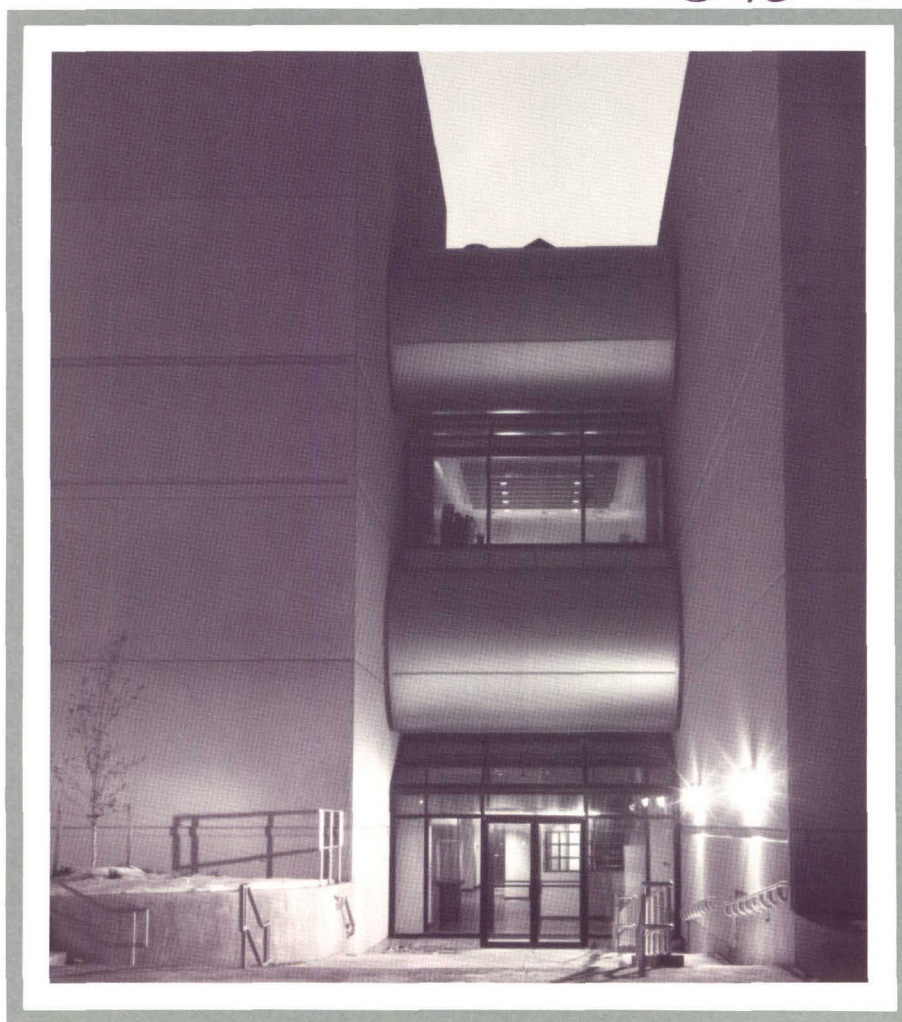




1988 FACT BOOK

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Report Documentation Page

Form Approved
OMB No. 0704-0188

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The NRL Fact Book is prepared as a reference source for information about the Naval Research Laboratory. Personnel and fiscal information are current as of 15 November 1987; organization changes are current as of 26 February 1988. To provide more timely information, a point of contact is listed for various activities.

The Naval Research Laboratory has a continuing need for physical scientists, mathematicians, engineers, and support personnel. Vacancies are filled without regard to age, race, creed, sex, or national origin. Information concerning current vacancies will be furnished on request. Address all such inquiries to:

Civilian Personnel Office (Code 1810)
Naval Research Laboratory
Washington, DC 20375-5000

COVER: Shown is the entranceway to the new electro-optics laboratory, which was built for NRL's Optical Sciences Division. This state-of-the-art research facility includes: computer-controlled environmental systems that monitor and maintain precise temperature, humidity, and air flow in each of its 21 optic labs; a 2-story draw-tower; a class-100 clean-room suite; special vibrationally isolated laboratory floors; secure electromagnetic-interference-shielded vault offices, labs, and computer room; laser-cooling capability; and liquid and gas piping throughout the facility.

REVIEWED AND APPROVED

A handwritten signature in dark ink, appearing to read "W.G. Clautice", with a stylized flourish at the end.

CAPT W.G. Clautice, USN
Commanding Officer

**1988
FACT
BOOK**

**NAVAL RESEARCH LABORATORY
WASHINGTON, DC 20375-5000**

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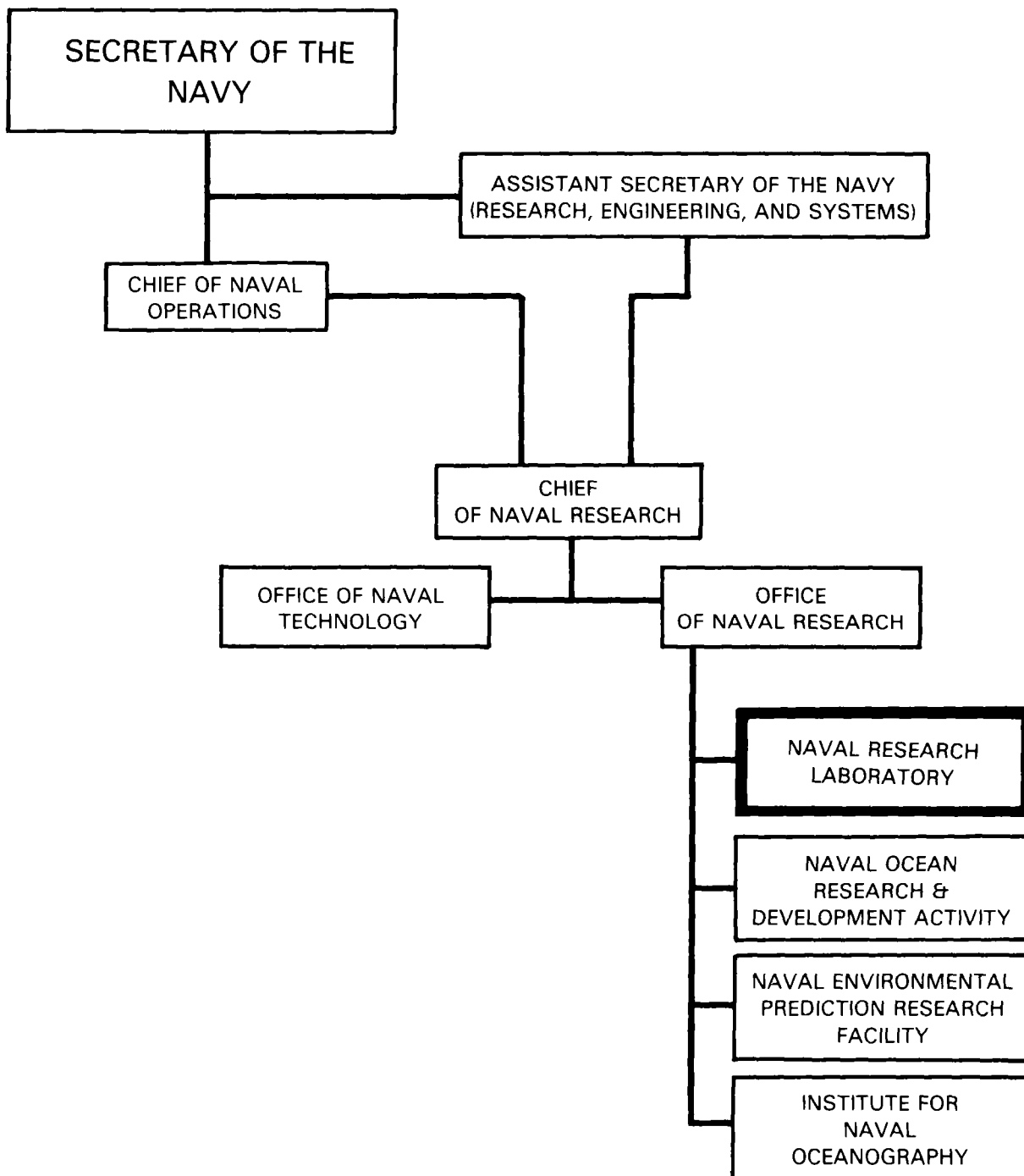
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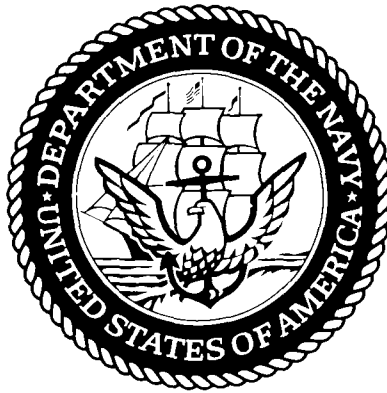
**INTRODUCTION
TO THE
NAVAL RESEARCH
LABORATORY**

Mission

The mission of the Naval Research Laboratory is 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:

- initiates and conducts scientific research of a basic and long-range nature in scientific areas of special interest to the Navy;
- conducts exploratory and advanced technological development deriving from or appropriate to the scientific program areas;
- within areas of technological expertise, develops prototype systems applicable to specific projects;
- 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;
- upon request from appropriate naval commands, assumes responsibility as the Navy's principal R&D center in areas of unique professional competence;
- serves as the principal activity for the Navy and its contractors in providing accurate calibration, test, and evaluation services on acoustic transducers and materials; in providing a service whereby an inventory of calibrated standard acoustic transducers is maintained for issue; and in performing research and development to advance the state of the art of acoustic measurements and standard transducers;
- performs research and development on sonar transducers and related acoustic materials;
- 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; and,
- provides to the Navy determinations of performance characteristics of developmental and prototype devices through limited engineering test and evaluation services.





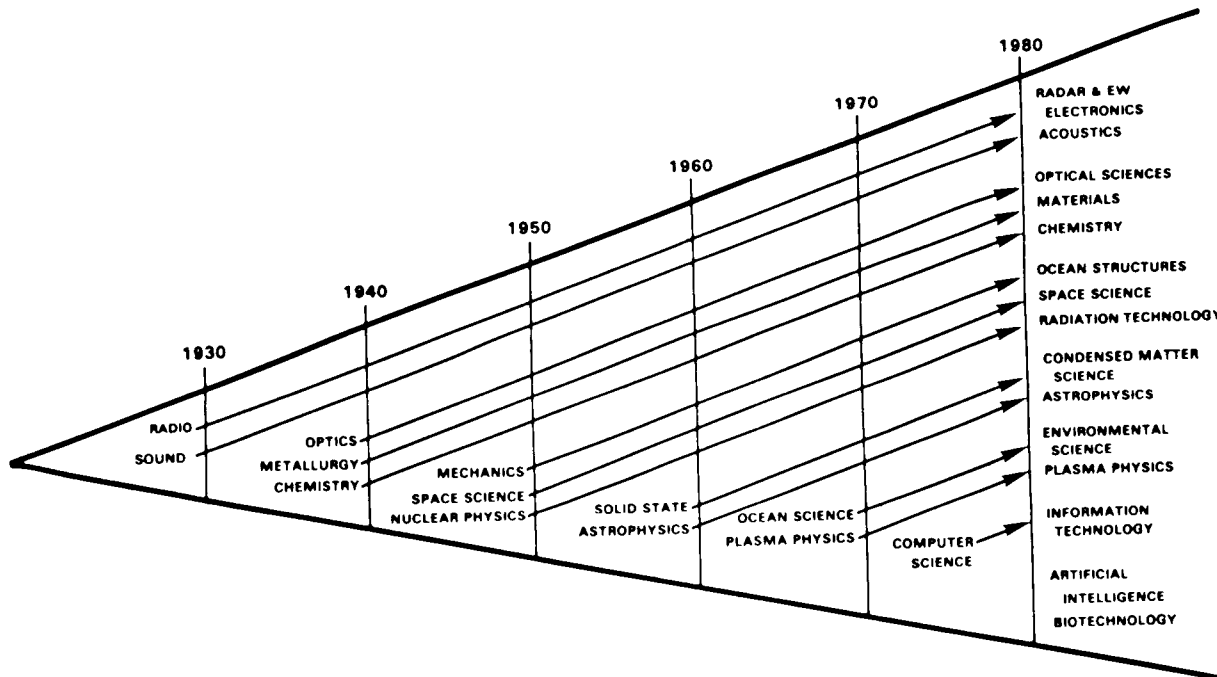
The Naval Research Laboratory in the Department of the Navy

The Naval Research Laboratory (NRL) is the principal in-house research laboratory under the command of the Chief of Naval Research (CNR). As the corporate research laboratory of the Navy, NRL is an important component in the Office of Naval Research's effort to meet its scientific research responsibilities.

For its basic research effort, the Laboratory receives guidance from the CNR that establishes the level of effort and trend direction. The Laboratory then develops a comprehensive research proposal package that is submitted to the CNR for consideration for Navy basic research support. The total Navy basic research program ultimately is evaluated by Congress.

In addition to internal critical review and the evaluation by the CNR and others, the research at NRL is published in refereed journals and/or reported at national and international scientific conferences. There is an aggressive policy of scientific interaction by which scientists from around the world visit NRL and are visited by NRL scientists. In this way, NRL research is subject not only to management review but also to peer evaluation.

NRL is an important link in the Navy R&D chain. Through NRL, the Navy has direct ties with sources of fundamental ideas in the academic community throughout the world and provides an effective coupling point to the R&D chain for the Office of Naval Research (ONR) contract research department.

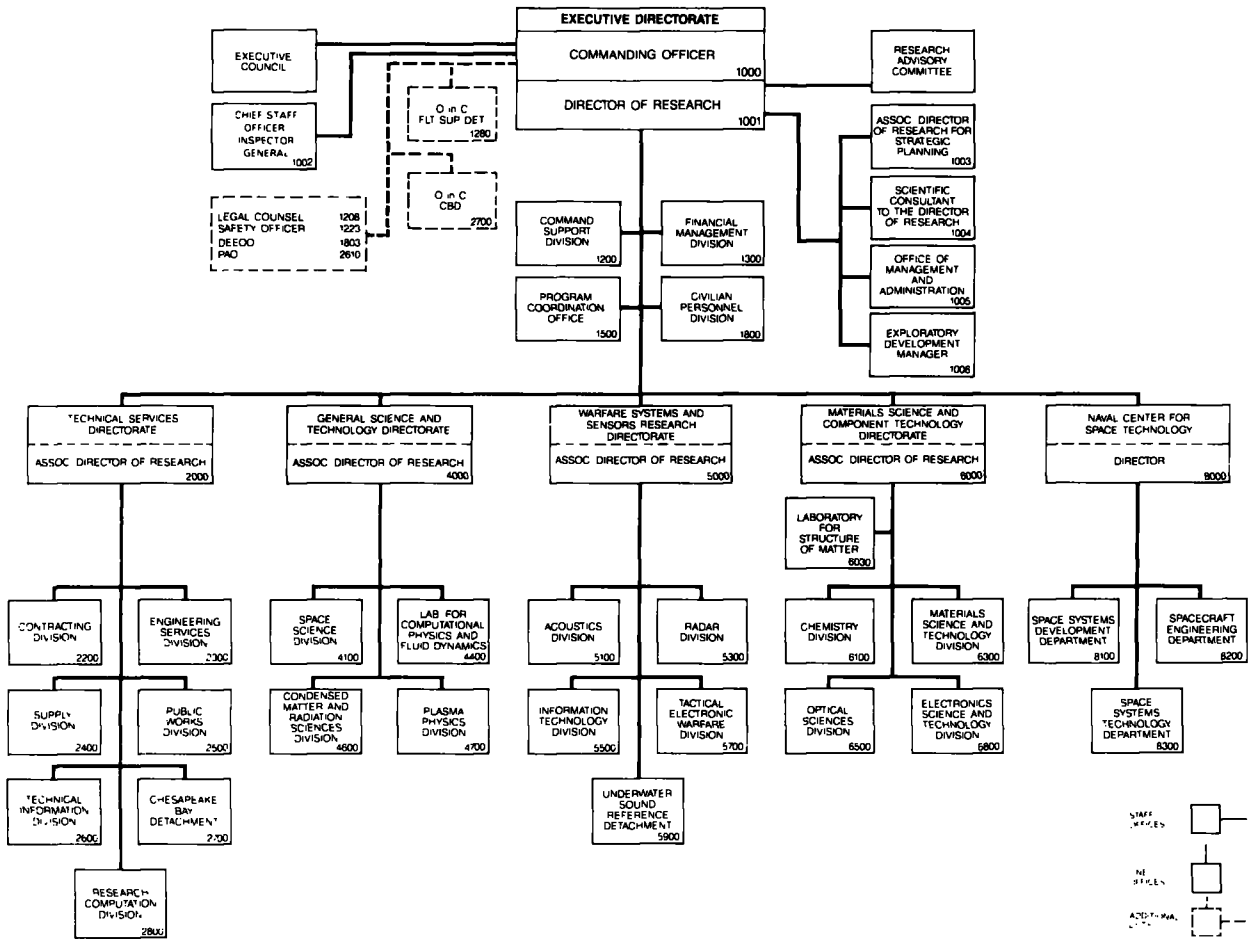


NRL PROGRAM EVOLUTION

The Naval Research Laboratory was officially established on July 2, 1923, as the Naval Experimental and Research Laboratory. In the following six decades, research efforts have expanded from the two original areas of radio and underwater sound to more than 10 broad areas of scientific endeavor, encompassing many diverse fields.

NRL has been designated a major shore command and is led by a Navy captain who serves as commanding officer. The principal official under the commanding officer responsible for directing Laboratory operations is the director of research, a senior civilian. The Laboratory's overall management structure is built around four principal directorates and one technology center. Three research directorates—each headed by a senior civilian associate director of research—comprise 13 research divisions and detachments established along scientific discipline lines. The Technical Services Directorate, similarly led, consists of seven support divisions and detachments. The recently established Naval Center for Space Technology—led by a senior civilian director—consists of three departments.

NRL 1988 Organization Chart



CURRENT RESEARCH

The following areas represent broad fields of NRL research. Under each, more specific topics that are being investigated for the benefit of the Navy and other sponsoring organizations are listed. Some details of this work are given in the *NRL Review*, published annually. More specific details are published in reports on individual projects provided to sponsors and/or presented as papers for professional societies or their journals.

Computer Science and Artificial Intelligence

Standard Computer Hardware, Development Environments, Operating Systems, and Run-Time Support Software
Methods of Specifying, Developing, Documenting, and Maintaining Software
Techniques for Naval Needs
Expert Systems for Resource Allocation, Signal Identification, Operational Planning, and Target Classification

Device Technology

Integrated Optics
Radiation-Hardened Electronics
Microelectronics
MM Wave Technology
Hydrogen Masers for GPS

Directed Energy Technology

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

Electronic Warfare

Decoys (RF and IR)
Repeaters/Jammers, EO/IR Active Countermeasures
EW/C³CM System Concepts

Enhanced Maintainability, Reliability, and Survivability Technology

Coatings
Lubricants and Greases
Water Additives and Cleaners
Fire Safety
Laser Hardening
Satellite Survivability

Environmental Effects on Naval Systems

Meteorological Effects on Electro-Optical System Performance

Air Quality in Confined Spaces
Electromagnetic Background in Space
Solar Activity
Ionospheric Behavior

Information Management

Antijam Communication Links
Network Architectures
Combat Management Information Systems

Materials

Superconductivity
Biomolecular Engineering
Materials Processing
Advanced Alloy Systems
Rapid Solidification Technology
High-Temperature Materials
Laser Fabrication and Processing
Ceramics and Composite Materials

Space Systems and Technology

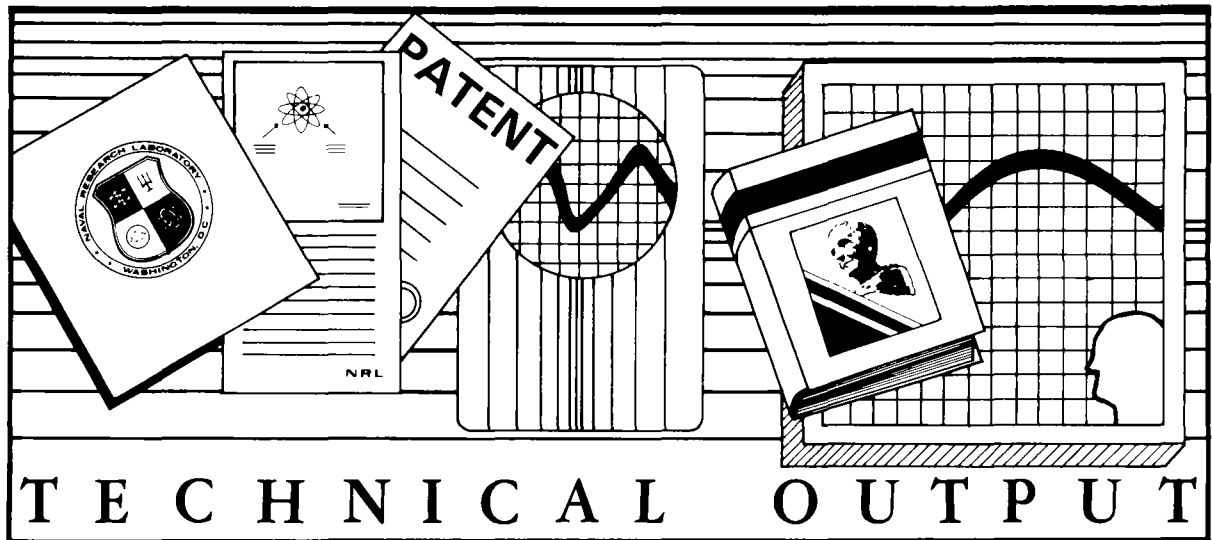
Advanced Space Systems
Space Sensing Applications
Satellite Communications
Spacecraft Design, Engineering, and Integration
Satellite Ground Station Design
Navigation Systems

Surveillance and Sensor Technology

Imaging Radars
Target Classification/Identification
Towed Acoustic Arrays
Underwater Acoustic Propagation
Electromagnetic Sensors—Gamma Ray to RF Wavelengths
SQUID for Magnetic Field Detection
Low Observables Technology

Undersea Technology

Autonomous Vehicles
Bathymetric Technology
Anechoic Coatings



Publications

Scientists and engineers at the Naval Research Laboratory have published more than 29,700 articles, reports, and books since the Laboratory was established in 1923. During fiscal year 1987, NRL researchers published 460 journal articles and 251 NRL reports. In addition, their work was described in 210 conference proceedings; 1430 presentations were made to scientific, military, and government audiences.

Patents

NRL scientists have made significant contributions in many areas of technology. One measure of the quality and quantity of these contributions is the number of patents received. During fiscal year 1987, researchers were awarded 49 patents; this brings NRL's total to 3187 patents issued since 1923.

Recently, Congress authorized a new form of patent protection known as the Statutory Invention Registration, or SIR. A SIR document provides all the protection generally needed by the Navy and carries all the prestige of a standard patent but at a significantly lower cost. SIRs are generally used to protect significant mission-related inventions that are primarily of military value and have little commercial application. In fiscal year 1987, 3 SIRs were issued to NRL researchers.

These patents and SIRs ensure the Navy's control over and free use of the technology it has developed.

Personnel*

Civilian

Full-time, Permanent (FTP)	
Graded	2960
Ungraded	440
Total	3400

Temporary, Part-time, Intermittent (TPTI)	
(TPTI)	285
Total Civilian	3685

Graded FTP Breakdown

Scientists, Engineers, and SES	1556
Administrative—Professional	39
Administrative—Management	345
Technicians	538
Other-Clerical	420
Other-General	62
Total	2960

Civilian Budgeted	
End-Strength	3576

Military

Officers	42
Enlisted	101
Total Military	143
Military Allowance	150

On Board	Total Military	Total Civilian	FTP	TPTI	FTP Ungraded	FTP Graded
3828	143	3685	3400	285	440	2960

Annual Civilian Turnover Rate (percent)

	1983	1984	1985	1986	1987
Research divisions	7.65	7.54	8.43	7.10	6.68
Nonresearch areas	11.70	16.15	11.68	11.32	12.14
Entire Laboratory	9.21	10.80	9.68	8.77	8.82

Highest Academic Degrees Held by Permanent Employees

Bachelors	497
Masters	323
Doctorates	729

*As of 30 September 1987

Major Capabilities and Facilities

(Listed alphabetically by organizational unit)

Acoustics Division

Large tank instrumented for investigating acoustic echo characteristics of targets
Tank 30 ft in diameter by 22 ft in depth, automated with computer control and analysis for detailed studies of acoustic fields, transducers, and other underwater devices

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

Connection Machine Facility: an experimental facility that exploits the natural computational parallelism inherent in data-intensive research problems established for use by researchers both within and outside NRL

Chemistry Division

Nanometer-Scale Surface Analytical Facility
Bio/Molecular Engineering Facility
Langmuir-Blodgett Film Facility
Chemical Diagnostic Facility
Surface Diagnostic Facility
Tribology Facility
Paint and Coating Facility
Mechanical and Chemical Characterization of Polymers Facility
Surface Cleaning Facility
Alternate and Petroleum-Derived Fuels Facility
Combustion Research Facilities
High-Temperature Chemistry Facility
Fire Research Facilities

Chesapeake Bay Detachment (CBD, Chesapeake Beach, MD)

Radar Experimental Test Site, which includes a variety of radars; ancillary equipment for test and evaluation of equipment, concepts, and techniques; and overwater ranges
Tactical Electronic Warfare Test Site
Communications facilities for transmission to and from land, sea, and air
Hypervelocity gun for ballistics research
Ship Motion Simulator with 12-ton payload capacity

Navy Technology Center for Safety and Survivability for fire extinguishment research
Boat services

Civilian Personnel Division

Supervisor/manager executive development
Employment inquiries
Science, engineering, and computer courses
Administrative support
Mechanical and technical trades training
Long-term and special programs
Instructional television via tape and microwave and satellite transmissions, as well as computer-based training

Condensed Matter and Radiation Sciences Division

Helium-3 Dilution Refrigerator
60-MeV Linear Electron Accelerator (Linac)
5-MV Positive Ion Van de Graaff Accelerator
Ion Implantation Facility
2-MV Electron Van de Graaff Accelerator
Cobalt-60 source
Hypervelocity Gun Ranges

Electronics Science and Technology Division

Microelectronics Processing Facility
Electron Beam Lithography System
Electron Microscopes and Electro-Optical Analytical Devices
Crystal-Growing Facilities including bulk growth, molecular beam epitaxy, and organo-metallic chemical vapor deposition
High Magnetic Field Facility
A variety of electronic testing and analysis facilities

Engineering Services Division

Mechanical, electronic, and project engineering and design
Manual and computer-aided design and drafting
Printed circuit CAD/CAM facility (REDAC)
Shops for machining, sheet metal, welding, casting, plating, plastics, printed circuits, electronic assembly, and other fabrication services

Health Physics Group

X-Ray and Gamma-Ray Calibration Facility

Information Technology Division

Extensive computer facilities
Microwave Space Research Facility
HF modem and channel simulation
Brandywine Antenna Range
Pomomkey Test Range
Signal Analysis Laboratory
Artificial Intelligence Computer Network
Distributed Simulation and Prototyping Test Bed

Laboratory for Computational Physics and Fluid Dynamics

Hardware: Two VAX 11/780s, one IRIS 4D Graphics Workstation and 4 SUN Graphics Workstations, plus peripherals and terminals. Network and MILNET, LANL X CRAY and Net, APTEC DPS + FPS and NUMERIX Array Processors, TEKTRONIX 4128 and METHEUS 3610 High-Speed Graphics Processor Stations connected to the NRL CRAY XMP/24, DEC front-end DICOMED D-38 Design Station and NRL DICOMED microfilm recorder
Wave channel: a 30-m channel with fan and mechanical wavemaker instrumented for the study of wave generation and wave effects
Tow channel: a 20-m dual-carriage tow channel with variable stratification for studies of geophysical flows and wakes
Lab measurements and diagnostics: multiple channels of hot-wire/hot-film and laser-doppler anemometry, visual and infrared digital imagery, fiber optic devices, real-time spectral analysis, high-resolution pressure transduction

Laboratory for Structure of Matter

Two X-ray diffractometers
Zymark robotics
Evans and Southerland computer graphics display system
Silicon graphics IRIS workstation
Chromatography

Materials Science and Technology Division

Ultrasonic gas atomizer
Hot isostatic press
Consumable arc electrode melter for reactive metals

High-energy dispersive X-ray analytical system

Electron microprobe SEM and STEM systems

Quantitative metallography

Computer-controlled multiaxial loading and SCC measurement systems

Computer-interactive, nonlinear, multimode fracture measurement system

Computer-aided experimental stress analysis
Crystallite orientation distribution function (CODF)

Elevated Temperature and Structural Characterization Laboratory

Impression creep and mechanical property evaluation

Automated physical constant measurement system

Nondestructive Evaluation Laboratory

Closed-loop, low- and high-cycle fatigue systems

Shock and Vibration Laboratory

Film deposition systems

Magnetometry

Mossbauer spectroscopy

Cryogenic facilities

High-field magnets

High-frequency facilities

Naval Center for Space Technology

CAD/CAM Facility

RF anechoic chambers

Thermal-vacuum chambers

Spin Balance Facility

Reverberation Chamber

Shock and Vibration Test Facility

Clean-room facilities

Satellite tracking, command, and control facilities

100-ft wave tank for studying dynamics of wind waves and their interactions with long waves; uses microwave Doppler spectrometry and optical and photometric techniques

Spacecraft Fabrication and Assembly Facility
Propellant Handling Facility

Operational Services

Mobile research platforms: three P3As, one P3B Orion aircraft. Three of the aircraft are especially configured for scientific support. The ASW suites have been removed, and the interiors have been converted for research project installations.

Optical Sciences Division

Electron-beam, electron-beam sustained, X-ray, and UV preionized laser devices with spectroscopic and other diagnostic equipment
Short-pulse excitation apparatus for kinetic mechanisms investigations
Optical Warfare Laboratory
IR laser facility for optical characterization of semiconductors
Mobile, high-precision optical tracker
Facilities for synthesis and characterization of optical glass compositions and for the fabrication of optical fibers
Hybrid optical/digital image processing facility
Facilities for fabricating and testing integrated optical devices
Optical probes laboratory to study viscoelastic, structural, and transport properties of molecular systems
Computer IR/EO Technology/Systems Simulation Center
High-Energy Pulsed Chemical Laser Laboratory
100-J UV Laser Research Facility
Field-qualified EO/IR measurements devices
Beam lines at the National Synchrotron Light Source, Brookhaven, for extensive materials characterization
Focal Plane Array Evaluation Facility

Plasma Physics Division

PAWN, 1-MJ Compact Inductive Storage Facility
Gamble I and II High-Voltage Pulsed Power Generators
PHAROS III, Three-Beam Neodymium-Glass Laser and Target Facility
1000-J NRL CO₂ Laser
7-MJ Homopolar Generator
High-Power Free-Electron Laser and Gyrotron Facilities
Modified Betatron Accelerator
Charged Particle Beam (CPB) propagation range
Super IBEX 5 MV, 100 kA, 40 ns CPB generator
Maxibeam 3 MV, 60 kA, 300 ns CPB generator

Public Works Division

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

Radar Division

Radar Cross Section Measurement System
Radar research and development test beds (at CBD)
Versatile C-, X-, and K_a-band monopulse precision tracking radar systems (at 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
Noncooperative Target Recognition Facility
Antenna Measurement Laboratory
Digital Image Processing Laboratory
Computer-Aided Engineering (CAE) Facility

Research Computation Division

Cray X-MP/24 Computer (front-ended by four DEC VAX 11/785 computers), an extremely large, high-speed, powerful computational system particularly well-suited for scientific and engineering usage
DEC VAX 11/785s (4) Front end to the Cray X-MP/24 computer, providing linkages to a wide variety of concurrent computer services to over 1300 scientists and engineers, both at NRL and at remote locations throughout the US. These services include high-volume, time-shared, local and remote batch, active graphics, and telecommunications processing.
NRL Broadband Local Area Network (NICENET) that connects most NRL buildings for computer communications and provides gateways to nationwide communications/computer capabilities.
Off-line graphics capability via TID's DICOMED
CALCOMP 1055 and 5200 Plotting Facilities
DEC-10 MIS Computer
VAX-11/750 Milnet Connection

Space Science Division

Waldorf Annex (lower site). This facility is instrumented for continuous recordings of atmospheric-electricity, micrometeorological, and lightning-flash data and is used for investigations into environmental phenomena.

Instrumented micrometeorological tower on San Nicolas Island, CA
Ionospheric sensing and propagation analysis
85-ft radio telescope at Maryland Point, Md.
Other antennas for radio astronomy
E.O. Hulburt Center for Space Research
Development and test facilities for space-borne instruments to perform astrophysical, solar, high-atmospheric, and space-environment sensing
Clean-room facilities
Extensive computer-assisted data manipulation and interpretive capability for space-data imaging and modeling

Supply Division

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

Tactical Electronic Warfare Division

Mobile Infrared Signature Measurement and Simulation Facility
Mobile ESM Laboratory
Hybrid RF/IR Missile-Seeker Simulation Facility
Central Target Simulation Facility for developing, testing, and evaluating EW systems and techniques, using real-time, hardware-in-the-loop models
RF Simulation Laboratory and signal simulators
Radar Cross-Section Measurement Facility (at CBD)

Search Radar ECM simulator
Advanced Tactical EW Environment Simulator
Electronic Warfare Coordinating Module

Technical Information Division

DICOMED (computer graphics system)
Electronic publishing
Technical library (2,000 subscriptions, 45,000 monographs, 50,000 technical reports)
LS-2000 on-line library catalog
Photographic laboratories
Writing, editing, publications consultation
Exhibits
Design services
Video productions
Billboard
Labstracts
NRL Television Network

Underwater Sound Reference Detachment (Orlando, FL)

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

Major NRL Sites and Facilities

Station and Location	Acreage			Buildings/ Structures
	Navy Title	Easement or Purchase	Permit or Lease	
District of Columbia				
NRL	129.23		1.45	116/20
Cyclotron building site, Bolling AFB			5.25	1/0
Virginia				
Midway Research Center, Quantico	162.00			7/1
Maryland				
NRL Flight Support Detachment, NAS Patuxent River*†			—	
Chesapeake Bay Detachment, Chesapeake Beach†	167.90		0.02	91/104
Multiple research site, Tilghman Island†	2.00			7/7
Dock facility, Fishing Creek, Chesapeake Bay			0.02	3/2
NRL Waldorf Annex, Waldorf†	23.94	35.16		18/24
Radio Astronomy Observatory, Maryland Point†	24.30		197.88	10/12
Radio antenna range, USAF Receiver Site, Brandywine†			22.98	
Free Space Antenna Range, Pomonkey†	14.12	28.40		9/13
Florida				
Underwater Sound Reference Detachment, Orlando†	10.46			26/21
USRD, Leesburg Bugg Spring			65.0	4/6
Alabama				
Ex-USS <i>Shadwell</i> (LSD-15), Mobile Bay	Decommissioned 457-ft vessel used for fire research			

*Site or equipment used by NRL under an intraservice (Navy) or interservice agreement.

