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FACT BOOK

NAVAL RESEARCH LABORATORY

Washington, D. C.

OCTOBER 1972

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**This document has been prepared as
a reference source of factual information
about the Naval Research Laboratory.**

October 1972

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Aerial view of the Naval Research Laboratory main site

The Naval Research Laboratory

MISSION

The mission of the Naval Research Laboratory is to conduct scientific research and development in the physical sciences and related fields directed toward new and improved materials, equipment, techniques, and systems for the Navy. In fulfillment of this mission, the Naval Research Laboratory:

1. Initiates and conducts scientific research and development of a basic and long-range nature in scientific areas of special interest to the Navy.
2. Performs scientific research and development for the Systems Commands and offices of the Navy and, where specially qualified, for the Defense Department and, in defense related efforts, for other government agencies.
3. Provides to the Navy and its contractors standardized techniques and procedures for measurements and for the accurate calibration of standard instruments in areas of special Navy needs.
4. Furnishes scientific consultative services for the Navy and, where specially qualified, for the Defense Department and, in defense related efforts, for other government agencies.
5. Provides to the Navy unbiased determination of performance characteristics of developmental and prototype devices through limited engineering test and evaluation services.

THE NAVY'S CORPORATE LABORATORY

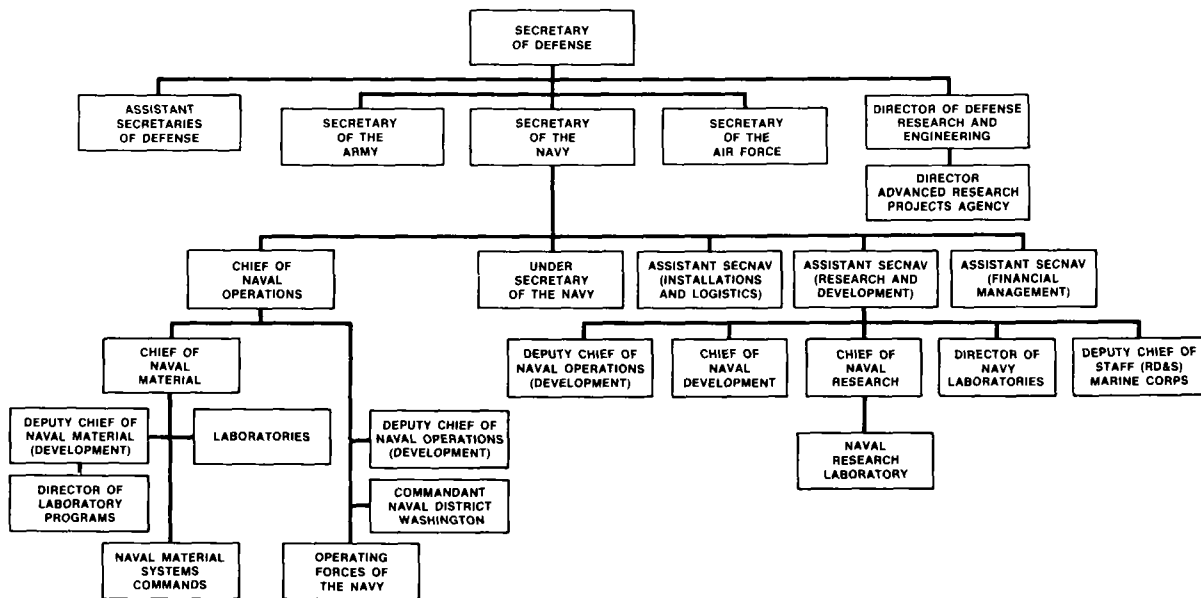
The Naval Research Laboratory is one of the principal in-house research and development institutions of the U.S. Government. It was established in 1923 to ensure that advancements in science and engineering could be readily applied to the Navy's needs. Directed always toward this end, the NRL research program has developed to its present status as a broadly based and coordinated effort in the physical, mathematical, and environmental sciences, in advanced engineering, and in naval analysis. The work of the Laboratory is conducted at the main establishment in the District of Columbia and at various field sites that provide unique environment and facilities not available at the main site.

Some principal elements of the research program include fundamental and applied work in radio wave propagation, oceanography, deep-sea instrumentation, submarine air purification, structural design theory, fracture mechanics, surface chemistry, optical physics, radar, underwater sound propagation, acoustic signal processing, sonar transducers, nuclear physics, radio astronomy, high-temperature lubricant, high-energy fuels, plasma physics, refractory metals, exotic materials for high-performance structures, x-ray astronomy, high-power lasers, solid-state physics, and stress-corrosion cracking of high-strength titanium steels and aluminum alloys.

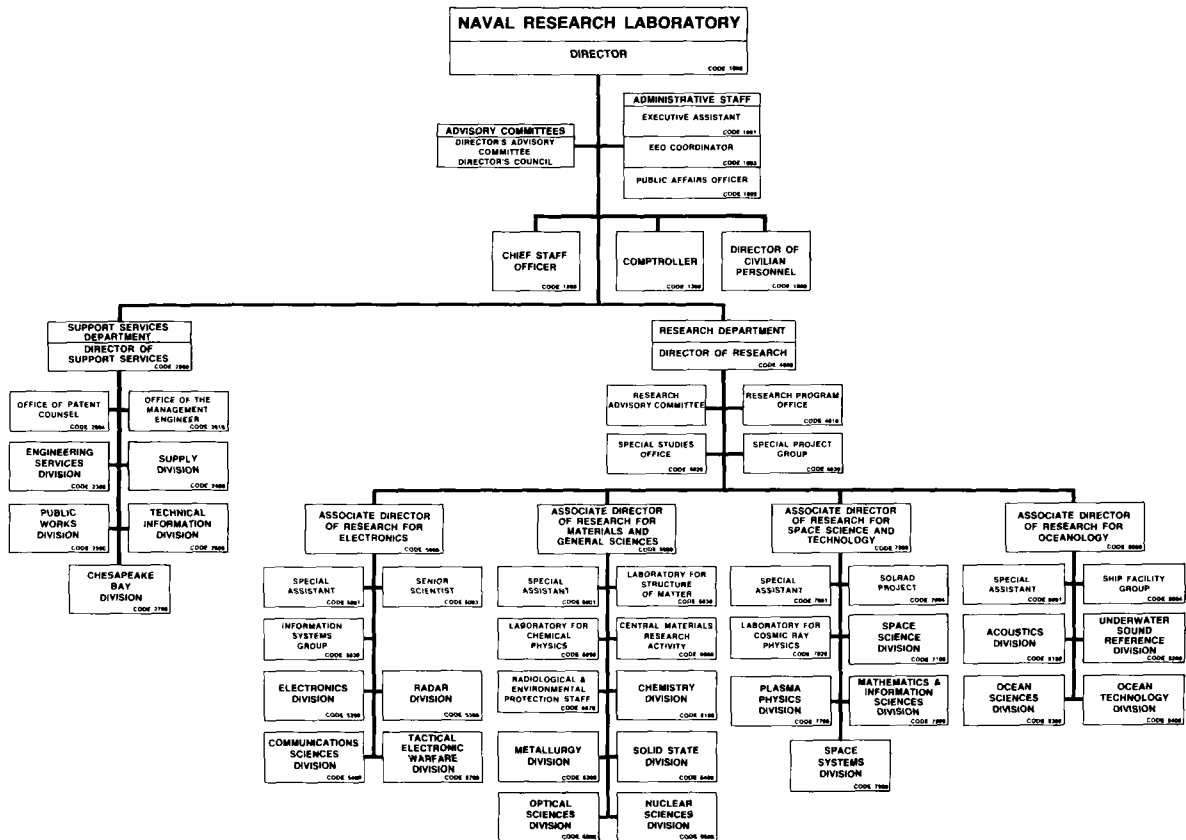
Over 1700 scientific and technical papers were produced in 1971 as a consequence of the research and development effort of the Laboratory staff. The figure includes 155 formal reports, 170 memorandum reports, 520 articles published in professional society journals, and over 800 papers presented at scientific and technical meetings in the United States and in foreign countries.

In addition, 76 U.S. patents were issued in 1971 on inventions made by present and former employees of the Naval Research Laboratory. This figure brings the grand total of NRL patents, through the calendar year 1971, to 2293.

In its investigations of broad scientific areas, in considering its findings for potential military applications, and in furnishing to the Naval Systems Commands and Secretariat expert consultative services relating to science and military systems, NRL functions as the corporate laboratory of the Navy. Thus it provides a central focus of research and development activity that supports the Navy. When NRL findings and capabilities have borne fruit in particular areas, the results are made known to and used by not only the Navy but also the Army, the Air Force, the Advanced Research Projects Agency, the Atomic Energy Commission, and other agencies of the government.



Position of NRL in the Department of Defense structure



Organization chart of NRL

MILITARY AND CIVILIAN PERSONNEL

Military Personnel Attached to NRL as of June 1, 1972

<i>Officers</i>	<i>Authorized</i>	<i>On Board</i>
Captain	3	2
Commander	8	9
Lieutenant Commander	11	3
Lieutenant	8	10
Lieutenant (Junior Grade)	0	3
Ensign	0	1
Warrant Officer	1	0
Total	31	28
 <i>Enlisted</i>	 81	 79

Civilian Employees on Rolls as of June 1, 1972

10 USC 1581 (formerly Public Law 313)	24
Classification Act (GS)	2793
Scientific & Professional	1387
Technical Supporting	629
General Administrative & Clerical	777
Wage Board	798
General Wage Service (WG)	632
Apprentices, Planning, Estimating, etc.(WD)	83
Printing & Lithographic Service (WI)	19
Supervisory General Wage Service (WS)	56
Inspection Service (WX)	6
Leader (WL)	2
Total	3615

Annual Civilian Turnover Rate (percent)

	<u>1970</u>	<u>1971</u>	<u>1972</u>
Research Department	4.9	4.5	5.4
Nonresearch Areas	11.6	11.3	8.7
Entire Laboratory	7.8	7.1	6.8

Highest Academic Degrees Held by Permanent Employees (as of June 1, 1972)

Bachelors	686
Masters	344
Doctorates	461

FISCAL INFORMATION
NRL FUNDING BY MAJOR SPONSOR
FISCAL YEARS 1971 AND 1972

Sponsor	FY 1971 (Act)		FY 1972 (Est)	
	Millions of Dollars	Percent	Millions of Dollars	Percent
R&D PROGRAM				
ONR	31.6	28.2	36.1	26.6
SHIP	14.2	12.7	16.0	11.8
ELEX	7.8	6.9	12.3	9.1
AIR	17.2	15.3	24.3	17.9
ORD	3.9	3.5	4.8	3.5
OTHER NAVY	<u>4.6</u>	<u>4.1</u>	<u>6.2</u>	<u>4.5</u>
TOTAL NAVY	79.3	70.7	99.7	73.4
OTHER DOD	18.3	16.3	20.2	14.9
NON-DOD	<u>11.2</u>	<u>10.0</u>	<u>12.1</u>	<u>8.9</u>
TOTAL R&D	108.8	97.0	132.0	97.2
NON R&D	<u>2.2</u>	<u>2.0</u>	<u>2.3</u>	<u>1.7</u>
TOTAL NIF	111.0	99.0	134.3	98.9
CAPITAL IMPROVEMENT	<u>1.2</u>	<u>1.0</u>	<u>1.5</u>	<u>1.1</u>
TOTAL FUNDS	112.2	100.0	135.8	100.0

EXPENDITURES
(Excluding Plant Account Funds)
FY 1971-1972

<u>Purpose</u>	<u>During FY 1971</u>	<u>During FY 1972</u>
Materials, supplies and parts	\$ 15,000,000	15,500,000
Salaries and wages	56,500,000	63,900,000
Contractural services and other costs	39,500,000	54,900,000
TOTAL	<u>\$111,600,000</u>	<u>134,300,000</u>

CAPITAL PROPERTY

As of May 1972

Class 1 (Land)	\$ 451,839
Class 2 (Buildings and improvements)	76,660,816
Class 3 (Equipment)	15,280,807
Class 4 (Industrial production equipment)	<u>15,698,078</u>
TOTAL CAPITAL PROPERTY	\$108,091,540

Office of the Director

The Director of the Naval Research Laboratory is a Navy Captain with appropriate educational background and experience. He is responsible for the overall operation and management of the Laboratory and its programs, and he executes the usual functions of command of a naval shore activity. The Directors of the Laboratory's two Departments, Research and Support Services, report to the Director. In carrying out the functions of his office, the Director is assisted by the Chief Staff Officer, the Comptroller, the Director of Civilian Personnel, an Executive Assistant, an EEO Coordinator, and a Public Affairs Officer.

Director, Naval Research Laboratory



Captain Earle W. Sapp, USN

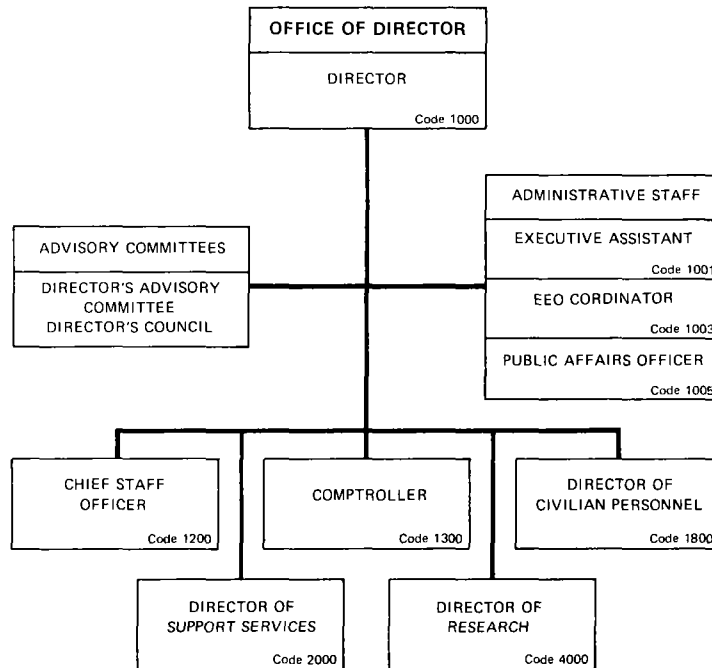
Captain Sapp [REDACTED], [REDACTED]. He attended Duke University from 1944 to 1947, where he majored in physics while in the Naval Reserve Officers Training Corps. He graduated in March 1947 and was commissioned Ensign, USN, at that time. He is a graduate of the Naval War College and has attended several Naval schools in the areas of antisubmarine warfare equipment and tactics, combat information center operations, and naval electronics. Captain Sapp also has attended special oceanographic courses, and his Navy technical subspecialty is oceanography.

Captain Sapp's R&D experience includes project assignments in fleet evaluation activities, in the Office of Naval Research, and in experimental ships assigned to Navy laboratories and the operational test and evaluation force. Prior to assuming the position of Director of the Laboratory on June 30, 1970, he was on the staff of the Director of Defense Research and Engineering, where he served as Deputy to the Assistant Director for Ocean Control.

Captain Sapp is a line officer and is qualified to command destroyers. During his naval career, Captain Sapp acquired broad operational and command experience in destroyer-type ships and in fleet staffs. He has commanded the experimental destroyer escort USS MALOY (EDE 791) and the fleet destroyer USS EUGENE A. GREENE (DD 711). His fleet experience includes deployments to both the European and Southeast Asia theaters, as well as experimental antisubmarine warfare operations.

He is a member of the Research Society of America, the Acoustical Society of America and the American Society of Naval Engineers.

OFFICE OF THE DIRECTOR



Key Personnel

<u>Name</u>	<u>Title</u>	<u>Code</u>
CAPT E.W. Sapp, USN	Director	1000
Mr. S.L. Cohen	Executive Assistant	1001
Mr. W. Webster	EEO Coordinator	1003
Mr. E.L. Smith	Public Affairs Officer	1005
CAPT J. Brozena, USN	Chief Staff Officer	1200
Mr. J.P. Donovan	Comptroller	1300
Mr. F.D. Wallace	Director of Civilian Personnel (Acting)	1800
CAPT J.A. Bortner	Director of Support Services	2000
Dr. A. Berman	Director of Research	4000

EXECUTIVE ASSISTANT

Basic Responsibilities

The Executive Assistant provides the Director with executive level staff and managerial support in connection with the duties, interests, and activities of the the Director.



Mr. S. L. Cohen

EQUAL EMPLOYMENT OPPORTUNITY COORDINATOR

Basic Responsibilities

The Equal Employment Opportunity Coordinator serves as an advisor to the Director on EEO matters; conducts surveys and studies relating to NRL's Affirmative Action Plan and recommends methods for achieving its goals of a fully integrated work force; acts as ex officio member of the EEO Committee; and assists the EEO counselors in settling initial complaints of alleged discrimination.

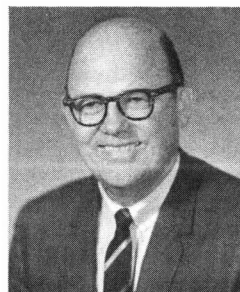


Mr. W. Webster

PUBLIC AFFAIRS OFFICER

Basic Responsibilities

As a collateral duty, the Head of the Technical Information Division (Code 2600) serves as Public Affairs Officer (Code 1005), and advisor to the Director of the Laboratory on all matters relating to public affairs. He is also responsible for the overall planning and guidance of the Laboratory's public affairs program implemented through the Public Affairs Branch (Code 2650).



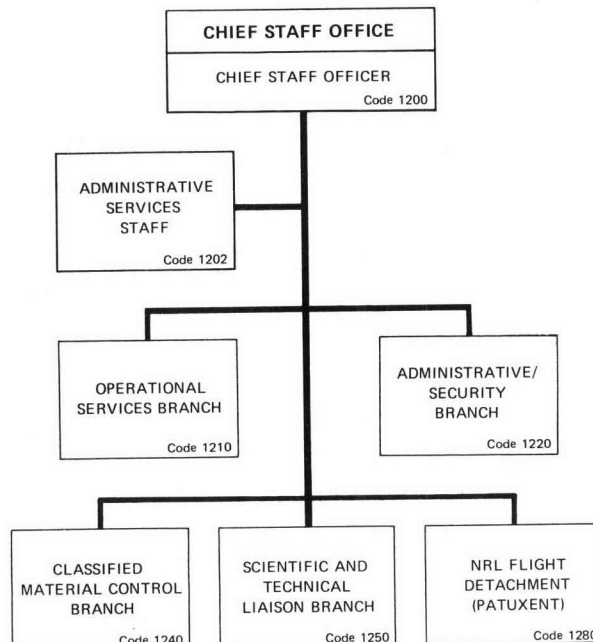
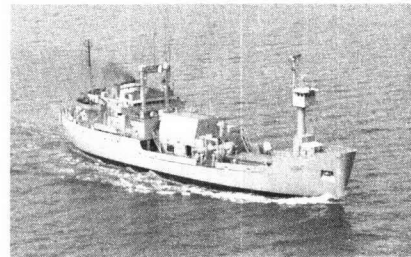
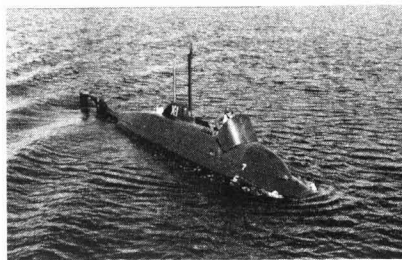
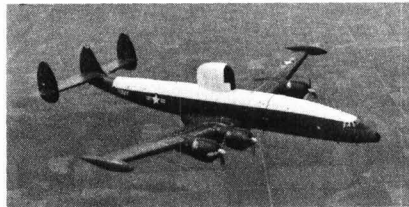
Mr. E. L. Smith



CAPT J. Brozena, USN

Chief Staff Office

- OPERATIONAL SERVICES
- SCIENTIFIC AND TECHNICAL LIAISON
- SECURITY
- CLASSIFIED MATERIAL CONTROL



Basic Responsibilities

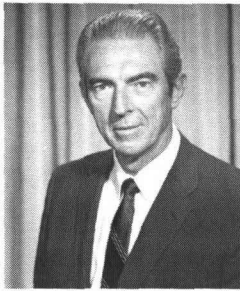
The Chief Staff Officer provides a military staff to the Director, Naval Research Laboratory, for the purpose of assisting the Director in the military aspects of the management of the Laboratory. He conducts liaison with DOD and Navy Commands and activities and the operating forces of the Navy in support of NRL research and development operations and the coordination of the military application of the scientific work of the Laboratory. The Staff supports four multi-engine Laboratory aircraft and obtains and coordinates such additional air, surface, and subsurface services as are required. The Military Staff is also responsible for personnel and plant security, communications, and control of classified material.

Key Personnel

<u>Name</u>	<u>Title</u>
CAPT J. Brozena, USN	Chief Staff Officer
Mr. J.R. Gallagher	Administrative Services Officer
LTJG T.R. Cocozza, USN	Communications/Military Personnel Officer
CDR D.F. Moxley, USN	Operational Services Officer
CDR L.R. Marshall	Administrative/Security Officer
Mr. W.C. Bryan	Head, Special Activities Office
Mr. J.M. Manser	Head, Security Section
Mr. J.J. Bagley	Classified Material Control Officer
CDR W. Glickman, USN	Scientific and Technical Liaison Officer
CDR G. Janulis, USN	OIC, NRL Flight Detachment (Patuxent)

Personnel Complement

On Board: 160
(81 Civilian, 79 Military)



Mr. J. P. Donovan

Office of the Comptroller



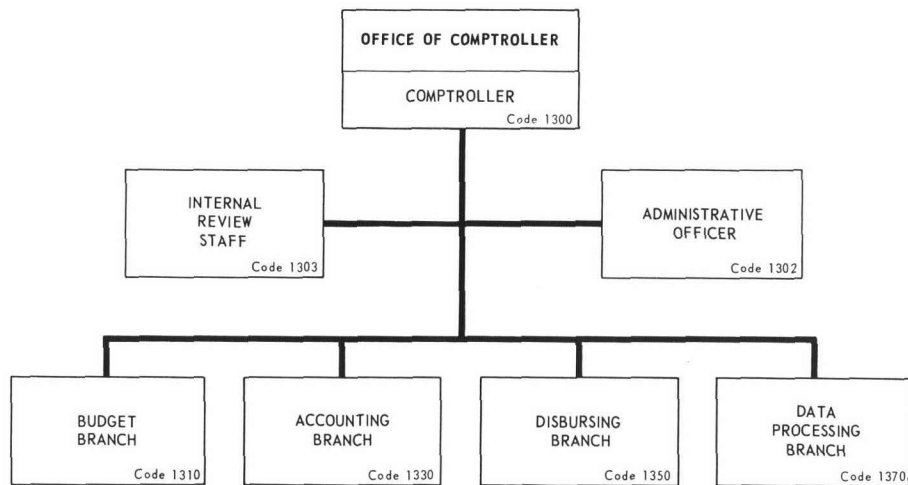
INTERNAL
REVIEW

BUDGET OFFICE



COMPUTER

- BUDGET
- ACCOUNTING
- DISBURSING
- DATA PROCESSING



Basic Responsibilities

The Comptroller is the financial adviser to the Director and other officials of the Laboratory. He administers the financial program of the Laboratory.

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. J.P. Donovan	Comptroller
Mr. D.M. Johnson	Budget Officer
Mr. D.K. Jones	Accounting Officer
WO1 Lydia C. Gelardi, USN	Disbursing Officer
Mr. R.L. Guest	Data Processing Officer
Mr. R.A. Showman	Head, Internal Review Staff

Personnel Complement

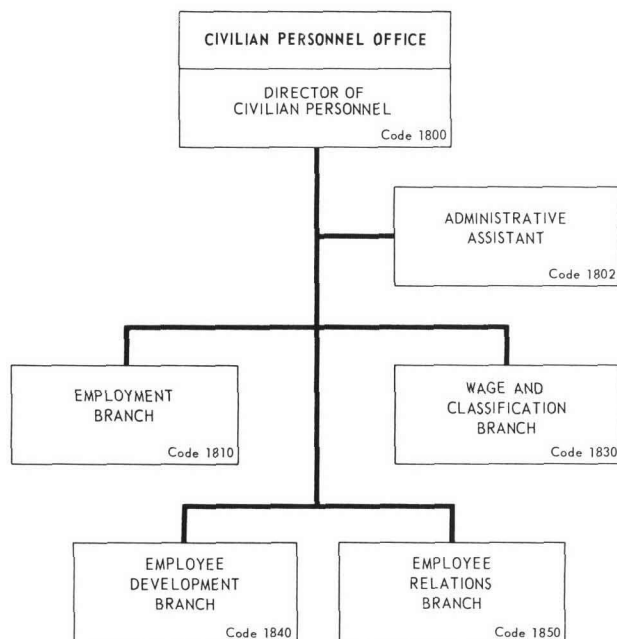
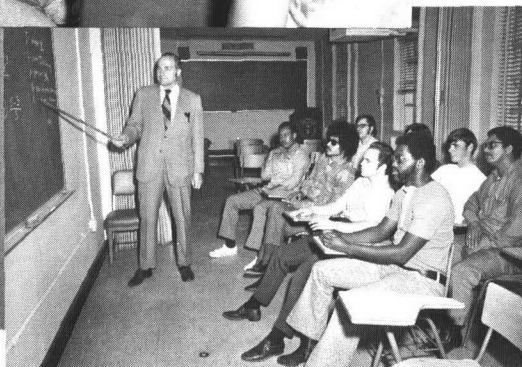
On Board: 84



Mr. F. D. Wallace

Civilian Personnel Office

- EMPLOYMENT
- WAGE AND CLASSIFICATION
- EMPLOYEE DEVELOPMENT
- EMPLOYEE RELATIONS



Basic Responsibilities

The Civilian Personnel Office administers the Laboratory's personnel program, which includes selection, development, promotion, utilization, appropriate recognition, and employee counseling and services for all civilian personnel.

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. F.D. Wallace	Director of Civilian Personnel
Mr. J.E. Goss	Head, Employment Branch
Miss D.A. Myers	Head, Wage and Classification Branch (Acting)
Mr. W.J. McLaughlin	Head, Employee Development Branch
Mr. H.H. Kay	Head, Employee Relations Branch

Personnel Complement

On Board: 48

The Research Department

The Research Department is headed by a civilian Director of Research who reports to the Director of NRL. The Department is comprised of four organizational areas of research—Electronics, Materials and General Sciences, Space Science and Technology, and Oceanology—each of which is headed by an Associate Director of Research. Encompassed by these four broad areas of research, which correspond to the principal areas of the Navy's interest in the physical and engineering sciences, are 17 divisions and additional special groups. Each division is headed by a civilian scientist and is comprised of an average of about 110 scientific, technical, and administrative personnel. The special groups average about 13 persons each. Three of the special groups (Laboratory for the Structure of Matter, Laboratory for Chemical Physics, and Laboratory for Cosmic Ray Physics) are headed by Chief Scientists who occupy corresponding "Chairs of Science."

