of the nuclear triad was re-confirmed by the President and Congress with the ratification of the New START Treaty in 2011.

Mission: Aboard a virtually undetectable platform, the submarine launched fleet ballistic missile deters nuclear war by means of assured second-strike capability in response to a major attack on the United States or its allies.

FY 2018 Program: Funds the development of advanced components to improve the reliability, safety and security of Arming, Fuzing and Firing systems and studies to support the National Nuclear Security Administration W88 ALT 370. Funds the procurement of flight test instrumentation, 12 Solid Rocket Motor sets, 12 Post Boost Control System Gas Generators, various SPALT kits, support equipment, and spares.

Prime Contractor: Lockheed Martin Corporation; Sunnyvale, CA

Trident II Ballistic Missile Mods										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	93.4	-	134.0	-	126.4	-	-	-	126.4	-
Procurement	1,089.1	-	1,103.1	-	1,143.6	-	-	-	1,143.6	-
Total	1,182.5	-	1,237.1	-	1,270.0	-	-	-	1,270.0	-

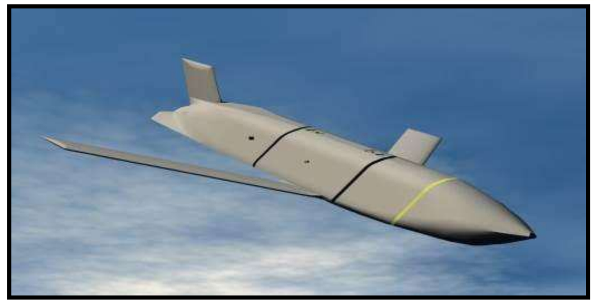
*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Offensive Anti-Ship Weapon (OASUW)

USN



The Offensive Anti-Ship Warfare (OASuW) Increment I is an accelerated acquisition program to develop the Long-Range Anti-Surface Warfare Missile (LRASM). LRASM is a precision-guided anti-ship missile with semi-autonomous guidance, day/night and all-weather capability. LRASM integrates a multi-modal sensor suite, a weapons data-link, enhanced digital anti-jam Global Positioning System capabilities, and a 1,000lb penetrator/blast fragmentation warhead. Increment I provides Combatant Commanders the ability to conduct Anti-Ship Warfare operations against high value surface combatants protected by Integrated Air Defense System with long range surface-to-air missiles and denies the adversary sanctuary of maneuver. The Increment I program has completed transition from Defense Advanced Research Projects Agency to Navy leadership and is scheduled to field on the Air Force B-1 Bomber by the end of Fiscal Year 2018 and F/A-18E/F by the end of Fiscal Year 2019. The OASuW Increment I is a joint Navy/Air Force program led by the Navy.

Mission: Provide robust anti-surface warfare capability to ensure freedom of maneuver, maintain sea lines-of-communication, and extend joint warfighter combat reach in contested maritime environments.

FY 2018 Program: Continue low rate production, integration, and test phase of the air-launched OASuW Increment I (LRASM) program.

Prime Contractor: Lockheed Martin Missiles and Fire Control Strike Weapons;
Orlando, FL

Offensive Anti-Ship Weapon (OASUW)										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	348.7	-	252.4	-	313.1	-	-	-	313.1	-
Procurement										
Navy	-	-	29.6	10	74.7	25	-	-	74.7	25
Air Force	-	-	59.5	20	44.7	15	-	-	44.7	15
Subtotal	-	-	89.1	30	119.4	40	-	-	119.4	40
Total	348.7	-	341.5	30	432.5	40	-	-	432.5	40

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Ground Based Strategic Deterrent (GBSD) — USAF

The Ground Based Strategic Deterrent (GBSD) program is the Air Force effort to replace the aging LGM-30 Minuteman III intercontinental ballistic missile (ICBM). The Minuteman III missile fleet was fielded in the 1970s with an initial 10-year service life, while its launch and command and control systems date back to the 1960s. The new GBSD weapon system will meet existing user requirements, while having the adaptability and flexibility to affordably address changing technology and threat environments through 2075. Deployment is projected to begin in the late 2020s.

Mission: As a critical part of the nuclear triad, ICBMs provide land-based strategic nuclear deterrence, assurance, and stability by providing a responsive and resilient capability that assures allies they do not need to expand their own capability, dissuade proliferation, deter adversaries, and, should deterrence fail, decisively defeat adversary targets and retaliatory capabilities as authorized and directed by the President. GBSD will continue to maintain strategic stability at a reasonable cost, while hedging against potential problems or vulnerabilities in other portions of the triad.

FY 2018 Program: Funds technology maturation and risk reduction activities to deliver mature and integrated technologically to support the preliminary design of the weapon system.

Prime Contractors: Currently in Source Selection to award up to two Technology Maturation and Risk Reduction contracts.

Ground Based Strategic Deterrent (GBSD)

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	65.0	-	113.9	-	215.7	-	-	-	215.7	-
Procurement	-	-	-	-		-	-	-	-	-
Total	65.0	-	113.9	-	215.7	-	-	-	215.7	-

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Long Range Stand-Off (LRSO) Missile

Long Range Stand-Off (LRSO) Missile is a nuclear cruise missile capable of penetrating and surviving complex advanced integrated air defense systems and GPS-denied environments from significant standoff ranges. LRSO replaces the Air Launched Cruise Missile (ALCM) which entered service in 1982 and is well past its original 10-year design service life. LRSO details are classified to protect critical program information.

Mission: The Long Range Stand Off cruise missile retains penetrating and survivable capabilities in advanced Integrated Air Defense Systems and GPS-denied environments from significant standoff ranges, ensuring we maintain a credible deterrent. Combined with nuclear capable bombers, LRSO provides the nuclear triad with a clear, visible, and tailorable deterrent to provide the President and U.S. Forces the ability to project power and hold at risk any target at any location on the globe. LRSO provides a hedge against future technological and geopolitical uncertainties. LRSO provides a reliable cost-effective force multiplier for the B-52, B-2 and the B-21 bomber.

FY 2018 Program: Funds the development, design, and planning for test, integration, qualification and nuclear certification activities. It continues funding for the Technology Maturation Risk Reduction (TMRR) efforts to include the first TMRR design reviews. The next major milestone after TMRR award is Milestone B and Engineering Manufacturing and Development contract award in FY 2022.

Prime Contractors: Currently in Source Selection to award up to two Technology Maturation and Risk Reduction contracts.

Long Range Stand-Off Missile (LRSO)

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	16.1	-	95.6	-	451.3	-	-	-	451.3	-
Procurement	-	-	-	-		-	-	-	-	-
Total	16.1	-	95.6	-	451.3	-	-	-	451.3	-

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

B61 Tail Kit Assembly (TKA)

USAF

The B61 is a nuclear gravity bomb developed by the Department of Energy's National Nuclear Security Administration (DOE/NNSA) for the Department of Defense. Current versions in the inventory were fielded between 1978-1990 and require component refurbishment and replacement to maintain a safe, secure and effective capability.

Mission: Provides the strategic weapons for the airborne leg of the nuclear triad and are carried on the B-52, the B-2, and NATO dual-use aircraft today. The new variant consolidates four versions and will be carried by the B-2 and North Atlantic Treaty Organization (NATO) aircraft as well as the F-35 and the B-21 bomber. To extend the life of this weapon, DOE/NNSA and the Air Force are jointly implementing a Life Extension Program (LEP) to refurbish the B61 with a First Production Unit in 2020. The Air Force portion of the LEP is to provide the development, acquisition and delivery of a guided tail kit assembly and all up round technical integration, system qualification and fielding of the B61-12 variant.

FY 2018 Program: Funds the development, design, test, integration, qualification and nuclear certification activities in support of the B61-12 LEP through continued Phase II of engineering and manufacturing development and prepare for the Milestone C decision in early FY 2019. Continues software development and integration for the F-15E and F-16 aircraft and begins B-2 and PA-200 integration.

Prime Contractors: Boeing Company

B61 Tail Kit Assembly (TKA)

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	204.4	-	137.9	-	91.2	-	-	-	91.2	-
Procurement	-	-	-	-	88.3	30	-	-	88.3	30.0
Total	204.4	-	137.9	-	179.5	30.0	-	-	179.5	30.0

* FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Shipbuilding and Maritime Systems

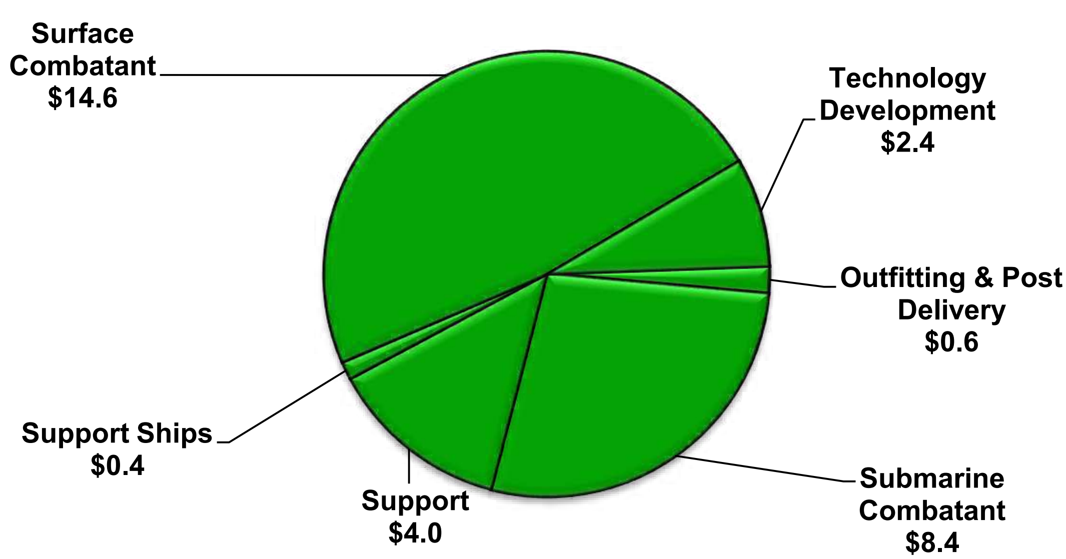
A central principle to the United States Maritime Strategy is forward presence, which promotes conflict deterrence by ensuring forces are in a position to expeditiously respond to conflict. Therefore, sea services must procure, build, and maintain maritime systems in accordance with mission need.

The Shipbuilding Portfolio for FY 2018 includes the funding for the construction of 12 ships (2 SSN 774 Virginia Class nuclear attack submarines; 1 CVN 78 *Ford* Class Aircraft Carrier; 2 DDG 51 *Arleigh Burke* Class destroyers; 1 Littoral Combat Ships (LCS); 1 Fleet Replenishment Oiler; 1 Towing, Salvage and Rescue (TATS(X) ship; 1 Landing Craft, and 3 Ship to Shore Connectors) and the second year of incremental construction funding for 1 Amphibious Assault ship, USS *Bougainville* (LHA 8). In addition, the FY 2018 request includes funding for Advance Procurement to support detail design activities and long lead items for the *Columbia* Class Fleet Ballistic Missile Submarine (SSBN) and long lead item for the Refueling and Complex Overhaul of USS *John C. Stennis* (CVN 74).

The funding in this category finances the developmental efforts, the equipment procurements, and the construction of ships that will allow the U.S. Navy to maintain maritime dominance and superiority well into the 21st century.

FY 2018 Shipbuilding and Maritime Systems – Total: $30.4 Billion

($ in Billions)



Numbers may not add due to rounding

John Lewis Class Fleet Replenishment Oiler

The Fleet Replenishment Oiler (T-AO) program will build a new class of fleet oilers for the Navy. The lead ship in the class is USNS *John Lewis* (T-AO 205). The T-AO will provide fuel and cargo delivery to support fleet operations. As compared to the previous class of Oilers, this class has increased space for dry cargo and a helicopter refueling capability. The *John Lewis* class will be built with a double-hull to guard against oil spills and to comply with international agreements concerning pollution from ships.

Mission: Transfers fuel and lubricants to Navy surface ships operating at sea to extend at-sea time for the ships and embarked aircraft.

FY 2018 Program: Funds construction of one T-AO, continued development of ship systems, and outfitting costs.

Prime Contractor: General Dynamics, National Steel and Shipbuilding Co.; San Diego, CA.

John Lewis Class Fleet Replenishment Oiler										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	-	-	1.1	-	2.0	-	-	-	2.0	-
Procurement	674.1	1	73.1	-	541.1	1	-	-	541.1	1
Total	674.1	1	74.2	-	543.1	1	-	-	543.1	1

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

CVN 78 *Gerald R. Ford* Class Nuclear Aircraft Carrier

Aircraft carriers are the centerpiece of U.S. Naval forces. The CVN 78 class ships will include new technologies and improvements to improve efficiency and operating costs as well as reduced crew requirements. This new class brings improved warfighting capability, quality-of-life improvements for Sailors, and reduced total ownership costs. USS *Gerald R. Ford* is the first aircraft carrier designed with all electric utilities, eliminating steam service lines from the ship, reducing maintenance requirements and improving corrosion control. The new A1B reactor, Electromagnetic Aircraft Launch System (EMALS), Advanced Arresting Gear (AAG) and Dual Band Radar (DBR) all offer enhanced capability with reduced manning. The ship's systems and configuration are optimized to maximize the sortie generation rate (SGR) of attached strike aircraft.

Mission: Provides the United States with the core capabilities for forward presence, deterrence, sea control, power projection, maritime security and humanitarian assistance. The Gerald R. Ford class will be the premier forward asset for crisis response and early decisive striking power in a major combat operation.

FY 2018 Program: Funds the first year of construction costs for USS *Enterprise* (CVN 80); the final year of construction costs for USS *John F. Kennedy* (CVN 79), outfitting, training, and continued development of ship systems.

Prime Contractor: Huntington Ingalls Industries; Newport News, VA

CVN 78 *Gerald R. Ford* Class Nuclear Aircraft Carrier										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	113.6	-	121.4	-	138.1	-	-	-	138.1	-
Procurement	2,655.2	-	2,669.6	-	4,500.0	1	-	-	4,500.0	1
Total	**2,768.7**	**-**	**2,791.1**	**-**	**4,638.1**	**1**	**-**	**-**	**4,638.1**	**1**

FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

***FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)*

DDG 51 *Arleigh Burke* Class Destroyer

US Navy Photo

The DDG 51 class guided missile destroyers provide a wide range of warfighting capabilities in multi-threat air, surface, and subsurface environments. The DDG 51 class ship is armed with a vertical launching system, which accommodates 96 missiles, and a 5-inch gun that provides Naval Surface Fire Support to forces ashore and anti-ship gunnery capability against other ships. This is the first class of destroyers with a ballistic missile defense capability. The *Arleigh Burke* class is comprised of four separate variants; DDG 51-71 represent the original design, designated Flight I ships, and are being modernized to current capability standards; DDG 72-78 are Flight II ships; DDG 79-123 ships are Flight IIA ships; DDG 124-136 will be constructed as Flight III ships with the Air and Missile Defense Radar (AMDR) capability.

Mission: Provides multi-mission offensive and defensive capabilities and can operate as part of a carrier strike group or independently. Conducts Anti-Air Warfare, Anti-Submarine Warfare, and Anti-Surface Warfare.

FY 2018 Program: Funds two Flight III DDG 51 class destroyers as part of a multiyear procurement for ten ships from FY 2018 – FY 2022, outfitting costs, and continued development of ship systems.

Prime Contractors: General Dynamics Corporation; Bath, ME
Huntington Ingalls Industries; Pascagoula, MS

DDG 51 *Arleigh Burke* Class Destroyer

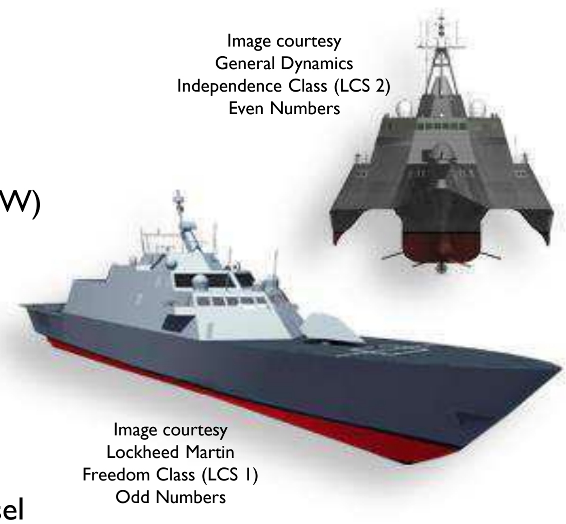
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	273.7	-	149.4	-	288.2	-	-	-	**288.2**	**-**
Procurement	4,266.8	3	3,348.9	2	3,725.6	2	-	-	**3,725.6**	**2**
Total	**4,540.5**	**3**	**3,498.3**	**2**	**4,013.7**	**2**	**-**	**-**	**4,013.7**	**2**

*FY 2016 includes actuals for Base and OCO *Numbers may not add due to rounding*

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Littoral Combat Ship (LCS)

USN



The Littoral Combat Ship (LCS) is a small surface combatant capable of operations close to shore. The design emphasizes speed, flexibility, and shallow draft. The LCS is designed for operations in three primary anti-access mission areas: Surface Warfare (SUW) operations emphasizing defeat of small boats, Mine Warfare (MIW), and Anti-Submarine Warfare (ASW). The ships are reconfigured for various operational roles by changing the mission module, each of which have mission area-specific equipment, vehicles, and crews. The modules are used to counter anti-access threats close to shore such as mines, quiet diesel submarines, and swarming small boats. The seaframe acquisition strategy procures two seaframe designs which are a separate and distinct acquisition program from the mission module program. The two programs are synchronized to ensure combined capability.

Mission: Defeats asymmetric threats and assures naval and joint forces access into contested littoral regions by prosecuting small boats and craft, conducting mine countermeasures, and performing anti-submarine warfare.

FY 2018 Program: Funds construction of one LCS seaframe, outfitting, trainers, and development costs for a new class of small surface combatant.

Prime Contractors: Lockheed Martin/Marinette Marine Corporation; Marinette, WI
Austal USA; Mobile, AL

Littoral Combat Ship

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	128.4	-	136.5	-	184.4	-	-	-	184.4	-
Procurement	1,688.3	3	1,462.4	2	968.1	1	-	-	968.1	1
Total	1,816.7	3	1,598.9	2	1,152.6	1	-	-	1,152.6	1

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

SSN 774 *Virginia* Class Submarine

USN

The *Virginia* Class Submarine is a multi-mission nuclear-powered attack submarine that provides the Navy with the capabilities to maintain undersea supremacy in the 21st century. Characterized by advanced stealth and enhanced features for Special Operations Forces, this submarine is able to operate in deep water and littoral environments. Equipped with vertical launchers and torpedo tubes, the submarine is able to launch Tomahawk cruise missiles as well as heavyweight torpedoes.

Mission: Seeks and destroys enemy ships and submarines across a wide spectrum of scenarios, working independently and in concert with a battle group, separate ships, and independent units. Provides theater commanders with time sensitive critical information for accurate knowledge of the battlefield.

FY 2018 Program: Funds two ships as part of a multiyear procurement contract, advance procurement for two ships in future years, and outfitting and support equipment. Continues funding the development of the *Virginia* Payload Module, technology, prototype components, and systems engineering required for design and construction.

Prime Contractors: General Dynamics Corporation; Groton, CT
Huntington Ingalls Industries; Newport News, VA

SSN 774 *Virginia* Class Submarine										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	305.1	-	208.5	-	190.3	-	-	-	190.3	-
Procurement	5,424.5	2	5,113.9	2	5,356.0	2	-	-	5,356.0	2
Total	5,729.5	2	5,322.3	2	5,546.3	2	-	-	5,546.3	2

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Ship to Shore Connector

USN

The Ship to Shore Connector (SSC) is the functional replacement for the existing fleet of Landing Craft, Air Cushioned (LCAC) vehicles, which are nearing the end of their service life. The SSC is an air-cushioned landing craft intended to transport personnel, weapon systems, equipment, and cargo from amphibious vessels to shore. The vessel can rapidly move assault forces to conduct amphibious operations and operate over the high water mark to include movements over ice, mud, and swamps.

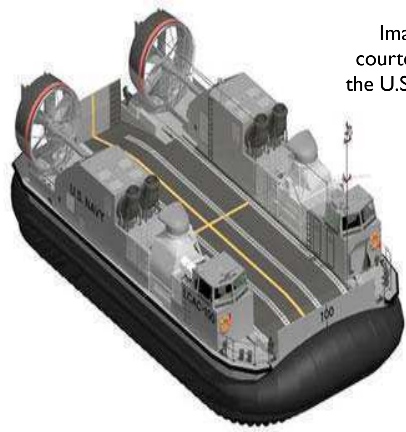


Image courtesy of the U.S. Navy

Mission: Transports vehicles, heavy equipment, and supplies through varied environmental conditions from amphibious ships to shore. Enhances the Navy and Marine Corps capability to execute a broad spectrum of missions from humanitarian assistance and disaster response to multidimensional amphibious assault.

FY 2018 Program: Procures three vessels and continues research, development, and testing.

Prime Contractor: Textron Incorporated; New Orleans, LA

Ship to Shore Connector

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	7.8	-	11.1	-	22.4	-	-	-	22.4	-
Procurement	210.6	5	128.1	2	222.7	3	-	-	222.7	3
Total	218.4	5	139.2	2	245.1	3	-	-	245.1	3

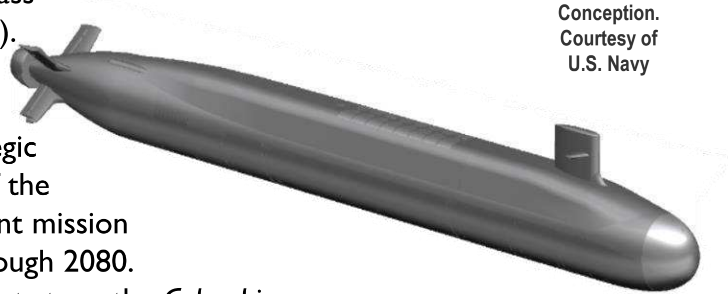
*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Columbia Class Ballistic Missile Submarine Program

USN



Artist Conception. Courtesy of U.S. Navy

The *Columbia* Class Ballistic Missile Submarine is designed to replace the current *Ohio* class of Fleet Ballistic Missile Submarine (SSBN). The USS *Columbia* program will deliver 12 SSBNs with the necessary capability and capacity to meet the sea based strategic deterrence mission beyond retirement of the current submarine force and with sufficient mission capability to counter credible threats through 2080. Currently in the research and development stage, the *Columbia* class requirements and specifications are being refined. The ships will begin construction in FY 2021 for FY 2028 delivery when the first *Ohio* class ships are due to be decommissioned. The nuclear propulsion systems will be acquired from the nuclear industrial base under the direction of Naval Reactors, under U.S. Department of Energy authorities. The program includes the development and construction of a Common Missile Compartment (CMC) capable of hosting the existing TRIDENT II missile system, which is conducted jointly with the United Kingdom (UK) to support the SUCCESSOR class SSBN.

Mission: Provides a sea-based strategic nuclear force.

FY 2018 Program: Funds advance procurement for long-lead items, detail design, and research and development of nuclear technologies and ship systems such as the propulsion system, combat systems technology, and the common missile compartment.

Prime Contractor: Common Missile Compartment Design: General Dynamics; Groton, CT

Columbia Class Ballistic Missile SubmarineProgram

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	1,367.1	-	1,091.1	-	1,041.6	-	-	-	**1,041.6**	-
Procurement	-	-	773.1	-	842.9	-	-	-	**842.9**	-
Total	**1,367.1**	**-**	**1,864.3**	**-**	**1,884.5**	**-**	**-**	**-**	**1,884.5**	**-**

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

CVN Refueling Complex Overhaul

USN

Photo Courtesy of Northrop Grumman

The CVN Refueling Complex Overhaul (RCOH) life extension program provides for the modernization of nuclear powered fleet aircraft carriers. During the RCOH, the nuclear fuel is replaced and major system modernization activities are implemented to extend the useful operational life of the ship. An RCOH is performed midway through the ship's lifespan, which, for *Nimitz* class carriers, is approximately 25 years, and can take four years to complete.

Mission: Refuel and upgrade the *Nimitz* class aircraft carriers at mid-life to ensure reliable operations during the remaining ship life.

FY 2018 Program: Continues funding for the RCOH for USS *George Washington* (CVN 73) and procurement of long-lead items and long-lead efforts for USS *John C. Stennis* (CVN 74) scheduled to begin in FY 2020.

Prime Contractor: Huntington Ingalls Incorporated; Newport News, VA

CVN Refueling Complex Overhaul

	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	-	-	-	-	-	-	-	-	-	-
Procurement	672.6	1	1,991.8	-	1,680.8	-	-	-	1,680.8	-
Total	672.6	1	1,991.8	-	1,680.8	-	-	-	1,680.8	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

LHA *America* Class Amphibious Assault Ship

USS *America* class ships are large-deck, amphibious assault ships designed to land and support ground forces. This class can transport a combination of helicopters and vertical take off and landing aircraft. The first two ships, America (LHA 6) and USS *Tripoli* (LHA 7), are designated as Flight 0 Variants and include an enlarged hangar deck, enhanced aviation maintenance facilities, increased aviation fuel capacity, and additional aviation storerooms as compared to the previous *Tarawa* (LHA 1) class ships. USS *Bougainville* (LHA 8) will be designated the first Flight I ship and will reincorporate a well deck for operational flexibility. The well deck will enable surface operations while maintaining the aviation capabilities.

Mission: Provides forward presence and power projection as an integral part of joint, interagency, and multinational maritime expeditionary forces. Operates for sustained periods in transit to and operations in an Amphibious Objective Area to include the embarkation, deployment, and landing of a Marine Landing Force and supporting forces by helicopters and tilt rotors supported by Joint Strike Fighters F-35B.

FY 2018 Program: Continues construction funding of LHA 8, outfitting costs, and continuing research and development efforts.

Prime Contractor: Huntington Ingalls Industries Incorporated; Pascagoula, MS

LHA *America* Class Amphibious Assault Ship										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	8.3	-	9.5	-	8.2	-	-	-	8.2	-
Procurement	489.2	-	1,638.8	1	1,740.1	-	-	-	1,740.1	-
Total	497.5	-	1,648.2	1	1,748.3	-	-	-	1,748.3	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

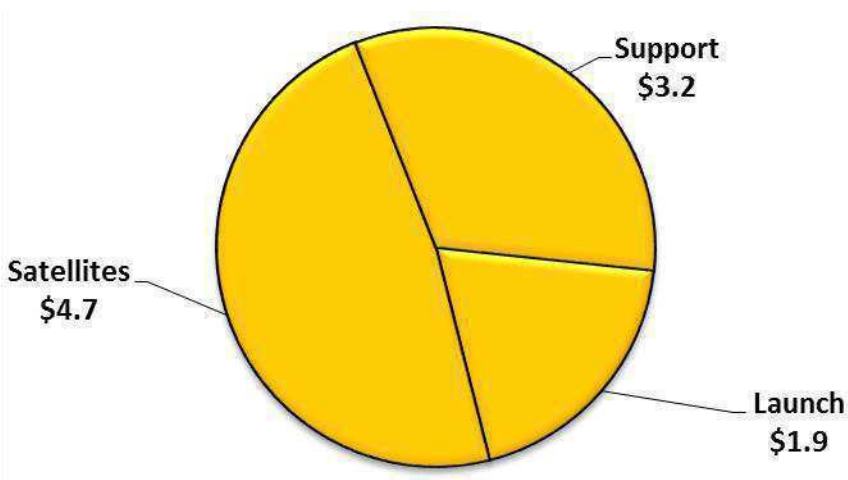
Space Based Systems

Space assets support deployed U.S. forces by providing communications services, navigation capabilities, and information collected by remote sensors such as weather satellites and intelligence collection systems. Space forces contribute to the overall effectiveness of U.S. military forces by acting as a force multiplier that enhances combat power. This investment addresses growing threats, complicating an adversary's ability to counter U.S. space superiority, while enhancing the Department's ability to identify, characterize, and attribute all threatening actions in space. The capability to control space contributes to achieving information superiority and battle space dominance. Procurement of launch vehicles and launch services are typically funded 2 years prior to launch. Generally speaking, the first two satellites of a new system are purchased with Research, Development, Test and Evaluation (RDT&E) funding and the remainder of the satellites are purchased with Procurement funding.

The FY 2018 budget highlights concludes incremental funding for procurement of the Space Based Infrared System (SBIRS) space vehicles Geosynchronous Earth Orbit (GEO)-5 and GEO-6, awarded June 2014; provides advance procurement for GEO-7 and GEO-8; continues funding for the production oversight of the Advanced Extremely High Frequency (AEHF) space vehicles AEHF-5 and AEHF-6, and continues the Space Modernization Initiative RDT&E activities. Also funds the procurement of Evolved Expendable Launch Vehicle (EELV) Launch Services, specifically three launch vehicles, and up to eight Launch Capability activities per year.

FY 2018 Space Based Systems – Total: $9.8 Billion

($ in Billions)



Does not include MDA or S&T Space related funding

Advanced Extremely High Frequency

USAF

The Advanced Extremely High Frequency (AEHF) system will be a four satellite constellation of communications satellites in geosynchronous orbit that will replenish the existing EHF system, Military Strategic Tactical Relay (MILSTAR), at a much higher capacity and data rate capability.

- 24-hour low, medium, and extended data rate satellite connectivity from 65 N to 65 S latitude worldwide
- 8 full-time spot beam antennas @ 75 bps to 8.192 Mbps data rate
- 24 time-shared spot beam coverages @ 75 bps to 2.048 Mbps data rate
- 2 crosslink antennas per satellite (60 Mbps)
- AEHF-1, AEHF-2, and AEHF-3 are in orbit and operational
- The launch of AEHF-4 is planned for 2017; AEHF-5 and AEHF-6 are scheduled to replace AEHF-1 and AEHF-2 at the end of their useful life

Mission: Provides survivable, anti-jam, low probability of detection/intercept, worldwide secure communications for tactical and strategic users and provides additional protection for strategic users against shocks from a nuclear attack. AEHF enables tactical users to obtain battlefield maps, share targeting data, and conduct voice calls. AEHF is a collaborative program that also includes resources for Canada, the United Kingdom, and the Netherlands.

FY 2018 Program: Continues funding for the production oversight of the space vehicles AEHF-5 and AEHF-6, and continues selected MILSATCOM Space Modernization Initiative (SMI) development activities which are focused on improving capabilities, to include AEHF system operational resiliency.

Prime Contractor: Lockheed Martin Corporation; Sunnyvale, CA

Advanced Extremely High Frequency										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	208.1	-	259.1	-	145.6	-	-	-	145.6	-
Procurement	327.4	-	645.6	-	57.0	-	-	-	57.0	-
Total	535.5	-	904.7	-	202.6	-	-	-	202.6	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

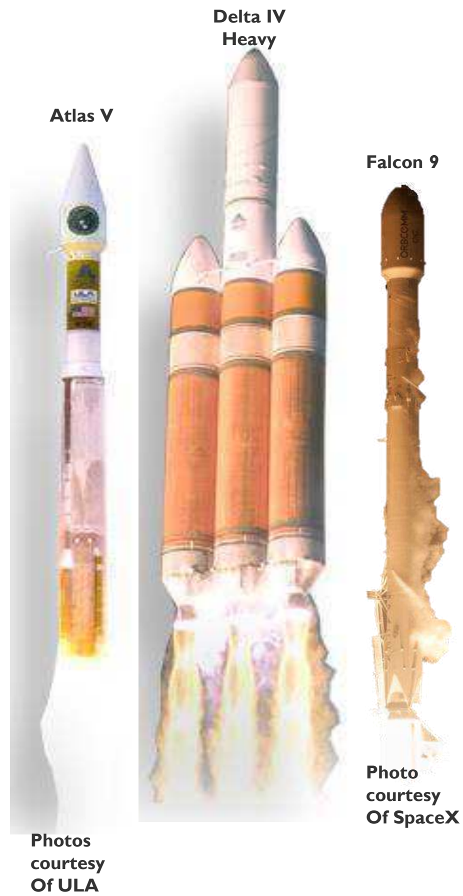
**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Evolved Expendable Launch Vehicle

USAF

The Evolved Expendable Launch Vehicle (EELV) provides to the Air Force, Navy, and the National Reconnaissance Office (NRO), and other government and commercial purchasers of launch services medium to heavy lift class satellites.

- 70 consecutive successful national security space (NSS) operational launches (as of March 19, 2017).
- The Air Force certified SpaceX as an EELV provider on May 19, 2015.



Mission: Provides launch services and capability for medium to heavy class national security space satellites.

FY 2018 Program: Procures three Air Force launch services. All three are planned for competition and which are usually ordered no-later-than 24 months prior to the planned mission unless additional first time integration is needed; funds EELV Launch Capability (ELC) effort including mission assurance, program management, systems engineering, integration of the space vehicle with the launch vehicle, launch site and range operations, and launch infrastructure maintenance and sustainment. Continues EELV launch service investment to provide two commercially-viable, domestically-sourced space launch service providers with the objective of eliminating reliance on a foreign-made liquid rocket engine.

Prime Contractors: United Launch Alliance (ULA); Centennial, CO
SpaceX; Hawthorne, CA

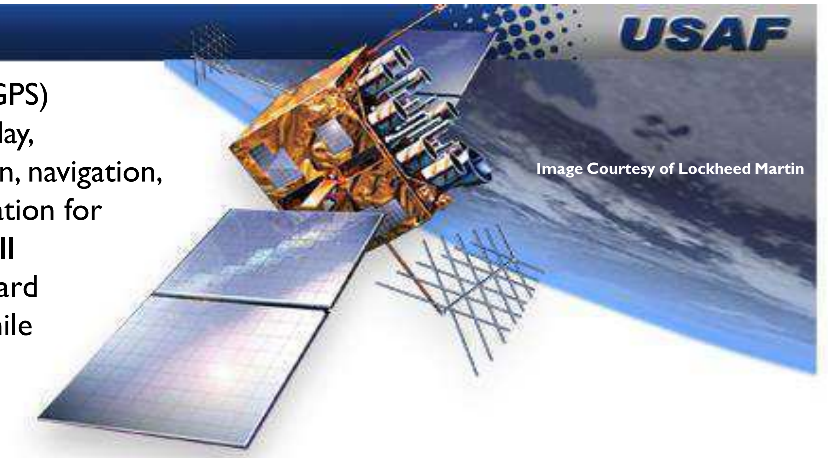
Evolved Expendable Launch Vehicle										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	224.9	-	296.6	-	297.6	-	-	-	**297.6**	-
Procurement	1,250.9	4	1,506.4	5	1,563.9	3	-	-	**1,563.9**	3
Total	**1,475.8**	**4**	**1,803.0**	**5**	**1,861.5**	**3**	-	-	**1,861.5**	**3**

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Global Positioning System



The Global Positioning System (GPS) provides world-wide, 24-hour a day, all weather 3-dimensional position, navigation, and precise timing (PNT) information for military and civil users. The GPS III space vehicles will be fully backward compatible with legacy signals while delivering new capabilities and enhancements to include a new Galileo-compatible signal (civil), a more powerful M-code (military) signal, and the possibility to on-ramp future capabilities. The GPS Next Generation Operational Control System (OCX) will enable operational use of all modernized GPS signals, as well as enabling improved PNT performance.

Mission: Provides worldwide PNT to military and civilian users.

FY 2018 Program: Funds launch campaign for GPS III Space Vehicles (SVs) 01 and 02, and design maturation supporting SV 11+. Continues the development of GPS OCX Blocks 1 and 2, and enhancements to the legacy Operational Control System prior to OCX delivery. Funds the technology development and lead platform integration of Military GPS User Equipment (MGUE) Increment 1. Funds the GPS Program Office's responsibility as the Prime Integrator (Enterprise Integration) to synchronize space, control, and user segment programs and manage civil/military specifications and requirements.

Prime Contractors: GPS III: Lockheed Martin Corporation; Denver, CO
GPS OCX: Raytheon Company; Aurora, CO
GPS MGUE Inc 1: L3 Interstate Electronics Corporation; Anaheim, CA
Rockwell Collins International; Cedar Rapids, IA
Raytheon Company; El Segundo, CA

Global Positioning System										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	634.7	-	970.6	-	1,018.3	-	-	-	**1,018.3**	-
Procurement	198.4	1	34.1	-	85.9	-	-	-	**85.9**	-
Total	**833.1**	**1**	**1,004.7**	-	**1,104.2**	-	-	-	**1,104.2**	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

Space Based Infrared System (SBIRS)

USAF

Space Based Infrared System (SBIRS) will field a four satellite constellation in Geosynchronous Earth Orbit (GEO) and a two hosted payload constellation in Highly Elliptical Orbit (HEO) with an integrated centralized ground station serving all SBIRS space elements. The SBIRS is the follow-on system to the Defense Support Program (DSP).

The GEO payload consists of a scanning infrared (IR) sensor, which provides a higher revisit rate, and a staring IR sensor, which provides a higher fidelity and persistent coverage for areas of interest. The HEO payload consists of a single IR sensor.

- The HEO-3 payload was delivered to the host satellite program in June 2013 and is now on orbit; the HEO-4 payload was delivered in May 2015.
- The GEO-3 satellite is expected to be delivered from storage for launch as early as November 2017 as SBIRS Flight 4 and the GEO-4 satellite was delivered directly from production and launched on January 20, 2017 as SBIRS Flight 3.
- The GEO-5 and GEO-6 satellites are scheduled to launch in 2021 and 2022 as replenishment satellites for GEO-1 and GEO-2 at the end of their useful lives.

Mission: Provides initial warning of strategic missile attack on the United States, its deployed forces, and its allies. Supports missile defense, battlespace awareness, and technical intelligence.

FY 2018 Program: Concludes incremental funding for procurement of the space vehicles GEO-5 and GEO-6, awarded June 2014; provides advance procurement for GEO-7 and GEO-8; and funds ground segment development, and continues the Space Modernization Initiative (SMI) development activities to reduce future production costs by improving insertion of new technologies to replace obsolete parts and materials.

Prime Contractor: Lockheed Martin Corporation; Sunnyvale, CA

Space Based Infrared System										
	FY 2016*		FY 2017**		FY 2018					
					Base Budget		OCO Budget		Total Request	
	$M	Qty	$M	Qty	$M	Qty	$M	Qty	$M	Qty
RDT&E	291.5	-	218.8	-	311.8	-	-	-	311.8	-
Procurement	542.7	-	362.5	-	1,113.4	-	-	-	1,113.4	-
Total	834.2	-	581.3	-	1,425.3	-	-	-	1,425.3	-

*FY 2016 includes actuals for Base and OCO

Numbers may not add due to rounding

**FY 2017 includes the President's Budget request + Nov 2016 Amendment + Mar 2017 Request for Additional Appropriations (Base + OCO)

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DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

The 60 Minute Network Security Guide

(First Steps Towards a Secure Network Environment)

Systems and Network Attack Center (SNAC)

October 16, 2001
Version 1.0

National Security Agency
9800 Savage Rd. Suite 6704
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Table 1:
TCP or UDP Servers to Completely Block at the Perimeter Router/Firewall

Port(s) (Transport)	Server	Port(s) (Transport)	Server
1 (TCP & UDP)	tcpmux	1981 (TCP)	Shockrave
7 (TCP & UDP)	echo	1999 (TCP)	BackDoor
9 (TCP & UDP)	discard	2001 (TCP)	Trojan Cow
11 (TCP & UDP)	systat	2023 (TCP)	Ripper
13 (TCP & UDP)	daytime	2049 (TCP & UDP)	nfs
15 (TCP & UDP)	netstat	2115 (TCP)	Bugs
17 (TCP & UDP)	qotd	2140 (TCP)	Deep Throat
19 (TCP & UDP)	chargen	2222 (TCP)	Subseven21
37 (TCP & UDP)	time	2301 (TCP & UDP)	compaqdiag
43 (TCP & UDP)	whois	2565 (TCP)	Striker
67 (TCP & UDP)	bootps	2583 (TCP)	WinCrash
68 (TCP & UDP)	bootpc	2701 (TCP & UDP)	sms-rcinfo
69 (UDP)	tftp	2702 (TCP & UDP)	sms-remctrl
93 (TCP)	supdup	2703 (TCP & UDP)	sms-chat
111 (TCP & UDP)	sunrpc	2704 (TCP & UDP)	sms-xfer
135 (TCP & UDP)	loc-srv	2801 (TCP)	Phineas P.
137 (TCP & UDP)	netbios-ns	4045 (UDP)	lockd
138 (TCP & UDP)	netbios-dgm	5800 - 5899 (TCP)	winvnc web server
139 (TCP & UDP)	netbios-ssn	5900 - 5999 (TCP)	winvnc
177 (TCP & UDP)	xdmcp	6000 - 6063 (TCP)	X11 Window System
445 (TCP & UDP)	microsoft-ds	6665 - 6669 (TCP)	irc
512 (TCP)	rexec	6711 - 6712 (TCP)	Subseven
513 (TCP)	rlogin	6776 (TCP)	Subseven
513 (UDP)	who	7000 (TCP)	Subseven21
514 (TCP)	rsh, rcp, rdist, rdump, rrestore	12345 - 12346 (TCP)	NetBus
515 (TCP)	lpr	16660 (TCP)	Stacheldraht
517 (UDP)	talk	27444 (UDP)	Trinoo
518 (UDP)	ntalk	27665 (TCP)	Trinoo
540 (TCP)	uucp	31335 (UDP)	Trinoo
1024 (TCP)	NetSpy	31337 - 31338 (TCP & UDP)	Back Orifice
1045 (TCP)	Rasmin	32700 - 32900 (TCP & UDP)	RPC services
1090 (TCP)	Xtreme	33270 (TCP)	Trinity V3
1170 (TCP)	Psyber S.S.	39168 (TCP)	Trinity V3
1234 (TCP)	Ultors Trojan	65000 (TCP)	Stacheldraht
1243 (TCP)	Backdoor-G		
1245 (TCP)	VooDoo Doll		
1349 (UDP)	Back Orifice DLL		
1492 (TCP)	FTP99CMP		
1600 (TCP)	Shivka-Burka		
1761 - 1764 (TCP & UDP)	sms-helpdesk		
1807 (TCP)	SpySender		

Table of Contents

Introduction

During the last four years the National Security Agency's Systems and Network Attack Center (C4) has released Security Guides for operating systems, applications and systems that operate in the larger IT network. These security guides can be found at our web site www.nsa.gov / Security Recommendation Guides. Many organizations across the Department of Defense have used these documents to develop new networks and to secure existing IT infrastructures. This latest Security Guide addresses security a bit differently. Our goal is to make system owners and operators aware of fixes that become "force multipliers" in the effort to secure their IT network.