†See maps, General Information section.

PROPERTY

Land:

Owned 598 acres
Leased 583 acres

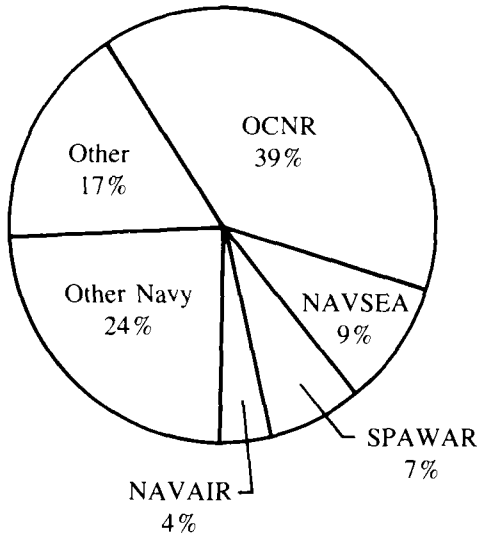
Acquisition Costs:

Real Property \$124.2 million
Major Equipment \$217.7 million
Minor Equipment \$ 27.0 million

Buildings:

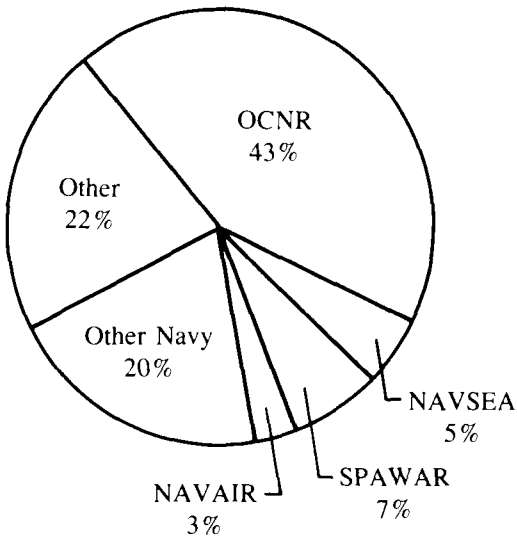
RDT&E 2,643,470 ft²
Administrative 194,307 ft²
Other 272,993 ft²

**SOURCES OF FUNDS
FY 1987 (NEW ORDERS RECEIVED)**



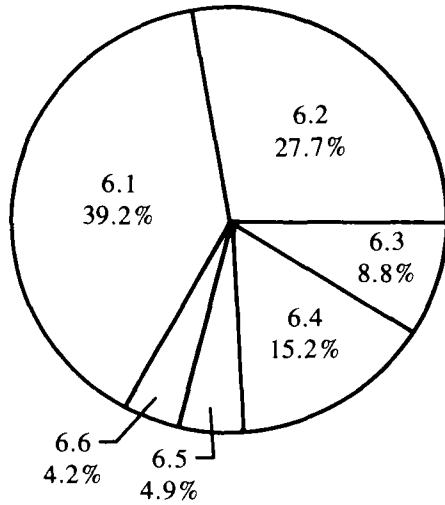
	<u>\$M</u>
Office of the Chief of Naval Research (OCNR)	122.3
Naval Sea Systems Command (NAVSEA)	27.3
Space and Naval Warfare Systems Command (SPAWAR)	23.7
Naval Air Systems Command (NAVAIR)	12.2
Other Navy	75.9
Other	<u>53.9</u>
Actual Reimbursable Funds	315.3
Actual Direct Cite Funds	<u>236.6</u>
Total Funds	551.9

FY 1988 PLAN (NEW ORDERS)



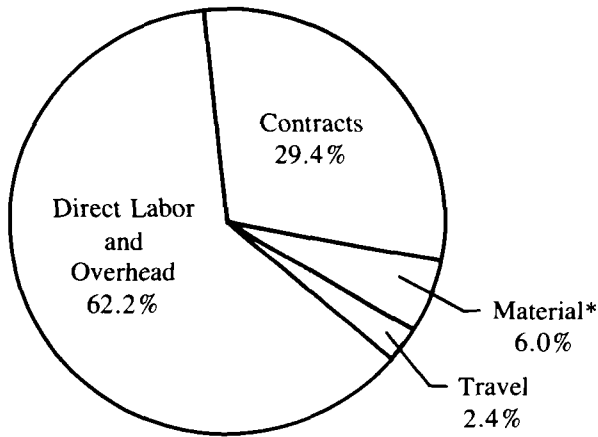
	<u>\$M</u>
Office of the Chief of Naval Research (OCNR)	153.4
Naval Sea Systems Command (NAVSEA)	17.8
Space and Naval Warfare Systems Command (SPAWAR)	25.0
Naval Air Systems Command (NAVAIR)	10.7
Other Navy	71.4
Other	<u>78.5</u>
Planned Reimbursable Funds	356.8
Planned Direct Cite Funds	<u>243.7</u>
Planned Total Funds	600.5

**RDT&E NAVY REIMBURSABLE FUNDS BY CATEGORY
FY 1988 PLAN (NEW ORDERS)**



	<u>\$M</u>
6.1 Research	74.3
6.2 Exploratory Development	52.6
6.3 Advanced Development	16.8
6.4 Engineering Development	28.8
6.5 Management and Support	9.4
6.6 Operational Systems Development	<u>8.0</u>
Total Funds	189.9

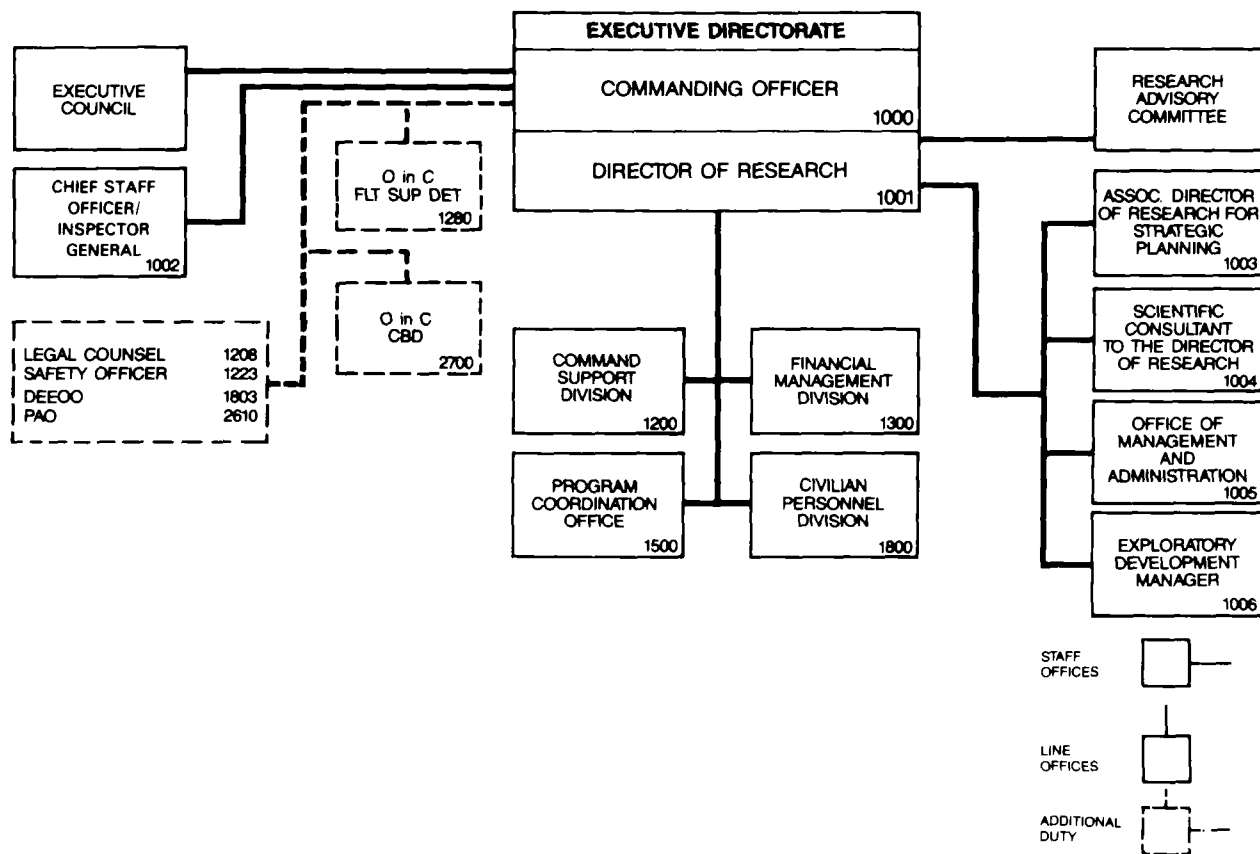
**DISTRIBUTION OF REIMBURSABLE FUNDS
FY 1988 PLAN**



	<u>\$M</u>
Contracts	105.0
Material*	21.3
Travel	8.5
Direct Labor and Overhead	<u>222.0</u>
Reimbursable Funds	356.8
Direct Cite Funds	<u>243.7</u>
Total Funds	600.5

*Also includes other costs, such as ADP charges, tuition, etc.

EXECUTIVE DIRECTORATE



Key Personnel

Name	Title	Code
CAPT W.G. Clautice, USN	Commanding Officer	1000
Dr. T. Coffey	Director of Research	1001
CAPT M.A. Howard, USN	Chief Staff Officer/Inspector General, Head, Command Support Division	1002/1200
Dr. W.M. Tolles	Associate Director of Research for Strategic Planning	1003
Dr. P. Mange	Scientific Consultant to Director of Research	1004
Mrs. M. Oliver	Head, Office of Management and Administration	1005
Dr. S. Sacks	Exploratory Development Manager	1006
Mr. R.H. Swennes II†	Legal Counsel	1208
Mr. H.C. Kennedy, Jr.†	Safety Officer	1223
CDR H.J. Wnuk, USN†	O in C Flight Support Detachment	1280
Mr. R.W. Steinbeck	Comptroller	1300
Dr. R.T. Swim	Head, Program Coordination Office	1500
Mr. D.J. Blome	Head, Civilian Personnel Division	1800
Ms. Sol del Ande Eaton†	Deputy Equal Employment Opportunity Officer	1803
Mr. J.W. Gately, Jr.†	Public Affairs Officer	2610
CDR S.I. Kummer, USN†	O in C Chesapeake Bay Detachment	2700

† Additional duty

The Executive Directorate



The Commanding Officer and the Director of Research share executive responsibility for the management of the Naval Research Laboratory. In accordance with Navy regulations, the Commanding Officer is responsible for the overall management of the Laboratory and exercises the usual functions of command including compliance with legal and regulatory requirements, liaison with other military activities, as well as the general supervision of the quality, timeliness, and effectiveness of the technical work and of the support services.

The Commanding Officer delegates line authority and assigns responsibility to the Director of Research for the technical program, its planning, conduct, and staffing; evaluation of the technical competence of personnel; liaison with the scientific community; selection of subordinate technical personnel; exchange of technical information; and the effective execution of the NRL mission.

Within the limits of Navy regulations, the Commanding Officer and the Director of Research share authority and responsibility for the internal management of the Laboratory. The Commanding Officer retains all authority and responsibility specifically assigned to him by higher authority.

The mission of the Laboratory is carried out by three science and technology directorates and the Naval Space Technology Center. They are supported by the Technical Services Directorate and the Executive 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 of this publication.

Commanding Officer

Captain William G. Clautice, U.S. Navy, was born in Baltimore, Maryland, and is a 1959 graduate of the U.S. Naval Academy. He holds a Master of Science degree in Ocean Engineering from the University of Rhode Island, a Master of Science in Systems Management from the University of Southern California, and a Master of Business Administration from Stetson University.

Upon being commissioned, Captain Clautice was assigned to USS *Sarsfield* (DD-837). He graduated from the Naval Submarine School in 1961 and reported to USS *Bashaw* (SS-241) on deployment in the Western Pacific from Pearl Harbor, Hawaii. In 1964, he completed nuclear power training and was assigned to the commissioning crew of USS *Sam Rayburn* (SSBN-635). In 1966, he became the commissioning Navigator and Operations Officer of USS *Will Rogers* (SSBN-659).

From 1969 to 1971, he served as Navigation Instructor, Assistant Director of the Executive Division, and Director of the Operations Division at the Naval Submarine School, New London, Connecticut. In 1972, he completed a tour on the USS *Dace* (SSN-607), qualified as engineer of naval nuclear power plants, and was assigned Executive Officer of USS *George C. Marshall* (SSBN-654). In 1973, he was selected for nuclear submarine command.

Following graduation from the Program Managers' Course at Defense Systems Management College in 1975, Captain Clautice served in the Headquarters, Strategic Systems Program Office until 1979 as Assistant Head of the Navigation Branch and then as Head of the Test Instrumentation Branch. From 1979 until 1983, he served as Commanding Officer of the Naval Ordnance Test Unit, Cape Canaveral, and was responsible for flight testing the Navy's strategic missiles. In 1983, he was selected to be major project manager and assumed command of the Strategic Weapons Facility Pacific, Bremerton, Washington in August of that year. Captain Clautice became the Assistant Chief of Naval Research in August of 1985 and assumed command of the Naval Research Laboratory on 26 August 1987.

Captain Clautice is the author of three technical papers that have been published in the *Institute of Navigation Journal* (1971, 1978), the *Marine Technology Society Journal* (1974), and the *Institut Francais de Navigation Revue Technique* (1979). He has been awarded the Legion of Merit (two awards), the Meritorious Service Medal (two awards), the Navy Achievement Medal (two awards), the Navy Unit Commendation and the Meritorious Unit Commendation as well as several campaign and service medals.

Director of Research

Dr. Timothy Coffey [REDACTED]. He graduated from the Massachusetts Institute of Technology in 1962, with a B.S. degree in electrical engineering, and obtained his M.S. (1963) and Ph.D. (1967), both in physics, from the University of Michigan.

During his graduate career, Dr. Coffey worked as a research assistant at the University of California (1963-64), a research physicist at the Air Force Cambridge Research Laboratories (1964-65), and a teaching fellow and research assistant in physics at the University of Michigan (1965-66). As a scientific consultant for EG&G, Inc. (1966-71), he was involved in investigations in theoretical and mathematical physics.

Dr. Coffey came to the Naval Research Laboratory in 1971, as Head of the Plasma Dynamics Branch, Plasma Physics Division. In this position, he directed research in the simulation of plasma instabilities, the development of multidimensional fluid and magnetohydrodynamic codes, and the development of computer codes for treating chemically reactive flows. In 1975, he was named Superintendent, Plasma Physics Division; he was appointed Associate Director of Research for General Science and Technology on January 1, 1980. On November 28, 1982, he was named Director of Research.

Dr. Coffey is recognized as an authority on the theory of nonlinear oscillations and has played a major role in the national program on high-altitude nuclear effects. The author or co-author of over 70 publications and reports, he has made several fundamental contributions to the theory of electron beam-plasma interaction and to the understanding of plasma processes in the earth's ionosphere.

Dr. Coffey is a fellow of the American Physical Society and a fellow of the Washington Academy of Sciences. Among Dr. Coffey's recent honors and awards are the Senior Executive Service Performance Award and the Rear Admiral William S. Parsons Award for Scientific and Technical Progress (honorable mention). In 1981, he was awarded the Presidential Rank of Meritorious Executive, and in 1988 he received the Distinguished Presidential Rank award.

Executive Council



Executive Council

The Executive Council consists of executive, management, and administrative personnel. The monthly Executive Council meeting is a scheduled forum that provides the Commanding Officer a personal means to relay new policy or changes to current policy that affect all divisions and allows the other members of the Council to advise the Commanding Officer and Director of Research on matters relating to the administration of the Laboratory. The council also provides an opportunity for information exchange among its members. The Executive Council members include:

- Commanding Officer, chairperson
- Director of Research
- Chief Staff Officer
- Associate Directors of Research
- Heads of Divisions
- Chief Scientist, Laboratory for Computational Physics and Fluid Dynamics
- Chief Scientist, Laboratory for Structure of Matter
- Deputy Equal Employment Opportunity Officer
- NRL Counsel
- Public Affairs Officer
- Head, Administrative Services Office
- Head, Management Information Systems Staff

Research Advisory Committee



Research Advisory Committee

The Research Advisory Committee advises the Commanding Officer and the Director of Research on scientific programs and the administration of the Laboratory. The committee assists in planning the long-range scientific program, coordinating the scientific work, reviewing the budget, accepting or modifying problems, considering personnel actions, and initiating such studies as may be necessary or desirable. The membership consists of:

Director of Research, chairperson
Commanding Officer
Associate Directors of Research

OFFICE OF STRATEGIC PLANNING (Code 1003)

The Office of Strategic Planning, formed in December 1987, is headed by the Associate Director of Research for Strategic Planning. He is a member of the Naval Research Laboratory's (NRL) Research Advisory Committee (RAC). He is the principal advisor to the Director of Research for the long-range planning of NRL's research and technology programs, and he represents the Director of Research and NRL on major national strategic planning committees. The Office recommends procedures and directions of the research programs at NRL, and produces long-range computer and information management. It develops strategies for new opportunities in naval research and technology, the best use of internal resources, joint ventures with other laboratories, and involvement with private industry and universities. The Office integrates directorate and division technology needs into an overall Laboratory plan, defining areas to be addressed and levels of investment.



Dr. William M. Tolles

Dr. Tolles [REDACTED] He obtained his undergraduate degree in chemistry from the University of Connecticut in 1958, and his Ph.D. in chemistry from the University of California, Berkeley in 1962. Subsequently, he spent one year as a Postdoctoral Fellow at Rice University.

In 1962, he assumed an appointment as Assistant Professor of Chemistry at the Naval Postgraduate School. His research there included electron paramagnetic resonance of energetic materials and radiation-damaged species, and quantum mechanical calculations of molecular properties.

He served as a consultant for the Naval Weapons Center, China Lake, between the years of 1965 and 1975, where he did considerable research involving the microwave properties of materials.

During a five-month period in 1975, he performed research at NRL involving the introduction of Coherent Antistokes Raman Spectroscopy (CARS), nonlinear optical spectroscopic methods (including variations on the Raman Induced Kerr Effect Spectroscopy (RIKES)), and related techniques.

In 1977, as a full professor, Dr. Tolles took the position of Dean of Research at the Naval Postgraduate School, and for four years, he also occupied the position of Dean of Science and Engineering.

He arrived at NRL in February 1984 as the Superintendent of the Chemistry Division. In 1987, he was appointed Associate Director of Research for Strategic Planning.

He is a member of the American Chemical Society, the American Physical Society, the American Optical Society, and Sigma Xi.

Chief Staff Officer/Inspector General



CAPT M.A. Howard

The Chief Staff Officer serves as the Deputy to the Commanding Officer and acts for the Commanding Officer in his absence. The Chief Staff Officer is the Laboratory's Inspector General, and when directed, he investigates, inspects, and/or inquires into matters that affect the operation and efficiency of NRL. These matters include but are not limited to: effectiveness, efficiency, and economy; safety and occupational health; personnel discipline, morale, and welfare; management practices, command relationships, and organizational structure; and fraud and waste. He serves as principal advisor to the Commanding Officer on all inspection matters and audits, and is the principal point of contact and liaison with all agencies outside NRL.

Deputy Equal Employment Opportunity Officer



Ms. Sol del Ande Eaton

The Deputy Equal Employment Opportunity Officer is the EEO program manager and the advisor to the Commanding Officer on all EEO matters. She manages the discrimination complaint process and directs the Laboratory's affirmative action plans and special emphasis programs (Federal Women's, Hispanic Employment, Handicapped, and Disabled Veterans). Duties include reviewing, coordinating, and monitoring implementation of EEO policies and developing local guidance, directives, and implementation procedures for the EEO programs. She also advises SES and Merit Pay System employees on setting EEO objectives.

Public Affairs Officer



Mr. J. W. Gately, Jr.

The Public Affairs Officer (PAO) advises the Commanding Officer and Director of Research on public affairs matters, including external and internal relations, and serves as the Commanding Officer's principal assistant in the area of public affairs. To do this, the PAO plans and directs a program of public information dissemination on official NRL activities. The PAO coordinates responses to requests from the news media and the public for unclassified information or materials dealing with the Laboratory, coordinates participation in community relations activities, and directs a program of internal information dissemination within the Laboratory. The PAO is also responsible for coordinating all actions within the Laboratory that respond to requirements of the Freedom of Information Act (FOIA).

Scientific Consultant to the Director of Research



Dr. P. Mange

The Scientific Consultant carries out studies and analyses relating to the technical programs being carried out at the Laboratory on behalf of the Director of Research. He represents the Laboratory on external technical boards, advisory panels, or working groups as requested by the Director of Research and is the Laboratory point of contact with the Strategic Defense Initiative Organization.

Exploratory Development Manager



Dr. S. Sacks

The Exploratory Development Manager carries out on behalf of the Director of Research, program management activities related to the Navy 6.2 (exploratory development) efforts. Mission activities include assurance of technical quality and program relevance, orientation of the program to priority needs and transition opportunities, and overall coordination of NRL 6.2 block efforts. The Exploratory Development Manager is the Laboratory point of contact with the Office of Naval Technology.

Office of Management and Administration

(Code 1005)

Basic Responsibilities

The Office of Management and Administration provides managerial, technical, and administrative support to the Director of Research in his planning and direction of research and development programs in a variety of scientific and engineering disciplines. Specific functions include: performing special studies involving major NRL programs and resource issues; providing administrative support in the areas of personnel, budget, facilities, equipment, and security; reviewing and managing director of research correspondence; providing management information and analyses for various aspects of the research program effort; coordinating NRL's Technology Transfer Program; coordinating VIP and foreign visits to NRL; managing the NRL Directives System; coordinating unsolicited proposals, congressional correspondence, and other external inquiries; maintaining the NRL R&D achievements file; reviewing and interpreting external Navy and DoD directives addressed to NRL; managing the Defense Retail Interservice Support Program (Host-Tenant Agreements); coordinating the IR&D Program; developing guidance for and monitoring the 6.1 (basic research) Program and 6.2 (exploratory development) Program; providing central word processing services to the Directorate; coordinating the NRL-NRC and ONT Postdoctoral Resident Research Associateship Programs, NRL-US Naval Academy Faculty Co-op Program, Navy ASEE Program, and other special Navy programs; interacting with ONR Headquarters and the R&D Centers as laboratory representative; developing NRL's Five-year Plan; and serving as liaison for all contacts with, and inquiries from, OMB, GAO, and other Government audit agencies.

Personnel

Full-time civilian: 26



Mrs. M. Oliver

Key Personnel

Name	Title
Mrs. M.C. Oliver	Head, Office of Management and Administration
Mr. D.J. DeYoung	Special Assistant
Ms. B.J. McDonald	Administrative Assistant
Mr. R. Fulper, Jr.	Head, Technology Transfer and Special Programs Staff
Mr. R.C. Spragg	Head, Management Information Staff
Ms. M.E. Barton	Head, Directives Staff

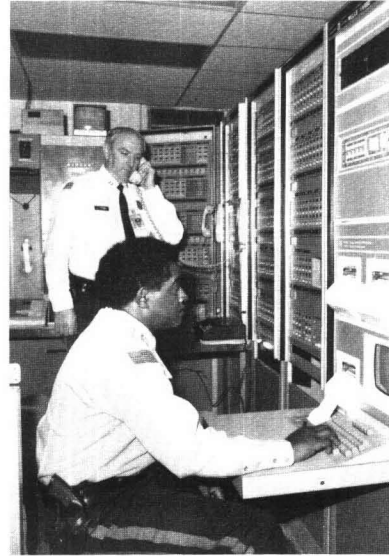
Point of contact: Ms. B.J. McDonald, Code 1005.2, 767-3634

Command Support Division

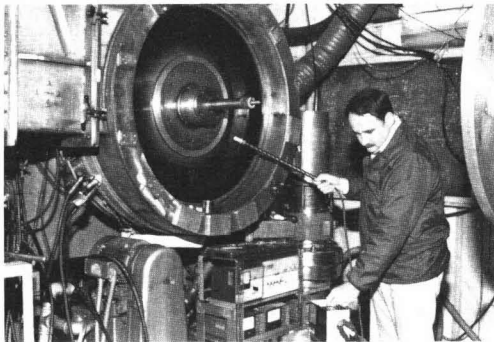
- MILITARY OPERATIONS
- FLIGHT DETACHMENT
- PERSONNEL AND PHYSICAL SECURITY
- SAFETY



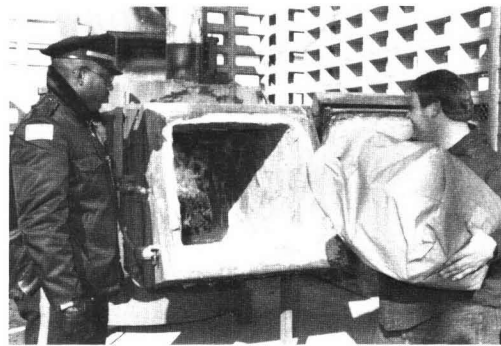
P-3 airborne research facility



Security monitoring



Safety evaluation



Classified burn detail



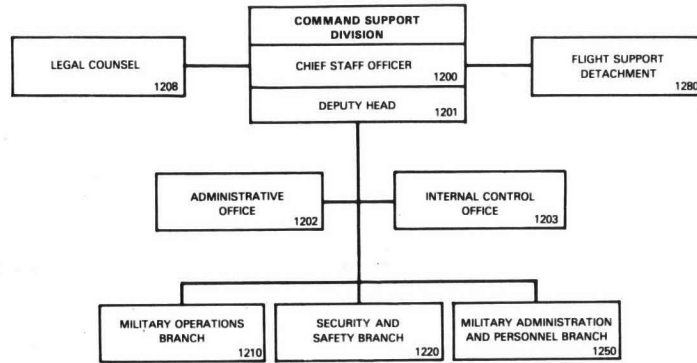
Legal staff



Division staff meeting



CAPT. M.A. Howard, USN



Basic Responsibilities

The Command Support Division is headed by the Chief Staff Officer who is also the Laboratory's Inspector General.

The Division provides a military staff to the Commanding Officer and to the Director of Research for the purpose of direct research support and assistance in the military aspects of the management of the Laboratory. The staff is the liaison with DOD, Navy commands/activities, and the operating forces of the Navy. It supports NRL research and development operations and coordinates military applications of the scientific work of the Laboratory. Direct research support is provided through operations of four multiengine Laboratory aircraft. In addition, the staff arranges for air, surface, and subsurface services as required by research and development operations.

The Division is responsible for physical, personnel, communications, information, industrial, and ADP security, and fire protection, as well as safety and occupational health. It provides intelligence support and support for international cooperative agreements in technology control.

It provides legal counsel and representation in the fields of procurement, business and commercial law, civilian personnel law, government regulations, intellectual property and patent law, EEO, standards of conduct, and litigation. The staff also coordinates the Laboratory's Internal Control and Research Reserve Programs.

Personnel

Full-time civilian: 152

Military: 143

Key Personnel

Name	Title
CAPT M.A. Howard, USN	Chief Staff Officer
Mr. M.B. Ferguson	Deputy Head
Ms. M.L. Bond	Administrative Officer
Ms. M.S. Rathbun	Internal Control Officer
Mr. R.H. Swennes, II	Legal Counsel
CDR J. Taber, USN	Military Operations Officer
Mr. J.R. Gallagher	Communications/Message Center
Mr. M.B. Ferguson	Head, Security and Safety Branch
Mr. F. Washington	Head, Classification Management and Control Section
Mr. W.C. Bryan	Head, Special Security Office/Special Activities Office
Mrs. S.A. Cornwell	Head, Personnel and Physical Security Section
Mr. H.C. Kennedy, Jr.	Safety Officer
LCDR T.R. Nadeau, USN	Head, Military Administration and Personnel Branch
CDR H.J. Wnuk, USN	O in C, NRL Flight Support Detachment

Point of Contact: Ms. M.L. Bond, Code 1202, 767-3204

Financial Management Division

- GENERAL ACCOUNTING
- COST ACCOUNTING
- SYSTEMS ACCOUNTING
- DISBURSING
- BUDGET



The Accounting Branch is divided into several sections that perform services essential to the Laboratory including vendor payments, payroll, payment information, and ledger accounting.



As a support division, our most important assets are the dedicated, knowledgeable employees within our area. Pictured above, Financial Management Division employees are shown providing valuable services in vendor payment and researching prompt payment actions.



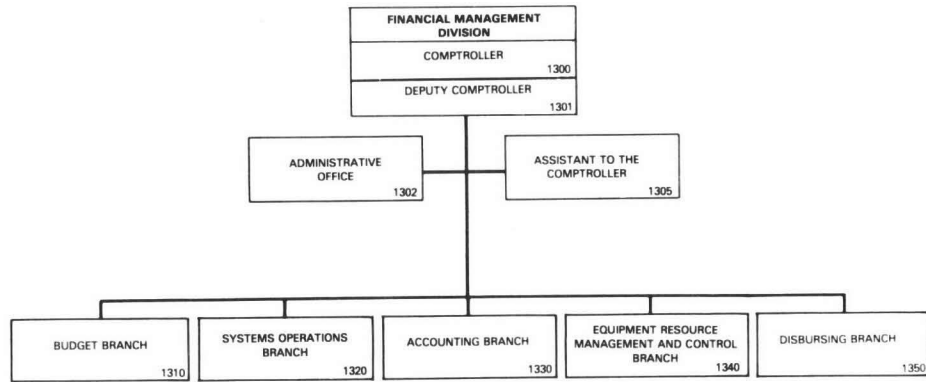
The Disbursing Branch is the most visible portion of the Financial Management Division. Its role in the Laboratory's operation includes disbursing checks, processing travel orders, and auditing.



The Payroll Section of the Accounting Branch provides customer services, processes payroll, and interacts with all divisions, branches and personnel within the Naval Research Laboratory.



Mr. R.W. Steinbeck



Basic Responsibilities

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

The Financial Management Division provides service to the Laboratory in budget formulation and funds administration, program and budget analysis, accounting and reporting, and disbursing. In addition, the division provides essential information and guidelines concerning equipment management.

Personnel

Full-time civilian: 102

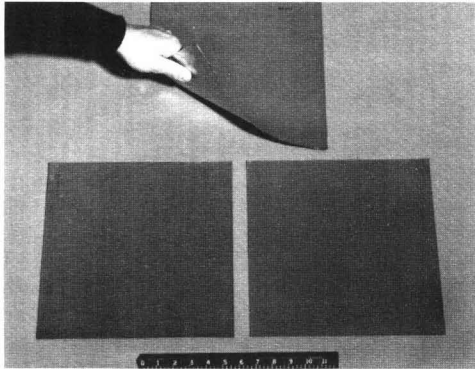
Key Personnel

Name	Title
Mr. R.W. Steinbeck	Comptroller
Mr. T.J. Santmyer	Deputy Comptroller
Ms. P.C. Reed	Administrative Officer
Mr. E.S York	Assistant to the Comptroller
Mr. H.A. Kinney	Head, Budget Branch
Mr. G. Rice	Head, Systems Operations Branch
Mr. J. Thomas*	Head, Accounting Branch
Mr. M. Mills*	Head, Equipment Resource Management and Control Branch
Mrs. H. McCauley	Head, Disbursing Branch

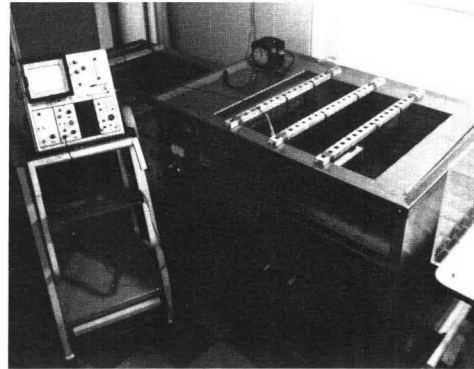
Point of contact: Ms. P.C. Reed, Code 1302, 767-2950

*Acting

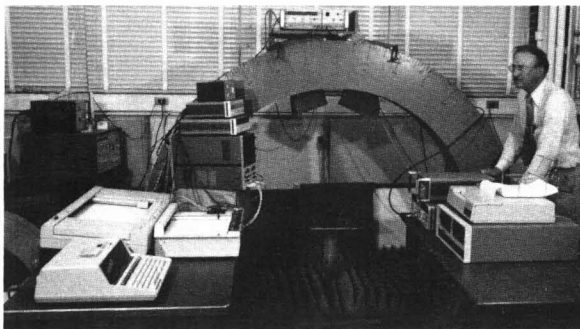
Program Coordination Office



Material preparation



Environmental testing



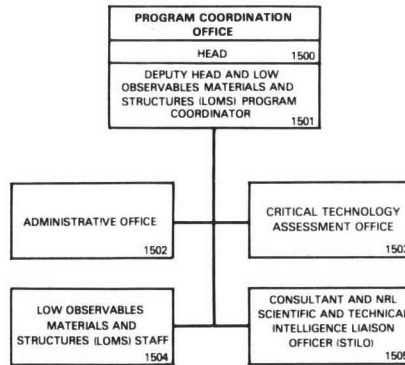
Characterization of materials



Automated material
characterization



Dr. R.T. Swim



Basic Responsibilities

The Program Coordination Office (PCO) coordinates and/or manages specific NRL programs that may be multidisciplinary in nature, that may span both divisions and directorates, and that may also require special security procedures. It is the Laboratory's focal point within the Navy and DoD for Low Observables programs. The Office conducts or coordinates studies, reviews, and technical assessments in various topical areas. The NRL Scientific and Technical Liaison Program and the Critical Technology Assessment Office are contained within the PCO.