The Director of Research is the Chief Scientist for the Laboratory; in this capacity he is responsible for:

- the conduct and effectiveness of the research program with direct authority and accountability for the technical work.
- long range and broad overall planning and programming.
- evaluating and accepting, modifying, or rejecting R&D proposals from NRL's scientific divisions; and for evaluating and recommending to the Director of NRL the acceptance or rejection of new problems from other activities.
- Research Department administration and the budgeting of funds.
- hiring, promoting, and effecting other personnel actions for Research Department personnel.

The Director of Research keeps the Director of Support Services informed at all times of the service needs of the scientific divisions and of any obstacles which may be impeding technical work of the Laboratory; he advises the Comptroller relative to requirements and control of funds; he also is encouraged to advise the Chief of Naval Research directly of the progress of the research program and of the overall climate for research at the Laboratory.

Director of Research



Dr. Alan Berman

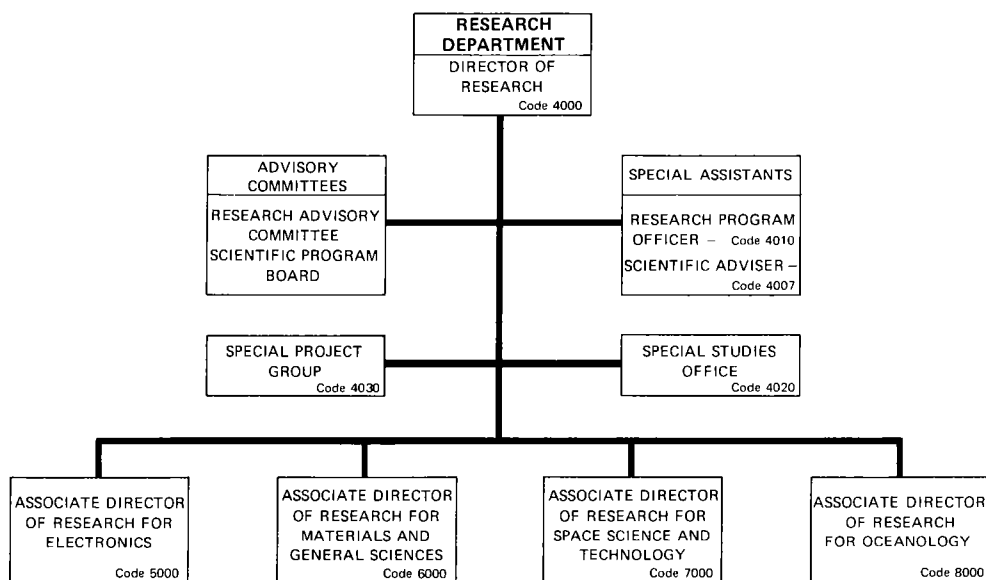
Dr. Berman [REDACTED]

[REDACTED] He received the A.B. degree in physics from Columbia College in 1947 and the Ph.D. degree in physics from Columbia University in 1952.

From 1952 to 1955 he was a research scientist at the Hudson Laboratories of Columbia University. He became Assistant Director of Hudson Laboratories in 1955, Associate Director in 1957, and Director in 1963. On May 29, 1967, Dr. Berman became Director of Research for the Naval Research Laboratory.

Dr. Berman's research specialties include the areas of underwater acoustics, oceanography, and signal processing. He has published numerous papers on these and related subjects. At present he is a member or chairman of a wide variety of Navy and oceanographic advisory groups. He also provides advisory services for a number of Department of Defense and other Government agencies.

Dr. Berman has on three occasions been visiting scientist to the Admiralty Research Laboratory, Teddington, England (1955, 1957, 1960), and once at the SACLANT ASW Research Center, La Spezia, Italy (1960).



Key Personnel

<u>Name</u>	<u>Title</u>	<u>Code</u>
Dr. A. Berman	Director of Research	4000
Mr. H.P. Gates	Consultant	4003
Mr. E.L. Brancato	Consultant	4004
Mr. A. Hollings	Head, Research Program Office	4010
Mr. C.L. Tipton	Head, Special Studies Office	4020
CAPT T.H. Sherman, USN	Head, Special Projects Group	4030
Dr. J.L. Allen	Associate Director of Research for Electronics	5000
Dr. J.H. Schulman	Associate Director of Research for Materials and General Sciences	6000
Dr. H. Rabin	Associate Director of Research for Space Science and Technology	7000
Dr. R.R. Goodman	Associate Director of Research for Oceanology	8000

RESEARCH PROGRAM OFFICE

Basic Responsibilities

The Research Program Office serves as staff to the research directorate of the Laboratory. It provides an orderly plan for coordinating NRL research programs with those of ONR and other sponsors or potential sponsors throughout the Departments of the Navy, the Army, and the Air Force, the Advanced Research Projects Agency, and other agencies of the government. It also serves as a focal point for program information for project managers and other key personnel of sponsoring activities on work in progress or in various stages of planning. The Research Program Office maintains a management information center which serves as a working tool for the Laboratory directorate, and it maintains appropriate records of the Laboratory's research programs.

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. A.J. Hollings	Head, Research Program Office
Mr. R.E. Seebold	Deputy Head, Research Program Office
Mr. R.C. Spragg	Head, Management Information Center Section
Mr. R.E. Seebold	Head, Short-Range Program Planning and Appraisal Section
Mr. N. Moglen	Staff Assistant—ADP



Mr. A. J. Hollings

Personnel Complement

On Board: 13

SPECIAL STUDIES OFFICE

Basic Responsibilities

The Special Studies Office provides analytical staff support to the Director of Research in the fields of strategic, tactical, and special naval warfare. Programs of operation research and system analysis are undertaken to provide substantive analytical bases for (a) the orientation of naval research and development, and (b) the general delineation of advanced naval weapon systems and force structures requirements for the mid- to long-range time period. Broad scope analyses of projected threats, operations, tactics, equipments, and forces are conducted by four study sections—Operations Analysis; Systems Analysis; Systems Applications; and Amphibious Warfare, respectively.

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. C.L. Tipton	Head, Special Studies Office
Mr. J. Reynolds	NRL Special Warfare Assistant

Personnel Complement

On Board: 15

Total Estimated R&D Funding

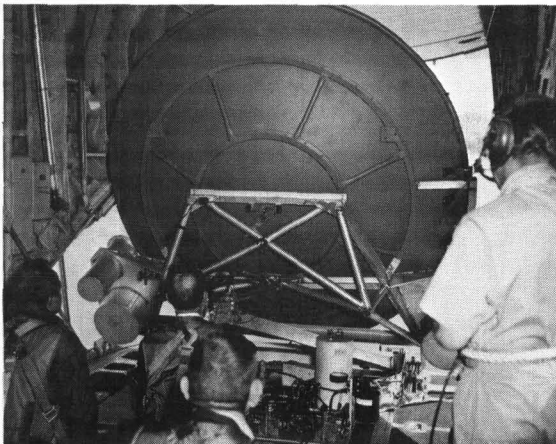
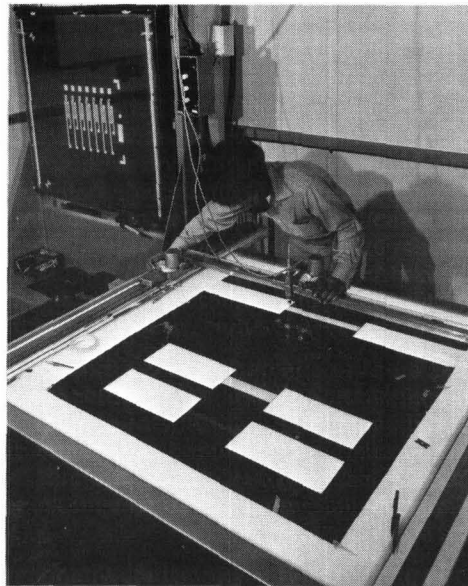
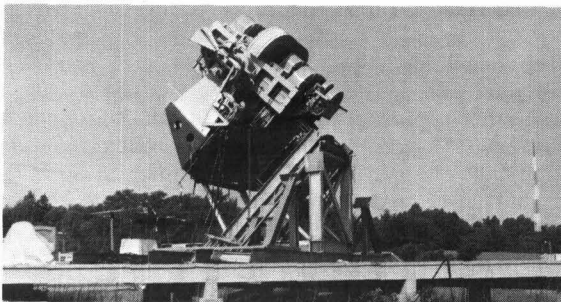
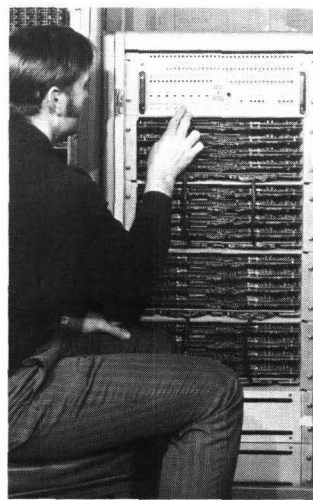
Fiscal Year 1972: \$950,000 (Projected)



Mr. C. L. Tipton

Electronics Area

The Navy's operational effectiveness depends greatly on its ability to make optimum use of the electromagnetic spectrum ranging from the very low to the extremely high frequencies. Accordingly, most of this Area's work is directed toward extending both the knowledge and the technological applications of the electromagnetic spectrum. The effort includes investigations of electronic devices, the phenomenology and advanced instrumentation associated with radio communications, radar, and related sensors, and digital computation and information-processing. NRL also serves as the lead laboratory for the Navy's exploratory development program in electronic warfare.



Associate Director of Research for Electronics

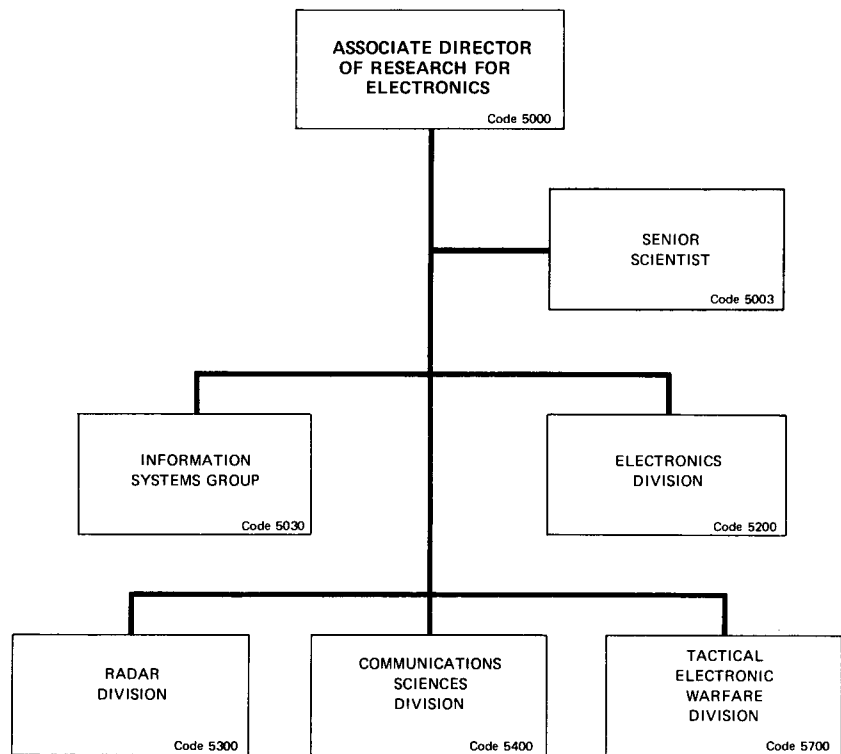


Dr. John L. Allen

Dr. Allen [REDACTED]. He graduated from Pennsylvania State University in 1958 with a B.S. degree in engineering science and from Massachusetts Institute of Technology with an M.S. in electrical engineering in 1962 and a Ph.D. in communications biophysics in 1968.

Dr. Allen joined the Research Department of NRL as the Associate Director of Research for Electronics on March 1, 1971. Prior to coming to NRL, he spent 4 years in the U.S. Air Force (1950-1954)—2 years as a student and an instructor at the Air Force Radar School and 2 years at Lincoln Laboratories, M.I.T. While attending Pennsylvania State University, he was employed as an engineer by HRB Singer, Inc. After graduating, he returned to Lincoln Laboratories as a member of the engineering staff and advanced to the position of Associate Head of the Radar Measurement Division.

Dr. Allen is a member of the Institute of Electrical and Electronic Engineers and the Tau Beta Pi Engineering Honor Society. He has served on several studies and committees for professional societies and for the Department of Defense; he is presently a member of the Defense Science Board Avionics Panel.



Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J.L. Allen	Associate Director of Research for Electronics
Dr. L.B. Wetzel	Senior Scientist
Mr. L.A. Gebhard	Consultant
Mr. H. Bress	Consultant
Dr. B. Wald	Head, Information Systems Group
Mr. A. Brodzinsky	Superintendent, Electronics Division
Dr. M.I. Skolnik	Superintendent, Radar Division
Dr. B. Wald	Superintendent, Communications Sciences Division (Acting)
Mr. L.A. Cosby	Superintendent, Tactical Electronic Warfare Division

INFORMATION SYSTEMS GROUP

Basic Responsibilities

The Information Systems Group conducts research and development in the computer sciences and their application to naval needs. The group also provides consultation and support to other components of NRL in the planning and execution of projects which exploit information-processing technology.

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. B. Wald	Head, Information Systems Group

Personnel Complement

On Board: 12

Total Estimated R&D Funding

Fiscal Year 1972: \$600,000

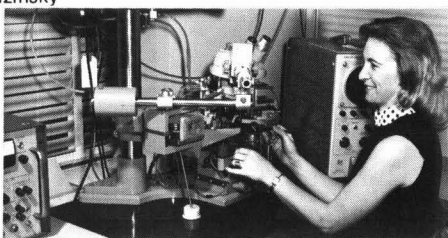


Dr. B. Wald

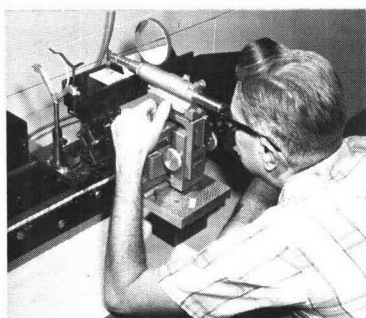


Electronics Division

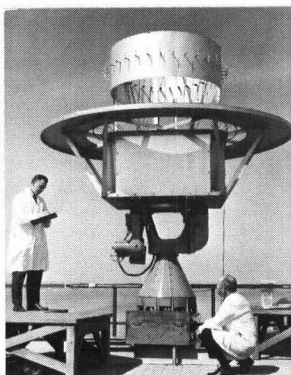
Mr. A. Brodzinsky



MICROELECTRONICS

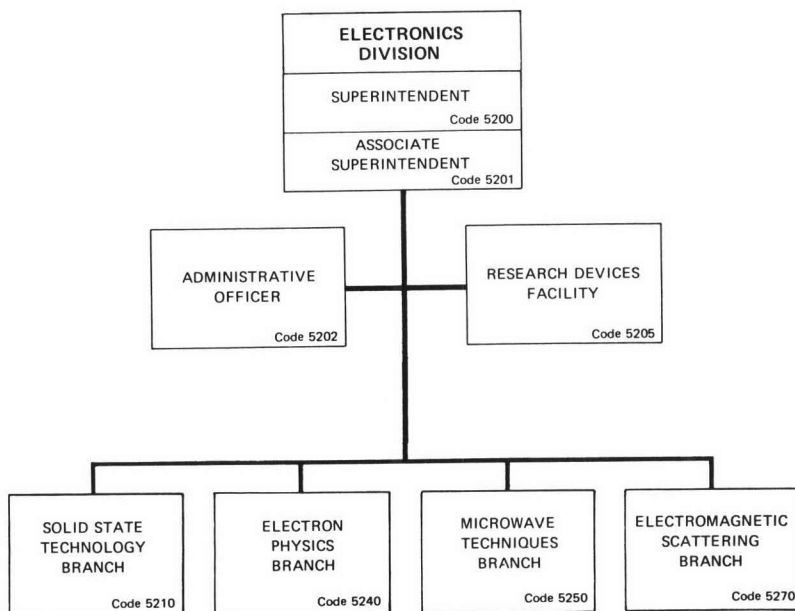


ELECTRO-OPTICAL SYSTEMS



ANTENNA RESEARCH

- SOLID STATE TECHNOLOGY
- ELECTRON PHYSICS
- MICROWAVE TECHNIQUES
- ELECTROMAGNETIC SCATTERING



Basic Responsibilities

The Electronics Division carries out programs of basic and applied research and development in the fields of electronic properties of solid materials, microwave antennas and components, micro-electronic technology, electromagnetic wave propagation, properties of ground and sea surface radar returns, and high power microwave electron devices.

Branches

Solid State Technology

Microwave device theory, fabrication,
and reliability
Ion implantation technology
High and low power devices for energy
conversion
Functional devices (thin film, MIS, CCD)
MIS failure physics; radiation hardening

Electron Physics

Microwave tubes
Surface physics research
Microwave components
Beam semiconductor devices

Microwave Techniques

Millimeter wave device research
Adaptive array studies
Advanced microwave antenna research
Microwave integrated circuits
Microwave ferrimagnetic components
Surface wave acoustics

Electromagnetic Scattering

Properties of ground and sea surface
radar echoes
Radar mapping of terrain
Target cross-section measurements
Sea surface analysis
ASW applications

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. A. Brodzinsky	Superintendent
Dr. R.W. Wright	Associate Superintendent
Mr. T.E. Hanley	Head, Research Devices Facility
Dr. J.E. Davey	Head, Solid State Technology Branch
Dr. S.T. Smith	Head, Electron Physics Branch
Dr. L.R. Whicker	Head, Microwave Techniques Branch
Mr. N.W. Guinard	Head, Electromagnetic Scattering Branch

Personnel Complement

On Board: 111

Total Estimated R&D Funding

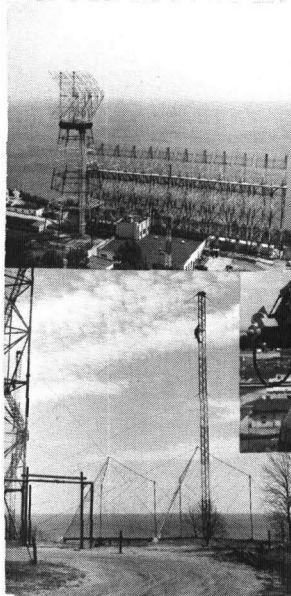
Fiscal Year 1972: \$5,300,000



Dr. M. I. Skolnik

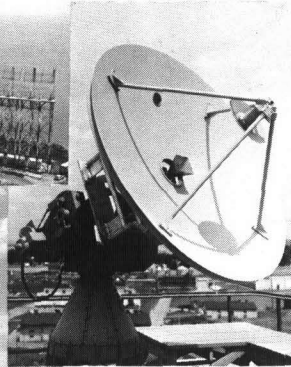
Radar Division

HF ADVANCED RESEARCH RADAR

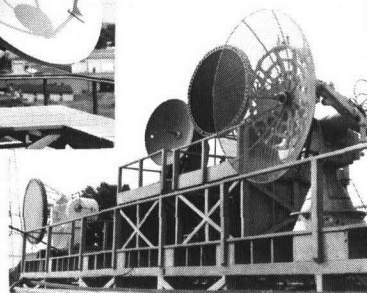


HF SURFACE WAVE ANTENNA

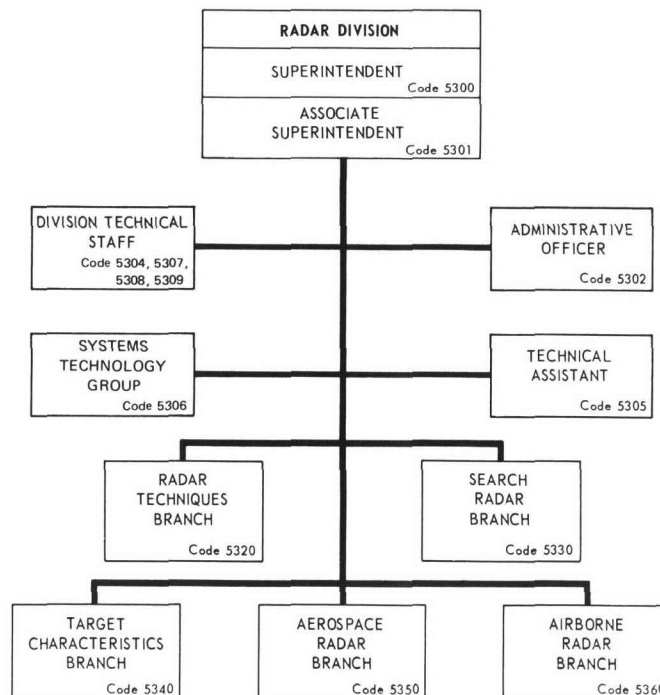
MARK 50
MONOPULSE RADAR



- RADAR TECHNIQUES
- SEARCH RADAR
- TARGET CHARACTERISTICS
- AEROSPACE RADAR
- AIRBORNE RADAR



MULTI-BAND EXPERIMENTAL
RADAR COMPLEX



Basic Responsibilities

The Radar Division conducts research on basic physical phenomena of importance to radar and related sensors, investigates new engineering techniques applicable to radar, demonstrates the feasibility of new radar concepts and systems, performs related systems analysis and evaluation of radar, and provides special consultative services. The emphasis is on new and advanced concepts and technology in radar and related sensors which are applicable to enhancing the Navy's ability to fulfill its mission.

Staff Activity

Division Technical Staff

Radar Analysis	Mechanical Design
Systems Research	Systems Technology
Systems Analysis	

Branches

Radar Techniques

High-frequency radar
Signal Processing

Aerospace Radar

Ocean surveillance

Airborne Radar

Airborne radar
Weapons analysis
Airborne early warning radar
Moving target indication

Search Radar

Phased array techniques
Precision tracking radar techniques
Radar evaluation
Range instrumentation
Signal processing

Target Characteristics

Target signature analysis
Target radar-spectra studies
Laser sensor systems
ECCM

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. M.I. Skolnik	Superintendent
Mr. J.H. Dunn	Associate Superintendent
Mr. W.N. Shaddix	Technical Assistant
Mr. F.M. Gager	Head, Radar Techniques Branch
Dr. R.J. Adams	Head, Search Radar Branch
Mr. I.D. Olin	Head, Target Characteristics Branch
Mr. R.E. Ellis	Head, Aerospace Radar Branch
Mr. D.L. Ringwalt	Head, Airborne Radar Branch

Personnel Complement

On Board: 189

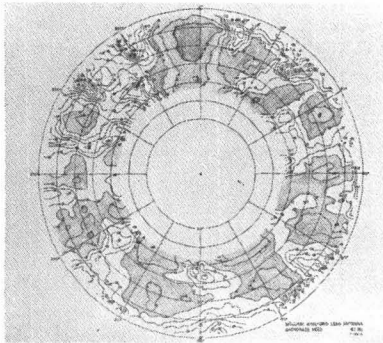
Total Estimated R&D Funding

Fiscal Year 1972: \$14,000,000



Dr. B. Wald

Communications Sciences Division

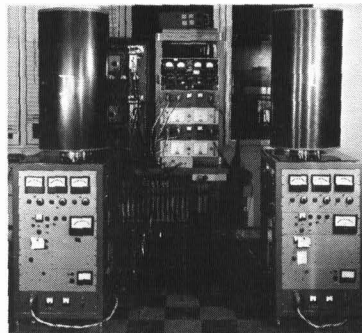


ANTENNA
PATTERN
MEASUREMENT

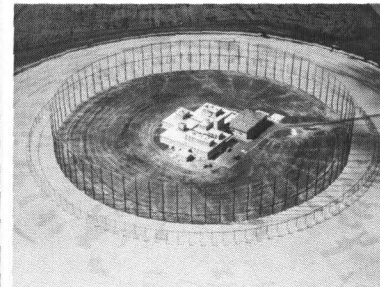
MICROWAVE SPACE
RESEARCH FACILITY



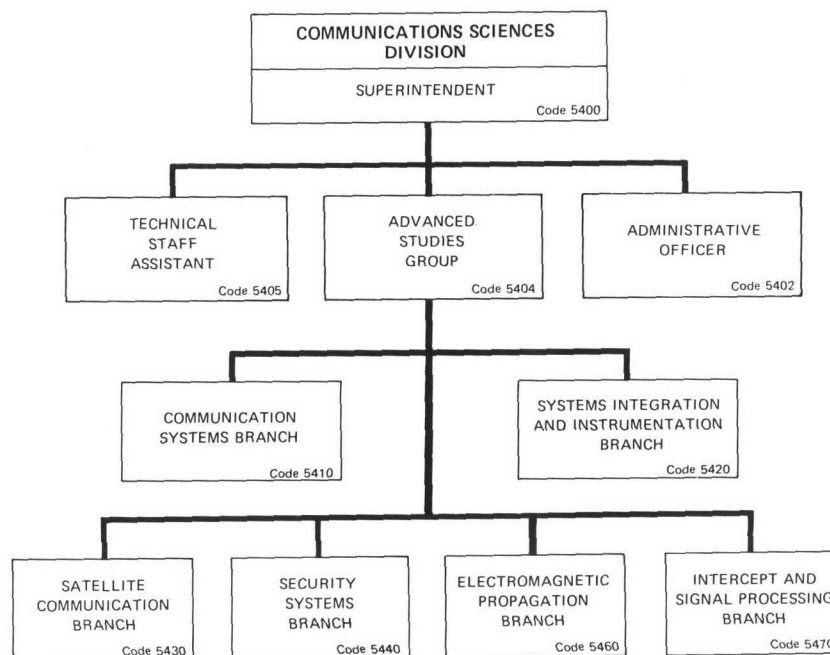
- COMMUNICATION SYSTEMS
- SYSTEMS INTEGRATION AND INSTRUMENTATION
- SATELLITE COMMUNICATION
- SECURITY SYSTEMS
- ELECTROMAGNETIC PROPAGATION
- INTERCEPT AND SIGNAL PROCESSING



HYDROGEN MASER TIME
STANDARDS



HF ANTENNA



Basic Responsibilities

The Communications Sciences Division conducts research and development in the systems, sensors, techniques, instrumentation and phenomenology of radio communications in aspects of navigation and identification, and in problems of emitter intercept and signal processing. The major emphasis is placed on those new concepts and techniques which will specifically enhance the Navy's operational capabilities in these areas.

