

# FACT BOOK

JANUARY 1978

## NAVAL RESEARCH LABORATORY



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WASHINGTON, D.C. 20375

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# Report Documentation Page

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

January 1978

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 Civilian Personnel Office (Code 1800), Naval Research Laboratory, Washington, D.C. 20375.

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*Aerial view of the Naval Research Laboratory main site*



## Mission . . .

To conduct a broadly based multidisciplinary program of scientific research and advanced technological development directed toward new and improved materials, equipment, techniques, systems, and related operational procedures for the Navy. In fulfillment of this mission, the Naval Research Laboratory:

(a) Initiates and conducts scientific research of a basic and long-range nature in scientific areas of special interest to the Navy.

(b) Conducts exploratory and advanced technological development deriving from or appropriate to the scientific program areas.

(c) Within areas of technological expertise, develops prototype systems applicable to specific projects.

(d) Performs scientific research and development for other Naval commands and, where specially qualified, for other agencies of the Department of Defense and, in defense-related efforts, for other Government agencies.

(e) Upon request from appropriate Naval commands, assumes responsibility as the Navy's principal R&D center in areas of unique professional competence.

(f) Provides to the Navy and its contractors standardized techniques and procedures for measurements and the accurate calibration of standard instruments in areas of special Navy needs.

(g) Furnishes scientific consultative services for the Navy and, where specially qualified, for other agencies of the Department of Defense and, in defense-related efforts, for other Government agencies.

(h) Provides to the Navy determinations of performance characteristics of developmental and prototype devices through limited engineering test and evaluation services.



## Introduction to NRL . . .

The Naval Research Laboratory (NRL) was officially established on July 2, 1923, as the Naval Experimental and Research Laboratory. NRL still occupies its original site on the banks of the Potomac River in the southwest sector of Washington, D.C. Over the past 55 years, the facility has grown from a modest beginning of five buildings and a few hand-picked scientists representing two major research areas--radio and underwater sound--to its present status as the "Corporate Laboratory of the Navy." Current resources include a Main Laboratory expanded to some 52.2 hectares (129

acres), about 20 field sites, more than 400 buildings and structures, and a work force in the neighborhood of 3600.

The overall management of the Laboratory is under the direction of a naval Commanding Officer and a civilian Director of Research. The internal structure of the Laboratory consists of several staffs and five directorates: the Support Services Directorate with six major divisions, and the four Research Directorates--each headed by an Associate Director of Research--comprising 15 research divisions.

## Current Research . . .

The following 14 headings represent broad fields of NRL research. Underneath each are more specific topics that are being investigated for the benefit of the Navy and other sponsoring organizations. Some details of this work are given in NRL's Review, published annually, and in the Report of NRL Progress, published monthly. More specific details are published in reports on individual projects provided to sponsors and presented when feasible as papers for professional societies or their journals.

### Communications

- Satellite Communications
- Secure Communications
- Computer Architecture
- Communication Intercept and Jamming

### Countermeasures

- Decoys (RF and IR)
- Repeaters
- Laser Countermeasures
- Optical Guidance Systems
- Jammers

### Device Technology

- Integrated Optics
- Radiation-Hardened Electronics
- Microelectronics

### Directed Energy Devices

- High-Energy Lasers
- Chemical Laser
- Laser Propagation
- Radiation Damage
- High-Power Microwave Sources
- Charged-Particle Devices

### Energy Conversion

- Kinetics of Combustion Processes
- Electrochemical Power Sources
- Fusion

### Environmental Effects

- Oceanography
- Underwater Acoustic Propagation
- Meteorological Effects on Electro-optical Systems
- Air Quality in Confined Spaces
- Extravisible Optical and Radio Background in Space.
- Solar Activity
- Ionospheric Behavior



### Hydrodynamics

Low-Drag Bodies  
Numerical Simulation of Naval  
Platforms  
Magnetohydrodynamics Code Generation

### Materials

Electronic Properties  
Special Purpose Polymers  
Failure Criteria  
High-Flux Environments  
High-Temperature Environments

### Navigation

Clock Development  
Navigation Technology Satellite - 2  
Global Positioning System (GPS) Support

### Sensor Systems

Acoustic & Electromagnetic  
COMINT, ELINT & ESM  
Focal Plane Imagers  
Microwave Remote Sensing

### Sonar Standards

Calibration  
Secondary Standards

### Surveillance Systems

Properties of the Medium  
Target Characteristics  
Sensors

### Undersea Technology

Autonomous Vehicles  
Deep Ocean Search  
Bathymetric Technology  
Anechoic Coatings

### Weapons Guidance

Global Positioning System  
(GPS) Guidance  
Optimized Optical Seeker  
Radar Guidance

## **Recent Accomplishments in Science and Technology . . .**

### Radar Technology

In demonstrations watched by many Navy visitors, NRL has shown that ship imaging by radar is a practical means of ship classification for ocean surveillance and missile targeting.

NRL has successfully demonstrated new sidelobe cancelling techniques. Preliminary results indicate that jammer rejection can be made many times greater than in previous systems.

NRL has developed a high-power millimeter wave gyrotron which has produced 50-ns pulses at 8-mm wavelength and 8-MW power level and also at 4 mm and 2 MW. A sound basis now exists for a family of high-power radars in millimeter wavelengths.

### Space Systems

On 23 June 1977 the NRL-designed and -built NTS-2, or Navigation Technology Satellite -2, was launched from Vandenberg Air Force Base. The satellite carries cesium-beam time standards for test in orbit as part of the NAVSTAR Global Positioning System (GPS) program.

NRL has begun a program to modernize the Navy Space Surveillance System (NAVSPASUR). This system was originally designed and developed by NRL and has been under the Operational Command of NAVSPASUR Headquarters in Dahlgren, VA, since 1960.

### Sonar and Undersea Technology

NRL is developing a fiber optic acoustic sensor which is expected to



have significant advantages over conventional hydrophones. The basic hydrophone consists of a probing optical beam confined to a low-loss optical fiber coiled in such a way as to allow a long (0.01-1 km) acousto-optic interaction length.

#### Materials and Materials Modification

Present methods of coal liquefaction are expensive and require somewhat extreme conditions. NRL has recently experimented with solvent-refined coal (molecular weight about 650) oxidized in inert solvents such as pyridine or quinoline by bubbling air through the mixtures under mild conditions (~170°C and one atmosphere). Yields of about 30% of products with molecular weights of about 210 have been obtained.

NRL has developed a new class of Teflon®-like coatings which may be applied by conventional painting techniques. After a successful small-scale test lasting a year in a bilge of the USS FORRESTAL (CV 59), the test was extended in 1977 to five of the FORRESTAL bilges. Major cost savings are expected to be realized.

#### Laser and Optical Technology

A promising new method of concentrating and separating deuterium in water is being developed at NRL, where laser radiation is used to promote a reaction which concentrates the deuterium in stable hydrocarbon products. To date, a 60% enrichment of deuterium in the hydrocarbon fragment has been achieved under conditions which allow high throughput.

In recent major laser-matter interaction experiments, NRL scientists found that certain types of time-shaped laser pulses have much lower absorption on a pellet. As a result,

Department of Energy laser fusion labs are now emphasizing pellet design and intense pulse shapes which avoid this difficulty.

#### Electronic Materials and Devices

Over several years NRL has built a capability to produce high voltage ion-implanted gallium arsenide (GaAs) in a uniform and repeatable manner. In the past year this technology has successfully been transferred between NRL and Hughes Research Laboratories and the process can therefore be considered amenable for commercial production.

In a joint program between NRL and the Defense Nuclear Agency, a prototype cesium frequency standard (CFS) has been built satisfying military radiation hardening requirements for nuclear and natural radiation in space without any change or impairment of frequency standard operation or performance, with a minimum weight penalty and no power penalty.

#### Environmental Studies

Geophysical and bathymetric measurements taken in the NRL Arctic program from 1971 through 1975 have been combined with hydrographic surveys, published reports, and archive data to plot a bathymetric contour chart of the region which uses a polar stereographic projection and a contour interval of 200 m.

#### Engine and Boiler Technology

The Laboratory has developed a new method of cleaning ships' boilers and other closed systems without interrupting their operations. The method includes the continuous addition of an organic chelating agent. This agent prevents buildup of scale and sludge and will increase by as much as tenfold the time between overhauls.



## Directed Energy Devices and Technology

Recent experiments conducted at NRL on the Gamble II accelerator have demonstrated focusing of intense proton and deuteron beams to fusion-pellet dimensions. Since light ions represent an ideal driver for advanced thermonuclear pellets, the demonstration of focusing of MeV-energy light ions to currents in ex-

cess of  $70 \text{ kA/cm}^2$  represents an important step in the realization of inertial fusion.

NRL has a continuing program aimed at developing high-power solid state lasers. Recent activities have centered on systems analysis using a superior laser glass of phosphate composition. A recent NRL design, called 7 x 40, could potentially lead to a factor of two reduction in laser glass volume.

## Patents and Papers

In breaking new ground during many of these projects, NRL scientists and engineers developed many improved devices and techniques. For such innovations, the Laboratory was awarded 51 patents during 1977. Since its founding, NRL has received 2641 patents.

The practical results of work on the projects listed above and on others that are undertaken in response to sponsor requests are made known and available not only to various Navy units, but also

to the Army, Air Force, the Defense Advanced Research Projects Agency, the Defense Nuclear Agency, and other Federal organizations. Moreover, NRL's research is reported to the scientific community in hundreds of presentations, journal articles, and reports every year. During the year ending December 31, 1977, NRL staff members were responsible for approximately 2435 presentations, reports, and other kinds of publications at NRL and in periodicals and books.

## Major Facilities and Capabilities

Listed by Divisions and Specialized Units

### Research Directorates

#### Research Computation Center

Texas Instruments Advanced Scientific Computer, an extremely large, fast, and powerful data processing system

Off-Line CRT Plotter Facility

DEC-10 Timesharing Computer

Analog-to-Digital Data Translation Facility

#### Electronics Technology Division

Silicon Integrated Circuit Processing Facility

Microscopes and electrooptical devices

Crystal-growing facilities

High-Field Magnet Facility

A variety of electronic testing and analysis facilities



### Radar Division

Antenna Measurement Laboratory  
MADRE Over-the-Horizon Radar  
Sea-Echo HF Radar Facility (San Clemente, CA)  
Radar Area Measurement System  
Radar Research and Development Activity (CBD)  
IFF Ground Station  
Interpretation Facility for Synthetic Aperture Radar (SAR)  
Airborne APS-116 Radar with SAR Processing  
Recording and Control System for Airborne Adaptive Array Research

### Optical Sciences Division

Optical Warfare Laboratory  
Infrared Mobile Optical Radiation Laboratory  
Facilities for synthesis and characterization of optical glass compositions and for the fabrication of optical fibers  
Hybrid optical/digital image processing facility

### Tactical Electronic Warfare Division

Mobile Infrared Signature Measurement and Simulation Facility (with data reduction capability)  
Hybrid RF/IR Missile Seeker Simulation Facility  
Central Target Simulation Facility for developing, testing, and evaluating EW systems and techniques (under construction)  
RF Simulation Laboratory  
Radar Cross Section (RCS) Measurement Facility (at CBD)

### Laboratory for Structure of Matter

Two x-ray diffractometers  
Electron diffractometer

### Radiological and Environmental Protection Staff

Neutron Irradiation Facility  
X-Ray and Gamma-Ray Irradiation Facility

### Chemistry Division

Chemical Diagnostic Facility  
Laser Chemistry Facility  
Surface Analysis and Lubrication Research Facility  
Paint and Coating Facility  
Filament Winding Facility  
Mechanical Characterization of Polymers Facility  
Alternate and Petroleum-Derived Fuels Facility  
Combustion Research Facilities  
Facilities for research in colloids, adhesion, aerosols and filters, gas absorption, plastics, and other aspects of chemistry  
Polymer Chemical Characterization Facility

### Material Science and Technology

High-Level Radiation Laboratory  
Computerized Mechanical Test Laboratory  
Electron microscopes and other microanalytical equipment  
High-energy laser test facility

### Radiation Technology Division

1.93-m (6.3-ft), 75-MeV Sector-Focusing Cyclotron  
60-MeV Linear Electron Accelerator (Linac)  
5-MeV Electrostatic Charged Particle Accelerator (Van de Graaff)  
2-MeV Electron Van de Graaff Accelerator  
Cobalt-60 source



Plasma Physics Division

Gamble I and II High-Voltage Pulsed Power Generators  
PHAROS II Two-Beam Neodymium-Glass Laser and Target Facility  
1000-J NRL CO<sub>2</sub> Laser

Laboratory for Cosmic Ray Physics

Cosmic Ray Physics Laboratory  
Nuclear Emulsion Processing Facility

Spacecraft Technology Center

Anechoic Chamber (for satellite checkout)  
Thermal Vacuum Chamber  
Two smaller thermal vacuum chambers  
Two miscellaneous vacuum chambers  
Spin Balance Facility  
Acoustics Facility (for testing)  
Vibration Facility  
Clean-room facilities  
Satellite ground station

Space Science Division

E. O. Hulburt Center for Space Research  
26.0-m (85-ft) radio telescope at Maryland Point  
Other antennas for radio astronomy

Communications Sciences Division

Microwave Space Research Facility  
Satellite Communications Antenna Facility  
Computer Architecture Simulation and Evaluation Facility  
HF Modem and Channel Simulation Facility  
HF Antenna Range  
SIGINT Analysis Facility

Space Systems Division

Hypervelocity Gun (listed under Chesapeake Bay Division)

Two other high-power guns for ballistics research  
Navigation Technology Satellite tracking stations  
Digital Optical Processing Laboratory

Acoustics Division

Large tank instrumented for investigating acoustic echo characteristics of targets  
Tank 9.1 m (30 ft) in diameter by 6.7-m (22-ft) deep for precise studies of transducer and other underwater devices  
Tank 6.1 m (20 ft) in diameter by 6.7-m (22-ft) deep for acoustic device development and test  
Multichannel Programmable Digital Data Processing System: a system of DEC computers, high-speed array processors, and peripherals for up to 256 channels. Designed for acoustic surveillance array processing

USNS HAYES. The Division is a major user of this oceanographic ship, which is listed later under "Mobile Platforms."

Underwater Sound Reference Division (Orlando, FL)

2.8-hectare (7-acre) lake with a large pier and instrumentation for underwater acoustic studies  
Anechoic tank for simulating ocean depths up to 700 m (2297 ft)  
Smaller pressure vessels for simulating depths to 7000 m (22,966 ft)  
Field station at Bugg Spring with floating platform and instrumentation for acoustic measurements

Ocean Sciences Division

Waldorf Annex (lower site). This facility is instrumented for



continuous recordings of atmospheric-electricity, micro-meteorologic, and lightning-flash data, and is utilized for numerous investigations into environmental phenomena.

Balloon Launch and Tracking Facility (CBD). Includes a shelter for inflating balloons and two GMD radiosound receiving and tracking units.

Gas Chromatography Facility  
Electrophysiological Laboratory  
Neural-physiological Laboratory  
Closed aquarium system for culturing marine borers

18.3-m (60-ft) wave tank for studying dynamics of wind-generated waves; uses micro-wave doppler spectrometry and optical and photometric techniques.

Towed Thermistor Chain: an array of temperature sensors and/or other sensors used in oceanographic research

USNS HAYES. The division is a major user of this oceanographic ship, which is listed later under "Mobile Platforms."

#### Ocean Technology Division

Shock and Vibration Laboratory  
Wave Channel: a 30-m (98-ft) channel with fan and mechanical wave-maker instrumented for generating and studying waves and their effects  
Water tunnel: a large blowdown water channel with a 15-m long test section for acoustic and flow-induced vibration studies of towed line arrays and flexible cables

## Support Services Directorate

#### Engineering Services Division

Mechanical, electronic, and project engineering and design  
Manual and computer-aided drafting  
Shops for machining, sheet metal, welding, casting, plating, plastics, printed circuits, electronic assembly, and other fabrication services  
A wide variety of testing and repair capabilities  
Vendor liaison and surveillance

#### Supply Division

Procurement, storage, distribution, and disposal of materials and equipment required by the Research Directorates

#### Public Works Division

Construction, engineering, repair, and other services to maintain and improve NRL's physical facilities

#### Technical Information Division

Editorial, graphic arts, photographic, and printing services; Technical Library; and exhibit and presentation support services

#### Chesapeake Bay Division (CBD)

Radar Experimental Test Site, which includes a variety of radars; ancillary equipment for test and evaluation of equipment, concepts and techniques; and over-water ranges



Radio telescope with 45.7-m (150-ft) antenna dish

Communications facilities for transmission to and from land, sea, and air

Hypervelocity gun for ballistics research

Ship Motion Simulator with 11-metric-ton (12-ton) payload capacity

Fire Test Facility for fire extinguishment research

Boat Services

Shops for machining, sheet metal, welding, and other fabrication services

## Mobile Research Platforms

Oceanographic ship USNS HAYES, a 3475-metric ton catamaran

Two-engine S-2D "Tracker" aircraft

Two four-engine turboprop P-3A "Orions"

Four-engine EC-121K Super Constellation instrumented for electronic warfare research



# Military and Civilian Personnel

Military Personnel Attached to NRL as of January 1, 1978

Officers	Authorized	On Board
Captain	4	5
Commander	9	8
Lieutenant Commander	8	4
Lieutenant	6	7
Lieutenant (Junior Grade)	1	0
Ensign	0	3
Warrant Officer	<u>4</u>	<u>3</u>
Total	32	30
Enlisted	114	102

Full-Time Permanent Civilians on Board as of January 1, 1978

10 USC 1581 (formerly Public Law 313)		22
Classification Act (GS)		2648
Scientific and Professional	1386	
Technical Supporting	631	
General Administrative & Clerical	631	
Wage Board		626
General Wage Service (WG)	522	
Apprentices (WT)	22	
Printing & Lithographic Service (WI)	15	
Supervisory General Wage Service (WS)	46	
Supervisory Planners & Estimators (WN)	2	
Planners, Estimators, etc. (WD)	17	
Leaders (WL)	2	
Total		3296

Annual Civilian Turnover Rate (percent)

	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
Research Divisions	7.5	5.9	5.9	5.9	7.5
Nonresearch Areas	12.0	11.3	10.2	14.0	14.3
Entire Laboratory	9.4	8.2	7.8	9.2	10.1

Highest Academic Degrees Held by Permanent Employees  
(As of January 1, 1978)

Bachelors	578
Masters	369
Doctorates	571



# Fiscal Information

## NRL FUNDING BY MAJOR SPONSOR

Sponsor	FY 1977		FY 1978	
	Actual Millions of Dollars	Percent	Budget Millions of Dollars	Percent
R&D Program				
ONR	42.1	23.4	62.3	31.5
CNM	12.0	6.7	16.8	8.5
ELEX	37.6	20.9	53.5	27.0
AIR	9.0	5.0	9.5	4.8
SEA	13.6	7.5	11.6	5.9
Other Navy	<u>40.8</u>	<u>22.7</u>	<u>17.8</u>	<u>9.0</u>
Total Navy	<u>155.1</u>	<u>86.2</u>	<u>171.5</u>	<u>86.7</u>
Other DOD	10.2	5.7	13.0	6.6
Non-DOD	<u>10.0</u>	<u>5.5</u>	<u>9.6</u>	<u>4.8</u>
Total R&D Program	<u>175.3</u>	<u>97.4</u>	<u>194.1</u>	<u>98.1</u>
Non-R&D Program	2.8	1.6	2.3	1.2
Capital Improvement	1.8	1.0	1.4	0.7
Total Funds	<u>179.9</u>	<u>100.0</u>	<u>197.8</u>	<u>100.0</u>

## BUDGET BY COST ELEMENT (Millions of Dollars)

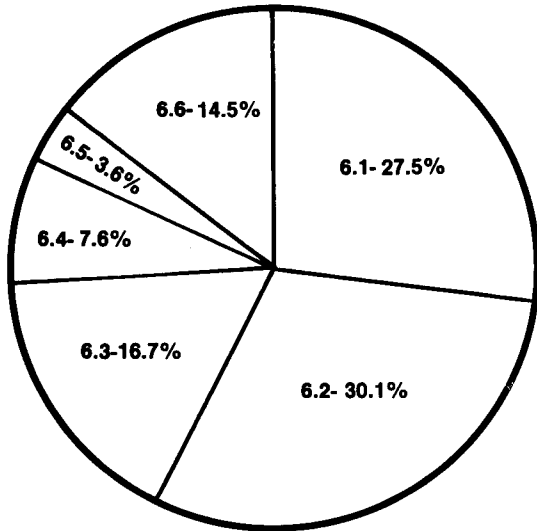
Purpose	FY 1977	FY 1978
Materials, supplies	17.4	17.4
Salaries and wages	88.2	93.3
Contractual services	63.7	70.4
Other costs	<u>10.6</u>	<u>16.7</u>
TOTAL	<u>179.9</u>	<u>197.8</u>

## CAPITAL PROPERTY

Type or Class	Value as of 30 September 1977 (\$K)
Class 1 (Land)	353
Class 2 (Buildings and improvements)	88,546
Class 3 (Equipment over 1.0K)	25,688
Class 4 (Industrial production equipment)	19,021
TOTAL CAPITAL PROPERTY	<u>133,608</u>



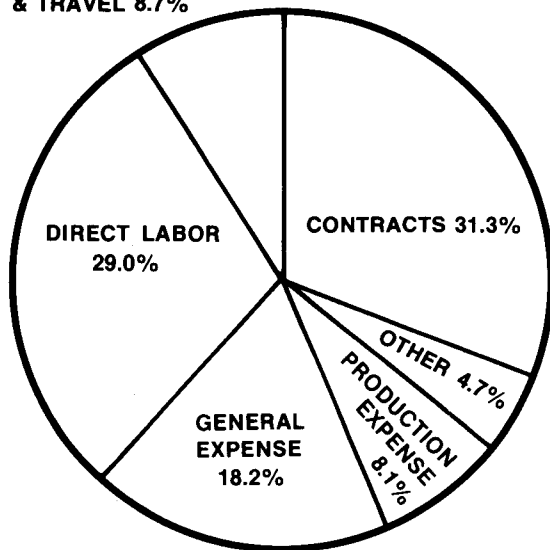
**RDT&E,N FUNDS BY CATEGORY  
PLANNED OBLIGATIONS FY-1978**



	(MILLIONS)
6.1 RESEARCH	\$ 43.2
6.2 EXPLORATORY DEVELOPMENT	47.3
6.3 ADVANCED DEVELOPMENT	26.2
6.4 ENGINEERING DEVELOPMENT	11.9
6.5 MANAGEMENT & SUPPORT	5.6
6.6 OPERATIONAL SYSTEMS DEVEL.	22.8
<b>TOTAL</b>	<b>\$157.0</b>

**DISTRIBUTION OF R&D OBLIGATIONS  
FY-1978 PLAN**

DIRECT MATERIAL  
& TRAVEL 8.7%

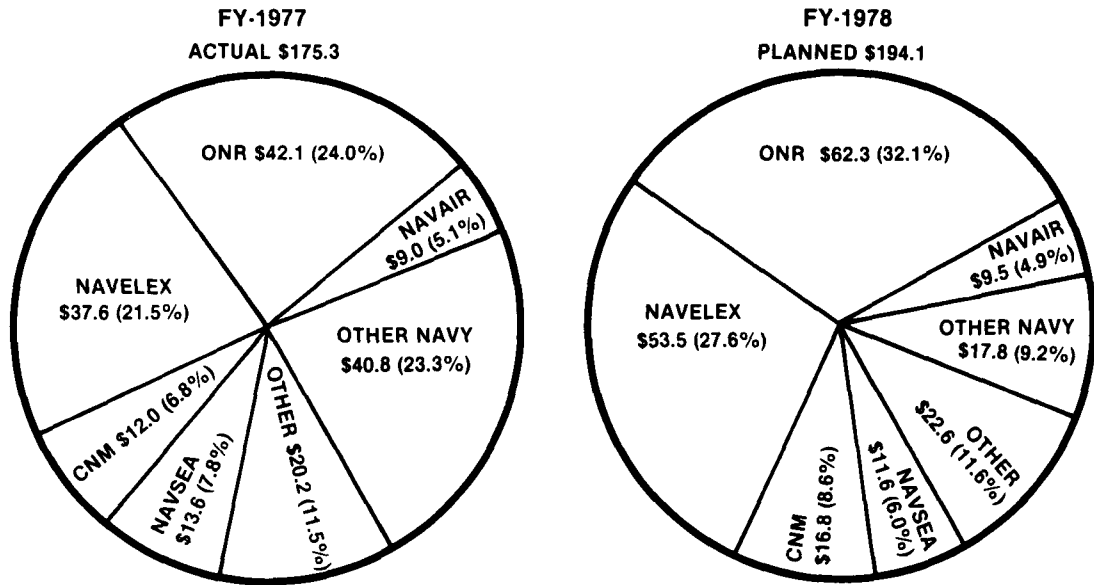


	(MILLIONS)
DIRECT LABOR	\$ 56.2
DIRECT MATERIAL & TRAVEL	\$ 16.9
CONTRACTS	\$ 60.8
OTHER	\$ 9.1
APPLIED OVERHEAD:	
PRODUCTION EXPENSE	\$ 15.7
GENERAL EXPENSE	\$ 35.4
<b>TOTAL</b>	<b>\$194.1</b>



## SOURCES OF R&D FUNDS

(IN MILLIONS)



ONR - OFFICE OF NAVAL RESEARCH  
 NAVELEX - NAVAL ELECTRONIC SYSTEMS COMMAND  
 NAVSEAS - NAVAL SEA SYSTEMS COMMAND  
 CNM - CHIEF OF NAVAL MATERIAL  
 NAVAIR - NAVAL AIR SYSTEMS COMMAND

## R&D PROGRAM FUNDS BY TYPE

(IN MILLIONS)

TYPE OR PURPOSE OF FUNDS	FY 1977		FY 1978	
	ACTUAL	PERCENT	PLANNED	PERCENT
<b>RDT&amp;E,N</b>				
6.1 RESEARCH	\$ 37.4	21.3	\$ 43.2	22.3%
6.2 EXPLORATORY DEVELOPMENT	36.3	20.7	47.3	24.4
6.3 ADVANCED DEVELOPMENT	23.9	13.6	26.2	13.5
6.4 ENGINEERING DEVELOPMENT	10.2	5.8	11.9	6.1
6.5 MANAGEMENT & SUPPORT	5.2	3.0	5.6	2.9
6.6 OPERATIONAL SYSTEMS DEVEL.	4.9	2.8	22.8	11.7
<b>SUBTOTAL</b>	<b>\$117.9</b>	<b>67.2</b>	<b>\$157.0</b>	<b>80.9</b>
OPN	1.5	0.9	1.9	1.0
O&MN	33.0	18.8	8.2	4.2
OTHER	22.9	13.1	27.0	13.9
<b>TOTAL</b>	<b>\$175.3</b>	<b>100.0</b>	<b>\$194.1</b>	<b>100.0</b>