Personnel

Full-time civilian: 17

Key Personnel

Name	Title
Dr. R.T. Swim	Head, Program Coordination Office
Dr. D.W. Forester	Deputy Head and Low Observables Materials and Structure Program Coordinator
Mrs. D. Ernst*	Administrative Officer
Mr. L.M. Winslow	Head, Critical Technology Assessment Office
Dr. D.W. Forester	Head, Low Observables Materials and Structure Staff
Mr. H. Bress	Consultant and NRL STILO

Point of contact: Dr. R. T. Swim, Code 1500, 767-3314

Civilian Personnel Division

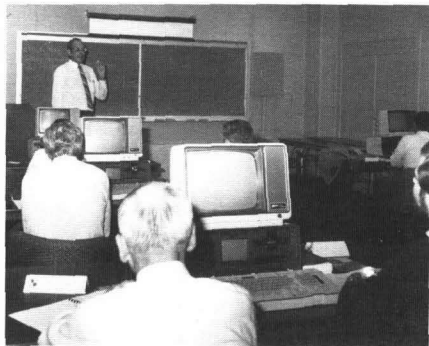
- PERSONNEL OPERATIONS
- EMPLOYEE DEVELOPMENT
- EMPLOYEE RELATIONS
- EQUAL EMPLOYMENT OPPORTUNITY



Personnel actions, records, and reports



EEO staff



Training—Management Use of Personal Computers



Personnel Operations reception area



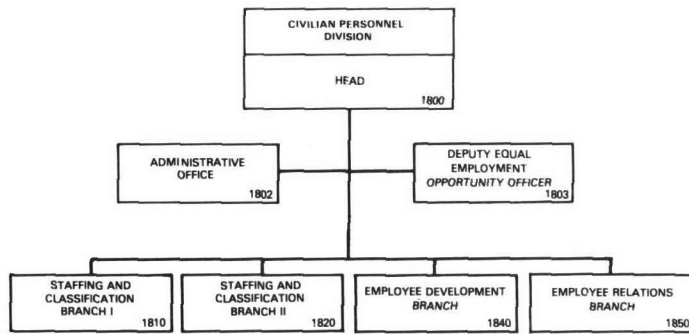
Employee Relations



Providing employment information



Mr. D.J. Blome



Director of Civilian Personnel

The Director of Civilian Personnel (OCNR Code 0124) of the Consolidated Civilian Personnel Office (Headquarters, ONR, NRL, and Naval Ocean Research & Development Activity) is Mr. F.D. Wallace. His office is located at the Office of the Chief of Naval Research in Arlington, Virginia. The on-site NRL division head is Mr. D.J. Blome.

Basic Responsibilities

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

Personnel

Full-time civilian: 61

Key Personnel

Name	Title
Mr. F.D. Wallace	Director of Civilian Personnel (OCNR Code 0124)
Mr. D.J. Blome	Head, Civilian Personnel Division
Mrs. P.L. Hetzler	Administrative Officer
Ms. S. Eaton	Deputy Equal Employment Opportunity Officer
Ms. Monica Jezek	Federal Women's Program Manager
Vacant	Handicap/Hispanic Program Manager
Mrs. B.A. Duffield	Head, Staffing & Classification Branch I
Mrs. C.A. Lowell	Head, Staffing & Classification Branch II
Mr. A.H. Sass	Head, Employee Development Branch
Ms. J. Hupp	Head, Employee Relations Branch

Point of contact: Mrs. P. L. Hetzler, Code 1802, 767-3421

**TECHNICAL SERVICES
DIRECTORATE**

Technical Services Directorate

The Technical Services Directorate provides administrative and technical services required to support the mission of the Laboratory. This support is in the areas of technical information; facility construction and maintenance; engineering design and fabrication; supply; contracts; operating and maintaining the Laboratory's central computer facilities; and providing administrative information to management. In addition, the Directorate operates and maintains a field facility for NRL research at the Chesapeake Bay.

TECHNICAL SERVICES DIRECTORATE



The Information Services Branch is the focal point for NRL's media, public affairs, and internal relations programs



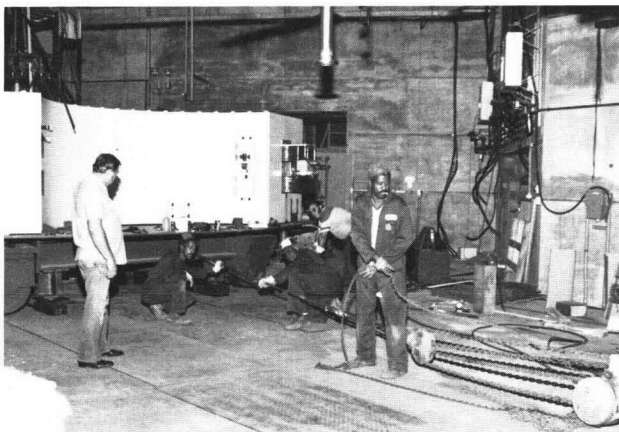
Mills, lathe, and matching center shown here are run by punched paper tape or by manually inputting computerized data



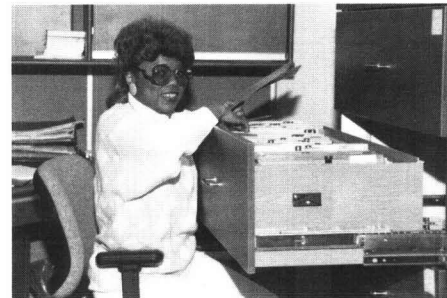
A contracting officer's technical representative (COTR) receives assistance from a contract specialist



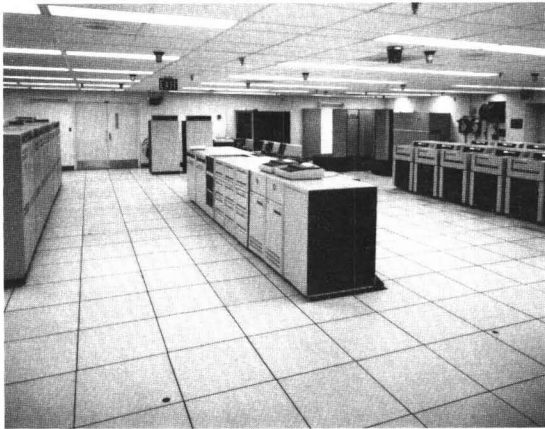
Editors ensure the professional presentation of research results



Public Works personnel move the cyclotron magnet



Supply technician researches a receipt control document



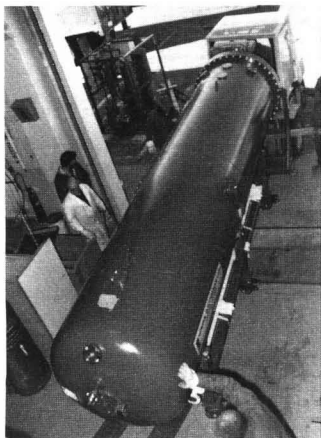
Front-end VAX Cluster



Distribution and Dispatch employees operate inserter machine that is used to stuff envelopes



Aerial view of Chesapeake Bay Detachment



Public Works installs large pieces of scientific equipment (this photo of pelletron accelerator)



Mail clerks load vehicles to deliver mail to Laboratory codes

Associate Director of Research for Technical Services

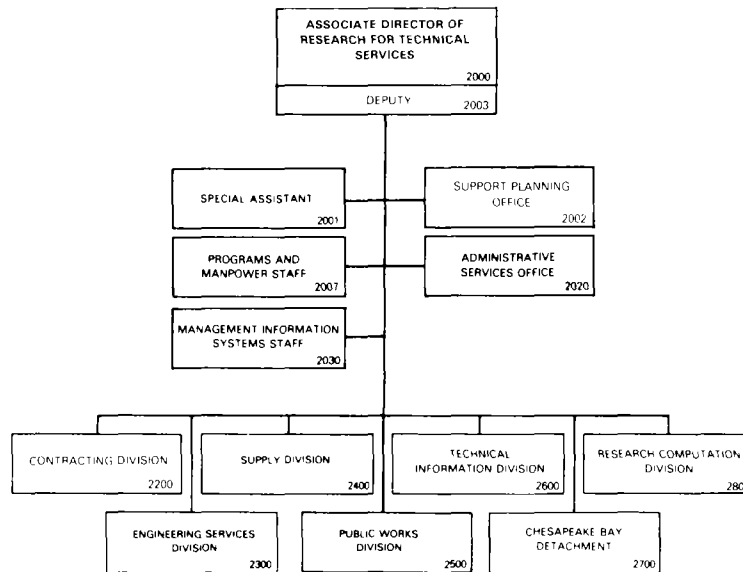


Mr. Jack D. Brown

Mr. Brown [REDACTED] He graduated from Michigan State University in 1943, with a BS degree in Physical Chemistry. He was called to active duty in the U.S. Army in 1943, and remained on active duty until he joined the Naval Research Laboratory on March 1, 1971.

Mr. Brown served as Associate Superintendent of the Plasma Physics Division from 1971 to 1981 when he was assigned duties as Associate Director of Research for Technical Services. In addition to his regular duties, he has been responsible for the organization and operation of a number of Laboratory-wide multidisciplinary study efforts on nonacoustic ASW and anomalous geophysical phenomena.

During his military service, Mr. Brown was designated an Atomic Energy Specialist and engaged in research and teaching in long-range detection of nuclear explosions, development and testing of nuclear weapons, and the effects of nuclear explosions in space. During this period he planned or served as technical director for nuclear effects tests in space, underground, and over open ocean. He also organized and coordinated major geophysical expeditions to observe solar eclipses and polar cap ionospheric events. From 1952 to 1953 he served as a guest scientist at the National Bureau of Standards where he investigated the infrared emissivity of metals at cryogenic temperatures.



Key Personnel

Name	Title	Code
Mr. J.D. Brown	Associate Director of Research for Technical Services	2000
Vacant	Special Assistant	2001
Mr. R. Flournoy	Head, Support Planning Office	2002
CDR L.E. Bounds, USN	Deputy for Operations	2003
Mrs. J. Cummings	Head, Programs and Manpower Staff	2007
Mrs. L.V. Dabney	Head, Administrative Services Office	2020
Mr. R. Guest	Head, Management Information Systems Staff	2030
Mr. J.H. Ablard	Head, Contracting Division	2200
CDR L.H. Bounds, USN†	Engineering Services Officer	2300
LCDR T.R. Lippert, SC, USN	Supply Officer	2400
CDR T.R. Rampe, CEC, USN	Public Works Officer	2500
Mr. P. Imhof	Head, Technical Information Division	2600
CDR S.I. Kummer, USN	O in C, Chesapeake Bay Detachment	2700
Mr. R.F. Saenger	Head, Research Computation Division	2800

Point of contact: Mr. J.D. Brown, Code 2000, 767-2879

†Additional duty

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Administrative Services Office

(Code 2020)

Basic Responsibilities

The Administrative Services Office plans, directs, and coordinates the following administrative services for the Laboratory: records and correspondence management; mail handling and messenger service; manages the purchase, acquisition, issuance, and withdrawal of filing equipment; manages the Forms Management Program, Paperwork Reduction Program, Reports Management Program, Correspondence Training Program, and Parking Facilities Management Program; coordinates and publishes the NRL Code Directory and Organizational Index; also coordinates staffing plans for the Technical Services Directorate.

Personnel

Full-time civilian: 30

Key Personnel

Name	Title
Mrs. L.V. Dabney	Head, Administrative Services Office
Mrs. M. Bozzi	Administrative Officer
Ms. L.T. Warder	Head, Records and Correspondence Management Branch
Mr. C.D. Moultrie	Head, Mail and Messenger Branch



Mrs. L.V. Dabney

Point of contact: Mrs. M. Bozzi, Code 2020.2, 767-3858

Management Information Systems Staff

(Code 2030)

Basic Responsibilities

The Management Information Systems Staff has dual responsibilities: conducting administrative data processing for the Laboratory, and designing, implementing, and controlling the Laboratory Management Information System (MIS) and its data bases. The Staff Head participates directly with the Commanding Officer, the Director of Research, and the Director of Technical Services in all policy matters pertaining to MIS and business data processing.

Personnel

Full-time civilian: 19

Key Personnel

Name	Title
Mr. R.L. Guest	Head, Mgt. Info. Sys. Staff
Mrs. M. Bozzi	Administrative Officer
Mrs. B. Hildreth	Head, Systems Development Section
Mr. W.L. Gollaher	Head, Applications Systems Support
Mrs. L. Johnson	Head, Operations Section



Mr. R.L. Guest

Point of contact: Phyllis Thompson, Code 2030, 767-2030

Contracting Division

- ADVANCE ACQUISITION PLANNING
- ACQUISITION STRATEGIES
- ACQUISITION TRAINING
- CONTRACT NEGOTIATIONS
- CONTRACTUAL EXECUTION
- CONTRACT ADMINISTRATION
- ACQUISITION POLICY INTERPRETATION
& IMPLEMENTATION
- DEFENSE ACQUISITION REGULATION
COUNCIL REPRESENTATION



Deputy contracting officer discusses policy matters with contract specialist.



Contracting officer begins Management of Contract Actions (MOCA) training with ONR intern.



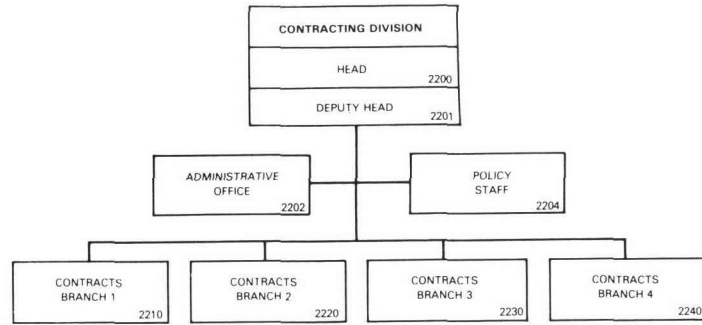
Contract specialist expands his knowledge of the automatic contract-writing system.



Procurement assistant discusses incoming procurement requests.



Mr. J.H. Ablard



Basic Responsibilities

The Contracting Division is responsible for the acquisition of major research and development, materials, services, and facilities where the value is in excess of \$25,000. It also maintains liaison with the ONR Procurement Directorate on procurement matters involving NRL. Specific functions include: providing consultant and advisory services to NRL division personnel on acquisition strategy, contractual adequacy of specifications, and proposal sources; reviewing procurement requests for accuracy and completeness; initiating and processing solicitations for procurement; awarding contracts; performing contract administration and post-award monitoring of contract terms and conditions, delivery, contract changes, patents, etc., and taking corrective actions as required; providing acquisition-related training to appropriate division personnel; interpreting and implementing acquisition-related Federal Department of Defense and Navy regulations; and chairing the Defense Acquisition Regulation Council (DAR) Subcommittee on Research & Development.

Personnel

Full-time civilian: 62

Key Personnel

Name	Title
Mr. J.H. Ablard	Head, Contracting Division
Mrs. J. Price	Administrative Officer
Mrs. A. Stuart	Deputy Head
Mr. J. Waldenfels*	Contract Branch #1
Mr. A. Guida	Contract Branch #2
Ms. M. Carpenter	Contract Branch #3
Mrs. C. Hayes	Contract Branch #4

Point of Contact: Mrs. J. Price, Code 2202, 767-3749

*Acting

Engineering Services Division

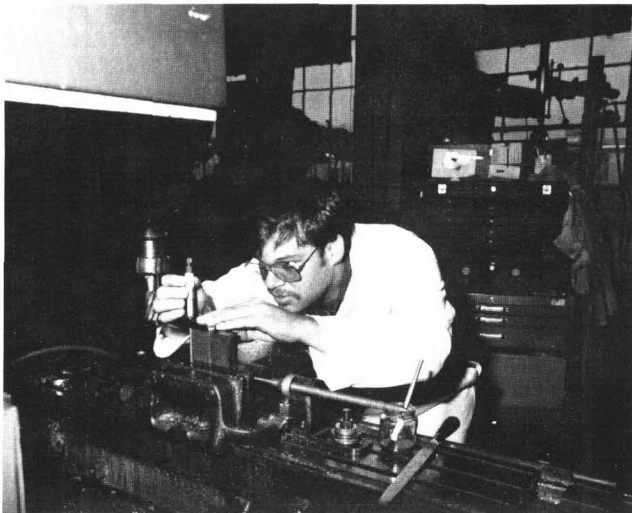
- MECHANICAL ENGINEERING AND MANUFACTURING
- ELECTRONIC ENGINEERING AND FABRICATION
- QUALITY ASSURANCE
- COMPUTER-AIDED DESIGN/COMPUTER-AIDED MANUFACTURING



Electronic engineers design and test circuits in one of ESD's laboratories by using microprocessor development systems to design and test the hardware and software. Personal computers are also used for various engineering applications such as FUTURENET, a schematic editor, and logic cell array design and simulation.



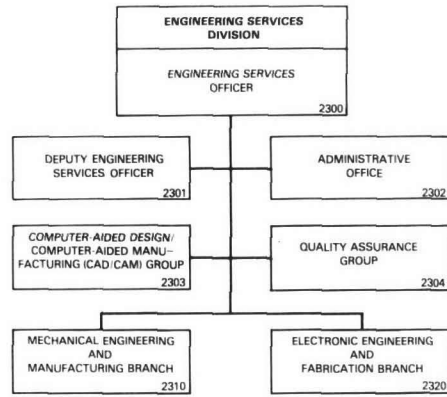
Technician from ESD's Sheet Metal Shop assembling an electronics chassis that he designed and fabricated; later he installed components provided by NRL scientists. Subsequently, the technician accompanied the scientists to the West Coast to assist in demonstrating the chassis to government and industry. The chassis is now used aboard Navy ships.



Machinist is milling a piece of copper component with a vertical milling machine for close tolerance requirements.



CDR L.H. Bounds



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.

Complete services covering the fields of mechanical and electronic engineering, fabrication, and manufacturing are provided and are supported by an in-house Quality Assurance Group. Emphasis is placed on quick reaction and flexibility to meet the needs of the Laboratory's research programs.

Mechanical support covers project engineering, computer-aided mechanical design and drafting, thermal and structural analysis, cost analysis, and environmental testing; it also includes shops for conventional machining or 4-axis numerical control manufacturing, sheet metal work, welding, plating, casting, plastic fabrication, engineering, and silk screen artwork.

Electronic support covers project engineering, digital and analog circuit design, microprocessor/microcomputer-based systems design (including programming), a computer-aided printed circuit board design (REDAC and Computervision), printed circuit board fabrication, electronic assembly and testing, and cable fabrication.

The division has the expertise to attack new problems, work with new and exotic materials on prototype developments, and provide researchers with support or consultation in these areas.

Personnel

Full-time civilian: 178

Key Personnel

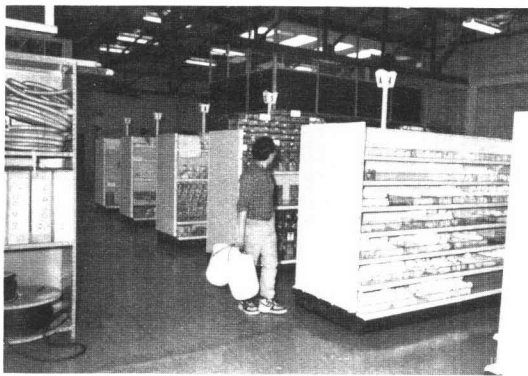
Name	Title
CDR L.H. Bounds, USN†	Engineering Services Officer
Mrs. J. Ford	Administrative Officer
Mr. M.A. Shimkus	Deputy Engineering Services Officer
Vacant	Computer-Aided Design/Computer-Aid Manufacturing Group
Mr. Q.A. Blush	Quality Assurance Group
Mr. R.I. Perlut	Head, Mechanical Engineering and Manufacturing Branch
Mr. A.G. Pezzulich	Head, Electronic Engineering and Fabrication Branch

Point of contact: Mr. Michael Shimkus, Code 2301, 767-6057

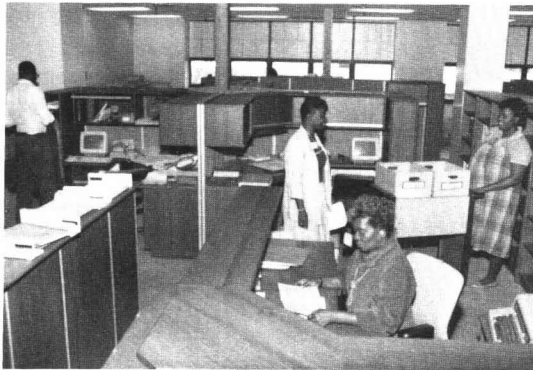
†Additional duty

Supply Division

- ADMINISTRATIVE SERVICES
- CUSTOMER LIAISON
- AUTOMATED INVENTORY MANAGEMENT SYSTEM
- PURCHASING
- RECEIPT CONTROL
- MATERIAL
- TECHNICAL



A customer shops in the new supply store.



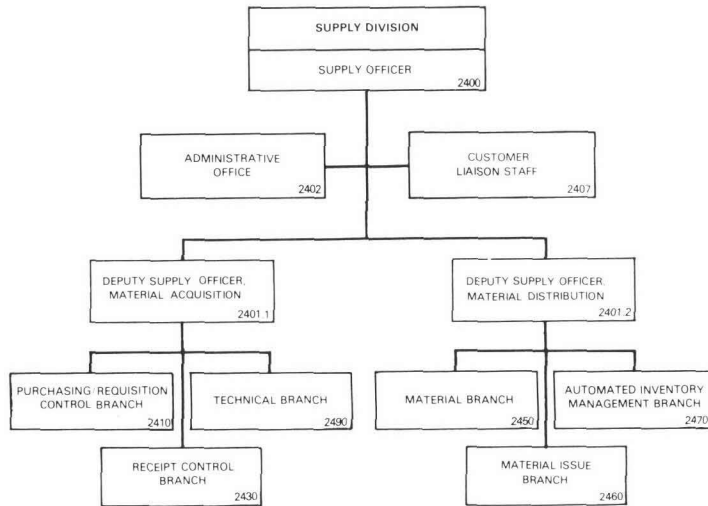
Supply technicians and inventory management specialists are gathering information for customers in their newly renovated spaces.



An inspector verifies the contents of a package.



LCDR T. Lippert



Basic Responsibilities

The Supply Division provides the Laboratory and its field activities with contracting, supply management, and logistics services. Specific functions include: procuring required equipment, material, and services; receiving, inspecting, storing, and delivering material and equipment; packing, shipping, and traffic management; surveying and disposing of excess and unusable property; operating various supply issue stores and performing stock inventories; providing technical and counseling services for the research directorates in the development of specifications for a complete procurement package; and obtaining and providing guidance in the performance stages of contractual services.

During FY 1987, the Supply Division processed 38,267 purchasing actions, which totaled approximately \$50,130,439. Inventory in the eight stores and bulk warehouse averaged \$1,291,046 and 9,807 line items.

Personnel

Full-time civilian: 155
 Military: 1

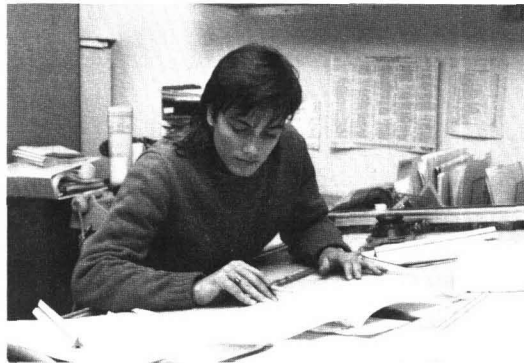
Key Personnel

Name	Title
LCDR T.R. Lippert, SC, USN	Supply Officer
Vacant	Deputy Supply Officer, Material Acquisition
Vacant	Deputy Supply Officer, Material Distribution
Mrs. C. Hartman	Head, Administrative Office
Mrs. D. Graves	Head, Customer Liaison Staff
Mr. W.R. Waynes	Head, Purchasing/Requisition Control Branch
Mr. J.J. Dupcavitch	Head, Receipt Control Branch
Mr. S. Kinney	Head, Material Branch
Mr. A. Zuccaro	Head, Material Issue Branch
Mrs. E.I. Woodland	Head, Automated Inventory Management Branch
Mr. B.A. Copson	Head, Technical Branch

Point of contact: Mrs. C. Hartman, Code 2402, 767-3478

Public Works Division

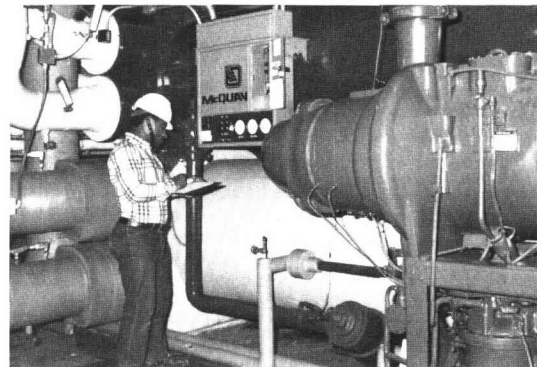
- PROJECT MANAGEMENT STAFF
- SELECTIVE CONTRACTS GROUP
- ENGINEERING
- MAINTENANCE, UTILITIES, AND TRANSPORTATION
- MAINTENANCE CONTROL
- ADMINISTRATION
- CONTRACTS
- PLANNING



The Public Works Division has a large in-house engineering staff to provide electrical, mechanical, and civil/structural modifications and repairs to NRL's many facilities.



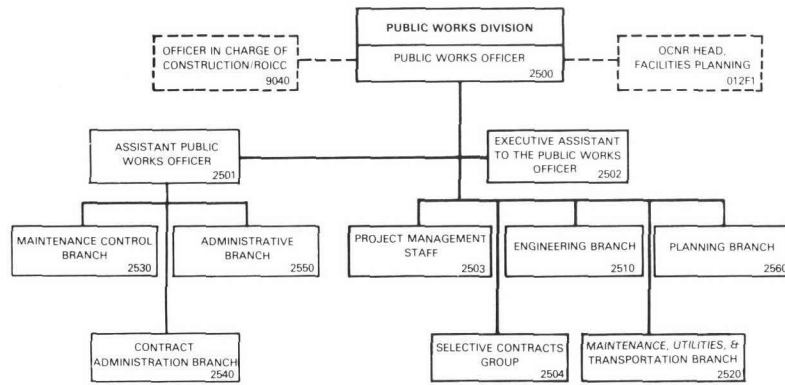
This technician is repairing an electronic security board. The Maintenance and Utilities Branch has 10 shops employing a skilled shop force of more than 200 personnel.



Checking operations at the Central Chilled Water Plant. The division also operates and maintains a central steam plant, electrical distribution, and telephone/alarm system communication networks.



CDR T.R. Rampe



Basic Responsibilities

The Public Works Division is responsible for the physical plant of NRL. This includes: responsibility for the design, construction, maintenance, and repair of public works and utilities; responsibility for the operation of these public works and utilities in accordance with the technical standards of the Naval Facilities Engineering Command; and 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 Resident Officer in Charge of Construction on all Naval Facilities Engineering Command and certain research and development contracts at NRL.

Personnel

Full-time civilian: 358
 Military: 2

Key Personnel

Name	Title
CDR T.R. Rampe, CEC,USN	Public Works Officer/Officer in Charge of Construction/OCNR Shore Facilities Engineer
LCDR J.F. McCollum, CEC, USN	Assistant Public Works Officer
Mr. J.P. Kosker	Executive Assistant to the Public Works Officer
Mr. T. Graves	Project Management Staff
Mr. G. Kitchin	Selective Contracts Group
Mr. J. Botkin	Head, Engineering Branch
Mr. C.B. Conner	Head, Maintenance, Utilities, & Transportation Branch
Mr. S. Harrison	Head, Maintenance Control Branch
Mrs. G. Johnson	Head, Contracts Administration Branch
Mrs. A. Coats	Head, Administrative Branch
Mr. D. Price	Head, Planning Branch

Point of contact: Mrs. A. Coats, Code 2550, 767-2168

Technical Information Division

- INFORMATION SERVICES
- TECHNICAL LIBRARY
- PUBLICATIONS
- PHOTOGRAPHIC



The Ruth H. Hooker Library provides access to an extensive collection of books, reports, and periodicals. Through online access and cooperative agreements most literature is available via interlibrary loan.

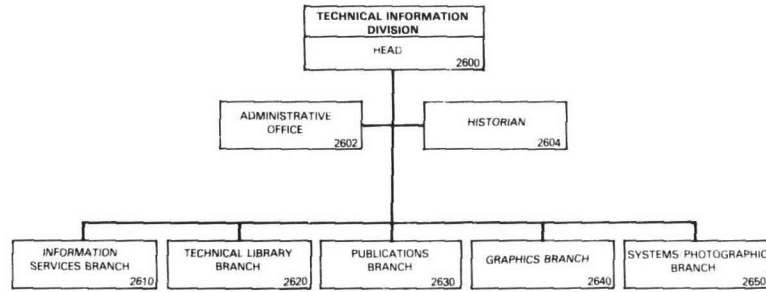
The graphic artists in the Graphic Services Branch design visuals and create artwork for NRL presentations and publications.



A full-service video/television production facility is available to produce professional-quality live and remote video technical reports. Complete editing, directing, and duplicating support are also available for video productions.



Mr. P. Imhof



Basic Responsibilities

The Technical Information Division provides centralized support to the Laboratory, and sometimes the Office of Naval Research, in the collection, retention, processing, publishing, presenting, and distribution of information in many forms to many audiences.

The following are the specific ways the Technical Information Division supports the Laboratory: by providing a full range of Library services; editing and publishing reports and publications; specialized scientific and general photographic services; illustration and visual aid services; DICOMED support; scientific composition; special projects graphics; auditorium and meeting support; collection and maintenance of historical data; exhibits; video data gathering services; management of public and internal information programs (publishing Labstracts, NRL's biweekly newspaper); and conducting Freedom of Information Act activities as required by law.

Personnel

Full-time civilian: 111

Key Personnel

Name	Title
Mr. P. Imhof	Head, Technical Information Division
Mrs. C. Uffelman	Administrative Officer
Dr. D. Van Keuren	Historian
Mr. J.W. Gately, Jr.	Head, Information Services Branch and Public Affairs Officer*
Ms. L. Stackpole	Head, Technical Library Branch
Mr. T. Calderwood	Head, Publications Branch
Ms. L. Jackson	Head, Graphics Branch
Mr. J. Lucas	Head, Systems/Photographic Branch

Point of contact: Mrs. C. Uffelman, Code 2602, 767-3370

*Additional Duty

Chesapeake Bay Detachment

- ADMINISTRATIVE
- SECURITY
- OPERATIONS
- MAINTENANCE AND SUPPORT



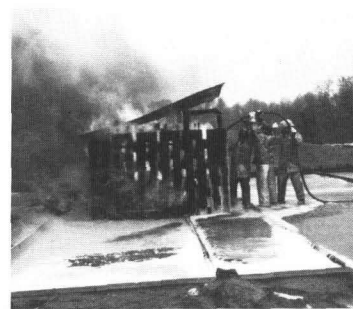
Research watercraft used to support research projects and for transportation to off-site facilities



Tilghman Island Facility located directly across the bay, 10 miles from CBD



Aerial view of the Chesapeake Bay Detachment



Fire Test Facility

Research Division Representatives

Optical Sciences Division

Mr. C. Gott, Field Experiments

Radar Division

Mr. J. Ahearn, Radar Division

Mr. M. Siegert, Target Characteristics Branch

Mr. J. Ward, Search Radar Branch

Mr. J.T. Ferrell, Radar Techniques Branch

Tactical Electronic Warfare Division

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

Chemistry Division

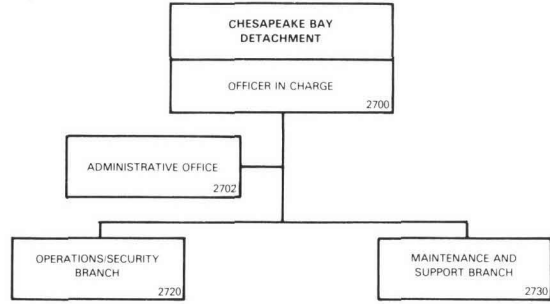
Dr. H. W. Carhart, Navy Technology Center for Safety and Survivability

Condensed Matter and Radiation Sciences Division

Mr. Alan J. Zakraysek, Impact Vulnerability Staff



CDR S.I. Kummer



Basic Responsibilities

The Chesapeake Bay Detachment operates and maintains an independent military facility for NRL research. It has a variety of shops, plant facilities, and specialized equipment used to support a variety of NRL and tenant research and development projects that are best carried out at this location.

The Physical Plant

Located in a relatively clear area away from congestion and industrial interference, the main site, at Randle Cliff (Chesapeake Beach), Maryland, covers 167.9 acres and has 165 structures of various sizes and types of construction, eight of which are major laboratory and/or office buildings. There is over 282 ft of usable dock space with a controlling water depth of 7 ft, located 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 10 mi.

Research watercraft available at CBD include a 74-ft LCM-8, one 45-ft support craft, one 36-ft patrol boat, and one 22-ft motor whaleboat. These are used in support of research projects and for transportation to off-site facilities.