Security of the IT infrastructure is a complicated subject, usually addressed by experienced security professionals. However, as more and more commands become ``wired'', an increasing number of people need to understand the fundamentals of security in a networked world. This Security Guide was written with the less experienced System Administrator and information systems manager in mind, to help them understand and deal with the risks they face.

Opportunistic attackers routinely exploit the security vulnerabilities addressed in this document, because they are easily identified and rarely fixed. ISSMs, ISSOs and System Administrators provide a level of risk management against the multitude of vulnerabilities present across the IT infrastructure. The task is daunting when considering all of their responsibilities. Security scanners can help administrator identify thousands of vulnerabilities, but their output can quickly overwhelm the IT team's ability to effectively use the information to protect the network. This Security Guide was written to help with that problem by focusing the experience our research and operational understanding of the DoD and other US Government IT infrastructures.

This Security Guide should not be misconstrued as anything other than security "best practices" from the National Security Agency's Systems and Network Attack Center (C4). We hope that the reader will gain a wider perspective on security in general, and better understand how to reduce and manage network security risk.

We welcome your comments and feedback. SNAC.Guides@nsa.gov

General Guidance

The following section discusses general security advice that can be applied to any network.

Security Policy

(This section is an abstract of the security policy section of RFC 2196, Site Security Handbook. Refer to this RFC for further details.)

A security policy is a formal statement of the rules that people who are given access to an organization's technology and information assets must abide. The policy communicates the security goals to all of the users, the administrators, and the managers. The goals will be largely determined by the following key tradeoffs: services offered versus security provided, ease of use versus security, and cost of security versus risk of loss.

The main purpose of a security policy is to inform the users, the administrators and the managers of their obligatory requirements for protecting technology and information assets. The policy should specify the mechanisms through which these requirements can be met. Another purpose is to provide a baseline from which to acquire, configure and audit computer systems and networks for compliance with the policy. In order for a security policy to be appropriate and effective, it needs to have the acceptance and support of all levels of employees within the organization.

A good security policy must:

- Be able to be implemented through system administration procedures, publishing of acceptable use guidelines, or other appropriate methods
- Be able to be enforced with security tools, where appropriate, and with sanctions, where actual prevention is not technically feasible
- Clearly define the areas of responsibility for the users, the administrators, and the managers
- Be communicated to all once it is established
- Be flexible to the changing environment of a computer network since it is a living document

Operating Systems and Applications: Versions and Updates

As much as possible, use the latest available and stable versions of the operating systems and the applications on all of the following computers on the network: clients, servers, switches, routers, firewalls and intrusion detection systems. Keep the operating systems and the applications current by installing the latest updates (e.g., patches, service packs, hotfixes), especially updates that correct vulnerabilities that could allow an attacker to execute code. Note that some updates may not be applied to the computer until a reboot occurs. The following applications should be given particular attention because they have been frequently targeted (e.g., by CodeRed, Melissa virus, Nimda): IIS, Outlook, Internet Explorer, BIND and Sendmail.

Know Your Network

Developing and maintaining a list of all hardware devices and installed software is important to the security of the IT infrastructure. Understanding software applications that are installed by default is also important (e.g., IIS is installed by default by SMS and SQL Server on Windows platforms). A quick method for taking inventory of services running on the network is to port scan.

TCP/UDP Servers and Services on the Network

Scan the network for all active TCP/UDP servers and services on each computer in the network. Shut down unnecessary servers and services. For those servers that are necessary, restrict access to only those computers that need it. Turning off functional areas, which are seldom used but have vulnerabilities, prevents an attacker from being able to take advantage of them. Other applications install with sample CGI scripts, which sometimes contain problems. As a general rule do not install sample applications in production systems.

Passwords

Poor password selection is frequently a major problem for any system's security. Users should be forced to change their passwords regularly. Set up password aging via Account Policy for Windows systems or the `/etc/default/passwd` file in UNIX. Administrators should obtain and run password-guessing programs (i.e., "*John the Ripper,*" *"L0phtCrack,"* and *"Crack"*) frequently to identify those users having easily guessed passwords. Because password cracking programs are very CPU intensive and can slow down the system on which it is running, it is a good idea to transfer the encrypted passwords (the dumped SAM database for Windows and the `/etc/passwd` and `/etc/shadow` files in UNIX) to a stand-alone (not networked) system. Also, by doing the work on a non-networked machine, any results found will not be accessible by anyone unless they have physical access to that system.

Passwords should:

- Be 12 or more characters in length on Windows systems, 8 characters in length on UNIX
- Include upper and lower case letters, numbers, and special characters
- Not consist of dictionary words
- Be changed regularly (every 30 to 90 days)
- For UNIX, be encrypted and stored in the /etc/shadow file (for some UNIX systems) with permissions set to 400 with ownership by root and group sys. The /etc/passwd file should have permissions 644 with owner root and group root.
- Be cracked every month to find users choosing easily guessed or cracked passwords

For UNIX, lock the following accounts by placing a *LK* in encrypted password field in /etc/shadow: adm, bin, daemon, listen, lp, nobody, noaccess, nuucp, smtp, sys, uucp. These accounts should not have login shells, rather they should be set to /dev/null.

Do Not Run Code From Non-Trusted Sources

For the most part, software applications run in the security context of the person executing them without any consideration to source. A PKI infrastructure may help, but when not available remember that spoofing the "From" line of an e-mail message and disguising URLs are trivial. DO NOT OPEN E-MAIL ATTACHMENTS OR RUN PROGRAMS UNLESS THE SOURCE AND INTENT ARE CONFIRMED AND TRUSTED. Always run Outlook so that it executes in the restricted zone and disable all scripting and active content for that zone. For more specific details, reference "*E-mail Client Security in the Wake of Recent Malicious Code Incidents"* available at http://www.nsa.gov.

Block Certain E-Mail Attachment Types

There are numerous kinds of executable file attachments that many organizations do not need to routinely distribute via e-mail. If possible, block these at the perimeter as a countermeasure against the malicious code threat. Organizations using Outlook can also block them using Outlook 2002 or, for earlier versions of Outlook, using the appropriate security patches.

The specific file types that can be blocked are:

.bas	.hta	.msp	.url
.bat	.inf	.mst	.vb
.chm	.ins	.pif	.vbe
.cmd	.isp	.pl	.vbs
.com	.js	.reg	.ws
.cpl	.jse	.scr	.wsc
.crt	.lnk	.sct	.wsf
.exe	.msi	.shs	.wsh

It may be prudent to add, or delete files from this list depending upon operational realities. For example, it may be practical to block applications within the Microsoft Office family, all of which can contain an executable component. Most notable are Microsoft Access files, which unlike other members of the Office family have no intrinsic protection against malicious macros.

Follow The Concept Of Least Privilege

Least privilege is a basic tenet of computer security that means users should be given only those rights required to do their job. Malicious code runs in the security context of the user launching the code. The more privileges the user has, the more damage the code can do. Recommendations pertaining to the least privilege principle include:

- Keep the number of administrative accounts to a minimum
- Administrators should use a regular account as much as possible instead of logging in as administrator or root to perform routine activities such as reading mail
- Set resource permissions properly. Tighten the permissions on tools that an attacker might use once he has gained a foothold on the system, e.g., `explorer.exe`, `regedit.exe`, `poledit.exe`, `taskman.exe`, `at.exe`, `cacls.exe`, `cmd.exe`, `finger.exe`, `ftp.exe`, `nbstat.exe`, `net.exe`, `net1.exe`, `netsh.exe`, `rcp.exe`, `regedt32.exe`, `regini.exe`, `regsvr32.exe`, `rexec.exe`, `rsh.exe`, `runas.exe`, `runonce.exe`, `svrmgr.exe`, `sysedit.exe`, `telnet.exe`, `tftp.exe`, `tracert.exe`, `usrmgr.exe`,

`wscript.exe`, and `xcopy.exe`. Unix tools or utilities that should be restricted are debuggers, compilers, and scripting languages such as `gcc, perl`, etc.

- The least privilege concept also applies to server applications. Where possible, run services and applications under a non-privileged account.

Application Auditing

Most server-level applications have extensive auditing capabilities. Auditing can be of value in tracking down suspected or actual intrusions. Enable auditing for server applications and audit access to key files (such as those listed above) that an attacker might use once he has gained a foothold on a compromised server.

Network Printer

Today's network printers contain built-in FTP, WEB, and Telnet services as part of their OS. Enabled network printers can be readily exploited and are often overlooked by system administrators as a security threat. These network printers can and are often exploited as FTP bound servers, Telnet jump-off platforms, or exploited by web management services. Change the default password to a complex password. Explicitly block the printer ports at the boundary router/firewall and disable these services if not needed.

Simple Network Management Protocol (SNMP)

SNMP is widely used by network administrators to monitor and administer all types of computers (e.g., routers, switches, printers). SNMP uses an unencrypted "community string" as its only authentication mechanism. Attackers can use this vulnerability in SNMP to possibly gather information from, reconfigure or shut down a computer remotely. If an attack can collect SNMP traffic on a network, then he can learn a great deal about the structure of the network as well as the systems and devices attached to it.

Disable all SNMP servers on any computer where it is not necessary. However, if SNMP is a requirement, then consider the following. Allow read-only access and not read-write access via SNMP. Do not use standard community strings (e.g., public, private). If possible, only allow a small set of computers access to the SNMP server on the computer.

Network Security Testing

Test regularly the security of all of the following computers on the network: clients, servers, switches, routers, firewalls and intrusion detection systems. Also, do this after any major configuration changes on the network.

Perimeter Routers and Firewalls

The following section addresses recommendations for securing network perimeter routers and firewalls.

Host Security

Recommendations for improved host security include:

- Shut down unneeded TCP/UDP servers (e.g., bootps, finger) on the router or the firewall. Servers that are not running cannot break. Also, more memory and processor slots are available with less servers running.
- For TCP/UDP servers on the router or the firewall that are necessary, make sure that access to them is limited only to the administrators.
- Shut down unneeded services (e.g., source routing, remote configuration) on the router or the firewall.
- Disable any unused interface on the router or the firewall. Protect each and every active interface on the router or the firewall from information gathering and attacks.
- Protect each and every management port on the router or the firewall from attacks. Disable any unused management port.
- Configure durable passwords on the router or the firewall. For each password use the following guidelines: be at least eight characters long, not be words, not begin with a number, and include at least one character from the sets of letters, numbers and all other characters (e.g., ,./<>;’:”[]\{}|~!@#$%^&*()_+`-=). Consider using different passwords for each router and each firewall. Change passwords at least once every 90 days.

Example: Cisco IOS Routers

The following scenario steps through the recommendations listed above.

- The `show processes` command can help to show active information about the servers on the router. The following commands show how to disable the following servers: TCP/UDP small servers (echo, discard, daytime, chargen), bootps, finger, http, identd and snmp.

```
Router(config)# no service tcp-small-servers

Router(config)# no service udp-small-servers

Router(config)# no ip bootp server

Router(config)# no service finger

Router(config)# no ip http server

Router(config)# no ip identd

Router(config)# no snmp-server community <community string>
```

- If SNMP on the router is required, use the following commands to clear out any SNMP servers with default community strings.

```
Router(config)# no snmp-server community public
```

```
Router(config)# no snmp-server community private
```

- Then set up the SNMP server with a community string that is difficult to guess. Also, if possible, allow only read-only access to the server; do not allow read-write access to the server. Apply an access-list to the server. Refer to the following section on TCP/IP Filters for discussion of an access-list for SNMP in more detail. The following command is an example.

```
Router(config)# snmp-server community S3cr3t-str1n9 ro 10
```

- The following commands disable the following services: Cisco Discovery Protocol (CDP), remote configuration downloading, source routing and zero subnet.

```
Router(config)# no cdp run
Router(config)# no service config
Router(config)# no ip source-route
Router(config)# no ip subnet-zero
```

- The following command disables a router interface.

```
Router(config-if)# shutdown
```

Secure each and every active interface on the router from Smurf attacks, ad-hoc routing and access-list queries with the following commands.

```
Router(config-if)# no ip directed-broadcast
Router(config-if)# no ip proxy-arp
Router(config-if)# no ip unreachables
```

- Configure the console line () and the virtual terminal lines () on the router to time out a session, to require a password at login and to allow only telnet traffic. If the auxiliary line () is not needed, then it should be disabled. Use the following line configuration commands to configure the lines.

```
Router(config)# line con 0
Router(config-line)# exec-timeout 5 0
Router(config-line)# login
Router(config-line)# transport input telnet
Router(config)# line aux 0
Router(config-line)# no exec
Router(config-line)# exec-timeout 0 5
Router(config-line)# no login
Router(config-line)# transport input none
Router(config)# line vty 0 4
```

```
Router(config-line)# exec-timeout 5 0
Router(config-line)# login
Router(config-line)# transport input telnet
```

- Configure the Enable Secret password, which is protected with an MD5-based algorithm. The following global configuration command is an example.

```
Router(config)# enable secret 0 2manyRt3s
```

Configure passwords for the console line, the auxiliary line and the virtual terminal lines. Use a different password for the console line and the auxiliary line versus the virtual terminal lines. The following line configuration commands are examples.

```
Router(config)# line con 0
Router(config-line)# password Soda-4-jimmY
Router(config)# line aux 0
Router(config-line)# password Popcorn-4-sara
Router(config)# line vty 0 4
Router(config-line)# password Dots-4-georg3
```

Provide a basic protection for the line passwords by using the following global configuration command.

```
Router(config)# service password-encryption
```

TCP/IP Filters

Carefully consider which TCP/IP services will be allowed through and to the perimeter routers and firewalls (inbound and outbound). Use the following guidelines for creating filters: those services that are not explicitly permitted are prohibited. The following tables present common services to restrict because they can be used to gather information about the protected network or they have weaknesses that can be exploited against the protected network.

- **Table 1** lists those TCP or UDP servers that should be completely blocked at the perimeter router or firewall. These services should not be allowed across the router or the firewall in either direction. Also, they should not be allowed to the router or the firewall.

- **Table 2** lists those TCP or UDP servers on the protected network, on the router or on the firewall that should not be accessible by external clients.

- **Table 3** lists the common TCP or UDP servers on the protected network, on the router or on the firewall that may need some access by internal or external clients and servers. Many of these services can be filtered to the few authorized computers (e.g., ftp server, mail server, domain name server, web server) on the protected network or on the DMZ subnet.

- **Table 4** lists the ICMP message types that can be allowed outbound from the protected network, while all other message types should be blocked.

- **Table 5** lists the ICMP message types that can be allowed inbound to the protected network, while all other message types should be blocked.

In general, the administrator should create filters focusing on what services and hosts are permitted and denying everything else. This method means that one may not need to block each service in the tables below with a specific filter statement. Finally, use an intrusion detection system on the protected network to monitor the TCP/IP traffic that is allowed past the perimeter routers and firewalls.

Table 1:
TCP or UDP Servers to Completely Block at the Perimeter Router/Firewall

Port(s) (Transport)	Server	Port(s) (Transport)	Server
1 (TCP & UDP)	tcpmux	1981 (TCP)	Shockrave
7 (TCP & UDP)	echo	1999 (TCP)	BackDoor
9 (TCP & UDP)	discard	2001 (TCP)	Trojan Cow
11 (TCP & UDP)	systat	2023 (TCP)	Ripper
13 (TCP & UDP)	daytime	2049 (TCP & UDP)	nfs
15 (TCP & UDP)	netstat	2115 (TCP)	Bugs
17 (TCP & UDP)	qotd	2140 (TCP)	Deep Throat
19 (TCP & UDP)	chargen	2222 (TCP)	Subseven21
37 (TCP & UDP)	time	2301 (TCP & UDP)	compaqdiag
43 (TCP & UDP)	whois	2565 (TCP)	Striker
67 (TCP & UDP)	bootps	2583 (TCP)	WinCrash
68 (TCP & UDP)	bootpc	2701 (TCP & UDP)	sms-rcinfo
69 (UDP)	tftp	2702 (TCP & UDP)	sms-remctrl
93 (TCP)	supdup	2703 (TCP & UDP)	sms-chat
111 (TCP & UDP)	sunrpc	2704 (TCP & UDP)	sms-xfer
135 (TCP & UDP)	loc-srv	2801 (TCP)	Phineas P.
137 (TCP & UDP)	netbios-ns	4045 (UDP)	lockd
138 (TCP & UDP)	netbios-dgm	5800 - 5899 (TCP)	winvnc web server
139 (TCP & UDP)	netbios-ssn	5900 – 5999 (TCP)	winvnc
177 (TCP & UDP)	xdmcp	6000 – 6063 (TCP)	X11 Window System
445 (TCP & UDP)	microsoft-ds	6665 - 6669 (TCP)	irc
512 (TCP)	rexec	6711 - 6712 (TCP)	Subseven
513 (TCP)	rlogin	6776 (TCP)	Subseven
513 (UDP)	who	7000 (TCP)	Subseven21
514 (TCP)	rsh, rcp, rdist, rdump, rrestore	12345 – 12346 (TCP)	NetBus
515 (TCP)	lpr	16660 (TCP)	Stacheldraht
517 (UDP)	talk	27444 (UDP)	Trinoo
518 (UDP)	ntalk	27665 (TCP)	Trinoo
540 (TCP)	uucp	31335 (UDP)	Trinoo
1024 (TCP)	NetSpy	31337 – 31338 (TCP & UDP)	Back Orifice
1045 (TCP)	Rasmin	32700 – 32900 (TCP & UDP)	RPC services
1090 (TCP)	Xtreme	33270 (TCP)	Trinity V3
1170 (TCP)	Psyber S.S.	39168 (TCP)	Trinity V3
1234 (TCP)	Ultors Trojan	65000 (TCP)	Stacheldraht
1243 (TCP)	Backdoor-G		
1245 (TCP)	VooDoo Doll		
1349 (UDP)	Back Orifice DLL		
1492 (TCP)	FTP99CMP		
1600 (TCP)	Shivka-Burka		
1761 – 1764 (TCP & UDP)	sms-helpdesk		
1807 (TCP)	SpySender		

Table 2:
TCP or UDP Servers to Block at the Perimeter Router/Firewall from External Clients

Port(s) (Transport)	Server
79 (TCP)	finger
161 (TCP & UDP)	snmp
162 (TCP & UDP)	snmp trap
514 (UDP)	syslog
550 (TCP & UDP)	new who

Table 3:
TCP or UDP Servers to Allow Limited Access at the Perimeter Router/Firewall

Port(s) (Transport)	Server
20 (TCP)	ftpdata
21 (TCP)	ftp
22 (TCP)	ssh
23 (TCP)	telnet
25 (TCP)	smtp
53 (TCP & UDP)	domain
80 (TCP)	http
110 (TCP)	pop3
119 (TCP)	nntp
123 (TCP)	ntp
143 (TCP)	imap
179 (TCP)	bgp
389 (TCP & UDP)	ldap
443 (TCP)	ssl
1080 (TCP)	socks
3128 (TCP)	squid
8000 (TCP)	http (alternate)
8080 (TCP)	http-alt
8888 (TCP)	http (alternate)

Table 4:
ICMP Message Types to Allow Outbound at the Perimeter Router/Firewall

Message Types	
Number	**Name**
4	source quench
8	echo request (ping)
12	parameter problem

Table 5:
ICMP Message Types to Allow Inbound at the Perimeter Router/Firewall

Message Types	
Number	**Name**
0	echo reply
3	destination unreachable
4	source quench
11	time exceeded
12	parameter problem

This section describes methods using filters to defend the router, the firewall and the protected network from information gathering and attacks. Note that one needs to be careful with combining the below recommendations together in any filter in order to prevent contradictions or other problems.

- When creating a TCP/IP filter always delete any previous filter.
- Set logging for each statement in the filter that blocks access. This feature will provide valuable information about what types of packets are being denied and can be used in intrusion detection against one's network. Refer to the following section on Logging and Debugging for discussion of logging configuration in more detail.
- Provide IP address spoof protection for the protected network. For inbound traffic do not allow any IP packet that contains an IP address in the source IP address field from the following: the protected network, any local host address (127.0.0.0 – 127.255.255.255), any reserved address (10.0.0.0 – 10.255.255.255, 172.16.0.0 – 172.31.255.255, 192.168.0.0 – 192.168.255.255), or any multicast address (224.0.0.0 – 239.255.255.255). For outbound traffic allow IP traffic from the protected network and do not allow IP traffic that contains an external IP address in the source IP address field.
- Protect the router or the firewall from the Land Attack. This attack involves sending a packet to the router with the same IP address in the source address and destination address fields and with the same port number in the source port and destination port fields. This attack can cause a denial of service.
- Protect the router or the firewall from the TCP SYN Attack. The TCP SYN Attack involves transmitting a volume of connections that cannot be completed at the destination. This attack causes the connection queues on the router or the firewall to fill up, thereby denying service to legitimate TCP traffic.
- Protect the router, the firewall or the protected network from unnecessary ICMP traffic. There are a variety of ICMP message types, and some are associated with programs. Some message types are used for network management and are automatically generated and interpreted by network devices. For example, the ping program works with message type Echo. With Echo packets an attacker can create a map of the protected networks behind the router or the firewall. Also, he can perform a denial of service attack by flooding the router, the firewall or the hosts on the protected network with Echo packets. With Redirect packets the attacker can cause changes to a host's routing tables.

  For outbound ICMP traffic, one should allow the message types Echo, Parameter Problem and Source Quench. Otherwise, block all other ICMP message types going outbound. With Echo packets users will be able to ping external hosts. Parameter Problem packets and Source Quench packets improve connections by informing about problems with packet headers and by slowing down traffic when it is necessary. For inbound ICMP traffic, one should allow the following message types: Echo Reply, Destination Unreachable, Source Quench, Time Exceeded and Parameter Problem. Otherwise, block all other ICMP message types coming inbound.

- Protect the router, the firewall or the protected network from inbound traceroute. Traceroute is a utility that prints the IP addresses of the routers that handle a packet as the packet hops along the network from source to destination. On Unix operating systems traceroute uses UDP packets and causes routers along the path to generate ICMP message types Time Exceeded and Unreachable. Similar to ICMP Echo packets, an attacker can use traceroute to create a map of the protected network behind the router or the firewall.

- Apply a filter to the router or the firewall to allow only a small set of computers (e.g., those used by the administrators) Telnet access to the router or the firewall. Log all successful and unsuccessful connections.
- If an SNMP server is necessary on the router or the firewall, then apply a filter to the router or the firewall to allow only a small set of computers (e.g., those used by the administrators) SNMP access to the router or the firewall. Log all successful and unsuccessful connections.

Example: Cisco IOS Routers

The following scenario steps through the recommendations listed above.

- The following commands show an example of how to clear out a previous version of an access-list before creating a new access-list.

```
Router(config)# no access-list 100
Router(config)# access-list 100 permit ip 10.2.9.0 0.0.0.255 any
Router(config)# access-list 100 permit ip 10.55.1.0 0.0.0.255 any
```

- The following commands show an example of how to set logging on an extended IP access-list statement.

```
Router(config)# access-list 102 permit tcp 10.4.6.0 0.0.0.255 any eq 80
Router(config)# access-list 102 deny ip any any log
```

Note that there is an implicit `deny` statement at the end of every access list on a Cisco router. This implicit statement blocks all other packets not permitted by the rest of the access-list. However, it does not log these packets. Thus, add the following statements at the end of each extended IP access-list. These statements will guarantee that the router will log the values for the source and destination ports for TCP and UDP traffic being denied.

```
Router(config)# access-list 106 deny udp any range 0 65535 any range 0 65535 log
Router(config)# access-list 106 deny tcp any range 0 65535 any range 0 65535 log
Router(config)# access-list 106 deny ip any any log
```

- Below are two example access-lists that provide IP address spoof protection. The first example is for inbound traffic to the protected network (e.g., 14.211.150.0).

```
Router(config)# access-list 100 deny  ip 14.211.150.0 0.0.0.255 any log
Router(config)# access-list 100 deny  ip 127.0.0.0 0.255.255.255 any log
Router(config)# access-list 100 deny  ip 10.0.0.0 0.255.255.255 any log
Router(config)# access-list 100 deny  ip 172.16.0.0 0.15.255.255 any log
Router(config)# access-list 100 deny  ip 192.168.0.0 0.0.255.255 any log
```

```
Router(config)# access-list 100 deny   ip 224.0.0.0 15.255.255.255 any log
Router(config)# access-list 100 permit ip any 14.211.150.0 0.0.0.255
Router(config)# interface Ethernet1/2
Router(config-if)# description "external interface"
Router(config-if)# ip address 25.73.1.250 255.255.255.248
Router(config-if)# ip access-group 100 in
```

The second example is for outbound traffic from the protected network (e.g., 14.211.150.0).

```
Router(config)# access-list 102 permit ip 14.211.150.0 0.0.0.255 any
Router(config)# access-list 102 deny   ip any any log
Router(config)# interface Ethernet0/1
Router(config-if)# description "internal interface"
Router(config-if)# ip address 14.211.150.17 255.255.255.240
Router(config-if)# ip access-group 102 in
```

Note that you can apply two access-lists to any interface on the router, one for network traffic leaving the interface and the other for network traffic entering the interface.

- The following commands show how to protect the router from the Land Attack.

```
Router(config)# access-list 101 deny   ip host 198.26.171.178 host 198.26.171.178 log
Router(config)# access-list 101 permit ip any any
Router(config)# interface serial2/1
Router(config-if)# description "external interface"
Router(config-if)# ip address 198.26.171.178 255.255.255.248
Router(config-if)# ip access-group 101 in
```

- Protect the router against the TCP SYN Attack for the following two scenarios: blocking external access and limited external access. Below is an example for blocking external access on a Cisco router. The access list blocks packets from any external network that have only the SYN flag set. Thus, it allows traffic from TCP connections that were established from the protected network (e.g., 14.2.6.0), and it denies anyone coming from any external network from starting any TCP connection.

```
Router(config)# access-list 100 permit tcp any 14.2.6.0 0.0.0.255 established
Router(config)# access-list 100 deny   ip  any any log
Router(config)# interface serial0/0
Router(config-if)# description "external interface"
Router(config-if)# ip access-group 100 in
```

Below is an example for allowing limited external access on a Cisco router. Using the TCP intercept feature, the access list blocks packets from unreachable hosts; thus, it only allows reachable external hosts to initiate connections to a host on the protected network (e.g., 14.2.6.0). In intercept mode the router intercepts a TCP connection and determines if a host is reachable. If successful, the router establishes the connection; otherwise, it prevents the connection. This protection does not stop reachable hosts from performing this attack against the router or the protected networks.

```
Router(config)# ip tcp intercept list 100

Router(config)# access-list 100 permit tcp any 14.2.6.0 0.0.0.255

Router(config)# access-list 100 deny   ip  any any log

Router(config)# interface e0/0

Router(config-if)# description "external interface"

Router(config-if)# ip access-group 100 in
```

- The following commands show how to allow outbound from the protected network (e.g., 14.2.6.0) only the following ICMP message types: Echo, Parameter Problem and Source Quench.

```
Router(config)# access-list 102 permit icmp 14.2.6.0 0.0.0.255 any echo

Router(config)# access-list 102 permit icmp 14.2.6.0 0.0.0.255 any parameter-problem

Router(config)# access-list 102 permit icmp 14.2.6.0 0.0.0.255 any source-quench

Router(config)# access-list 102 deny   icmp any any log
```

The following commands show how to allow inbound to the protected network (e.g., 14.2.6.0) only the following ICMP message types: Echo Reply, Destination Unreachable, Source Quench, Time Exceeded and Parameter Problem.

```
Router(config)# access-list 100 permit icmp any 14.2.6.0 0.0.0.255 echo-reply

Router(config)# access-list 100 permit icmp any 14.2.6.0 0.0.0.255 unreachable

Router(config)# access-list 100 permit icmp any 14.2.6.0 0.0.0.255 source-quench

Router(config)# access-list 100 permit icmp any 14.2.6.0 0.0.0.255 time-exceeded

Router(config)# access-list 100 permit icmp any 14.2.6.0 0.0.0.255 parameter-problem

Router(config)# access-list 100 deny   icmp any any log
```

- The following command shows how to block inbound traceroute from a Unix computer.

```
Router(config)# access-list 111 deny udp any any range 33434 33534 log
```

- The following commands show how to allow Telnet access from certain computers on the protected network (e.g., 14.4.4.0) to the router via an extended IP access-list. The administrator can telnet to any interface IP address on the router. However, the router converts any interface IP address to 0.0.0.0. Thus, the unusual destination IP address 0.0.0.0 must be used in the access-list.

```
Router(config)# access-list 105 permit tcp host 14.4.4.10 host 0.0.0.0 eq 23 log
Router(config)# access-list 105 permit tcp host 14.4.4.11 host 0.0.0.0 eq 23 log
Router(config)# access-list 105 permit tcp host 14.4.4.12 host 0.0.0.0 eq 23 log
Router(config)# access-list 105 deny   ip  any any log
Router(config)# line vty 0 4
Router(config-line)# access-class 105 in
```

- The following commands show how to allow SNMP access from certain computers on the protected network (e.g., 14.4.4.0) to the router via a standard IP access-list.

```
Router(config)# access-list 10 permit 140.4.4.10
Router(config)# access-list 10 permit 140.4.4.11
Router(config)# access-list 10 permit 140.4.4.12
Router(config)# snmp-server community snmp72str1ng64 ro 10
```

Logging and Debugging

Logging on a router or a firewall offers several benefits. It informs the administrator if the router or the firewall is working properly or has been compromised. It can also show what types of attacks are being attempted against the router, the firewall or the protected network.

The following are recommendations for logging and debugging:

- Send the most serious level of logs to the console on the router or the firewall in order to alert the administrator.
- Send the logs to a log host, which should be a dedicated computer on the protected network whose only job is to receive logs. The log host should have all unnecessary servers and accounts disabled except for syslog.
- Configure the router or the firewall to include more specific time information in the logging and in the debugging. Direct the router or the firewall to at least two different, reliable network time protocol (NTP) servers to ensure accuracy and availability of time information. Set all NTP messages with the same IP source address of an interface on the internal network. This configuration will allow the administrator to create a TCP/IP filter that allows time information only from the internal IP address of the router or the firewall to the external NTP servers. This filter will help to prevent spoofing or flooding NTP messages to the router or the firewall. Include a more specific timestamp in each log message and each debug message. This will allow an administrator to trace network attacks more credibly.

- By default, a log message contains the IP address of the interface it uses to leave the router or the firewall. Instead, set all log messages with the same IP source address of an interface on the internal network, regardless of which interface the messages use. This configuration will allow the administrator to create a TCP/IP filter that allows logs only from the internal IP address of the router or the firewall to the logging host. This filter will help to prevent spoofing or flooding log messages to the logging host.
- Finally, consider also sending the logs to a dedicated printer to deal with worst-case scenarios, e.g., failure of the log host.

Example: Cisco IOS Routers

The following scenario steps through the recommendations listed above.

- Enable the router's logging capability with the following command.

```
Router(config)# logging on
```

- Set the syslog level to be sent to the router console. The following command is an example.

```
Router(config)# logging console informational
```

Note that the effect of the `log` keyword with the IP extended access-list statements depends on the setting of the `logging console` command. The `log` keyword takes effect only if the `logging console` syslog level is set to 6 (`informational`) or 7 (`debugging`). If the level is changed to a value less than 6 and if the `log` keyword is used within an IP extended access-list command, then no information is logged to the log host or displayed to the console. Refer to the previous section on TCP/IP Filters for discussion of access-lists in more detail. Finally, disable logging to all terminal lines except for the router console with the following command.

Router(config)# no logging monitor

- Set the IP address of the log host. Set the syslog level to be sent to the log host. Set the syslog facility type in which log messages are sent. The following commands are examples.

```
Router(config)# logging 10.1.1.200
Router(config)# logging trap debugging
Router(config)# logging facility local7
```

- The following commands show an example of how to set time information for the logging and for the debugging.

```
Router(config)# ntp server 192.168.41.40
Router(config)# ntp server 192.168.41.41
Router(config)# ntp source Ethernet0/1
```

```
Router(config)# service timestamps log datetime localtime show-timezone
Router(config)# service timestamps debug datetime localtime show-timezone
Router(config)# clock timezone EST –5
Router(config)# clock summer-time EDT recurring
```

- The following command shows an example of how to set all log messages with the same IP source address of a router interface.

```
Router(config)# logging source-interface e0/1
```

General Recommendations

It is highly recommended that the configuration files for the router or the firewall be created, stored and maintained on a computer offline in ASCII format. These files will contain any comments that can help give perspective to the configuration settings and the filters. Also, changes to the filters can be done with much more ease and accuracy. Then the file can be transferred from the computer to the router or the firewall. This is invaluable for diagnosing suspected attacks and recovering from them. Finally, protect the contents of the configuration files from unauthorized individuals.

Windows NT 4.0 and Windows 2000

Service Packs And Hotfixes

A service pack is a periodic update to the operating system that contains fixes to vulnerabilities and bugs. To date, Microsoft has released six service packs for Windows NT 4.0 and two service packs for Windows 2000. Updates addressing specific vulnerabilities and bugs introduced between Service Packs are called hotfixes. Service packs are cumulative, meaning they include all hotfixes from previous service packs, as well as new fixes.

In addition to installing the latest service packs, it is important to install new hotfixes, as these patches will often address current attacks that are proliferating throughout networks. Although Microsoft recommends applying a hotfix only if a system experiences the specific problem, it is recommended that all security-related hotfixes be installed immediately after installation of the latest service pack. If a service pack is reapplied at any time, the hotfixes must also be re-installed.

Checking System Patch Status

A major challenge for network administrators is keeping up to date on the latest patches. Microsoft now provides a Network Security Hotfix Checker (Hfnetchk.exe) tool that lets administrators scan their servers -- including remote ones -- to ensure that that they are up to date on all security patches for Windows NT 4.0, Windows 2000, IIS 4.0, IIS 5.0, IE and SQL Server. Detailed information on Hfnetchk, including download location, is available in Knowledge Base article Q303215 at
http://www.microsoft.com/technet/treeview/default.asp?url=/technet/security/tools/hfnetchk.asp.

Windows NT 4.0 Patches

To achieve the highest level of Windows NT security, install Service Pack 6a and the post Service Pack 6a hotfixes. For a complete list of available service packs and hotfixes go to http://www.microsoft.com/ntserver/nts/downloads/recommended/SP6/.

Microsoft has provided the Security Rollup Package (SRP) as a mechanism for managing the rollout of security related fixes. The SRP includes the functionality from many security patches released for Windows NT 4.0 since the release of Service Pack 6a. The SRP includes post-Service Pack 6a fixes that were delivered via Microsoft security bulletins as well as a small number of fixes that were not addressed through this forum. For a complete listing of all fixes in the SRP, refer to Microsoft Knowledge Base Article (Q299444), “Post-Windows NT 4.0 Service Pack 6a Security Rollup Package (SRP),” at
http://support.microsoft.com/support/kb/articles/q299/4/44.asp.

Fixes not included in the SRP:

Fixes for newer vulnerabilities may not be included in the SRP. These must be applied separately and may be downloaded from
http://www.microsoft.com/ntserver/nts/downloads/recommended/SP6/. In addition, the following vulnerability affecting Windows NT 4.0 systems is not included in the SRP.

Enhanced Security Level Hotfix - When changing the domain password with the C2 security registry entry enabled a “Stop 0x1E” error message may occur. The problem occurs if the administrator has Service Pack 6a (SP6a) installed and the following registry entry is set:

Hive: HKEY_LOCAL_MACHINE
Key: SYSTEM\CurrentControlSet\Control\Session Manager
Value: EnhancedSecurityLevel
Type: REG_DWORD
Data: 1

This key ensures that Object Manager can change the attributes of a kernel object in the Object table for the current process if the previous mode of the caller is kernel mode. When attempting to change the password after setting this registry value, the following error message will be received: Stop 0x0000001e (0xc0000005, 0x8019bb12, 0x00000000, 0x0000022c)

A supported fix that corrects this problem is now available from Microsoft, but it is not available for public download. To resolve this problem immediately, contact Microsoft Product Support Services to obtain the fix. This hotfix is also available from NSA. For a complete list of Microsoft Product Support Services phone numbers and information on support costs, please go to the following address on the World Wide Web:
http://support.microsoft.com/directory/overview.asp

Windows 2000 Patches

To achieve the highest level of Windows 2000 security, install Service Pack 2and the post Service Pack 2 hotfixes. For a complete list of available service packs and hotfixes, refer to http://www.microsoft.com/windows2000/downloads/default.asp

List Of NT/Windows 2000 Security Measures

This list of NT/Windows 2000 security measures is by no means exhaustive. There are approximately 400 known vulnerabilities with Windows NT/2000 and associated applications. This list addresses less than 10 percent of those vulnerabilities. It should also be understood that alleviating one's network of these vulnerabilities does not render the network "secure".

- Ensure that the file system is NTFS versus FAT. NTFS allows file access control to be set; FAT does not.
- Limit the information available from a null connection. Null connections (anonymous users) are included in the built-in **Everyone** security group; thus, anonymous users have access to any resources that the **Everyone** group has access to. Windows NT Service Pack 6a limits much of what an anonymous user can do. Prevent anonymous users from being able to enumerate account names and shares by setting the following registry key:

  Hive: HKEY_LOCAL_MACHINE
  Key: System\CurrentControlSet\Control\Lsa
  Name: RestrictAnonymous
  Type: REG_DWORD
  Value: 1

- Remove the Everyone group from the “Access this Computer from the Network” user right. Replace it with the Authenticated Users group. In Windows NT 4.0, this can be accomplished under User Manager -> Policies -> User Rights. In Windows 2000, this can be done via the Security Configuration Toolset and Group Policy.

- Do not allow remote registry access. There are many registry keys that allow the Everyone group, and therefore anonymous users, read and/or set value permissions. If an unauthorized user was able to remotely edit the registry, he could modify registry keys in an attempt to gain elevated privileges. Restricting remote registry access is accomplished by setting security permissions on the HKLM\SYSTEM\CurrentControlSet\Control\SecurePipeServers\winreg key. It is highly recommended that only Administrators and System have remote access to the registry.
- Ensure that the Guest Account is disabled. Ensure that all accounts (service and user) have passwords regardless if the account is enabled or disabled.
- Disable LanMan authentication. LanMan passwords are used for backwards compatibility with older Windows operating systems (e.g., Windows 9x) and are simply the NT/2000 password converted to all uppercase and encrypted in a different way. LanMan passwords are easier to crack than NTLM hash because they are treated as two 7-character passwords. It is recommended that LanMan passwords be disabled. If Windows 9x boxes reside on the network, Directory Client Services (available on the Windows 2000 CD) must be installed on these systems in order to allow NTLM version 2 authentications. To disable LanMan authentication, set the following registry key:

  Hive: HKEY_LOCAL_MACHINE
  Key: System\CurrentControlSet\Control\Lsa
  Name: LMCompatibilityLevel
  Type: REG_DWORD
  Value: 5

- Close ports 135, 137, 138, and 139 either at the premise router or firewall. For networks containing Windows 2000 systems, also block port 445. These ports are needed in an internal network, but not externally. Blocking these ports will stop many attacks against Windows NT and Windows 2000. Also, remove unneeded protocols (e.g. NetBeui, IPX).
- Out-of-the-box permissions on Windows NT system files and registry keys are overly permissive. Replace the Everyone group with the Authenticated Users group on critical system folders and files (e.g. WINNT, system32) and registry keys (e.g., HKLM\Software\Microsoft\Windows\Run and HKLM\Software\Microsoft\Windows NT\CurrentVersion\AEDebug).
- Restrict permissions on network shares. When a share is created, the default access control is Everyone having Full Control. Restrict the share permissions to only those groups that need access.
- Remove all services that are not required (e.g., Telnet, FTP, Web). Ensure proper placement of services on the network (e.g. RAS or Web service should not be on a Domain Controller).
- Enable auditing. At a minimum, audit logons and logoffs, failed attempts at exercising user privileges, and system events such as shutdowns.
- Review Trust Relationships between domains. Remove unnecessary trusts.