Branches

Communication Systems

Submarine communication systems
Crypto-logic systems
Communication antenna studies
Antenna circuitry
Underwater reception

Systems Integration and Instrumentation

Precise frequency and time
Centralized electronic control
Integrated communication, navigation
and identification systems
Advanced monitoring and testing
techniques

Intercept and Signal Processing

Radio frequency intercept
Direction finding
Signal processing
Data storage
Data processing
Recording and display

Satellite Communication

Satellite communication systems
Precision satellite communication experiments
Modem studies

Electromagnetic Propagation

ELF/VLF and LF propagation studies
Noise measurements and predictions
Effects of propagation on navigational accuracy

Security Systems

Experimental systems
Security systems
Advanced development

Key Personnel

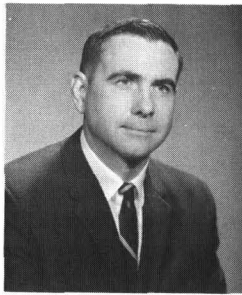
<u>Name</u>	<u>Title</u>
Dr. B. Wald	Superintendent (Acting)
Mr. M.L. Musselman	Technical Staff Assistant
Dr. J. Galejs	Advanced Studies Group
Dr. W.S. Ament	Advanced Studies Group
Mr. H.D. Cabbage	Head, Communication Systems Branch
Mr. D.I. Himes	Head, Systems Integration and Instrumentation Branch
Mr. J.P. Leiphart	Head, Satellite Communication Branch
Mr. C.V. Parker	Head, Security Systems Branch
Mr. W.E. Garner	Head, Electromagnetic Propagation Branch
Mr. R.D. Misner	Head, Intercept and Signal Processing Branch

Personnel Complement

On Board: 169

Total Estimated R&D Funding

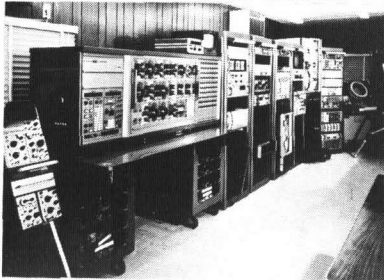
Fiscal Year 1972: \$16,000,000



Tactical Electronic Warfare Division

Mr. L. A. Cosby

ANALOG SIMULATION OF EW SYSTEMS

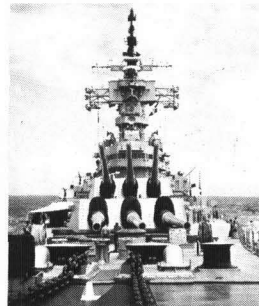
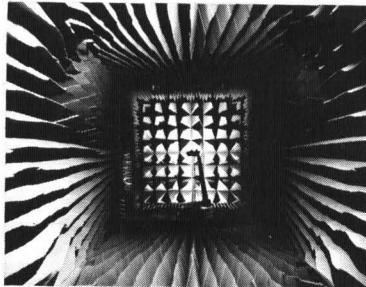


EXPENDABLES AND OFF-BOARD EW

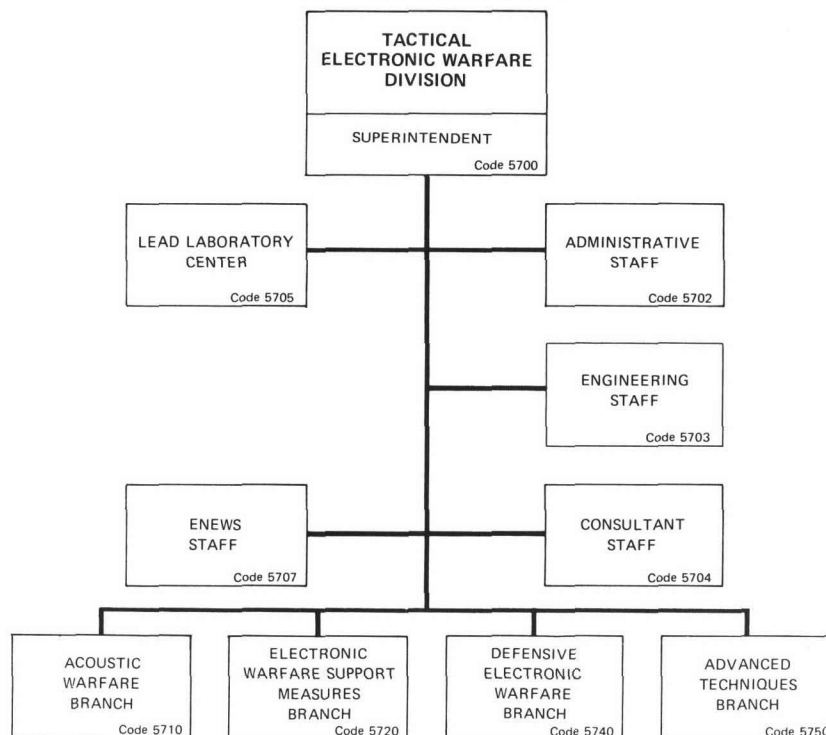


- LEAD LABORATORY CENTER
- EFFECTIVENESS OF NAVAL EW SYSTEM (ENEWS)
- ACOUSTIC WARFARE
- ELECTRONIC WARFARE SUPPORT MEASURES
- DEFENSIVE ELECTRONIC WARFARE
- ADVANCED TECHNIQUES

ANECHOIC CHAMBER MEASUREMENTS



SHIPBOARD & AIRCRAFT EW SYSTEMS



Basic Responsibilities

The Tactical Electronic Warfare Division is responsible for research and development in support of the Navy's tactical electronic and certain acoustic warfare requirements and missions. These include electronic warfare support measures, electronic and acoustic countermeasures, supporting counter-countermeasures, as well as study, analyses, and simulations for the determination and improvement of the effectiveness of these systems.

Staff Activities

Lead Laboratory Staff

Navy in-house exploratory development
Program reference center
Advanced technical objectives working group
Electronic warfare effectiveness
Analyses and liaison

ENEWS

EW effectiveness

Branches

Acoustic Warfare

Intelligence and analysis
AW techniques and components research
AW systems
Simulation and modeling
Operations research

Electronic Warfare Support Measures

Intercept receivers
Signal processors
Direction finding
Systems integration
Command & control interfaces

Defensive Electronic Warfare

Jamming technology
Deception techniques
Electronic warfare systems
Passive ECM

Advanced Techniques

Analysis and simulation
Expendables
New components
Advanced design

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. L.A. Cosby	Superintendent
Dr. G.P. Ohman	Lead Laboratory Coordinator and Head, Lead Laboratory Center
Mr. D.F. Grady	Manager, ENEWS Program
Mr. R.H. Mathes	Head, Acoustic Warfare Branch
Mr. M.J. Sheets	Head, Electronic Warfare Support Measures Branch
Mr. A.J. Jesswein	Head, Defensive Electronic Warfare Branch
Mr. R.L. Brandenburg	Head, Advanced Techniques Branch (Acting)

Personnel Complement

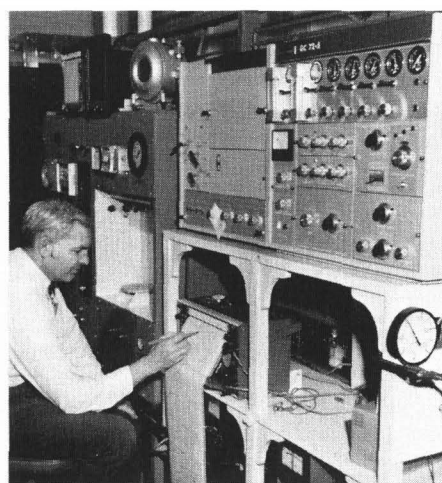
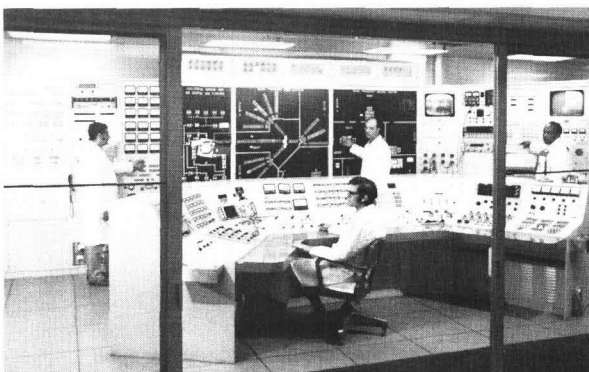
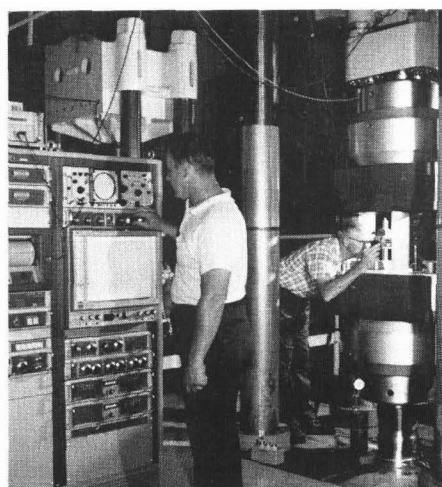
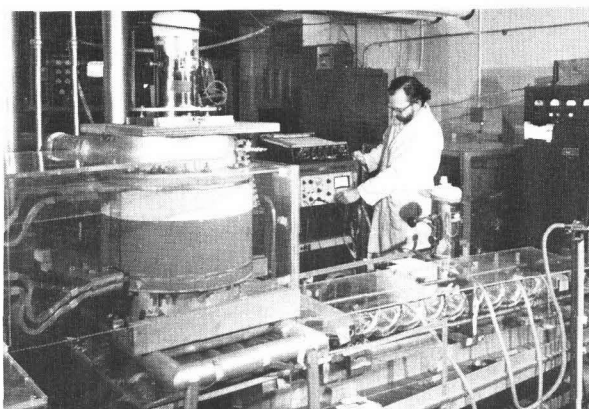
On Board: 120

Total Estimated R&D Funding

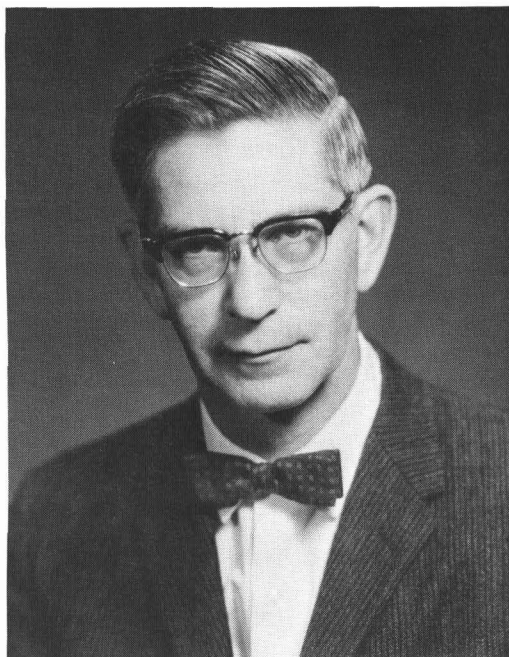
Fiscal Year 1972: \$15,000,000

Materials and General Sciences Area

The Materials and General Sciences Area is an administrative grouping of chemists, metallurgists, and solid-state, optical, and nuclear scientists who (a) carry on interdisciplinary basic and applied research on the mechanical, electrical, thermal, magnetic, optical, and nuclear properties of matter, and (b) develop components, devices, and systems based on the phenomena and principles of the several disciplines involved.



Associate Director of Research for Materials and General Sciences



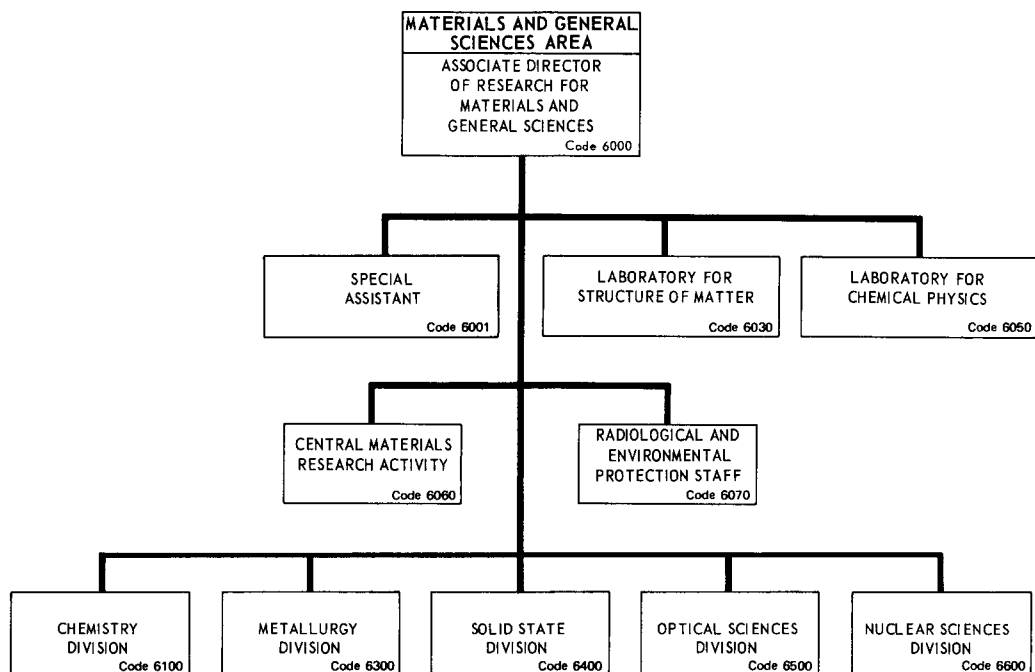
Dr. James H. Schulman

Dr. Schulman [REDACTED] He received the degrees of B.S. (1939) and Ph.D. (1942), both in chemistry, from the Massachusetts Institute of Technology. He has held teaching positions at Suffolk University and M.I.T. and research positions at the M.I.T. Laboratory for Insulation Research and Sylvania Electric Products.

Since coming to NRL in 1946 to initiate research on luminescence in solids, he has served as Head of Branches in the Metallurgy and Solid State Divisions and as Superintendent of the Optical Physics Division. From August 1960 until December 1961, he was Deputy Scientific Director of the London Branch of the Office of Naval Research. In November 1964, Dr. Schulman was appointed to the Chair of Materials Sciences in recognition of his distinguished research accomplishments. In September 1967, he was appointed Associate Director of Research for Materials. In February 1971 the Materials Area was broadened to include the Optical Science and Nuclear Science Divisions and was renamed the Materials and General Sciences Area.

Dr. Schulman received the Applied Science Award of the NRL Branch of the Research Society of America (1957) and the Navy Superior Civilian Service Award (1965), both in recognition of his many contributions to the science of luminescent materials and phenomena, radiation-induced optical effects in solids, and the application of these effects to radiation dosimetry. He is author or co-author of over 90 papers and a book on these subjects, and he holds numerous patents.

Dr. Schulman is a Fellow of the American Physical Society, the Optical Society of America, and the American Association for the Advancement of Science, as well as an Associate Editor of two scientific journals. He has served on several panels and committees of the National Academy of Sciences and of various scientific societies.



Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J.H. Schulman	Associate Director of Research for Materials and General Sciences
Dr. D.A. Patterson	Special Assistant
Dr. J. Karle	Head, Laboratory for Structure of Matter
Dr. W.A. Zisman	Head, Laboratory for Chemical Physics
Mr. R.J. Ginther	Head, Central Materials Research Activity
Mr. L.A. Brauch	Head, Radiological and Environmental Protection Staff (Acting)
Dr. R.E. Kagarise	Superintendent, Chemistry Division
Mr. W.S. Pellini	Superintendent, Metallurgy Division
Dr. C.C. Klick	Superintendent, Solid State Division
Dr. W.R. Sooy	Superintendent, Optical Sciences Division
Dr. J. McElhinney	Superintendent, Nuclear Sciences Division

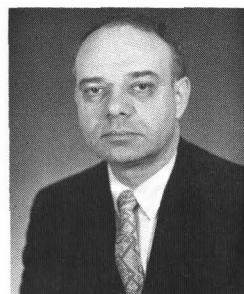
LABORATORY FOR STRUCTURE OF MATTER

Basic Responsibilities

The Laboratory for Structure of Matter carries out experimental and theoretical investigations of the atomic, molecular, glassy, and crystalline structures of materials. The methods of x-ray, electron, and neutron diffraction are used in a broad program of structure studies which can form the basis for understanding and interpreting the results of research investigations in a wide variety of scientific disciplines.

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J. Karle	Head, Laboratory for Structure of Matter



Dr. J. Karle

Personnel Complement

On Board: 14

Total Estimated R&D Funding

Fiscal Year 1972: \$650,000

LABORATORY FOR CHEMICAL PHYSICS

Basic Responsibilities

The Laboratory for Chemical Physics carries out an interdisciplinary program of fundamental and applied research with especial emphasis on phenomena occurring at phase boundaries, i.e., the interfaces between solids and solids, solids and liquids, solids and gases, liquids and liquids, and liquids and gases. Currently, attention is being given to adhesion and adhesion promoters, wetting and spreading of liquids on solids including liquid metals and ceramics, surface electric properties of metals and plastics, interfacial phenomena in composite materials, the quantitative relation of dry film lubricants to shear strength and its pressure coefficient, the ability of insoluble monolayers to dampen capillary waves on liquids, the relation of interfacial properties to various aspects of blood clotting and bioadhesion.

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. W.A. Zisman	Chief Scientist, Laboratory for Chemical Physics



Dr. W. A. Zisman

Personnel Complement

On Board: 9

Total Estimated R&D Funding

Fiscal Year 1972: \$300,000

CENTRAL MATERIALS RESEARCH ACTIVITY

Basic Responsibilities

The responsibilities of the Central Materials Research Activity are twofold: (1) to perform basic and applied research in the preparation and characterization of materials, and (2) to provide consultation or assistance for all laboratory research personnel in the above matters. Special research areas investigated by the staff include glasses, luminescent materials, and single-crystal high-purity and rare earth materials. The primary means involved in characterization are wet chemical analysis, x-ray fluorescent and electron beam microprobe analysis, emission and solid state spark source spectrometry, electron microscopy, and x-ray diffraction techniques.

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. R.J. Ginther	Head, Central Materials Research Activity
Mr. D.I. Walter	Head, Analytical Chemistry Branch
Mr. R.J. Ginther	Head, Structure and Composition Branch



Mr. R. J. Ginther

Personnel Complement

On Board: 26

Total Estimated R&D Funding

Fiscal Year 1972: \$650,000

RADIOLOGICAL AND ENVIRONMENTAL PROTECTION STAFF

Basic Responsibilities

The Radiological & Environmental Protection Staff is assigned the responsibility for radiological safety and the overall minimization of pollution from all sources at NRL and its field stations. The NRL radiological protection program has three primary purposes: (1) to assure that all operations using ionizing radiation are safe and in compliance with Federal Regulations; (2) to provide employees with instruments, instructions, and assistance to assure radiological safety in the performance of their duties; and (3) to conduct research in radiation dosimetry, instrumentation, and methodology. The environmental control responsibilities are to: (1) review programs to identify sources of pollution at NRL; (2) recommend preventative or corrective measures necessary to reduce or eliminate pollution; and (3) conduct research in the field.

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. L.A. Brauch	Head, Radiological & Environmental Protection Staff (Acting)
Mr. T.L. Johnson	Head, Research Section
Mr. R.B. Luersen	Head, Accelerators & Analysis Section
Mr. J.N. Stone	Head, Operations Section
Mr. V.R. Piatt	Head, Environmental Control Section



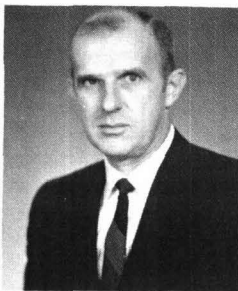
Mr. L. A. Brauch

Personnel Complement

On Board: 21

Total Estimated R&D Funding

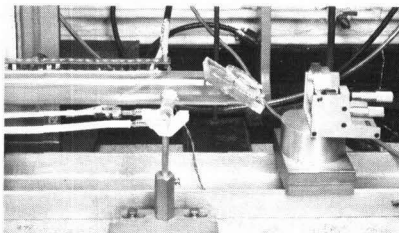
Fiscal Year 1972: \$418,000



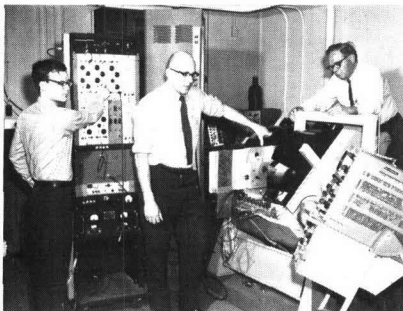
Dr. R. E. Kagarise

Chemistry Division

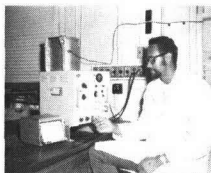
CHEMICAL LASER



PULSED-NMR APPARATUS



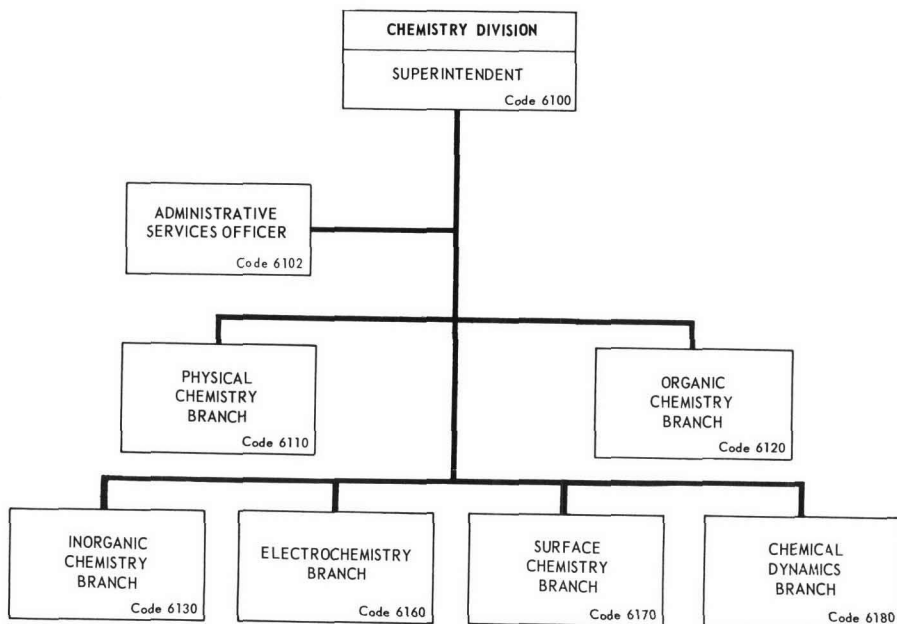
- PHYSICAL CHEMISTRY
- ORGANIC CHEMISTRY
- INORGANIC CHEMISTRY
- ELECTROCHEMISTRY
- SURFACE CHEMISTRY
- CHEMICAL DYNAMICS



TOTAL HYDROCARBON ANALYZER



AQUEOUS FILM-FORMING FOAM



Basic Responsibilities

The Chemistry Division conducts a diversified program of basic and applied research and development in physical, organic, inorganic, and analytical chemistry. Specialized programs within these fields include fuels, lubricants, surface chemistry, fire suppression, protective coatings, polymers, electrochemistry, molecular structure, chemical lasers, submarine atmosphere purification, and BW/CW personnel protection. Consultative services form an important element in the division effort.

Branches

Physical Chemistry

Infrared and ultraviolet spectroscopy
Analytical mass spectrometry
Nuclear magnetic resonance spectroscopy
Chemical lasers
Thermal and oxidative degradation

Organic Chemistry

Synthesis and properties of polymers
Functional organic coatings
Properties of resins under high compressive loads

Inorganic Chemistry

Submarine air purification
Ceramic materials
Synthesis of novel inorganic fluids
Corrosion prevention

Electrochemistry

Fuel cells
Fundamental electrode reactions
Electrochemical power sources

Surface Chemistry

Lubricants
Surface properties of fibers
Drag reduction
Adsorbents
Surface and solid kinetics

Chemical Dynamics

Organic contaminants in submarine atmosphere
Distillate fuels research
Autoxidation and combustion dynamic
Fire suppression
CW/BW ship defense

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. R.E. Kagarise	Superintendent
Dr. L.B. Lockhart, Jr.	Head, Physical Chemistry Branch
Dr. R.E. Kagarise	Head, Organic Chemistry Branch (Acting)
Dr. W.D. Fox	Head, Inorganic Chemistry Branch
Mr. S. Schuldiner	Head, Electrochemistry Branch
Dr. N.L. Jarvis	Head, Surface Chemistry Branch
Dr. H.W. Carhart	Head, Chemical Dynamics Branch

Personnel Complement

On Board: 117

Total Estimated R&D Funding

Fiscal Year 1972: \$5,500,000

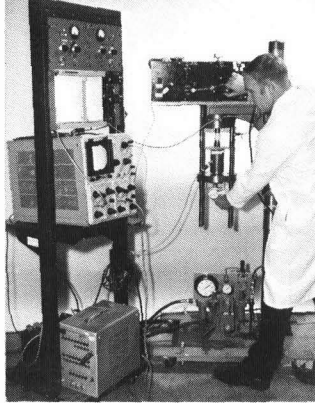


Metallurgy Division

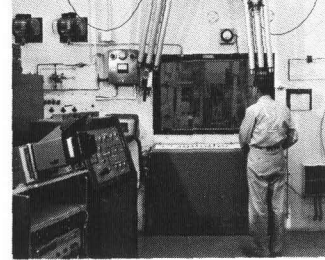
Mr. W. S. Pellini

- PHYSICAL METALLURGY
- METAL PHYSICS
- TRANSFORMATIONS AND KINETICS
- STRENGTH OF METALS
- REACTOR MATERIALS

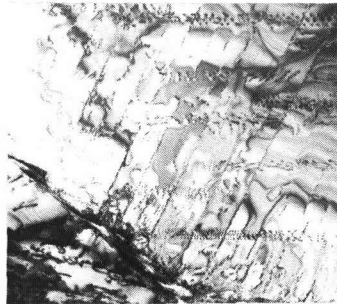
FRACTURE MECHANICS



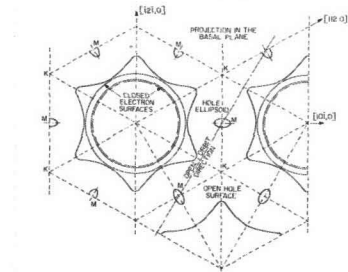
REMOTE HANDLING ROOM



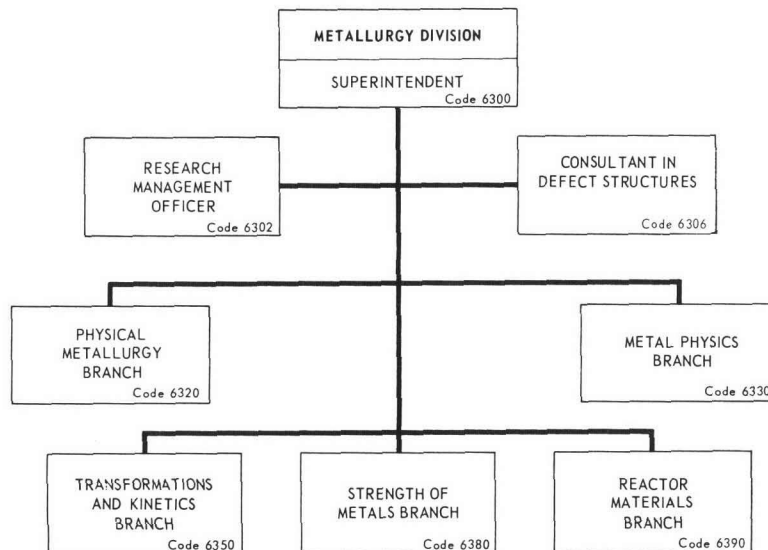
COPLANAR SLIP:
S.G.C. IN TI ALLOYS



A FERMIF SURFACE MODEL FOR OSMIUM SUGGESTED BY THE BAND STRUCTURE AND CONSISTENT WITH THE EXPERIMENTAL DE HAAS-VAN ALPHEN RESULTS



FERMI SURFACE MODEL FOR OSMIUM



Basic Responsibilities

The Metallurgy Division is concerned with basic and applied research in physical, mechanical, chemical, and structural aspects of metals. Metal physics activities center in the investigation of electronic transport properties in terms of quantum-mechanical principles. The mechanical studies are largely related to the attainment of quantitative analytical capabilities in the definition of plastic flow and fracture properties. The chemical interests involve electrochemical aspects of various forms of catastrophic corrosion, particularly the complex phenomenon of stress corrosion cracking. The metal structure studies cover a broad range of topics including strengthening mechanisms, role of defect structures, microscale separation events in fracture, transformation processes, and mechanisms of environmental effects. This broad range of activity evolves from a balance staff which includes materials scientists, physical metallurgists, physicists, chemists, and mechanical engineers. Important consultative services on subjects ranging from concept formulation to system development are provided to the Navy and other DOD activities.