Personnel

Full-time civilian: 25

Military: 1

Key Personnel

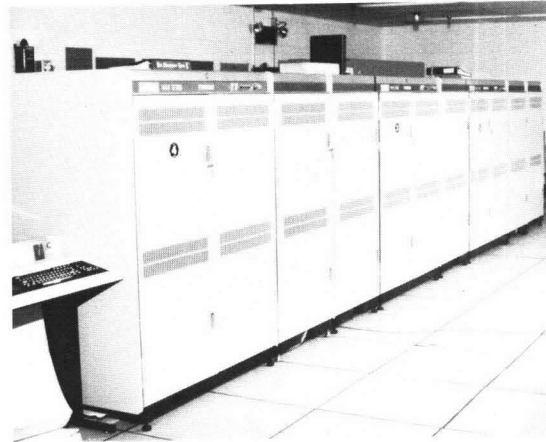
Name	Title
CDR S.I. Kummer, USN	Officer in Charge
Vacant	Administrative Officer
Mr. P.L. Phelps	Operations/Security Officer
Mr. T.N. Erwin	Maintenance and Support Officer

Point of contact: CDR S.I. Kummer, USN, Code 2700, (301) 257-4002

Research Computation Division



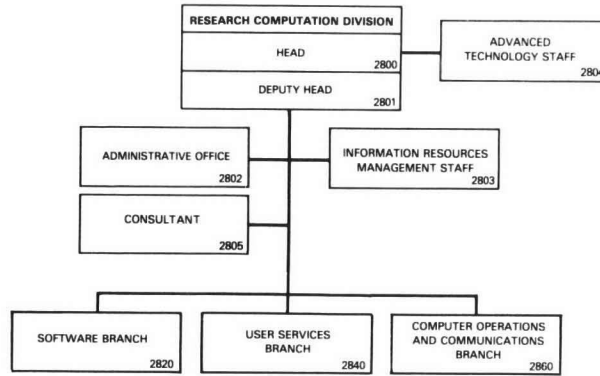
The Cray X-MP/24 multiprocessor supercomputer provides very high-speed vector and scalar processing. The Cray provides a per processor sustainable speed of 210 million floating point operations per second (MFLOPS) and has a central memory capacity of 4 million 64-bit words.



These four VAX 11/785s provide access to the Cray X-MP/24 from NRL's local area network and the Defense Data Network, thus providing access from terminals, PCs, minicomputers, workstations, and other computers throughout the country.



Mr. R.F. Saenger



Basic Responsibilities

The Research Computation Division (RCD) provides a wide variety of concurrent computer services to more than 1300 scientists, analysts, and engineers, both at NRL and at remote locations throughout the United States. These services include high-volume, time-shared, local and remote batch; active graphics; and telecommunications processing.

The RCD manages and operates NRL's Central Computer Facility (CCF), a totally integrated computer system consisting of a Cray X-MP multiprocessor with its associated support equipment, and a high-speed network of Digital Equipment Corporation VAX 700 plus VAX 8000 computer systems that facilitate communications between the user community and the CCF. The Cray X-MP, a class VI computer, is the fastest computer manufactured in the United States. Through use of local area networking (NICENET) and a worldwide networking system (Defense Data Network), both local and remote users access the CCF through their host computers (including personal workstations) or by terminals.

The RCD also provides appropriate ADP technical logistic support services for NRL; identifies ADP requirements and may secure and administer contractual ADP support services; and supports the Navy Laboratory Computing Committee and the Navy Laboratory Computer Network. The Head of the RCD, by additional duty assignment, is the OCNR Special Assistant for Information Resources Management.

Personnel

Full-time civilian: 48

Key Personnel

Name	Title
Mr. R.F. Saenger	Head, Research Computation Division
Ms. D.E. Gossett	Deputy Head
Ms. B.M. Thomas	Administrative Officer
Mr. J.B. Smith	Head, Information Resources Management Staff
Mr. R.F. Saenger*	Head, Advanced Technology Staff
Mr. H.K. Brock	Head, Consultant Staff
Mr. G.E. Perez	Head, Software Branch
Ms. H. Kay Howell	Head, User Services Branch
Mr. J.N. Lockard	Head, Computer Operations and Communications Branch

Point of contact: Mr. Rudi F. Saenger, Code 2800, 767-2751

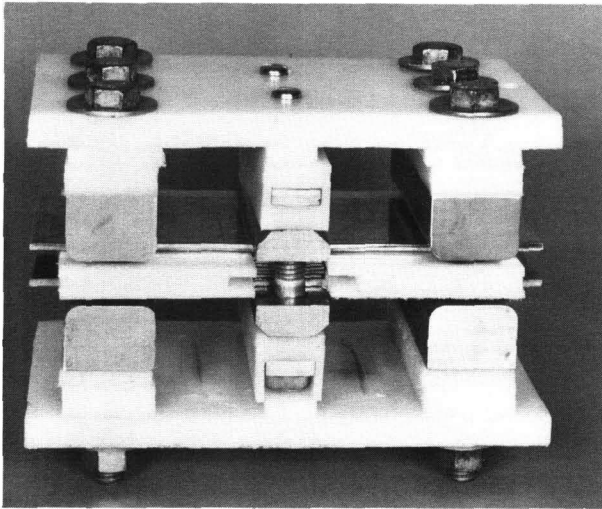
*Acting

**GENERAL SCIENCE
AND
TECHNOLOGY DIRECTORATE**

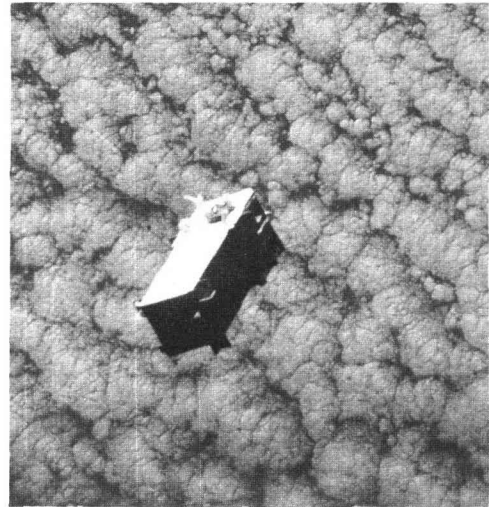
General Science and Technology Directorate

The Navy's operational effectiveness depends on its ability to keep pace with rapidly developing technologies. This directorate contributes to this requirement by conducting research in computational physics; astrophysics; atmospheric, ionospheric, space, and plasma sciences; fundamental properties of materials; radiation; and pulsed power technologies. Areas of particular emphasis include solar physics, wide-spectrum astronomy, fluid mechanics and hydrodynamics, modeling of atmospheric and ionospheric processes, nuclear weapons effect simulations, high-energy density storage devices, interactions of various types of radiation with matter, survivability of materials and components, and directed energy devices.

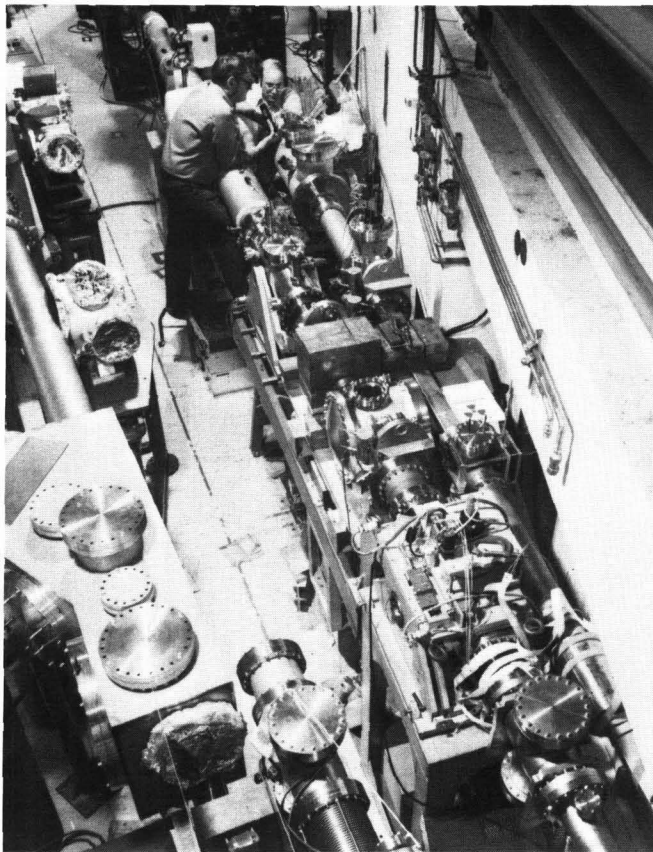
GENERAL SCIENCE AND TECHNOLOGY DIRECTORATE



Multimegampere opening switch for rail-gun experiments



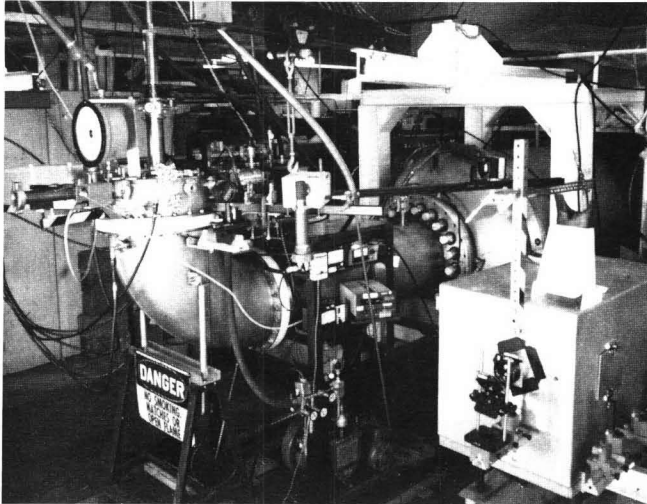
SPARTAN-I X-ray satellite after release from satellite



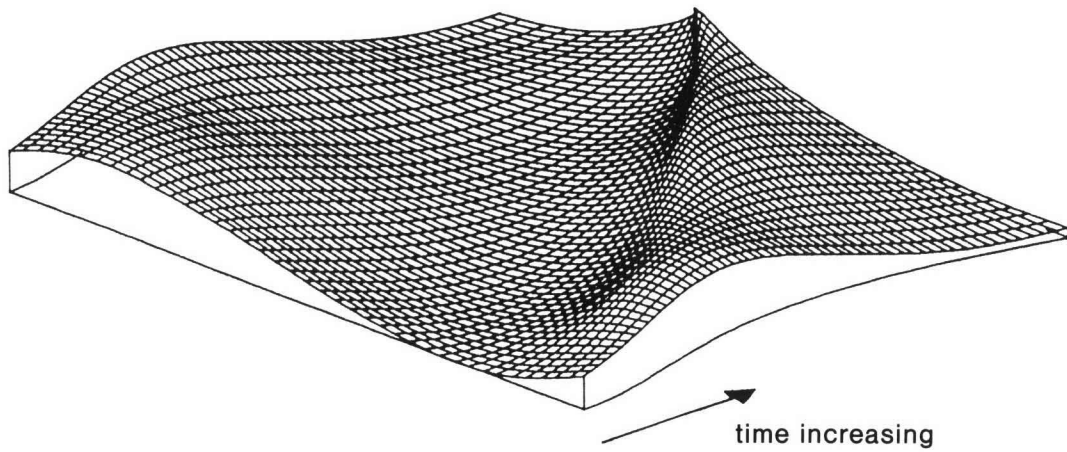
NRL synchrotron radiation beam lines at the National Synchrotron Light Source, Brookhaven



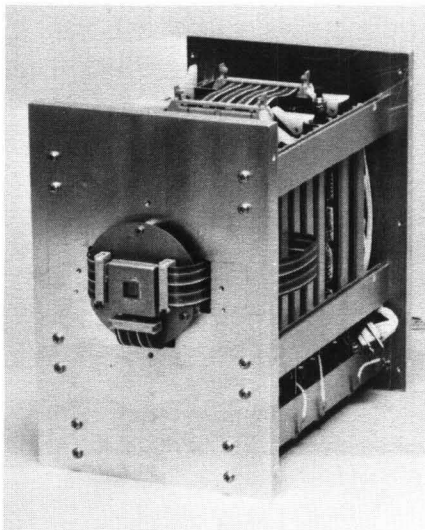
NRL payload specialist in orbit on Skylab-2 mission



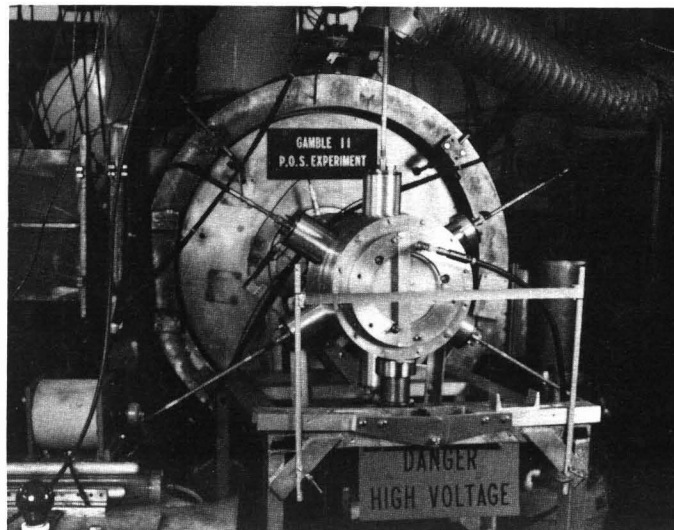
Pinch experiment for development of fusion plasmas



Numerical simulation of the temporal growth of a steep wave to the onset of breaking in deep water

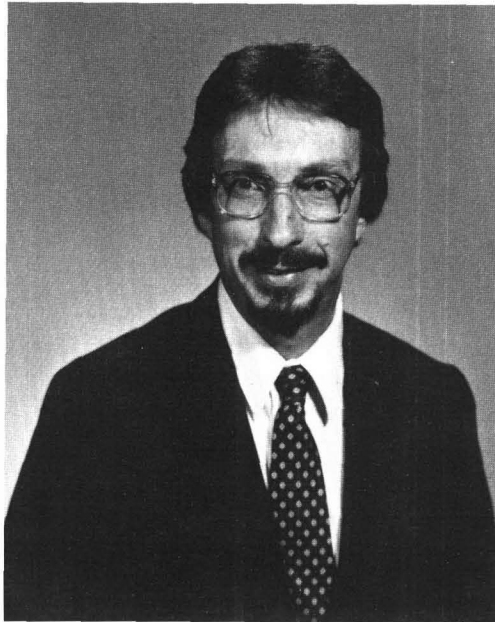


Radiation-hardened star-tracker—
heart of autonomous satellite
navigation system



One-thousand gigawatt plasma erosion opening switch

Associate Director of Research for General Science and Technology

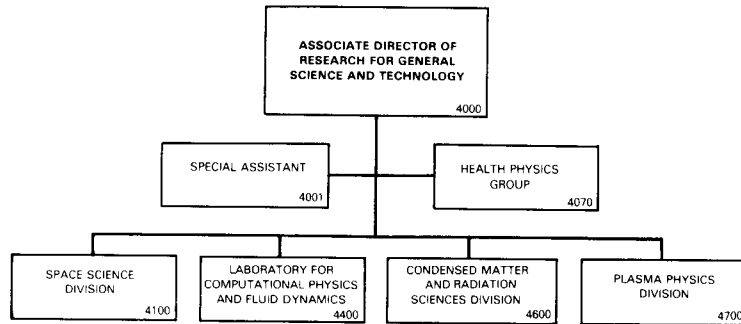


Dr. William R. Ellis

Dr. Ellis [REDACTED] He obtained his undergraduate degree in physics from Clemson University in 1962 and did his graduate work at Princeton University, where he obtained an M.S. degree in 1965 and a Ph.D. in 1967, gaining one of the first doctorates awarded in the emerging field of plasma propulsion.

In 1967-69, Dr. Ellis worked at the Culham Laboratory for Plasma Physics and Fusion Research in England, where he headed an experimental group investigating toroidal discharge physics problems in plasma confinement. In 1970, he accepted a position with the Los Alamos Scientific Laboratory in New Mexico where he became Associate Group Leader for the Scyllac experimental group in the Controlled Thermonuclear Research Division. In 1976, Dr. Ellis joined the Energy Research and Development Administration (ERDA), the predecessor agency of the Department of Energy. In 1979, he was appointed Director of the Department of Energy's Mirror Confinement Systems Division in the Office of Fusion Energy, Office of Energy Research, where he was responsible for programs to develop fusion power reactors based on the magnetic mirror confinement concept. Dr. Ellis was appointed Associate Director of Research for General Science and Technology at the Naval Research Laboratory in October 1983.

Dr. Ellis is a member of the American Physics Society, American Nuclear Society, Sigma Xi, American Association for the Advancement of Science, and the American Geophysical Union. He served on the Executive and Prize Committees of the APS Division of Plasma Physics, the Program Committee of the International School of Plasma Physics in Varenna, and the Department of Energy's USA/USSR Joint Fusion Power Coordinating Committee. He has received the Department of Energy's Exceptional Service Award, and is a patentee in his field. He is the Navy's alternate member on the Under Secretary of Defense's High Power Microwave Executive Steering Group, a member of the Executive Steering Group's Program Implementation Panel, and Chairman of the Directed Energy Coordinating Committee of the Naval Research Laboratory. Dr. Ellis has published over 100 papers, reports, and articles in the areas of experimental and theoretical plasma physics and fusion research. He also has authored a regular newspaper column (about 50 articles) on science and the environment.



Key Personnel

Name	Title	Code
Dr. W.R. Ellis	Associate Director of Research for General Science and Technology	4000
Ms. Grace Bell	Special Assistant	4001
Mr. J.N. Stone	Head, Health Physics Group	4070
Dr. H. Gursky	Superintendent, Space Science Division	4100
Dr. J.P. Boris	Chief Scientist and Director, Laboratory for Computational Physics and Fluid Dynamics	4400
Dr. D.J. Nagel	Superintendent, Condensed Matter and Radiation Sciences Division	4600
Dr. S. Ossakow	Superintendent, Plasma Physics Division	4700

Point of contact: Nancy H. Sell, Code 4000A, 767-3324

Health Physics Group

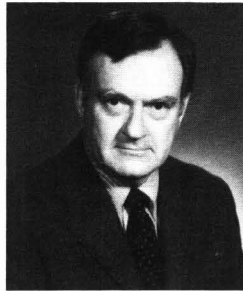
(Code 4070)

Basic Responsibilities

The Health Physics Group provides a Laboratory-wide protection program for the possession and use of all sources of ionizing and radio-frequency/microwave radiation. The group performs technical monitoring, evaluation, and research to assure that NRL radiological and radio-frequency/microwave operations are safe and in compliance with federal, state, and Navy regulations. It provides employees with training, instructions, instruments, assistance, and controls needed to carry out their radiological and radio-frequency/microwave safety responsibilities.

Personnel

Full-time civilian: 14



Mr. J. N. Stone

Key Personnel

Name	Title
Mr. J.N. Stone	Head, Health Physics Group
Mr. T.L. Johnson	Head, Research & Technical Support Section
Mr. R.B. Luersen	Head, Survey & Analysis Section

Point of contact: J.N. Stone, Code 4070, 767-2232

Space Science Division

Research Activity Areas

Atmospheric Physics

Boundary layer and electro-optics meteorology; aerosol and cloud atmospheric electricity

X-ray Astronomy

X-ray observation, analysis, and theory of space astronomical sources

Radio and Infrared Astronomy

Galactic/extragalactic, radio/IR astronomy; VLBI interferometry; middle-atmosphere microwave sensing

Ultraviolet Measurements

Ultraviolet astronomy; sensing/modeling of atmos/ionospheres

Gamma and Cosmic Ray Astrophysics

Gamma-ray astrophysics; solar-flare gamma-rays; space cosmic-ray particle environment

Solar Physics

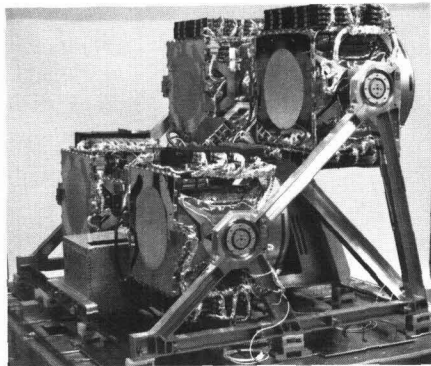
Solar ultraviolet spectroscopy, especially on shuttle/Spacelab

Solar-Terrestrial Relationships

Solar X-ray/EUV plasma diagnostic coronal effects at Earth

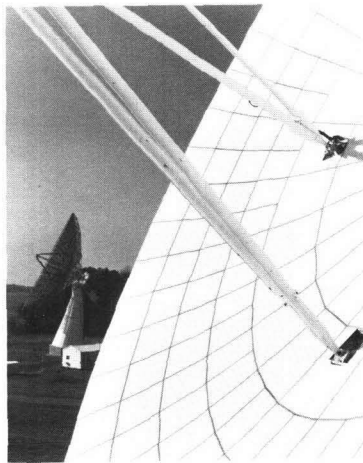
Ionospheric Effects

Ionospheric modification; ionospheric propagation, modeling

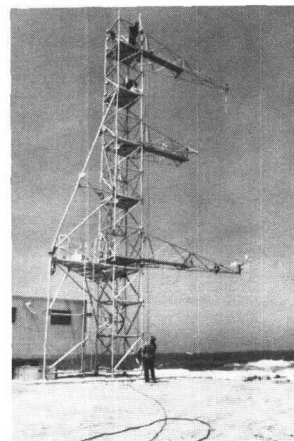


Oriented Scintillation Spectrometer Experiment (OSSE) for the Gamma Ray Observatory (GRO) Mission.

OSSE is an 1818 kg (4000 lb) instrument that will measure the continuum and search for gamma ray spectral lines in the 0.05- to 10-meV region by using four identical and independently movable detectors.



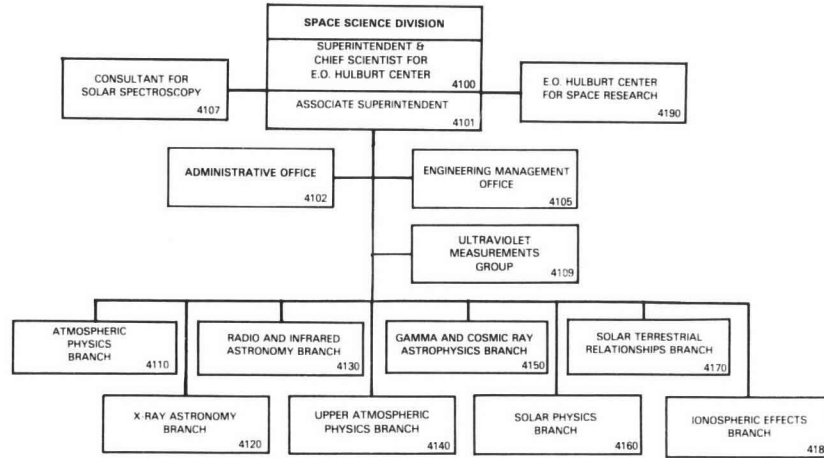
Radio Telescopes at Maryland Point (MD) Observatory



Marine Boundary Layer Experiment at San Nicolas Island, CA



Dr. H. Gursky



Basic Responsibilities

The Space Science Division conducts research in the fields of astronomy and astrophysics, solar-terrestrial physics, and atmospheric science. Satellites, rockets, and ground-based facilities are used to obtain information on radiation from the sun and celestial sources, and to study the behavior of the ionosphere and high atmosphere. Radio telescopes are used for astronomical observations and atmospheric sensing. Research results are of importance to radio communications, to utilization of the space environment, to weather prediction, and to fundamental understanding of natural radiation and geophysical phenomena. The Superintendent also acts as Chief Scientist of the E.O. Hulburt Center for Space Research, created to provide research opportunities in space science to appointees from universities.

Personnel

Full-time civilian: 133

Key Personnel

Name	Title
Dr. H. Gursky	Superintendent
Dr. R.G. Groshans	Associate Superintendent
Mrs. C.J. Marks	Administrative Officer
Mr. J. Vranick	Engineering Management Officer
Dr. R. Tousey	Consultant (Emeritus)
Dr. H. Gursky†	Chief Scientist, E. O. Hulburt Center for Space Research
Dr. H. Friedman	Chief Scientist (Emeritus) E. O. Hulburt Center for Space Research
Dr. G. Carruthers	Head, Ultraviolet Measurement Group
Dr. L. Ruhnke	Head, Atmospheric Physics Branch
Mr. G.G. Fritz	Head, X-Ray Astronomy Branch
Dr. K.J. Johnston	Head, Radio & Infrared Astronomy Branch
Dr. R.R. Meier	Head, Upper Atmospheric Physics Branch
Dr. J.D. Kurfess	Head, Gamma and Cosmic Ray Astrophysics Branch
Dr. G.E. Brueckner	Head, Solar Physics Branch
Dr. G.A. Doschek	Head, Solar Terrestrial Relationships Branch
Dr. J.M. Goodman	Head, Ionospheric Effects Branch

Point of contact: Mrs. Carolyn J. Marks, Code 4102, 767-3631

†Additional duty

Laboratory for Computational Physics and Fluid Dynamics

Research Activity Areas

Reactive Flows

- Fluid dynamics in combustion
- Turbulence in compressible flows
- Multiphase flows
- Molecular dynamics
- Theoretical quantum chemistry

Fluid Structure Interaction

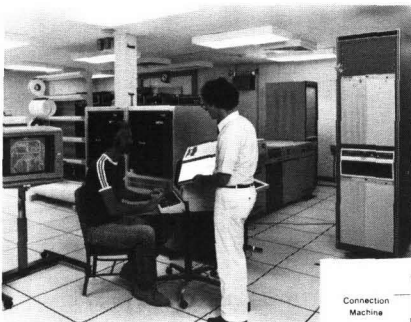
- Boundary layer hydrodynamics
- Marine hydrodynamics
- Computational hydrodynamics
- Hydro-acoustics

Applied Hydrodynamics

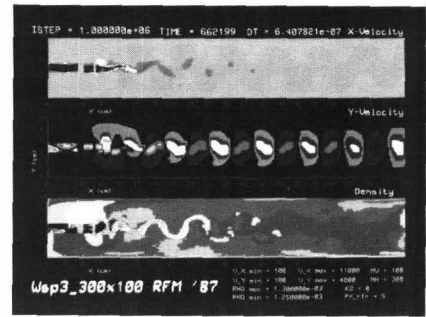
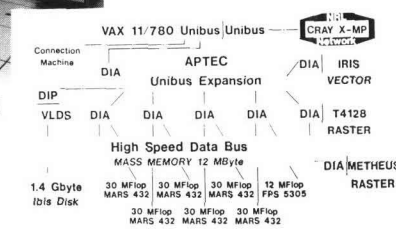
- Turbulent jets and wakes
- Nonlinear and breaking ocean waves
- Stratified flows
- Turbulence modeling

Computational Physics Developments

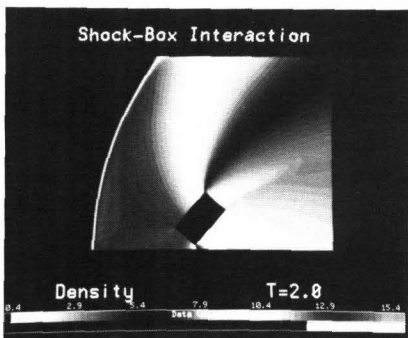
- Laser plasma interactions
- Inertial confinement fusion
- Solar physics modeling
- Dynamical gridding algorithms
- Advanced graphical and parallel processing systems



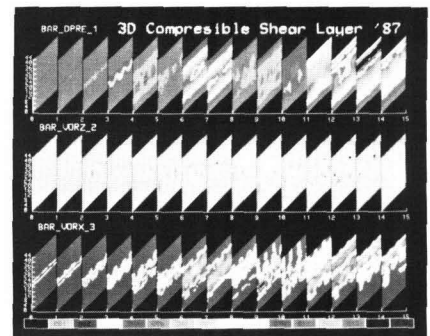
Working at the LCP Graphical Array Processing System (GAPS)



VOYEUR presentation of horizontal velocity (top), vertical velocity (middle), and density (bottom) in a 2D simulation of vortex shedding behind a bluff body. The simulation on this 300×100 finite difference grid was carried to 1,000,000 timesteps on GAPS.



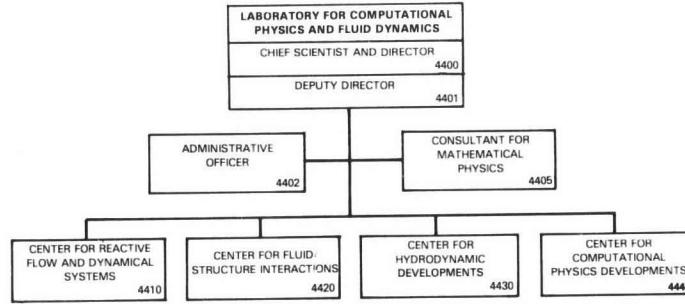
Cray computation of a Mach 10 shock hitting a solid box from the left. New techniques developed to resolve complex geometries and complex flows allow the geometry to change during a simulation. The box has nearly overturned due to the unbalanced pressure of the shock.



VOYEUR presentation of vortex merging in a 3D compressible shear layer. Pressure fluctuations (top), streamwise vorticity (middle), and spanwise vorticity (bottom) are each contoured in 15 cross-sectional planes. Streamwise ribs corrugate the major spanwise vortex rolls.



Dr. J.P. Boris



Basic Responsibilities

The Laboratory for Computational Physics and Fluid Dynamics is responsible for the research leading to and the application of advanced analytical, numerical, and experimental capabilities which are relevant to Navy, DOD, and other programs of national interest. This research is pursued in the fields of compressible and incompressible fluid dynamics, reactive flows, fluid/structure interaction, atmospheric and ocean geophysics, magnetoplasma dynamics for laboratory and space applications, and in other disciplines of continuum and quantum computational physics as required to further the overall mission of the Naval Research Laboratory. The specific objectives of the Laboratory for Computational Physics and Fluid Dynamics are: to develop and maintain state-of-the-art analytic, computational, and experimental capabilities in fluid dynamics and related fields of physics; to establish in-house expertise in parallel processing for large-scale scientific computing; to perform analyses, computations, and experiments on specific relevant problems using these capabilities; and to transfer this technology to new and ongoing projects through cooperative programs with the research divisions at NRL and elsewhere.

Personnel

Full-time civilian: 33

Key Personnel

Name	Title
Dr. J.P. Boris	Chief Scientist and Director
Dr. William C. Sandberg	Deputy Director
Ms. D. Miller	Administrative Officer
Dr. D.L. Book	Consultant for Mathematical Physics
Dr. E.S. Oran	Head, Center for Reactive Flow and Dynamical Systems
Dr. O.M. Griffin	Head, Center for Fluid/Structure Interactions
Dr. S.E. Ramberg	Head, Center for Hydrodynamic Developments
Mr. J.H. Gardner	Head, Center for Computational Physics Developments

Point of contact: Ms. Darlene Miller, Code 4402, 767-6581

Condensed Matter and Radiation Sciences Division

Research Activity Areas

Condensed Matter Physics

- X-ray sources, optics, and detectors
- X-ray analysis of materials
- Plasma spectroscopy
- Synchrotron radiation applications
- Phase transformations
- Highly excited materials
- Radiation effects in microelectronics
- Condensed matter theory

Materials Modification and Analysis

- Modification of surfaces by ion implantation and ion activated deposition
- Radiation effects from high energy, charged particle beams
- Crystal studies by channeling techniques
- Sputtering by high-energy ions
- Theory of ion-solid interactions
- 200-kV ion implantation systems
- 3-MV tandem ion accelerator

Radiation-Matter Interactions

- Interaction of laser and microwave radiation with materials and systems

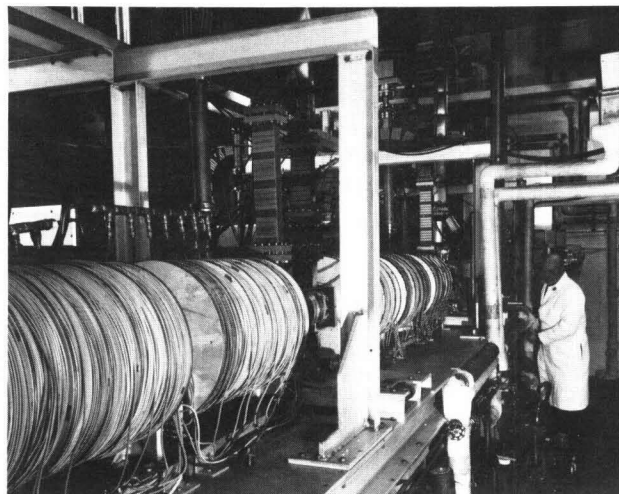
- Interaction of particle beams with materials
- Radiation transport calculations
- Energetic radiation applications
- Molecular collisions
- Hypervelocity impact

Radiation Survivability

- Satellite survivability
- Single event upsets
- Device and material damage and hardening
- Ultrafast charge collection
- Space experiments
- Nuclear radiation detection
- 60-MeV LINAC
- 2-MV Van de Graaff and Co-60 sources

Directed Energy Effects

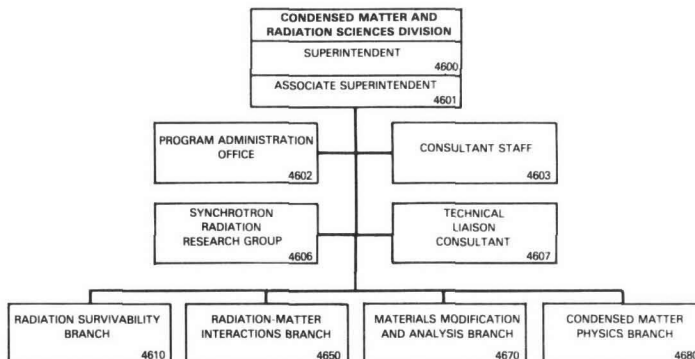
- Laser and microwave susceptibility and hardening



Adjusting the cooling system for the accelerator waveguides on the electron LINAC



Dr. D. J. Nagel



Basic Responsibilities

The Condensed Matter and Radiation Sciences Division conducts a broad program of basic and applied research on the fundamental properties of materials and on the interactions of various types of radiation with matter. Physical properties of condensed matter are investigated theoretically and experimentally as well as by various radiation probes. Damage produced by radiation, ranging from laser and x-ray beams through charged and neutral particle beams in the megavolt region, is studied. Techniques to utilize radiation for beneficial modification of materials are also developed. Radiations of military significance are studied and simulated in the laboratory by various radiation facilities maintained and operated by the Division primarily for DoD users.