## NRL Sites and Facilities

Station and Location	Acreage			Value	Buildings and Structures
	Fee Title	Easement or Purchase	Permit or Lease		
<u>District of Columbia</u>					
Naval Research Laboratory	129.23		1.29	\$70,290,310	158
Cyclotron Building Site Bolling AFB			5.24	3,883,846	1
<u>Virginia</u>					
Radio Research Site, Coast Guard Radio Station, Alex.			55.40		
Atmospheric Monitoring Facility, Big Meadows Util. Area, Shenandoah Nat'l Park			NA <sup>1</sup>		
<u>Maryland</u>					
NRL Flight Support Detachment, NAS Patuxent River			<sup>2</sup>		
<sup>3</sup> Chesapeake Bay Div. Chesapeake Beach	167.90			10,678,431	180
Multiple Research Site, Tilghman Is.	2.00			110,662	12
Dock Facility, Fishing Ck., Ches. Bay			0.60	18,533	5
Theodolite Station, North Beach			0.29	800	1
Optics Research Platform in Ches. Bay			0.23	1,500	2
Stabilized Platform, Ches. Bay				21,400	1
Foghorn Platform, Ches. Bay Bridge			NA		
Research Gondola, Ches. Bay Bridge			NA		
NRL Waldorf Annex, Waldorf	23.94	35.16		1,291,301	37
Radio Astronomy Observatory, Md. Pt.	24.30		197.88	265,988	13

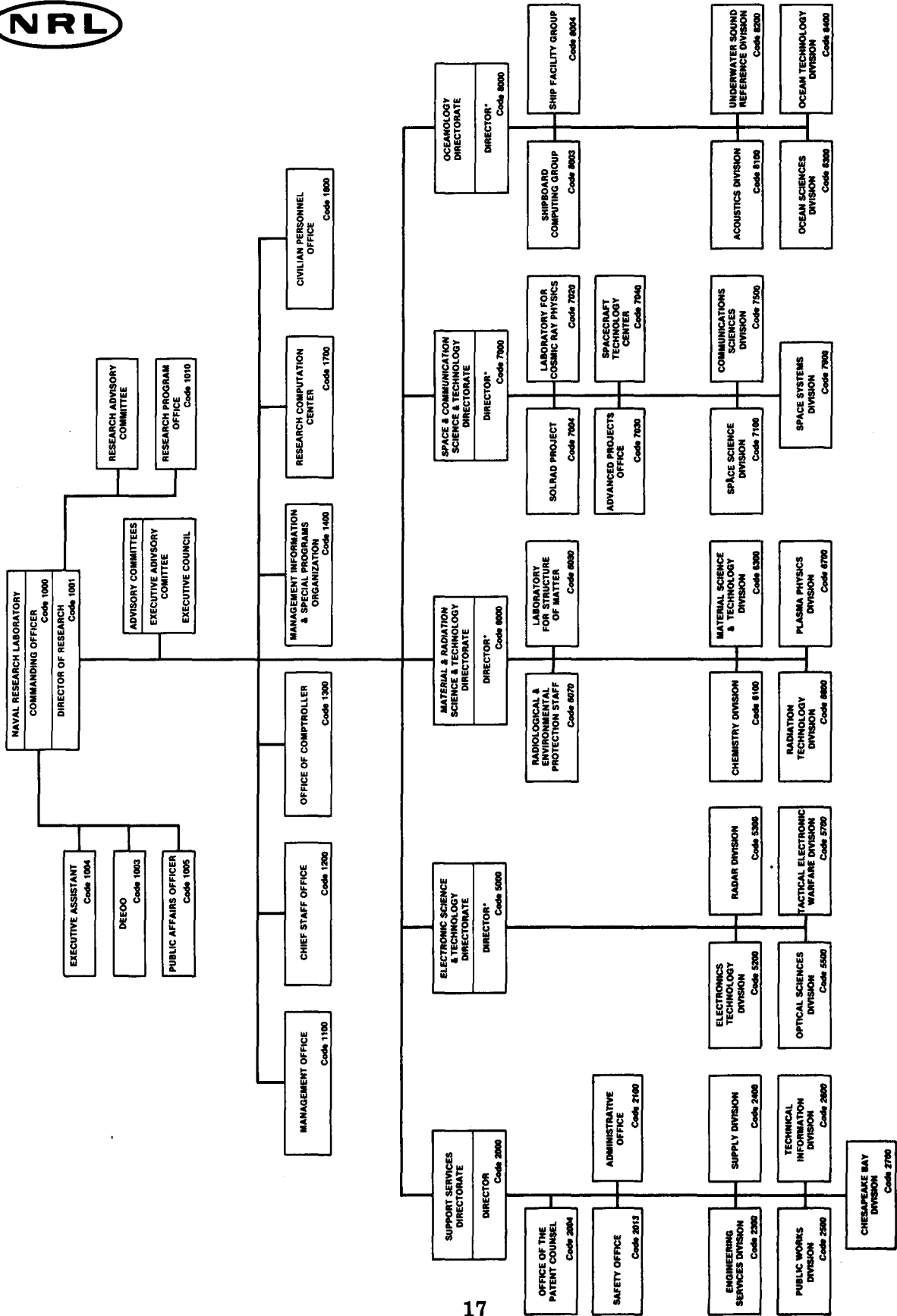


Station and Location	Acreage			Value	Buildings and Structures
	Fee Title	Easement or Purchase	Permit or Lease		
Radio Antenna Range, USAF Receiver Site, Brandywine			22.98		
Free Space Antenna Range, Pomonkey	14.12	28.40		811,818	13
Satellite Tracking Facility, Blossom Point			135.57		
<u>California</u>					
Naval Construction Bn., Port Hueneme					
NRL Field Site, Point Mugu					
Satellite Tracking Facility, Vandenberg AFB					
<u>Puerto Rico</u>					
Naval Station, Roosevelt Roads					
<u>Florida</u>					
<sup>1</sup> Underwater Sound Reference Div., Orlando	10.46			1,269,830	31
<sup>2</sup> USRD, Leesburg Facility, Bugg Spring			6.92	255,012	9
Marine Corrosion Lab., Key West					
Totals:	371.95	63.56	426.40	88,899,431	463

<sup>1</sup> NA (not applicable)--Indicates an insignificant area, frequently just a location for instruments.

<sup>2</sup> Site or equipment used by NRL under an intraservice (Navy) or inter-service agreement.

<sup>3</sup> Also included in list of "Major Facilities and Capabilities."



\*ASSOCIATE DIRECTOR OF RESEARCH

## Office of the Commanding Officer

The Commanding Officer of the Naval Research Laboratory is responsible for the overall management of the Laboratory; he exercises the usual functions of command including compliance with legal and regulatory requirements and liaison with other military activities, as well as general supervision of the timeliness and effectiveness of the technical work and of the support services. The mission of the Laboratory is carried out by the four science and technology directorates, supported by the Support Services Directorate. In addition, the Laboratory's operating staffs provide assistance in their special fields to the Commanding Officer and the Director of Research. The operating staffs are listed on the following pages.

## Commanding Officer Naval Research Laboratory



Captain L.M. Noel, USN

CAPTAIN L.M. NOEL [REDACTED] [REDACTED] [REDACTED] He attended Cornell University in Ithaca, New York, before entering the U.S. Naval Academy in 1945. He was graduated and commissioned an Ensign in June 1949.

CAPTAIN NOEL began graduate education in electronics at the U.S. Naval Postgraduate School at Monterey, California, but then shifted to an applied science program under ONR sponsorship at Princeton University, Princeton, N.J., where he received an M.A. Degree in mathematical statistics in 1956.

He has served in various shipboard assignments on carriers and minesweepers including duty in Korean waters during the Korean War. In 1958, CAPTAIN NOEL was designated for engineering duty and assigned to the Mare Island Naval Shipyard as Fleet Ballistic Missile (FBM) Project Officer in the construction of USS THEODORE ROOSEVELT (SSBN-600) and USS ANDREW JACKSON (SSBN-619). Additional assignments in the FBM program included: Design Project Officer for SSBN-616 and 640 Classes at Supervisor of Shipbuilding, Groton, Conn. (1961-1965), and Senior Special Projects Representative at Cammell-Laird's Shipyard, Birkenhead, England (1965-1968) in connection with installation and test of the POLARIS Weapon System on British FBM submarines HMS RENOWN (SSBN-02) and HMS REVENGE (SSBN-04).

In 1968, CAPTAIN NOEL reported to the Strategic Systems Project Office as Deputy Technical Director. In this capacity, he served during development and deployment of the POSEIDON Weapon System and development of the TRIDENT Weapon System.

CAPTAIN NOEL assumed command of the Naval Research Laboratory on 30 June 1976. He is a member of the Institute of Mathematical Statistics, Tau Beta Phi, and Eta Kappa Nu, and an associate member of Sigma Xi. For his work with the Fleet Ballistic Missile Program he was awarded the Meritorious Service Medal, and for the POSEIDON and TRIDENT Strategic Weapons Systems, The Legion of Merit.

CAPTAIN NOEL is married to the former Sally Gibson of Ithaca, N.Y. The Noels have four children, Lionel Jr., Dorothy, Andrew, and David, and reside in Falls Church, Va.

## The Director of Research

The Research Directorates are supervised by a civilian Director of Research who reports to the Commanding Officer of NRL. The Research Directorates consist of four organizational areas of research - Electronic Science and Technology, Material and Radiation Science and Technology, Space and Communication 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 15 divisions and a number of 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 are organized on either a project management or a special laboratory basis.

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 research planning and programming.

evaluating and accepting, modifying, or rejecting R&D proposals from NRL scientific divisions for NRL's ONR 6.1 research program; evaluating and accepting new problems from other sponsors; or as appropriate recommending to the Commanding Officer rejection of proposed new problems.

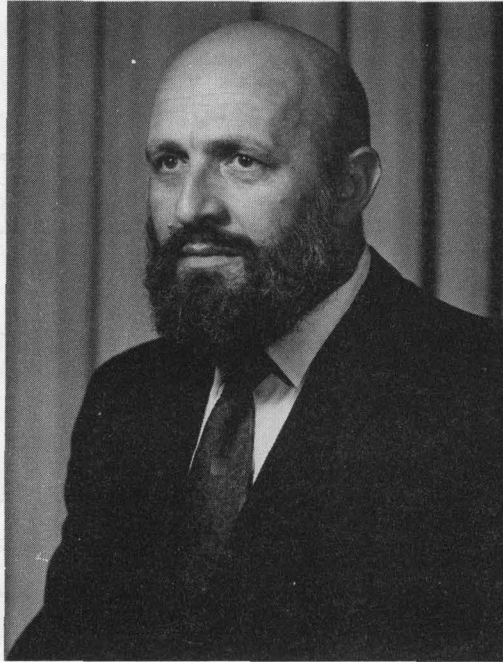
administration and the budgeting of funds for the Research Directorates.

hiring, promoting, and effecting other personnel actions for the Research Directorates.

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 research program 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.

The Director of Research works closely with the Commanding Officer to establish broad Laboratory goals and policies. In addition, he assists the Commanding Officer in resolving issues of resource and manpower allocations.

## Director of Research Naval Research Laboratory



Dr. Alan Berman

Dr. Berman [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.

In 1952 he began his professional career as 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. Dr. Berman became Director of Research for the Naval Research Laboratory in May 1967.

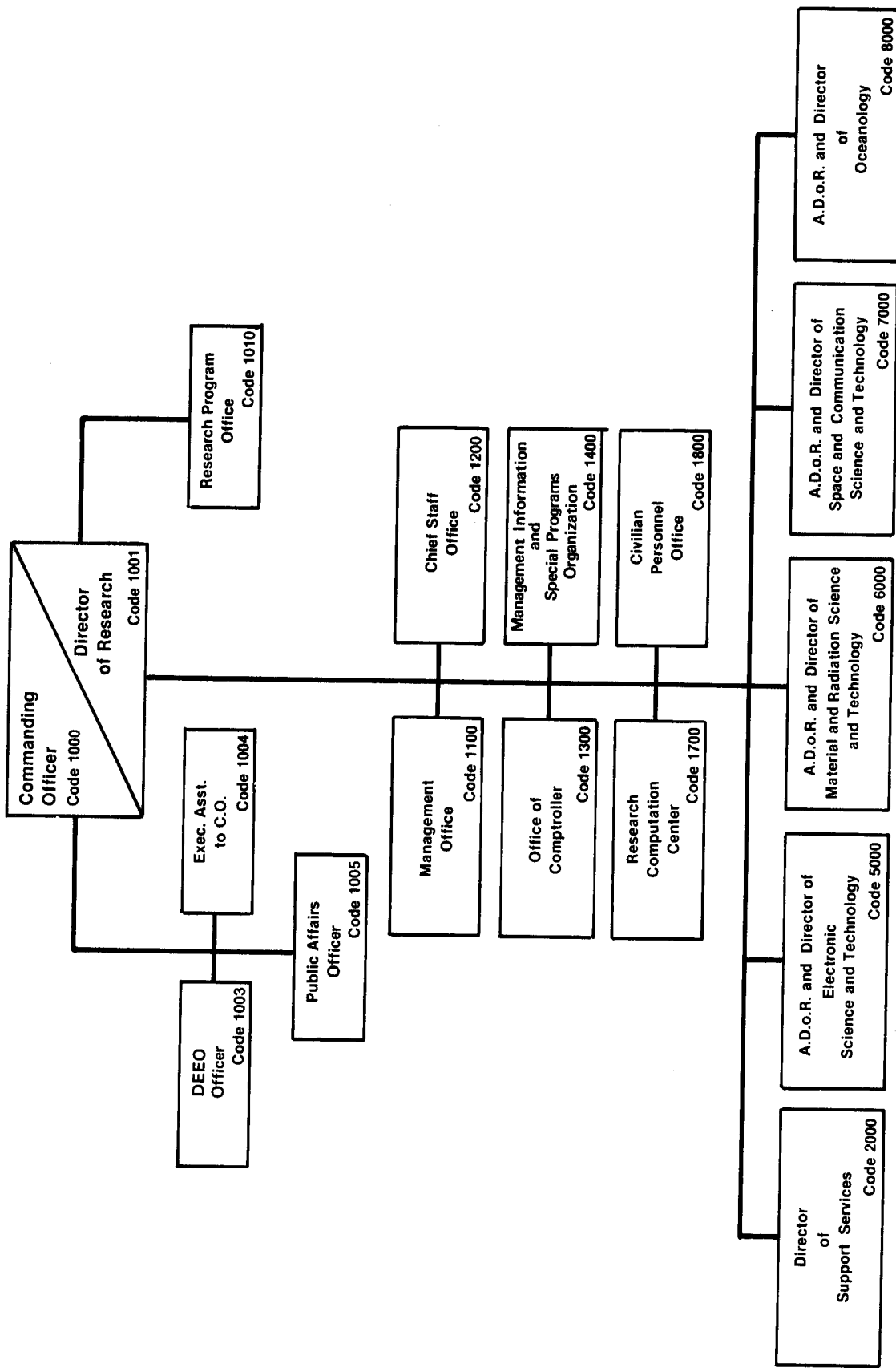
Dr. Berman's personal research specialties include the areas of underwater acoustics, oceanography, and signal processing. He has published numerous papers on these and related subjects and has served on many Navy and national-level advisory groups. In addition to providing consultative services for a number of Department of Defense and other Government agencies, he has led several interagency study groups and has served as a consultant to the National Security Council and the Office of Science and Technology Policy.

Dr. Berman has on three occasions served as a visiting scientist at the Admiralty Research Laboratory, Teddington, England (1955, 1957, 1960), and once at the SACLANT ASW Research Center, La Spezia, Italy (1960). He is a fellow of the American Physical Society and the Acoustical Society of America, and is a member of the American Institute of Physics and Sigma Xi.

In 1969 Dr. Berman was awarded the Department of the Navy Superior Civilian Service Award. In 1973 he received the Department of Defense Distinguished Civilian Service Award, and in 1977 he received a personal letter of commendation from the President for his services as a technical advisor to the National Security Council.

Dr. Berman and his wife Charlotte live in Alexandria, Virginia. They have three daughters and two sons.

# Commanding Officer/Director of Research



### Key Personnel

<u>Name</u>	<u>Title</u>	<u>Code</u>
CAPT L.M. Noel, USN	Commanding Officer	1000
Dr. A. Berman	Director of Research	1001
Mr. W.H. Webster	Dep. Eq. Empl. Op. Officer	1003
Mr. S.L. Cohen	Executive Assistant	1004
Mr. J.E. Sullivan	Public Affairs Officer	1005
Mr. A.J. Hollings	Head, Research Program Office	1010
Mr. A.M. Toscano	Director, Management Office	1100
CAPT E.L. Ebbert, USN	Chief Staff Officer	1200
Mr. P.F. Kennedy	Comptroller	1300
Mr. R.E. Ellis	Head, Management Information and Special Programs Organization	1400
Mr. A.B. Bligh	Head, Research Computation Center	1700
Mr. F.D. Wallace	Director of Civilian Personnel	1800
CAPT K.P. Hughes, USN	Director of Support Services	2000
Dr. H.Q. North	Associate Director of Research and Director of Electronic Science and Technology	5000
Dr. A.J. Schindler	Associate Director of Research and Director of Material and Radiation Science and Technology	6000
Dr. H. Rabin	Associate Director of Research and Director of Space and Communication Science and Technology	7000
Mr. R.R. Rojas	Associate Director of Research and Director of Oceanology	8000

## EXECUTIVE ASSISTANT



Mr. S. L. Cohen

### Basic Responsibilities

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

## DEPUTY EQUAL EMPLOYMENT OPPORTUNITY OFFICER



Mr. W. H. Webster

### Basic Responsibilities

The Deputy Equal Employment Opportunity Officer serves as an advisor to the Commanding Officer 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. This is accomplished with the assistance of the Federal Women's Program Coordinator, Patricia Ioki.

## PUBLIC AFFAIRS OFFICER



Mr. J. E. Sullivan

### Basic Responsibilities

The Public Affairs Officer advises the Commanding Officer and staff on all public affairs matters including external and internal relations; serves as the Commanding Officer's principal assistant in public affairs matters; supervises the Laboratory's public affairs programs, and serves as the focal point for Laboratory implementation of the Freedom of Information Act.

# RESEARCH PROGRAM OFFICE

## Basic Responsibilities

The Research Program Office serves as staff to the research directorates 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 Defense 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 directorates, 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.C. Spragg	Deputy Head, Research Program Office, and Head, Management Information Center Section
Mr. R. Donley	Head, Program Plans and Administration Section
Mr. N. Moglen	ADP Assistant



Mr. A. J. Hollings

## Civilian Personnel

Full-Time Permanent: 11

# Management Office

## Basic Responsibilities

The Management Office provides to the Commanding Officer, Director of Research, Director of Support Services, and all other managers, analysis and advice on concepts, systems, procedures, and techniques that improve the way broad management functions are carried out at the Laboratory. The Office is further responsible for (1) interpreting directives from higher authorities and preparing documentation or recommending appropriate action for responses, (2) ensuring that Laboratory directives are consistent with the policies of NRL and higher authorities, and that they are written to convey the meanings intended, (3) conducting programs such as Cost Reduction, Position Management, and Commercial/Industrial Activities, (4) providing Congressional and OMB liaison, (5) conducting in-house surveys, (6) coordinating and maintaining logistic support agreements, (7) coordinating inspections and audits of NRL by outside groups, and (8) providing organizational analyses/recommendations.

## Key Personnel

<u>Name</u>	<u>Title</u>
Mr. A.M. Toscano	Director, Management Office



Mr. A. M. Toscano

## Civilian Personnel

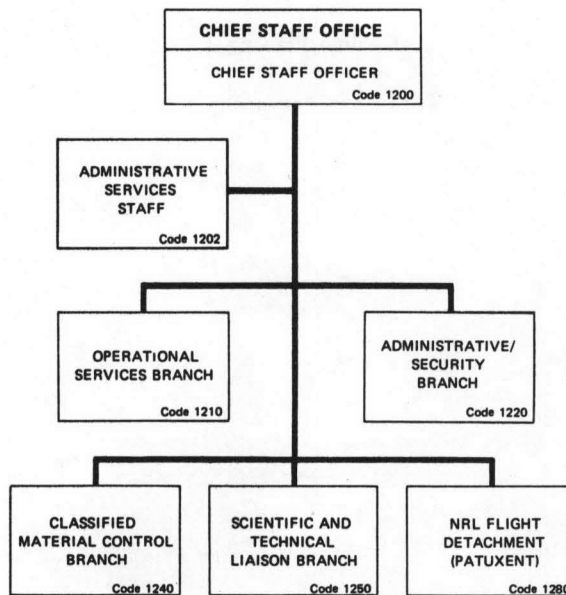
Full-Time Permanent: 9



CAPT E. L. Ebbert, USN

## Chief Staff Office

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



### **Basic Responsibilities**

The Chief Staff Officer provides a military staff to the Commanding Officer and to the Director of Research, Naval Research Laboratory, for the purpose of assisting them 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 multiengine Laboratory aircraft and obtains and coordinates such additional air, surface, and subsurface services as are required. The Chief Staff Office is also responsible for personnel and plant security, communications, and control of classified material.

### **Key Personnel**

<u>Name</u>	<u>Title</u>
CAPT E.L. Ebbert, USN	Chief Staff Officer
Mr. J.R. Gallagher	Administrative Officer
LT R.S. Cross, USN	Communications/Military Personnel Officer
CDR W.A. Janes, USN	Operational Services Officer
CDR C.L. Hanson, USN	Administrative/Security Officer
Mr. W.C. Bryan	Head, Special Activities Office
Mr. R.E. Abercrombie	Head, Security Section
Mr. G.L. Berkin	Classified Material Control Officer
CAPT R.N. Featherston, USN	Scientific and Technical Liaison Officer
CDR R.F. Carlson, USN	OIC, NRL Flight Detachment (Patuxent)

### **Civilian Personnel**

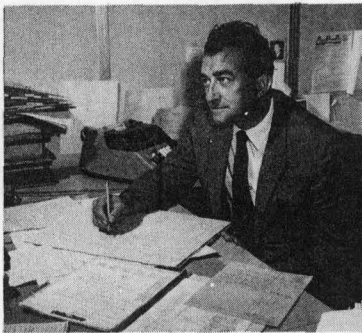
Full-Time Permanent: 80

Military: 81



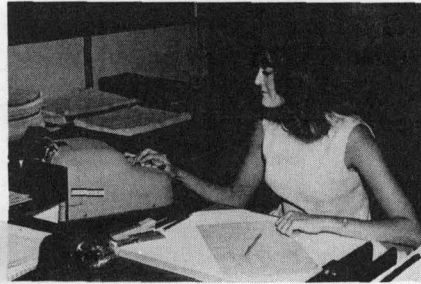
Mr. P. F. Kennedy

# Office of the Comptroller



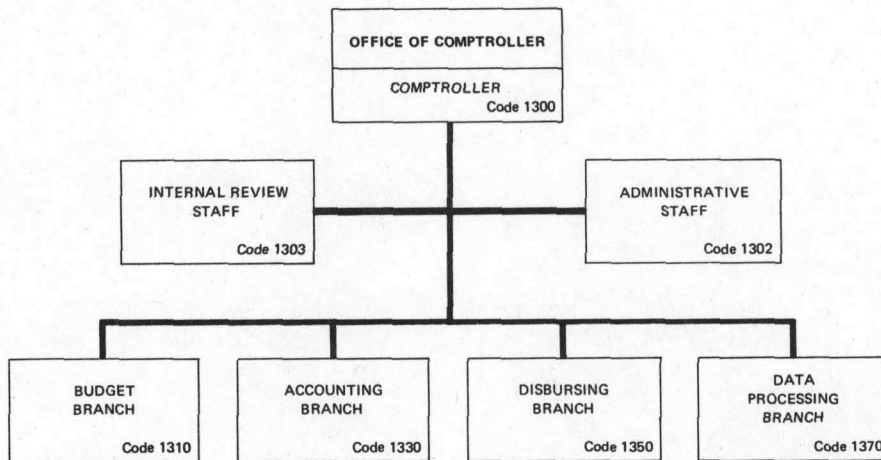
INTERNAL REVIEW

BUDGET OFFICE



COMPUTER

- BUDGET
- ACCOUNTING
- DISBURSING
- DATA PROCESSING



### **Basic Responsibilities**

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

### **Key Personnel**

<u>Name</u>	<u>Title</u>
Mr. P.F. Kennedy	Comptroller
Mrs. L.M. Boehlert	Administrative Officer
Mr. R.A. Showman	Head, Internal Review Staff
Mr. D.M. Johnson	Budget Officer
Mr. E.S. York	Accounting Officer
Mr. A.E. Thomas	Disbursing Officer
Mr. R.L. Guest	Data Processing Officer

### **Civilian Personnel**

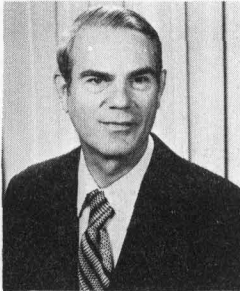
Full-Time Permanent: 85

# Management Information and Special Programs Organization

## Basic Responsibilities

The Management Information and Special Programs Organization (MISPO) provides staff support to the Commanding Officer and the Director of Research. This staff support covers a wide spectrum of management information areas for which data are collected, analyzed, and presented as an aid in formulating management decisions. The data considered for analysis involve budget, personnel, supply, facilities, equipment, programs, and resources.

In addition, the MISPO is responsible for the control and management of the Management Information System data base. Another area of support is providing for the management of projects or programs that do not logically fit into any division area of responsibility or require the combined efforts of two or more divisions.



Mr. R.E. Ellis

## Key Personnel

<u>Name</u>	<u>Title</u>
Mr. R.E. Ellis	Head, Management Information and Special Programs Organization
Dr. A.H. Aitken	Associate Head, Management Information and Special Programs Organization
Mrs. B.A. Maag	Administrative Officer
Dr. P.B. Richards	Fleet Medical Support Project Staff
Mr. E.L. Brancato	Consultant Staff
Dr. S. Teitler	Program and Resource Analysis Office
Dr. A.H. Aitken	Special Projects Management Office
Dr. J.M. MacCallum	EOTPO Head
Mr. P.C. Buck	Facilities and Equipment Control Office
Mr. R.E. Ellis	Management Information Systems Office
Mr. C.L. Tipton	Head, Special Applications Branch
Mrs. E.E. Wald	Head, Software Systems Development Branch

## Civilian Personnel

Full-Time Permanent: 43

## Total Estimated R&D Funding

Fiscal Year 1978: \$3,400,000

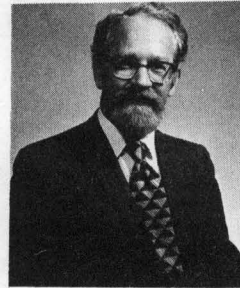
# Research Computation Center

## Basic Responsibilities

The Research Computation Center (RCC) provides for the operation and maintenance of the Laboratory's central computer facilities for the benefit of all divisions of the Laboratory; develops and maintains equipment for data collection purposes and for converting field-collected data to a form suitable for efficient processing; provides system software support services for its computers; and provides a variety of user support and applications programming services. The RCC also provides appropriate ADP technical logistic support services for NRL; identifies ADP requirements and secures and administers contractual ADP support services; and supports the NRL Computation Committee and the Navy Laboratories Computing Committee. The Head of the RCC provides the principal support to the Director of Research in ADP management and planning and is, by additional duty assignment, the ONR Special Assistant for ADP Coordination.