Microsoft Applications

Vulnerabilities in applications such as Outlook, Microsoft Exchange, SQL Server, and IIS may open a network to attack. Therefore, it is important that applications be kept current with the latest patches and service packs. Microsoft provides several tools for improving application security. Some of these tools are listed below, along with a web reference to follow for more information.

URL Scan Security Tool – Allows web server administrators to restrict servers to ensure that they only respond to legitimate requests.
http://www.microsoft.com/technet/security/URLScan.asp

IIS Lockdown Tool - A Microsoft tool for securing IIS 4.0 or 5.0 web server.
http://www.microsoft.com/technet/security/tools/locktool.asp

Improved Outlook E-mail Security Update - A new version of the Outlook E-mail Security Update is available that provides protection against additional types of e-mail-based attacks.
http://office.microsoft.com/downloads/2000/Out2ksec.aspx

HFNetChk Security Tool – In addition to operating system patches, checks security patches for IIS 4.0, IIS 5.0, IE, and SQL Server.
http://www.microsoft.com/technet/security/tools/hfnetchk.asp

Microsoft Personal Security Advisor - A Microsoft tool for checking that workstations are current with all security patches and configured for secure operation.
http://www.microsoft.com/technet/security/tools/mpsa.asp

UNIX Networks

The following recommendations can be taken to secure UNIX networks.

Startup Scripts

Check the permissions and ownership of files. If they allow world access, browse scripts to see if any unusual process or script is started, especially if in user directories. Files and directories should be owned by root/root or root/sys with limited or no world write or execute permissions so that they cannot be modified or exploited by unauthorized users. User startup files should be owned by the individual user and have permissions of 640. In each user's directory, check for hidden files (e.g.,. `login`, *`.profile`*, etc...) that have extensions, such as *`.old/.backup`* or begin with *"..", "...".*

Services/Ports

Run a port scanner, such as *nmap* (available at http://www.insecure.org/nmap) to list open ports and services. Many UNIX services have well known security vulnerabilities associated with them, which allow root access. All unnecessary services (e.g., r*exd, rquotad, talk, sadmind, kcmsd, rstatd, fs, exec, daytime, walld, fingerd, systat, rusersd, sprayd, uucpd,* *chargen, time, echo, display, tftp, comsat and discard*) should be disabled by placing a # at the beginning of the lines in the `/etc/rc*` files or in the /`etc/inetd.conf` file that caused the program to be executed. In addition, these ports should be blocked at the perimeter router or firewall.

System Trust

There are various ways for UNIX systems to allow access to a machine or an account without providing a password. Through the use of *`.rhosts ,.forward, .netrc, hosts.lpd,`* and *`hosts.equiv`* files, it is possible for a user on one system to access another system without providing a password. This practice should be reviewed for necessity. An intruder breaking into an authorized user's account can use those same trusts to reach multiple machines with little effort. Do not use plus signs (+) in these files as they allow wider access (to users and/or machines) than might be intended. Prohibit root from logging directly into a remote system through either the /`etc/ttys, /etc/ttytab`, or `/dev/default/login` files.

R Commands

Telnet and the *"r commands"* (*rlogin, rcp, rsh* and *rexec*) may transmit the username and password in the clear making it easy for an attacker with a sniffer to capture this information and act as a trusted user. If trust relationships are set up, "r" commands enable someone to access a remote system without supplying a password. If an attacker gains control of any machine in a trusted network, then he or she can gain access to all other machines that trust the hacked machine. If these services are not required, they should be disabled; otherwise, install *openssh* (available at http://www.openssh.com/). In addition, *ssh*, which includes *sftp*, is an alternative solution to FTP. The service encrypts all traffic including the password to reduce the threat of eavesdropping. Do not allow trust relationships.

Network Configurations

Check to see if network configuration files (such as *`hosts, defaultdomain, defaultrouter, netmasks,`* etc.) are owned by root/root and have permissions of 644. This is suggested to alleviate unauthorized modifications.

Patches

Ensure applicable system and security patches are current and have been installed. Note that patches may not be applied until a reboot occurs. Therefore, if a patch is listed in the output from *"Patchdiag", "showrev",* or whatever specific patch checker tool or UNIX command is used, but the machine has not been rebooted in awhile, there is a possibility that the machine may still be vulnerable.

User Accounts

Review all user accounts. Do they all have unique UIDs? This is important to enforce so that a person will not obtain the privileges associated with someone else's account or be able to read, delete, or modify another person's files. Check to make sure each shell field is set to a valid shell to alleviate malicious code from being executed and granting root access. The **nobody4** account is for SunOS backward capability and should be deleted, if not needed. Make sure every line in the `/etc/passwd` file is in the proper format to alleviate accidental logins by an unauthorized person. Permissions for most home directories should be 740. Ftp and uucp users may be exceptions. Check automount directories for unauthorized automount maps. All maps should be protected with permissions 755 and owned by root/root.

System administrators should not directly log in as root, but rather as themselves and then switch user (*su*) to root. This is important for accountability. An administrative group (e.g. wheel) should be created in the */etc/group* file and each administrative user should belong to that group. Once the administrative group has been created, the *"su"* program should have its ownership, group, and permissions changed (root/wheel, 750).

Permissions

Look for '*setuid'* or *'setgid'* files and programs. Drop the *'suid'* and/or *'sgid'* bits, if not needed. Look for world writable directories and files and drop the world permissions, if not needed. This will help prevent unauthorized access or the insertion of malicious code. Also check for files owned by root and are mode world read/write. These files may indicate a potential symbolic link attack if one of the parent directories are writable by the attacker. Check umask values. Suggest that user umasks be set to 022.

Cron/At Jobs

Check permissions on *cron* and *at* job *.allow* and *.deny* files. They should be 644, root/sys. *.allow* files permit users to use *crontab* and *atjobs. .deny* restricts these users from access. If *.allow* files do not exist, then the system checks the *.deny* files. If neither file exists, depending on system configurations, it either allows just root or everyone to write cron/at jobs. Check to make sure that all *cron* and *at* jobs have valid users associated with them. Crontab and atjob files should be owned by the specific user associated with them and have permissions of 600. Make sure that all cron or at jobs use absolute paths (full path names).

Core Dumps

Check for *core* files. Most reside in the "/" directory, but others may be located elsewhere. Core files may contain sensitive system data or user passwords. Remove core files from the system. Configure the system so that when core files are created, they are automatically redirected to */dev/null* or have a *ulimit=0*.

Network Services

NIS

Ensure NIS maps do not contain system accounts. Establish a securenets file in the NIS environment as an effective way to secure access. Look for strange entries within the NIS *ypserv.log* file. This is suggested to prohibit unauthorized access.

NIS +

Check to see if NIS + is running in yp compatibility mode. If the "-YP" argument is there, the server is in NIS emulation mode and all exploits for NIS apply. Delete **nobody** permissions so that unauthorized persons don't have access to the NIS+ tables. Make sure world is given read-only permissions, except for the password table, which shouldn't allow any world access. When checking table permissions and access rights, they should match. Individual users should only have read access to the password table to prevent users from changing their UID value to 0, which would give them root access.

NFS

Ensure the NFS environment is not exporting sensitive file systems to the world (i.e., /etc,...) regardless of permission settings. Ensure no critical file systems are shared to the world with read-write access. Ensure exported file systems are directed to specific hosts via the */etc/dfs/dfstab* file or via *netgroups*. Ensure files are not exported to *"localhost"*. Ensure files are shared with the *"nosuid"* designator, unless suid is required. Ensure the anonymous user has been established correctly. If the system has anon=0, then *"root"* users of remote machines will have the UID specified after the "=" equal sign. If the "root=" user has been established, then root users of the machines specified after the "=" equal sign will have a UID of zero on the remotely mounted file systems. Check all clients and servers to see which file systems are being mounted locally or remotely.

DNS

The Domain Name Service is the mechanism that Internet hosts use to determine the IP address that corresponds to a given hostname. Attackers often attempt zone transfers in order to gather information about a local network. One way to prevent zone transfers is to block tcp port 53. This can be done via firewall or or router access filters. Disable the BIND name daemon (*named*) on systems not authorized to be DNS servers. On the servers, upgrade to the latest version of BIND and run it as a non-privileged user. Run DNS in a *chroot*ed environment. Hide the version string via the version option in named.conf.

Sendmail

Upgrade to the latest version of *Sendmail*. Do not run *Sendmail* in daemon mode (turn off the -bd option) on machines that are not mail servers or relays. Do not display the version number through sendmail banners. Ensure that the decode alias is not available. Decode should be removed or commented out of the `/etc/aliases` file so that it does not pipe to the 'uudecode' command and allow an attacker to overwrite system files. Check for `.forward` files as they can open up the system to attacks. If not needed, remove them or link to `/dev/null`. If needed, permissions should be 740 and owned by the user. If the system is not a server or does not have to listen for incoming mail, rename the *sendmail* startup script, binaries, and configuration files and change their permissions to 000.

Logs

System logging is crucial for troubleshooting and tracking unauthorized user accesses. Ideally, logs should be kept locally AND sent to a central loghost that does nothing but accept and store log messages. Your network security policy should help dictate which events need to be audited. *Logcheck* and *swatch* are tools that system administrators can use to examine log files for unusual activity, based on key phrases or specially set string patterns. They can also send emails to the system administrators, alerting them to possible unauthorized activity. Both are open source tools.

X-Window Environments

Remove the X Windowing environment on the server. By removing the Common Desktop Environment (CDE) and/or SUN's OPENWINDOW environment, the network server will not be susceptible to a variety of vulnerabilities.

Distributed Server Functions

It is commonly considered a good security practice to distribute the server functions of a network among separate systems. For instance, the DNS server should be separate from the mail server, which should be separate from the firewall, etc. A number of products, such as

Borderware's firewall product, include the software to run a web server, mail server, DNS server and other server functions all from the firewall. However, this presents a single point of failure for the network and therefore an avoidable vulnerability. Ideally, network servers should be set apart from the user segment in a secure DMZ or secure server network. Most firewalls allow this and if it does not, it can easily be accomplished by using routers behind the firewall.

Chroot Environments

chroot() is a UNIX command used to run a command or interactive shell with a special root directory. This command can also be used to create a "virtual" operating system and directory tree. It would be inside of the new "virtual" directory tree that DNS, Sendmail, Web, and other various servers could run. This would provide a potentially safe location for the applications. Building a *chroot()*ed environment can be very useful in protecting the rest of the system and keeping hackers out, however, it is easy to make a mistake while creating this *chroot()*ed environment. If it is improperly installed, it could create more ways for the hacker to infiltrate the machine.

Interesting Files

Check for files that have no permissions or have invalid owners or groups. Sometimes admins will have specific files which have no permissions assigned to them. These files can be kicked off by a script, cronjob, or app that temporarily changes the permissions during the execution of the program, then resets the program back to the original state.

Peripheral Devices

Consider removing or restricting access to local or network peripheral devices. Malicious code is easily introduced into secure networks via their peripheral devices. If an external device is not required for a specific client or server, have it removed. If the device cannot be removed, disable access to it via the hardware or software. Check to see if local and network printers are secure. Floppies should not be introduced to a client or server without the prior consent of the local Network Security Officer representative.

Buffer Overflows

Ensure that SOLARIS systems have a non-executable stack environment enabled. This will help prevent buffer overflows that originate from within the memory stack. For buffer overflows in RPC services, block the RPC port 111 at the router or firewall.

System Utilities and Commands

Restrict access or remove system utilities such as compilers, debuggers, etc. These utilities aid an adversary in informational reconnaissance. System commands like "*strings*" and "*ln*" should either have their permission bits restricted or have them removed form the system.

Current OS Packages

Ensure that the system packages are current. Solaris 7 and 8 can check the integrity and accuracy of system packages. Sometimes malicious code can be introduced to a system as a system package.

Rootkits

There are several scripts that can be implemented on a UNIX system that will search for rootkits on clients and servers. Checking the integrity of system files against a master backup known not to be altered by malicious code is also a good practice.

Security Tools

To ensure and maintain the integrity of the network servers, it is important to constantly monitor them for signs of malicious activity. There are a number of tools that can aid an administrator in this task. Two of these tools that are commonly implemented are Tripwire and TCPD.

Tripwire

Tripwire monitors the permissions and checksums of important system files to easily detect files that have been replaced, corrupted, or tampered. For example, if an intruder gains access to the server and replaces the */bin/ls* command with one that performs unwanted functions, tripwire will send an alert. Tripwire will send the system administrator a report each night. Tripwire calculates the checksums of executable files from a clean install. It then recalculates these checksums and compares them on a regular basis. Since some hackers are skilled enough to spoof the checksums on modified files, tripwire uses two different checksum methods. It is important to save the original checksums on a non-rewriteable CD on the system. This ensures data integrity.

TCPD

TCPD, also referred to as "TCP wrappers," allows one to log connections to TCP services such as *telnet, rlogin* and *finger*. In addition, it allows one to restrict which systems can connect to these services via two files, *hosts.allow* and *hosts.deny*. Both of these features can be very useful when tracking or controlling unwanted guests on a network. TCPD is easy to install and does not require modification to existing network programs. Just modify `the` `/etc/inetd.conf` file to execute TCPD instead of the actual program. TCPD will then do any necessary logging and security checks before running the real daemon.

For example, if the `/etc/inetd.conf` originally contained this line:

```
telnet stream tcp nowait root /etc/in.telnetd in.telnetd
```

Change it to this:

```
telnet stream tcp nowait root /usr/etc/tcpd in.telnetd
```

UNIX Web Servers

This section describes security configuration for UNIX web servers, using Apache as the example. It is assumed that Apache has been installed from the distribution and that none of the security parameters has been modified that come default in the original setup.

General Guidance

- Ensure that the computer that runs the web server is dedicated. It should not have other uses, e.g., being a client workstation or print server. Always upgrade to the latest version of the web server available that is not the beta version.
- Do not perform development work on the operational web server. All data should be in final form and simply copied into place. Create a secondary mirror of the server for all development services and experimentation. Transfer data to the web server by tape, disk, or CD. Do not use FTP or telnet for data transfer.
- Remove all unnecessary services on the web server, including FTP, telnet, and X Windows. If that is not an option, make sure to run `tcpwrappers` on the open services. Use a port scanner to check for open ports on both the TCP and UDP protocols. If possible, use command line interfaces instead of X Windows. Using an X windowed interface opens up ports that cannot be effectively closed and still have the system remain functional. Since the server should be in production mode only, only a command line is required to update the site. Testing of the site should be done from a separate client.
- Isolate the web server physically and virtually. If possible allow local access to the web server to the fewest number of people with a minimal number of users. Keep the web server close to the administrator, the web engineer, or the webmaster. Keep the web server on a LAN segment separate from the rest of the IT infrastructure. Do not mount or share services to and from the server.

Example: Apache

As of 26 September 2001, Apache 1.3.20 is the latest version and is available at `http://httpd.apache.org`

- Ensure the user running the Apache web server is set to `nobody`. In the `httpd.conf` file in the `/usr/local/apache/conf` directory, make sure that the effective user is `nobody` and that the group option is also set to `nobody`. Below are the lines to add to the file.

  User nobody

  Group nobody
- Ensure that user nobody does not own or have write access to the htdocs or cgi-bin subdirectories or any other subdirectory under these. Below are the commands to set ownership of these directories to root and to restrict write access to only root.

  chown -R root /usr/local/apache/htdocs

chown -R root /usr/local/apache/cgi-bin

chmod 755 /usr/local/apache/htdocs

chmod 755 /usr/local/apache/cgi-bin

- Do not store cgi-bin related data in a directory accessible to the web server. For example, create another directory called cgi-data in /usr/local/apache alongside cgi-bin and htdocs. Have the cgi scripts use that directory for data storage and manipulation.
- Turn off AutoIndexing and Follow Symbolic Links. By default, Apache usually comes with automatic indexing of directories enabled. Look in the httpd.conf file (usually in the /usr/local/apache/conf directory) for the following line.

  <Directory "/usr/local/apache/htdocs">

  Within those set of options you will see an Options line that may look like the following.

  Options Indexes FollowSymLinks Multiviews

  This configuration means any requests for a directory that do not find an index file will build an index of what is in the directory. Also, any symbolic link in the document directory will also be followed even if it is outside of the web server's purview. For example, a symbolic link may be made to the root directory, giving at least read access to a great deal of the system as the owner of the web server process.

  For the most secure/functional Directory options, this segment of the httpd.conf file should look like the following.

  <Directory "/usr/local/apache/htdocs">

  Options Multiviews

  AllowOverride None

  Order allow,deny

  Allow from all

  </Directory>

Refer to the following URLs for further guidance:

- http://httpd.apache.org/docs/misc/security_tips.html
- http://www.linuxplanet.com/linuxplanet/tutorials/1527/1/
- http://www.modperl.com/perl_conference/apache_security/
- http://www.bignosebird.com/apache/a11.shtml

Intrusion Detection Systems (IDS)

This section of the 60 Minute Network Security Guide departs from the explicit detail of previous sections and provides a brief overview of Intrusion Detection Systems, describing in general terms the steps to be taken when deploying IDS in your environment.

Generally, there are two types of IDS: host based and network based. Host based IDS monitor security within a network component, such as a server or a workstation. Network based ID systems monitor the traffic between network components and networks. Some IDS are strictly network based, whereas others are a combination of network and host based.

Most IDS are comprised of two components, sensors and managers. Depending on the IDS type, sensors can be either network based or host based.

The following are steps to be taken when deploying an IDS.

Step 1 - Identify what needs to be protected

To maximize the utilization of IDS, the organization must first determine in order of priority what needs to be protected. For many organizations, the various servers, i.e., application, database, file and domain controllers, contain mission critical resources. Furthermore, depending on the organization, some departments may be more critical than others or must enforce different trust relationships. All of this must be defined in a priority list prior to deploying any IDS.

Step 2 - Determine what types of sensors are required

The types of sensors that are required are dependant on the priority list defined in Step 1. A host sensor would be used to monitor a critical server, whereas a network sensor would be used to monitor network entry points and critical network segments.

Another important issue to consider is how many sensors the organization can afford to buy. This number will influence how the sensors are deployed throughout the network, as the number of critical resources must be balanced against how many sensors can be acquired and maintained.

Step 3 - Configure host system securely

Prior to loading any IDS, the host that the IDS will reside on must be configured securely. Often, the vendor of the IDS will supply its own host to run the IDS sensor, in which case, the vendor should supply guidelines on how to secure that host. Otherwise, the IDS typically reside on Unix and Microsoft Windows NT/2000 hosts. The guidelines for securing Unix and Microsoft Windows NT/2000 systems are well documented elsewhere in this document.

Step 4 - Keep signature database current

The majority of IDS that are currently available for use are signature based. Because new vulnerabilities and attacks are being discovered daily, the signature database must be kept current. The respective vendors should supply the latest signatures for their IDS.

Step 5 - Deploy IDS sensors

The final phase is to actually deploy the IDS. The following scenarios are based on how many sensors are available for deployment versus what is deemed critical.

Scenario 1

If the organization can only afford to purchase and monitor one sensor of any type, then it should be a network sensor. As described earlier, a network sensor is much better suited to monitoring large segments of a network, whereas a host sensor is limited to monitoring the system that it resides on. In this scenario, the ideal location to place the sole network sensor is in the DMZ, between the external router and the firewall, as shown in Figure 1. In spite of having only one sensor, this design allows the IDS to be used for maximum effectiveness. By placing the IDS sensor between the external router and the firewall, the sensor can monitor all network traffic going to and coming from the Internet.

Furthermore, because the router can filter all incoming traffic from the Internet, the IDS sensor can be tuned to ignore certain types of attacks, thereby allowing the sensor to operate with maximum efficiency.

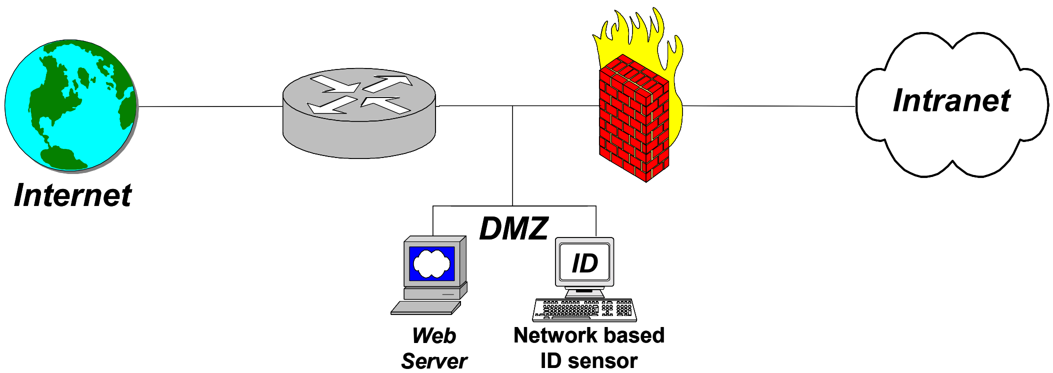

Figure 1 - Deploying 1 ID system

Scenario 2

In the case where only two sensors of any type can be acquired and maintained, then they should be network sensors. Like the previous scenario, one of the sensors should be placed in the DMZ, between the external router and the firewall. The second sensor should then be placed between firewall and the intranet, as shown in Figure 2. The second sensor can indicate what attack breached the firewall. By strategic placement of these two sensors, all access points from the Internet will be monitored.

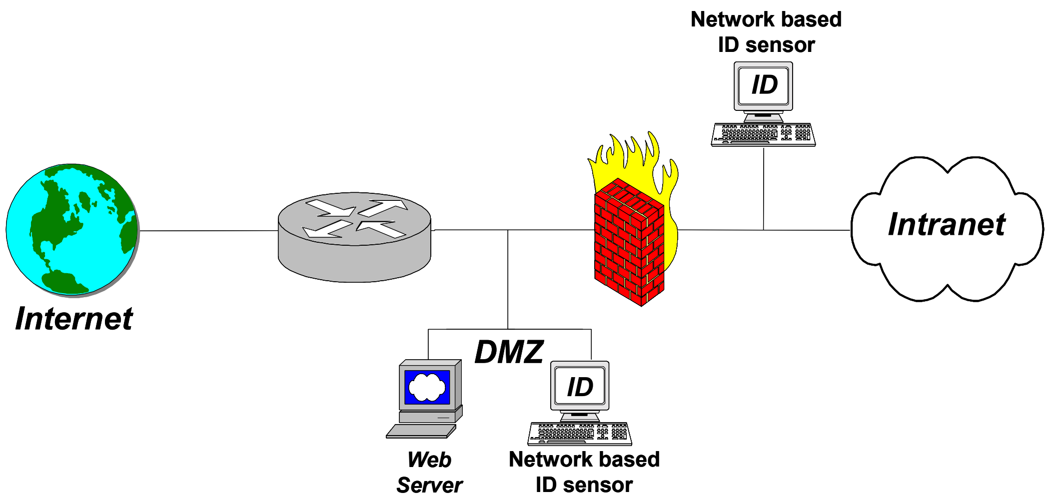

Figure 2 - Deploying 2 ID systems

Scenario 3

If more than two sensors of any type can be acquired and maintained, then at least two should be network sensors. Those sensors should be deployed as described in Scenario 2. If a critical LAN within the intranet needs to be protected, then a network sensor should be placed at the entry point to that LAN. The remaining sensors should be host sensors that are loaded onto critical servers, such as domain controllers, file servers, web servers, and mail servers. The order of what is deemed critical is determined by the organization, as directed in Step 1.

Step 6 - Management and Configuration

The other component of IDS, the manager, should be centrally located where dedicated security staff can monitor the health of the systems and network. Many organizations have a Network Operations Centers (NOC) that fulfills the role of a central location to place the manager. IDS sensors could then report all alerts to the NOC, thereby allowing the security staff to respond quickly to attacks and to notify the appropriate authorities, such as CERT technicians.

The other issue to consider is how to configure the sensors. Careful configuration of the sensors can increase the effectiveness of IDS and all unnecessary signatures should be disabled. For example, if the network is entirely composed of Microsoft Windows NT systems, then the sensors can be configured to ignore any attacks that are directed against Unix systems. Therefore, if the organization has a priority list as defined in Step 1, as well as knowing the network intimately, it can benefit greatly from having a properly configured IDS.

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(Swedish) "Men läs själv då för fan." / Gustav Norström.

(English) " Read this PDF text damn yourself, and then come back. "
or "Fuck you, then read it yourself."

" If you read something, and can't separera truth from fiction, when you read it, something important is missing you. " / Gustav Norström.

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The New York Times https://www.nytimes.com/2022/10/14/us/politics/cia-havana-syndrome-report.html

Report Criticizes C.I.A.'s Initial Handling of Havana Syndrome Cases

An inspector general report sent to Congress this week finds fault with the intelligence agency's Office of Medical Services.

By Julian E. Barnes

Oct. 14, 2022

WASHINGTON — The C.I.A. sent an inspector general report that was critical of how the agency handled early reports of injuries that came to be known as Havana syndrome to Congress this week, according to current and former officials.

The report, said people briefed on the findings, criticized how the Central Intelligence Agency's top physicians in the Office of Medical Services dealt with the unexplained incidents during the Trump administration, when some C.I.A. officials were doubtful about Havana syndrome-related illnesses. As a result, many people with symptoms found it difficult to get prompt medical care.

Diplomats and C.I.A. officers began reporting ailments arising from strange incidents beginning in 2016 in Havana. Since then, government employees and family members in China, Austria, Serbia and other locations around the world have also reported symptoms.

The report comes as the agency has begun making payments to some victims of what the government calls anomalous health incidents. Those victims have been frustrated with intelligence conclusions that the injuries were not the result of a worldwide campaign by a hostile country, such as Russia.

C.I.A. officials declined to discuss details of the report, but a spokeswoman said the review covered 2016 to 2020 and acknowledged it had found weaknesses in the agency's response.

"The review found the challenge of simultaneously understanding and effectively responding to the myriad of challenges associated with anomalous health incidents complicated the agency's response during this time period," said Susan Miller, a spokeswoman for the C.I.A.

The report, which went to lawmakers on Capitol Hill on Wednesday, is largely classified. Victims called on the government Friday to declassify the report, or at least its conclusions.

"It is imperative the report be released to the public as victims deserve to know what actually occurred," said Marc E. Polymeropoulos, a former C.I.A. officer who suffered Havana syndrome symptoms on a trip to Moscow in 2017. "The delay in health care that many suffered complicated their recovery."

The Office of Medical Services has long been criticized by C.I.A. officers who sought treatment for symptoms related to Havana syndrome.

During the Trump administration, many officials were deeply skeptical of the Havana syndrome incidents, influenced by an F.B.I. document that concluded that many of them could be psychosomatic responses. A subsequent study by outside experts overseen by the National Security Council and the Office of the Director of National Intelligence has said in many cases the physical injuries to the brain cannot be explained by stress or other psychological illness.

Soon after becoming C.I.A. director, William J. Burns removed the head of the Office of Medical Services, replacing him with a physician focused on patient care.

Mr. Burns also made it easier for C.I.A. officers to see brain injury experts at the Walter Reed National Military Medical Center. In the statement, Ms. Miller emphasized that the C.I.A. has taken steps to improve the health care provided to officers who have reported Havana syndrome symptoms.

"As we learn from the past and look to the future, we have expanded access to care and resources significantly over the past year and a half," she said.

Many experts who have studied brain scans of victims are convinced that at least some of the incidents were caused by directed energy or radio waves.

But calls by the C.I.A., the State Department and the Pentagon early in the Biden administration for government officials to report possible incidents yielded hundreds of reports, most of which turned out to be explained by environmental causes or undiagnosed medical conditions.

The C.I.A. has been investigating the incidents with a new team of officers since Mr. Burns took over. While some victims believe the incidents were caused by a foreign power, the C.I.A. investigators have not found any evidence to support that conclusion.

Some individual incidents could have been the result of hostile action or a listening device turned into a weapon, but no single adversary appears to be responsible for the various incidents around the world, according to government officials.

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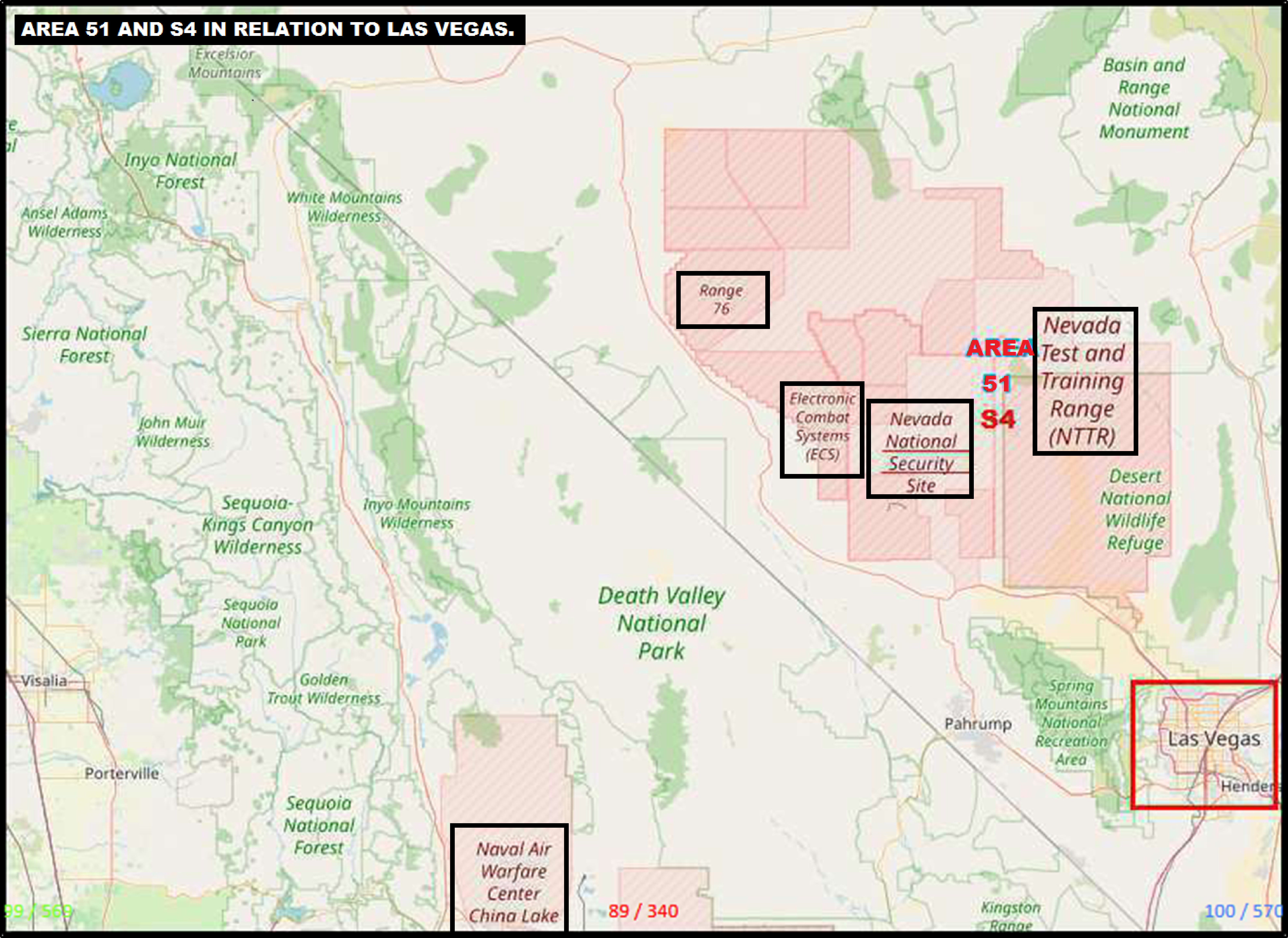
AREA 51 AND S4 IN RELATION TO LAS VEGAS.
Excelsior Mountains
Basin and Range National Monument
Inyo National Forest
White Mountains Wilderness
Ansel Adams Wilderness
Range 76
Nevada Test and Training Range (NTTR)
AREA 51
S4
Sierra National Forest
Electronic Combat Systems (ECS)
Nevada National Security Site
John Muir Wilderness
Desert National Wildlife Refuge
Sequoia-Kings Canyon Wilderness
Inyo Mountains Wilderness
Death Valley National Park
Sequoia National Park
Visalia
Golden Trout Wilderness
Spring Mountains National Recreation Area
Pahrump
Las Vegas
Porterville
Sequoia National Forest
Naval Air Warfare Center China Lake
Kingston Range
89 / 340
100 / 570


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AREA 51
CALIFORNIA
Las Vegas
North Pacific Ocean
Los Angeles
ARIZONA
NELLIS BOMBING AND GUNNERY RANGE
RESTRICTED AREA
NO TRESPASSING
BEYOND THIS
POINT
PHOTOGRAPHY IS
PROHIBITED
WARNING
U.S. Air Force Installation
It is unlawful to enter this area without permission of the Installation Commander.
While on this Installation all personnel and the property under their control are subject to search.
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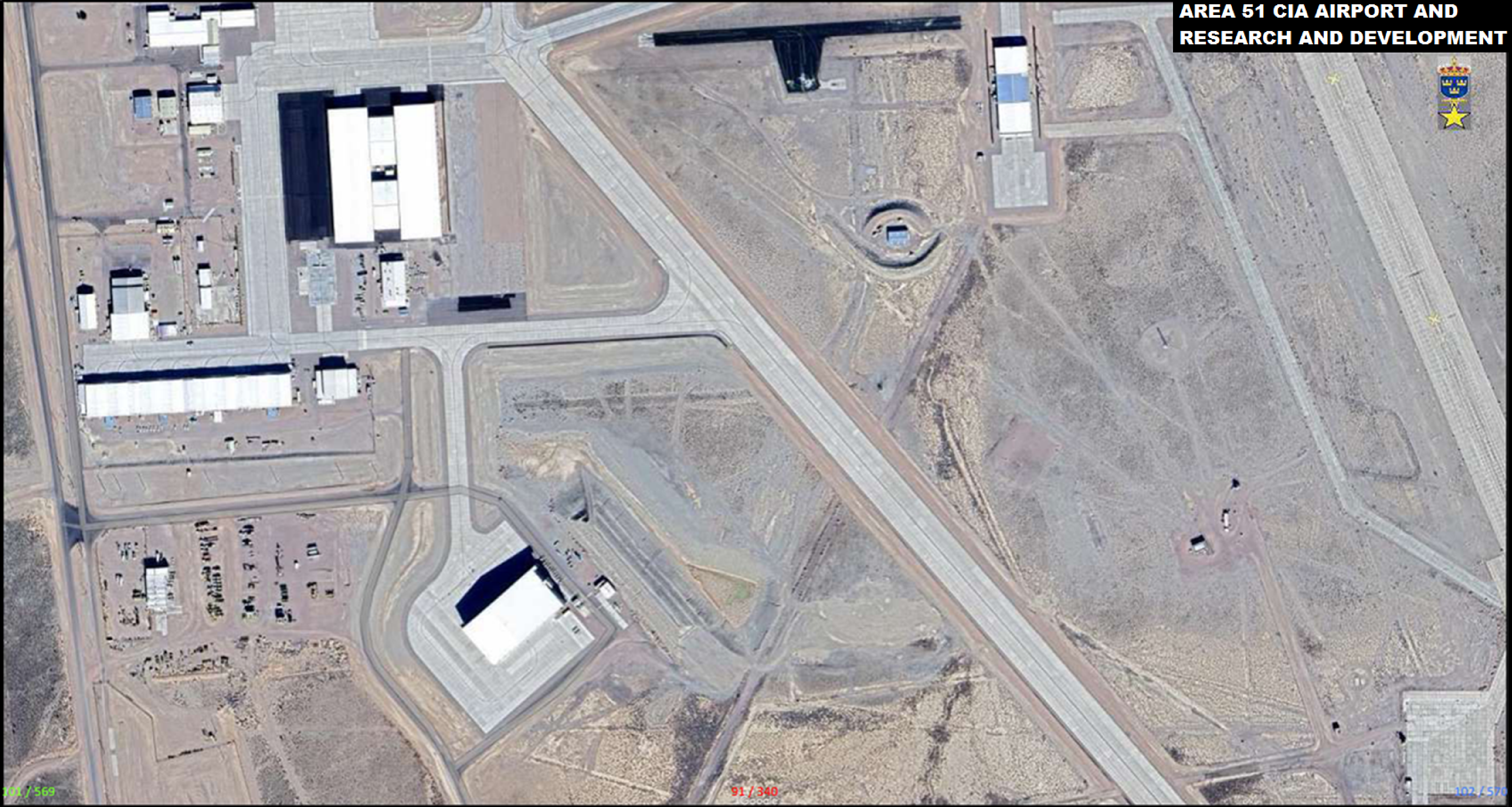
AUTHORITY:
PUNISHME


AREA 51 - NEVADA - U.S.A.
US AIR FORCE
TBM - Tunnel Boring Machine - in the Nevada desert. Photo: Department of Energy.
The Nevada National Security Site. Perhaps you have heard about tunnels in Area XX et cetera.
This is what it looks like when you dump tunnel rubble from a TBM, the Tunnel Boring Machine.
Image © 2023 Maxar Technologies

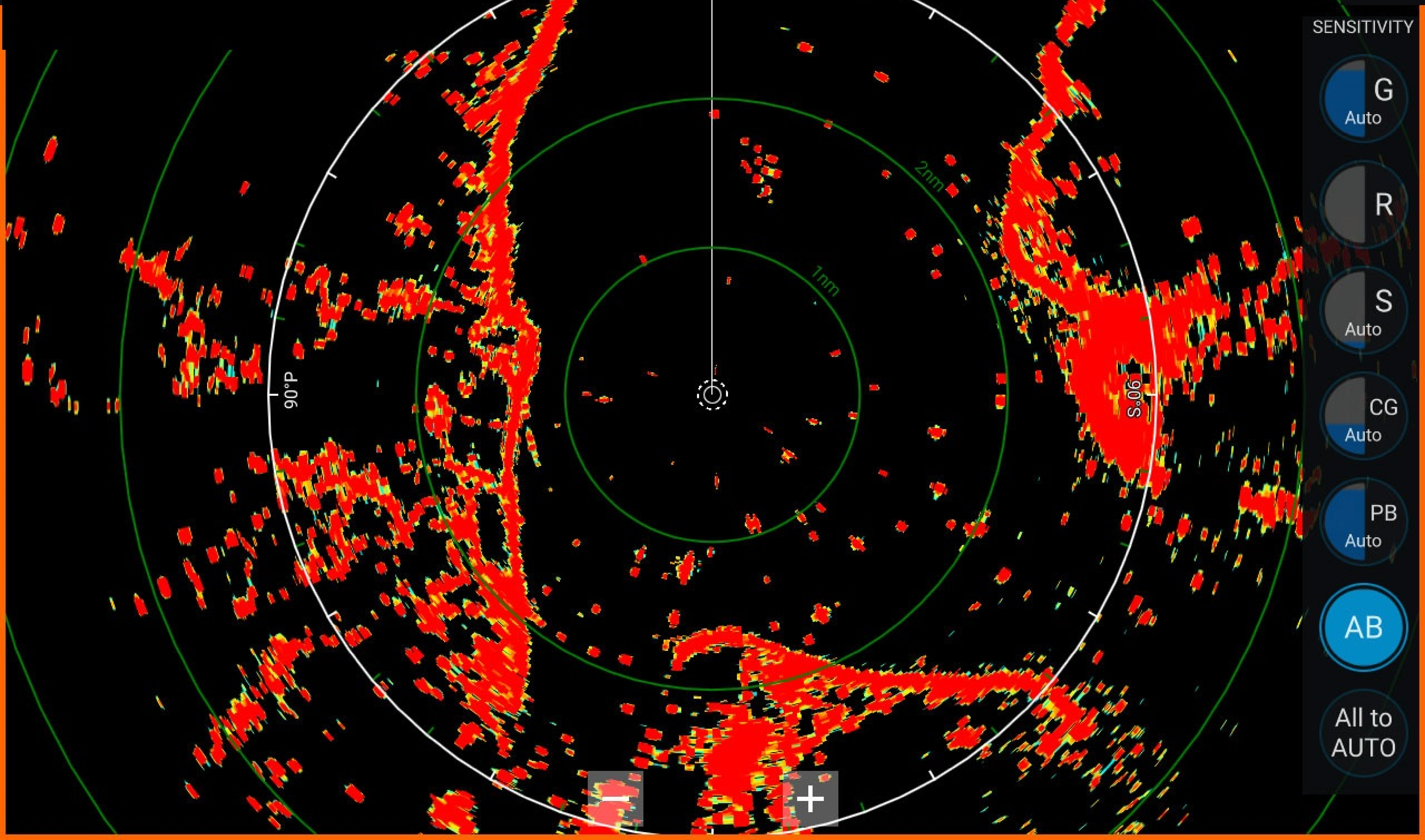

AREA 51 CIA AIRPORT AND
RESEARCH AND DEVELOPMENT
101 / 569
91 / 340
102 / 570

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA


GROOM LAKE AREA 51
PAPOOSE LAKE S-4

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

CHEAP NAVY / SHIP RADAR FROM RAYMARINE.