Personnel

Full-time civilian: 109

Key Personnel

Name	Title
Dr. D.J. Nagel	Superintendent
Dr. G.P. Mueller*	Associate Superintendent
Ms. B. Murphy	Head, Program Administration Office
Dr. A.W. Saenz	Consultant, Non-Linear Dynamics
Dr. J.W. Butler	Consultant, Ion Beam Applications
Dr. M. Kabler	Head, Synchrotron Radiation Research Group
Mr. J.C. Ritter	Head, Radiation Survivability Branch
Dr. A. Stolovy*	Head, Radiation-Matter Interaction Branch
Dr. F.A. Smidt	Head, Materials Modification and Analysis Branch
Dr. B.M. Klein	Head, Condensed Matter Physics Branch

Point of contact: Ms. B. Murphy, Code 4602, 767-3407

*Acting

Plasma Physics Division

Research Activity Areas

High-Power Electromagnetic Radiation

Application of high-current relativistic electron beams to microwave and millimeter wave generation, e.g., gyrotrons, short-pulse FEL, and CARM
Electron accelerators
Plasma microwave electronics

Experimental Plasma Physics

Dense Z-pinch
Magnetic fusion studies

Laser Plasma

Laser-plasma interaction
Laser fusion
High-altitude nuclear explosion simulations
Plasma diagnostics
Large glass laser facility
Laser-driven X-ray lasers
KrF laser development

Plasma Radiation

Radiation dynamics and transport
X-ray laser modeling
Atomic structure and processes
Radiation hydrodynamics

Advanced Beam Technologies

Modified Betatron Accelerator
Rebatron Accelerator
High-quality electron beams
Wake field accelerators

Plasma Technology

Production of intense relativistic electron beams
Electron beam propagation and focusing
Pulse-power-driven X-ray lasers
Generation of intense ion beams
Inductive energy storage

Geophysical and Plasma Dynamics

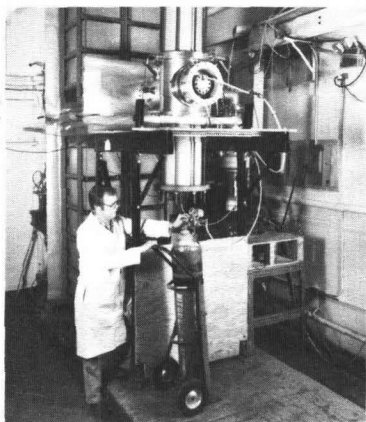
Theoretical and numerical simulation of ionospheric and magnetospheric phenomena
High-altitude, nuclear weapons effects on the ionosphere/magnetosphere
Solar-terrestrial relations
Ionospheric-magnetospheric coupling

Plasma Theory

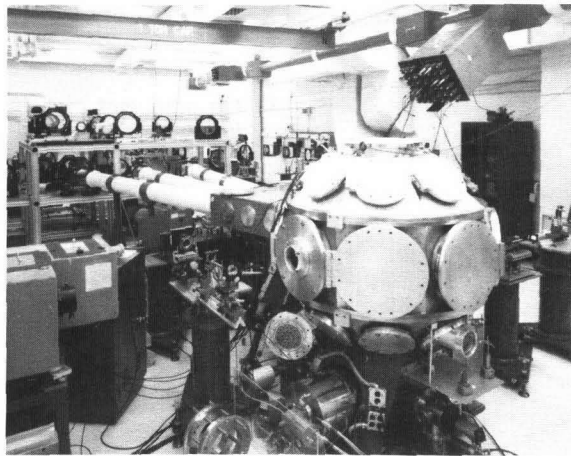
Numerical simulation of high-density plasmas
Theoretical study of nonlinear plasma dynamics
Production and propagation of high-energy charged particle beams
Radiation source development
FEL theory

Charged Particle Physics

Charged particle beam generation and propagation
Plasma channels in air
Experimental study of plasma chemistry
Rocket, satellite, and shuttle-borne natural and active experiments
Laboratory simulation of space plasma processes



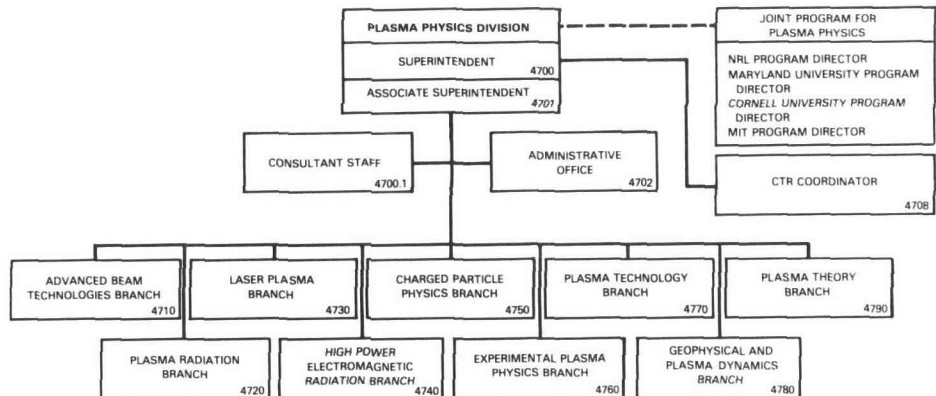
A new device called PAWN is being developed at NRL. It is a pulse generator that uses inductive energy storage and opening switch techniques to condition electrical power for various pulsed power applications.



This is the target chamber of the Pharos III laser facility. Pharos III is a three-beam Nd:glass laser that can produce a kilojoule of energy in a few nanoseconds. When the light is focused onto a target, temperatures of 10 to 100 million degrees can be easily produced. The facility is being used to simulate high-altitude nuclear weapons effects, to study the physics of inertial confinement fusion, and to develop new X-ray lasers.



Dr. S. Ossakow



Basic Responsibilities

The Plasma Physics Division conducts a broad theoretical and experimental program of basic and applied research in plasma physics, intense electron and ion beams, atomic physics, pulsed power sources, and laser physics. The effort of the Division is concentrated on a few closely coordinated theoretical and experimental programs. Considerable emphasis is placed on large-scale numerical simulations related to plasma dynamics; ionospheric, magnetospheric, and atmospheric dynamics; the effects of high-altitude nuclear weapons on the atmosphere; thermonuclear plasma confinement; atomic physics; and relativistic electron beam propagation. Areas of experimental interest include: relativistic electron beams, laser-matter interaction, thermonuclear fusion, electromagnetic wave generation, the generation of intense ion beams, advanced accelerator development, inductive energy storage, the interaction of charged particle beams with the atmosphere, and *in-situ* space plasma measurements.

Personnel

Full-time civilian: 113

Key Personnel

Name	Title
Dr. S. Ossakow	Superintendent
Mr. I. Vitkovitsky	Associate Superintendent
Dr. W. Ali	Consultant
Dr. P. Palmadesso	Consultant
Dr. M. Friedman	Consultant
Ms. T. Mason	Administrative Officer
Dr. A. Robson	Coordinator, CTR Program
Dr. C. Kapetanakos	Head, Advanced Beam Technologies Branch
Dr. J. Davis	Head, Plasma Radiation Branch
Dr. S. Bodner	Head, Laser Plasma Branch
Dr. W. Manheimer	Head, High-Power Electromagnetic Radiation Branch
Dr. R.A. Meger	Head, Charged Particle Physics Branch
Dr. A. Robson	Head, Experimental Plasma Physics Branch
Dr. G. Cooperstein	Head, Plasma Technology Branch
Dr. J. Huba	Head, Geophysical and Plasma Dynamics Branch
Dr. P. Sprangle	Head, Plasma Theory Branch

Point of contact: Dr. S. Ossakow, Code 4700, 767-2723

**WARFARE SYSTEMS
AND SENSORS RESEARCH
DIRECTORATE**

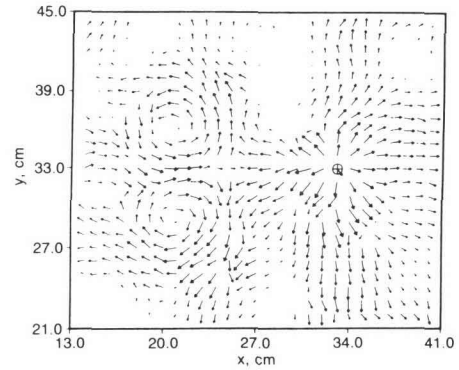
Warfare Systems and Sensors Research Directorate

The Warfare Systems and Sensors Research Directorate performs basic research and development for major generic Navy systems. The emphasis is on radar, electronic warfare, undersea warfare systems, and the integration of these primary sensors by communications and battle management systems. The Directorate conducts an extensive experimental program in the field, using both ship and aircraft platforms to support the above activities. Programs in ocean engineering, environmental factors, artificial intelligence, and calibration and standards for underwater acoustic devices are pursued in support of research and development for Navy systems.

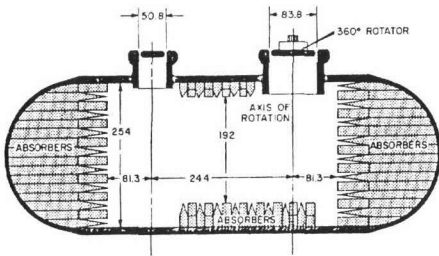
WARFARE SYSTEMS AND SENSORS RESEARCH DIRECTORATE



The Tactical Electronic Warfare Division extensively uses a P-3 aircraft as a flying Electronic Warfare Research, Development, Test, and Evaluation Laboratory



Acoustic field research-energy flow in a flat plate (⊕ source)



ALL DIMENSIONS IN CENTIMETERS

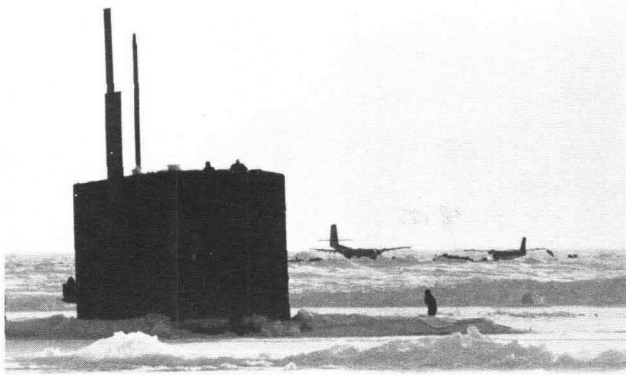
Schematic of anechoic tank at USRD Orlando, Florida



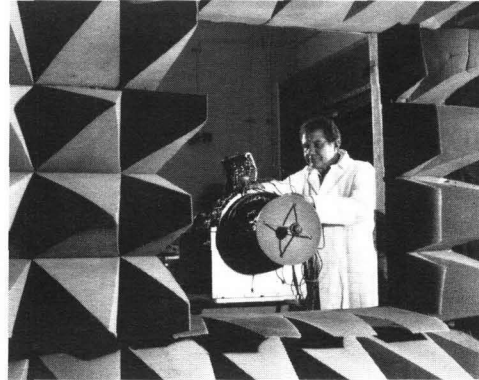
Aerial view of Underwater Sound Reference Detachment, Orlando, Florida



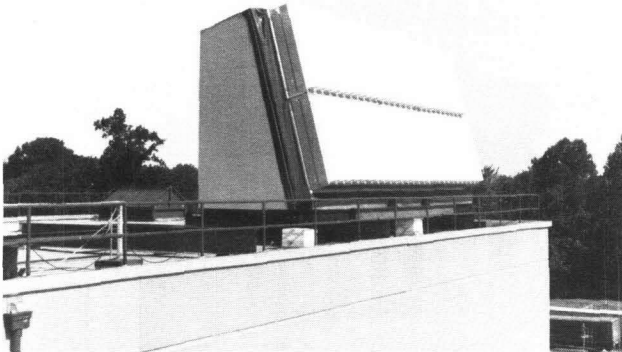
Simulated topside of ship for antenna and communication system measurements at Pomonkey, Maryland, Test Range



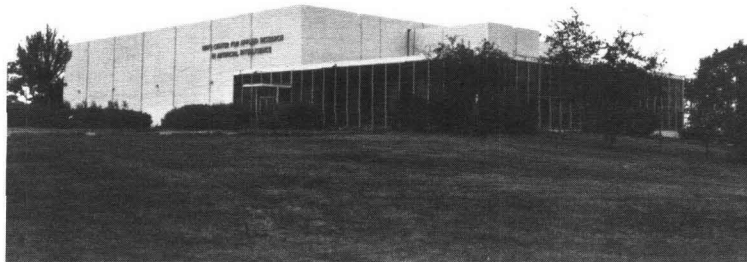
Arctic operations



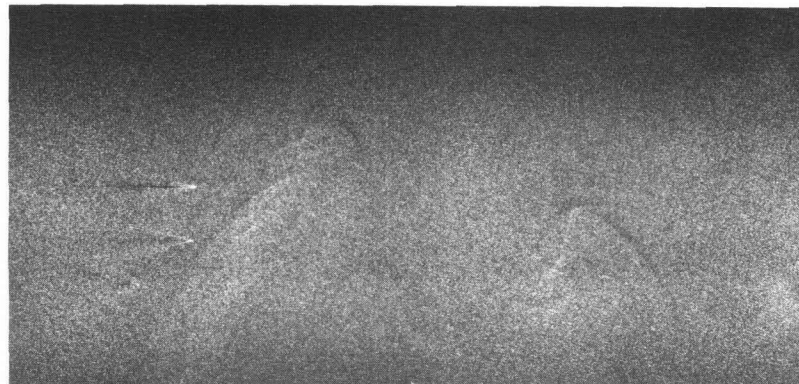
Electronic warfare RF testing facility



Fixed Array Surveillance Radar (FASR), a UHF long-range air-surveillance test bed radar

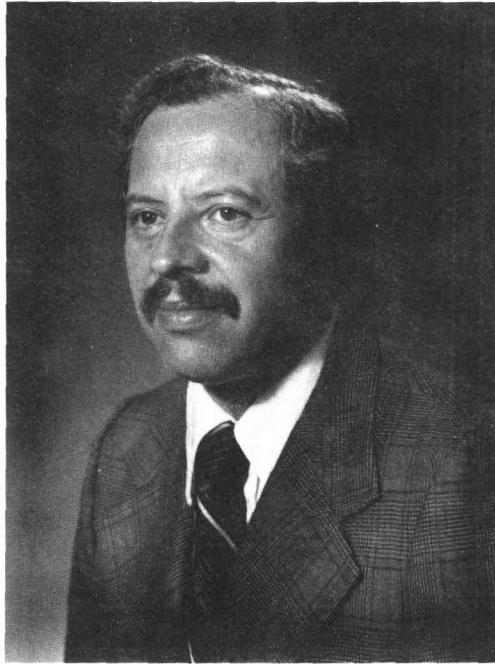


Navy Center for Applied Research in Artificial Intelligence



Radar image of three ships showing centerline wake and evidence of Kelvin Vee wake

Associate Director of Research for Warfare Systems and Sensors Research



Mr. R.R. Rojas

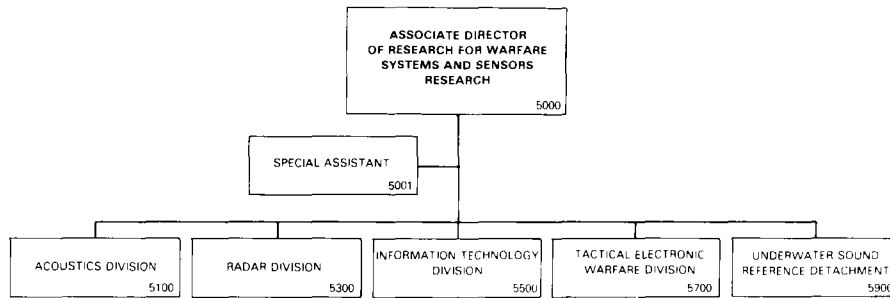
Mr. Rojas [REDACTED]. He attended City College of New York, where in 1952 he received a B.E.E. degree. In 1961, he received an M.E.E. degree from Drexel Institute of Technology, Philadelphia. Further graduate studies in mathematics and engineering were pursued at the University of Pennsylvania, Philadelphia.

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 was responsible for directing an experimental and theoretical program whose purpose was to evaluate and develop advanced surveillance systems for the Navy. Mr. Rojas served as Associate Director of Research and Director of Oceanology from 1977 until 1980, Associate Director of Systems Research and Technology Directorate from 1980 to 1986, and is currently Associate Director of the Warfare Systems and Sensors Research Directorate. 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 and Fellow of the Acoustic Society of America, Sigma Xi, the Institute of Electrical and Electronics Engineers, and the Association of Old Crows; he is also a charter member of the Marine Technology Society.



Key Personnel

Name	Title	Code
Mr. R.R. Rojas	Associate Director of Research for Warfare Systems and Sensors Research	5000
Ms. B.L. Capossela	Special Assistant	5001
Dr. D.L. Bradley	Superintendent, Acoustics Division	5100
Dr. M.I. Skolnik	Superintendent, Radar Division	5300
Dr. J.R. Davis	Superintendent, Information Technology Division	5500
Dr. J.A. Montgomery	Superintendent, Tactical Electronic Warfare Division	5700
Dr. J.E. Blue	Superintendent, Underwater Sound Reference Detachment	5900

Point of contact: Mr. R.R. Rojas, Code 5000, 767-3294

Acoustics Division

Staff Activities

Special Programs Management
Systems studies
Systems concepts and evaluation
Journal of Underwater Acoustics

Research Activity Areas

Marine Physics

Geophysical, geological, and oceanographic parameters that influence underwater acoustics

Applied Ocean Acoustics

Airborne underwater acoustics
Bottom-limited acoustics
Arctic underwater acoustics
Propagation
Noise
Ambient noise measurements and modeling
Spectral estimation
Signal processing

Physical Acoustics

Reflection, diffraction, scattering by bodies
Target strength modeling
Schlieren visualization
Fiber-optic acoustic sensors
Acoustics of coatings

Signal Processing

Tactical computers
Tactical support software
Signal processors

Acoustics Systems

Propagation, coherence, and wave-front behavior
Large-scale spatial and temporal integration
Array deformation
Low-frequency monostatic and bistatic reverberation
Shallow-water acoustics
Mode analysis
Models of signal and noise fields

Marine Systems

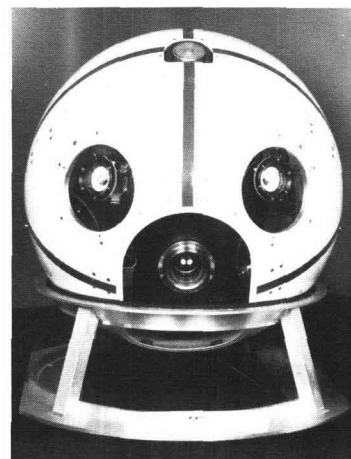
Autonomous vehicle development
Vehicle stability, control, and navigation
Sensor research and development
Adaptive sensor and control systems

Ocean Dynamics

Mesoscale, fine-structure, micro-structure variability
Mixed layer and thermocline applications
Ocean towed instrumentation techniques



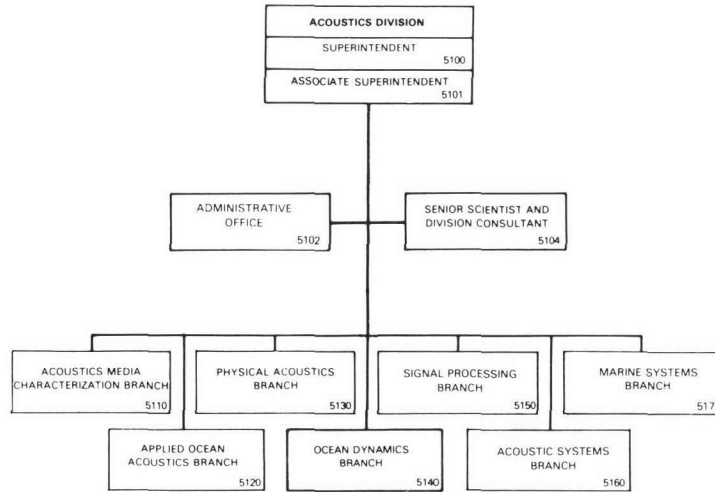
Arctic operations



Underwater inspection vehicle



Dr. D.L. Bradley



Basic Responsibilities

The Acoustics Division conducts basic and applied research in undersea acoustics. The basic research areas are: signal processing; ocean acoustics and the associated description of the ocean environment as it impacts advanced systems; and physical acoustics. The applied spectrum includes: developing and proving system concepts; signal processing for active and passive detection, tracking and classification of underwater targets; echo strength; large area assessment techniques; and development of Navy Data Processing Systems. Also included are basic and applied research in marine characteristics and technology for ocean applications. The Division program is interactive with the ONR Contract Research Program, NORDA, and other Navy laboratories, both U.S. and foreign. The Division is responsible for bringing the Connection Machine (a parallel processor computer) on-line as part of NRL's commitment to maintaining a state-of-the-art computational capability.

Personnel

Full-time civilian: 155

Key Personnel

Name	Title
Dr. D.L. Bradley	Superintendent
Mr. B.G. Hurdle	Associate Superintendent
Mrs. N.J. Beauchamp	Administrative Officer
Dr. S. Hanish	Senior Scientist and Division Consultant
Mr. H.S. Fleming	Head, Acoustics Media Characterization Branch
Dr. O. Diachok	Head, Applied Ocean Acoustics Branch
Dr. J. Bucaro	Head, Physical Acoustics Branch
Mr. E.E. Rudd	Head, Ocean Dynamics Branch
Mrs. E.E. Wald	Head, Signal Processing Branch
Dr. E. Franchi	Head, Acoustic Systems Branch
Mr. D. Steiger	Head, Marine Systems Branch

Point of contact: Dr. D.L. Bradley, Code 5100, 767-3482

Radar Division

Staff Activities

Systems research
Electromagnetic propagation
Electromechanical design

Research Activity Areas

Radar Analysis

Automatic detection and tracking
Radar signal processing
Radar systems simulations
Target signature modeling

Radar Techniques

High-frequency over-the-horizon radar
Signal analysis
Space-based radar

Search Radar

Shipboard surveillance radar
Precision tracking techniques
Air traffic control

Target Characteristics

Radar counter-countermeasures
Adaptive signal processing
Phased array radar
Target signature analysis

Identification Systems

Mark XII IFF improvements
NATO Identification System (Mk XV)
Future identification technology

Airborne Radar

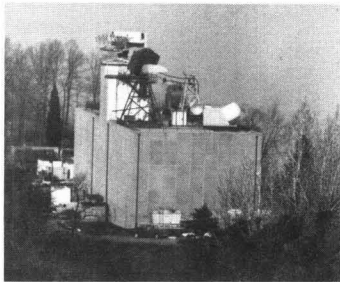
Airborne early-warning radar (AEW)
Inverse synthetic aperture radar (ISAR)

Electromagnetics

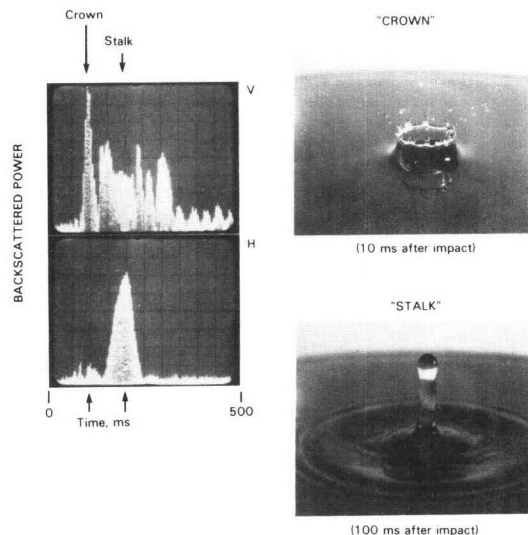
Microwave antenna research
Phased array antennas
Adaptive array research

Systems Control and Research

Image processing research
Synthetic aperture radar (SAR)
processing
Multispectral image correlation
Space sensor and mission analysis



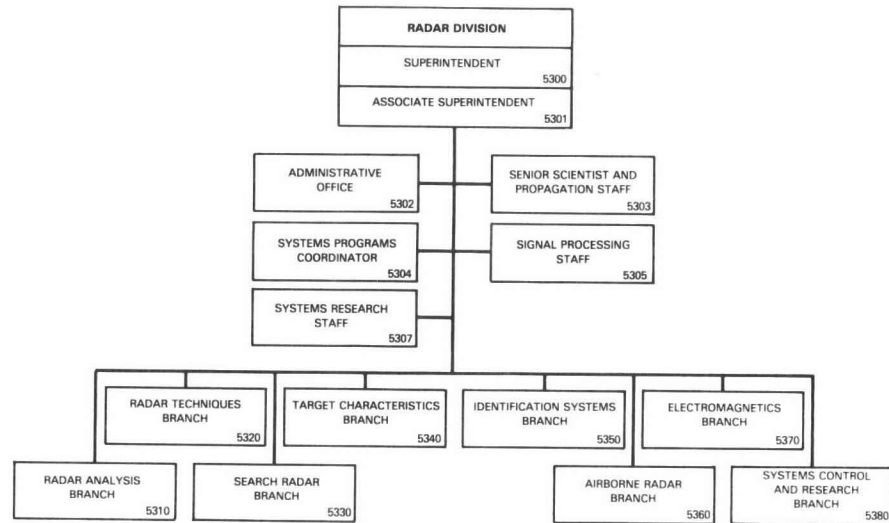
Radar test site at Chesapeake Bay Detachment (Chesapeake Beach, Maryland) on the roof of Building 75, showing the Senrad long-range, air-surveillance radar (upper left), the 2D/3D radar test bed (center), and the DMAR mirror scan antenna radar (right). The phased-array surveillance radar (FASR) is in the background. Other radars not visible in this view include millimeter wave, K_a , X , and C-band instrumentation radars; surface search test-bed radars; Low Probability of Intercept (LPI) radar; and L-band, UHF, and VHF surveillance radar test beds.



Time-history of the radar backscatter from a splashing drop in water for horizontal and vertical polarization. Radar frequency, 9 GHz; radar incidence angle, 15° ; and drop size, 4 mm.



Dr. M.I. Skolnik



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 analyses and evaluation of radar, and provides special consultative services. The emphasis is on new and advanced concepts and technology in radar and related sensors that are applicable to enhancing the Navy's ability to fulfill its mission.

Personnel

Full-time civilian: 150

Key Personnel

Name	Title
Dr. M.I. Skolnik	Superintendent
Mr. I.D. Olin	Associate Superintendent
Mrs. C. Hill	Administrative Officer
Dr. L.B. Wetzel	Senior Scientist and Head, Propagation Staff
Mr. D.F. Hemenway	Systems Program Coordinator
Mr. J.P. Letellier	Head, Signal Processing Staff
Mr. J.E. Jedrey	Head, Systems Research Staff
Dr. G.V. Trunk	Head, Radar Analysis Branch
Mr. J.M. Headrick	Head, Radar Techniques Branch
Dr. C.L. Temes	Head, Search Radar Branch
Mr. W.H. Harper	Head, Target Characteristics Branch
Mr. C.M. Veronda	Head, Identification Systems Branch
Mr. T.L. apRhys	Head, Airborne Radar Branch
Mr. T.C. Cheston	Head, Electromagnetics Branch
Dr. A.F. Petty	Head, Systems Control and Research Branch

Point of contact: Mr. I.D. Olin, Code 5301, 767-2089

Information Technology Division

Research Activity Areas

Navy Center for Applied Research in Artificial Intelligence

- Natural language for automated message processing
- Automated fault diagnosis
- Expert systems for decision aids and consultation
- Machine learning

Communication System Engineering

- Network design
- Secure communication systems
- Modulation, coding, and waveform design
- Satellite communication system technology
- Distributed simulation and prototyping

Human-Computer Interaction (HCI) Laboratory

- Cognitive processes and abilities
- Devices/techniques for HCI
- Voice processing (synthesis, recognition, etc.)

Transmission Technology

- Arctic communication
- Submarine communication technology
- Communication system architecture
- Communication antenna/propagation technology
- RF technology

Integrated Warfare Technology

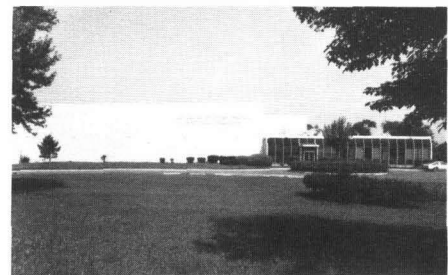
- Combat management information system analyses
- Command information system design
- Communication, command, and control countermeasures
- Signal processing for high-frequency intercept system

Computer Science and Systems

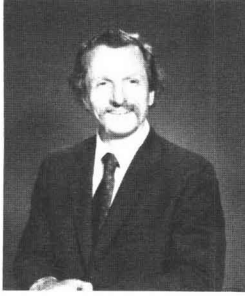
- Software engineering
- Information theory
- Message processing technology
- Computer security



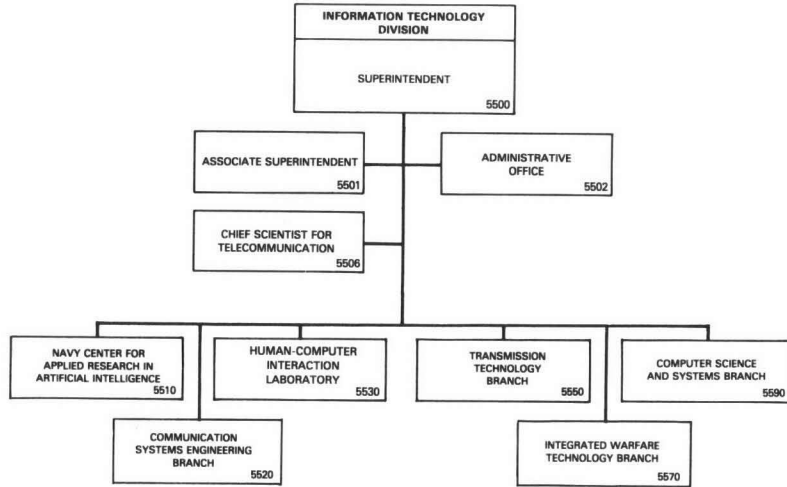
The Human-Computer Interaction Laboratory (HCI) conducts basic and applied research in the study of human-computer interactions, adapts, invents, and evaluates techniques applicable to building and maintaining human-computer interfaces, and collaborates with colleagues at NRL and elsewhere addressing HCI applications in a Navy tactical context.



The Navy Center for Applied Research in Artificial Intelligence is engaged in research and development designed to address the application of artificial intelligence technology and techniques to critical Navy and national problems.



Dr. J.R. Davis



Basic Responsibilities

The Information Technology Division conducts research and development programs in the collection, transmission, and processing of information in order to provide a basis for improvement in the conduct of military operations. The organization of the Division is directed toward addressing the technologies and subsystems necessary to develop architectures and system designs for the next-generation Battle Force warfare systems.

Personnel

Full-time civilian: 156

Key Personnel

Name	Title
Dr. J.R. Davis	Superintendent
Mr. W.D. Long	Associate Superintendent
Ms. J. Saunders	Administrative Officer
Mr. D.I. Himes	Chief Scientist for Telecommunication
Dr. R.P. Shumaker	Director, Navy Center for Applied Research in Artificial Intelligence
Mr. D.I. Himes	Head, Communication System Engineering Branch
Vacant	Head, Human-Computer Interaction Laboratory
Mr. E.J. Kennedy	Head, Transmission Technology Branch
Mr. M.S. McBurnett	Head, Integrated Warfare Technology Branch
Mr. S.H. Wilson	Head, Computer Science and Systems Branch

Point of contact: W.D. Long, Code 5501, 767-2954

Tactical Electronic Warfare Division

Staff Activities

- Long-range EW strategic planning
- Lead laboratory coordinating
- Central Target Simulator Program
- Effectiveness of Naval EW Systems (ENEWS)
- Special Project Group
- Special Facilities Development Group

Research Activity Areas

Off-Board Countermeasures

- Expendable technology
- Expendable devices
- Off-board systems
- Decoys

Airborne Electronic Warfare Systems

- Air systems development
- Penetration aids
- Power source development
- Jamming and deception
- Millimeter-wave technology

Ships Electronic Warfare Systems

- Ships systems development
- Jamming technology
- Deception techniques
- EW antennas
- Threat simulators

Electronic Warfare Support Measures

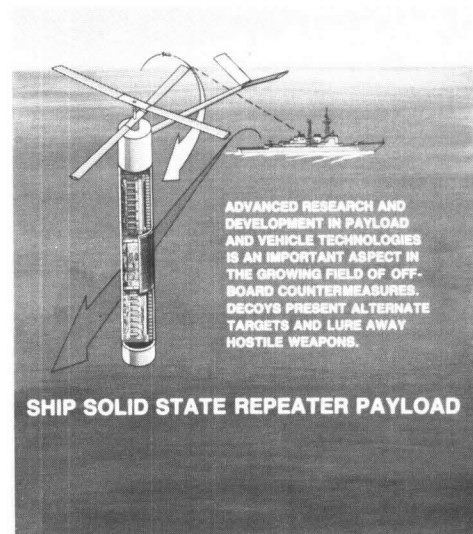
- Intercept systems and direction finders
- RF signal simulators
- Systems integration
- Command and control interfaces
- Signal processing

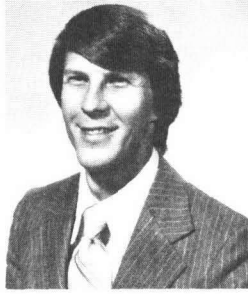
Advanced Techniques

- Analysis and modeling simulation
- New EW techniques
- Experimental systems
- EW concepts
- Infrared technology

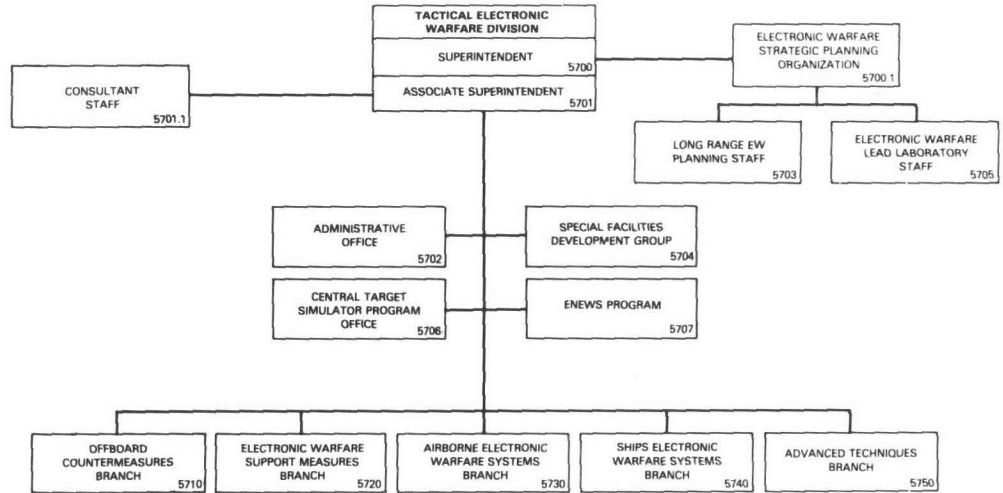


TEW's Flying Research, Development, Test, and Evaluation Laboratory. This instrumented P-3 aircraft is used to support electronic warfare research and development programs as well as Fleet exercises. Hung beneath the wings are pods that generate and receive the signals being studied.