Branches

Physical Metallurgy

Micromechanical metallurgy
Corrosion science related to advanced alloys
Marine corrosion and cathodic protection

Metal Physics

Fermi surface studies of pure metals and alloys
Electronic, magnetic, and optical properties of metallic materials
Charged particle irradiation effects
Electronic, thermal and optical properties of liquid metals
Response of metallic systems to high rates of energy deposition

Transformations and Kinetics

Phase transformations, solidification, metallic crystal growth
Thermodynamics of lattice defects, crystal plasticity
Applications of holography to metallurgical studies
Preparation and processing of electronically active alloys

Strength of Metals

Characterization criteria
Fracture-safe design parameters
Role of processing for high strength metals
Macroscale and microscale aspects of metal separation processes

Reactor Materials

Environmental factors in neutron irradiation
Basic mechanisms of radiation damage
Spectral analyses and dosimetry
Characterization criteria for mechanical damage

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. W.S. Pellini	Superintendent
Dr. M.R. Achter	Consultant
Mr. W.S. Pellini	Head, Physical Metallurgy Branch (Acting)
Dr. A.I. Schindler	Head, Metal Physics Branch
Dr. M.E. Glicksman	Head, Transformations and Kinetics Branch
Mr. R.J. Goode	Head, Strength of Metals Branch
Mr. L.E. Steele	Head, Reactor Materials Branch

Personnel Complement

On Board: 94

Total Estimated R&D Funding

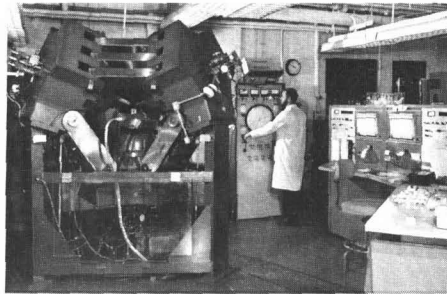
Fiscal Year 1972: \$4,300,000



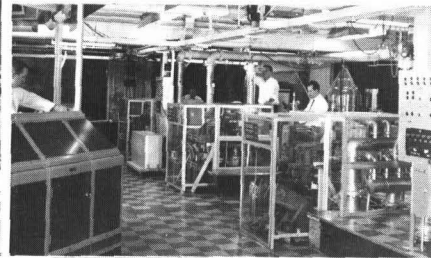
Dr. C. C. Klick

Solid State Division

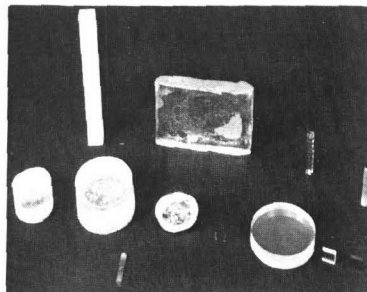
TETRAHEDRAL
PRESS AND
X-RAY EQUIPMENT



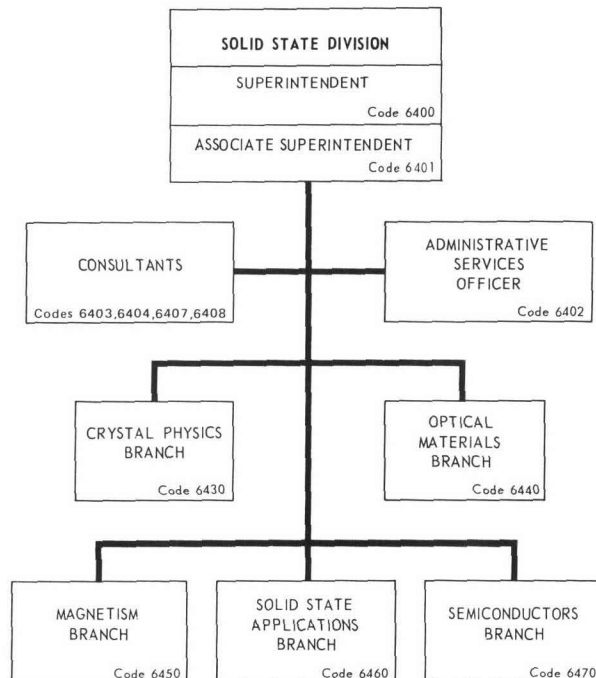
HIGH MAGNETIC FIELD FACILITY



LUMINESCENT
PROPERTIES
OF GLASS



- CRYSTAL PHYSICS
- OPTICAL MATERIALS
- MAGNETISM
- SOLID STATE APPLICATIONS
- SEMICONDUCTORS



Basic Responsibilities

The Solid State Division is concerned with basic and applied research in the physics of materials, principally solids, and with the interaction of matter with radiation. Its purposes are to increase understanding of the physical principles involved, to pursue applications related to military and industrial problems, and to serve as a corps of experts in solids for the Laboratory specifically and the Navy generally. The research work of the Division is fairly comprehensive in magnetism, semiconductors, and alkali halides. Important work is also carried on in surface physics, structure, and optical properties of glass, properties of metals at low temperatures and high magnetic fields, the effects of high pressures on solids, and radiation damage. Applications in solid state dosimeters, superconducting electronics, information storage systems, and infrared detectors are being pursued actively.

Branches

Crystal Physics

High-pressure effects
Superconducting materials
Superconducting electronics

Optical Materials

Electronic properties of nonmetal crystals and glasses
Radiation induced defects, color centers
Lattice dynamics

Magnetism

Electronic and nuclear paramagnetism
Spin-ordered magnetic phenomena
Rare earth magnetic materials

Solid State Applications

Environmental effects on semiconductor and dielectric materials and devices
Applications of magnetic materials
Semiconductor applications
IR light sources such as semiconductor lasers

Semiconductors

Electronic energy levels and band structure
Physical properties of semiconductors
Infrared magneto optics
Infrared detector physics
Raman spectroscopy

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. C.C. Klick	Superintendent
Mr. J.R. Clement	Associate Superintendent (Acting)
Dr. P.L. Smith	Consultant
Mr. J.R. Clement	Consultant
Dr. H.B. Rosenstock	Consultant
Dr. M. Hass	Consultant
Dr. R.A. Hein	Head, Crystal Physics Branch
Dr. M.N. Kabler	Head, Optical Materials Branch
Dr. G.T. Rado	Head, Magnetism Branch
Dr. D.L. Mitchell	Head, Solid State Applications Branch
Dr. S. Teitler	Head, Semiconductors Branch

Personnel Complement

On Board: 97

Total Estimated R&D Funding

Fiscal Year 1972: \$4,000,000

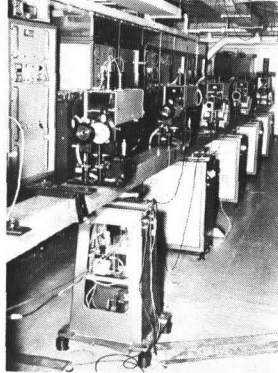


Dr. W. R. Sooy

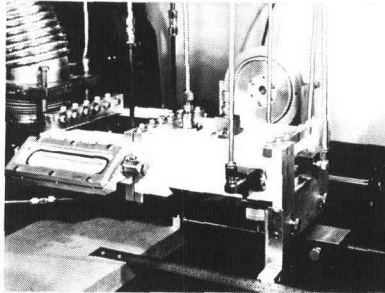
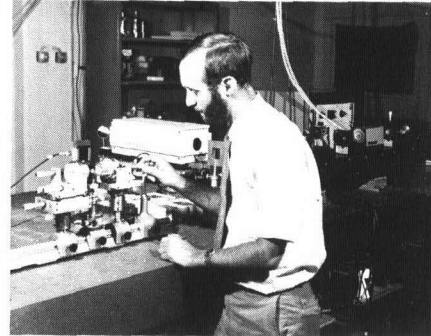
- OPTICAL PHYSICS
- APPLIED OPTICS
- LASER PHYSICS
- OPTICAL WARFARE
- OPTICAL ENGINEERING

Optical Sciences Division

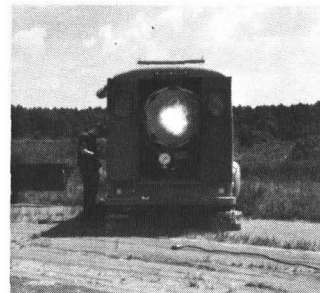
GLASS LASER



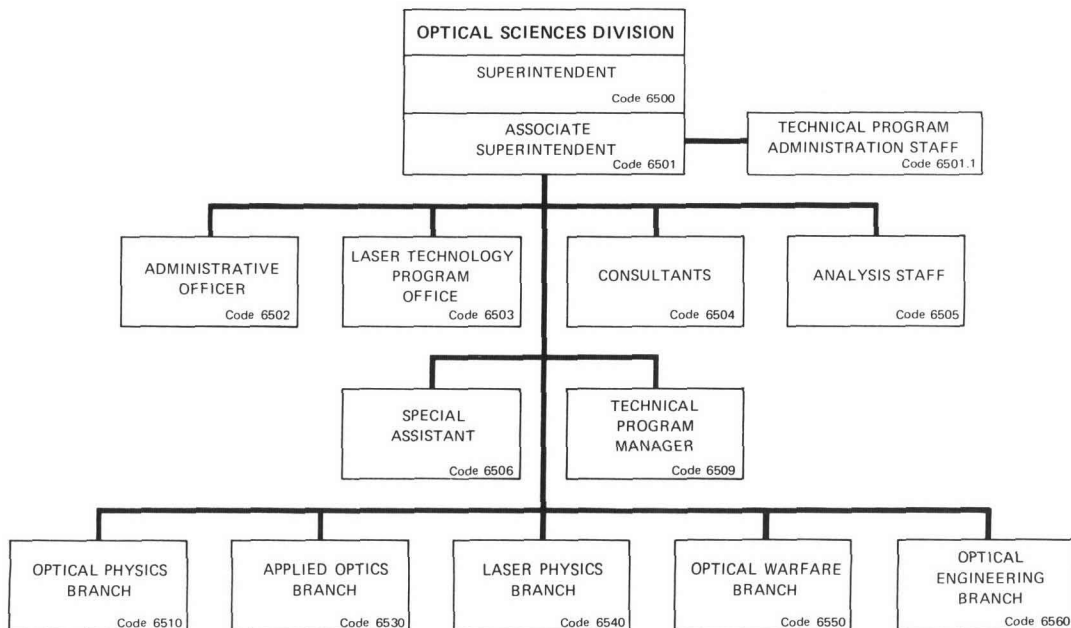
OPTICAL PARAMETRIC OSCILLATOR



DF-CO₂ TRANSFER LASER



LINEAR PROPAGATION EXPERIMENTS



Basic Responsibilities

The Optical Sciences Division carries out a variety of research, development, and application-oriented activities in the generation, propagation, detection, and use of radiation in the wavelength region between near ultraviolet and far infrared. The research, both theoretical and experimental, is concerned with discovering and understanding the basic physical principles and mechanisms involved in optical devices and phenomena. The development effort is aimed at extending this understanding in the direction of device engineering and advanced operational techniques. The applications activities include systems analysis and prototype system development and exploitation of research and development for the solution of optically related military problems. In addition to its internal program activities, the Division serves the Laboratory specifically and the Navy generally as a consulting body of experts in optical sciences. The work in the Division includes studies in quantum optics, laser physics, infrared physics, atmospheric propagation, optical technology, holography, optical warfare, optical radar, and optical systems. A variety of field measurement programs on optical problems of specific interest are also conducted.

Staff Activities

Laser Technology Program Office

Laser program assessment and advisory support

Analysis Staff

Systems analysis
Operations analysis
Special studies
Consultative service

Branches

Optical Physics

Nonlinear optical phenomena
Optical parametric oscillators
Optical up-conversion
Picosecond light pulses
Light scattering in solids
Nonlinear effects in materials
Optical waveguides

Optical Engineering

Laser system engineering
High energy mirror technology
Electro-optic applications
Modulation/demodulation
Optical instrumentation
Interferometry
Systems operation

Applied Optics

Optical information processing
Optical characteristics of military targets
Atmospheric optics
Optical technology

Optical Warfare

Optical and IR countermeasures
Optical intelligence
Optical and electro-optical techniques
Optical radar

Laser Physics

Molecular laser physics
Chemical laser physics
High power solid state lasers
Plasma light source development

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. W.R. Sooy	Superintendent
Dr. L.F. Drummeter, Jr.	Associate Superintendent
Dr. J.M. MacCallum, Jr.	Deputy Head, Laser Technology Program Office
Dr. H.W. Gandy	Special Assistant
Dr. J.L. Walsh	Head, Analysis Staff
Dr. R.A. Patten	Technical Program Manager
Dr. R.A. Andrews	Head, Optical Physics Branch (Acting)
Dr. H. Shenker	Head, Applied Optics Branch
Dr. J.L. Emmett	Head, Laser Physics Branch
Mr. J.R. Anderson	Head, Optical Warfare Branch
Mr. D.J. McLaughlin	Head, Optical Engineering Branch (Acting)

Personnel Complement

On Board: 114

Total Estimated R&D Funding

Fiscal Year 1972: \$9,000,000

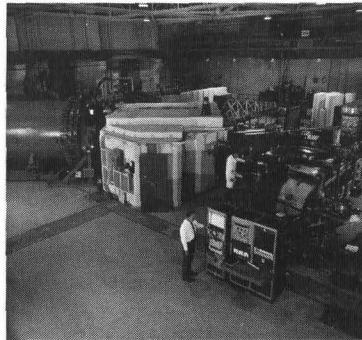


Dr. J. McElhinney

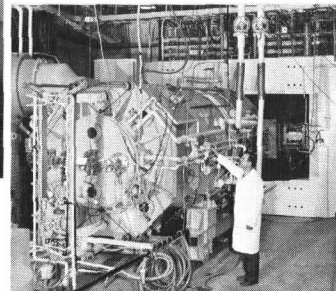
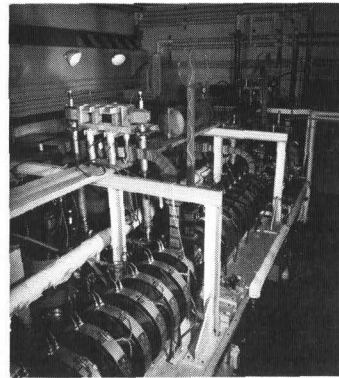
Nuclear Sciences Division

- CYCLOTRON
- LINAC
- THEORY
- VAN DE GRAAFF
- X-RAY OPTICS

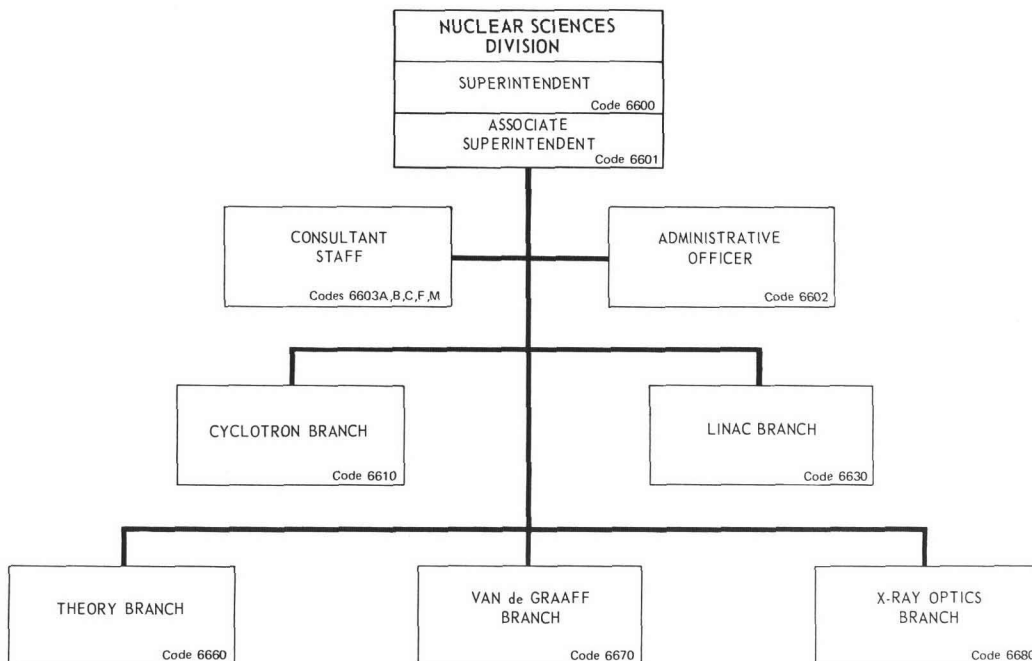
VAN DE GRAAFF



LINAC



CYCLOTRON



Basic Responsibilities

The Nuclear Sciences Division is engaged in a broad program of basic and applied research in nuclear physics and related areas. Included are theoretical and experimental programs in properties of nuclei, nuclear forces, nuclear reactions, shielding studies, x-ray and electron optics, materials analysis, transient radiation effects on electronics, measurements of pulsed x-rays and neutrons, and nuclear-weapon-related research. The Division operates a 75-MeV sector focussing cyclotron, 60-MeV Linac, 5-MeV Van de Graaff, and other particle accelerators and radiation sources.

Branches

Cyclotron

Charged particle nuclear reactions
Nuclear structure
Charged particle scattering
Neutron beams
Radioactivation analysis
Ion-induced x-rays
Production of radioactive sources
Radiation damage

Theory

Nuclear reactions
Nuclear structure
Nucleon-nucleon interactions
Coherent bremsstrahlung
Electron scattering by nuclei
Fundamental quantum-mechanical
scattering theory
High-intensity laser beam propagation
Deposition of energy by charged particles

Linac

Electron scattering
Nuclear excitation

Linac (continued)

Neutron capture reactions
Transient radiation effects on electronics
Radioactivation analysis
Service irradiations
Measurement of neutrons from pulsed sources

Van de Graaff

Materials analysis by means of charged
particle beams
Implantation of ions into solids
Radiation effects caused by high energy
charged particle beams
Crystal studies by means of particle
channeling techniques
Ion-induced x-rays

X-Ray Optics

X-ray spectral measurements
X-ray fluorescence analysis
Electron probe micro-analysis
X-ray production by charged particles
X-ray shielding

<u>Name</u>	Key Personnel	<u>Title</u>
Dr. J. McElhinney	Superintendent	
Dr. E.A. Wolicki	Consultant and Associate Superintendent (Acting)	
Mr. F.H. Attix	Consultant	
Dr. J.W. Butler	Consultant	
Mr. D.C. Cook	Consultant	
Dr. B.J. Faraday	Consultant	
Dr. K.W. Marlow	Consultant	
Dr. R.O. Bondelid	Head, Cyclotron Branch	
Dr. T.F. Godlove	Head, Linac Branch	
Dr. A.W. Saénz	Head, Theory Branch	
Dr. K.L. Dunning	Head, Van de Graaff Branch	
Mr. L.S. Birks	Head, X-Ray Optics Branch	

Personnel Complement

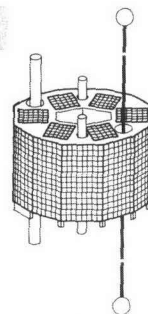
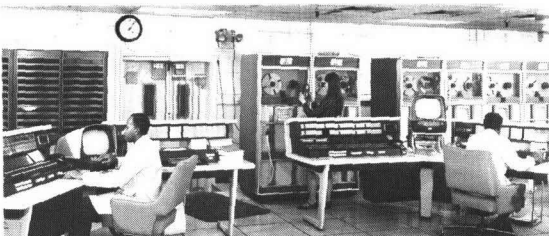
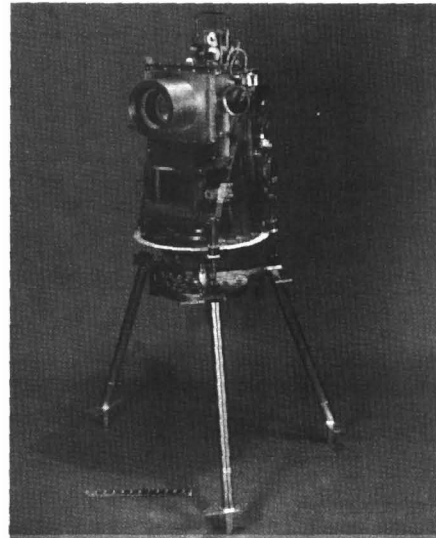
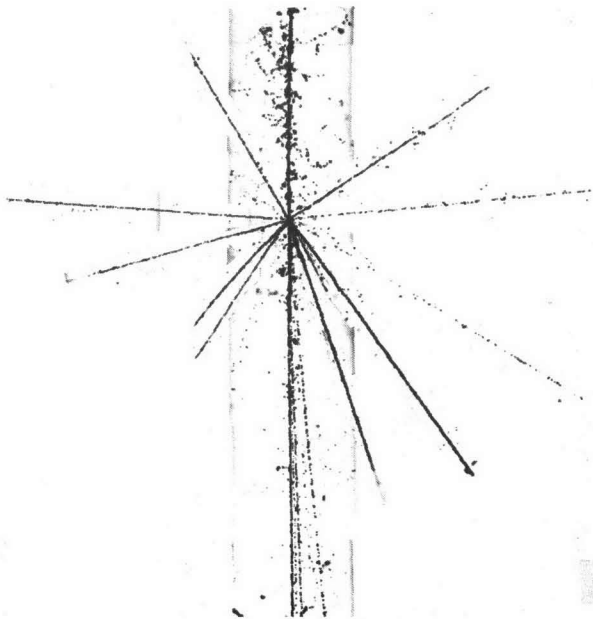
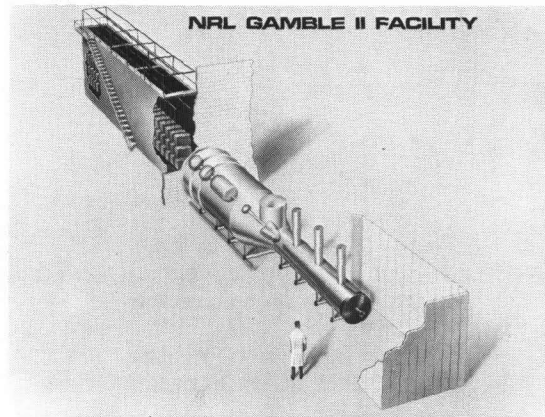
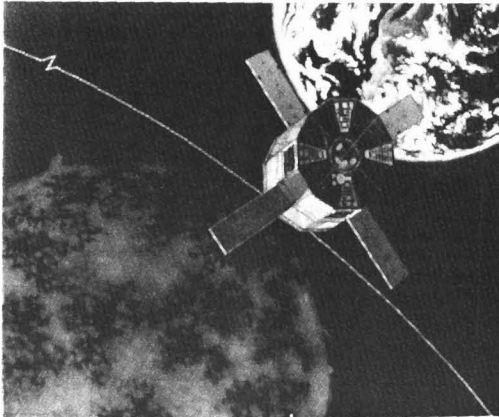
On Board: 100

Total Estimated R&D Funding

Fiscal Year 1972: \$3,900,000

Space Science and Technology Area

The Naval Research Laboratory conducts basic and applied research in upper air physics, astronomy, and astrophysics to improve naval capabilities in communications, navigation, detection, surveillance, and other fields; the investigations are made by means of several radio telescopes and a wide variety of space probes. Both experimental and theoretical techniques are used to conduct plasma research, to understand more fully natural and man-made plasma phenomena, and to develop controlled thermonuclear power sources. The area is involved also in the study and application of advanced mathematical techniques and in the many approaches afforded by the computer sciences.



TIMATION EXPERIMENTAL NAVIGATION SATELLITE SYSTEM

TIMATION III — EXPERIMENTAL NAVIGATION SATELLITE FOR DESIGN DEMONSTRATION

- HIGH-ALTITUDE PASSIVE-RANGING SATELLITE
- ORBIT ALTITUDE—7500 NM
- OPERATING FREQUENCY—400 AND 1600 MHz
- FUNCTION
 - MEASURE ORBITAL PARAMETERS
 - DEMONSTRATE ABILITY TO MEET SYSTEM ERROR ESTIMATE
 - MEASURE POSITION FIXING AND NAVIGATION
 - MEASURE VELOCITY OF USER'S PLATFORM
 - DEMONSTRATE ABILITY TO TRANSFER TIME
 - CONFIRM EXPERIMENTS ON GEODETIC POSITIONING
 - MEASURE AZIMUTH ANGLES

Associate Director for Space Science and Technology



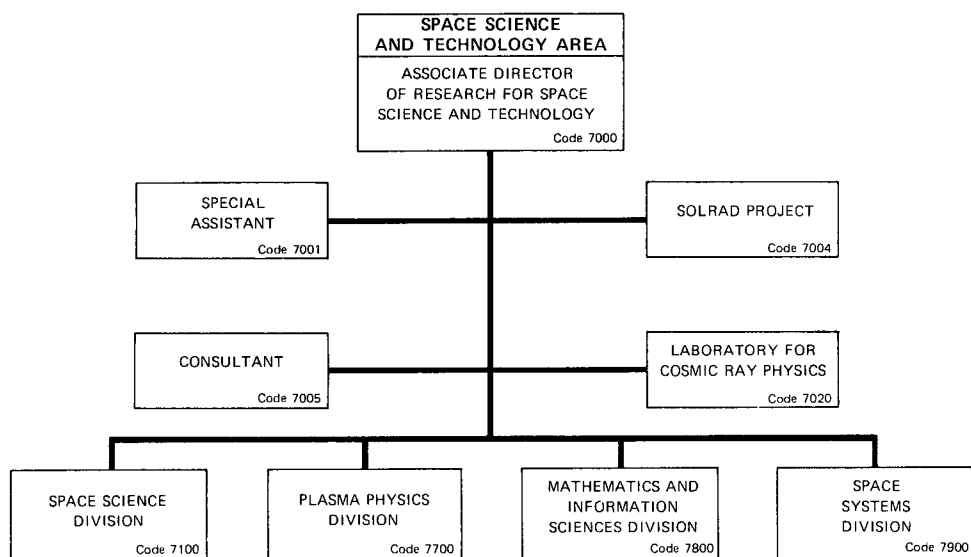
Dr. Herbert Rabin

Dr. Rabin [REDACTED] He received a B.S. degree in physics from the University of Wisconsin in 1950, an M.S. degree in physics from the University of Illinois in 1951, and a Ph.D. degree in physics from the University of Maryland in 1959.