## Key Personnel

<u>Name</u>	<u>Title</u>
Mr. A.B. Bligh	Head, Research Computation Center
Ms. D.E. Gossett	Deputy Head
Ms. J.C. McCullough	Administrative Officer
Mr. J.B. Smith	External Relations Staff
Mr. E.L. Aiken	Timesharing Comp Group
Mr. I.J. Levy	Head, Operations and Engineering Branch
Mr. G.J. Flenner	Head, Software Systems and Support Branch



Mr. A. B. Bligh

## Civilian Personnel

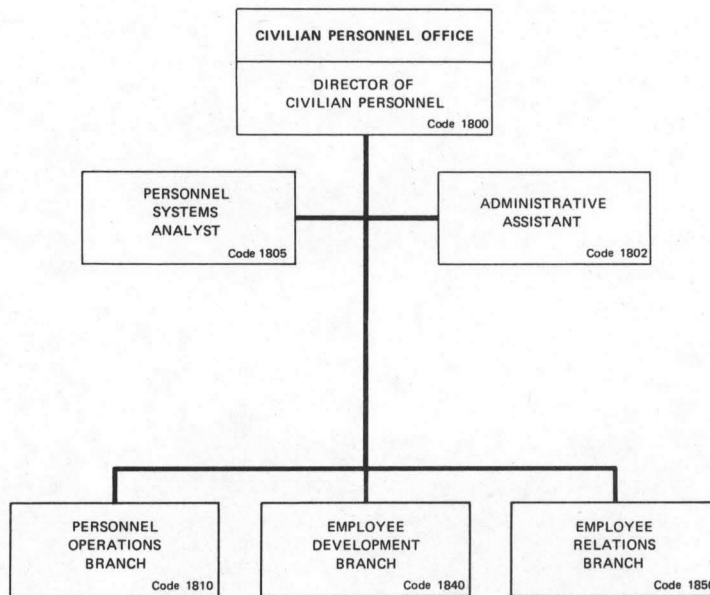
Full-Time Permanent: 50



Mr. F. D. Wallace

# Civilian Personnel Office

- PERSONNEL OPERATIONS
- 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
Mrs. J. Gandy	Administrative Assistant
Mr. A.F. Osborne	Personnel Systems Analyst
Mr. D.J. Blome	Head, Personnel Operations Branch
Dr. O.J. Doty	Head, Employee Development Branch
Mr. F. Carter	Head, Employee Relations Branch

### **Civilian Personnel**

Full-Time Permanent: 42

# The Support Services Directorate

The Director of Support Services is a Navy Captain with appropriate training and experience; he reports to the Commanding Officer and the Director of Research 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 Directorates. (Usually, he is the next senior officer to the Commanding Officer and assumes the responsibilities of and acts for the Commanding Officer 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, Administrative Office, and Chesapeake Bay) and also his staff functions (Safety Office and Patent Counsel) so that services rendered are adequate, prompt, accurate, and economical in the use of personnel and money.

exercising, for the Commanding Officer and the Director of Research of NRL, approval authority for the NRL directives system, assuring that interests of all concerned components are taken into account, that staff work is complete, and that implementation is in a manner appropriate to the research environment.

being familiar with the scientific program and 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 Commanding Officer and the Director of Research of NRL in maintaining overall short- and long-range organization plans for the support areas to best serve and advance the research mission. Advising on and participating in allocation of resources to meet support services mission and support research.

keeping the Commanding Officer and the Director of Research of NRL advised of matters requiring their attention, decision, or other action; acting for them in the approval of routine matters; assisting them generally with administrative detail, correspondence, reports, and similar matters.

issuing NRL directives and procedures for the Commanding Officer and the Director of Research.

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 the organizations and personnel of the Research Directorates; 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 of the Support Services Directorate.

## Director of Support Services

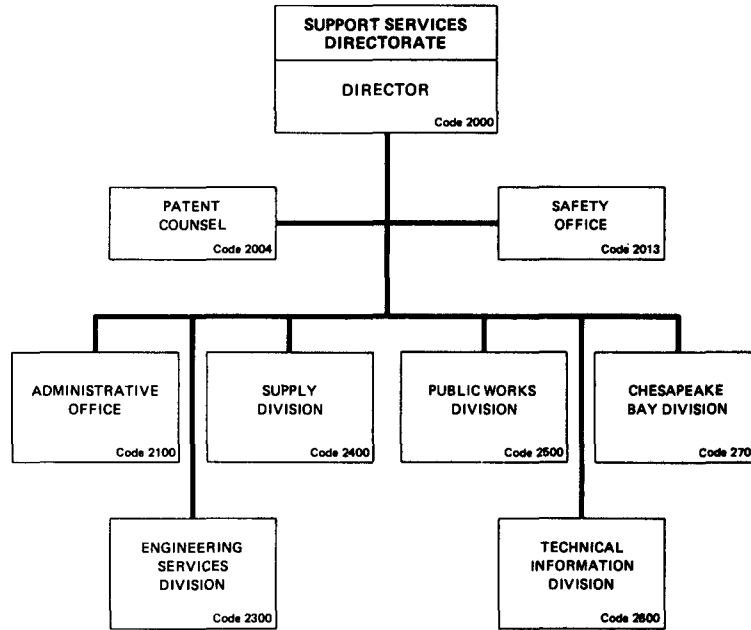


Captain Kenneth P. Hughes

CAPTAIN KENNETH P. HUGHES, [REDACTED] is a 1953 graduate of the U.S. Naval Academy. He was also graduated from the U.S. Naval Postgraduate School, Ordnance Engineering Curriculum. In addition, he is a graduate of the Industrial College of the Armed Forces, Class of 1976.

CAPTAIN HUGHES served successive tours on the USS O'HARE (DDR-889), USS DONNER (LSD-20), and as Aide and Flag Lieutenant to Commander Amphibious Group Four. After Postgraduate School he served as Commanding Officer, USS LUISENO (AFT-156), and as Executive Officer on the USS STEINAKER (DD-863). His other assignments included a tour with the Undersea Directorate, Naval Ordnance Systems Command; as Commander, Task Group 115.3; as Senior Advisor, Third Coastal Zone, Vung Tau, Vietnam; and as Assistant to Commander, Anti-Submarine Warfare Projects for Test and Evaluation. CAPTAIN HUGHES was designated for Ordnance Engineering Duty in 1970 and for Engineering Duty in 1974. He assumed the position of Director of Support Services at NRL on 21 June 1976.

CAPTAIN HUGHES is married to the former Peggy J. Seawell of Norfolk, Virginia; they have one daughter.



### Key Personnel

<u>Name</u>	<u>Title</u>	<u>Code</u>
CAPT K.P. Hughes, USN	Director of Support Services	2000
Dr. P. Schneider	Patent Counsel	2004
Mr. H.C. Kennedy, Jr.	Safety Officer	2013
Mr. J. Cooper	Head, Administrative Office	2100
CDR A.P. Amesse, USN	Engineering Services Officer	2300
CDR R.W. Gunther, SC, USN	Supply Officer	2400
CDR V. Podbielski, CEC, USN	Public Works Officer	2500
Mr. E.E. Kirkbride	Head, Technical Information Division	2600
CDR B.A. Bauer, USN	Chesapeake Bay Division Officer	2700

## OFFICE OF PATENT COUNSEL

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, claims of patent or copyright infringement involving NRL, and the provisions in interagency agreements relating to inventions, patents, trademarks, copyrights, and related matters. Assistance is provided the Research Directorates through state-of-the-art searches in the patent literature pertinent to particular research problems.

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. P. Schneider	Patent Counsel



Dr. P. Schneider

### Civilian Personnel

Full-Time Permanent: 8

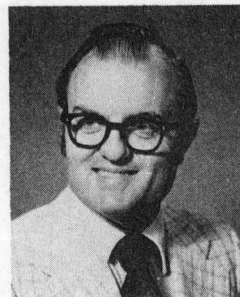
## SAFETY OFFICE

### Basic Responsibilities

The Safety Office administers the Laboratory's safety and health program except in the fields of microwave and radiological safety. Its responsibilities include inspection, training, and education. It also conducts accident investigations, prepares directives, provides accident prevention information, directs the activities of Safety Representatives and Committees, reviews hazardous experiments, and guides management in matters of safety. Other activities include JAG investigations and waste-chemical disposal.

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. H.C. Kennedy, Jr.	Head, Safety Office



Mr. H. C. Kennedy, Jr.

### Civilian Personnel

Full-Time Permanent: 4



# Administrative Office

## Basic Responsibilities

The Administrative Office provides staff support to administrative officials of the Laboratory in the areas of Travel Management, Records and Correspondence Management, Files Management, Mail and Messenger service, Forms Management, Design and Analysis, Report Management Analysis and Control, and Directives Management for all components of the Laboratory. The office also provides for the NRL Code Directory control, the administration of the Laboratory parking facilities, and management of the Administrative Paperwork Reduction Program. In addition, the office conducts direct routine administrative correspondence with other units of the Navy, DOD, and other governmental and civilian agencies.

## Key Personnel

<u>Name</u>	<u>Title</u>
Mr. J. Cooper	Head, Administrative Office
Mrs. C. Schmitt	Administrative Officer
Mrs. T.R. Fitch	Head, Travel Branch
Mrs. L.V. Dabney	Head, Records and Correspondence Management Branch
Mr. O.L. Scott	Head, Mail and Messenger Branch



Mr. J. Cooper

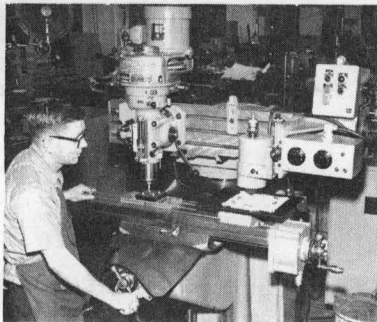
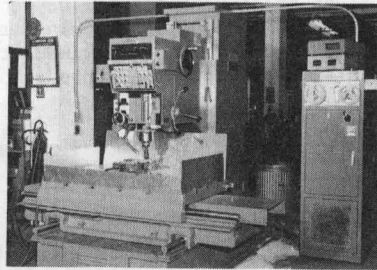
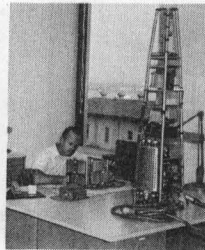
## Civilian Personnel

Full-Time Permanent: 43

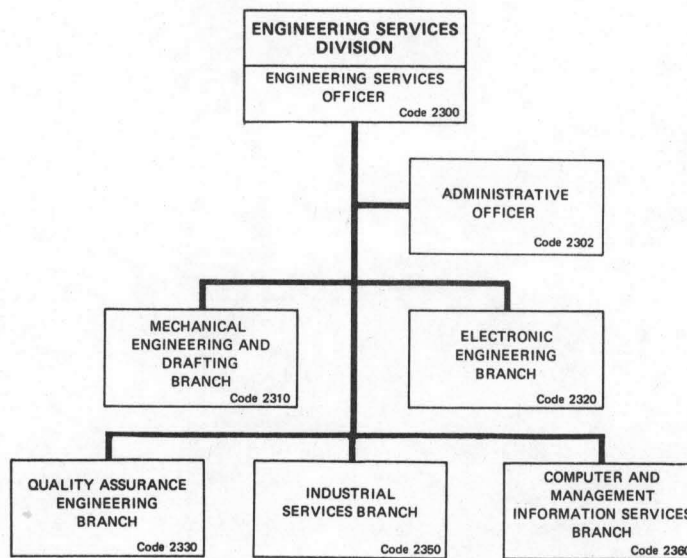


CDR A. P. Amesse, USN

# Engineering Services Division



- MECHANICAL ENGINEERING AND DRAFTING
- ELECTRONIC ENGINEERING
- QUALITY ASSURANCE ENGINEERING
- INDUSTRIAL SERVICES
- COMPUTER AND MANAGEMENT INFORMATION 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 A.P. Amesse, USN	Engineering Services Officer
Mrs. A. Cox	Administrative Officer
Mr. M.A. Shimkus	Head, Mechanical Engineering and Drafting Branch
Mr. J.J. Brotzman	Head, Electronic Engineering Branch
Mr. S.G. Carr*	Head, Quality Assurance Engineering Branch
Mr. J.L. Leizear	Head, Industrial Services Branch
Mr. L.G. Murphy	Head, Computer and Management Information Services Branch

### Civilian Personnel

Full-Time Permanent: 274  
Military: 1

\*Acting

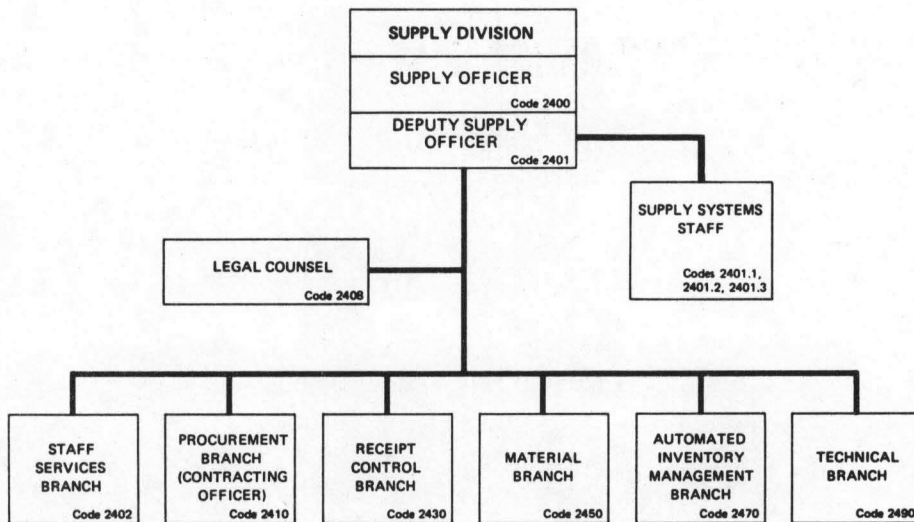
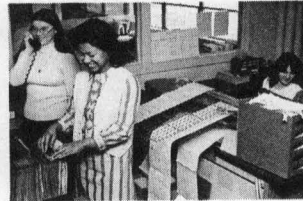


CDR R. W. Gunther, USN

# Supply Division



- STAFF SERVICES
- AUTOMATED INVENTORY MGT. SYSTEM
- PROCUREMENT
- RECEIPT CONTROL
- MATERIAL
- TECHNICAL



### Basic Responsibilities

The Supply Division provides service functions to the Laboratory and its field activities, including the operation of Supply issue stores; procurement of equipment, material, and contractual services; receipt, inspection, and delivery of material and 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 Directorates, in the development of specifications for a complete procurement package; consultation as needed in the handling of claims against the Laboratory, guidance in the performance stages of contractual services, and material transportation services.

During FY 1977 the Supply Division occupied 14,924 m<sup>2</sup> (160,641 sq. ft.) of building space; its stores (six retail and one bulk warehouse) inventory averaged \$1,771,705; stores issues totalled \$2,350,000; and the Procurement Branch processed 51,350 procurement documents totaling \$57,900,000 on the open market with an additional 6950 documents totaling \$52,000,000 to other Government organizations for a grand total of 58,300 documents totaling \$107,400,000.

### Key Personnel

<u>Name</u>	<u>Title</u>
CDR R.W. Gunther, SC, USN	Supply Officer
Mr. R.S. Sylvest	Deputy Supply Officer
Atty. A.S. Horton	Legal Counsel
Mr. A.W. Medley, Sr.	Head, Staff Services Branch
Mr. J.K. Walmer	Head, Automated Inventory Management Branch
LCDR J.E. Culver, USN	Head, Procurement Branch
Mrs. V.S. Thomas	Head, Receipt Control Branch
Mr. H.D. Thompson	Head, Material Branch
Mr. A.E. Dean	Head, Technical Branch

### Civilian Personnel

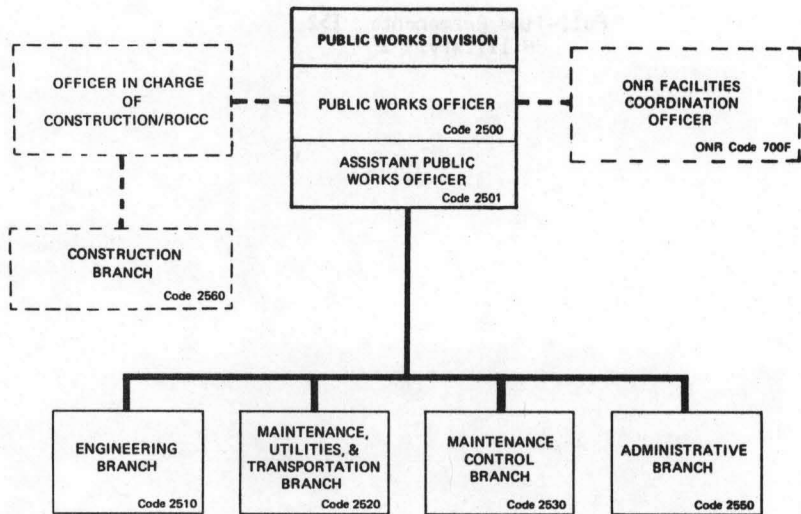
Full-Time Permanent: 152  
Military: 2



# Public Works Division

CDR Victor Podbielski, CEC, USN

- ENGINEERING
- MAINTENANCE, UTILITIES, AND TRANSPORTATION
- MAINTENANCE CONTROL
- ADMINISTRATION
- CONSTRUCTION



### Basic Responsibilities

The Public Works Division is responsible for the physical plant of NRL. This includes: (a) responsibility for the design, construction, maintenance, and repair of public works and utilities; (b) responsibility for the operation of these public works and utilities in accordance with the technical standards of the Naval Facilities Engineering Command; and (c) supporting the scientific program of the Laboratory by the construction, repair, and alteration of experimental and test equipment. In addition, the Division obtains required approvals for work for which the Division is responsible from the Chesapeake Division of the Naval Facilities Engineering Command; the Office of Naval Research; the Secretary of the Navy; and other authorities as appropriate.

The Public Works Division also supports the Office of Naval Research for Facilities Coordination and supports the Officer in Charge of Construction/Resident Officer in Charge of Construction on all Naval Facilities Engineering Command and certain research and development contracts at NRL.

### Key Personnel

<u>Name</u>	<u>Title</u>
CDR V. Podbielski, CEC, USN	Public Works Officer/Officer in Charge of Construction/ROICC/ONR Facilities Coordination Officer
LT. R.A. Elliot, USN	Assistant Public Works Officer
Mr. J.R. Lescault	Head, Administrative Branch
Mr. J.E. Browne*	Head, Engineering Branch
Mr. L.P. Carpenter	Head, Maintenance, Utilities, & Transportation Branch
Mr. R.O. Weidman	Head, Maintenance Control Branch
Mr. J.B. Canha	Head, Construction Branch

### Civilian Personnel

Full-Time Permanent: 374  
Military: 2

\*Acting

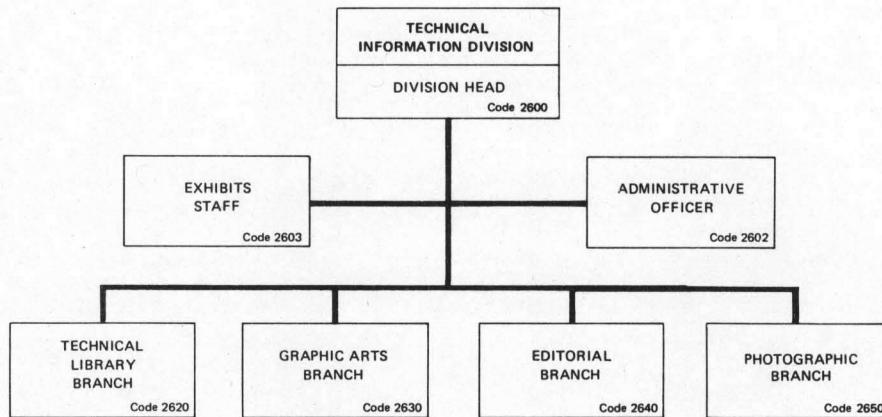
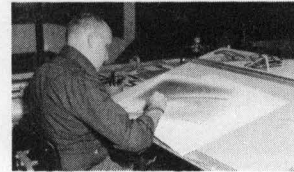
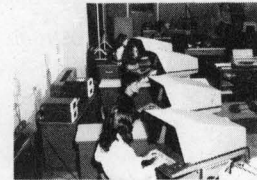


Mr. E. E. Kirkbride

# Technical Information Division



- EDITORIAL
- LIBRARY
- GRAPHIC ARTS
- PHOTOGRAPHIC



### **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, and exhibits. It provides centralized professional services to both NRL and ONR in writing, editing, printing, exhibits, photography, graphic arts, documentation, and language translations. It operates one of the Navy's largest integrated technical libraries with holdings of 202,000 bound volumes and 400,000 technical reports.

#### **Key Personnel**

<u>Name</u>	<u>Title</u>
Mr. E.E. Kirkbride	Head, Technical Information Division
Mrs. D.E. Cameron	Administrative Officer
Mr. H. Poole	Head, Exhibits Staff
Mrs. D.P. Baster	Head, Technical Library Branch
Mr. D. Darr	Head, Graphic Arts Branch
Mr. S.R. Smith	Head, Editorial Branch
Mr. J. Otto	Head, Photographic Branch

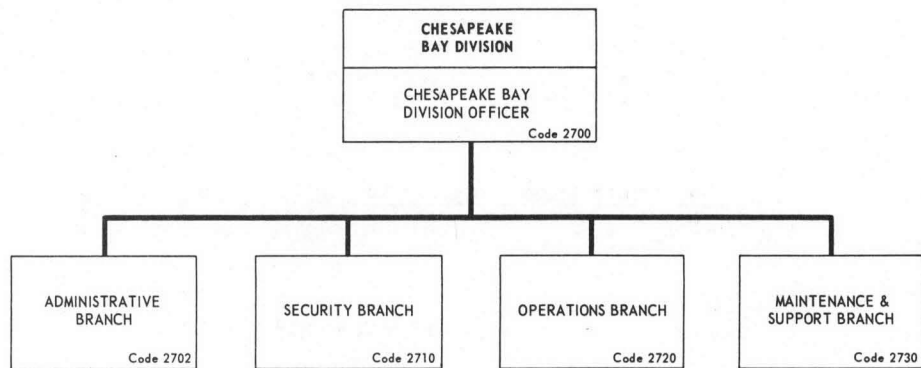
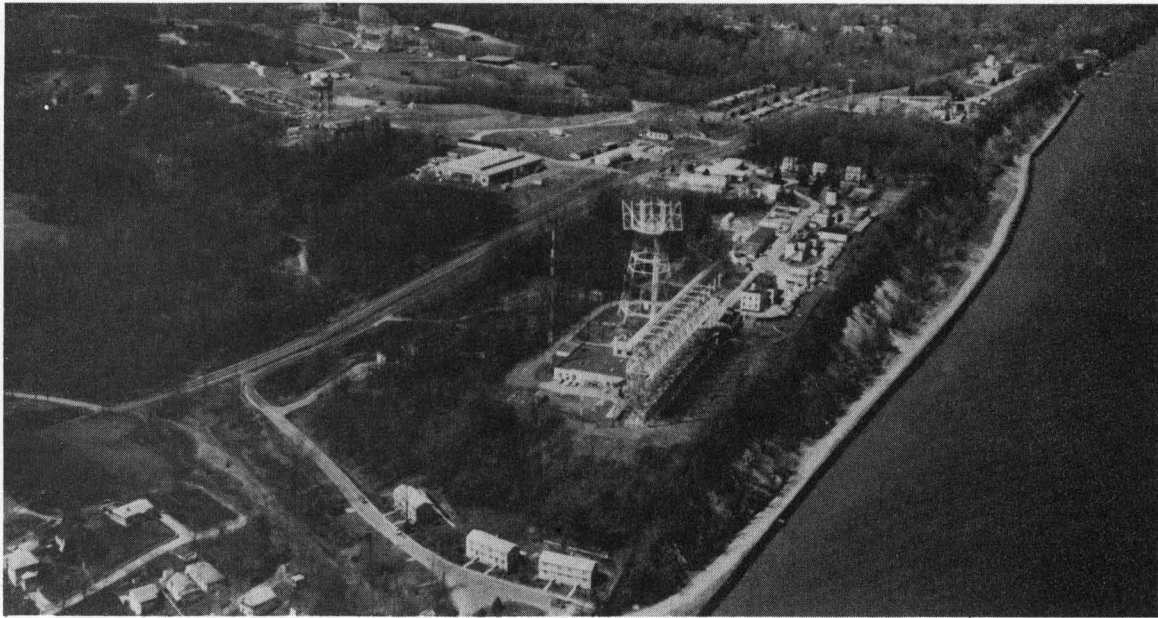
#### **Civilian Personnel**

Full-Time Permanent: 128



# Chesapeake Bay Division

CDR Bruce Bauer, USN



## Basic Responsibilities

The Chesapeake Bay Division operates and maintains shops, plant facilities, and equipment in support of the variety of NRL research and development projects which can best be carried out there.

## The Physical Plant

Located in a relatively clear area away from congestion and industrial interference, the main site, at Randle Cliff, Maryland, covers 68.1 hectares (170 acres) containing 200 structures of various sizes and construction, six of which are major laboratory buildings. There is over 86 m (282 ft.) of usable dock space with a controlling water depth of 2.1 m (7 ft.), located 3.2 km (2 mi.) north of the main site in Chesapeake Beach. Off-site facilities include the Tilghman Island Facility, located directly across the Bay from CBD at a range of 16.25 km (10 mi.).

Research watercraft available at CBD include one 19.2-m (63-ft.) catamaran, one 17-m (56-ft.) landing craft, one Jack-up-Barge, and one 11-m (36-ft.) motor boat. These are used in support of research projects and for transportation between off-site facilities.