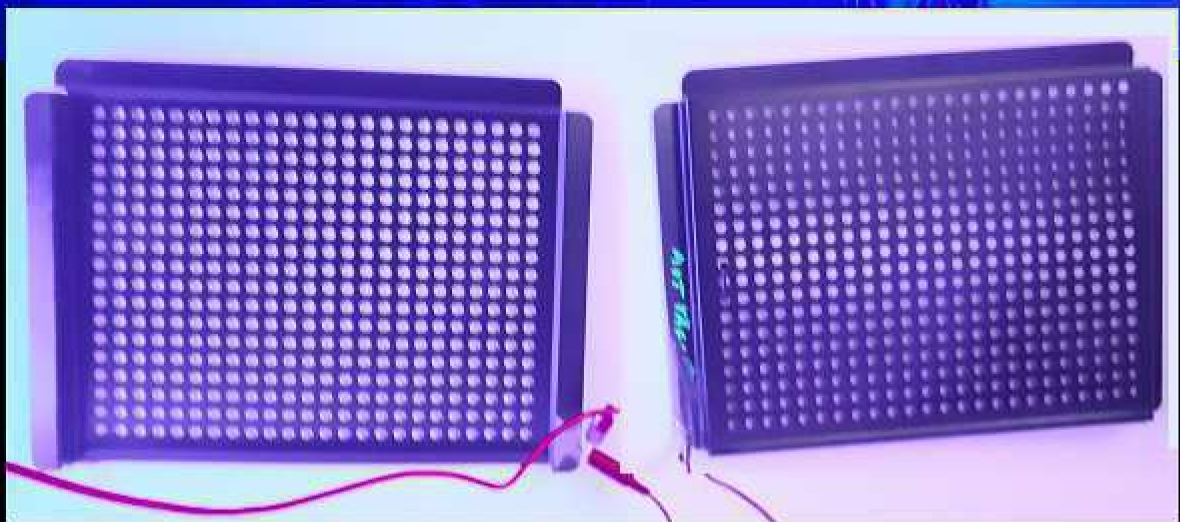
NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

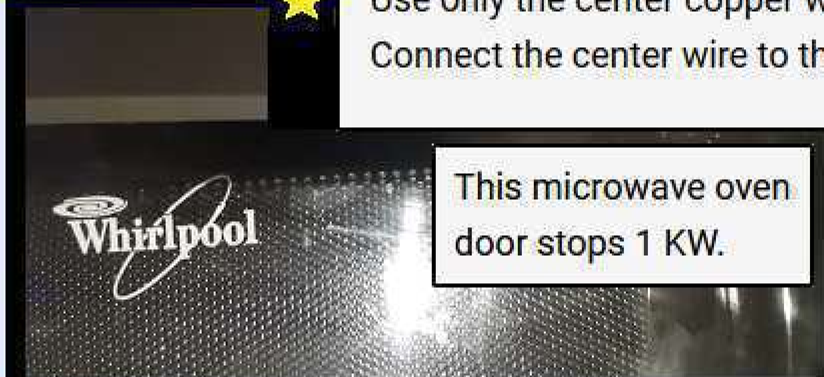
Here is how you build a DIY (Do It Yourself) Radio Warfare Defense System for less than $ 100.00 USD.

If you look closely, the left black antenna metal plate is flat against the ceiling. The second (right plate) is about 3 centimeters below the ceiling. Both plates are perforated with holes (see close-up at the bottom left). Then a power cable with crocodile clips is connected between the two plates (or more correctly, the 2 black ceiling antennas). This interconnection of the plates **makes the signal hit** the metal plates slightly differently in time, and the cable between them short-circuits the signal. To provide good peace of mind throughout the installation room, you should then connect a ground cable to the short-circuit cord, to guide everything present in the black antennas straight down into the ground. What would now have been microwaves in the room, which bounce around, are first collected, then short-circuited with themselves, and the residues are then led down and neutralized in the ground or soil.

The left one is flat against the ceiling. The right one is 2 to 3 cm from the roof. Both antennas are perforated with holes.

Grounding kit. Drill and 15 meter satellite cable = $ 15.00 USD.
Use only the center copper wire. The outer protects the ground wire.
Connect the center wire to the top and hit the drill into the ground.





This microwave oven door stops 1 KW.

MICROWAVE OVEN DOOR WITH NET HOLES.

400 mm DRILL = $ 2.00 USD.

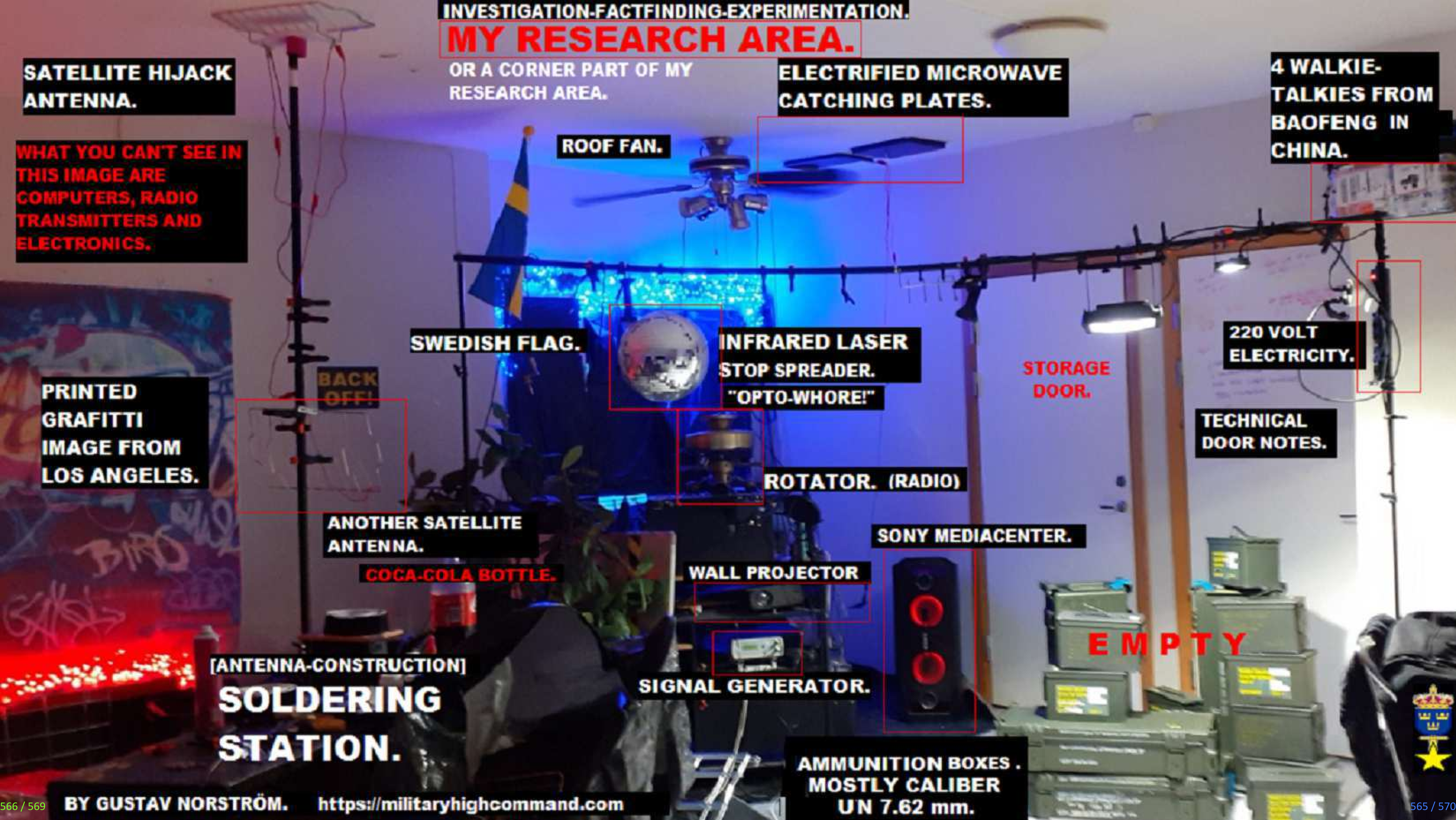
An even more powerful construction can be achieved by applying heavy magnets to the construction. I can show you later.

You can contact me at security.terminal@gustavnorstrom.com - or via telephone - 00 46 073 970 26 00 .
This working prototype can be studied where it is built in Sweden. Heden 132 Bollnäs, 821 31.

<u>— I of course have more advanced systems, but this one is cheap, works and provides relax for your head.</u>

Owner of this Website and Military Contractor: Mr. Gustav Norstrom.
Working on the behalf of The Royal Kingdom of Sweden.

Direct Telephone Number: 00 46 (0) 73 970 26 00.


INVESTIGATION-FACTFINDING-EXPERIMENTATION.
MY RESEARCH AREA.
OR A CORNER PART OF MY RESEARCH AREA.
SATELLITE HIJACK ANTENNA.
WHAT YOU CAN'T SEE IN THIS IMAGE ARE COMPUTERS, RADIO TRANSMITTERS AND ELECTRONICS.
ROOF FAN.
ELECTRIFIED MICROWAVE CATCHING PLATES.
4 WALKIE-TALKIES FROM BAOFENG IN CHINA.
SWEDISH FLAG.
INFRARED LASER STOP SPREADER.
"OPTO-WHORE!"
BACK OFF!
STORAGE DOOR.
220 VOLT ELECTRICITY.
PRINTED GRAFITTI IMAGE FROM LOS ANGELES.
TECHNICAL DOOR NOTES.
ROTATOR. (RADIO)
ANOTHER SATELLITE ANTENNA.
SONY MEDIACENTER.
COCA-COLA BOTTLE.
WALL PROJECTOR
E M P T Y
[ANTENNA-CONSTRUCTION]
SOLDERING STATION.
SIGNAL GENERATOR.
AMMUNITION BOXES . MOSTLY CALIBER UN 7.62 mm.
BY GUSTAV NORSTRÖM. https://militaryhighcommand.com
566 / 569
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END NOTE.

2 X SPEED OF LIGHT.

FLASHLIGHT.

**Albert Einstein said that nothing could travel faster than the speed of light.
It was a popular thinking for some time. —But it's wrong. —I say.
—If I throw away a flashlight, at the speed of light, and then turn on the light (pointed forward in the throw direction). The light will travel away from the flashlight at a 2 X SPEED OF LIGHT. That's it.
Like, if you drive a car at 100 kilometers per hour. (100 KM/H = 62 MPH/Miles Per Hour).
And then turn on the headlights, full power. The CAR HEADLIGHTS will travel at LIGHT SPEED + 100 KM/HOUR. Your CARS BACKTAIL LIGHTS will send out RED LIGHT at LIGHTSPEED minus 100 KM/H.
The lightsource is already moving. / GUSTAV NORSTRÖM. SWEDEN. 740621-1750.**

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

Gustav Norström

U.S. Department *of* Defense

TOP SECRET//SI/TK//NOFORN

FY 2013
Congressional Budget Justification

Volume I

NATIONAL INTELLIGENCE PROGRAM SUMMARY

FEBRUARY 2012

TOP SECRET//SI/TK//NOFORN

Access to the information in this document is restricted to US citizens with active SCI accesses for **SPECIAL INTELLIGENCE** and **TALENT-KEYHOLE** information.

DISSEMINATION CONTROL ABBREVIATIONS
NOFORN - Not Releasable to Foreign Nationals
This Component Budget of the National Intelligence Program is produced pursuant to provisions of Executive Order 12333, as amended by Executive Order 13470, and section 102A(c) of the National Security Act of 1947, as amended.

NATIONAL SECURITY INFORMATION

Unauthorized Disclosure Subject to Criminal Sanctions

(U) DIRECTOR OF NATIONAL INTELLIGENCE STATEMENT

(U//FOUO) The Intelligence Community (IC) is crucial to ensuring the Nation's safety and security. We face worldwide threats that are expanding in scope and complexity. This Fiscal Year (FY) 2013 National Intelligence Program (NIP) budget reflects hard choices to ensure critical national security requirements are addressed in the face of a reduced budget environment. We must be prepared to accept -- and manage -- reasonable risk.

(U//FOUO) Keeping America safe by providing the finest intelligence support to our policymakers, military, law enforcement partners, and allies remains our highest priority. With the superb talent and ingenuity of our workforce, the IC will continue to deploy the most technologically sophisticated and innovative intelligence capabilities in the world. Through integration and efficiency, we will sustain responsive, insightful intelligence support.

(S//NF) The FY 2013 NIP budget of $52.6 billion (including $4.9 billion for Overseas Contingency Operations (OCO)) and 107,035 positions supports the National Intelligence Strategy and advances our Nation's security priorities. This budget represents a decrease of $1.3 billion, or 2.4 percent, below the FY 2012 enacted level; and it reduces personnel by 1,241 positions, or one percent. The request meets the fiscal demands laid out in the Budget Control Act by setting the IC on a path to reduce expenditures by $25 billion for ten years; with over $15 billion of that amount saved by FY 2017.

(U) Developing a Balanced Intelligence Budget

(S) The IC leadership worked as a corporate body to develop the budget. The team first drew on lessons learned from the drawdown in the 1990s, which left the IC with a distorted workforce that lacked sufficient mid-career personnel and technical expertise. As a result of that drawdown, the IC reverted to extraordinary measures to rebuild and balance the workforce. Moreover, we deferred infrastructure recapitalization, resulting in obsolete facilities, single point failures, and inadequate power, space, and cooling. We also delayed investment, reducing our ability to keep pace with technical advances to meet mission needs.

(U) Second, we looked forward to determine how best to meet increasing mission requirements over the next decade in a resource-constrained environment. The IC leadership weighed the relative merit of capabilities and looked at dependencies across the components. In addition, we coordinated closely with the Defense and domestic departments to minimize disconnects and ensure balance.

(S) At the outset, I determined that we would not take a proportional reduction from each IC program, but rather compare relative merits of programs. We carefully weighed cost and risk to understand both the short and long term impact of our actions. To maximize investments for the future, we focused reductions on lower priority capabilities; sought efficiencies and smarter ways to do business; and prudently accepted risk. Overall, this budget is guided by the imperative to achieve the right balance against competing demands. Our guiding principles were to:

- (U) Sustain a skilled workforce;
- (U) Focus on further integration and collaboration;
- (U) Bolster agile capabilities that support multiple missions;
- (S) Enhance counterintelligence; and
- (U) Protect key investment for the future.

(U) Reductions

(U) To the extent possible, we protected the activities highlighted above; but with the magnitude of the reduction, we could not avoid limited, targeted cuts to priority areas. The following are some activities reduced from the base budget plan:

- (S//NF) ***Sustained Congressional Cuts.*** We sustain FY 2012 cuts to the CIA's Global Deployment Initiative and NRO's Integrated Ground Architecture.

- (S) ***Workforce.*** We continue Congressional reductions to the government workforce; curtail plans for future personnel growth, and take targeted reductions to baseline personnel where the risk can be managed. Furthermore, we reflect savings from a lower than projected civilian pay raise and continue to reduce our reliance on core contractors.

- (TS//NF) ***Operations.*** We decrease collection, production, and hard copy media generation in the GEOINT system, slow SIGINT network exploitation and processing modernization; cut GDIP HUMINT, non-core MASINT, covert action programs, and some Specialized Reconnaissance Programs (SRP) operations; and streamline the ODNI business transformation activities. Furthermore, we discontinue or terminate some lower-priority missions, such as de-orbiting the Baseline ONYX satellite and transferring funding responsibility to the MIP for legacy satellites.

- (S//TK//NF) ***Long-Term Investments.*** We are terminating an NRO compartmented project, delaying TOPAZ performance enhancements until the second generation of TOPAZ satellites; and reducing technology insertion opportunities in other satellites. In addition, we are delaying some SRP investments and terminating the Community's investment in a consolidated human resources information system.

- (S//NF) ***Infrastructure.*** We reduce enterprise management activities; eliminate the IC Data Center; downsize the IC Bethesda Campus; suspend some facility improvements; and delay the replacement of aged facility components. As a result, we will continue to house some of the IC workforce in older and less capable facilities that may not meet current antiterrorism/force protection requirements and we will accept some degradation in the IC's facility condition index.

- (S//NF) ***Information Technology.*** We reduce capital equipment replacement and recapitalization; decrease support for heritage systems; delay consolidation of older systems; and eliminate plans for additional backup systems. These offsets prevent spending to sustain or improve legacy environments when our direction is to establish a new IT environment based on more centralized common services. Investments required to establish a more efficient IC IT Enterprise are protected.

(U) Investments

(U) Although the budget is declining, the mission is not. Prioritizing our requirements was a key element to produce a budget that meets customer needs, supports critical capabilities, addresses gaps, and helps to maintain a strategic advantage. In the FY 2013 NIP budget, the IC makes targeted investments in:

- (TS//SI//NF) ***Signals Intelligence (SIGINT).*** We are bolstering our support for clandestine SIGINT capabilities to collect against high priority targets, including foreign leadership targets. Also, we are investing in groundbreaking cryptanalytic capabilities to defeat adversarial cryptography and exploit internet traffic.

- (S//NF) ***Cybersecurity.*** As the cyber threat continues to grow, we sustain the budget for the Comprehensive National Cybersecurity Initiative and begin construction of a second High Performance Computing Center at Fort Meade, Maryland to keep pace with cyber processing demands.

- (TS//NF) ***Counterintelligence (CI).*** To further safeguard our classified networks, we continue to strengthen insider threat detection capabilities across the Community. In addition, we are investing in target surveillance and offensive CI against key targets, such as China, Russia, Iran, Israel, Pakistan, and Cuba.

- (S//TK//NF) ***Major System Acquisitions (MSA).*** We are sustaining the acquisition baseline and maintaining the schedule for the MSAs that replace current capabilities. For example, the NRO is modernizing overhead SIGINT, geospatial, and communications major system acquisitions. To reduce reliance on the Tracking and Data Relay Satellite System (TDRSS), the NRO begins investing in a special communications capability. Also, launch requirements are fully funded.

- (S//NF) ***Ballistic Missile Collection.*** We are pursuing an affordable MASINT solution for integrating, improving, and sustaining coverage of and collection against North Korean, Iranian, Chinese, Russian, Pakistani and other ballistic missiles threats.

- (S//NF) ***Mission Focused Science & Technology (S&T).*** We continue investing in cutting edge S&T that enables new mission capabilities. We are tackling hard problems in quantum computing, biometrics, cyber, weapons of mass destruction, and large complex data sets.

(U) Optimizing Our Efforts

(U) To succeed, the IC must employ its resources judiciously. The need to integrate all elements of the IC is essential to identify opportunities as well as dangers. In FY 2011, the elimination of Usama Bin Ladin along with 32 other high value targets is just one testament to IC collaboration. Our ability to rapidly respond to the requirements of Operation Unified Endeavor, while simultaneously maintaining support for operations in Afghanistan, Iraq, and around the world, is another. We achieved this by reducing the cultural, technological and policy barriers to sharing information, and exploring new strategies for integrating our intelligence efforts. The FY 2013 budget sustains the imperative of integration, and provides the framework and common solutions to further collaboration.

(U) Focusing on Integration

(U) The Office of the DNI has promoted information sharing and collaboration through the integration of analysis and collection at the strategic level. This has improved mission management of key intelligence problems, leading to a sharper focus on, and encouragement of, integration within the Community. The heightened attention on intelligence integration has changed the dynamics of intelligence activities. Without requiring individual IC elements to reorganize, the emphasis on integration has led Community elements to think and operate in ways that are responsive to strategic management and direction that encourages, recognizes, and rewards integrated intelligence operations.

(U//FOUO) The National Intelligence Managers (NIM) are the principal agents of mission integration. They oversee and integrate all aspects of the IC's efforts against a particular regional or functional problem to provide a more complete understanding of the associated issues. A major responsibility includes the development, planning, execution, and oversight of Unifying Intelligence Strategies (UIS) for their individual accounts, with the principal aim of managing the relevant policies, priorities, and relationships among the IC elements who participate in each of these target domains.

(U//FOUO) These UIS are the instruments that are used to integrate IC efforts against critical priorities. Each UIS supports decision-making by outlining gaps and challenges, as well as opportunities that would most benefit from integration of IC efforts. In addition, the UIS present a select number of integration initiatives to provide a holistic perspective across the strategies.

(U) Promoting Information Sharing

(U) Information sharing also is a critical enabler of integration across the Community. This budget begins to implement a restructuring of the IC information technology (IT) architecture that will provide a strong backbone enabling greater IC integration, information sharing, and improved safeguarding of networks. The need for the IC to contribute to deficit reduction was the catalyst for achieving greater efficiencies in information technology. The IC IT Enterprise will transform from agency-centric IT programs which are often duplicative and costly, to greater centralization of common services for IC-wide use. Within this framework, we are leveraging existing efforts across the Community and sustaining unique approaches only when they are essential to the mission. Furthermore, we are investigating data management solutions and their associated security issues, such as the viability of comingling data in virtualized data stores to facilitate analytical integration of different data from different sources and Agencies. This includes new management and operating practices for the secure storage and handling of the varied information contained in different intelligence systems through the use of cloud computing.

(U) Engaging Partners

(U) Expanding the IC's culture of sharing with our partners is essential to leverage and maximize our collective capabilities. We are strengthening relationships with federal, state, local, tribal, and international partners to fuse domestic and foreign intelligence to quickly understand and act on threats. Through coordinated efforts, we can optimize our efforts to improve intelligence support.

(U) As part of the Administration's overall foreign trade initiative, the IC will more closely coordinate its intelligence gathering and analysis efforts with federal agencies responsible for monitoring foreign trade barriers and enforcing U.S. trade rights under international trade agreements. The IC will directly support and strengthen U.S. interagency trade enforcement efforts to address unfair trade practices through the World Trade Organization and under other domestic and international trade enforcement authorities

(U) Furthermore, the IC is postured to support the warfighter as the Department of Defense implements a new strategy. The strategy is consistent with the IC approach to the FY 2013 budget. We will support the increased focus on the Pacific region, and surge as needed for military operations. In addition, we expect there will be a greater reliance on the IC to provide global coverage and warning of emerging threats.

(U) Aligning Resources

(U) This year, the IC implemented guiding principles to clarify responsibility for programming NIP resources.

(S) The IC developed guidelines to more clearly delineate programming responsibility for the NIP and the MIP to further optimize resource allocation. These guidelines better align NIP and MIP resources with mission requirements, reduce the number of split funded projects, and enable more efficient budget execution. The FY 2013 budget begins to implement the guidelines by transferring $165 million and 1,078 positions between the NIP and MIP. This transfer maintains the mission, function, and execution of activities; it does not represent growth in either program.

(S) In addition, the DHS Office of Intelligence and Analysis (I&A) implemented a change in how it accounts for resources that support the intelligence mission. Beginning in the FY 2013 budget, activities that predominately support departmental missions are funded outside the NIP. Under the new methodology, $11 million and 44 positions are transferred out of the NIP.

(U) Supporting Current Intelligence Operations

(S//NF) In FY 2013, the IC will continue to provide crucial intelligence support to military operations in Afghanistan and to combat terrorism worldwide.

(S//SI//NF) The request for Afghanistan and Pakistan decreases as support for the military's counterterrorism and counterinsurgency operations declines, coincident with planned troop reductions. Accordingly, this request sustains HUMINT and CI operations, along with the related analytic, processing, and exploitation capabilities.

Also, NSA is augmenting SIGINT access and penetration, and Treasury enhances threat finance analysis to track terrorist and insurgent networks.

(TS//NF) With the completion of the military drawdown in Iraq, intelligence support transitions to a smaller long-term presence. The IC's request is significantly reduced from FY 2012 as our support focuses on providing foreign intelligence in support of diplomatic activities and monitoring Iraq's plans and intentions and those of its volatile neighbor, Iran. This budget sustains HUMINT operations, with a smaller footprint, as well as SIGINT collection capabilities. Most support for media exploitation, commercial imagery, and other operational enablers is eliminated.

(TS//NF) The counterterrorism (CT) mission requires a global perspective to predict, penetrate, and preempt global threats to U.S. security. Therefore, the IC is sustaining operations, analytic, and enabling activities. With Yemen, Somalia, and other Horn of Africa countries emerging as the most recent breeding ground for terrorism, the IC is increasing efforts in those regions. Furthermore, we are sustaining CT capabilities in Libya to deny extremists a safe haven. In an effort to reduce our reliance on OCO as a funding vehicle, we transfer to the base some enduring long term activities.

(S//NF) The counterproliferation (CP) mission continues to support a variety of actions to deter, disrupt, and prevent proliferation. This includes improving our understanding of Pakistani nuclear weapons and dangerous nuclear material security; intelligence on proliferators, such as Iran and North Korea, to roll back and block weapons programs; increasing our ability to ascertain global chemical and biological threats; and better integrating multidiscipline coverage of WMD targets such as chemical weapons in Libya and Syria.

(U) Moving Forward

(S//NF) Today's national security threats virtually defy rank-ordering. Capabilities, technologies, know-how, communications, and environmental forces are not confined by borders, and can trigger transnational disruptions with astonishing speed. Never before has the IC been called upon to master such complexity and so many issues in such a resource-constrained environment. We are rising to the challenge by continuing to integrate the IC, capitalize on new technologies, implement new efficiencies, and, as always, remaining vigilant 24/7 worldwide.

(U//FOUO) The pressure to maintain the world's premier intelligence enterprise in the face of shrinking budgets will be difficult. We will accept and manage risk, more so than we've had to in the last decade.

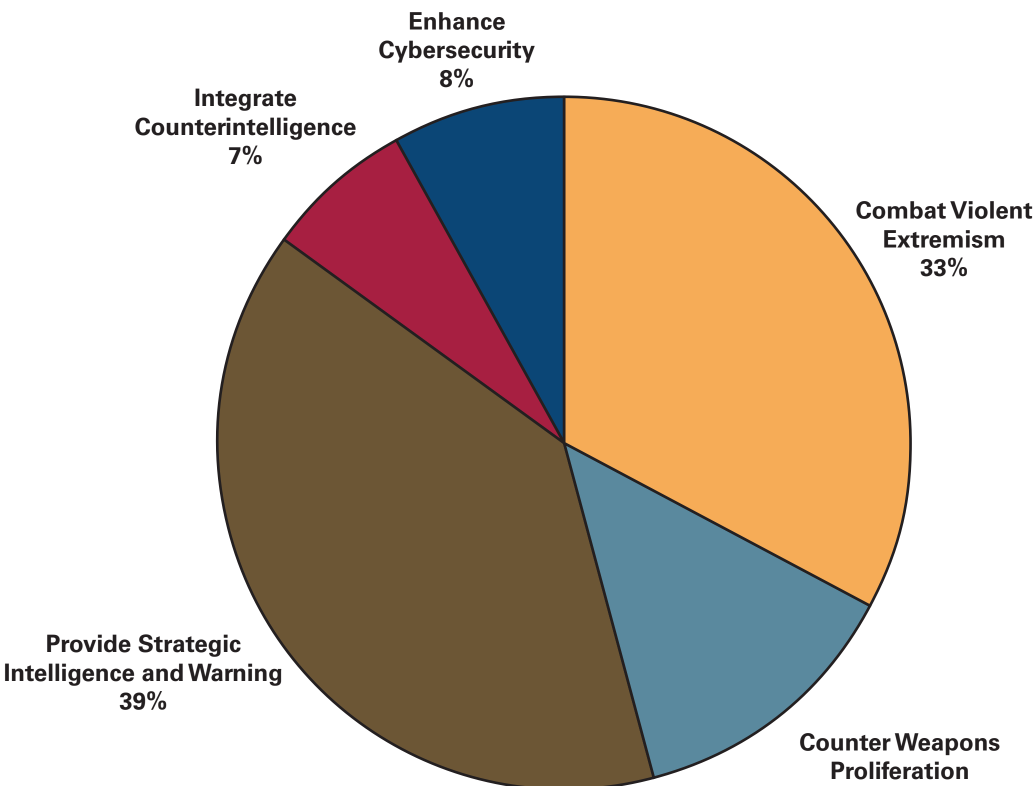
(U//FOUO) This NIP budget proposed is balanced and executable. It does not reflect the potential for a sequester in January 2013. Instead, the FY 2013 President's Budget proposes savings in other areas that exceed the Joint Committee threshold, and as a result seeks to cancel the automatic reductions and restore the caps to the original definitions in the Budget Control Act.

(U) Intelligence is the first line of defense. This budget provides the programs and initiatives vital to our national security. Our partnership with you -- our Congressional oversight committees -- is critical to our collective success. With your continued support, the IC can continue to fulfill our mission to keep America and its interests secure.

FY 2013 Mission Objective Funding*

$52.0 Billion

CIARDS funding not included.



* MO6: Support to Current Operations is covered in other MO sections.

Figure 1.

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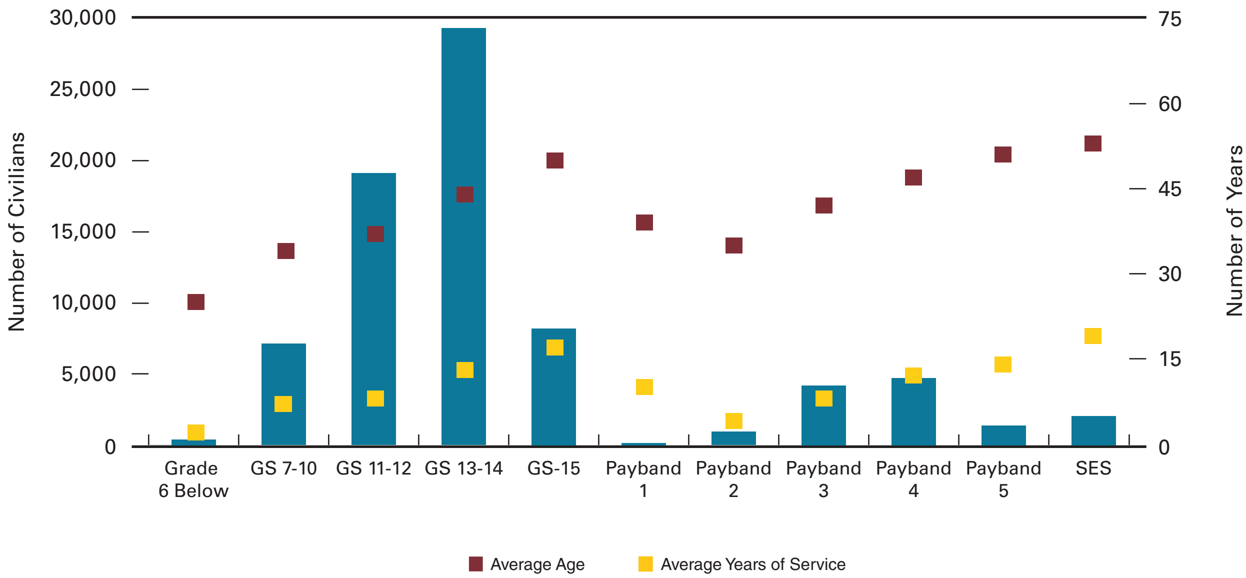
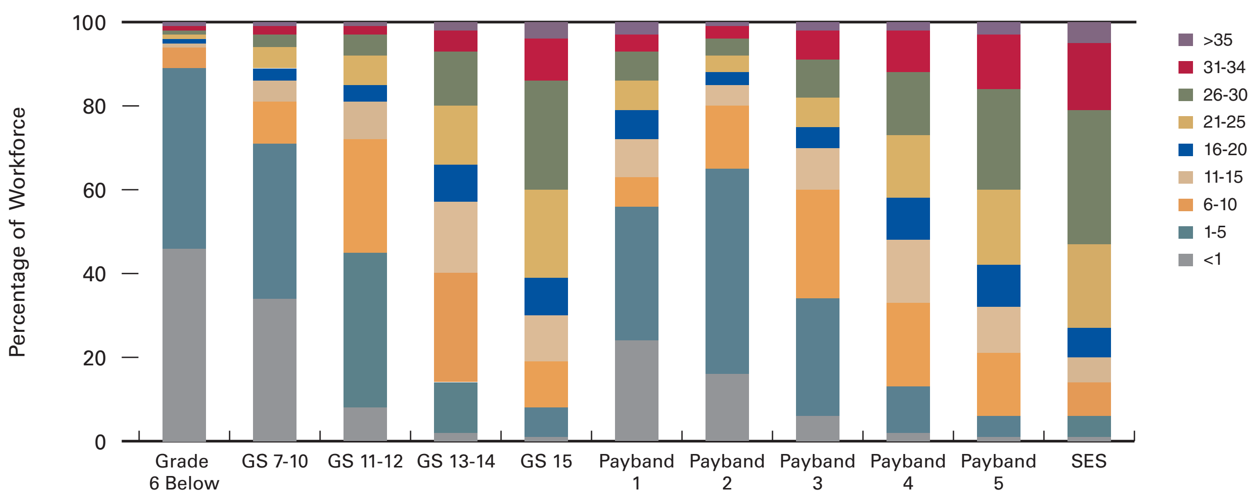
FY 2011 Intelligence Community Civilian Workforce

Grade Distribution by Average Age



Grade by Years of Service



Note: This chart contains data adjusted to facilitate display in whole percentages only and some categories with <0.50% will display as 0%. Actual percentages are available upon request.

Figure 2.

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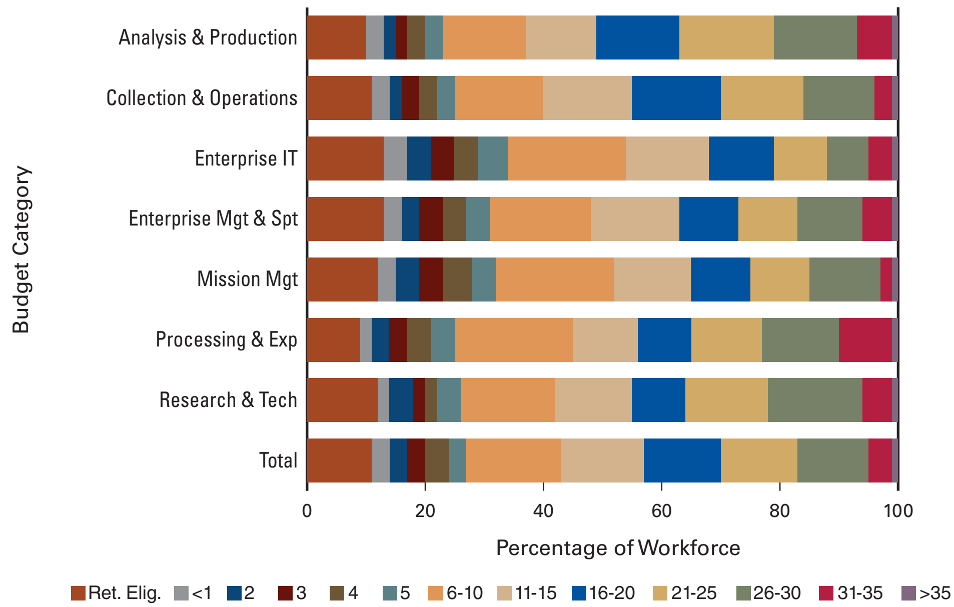
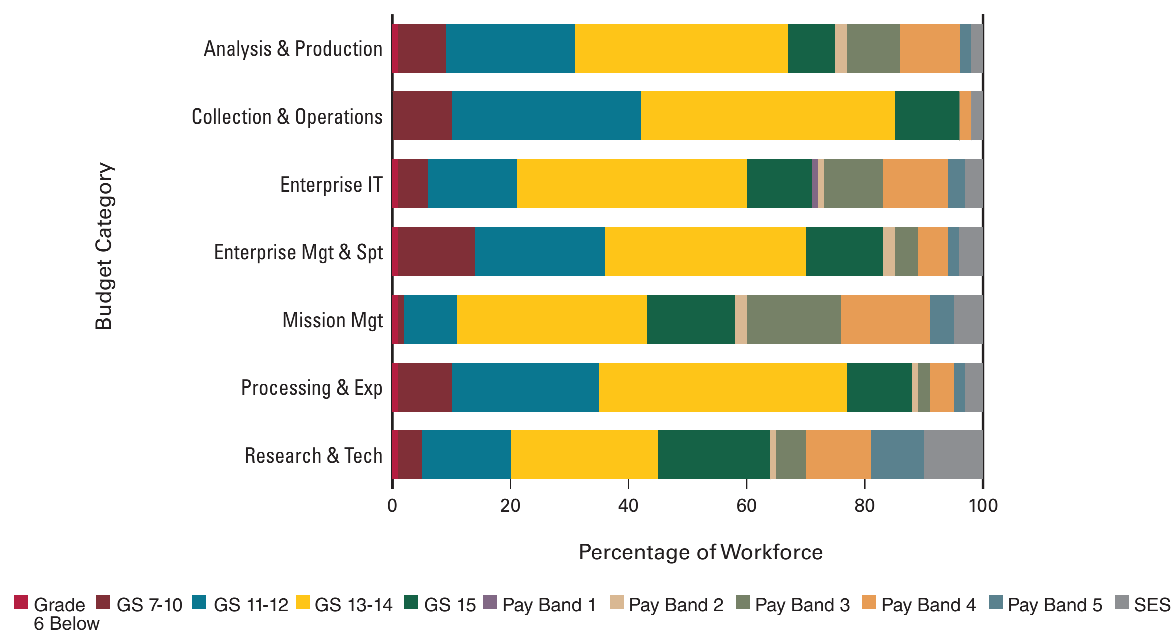
FY 2011 Intelligence Community Civilian Workforce

Years to Optional Retirement



Note: This chart contains data adjusted to facilitate display in whole percentages only and some categories with <0.50% will display as 0%. Actual percentages are available upon request.

Budget Category by Grade Levels



Note: This chart contains data adjusted to facilitate display in whole numbers only. Actual figures are available upon request.

Figure 3.

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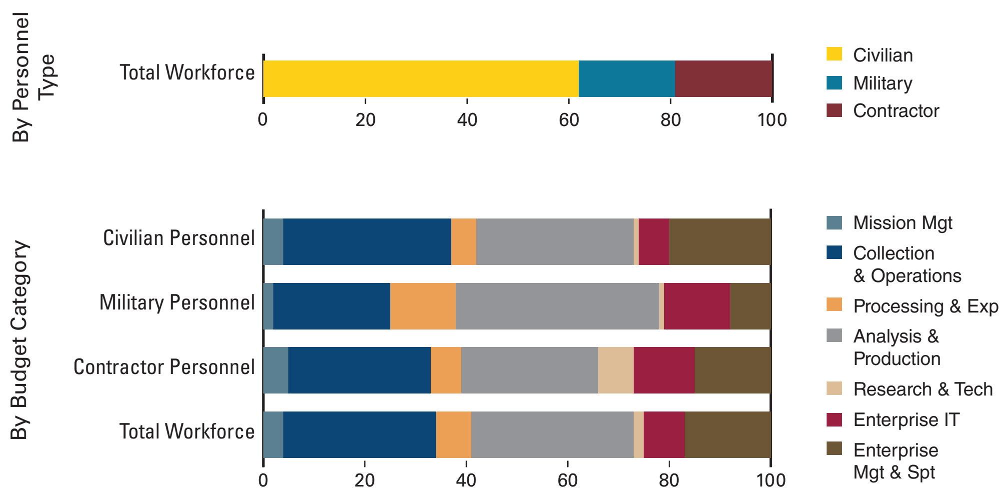
FY 2011 Intelligence Community Workforce

Total Civilian, Military, and Contractor Personnel Workforce by Personnel Type and Budget Category



Note: This chart contains data adjusted to facilitate display in whole percentages only and some categories with <0.50% will display as 0%. Actual percentages are available upon request.

Civilian Workforce/Attrition

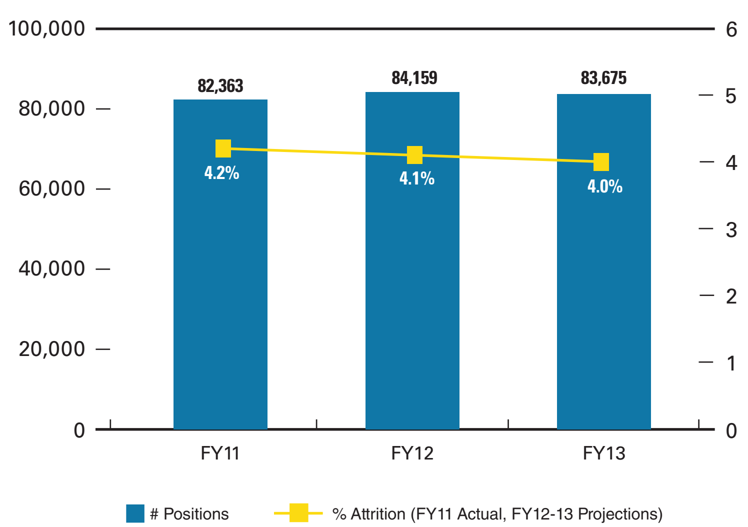


Figure 4.