He has been employed at the Naval Research Laboratory since 1952, working in the fields of high-energy gamma ray and electron facilities, radiation dosimetry, solid state studies of lattice defects, and nonlinear optics and laser physics. In these research areas Dr. Rabin has authored or coauthored well over a hundred papers and conference presentations. In addition, Dr. Rabin holds five patents.

Prior to his present appointment Dr. Rabin held several supervisory positions at NRL, the most recent being Head, Quantum Optics Branch, Optical Sciences Division. He has taught courses in the Physics Department at George Washington University; he was a visiting scientist at the Technische Hochschule in Stuttgart, Germany; and he was a consultant to the school of Engineering of the University of Sao Paulo, Sao Carlos, Brazil, under sponsorship of the Pan American Union.

Dr. Rabin is a Fellow of the American Physical Society and holds membership in the Optical Society of America, the Philosophical Society of Washington, the American Association for the Advancement of Science, the American Institute of Aeronautics and Astronautics, and several honorary societies. He is also a corresponding member of the Brazilian Academy of Sciences. Dr. Rabin received the Navy Meritorious Civilian Service Award in 1969 and the E.O. Hulburt Annual Science Award for 1970.



Key Personnel

<u>Name</u>	<u>Title</u>
Dr. H. Rabin	Associate Director of Research for Space Science and Technology
Mr. J.M. Shaw, Jr.	Special Assistant
Mr. E.W. Peterkin	Technical Project Manager
Dr. J.W. Schwartz	Consultant
Dr. M.M. Shapiro	Head, Laboratory for Cosmic Ray Physics
Dr. H. Friedman	Superintendent, Space Science Division
Dr. R.A. Shanny	Superintendent, Plasma Physics Division
Dr. P.B. Richards	Superintendent, Mathematics & Information Sciences Division
Mr. H.O. Lorenzen	Superintendent, Space Systems Division

LABORATORY FOR COSMIC RAY PHYSICS

Basic Responsibilities

The Laboratory for Cosmic Ray Physics conducts a program of fundamental investigations of cosmic radiation — its composition and spectra, its origin, its “age,” its propagation through space, its interactions with particles and fields in the regions of space that it traverses, and its role in various astrophysical phenomena including those of gamma ray astronomy. The program is framed so as to be broadly responsive to the anticipated technical requirements of the Navy and the general research and development program of the Department of Defense.

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. M.M. Shapiro	Chief Scientist, Laboratory for Cosmic Ray Physics
Mr. N. Seeman	Head, Gamma Rays
Dr. R. Silberberg	Senior Scientist
Mr. F.W. O'Dell	Senior Scientist



Dr. M. M. Shapiro

Personnel Complement

On Board: 20

Total Estimated R&D Funding

Fiscal Year 1972: \$820,000

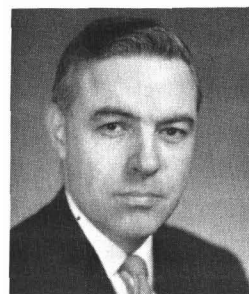
SOLRAD PROJECT

Basic Responsibilities

The SOLRAD Project was established to support NAVAIR exploratory development tasks in solar x-ray monitoring, and specifically to (1) develop, construct, test, evaluate, and provide launch support of SOLRAD satellites, (2) track, command, and acquire satellite telemetry, and (3) reduce, analyze, and transmit solar emission data for scientific and application purposes.

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. E.W. Peterkin	Technical Project Manager
Mr. R.W. Kreplin	Scientific Program Manager
Mr. C.H. Chrisman	Assistant Manager for Data Processing
Mr. P.W. Wilhelm	Assistant Manager for Space Craft
Mr. G.E. Leavitt	Technical Assistant for Experiments Electronics



Mr. E. W. Peterkin

Manpower Support: 40 man-years

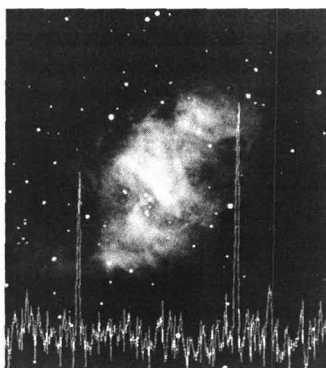
Total Estimated R&D Funding

Fiscal Year 1972: \$2,500,000

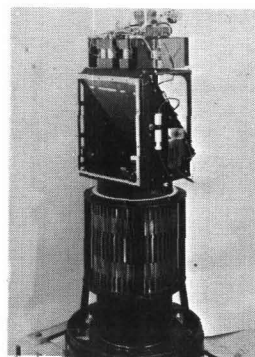


Space Science Division

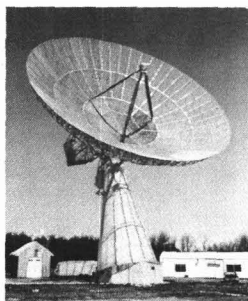
Dr. H. Friedman
 UPPER AIR PHYSICS
 RADIO ASTRONOMY
 ROCKET SPECTROSCOPY
 • • • • •
 E. O. HULBURT CENTER
 FOR SPACE RESEARCH



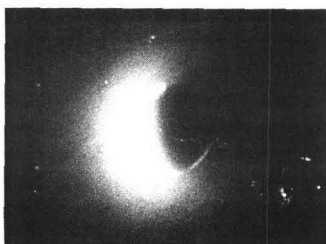
*X-RAY PULSAR IN
 THE CRAB NEBULA*



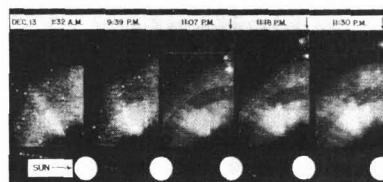
*IMAGE-CONVERTER SPECTROGRAPH
 FOR FAR-UV ROCKET ASTRONOMY*



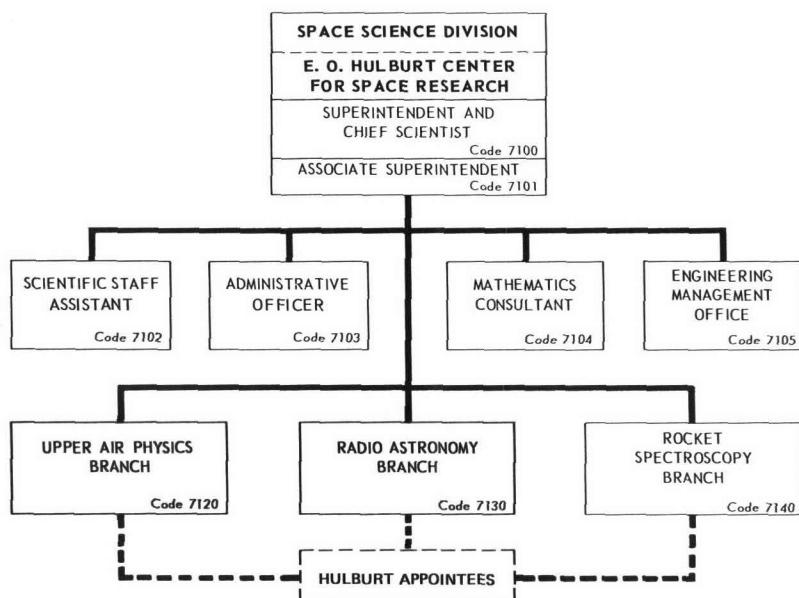
*RADIO
 TELESCOPE
 MARYLAND
 POINT*



FAR-ULTRAVIOLET PHOTOGRAPH OF EARTH



OSO-7 WHITE LIGHT CORONAGRAPH



Basic Responsibilities

The Space Science Division conducts research, development, and tests in the fields of upper air physics, astronomy, and astrophysics. Satellites and rockets are used to obtain information on radiation from the sun and celestial sources, and to study the composition and behavior of the ionosphere. Radio telescopes are used for astronomical observations. Results are of importance to radio communications, to utilization of the space environment, and to the fundamental understanding of natural radiation phenomena.

Branches

Upper Air Physics

Gamma-ray, x-ray, ultraviolet, and infrared astronomy
Aeronomy
Solar x-ray monitoring satellites
Electronic imaging studies
Meteor astronomy

Rocket Spectroscopy

X-ray and ultraviolet solar spectroscopy
Spectroheliographic and coronagraphic research
Laboratory astrophysics
XUV spectroradiometry
Apollo telescope mission solar research

Radio Astronomy

Galactic and extragalactic radio astronomy
Radar measurements of earth-moon distance and topography of moon
Radar and microwave applications to oceanography
VLBI (very long base interferometry)
Intergalactic gases

E.O. Hulburt Center for Space Research

The program is that of the combined Upper Air Physics, Rocket Spectroscopy, and Radio Astronomy Branches. It allows graduate and postgraduate students and visiting faculty members to cooperate with NRL in space research.

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. H. Friedman	Superintendent
Dr. P. Mange	Associate Superintendent
Dr. B. Lepson	Mathematics Consultant
Dr. T.A. Chubb	Head, Upper Air Physics Branch
Mr. C.H. Mayer	Head, Radio Astronomy Branch
Dr. R. Tousey	Head, Rocket Spectroscopy Branch
Dr. H. Friedman	Chief Scientist, Hulburt Center

Personnel Complement

On Board: 132

Total Estimated R&D Funding

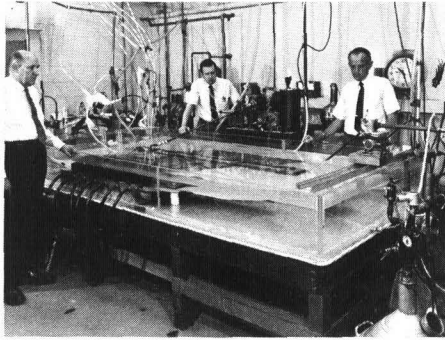
Fiscal Year 1972: \$16,500,000



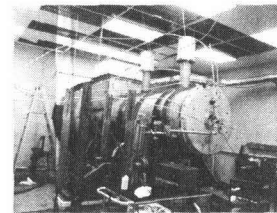
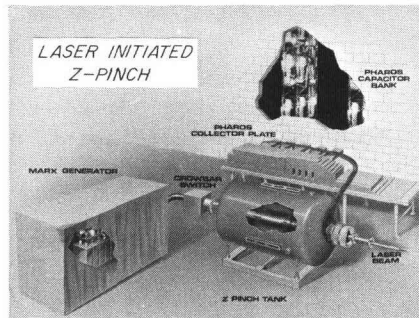
Dr. R. A. Shanny

Plasma Physics Division

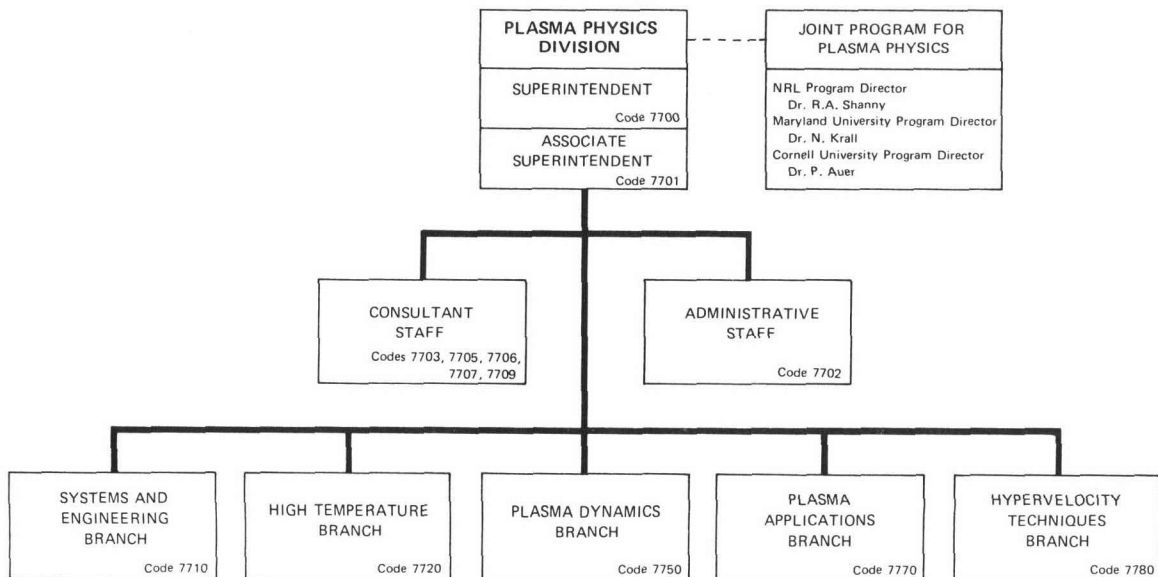
VACUUM ULTRAVIOLET LASER



- HIGH TEMPERATURE PHYSICS
- PLASMA DYNAMICS
- PLASMA APPLICATIONS
- SYSTEMS & ENGINEERING
- HYPERVELOCITY TECHNIQUES



GAMBLE I ELECTRON BEAM GENERATOR



Basic Responsibilities

The Plasma Physics Division conducts both basic and applied experimental and theoretical research. Examples of effort underway include: fusion physics and the generation and containment of high temperature plasmas, directed toward eventual power sources, laser produced plasmas, laboratory astrophysics, collision-free shock waves, the behavior of the ionosphere as a partial plasma, electron beam experiments, and the production and effects of hypervelocity particles.

Branches

High Temperature Physics

Generation and diagnostics of high temperature plasmas
Experimental study of the physics of plasma shock waves, instabilities, and turbulence
Experimental study of plasma chemistry

Plasma Dynamics

Theoretical and numerical simulation studies of problems in nonlinear plasma dynamics
Global ionospheric modeling

Plasma Applications

Production of intense relativistic electron beams
Electron beam propagation
Interaction of intense electron beams with target materials
Acceleration of heavy ions by electron beams

Hypervelocity Techniques

Vulnerability mechanics
Hypervelocity kill mechanisms
Hypervelocity impact mechanics

Systems and Engineering

Physics and chemistry of flame plasmas
Technical support of major division experiments

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. R.A. Shanny	Superintendent
Mr. J.D. Brown	Associate Superintendent
Mr. J.D. Shipman	Consultant
Dr. K. Hain	Consultant
Mr. D.C. dePackh	Consultant
Dr. J.P. Boris	Consultant
Dr. W.C. Lupton	Consultant
Mr. W. Balwanz	Consultant
Dr. R.C. Elton	Head, High Temperature Physics Branch
Dr. T.C. Coffey	Head, Plasma Dynamics Branch
Dr. L.S. Levine	Head, Plasma Applications Branch
Mr. J.D. Brown	Head, Systems and Engineering Branch (Acting)
Mr. W.W. Atkins	Head, Hypervelocity Techniques Branch

Personnel Complement

On Board: 115

Total Estimated R&D Funding

Fiscal Year 1972: \$6,500,000



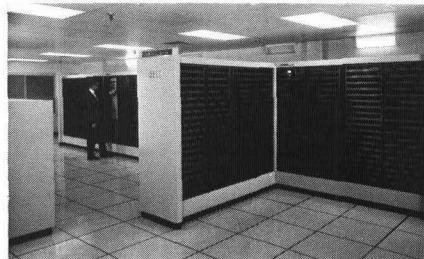
Dr. P. B. Richards

Mathematics and Information Sciences Division

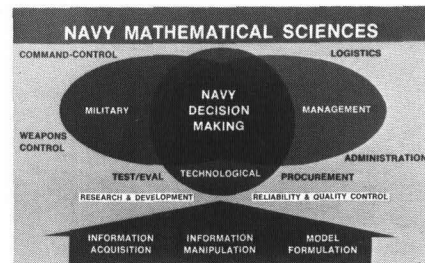
- RESEARCH COMPUTATION CENTER
- MATHEMATICS RESEARCH CENTER
- OPERATIONS RESEARCH BRANCH



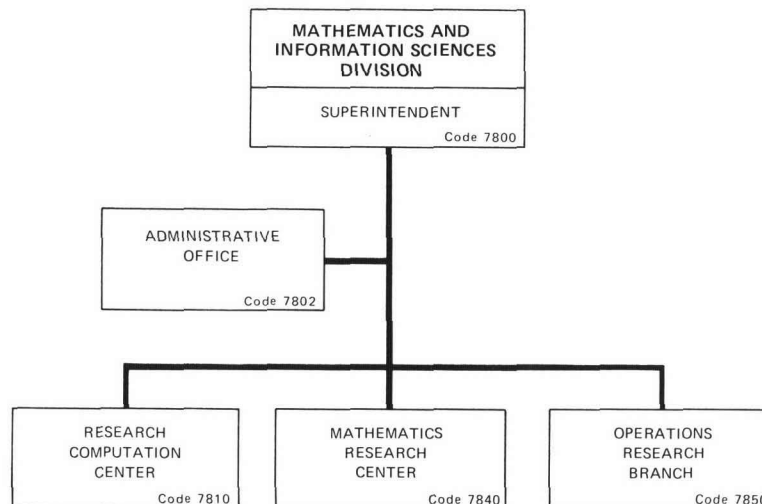
RESEARCH
COMPUTATION
CENTER



CDC 3800 COMPUTER



MATHEMATICS SCIENCE COORDINATION



Basic Responsibilities

The Mathematics and Information Sciences Division conducts basic and applied research in the mathematical sciences; determines present and future Navy needs with reference to mathematics and the computer-oriented sciences; creates and maintains the competence required to formulate and to meet these needs; and operates large-scale computers to meet overall NRL needs.

Branches

Research Computation

Data engineering and operations
Programming
Programming systems
Information retrieval

Operations Research

Mission analysis
Pursuit-evasion problems
Weapons system evaluation
Surveillance
Celestial mechanics
Networks and combinatorics
Resource allocation
Computer sciences
Pollution research

Mathematics Research Center

Functional analysis
Ordinary differential equations
Special functions
Approximation theory
Functions of a complex variable
Diophantine approximations
Approximation theory
Control theory
Numerical methods
Celestial mechanics

Key Personnel

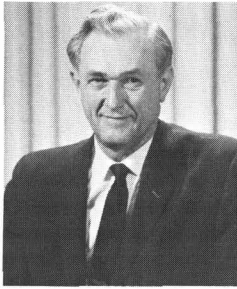
<u>Name</u>	<u>Title</u>
Dr. P.B. Richards	Superintendent
Dr. A.F. Petty	Head, Operations Research Branch
Mr. A.B. Bligh	Head, Research Computation Center
Dr. P. Lanzano	Head, Mathematics Research Center

Personnel Complement

On Board: 65

Total Estimated R&D Funding

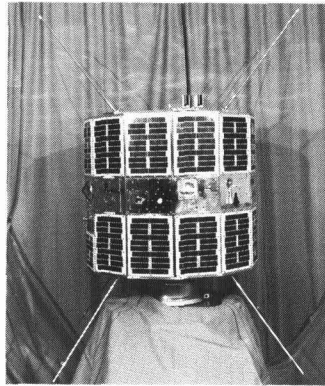
Fiscal Year 1972: \$650,000



Mr. H. O. Lorenzen

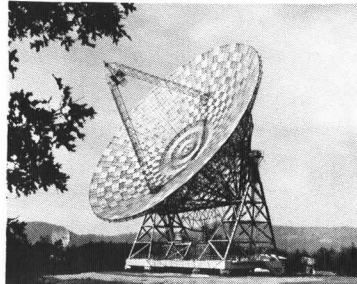
Space Systems Division

*SOLRAD
SATELLITE*

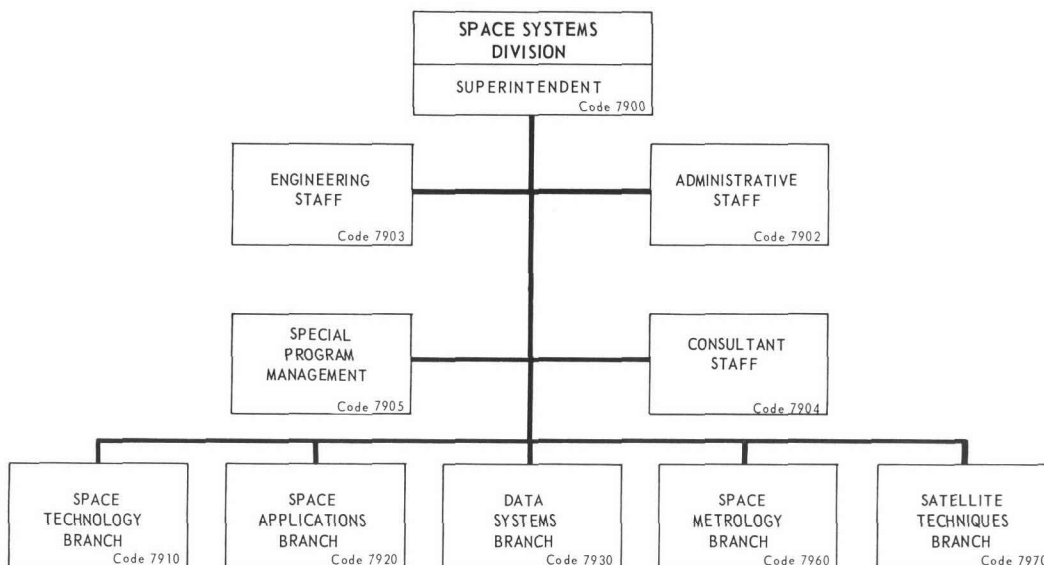
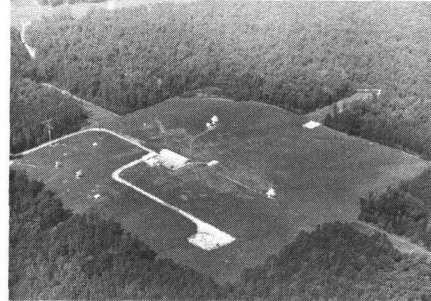


- SPACE TECHNOLOGY
- SPACE APPLICATIONS
- DATA SYSTEMS
- SPACE METROLOGY
- SATELLITE TECHNIQUES

*150-FOOT
ANTENNA
SUGAR GROVE*



BLOSSOM POINT



Basic Responsibilities

The Space Systems Division is responsible for research and development leading to the design, fabrication, launch, operation, and support of space systems for the Navy. The application of space technology to the naval mission extends through all of the R&D spectrum, from concept formulation to launch techniques of the completed spacecraft and interface with boosters. The Division is also responsible for R&D in environmental problem areas which affect the operation and performance of these space vehicles and for sharing the results with other related activities.

Branches

Space Technology

Large parabolic antenna systems
Electromagnetic radiation observations
Special media propagation
Electromagnetic exosphere phenomena
National radio quiet zone

Space Metrology

Navigation systems
Geodesy systems
Time synchronization
System analysis

Space Applications

Space systems concepts
Space systems research
Ground support systems
Spacecraft RF components development

Satellite Techniques

Spacecraft structure design
Fabrication and environmental testing
Ground station maintenance
Telemetry analysis

Data Systems

Operational data systems
Automatic processing instrumentation
Satellite telemetry
Orbital data analysis

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. H.O. Lorenzen	Superintendent
Mr. F. Welden	Consultant
Mr. J. Jackson	Consultant
Mr. C.W. Price	Engineering Staff
Mr. E.L. Dix	Special Program Management
Mr. J.H. Trexler	Space Technology Branch
Mr. R.D. Mayo	Space Applications Branch
Mr. C.H. Chrisman	Data Systems Branch
Mr. R.L. Easton	Space Metrology Branch
Mr. P.G. Wilhelm	Space Techniques Branch

Personnel Complement

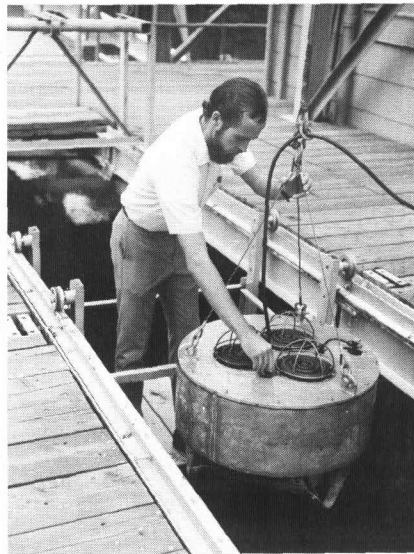
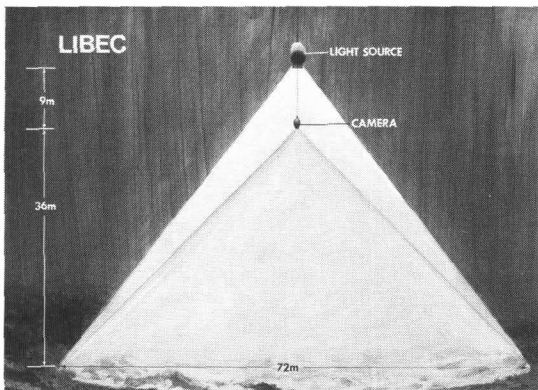
On Board: 160

Total Estimated R&D Funding

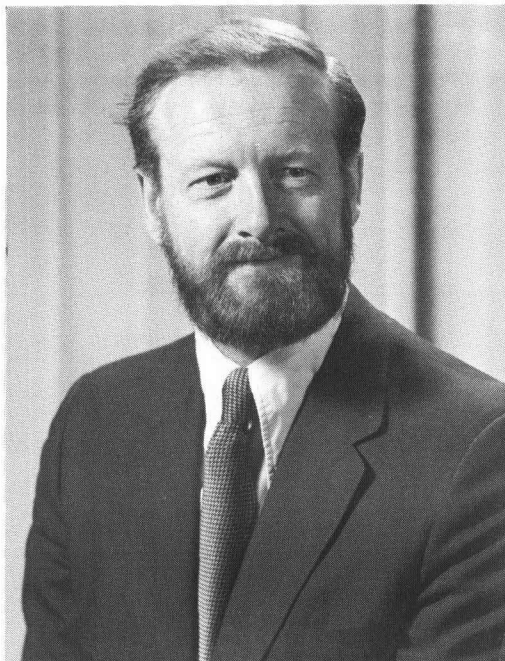
Fiscal Year 1972: \$22,000,000

Oceanology Area

The Naval Research Laboratory conducts research at sea and in the laboratory in the fields of underwater acoustics, oceanography marine geophysics, atmospheric physics, and ocean engineering and technology. Subjects of investigation include antisubmarine warfare, acoustic propagation and scattering, ambient noise in the ocean, signal processing, marine and atmospheric pollution, instrumentation systems for deep ocean search and inspection, and methods of design and installation of structures and apparatus for use in the ocean. NRL also serves as a focal point in the Navy for standardization of underwater sound measurements, and it holds a major responsibility for research and development in undersea acoustic surveillance.