## Key Personnel

<u>Name</u>	<u>Title</u>
CDR B.A. Bauer, USN	Division Officer
Mr. R.M. Conlyn	Station Engineer
Mrs. M.J. Hamor	Administrative Officer
Mr. W.S. Kratz	Security Officer
BMC L. Williams, USN	Operations Officer

## Research Division Representatives

### Optical Sciences Division

Mr. T.H. Cosden, Field Experiments Representative

### Radar Division

Mr. M.W. Lehman, Radar Division Representative  
Mr. W.K. Fliss, Target Characteristics Branch  
Mr. P. Ward, Search Radar Branch  
Mr. D. Rohlf, Radar Techniques Branch

### Tactical Electronic Warfare Division

Mr. V.J. Kutsch, Tactical Electronic Warfare  
Division Representative

### Space Systems Division

Mr. P.T. Boltz, Impact Vulnerability Staff  
Representative

## Tenant

### Naval Intelligence Support Center

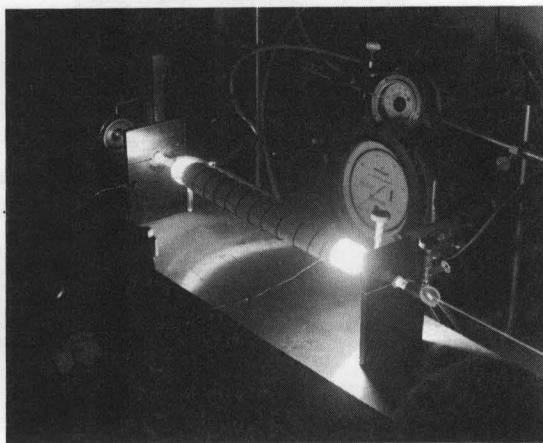
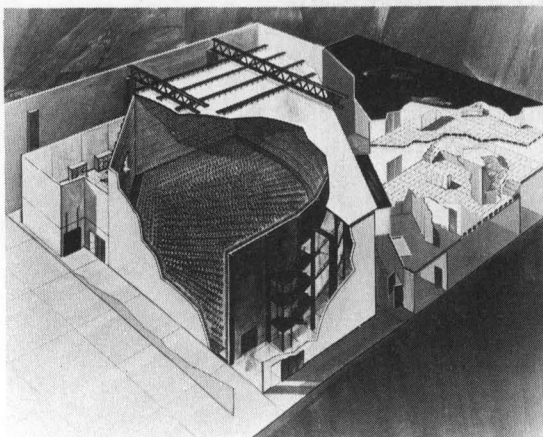
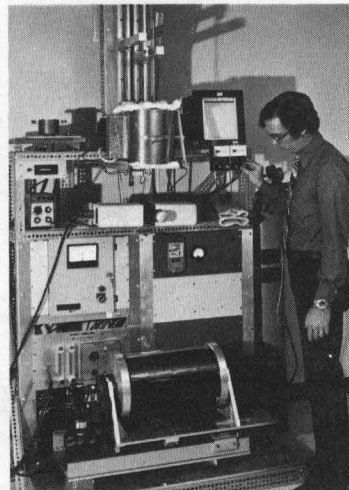
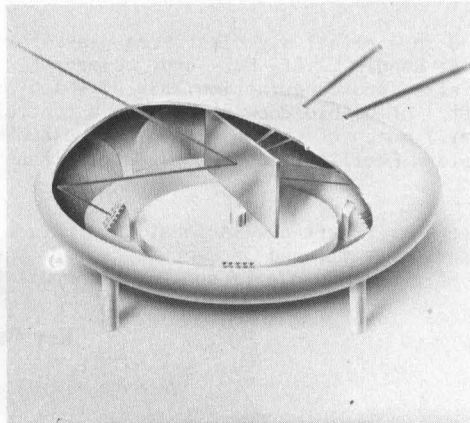
Mr. J.A. Sydow, Navy Foreign Material  
Exploitation Program

## Civilian Personnel

Full-Time Permanent: 62  
Military: 2

# Electronic Science and Technology Directorate

The Navy's operational effectiveness depends critically on its ability to utilize the electromagnetic spectrum from frequencies close to zero to those in the optical range. This ability requires both a basic understanding of the underlying phenomena, and the development of systems, materials, and devices to exploit this understanding through applications of technology. Accordingly, the work of this Directorate ranges from basic research in materials physics, electromagnetic propagation, and signal processing, through the development of electronic systems, components, and devices, to the final assurance of reliably functioning systems in the Fleet.



## Associate Director of Research and Director of Electronic Science and Technology



Dr. Harper Q. North

Dr. North [REDACTED] He graduated from the California Institute of Technology in 1938 with a B.S. degree in science. He obtained his M.A. and Ph.D., both in physics, from the University of California at Los Angeles, in 1940 and 1947, respectively. He completed the University of California at Los Angeles Executive Program in Business Management in 1958.

Dr. North joined the Research Department of NRL as the Associate Director of Research for Electronics on 17 March 1975. On 1 January 1978, his title became Associate Director of Research and Director of Electronic Science and Technology. He came to NRL from the Northrop Corporation where, since 1973, he had been the Consultant to the Division General Manager. From 1969 to 1973, as Head of the Electro Optical Department of Northrop, he was responsible for developing a family of digitally addressed, flat cathode-ray tubes for military applications.

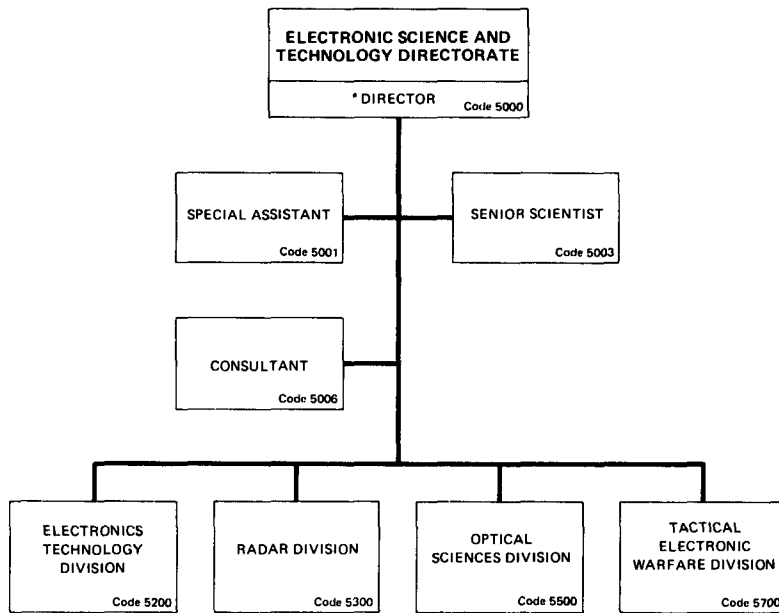
From 1962 to 1969 Dr. North was Corporate Vice President, Research and Development, for TRW, Inc. In 1954 he founded Pacific Semi-Conductors, Inc. (now the TRW Semi-Conductor Division) and was the Company's President from 1954 to 1962.

From 1949 to 1954, he was Director of the Semi-Conductor Division of the Hughes Aircraft Company, and he holds patents on the familiar miniature glass diode which has been manufactured throughout the world.

From 1940 to 1949, Dr. North worked as a Research Associate in the General Electric Research Laboratory, where he was involved in various research and development projects, including the development of radar mixer crystals, and the discovery of the "varactor diode" principle in germanium.

Dr. North served for two years as Chairman of the Board of Governors of the Electronic Industries Association, and he received the Organization's Medal of Honor in 1966. He has written numerous articles and papers on a variety of technical subjects, technological forecasting, and management. He also holds a number of patents.

Dr. North is a Fellow of the Institute of Electrical and Electronic Engineers and a Fellow of the American Physical Society. He served for several years as Chairman of the Advisory Group on Electron Devices, Office of the Department of Defense Research and Engineering.



\*Associate Director of Research

### **Key Personnel**

<u>Name</u>	<u>Title</u>
Dr. H.Q. North	Associate Director of Research and Director of Electronic Science and Technology
Mr. E.M. Man	Special Assistant
Dr. L.B. Wetzel	Senior Scientist
Mr. H. Bress	Consultant
Mr. A. Brodzinsky	Superintendent, Electronics Technology Division
Dr. M.I. Skolnik	Superintendent, Radar Division
Dr. T.A. Jacobs	Superintendent, Optical Sciences Division
Mr. L.A. Cosby	Superintendent, Tactical Electronic Warfare Division

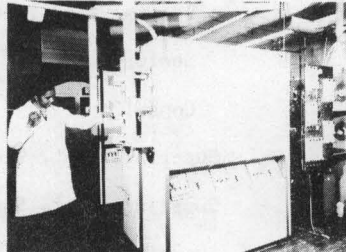
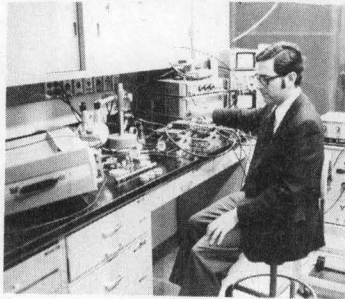


Mr. A. Brodzinsky

# Electronics Technology Division

- SOLID STATE DEVICES
- ELECTRONIC MATERIAL TECHNOLOGY
- SURFACE PHYSICS
- MICROWAVE TECHNOLOGY
- MICROELECTRONICS
- SEMICONDUCTORS
- CRYOGENICS AND SUPERCONDUCTIVITY
- MAGNETISM

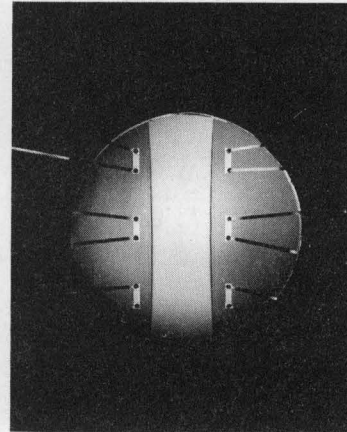
*MICROWAVE DEVICES AND CIRCUITS*



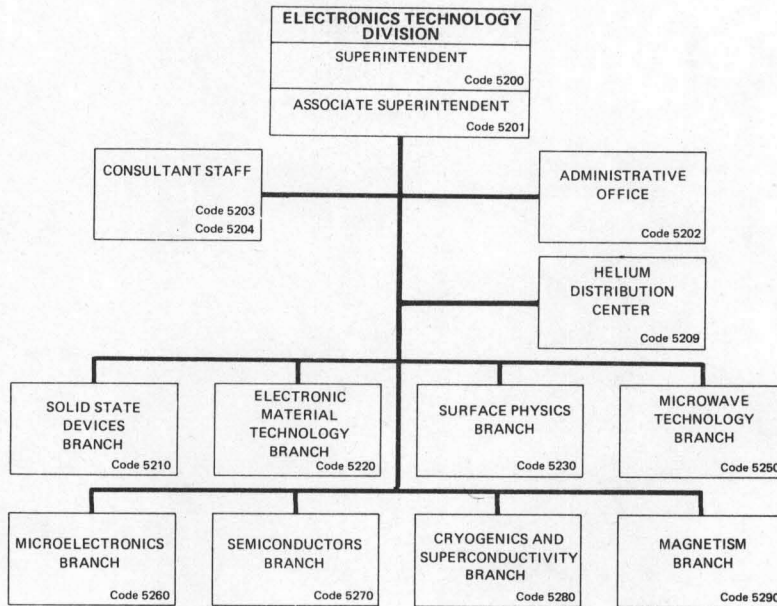
FABRICATION OF SOLID STATE DEVICES



ARC PLASMA GROWTH OF MAGNETIC CRYSTALS



SURFACE ACOUSTIC WAVE DELAY LINES FABRICATED ON SILICON WAFER WITH THE USE OF ZINC OXIDE LAYERS



## Basic Responsibilities

The Electronics Technology Division carries out programs of basic and applied research and development in the fields of electronic properties of solid materials, materials development, surface physics, microwave techniques, microelectronic devices research and fabrication, high-power microwave generation, and basic research in electronic materials, especially semiconductors, and in magnetism and cryoelectronics. The activities of the Division couple device research both to basic materials investigations and to systems research and development needs.

### Branches

#### Solid State Devices

Ion implantation technology  
High- and low-power devices  
for energy conversion  
Field effect transistor  
reliability and failure  
analysis  
MIS failure physics, radi-  
ation vulnerability and  
hardening  
High-frequency microwave  
devices

#### Electronic Material Technology

Preparation and development  
of magnetic dielectric,  
optic, and semiconductor  
materials  
Optical components and coat-  
ings, and glassblowing.

#### Surface Physics

Surface and interface  
physics  
Cathode research and  
development  
Characterization of and  
growth of semiconductor,  
metal, and insulator films  
and surfaces

#### Surface Physics (cont'd)

Bonding and adhesion studies  
Thermionic energy conversion

#### Microwave Technology

Surface acoustic waves  
Microwave and millimeter-  
wave integrated circuits  
Surface magnetostatic waves  
Microwave solid state  
sources  
Microwave ferrimagnetic and  
ferromagnetic components  
Millimeter-wave devices  
research

#### Microelectronics

Silicon device processing  
Microelectronic fabrications  
Integrated circuit  
technology

#### Semiconductors

Solid state theory  
Electric and optical charac-  
terization of materials

#### Semiconductors (cont'd)

Impurity and defect studies  
Structural and electronic  
properties of amorphous  
semiconductors  
Optical and magneto-optical  
studies of surface and  
interfaces  
Electrical and optical  
studies of semiconductor  
interfaces

#### Cryogenics and Superconductivity

Phase transformations/high-  
pressure effects  
Superconducting materials  
Superconducting electronics

#### Magnetism

Resonance in magnetic  
materials  
Spin-ordered magnetic  
phenomena  
Rare earth - transition  
metal magnetic materials  
Magnetic properties of  
amorphous materials  
Magneto-optics

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. A. Brodzinsky	Superintendent
Mrs. M.H. Grimes	Administrative Officer
Dr. L. Young	Consultant
Mr. M. Siegmann	Consultant
Mr. R. Anonsen	Helium Distribution Center
Dr. J.E. Davey†	Head, Solid State Devices Branch
Mr. H. Lessoff	Head, Electronic Material Technology Branch
Dr. R.F. Greene	Head, Surface Physics Branch
Dr. L.R. Whicker	Head, Microwave Techniques Branch
Dr. D.F. Barbe	Head, Microelectronics Branch
Dr. B.D. McCombe	Head, Semiconductors Branch
Dr. R.A. Hein	Head, Cryogenics and Superconductivity Branch
Dr. G.T. Rado	Head, Magnetism Branch

#### Civilian Personnel

Full-Time Permanent: 149

#### Total Estimated R&D Funding

Fiscal Year 1978: \$15,225,000

†Additional duty as acting Associate Superintendent



Dr. M. I. Skolnik

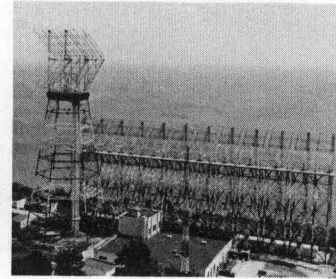
# Radar Division

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

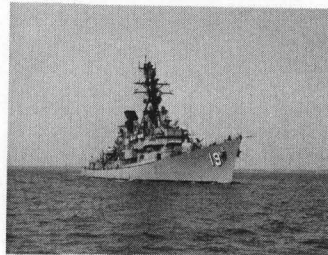
**AIRBORNE EARLY WARNING RADAR  
SYNTHETIC APERTURE RADAR**



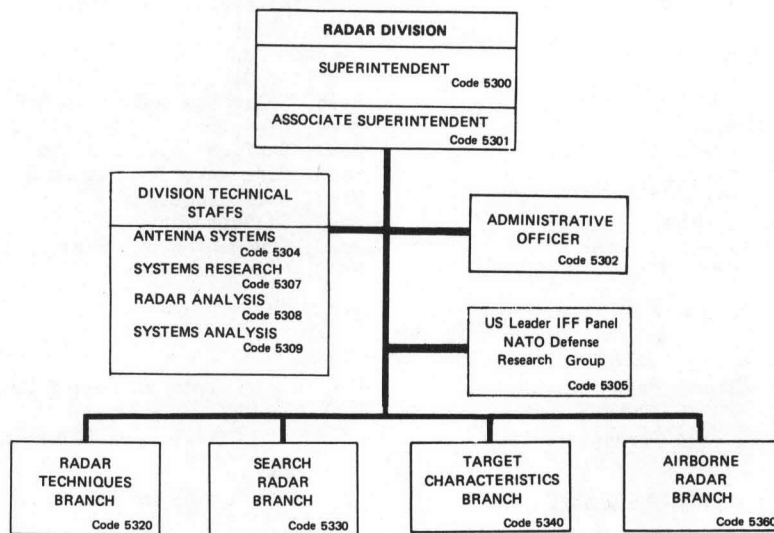
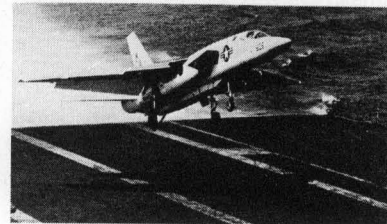
**OVER THE HORIZON RADAR "MADRE"**



**SHIPBOARD SURVEILLANCE  
AND WEAPON CONTROL RADAR**



**AIRBORNE-INTERCEPTOR RADAR**



### 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 Activities

#### Radar Analysis

Automatic detection and tracking  
Radar systems simulations

#### Systems Analysis

Airborne weapon systems simulation  
Anti-air weapons countermeasures

#### Antenna Systems

Microwave antenna research  
Electromechanical design

#### Systems Research

Conceptual studies of new radar systems

### Branches

#### Radar Techniques

High-frequency radar  
Signal processing  
Ionospheric radio-wave transmission  
Maintenance-free radar

#### Target Characteristics

Radar counter-countermeasures  
Adaptive signal processing  
Shipboard radar concepts  
Target signature analysis

#### Search Radar

Shipboard radar  
Precision tracking techniques  
Range instrumentation

#### Airborne Radar

Airborne early warning radar  
Moving target indication  
Synthetic aperture radar (SAR)  
Electromagnetic propagation  
Microwave radiometry

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. M.I. Skolnik	Superintendent
Mr. I.O. Olin	Associate Superintendent
Mrs. A.G. Dunn	Administrative Officer
Dr. M.I. Skolnik	Head, Systems Research Staff
Dr. G.V. Trunk	Head, Radar Analysis Staff
Mr. C.M. Loughmiller	Head, Systems Analysis Staff
Dr. W. Gabriel	Head, Antenna Systems Staff
Mr. C.V. Parker	U.S. Leader to the IFF Panel of the NATO Defense Research Group
Mr. J.M. Headrick	Head, Radar Techniques Branch
Dr. C.L. Temes	Head, Search Radar Branch
Mr. J.P. Shelton	Head, Target Characteristics Branch
Mr. D.L. Ringwalt	Head, Airborne Radar Branch

#### Civilian Personnel

Full-Time Permanent: 139

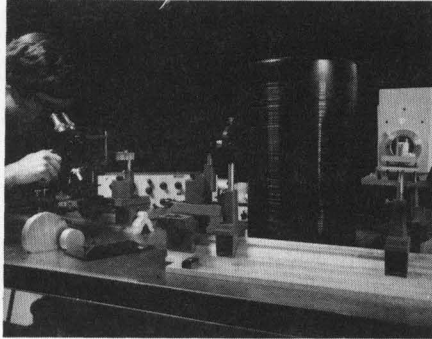
#### Total Estimated R&D Funding

Fiscal Year 1978: \$13,200,000

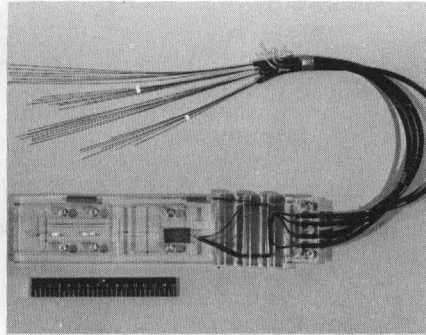


# Optical Sciences Division

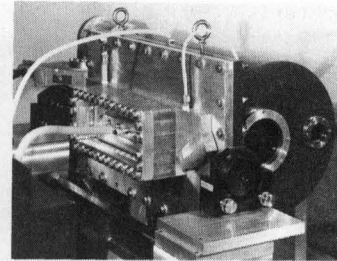
Dr. T. A. Jacobs



OPTICAL FIBER TECHNOLOGY

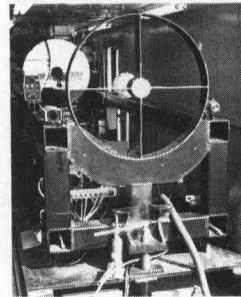


MULTICHANNEL FIBER OPTICS COUPLER

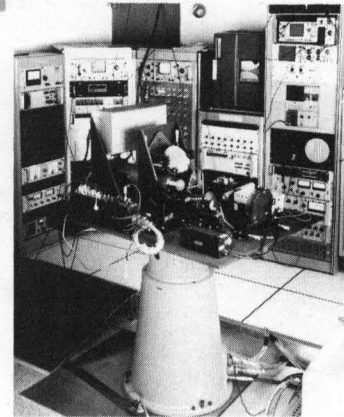


HIGH-PRESSURE TUNABLE INFRARED LASER

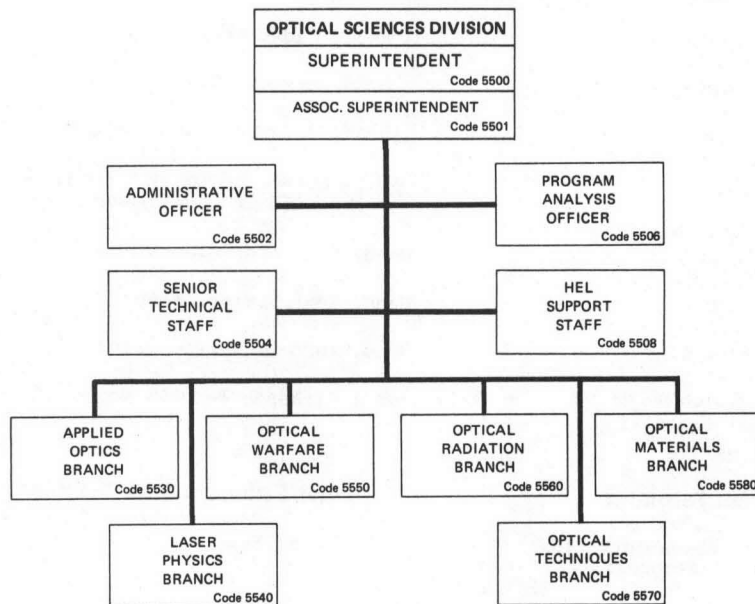
- APPLIED OPTICS
- LASER PHYSICS
- OPTICAL WARFARE
- OPTICAL RADIATION
- OPTICAL TECHNIQUES
- OPTICAL MATERIALS



MOBILE OPTICAL TRANSMITTER TELESCOPE



RATE TABLE



### 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 wavelengths. The research, both theoretical and experimental, is concerned with discovering and understanding the basic physical principles and mechanisms involved in optical devices, optical materials, and optical 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, laser-matter interactions, atmospheric propagation, optical technology, holography, optical warfare, optical data processing, optical systems, optical materials, radiation damage studies, optical materials fabrication, optical recording materials, and optical diagnostic techniques. A significant portion of the effort is devoted to developing, analyzing, and using special optical materials. A variety of field measurement programs on optical problems of specific interest are also conducted.