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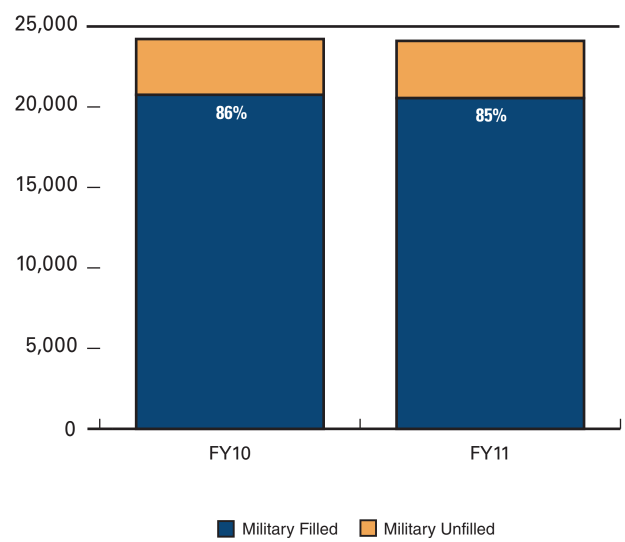
FY 2011 Intelligence Community Workforce

Military Workforce/Fill Rates



Foreign Language Proficiency Payments: Total NIP*

Top Foreign Languages	Civilian	Special Interest Languages	Civilian
Spanish	2,725	Tagalog	62
French	827	Indonesian	48
Chinese (All Dialects)	903	Hindi	73
Arabic (All Dialects)	1,191	Somali	5
Russian	736	Pashto	88
German	521	Persian - Afghan (Dari)	96
Korean	490	Urdu	89
Persian (Farsi) - Iranian	357	Punjabi	45
Portuguese	295	Hausa	3
Other Languages **	1,639		
Total	**10,193**	Total Special Interest	509

*Includes payments to 7,507 U.S. Government civilian personnel in CIA, DIA, FBI, NGA, NSA, and others included in the program volumes.

**There are up to 71 "Other" Languages for which proficiency payments are made. The complete list is available upon request.

Figure 5.

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FY 2013 Request by Program

$52.6 Billion

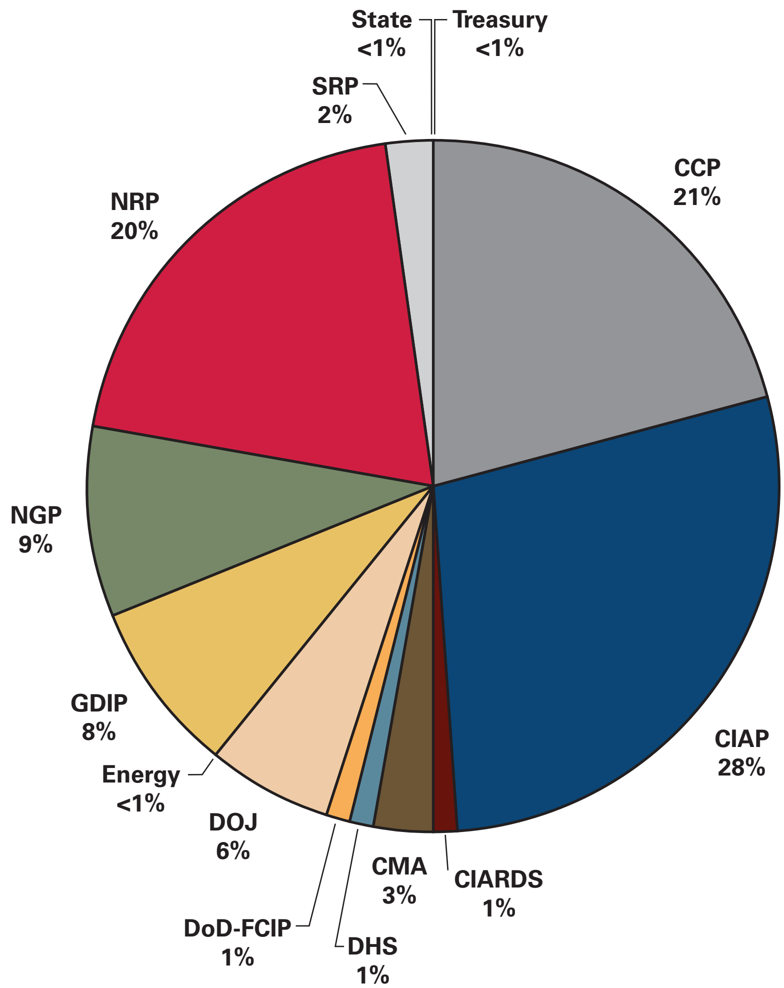

Figure 6.

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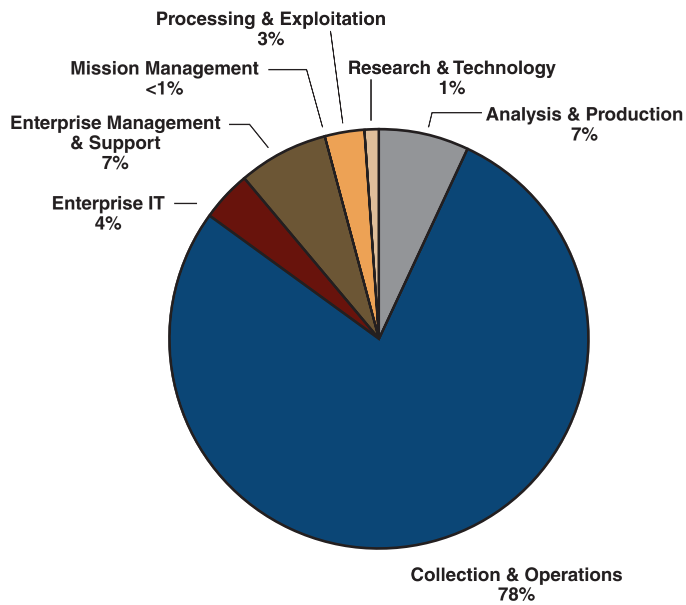
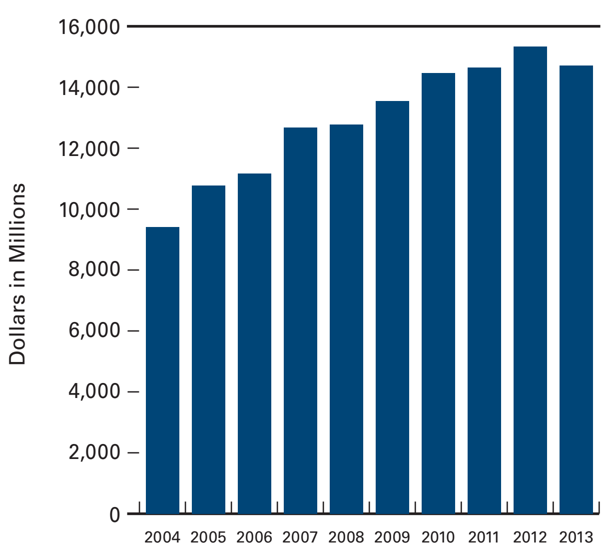
Central Intelligence Agency Program

FY 2013
Funding by Budget Category



Funds FY 2004 - FY 2013



Positions FY 2004 - FY 2013

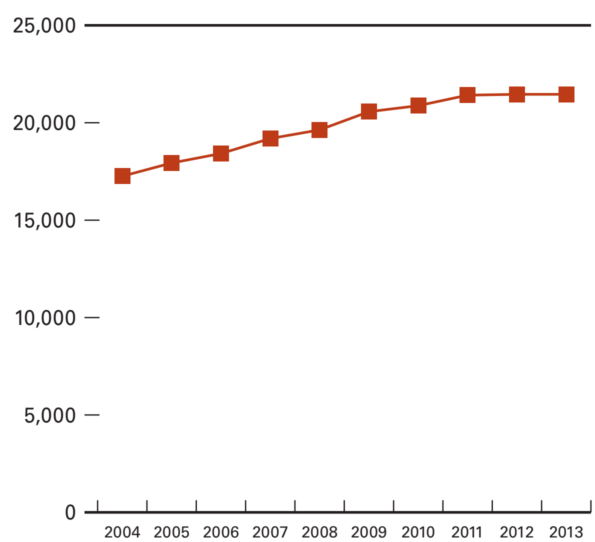


Figure 7.

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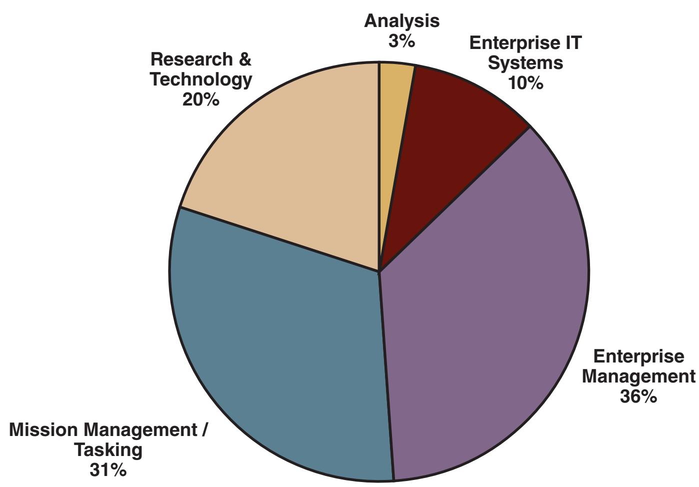
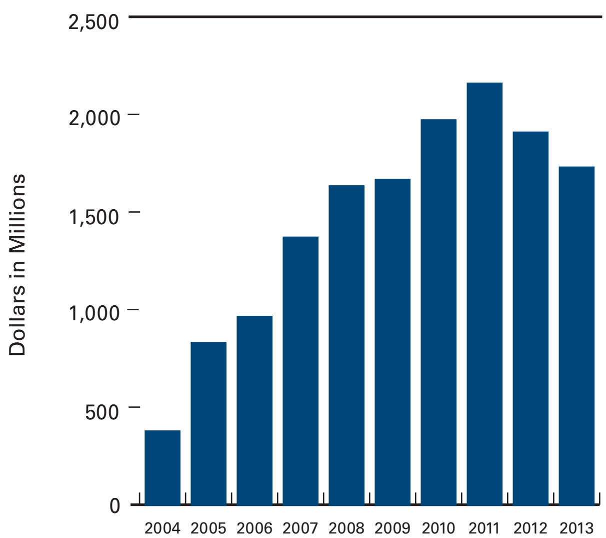
Community Management Account

FY 2013
Funding by Expenditure Center



Funds FY 2004 - FY 2013



Positions FY 2004 - FY 2013

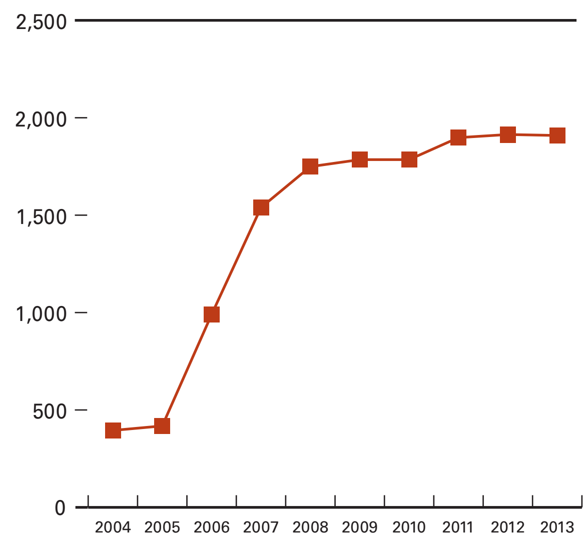


Figure 9.

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Consolidated Cryptologic Program

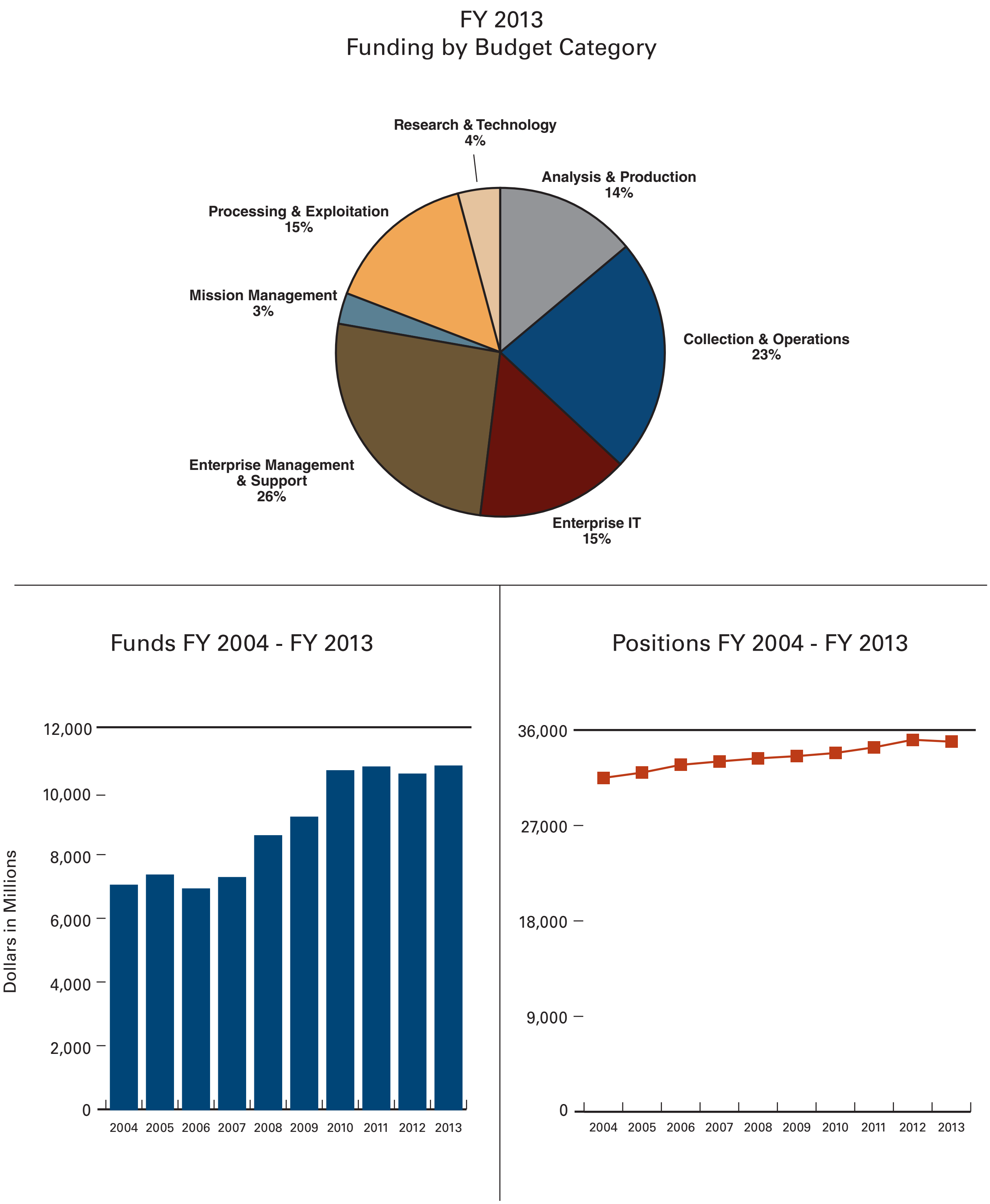

Figure 10.

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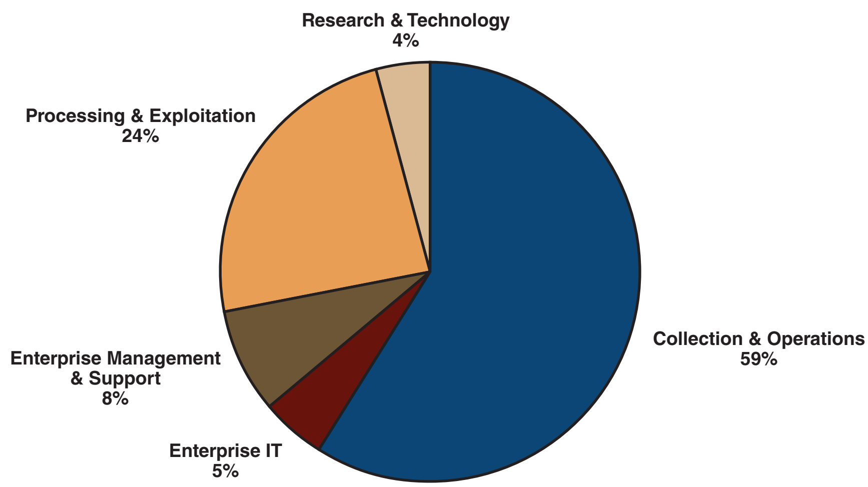
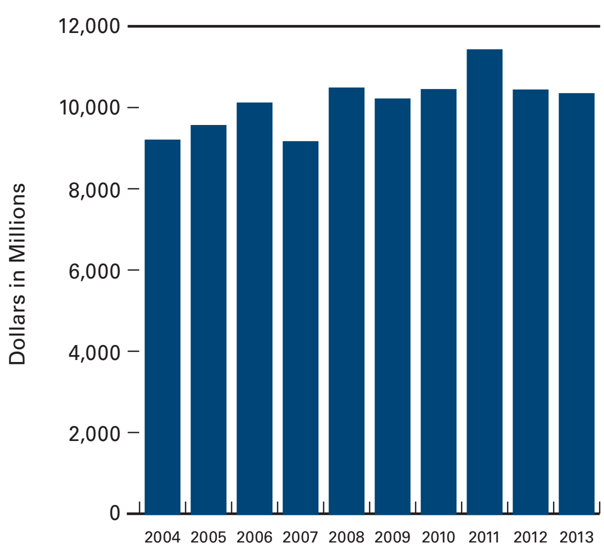
National Reconnaissance Program

FY 2013
Funding by Budget Category



Funds FY 2004 - FY 2013



Positions FY 2004 - FY 2013

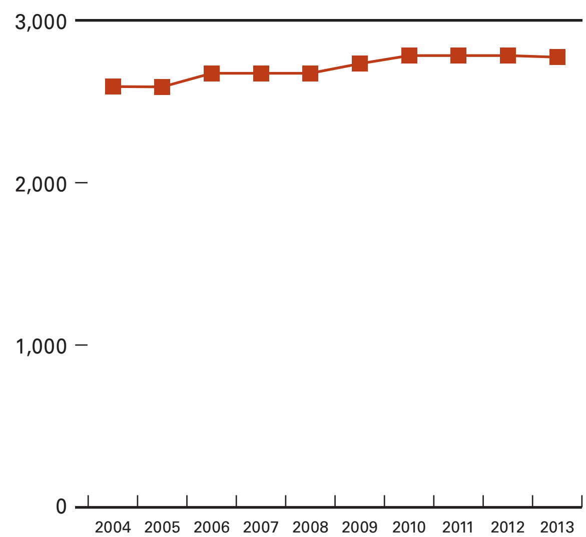


Figure 14.

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Resource Exhibit No. 1A
National Intelligence Program
Funds by Program
FY 2011 – FY 2017
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(Dollars in Thousands)

Program	FY 2011 Actual	FY 2012 Appropriated	FY 2013 Base	FY 2013 OCO	FY 2013 Request	FY 2012 – FY 2013 Change		FY 2013 – FY 2017 Total[1]
						Funds	Percent	
CCP	10,737,163	10,514,035	10,036,851	730,914	10,767,765	253,730	2	50,652,537
CIAP	14,652,379	15,332,901	12,037,708	2,672,317	14,710,025	-622,876	-4	64,567,982
CIARDS	292,000	513,700	514,000	—	514,000	300	—	2,570,000
CMA	2,063,394	1,870,255	1,676,387	—	1,676,387	-193,868	-10	10,274,665
DHS	275,136	307,359	284,332	—	284,332	-23,027	-7	1,462,089
DoD-FCIP	517,720	505,895	456,475	72,485	528,960	23,065	5	2,487,905
DOJ	2,978,329	3,010,795	3,019,958	—	3,019,958	9,163	—	15,596,944
Energy	163,700	186,699	188,619	—	188,619	1,920	1	943,095
GDIP	4,767,009	4,815,583	3,655,662	774,480	4,430,142	-385,441	-8	19,901,677
NGP	5,227,945	5,041,569	4,339,195	539,735	4,878,930	-162,639	-3	22,786,959
NRP	11,401,745	10,411,335	10,268,773	53,150	10,321,923	-89,412	-1	54,842,860
SRP	1,466,792	1,267,751	1,099,820	33,784	1,133,604	-134,147	-11	6,010,922
State	68,773	68,203	72,655	—	72,655	4,452	7	377,056
Treasury	27,422	27,123	27,297	—	27,297	174	1	138,274
NIP Total	**54,639,507**	**53,873,203**	**47,677,732**	**4,876,865**	**52,554,597**	**-1,318,606**	**-2**	**252,612,965**

[1]FY 2013-2017 Total includes the OCO Request for FY 2013 only.

Resource Exhibit No. 1B *(Number of Personnel)*
National Intelligence Program *(Number of Positions)*
Total Personnel[1] and Total Positions[2] by Program
FY 2011 - FY 2013
This Exhibit is SECRET//NOFORN

	FY 2011 Actual		FY 2012 Authorized		FY 2013 Request		FY 2012 - FY 2013 Change		FY 2012 - FY 2013 Change	
Program	**Total Personnel**	**Total Positions**	**Total Personnel**	**Total Positions**	**Total Personnel**	**Total Positions**	**Total Personnel**	**Percent**	**Total Positions**	**Percent**
CCP	34,367	34,367	35,083	35,083	34,901	34,901	-182	-1	-182	-1
CIAP	21,426	21,416	22,206	21,459	22,206	21,459	—	—	—	—
CIARDS	—	—	—	—	—	—	—	—	—	—
CMA	1,719	1,898	1,742	1,914	1,813	1,909	71	4	-5	0
DHS	762	838	940	1,000	885	965	-55	-6	-35	-4
DoD-FCIP	2,099	2,162	2,152	2,217	2,271	2,332	119	6	115	5
DOJ	14,800	15,037	15,058	15,345	15,072	15,338	14	0	-7	—
Energy	199	199	198	198	199	199	1	1	1	1
GDIP	17,202	18,322	17,562	18,527	17,239	17,904	-323	-2	-623	-3
NGP	8,705	8,678	8,813	8,982	8,519	8,484	-294	-3	-498	-6
NRP	2,867	2,783	2,871	2,783	2,904	2,773	33	1	-10	0
SRP	249	249	249	249	249	249	—	—	—	—
State	359	360	360	361	363	364	3	1	3	1
Treasury	151	158	155	158	156	158	1	1	—	—
NIP Total	**104,905**	**106,467**	**107,389**	**108,276**	**106,777**	**107,035**	**-612**	**-1**	**-1,241**	**-1**

[1] Total Personnel is the sum of Civilian FTEs and Military Positions and excludes Foreign Indirect Hires.

[2] Total Positions is the sum of Civilian Positions and Military Positions and excludes Foreign Indirect Hires.

Resource Exhibit No. 2A *(Dollars in Thousands)*
National Intelligence Program
Funds by Program and Service/Agency
FY 2011 - FY 2017
This Exhibit is SECRET//NOFORN

Program	Service/ Agency	FY 2011 Actual	FY 2012 Appropriated	FY 2013 Base	FY 2013 OCO	FY 2013 Request	FY 2012 - FY 2013 Change: Funds	FY 2012 - FY 2013 Change: Percent	FY 2013 - FY 2017 Total[1]
Department of Defense, NIP									
CCP	Air Force	164,934	168,497	157,833	3,523	161,356	-7,141	-4	830,815
	Army	108,003	107,912	74,444	21,603	96,047	-11,865	-11	397,401
	Marine Corps	—	837	1,046	—	1,046	209	25	5,404
	NSA	10,394,017	10,177,996	9,750,818	705,788	10,456,606	278,610	3	49,141,080
	Navy	70,209	58,793	52,710	—	52,710	-6,083	-10	277,837
CCP Total		**10,737,163**	**10,514,035**	**10,036,851**	**730,914**	**10,767,765**	**253,730**	**2**	**50,652,537**
CIAP	CIA	14,652,379	15,332,901	12,037,708	2,672,317	14,710,025	-622,876	-4	64,567,982
CIAP Total		**14,652,379**	**15,332,901**	**12,037,708**	**2,672,317**	**14,710,025**	**-622,876**	**-4**	**64,567,982**
CMA	Air Force	1,390,793	1,322,364	1,136,135	—	1,136,135	-186,229	-14	7,384,743
CMA Total		**1,390,793**	**1,322,364**	**1,136,135**	**—**	**1,136,135**	**-186,229**	**-14**	**7,384,743**
DoD-FCIP	Air Force	122,927	103,393	87,322	9,903	97,225	-6,168	-6	462,967
	Army	97,857	98,039	91,432	19,360	110,792	12,753	13	510,468
	DIA	162,829	171,927	137,672	30,552	168,224	-3,703	-2	760,843
	DSS	3,588	3,625	7,386	—	7,386	3,761	104	36,720
	DTRA	5,593	6,605	9,308	—	9,308	2,703	41	43,821
	Navy	124,926	122,306	123,355	12,670	136,025	13,719	11	673,086
DoD-FCIP Total		**517,720**	**505,895**	**456,475**	**72,485**	**528,960**	**23,065**	**5**	**2,487,905**
GDIP	Air Force	708,306	731,191	610,153	6,844	616,997	-114,194	-16	3,442,093
	Army	267,515	266,867	200,066	23,480	223,546	-43,321	-16	1,033,545
	DIA	3,225,544	3,267,174	2,412,077	739,613	3,151,690	-115,484	-4	13,186,766
	Marine Corps	—	—	479	—	479	479	—	2,173
	Navy	488,152	477,668	432,887	4,543	437,430	-40,238	-8	2,237,100
	SOCOM	77,492	72,683	—	—	—	-72,683	-100	—
GDIP Total		**4,767,009**	**4,815,583**	**3,655,662**	**774,480**	**4,430,142**	**-385,441**	**-8**	**19,901,677**
NGP	Air Force	101,540	112,930	114,383	—	114,383	1,453	1	522,051
	Army	47,802	52,620	49,052	—	49,052	-3,568	-7	264,527
	NGA	5,068,107	4,860,907	4,160,116	539,676	4,699,792	-161,115	-3	21,912,709
	Navy	10,496	15,112	15,644	59	15,703	591	4	87,672
NGP Total		**5,227,945**	**5,041,569**	**4,339,195**	**539,735**	**4,878,930**	**-162,639**	**-3**	**22,786,959**
NRP	NRO	11,401,745	10,411,335	10,268,773	53,150	10,321,923	-89,412	-1	54,842,860
NRP Total		**11,401,745**	**10,411,335**	**10,268,773**	**53,150**	**10,321,923**	**-89,412**	**-1**	**54,842,860**
SRP	Navy	1,466,792	1,267,751	1,099,820	33,784	1,133,604	-134,147	-11	6,010,922
SRP Total		**1,466,792**	**1,267,751**	**1,099,820**	**33,784**	**1,133,604**	**-134,147**	**-11**	**6,010,922**
Department of Defense, NIP Total		**50,161,546**	**49,211,433**	**43,030,619**	**4,876,865**	**47,907,484**	**-1,303,949**	**-3**	**228,635,585**
Non-Defense, NIP									
CIARDS	CIARDS	292,000	513,700	514,000	—	514,000	300	0	2,570,000
CIARDS Total		**292,000**	**513,700**	**514,000**	**—**	**514,000**	**300**	**0**	**2,570,000**
CMA	CMA	672,601	547,891	540,252	—	540,252	-7,639	-1	2,889,922
CMA Total		**672,601**	**547,891**	**540,252**	**—**	**540,252**	**-7,639**	**-1**	**2,889,922**

Resource Exhibit No. 2A (continued) *(Dollars in Thousands)*
National Intelligence Program
Funds by Program and Service/Agency
FY 2011 - FY 2017
This Exhibit is SECRET//NOFORN

Program	Service/ Agency	FY 2011 Actual	FY 2012 Appropriated	FY 2013 Base	FY 2013 OCO	FY 2013 Request	FY 2012 - FY 2013 Change Funds	FY 2012 - FY 2013 Change Percent	FY 2013 - FY 2017 Total[1]
DHS	CG Non-DoD	22,687	47,717	51,101	—	51,101	3,384	7	262,775
	DHS	252,449	259,642	233,231	—	233,231	-26,411	-10	1,199,314
DHS Total		**275,136**	**307,359**	**284,332**	**—**	**284,332**	**-23,027**	**-7**	**1,462,089**
DOJ	DEA	13,578	13,647	14,123	—	14,123	476	3	73,059
	FBI	2,964,751	2,997,148	3,005,835	—	3,005,835	8,687	0	15,523,885
DOJ Total		**2,978,329**	**3,010,795**	**3,019,958**	**—**	**3,019,958**	**9,163**	**0**	**15,596,944**
Energy	Energy	163,700	186,699	188,619	—	188,619	1,920	1	943,095
Energy Total		**163,700**	**186,699**	**188,619**	**—**	**188,619**	**1,920**	**1**	**943,095**
State	State	68,773	68,203	72,655	—	72,655	4,452	7	377,056
State Total		**68,773**	**68,203**	**72,655**	**—**	**72,655**	**4,452**	**7**	**377,056**
Treasury	Treasury	27,422	27,123	27,297	—	27,297	174	1	138,274
Treasury Total		**27,422**	**27,123**	**27,297**	**—**	**27,297**	**174**	**1**	**138,274**
Non-Defense, NIP Total		**4,477,961**	**4,661,770**	**4,647,113**	**—**	**4,647,113**	**-14,657**	**0**	**23,977,380**
National Intelligence Program Total		**54,639,507**	**53,873,203**	**47,677,732**	**4,876,865**	**52,554,597**	**-1,318,606**	**-2**	**252,612,965**

[1]FY 2013 - FY 2017 Total includes the OCO only for FY 2013.

Resource Exhibit No. 2B *(Number of Civilian FTEs)*
National Intelligence Program *(Number of Military Positions)*
Total Personnel by Program and Service/Agency[1]
FY 2011 - FY 2013
This Exhibit is SECRET//NOFORN

Program	Service/Agency	FY 2011 Actual Total Personnel	FY 2012 Enacted Total Personnel	FY 2013 Request Total Personnel	FY 2012 - FY 2013 Change Total Personnel	FY 2012 - FY 2013 Change Percent
Department of Defense, NIP						
CCP	Air Force	5,337	5,345	5,310	-35	-1
	Army	3,272	3,270	3,254	-16	-0
	Marine Corps	—	393	392	-1	-0
	NSA	20,877	21,650	21,575	-75	-0
	Navy	4,881	4,425	4,370	-55	-1
CCP Total		**34,367**	**35,083**	**34,901**	**-182**	**-1**
CIAP	CIA	21,426	22,206	22,206	—	—
CIAP Total		**21,426**	**22,206**	**22,206**	**—**	**—**
CMA	Air Force	963	1,052	1,047	-5	-0
CMA Total		**963**	**1,052**	**1,047**	**-5**	**—**
DoD-FCIP	Air Force	705	712	726	14	2
	Army	500	519	571	52	10
	DIA	310	336	367	31	9
	DSS	9	9	14	5	56
	DTRA	33	36	40	4	11
	Marine Corps	13	13	17	4	31
	Navy	529	527	536	9	2
DoD-FCIP Total		**2,099**	**2,152**	**2,271**	**119**	**6**
GDIP	Air Force	3,141	3,234	2,985	-249	-8
	Army	1,064	1,146	1,041	-105	-9
	DIA	10,180	10,295	10,653	358	3
	Marine Corps	—	224	268	44	20
	Navy	2,459	2,305	2,292	-13	-1
	SOCOM	358	358	—	-358	-100
GDIP Total		**17,202**	**17,562**	**17,239**	**-323**	**-2**
NGP	Air Force	274	292	297	5	2
	Army	182	250	214	-36	-14
	Marine Corps	—	6	35	29	483
	NGA	8,224	8,233	7,943	-290	-4
	Navy	25	32	30	-2	-6
NGP Total		**8,705**	**8,813**	**8,519**	**-294**	**-3**
NRP	Air Force	1,577	1,577	1,618	41	3
	Army	22	22	22	—	—
	NRO	972	976	975	-1	-0
	Navy	296	296	289	-7	-2
NRP Total		**2,867**	**2,871**	**2,904**	**33**	**1**
SRP	Navy	249	249	249	—	—
SRP Total		**249**	**249**	**249**	**—**	**—**
Department of Defense, NIP Total		**87,878**	**89,988**	**89,336**	**-652**	**-1**
Non-Defense, NIP						
CMA	CMA	756	690	766	76	11
CMA Total		**756**	**690**	**766**	**76**	**11**

[1]Excludes Foreign Indirect Hires

Resource Exhibit No. 2B (continued) *(Number of Civilian FTEs)*
National Intelligence Program *(Number of Military Positions)*

Total Personnel by Program and Service/Agency[1]
FY 2011 - FY 2013
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Program	Service/Agency	FY 2011 Actual Total Personnel	FY 2012 Enacted Total Personnel	FY 2013 Request Total Personnel	FY 2012 - FY 2013 Change Total Personnel	FY 2012 - FY 2013 Change Percent
DHS	CG Non-DoD	142	250	259	9	4
	DHS	620	690	626	-64	-9
DHS Total		**762**	**940**	**885**	**-55**	**-6**
DOJ	DEA	58	58	58	—	—
	FBI	14,742	15,000	15,014	14	0
DOJ Total		**14,800**	**15,058**	**15,072**	**14**	**0**
Energy	Energy	199	198	199	1	1
Energy Total		**199**	**198**	**199**	**1**	**1**
State	State	359	360	363	3	1
State Total		**359**	**360**	**363**	**3**	**1**
Treasury	Treasury	151	155	156	1	1
Treasury Total		**151**	**155**	**156**	**1**	**1**
Non-Defense, NIP Total		**17,027**	**17,401**	**17,441**	**40**	**0**
National Intelligence Program Total		**104,905**	**107,389**	**106,777**	**-612**	**-1**

[1]Excludes Foreign Indirect Hires

Resource Exhibit No. 5 *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program and Appropriation
FY 2011 - FY 2017
This Exhibit is SECRET//NOFORN

Program	Appropriation	FY 2011	FY 2012	FY 2013[1]	FY 2014	FY 2015	FY 2016	FY 2017
CCP	Fam Hsg Con, AF	50	50	—	—	—	—	—
	Fam Hsg O&M, AF	4,052	4,119	3,463	3,438	3,406	3,482	3,642
	Fam Hsg O&M, DW	10,402	10,250	10,973	11,147	11,335	11,527	11,883
	MilCon, DW	707,947	361,753	562,030	507,553	125,698	53,000	47,321
	O&M, A	108,003	107,912	96,047	72,698	74,711	76,287	77,658
	O&M, AF	160,832	164,328	157,893	162,002	161,848	164,988	166,653
	O&M, DW	6,644,135	6,807,617	7,007,018	6,757,464	6,758,435	6,967,731	7,056,018
	O&M, MC	—	837	1,046	1,061	1,081	1,101	1,115
	O&M, N	70,209	58,793	52,710	54,756	55,810	56,932	57,629
	P, DW	403,589	336,503	369,762	348,313	323,805	324,545	322,735
	RDT&E, DW	2,627,944	2,661,873	2,506,823	2,370,319	2,248,074	2,221,552	2,206,019
CCP Total		10,737,163	10,514,035	10,767,765	10,288,751	9,764,203	9,881,145	9,950,673
CIAP	OP, AF	14,652,379	15,332,901	14,710,025	12,109,861	12,299,144	12,633,506	12,815,446
CIAP Total		14,652,379	15,332,901	14,710,025	12,109,861	12,299,144	12,633,506	12,815,446
CIARDS	CIARDS	292,000	513,700	514,000	514,000	514,000	514,000	514,000
CIARDS Total		292,000	513,700	514,000	514,000	514,000	514,000	514,000
CMA	ICMA	672,601	547,891	540,252	566,850	578,665	597,119	607,036
	RDT&E, AF	1,390,793	1,322,364	1,136,135	1,382,639	1,650,208	1,511,045	1,704,716
CMA Total		2,063,394	1,870,255	1,676,387	1,949,489	2,228,873	2,108,164	2,311,752
DHS	Analysis and Operations, DHS	223,299	231,542	205,085	206,932	210,449	214,026	218,094
	Office of the Under Secretary for Management	29,150	28,100	28,146	28,397	28,883	29,374	29,928
	Operating Expenses	22,687	47,717	51,101	51,560	52,438	53,332	54,344
DHS Total		275,136	307,359	284,332	286,889	291,770	296,732	302,366
DOJ	Construction	105,095	78,982	78,982	80,326	81,693	83,081	84,577
	Salaries and Expenses, DEA	13,578	13,647	14,123	14,362	14,605	14,851	15,118
	Salaries and Expenses, FBI	2,859,656	2,918,166	2,926,853	2,973,857	3,021,655	3,070,260	3,122,601
DOJ Total		2,978,329	3,010,795	3,019,958	3,068,545	3,117,953	3,168,192	3,222,296
DoD-FCIP	BRAC	21	—	—	—	—	—	—
	O&M, A	97,444	97,616	110,358	95,410	98,543	101,479	102,431
	O&M, AF	120,818	101,244	95,040	84,986	88,193	91,329	92,117
	O&M, DW	159,996	170,114	179,886	151,252	156,524	164,933	165,868
	O&M, MC	507	1,632	4,329	4,857	5,437	5,224	5,347
	O&M, N	124,419	120,674	129,494	123,291	127,003	130,399	131,587
	OP, A	413	423	434	441	449	457	466
	OP, N	—	—	1,001	—	—	—	—
	P, MC	—	—	1,201	800	800	1,500	816
	RDT&E, AF	2,109	2,149	2,185	2,221	2,258	2,296	2,342
	RDT&E, DW	11,993	12,043	5,032	4,998	4,947	3,999	3,945
DoD-FCIP Total		517,720	505,895	528,960	468,256	484,154	501,616	504,919
Energy	Other Defense Activities	163,700	186,699	188,619	188,619	188,619	188,619	188,619
Energy Total		163,700	186,699	188,619	188,619	188,619	188,619	188,619

Resource Exhibit No. 5 (continued) *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program and Appropriation
FY 2011 - FY 2017
This Exhibit is SECRET//NOFORN

Program	Appropriation	FY 2011	FY 2012	FY 2013[1]	FY 2014	FY 2015	FY 2016	FY 2017
GDIP	AP, AF	12,909	16,502	20,164	16,991	17,463	12,018	9,303
	BRAC	5,022	—	—	—	—	—	—
	Fam Hsg O&M, DW	38,548	39,251	39,993	40,628	41,318	42,020	42,872
	MilCon, AF	78,851	79,000	—	—	—	—	—
	MilCon, DW	2,994	30,584	2,919	—	—	—	—
	O&M, A	260,679	259,869	218,177	200,632	192,443	195,603	198,911
	O&M, AF	514,077	549,487	525,873	529,506	602,706	619,833	633,745
	O&M, DW	3,090,315	3,109,351	2,976,404	2,281,670	2,329,035	2,365,332	2,403,146
	O&M, MC	—	38,561	35,658	33,738	33,046	33,542	34,062
	O&M, N	406,086	352,233	338,887	345,820	348,602	354,775	360,840
	OP, A	2,908	2,975	1,270	1,291	1,313	1,341	1,368
	OP, AF	60,555	29,415	24,573	41,394	56,888	67,947	61,414
	OP, N	21,608	14,402	12,062	10,108	10,132	10,243	10,466
	P, DW	46,072	39,035	24,991	37,258	24,771	20,846	21,120
	P, MC	—	—	479	446	410	415	423
	RDT&E, A	3,928	4,023	4,099	4,163	4,235	4,306	4,393
	RDT&E, AF	41,914	56,787	46,387	52,482	43,036	30,531	29,839
	RDT&E, DW	120,085	121,636	107,383	96,022	95,992	96,345	96,701
	RDT&E, N	60,458	72,472	50,823	51,131	53,612	54,211	55,342
GDIP Total		4,767,009	4,815,583	4,430,142	3,743,280	3,855,002	3,909,308	3,963,945
NGP	BRAC	134,297	1,791	—	—	—	—	—
	MilCon, DW	—	63,878	—	—	—	—	265,504
	O&M, A	47,306	50,437	46,792	51,112	52,464	51,053	50,624
	O&M, AF	72,629	82,585	82,508	82,706	82,247	78,570	74,225
	O&M, DW	3,786,519	3,765,161	3,622,550	3,079,112	3,174,373	3,165,183	3,264,611
	O&M, MC	1,859	4,720	6,976	7,441	7,901	7,281	7,336
	O&M, N	8,141	8,280	7,601	8,059	8,535	8,413	8,567
	OP, A	—	1,670	1,731	1,822	1,948	2,088	2,130
	P, DW	271,191	188,749	194,051	199,672	228,300	272,839	146,748
	P, MC	—	1,606	610	3,208	1,292	901	908
	RDT&E, A	496	513	529	543	560	560	571
	RDT&E, AF	28,911	30,345	31,875	28,684	29,483	18,364	13,389
	RDT&E, DW	876,100	841,328	883,191	809,324	907,295	931,652	768,304
	RDT&E, N	496	506	516	523	531	531	542
NGP Total		5,227,945	5,041,569	4,878,930	4,272,206	4,494,929	4,537,435	4,603,459
NRP	MslP, AF	805,106	768,980	1,097,483	1,378,812	1,908,564	1,662,508	1,438,311
	O&M, AF	52,831	49,729	57,086	59,257	61,019	62,832	65,625
	O&M, N	20,757	27,012	22,943	23,821	24,536	25,272	26,420
	OP, AF	2,279,991	2,338,408	2,269,031	2,299,888	2,491,919	2,630,320	2,719,955
	RDT&E, AF	8,243,060	7,227,206	6,875,380	6,568,544	6,511,225	7,018,456	7,543,653
NRP Total		11,401,745	10,411,335	10,321,923	10,330,322	10,997,263	11,399,388	11,793,964
SRP	RDT&E, N	1,466,792	1,267,751	1,133,604	1,137,278	1,218,707	1,248,078	1,273,255
SRP Total		1,466,792	1,267,751	1,133,604	1,137,278	1,218,707	1,248,078	1,273,255

Resource Exhibit No. 5 (continued) *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program and Appropriation
FY 2011 - FY 2017
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Program	Appropriation	FY 2011	FY 2012	FY 2013[1]	FY 2014	FY 2015	FY 2016	FY 2017
State	Diplomatic and Consular Programs	68,773	68,203	72,655	73,981	75,373	76,798	78,249
State Total		68,773	68,203	72,655	73,981	75,373	76,798	78,249
Treasury	Salaries and Expenses, Treasury	27,422	27,123	27,297	27,474	27,652	27,832	28,019
Treasury Total		27,422	27,123	27,297	27,474	27,652	27,832	28,019
National Intelligence Program Total		**54,639,507**	**53,873,203**	**52,554,597**	**48,458,951**	**49,557,642**	**50,490,813**	**51,550,962**

[1]FY 2013 - FY 2017 Total includes the OCO only for FY 2013.