Associate Director of Research for Oceanology



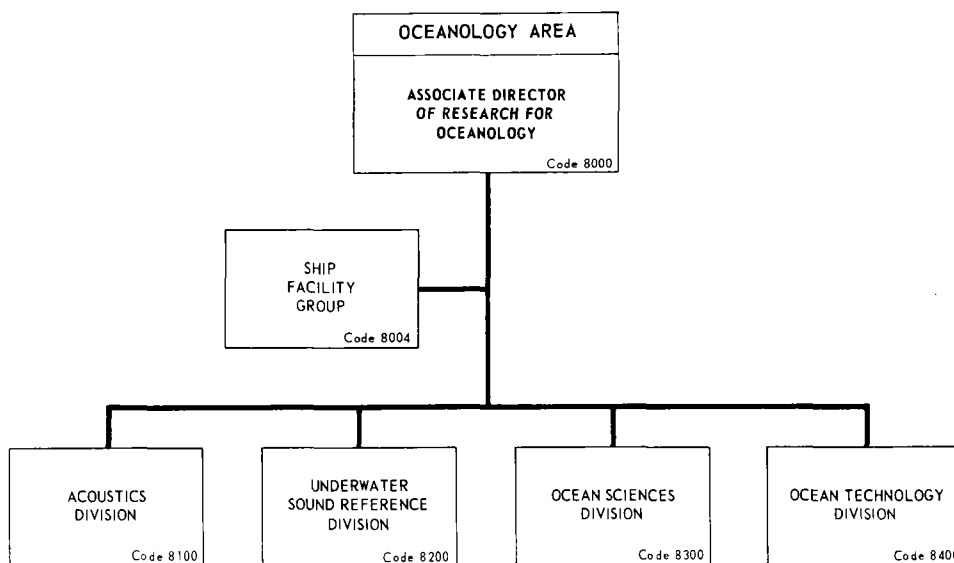
Dr. Ralph R. Goodman

Dr. Goodman was born in Detroit, Michigan, on March 18, 1927. He attended the University of Michigan, Ann Arbor, where in 1950 he received a B.S. degree in mathematics, in 1951 a B.S. in physics, in 1952 an M.S. in physics, and in 1958 a Ph.D. in physics.

He began his scientific career at the Navy Electronics Laboratory in 1958, joined the staff of Colorado State University in 1959 as Assistant Professor, and served as a consultant to the Applied Physics Group at the SACLAN T ASW Research Center, La Spezia, Italy, from 1961 to 1963. He then returned to Colorado State University, where from 1963 to 1968 he served as Associate Professor and Professor of Physics and, during his last year there, as Acting Chairman of the Department of Physics. He came to NRL with the appointment of Associate Director of Research in September 1968.

Dr. Goodman's research interests are centered on acoustic propagation, scattering, and physical acoustics. He also maintains an active interest in solid state physics.

Dr. Goodman is a member of the American Physical Society, the Acoustical Society of America, the American Geophysical Union, the American Institute of Physics, Sigma Xi, Phi Kappa Phi, and Tau Beta Pi. He was also a member of the Board of Trustees of the Colorado State University Research Foundation and the NAS/NRC Committee on Undersea Warfare.



Key Personnel

<u>Name</u>	<u>Title</u>
Dr. R.R. Goodman	Associate Director of Research for Oceanology
Mr. A.L. Gotthardt	Ship Facility Group
Dr. J.C. Munson	Superintendent, Acoustics Division
Mr. R.J. Bobber	Superintendent, Underwater Sound Reference Division
Dr. J.O. Elliott	Superintendent, Ocean Sciences Division (Acting)
Dr. J.P. Walsh	Superintendent, Ocean Technology Division

SHIP FACILITY GROUP

Basic Responsibilities

The Ship Facility Group is responsible for coordinating and providing ship services, sea-going facilities, and specialized expertise common to and required by the at-sea experiments of Research Divisions under the Associate Director of Research for Oceanology.

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. A.L. Gotthardt	Head, Ship Facility Group

Personnel Complement

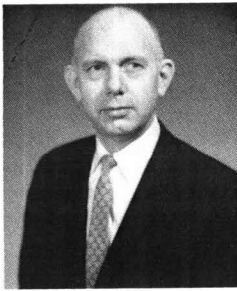
On Board: 16

Total Estimated R&D Funding

Fiscal Year 1972: \$3,300,000



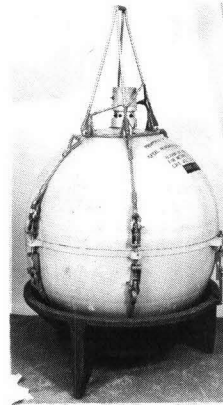
Mr. A. L. Gotthardt



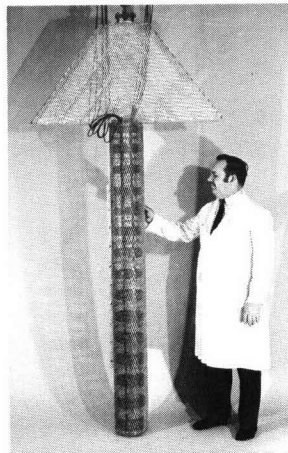
Dr. J. C. Munson

Acoustics Division

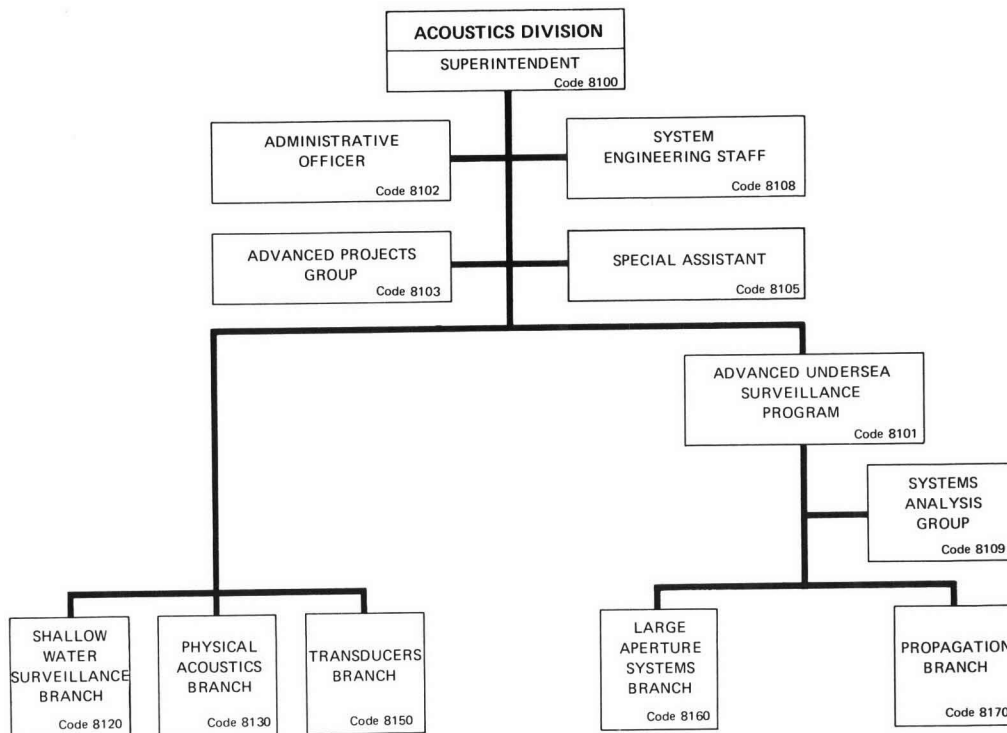
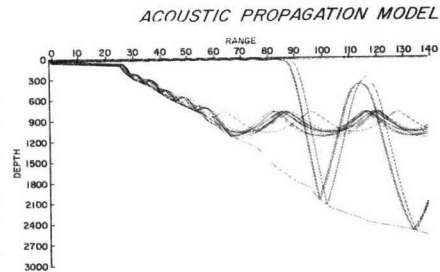
- LARGE APERTURE SYSTEMS
- PHYSICAL ACOUSTICS
- TRANSDUCER
- PROPAGATION
- SHALLOW WATER SURVEILLANCE



AMBIENT NOISE BUOY



RING TRANSDUCER ARRAY



Basic Responsibilities

The Acoustics Division has major responsibilities for basic and applied research and development in the Navy's undersea warfare programs. The spectrum of work covered in the program includes acoustic radiation and transduction, propagation and scattering, environmental prediction, surveillance system concepts, and system analysis. The Division conducts theoretical and experimental research programs in physical acoustics and ocean acoustics; it develops models of the interaction of acoustic energy with the ocean environment and with structures; it conducts experiments in the deep ocean, in acoustically shallow water and in the Arctic. The Division program is heavily oriented toward research and development in support of the undersea surveillance mission but also includes other missions. The Division is supported by an Engineering Staff in the conduct of at sea experiments aboard the USNS HAYES and often uses other ships and aircraft in multiplatform experiments. The Division interacts with research programs outside the Division in areas such as oceanography, deep ocean technology, systems analysis and Fleet operations.

Staff Activities

<u>System Engineering</u>	<u>Systems Analysis</u>	<u>Advanced Projects</u>
Support and ship facility	Systems studies	Advanced surveillance systems
Acoustic sources	Surveillance systems	Information processes for
Engineering research	planning and evaluation	underwater acoustics

Branches

<u>Shallow Water Surveillance</u>	<u>Large Aperture Systems</u>
Mode analysis	Active target detection and classification
Model the signal, noise and reverberation fields	Propagation, coherency, and wave front behavior
Source and receiving array configurations	Low frequency monostatic and bistatic reverberation studies
Signal design and processing requirements	Propagation models
	Natural and man-made noise
<u>Physical Acoustics</u>	<u>Propagation</u>
Ultrasonic investigation of liquids and amorphous solids	Long-range propagation models
Reflection, diffraction, scattering by bodies	Application of long-range low-frequency propagation
Target strength modeling	Scattering from ocean bottom, surface, and volume
Light-sound interaction	Arctic underwater acoustics
Bulk and interface wave properties	Very low frequency propagation
<u>Transducer</u>	
Basic radiation theory	
Electroacoustic modeling	
Transducer physical models	
Transducer mathematical models	
Calibration of large transducer arrays	
Acoustic array calculations	

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J.C. Munson	Superintendent
Mr. A.T. McClinton	Head, System Engineering Staff
Mr. W.J. Finney	Head, Advanced Projects Group
Mr. R.R. Rojas	Head, Advanced Undersea Surveillance Program
Dr. J.C. Knight	Head, Systems Analysis Group
Mr. R.H. Ferris	Head, Shallow Water Surveillance Branch
Dr. C.M. Davis, Jr.	Head, Physical Acoustics Branch
Mr. S. Hanish	Head, Transducer Branch
Dr. B.B. Adams	Head, Large Aperture Systems Branch
Mr. B.G. Hurdle	Head, Propagation Branch

Personnel Complement

On Board: 140

Total Estimated R&D Funding

Fiscal Year 1972: \$8,500,000

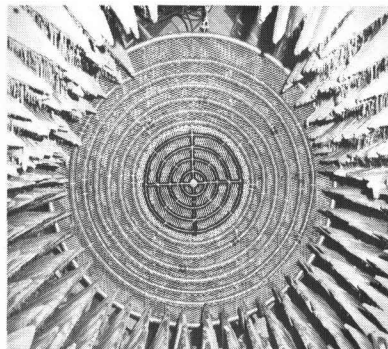
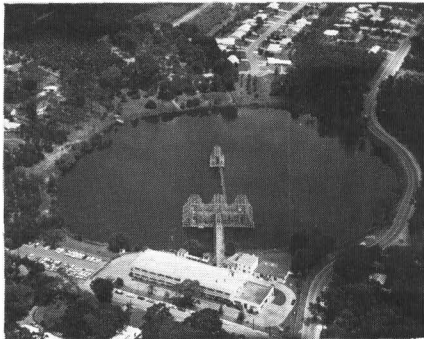


Underwater Sound Reference Division

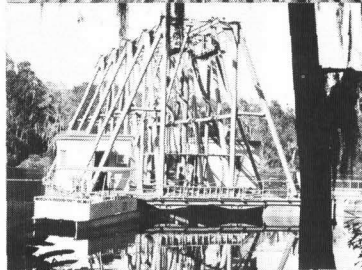
Mr. R. J. Bobber

- UNDERWATER ELECTROACOUSTIC MEASUREMENT METHODS
- UNDERWATER ELECTROACOUSTIC STANDARDS
- UNDERWATER ELECTROACOUSTIC MEASUREMENT SERVICES

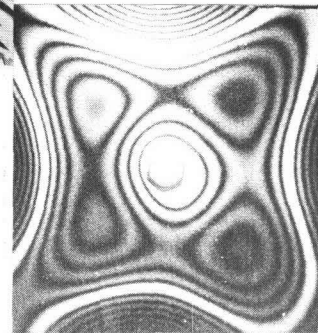
UNDERWATER SOUND REFERENCE DIVISION,
ORLANDO, FLORIDA



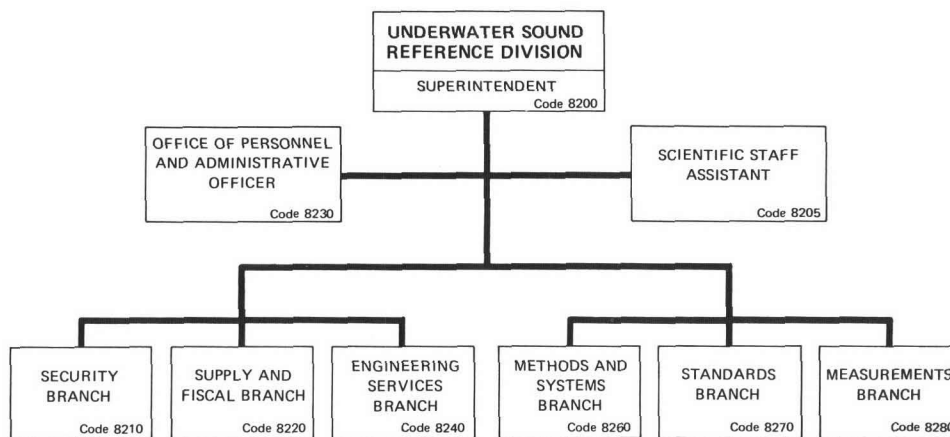
NEAR-FIELD TRANSDUCER
ARRAY IN ANECHOIC
TANK FACILITY



LEESBURG FACILITY -
CALIBRATION BARGE



HOLOGRAM OF VIBRATING
TRANSDUCER DIAPHRAGM



Basic Responsibilities

The Underwater Sound Reference Division is a focal point in the Navy for standardization in the science and technology of underwater sound measurements. Its research and development program is aimed at expanding the state of the art and providing Navy in-house expertise. Reference calibration measurements in a large complex of specialized facilities and calibrated standard transducers are available to all naval activities and contractors in support of undersea warfare programs.

Research and Development Branches

Methods and Systems

Calibration theory and accuracy
Measurement methods
Digital and analog systems
Acoustic absorption
Signal analysis

Standards

Transducer materials
Electroacoustic standards
Acoustic sources
Specialized electroacoustic transducers
Vibration analysis techniques
Standard loan services

Measurements

Standard calibration services
Sonar transducer test and evaluation
Measurements on acoustic materials
Simulated deep-submergence measurements
Measurement facility development

Key Personnel

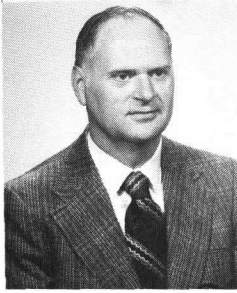
<u>Name</u>	<u>Title</u>
Mr. R.J. Bobber	Superintendent
Mr. J.M. Taylor	Scientific Staff Assistant
Mr. J.C. Michael	Supply and Fiscal Officer
Mrs. W.M. Scott	Personnel and Administrative Officer
Mr. W.W. Carlson	Head, Engineering Services Branch
Mr. A.Z. Robinson	Head, Methods and Systems Branch
Mr. I.D. Groves	Head, Standards Branch
Dr. W.L. Paine	Head, Measurements Branch

Personnel Complement

On Board: 100
(Graded 84, Ungraded 16)

Total Estimated R&D Funding

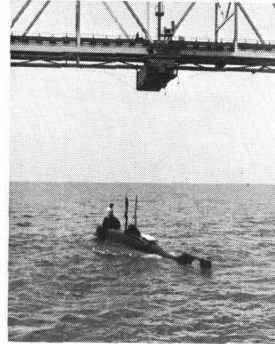
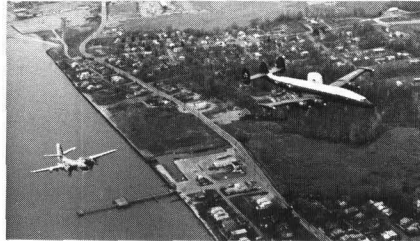
Fiscal Year 1972: \$1,700,000



Dr. J. O. Elliot

Ocean Sciences Division

CLOUD PHYSICS STUDIES

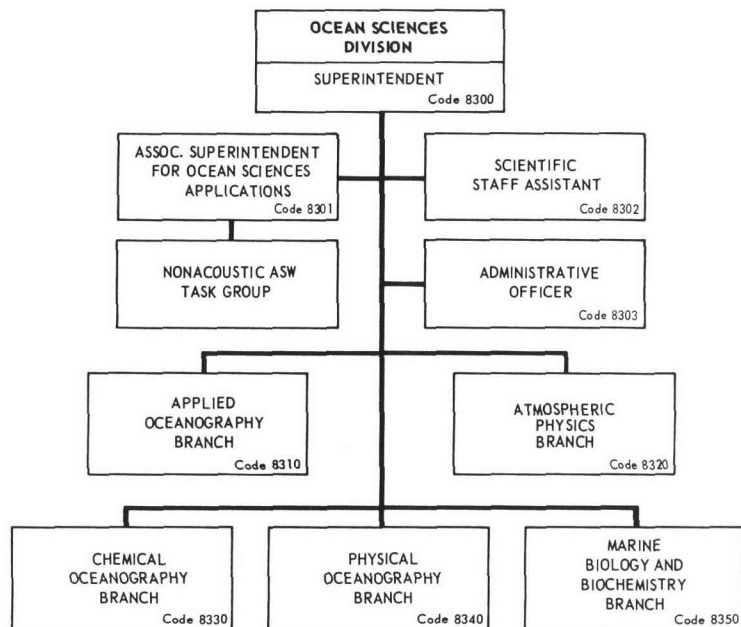


SURFACE EFFECTS

- APPLIED OCEANOGRAPHY
- ATMOSPHERIC PHYSICS
- CHEMICAL OCEANOGRAPHY
- PHYSICAL OCEANOGRAPHY
- MARINE BIOLOGY & BIOCHEMISTRY
- NONACOUSTIC ASW



*NANSEN BOTTLE
PREPARATION*



Basic Responsibilities

The Ocean Sciences Division conducts basic and applied research and development in the ocean sciences. Included are studies of the physics, chemistry, geology, and biology of the oceans directed toward an improved understanding and use of the oceans as the major operating environment of the Navy. Practical results lead ultimately to improvement in the design and effectiveness of naval equipment, materials, and systems.

Staff Activity

Nonacoustic ASW (R&D) Task Group

Branches

Applied Oceanography

Nonacoustic detection of submarines
Hydrodynamics of submerged bodies
Infrared characteristics of the ocean

Atmospheric Physics

Air-sea interactions
Atmospheric dynamics
Cloud physics
Weather instrumentation

Chemical Oceanography

Physical and analytical chemistry of
seawater, dissolved gases, and marine
sediments

Physical Oceanography

Hydrodynamics and turbulence
of the oceans
Marine geophysics

Marine Biology & Biochemistry

Biodegradation of materials in the marine
environment
Organic chemistry of seawater
Biochemistry of marine organisms

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J.O. Elliot	Superintendent (Acting)
Dr. J.O. Elliot	Associate Superintendent for Ocean Science Applications
Dr. A.H. Schooley	Senior Research Scientist
Mr. J.I. Hoover	Consultant
Mr. H.L. Clark	Head, Applied Oceanography Branch
Dr. L. Ruhnke	Head, Atmospheric Physics Branch
Dr. P.E. Wilkniss	Head, Chemical Oceanography Branch (Acting)
Mr. K.G. Williams	Head, Physical Oceanography Branch (Acting)
Dr. D.W. Strasburg	Head, Marine Biology and Biochemistry Branch

Personnel Complement

On Board: 85

Total Estimated R&D Funding

Fiscal Year 1972: \$4,500,000



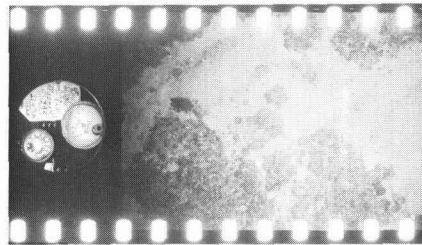
Dr. J. P. Walsh

Ocean Technology Division

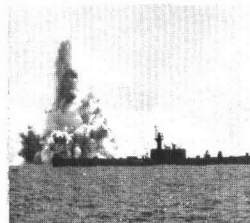
MIZAR



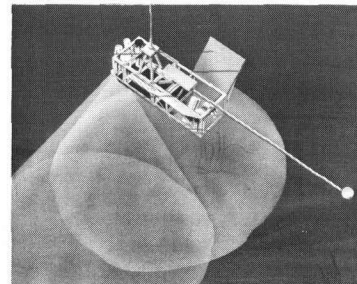
BOTTOM STUDIES



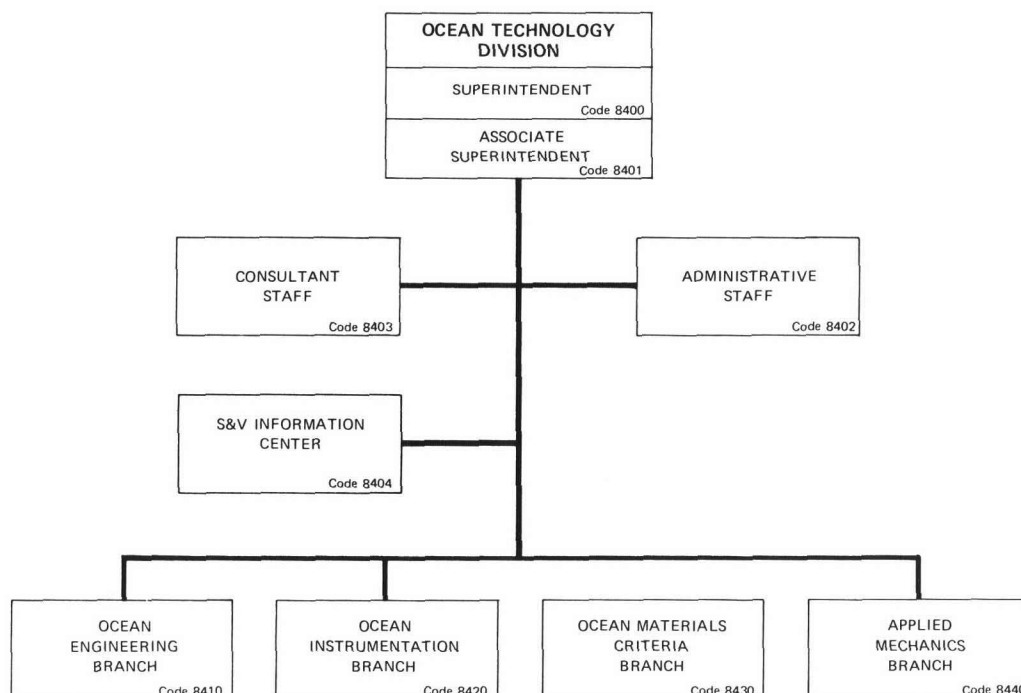
- OCEAN ENGINEERING
- OCEAN MATERIALS CRITERIA
- OCEAN STRUCTURES



UNDERWATER SHOCK STUDIES



UNDERWATER CAMERA



Basic Responsibilities

The Ocean Technology Division researches, develops, and applies specialized equipment, instrumentation, and techniques for conducting ocean and ocean-floor operations, and it evolves operational technology for advanced systems. The Division utilizes advanced materials and design technology for engineering optimization of required equipment. It also conducts research activities in select areas of ocean technology with coupling and support activities related to other ongoing research and development in these and other fields of interest. The DoD Shock and Vibration Information Center is included in the Division; this Center provides a single source for up-to-date information on shock and vibration for scientists and engineers. This Division, in conjunction with other Divisions of NRL and out-of-house agencies, brings the collective expertise to bear on crucial problems.

Staff Activity

S&V Information Center

Branches

Ocean Engineering

Research and development on ocean systems, subsystems, and components
Systems engineering
Design
Conduct at-sea operations

Ocean Materials Criteria

Fracture mechanics and fracture strength
Plastic flowing
Compression failure mechanisms
Armor research and development
Deep submergence materials-structures
Missile component failure
Nondestructive testing

Applied Mechanics

Shipboard shock fundamentals
Shock protection for weapons systems
Methods for design against shock
Fracture mechanics design studies
Developmental studies of prototypes
Shock strength of materials
Hydromechanic studies

Ocean Instrumentation

Instrumentation analysis, research and development
Sensors, detectors
Data and signal processing
Stress and kinematic quantities measurements

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J.P. Walsh	Superintendent
Mr. C.L. Buchanan	Associate Superintendent
Dr. R.O. Belsheim	Consultant
Dr. R.O. Belsheim	Head, S&V Information Center
Mr. J.J. Gennari	Head, Ocean Engineering Branch (Acting)
Mr. C.L. Buchanan	Head, Ocean Instrumentation Branch (Acting)
Dr. J.M. Krafft	Head, Ocean Materials Criteria Branch
Dr. F. Rosenthal	Head, Applied Mechanics Branch

Personnel Complement

On Board: 70

Total Estimated R&D Funding

Fiscal Year 1972: \$4,430,000

The Support Services Department

The Director of Support Services is a Navy Captain with appropriate training and experience; he reports to the Director of NRL. His primary responsibility is the supervision, coordination, and control of the administrative and service operations required in support of the work of the Research Department. Usually, he is the next senior officer to the Director and assumes the responsibilities of and acts for the Director in his absence.