### Staff Activities

#### Senior Scientific and Consultant Staff

Special system analysis  
Technical study groups  
Technical contract monitoring  
Theoretical studies

### Branches

#### Applied Optics

Optical processing  
Optical characteristics of military targets  
Optical technology  
Laser x-ray generation

#### Laser Physics

Molecular laser physics  
Chemical laser physics  
Electrically driven lasers  
Laser-induced reactions

#### Optical Warfare

Optical and IR counter-measures

#### Optical Warfare (cont'd)

Optical intelligence  
Optical Seeker studies

#### Optical Radiation

Electrooptic applications  
Optical instrumentation  
Interferometry  
Atmospheric optics  
Propagation studies

#### Optical Techniques

Nonlinear optical phenomena  
Picosecond light pulses

#### Optical Techniques (cont'd)

Nonlinear effects in materials  
Optical waveguides  
Molecular waveguides  
Laser-matter interactions

#### Optical Materials

Electronic properties of nonmetallic crystals and glasses  
Radiation-induced defects  
Optical properties: fibers, windows, data processing materials  
Surface properties

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. T.A. Jacobs	Superintendent
Dr. L.F. Drummeter, Jr.	Associate Superintendent
Mrs. H.E. Burchell	Administrative Officer
Mr. D.F. France	Program Analysis Officer
Dr. R.C. Elton	Senior Technical Staff
Dr. W.L. Faust	Senior Technical Staff
Mr. J. Giuliani	Senior Technical Staff
Dr. M. Hass	Senior Technical Staff
Dr. P.M. Livingston	Senior Technical Staff
Dr. H.B. Rosenstock	Senior Technical Staff
Dr. A.J. Skalafuris	Senior Technical Staff
Mr. F.R. Fluhr	Head, High Energy Laser Support Staff
Dr. R.A. Patten	Head, Applied Optics Branch
Dr. W.S. Watt	Head, Laser Physics Branch
Dr. A.F. Milton	Head, Optical Warfare Branch
Dr. P.B. Ulrich*	Head, Optical Radiation Branch
Dr. T.G. Giallorenzi	Head, Optical Techniques Branch
Dr. M.N. Kabler	Head, Optical Materials Branch

#### Civilian Personnel

Full-Time Permanent: 113

#### Total Estimated R&D Funding

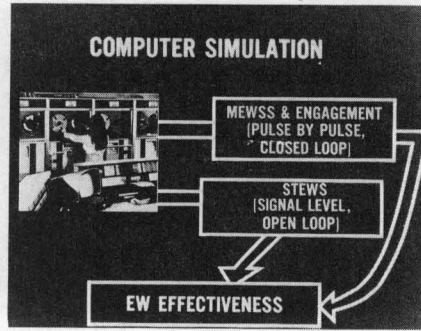
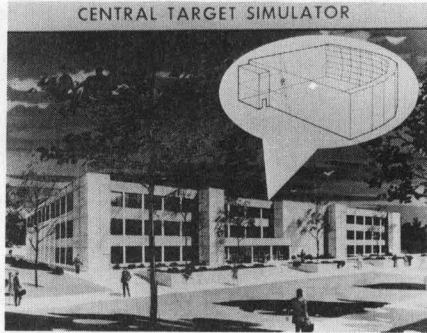
Fiscal Year 1978: \$9,855,000

\*Acting

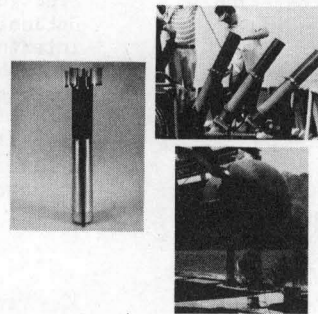


Mr. L. A. Cosby

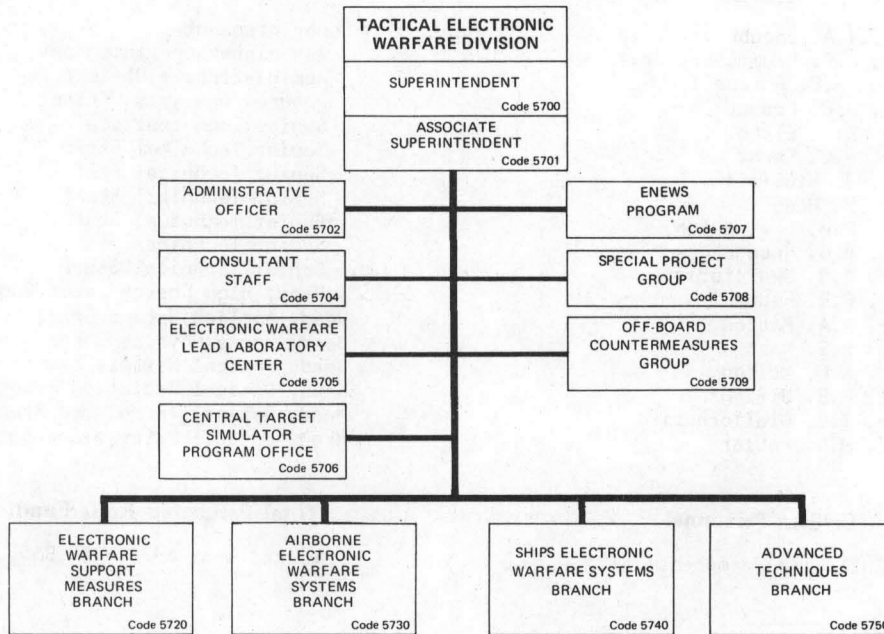
# Tactical Electronic Warfare Division



- AIRBORNE ELECTRONIC WARFARE SYSTEMS
- SHIPS ELECTRONIC WARFARE SYSTEMS
- ADVANCED TECHNIQUES
- ELECTRONIC WARFARE SUPPORT MEASURES



OFF-BOARD COUNTERMEASURES



## Basic Responsibilities

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

## Staff Activities

### Lead Laboratory Coordinating Staff

Navy in-house exploratory development  
Program reference center  
Navy Laboratory Electronic Warfare  
Advisory Group  
Threat analyses  
Liaison w/other laboratories & commands

### Off-Board Countermeasures Group

Expendable technology  
Expendable devices  
Off-board systems

### Airborne Electronic Warfare Systems

Air systems development  
Penetration aids  
Power source development

### Ships Electronic Warfare Systems

Ships systems development  
Jamming technology  
Deception techniques  
EW antennas  
Threat simulators

### Central Target Simulator Program

Design, construct, operate CTS  
Facility

### Effectiveness of Naval EW Systems (ENEWS)

EW effectiveness  
Simulation analysis and measurement  
Research & development support

### Special Project Group

Vulnerability analyses  
Special countermeasures

## Branches

### Electronic Warfare Support Measures

Intercept systems  
Direction finding  
Systems integration  
Command and control interfaces  
Signal processing

### Advanced Techniques

Analysis and modeling simulation  
New EW techniques  
Experimental systems  
EW concepts

## Key Personnel

### Name

Mr. L.A. Cosby  
Dr. G.P. Ohman  
Miss G. Batchelder  
Dr. G.P. Ohman\*  
  
Mr. A.A. DiMattesa  
Mr. D.F. Grady  
Mr. L.A. Cosby  
Mr. N.J. Lesko  
Mr. J.A. Montgomery  
Mr. H.W. Zwack  
Mr. E.E. Koos  
Mr. L.O. Sweet  
Dr. G.E. Freidman

### Title

Superintendent  
Associate Superintendent  
Administrative Officer  
Lead Laboratory Coordinator and  
Head, Electronic Warfare Lead Laboratory Center  
Manager, Central Target Simulator Program  
Manager, ENEWS Program  
Program Manager, Special Project Group  
Deputy Program Manager, Special Project Group  
Head, Off-Board Countermeasures Group  
Head, Electronic Warfare Support Measures Branch  
Head, Airborne Electronic Warfare Systems Branch  
Head, Ships Electronic Warfare Systems Branch  
Head, Advanced Techniques Branch

## Civilian Personnel

Full-Time Permanent: 167

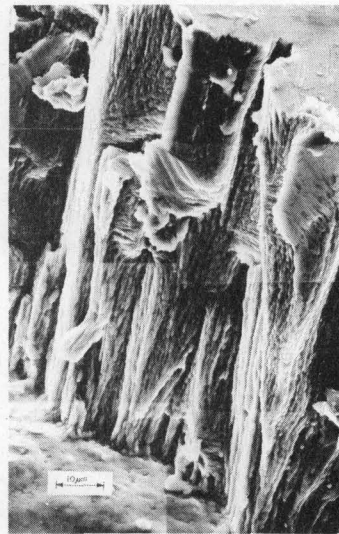
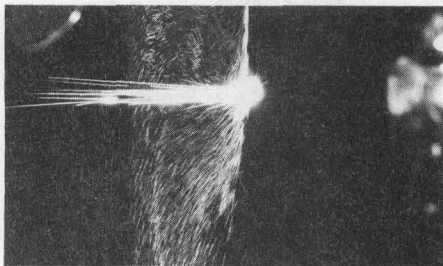
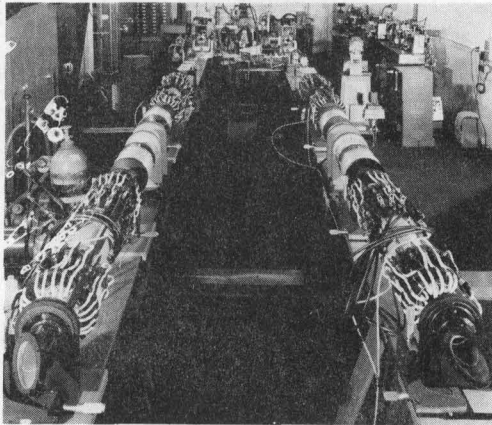
## Total Estimated R&D Funding

Fiscal Year 1978: \$28,400,000

\*Acting

## Material and Radiation Science and Technology Directorate

The Material and Radiation Science and Technology Directorate is an interdisciplinary grouping of scientists and engineers who conduct basic and applied research on the electrical, chemical, and mechanical properties of matter and on energy-matter interactions. The program includes investigations of the physical properties of various materials, including pure metals, alloys, glasses, plastics, and composites on which important naval devices, components, and systems are based. New techniques for producing, processing, and fabricating materials for important naval applications are developed. Theoretical and experimental research and numerical modeling of plasmas are conducted to understand more fully natural and man-made plasma phenomena, electron and ion beams, and lasers which have application to controlled thermonuclear power sources, pulsed power generation, and high-altitude radiation effects.



## Associate Director of Research and Director of Material and Radiation Science and Technology



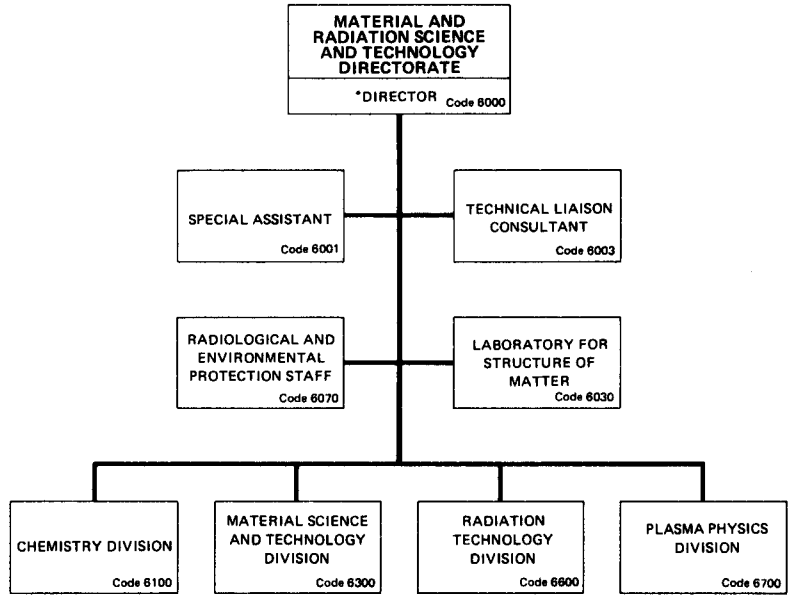
Dr. Albert I. Schindler

Dr. Schindler [REDACTED] He received the degrees of B.S. (1947), M.S. (1948), and D.Sc. (1950), all in physics, from Carnegie Institute of Technology.

He came to the Naval Research Laboratory in 1951 and as Head, Metal Physics Branch, Material Sciences Division, conducted and directed research on the physical properties of metallic alloys. Dr. Schindler has authored or coauthored over 90 papers in solid state physics on topics including galvanomagnetic effects in alloys, electronic specific heat of transition metals, and irradiation effects in magnetic materials. In this latter area, he holds several patents. He is an Adjunct Professor of Physics at Howard University, and has supervised thesis research there as well as at Catholic University, the University of Maryland, and American University. During a sabbatical year, Dr. Schindler was a visiting scientist at Imperial College of Science and Technology in London, England.

For his distinguished research Dr. Schindler has received numerous awards, including the 1966 Award for Scientific Achievement presented by the Washington Academy of Science, and the Navy Award for Distinguished Achievement in Science (1975).

Dr. Schindler is a Fellow of the American Physical Society and of the Washington Academy of Sciences. He also is a member of the Philosophical Society of Washington and of Sigma Xi, for which he served as a member of the Board of Directors from 1974 to 1976.



\*Associate Director of Research

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. A.I. Schindler	Associate Director of Research and Director of Material and Radiation Science and Technology
Mr. R. Nekritz	Special Assistant
Dr. F.W. Patten	Technical Liaison Consultant
Dr. J. Karle	Chief Scientist, Laboratory for Structure of Matter
Mr. L.A. Brauch	Head, Radiological and Environmental Protection Staff
Dr. F.E. Saalfeld	Superintendent, Chemistry Division
Dr. L.R. Hettche	Superintendent, Material Science and Technology Division
Dr. J. McElhinney	Superintendent, Radiation Technology Division
Dr. T. Coffey	Superintendent, Plasma Physics Division

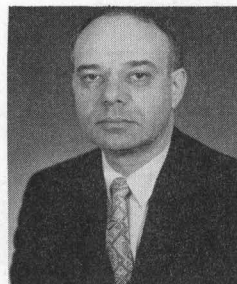
# LABORATORY FOR STRUCTURE OF MATTER

## 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. Applications are made to device materials and other substances whose chemical and physical properties are of interest.

### Key Personnel

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



Dr. J. Karle

Civilian Personnel	Total Estimated R&D Funding
Full-Time Permanent: 10	Fiscal Year 1978: \$670,000

# RADIOLOGICAL AND ENVIRONMENTAL PROTECTION STAFF

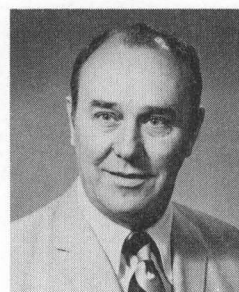
## Basic Responsibilities

The Radiological & Environmental Protection Staff provides a Laboratory-wide protection program for the possession and use of all sources of ionizing radiation and microwave radiation. The Staff performs technical monitoring, evaluations, and research to assure that NRL radiological and microwave operations are safe and in compliance with federal, state, and Navy regulations. It provides employees with the instructions, instruments, assistance, and controls needed to carry out the protection responsibilities.

For environmental protection (pollution control) the Staff reviews Laboratory programs and plans to identify potential sources of pollution at NRL; recommends preventive or corrective measures necessary to reduce or eliminate unnecessary pollution; and monitors the air and water to determine compliance with applicable rules and regulations.

### Key Personnel

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



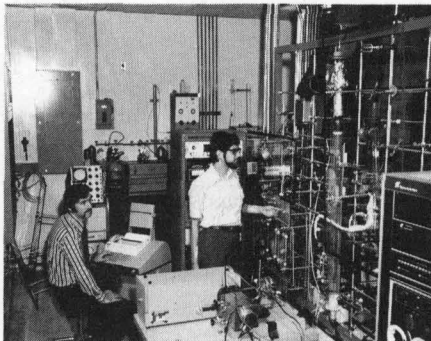
Mr. L.A. Brauch

Civilian Personnel	Total Estimated R&D Funding
Full-Time Permanent: 15	Fiscal Year 1978: \$30,000

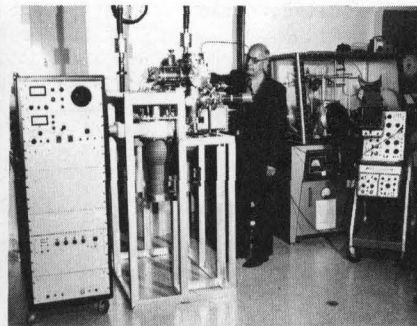


Dr. F. E. Saalfeld

# Chemistry Division



STUDY OF "COOL FLAMES"

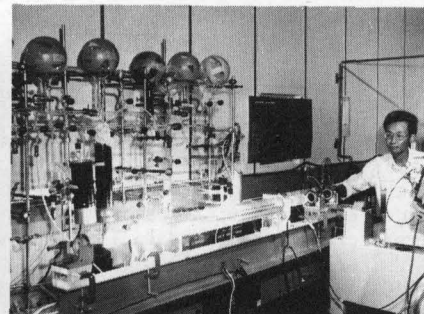


HIGH-TEMPERATURE MASS SPECTROMETER

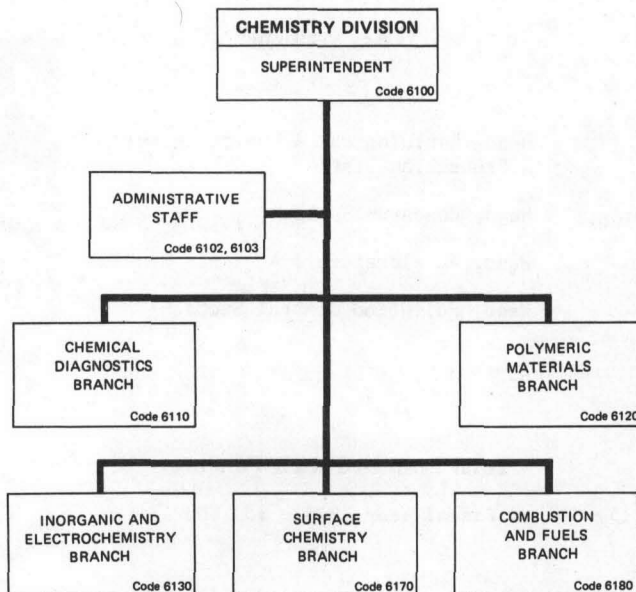
- CHEMICAL DIAGNOSTICS
- POLYMERIC MATERIALS
- INORGANIC AND ELECTROCHEMISTRY
- SURFACE CHEMISTRY
- COMBUSTION AND FUELS



FAST SCAN ELECTRON SPIN RESONANCE



CHEMICAL LASER



## Basic Responsibilities

The Chemistry Division conducts basic and applied research and development studies in the broad fields of chemical diagnostics, polymeric materials, inorganic and electrochemistry, surface chemistry, and combustion and fuels chemistry. Specialized programs currently within these fields include lubricants, composite materials, coatings, adhesives, dynamics, chemical lasers, molecular structure determinations, submarine atmosphere analysis and control, corrosion, personnel protection, and fire suppression.

## Branches

### Chemical Diagnostics

Optical diagnostics of chemical reactions  
Kinetics of gas phase reactions  
Chemical lasers and energy transfer  
Trace analysis  
Atmosphere analysis and control  
Laser-induced chemistry

### Polymeric Materials

Synthesis of unique polymers  
Functional organic coatings  
High-strength composites  
Photophysical processes in polymers  
Polymer characterization  
Adhesion and structural adhesives

### Inorganic & Electrochemistry

Solid state chemistry  
Fundamental electrode reactions  
Solution chemistry

### Inorganic & Electrochemistry (cont'd)

Synthesis and characterization of novel inorganic compounds  
Corrosion prevention

### Surface Chemistry

Lubricants  
Surface properties of fibers  
Rheology  
Surface analysis

### Combustion & Fuels

Distillate fuels research  
Autoxidation and combustion dynamics  
Fire suppression  
Personnel protection in fires  
Modeling and scaling of combustion systems

## Key Personnel

<u>Name</u>	<u>Title</u>
Dr. F.E. Saalfeld	Superintendent
Mrs. B.C. Gibbs	Administrative Officer
Dr. A.B. Harvey	Head, Chemical Diagnostics Branch
Dr. L.B. Lockhart, Jr. †	Head, Polymeric Materials Branch
Dr. W.B. Fox	Head, Inorganic & Electrochemistry Branch
Dr. N.L. Jarvis	Head, Surface Chemistry Branch
Dr. H.W. Carhart	Head, Combustion and Fuels Branch

### Civilian Personnel

Full-Time Permanent: 103

### Total Estimated R&D Funding

Fiscal Year 1978: \$7,650,000

†Additional duty as Associate Superintendent



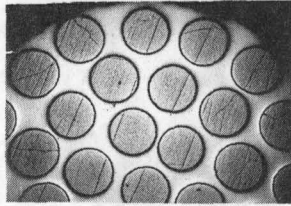
# Material Science and Technology Division

Dr. L. R. Hettche

- ADVANCED MATERIALS TECHNOLOGY
- ALLOY TRANSFORMATIONS AND KINETICS
- METAL PHYSICS
- CERAMICS
- COMPOSITE MATERIALS
- METALS PERFORMANCE
- THERMOSTRUCTURAL MATERIALS

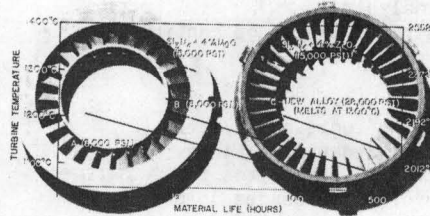


LASER WELDING AND PROCESSING

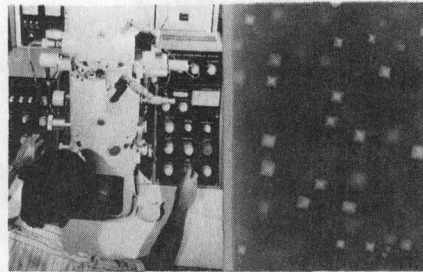


X-SECTION of W/SUPERALLOY 1mm

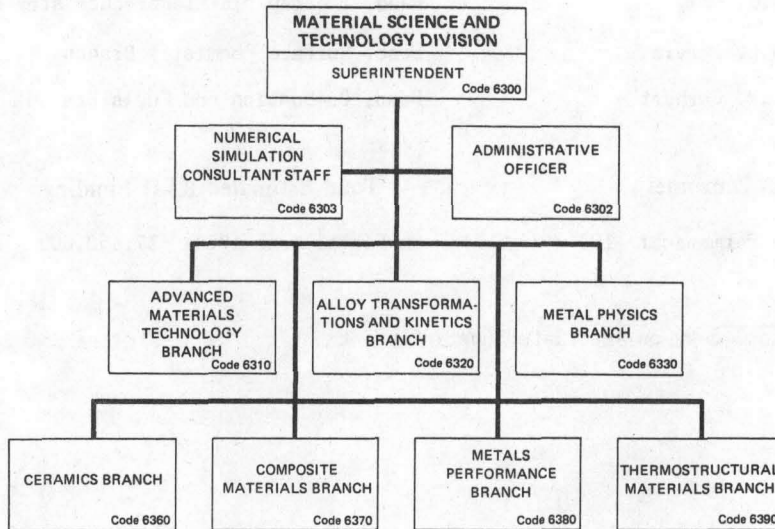
ADVANCED COMPOSITE MATERIALS FOR NAVAL APPLICATIONS



CERAMIC DEVELOPMENT FOR THERMOSTRUCTURAL AND DEVICE APPLICATIONS



OBSERVATION OF RADIATION PRODUCED MICROVOIDS (500 Å DIA) IN METALS



### Basic Responsibilities

The Material Science and Technology Division conducts basic and applied research and engages in exploratory and advanced development of materials technology having substantive value to the Navy. R&D programs encompass the intrinsic behavior of metals, alloys, ceramics, glasses, and composites; the fabrication of naval structures and devices from these materials; the effects of projected military service environment on the performance and reliability of these materials. Program objectives include achieving fundamental understanding of the mechanical and physical properties of materials; identifying composition, processing, and microstructural factors to produce improved materials; developing criteria for the selection, design, certification, and life-cycle management of materials in naval vehicles and systems. Current program emphases are listed below for each Branch activity. This diversity of programs is carried out by interdisciplinary teams of material scientists, metallurgists, ceramists, physicists, chemists, and engineers, utilizing the most advanced testing facilities and diagnostic techniques.

### Branches

#### Advanced Materials Technology

Microstructural characterization  
Weldability of advanced alloys  
Thermomechanical effects  
Micromechanisms of crack growth  
Novel fabrication and processing

#### Alloy Transformations and Kinetics

Phase transformations  
Crystalline defect states  
Microstructural effects in superconductors  
Elasticity, plasticity, mechanical phenomena  
Ion implantation  
Small angle neutron scattering

#### Metal Physics

Electronic and magnetic properties  
Thermal and optical properties  
Laser material interactions  
Optical radiation vulnerability  
Magnetostriction

#### Ceramics

Processing and fabrication  
Microstructural characterization  
Strength and fracture behavior  
Thermostructural applications  
Ceramics for electronic, piezo-electric, optical, and other nonmechanical applications

#### Composite Materials

Physical, mechanical, and failure characterizations  
Fabrication and processing techniques  
Mechanical and failure analyses  
High-temperature structural and ordnance applications

#### Metals Performance

Subcritical crack growth and fracture  
Failure-safe design parameters  
Metallurgical optimization for high-strength metals  
Corrosion science related to advanced alloys  
Marine corrosion and cathodic protection

#### Thermostructural Materials

Elevated temperature behavior of materials  
Influence of environment on high-temperature materials  
Basic mechanisms of radiation damage  
Criteria for improved structural design using high-temperature materials

<u>Name</u>	<u>Key Personnel</u>	<u>Title</u>
Dr. L.R. Hettche		Superintendent
Mrs. E. Wray		Administrative Officer
Mr. C.D. Beachem		Head, Advanced Materials Technology Branch
Dr. B.B. Rath		Head, Alloy Transformations and Kinetics Branch
Dr. J.T. Schriempf		Head, Metal Physics Branch
Mr. R.W. Rice		Head, Ceramics Branch
Dr. S.C. Sanday		Head, Composite Materials Branch
Mr. R.J. Goode		Head, Metals Performance Branch
Mr. L.E. Steele†		Head, Thermostructural Materials Branch

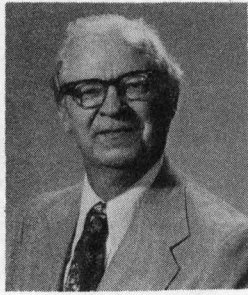
#### **Civilian Personnel**

Full-Time Permanent: 123

#### **Total Estimated R&D Funding**

Fiscal Year 1978: \$9,350,000

†Additional duty as Associate Superintendent

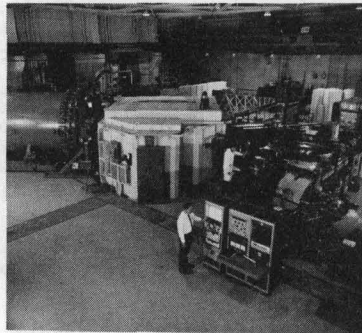


Dr. J. McElhinney

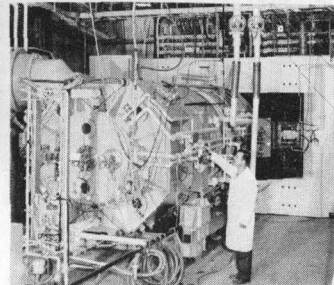
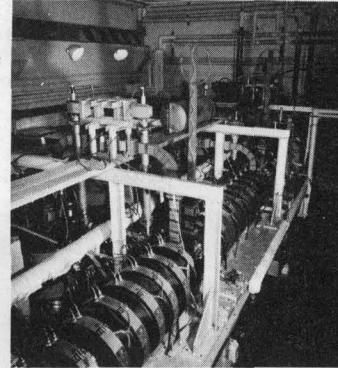
# Radiation Technology Division

- RADIATION EFFECTS
- CYCLOTRON APPLICATIONS
- RADIATION-MATTER INTERACTIONS
- MATERIALS MODIFICATION AND ANALYSIS
- X-RAY OPTICS

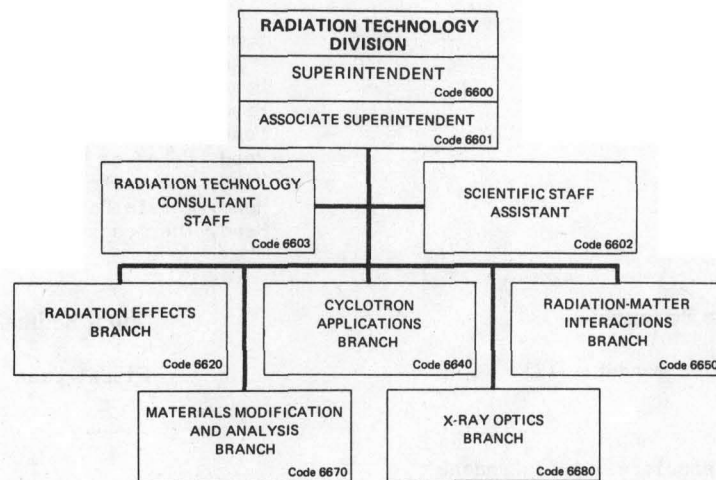
VAN DE GRAAFF



LINAC



CYCLOTRON



### Basic Responsibilities

The Radiation Technology Division conducts a broad program of basic and applied research in radiation technology and related areas. Both theoretical and experimental research are performed in areas such as radiation sources, accelerators, radiation detection and analysis, radiation dosimetry, interaction of various radiations with materials and devices, vulnerability of military equipment to radiations, modification of materials by radiations, analysis of materials by radiations, biomedical applications of radiations, characteristics and uses of x-ray sources, lattice defects, and advanced nuclear power sources. Major facilities include a 75-MeV sector-focusing cyclotron, a 60-MeV electron Linac, a 5-MV Van de Graaff, and several smaller radiation sources.