Resource Exhibit No. 7B *(Dollars in Thousands)*
National Intelligence Program
Comparison of FY 2012 Total and FY 2013 Total Request by Program
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Program	FY 2012 Total	FY 2013 Base Request	FY 2013 OCO Request	FY 2013 Total Request	FY 2012 Total Compared to FY 2013 Total Request
Defense Appropriations					
CCP	10,514,035	10,036,851	730,914	10,767,765	253,730
CIAP	15,332,901	12,037,708	2,672,317	14,710,025	-622,876
CIARDS	513,700	514,000	—	514,000	300
CMA	1,870,255	1,676,387	—	1,676,387	-193,868
DoD-FCIP	505,895	456,475	72,485	528,960	23,065
GDIP	4,815,583	3,655,662	774,480	4,430,142	-385,441
NGP	5,041,569	4,339,195	539,735	4,878,930	-162,639
NRP	10,411,335	10,268,773	53,150	10,321,923	-89,412
SRP	1,267,751	1,099,820	33,784	1,133,604	-134,147
Defense Appropriations Total	**50,273,024**	**44,084,871**	**4,876,865**	**48,961,736**	**-1,311,288**
Non-Defense Appropriations					
DHS	307,359	284,332	—	284,332	-23,027
DOJ	3,010,795	3,019,958	—	3,019,958	9,163
Energy	186,699	188,619	—	188,619	1,920
State	68,203	72,655	—	72,655	4,452
Treasury	27,123	27,297	—	27,297	174
Non-Defense Appropriations Total	**3,600,179**	**3,592,861**	**—**	**3,592,861**	**-7,318**
National Intelligence Program Total	**53,873,203**	**47,677,732**	**4,876,865**	**52,554,597**	**-1,318,606**

Resource Exhibit No. 9
National Intelligence Program
Estimated Funding for Counterterrorism
FY 2011 - FY 2013
This Exhibit is SECRET//NOFORN

(Dollars in Thousands)

						FY 2012 - FY 2013 Change	
Program	**FY 2011 Actual**	**FY 2012 Enacted**	**FY 2013 Base**	**FY 2013 OCO**	**FY 2013 Request**	**Funds**	**Percent**
CCP	2,651,989	2,570,763	1,827,354	730,914	2,558,268	-12,495	0
CIAP	6,796,553	7,073,722	4,473,356	2,205,992	6,679,348	-394,374	-6
CMA	1,215,078	1,172,548	1,057,954	—	1,057,954	-114,594	-10
DHS	—	183,033	165,407	—	165,407	-17,626	-10
DOJ	1,372,785	1,378,348	1,386,791	—	1,386,791	8,443	1
Energy	3,131	3,108	3,108	—	3,108	—	—
GDIP	1,344,200	1,250,442	599,789	408,440	1,008,229	-242,213	-19
NGP	1,358,459	1,255,741	674,758	523,017	1,197,775	-57,966	-5
NRP	2,071,936	2,024,003	2,227,589	9,036	2,236,625	212,622	11
SRP	366,809	321,924	254,681	33,784	288,465	-33,459	-10
State	2,835	2,819	2,896	—	2,896	77	3
Treasury	15,221	15,194	15,044	—	15,044	-150	-1
Counterterrorism Total	**17,198,996**	**17,251,645**	**12,688,727**	**3,911,183**	**16,599,910**	**-651,735**	**-4**

Resource Exhibit No. 10 *(Dollars in Thousands)*
National Intelligence Program
Estimated Funding for Counterproliferation
FY 2011 - FY 2013
This Exhibit is SECRET//NOFORN

Program	FY 2011 Actual	FY 2012 Enacted	FY 2013 Base	FY 2013 OCO	FY 2013 Request	FY 2012 - FY 2013 Change Funds	Percent
CCP	824,757	860,681	864,288	—	864,288	3,607	0
CIAP	1,932,216	2,084,133	2,065,665	6,069	2,071,734	-12,399	-1
CMA	272,168	211,998	177,767	—	177,767	-34,231	-16
DHS	—	2,189	2,265	—	2,265	76	3
DOJ	328,787	333,344	333,033	—	333,033	-311	0
Energy	86,852	105,956	119,643	—	119,643	13,687	13
GDIP	673,450	651,608	459,139	60,816	519,955	-131,653	-20
NGP	847,285	850,970	859,703	16,718	876,421	25,451	3
NRP	1,853,746	1,614,191	1,564,895	4,784	1,569,679	-44,512	-3
SRP	184,262	163,182	146,448	—	146,448	-16,734	-10
State	1,385	1,377	1,413	—	1,413	36	3
Treasury	2,439	2,381	2,478	—	2,478	97	4
Counterproliferation Total	**7,007,347**	**6,882,010**	**6,596,737**	**88,387**	**6,685,124**	**-196,886**	**-3**

Resource Exhibit No. 11 *(Dollars in Thousands)*
National Intelligence Program

Estimated Funding for Homeland Security With Related WMD[1]
FY 2011 - FY 2013
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Description	Program	FY 2011 Actual	FY 2012 Enacted	FY 2013 Base	FY 2013 OCO	FY 2013 Request	FY 2012 - FY 2013 Change Funds	Percent
Homeland Security	CCP	358,204	382,225	394,295	1,754	396,049	13,824	4
	CIAP	36,492	39,314	39,625	—	39,625	311	1
	CMA	335,798	301,108	325,186	—	325,186	24,078	8
	DHS	272,186	300,624	273,758	—	273,758	-26,866	-9
	DoD-FCIP	14,867	14,765	14,553	—	14,553	-212	-1
	DoJ	2,592,144	2,807,474	2,831,971	—	2,831,971	24,497	1
	Energy	73,158	73,853	73,795	—	73,795	-58	0
	GDIP	22,841	6,752	6,719	—	6,719	-33	0
	NGP	170,837	165,759	121,244	—	121,244	-44,515	-27
	NRP	7,545	7,001	6,070	—	6,070	-931	-13
	SRP	25,949	20,826	18,799	—	18,799	-2,027	-10
	State	401	401	406	—	406	5	1
	Treasury	27,422	27,123	27,296	—	27,296	173	1
Homeland Security Total		**3,937,844**	**4,147,225**	**4,133,717**	**1,754**	**4,135,471**	**-11,754**	**-1**
Homeland Security - Related WMD	DHS	—	689	691	—	691	2	0
	DoJ	76,318	76,556	76,970	—	76,970	414	1
	Energy	18,895	17,579	17,579	—	17,579	—	—
Homeland Security - Related WMD Total		**95,213**	**94,824**	**95,240**	**—**	**95,240**	**416**	**1**
NIP Homeland Security with Related Weapons of Mass Destruction Total		**4,033,057**	**4,242,049**	**4,228,957**	**1,754**	**4,230,711**	**-11,338**	**-1**

[1]Definition of Homeland Security from OMB Circular A-11.

Resource Exhibit No. 12
National Intelligence Program
Estimated Funding for Counternarcotics
FY 2011 - FY 2013
This Exhibit is SECRET//NOFORN

(Dollars in Thousands)

Program	FY 2011 Actual	FY 2012 Enacted	FY 2013 Base	FY 2013 OCO	FY 2013 Request	FY 2012 - FY 2013 Change Funds	FY 2012 - FY 2013 Change Percent
CCP	308,321	308,087	318,938	—	318,938	10,851	4
CIAP	579,033	574,392	461,457	210	461,667	-112,725	-20
CMA	9,145	17,188	14,415	—	14,415	-2,773	-16
DOJ	13,578	13,647	14,123	—	14,123	476	3
GDIP	257	290	284	—	284	-6	-2
NGP	144,361	141,931	141,226	—	141,226	-705	0
NRP	305,372	265,267	259,312	570	259,882	-5,385	-2
SRP	47,609	40,554	34,503	—	34,503	-6,051	-15
State	715	710	730	—	730	20	3
Treasury	309	310	332	—	332	22	7
Counternarcotics Total	**1,408,700**	**1,362,376**	**1,245,320**	**780**	**1,246,100**	**-116,276**	**-9**

Resource Exhibit No. 13 *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program, Expenditure Center, and Project
FY 2011 - FY 2013
This Exhibit is SECRET//NOFORN

Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
CCP	Analysis	Analytic Integrity & Standards	32,962	34,635	39,752	5,117
		Cyber	164,090	145,981	138,639	-7,342
		Military Forces & Weapons Analysis	98,983	92,199	80,817	-11,382
		Regional	191,839	227,812	207,302	-20,510
		Transnational	159,521	160,573	188,132	27,559
	Analysis Total		**647,395**	**661,200**	**654,642**	**-6,558**
	Analysis Enabling	Analytic Operational Support	171,484	175,530	179,561	4,031
		Analytics Modernization	423,831	512,479	427,449	-85,030
		Linguists/Translators	228,123	226,820	217,504	-9,316
	Analysis Enabling Total		**823,438**	**914,829**	**824,514**	**-90,315**
	Computer Network Operations	Data Acquisition and Cover Support	56,949	100,987	117,605	16,618
		GENIE	615,177	636,175	651,743	15,568
		SIGINT Enabling	298,613	275,376	254,943	-20,433
	Computer Network Operations Total		**970,739**	**1,012,538**	**1,024,291**	**11,753**
	Cryptanalysis & Exploitation Services	Analysis of Target Systems	39,429	35,128	34,321	-807
		Cryptanalytic IT Systems	130,012	136,797	247,121	110,324
		Cyber Cryptanalysis	181,834	110,673	115,300	4,627
		Exploitation Solutions	90,024	59,915	58,308	-1,607
		Microelectronics	64,603	61,672	45,886	-15,786
		PEO Program	37,683	65,892	47,185	-18,707
		PEO Program B	132,500	39,471	18,000	-21,471
		PEO Program C	83,599	242,945	360,898	117,953
		Target Pursuit	75,686	70,144	76,168	6,024
		Target Reconnaissance & Survey	77,668	74,513	—	-74,513
	Cryptanalysis & Exploitation Services Total		**913,038**	**897,150**	**1,003,187**	**106,037**
	Enterprise IT Systems	Connectivity	407,592	366,995	363,554	-3,441
		Data Handling & End-User Functionality	157,110	237,642	225,780	-11,862
		Enterprise Architecture & Planning	18,233	11,801	16,467	4,666
		Information Assurance	141,190	174,659	139,893	-34,766
		Management & Support	79,799	92,200	93,395	1,195
		Platforms	773,633	729,336	750,215	20,879
	Enterprise IT Systems Total		**1,577,557**	**1,612,633**	**1,589,304**	**-23,329**
	Enterprise Management	Acquisition Management	111,495	110,325	116,699	6,374
		COOP	6,702	6,633	7,015	382
		Corporate Support	—	60,599	65,515	4,916
		Education & Training	227,968	244,249	232,999	-11,250
		Entitlements Reimbursement	2,089	1,805	1,805	—
		Finance	108,355	95,415	110,879	15,464
		Foreign Relations & Liaison	23,312	24,328	20,868	-3,460
		HQ Management	139,033	111,151	115,822	4,671
		Human Resources	128,380	125,757	127,313	1,556
		Military HQ Management	74,349	73,346	69,982	-3,364

Resource Exhibit No. 13 (continued) *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program, Expenditure Center, and Project
FY 2011 - FY 2013
This Exhibit is SECRET//NOFORN

Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
		Security	255,787	266,175	269,790	3,615
		Systems Engineering: SIGINT	97,938	110,075	85,984	-24,091
	Enterprise Management Total		**1,175,408**	**1,229,858**	**1,224,671**	**-5,187**
	Facilities & Logistics	Facilities	1,490,711	1,199,825	1,514,217	314,392
		Logistics	105,409	107,464	102,501	-4,963
	Facilities & Logistics Total		**1,596,120**	**1,307,289**	**1,616,718**	**309,429**
	Mid Point RF Access	FORNSAT	136,710	108,385	81,330	-27,055
		Quick Reaction Capabilities	40,136	45,957	—	-45,957
		RF Operations	103,985	65,538	98,922	33,384
		Tailored RF Solutions	—	—	131,276	131,276
		Terrestrial Collection	90,978	84,302	69,090	-15,212
	Mid Point RF Access Total		**371,809**	**304,182**	**380,618**	**76,436**
	Mission Management / Tasking	Collection Management	76,193	113,924	125,896	11,972
		Customer Service	149,188	173,186	158,473	-14,713
		Foreign Partner Operations	74,746	71,642	67,287	-4,355
		Journeyman	13,357	13,206	12,986	-220
		Mission Management Modernization	29,139	22,220	22,333	113
	Mission Management / Tasking Total		**342,623**	**394,178**	**386,975**	**-7,203**
	Mission Processing & Exploitation	ELINT Modernization	75,999	40,923	55,706	14,783
		FISINT Modernization	9,725	34,196	29,510	-4,686
		Net-centric Capabilities	292,217	281,552	219,583	-61,969
	Mission Processing & Exploitation Total		**377,941**	**356,671**	**304,799**	**-51,872**
	Research & Technology	Computer & Information Science Research	20,777	44,254	29,579	-14,675
		Coping with Information Overload	39,046	64,332	48,612	-15,720
		Cryptologic Math & IDA Research	146,432	128,511	119,300	-9,211
		Human Language Technology Research	26,361	34,030	29,357	-4,673
		Improving Research Operations	37,181	30,503	31,195	692
		Owning the Net	66,933	61,167	67,589	6,422
		Penetrating Hard Targets	62,783	55,347	79,740	24,393
		Ubiquitous Secure Collaboration	14,651	25,762	23,741	-2,021
	Research & Technology Total		**414,164**	**443,906**	**429,113**	**-14,793**
	Sensitive Technical Collection	CLANSIG	346,961	325,506	348,196	22,690
		SCS	269,708	245,829	249,088	3,259
	Sensitive Technical Collection Total		**616,669**	**571,335**	**597,284**	**25,949**
	SIGINT Stations	Cryptologic Centers	29,299	30,602	24,588	-6,014
		Field Sites	191,128	184,643	185,917	1,274
		OCMC	6,166	6,416	7,165	749
		SIGINT Ground Operations	71,912	62,008	50,519	-11,489
	SIGINT Stations Total		**298,505**	**283,669**	**268,189**	**-15,480**
	Special Source Access	Corporate Partner Access	393,667	310,234	278,131	-32,103
		Foreign Partner Access	90,979	75,108	56,593	-18,515

Resource Exhibit No. 13 (continued) *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program, Expenditure Center, and Project
FY 2011 - FY 2013
This Exhibit is SECRET//NOFORN

Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
		National Program	1,771	2,038	2,247	209
		Special Source Operations	125,340	137,217	126,489	-10,728
	Special Source Access Total		**611,757**	**524,597**	**463,460**	**-61,137**
CCP Total			**10,737,163**	**10,514,035**	**10,767,765**	**253,730**
CIAP	Analysis	Analytic Integrity & Standards	5,729	6,063	5,872	-191
		CI	14,301	14,515	14,586	71
		Regional	214,891	210,477	209,161	-1,316
		Transnational	456,005	456,887	434,248	-22,639
	Analysis Total		**690,926**	**687,942**	**663,867**	**-24,075**
	Analysis Enabling	Education & Training	39,333	40,797	37,335	-3,462
		Mission IT	239,295	257,685	252,862	-4,823
		Mission Support	81,360	91,377	99,937	8,560
		Production and Dissemination	22,564	25,046	34,488	9,442
	Analysis Enabling Total		**382,552**	**414,905**	**424,622**	**9,717**
	Computer Network Operations	Education & Training	4,209	2,245	2,250	5
		Information Operations	637,295	652,559	673,399	20,840
		Mission IT	7,830	9,443	9,726	283
	Computer Network Operations Total		**649,334**	**664,247**	**685,375**	**21,128**
	Counterintelligence	CI Operations	125,942	141,669	140,061	-1,608
		Education & Training	4,779	5,892	4,257	-1,635
		Mission Activities and Support	15,785	14,497	11,784	-2,713
		Mission IT	2,178	2,189	2,096	-93
	Counterintelligence Total		**148,684**	**164,247**	**158,198**	**-6,049**
	Covert Action	Covert Action Infrastructure	600,696	542,075	523,402	-18,673
		Covert Action Programs	2,011,811	1,970,933	2,036,006	65,073
	Covert Action Total		**2,612,507**	**2,513,008**	**2,559,408**	**46,400**
	Enterprise IT Systems	Connectivity	85,795	67,225	70,878	3,653
		Data Handling & End-User Functionality	35,004	56,120	42,839	-13,281
		Education & Training	9,566	9,782	10,267	485
		Enterprise Architecture & Planning	8,252	8,619	15,306	6,687
		Information Assurance	768	12,736	6,328	-6,408
		Management & Support	256,750	279,083	249,467	-29,616
		Platforms	126,993	138,301	133,940	-4,361
	Enterprise IT Systems Total		**523,128**	**571,866**	**529,025**	**-42,841**
	Enterprise Management	Acquisition Management	22,284	33,149	26,262	-6,887
		COOP	9,401	8,748	6,188	-2,560
		Corporate Support	113,139	129,224	148,737	19,513
		Education & Training	104,253	110,671	101,423	-9,248
		Finance	52,198	51,810	57,853	6,043
		HQ Management	153,774	115,838	113,833	-2,005
		Human Resources	184,854	190,959	186,051	-4,908
		Inspector General	—	32,776	34,796	2,020
		Security	242,078	224,078	224,265	187
	Enterprise Management Total		**881,981**	**897,253**	**899,408**	**2,155**

Resource Exhibit No. 13 (continued) *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program, Expenditure Center, and Project
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Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
	Facilities & Logistics	Facilities	147,049	251,686	154,231	-97,455
		Logistics	18,046	18,472	17,347	-1,125
	Facilities & Logistics Total		**165,095**	**270,158**	**171,578**	**-98,580**
	HUMINT Enabling	Cover Services	57,765	67,360	68,656	1,296
		Education & Training	156,778	162,967	169,166	6,199
		Mission IT	794,985	815,727	814,815	-912
		Mission Support	1,376,353	1,527,520	1,476,607	-50,913
	HUMINT Enabling Total		**2,385,881**	**2,573,574**	**2,529,244**	**-44,330**
	HUMINT Operations	Headquarters	19,268	18,918	19,119	201
		Non-Traditional	456,491	453,143	466,137	12,994
		Traditional	1,737,389	1,815,936	1,858,423	42,487
	HUMINT Operations Total		**2,213,148**	**2,287,997**	**2,343,679**	**55,682**
	HUMINT Technical Tools	Education & Training	8,488	10,606	11,167	561
		Mission IT	6,619	7,844	6,358	-1,486
		Special Activities and Platforms	373,212	368,215	356,571	-11,644
		Tactical Collection	486,824	479,919	495,957	16,038
		Technical Tradecraft	458,790	500,370	543,333	42,963
	HUMINT Technical Tools Total		**1,333,933**	**1,366,954**	**1,413,386**	**46,432**
	Mission Management / Tasking	Mission IT	4,646	7,938	3,531	-4,407
		National Clandestine Service Community	8,282	9,252	7,373	-1,879
	Mission Management / Tasking Total		**12,928**	**17,190**	**10,904**	**-6,286**
	Open Source	Collection & Production	245,531	260,126	253,068	-7,058
		Education & Training	10,921	12,678	12,652	-26
		Mission IT	153,126	111,136	121,627	10,491
	Open Source Total		**409,578**	**383,940**	**387,347**	**3,407**
	Research & Technology	Science and Research	85,315	87,310	76,763	-10,547
		Strategic Technical Investment	61,862	52,640	50,198	-2,442
	Research & Technology Total		**147,177**	**139,950**	**126,961**	**-12,989**
	Reserve for Contingencies	Reserve	15,000	20,000	35,000	15,000
	Reserve for Contingencies Total		**15,000**	**20,000**	**35,000**	**15,000**
	Sensitive Technical Collection	Clandestine Technical Collection	1,208,948	1,431,227	837,755	-593,472
		Clandestine Weapons Technical Collection	239,093	247,072	266,429	19,357
		CLANSIG	446,216	467,900	464,625	-3,275
		Education & Training	13,889	15,269	21,574	6,305
		SCS	95,006	121,537	105,758	-15,779
		Support to National Programs	77,375	76,665	75,882	-783
	Sensitive Technical Collection Total		**2,080,527**	**2,359,670**	**1,772,023**	**-587,647**
CIAP Total			**14,652,379**	**15,332,901**	**14,710,025**	**-622,876**
CIARDS	Enterprise Management	Human Resources	292,000	513,700	514,000	300
	Enterprise Management Total		**292,000**	**513,700**	**514,000**	**300**
CIARDS Total			**292,000**	**513,700**	**514,000**	**300**

Resource Exhibit No. 13 (continued) *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program, Expenditure Center, and Project
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Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
CMA	Analysis	Intelligence Today	2,067	—	—	—
		NIC	55,930	50,412	42,952	-7,460
		President's Daily Briefing Staff	7,969	8,017	8,488	471
	Analysis Total		**65,966**	**58,429**	**51,440**	**-6,989**
	Enterprise IT Systems	Chief Information Office	175,796	73,791	142,509	68,718
		Information Integration	127,906	98,281	—	-98,281
		Program Manager Information Sharing Environment	21,751	23,036	25,884	2,848
	Enterprise IT Systems Total		**325,453**	**195,108**	**168,393**	**-26,715**
	Enterprise Management	Acquisition and Technology	43,888	34,385	32,212	-2,173
		Analysis	50,275	—	—	—
		Chief Financial Office	16,734	24,690	30,582	5,892
		Chief Human Capital Officer	54,885	35,434	—	-35,434
		Collection	39,797	—	—	—
		COOP	70,862	72,552	57,817	-14,735
		Director of National Intelligence	105,594	65,944	39,463	-26,481
		Education & Training	84,068	89,492	—	-89,492
		Human Capital and Learning	—	—	103,903	103,903
		Inspector General	—	5,381	6,901	1,520
		Mission Support Center	241,914	310,762	241,186	-69,576
		Policy and Outreach Management	—	17,105	22,800	5,695
		Policy Plans and Requirements	18,758	—	—	—
		Security	36,497	34,508	33,302	-1,206
		Systems and Resource Analysis	26,328	26,946	28,913	1,967
	Enterprise Management Total		**789,600**	**717,199**	**597,079**	**-120,120**
	Mission Management / Tasking	Community CI	56,944	61,980	46,888	-15,092
		Mission Managers	8,515	—	—	—
		National Intelligence Coordination Center	12,671	—	—	—
		National Intelligence Integration	—	95,989	85,469	-10,520
		NCPC	60,627	40,606	22,461	-18,145
		NCTC	376,700	368,373	371,578	3,205
	Mission Management / Tasking Total		**515,457**	**566,948**	**526,396**	**-40,552**
	Research & Technology	Intelligence Advanced Research Projects Activity (IARPA)	350,978	327,349	333,079	5,730
		National R&D Commission	2,000	—	—	—
		Rapid Technology Transition Initiative	13,940	5,222	—	-5,222
	Research & Technology Total		**366,918**	**332,571**	**333,079**	**508**
CMA Total			**2,063,394**	**1,870,255**	**1,676,387**	**-193,868**
DHS	Analysis	Homeland Security	223,299	230,084	192,343	-37,741
		Transnational	22,687	47,717	41,218	-6,499
	Analysis Total		**245,986**	**277,801**	**233,561**	**-44,240**
	Counterintelligence	DHS Counterintelligence	—	—	12,742	12,742
		USCG Counterintelligence	—	—	9,883	9,883
	Counterintelligence Total		**—**	**—**	**22,625**	**22,625**

Resource Exhibit No. 13 (continued) *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program, Expenditure Center, and Project
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Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
	Enterprise Management	COOP	—	1,458	—	-1,458
		Security	29,150	28,100	28,146	46
	Enterprise Management Total		**29,150**	**29,558**	**28,146**	**-1,412**
DHS Total			**275,136**	**307,359**	**284,332**	**-23,027**
DoD-FCIP	Analysis	CI	34,283	37,974	38,162	188
	Analysis Total		**34,283**	**37,974**	**38,162**	**188**
	Counterintelligence	CI Campaigns	75,625	67,937	60,750	-7,187
		CI Operations	21,336	23,678	34,116	10,438
		Defense Cyber Crime Center	15,459	17,935	19,328	1,393
		Education & Training	39,072	37,821	36,159	-1,662
		Joint Terrorism Task Force	14,867	14,765	14,553	-212
		Mission Activities and Support	233,254	216,835	223,734	6,899
		Mission IT	38,354	37,322	36,364	-958
		Research & Technology Protection	6,424	6,454	20,513	14,059
	Counterintelligence Total		**444,391**	**422,747**	**445,517**	**22,770**
	Enterprise IT Systems	Platforms	12,774	15,578	16,183	605
	Enterprise IT Systems Total		**12,774**	**15,578**	**16,183**	**605**
	Enterprise Management	HQ Management	24,199	21,382	20,613	-769
		Human Resources	2,052	1,906	2,003	97
	Enterprise Management Total		**26,251**	**23,288**	**22,616**	**-672**
	Facilities & Logistics	Facilities	21	6,308	6,482	174
	Facilities & Logistics Total		**21**	**6,308**	**6,482**	**174**
DoD-FCIP Total			**517,720**	**505,895**	**528,960**	**23,065**
DOJ	Analysis	Computer Intrusions	114,083	116,434	—	-116,434
		Transnational	759,564	771,582	849,037	77,455
	Analysis Total		**873,647**	**888,016**	**849,037**	**-38,979**
	Analysis Enabling	Linguists/Translators	147,022	148,427	149,263	836
	Analysis Enabling Total		**147,022**	**148,427**	**149,263**	**836**
	Counterintelligence	CI Operations	562,345	367,383	489,821	122,438
	Counterintelligence Total		**562,345**	**367,383**	**489,821**	**122,438**
	Enterprise IT Systems	Platforms	54,670	40,960	40,034	-926
	Enterprise IT Systems Total		**54,670**	**40,960**	**40,034**	**-926**
	Enterprise Management	Education & Training	41,029	46,429	45,945	-484
		HQ Management	471,434	520,945	25,038	-495,907
	Enterprise Management Total		**512,463**	**567,374**	**70,983**	**-496,391**
	Facilities & Logistics	Facilities	60,311	43,480	43,256	-224
	Facilities & Logistics Total		**60,311**	**43,480**	**43,256**	**-224**
	HUMINT Operations	Traditional	471,449	663,226	919,798	256,572
	HUMINT Operations Total		**471,449**	**663,226**	**919,798**	**256,572**
	Technical Operations	Computer Intrusions	—	—	168,146	168,146
		Technical Services	296,422	291,929	289,620	-2,309
	Technical Operations Total		**296,422**	**291,929**	**457,766**	**165,837**
DOJ Total			**2,978,329**	**3,010,795**	**3,019,958**	**9,163**
Energy	Analysis	Transnational	105,862	126,288	142,771	16,483
	Analysis Total		**105,862**	**126,288**	**142,771**	**16,483**

Resource Exhibit No. 13 (continued) *(Dollars in Thousands)*
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Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
	Counterintelligence	CI Operations	57,838	60,411	45,848	-14,563
	Counterintelligence Total		**57,838**	**60,411**	**45,848**	**-14,563**
Energy Total			**163,700**	**186,699**	**188,619**	**1,920**
GDIP	Analysis	Analytic Integrity & Standards	1,081	1,592	—	-1,592
		C4ISR Analysis	98,071	100,670	133,051	32,381
		Medical	19,791	21,689	20,218	-1,471
		Military Forces & Weapons Analysis	136,704	126,135	127,647	1,512
		Regional	164,595	170,533	154,064	-16,469
		S&T Analysis	303,337	273,389	272,155	-1,234
		Transnational	228,118	247,175	210,191	-36,984
		Warning	15,319	17,725	17,370	-355
	Analysis Total		**967,016**	**958,908**	**934,696**	**-24,212**
	Analysis Enabling	Analytic Tools	86,927	130,671	154,132	23,461
		Education & Training	12,423	14,292	19,654	5,362
		Mission Support	72,624	83,894	74,228	-9,666
	Analysis Enabling Total		**171,974**	**228,857**	**248,014**	**19,157**
	Enterprise IT Systems	Connectivity	253,578	246,141	212,087	-34,054
		Enterprise Architecture & Planning	40,793	44,046	44,594	548
		Information Assurance	22,943	42,238	44,184	1,946
		Management & Support	189,018	169,135	147,293	-21,842
		Platforms	458,876	428,516	385,254	-43,262
	Enterprise IT Systems Total		**965,208**	**930,076**	**833,412**	**-96,664**
	Enterprise Management	Acquisition Management	16,755	18,590	18,594	4
		COOP	4,683	4,926	5,438	512
		Education & Training	62,849	66,190	74,278	8,088
		Finance	60,478	66,589	74,315	7,726
		Foreign Relations & Liaison	9,232	10,316	—	-10,316
		HQ Management	52,128	53,609	52,095	-1,514
		Human Resources	59,347	52,720	68,170	15,450
		Security	86,005	87,659	108,791	21,132
	Enterprise Management Total		**351,477**	**360,599**	**401,681**	**41,082**
	Facilities & Logistics	Facilities	287,110	311,386	181,221	-130,165
		Logistics	164,068	126,974	93,699	-33,275
	Facilities & Logistics Total		**451,178**	**438,360**	**274,920**	**-163,440**
	HUMINT Enabling	Cover Services	30,453	32,460	41,932	9,472
		Education & Training	50,450	45,519	46,034	515
		Mission IT	19,679	8,490	8,936	446
		Mission Support	258,833	303,126	310,263	7,137
	HUMINT Enabling Total		**359,415**	**389,595**	**407,165**	**17,570**
	HUMINT Operations	Non-Traditional	208,226	214,606	175,599	-39,007
		Special Mission Unit	76,180	72,683	—	-72,683
		Traditional	109,835	114,395	129,037	14,642
	HUMINT Operations Total		**394,241**	**401,684**	**304,636**	**-97,048**
	MASINT	Close Access/Persistent Surveillance	41,265	42,523	31,961	-10,562
		Directed Energy Weapons	6,263	6,369	6,417	48
		Education & Training	1,942	1,996	2,035	39

Resource Exhibit No. 13 (continued) *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program, Expenditure Center, and Project
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Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
		Missiles	201,268	224,609	171,822	-52,787
		Mission IT	6,930	6,905	8,712	1,807
		Mission Support	37,654	47,113	38,208	-8,905
		National Signatures Program	10,930	6,463	1,270	-5,193
		WMD	268,164	285,611	275,425	-10,186
	MASINT Total		**574,416**	**621,589**	**535,850**	**-85,739**
	Mission Management / Tasking	Collection Management	34,775	49,873	63,573	13,700
		Foreign Relations & Liaison	—	—	10,147	10,147
		Mission Management Centers	31,466	—	—	—
	Mission Management / Tasking Total		**66,241**	**49,873**	**73,720**	**23,847**
	Open Source	Media Exploitation and Open Source	238,768	212,548	210,685	-1,863
		Mission IT	13,611	17,604	16,893	-711
	Open Source Total		**252,379**	**230,152**	**227,578**	**-2,574**
	Research & Technology	Analysis Development	6,840	5,904	4,659	-1,245
		IT Technology Insertion	28,951	21,909	12,372	-9,537
		MASINT Technology Development & Demonstration	90,292	87,441	83,260	-4,181
	Research & Technology Total		**126,083**	**115,254**	**100,291**	**-14,963**
	Sensitive Technical Collection	Maritime Surveillance	87,381	90,636	88,179	-2,457
	Sensitive Technical Collection Total		**87,381**	**90,636**	**88,179**	**-2,457**
GDIP Total			**4,767,009**	**4,815,583**	**4,430,142**	**-385,441**
NGP	Analysis	AGI Analysis	175,731	178,199	172,741	-5,458
		Analytic Integrity & Standards	601	554	580	26
		Deployed Operations	75,611	88,723	101,935	13,212
		Homeland Security	47,060	47,139	16,439	-30,700
		Integrated Operations Center - Special Projects (IOC-SP)	81,502	83,464	86,180	2,716
		International Operations	31,291	40,677	—	-40,677
		Regional	331,943	336,689	269,649	-67,040
		Transnational	328,597	318,580	287,344	-31,236
		Warning	42,909	42,310	37,887	-4,423
	Analysis Total		**1,115,245**	**1,136,335**	**972,755**	**-163,580**
	Commercial Remote Sensing	Mission Support	15,956	15,251	—	-15,251
		Purchases	220,718	205,670	—	-205,670
	Commercial Remote Sensing Total		**236,674**	**220,921**	**—**	**-220,921**
	Enterprise IT Systems	Connectivity	164,499	179,223	184,835	5,612
		Data Handling & End-User Functionality	212,535	213,359	186,702	-26,657
		Information Assurance	46,490	46,375	42,365	-4,010
		Management & Support	50,594	85,521	94,056	8,535
		Platforms	49,728	66,141	78,485	12,344
		Systems Maintenance	374,975	454,458	429,214	-25,244
	Enterprise IT Systems Total		**898,821**	**1,045,077**	**1,015,657**	**-29,420**
	Enterprise Management	Acquisition Management	42,003	39,937	38,142	-1,795
		COOP	7,166	6,062	6,053	-9
		Education & Training	88,052	75,835	78,985	3,150

Resource Exhibit No. 13 (continued) *(Dollars in Thousands)*
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Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
		Finance	44,988	61,809	50,159	-11,650
		GEOINT Functional Management	24,074	21,841	—	-21,841
		HQ Management	54,788	45,778	48,032	2,254
		Human Resources	46,966	41,118	43,340	2,222
		Security	143,161	123,726	147,391	23,665
	Enterprise Management Total		**451,198**	**416,106**	**412,102**	**-4,004**
	Facilities & Logistics	Facilities	516,506	219,792	112,716	-107,076
		Logistics	2,632	2,902	2,754	-148
	Facilities & Logistics Total		**519,138**	**222,694**	**115,470**	**-107,224**
	GEOINT Data	Commercial Imagery	—	—	189,744	189,744
		Source Assessment & ERM	—	—	347,335	347,335
	GEOINT Data Total		**—**	**—**	**537,079**	**537,079**
	Mission Management / Tasking	GEOINT Functional Management	—	—	23,406	23,406
		International Operations	—	—	37,657	37,657
		Mission Readiness	17,227	15,348	11,107	-4,241
		Source Assessment & ERM	364,828	330,725	—	-330,725
		Source Tasking Operations & Management	117,364	148,201	120,802	-27,399
	Mission Management / Tasking Total		**499,419**	**494,274**	**192,972**	**-301,302**
	Mission Processing & Exploitation	Compartmented GEOINT Enterprise Services (CGES)	69,539	92,148	68,499	-23,649
		NSG Enterprise Modernization	261,759	202,416	218,695	16,279
		NSG Integrated Architecture Services	119,781	185,238	213,519	28,281
		NSG Operational Systems	446,191	415,591	516,352	100,761
		NSG Sensor Integration	146,665	138,948	133,328	-5,620
		NSG Systems Engineering	220,717	215,872	222,910	7,038
		STIL	22,817	34,484	42,648	8,164
	Mission Processing & Exploitation Total		**1,287,469**	**1,284,697**	**1,415,951**	**131,254**
	Research & Technology	Advanced Radar GEOINT	7,105	—	—	—
		GEOINT Advanced Technology Development	85,550	93,341	94,405	1,064
		GEOINT Basic & Applied Research	70,631	74,867	70,591	-4,276
		GEOINT Research and Technology Enablers	56,695	53,257	51,948	-1,309
	Research & Technology Total		**219,981**	**221,465**	**216,944**	**-4,521**
NGP Total			**5,227,945**	**5,041,569**	**4,878,930**	**-162,639**
NRP	Enterprise IT Systems	Connectivity	545,666	456,333	486,588	30,255
		Enterprise Architecture & Planning	22,710	36,653	36,215	-438
		Information Assurance	18,118	18,042	13,264	-4,778
	Enterprise IT Systems Total		**586,494**	**511,028**	**536,067**	**25,039**
	Enterprise Management	Acquisition Management	38,641	28,831	26,114	-2,717
		COOP	7,545	7,001	6,070	-931
		Education & Training	2,612	1,646	1,524	-122
		Finance	18,202	18,648	19,794	1,146
		HQ Management	46,261	42,834	37,043	-5,791
		Human Resources	219,727	226,992	233,560	6,568

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Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
		NRO Mission Support	60,739	45,050	88,312	43,262
		Security	81,499	94,393	86,481	-7,912
		Spectrum Management	7,931	7,922	8,280	358
		Systems Engineering	131,492	153,980	137,970	-16,010
	Enterprise Management Total		**614,649**	**627,297**	**645,148**	**17,851**
	Facilities & Logistics	Facilities	98,964	169,761	165,382	-4,379
		Logistics	49,840	46,229	54,476	8,247
	Facilities & Logistics Total		**148,804**	**215,990**	**219,858**	**3,868**
	GEOINT EO	Enhanced Imagery System	1,527,603	225,101	186,701	-38,400
		EO Integration & Support	45,094	30,478	91,235	60,757
		Evolved Enhanced CRYSTAL System	—	1,246,345	1,549,148	302,803
	GEOINT EO Total		**1,572,697**	**1,501,924**	**1,827,084**	**325,160**
	GEOINT Radar	GEOINT Radar Sustainment	—	10,000	—	-10,000
		Radar Integration & Support	82,493	123,264	85,785	-37,479
		TOPAZ (1-5)	594,020	429,823	67,686	-362,137
		TOPAZ Block 2	—	—	124,789	124,789
	GEOINT Radar Total		**676,513**	**563,087**	**278,260**	**-284,827**
	GEOINT/SIGINT Integrated Ground Development Engineering & Management	Command & Control	246,469	179,965	54,850	-125,115
		Ground Integration & Support	212,455	204,316	183,199	-21,117
		Mission Control	—	—	362,173	362,173
		Mission Framework	268,307	351,013	198,814	-152,199
		Mission Management	175,776	149,761	35,913	-113,848
		Mission Processing	648,756	559,002	638,850	79,848
	GEOINT/SIGINT Integrated Ground Development Engineering & Management Total		**1,551,763**	**1,444,057**	**1,473,799**	**29,742**
	Launch	Launch Capability Infrastructure	282,051	269,500	286,000	16,500
		Launch Operations & Engineering	288,344	303,301	295,414	-7,887
		Launch Vehicles	330,092	377,771	679,073	301,302
	Launch Total		**900,487**	**950,572**	**1,260,487**	**309,915**
	Mission Ground Stations	CONUS Operations	792,345	804,687	700,673	-104,014
		OCONUS Operations	271,709	280,233	276,593	-3,640
		Station Integration & Support	42,288	41,121	31,684	-9,437
	Mission Ground Stations Total		**1,106,342**	**1,126,041**	**1,008,950**	**-117,091**
	Research & Technology	Research & Technology Development	352,634	353,665	391,110	37,445
		Research & Technology Support	11,333	7,365	10,250	2,885
	Research & Technology Total		**363,967**	**361,030**	**401,360**	**40,330**
	Sensitive Technical Collection	NRO Compartmented Programs	653,027	750,955	482,027	-268,928
	Sensitive Technical Collection Total		**653,027**	**750,955**	**482,027**	**-268,928**
	SIGINT High	High Altitude Integration & Support	127,402	126,674	105,152	-21,522
		NEMESIS 2	502,433	—	—	—
		ORION 7	9,130	—	—	—
		ORION 8	182,277	130,383	37,967	-92,416
		RAVEN 5/6	—	—	—	—

Resource Exhibit No. 13 (continued) *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program, Expenditure Center, and Project
FY 2011 - FY 2013
This Exhibit is SECRET//NOFORN

Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
		SIGINT High Altitude Replenishment Program (SHARP)	948,443	832,977	784,338	-48,639
	SIGINT High Total		**1,769,685**	**1,090,034**	**927,457**	**-162,577**
	SIGINT Low	INTRUDER 11/12	—	—	—	—
		INTRUDER 5/6	231,484	112,570	—	-112,570
		INTRUDER 7/8	489,969	439,948	323,427	-116,521
		Low Altitude Integration & Support	122,197	113,563	122,932	9,369
	SIGINT Low Total		**843,650**	**666,081**	**446,359**	**-219,722**
	Space Communications	Mission System Encryption	26,425	29,174	30,073	899
		QUASAR R/S - 17/18	26,143	—	—	—
		QUASAR R/S - 19	7,223	—	—	—
		QUASAR R/S 20/21	252,337	263,603	435,300	171,697
		QUASAR R/S 22/23	—	27,573	80,781	53,208
		Relay Readiness and Launch	80,264	42,216	16,919	-25,297
		Space Communications Integration & Support	91,351	78,791	99,914	21,123
		Space Operations Development Segment	129,924	161,882	152,080	-9,802
	Space Communications Total		**613,667**	**603,239**	**815,067**	**211,828**
NRP Total			**11,401,745**	**10,411,335**	**10,321,923**	**-89,412**
SRP	Enterprise Management	(Project P_MA)	31,955	28,326	28,682	356
		COOP	3,441	500	500	—
	Enterprise Management Total		**35,396**	**28,826**	**29,182**	**356**
	Research & Technology	(Project P_APP)	81,255	65,330	56,377	-8,953
	Research & Technology Total		**81,255**	**65,330**	**56,377**	**-8,953**
	Sensitive Technical Collection	(Project P_GBG)	109,463	123,712	119,918	-3,794
		(Project P_O_ST)	95,625	107,695	103,258	-4,437
		(Project P_RUSH)	198,086	195,263	197,312	2,049
		(Project P_SRC)	129,486	90,695	90,159	-536
	Sensitive Technical Collection Total		**532,660**	**517,365**	**510,647**	**-6,718**
	Special Source Access	(Project P_AC)	424,291	329,096	239,779	-89,317
		(Project P_CCBS)	24,978	—	—	—
		(Project P_O_SA)	51,727	48,480	49,357	877
		(Project P_SCOL)	316,485	278,654	248,262	-30,392
	Special Source Access Total		**817,481**	**656,230**	**537,398**	**-118,832**
SRP Total			**1,466,792**	**1,267,751**	**1,133,604**	**-134,147**
State	Analysis	Analytic Integrity & Standards	143	143	144	1
		Transnational	44,715	44,552	44,968	416
	Analysis Total		**44,858**	**44,695**	**45,112**	**417**
	Analysis Enabling	Mission Support	13,299	13,241	13,930	689
	Analysis Enabling Total		**13,299**	**13,241**	**13,930**	**689**
	Enterprise IT Systems	Management & Support	10,616	10,267	13,613	3,346
	Enterprise IT Systems Total		**10,616**	**10,267**	**13,613**	**3,346**
State Total			**68,773**	**68,203**	**72,655**	**4,452**
Treasury	Analysis	Transnational	22,568	22,569	22,743	174
	Analysis Total		**22,568**	**22,569**	**22,743**	**174**

Resource Exhibit No. 13 (continued) *(Dollars in Thousands)*
National Intelligence Program
Budget Authority by Program, Expenditure Center, and Project
FY 2011 - FY 2013
This Exhibit is SECRET//NOFORN

Program	Expenditure Center	Project	FY 2011	FY 2012	FY 2013	FY 2012 - FY 2013 Change
	Enterprise IT Systems	Platforms	4,854	4,554	4,554	—
	Enterprise IT Systems Total		**4,854**	**4,554**	**4,554**	**—**
Treasury Total			**27,422**	**27,123**	**27,297**	**174**
National Intelligence Program Total			**54,639,507**	**53,873,203**	**52,554,597**	**-1,318,606**

2.1 Bokstaveringsalfabetet (Svenska)

A	Adam	O	Olof	1	Ett
B	Bertil	P	Petter	2	Tvåa
C	Cesar	Q	Qvintus	3	Trea
D	David	R	Rudolf	4	Fyra
E	Erik	S	Sigurd	5	Femma
F	Filip	T	Tore	6	Sexa
G	Gustav	U	Urban	7	Sju
H	Helge	V	Viktor	8	Åtta
I	Ivar	W	Wilhelm	9	Nia
J	Johan	X	Xerxes	0	Nolla
K	Kalle	Y	Yngve	.	Punkt
L	Ludvig	Z	Zäta	,	Komma
M	Martin	Å	Åke	-	Minus
N	Niklas	Ä	Ärlig	+	Plus
		Ö	Östen		Mellanslag

Tabell 4: Svenska bokstaveringsalfabetet

2.2 Bokstaveringsalfabetet (Internationella)

A	Alfa	P	Papa	0	Zero
B	Bravo	Q	Quebec	1	One
C	Charlie	R	Romeo	2	Two
D	Delta	S	Sierra	3	Tree
E	Echo	T	Tango	4	Fower
F	Foxtrot	U	Uniform	5	Fife
G	Golf	V	Victor	6	Six
H	Hotel	W	Whiskey	7	Seven
I	India	X	X-ray	8	Ait
J	Juliet	Y	Yankee	9	Niner
K	Kilo	Z	Zulu	.	Stop
L	Lima	Å/AA	Alfa-Alfa	,	Decimal
M	Mike	Ä/AE	Alfa-Echo	-	Minus
N	November	Ö/OE	Oscar-Echo	+	Plus
O	Oscar				Space

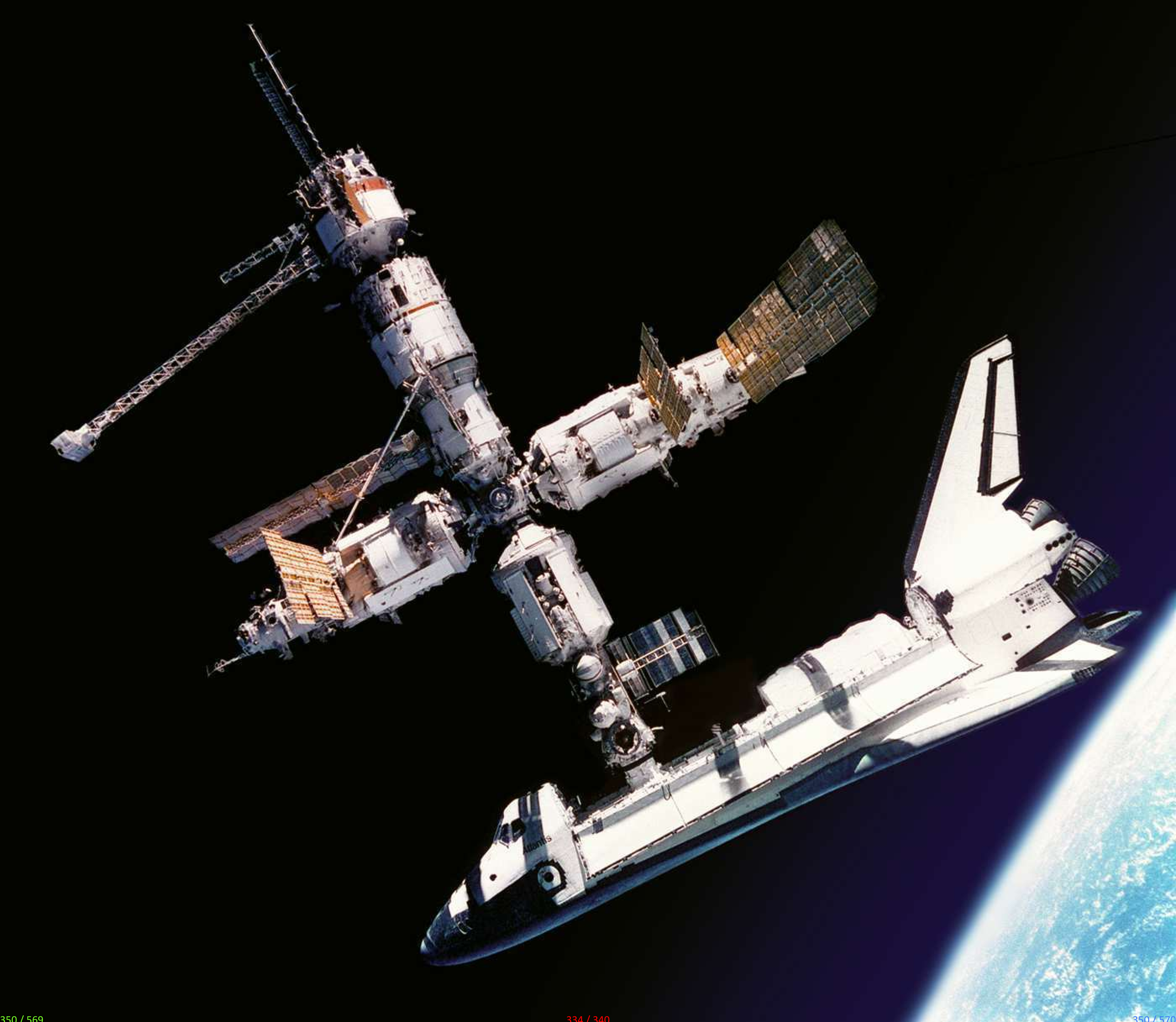
NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

This photo is taken by a U.S. Air Force Aircraft.

I don't understand why the Department of Defense releases the Unknown Aircraft image, above, in 'black and white' // when they could have released the image in full color instead.


- 2°
SLAVE
LST
1688

MISSION CONTROL CENTER
esa
JAXA
NASA
Crew Sleep
ISS D/L 1 LOS
ISS D/L 2 LOS
ADCO
SPARTAN
ISO
ETHOS
OPS PLANNER
FLIGHT DIRECTOR
CAPCOM
POSN 4272


Atlantis


PASS
PASSPORT
PASSEPORT
SVERIGE
SWEDEN
SUÈDE
Typ/ Type
P
Kod/ Code
SWE
Passnr./ Passport No.
AA2793436
1. Efternamn/ Surname
NORSTRÖM
2. Förnamn/ Given names
PER GUSTAV OLOF
3. Nationalitet/ Nationality
SVENSK/ SWEDISH
3a. Personnr./ Personal Id. No.
740621-1750
4. Födelsedatum/ Date of birth
21 JUN/JUN 74
6. Utfärdat datum/ Date of issue
08 DEC/DEC 22
7. Sista giltighetsdag/ Date of expiry
08 DEC/DEC 27
CAN
101809
4a. Längd/ Height
185 CM
5. Kön/ Se
M/M
8. Födelseort/ Place of bir
KLOSTER
SVERIGE
SVERIGE
Myndighet/ Authority


GUSTAV NORSTRÖM
HÖGKVARTERET
DATASERVICE ADM AU-IT


STOPP
SWEDISH MILITARY HQ

NATIONAL SECURITY AGENCY
UNITED STATES OF AMERICA

Gustav Norström

U.S. Department of Defense

RESTRICTED

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TO 12D1-3-11-1

MAJESTIC-12 GROUP SPECIAL OPERATIONS MANUAL

EXTRATERRESTRIAL ENTITIES AND TECHNOLOGY, RECOVERY AND DISPOSAL

TOP SECRET/MAJIC EYES ONLY

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MAJESTIC-12 GROUP * APRIL 1954

MJ-12 4838B-Mar 270435°-54-1

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5.20	0959/03JUL55	MJ/04	EWL	0830/12JUL55	EWL
5.6	1304/10MAY56	MJ/04	JRT	0900/14MAY56	JRT
17-19	1050/16AUG56	MJ/04	JRT	1635/16AUG56	JRT
6.12.	18 0919/05FEB	57 MJ/01	JRT	1105/05FEB57	JRT

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Special Operations Manual
No. 1- 01

MAJESTIC-12 GROUP
Washington 25, D.C., *7 April 1954*

EXTRATERRESTRIAL ENTITIES AND TECHNOLOGY, RECOVERY AND DISPOSAL

CHAPTER 1
OPERATION MAJESTIC-12

Section I. PROJECT PURPOSE AND GOALS

1. Scope

This manual has been prepared especially for Majestic-12 units. Its purpose is to present all aspects of Majestic-12 so authorized personnel will have a better understanding of the goals of the Group, be able to more expertly deal with Unidentified Flying Objects, Extraterrestrial Technology and Entities, and increase the efficiency of future operations.

2. General

MJ-12 takes the subject of the UFOBs, Extraterrestrial Technology and Extraterrestrial Biological Entities very seriously and considers the entire subject to be a matter of the very highest national security. For that reason everything relating to the subject has been assigned the very highest security classification. Three main points will be covered in this section.

a. The general aspects of MJ-12 to clear up any misconceptions that anyone may have.
b. The importance of the operations.
c. The need for absolute secrecy in all phases of operations.

3. Security Classification

All information relating to MJ-12 has been classified MAJIC EYES ONLY and carries a security level 2 points above that of Top Secret. The reason for this has to do with the consequences that may arise not only from the impact upon the public should the existence of such matters become general knowledge, but also the danger of having such advanced technology as has been recovered by the Air Force fall into the hands of unfriendly foreign powers. No information is released to the public press and the official government position is that no special group such as MJ-12 exists.

4. History of the Group

Operation Majestic-12 was established by special classified presidential order on 24 September 1947 at the recommendation of Secretary of Defense James V. Forrestal and Dr. Vannevar Bush, Chairman of the Joint Research and Development Board. Operations are carried out under a Top Secret Research and Development - Intelligence Group directly responsible only to the President of the Unites States. The goals of the MJ-12 Group are as follows:

a. The recovery for scientific study of all materials and devices of a foreign or extraterrestrial manufacture that may become available. Such material and devices will be recovered by any and all means deemed necessary by the Group.

b. The recovery for scientific study of all entities and remains of entities not of terrestrial origin which may become available through independent action by those entities or by misfortune or military action.

c. The establishment and administration of Special Teams to accomplish the above operations.

d. The establishment and administration of special secure facilities located at secret locations within the continental borders of the Unites States for the receiving, processing, analysis, and scientific study of any and all materials and entities classified as being of extraterrestrial origin by the Group of the Special Teams.

e. Establishment and administration of covert operations to be carried out in concert with Central Intelligence to effect the recovery for the United States of extraterrestrial technology and entities which may come down inside the territory of or fall into the possession of foreign powers.

f. The establishment and maintenance of absolute top secrecy concerning all the above operations.

5. Current Situation

It is considered as far as the current situation is concerned, that there are few indications that these objects and their builders pose a direct threat to the security of the United States, despite the uncertainty as to their ultimate motives in coming here. Certainly the technology possessed by these beings far surpasses anything known to modern science, yet their presence here seems to be benign, and they seem to be avoiding contact with our species, at least for the present. Several dead entities have been recovered along with a substantial amount of wreckage and devices from downed craft, all of which are now under study at various locations. No attempt has been made by extraterrestrial entities either to contact authorities or to recover their dead counterparts or the downed craft, even though one of the crashes was the result of direct military action. The greatest threat at this time arises from the acquisition and study of such advanced technology by foreign powers unfriendly to the United States. It is for this reason that the recovery and study of this type of material by the United States has been given such a high priority.

TOP SECRET / MAJIC EYES ONLY

CHAPTER 2
INTRODUCTION

Section I. GENERAL

6. Scope

a. This operation manual is published for the information and guidance of all concerned. It contains information on determination, documentation, collection, and disposition of debris, devices, craft, and occupants of such craft as defined as Extraterrestrial Technology or Extraterrestrial Biological Entities, EBEs in Section II of this chapter.

b. Appendix I-Ia contains a list of current references, including technical manuals and other available publications applicable to these operations.

c. Appendix II contains a list of personnel who comprise the Majestic-12 Group.

7. Forms and Records

Forms used for reporting operation are listed in Appendix I.

Section II. DEFINITION AND DATA

8. General

Extraterrestrial Technology is defined as follows:

a. Aircraft identified as not manufactured in the United States or any terrestrial foreign powers, including experimental military or civilian aircraft. Aircraft in this category are generally known as Unidentified Flying Objects, or UFOBs. Such aircraft may appear as one of several shapes and configurations and exhibit extraordinary flight characteristics.

b. Objects and devices of unknown origin or function, manufactured by processes or of materials not consistent with current technology or scientific knowledge.

c. Wreckage of any aircraft thought to be of extraterrestrial manufacture or origin. Such wreckage may be the results of accidents or military action.

d. Materials that exhibit unusual or extraordinary characteristics not consistent with current technology or scientific knowledge.

Extraterrestrial Biological Entities (EBEs) are described as:

a. Creatures, humanoids or otherwise, whose evolutionary processes responsible for their development are demonstrably different from those postulated or observed in homo sapiens.

9. Description of Craft

Documented extraterrestrial craft (UFOBs) are classified in one of four categories based on general shape, as follows:

a. Elliptical, or disc shape. This type of craft is of a metallic construction and dull aluminum in color. They have the appearance of two pie-pans or shallow dishes pressed together and may have a raised dome on the top or bottom. No seams or joints are visible on the surface, giving the impression of one-piece construction. Discs are estimated from 50-300 feet in diameter and the thickness is approximately 15 per cent of the diameter, not including the dome, which is 30 per cent of the disc diameter and extends another 4-6 feet above the main body of the disc. The dome may or may not include windows or ports, and ports are present around the lower rim of the disc in some instances. Most disc-shaped craft are equipped with lights on the top and bottom, and also around the rim. These lights are not visible when the craft is at rest or not functioning. There are generally no visible antenna or projections. Landing gear consists of three extendible legs ending in circular landing pads. When fully extended this landing gear supports the main body 2-3 feet above the surface at the lowest point. A rectangular hatch is located along the equator or on the lower surface of the disk.

b. Fuselage or cigar shape. Documented reports of this type of craft are extremely rare. Air Force radar reports indicate they are approximately 2 thousand feet long and 95 feet thick, and apparently they do not operate in the lower atmosphere. Very little information is available on the performance of these craft, but radar reports have indicated speeds in excess of 7,000 miles per hour. They do not appear to engage in the violent and erratic maneuvers associated with the smaller types.

c. Ovoid or circular shape. This type of craft is described as being shaped like an ice cream cone, being rounded at the large end and tapering to a near-point at the other end. They are approximately 30-40 feet long and the thick end diameter is approximately 20 per cent of the length. There is an extremely bright light at the pointed end, and this craft usually travels point down. They can appear to be any shape from round to cylindrical, depending upon the angle of observation. Often sightings of this type of craft are elliptical craft seen at an inclined angle or edge-on.

d. Airfoil or triangular shape. This craft is believed to be new technology due to the rarity and recency of the observations. Radar indicates an isosceles triangle profile, the longest side being nearly 300 feet in length. Little is known about the performance of these craft due to the rarity of good sightings, but they are believed capable of high speeds and abrupt maneuvers similar to or exceeding the performance attributed to types "a" and "c".

10. Description of Extraterrestrial Biological Entities (EBEs)

Examination of remains recovered from wreckage of UFOBs indicates that Extraterrestrial Biological Entities may be classified into two distinct categories as follows:

a. EBE Type I. These entities are humanoid and might be mistaken for human beings of the Oriental race if seen from a distance. They are bi-pedal, 5-5 feet 4 inches in height and weigh 80-100 pounds. Proportionally they are similar to humans, although the cranium is somewhat larger and more rounded. The skin is a pale, chalky-yellow in color, thick, and slightly pebbled in appearance. The eyes are small, wide-set, almond-shaped, with brownish-black irises with very large pupils. The whites of the eyes are not like that of humans, but have a pale gray cast. The ears are small and set low on the skull. The nose is thin and long, and the mouth is wider than in humans, and nearly lipless. There is no apparent facial hair and very little body hair, that being very fine and confined to the underarm and the groin area. The body is thin and without apparent body fat, but the muscles are well-developed. The hands are small, with four long digits but no opposable thumb. The outside digit is jointed in a manner as to be nearly opposable, and there is no webbing between the fingers as in humans. The legs are slightly but noticeably bowed, and the feet are somewhat splayed and proportionally large.

b. EBE Type II. These entities are humanoid but differ from Type I in many respects. They are bi-pedal, 3 feet 5 inches - 4 feet 2 inches in height and weigh 25-50 pounds. Proportionally, the head is much larger than humans or Type I EBEs, the cranium being much larger and elongated. The eyes are very large, slanted, and nearly wrap around the side of the skull. They are black with no whites showing. There is no noticeable brow ridge, and the skull has a slight peak that runs over the crown. The nose consists of two small slits which sit high above the slit-like mouth. There are no external ears. The skin is a pale bluish-gray color, being somewhat darker on the back of the creature, and is very smooth and fine-celled. There is no hair on either the face or the body, and these creatures do not appear to be mammalian. The arms are long in proportion to the legs, and the hands have three long, tapering fingers and a thumb which is nearly as long as the fingers. The second finger is thicker than the others, but not as long as the index finger. The feet are small and narrow, and four toes are joined together with a membrane.

It is not definitely known where either type of creature originated, but it seems certain that they did not evolve on earth. It is further evident, although not certain, that they may have originated on two different planets.

11. Description of Extraterrestrial Technology

The following information is from preliminary analysis reports of wreckage collected from crash sites of extraterrestrial craft 1947-1953, excerpts from which are quoted verbatim to provide guidance as to the type of characteristics of material that might be encountered in future recovery operations.

a. Initial analysis of the debris from the crash site seems to indicate that the debris is that of an extraterrestrial craft which exploded from within and came into contact with the ground with great force, completely destroying the craft. The volume of matter indicates that the craft was approximately the size of a medium aircraft, although the weight of the debris indicates that the craft was extremely light for its size.

b. Metallurgical analysis of the bulk of the debris recovered indicates that the samples are not composed of any materials currently known to Terrestrial science.

c. The material tested possesses great strength and resistance to heat in proportion to its weight and size, being stronger by far than any materials used in military or civilian aircraft at present.

d. Much of the material, having the appearance of aluminum foil or aluminum-magnesium sheeting, displays none of the characteristics of either metal, resembling instead some kind of unknown plastic-like material.

e. Solid structures and substantial beams having a distinct similarity in appearance to very dense grain-free wood, was very light in weight and possesses tensile and compression strength not obtainable by any means known to modern industry.

f. None of the material tested displayed measurable magnetic characteristics or residual radiation.

g. Several samples were engraved or embossed with marks and patterns. These patterns were not readily identifiable and attempts to decipher their meaning has been largely unsuccessful.

h. Examination of several apparent mechanical devices, gears, etc. revealed little or nothing of their functions or methods of manufacture.

CHAPTER 3
RECOVERY OPERATIONS

Section I. SECURITY

12. Press Blackout

Great care must be taken to preserve the security of any location where Extraterrestrial Technology might be retrievable for scientific study. Extreme measures must be taken to protect and preserve any material or craft from discovery, examination, or removal by civilian agencies or individuals of the general public. It is therefore recommended that a total press blackout be initiated whenever possible. If this course of action should not prove feasible, the following cover stories are suggested for release to the press. The officer in charge will act quickly to select the cover story that best fits the situation. It should be remembered when selecting a cover story that official policy regarding UFOBs is that they do not exist.

a. Official Denial. The most desirable response would be that nothing unusual has occurred. By stating that the government has no knowledge of the event, further investigation by the public press may be forestalled.

b. Discredit Witnesses. If at all possible, witnesses will be held incommunicado until the extent of their knowledge and involvement can be determined. Witnesses will be discouraged from talking about what they have seen, and intimidation may be necessary to ensure their cooperation. If witnesses have already contacted the press, it will be necessary to discredit their stories. This can best be done by the assertion that they have either misinterpreted natural events, are the victims of hysteria or hallucinations, or are the perpetrators of hoaxes.

c. Deceptive Statements. It may become necessary to issue false statements to preserve the security of the site. Meteors, downed satellites, weather balloons, and military aircraft are all acceptable alternatives, although in the case of the downed military aircraft statement care should be exercised not to suggest that the aircraft might be experimental or secret, as this might arouse more curiosity of both the American and the foreign press. Statements issued concerning contamination of the area due to toxic spills from trucks or railroad tankers can also serve to keep unauthorized or undesirable personnel away from the area.

13. Secure the Area

The area must be secured as rapidly as possible to keep unauthorized personnel from infiltrating the site. The officer in charge will set up a perimeter and establish a command post inside the perimeter. Personnel allowed on the site will be kept to the absolute minimum necessary to prepare the craft or debris for transport, and will consist of Military Security Forces.

Local authorities may be pressed into service on traffic and crowd control. *Under no circumstances* will local official or law enforcement personnel be allowed inside the perimeter and all necessary precautions should be taken to ensure that they do not interfere with the operation.

a. Perimeter. It is desirable that sufficient military personnel be utilized to set up a perimeter around the site large enough to keep both unauthorized personnel and the perimeter personnel from seeing the site. Once the site is contained, regular patrols will be set up along the perimeter to ensure complete security, and electronic surveillance will be utilized to augment the patrols. Perimeter personnel will be equipped with hand communication and automatic weapons with live ammunition. Personnel working at the site will carry sidearms. No unauthorized personnel will be allowed into the secure area.

b. Command Post. Ideally, the command post should be as close to the site as is practical to efficiently coordinate operations. As soon as the command post is operational, contact with the Majestic-12 Group will be established via secure communications.

c. Area Sweep. The site and the surrounding area will be cleared of all unauthorized personnel. Witnesses will be debriefed and detained for further evaluation by MJ-12. *Under no circumstances* will witnesses be released from custody until their stories have been evaluated by MJ-12 and they have been thoroughly debriefed.

d. Situation Evaluation. A preliminary evaluation of the situation will be completed and a preliminary report prepared. The MJ-12 Group will then be briefed on the situation at the earliest possible opportunity. The MJ-12 Group will then make a determination as to whether or not a MJ-12 RED TEAM or OPNAC Team will be dispatched to the area.

Section II. TECHNOLOGY RECOVERY

14. Removal and Transport

As soon as communication is established, removal and transport of all material will commence under order from MJ-12.

a. Documentation. If the situation permits, care should be taken to document the area with photographs before anything is moved. The area will be checked for radiation and other toxic agents. If the area cannot be kept secure for an extended period of time, all material must be packed and transported as quickly as possible to the nearest secure military facility. This will be accomplished by covered transport using little-traveled roads wherever possible.

b. Complete or Functional Craft. Craft are to be approached with extreme caution if they appear functional, as serious injury may result from exposure to radiation and electrical discharges. If the craft is functioning, but appears to be abandoned, it may be approached only by specially trained MJ-12 RED TEAM personnel wearing protective clothing. Any device that seems to be functioning should also be left to MJ-12 RED TEAM disposal. Complete craft and parts of crafts too large to be transported by covered transport will be disassembled, if this can be accomplished easily and quickly. If they must be transported whole, or on open flatbed trailers, they will be covered in such a manner as to camouflage their shape.

c. Extraterrestrial Biological Entities. EBEs must be removed to a top security facility as quickly as possible. Great care should be taken to prevent possible contamination by alien biological agents. Dead EBEs should be packed in ice at the earliest opportunity to preserve tissues. Should live EBEs be encountered, they should be taken into custody and removed to a top security facility by ambulance. Every effort should be taken to ensure the EBE's survival. Personnel involvement with EBEs alive or dead must be kept to an absolute minimum. (See Chapter 5 for more detailed information dealing with EBEs.)

15. Cleansing the Area

Once all material has been removed from the central area, the immediate area will be thoroughly inspected to make sure that all traces of Extraterrestrial Technology have been removed. In the case of a crash, the surrounding area will be thoroughly gone over several times to ensure that nothing has been overlooked. The search area involved may vary according to local conditions, at the discretion of the officer in charge. When the officer in charge is satisfied that no further evidence of the event remains at the site, it may be evacuated.

16. Special or Unusual Conditions

The possibility exists that extraterrestrial craft may land or crash in heavily populated areas, where security cannot be maintained or where large segments of the population and the public press may witness these events. Contingency Plan MJ-1949-04P / 78 (TOP SECRET-EYES ONLY) should be held in readiness should the need to make a public disclosure become necessary.

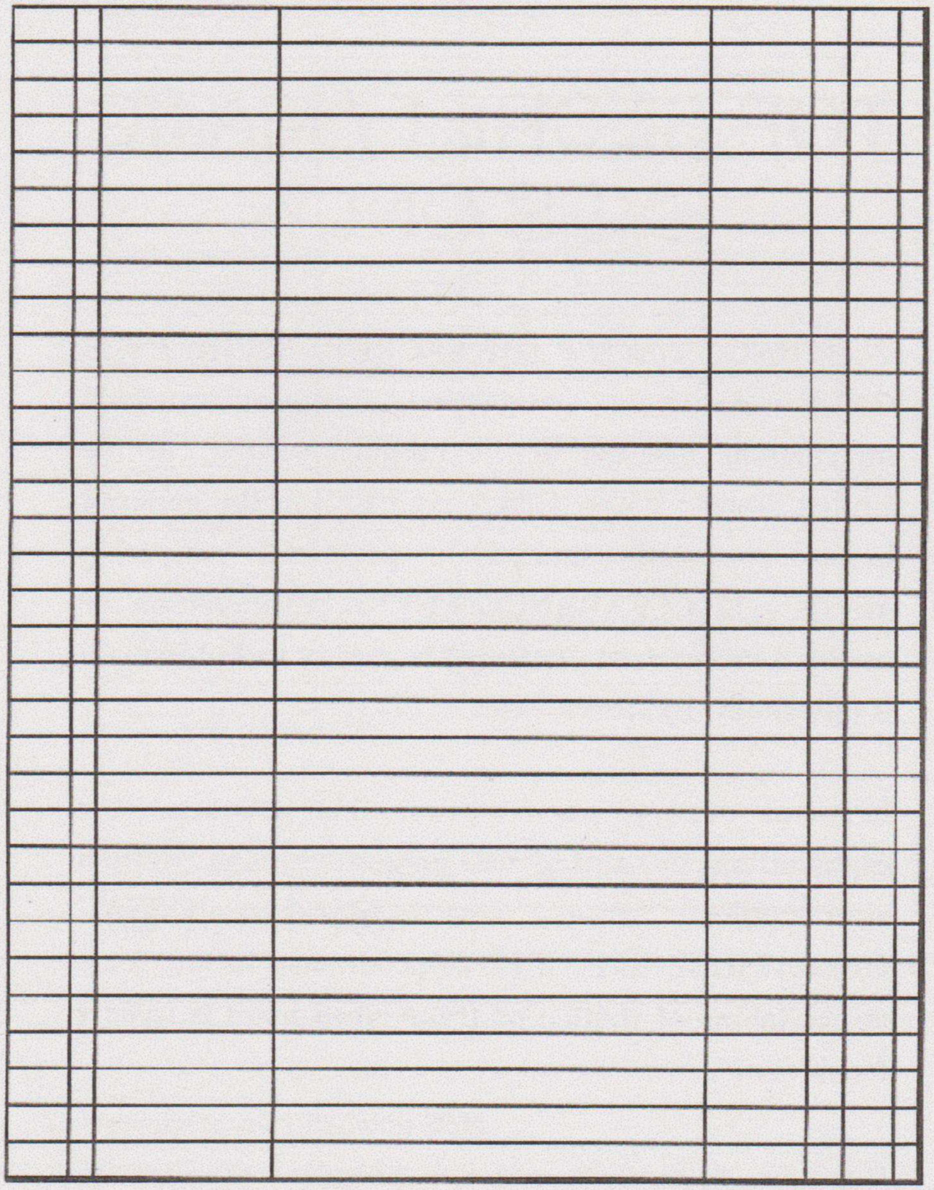
17. Extraterrestrial Technology Classification Table

No.	Item	Description or condition	MJ—12 Code	Receiving Facility
1	Aircraft.	Intact, operational, or semi-intact aircraft of Extraterrestrial design and manufacture.	UA-002-6	Area 51 S-4
2	Intact device.	Any mechanical or electronic device or machine which appears to be undamaged and functional.	ID-301-F	Area 51 S-4
3	Damaged device.	Any mechanical or electronic device or machine which appears to be damaged but mostly complete.	DD-303N	Area 51 S-4
4	Powerplant.	Devices and machines or fragments which are possible propulsion units, fuel and associated control devices and panels.	PD-40-8G	Area 51 S-4
5	Identified fragments.	Fragments composed of elements or materials easily recognized as known to current science and technology, i.e., aluminum, magnesium, plastic, etc.	IF-101-K	Area 51 S-4
6	Unidentified fragments.	Fragments composed of elements or materials not known to current science and technology and which exhibit unusual or extraordinary characteristics.	UF-103-M	Area 51 S-4
7	Supplies and provisions.	Non-mechanical or non-electronic materials of a support nature such as clothing, personal belongings, organic ingestibles, etc.	SP-331	Blue Lab WP-61
8	Living entity.*	Living non-human organisms in apparent good or reasonable health.	EBE-010	OPNAC BBS-01
9	Non-living entity.	Deceased non-human organisms or portions of organisms, organic remains and other suspect organic matter.	EBE-XO	Blue Lab WP-61
10	Media.	Printed matter, electronic recordings, maps, charts, photographs and film.	MM-54A	Building 21 KB-88
11	Weapons.	Any device or portion of a device thought to be offensive or defensive weaponry.	WW-010	Area 51 S-4

**Living entity must be contained in total isolation pending arrival of OPNAC personnel*

18. Use of Inventory System

a. The identification is performed as a duty of the officer making an inventory of the Extraterrestrial Technology or entities with the assistance of MJ Forms 1-006 and 1-007. (Fig. 1 and 2.) Instructions for the use of each form appear on the reverse side of the forms.



SOM 01 - 1

Figure 1. MJ Form 1-006

TOP SECRET / MAJIC EYES ONLY

TOP SECRET / MAJIC EYES ONLY

EXTRATERRESTRIAL TECHNOLOGY PACKING LIST

INSTRUCTIONS on other side

POINT OF ORIGIN	SHIPPING CODE NO.	DATE
FINAL DESTINATION	PACKED BY	DATE/TIME
SHIPPING METHOD	INSPECTED BY	DATE/TIME

NO	ITEM	CLASSIFICATION NO	NO	ITEM	CLASSIFICATION NO
1			21		
2			22		
3			23		
4			24		
5			25		
6			26		
7			27		
8			28		
9			29		
10			30		
11			31		
12			32		
13			33		
14			34		
15			35		
16			36		
17			37		
18			38		
19			39		
20			40		

41 REMARKS OR SPECIAL INSTRUCTIONS

If additional space is required, attach MJ Form 1-007a

RECEIVED BY	DATE/TIME	INSPECTED BY	DATE/TIME

MJ MJ-12 FORM 1 MAY 53 1-007

TOP SECRET / MAJIC EYES ONLY

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Figure 2. MJ Form 1-007

19. Packaging and Packing Data

a. Domestic Shipment. Individual items are tagged and wrapped in a moisture-vaporproof barrier and heat sealed. They are then placed in a corrugated fiberboard box. The voids within the box are packed thoroughly with a neutral cellulose wadding to prevent movement of the items. The box closure is sealed with gummed Kraft tape. MJ Form 1-007 is placed in a sealed manila envelope marked "MAJIC-12 ACCESS ONLY" and is firmly taped to the top of the box. The box is then cushioned at each corner and at the top and bottom with fiberboard inserts and is placed within a large corrugated fiberboard box. The entire outer box closure is sealed with gummed Kraft tape. A label is affixed to the outer box bearing the following information: destination, shipping code number, and the warning, "MAJIC-12 ACCESS ONLY."

b. Overseas Shipment. Items are packaged as described above except that a dessicant and humidity indicator are included within the inner corrugated fiberboard box. Next, the box is wrapped in a moisture-vaporproof barrier and heat sealed. Then, packaged items are placed within a second waterproof carton sealed with waterproof tape. This second carton is marked "MAJIC-12 ACCESS ONLY" on all sides and is placed within a water-grease proof lined wooden shipping container. The lining is sealed with waterproof tape and the wooden shipping container is screwed shut. The shipping container is reinforced further by nailing two [3/4]-inch metal caps about 8 inches from each end. Shipping information is then stenciled on the surface of the wooden shipping container.

Note. The packaging and packing procedure detailed above applies to non-organic items only. Data for handling, packaging, packing, and shipping of organic matter and non-living entities is provided in Chapter 5, Section II of this manual.

CHAPTER 4
RECEIVING AND HANDLING

Section I. HANDLING UPON RECEIPT OF MATERIAL

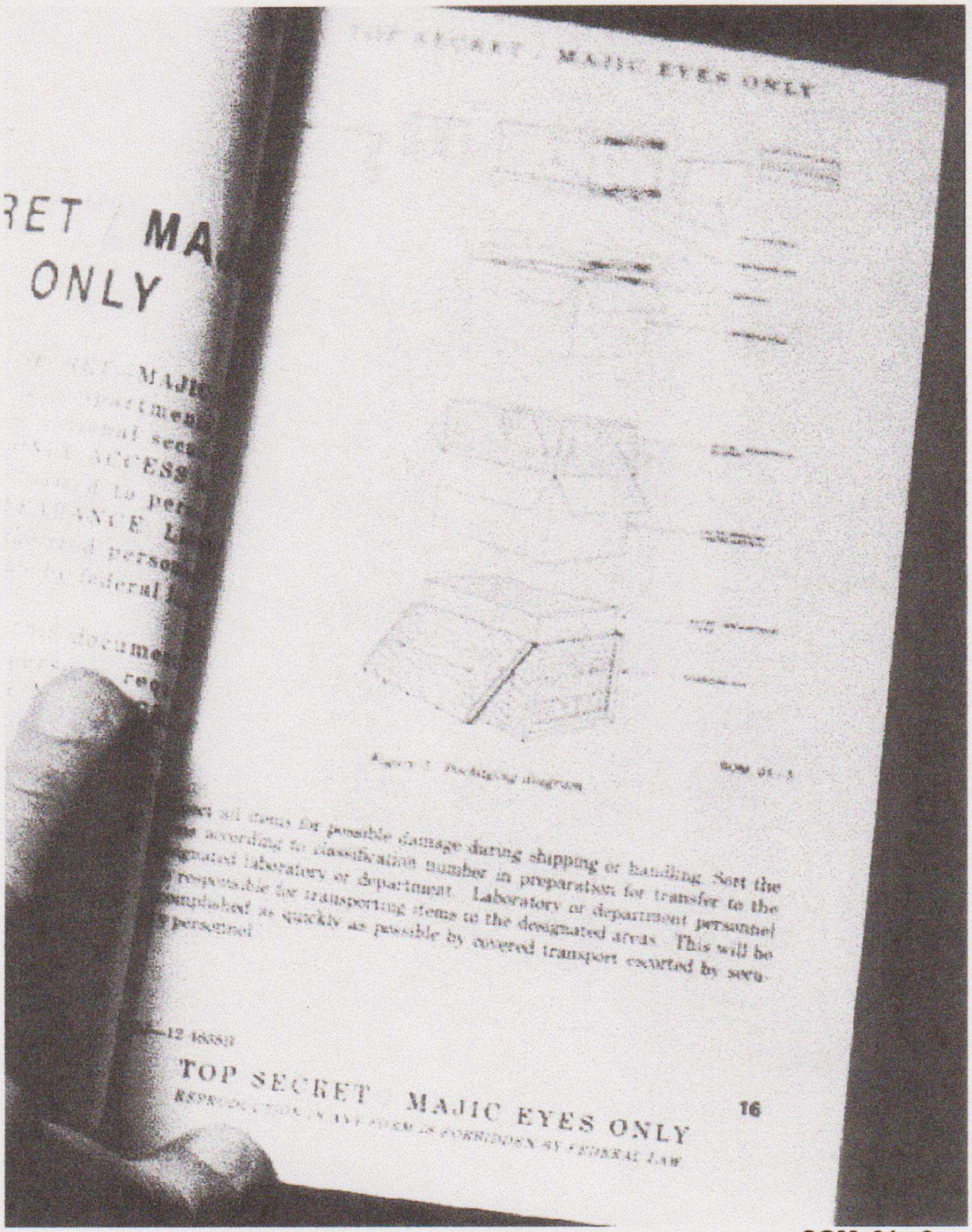
20. Uncrating, Unpacking, and Checking

(Fig. 3)

Note. The uncrating, unpacking, and checking procedure for containers marked "MAJIC-12 ACCESS ONLY" will be carried out by personnel with MJ-12 clearance. Containers marked in this manner will be placed in storage in a top security area until such time as authorized personnel are available for these procedures.

a. Be very careful when uncrating and unpacking the material. Avoid thrusting tools into the interior of the shipping container. Do not damage the packaging material any more than is absolutely necessary to remove the specimens; these materials may be required for future packaging. Stow the interior packaging material within the shipping container. When uncrating and unpacking the specimens, follow the procedure given in (1) through (11) below:

(1) Unpack the specimens in a top security area to prevent access of unauthorized personnel.
(2) Cut the metal wires with a suitable cutting tool, or twist them with pliers until the straps crystallize and break.
(3) Remove screws from the top of the shipping container with a screw driver.
(4) Cut the tape and seals of the case liner so that the waterproof paper will be damaged as little as possible.
(5) Lift out the packaged specimens from the wooden case.
(6) Cut the tape which seals the top flaps of the outer cartons; be careful not to damage the cartons.
(7) Cut the barrier along the top heat-sealed seam and carefully remove the inner carton.
(8) Remove the sealed manila envelope from the top of the inner carton.
(9) Open the inner carton and remove the fiberboard inserts, dessicant and humidity indicator.
(10) Lift out the heat-sealed packaging containing the specimens; arrange them in an orderly manner for inspection.
(11) Place all packaging material in the shipping container for use in future repacking.



SOM 01 - 3

Figure 3. Packaging diagram

b. Thoroughly check all items against the shipping documents. Carefully inspect all items for possible damage during shipping or handling. Sort the items according to classification number in preparation for transfer to the designated laboratory or department. Laboratory or department personnel are responsible for transporting items to the designated areas. This will be accomplished as quickly as possible by covered transport escorted by security personnel.