Dr. J.A. Montgomery



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 improvements of the effectiveness of these systems.

Personnel

Full-time civilian: 219

Key Personnel

Name	Title
Dr. J.A. Montgomery	Superintendent
Mr. H.W. Zwack	Associate Superintendent
Dr. C.H. Heider	Head, EW Strategic Planning Organization
Mrs. J. Jablonski*	Administrative Officer
Dr. C.H. Heider	Head, Long Range EW Planning Staff
Vacant	Head, Special Facilities Development Group
Mr. R.L. Aberg	Head, Electronic Warfare Lead Laboratory Staff
Mr. A.A. Di Mattesa	Manager, Central Target Simulator Program Office
Mr. D.F. Grady	Manager, ENEWS Program
Dr. F.J. Klemm	Head, Offboard Countermeasures Branch
Mr. T. Jones	Head, Electronic Warfare Support Measures Branch
Mr. E.E. Koos	Head, Airborne Electronic Warfare Systems Branch
Mr. H.E. Crecraft	Head, Ships Electronic Warfare Systems Branch
Dr. G.E. Friedman	Head, Advanced Techniques Branch

Point of contact: Mr. H.W. Zwack, Code 5701, 767-3622

*Acting

Underwater Sound Reference Detachment

Research Activity Areas

Measurements

- Calibration theory and accuracy
- Measurement methods
- Standard calibration services
- Sonar transducer test and evaluation
- Transduction and radiation theory
- Wave-number calibration
- Shock testing

Acoustical Systems

- Computation services
- Digital systems
- Analog systems
- Signal analysis
- Low-noise preamplifiers
- Measurement systems

Acoustic Materials

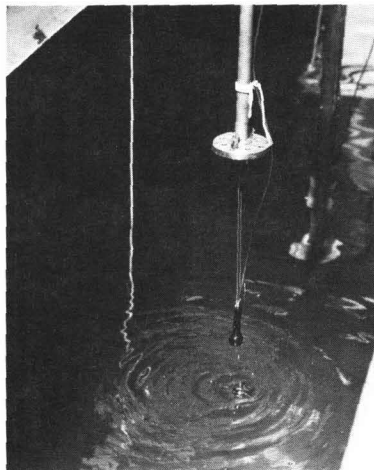
- Polymers
- Transduction materials
- Adhesives
- Measurements
- Quality control
- Chemical analysis

Transducers

- Electroacoustic standards
- Acoustic sources
- Specialized electroacoustic transducers
- Standard loan services
- Transducer reliability
- Sonar transducers
- Accelerated life testing
- Transducer modeling



Chemistry laboratory where polymer materials used in underwater acoustical systems are developed and analyzed.



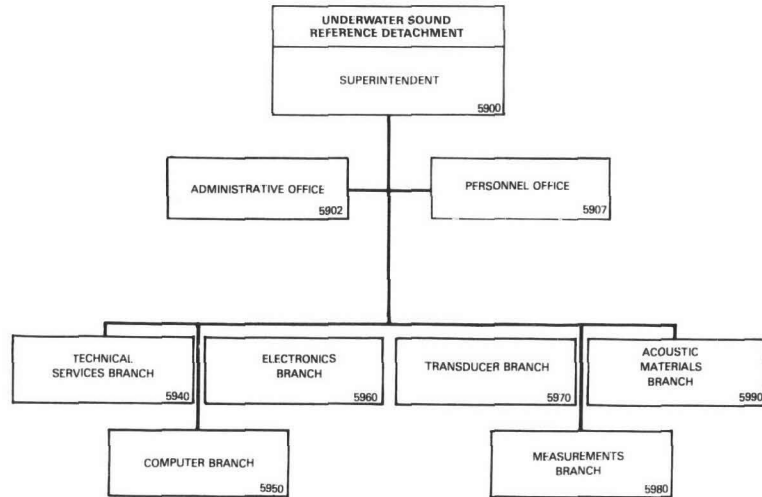
A USRD standard F42C transducer being raised from a test well



Technician lowering the cover to the smaller of the two ports of entry/exit to the anechoic tank pressure vessel in preparation for a test. The tank is used to test various types of sonar transducers as a function of temperature and pressure.



Dr. J. E. Blue



Basic Responsibilities

The Underwater Sound Reference Detachment (USRD) serves as the principal Navy expert in the theory and practice of underwater sound measurements. Specialized facilities provide acoustic calibration and test and evaluation measurements for acoustic transducers and materials. These facilities can simulate actual ocean temperatures and pressures over a broad frequency range, allowing them to accommodate nearly all underwater acoustic devices. The USRD conducts research and development on the theory and design of underwater electroacoustic transducers and in developing analytical techniques and instrumentation for electrical, mechanical, and electromechanical bench-testing of transducers and transducer components. Research is also conducted in the area of materials used to generate, transmit, and absorb underwater sound. It is a link in the traceability of underwater sound measurements to the National Bureau of Standards, supplying calibrated transducers for use in calibration and development of underwater acoustic weapons and sonar transducers. This provides greater uniformity, accuracy, and reliability in underwater acoustic measurement throughout the Navy and industry. The USRD manages a Navy-wide sonar transducer reliability improvement program and participates in the establishment of Navy, national, and international standards for underwater acoustics.

Personnel

Full-time civilian: 107

Key Personnel

Name	Title
Dr. J.E. Blue	Superintendent
Dr. R.W. Timme†	Associate Superintendent
Ms. D.A. Pieper	Head, Administrative Office
Ms. N.L. Rose	Head, Personnel Office
Mr. G. Woods	Head, Technical Services Branch
Mr. R.E. Scott	Head, Computer Branch
Mr. C.K. Brown	Head, Electronics Branch
Dr. R.W. Timme	Head, Transducer Branch
Dr. A.L. Van Buren	Head, Measurements Branch
Dr. R. Ting	Head, Acoustic Materials Branch

Point of contact: Mrs. L.R. Jevnager, Code 5902, (305) 857-5237

† Additional duty

**MATERIALS SCIENCE
AND
COMPONENT TECHNOLOGY
DIRECTORATE**

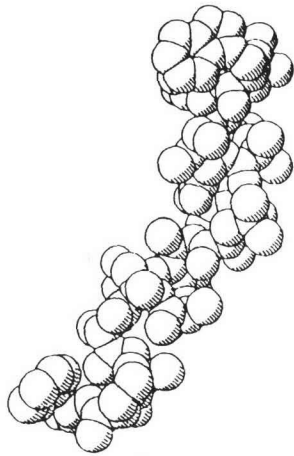
Materials Science and Component Technology Directorate

The Materials Science and Component Technology Directorate carries out a multidisciplinary research program whose objectives are the discovery and exploitation of new improved materials, the generation of new concepts associated with materials behavior, and the development of advanced components based on these new and improved materials and concepts. Theoretical and experimental research is carried out to determine the scientific origins of materials behavior and to develop procedures for modifying these materials to meet important Naval needs such as fire suppression. The program includes investigations of a broad spectrum of materials including

insulators, semiconductors, superconductors, metals and alloys, optical materials, polymers, plastics, and artificially structured biomolecular materials and composites, which are used in important naval devices, components, and systems. New techniques are developed for producing, processing, and fabricating these materials for crucial naval applications.

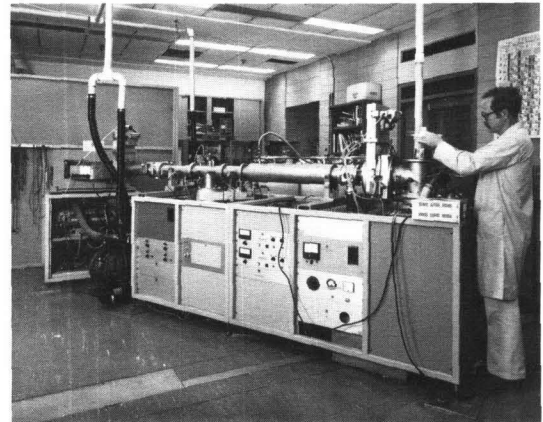
The properties and limits of performance of these materials in natural or radiation environments, components under deleterious conditions such as those associated with the marine environment, neutron or directed energy beam irradiation, or extreme temperatures and pressures, are established.

MATERIALS SCIENCE AND COMPONENT TECHNOLOGY DIRECTORATE

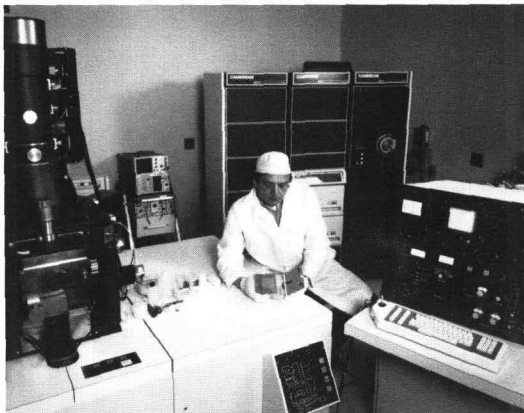


Hydrogen atoms not included

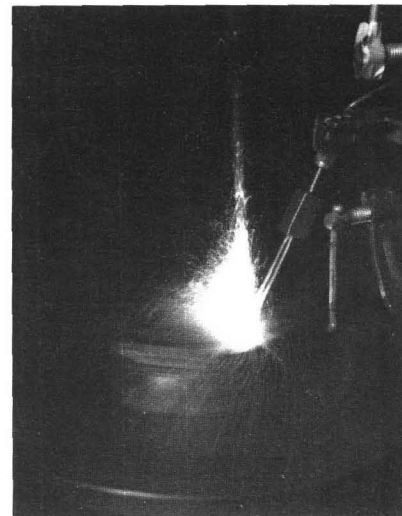
Space-filling model of the structure of an analog of the antibiotic zervamycin



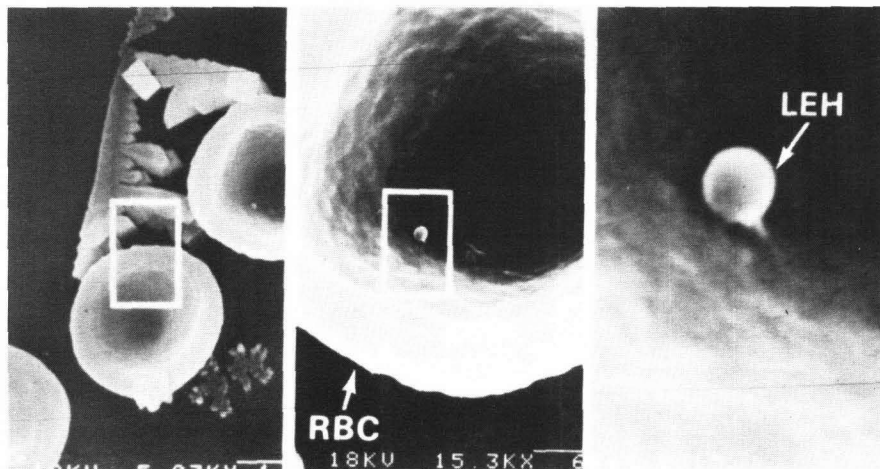
Ion implantation of semiconductor materials



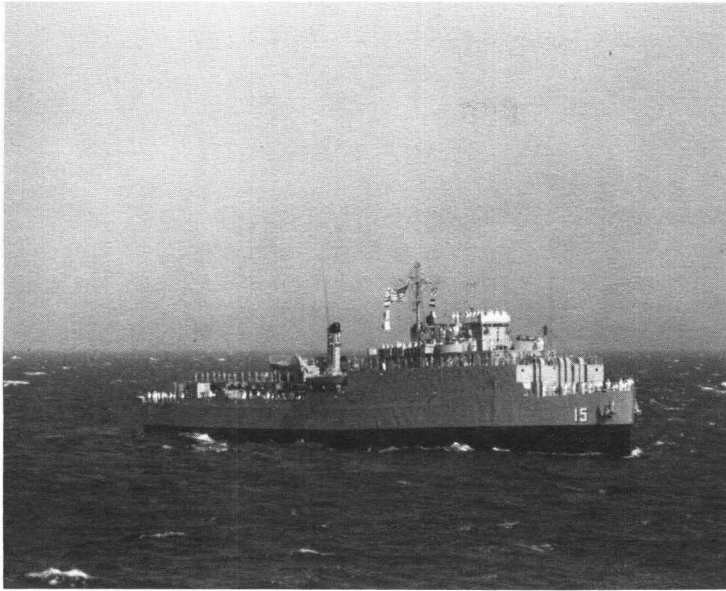
Electron beam lithography for microfabrication of semiconductor integrated circuits



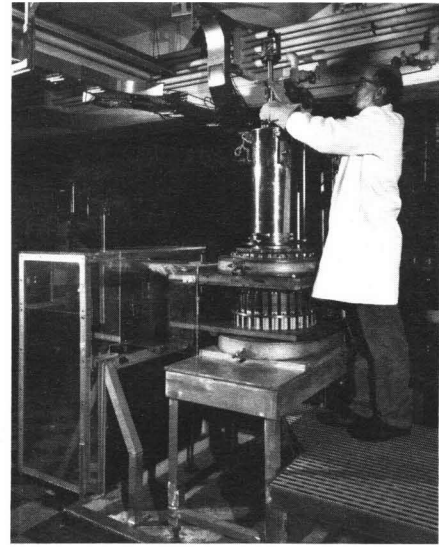
Laser melt particle injection process



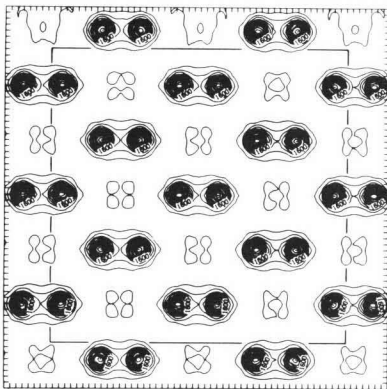
Studying liposome-encapsulated hemoglobin (LEH) as a synthetic red blood cell (RBC)



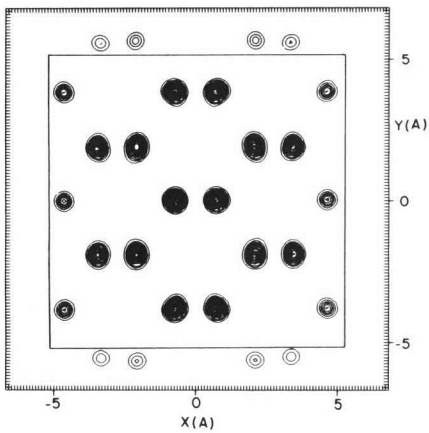
The ex-*Shadwell* (LSD-15) — advanced fire test laboratory for the Navy Center for Safety and Survivability



High-magnetic-field apparatus for spectroscopic characterization of materials



a. Original structure

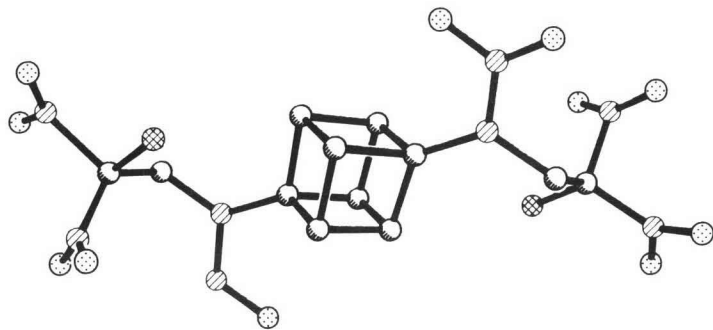


b. Reconstruction

Atomic resolution image reconstruction by use of microdiffraction patterns from overlapping regions



Picosecond Stimulated Raman Scattering Facility



Substituted cubane containing many nitro propellants

Associate Director of Research for Materials Science and Component Technology



Dr. B.B. Rath

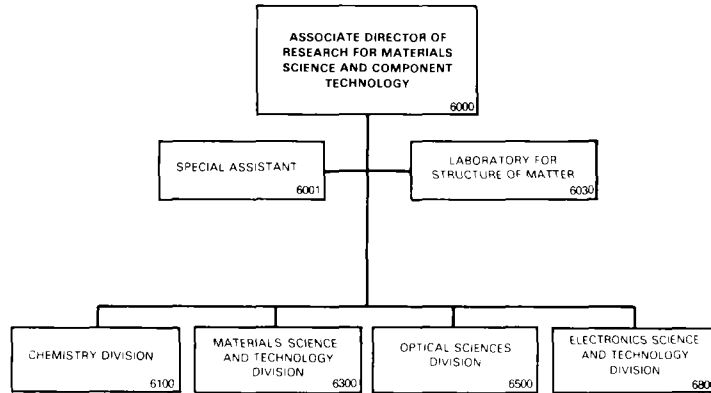
Dr. Rath [REDACTED] He received the B.S. degree in physics and mathematics from Utkal University, an M.S. in metallurgical engineering from Michigan Technological University, and a Ph.D from the Illinois Institute of Technology.

Dr. Rath was Assistant Professor of Metallurgy and Materials Science at Washington State University from 1961-1965. From 1965 to 1972, he was with the staff of the Edgar C. Bain Laboratory for fundamental research of the U.S. Steel Corporation. From 1972 to 1976, he headed the Metal Physics Research Section of the McDonnell Douglas Research Laboratories, in St. Louis, Missouri, until he came to NRL as Head of the Physical Metallurgy Branch. During this period he was adjunct Professor at the Carnegie-Mellon University and the University of Maryland. Dr. Rath served as Superintendent of the Material Science and Technology Division from 1982 to 1986, when he was appointed to his present position.

Dr. Rath is recognized in the fields of solid state transformations, grain boundary migrations, and structure-property relationship in metallic systems. He has published over 100 papers in these fields and edited several books and conference proceedings.

Dr. Rath serves on several planning, review, and advisory boards including the Department of Defense, Joint Directors of Laboratories, National Materials Advisory Board of the National Academy of Science, National Science Foundation, Carnegie-Mellon University, University of Virginia, and Colorado School of Mines. He is a member of the panel on Metals and Materials in Structures for the TTCP countries and the Indo-US Joint Commission on Science and Technology.

Dr. Rath is a fellow of the American Society for Materials-International (ASM), Washington Academy of Sciences, a member of Sigma Xi, and The Metallurgical Society (TMS). He serves as a member of the Board of Directors of TMS and as chairman of several committees of TMS and ASM.



Key Personnel

Name	Title	Code
Dr. B.B. Rath	Associate Director of Research for Materials Science and Component Technology	6000
Dr. J. Karle	Chief Scientist, Laboratory for Structure of Matter	6030
Dr. J.S. Murday*	Superintendent, Chemistry Division	6100
Dr. D.U. Gubser	Superintendent, Materials Science and Technology Division	6300
Dr. T.G. Giallorenzi	Superintendent, Optical Sciences Division	6500
Dr. G.M. Borsuk	Superintendent, Electronics Science and Technology Division	6800

Point of contact: Virginia Bradley, Code 6000A, 767-3566

*Acting

Laboratory for Structure of Matter

(Code 6030)

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 structural studies that can form the basis for understanding and interpreting the results of research investigations in a wide variety of scientific disciplines. Structural investigations relate structure to function, facilitate industrial syntheses and the creation of new materials with improved properties, and provide foundation information for numerous associated disciplines and studies. Applications are made, for example, to propellants, explosives, dense energetic materials, absorptive carbons, metallic glasses, device materials, ion carriers, antibiotics, analgesics, reversible oxygen carriers, and synthetic reaction intermediates and final products.

Personnel

Full-time civilian: 12



Dr. J. Karle
Recipient of 1985 Nobel Prize in Chemistry

Key Personnel

Name	Title
Dr. J. Karle	Chief Scientist, Laboratory for Structure of Matter

Point of contact: Dr. Clifford George, Code 6030, 767-3463

Chemistry Division

Staff Activity

Fire Protection and Damage Control
Program Office

Research Activity Areas

Chemical Diagnostics

Optical diagnostics of chemical reactions
Kinetics of gas phase reactions
Trace analysis
Atmosphere analysis and control
Ion/molecule processes
Theoretical chemistry

Polymeric Materials

Synthesis and evaluation of innovative polymers
Functional organic coatings
Polymer characterization
Superconducting materials
Quality control methodology
Degradation and stabilization mechanisms
High-temperature resins
OMCVD materials
Corrosion prevention

Surface/Interface Chemistry

Tribology
Surface properties of materials
Surface/interface analysis
Chemical microdetectors
IR/RF decoy materials
Surface reaction dynamics

High-temperature chemistry
Fundamental chemistry
Beam-enhanced chemistry

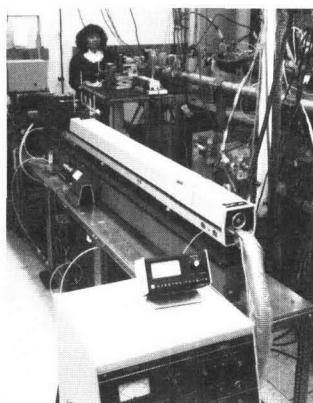
Combustion & Fuels

Distillate fuels research
Combustion dynamics
Fire protection and suppression
Personnel protection
Modeling and scaling of combustion systems
Chemical and biological defense
Synthetic fuels
Safety and survivability

Bio/Molecular Engineering

Biophysical chemistry
Immunochemistry
Biomembranes
Lipid and protein structure
Molecular graphics
Biosensors
Polymerizable lipids
Langmuir-Blodgett films
Red blood cell surrogate
Bio-derived microstructures

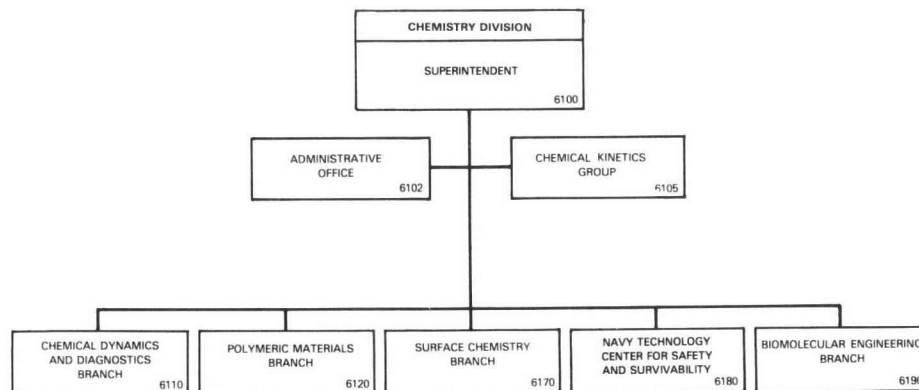
Navy combatant ships are now receiving Naval Firefighters Thermal Imagers (NFTIs) as a result of a 4-year evaluation and testing program conducted by NRL scientists. NFTI, which has already been used in one fire aboard an aircraft carrier, allows firefighters to immediately locate and extinguish a fire.



The NRL shock tube is equipped with infrared, visible light, and ultraviolet laser diagnostics and a computerized data-acquisition system. It is currently being used to study reactions that are important in high-temperature combustion systems and in the thermal decomposition of energetic materials.



Dr. J. S. Murday



Basic Responsibilities

The Chemistry Division conducts basic and applied research and development studies in the broad fields of chemical diagnostics, polymeric materials, surface and electrochemistry, biomolecular engineering, combustion, and fuels chemistry. Specialized programs within these fields include organic polymeric materials, coatings, dynamics, laser chemistry, electroactive polymers, tribology, physical and chemical characterization of surfaces and theory of surfaces, chemistry of electronic materials, submarine atmosphere analysis and control, lipid chemistry, membranes and novel structures, sensors, solution chemistry, personnel protection (including chemical and biological defenses), fire suppression, and the chemistry and physics of synfuels.

Personnel

Full-time civilian: 120

Key Personnel

Name	Title
Dr. J.S. Murday*	Superintendent
Dr. W.B. Fox	Associate Superintendent
Ms. B.L. Russell	Administrative Officer
Dr. M.C. Lin	Head, Chemical Kinetics Group
Dr. J. McDonald	Head, Chemical Diagnostics Branch
Dr. W.B. Moniz	Head, Polymeric Materials Branch
Dr. J.S. Murday	Head, Surface Chemistry Branch
Dr. H.W. Carhart	Head, Navy Technology Center for Safety and Survivability
Dr. J. Schnur	Head, Biomolecular Engineering Branch

Point of contact: Ms. Brenda Russell, Code 6102, 767-2460

*Acting

Materials Science and Technology Division

Research Activity Areas

Materials Physics

- Superconductivity
- Magnetism
- Electronic properties
- Metallic film growth and characterizations

Physical Metallurgy

- Phase transformations and defect states
- Microstructure-property relationships
- Elasticity, plasticity, mechanical phenomena
- Surface processing
- Alloy development
- Elevated temperature behavior of materials
- Rapid solidification processing of materials

Mechanics and Structural Properties

- Micromechanisms of crack growth
- Subcritical crack growth and fracture
- Failure mechanisms and criteria
- Computational, fracture, and structural mechanics
- Constitutive theories
- Reliability analysis and failure modes of components and systems

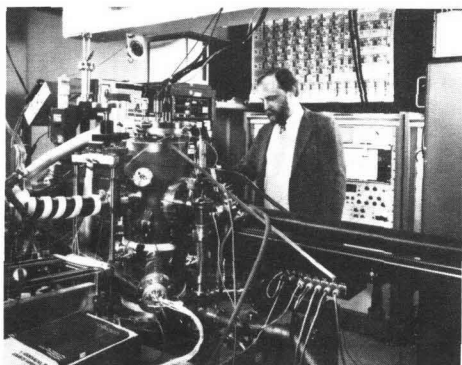
- Nondestructive evaluation
- Performance and survivability
- Elevated temperature materials

Composites and Ceramics

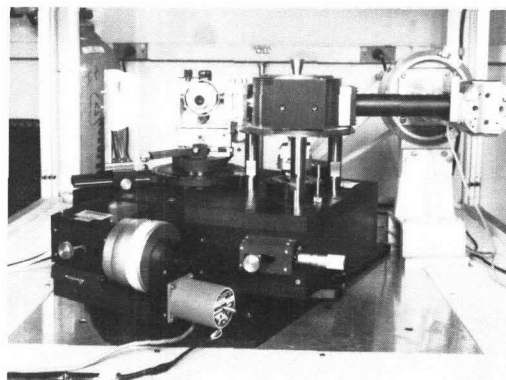
- Processing, fabrication, and microstructural characterization
- Thermostructural applications
- Ceramics for electronic, piezoelectric, optical, and other nonmechanical applications
- Physical, mechanical, and failure characterization and analysis

Environmental Effects

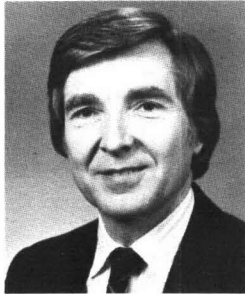
- Microstructural characterization
- Influence of environment on high-temperature materials
- Corrosion science and mechanisms
- Stress corrosion cracking
- Surface protection and inhibitors
- Marine corrosion



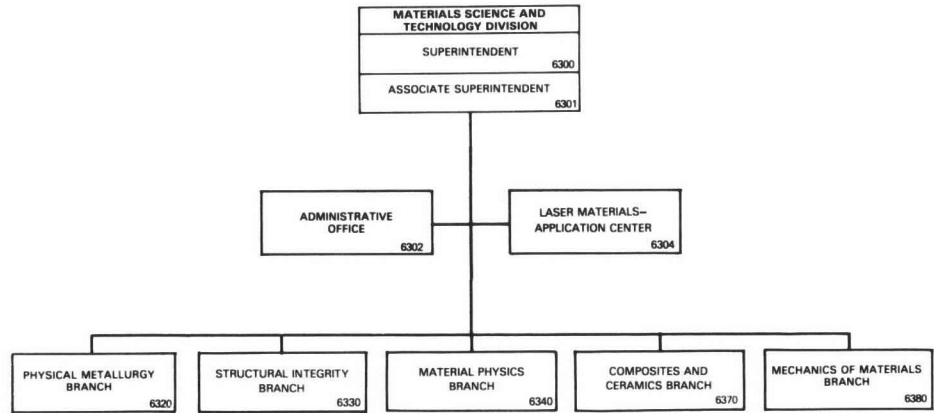
The growth of single crystal magnetic films on semiconductor substrates for electronics applications is observed.



Computer controlled double-crystal diffractometer used for determination of crystal perfection, and for mapping the distribution of elastic and plastic strains in deformed single crystal and polycrystals. Information gained by this device yields information on dislocation density distribution resulting from a deformation; fatigue failure may also be predicted from the depth and spatial distribution of the excess dislocation density.



Dr. D.U. Gubser



Basic Responsibilities

The Materials Science and Technology Division conducts basic and applied research and engages in exploratory and advanced development of materials having substantive value to the Navy. R&D programs encompass the intrinsic behavior of metals, alloys, ceramics, glasses, and composites, and their performance and reliability in naval structures and devices. Program objectives include achieving fundamental understanding of the mechanical, physical, electrical, magnetic, superconducting, and electrochemical properties of materials; identifying composition, processing, and microstructural parameters to produce improved materials; and developing guidelines for the selection, design, and certification of materials for life-cycle management of naval structures and systems. This diversity of programs is carried out by interdisciplinary teams of material scientists, metallurgists, ceramists, physicists, chemists, and engineers, using the most advanced testing facilities and diagnostic techniques.

Personnel

Full-time civilian: 130

Key Personnel

Name	Title
Dr. D.U. Gubser	Superintendent
Mr. R.W. Judy, Jr.	Associate Superintendent
Mrs. A. McIntire	Administrative Officer
Mr. R.L. Stegman	Head, Laser Materials-Application Center
Dr. C.R. Crowe	Head, Physical Metallurgy Branch
Dr. C.I. Chang	Head, Structural Integrity Branch
Dr. S.A. Wolf	Head, Material Physics Branch
Dr. S.C. Sanday	Head, Composites and Ceramics Materials Branch
Dr. R. Badaliance	Head, Mechanics of Materials Branch

Point of contact: Mrs. J.E. Smithwick, Code 6300A, 767-2345

Optical Sciences Division

Staff Activities

Program analysis and development
Special systems analysis
Technical study groups

Technical contract monitoring
Theoretical studies

Research Activity Areas

Optical Probes

Laser-matter interactions
Photophysical processes
Nonlinear optical phenomena
Electronic properties of materials
Optical instrumentation
Synchrotron radiation
Interferometry

Advanced Concepts

IR low observables
IR space surveillance systems
EO/IR systems analysis
Airborne IR search and
track technology
Atmospheric IR measurements
Ship IR signatures

Applied Optics

Optical image and information processing
Optical technology
Ultraviolet component development and
UV countermeasures
Atmospheric optics
Propagation studies
Laser radar

Laser Physics

Molecular and chemical
laser physics
Interferometry

Laser chemical kinetics
Electrically driven lasers
Laser-induced reactions
Laser materials diagnostics
Nonlinear frequency conversion
Beam cleanup technology
Optical phase conjugation
Optical instrumentation and probes

Electro-Optical Technology

Optical and IR countermeasures
Detection signal processing studies
Optical seeker studies
Solid state laser development
Optical imager development
Optical interactions in semi-
conductor superlattices
Nonlinear optical organic solids

Optical Techniques

Picosecond light pulses
Diode laser applications
Optical waveguides
Radiation-induced defects
Optical control of solid state electronic devices
Fiber-optic sensors
Integrated optics
Fiber-optic materials and fabrication



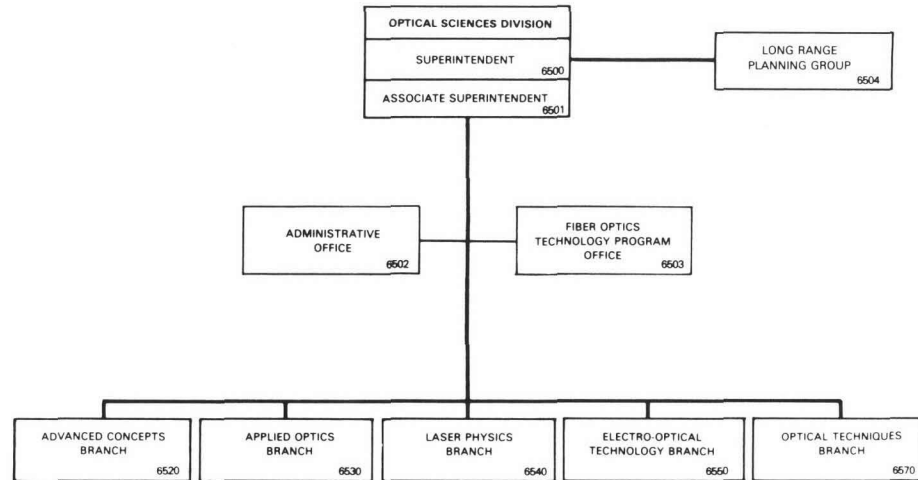
The Missile Seeker Evaluation Facility is a computerized facility that is used to evaluate optical countermeasures to infrared missile seekers and infrared imaging sensors.



The Focal Plane Array Evaluation Facility consists of the optical sources and electronics required to evaluate monolithic or hybrid infrared focal plane arrays that use charge-coupled device, charge-injection device, direct-readout, or charge-imaging matrix technologies.