### Staff Activities

#### Consultant Staff

Radiation instrumentation  
Ion-solid interactions  
Radiation detection  
Radiation theory

### Branches

#### Radiation Effects

Radiation effects on infrared detectors, optical and electronic materials, and satellite components  
Solar cells  
Radiation belts  
Hardening satellite components against laser beams  
Radiation vulnerability  
Radiation curing of polymers  
Photographic Image Enhancement

2-MV electron Van de Graaff  
Cobalt-60 source  
60-MeV electron Linac

#### Cyclotron Applications

Radiations for biological and medical purposes  
Neutron beams for cancer therapy  
Radioisotope production  
Ion-induced x rays

75-MeV cyclotron

#### X-Ray Optics

X-ray spectrochemical analysis  
X-ray diffraction  
Band structure and superconductivity  
Plasma diagnostics  
Ion collision spectroscopy  
Weapons simulation  
Fusion energy

#### Radiation - Matter Interactions

Measurements on targets bombarded by MeV electron beams  
Deposition of energy by charged particles  
Neutron transport  
Neutron reactions in tissue resident elements  
Initiation of explosives by electron beam

#### Materials Modification and Analysis

Materials analysis by means of charged-particle beams  
Implantation of ions into solids  
Radiation effects caused by high-energy charged-particle beams  
Radiation damage in reactor materials  
Crystal studies by means of particle channeling techniques  
Ion-induced x rays  
Modification of surface and subsurface properties by ion implantation

5-MV Van de Graaff

#### Name

#### Key Personnel

#### Title

Dr. J. McElhinney  
Dr. E.A. Wolicki  
Mr. H.J. Quinn  
Mr. D.C. Cook  
Dr. K.L. Dunning  
Dr. K.W. Marlow  
Dr. A.W. Saenz  
Dr. B.J. Faraday  
Dr. R.O. Bondelid  
Dr. J.B. Aviles

Dr. J.W. Butler

Mr. L.S. Birks

Superintendent  
Associate Superintendent  
Scientific Staff Assistant  
Consultant (Radiation Instrumentation)  
Consultant (Ion-Solid Interactions)  
Consultant (Radiation Detection)  
Consultant (Radiation Theory)  
Head, Radiation Effects Branch  
Head, Cyclotron Applications Branch  
Head, Radiation-Matter Interaction Branch  
Head, Materials Modification and Analysis Branch  
Head, X-Ray Optics Branch

### Civilian Personnel

Full-Time Permanent: 88

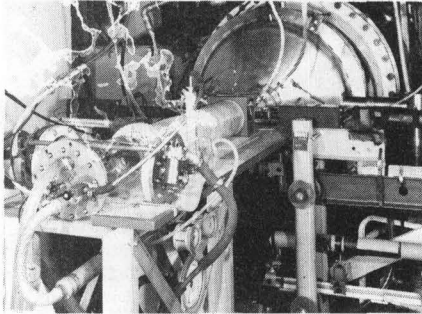
### Total Estimated R&D Funding

Fiscal Year 1978: \$6,500,000

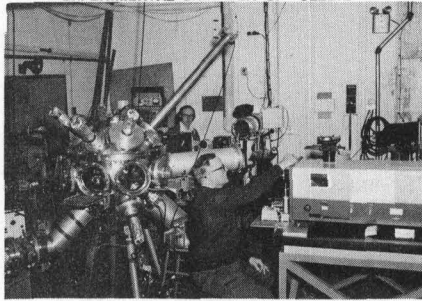


Dr. Timothy Coffey

# Plasma Physics Division

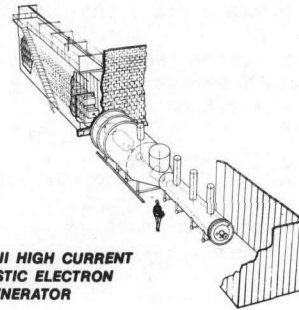


EXPERIMENTAL CHAMBER OF "SEEBIE"

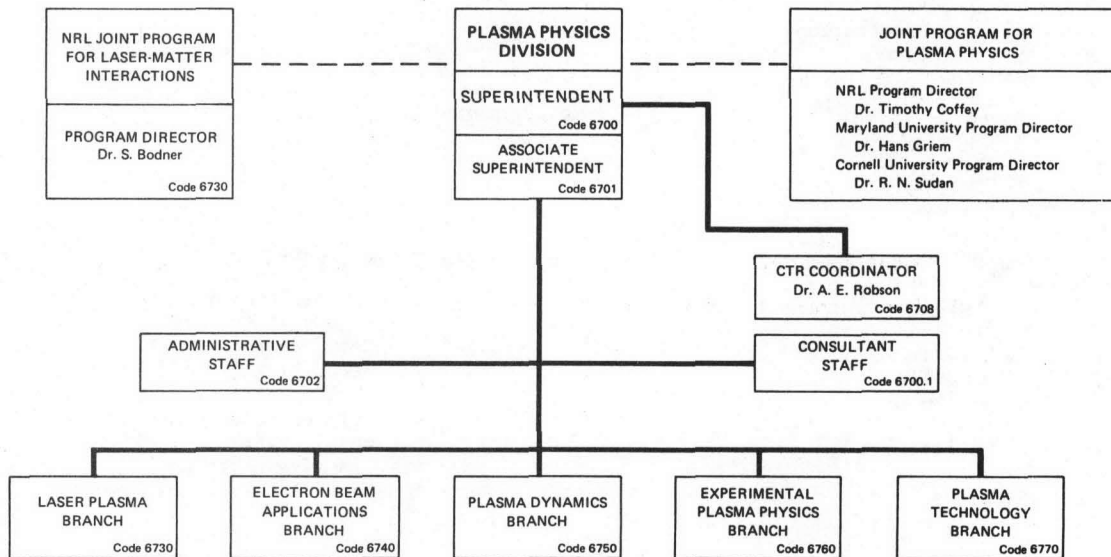


LASER PLASMA EXPERIMENT

- LASER PLASMA INTERACTION
- ELECTRON BEAM APPLICATIONS
- PLASMA DYNAMICS
- EXPERIMENTAL PLASMA PHYSICS
- PLASMA TECHNOLOGY



GAMBLE II HIGH CURRENT RELATIVISTIC ELECTRON BEAM GENERATOR



## Basic Responsibilities

The Plasma Physics Division conducts both basic and applied experimental and theoretical research. Examples of efforts underway include: fusion physics and the generation and containment of high-temperature plasmas, laser-produced plasmas, the behavior of the ionosphere as a partial plasma, electron and ion beam experiments, simulation of high-altitude nuclear weapons effects by pulsed radiation devices, and numerical simulation techniques through the use of the NRL Advanced Scientific Computer.

## Branches

### Electron Beam Applications

Application of high-current relativistic electron beams to microwave and millimeter wave generation  
Electron and ion beam weapons concepts

### Experimental Plasma Physics

Ion ring experiment  
SEEBIE electron beam plasma  
CUSP plasma preheating experiment  
Theory/system modeling  
Experimental study of plasma chemistry

### Laser Plasma

Laser-plasma interaction  
Laser fusion  
Plasma diagnostics

Large glass laser facility

### Plasma Dynamics

Theoretical and numerical simulation studies of problems in nonlinear plasma dynamics  
Ionospheric modeling  
Numerical simulation of high-density plasmas  
Geophysical fluid dynamics

### Plasma Technology

Production of intense relativistic electron beams  
Electron beam propagation and focusing  
Experimental research in high-power exploding wires  
Generation of intense ion beams  
Inductive energy storage  
Magnetic flux compression

## Key Personnel

<u>Name</u>	<u>Title</u>
Dr. T. Coffey	Superintendent
Mr. J.D. Brown	Associate Superintendent
Ms. B.D. Bassford	Administrative Officer
Dr. A. Robson	Coordinator, CTR Program
Dr. W. Ali	Consultant
Dr. K. Hain	Consultant
Dr. K. Papadopoulos	Consultant
Dr. J. Shipman	Consultant
Dr. S. Bodner	Head, Laser Plasma Branch
Dr. T. Coffey*	Head, Electron Beam Applications Branch
Dr. J. Boris	Head, Plasma Dynamics Branch
Dr. A. Robson	Head, Experimental Plasma Physics Branch
Dr. P. Turchi	Head, Plasma Technology Branch

### **Civilian Personnel**

Full-Time Permanent: 109

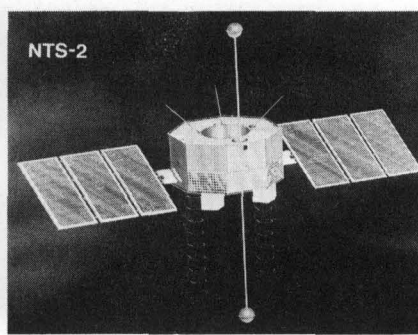
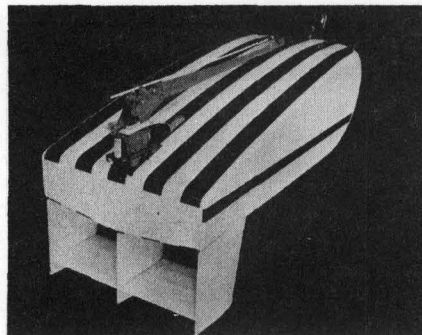
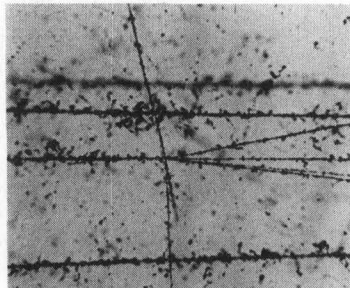
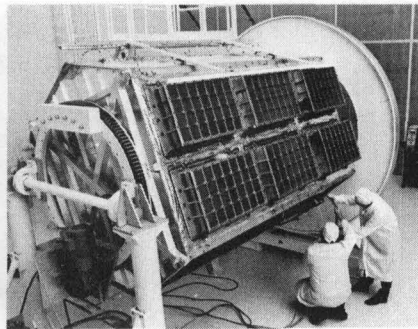
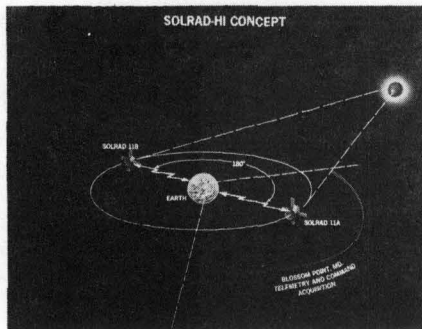
### **Total Estimated R&D Funding**

Fiscal Year 1978: \$10,000,000

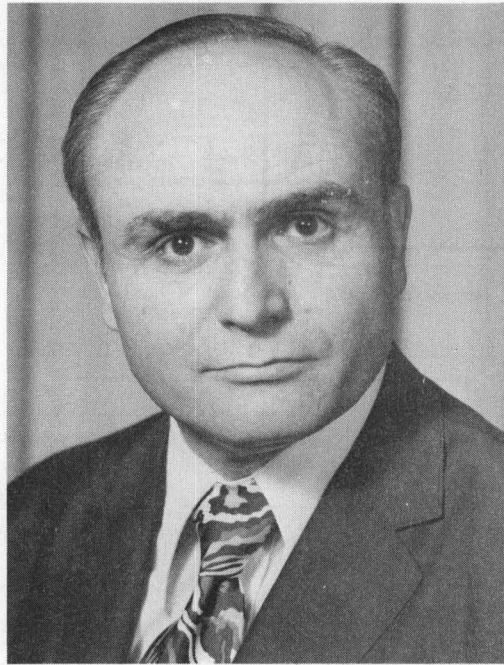
\*Acting

# Space and Communication Science and Technology Directorate

This Directorate conducts basic and applied space research to improve naval capabilities in communications, navigation, detection, surveillance, and environmental sensing. It also is responsible for research and development in the systems, sensors, techniques, instrumentation, and phenomenology of communications, command and control, signal exploitation, and information processing. Work in these fields is supported by theoretical studies and analyses, as well as by experimental development and flight of payloads for rockets, balloons, and satellites. Special facilities for building and testing complete spacecraft are available for on-orbit evaluation of space concepts and techniques.



## Associate Director of Research and Director of Space and Communication Science and Technology



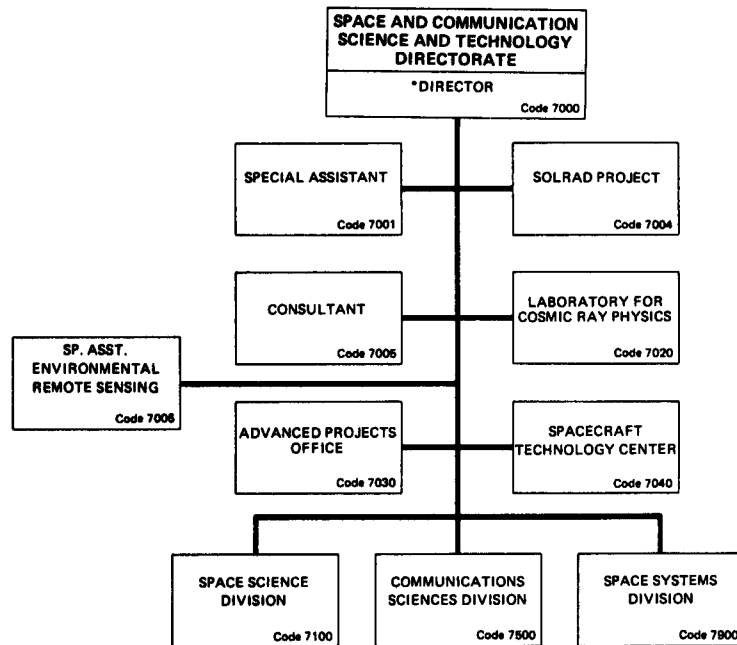
Dr. Herbert Rabin

Dr. Rabin was born in Milwaukee, Wisconsin, on November 14, 1928. 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. Dr. Rabin currently serves as a coeditor of a series of technical volumes on quantum electronics. In addition, Dr. Rabin holds six 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, the E.O. Hulburt Annual Science Award in 1970, and the Navy Distinguished Civilian Service Award in 1976.



\*Associate Director of Research

### Key Personnel

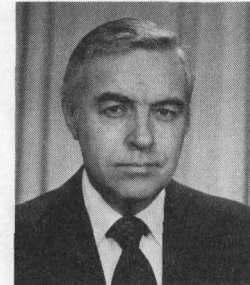
<u>Name</u>	<u>Title</u>
Dr. H. Rabin	Associate Director of Research and Director of Space and Communication Science and Technology
Mr. J.M. Shaw, Jr.	Special Assistant
Mr. E.W. Peterkin	SOLRAD Project Manager
Dr. J.W. Schwartz	Consultant
Dr. V.E. Noble	Special Assistant for Navy Environmental Remote Sensing
Dr. M.M. Shapiro	Head, Laboratory for Cosmic Ray Physics
Mr. R.D. Mayo	Head, Advanced Projects Office
Mr. P.G. Wilhelm	Head, Spacecraft Technology Center
Dr. H. Friedman	Superintendent, Space Science Division
Dr. B. Wald	Superintendent, Communication Sciences Division
Mr. N.W. Guinard	Superintendent, Space Systems Division

## SOLRAD PROJECT

The SOLRAD Project supports NAVELX advanced development tasks in solar x-ray and particle emission monitoring to (a) develop, construct, test, evaluate, and provide launch support of SOLRAD satellites; (b) track, command, and acquire satellite telemetry; and (c) reduce, analyze, and distribute solar emission data for application and scientific purposes.

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. E.W. Peterkin	Technical Project Manager
Mr. R.W. Kreplin	Scientific Program Manager
Dr. D.M. Horan	Experiments Manager
Mr. P.G. Wilhelm	Assistant Project Manager (Spacecraft)
Mr. J.G. Winkler	Spacecraft Manager
Dr. J.M. Goodman	Assistant Project Manager (Data Processing)
Mr. A.J. Martin	Data Processing Coordinator



Mr. E. W. Peterkin

### Manpower Support

8 man-years

### Total Estimated R&D Funding

Fiscal Year 1978: \$70,000

## LABORATORY FOR COSMIC RAY PHYSICS

### Basic Responsibilities

The Laboratory for Cosmic Ray Physics conducts several interrelated programs: (a) investigating the high-energy radiation environment at satellite orbits and at altitudes of high-flying airplanes, (b) determining radiation damage to men, electronic components, and materials, using high-energy heavy-ion accelerators, (c) studying neutrino interactions, and (d) exploring the acoustic detection of charged particles. Program (a) includes studies of the nature and interactions of both solar-flare and galactic high-energy particles. In Program (b) the nuclear fragmentations and energy deposition in biological tissue-like materials are investigated; this work yields data for exploratory heavy-ion cancer therapy. Energetic heavy ions are also used to simulate neutron damage to components and materials of future high-flux reactors. The entire program is designed to be responsive to 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	Senior Scientist
Dr. R. Silberberg	Senior Scientist
Mr. F.W. O'Dell	Senior Scientist



Dr. M. M. Shapiro

### Civilian Personnel

Full-Time Permanent: 11

### Total Estimated R&D Funding

Fiscal Year 1978: \$ 650,000

# ADVANCED PROJECTS OFFICE

## Basic Responsibilities

The Advanced Projects Office has NRL Program Management responsibility for an advanced space project. This involves system concept generation, system design, design implementation, fabrication, testing, and deployment of the total space system which includes both the operational overseas data collection systems as well as the satellite payloads. In addition, systems analysis, mathematical modeling, technical system integration, and operational evaluation of advanced space/ground systems is performed. The Advanced Projects Office also develops Future System Concepts and Future System Proposals and Designs in the areas of Space Science and Technology.



Mr. R. D. Mayo

### Systems Development Branch

System Studies Section  
Systems Design Section  
Systems Implementation Section  
Flight Systems Section

### Systems Engineering & Integration Branch

Management & Liaison Section  
System Engineering Management Section  
Advanced Analysis Section

## Key Personnel

<u>Name</u>	<u>Title</u>
Mr. R.D. Mayo	Manager, Advanced Projects Office
Ms. L.P. Harding	Administrative Officer
Mr. F.V. Hellrich	Head, Systems Development Branch
Mr. L.M. Hammarstrom	Head, Systems Engineering & Integration Branch

### Civilian Personnel

Full-Time Permanent: 56

### Total Estimated R&D Funding

Fiscal Year 1977: \$7,000,000

# SPACECRAFT TECHNOLOGY CENTER

## Basic Responsibilities

The Spacecraft Technology Center is responsible for providing complete spacecraft systems for purposes of conducting research and development in the space environment. This involves a broad and complete spectrum of activities ranging from system concept formulation, preliminary and detailed design, and prototype development to complete flight systems. The Center maintains all of the necessary special facilities for aerospace-type fabrication and environmental testing and the expertise which is generally required in the spacecraft system. The Center also maintains dedicated ground stations for the purpose of transmitting command/control signals to, and receiving and analyzing telemetered data from, those of its spacecraft which have been placed into orbit.

## Key Personnel

<u>Name</u>	<u>Title</u>
Mr. P.G. Wilhelm	Head, Spacecraft Technology Center
Mrs. B.L. Murphy	Administrative Officer
Mr. A.C. Salvato	Product Assurance Section
Mr. R.T. Beal	Mechanical Systems Section
Mr. R.S. Rovinski	Structures Design Section
Mr. F.W. Raymond	Engineering Physics Section
Mr. J.G. Winkler	Power Systems Section
Mr. L.E. Hearton	R. F. Systems Section
Mr. R.E. Eisenhauer	Digital Systems Section



Mr. P.G. Wilhelm

## Civilian Personnel

Full-Time Permanent: 67

## Total Estimated R&D Funding

Fiscal Year 1978: \$ 11,250,000



### Basic Responsibilities

The Space Science Division conducts research, development, and tests in the fields of upper air physics, astronomy, astrophysics, and remote geosensing. Satellites and rockets are used to obtain information on radiation from the sun and celestial sources, to study the composition and behavior of the ionosphere, and to sense remotely the terrestrial environment. 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

#### Advanced Space Sensing Applications

Active and passive sensor development for remote sensing  
Satellite radar altimetry  
Remote sensing of ocean environment and surface properties  
Remote sensing of arctic conditions  
Determining volume of oil spills at sea

#### Upper Air Physics

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

#### Radio Astronomy

Galactic and extragalactic radio astronomy  
VLBI (very long baseline interferometry)

#### Radio Astronomy (continued)

Intergalactic gases  
Atmospheric radiation  
Extraterrestrial radio radiation

#### Rocket Spectroscopy

X-ray and ultraviolet solar spectroscopy  
Spectroheliographic and coronagraphic research  
Solar-terrestrial relationships  
XUV spectroradiometry  
Apollo telescope mission solar research

#### E.O. Hulburt Center for Space Research

The program is that of the four combined 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
Miss K.A. DeAngelis	Scientific Staff Assistant
Mr. B. Yapple	Head, Advanced Space Sensing Application Branch
Dr. V.E. Noble	Deputy Head, Advanced Space Sensing Application Branch
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

#### Civilian Personnel

Full-Time Permanent: 137

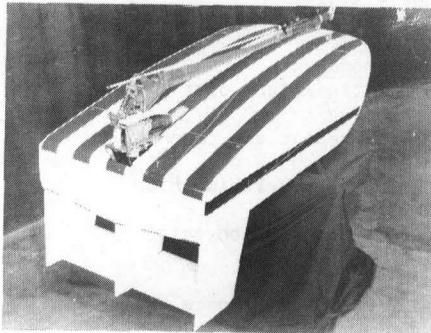
#### Total Estimated R&D Funding

Fiscal Year 1978: \$10,300,000



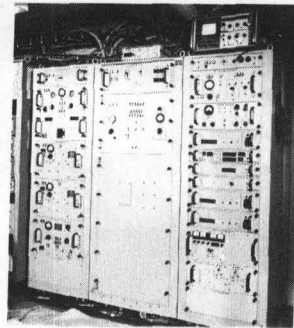
Dr. B. Wald

# Communications Sciences Division

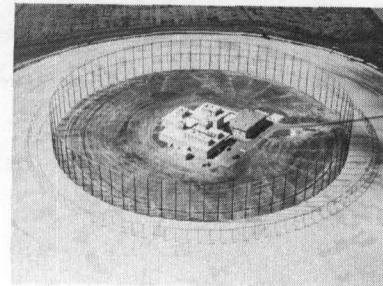


AN/BSQ-5 (XB-1)  
SUBMARINE TOWED  
COMMUNICATION BUOY

MICROWAVE SPACE  
RESEARCH FACILITY

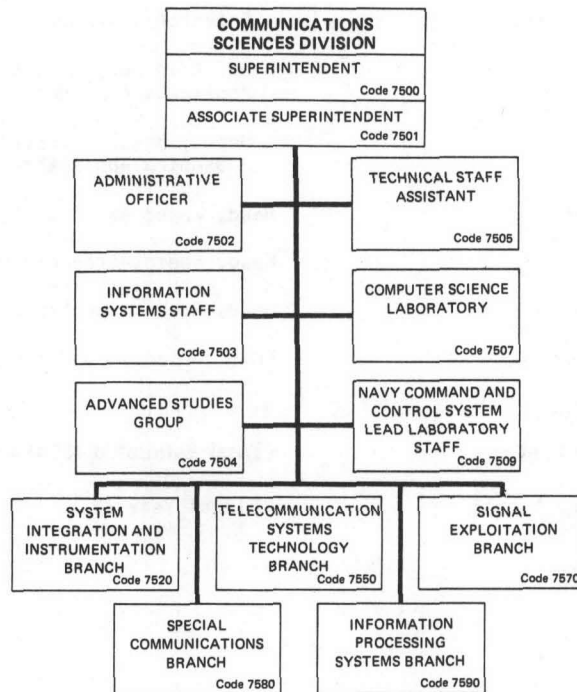


AN/SSC-7 SHIPBOARD  
SHF SATCOM SET



HF ANTENNA

- TELECOMMUNICATION SYSTEMS TECHNOLOGY
- SYSTEMS INTEGRATION AND INSTRUMENTATION
- SIGNAL EXPLOITATION
- SPECIAL COMMUNICATIONS
- INFORMATION PROCESSING SYSTEMS



### Basic Responsibilities

The Communications Sciences Division conducts research and development in the systems, sensors, techniques, instrumentation and phenomenology of communications, command and control, signal exploitation, and information processing. The major emphasis is placed on those new concepts and techniques that will specifically enhance the Navy's capabilities in the collection, processing, transmission, and distribution of information.

### Staff Activities

Computer Science Lab  
Intelligent systems  
Clustering and pattern  
recognition  
Heuristics

Navy Command & Control  
System Lead Laboratory  
Technical/management  
overview  
Goal clarification  
Transition planning

Information Systems Staff  
System architecture  
Information management  
Software engineering

### Branches

#### Systems Integration and Instrumentation

Narrow-band digital voice systems  
Secure communication systems  
Source data and channel encoding

#### Signal Exploitation

Radio frequency intercept and  
signal processing  
Direction finding and position  
location  
Signal storage and display

#### Special Communications

Antijam and LPI communications  
Satellite communications systems  
Advanced modems and processors

#### Information Processing Systems

High-performance signal processors  
Computer family architecture  
Signal processing language

#### Telecommunication Systems Technology

Submarine communications technology  
Investigation of electromagnetic  
transmission media  
Adaptive communications control  
techniques

### Key Personnel

<u>Name</u>	<u>Title</u>
Dr. B. Wald	Superintendent
Mr. W.E. Garner	Associate Superintendent
Mrs. C.E. Holt	Administrative Officer
Mr. M.L. Musselman	Technical Staff Assistant
Dr. E. Freeman*	Head, Information Systems Staff
Dr. J.R. Slagle	Head, Computer Science Laboratory
Dr. M.E. Melich	Head, Navy Command & Control System Lead Laboratory
Dr. W.S. Ament	Advanced Studies Group
Mr. D.I. Himes	Head, Systems Integration and Instrumentation Branch
Dr. J.R. Davis	Head, Telecommunication Systems Technology Branch
Mr. R.D. Misner	Head, Signal Exploitation Branch
Dr. R.A. LeFande	Head, Special Communications Branch
Mr. Y.S. Wu	Head, Information Processing Systems Branch

#### Civilian Personnel

Full-Time Permanent: 163

#### Total Estimated R&D Funding

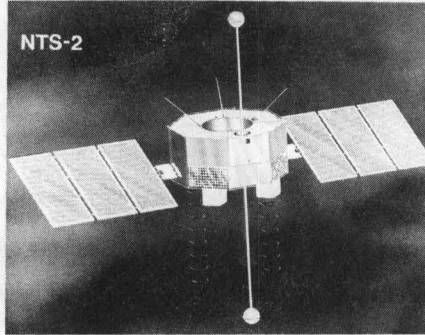
Fiscal Year 1978: \$18,500,000

\*Acting



Mr. N. W. Guinard

# Space Systems Division

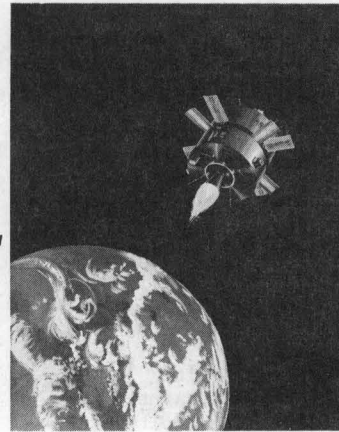


NTS-2

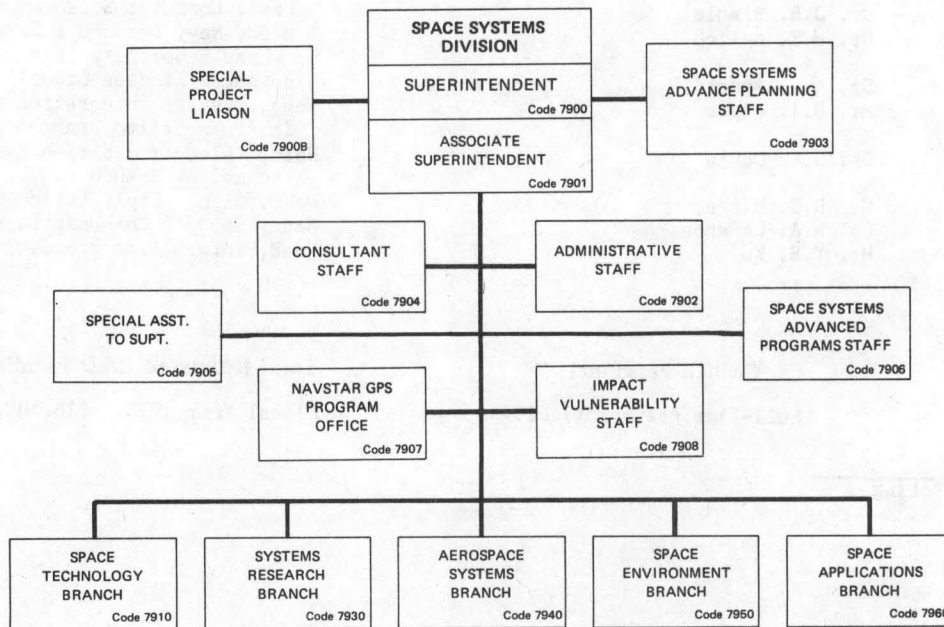
- SPACE TECHNOLOGY
- AEROSPACE SYSTEMS
- SPACE APPLICATIONS
- SPACE ENVIRONMENT
- SYSTEMS RESEARCH



GACT



SOLRAD HI



### 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. Both active and passive sensor technology are developed for space use. 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.