The Director of Support Services is responsible for:

- guiding and coordinating the service Divisions of the Laboratory (Engineering Services, Supply, Public Works, Technical Information, and Chesapeake Bay) and also his staff functions (Management Engineer and Patent Counsel) so that services rendered are adequate, prompt, accurate, and economical in the use of men and money.
- implementing, for the Director of NRL, the orders and instructions of higher authority in a manner appropriate to the research environment as manifested in the policies and the organization of the Laboratory.
- being familiar with the scientific program and for following the progress of the scientific efforts of the Laboratory in sufficient detail to ensure that administrative decisions are made which support the scientific program.
- assisting the Director of NRL in maintaining an overall plan of organization for the best direction and control of the Laboratory.
- keeping the Director of NRL advised of matters requiring his attention, decision, or other action; acting for the Director of NRL in the approval of usual or routine matters; for assisting the Director of NRL generally with administrative detail, correspondence, reports, and similar matters.
- formulating, amending, and issuing instructions, policy statements, and procedures approved by the Director of NRL.

The Director of Support Services keeps in constant touch with the Director of Research to ensure that the service units of the Laboratory are providing complete support to the scientific divisions. He coordinates with the Director of Research in the planning and carrying out of administrative actions affecting Research Department organization and personnel; and he maintains a close working relationship with the Chief Staff Officer and officers assigned to him to assure provision of support services in operations conducted by the Chief Staff Officer. He also has direct "line" authority over the heads of special staff and service divisions.

Director, Support Services



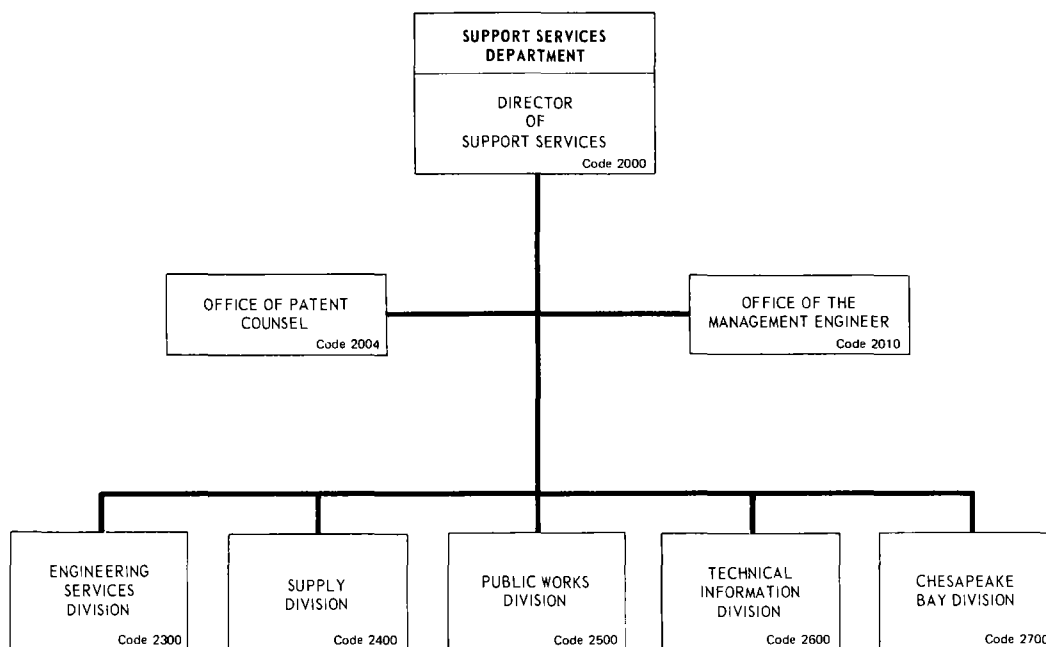
Captain James A. Bortner, USN

Captain Bortner [REDACTED]. He has had formal education and Navy experience, both as an enlisted man and as a commissioned officer, in physics, mathematics, electronics, naval engineering, and management. He served four years of active enlisted duty with the Naval Reserve, including assignment to the Radio Material School at NRL during World War II.

He remained active with the Naval Reserve while a student at York Junior College and later at Bucknell University in Lewisburg, Pennsylvania. In 1949, he received a B.S. in physics and an M.S. in mathematics from Bucknell and was appointed to its mathematics faculty. He returned to active duty during the Korean conflict and was commissioned as an Engineering Duty Officer (LT/JG) upon graduation from the Officer Candidate School at Newport, Rhode Island, where he stood first in his class. Later he completed a postgraduate course in Naval Construction and Engineering at the Massachusetts Institute of Technology and two postgraduate courses in Management—one at the Naval Postgraduate School and one at the Defense Weapons Systems Management Center, Wright-Patterson AFB, Dayton, Ohio.

As an officer, he has served in key assignments with the Atlantic Reserve Fleet, the Boston Naval Shipyard, the Ship Repair Facility on Guam, M.I., the Pacific Fleet, and the U.S. Naval Academy. In the latter assignment he was Chairman of the Department of Electrical Engineering. Since 1968 he has been with the Naval Ship Systems Command serving in succession as Head of the Ship Communications Branch; Director of the Warfare Systems Division; and Deputy Project Manager, Tactical Electromagnetic Programs.

Captain Bortner is a member of Pi Mu Epsilon, Sigma Pi Sigma, the Society of Naval Architects and Marine Engineers, the American Society of Naval Engineers, and the Armed Forces Communications and Electronics Association.



Key Personnel

<u>Name</u>	<u>Title</u>	<u>Code</u>
CAPT J.A. Bortner, USN	Director of Support Services	2000
Dr. A.L. Branning	Patent Counsel	2004
Mr. S.L. Cohen	Management Engineer	2010
CDR C.M. Kunstmann, USN	Engineering Services Officer	2300
CDR J.R. Webb, SC, USN	Supply Officer	2400
CDR C. Geoly, CEC, USN	Public Works Officer	2500
Mr. E.L. Smith	Head, Technical Information Division	2600
CDR J.M. Fitts, USN	Chesapeake Bay Division Officer	2700

OFFICE OF THE MANAGEMENT ENGINEER

Basic Responsibilities

The Office of the Management Engineer provides staff support to management officials of the Laboratory in matters of administrative operations, management control, and facilities planning. In addition, the Office conducts the Laboratory's Safety Program (except in the fields of microwave, radiological, and nuclear safety, which are the responsibility of the Radiological and Environmental Protection Staff.

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. S.L. Cohen	Management Engineer
Mr. A.M. Toscano	Deputy Management Engineer and Head, Management Engineering Branch
Mr. H. Kennedy	Head, Safety Branch



Mr. S. L. Cohen

Personnel Complement

On Board: 16

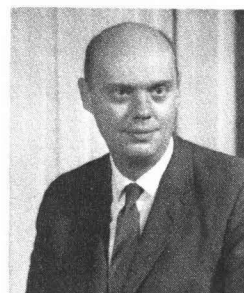
OFFICE OF PATENT COUNSEL

Basic Responsibilities

The Office of Patent Counsel provides services concerning inventions, patents, trademarks, copyrights, and other related matters. Patent applications are prepared, filed, and prosecuted on NRL inventions of significance to the Government. The Patent Counsel serves as consultant and adviser on patent and data clauses in R&D and procurement contracts. Assistance is provided the Research Department through state-of-the-art searches in the patent literature pertinent to particular research problems.

Key Personnel

<u>Name</u>	<u>Title</u>
Dr. A.L. Branning	Patent Counsel
Dr. P. Schneider	Deputy Patent Counsel



Dr. A. L. Branning

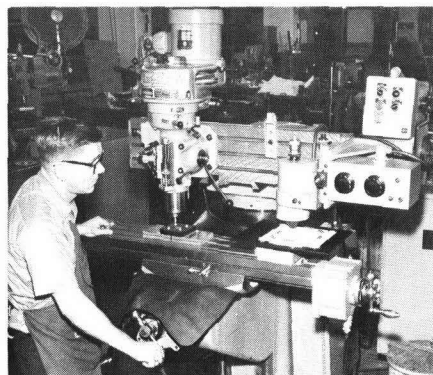
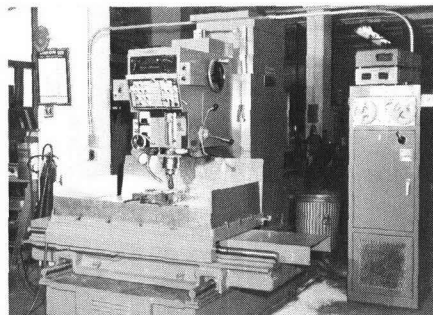
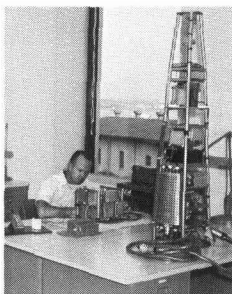
Personnel Complement

On Board: 22
(Includes NRL and ONR)

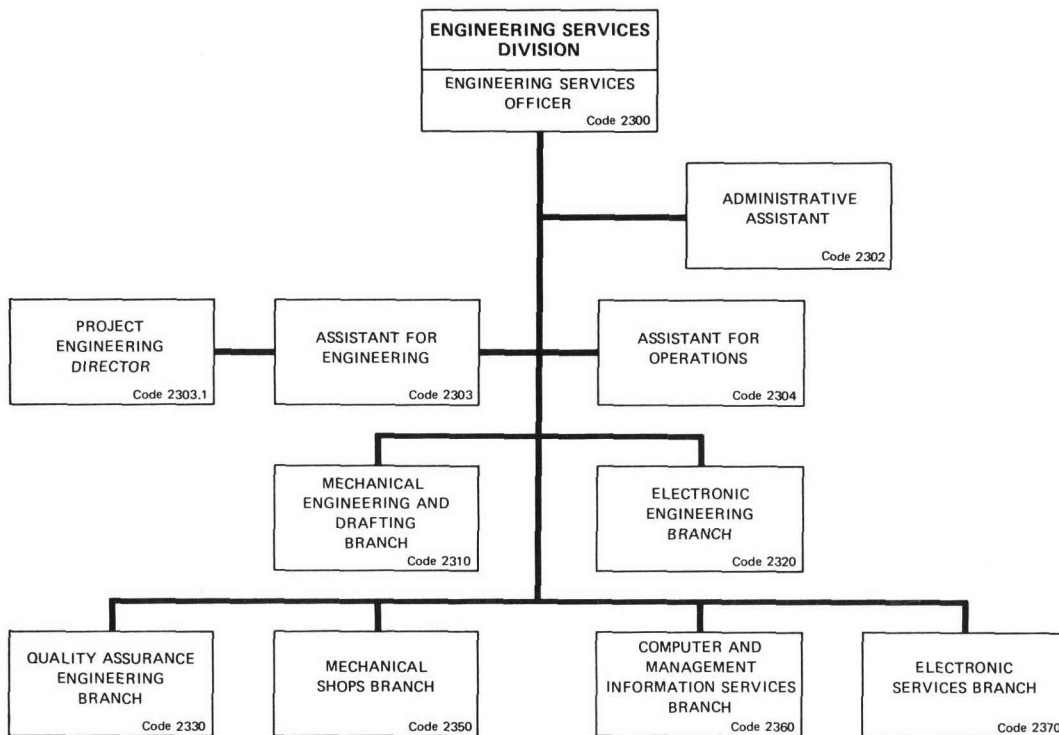


CDR C. M. Kunstmann, USN

Engineering Services Division



- MECHANICAL ENGINEERING AND DRAFTING
- ELECTRONIC ENGINEERING
- QUALITY ASSURANCE ENGINEERING
- MECHANICAL SHOPS
- COMPUTER AND MANAGEMENT INFORMATION SERVICES
- ELECTRONIC SERVICES



Basic Responsibilities

The Engineering Services Division provides the engineering, design, fabrication, assembly, and test of experimental research equipment in support of the Laboratory's research efforts.

Key Personnel

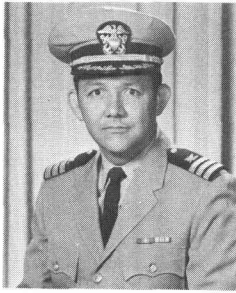
<u>Name</u>	<u>Title</u>
CDR C.M. Kunstmann, USN	Engineering Services Officer
Mr. P.R. Shifflett	Assistant for Engineering
Mr. J.P. Manning	Assistant for Operations
Mr. M. Shimkus	Head, Mechanical Engineering and Drafting Branch (Acting)
Mr. J. Brotzman	Head, Electronic Engineering Branch
Mr. P.C. Buck	Head, Quality Assurance Engineering Branch
Mr. I.F. Long	Head, Mechanical Shops Branch
Mr. L.G. Murphy	Head, Computer and Management Information Services Branch
Mr. J.L. Leizear	Head, Electronic Services Branch

Personnel Complement

On Board: 488

(Graded 162, Ungraded 325, Military 1)

Management & Staff	56
Engineers	37
Technicians	107
Journeyman	204
Machine Operators & Helpers	33
Apprentices	51

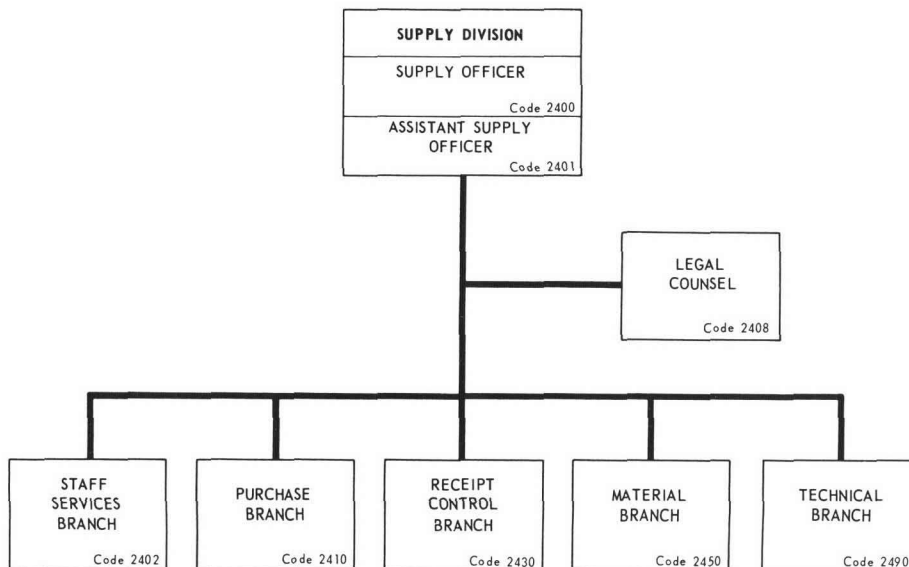


Supply Division

CDR J. R. Webb, USN



- STAFF SERVICES
- PURCHASE
- RECEIPT CONTROL
- MATERIAL
- TECHNICAL



Basic Responsibilities

The Supply Division provides service functions to the Laboratory, including the operation of supply issue stores, procurement of equipment, material, and contractual services; receipt, inspection, and delivery of material and equipment; storage of inactive laboratory equipment; packing, shipping, and traffic management; and survey and disposal of excess and unusable property.

In addition, Supply offers technical and counseling services to the Research departments in the development of specifications for a complete procurement package; consultation as needed in the handling of claims against the Laboratory and guidance in the performance stages of contractual services. Maintains a technical library of hard-copy commercial catalogs for over 7,000 firms.

During FY 1972, the Supply Division occupied 204,531 sq ft of building space; its stores (six retail and one bulk warehouse) inventory averaged \$648,941.00; procurements totalled \$52,798,104.00; stores issues totalled \$2,168,044.00; and disposals totalled \$4,116,124.00.

Key Personnel

<u>Name</u>	<u>Title</u>
CDR J.R. Webb, SC, USN	Supply Officer
LT R.W. Zeiler, III, SC, USN	Assistant Supply Officer
Mr. A.S. Horton	Legal Counsel
Mr. A.W. Medley, Sr.	Head, Staff Services Branch
Mr. H.E. Senasack	Head, Purchase Branch
Mrs. V.S. Thomas	Head, Receipt Control Branch
Mr. H.W. Dickinson	Head, Material Branch
Mr. R.R. Black	Head, Technical Branch

Personnel Complement

On Board: 139

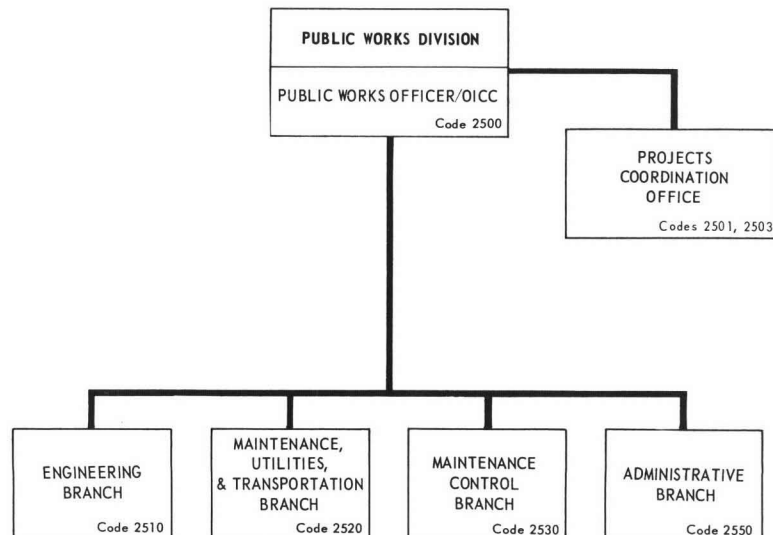
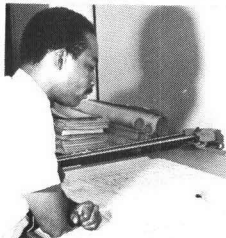
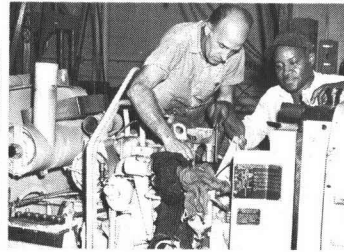
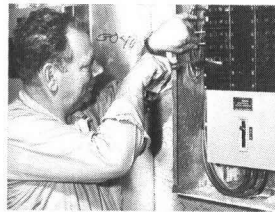
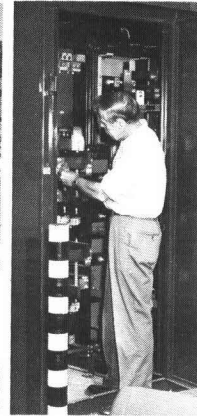
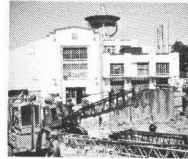
(Graded 90, Ungraded 49, Military 2)



CDR C. Geoly, CEC, USN

Public Works Division

- ENGINEERING
- ADMINISTRATION
- MAINTENANCE, UTILITIES, & TRANSPORTATION
- MAINTENANCE CONTROL
- CONSTRUCTION
- PROJECTS PROGRAMMING



Basic Responsibilities

The Public Works Division is responsible for the physical plant of NRL. This includes responsibility for the design, construction, operation, maintenance, and repair of all buildings, grounds, roads, utilities, and other structures and activities. Also included are transportation; weight-handling and heavy-construction equipment; heating and refrigeration plants; electric, water, steam, air, and gas supply distribution; telephone communication systems; and sewage disposal.

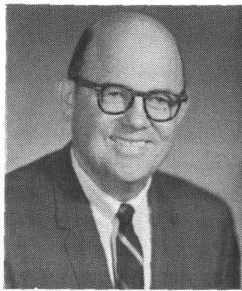
The Public Works Division provides professional consulting services to the scientific divisions on facilities planning and engineering.

Key Personnel

<u>Name</u>	<u>Title</u>
CDR C. Geoly, CEC, USN	Public Works Officer/Officer in Charge of Construction
ENS E. Weatherby, III, CEC, USNR	Staff Assistant
Mr. G. Ridings	Projects Coordination
Mr. G.H. Seaver, Jr.	Projects Coordination
Mr. J.R. Lescault	Head, Administrative Branch
Mr. C.R. Parsons	Head, Engineering Branch
Mr. L.P. Carpenter	Head, Maintenance, Utilities, & Transportation Branch
Mr. R.O. Weidman	Head, Maintenance Control Branch

Personnel Complement

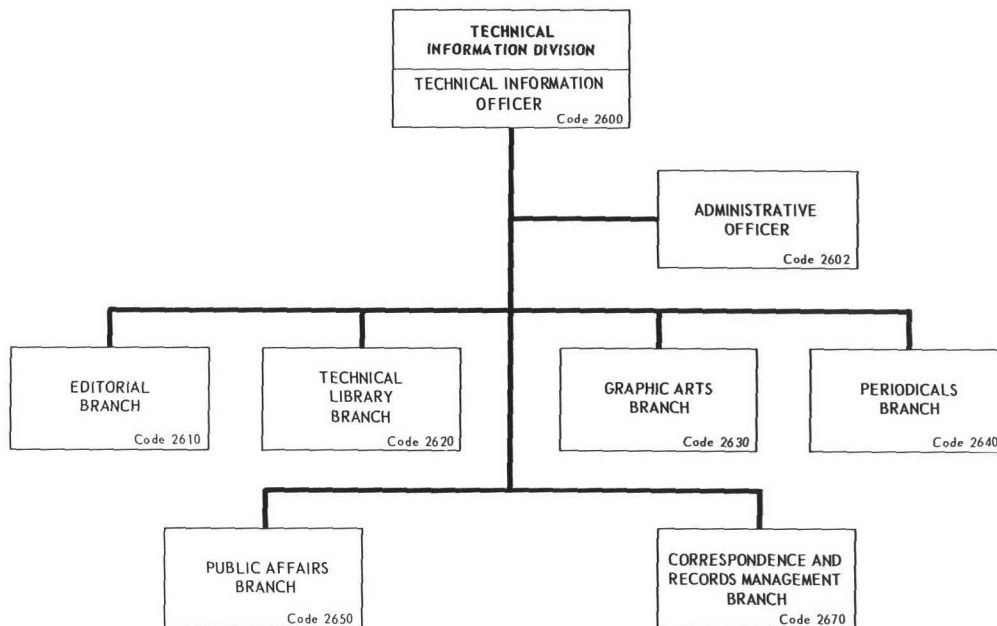
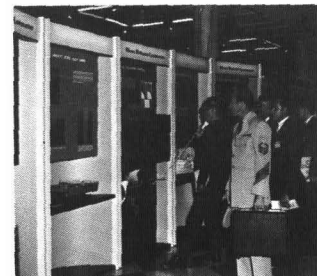
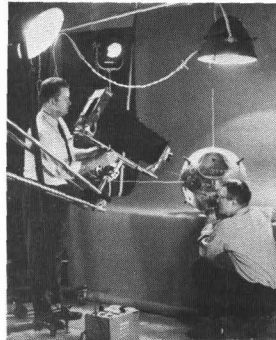
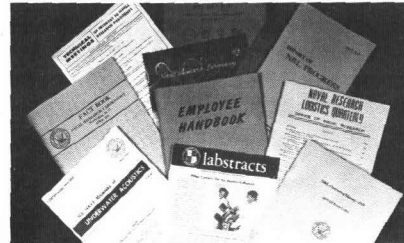
On Board: 373
(Graded 46, Ungraded 325, Military 2)



Mr. E. L. Smith

Technical Information Division

- EDITORIAL
- LIBRARY
- GRAPHIC ARTS
- PERIODICALS
- PUBLIC AFFAIRS
- CORRESPONDENCE AND RECORDS MANAGEMENT



Basic Responsibilities

The Technical Information Division plans and administers the Laboratory's program of preparing and disseminating the results of scientific research through official publications, scientific journals, presentations, films, exhibits, and news media. It provides centralized professional services to both NRL and ONR in writing, editing, printing, exhibits, photography, graphic arts, public affairs, documentation, language-translations, and mail-records services. It operates one of the Navy's largest integrated technical libraries with holdings of 200,000 bound volumes and 350,000 technical reports.

Key Personnel

<u>Name</u>	<u>Title</u>
Mr. E.L. Smith	Head, Technical Information Division
Mrs. D.E. Cameron	Administrative Officer
Mrs. D.P. Baster	Librarian
Mr. W.H. Ramey	Head, Graphic Arts Branch
Mr. W.M. Leak	Head, Periodicals Branch
Mr. I.S. Rudin	Head, Editorial Branch
Mr. J.E. Sullivan	Head, Public Affairs Branch
Mrs. L.V. Dabney	Head, Correspondence and Records Management Branch (Acting)

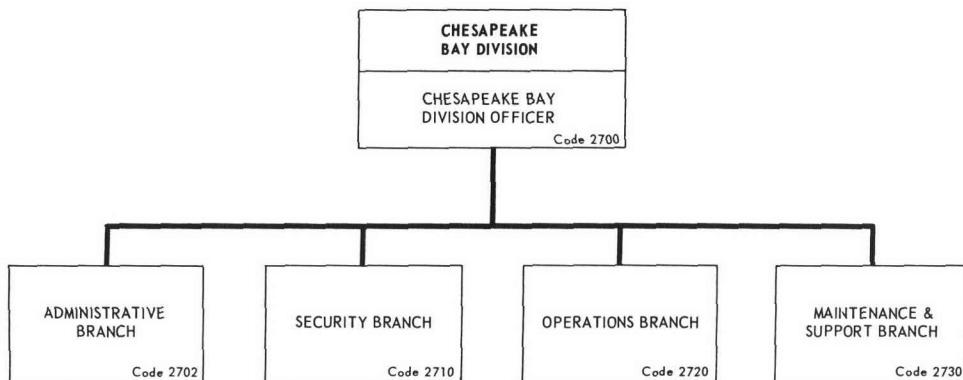
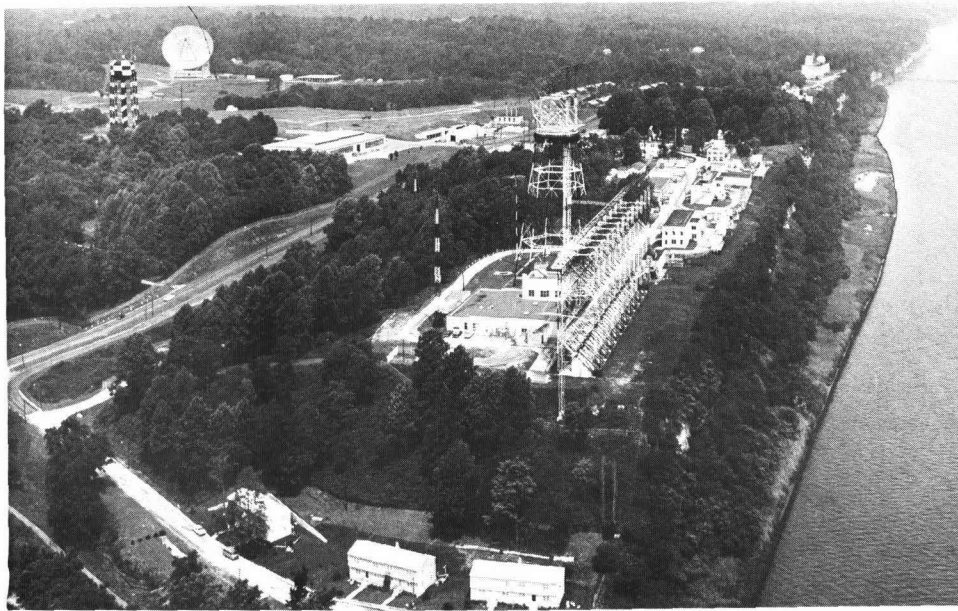
Personnel Complement

On Board: 163
(Graded 144, Ungraded 19)



CDR J. M. Fitts, USN

Chesapeake Bay Division



Basic Responsibilities

The Chesapeake Bay Division provides and maintains facilities and services for test, development and evaluation of radar, radio, and fire control equipment. It also services and supports all research projects conducted at the Chesapeake Beach and Tilghman Island complexes of NRL.