CHAPTER 5
EXTRATERRESTRIAL BIOLOGICAL ENTITIES

Section I. LIVING ORGANISMS

21. Scope

a. This section deals with encounters with living Extraterrestrial Biological Entities (EBEs). Such encounters fall under the jurisdiction of MJ-12 OPNAC BBS-01 and will be dealt with by this special unit only. This section details the responsibilities of persons or units making the initial contact.

22. General

Any encounter with entities known to be of extraterrestrial origin is to be considered to be a matter of national security and therefore classified TOP SECRET. Under no circumstances is the general public or the public press to learn of the existence of these entities. The official government policy is that such creatures do not exist, and that no agency of the federal government is now engaged in any study of extraterrestrials or their artifacts. Any deviation from this stated policy is absolutely forbidden.

23. Encounters

Encounters with EBEs may be classified according to one of the following categories:

a. Encounters initiated by EBEs. Possible contact may take place as a result of overtures by the entities themselves. In these instances it is anticipated that encounters will take place at military installations or other obscure locations selected by mutual agreement. Such meetings would have the advantage of being limited to personnel with appropriate clearance, away from public scrutiny. Although it is not considered very probable, there also exists the possibility that EBEs may land in public places without prior notice. In this case the OPNAC Team will formulate cover stories for the press and prepare briefings for the President and the Chiefs of Staff.

b. Encounters as the result of downed craft. Contact with survivors of accidents or craft downed by natural events or military action may occur with little or no warning. In these cases, it is important that the initial contact be limited to military personnel to preserve security. Civilian witnesses to the area will be detained and debriefed by MJ-12. Contact with EBEs by military personnel not having MJ-12 or OPNAC clearance is to be strictly limited to action necessary to ensure the availability of the EBEs for study by the OPNAC Team.

24. Isolation and Custody

a. EBEs will be detained by whatever means are necessary and removed to a secure location as soon as possible. Precautions will be taken by personnel coming in contact with EBEs to minimize the risk of disease as a result of contamination by unknown organisms. If the entities are wearing space suits or breathing apparatus of some kind, care should be exercised to prevent damage to these devices. While all efforts should be taken to assure the well-being of the EBEs, they must be isolated from any contact with unauthorized personnel. While it is not clear what provisions or amenities might be required by non-human entities, they should be provided if possible. The officer in charge of the operation will make these determinations, as no guidelines now exist to cover this area.

b. Injured or wounded entities will be treated by medical personnel assigned to the OPNAC Team. If the team medical personnel are not immediately available, First Aid will be administered by Medical Corps personnel at the initial site. Since little is known about EBE biological functions, aid will be confined to the stopping of bleeding, bandaging of wounds and splinting of broken limbs. No medications of any kind are to be administered as the effect of terrestrial medications on non-human biological systems are impossible to predict. As soon as the injuries are considered stabilized, the EBEs will be moved by closed ambulance or other suitable conveyance to a secure location.

c. In dealing with any living Extraterrestrial Biological Entity, security is of paramount importance. All other considerations are secondary. Although it is preferable to maintain the physical well-being of any entity, the loss of EBE life is considered acceptable if conditions or delays to preserve that life in any way compromises the security of the operations.

d. Once the OPNAC Team has taken custody of the EBEs, their care and transportation to designated facilities become the responsibility of OPNAC personnel. Every cooperation will be extended to the team in carrying out duties. OPNAC Team personnel will be given TOP PRIORITY at all times regardless of their apparent rank or status. No person has the authority to interfere with the OPNAC Team in the performance of its duties by special direction of the President of the United States.

Section II. NON-LIVING ORGANISMS

25. Scope

Ideally, retrieval for scientific study of cadavers and other biological remains will be carried out by medical personnel familiar with this type of procedure. Because of security considerations, such collection may need to be done by non-medical personnel. This section will provide guidance for retrieval, preservation, and removal of cadavers and remains in the field.

26. Retrieval and Preservation

a. The degree of decomposition of organic remains will vary depending on the length of time the remains have been lying in the open unprotected and may be accelerated by both local weather conditions and action by predators. Therefore, biological specimens will be removed from the crash site as quickly as possible to preserve the remains in as good a condition as possible. A photographic record will be made of all remains before they are removed from the site.

b. Personnel involved in this type of operation will take all reasonable precautions to minimize physical contact with the cadavers or remains being retrieved. Surgical gloves should be worn or, if they are not available, wool or leather gloves may be worn provided they are collected for decontamination immediately after use. Shovels and entrenching tools may be employed to handle remains provided caution is exercised to be certain no damage is done to the remains. Remains will be touched with bare hands only if no other means of moving them can be found. All personnel and equipment involved in recovery operations will undergo decontamination procedures immediately after those operations have been completed.

c. Remains will be preserved against further decomposition as equipment and conditions permit. Cadavers and remains will be bagged or securely wrapped in waterproof coverings. Tarpaulins or foul weather gear may be used for this purpose if necessary. Remains will be refrigerated or packed with ice if available. All remains will be tagged or labeled and the time and date recorded. Wrapped remains will be placed on stretchers or in sealed containers for immediate removal to a secure facility.

d. Small detached pieces and material scraped from solid surfaces will be put in jars or other small capped containers if available. Containers will be clearly marked as to their contents and the time and date recorded. Containers will be refrigerated or packed with ice as soon as possible and removed to a secure facility.

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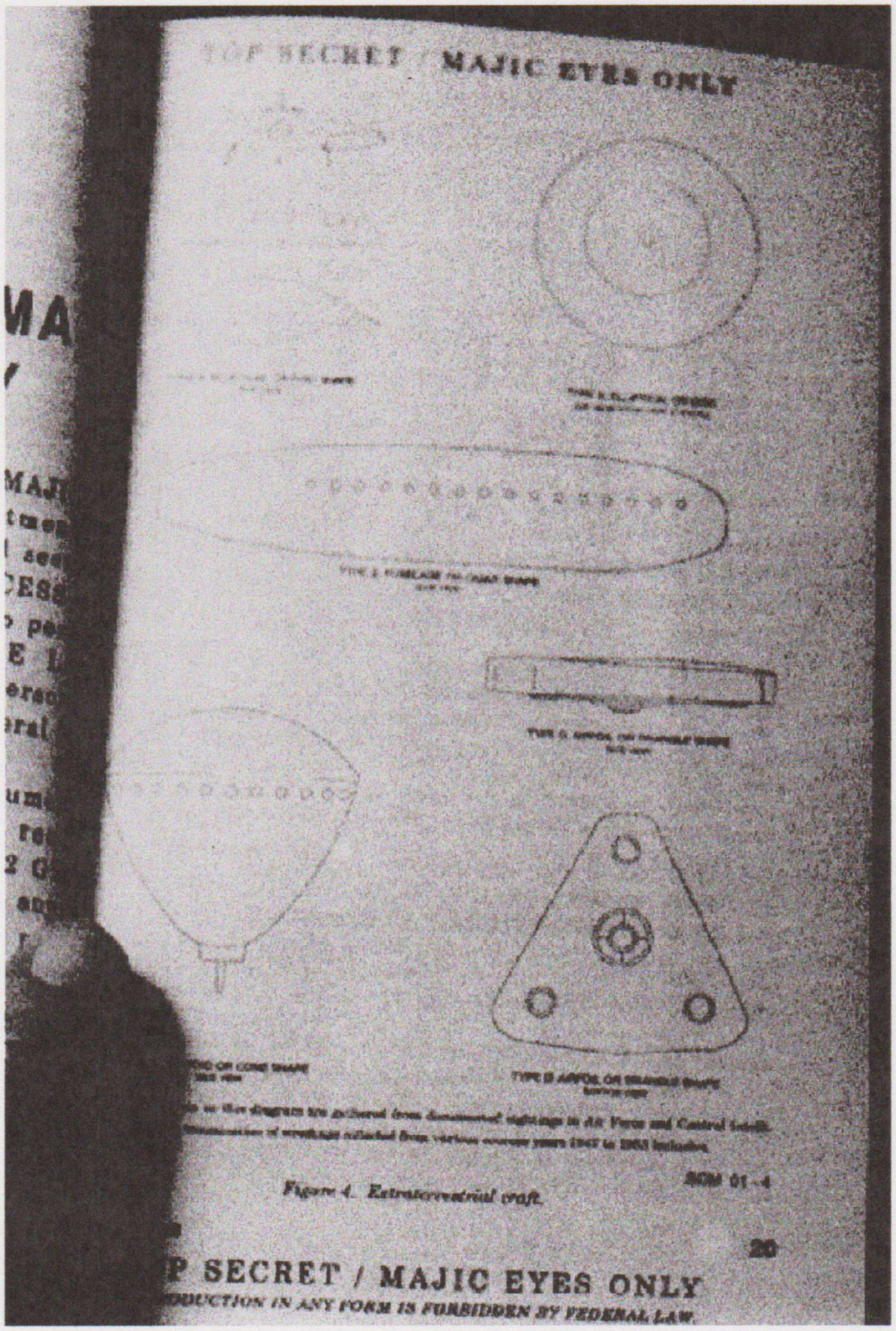

Note: Illustrations in this diagram are gathered from documented sightings in Air Force and Central Intelligence and from Examination of wreckage collected from various sources years 1947-1953 inclusive.

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Figure 4. Extraterrestrial Craft

CHAPTER 6
GUIDE TO UFO IDENTIFICATION

Section I. UFOB GUIDE

27. Follow-up Investigations

A UFOB report is worthy of follow-up investigation when it contains information to suggest that positive identification with a well-known phenomenon may be made or when it characterizes an unusual phenomenon. The report should suggest almost immediately, largely by the coherency and clarity of the data, that there is something of identification and / or scientific value. In general, reports which should be given consideration are those which involve several reliable observers, together or separately, and which concern sightings of greater duration than one quarter minute. Exception should be made to this when circumstances attending the report are considered to be extraordinary. Special attention should be given to reports which give promise to a "fix" on the position and those reports involving unusual trajectories.

28. Rules of Thumb

Each UFOB case should be judged individually but there are a number of "rules of thumb", under each of the following headings, which should prove helpful in determining the necessity for follow-up investigation.

a. Duration of Sighting. When the duration of a sighting is less than 15 seconds, the probabilities are great that it is not worthy of follow-up. As a word of caution, however, should a large number of individual observers concur on an unusual sighting of a few seconds duration, it should not be dismissed.

b. Number of Persons Reporting the Sighting. Short duration sightings by single individuals are seldom worthy of follow-up. Two or three competent independent observations carry the weight of 10 or more simultaneous individual observations. As an example, 25 people at one spot may observe a strange light in the sky. This, however, has less weight than two reliable people observing the same light from different locations. In the latter case a position-fix is indicated.

c. Distance from Location of Sightings to Nearest Field Unit. Reports which meet the preliminary criterion stated above should all be investigated if their occurrence is in the immediate operating vicinity of the squadron concerned. For reports involving greater distances, follow-up necessity might be judged as being inversely proportional to the square of the distances concerned. For example, an occurrence 150 miles away might be considered to have four times the importance (other things being equal) than one that is 300 miles away.

d. Reliability of Person or Persons Reporting. In establishing the necessity of follow-up investigation only "short term" reliability of individuals can be employed. Short term reliability is judged from the logic and coherency of the original report and by the age and occupation of the person. Particular attention should be given to whether the occupation involves observation reporting or technical knowledge.

e. Number of Individual Sightings Reported. Two completely individual sightings, especially when separated by a mile or more constitutes sufficient cause for follow-up, assuming previous criterion have not been violated.

f. The Value of Obtaining Additional Information Immediately. If the information cannot be obtained within seven days, the value of such information is greatly decreased. It is of great value to obtain additional information immediately if previously stated criteria have been met. Often, if gathered quickly, two or three items (weather conditions, angular speed, changes in trajectory, duration, etc.) are sufficient for immediate evaluation. If investigation is undertaken after weeks or months, the original observers cease to be of value as far as additional new information is concerned. Generally, late interrogation yields only bare repetition of facts originally reported plus an inability on the part of the observer to be objective.

g. Existence of Physical Evidence (Photographs, Material, Hardware). In cases where any physical evidence exists, a follow-up should be made even if some of the above criteria have not been met.

29. Conclusion - UFOB Guide.

It is understood that all above criteria must be evaluated in terms of "common sense." The original report, from its working and clarity will almost always suggest to the reader whether there is any "paydirt" in the report.

Section II. IDENTIFICATION CRITERIA

30. General

When a UFO report meets, in large measure, the criteria projected in Section I and a follow-up investigation is instituted, then the interrogator should ask what physical object or objects might have served as the original stimulus for the report. The word "object" here includes optical phenomena such as reflections from clouds, sundogs, etc. Frequently one or perhaps two solutions will be immediately suggested by the nature of the report. The word "solution" cannot be used here in the scientific sense. A solution in UFOB work means that a hypothesis has been arrived at which appears to have the greatest probability of having given rise to the given report. Following is a group of hypotheses or examples which should prove helpful in arriving at solutions. A check should be made to see how many of the items are satisfied by the report and how many are missing. An effort should be made to obtain any missing items as soon as possible. Each typical hypothesis is listed in a separate paragraph.

31. Aircraft

a. Shape. From conventional to circular or elliptical.

b. Size. Pinpoint to actual

c. Color. Silver to bright yellow (night - black or color of lights).

d. Speed. Generally only angular speeds can be observed. This depends on distance but small objects crossing major portion of sky in less than a minute can be ruled out. Aircraft will not cross major portion of sky in less than a minute whereas a meteor certainly will.

e. Formation. Two to twenty. Numbers greater than 20 more likely birds than aircraft.

f. Trails. May or may not have (vapor and exhaust).

g. Sound. Zero to loud shrill or low depending on altitude.

h. Course. Steady, straight or gently curving (not erratic - may appear still if approaching head-on). Right angle turns and sudden reversals, changes in altitude ruled out. Note: Although report may indicate erratic course, if other items check, follow-up should proceed on basis of aircraft because of psychological tendencies of excited people to exaggerate course changes.

i. Time In Sight. More than 15 seconds, generally of the order of a minute or two.

j. Lighting Conditions. Night or Day.

k. Radar. Should show normal aircraft returns.

32. Balloons

a. Shape. Round to cigar or pinpoint.

b. Size. Balloons up to a hundred feet will generally appear from pinpoint to size of a pea held at arm length.

c. Color. Silver, white or many tints. It may possibly appear dark as when projected against the clouds.

d. Speed. Large scale erratic speed ruled out. In general, hovering to slow apparent speed.

e. Formation. Single to cluster.

f. Trail. None.

g. Sound. None.

h. Course. Straight with a general gradual ascent, unless falling.

i. Time In Sight. Generally long. Note: Balloons may suddenly burst and disappear.

j. Lighting Conditions. Night or day but especially at sunset.

k. Radar. No return except when carrying sonde equipment.

33. Meteor

a. Shape. Round to elongated.

b. Size. Pinpoint to size of moon.

c. Color. Flaming yellow with red, green or blue possible.

d. Speed. Crosses large portion of sky in few seconds except if coming head-on.

e. Formation. Generally single - can break into shower at end of trajectory. Occasionally (but rare) small groups.

f. Trail. At night almost always a luminous train which can persist as long as a half hour (rarely). Daytime meteors are much less frequently observed. In daytime, leaves a whitish to dark smoke trail.

g. Sound. None, although occasionally reported (believed psychological).

h. Course. Generally streaking downward, but not necessarily sharply downward. Can on rare occasion give impression of slight rise.

i. Time In Sight. Longest report about 30 seconds, generally less than 10.

j. Lighting Conditions. Day or Night. Mostly night.

k. Radar. Return from meteor itself is highly improbable, however, the train left by a meteor, is a good radar reflector.

l. Other. An exceptionally bright meteor is called a fireball. These are rare but extremely spectacular and on occasion have been known to light surroundings to the brightness of daylight.

34. Stars or Planets

The planets, Venus, Mars, Jupiter, and Saturn are generally brighter than any star, but they twinkle very much less (unless very close to horizon). Stars twinkle a great deal and when near the horizon can give impression of flashing light in many colors.

a. Shape. Pinpoint - starlike.

b. Size. Never appreciable.

c. Color. Yellow with rainbow variations.

d. Speed. Stars apparent speeds carry them from east to west in the course of the night but they are often reported as erratic. The effect is psychological, most people being unable to consider a point as being stationary. Occasionally turbulence in the upper atmosphere can cause a star to appear to jump (rare) but somehow twinkling gives the impression of movement to many people.

Note: Just because the report says the light moves does not rule out the possibility of it being a star unless motion is from one part of sky to another relatively short time.

e. Formation. There are no clusters of very bright stars but faint stars are grouped in their familiar constellations. Note: a report of 4 or 5 bright clustering lights would rule out stars.

f. Trail. None.

g. Sound. None.

h. Course. Always describe 24 hour circle around pole of sky from east to west.

i. Time In Sight. When clear, stars are always visible. Most stars rise or set during the course of the night. Stars low in western sky set within an hour or two. Stars in east, always go higher in sky.

j. Lighting Conditions. Night - twilight.

k. Radar. None.

35. Optical Phenomena

This can cover a multitude of things. Original scanning of the report should be made to attempt to determine whether it more likely describes a material object or an optical phenomenon. Optical phenomena which have been reported as UFOBs run from reflections on clouds and layers of ice crystals (sundogs) to the many types of mirages. No one set of optical phenomena can be set down as representation for the whole class. There is no limit to the speed of optical phenomena. Reflections can travel from incredible speed, as in the case of a search-beacon on high clouds, to stationary. These cases if well reported will almost always warrant follow-up. Their variety and connection with upper atmospheric conditions make these observations especially valuable scientifically.

a. Shape. Generally round but can be elliptical or linear.

b. Size. Starlike to large luminous glow.

c. Color. Generally yellow.

d. Speed. Stationary to fantastic.

e. Formation. Any.

f. Trail. None.

g. Sound. None.

h. Course. Any.

i. Time In Sight. Any.

j. Lighting Conditions. Day and night.

k. Radar. No return. In special cases, radar response will occasionally have to do with unusual clouds, and meteorological phenomena such as described in Minnaert's book "Light and Color in the Open Air."

l. Other. One of the standard types is the "sundog." In this a large luminous halo is seen around the sun with one to four images of the sun placed along the halo circle at intervals of 90 degrees. Another report often has to do with a bright planet or even the moon shining through a light overcast. Mirages reflections are said to occur frequently when temperature inversions exists in the atmosphere. If an optical phenomena is suspected, routine check of the meteorological records should be made to establish whether such inversions existed.

APPENDIX I
REFERENCES

For the availability of items listed, check SR 310-20-3, SR 310-20-4, SR 310-20-5 and SR 310-20-7.

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1. [Applicable] Regulations

AR 380-4	Military security (Safeguarding Security Information).
AR 750-4	Maintenance of Supplies and Equipment, Maintenance Responsibilities and Shop Operation.

2. Supply

SR 725-405-5	Preparation and Submission of Requisitions for Supplies.

3. Other Publications

XX 219-20-3	Index of Training Manuals.
XX 310-20-4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletin Lubrications Orders, and Modification Work Orders.
XX 310-20-5	Index of Administrative Publications.
XX 310-20-7	Index of Tables of Organization and Equipment, Reduction Tables, Tables of Organization, Tables of Equipment, Type Tables of Distribution and Tables of Allowance.

4. Test Equipment References

TM 11-664	Theory and Use of Electronic Test Equipment.

5. Photographic References

TM 11-404A	Photographic Print Processing Unit AN/TFQ-9.
TM 11-405	Processing Equipment PH-406.
TM 11-401	Elements of Signal Photography.
TM 11-2363	Darkroom PH-392.

Author Caveats

This manual is a replica of one that was photographed by an unknown person.

The Tri-X negatives were mailed to Mr. Don Berliner, postmarked March 7, 1994. Don provided copies to the GAO. He took early initiative to determine their authenticity. Presently in November 1998, although he has not been able to review the arguments summary, he is not inclined to regard SOM 1-01 as genuine.

The 1st generation print copies became a basis for this replica. It is very accurate, and includes faithful replication of the few errors missed by the original proofreaders. Through page 21 was on the film, but pages 22-25 about the UFOB Guide were found in an unclassified FOIA released document provided to Mr. Brian Parks from Maxwell Air Force Base, referring to the transmittal of such a guide in an unclassified letter dated 14 Jan 1955.

This manual SOM 1-01 is now in the public domain, having been largely reprinted in a book, "TOP SECRET/MAJIC" by Mr. Stanton T. Friedman. That version, however, is incomplete, contains typesetting errors, and does not replicate the six by nine-inch format that was used.

A number of arguments have been proposed to question the authenticity. It is the authors' opinions that they have all been dealt with, and that there is no question at all that this is a genuine manual used for the purposes stated therein.

These points of discussion will be treated in detail in an upcoming book by the authors noted below.

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a retyped
memorandum directive
establishing the NSA
Jim

TOP SECRET

A20707 5/4/54/050

Oct 24 1952

MEMORANDUM FOR: The Secretary of State
The Secretary of Defense

SUBJECT: Communications Intelligence Activities

The communications intelligence (COMINT) activities of the United States are a national responsibility. They must be organized and managed as to exploit to the maximum the available resources in all participating departments and agencies and to satisfy the legitimate intelligence requirements of all such departments and agencies.

I therefore designate the Secretary of State and Defense as a Special Committee of the National Security Council for COMINT, which Committee shall, with the assistance of the Director of Central Intelligence, establish policies governing COMINT activities, and keep me advised of such policies through the Executive Secretary of the National Security Council.

I further designate the Department of Defense as executive agent of the Government, for the production of COMINT information.

I direct this Special Committee to prepare and issue directives which shall include the provisions set forth below and such other provisions as the Special Committee may determine to be necessary.

1. A directive to the United States Communications Intelligence Board (USCIB). This directive will replace the National Security Council Intelligence Directive No.9, and shall prescribe USCIB's new composition, responsibilities and procedures in the COMINT fields. The directive shall include the following provisions:

a. USCIB shall be reconstituted as a body acting for and under the Special Committee, and shall operate in accordance with the provisions of the new directive. Only those departments or agencies represented in USCIB are authorized to engaged in COMINT activities.

Downgraded per NSC Information Security Oversight Office, 28 Jan 1981

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PAGE *1* OF *8* PAGES
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TOP SECRET

b. The Board shall be composed of the following members:

(1) The Director of Central Intelligence, who shall be the Chairman of the Board.

(2) A representative of the Secretary of State.

(3) A representative of the Secretary of Defense.

(4) A representative of the Director of the Federal Bureau of Investigation.

(5) The Director of the National Security Agency.

(6) A representative of the Department of the Army.

(7) A representative of the Department of the Navy.

(8) A representative of the Department of the Air Force.

(9) A representative of the Central Intelligence Agency.

c. The Board shall have a staff headed by an executive secretary who shall be appointed by the Chairman with approval of the majority of the Board.

d. It shall be the duty of the Board to advise and make recommendations to the Secretary of Defense, in accordance with the following procedure, with respect to any matter relating to communications intelligence which falls within the juristiction of the Director of NSA.

(1) The Board shall reach its decision by a majority vote. Each member of the Board shall have one vote except the representatives of the Secretary of State and of Central Intelligence Agency who shall each have two votes. The Director of Central Intelligence, as Chairman, will have no vote. In the event that the Board votes and reaches a decision, any dissenting member of the Board may appeal from such decision written 7 days to the

Special Committee. In the event that the Board votes but fails to reach a decision, any member of the Board may appeal within 7 days to the Special Committee. In either event the Special Committee shall review the matter, and its determination thereon shall be final. Appeals by the Director of NSA and/or the representatives of the Military Departments shall only be filed with the approval of the Secretary of Defense.

(2) If any matter is voted on by the Board but-

(a) no decision is reached and any member files an appeal;

(b) a decision is reached in which the representative of the Secretary of defense does not concur and files an appeal; no action shall be taken with respect to the subject matter until the appeal is decided, provided that, if the Secretary of Defense determines, after consultation with the Secretary of State, that the subject matter presents a problem of an emergency nature and requires immediate action, his decision shall govern, pending the result of the appeal. In such an emergency situation the appeal may be taken directly to the President.

(3) Recommendations of the Board adopted in accordance with the foregoing procedures shall be binding on the Secretary of Defense. Except on matters which have been voted on by the Board, the Director of NSA shall discharge his responsibilities In accordance with his own judgement, subject to the direction Of the Secretary of Defense.

(4) The Director of NSA shall make such report and furnish such information from time to time to the Board, either orally

in writing, as the Board may request, and shall bring to the attention of the Board either such reports or otherwise any new major policies or programs in advance of their adoption by him.

e. It shall also be the duty of the Board as to matters not falling within the jurisdiction of NSA;

(1) To coordinate the communications intelligence activities among all departments and agencies authorized by the President to participate therein;

(2) To initiate, to formulate policies concerning, and subject to the provisions of NSCID No.5, to supervise all arrangements with foreign governments in the field of communications intelligence; and

(3) to consider and make recommendations concerning policies relating to communications intelligence of common interest to the departments and agencies, including security standards and procedures, and, for this purpose, to investigate and study the standards and practices of such departments and agencies in utilizing and protecting COMINT information.

f. Any recommendation of the Board with respect to the matters described in paragraph e above shall be binding on all departments or the members of the Board. Recommendations approved by a majority, but not all of the members of the Board shall be transmitted by it to the Special Cimmittee for such action as the Special Committee may see fit To take.

g. The Board will meet monthly, or oftener at the call of the Chairman or any member, and shall determine its own procedures.

2. A directive to the Secretary of Defense. This directive shall Include the following provisions.

a. Subject to the specific provisions of this directive, the Secretary of Defense may delegate in whole or in part authority over The Director of NSA within his department as he sees fit.

b. The COMINT mission of the National Security Agency (NSA) shall Be to provide an effective, unified organization and control of the communications intelligence activities of the United States conducted against foreign governments, to provide for integrated operational policies and procedures pertaining thereto. As used in this directive, the terms "communications intelligence: or "COMINT" shall be construed all procedures and methods used in the interception of communications other than foreign press and propaganda broadcasts and the intended recipients,* but shall include censorship and the production and dissemination of finished intelligence.

c. NSA shall be administrated by a Director, designated by the Secretary of Defense after consultation with the Joint Chiefs of Staff, who shall serve for a minimum term of 4 years and who shall be eligible for reappointment. The Director shall be a career commissioned officer of the armed services on active or reactivated status, and shall enjoy at least 3 star rank during the period of his incumbancy.

d. Under the Secretary of Defense, and in accordance with approved policies of USCIB, the Director of NSA shall be responsible for accomplishing

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- See Public Law 513- -81st Congress 1950.

the mission of the NSA. For this purpose all COMINT collection and production resources of the United States are place under his operational and technical control. When action by the Chiefs of the operating agencies of the Services or civilian departments or agencies is required, the Director shall normally issue instructions pertaining to COMINT operations through them. However, due to the unique technical character of COMINT operations, the Director is authorized to issue direct to any operating elements under his operational control task assignments and pertinent instructions which are within the capacity of such elements to accomplish. He shall also have direct access to, and direct communication with, any elements of the service or civilian COMINT agencies on any other matters of operational and technical control as may be necessary, and he is authorized to obtain such information and intelligence material from them as he may require. All instructions issued by the Director under the authority provided in this paragraph shall be mandatory, subject only to appeal to the Secretary of Defense by the Chief of Service or head of civilian department or agency concerned.

e. Specific responsibilities of the Director of NSA include the following:

(1) Formulating necessary operational plans and policies for the conduct of the U.S. COMINT activities.

(2) Conducting COMINT activities, including research and development, as required to meet the needs of the departments and agencies which are authorized to receive the products of COMINT.

(3) Determining; and submitting to appropriate authorities, Requirements for logistic support for the conduct of COMINT activities, together with specific recommendations as to what each of the responsible departments and agencies of the Government should apply.

(4) Within NSA's field of authorized operations prescribing requisite security regulations covering operating practices, including the transmission, handling and distribution of COMINT material within and among the COMINT elements under his operational or technical contro[l]; and exercising the necessary monitoring and supervising control, including inspections if necessary, to ensure compliance with the regulations.

(5) Subject to the authorities granted the Director of Central Intelligence under NSCID No.5, conducting all liaison on COMINT matters with foreign governmental communications intelligence agencies.

f. To the extent he deemd feasible and in consonance with the aims of maximizing over-all efficiency, economy, and effectiveness, the Director shall centralize or consolidate the performance of COMINT functions for which he is responsible. It is recognized that in certain circumstances elements of the Armed Forces and other agencies being served will require close COMINT support. Where necessary for this close support, direct operational control of specified COMINT facilities and resources will be delegated by the Director, during such periods and for such tasks as are determined by him, to military commanders or the Chiefs of other agencies supported.

g. The Director shall exercise such administrative control over COMINT activities as he deems necessary to the effective/perfomance of his mission. Otherwise, administrative control of personnel and facilities will remain with the departments and agencies providing them.

h. The Director shall make provision for participation by representatives of each of the departments and agencies eligible to receive COMINT products in those offices of NSA where priorities of intercept and processing are finally planned.

i. The Director shall have a civilian deputy whose primary responsibility shall be to ensure the mobilization and effective employment of the best available human and scientific resources in the field of cryptologic research and development.

j. Nothing in this directive shall contravene the responsibilities of the individual departments and agencies for the final evaluation of COMINT information, its synthesis with information from other sources, and the dissemination of finished intelligence to users.

3. The special nature of COMINT activities requires that they be treated in all respects as being outside the framework of the general intelligence activities. Orders, directives, policies, or recommendations of any authority of the Executive Branch relating to the collection, production, security, handling, dissemination, utilization of intelligence, and/or classified material, shall not be applicable to COMINT activities, unless specifically so stated and issued by component departments or agency authority represented on the Board. Other National Security Council Intelligence Directives to the Director of Central Intelligence shall be construed as non-applicable to COMINT activities, unless the National Security Council has made its directive specifically applicable to COMINT.

NSA CONTRL. NO. 7300405
COPY NUMBER 2
PAGE 8 OF 8 PAGES

/s/ HARRY S. TRUMAN

FLOYD K. HASKELL
COLORADO

United States Senate

WASHINGTON, D.C. 20510

August 29, 1975

Theodore P. Rosack
Special Agent In Charge
Denver Federal Building
1961 Stout Street
Denver, Colorado 80202

Dear Mr. Rosack:

For several months my office has been receiving reports of cattle mutilations throughout Colorado and other western states. At least 130 cases in Colorado alone have been reported to local officials and the Colorado Bureau of Investigation (CBI); the CBI has verified that the incidents have occured for the last two years in nine states.

The ranchers and rural residents of Colorado are concerned and frightened by these incidents. The bizarre mutilations are frightening in themselves: in virtually all the cases, the left ear, left eye, rectum and sex organ of each animal has been cut away and the blood drained from the carcass, but with no traces of blood left on the ground and no footprints.

In Colorado's Morgan County area, there has also been reports that a helicopter was used by those who mutilated the carcasses of the cattle, and several persons have reported being chased by a similar helicopter.

Because I am gravely concerned by this situation, I am asking that the Federal Bureau of Investigation enter the case. Although the CBI has been investigating the incidents, and local officials also have been involved, the lack of a central unified direction has frustrated the investigation. It seems to have progressed little, except for the recognition at long last that the incidents must be taken seriously.

Now it appears that ranchers are arming themselves to protect their livestock, as well as their families and themselves, because they are frustrated by the unsuccessful investigation. Clearly something must be done before someone gets hurt.

HERE IS SOMETHING IMPORTANT.
There are reports of deaf people, that was being yelled at,
by angry voices, inside of their own minds, on the totally wrong language.
Like English, but Arab.
THEY were accidently hit with AUDIO that was not meant to be within THEM at all.

THE WHOLE SHO-BANG IN THEIR HEADS WAS MADE FOR SOME 'FOLKS' ELSEWHERE.
But apparently, there are something called 'making no sounds at all in the deaf people technology'.

You know, deaf people, people who can not hear,
they read lips, when talked to.
And they did not recognize this speech.
The whole shit was made for another Planet, completely.

THAT'S THE SHIT. 'SIR.

Let me repeat myself:
They did not recognize this speech.
Some of them are not deaf from birth, but still remembers conversations.
This Branch of Deaf People are harder to fuck around with. They all had perfect hearing recently.
The whole shit was made for another Planet, completely.

When? About 15 years ago. 2005-2007 somewhere. I read some Swedish newspaper writing about it.
And I picked it up again, a second time, when making languageschools for Political Avenue dot com. Category SIGN LANGUAGE.
I don't shit you. This happened. // G.N.

HERE ARE SOME TERMS AND ABBS YOU NEED TO KNOW ABOUT BEFORE READING CLASSIFIED DOCUMENTS.
BELOW ARE THE MOST COMMON DOCUMENT OR PROJECTION SLIDE SECRET CLASSIFICATION LABELS,
THAT YOU WILL FIND IN THE RESTRICTED PDF DOCUMENTS:

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DTRA = Defense Threat Reduction Agency.
EMP  = Electromagnetic Pulse.
E.O. = Executive Order.
FOUO = For Official Use Only.
IAW  = In Accordance With.
ISOO = Information Security Oversight Office.
JP   = Joint Publication.
MCS  = Mission Critical System.
MCTL = Militarily Critical Technologies List.
MOPP = Mission-Oriented Protective Posture.
OPR  = Office of Primary Responsibility.
SCG  = Security Classification Guide.

CIA  - Central Intelligence Agency.
DOD  - Department of Defense.
FBI  - Federal Bureau of Investigation.
FOIA - Freedom of Information Act.
RAAF - Roswell Army Air Field.
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EYES ONLY =PRESIDENT LEVEL. TWO POINTS ABOVE TOP SECRET. THIS CLASSIFICATION SEEMS TO BE FORGOTTEN OR NOT USED FOR A LONG TIME.
TS =TOP SECRET.
NOFORN =NO FOREIGNERS. MOSTLY MEANS WHEN USA DENIES ALLIES LIKE UNITED KINGDOM ANY KNOWLEDGE OR INFORMATION.
SI =INFORMATION CLASSED AS SPECIAL INTELLIGENCE. ONE SECRECY POINT ABOVE TOP SECRET AND MORE RARE TO BE APPROVED OF.
SCI =SPECIAL COMPARTMENTED INFORMATION. —HERE IS WHERE THE GOOD STUFF GETS HIDDEN.
CUI = Controlled Unclassified Information. Here it gets a little tricky.
DoD = Department of Defense.
DD Form = >Department of Defense Form (to fill in or check).
DoDD = Department of Defense Directive.
DoDI = Department of Defense Instruction.
DoDM = Department of Defense Manual.
FVEY =ONLY MEANT FOR THE FIVE EYES (SPYRING). They are the USA/UNITED KINGDOM/AUSTRALIA/NEW ZEALAND/CANADA.
OASD(NCB/CB) = Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs.
ORCON = ORIGINATOR CONTROLLED. Only the ORIGINATOR may release the information.
S =SECRET INFORMATION. A LEVEL OF CLASSIFICATION OFTEN USED IN MILITARY PAPERS AND DOCUMENTS.
U =UNCLASSIFIED INFORMATION. YOU CAN SPEAK FREELY ABOUT THIS.
SSO =SPECIAL SOURCE OPERATIONS.
FOUO or **CONFIDENTIAL** = **FOR OFFICIAL USE ONLY** . THE DOCUMENT CONTAINS GOVERNMENT INFORMATION THAT SHOULD NOT BE RELEASED TO THE PUBLIC.
SIGINT =SIGNALS INTELLIGENCE. TRACKS INTERNET, RADIO TRANSMISSIONS, COMMUNICATIONS, GPS LOCATIONS, INDIVIDUAL PERSONS TRACKING ET CETERA.
SIGAD =SIGINT ACTIVITY DESIGNATOR. Determines the collection sources used, taken from within the produced information chain.
COMINT =COMINT is the Communication Intelligence part of SIGINT (Signals Intelligence), dedicated to Electronic Warfare Operations.
SC =SECRET CODEWORD.
TSC =TOP SECRET CODEWORD.
COMINT CODEWORD =A FIVELETTER WORD THAT PRIMARILY IDENTIFIES THE SOURCE OF THE COMINT INFORMATION THAT WAS RELAYED OR DOCUMENTED.
UMBRA =IF USED TOGETHER WITH **TS** IN A DOCUMENT - IT'S THE FIVELETTER CODEWORD THAT IDENTIFIES THE COMINT INFORMATION AS THE HIGHEST - CLASS 3.
CJCSM = The Chairman of the Joint Chiefs of Staff Manual.
COA = Course of Action.
CCO =HANDLE VIA **COMINT CHANNELS ONLY** . INFORMATION ONLY FOR PEOPLE WHO HAVE ACCESS TO READ COMINT MESSAGES AND DOCUMENTS NORMALLY.
PAPERTRAILS =SOMETHING YOU CAN GET RID OF. PAPERS THAT POINT TO THAT YOU WERE A CRIMINAL WHEN AT WORK. I.E. —THE USE OF PAPER SHREDDERS.
GOD =A PERSON YOU CAN NOT GET RID OF . Many have tried. We advice not to try again. —Don't fuck with the Almighty. Or His Universe.

—Why are anyone interested in you? Or in your communications?

Why would anyone attack your computer or smartphone?
Half world control, half target practice.

Otherwise one do not have world control .

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INTRODUCTION.

EXTRAS:

//// GO BACK TO PAGE 97 - AND IN THE PHOTO SECTION OF THIS REPORT // SEE THE DOCUMENT ABOUT MURDERING SECRETARY OF DEFENSE FORRESTAL THAT WISHED TO GO PUBLIC WITH U.F.O.

First he was placed in a mental hospital, and then he was thrown out of a window there.

Did they give him a poison before he went to the mental hospital?

All pictures are real and not photoshopped. There are more than 100 photos and images herein.

Working on behalf of the Royal Kingdom of Sweden for all Governments worldwide.

*** = ALL THE 1950'S DOCUMENTS INDEXED ABOVE ARE REAL U.S. GOVERNMENT PROPERTY.
I don't personally speculate in this REPORT, about the accuracy and written truths served to you from these 1950's documents.
I only guarantee you that the old external documents published herein this SWEDISH PDF REPORT, are real U.S. GOVERNMENT PROPERTY from the 1950's.
Educate yourself by reading these GOVERNMENT PAPERS.

THIS SWEDISH REPORT INCLUDES OVER ONE HUNDRED RELATED PHOTOGRAPHS.

Our governments are our neighbors, but our neighbor does not tell us everything, and often deceives us.

"

I made some damn PDF about space and the moon, but in my factfinding, I got really stuck on some stuff. A mouse that looks like a frog. Mutilated cows. Genitalia and eyes removed. Is there any background to all that? And then you find a military lab down in a mountain range where they are working on DNA. Right next to the field where a State Trooper, (Traffic Police we should have said), anyway, he, found a cow with a "calf" inside, which looked like a frog, a fish and a human. And this within 10 miles of the DNA military lab in the mountain. Is it that simple?
IT FUCKING LOOKS LIKE IT. " / Gustav Norström.


THIS LOOKS LIKE A CROCODILE - A DOG - AND A COW.

Modell:
Polisbil 2023 SÄPO. ☆

Skrämljus med sidriktad vit trottoarbelysning från STANDBY.

SKRÄMSELEFFEKT: ☆ ☆ ☆ ☆ ☆ FEM STJÄRNOR AV FEM MÖJLIGA.

Jag frågade en tjej: Tänk om SÄPO stannade utanför er villa och tog med sig din kille. Fattaru vilken skillnad det är om en vanlig civilpolisbil stannar eller om det är den här fräna versionen? "-Då blir man ju skraj sa hon. Om man ser den där jävla bilen!" Det är meningen också sa jag. Eller så står man utanför den Kinesiska Ambassaden,

OCH BARA BLINKAR LITE EN STUND.

VAD TYX OM BILEN?

Jag satt någon helg för två år sedan med en dyr flaska rödvin och en dator, och gjorde bilen ovan.

När jag tänker efter så var det kanske 2-3 flaskor rödvin och lite tabletter. Lite påtänd så där.

DET ÄR KANSKE 3 ÅR SEDAN OCH FEM FLASKOR RÖDVIN. ELLER NYINKÖPT HANDSPRIT MED COCA-COLA.

SAME SHIT!

KOLLA GALLREN PÅ PASSAGERARSIDAN BÅDE FRAMÅT OCH BAKÅT. KAN INTE SÄPO ÅKA RUNT JÄMNT I STOCKHOLM, MED DEN HÄR BILEN, OCH HA FÖRSTÄRKNINGSVAPEN TILL ALLA I LÅDORNA DÄR BAK.

Fotar man dessutom personer från den här bilen, så sätter man ju nojor i huvudet på dem som man fotar av. DET ÄR DET SOM ÄR AVSIKTEN !

SÅ DE GÖR BORT SIG SENARE PGA NOJOR.

AV: 740621-1750

VIDEOLINKS

The link address to the U.S. MILITARY FOOTAGE ARCHIVE FILMS saved on website.
You can also listen to the original audio from the ABC RADIO NATIONWIDE Newsflash the 8:th of July 1947.

https://restricteddocuments.com/NEWSFLASH.mp4

Chemtrails Video. It's not about one picture, which might be explainable, but the amount of images, which needs another Government answer.

https://restricteddocuments.com/Emergency-BroadcastSWEDEN1.mp4

Federal Reserve. It's about cash.

https://restricteddocuments.com/FIRST%20LOOK%20inside%20the%20FEDERAL%20RESERVE%2028.04.2013%20_Full%20Lenght_.mp4