### Staff Activities

<u>Impact Vulnerability</u>	<u>Space Systems Advanced Planning Staff</u>	<u>Space Systems Advanced Programs Staff</u>	<u>NAVSTAR GPS Program Office</u>
Vulnerability Mechanics	Program Direction (exploratory development efforts)	Program Direction (advanced development)	Navigation
Hypervelocity Kill Machine	Technology Assessment	Conduct research analyses (in-house/contracted)	Geodesy
Hypervelocity Impact Mechanics	Systems Analyses	Integrate analyses and determine system feasibility	Time Synchronization

### Branches

<u>Space Technology</u>	<u>Aerospace Systems (continued)</u>
Large parabolic antenna systems	Satellite system research
Electromagnetic radiation observations	Data systems
Special media propagation	Automatic computations
Electromagnetic exosphere phenomena	
	<u>Space Environment</u>
<u>Systems Research</u>	Space environment
Image processing research	Ionospheric predictions
Radiative transfer	Radio-wave propagation
Potential theory applications	Data processing
Space mission analysis	Computer simulation
Military OR methods	Solar-terrestrial relationships
Formula manipulation on computers	
	<u>Space Applications</u>
<u>Aerospace Systems</u>	Navigation systems
Ocean surveillance	Satellite tracking
Electromagnetic scatter research	Geodesy systems
Propagation research	Time synchronization
O/S display systems	System analysis
	Hydrogen maser

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. N.W. Guinard	Superintendent
Mr. B.C. Dodson*	Associate Superintendent
Mrs. S.M. Randleman	Administrative Officer
Mr. P.E.V. Shannon	Staff Leader, Space Systems
	Advanced Planning Staff
Dr. H.W. Gandy	Special Assistant
Mr. B.C. Dodson	Staff Leader, Space Systems
	Advanced Programs Staff
Dr. P. Lanzano	Senior Research Scientist
Dr. K.I. Alfried	Head, Technical Staff
Mr. R.L. Easton	Manager, NAVSTAR GPS Program
Mr. W.W. Atkins	Head, Impact Vulnerability Staff
Mr. J.H. Trexler	Head, Space Technology Branch
Dr. A.F. Petty	Head, Systems Research Branch
Mr. H.O. Ankenbruck	Head, Aerospace Systems Branch
Dr. J.M. Goodman	Head, Space Environment Branch
Mr. R.L. Easton	Head, Space Applications Branch

### Civilian Personnel

Full-Time Permanent: 115

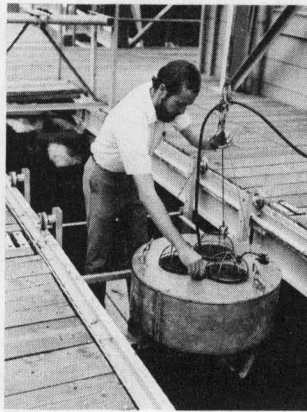
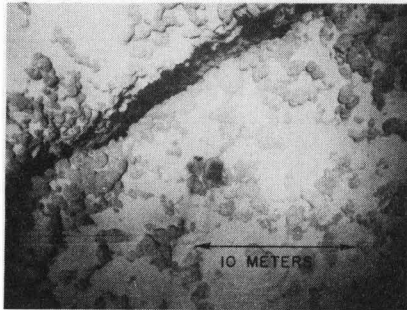
### Total Estimated R&D Funding

Fiscal Year 1978: \$14,350,000

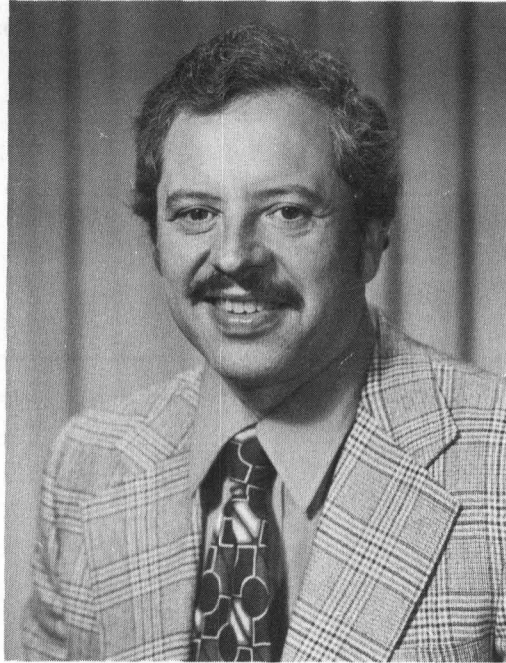
\*Acting

## Oceanology Directorate

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 the focal point in the Navy for standardization of underwater sound measurements, and holds a major responsibility for research and development in undersea acoustic surveillance.



## Associate Director of Research and Director of Oceanology



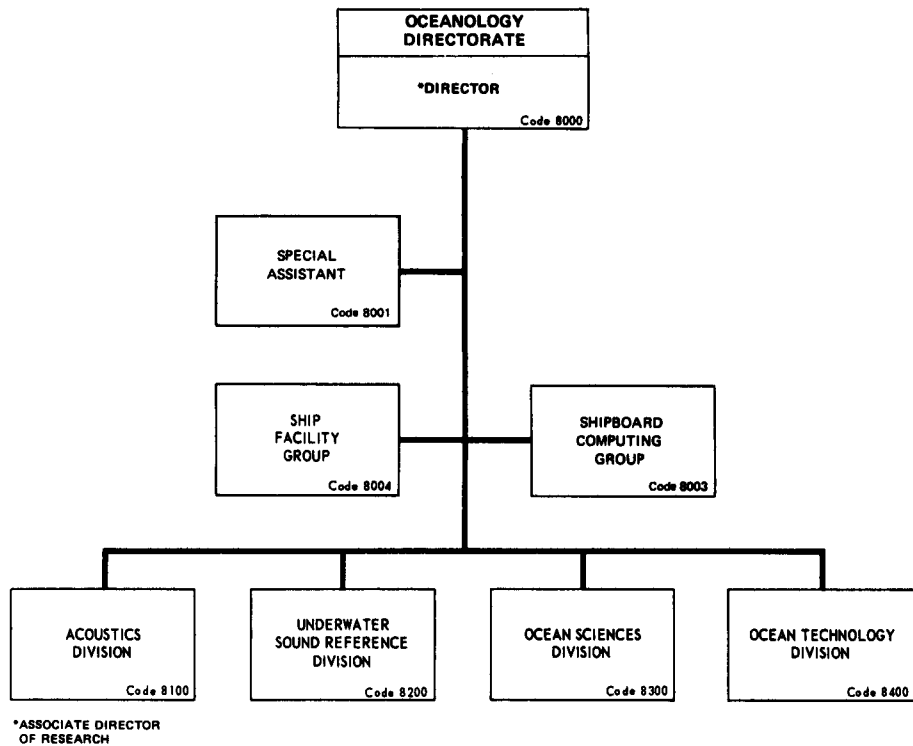
Mr. Richard R. Rojas

Mr. Rojas [REDACTED] He attended the College of the City of New York, where in 1952 he received a BEE degree. In 1961 he received a MEE degree from Drexel Institute of Technology, Philadelphia. Further graduate studies in mathematics and engineering were taken at the University of Pennsylvania, Philadelphia.

From 1952 to 1960, Mr. Rojas was a project engineer in the Missile Department at Philco Corporation where he participated in the TALOS, TERRIER, and TARTAR missile fuze programs, and the Terrier missile guidance project. While at Philco, he received a company achievement award for his work on the design of specialized missile test equipment. From 1960 to 1969 he was manager of the Hydroacoustics Department at the Magnavox General Atronics Corporation. At General Atronics he was active in the area of signal processing techniques as applied to sonar, communication systems, and seismic detection systems. In 1969, he joined the Naval Research Laboratory as Head of the Advanced Undersea Surveillance Program. In this capacity he had the responsibility for directing an experimental and theoretical program whose purpose was to evaluate and develop advanced surveillance systems for the Navy. Mr. Rojas also was on the graduate teaching staff at the Pennsylvania State University.

Mr. Rojas' research interests are centered on signal processing and the physics of underwater acoustic propagation, ambient noise, and reverberation.

Mr. Rojas is a member of the Acoustical Society of America, Sigma Xi, the Institute of Electrical and Electronics Engineers, and a charter member of the Marine Technology Society.



### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. R.R. Rojas	Associate Director of Research and Director of Oceanology
Mr. W.L. Brundage, Jr.	Special Assistant
Mr. D. Steiger	Head, Shipboard Computing Group
Mr. A.L. Gotthardt	Head, Ship Facility Group
Dr. J.C. Munson	Superintendent, Acoustics Division
Mr. R.J. Bobber	Superintendent, Underwater Sound Reference Division
Dr. V.J. Linnenbom	Superintendent, Ocean Sciences Division
Dr. J.P. Walsh	Superintendent, Ocean Technology Division

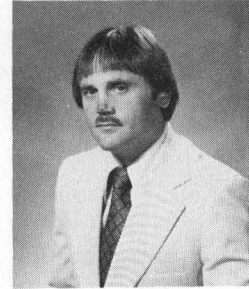
# SHIPBOARD COMPUTING GROUP

## Basic Responsibilities

The Shipboard Computing Group develops, operates, and maintains computer facilities on NRL's research ship, NRL aircraft, and at the Laboratory. The Group assists experimenters in the use of their measuring equipment and in the utilization of the computer system in the automatic acquisition, reduction, and processing of their data. The Group performs this work under the Director of Oceanology.

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. D. Steiger	Head, Shipboard Computing Group



Mr. D. Steiger

### Civilian Personnel

Full-Time Permanent: 6

# SHIP FACILITY GROUP

## Basic Responsibilities

The Ship Facility Group is responsible for coordinating, maintaining, and providing ship services, sea-going facilities, and specialized expertise in the area of navigation, communication, explosives, and deck handling common to and required by the at-sea experiments of research divisions under the Director of Oceanology.

### Key Personnel

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



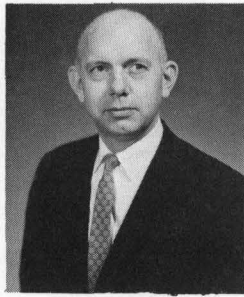
Mr. A. L. Gotthardt

### Civilian Personnel

Full-Time Permanent: 14

### Total Estimated R&D Funding

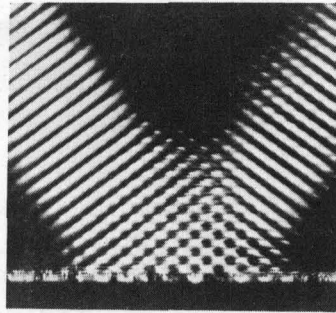
Fiscal Year 1978: \$4,000,000



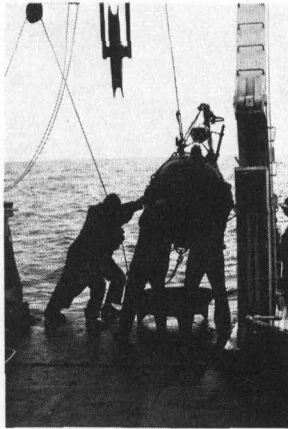
Dr. J. C. Munson

# Acoustics Division

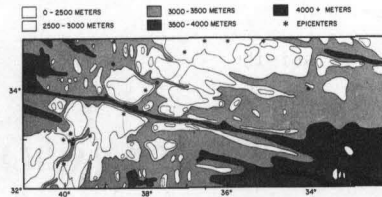
- APPLIED OCEAN ACOUSTICS
- LARGE APERTURE ACOUSTICS
- PHYSICAL ACOUSTICS
- SYSTEMS ENGINEERING



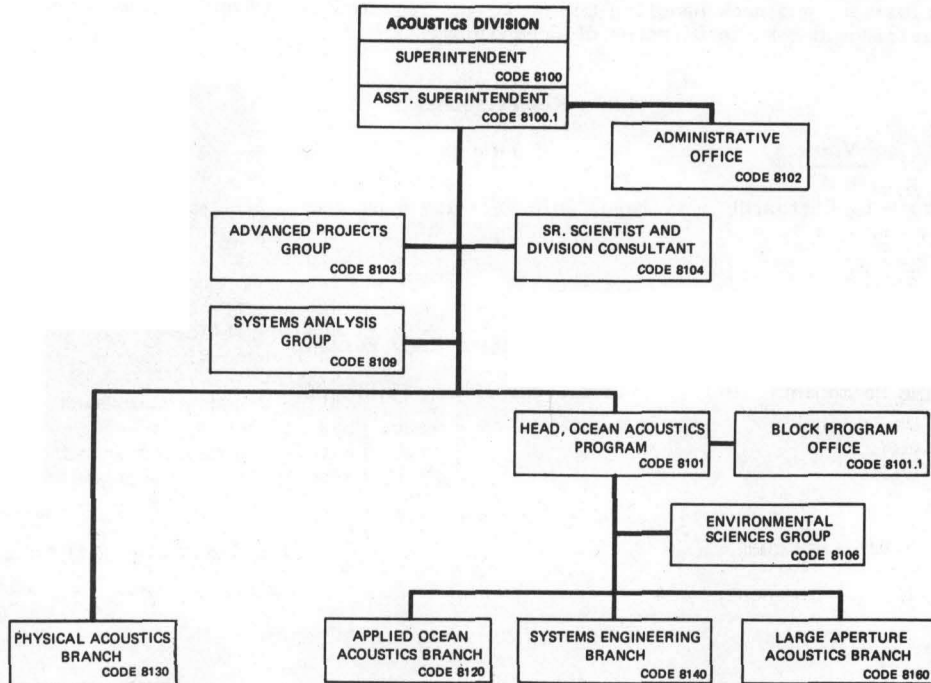
ACOUSTIC FIELD VISUALIZATION WITH SCHLIEREN TECHNIQUES



LAUNCHING EXPERIMENTAL BUOYS



MAP OF HAYES FRACTURE ZONE



## Basic Responsibilities

The Acoustics Division has major responsibilities for basic and applied research and development in the Navy's undersea acoustic surveillance programs. The main thrust of the Division program is to measure and model the ocean environment as it pertains to the development and use of acoustic detection and classification systems. Accordingly, the program consists of analyses and model development of long-range propagation, coherency, wave-front behavior, ambient noise, and reverberation in the deep ocean. Special areas of interest include propagation and ambient noise in the Arctic and in acoustically shallow water. Models developed in this program are used in the performance prediction of operational or developmental acoustic detection systems or of proposed system concepts. Other research areas in the Division program include target strength measurement and modeling; diffraction, reflection, and scattering; and the use of acoustical techniques in measuring the thermodynamic properties of materials. The program is both theoretical and experimental and is supported by systems analyses and systems engineering, particularly in support of the extensive at-sea experimental part of the program. The Division interacts with research programs outside the Division and the Laboratory in areas such as materials, transducer development, oceanography, deep-ocean technology, systems analysis, and Fleet operations.

## Staff Activities

### Environmental Sciences

Research & development to establish geophysical & oceanographic parameters influencing underwater acoustics

### System Analysis

Systems studies  
Surveillance system concepts and evaluation

### Advanced Projects

Advanced surveillance systems  
Information processes for underwater acoustics

## Branches

### Applied Ocean Acoustics

Shallow-water acoustics  
Mode analysis  
Models of signal and noise fields  
Long-range propagation  
Very low frequency  
Convergence zone stability  
Arctic underwater acoustics  
Propagation  
Noise

### Large Aperture Acoustics

Propagation, coherency, and wave-front behavior  
Large-scale spatial and temporal integration  
Array deformation  
Ambient noise measurements and modeling  
Low-frequency monostatic and bistatic reverberation

### Physical Acoustics

Reflection, diffraction, scattering by bodies  
Target strength modeling  
Schlieren visualization  
Fiber optic acoustic sensors

### Systems Engineering

Engineering Research & Development  
Develop/provide equipment for ocean-going program  
Participate in at-sea experiments

## Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J.C. Munson	Superintendent
Mr. B.G. Hurdle	Assistant Superintendent
Mrs. J.L. Wilkerson	Administrative Officer
Dr. S. Hanish	Senior Scientist and Division Consultant
Mr. W.J. Finney	Head, Advanced Projects Group
Dr. J.C. Munson*	Head, Ocean Acoustics Program
Mr. F.C. Titcomb	Block Program Office
Mr. H.S. Fleming	Head, Environmental Sciences Group
Dr. J.C. Knight	Head, Systems Analysis Group
Mr. R.H. Ferris	Head, Applied Ocean Acoustics Branch
Dr. C.M. Davis, Jr.	Head, Physical Acoustics Branch
Dr. J.C. Munson*	Head, Systems Engineering Branch
Dr. B.B. Adams	Head, Large Aperture Acoustics Branch

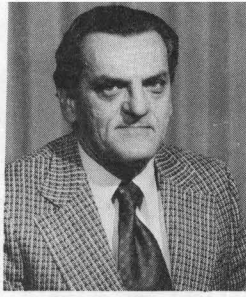
### Civilian Personnel

Full-Time Permanent: 104

### Total Estimated R&D Funding

Fiscal Year 1978: \$9,850,000

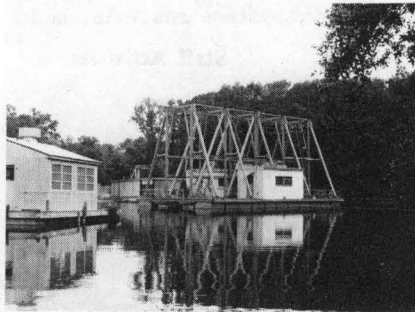
\*Acting



Mr. R. J. Bobber

# Underwater Sound Reference Division

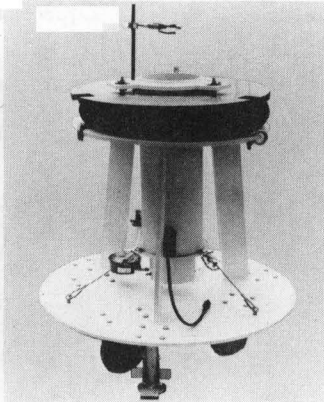
- MEASUREMENTS
- COMPUTER
- TRANSDUCER
- ELECTRONICS
- SUPPLY AND FISCAL
- ENGINEERING SERVICES



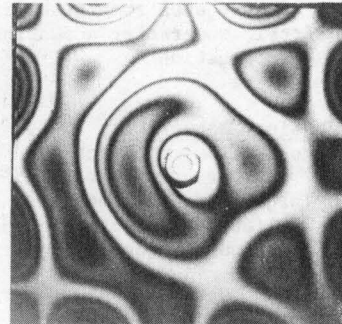
LEESBURG FACILITY - CALIBRATION BARGE



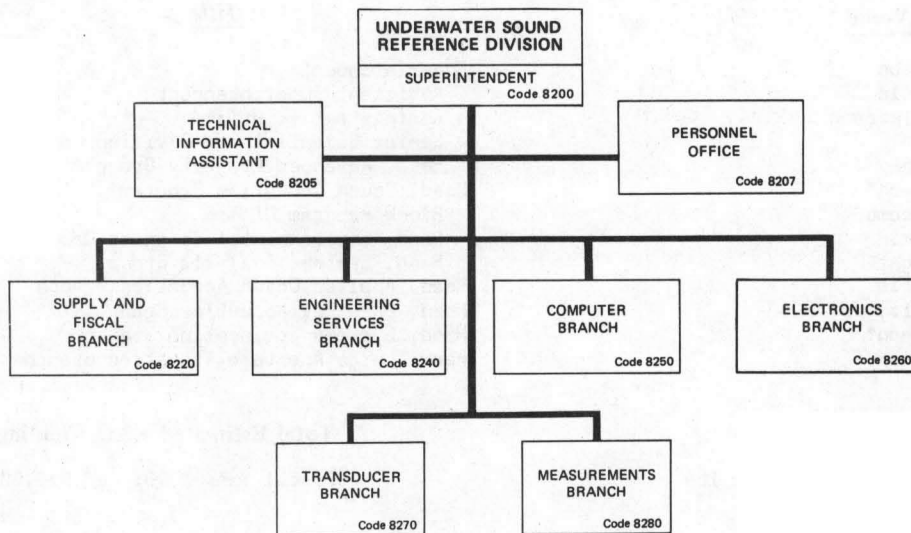
UNDERWATER SOUND REFERENCE DIVISION, ORLANDO, FLORIDA



USRD TYPE G40 SHIPBOARD CALIBRATOR



HOLOGRAM OF VIBRATING TRANSDUCER DIAPHRAGM



### Basic Responsibilities

The Underwater Sound Reference Division is the 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

#### Measurements

Calibration theory and accuracy  
Measurement methods  
Standard calibration services  
Sonar transducer test and evaluation  
Transduction and radiation theory  
Nonlinear acoustics

#### Computer

Computerized data reduction  
Computation services

#### Transducer

Acoustic materials  
Acoustic material measurements  
Electroacoustic standards  
Acoustic sources  
Specialized electroacoustic transducers  
Standard loan services  
Transduction

#### Electronics

Digital systems  
Analog systems  
Signal analysis

### Key Personnel

<u>Name</u>	<u>Title</u>
Mr. R.J. Bobber	Superintendent
Ms. D.A. Pieper	Technical Information Assistant
Mrs. M.S. Williams	Personnel Officer
Mr. J.C. Michael	Head, Supply and Fiscal Branch
Mr. W.V. Carlson	Head, Engineering Services Branch
Mr. J.D. George	Head, Computer Branch
Mr. M.O. Rhue	Head, Electronics Branch
Mr. I.D. Groves†	Head, Transducer Branch
Dr. J.E. Blue	Head, Measurements Branch

#### Civilian Personnel

Full-Time Permanent: 84

#### Total Estimated R&D Funding

Fiscal Year 1978: \$2,900,000

†Additional duty as Associate Superintendent

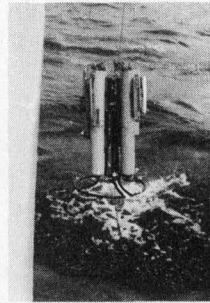


Dr. V. J. Linnenbom

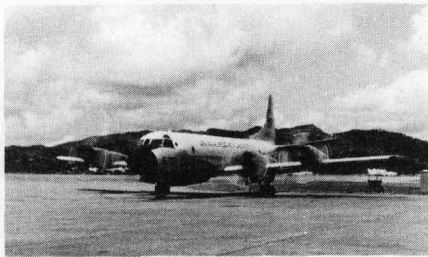
# Ocean Sciences Division

- APPLIED OCEANOGRAPHY
- ATMOSPHERIC PHYSICS
- CHEMICAL OCEANOGRAPHY
- PHYSICAL OCEANOGRAPHY
- MARINE BIOLOGY AND BIOCHEMISTRY

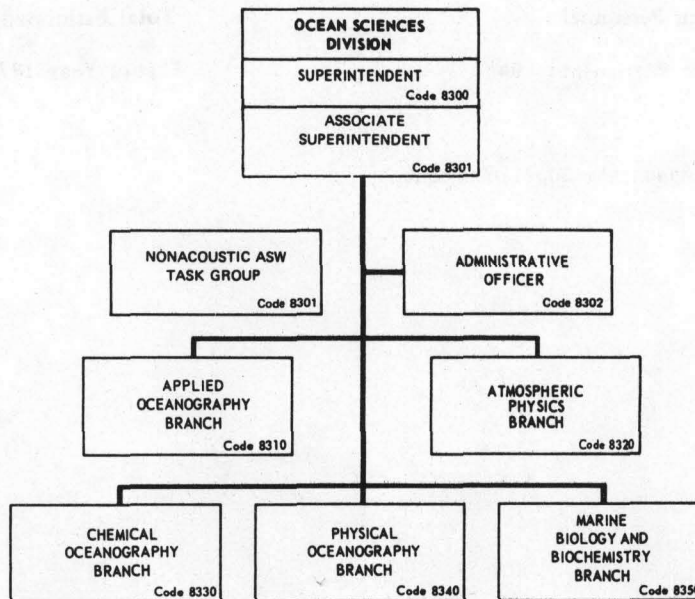
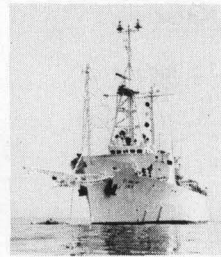
## OCEANOGRAPHY



## ATMOSPHERIC PHYSICS AND CHEMISTRY



## AIR-SEA INTERACTIONS



## Basic Responsibilities

The primary responsibility of the Ocean Sciences Division is research on fundamental problems in oceanography and the atmospheric sciences. At present, the Division studies problems in physical, chemical, and biological oceanography and in atmospheric physics to gain a better understanding of the Navy's operational environment. This knowledge is applied to various Navy programs in antisubmarine warfare, protection of the marine environment, protection against biodegradation of naval materials, and prediction of oceanic and atmospheric phenomena affecting naval operations.