The Physical Plant

Located in a relatively clear area away from any congestion or industrial interference, the main site, at Chesapeake Beach, covers 174.9 acres containing 197 structures of various size and construction, six of which are major laboratory buildings. There is over 200 ft of usable dock space with a water depth of 4 to 7 ft, located 2 mi north of the main site. Off-site facilities include the Tilghman Island Facility, located directly across the Bay from CBD at a distance of about 10 mi; the Theodolite House, at North Beach; and the Off-Shore Platform, approximately 2 mi southeast of CBD in the Bay.

Research watercraft available at CBD include one 60-ft catamaran, one 45-ft modified aviation rescue boat, and one 36-ft motor boat. These are used in support of research projects and for transportation between off-site facilities. Housing includes 24 public quarters.

Key Personnel

<u>Name</u>	<u>Title</u>
CDR J.M. Fitts, USN	Division Officer
Mr. F.R. Theodore	Administrative Officer
Mr. K.V. Davis	Security Officer
BMCM F. McGinnis, USN	Operations Officer
Mr. R.M. Conlyn	Station Engineer

Research Division Representatives

Optical Sciences Division

Mr. A.C. Grosvenor, High Energy Laser Facility Group
Mr. T.H. Cosden, Applied Optics Branch

Radar Division

Mr. M.W. Lehman, Radar Geophysics Branch
and Division Representative
Mr. W.K. Fliss, ECCM Staff Representative
Mr. P.W. Ward, Target Characteristics Branch

Plasma Physics Division

Mr. C.D. Porter, Hypervelocity Techniques Branch

Personnel Complement

On Board: 92
(Graded 39, Ungraded 51, Military 2)

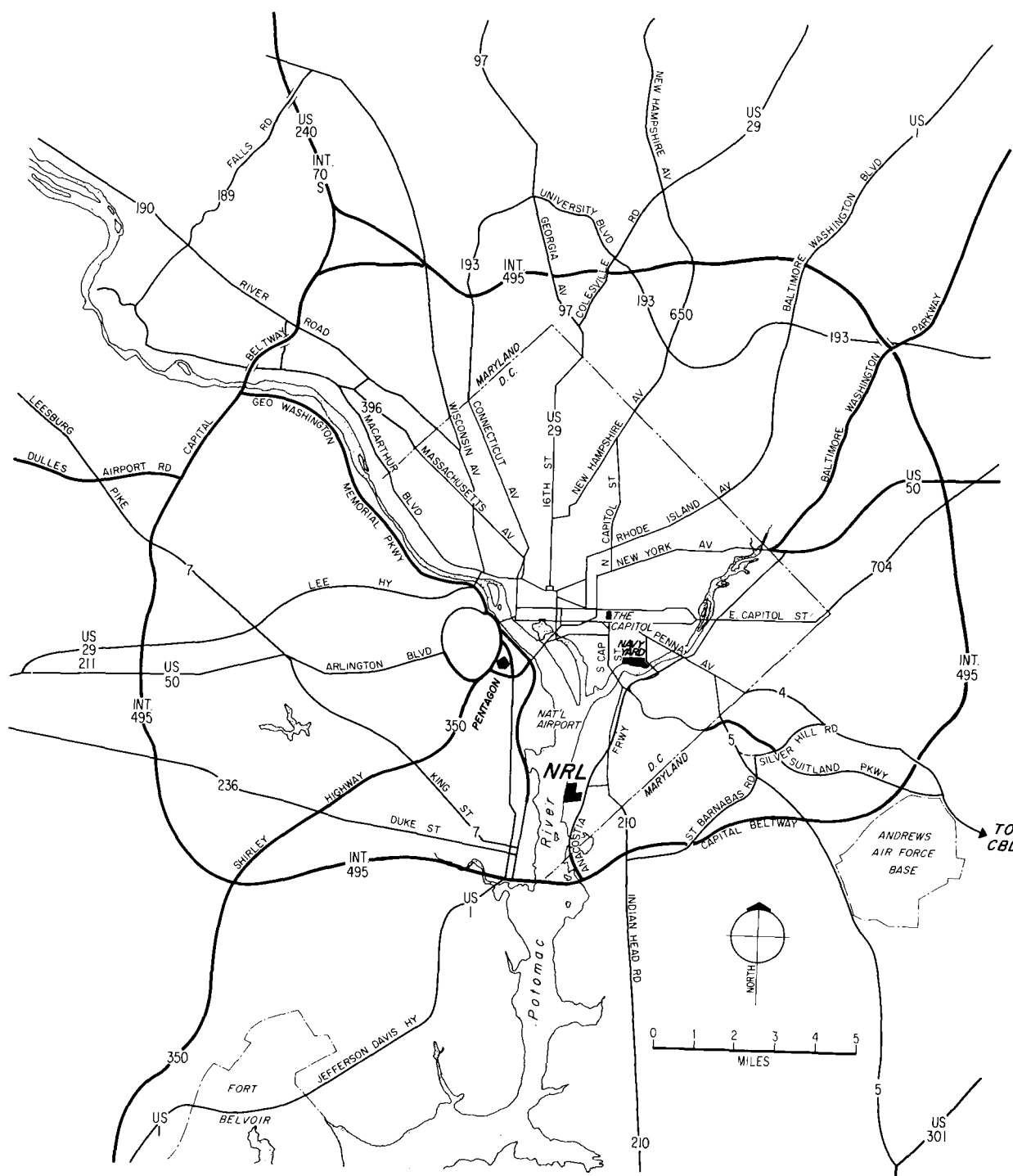
Awards Received by Civilian Employees

As of June 1, 1972

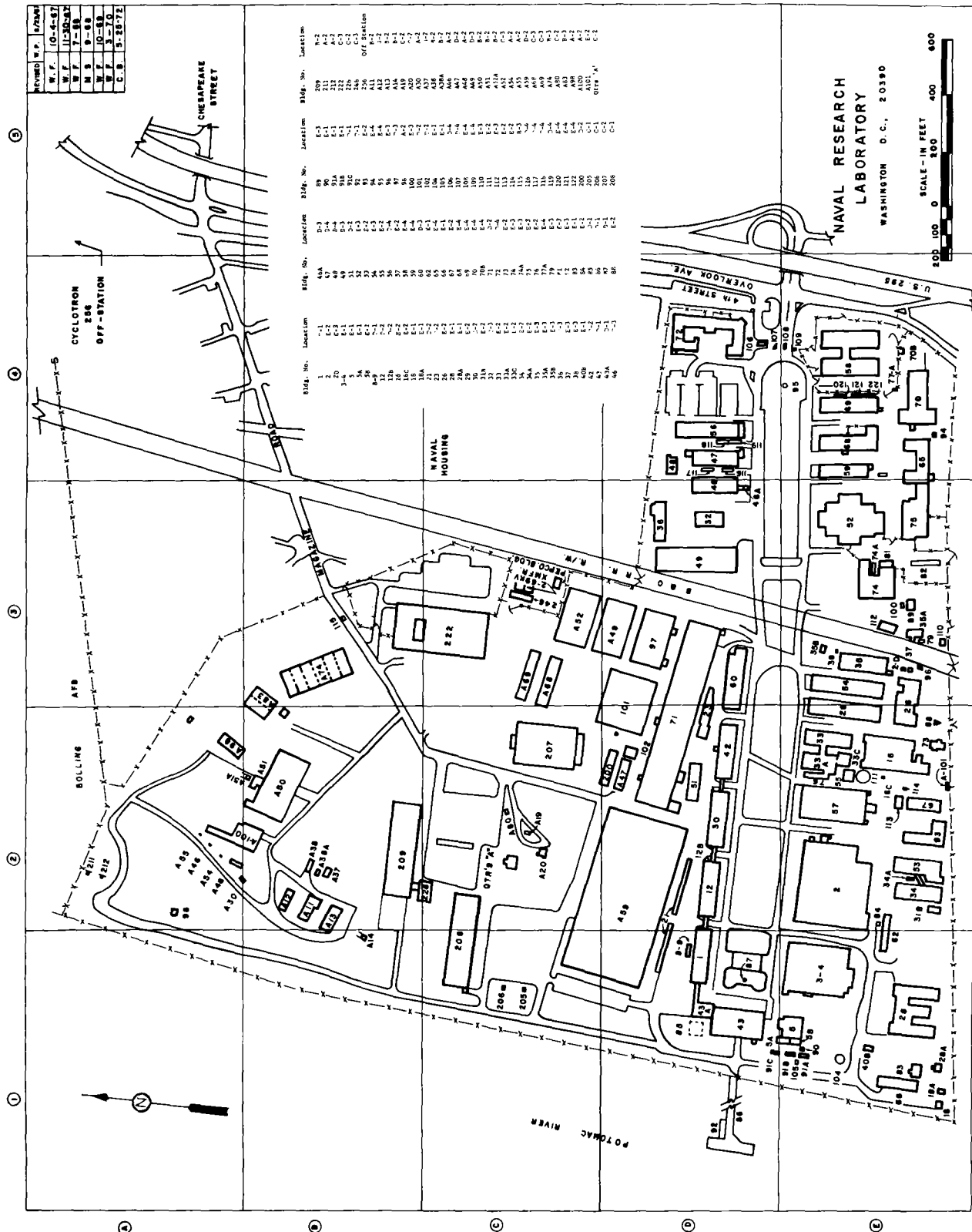
<u>Government Awards</u>	Number
The Medal of Merit from the President of the United States	1
The Certificate of Merit from the President of the United States	11
National Medal of Science from the President of the United States	1
The President's Award for Distinguished Federal Civilian Service	2
Department of Defense Distinguished Civilian Service Award	4
Department of Defense Certificate of Merit	1
Department of the Navy Award for Distinguished Achievement in Science	3
Navy Distinguished Civilian Service Award	59
Navy Captain Robert Dexter Conrad Award	4
Navy Superior Civilian Service Award (established 1959)	37
Navy Meritorious Civilian Service Award	195
E. O. Hulburt Annual Science Award (local NRL award)	17
<u>Non-Government Awards</u>	
Rockefeller Public Service Award	1
Henry Draper Medal of the National Academy of Sciences	1
Engineering Science Award of the Washington Academy of Sciences	2
Physical Sciences Award of the Washington Academy of Sciences	4
Mathematical Sciences Award of the Washington Academy of Sciences	1
Morris Liebmann Memorial Prize of the Institute of Electrical and Electronics Engineers	1
Medal of Merit Award of the Institute of Electrical and Electronics Engineers	2
Harry Diamond Award of the Institute of Electrical and Electronics Engineers	4
John Scott Medal of the City of Philadelphia	1
Patrons Award of the Institute of Electrical and Electronics Engineers (Washington section)	1
Reliability and Quality Control Award of the Radio Engineers Professional Group	1
Frederic Ives Award of the Optical Society of America	2
A. G. Bissell Memorial Award of the American Welding Society	1
Joseph S. Seaman Gold Medal Award of the American Foundrymen's Society	1
John A. Penton Gold Medal Award of the American Foundrymen's Society	1
Eisenman Medal of the American Society for Metals (Philadelphia Chapter)	1
Burgess Prize Award of the American Society for Metals	2
Burgess Memorial Lecture of the American Society for Metals (Washington Section)	1
Charles B. Dudley Medal of the American Society for Testing Materials	1
Sam Tour Award of the American Society for Testing Materials	1
Gold Medal Award of the American Society of Naval Engineers	2
Trent-Crede Award of the Acoustical Society of America	1
Society of Technical Writers and Publishers (Washington, D.C. Chapter)	1

<u>Non-Government Awards (Continued)</u>	Number
District Meritorious Certificate Award of the American Welding Society	1
Stuart Ballantine Medal of the Franklin Institute of Pennsylvania	1
A. K. Doolittle Award of the National American Chemical Society	1
Kendall Company Award of the American Chemical Society	1
Hillebrand Prize of the American Chemical Society	2
William Blum Award of the Washington-Baltimore Electrochemical Society	2
National Award of the American Society of Lubrication Engineers	1
Annual Award of the Society for Applied Spectroscopy	2
E. Edward Pendray Award of the American Rocket Society	1
James H. Wyld Memorial Award of the American Rocket Society	1
Space Science Award of the American Institute of Aeronautics and Astronautics	1
Eddington Medal of the Royal Astronomical Society (Great Britain)	1
Janssen Medal of the French Photographic Society	1
Ancel Prize of the French Photographic Society	1
Progress Award of the Photographic Society of America	1
Professional Achievement Award of the D. C. Council of Engineers and Architectural Studies	1
National Capital Award of the D. C. Council of Engineers and Architectural Studies	3
Award for Technical Achievement of the American Society of Mechanical Engineers	1
Mayo D. Hersey Award of the American Society of Mechanical Engineers	1
Service to Mankind Award of the Washington Sertoma Club	1
Pittsburgh Spectroscopy Award of the Spectroscopy Society of Pittsburgh	1
Pure Science Award of the Scientific Research Society of America (NRL Branch)	20
Applied Science Award of the Scientific Research Society of America (NRL Branch)	19
Arthur S. Fleming Award of the Washington Chamber of Commerce	3
Society of Women Engineers Achievement Award	1
Notre Dame Centennial of Science Award	2
M. Barry Carlton Award - Institute of Electrical and Electronics Engineers	1
National Civil Service League Merit Citation	1
Brazilian Ordem do Merito Naval (Legion of Naval Merit) Cavaleiro	1
Outstanding Americans Foundation	1
Frank Booth Award - International Power Sources Symposium	1
Kratel Award of the Eurocontamination Foundation	1
Burgess Memorial Award of the American Society for Metals	1
Award of Merit of the American Society for Testing and Materials	1
John Adam Fleming Award by the American Geophysical Union of the National Academy of Science—National Research Council	1
Marcus A. Grossmann Award of the American Society of Metals	1
Victor K. LaMer Award for Outstanding Graduate Research in Colloid and Surface Chemistry	1

Location of NRL

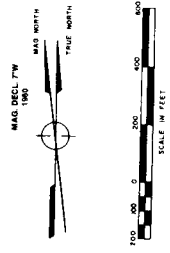
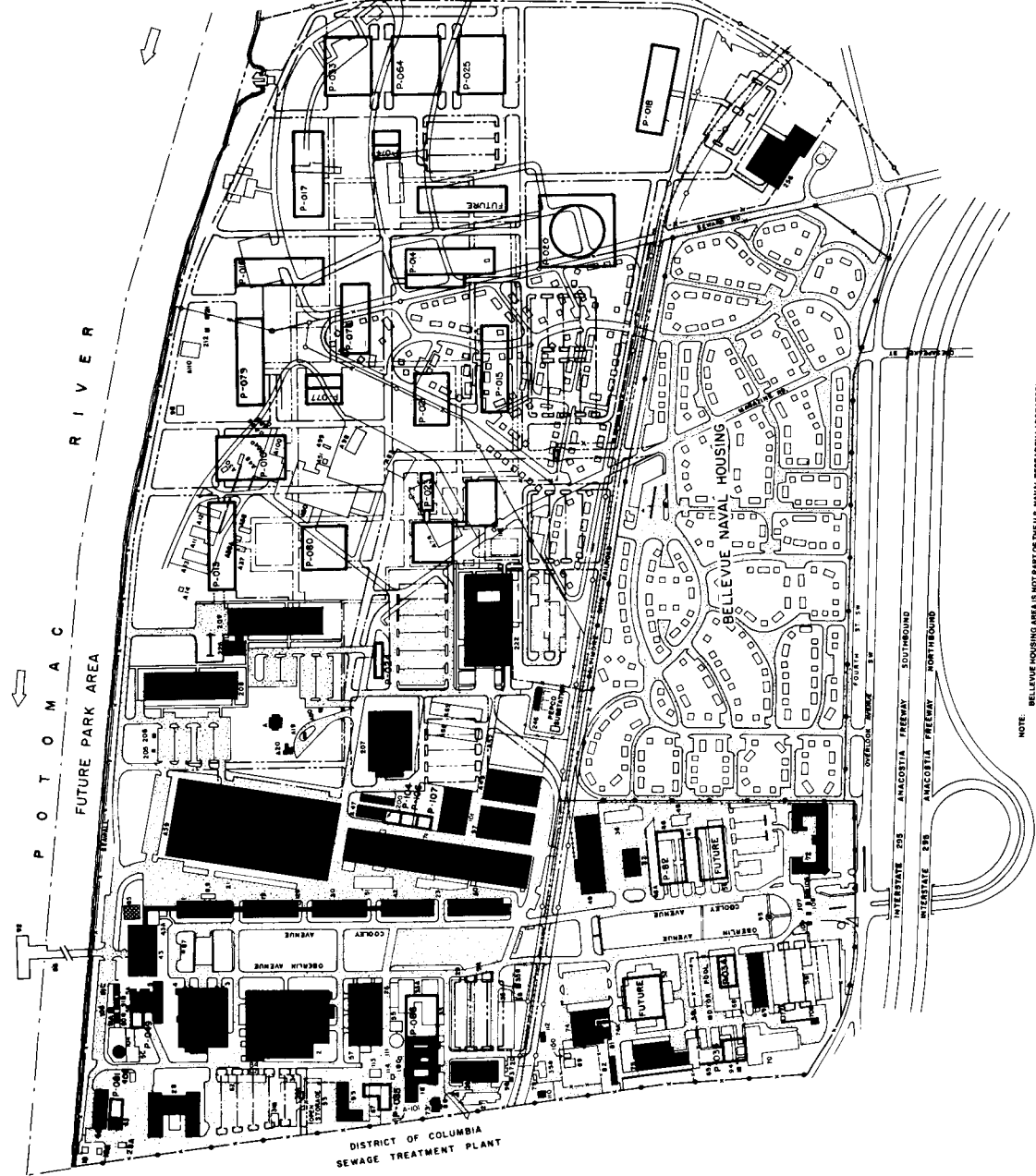


Location of Buildings at Main Site



General Development Plan

- LEGEND**
- BUILDINGS & STRUCTURES
 - NAVY PROPERTY BOUNDARY WITHOUT FENCE
 - NAVY PROPERTY BOUNDARY WITH FENCE
 - ROADS, WALKS & BIKEWAYS
 - FENCE
 - MAIN STATION ENTRANCE
 - GATE
 - RIVER DIRECTION OF FLOW
 - RAILROAD
 - UNDERGROUND STRUCTURES
 - EXISTING TO BE RETAINED
 - EXISTING TO BE REMOVED
 - PLANNED PRELIMINARY



NOTE: BELLEVUE HOUSING AREA IS NOT PART OF THIS PLAN, BUT BECAUSE OF ITS CONTIGUOUS LOCATION IT IS SHOWN FOR REFERENCE. LONG. 77° 01' 00" W. LAT. 38° 49' 30" N. AT THOMAS EDISON MONUMENT, STRUCTURE # 88. MAP GRID IS BASED ON TRUE NORTH.

Listing of NRL Sites and Facilities

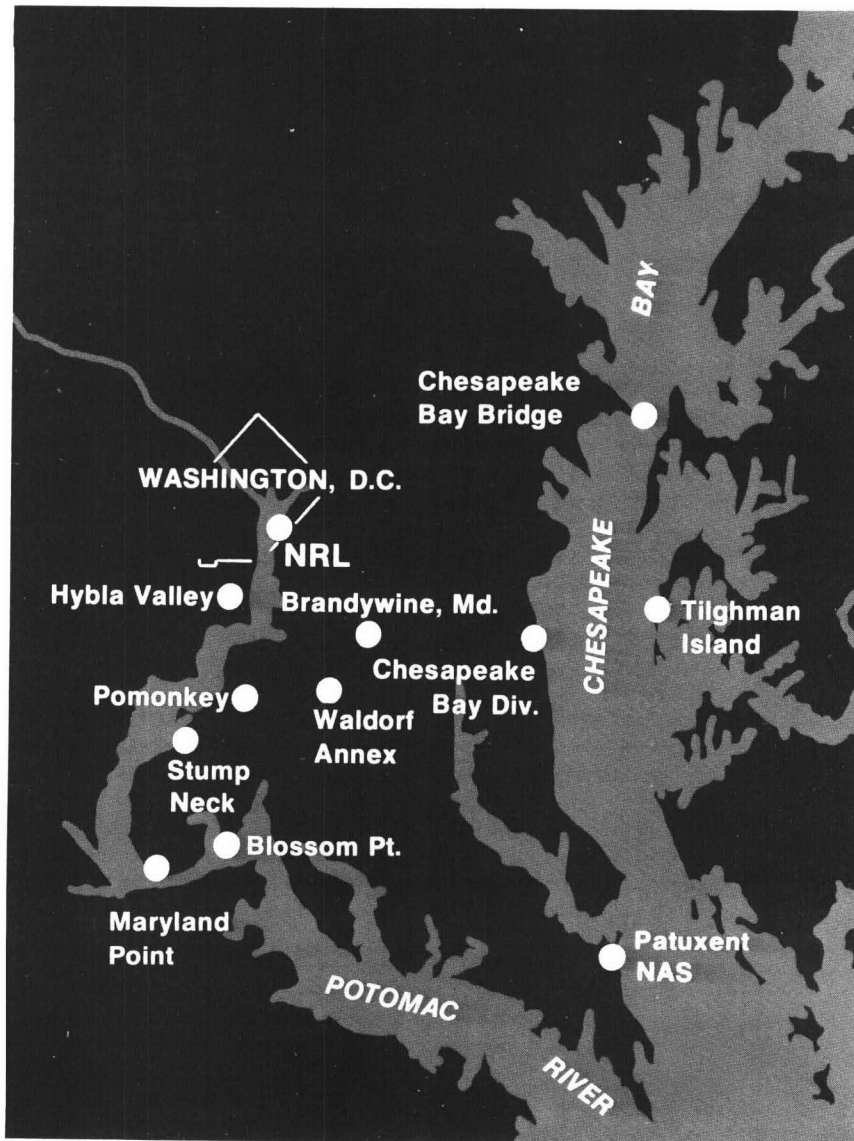
September 30, 1972

Station and Location	Acreage			Class I & II Plant Account	
	Fee Title	Easement or Purchase	Permit or Lease	Value	No. of Buildings and Structures
Naval Research Laboratory, Washington, D.C.	129.23		1.29	57,619,841	153
Radio Research Site, Blue Plains, D.C.			0.30		
Cyclotron Building Site Bolling Air Force Base, D.C.			5.24	3,606,621	1
Radio Research Site Coast Guard Radio Station, Alexandria, Va.			55.40		
Radio Test Area, Hybla Valley, Va.	1,262.46			60,000	
A&A Test Site, Shenandoah National Park Luray, Va.			NA		
Coast Guard Station, Va. Beach			NA		
NRL Flight Support Detachment, Naval Air Station, Patuxent River, Md.			NA		
Chesapeake Bay Division, Chesapeake Beach, Md.	174.90			10,375,430	184
Multiple Research Site, Tilghman Island, Md.	2.00			110,662	9
Dock Facility, Chesapeake Bay, Md.			0.60	18,533	5
Theodolite Station, North Beach, Md.			0.29	800	1
Tunnel under Maryland State Road 261			NA		
Optics Research Platform in the Chesapeake Bay, Md.			0.23	1,500	2
Research Platform, Chesapeake Bay Bridge, Md.				21,400	1
2 Foghorn Platforms, Chesapeake Bay Bridge, Md.			NA		
Research Gondola, Chesapeake Bay Bridge, Md.			NA		
NRL Waldorf Annex, Md.	23.94	35.16		1,217,707	35
Radio Astronomy Observatory, Maryland Point, Md.	24.30		197.88	247,002	12
Radio Antenna Range, USAF Receiver Site, Brandywine, Md.			22.98		
Radio Research Site, Stump Neck Annex, Naval Ordnance Station, Indian Head, Md.			5.90		
Free Space Antenna Range, Pomomkey, Md.	14.12	28.40		736,508	12
Navy Radio Research Station Sugar Grove, West Va.				74,091	2
Satellite Tracking Facility, Blossom Point, Md.			23.00		
Edgewood Arsenal, Md.			NA		
Coast Guard Station, Cove Light Station, Md.			NA		
*Satellite Tracking Station, Roma, Texas	27.84	1.00		725,239	5
*Satellite Tracking Station, Raymondville, Texas	171.55	2.85		1,206,770	16
Underwater Sound Reference Division, Orlando, Fla.	10.46			1,242,389	32
USRD, Leesburg Facility, Bugg Spring, Fla.			6.92	167,067	7
Marine Corrosion Laboratory, Key West, Fla.			NA		
*Underwater Track Facility Argus Island (near Bermuda)			NA		
Totals:	1,840.80	67.41	320.03	77,431,560	

*Now being screened for disposal

Location of Principal Field Stations

Another station is located at Sugar Grove, W. Va. The Underwater Sound Reference Division is located at Orlando, Fla.



Research Platforms

Aircraft

1. The S2D (BUNO 149240) contains specially installed equipment and wing mounted pods for cloud physics research. It is also used in chaff research and for short-term experiments compatible with space limitations of the aircraft.
2. The EC-121K (BUNO 128324) is used for wave propagation studies in the four-frequency radar system.
3. The EC-121K (BUNO 135753) is used for research in cloud physics, ECM, low-frequency radar, and various projects requiring minimal aircraft conversion.
4. The EC-121K (BUNO 141297) is used mainly by the Tactical Electronic Warfare Division to experiment, evaluate, and improve Fleet electronic warfare capabilities.
5. The P3A (BUNO 149670) is primarily used for airborne radiometric studies and to a lesser degree for cloud physics and acoustic research.

Available Ships

1. USNS MIZAR (T-AGOR-11) Under operational control of MSCLANT. Scheduled by NRL.
2. USNS HAYES (T-AGOR-16)
(Will use the inherent catamaran design to accomplish oceanographic and acoustics research at sea)
3. USS X-1 (SSX-1) is a one-sixth scale research submarine used mainly for oceanographic research. It is under operational control of COMSUBLANT, but is scheduled by NRL.
4. Fleet units are regularly scheduled for NRL in support of CNO assigned projects by OPTEVFOR.

The Naval Research Laboratory has a continuing need for physical scientists, mathematicians, engineers, and supporting personnel. Vacancies are filled without regard to race, creed, color, sex, or national origin. Information concerning current vacancies will be gladly furnished upon request. Address all such inquiries to the Personnel Office (Code 1800), Naval Research Laboratory, Washington, D. C. 20390.