Dr. T.G. Giallorenzi



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, materials, and phenomena. The development effort is aimed at extending this understanding in the direction of device engineering and advanced operational techniques. The applications activities include systems analysis, prototype system development, and exploitation of R&D results 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, optical waveguide technologies, laser-matter interactions, atmospheric propagation, optical technology, holography, optical warfare, optical data processing, optical systems, optical materials, radiation damage studies, IR surveillance and missile seeker technologies, IR signature measurements, optical recording materials, and optical diagnostic techniques. A significant portion of the effort is devoted to developing, analyzing, and using special optical materials. Various field measurement programs on optical problems of specific interest are also conducted.

Personnel

Full-time civilian: 129

Key Personnel

Name	Title
Dr. T.G. Giallorenzi	Superintendent
Mr. J.M. McMahon*	Associate Superintendent
Mrs. D.D. Nolan	Administrative Officer
Mr. J.E. Donovan	Head, Fiber Optics Technology Program Office
Dr. J.C. Kershenstein	Long-Range Planning Group
Mr. J.M. McMahon	Long-Range Planning Group
Dr. R.A. Patten	Long-Range Planning Group
Dr. D.L. Esterowitz	Long-Range Planning Group
Dr. J.C. Kershenstein	Head, Advanced Concepts Branch
Dr. R.A. Patten	Head, Applied Optics Branch
Dr. B. Feldman	Head, Laser Physics Branch
Dr. L. Esterowitz	Head, Electro-optical Technology Branch
Dr. J. Weller	Head, Optical Techniques Branch

Point of contact: Mrs. D. Nolan, Code 6502, 767-2855

*Acting

Electronics Science and Technology Division

Research Activity Areas

Semiconductors

Electrical, optical, and magneto-optical studies of semiconductor microstructures, surfaces, and interfaces

Impurity and defect studies

Structural and electronic properties of amorphous semiconductors

Condensed matter theory

High magnetic field phenomena

Surface Physics

Surface and interface physics

Vacuum surface research

Processing research for nanometric electronics

Growth and characterization of surfaces and interfaces

Ion implantation technology

Reliability and failure physics of electronic devices and circuits

Microwave Technology

Microwave, millimeter-wave, and submillimeter-wave component and circuit research

Microwave and millimeter-wave integrated circuits

Surface acoustic wave devices

High-frequency-device design, simulation, and fabrication

High-temperature superconductors

Solid State Devices

Solid-state optical sensors

Radiation effects/hardening of electronic devices, circuits, and optoelectronic sensors

Microelectronics device research and fabrication

Solid state circuits research

Signal processing research

Electronic Materials

Preparation and development of magnetic, dielectric, optic, and semiconductor materials

Molecular beam epitaxy

Metal organic chemical vapor

Vacuum Electronics

Microwave and millimeter power amplifier research and development

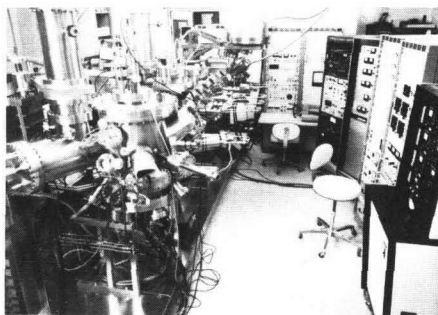
Cathode research and development

Thermionic energy conversion

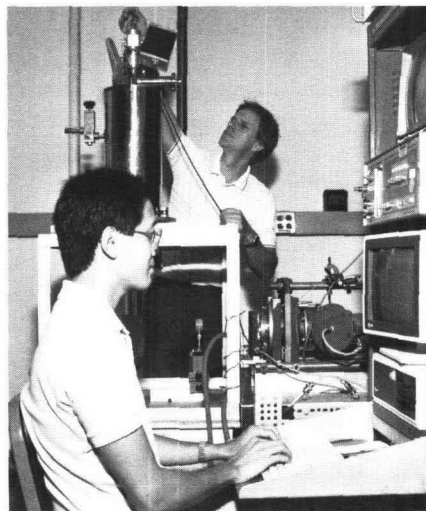
Field emission arrays

Vacuum electronic devices

Tube fabrication and support technology



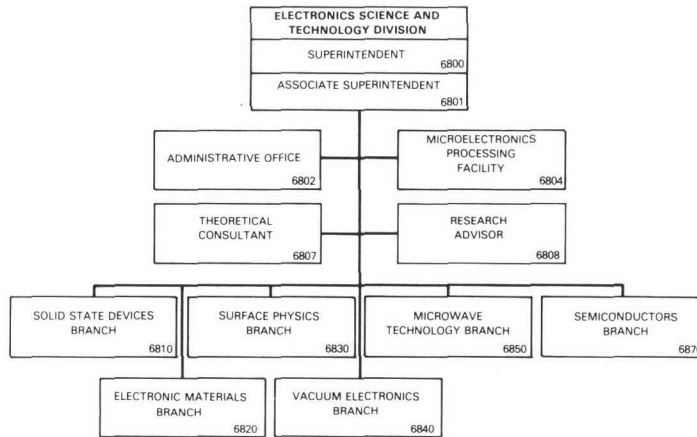
Silicon Molecular Beam Epitaxy Machine—The molecular beam epitaxy system is used in the growth of layered silicon structures with thicknesses and compositional and doping profiles that are accurately controlled on an atomic scale. The study of such specifically tailored semiconductor microstructures is one of the fastest growing and most exciting areas of solid state science and technology.



Scientists measure the optical response of superconducting films.



Dr. G. M. Borsuk



Basic Responsibilities

The Electronics Science and Technology Division conducts programs of basic science and applied research and development in materials growth and properties, surface physics, microstructure electronics, microwave techniques, microelectronic device research and fabrication, vacuum electronics, high-power microwave generation, and cryoelectronics, including superconductors. The activities of the Division couple device research both to basic materials investigations and to systems research and development needs.

Personnel

Full-time civilian: 140

Key Personnel

Name	Title
Dr. G.M. Borsuk	Superintendent
Dr. S. Teitler	Associate Superintendent
Mrs. A. McDaniel	Administrative Officer
Dr. K.L. Ngai	Theory Consultant
Dr. R.F. Greene	Research Advisor
Dr. M.C. Peckerar	Head, Microelectronics Processing Facility
Dr. J.M. Killiany	Head, Solid State Devices Branch
Mr. H. Lessoff	Head, Electronic Materials Technology Branch
Dr. A. Christou	Head, Surface Physics Branch
Dr. R.K. Parker	Head, Vacuum Electronics Branch
Dr. D. Webb	Head, Microwave Technology Branch
Dr. S.G. Bishop	Head, Semiconductors Branch

Point of contact: Dr. Sidney Teitler, Code 6801, 767-2807

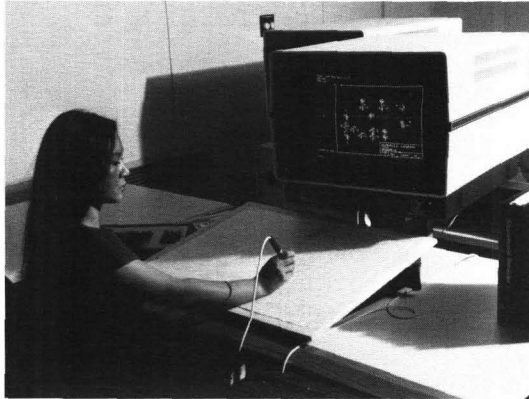
**NAVAL CENTER
FOR SPACE TECHNOLOGY**

Naval Center for Space Technology

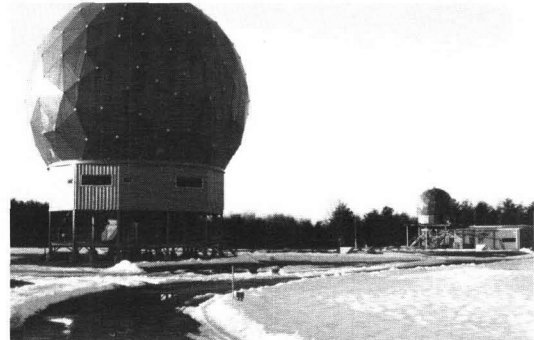
In its role to preserve and enhance a strong space technology base and provide expert assistance in the development and acquisition of space systems that support naval missions, the Naval Center for Space Technology activities extend from basic and applied research through advanced development in all areas of interest to the Navy space program. These activities include developing spacecraft, systems using these spacecraft, and ground command and control stations. Principal functions of the Center include understanding and clarifying requirements; recognizing and prosecuting promising research and development; analyzing and testing systems to quantify their capabilities; developing opera-

tional concepts that exploit new technical capabilities; system engineering to allocate design requirements to subsystems; and engineering development and initial operation to test and evaluate selected spacecraft subsystems and systems. The Center is a focal point and integrator for those divisions at NRL whose technologies are used in space systems. The Center also provides systems engineering and technical direction assistance to system acquisition managers of major space systems. In this role, technology transfer is a major goal and motivates a continuous search for new technologies and capabilities and the development of prototypes that demonstrate the integration of such technologies.

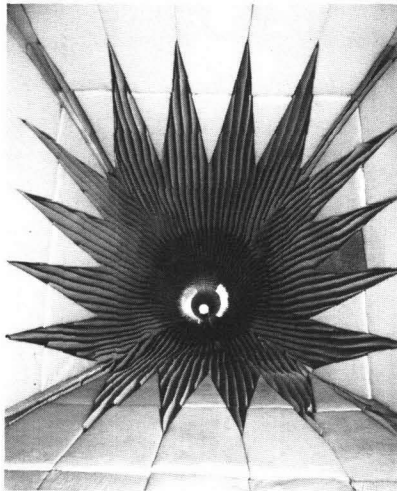
NAVAL CENTER FOR SPACE TECHNOLOGY



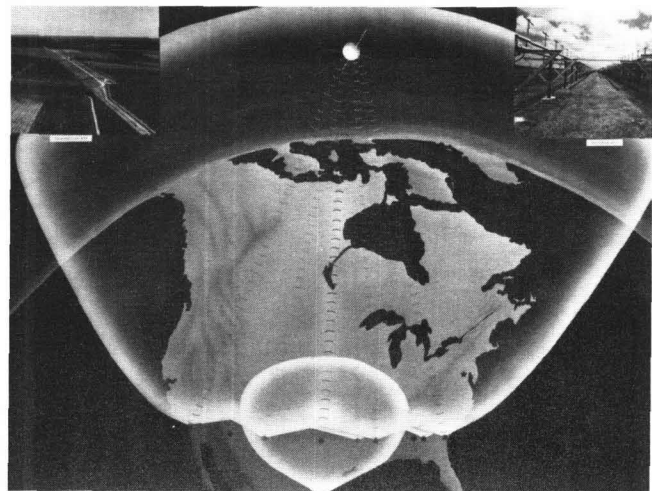
One station of the computer-aided design/computer-aided manufacturing (CAD/CAM) systems used for design and engineering of spacecraft



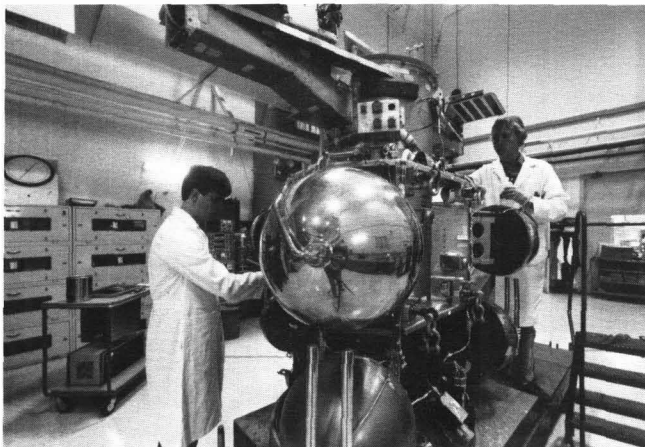
Satellite Tracking and Calibration Facility



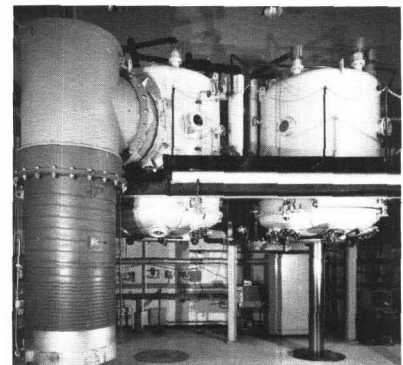
Transmitter end of one of NCST's RF anechoic chambers



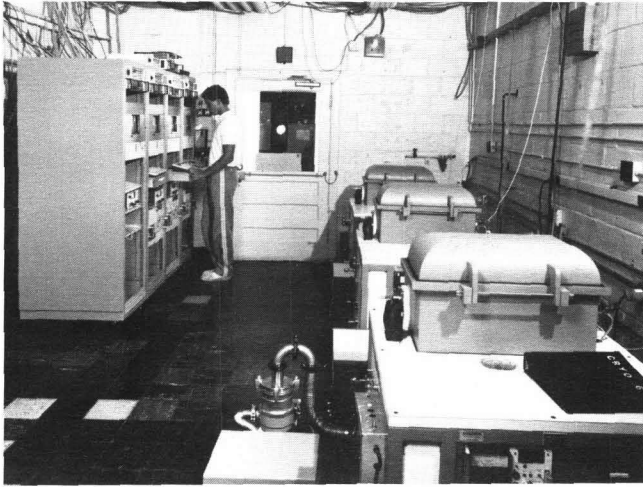
Navy Space Surveillance System developed at NRL



Spacecraft being assembled in the Assembly and Test Facility



Two bottom-loading thermal-vacuum chambers in the Test and Assembly Facility



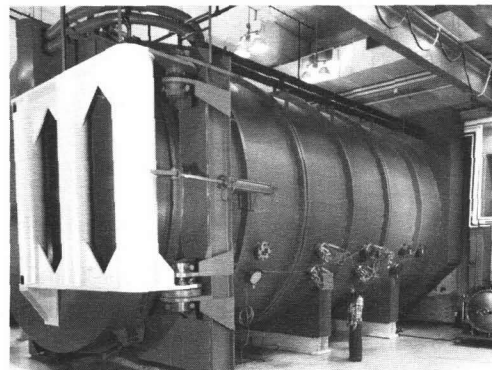
Part of NRL Space Clock Test Facility. Cesium clocks are tested in thermal-vacuum chambers (right) that are automatically controlled by the units at left



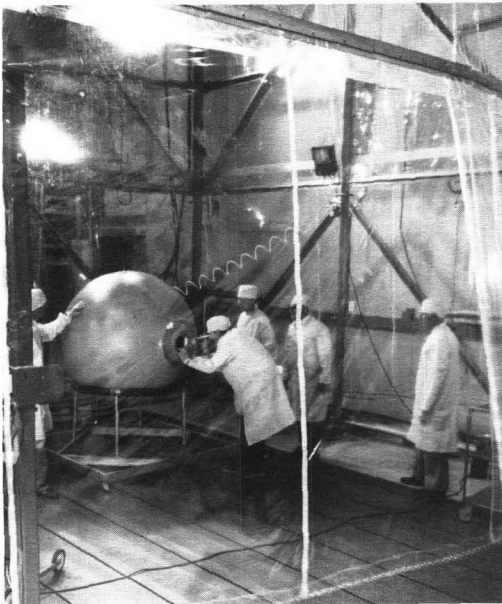
Launch of an NRL satellite



Example of spacecraft orbit analysis capability of the NCST Date Processing Facility



Exterior view NCST Thermal-Vacuum Chamber in the Assembly and Test Facility



Inspection of a spacecraft propellant tank in the NCST Test and Assembly Facility



NCST Clean Room where spacecraft components are cleaned, inspected, tested and assembled

Director of Naval Center for Space Technology

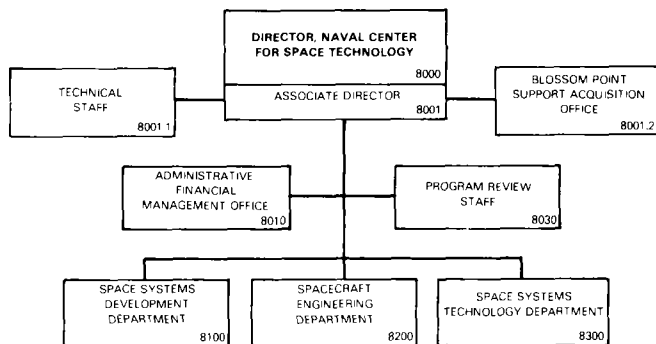


Mr. P.G. Wilhelm

Mr. Wilhelm [REDACTED] He attended Purdue University, where he received a B.S.E.E. degree in 1957. By 1961, he had completed all the course work for an M.S.E. degree from George Washington University.

From 1957 to 1959, Mr. Wilhelm served as an electrical engineer with Stewart Warner Electronics where he was assigned to a project to redesign the UPM-70, a Navy radar test set. In March 1959, he joined the Naval Research Laboratory as an electrical scientist in the Electronics Division. In December 1959, he joined the Satellite Techniques Branch. In 1961, he became Head of the Satellite Instrument Section; in 1965, he became Head of the Satellite Techniques Branch; and in 1974, Head of the Spacecraft Technology Center. In these positions, he performed satellite system design, equipment development, environmental testing, launch operations, and orbital data handling. In 1981, he was named the Superintendent of the Space Systems and Technology Division, the Navy's principal organization, or "lead laboratory," for space. He is credited with contributions in the design, development, and operation of 78 scientific and Fleet-support satellites. He has been awarded five patents. In October 1986, he was appointed Director of the newly established Naval Center for Space Technology. The Center's mission is to "preserve and enhance a strong space technology base and provide expert assistance in the development and acquisition of space systems which support naval missions."

Mr. Wilhelm has been recognized with numerous awards including the Navy's Meritorious Civilian Service Award, the Distinguished Civilian Service Award, the Presidential Meritorious Executive Award, NRL's Space Systems Program Achievement Award, the Institute of Electrical and Electronics Engineers Aerospace and Electronic Systems Group Man of the Year Award in 1981, and the NRL E.O. Hulburt Annual Science and Engineering Award for 1982. He also has been elected a Fellow of the Washington Academy of Sciences and an Associate Fellow of the American Institute of Aeronautics and Astronautics.



Key Personnel

Name	Title	Code
Mr. P.G. Wilhelm	Director, Naval Center for Space Technology	8000
Mr. F.V. Hellrich	Associate Director, Naval Center for Space Technology	8001
Mrs. L.T. McDonald	Head, Administrative/Financial Management Office	8010
Mr. L.E. Earl	Head, Program Review Staff	8030
Mr. R.E. Eisenhauer	Superintendent, Space Systems Development Department	8100
Mr. R.T. Beal	Superintendent, Spacecraft Engineering Department	8200
Mr. L.M. Hammarstrom	Superintendent, Space Systems Technology Department	8300

Point of Contact: Mr. F.V. Hellrich, Code 8001, 767-6549

Space Systems Development Department

Research Activity Areas

Special Projects

Advanced and experimental communications systems for spacecraft and Earth terminals
Investigations and technology assessment of advanced satellite programs

Spacecraft Engineering

Spacecraft power and ordnance systems
Aerospace systems fabrication
Quality assurance and reliability
Spacecraft test systems designs

Advance Systems Development

Survivability concepts
Spaceborne signal and data processors development

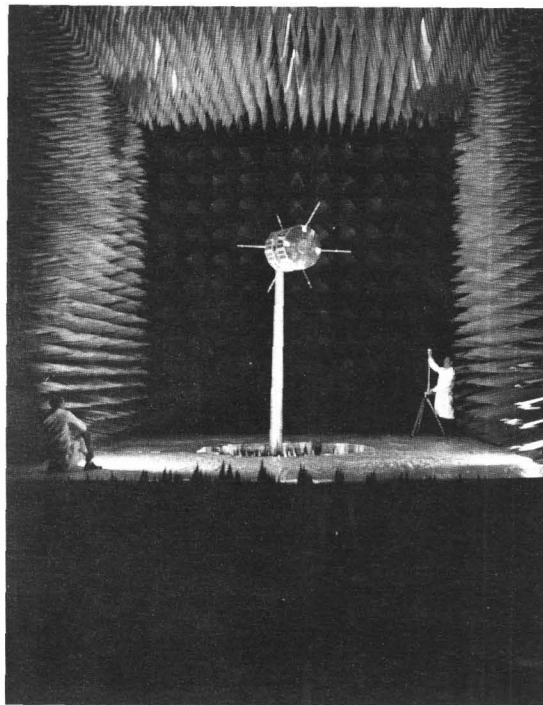
Spacecraft telemetry, command, and data management

Communications Systems Technology

Advanced space and related ground communications systems
Radio frequency active components and antennae
Communications systems study and analysis
Electromagnetic spectrum utilization
Laser-based optical communications systems

Terrestrial Systems

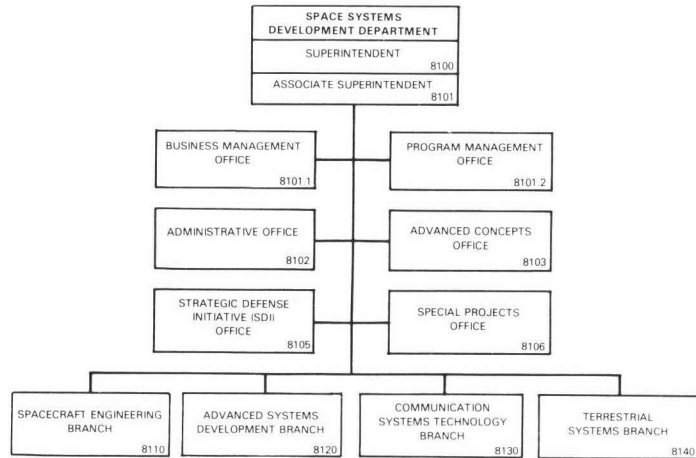
Software for collection systems control
Advanced satellite ground station design
Fleet-deployed satellite systems



The RF Anechoic Chamber is used to test and qualify satellites and other spacecraft components. It simulates the RF environment of free space so that accurate measurements can be made.



Mr. R.E. Eisenhauer



Basic Responsibilities

The Space Systems Development Department (SSDD) is the space systems research and development organization of the Naval Center for Space Technology. The SSDD develops space systems (both satellite and ground elements) to support Navy mission requirements and develops new technologies for use in space. Research continually strives to improve performance, capacity, reliability, efficiency, and life-cycle cost. To this end, the SSDD defines system requirements based on overall mission objectives, develops alternative system architectures, and designs and develops optimized operational space/ground systems. These development responsibilities extend across the entire space/ground spectrum of hardware, software, and systems advanced technologies including digital processing and control, analog, power, communications, command and telemetry, radio frequency, optical, and electromechanical systems. The SSDD pursues advanced concepts studies, analyses, and technical enhancements that enable advanced systems.

Personnel

Full-time civilian: 156

Key Personnel

Name	Title
Mr. R.E. Eisenhauer	Superintendent
Mr. J.G. Winkler	Associate Superintendent
Ms. D.E. Mignogna	Administrative Officer
Mr. J.A. Reynolds	Head, Business Office
Mr. J. Asher	Head, Program Management Office
Mr. B. Kaufman	Head, Advanced Concepts Office
Mr. R.E. Palma	Head, Strategic Defense Initiative Office
Mr. L.E. Hearton	Head, Special Projects Office
Mr. G.E. Flach	Head, Spacecraft Engineering Branch
Mr. A.J. Fox	Head, Advanced Systems Development Branch
Mr. F.E. Betz	Head, Communication Systems Technology Branch
Mr. T.W. Fisher	Head, Terrestrial Systems Branch

Point of contact: Ms. D.E. Mignogna, Code 8102, 767-0432

Spacecraft Engineering Department

Research Activity Areas

Design, Manufacturing and Processing

- Launch vehicle integration
- Spacecraft production design, planning, manufacturing, and assembly

Systems Analysis and Test

- Spacecraft structural design
- Spacecraft environmental testing
- Mechanical analysis and testing

Control Systems Branch

- Attitude and thermal control system
- Reaction control systems

Propulsion systems

Launch operations support

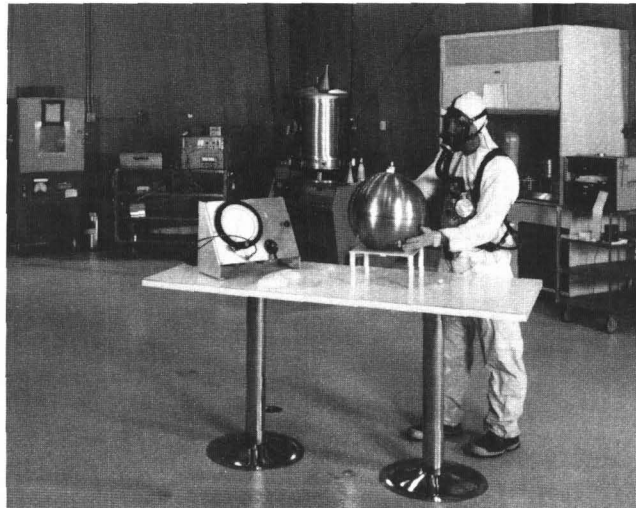
Concept Development

Engineering analysis and conceptual design for new space systems

Flexible space structures research

Expert systems

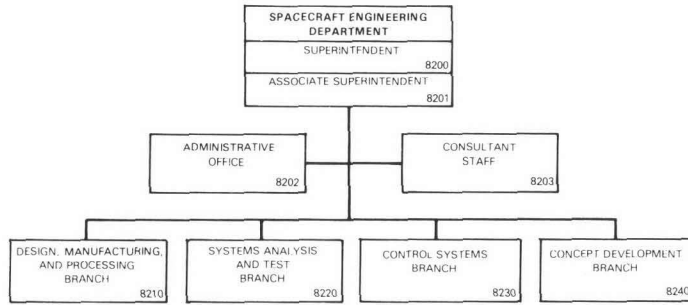
Spaceborne applications of robotics



A specially designed and constructed facility for the safe handling and testing of propellants used in Naval Center for Space Technology spacecraft



Mr. R.T. Beal



Basic Responsibilities

The Spacecraft Engineering Department (SED) is the focal point for the Navy's in-house spacecraft capability. The two primary functions of the SED are to design and build spacecraft platforms in support of Navy missions and to provide transfer vehicles to inject these spacecraft into their unique mission orbits. The activities of the SED range from concept and feasibility planning through the on-orbit Initial Operational Capability (IOC) for Navy Space Systems. The SED provides analysis, design, and hardware expertise in structures and mechanisms, attitude control systems, propulsion and reaction control systems, thermal control systems, satellite design integration, launch vehicle integration, and satellite-to-boost-stage integration.

The SED functions as a program manager for Navy programs by providing systems engineering and technical direction while maintaining an active in-house satellite development, test, and fabrication capability. In this role, the SED performs as a prototype laboratory and pursues the program to facilitate the transfer of technology to industry so that production satellites can be built in a cost-effective environment. To accomplish this, the SED supports the Navy Program Acquisition Office by providing experienced technical consultation after the prototype is built at NRL.

Personnel

Full-time civilian: 66

Key Personnel

Name	Title
Mr. R.T. Beal	Superintendent
Vacant	Associate Superintendent
Mrs. C. Warner	Administrative Officer
Mr. R. Barnes	Consultant
Mr. R.T. Beal	Head, Design, Manufacturing, and Processing Branch
Mr. E. Senasack	Head, Systems Analysis and Test Branch
Mr. S. Hollander	Head, Control Systems Branch
Vacant	Head, Concept Development Branch

Point of contact: Mr. R.T. Beal, Code 8200, 767-6407

Space Systems Technology Department

Research Activity Areas

Navy Space Technology

Technical consultant to current Navy space programs
Navy technology planning
Exploratory development block management

Space Sensing

Surveillance sensor and algorithm development
Electromagnetic and scatter research
Surveillance system performance
Requirements definition

Space Applications

Navigation systems
Time synchronization

Hydrogen masers

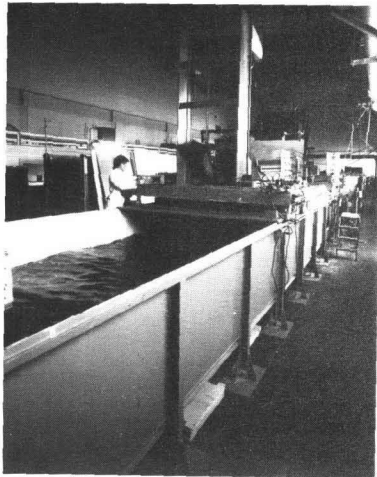
Frequency standard development

Systems Engineering and Analysis

Space system integration and test
Space system technical evaluation

Advance Concepts Processing Branch

Coherent receiver development
Spacecraft calibration systems
Advance data processing development



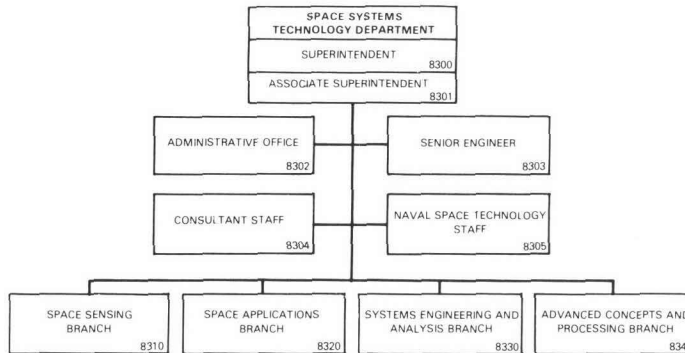
This 30.5-m wave tank is used to study the dynamics of wind waves and their interactions with long waves. Measurements are made by using microwave Doppler spectrometry and optical and photometric techniques.



In its precise time programs for the Naval Observatory and the NAVSTAR Global Positioning System (GPS), NRL has developed an extremely precise in-house time standard and equipment to test candidate clocks. These measurements can be made locally or via satellite or other special links. The link with the Observatory is precise to within 50 trillionths of a second.



Mr. L. Hammarstrom



Basic Responsibilities

The Space Systems Technology Department (SSTD) is involved in a wide range of activities from basic research through concepts technology and testing of space systems. The department has highly skilled teams doing research on remote sensing of the oceans of the world and state-of-the-art frequency standards from the Global Positioning System and the Naval Observatory. It continues to improve the Naval Space Surveillance System. The SSTD builds complex receiving and transmitting systems that exploit the latest concepts in microprocessing and device technologies. Detailed analysis, simulation, and testing are performed on space systems. Hardware, software, and computer systems for use in space systems are being developed. Two remote field sites, a large wave tank facility, and the NRL P-3 aircraft support the work. The SSTD interacts with operational forces in examining areas for future research and development.

Personnel

Full-time civilian: 112

Key Personnel

Name	Title
Mr. L.M. Hammarstrom	Superintendent
Mr. G.W. Hoskins	Associate Superintendent
Ms. E.M. Coates	Administrative Officer
Mr. D.L. Pettit	Senior Engineer
Mr. G.R. Price	Head, Naval Space Technology Staff
Dr. V.E. Noble	Head, Remote Sensing Branch
Mr. R.L. Beard	Head, Space Applications Branch
Mr. T.F. Lawton	Head, Test and Analysis Branch
Mr. J.N. O'Connor	Head, Advanced Concepts and Processing Branch

Point of contact: Ms. E.M. Coates, Code 8302, 767-6546

PROFESSIONAL DEVELOPMENT

PROFESSIONAL DEVELOPMENT

NRL has established many programs for the professional and personal development of its employees so they may better serve the needs of the Navy. These programs develop and retain talented people and keep them abreast of advanced technology and management skills. Graduate assistantships, fellowships, sabbatical study programs, cooperative education programs, individual college courses, and short courses for personal improvement contribute to professional development.

Programs also exist for non-NRL employees. These programs enhance Laboratory research efforts by providing means for non-NRL professionals to work at the Laboratory, thereby improving the interchange of ideas, meeting critical short-term technical requirements, and providing sources for new scientists and engineers. The programs include two-year graduate fellowships, faculty and professional interchanges, undergraduate work, and introducing gifted and talented high school students to the world of technology.

Programs for NRL Employees

During 1987, NRL employees participated in approximately 4400 individual training events. Many of these were presented as either video-taped or on-site instructed courses on diverse technical subjects, management techniques, and enhancement of personal skills (efficient use of time, memory improvement, interpersonal communications, speed reading, etc.).

One common study procedure is for employees to work full time at the Laboratory and take job-related scientific courses at universities and schools in the Washington area. The training ranges from individual courses to full-time graduate- and postgraduate-level programs. Tuition for job-related training is paid by NRL. Formal programs offered by NRL include:

Graduate Programs

- **The Advanced Graduate Research Program** (formerly the Sabbatical Study Program) enables selected professional employees to devote full time to research or course work in their own or a related field for one academic year at an institution of their choice without the loss of regular salary, leave, or fringe benefits. NRL pays all education, travel, and moving expenses for the individual and dependents. The program is open to paraprofessional (and above) employees who have completed six years of federal service, including four years at NRL.

- **The Edison Memorial Graduate Training Program** enables employees to pursue advanced studies in their fields at local universities. Eligible employees who are selected for participation in this program normally spend 24

hours of every work week in their studies. The criteria for eligibility include a minimum of one year of service at NRL, a bachelor's or master's degree in an appropriate field, and professional standing in keeping with the candidate's opportunities and experience.

- To be eligible for the **Select Graduate Student Program**, employees must have a college degree in an appropriate field and must have maintained at least a B average in undergraduate study. Accepted students devote a full academic year to graduate study. While attending school, they receive one half of their salary, and NRL pays for tuition, books, and laboratory expenses. During the summer, they work at the Laboratory and receive normal pay and fringe benefits.

- Research conducted at NRL may be used as **thesis material for an advanced degree**. This

original research is supervised by a qualified employee of NRL who is approved by the graduate school. The candidate should have completed the required course work and should have satisfied the language, residence, and other requirements of the graduate school from which the degree is sought. NRL provides space, research facilities, and supervision but leaves decisions on academic policy to the cooperating schools.

- **The Alfred P. Sloan Fellows Program** is designed for competent young executives whose job performance indicates senior management potential. The Sloan Fellows spend one year with the Massachusetts Institute of Technology faculty and with policymakers in industry and government. They study the theory and practice of effective and responsible management in a rapidly changing society.

- **The Education for Public Management Program** serves the training needs of individuals who are at midcareer and who have the talent to assume increasing responsibilities to direct agency programs and policies.