## Staff Activity

Nonacoustic ASW (R&D) Task Group

### Branches

#### Applied Oceanography

Antisubmarine warfare  
Hydrodynamics of submerged bodies

#### Atmospheric Physics

Marine boundary layer meteorology  
Aerosol and cloud physics  
Atmospheric electricity  
Electro-optics meteorology

#### Chemical Oceanography

Physical chemistry of seawater  
Dissolved gases in seawater  
Marine aerosols  
Interface Chemistry

#### Physical Oceanography

Ocean dynamics  
Mixed layer studies  
Wave interactions  
Mesoscale variability

#### Marine Biology & Biochemistry

Biodegradation of naval materials  
Marine pollution  
Bioluminescence  
Chemosensing

## Key Personnel

<u>Name</u>	<u>Title</u>
Dr. V.J. Linnenbom	Superintendent
Dr. J.O. Elliot	Associate Superintendent and Director, Nonacoustic ASW (R&D) Task Group
Mrs. R.M. Baltzell	Administrative Officer
Dr. A.H. Schooley	Senior Research Scientist
Dr. J.O. Elliot*	Head, Applied Oceanography Branch
Dr. L.H. Ruhnke	Head, Atmospheric Physics Branch
Dr. C.H. Cheek	Head, Chemical Oceanography Branch
Dr. J.M. Witting	Head, Physical Oceanography Branch
Dr. D.W. Strasburg	Head, Marine Biology and Biochemistry Branch

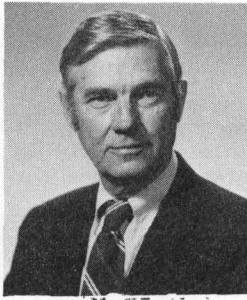
### Civilian Personnel

Full-Time Permanent: 70

### Total Estimated R&D Funding

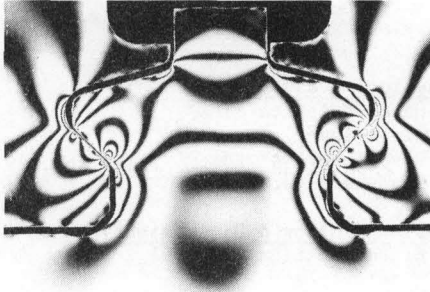
Fiscal Year 1978: \$4,750,000

\*Acting



Dr. J. P. Walsh

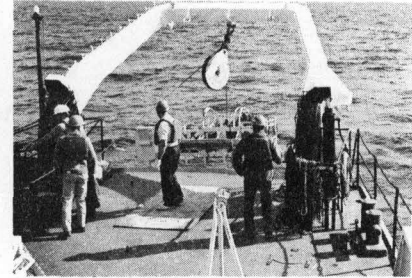
# Ocean Technology Division



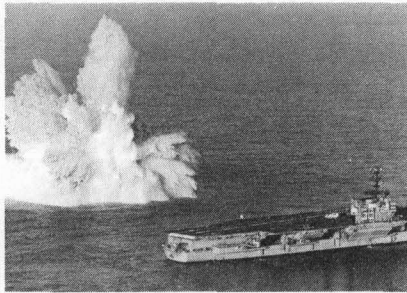
PHOTOELASTIC PATTERN OF THE STRESS DISTRIBUTION IN THE BLADE LUG REGION OF THE THIRD STAGE OF A TURBINE ENGINE



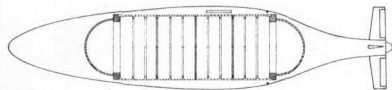
VORTEX SHEDDING FROM A VIBRATING CYLINDER



DEEP OCEAN SEARCH SYSTEM

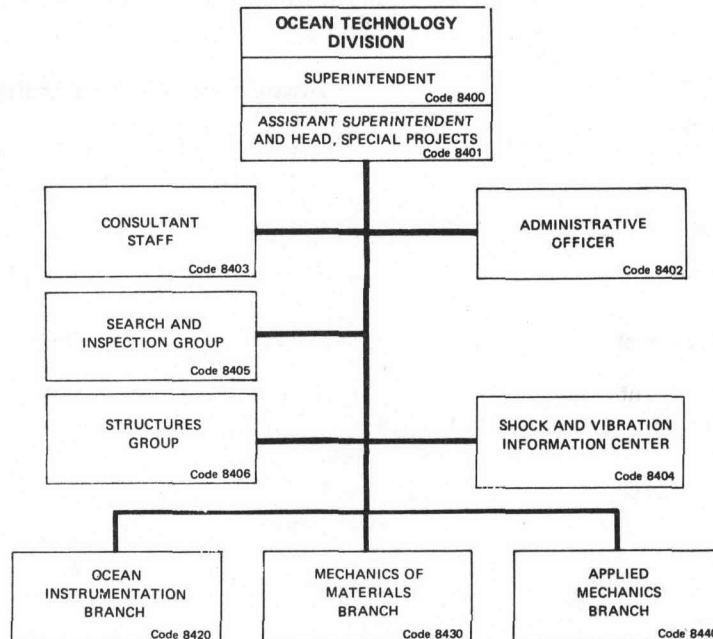


UNDERWATER SHOCK TEST OF AN AIRCRAFT CARRIER



UNDERWATER FREE SWIMMING SUBMERSIBLE

- MECHANICS OF MATERIALS
- OCEAN INSTRUMENTATION
- APPLIED MECHANICS



## Basic Responsibilities

The Ocean Technology Division conducts research and development in the following ocean engineering fields: the mechanics of materials in the ocean environment; hydromechanics with emphasis on fluid-structure interactions; structural mechanics; instrumentation, sensors, and robots for use in the ocean. The Shock and Vibration Information Center provides a source of information on shock and vibration for engineers nationwide.

## Staff Activities

S&V Information Center  
Search and Inspection Group  
Structures Group

## Branches

### 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

### Mechanics of Materials

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

### Ocean Instrumentation

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

## Key Personnel

<u>Name</u>	<u>Title</u>
Dr. J.P. Walsh	Superintendent
Dr. R.T. Swim*	Assistant Superintendent
Mrs. A.G. Branham	Administrative Officer
Mr. H.C. Pusey	Head, S&V Information Center
Mr. G.O. Thomas	Head, Search and Inspection Group
Mr. G.J. O'Hara	Head, Structures Group
Mr. H.A. Johnson	Head, Ocean Instrumentation Branch
Dr. J.M. Krafft	Head, Mechanics of Materials Branch
Dr. F. Rosenthal	Head, Applied Mechanics Branch

### **Civilian Personnel**

Full-Time Permanent: 63  
Military: 42

### **Total Estimated R&D Funding**

Fiscal Year 1978: \$5,800,000

\*Acting

# Awards Received by Civilian Employees

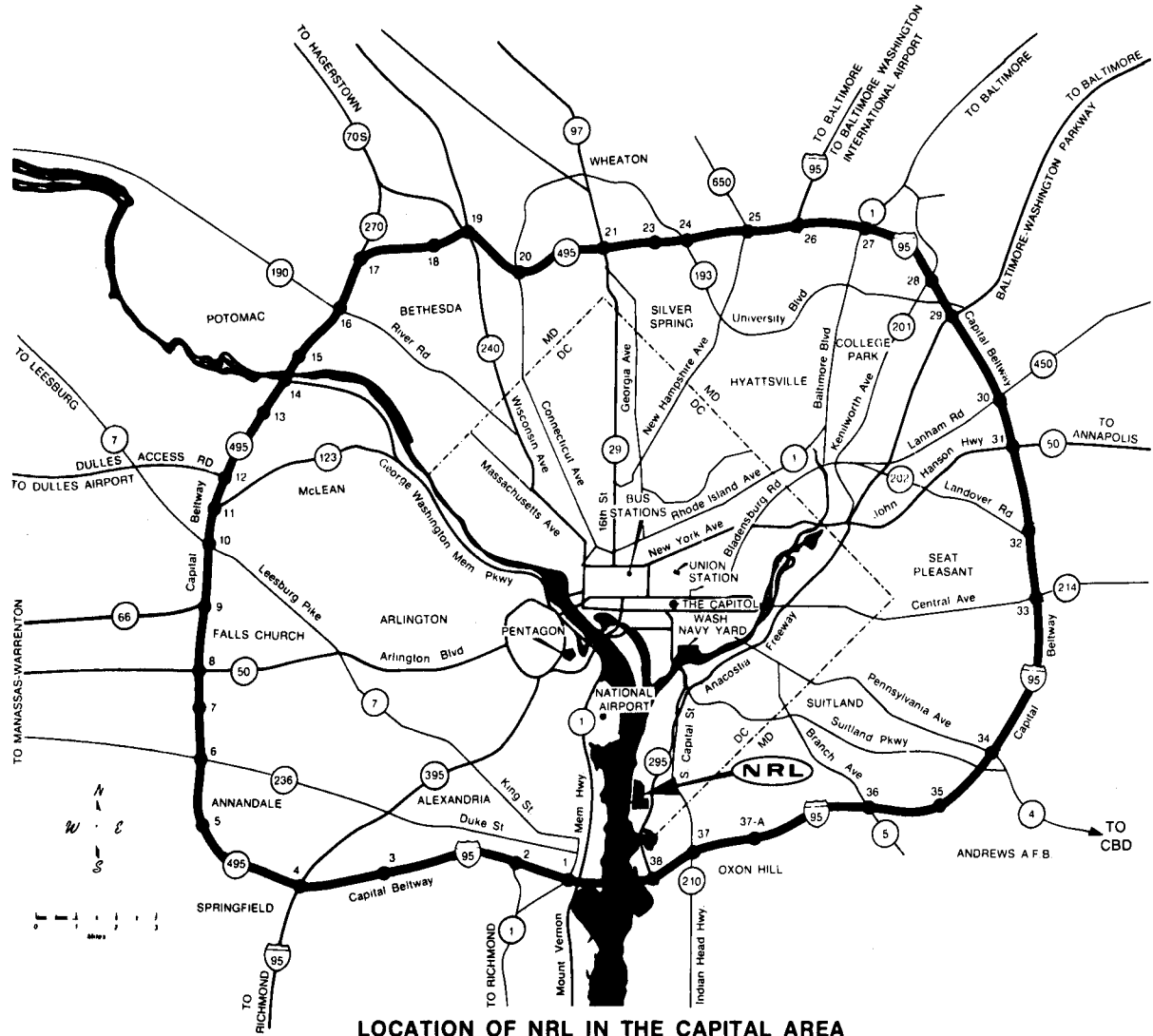
As of January 1, 1978

<u>Government Awards</u>	<u>Number</u>
Chair of Science Award (local NRL Award)	4
Department of Defense Certificate of Merit	1
Department of Defense Distinguished Civilian Service Award	6
E.O. Hulburt Annual Science Award (local NRL Award)	22
Federal Woman's Award	1
NASA Scientific Achievement Medal	1
National Medal of Science from the President of the United States	1
Navy Award for Distinguished Achievement in Science	5
Navy Captain Robert Dexter Conrad Award	7
Navy Distinguished Civilian Service Award	63
Navy Meritorious Civilian Service Award	219
Navy Superior Civilian Service Award	46
Secretary of the Navy Environmental Protection Award	1
The Certificate of Merit from the President of the United States	11
The Medal of Merit from the President of the United States	1
The President's Award for Distinguished Federal Civilian Service	2
 <u>Nongovernment Awards</u>	
A.G. Bissell Memorial Award of the American Welding Society	1
A.K. Doolittle Award of the American Chemical Society	1
Albert A. Michelson Award of the Franklin Institute	1
Albert Sauveur Achievement Award	1
American Nuclear Society Special Award	1
Ancel Prize of the French Photographic Society	1
Annual Award of the Society for Applied Spectroscopy	2
Applied Science Award of Sigma Xi	26
Arthur S. Fleming Award of the Washington Chamber of Commerce	5
Award in the Chemistry of Plastics & Coatings of the American Chemical Society	1
Award of Merit of the Society of Technical Writers and Publishers - Washington, D.C. Chapter	1
Award of Merit of the American Society for Testing and Materials	3
Brazilian Legion of Naval Merit	1
Burgess Memorial Award of the American Society for Metals	4
Burgess Memorial Lecture of the American Society for Metals (Washington Section)	1
Burgess Prize Award of the American Society for Metals	2
Charles B. Dudley Medal of the American Society for Testing Materials	4
District Meritorious Certificate Award of the American Welding Society	1
Dryden Research Award of the American Institute of Aeronautics and Astronautics	1
E. Edward Pendray Award of the American Rocket Society	1
Eddington Medal of the Royal Astronomical Society (Great Britain)	2
Engineers and Architects Day Award	4
Engineering Science Award of the Washington Academy of Sciences	2
Frank Booth Award - International Power Sources Symposium	1
Frederic Ives Award of the Optical Society of America	2
Garvan Medal of the American Chemical Society	1
Gold Medal Award of the American Society of Naval Engineers	2
Harry Diamond Award of the Institute of Radio Engineers	4
Henry Draper Medal of the National Academy of Sciences	1
Hillebrand Prize of the American Chemical Society	4
Irwin Vigness Award of the Institute of Environmental Sciences	1
James H. Wyld Memorial Award of the American Rocket Society	1
Janssen Medal of the French Photographic Society	1
John Adam Fleming Award of the American Geophysical Union of the National Academy of Sciences - National Research Council	1
John A. Penton Gold Medal of the American Foundrymen's Society	1
John Scott Medal of the City of Philadelphia	1
Joseph S. Seaman Gold Medal Award of the American Foundrymen's Society	1
Kendall Company Award of the American Chemical Society	1
Kratel Award of the Eurocontamination Foundation	1

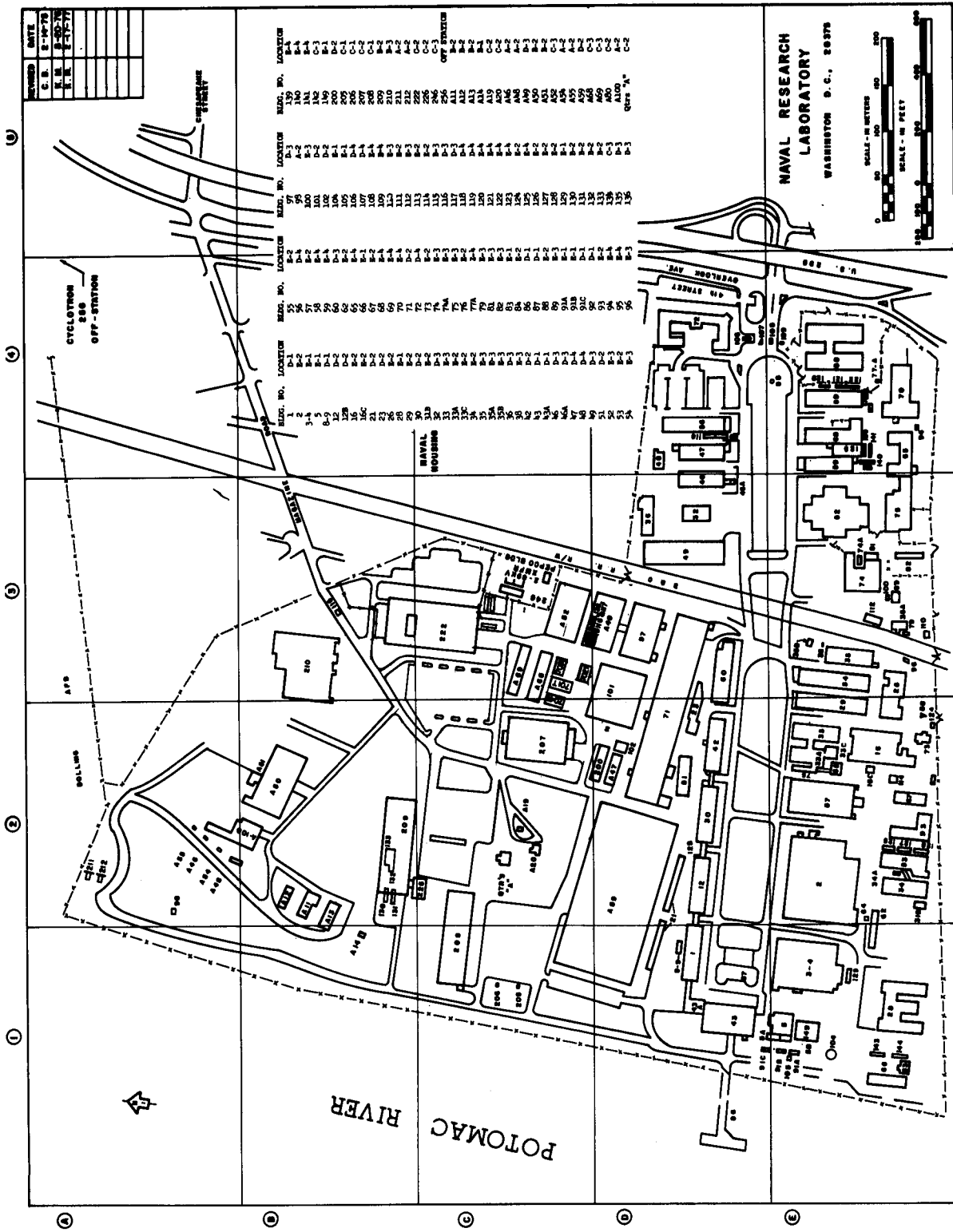
Nongovernment Awards (Continued)

	<u>Number</u>
M. Barry Carlton Award Institute of Electrical & Electronics Engineers	1
Marcus A. Grossman Award of the American Society of Metals	2
Mayo D. Hersey Award of the American Society of Mechanical Engineers	1
Medal of Honor Award of the Institute of Radio Engineers	2
Merit Award of Carnegie-Mellon University	1
Morris Liebman Memorial Prize of the Institute of Radio Engineers	1
National Academy of Sciences, elected members	3
National Capital Award of the D.C. Council of Engineering and Architectural Studies	3
National Civil Service League Career Service Award	1
National Award of the American Society of Lubrication Engineers	1
Notre Dame Centennial Award	2
Outstanding Americans Foundation Award	1
Patrons Award of the Institute of Radio Engineers	2
Physical Science Award of the Washington Academy of Sciences	5
Pittsburgh Spectroscopy Award of the Spectroscopy Society of Pittsburgh	1
Professional Achievement Award of the D.C. Council of Engineering and Architectural Societies	1
Progress Award of the Photographic Society of America	1
Pure Science Award of Sigma Xi	26
Reliability and Quality Control Award of the Radio Engineers Professional Group	2
Rockefeller Public Service Award	1
Sam Tour Award of the American Society for Testing and Materials	2
Scientific Achievement Award of the Washington Academy of Sciences	1
Service Award of the Chemical Society of Washington	1
Service to Mankind Award of the Washington Sertoma Club	1
Society of Technical Writers & Publishers - Washington, D.C. Chapter	1
Society of Women Engineers Achievement Award	1
Space Science Award of the American Institute of Aeronautics & Astronautics	1
Stuart Ballantine Medal of the Franklin Institute of Pennsylvania	2
Technical Achievement Award of the American Society of Mechanical Engineers	1
Trent - Credo Award of the Acoustical Society of America	1
United Negro College Fund Distinguished Service Citation	1
Victor K. LaMer Award of the Colloid and Surface Chemistry Division, American Chemical Society	1
William Blum Award of the Washington-Baltimore Electrochemical Society	5
William Hunt Eisenman Medal of the American Society for Metals	1

# Location of NRL



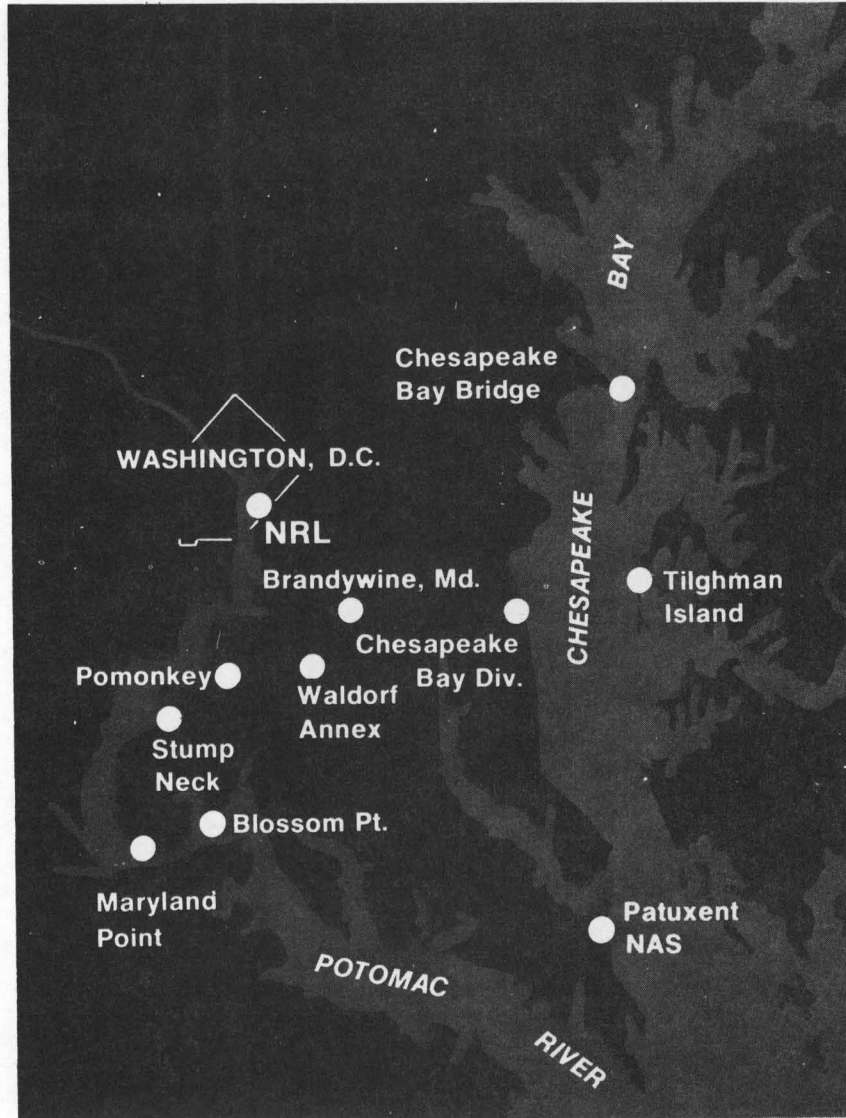
# Location of Buildings at Main Site





# Location of Principal Field Stations

The Underwater Sound Reference Division is located at Orlando, Fla.



## Key Personnel

<u>Code</u>	<u>Office and Incumbent</u>	<u>Ext.</u>
OFFICE OF COMMANDING OFFICER/DIRECTOR OF RESEARCH		
1000	Commanding Officer	CAPT L.M. Noel 73403
1001	Director of Research	Dr. A. Berman 73301
1003	DEEO Officer	Mr. W.H. Webster 72486
1004	Executive Assistant	Mr. S.L. Cohen 73231
1005	Public Affairs Officer	Mr. J.E. Sullivan 72541
1010	Research Program Office	Mr. A. Hollings 73081
1100	Director, Management Office	Mr. A.M. Toscano 72030
1200	Chief Staff Officer	CAPT E.L. Ebbert 73621
1226	Security Section	Mr. R.E. Abercrombie 73711
1300	Comptroller	Mr. P.F. Kennedy 73405
1400	Head, Mgt. Info. & Spec. Prog. Org.	Mr. R. E. Ellis 73666
1700	Head, Res. Comp. Center	Mr. A.B. Bligh 72751
1800	Director of Civ. Pers.	Mr. F.D. Wallace 73421
1810	Personnel Operations	Mr. D.J. Blome 73030
SUPPORT SERVICES DIRECTORATE		
2000	Director of Support Services	CAPT K.P. Hughes 72879
2100	Head, Administrative Office	Mr. J. Cooper 73859
2300	Engineering Services Officer	CDR A.P. Amesse 72300
2400	Supply Officer	CDR R.W. Gunther 73446
2500	Public Works Officer	CDR V. Podbielski 73371
2600	Head, Tech. Info. Div.	Mr. E.E. Kirkbride 73388
2700	Chesapeake Bay Div. Officer (CBD Interdepartmental Dial System Tel. No. is 1220-201, Outside Tel. No. is Area Code 301-257-2111)	CDR B.A. Bauer
RESEARCH DIRECTORATES		
5000	Director of Electronic Sci. & Tech.	Dr. H.Q. North 73324
5200	Electronics Tech. Div. Supt.	Mr. A. Brodzinsky 73525
5300	Radar Div. Supt.	Dr. M.I. Skolnik 72936
5500	Optical Sciences Div. Supt.	Dr. T.A. Jacobs 73171
5700	Tactical Elec. Warfare Div. Supt.	Mr. L.A. Cosby 72191
6000	Director of Mat. & Rad. Sci. & Tech.	Dr. A.I. Schindler 73566
6030	Lab for Structure of Matter	Dr. J. Karle 72665
6070	Radiol. and Environ. Protection	Mr. L.A. Brauch 72232
6100	Chemistry Div. Supt.	Dr. F.E. Saalfeld 73026
6300	Mat. Sci. & Tech. Div. Supt.	Dr. L.R. Hettche 72926
6600	Radiation Tech. Div. Supt.	Dr. J. McElhinney 72931
6700	Plasma Physics Div. Supt.	Dr. T.P. Coffey 72723
7000	Director of Space & Commun. Sci. and Tech.	Dr. H. Rabin 72964
7020	Lab for Cosmic Ray Physics	Dr. M.M. Shapiro 72965
7030	Advanced Projects Office Manager	Mr. R.D. Mayo 72043
7040	Spacecraft Technology Center	Mr. P.G. Wilhelm 72073
7100	Space Science Div. Supt.	Dr. H. Friedman 73363
7500	Commun. Sciences Div. Supt.	Dr. B. Wald 72903
7900	Space Systems Div. Supt.	Mr. N.W. Guinard 73468
8000	Director of Oceanology	Mr. R.R. Rojas 73294
8100	Acoustics Div. Supt.	Dr. J.C. Munson 73482
8200	Underwater Sound Reference Div. Supt. (Area Code 305-859-5120 or via AUTOVON NTC 791-4111)	Mr. R.J. Bobber
8300	Ocean Sciences Div. Supt.	Dr. V.J. Linnenbom 72974
8400	Ocean Technology Div. Supt.	Dr. J.P. Walsh 73314

### MISCELLANEOUS

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