- **The Education Program for Federal Officials** exists for a small group of Federal employees who have demonstrated high competence and unusual promise. The Woodrow Wilson School of Princeton University has developed this program to enable selected midcareer officials to enlarge their knowledge in particular disciplines, to relate their fields of specialization to the broader concerns of government, and to sharpen their capacity for objective analysis of governmental problems.

- Federal Executive fellowships are available each year for employees to study in the **Brookings Institute Advanced Study Program**. In this program, the fellow is exposed to and participates in planning, developing, and conducting educational conferences on public policy issues for leaders in public and private life.

- **The Fellowship in Congressional Operations for Executives** provides an opportunity for some of the most promising young, technically oriented Federal executives to participate in a variety of assignments designed to develop their knowledge and understanding of Congressional operations. These fellows share activities with other members of the Congressional Fellowship

Program who come mainly from journalism, law, and college teaching.

- **The Maxwell Midcareer Development Program** of the Maxwell Graduate School of Citizenship and Public Affairs, Syracuse, New York, increases the managerial knowledge, ability, and skills of experienced Government officials who have been identified by their agencies as having potential for advancement to positions demanding progressively greater managerial and executive responsibilities.

- **The Practicing Engineer Advanced Study Program** of the M.I.T. Center for Advanced Engineering, Cambridge, Massachusetts, enables experienced engineers and applied scientists to work in-depth in technological areas pertinent to their professions, preparing for continued leadership in an age of unparalleled technological change.

- **The Science and Technology Fellowship Program**, a subsidiary of the Commerce Science Program, includes a variety of special events, lectures, seminars, visits, conferences, field trips, and interactions with key people from both the public and private sectors. Participants spend one week on Capitol Hill in an intensive, congressional orientation; they spend one week with the Brookings Institute, Science Policy Conference; and they take two week-long field trips for on-site inspection of scientific institutions and industrial complexes.

- **The Stanford-Sloan Program of the Graduate School of Business**, Stanford, California, gives exceptional young executives an opportunity to make an intensive study of new concepts and developments in business, to develop a top management perspective, and to broaden their intellectual horizons.

- **The Naval Postgraduate School (NPS)** in Monterey, California, provides advanced graduate study for selected Federal civilian employees who meet NPS academic requirements for the program in which they are interested, and whose employing agency is willing to act as sponsor.

Continuing Education

- Local colleges and universities offer **undergraduate courses** at NRL for employees to

improve their skills and keep abreast of current developments in their fields. These courses are also available at many other DoD installations in the Washington, D.C. area.

- The Employee Development Branch at NRL offers to all employees **short courses** in certain program areas that are not available at local schools; laboratory employees may attend these courses at nongovernment facilities as well. Interagency courses in management, personnel, finance, supervisory development, clerical skills, and other areas are also available.

For further information on any of the above programs, contact the Employee Development Branch at 767-2956.

Growth Opportunities

NRL has several programs, professional society chapters, and informal clubs that enhance the professional growth of employees. Some of these are listed below.

- The **Career Counseling Center** helps employees to define short- and long-range career goals, to improve their job-seeking skills, and to deal with issues affecting job productivity.

- A chartered chapter of **Women in Science and Engineering (WISE)** has been established at NRL. Informal monthly luncheons and seminars are held to inform scientists and engineers of women's research at NRL and to provide an informal environment for practicing their presentations.

- **Sigma Xi**, the Scientific Research Society, encourages original investigation in pure and applied science. The NRL chapter of approximately 450 active members meets nine times each year (from October to June) and sponsors a series of lectures on a wide range of pure and applied scientific topics of interest to both scientific and government communities. Each spring it sponsors an Edison Memorial Lecture at which a distinguished scientist, usually a Nobel Laureate, speaks on his or her research. The chapter also presents annual awards in pure and applied science.

- Any employee who is interested in developing effective self expression, listening, thinking, and leadership potential can join either of the two NRL chapters of **Toastmasters International**. Members of these clubs, who possess diverse career backgrounds and talents, meet three times a month to learn to communicate not by rules but by doing in an atmosphere of understanding and helpful fellowship.

Other programs that enhance the development of NRL employees include computer clubs (Edison Atari, Edison Commodore, and the NRL-IBM PC) and the Amateur Radio Club. The Recreation Club offers many facilities to promote physical fitness. The Showboaters, a nonprofit drama group, presents live theater for the enjoyment of NRL and the community and produces two major productions each year, in addition to occasional performances at Laboratory functions and benefits for local charities.

Programs for Non-NRL Employees

Programs also exist for non-NRL employees. These programs encourage and support the participation of visiting scientists and engineers in research of interest to the Laboratory. Some of the programs may serve as stepping stones to federal careers in science and technology. Their objective is to enhance the quality of Laboratory research activities through working associations and interchanges with highly capable scientists and engineers and to provide opportunities for outside scientists and engineers to work in the Navy laboratory environment. Along with enhancing NRL research, these programs acquaint participants with Navy capabilities and concerns.

Recent Ph.D., Faculty Member, and College Graduate Programs

- **The National Research Council (NRC)/NRL Cooperative Research Associate-ship Program** selects associates who conduct research at NRL in their chosen fields in collaboration with NRL scientists and engineers. The tenure period is two years, and following their tenure, the Office of Naval Research offers the associate posttenure research grants tenable at an academic institution.

- The American Society for Engineering Education (ASEE) administers the **Office of Naval Technology (ONT) Postdoctoral Fellowship Program** to increase the involvement of highly trained scientists and engineers in disciplines to meet the evolving needs of naval technology. Appointments are for one year (renewable for a second and sometimes a third year). The appointments are competitive and are made jointly by ONT and ASEE.

- The American Society for Engineering Education also administers the **Navy/ASEE Summer Faculty Research Program** for university faculty members to work for 10 weeks with professional peers in participating Navy laboratories on research of mutual interest. NRL hosted 53 of these faculty participants in 1987.

- **The NRL/United States Naval Academy (USNA) Cooperative Program for Scientific Interchange** allows faculty members of the U.S. Naval Academy to participate in NRL research. This collaboration benefits the Academy by providing the opportunity for USNA faculty

members to work on research of a more practical or applied nature. In turn, NRL's research program is strengthened by the available scientific and engineering expertise of the USNA faculty.

- **The Office of Naval Research Graduate Fellowship Program** helps U.S. citizens obtain advanced training in disciplines of science and engineering critical to the U.S. Navy. The three-year program awards fellowships to recent outstanding graduates to support their study and research. This research must lead to doctoral degrees in specified disciplines such as electrical engineering, computer sciences, material sciences, applied physics, and ocean engineering. Award recipients are encouraged to continue their study and research in a Navy laboratory during the summer. The summer option began in 1983; 5 ONR graduate fellows chose NRL for their summer work in 1987.

Contact: Employee Development Branch, 767-2956

- **The United States Naval Academy Ensign Program** assigns Naval Academy graduates to NRL to work in areas of their own choosing and commensurate with their academic qualifications. These graduates provide invaluable summer research assistance while gaining experience in Navy R&D programs.

Professional Appointments

- **Faculty Member Appointments** use the special skills and abilities of university faculty members for short periods to fill scientific, engineering, professional, or analytical positions.

- **Consultants and experts** are employed because they are outstanding in their specialized fields or because they possess rare abilities but cannot normally be employed as regular full-time civil servants.

- **Intergovernmental Personnel Act Appointments** temporarily assign personnel from state or local governments or educational institutions to the Federal Government (or vice versa) to improve public services rendered by all levels of government.

Contact: Staffing & Classification Branch I, 767-3030

Undergraduate College Student Programs

Several programs are tailored to the undergraduate that provide employment and work experience in naval research. These are designed to attract applicants for professional employment in the Laboratory's shortage category positions such as engineers, physicists, mathematicians, and computer scientists. The student employment programs foster an understanding of NRL job opportunities among students and educational personnel so that educators can provide students who will meet NRL's occupational needs. The employment programs for college students include:

- **The Cooperative Education Program** alternates periods of work and study for students pursuing bachelor degrees in engineering, computer science, or the physical sciences. Several universities participate in this program.

- **The Federal Junior Fellowship Program** hires students entering college to be assistants to scientific, professional, or technical employees.

- **The Summer Employment Program** employs students for the summer in paraprofessional and technician positions in engineering, physical sciences, and computer sciences. A limited number of positions are also filled in administrative occupations.

- **The Student Volunteer Program** helps students gain valuable experience by allowing them to voluntarily perform educationally related work at NRL.

- **The 1040-Hour Appointment** employs students on a halftime basis to assist in scientific work that is related to their academic program. A limited number of positions are also filled in administrative occupations.

Contact: Staffing & Classification Branch I, 767-3030

High School Programs

- **The Gifted and Talented Internship Program** provides a meaningful, part-time employment experience for high school graduates who plan to pursue a bachelor's degree in engineering, computer science, or the physical sciences.

Contact: Staffing & Classification Branch I, 767-3030

- **The DOD Summer Science and Engineering Apprentice Program** employs high school juniors and seniors to serve for eight weeks as junior research associates as part of a university grant program. Under the direction of a mentor, students gain a better understanding of research, its opportunities, and challenges through participation in scientific programs. Criteria for eligibility are based on science and mathematics courses completed and grades achieved; scientific motivation, curiosity, and capacity for sustained hard work; a desire for a technical career; teacher recommendations; and ability and achievement test scores.

- **The Clerical Cooperative Education Program** allows students to work part time while attending high school. Several high schools participate in this program.

Contact: Staffing & Classification Branch I, 767-3030

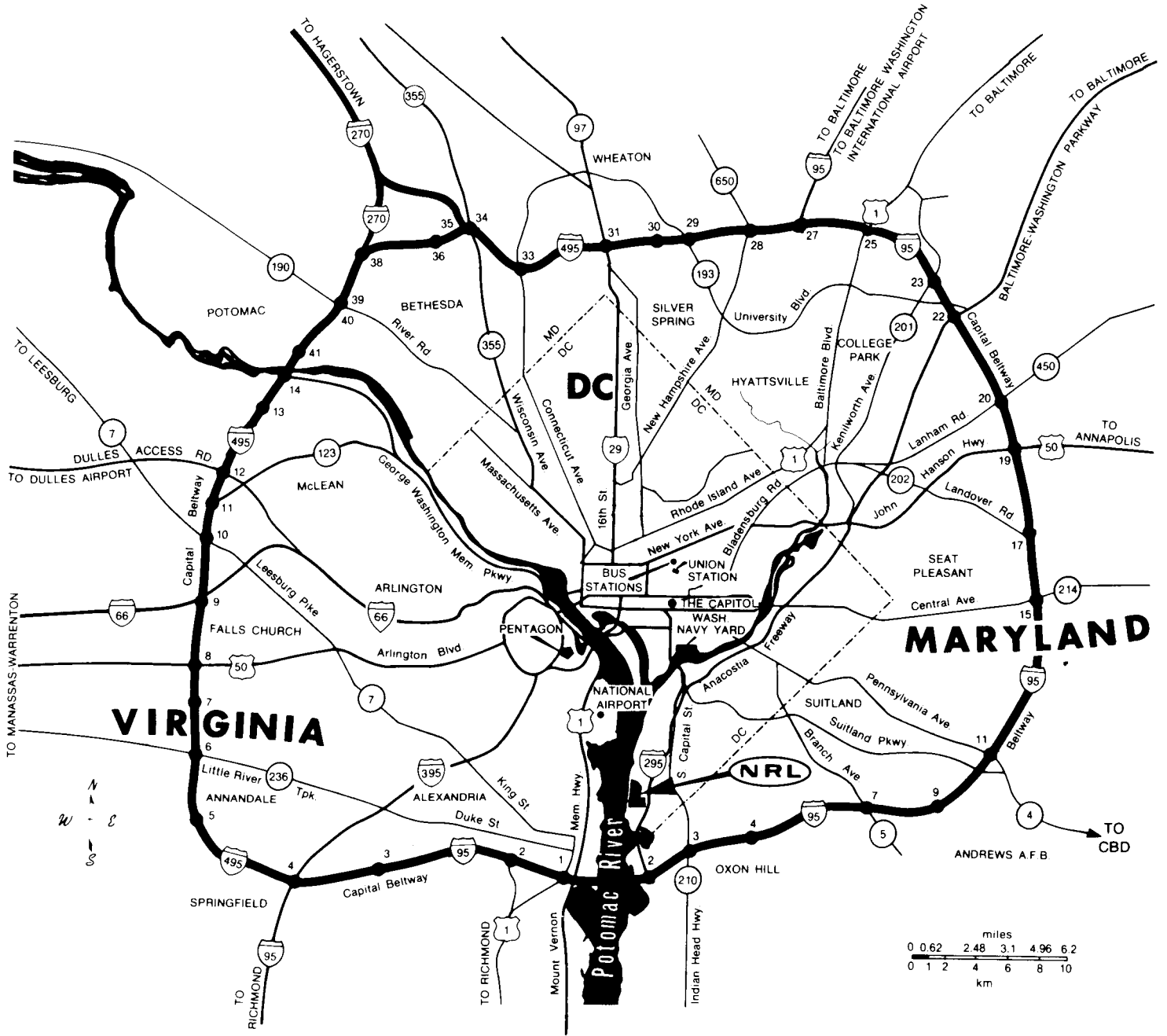
1987 Government Awards to Civilian Employees

	Number
Secretary of the Navy Award for Distinguished Achievement in Science	1
Distinguished Executive Award, Senior Executive Service	1
Meritorious Executive Award, Senior Executive Service	1
Senior Executive Bonus Award	6
Navy Meritorious Civilian Service Award	1
Navy Superior Civilian Service Award	4
E.O. Hulburt Award for Science	1
NRL Award for Achievement in the Field of Equal Opportunity	2

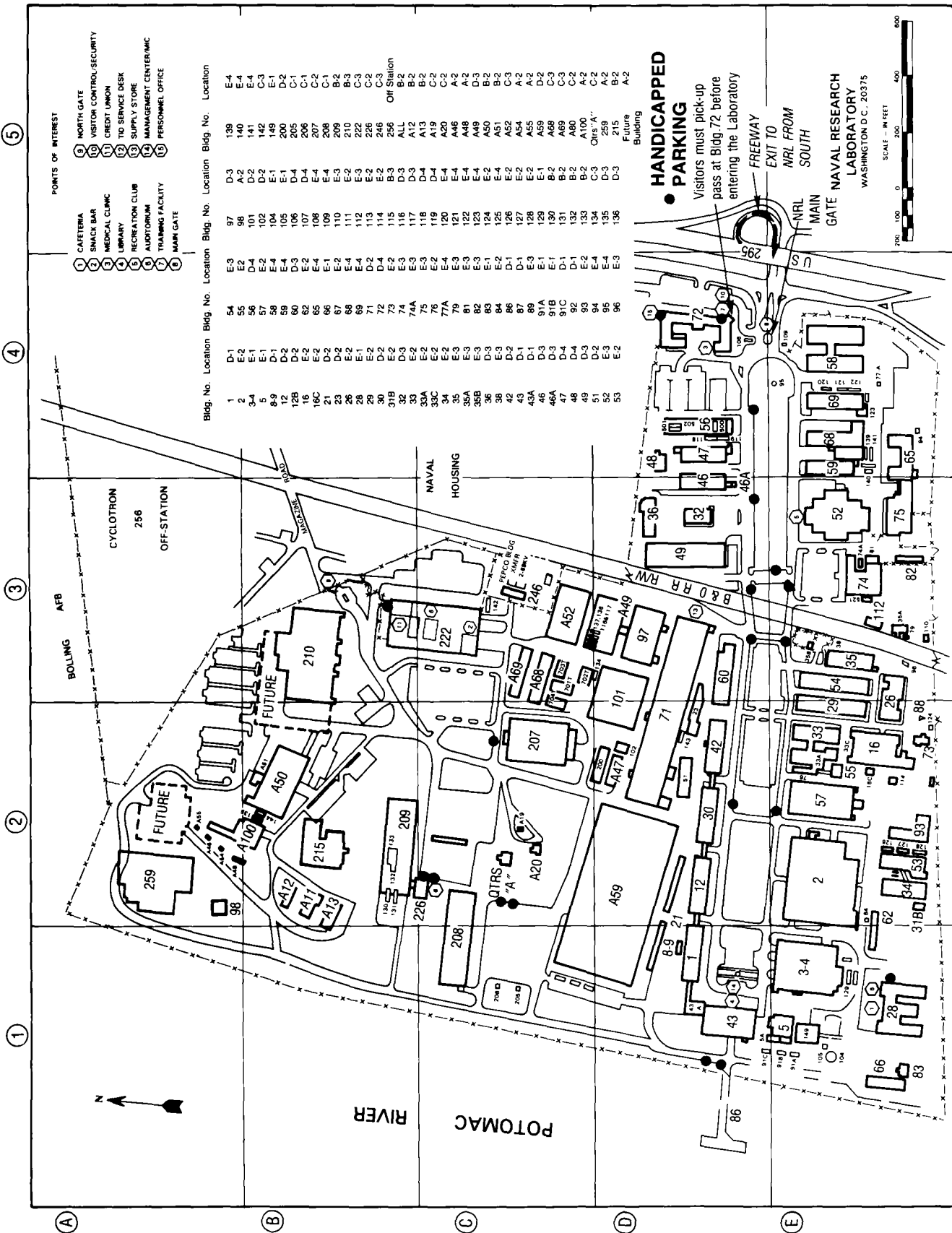


GENERAL INFORMATION

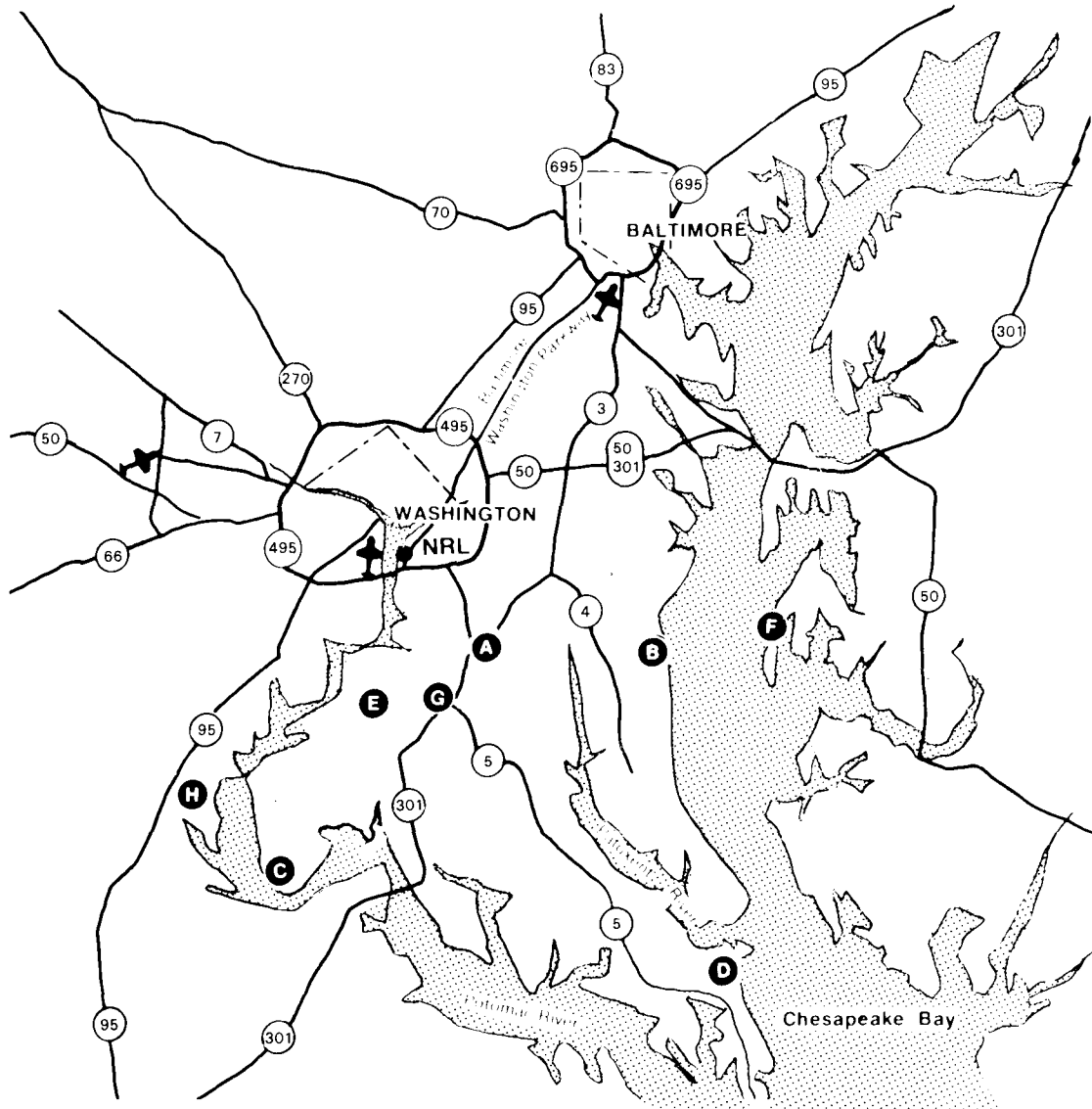
Location of NRL in the Capital Area



Location of Buildings at Main Site



Location of Principal Field Stations



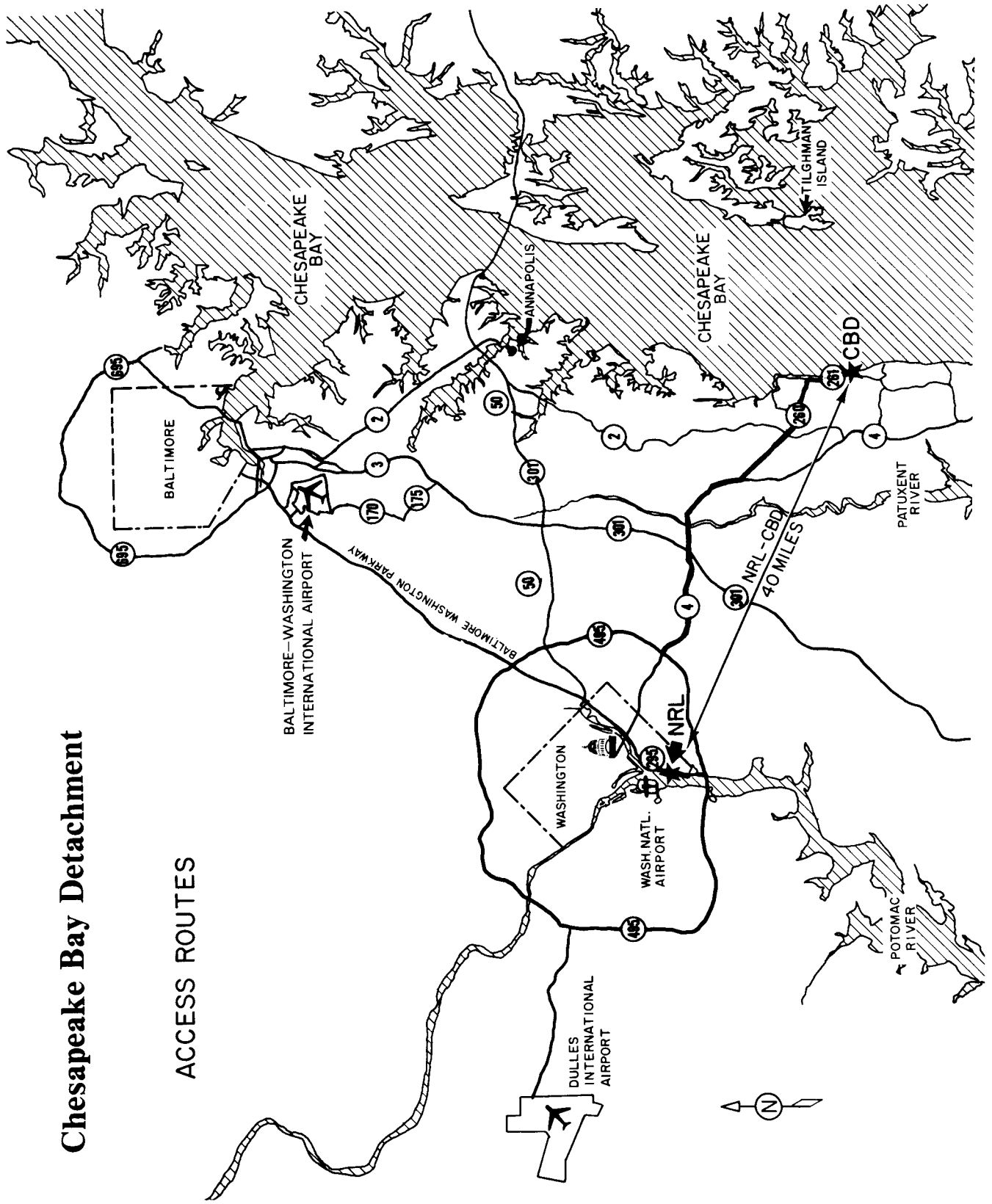
Approximate distance from NRL and Return.

A — Brandywine, MD	56 mi	E — Pomonkey, MD	40 mi
B — CBD (Chesapeake Bay Detachment)	80 mi	F — Tilghman Island, MD	220 mi
C — Maryland Point Observatory	90 mi	G — Waldorf Radio Site, MD	48 mi
D — Patuxent River Naval Air Station ..	128 mi	H — Midway Research Center	
		Quantico, VA	76 mi

The Underwater Sound Reference Division is located at Orlando, FL

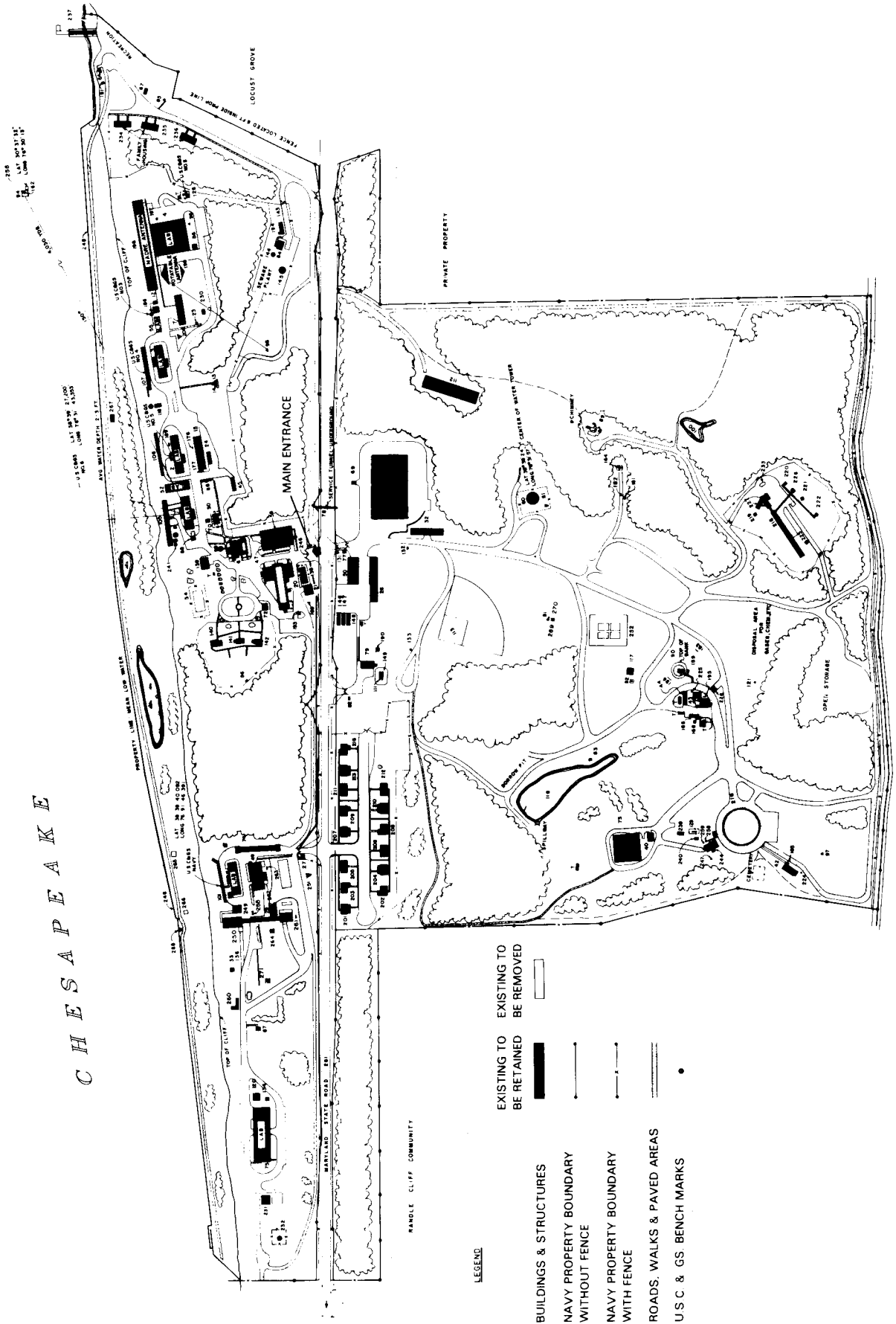
Chesapeake Bay Detachment

ACCESS ROUTES



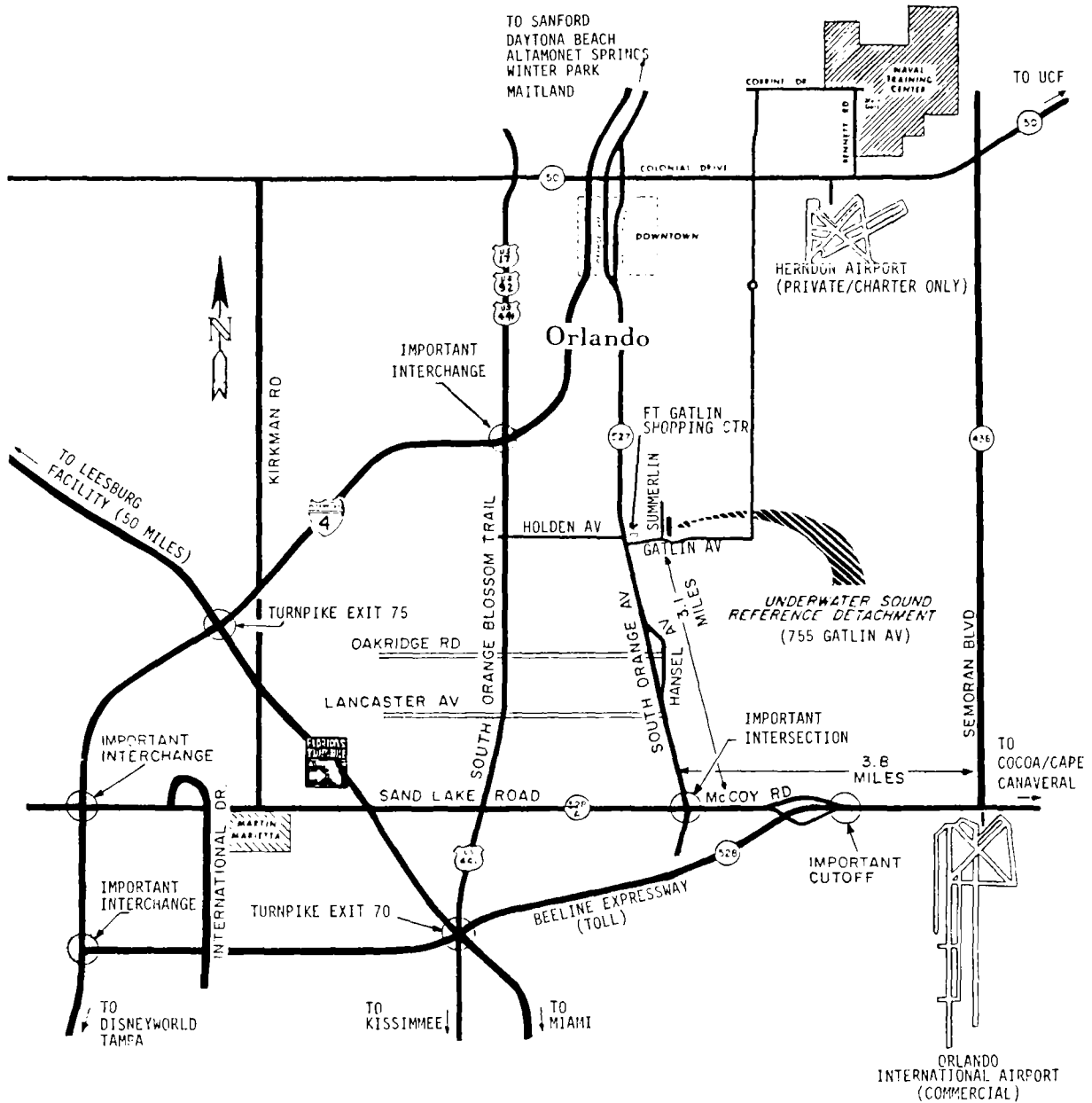
Location of Buildings at Chesapeake Bay Detachment

B A Y



- LEGEND
- EXISTING TO BE RETAINED
 - EXISTING TO BE REMOVED
 - BUILDINGS & STRUCTURES
 - NAVY PROPERTY BOUNDARY WITHOUT FENCE
 - NAVY PROPERTY BOUNDARY WITH FENCE
 - ROADS, WALKS & PAVED AREAS
 - U.S.C. & G.S. BENCH MARKS

Underwater Sound Reference Detachment (Orlando, Florida)



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1002	Chief Staff Officer/Inspector General	CAPT M.A. Howard, USN	73621
1003	Associate Director of Research for Strategic Planning	Dr. W.M. Tolles	73584
1004	Scientific Consultant to the Director of Research	Dr. P. Mange	73724
1005	Head, Office of Management and Administration	Mrs. M. Oliver	73086
1006	Exploratory Development Manager	Dr. S. Sacks	73666
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1220	Security Manager	Mr. M.B. Ferguson	73048/72240
1223	Safety Officer	Mr. H.C. Kennedy, Jr.	72249
1280	O in C Flight Support Detachment (PAX River NAS)	CDR H.J. Wnuk, USN	(autovon) 8-356-3751
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1800	Head, Civilian Personnel Division	Mr. D.J. Blome	73421
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Introduction to the Naval Research Laboratory

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Materials Science and Component Technology Directorate

Naval Center for Space Technology

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General Information

