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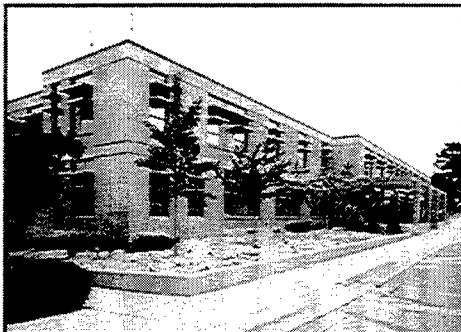
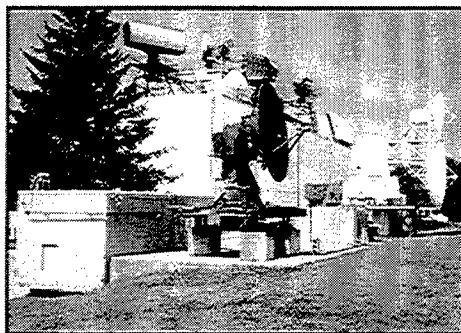
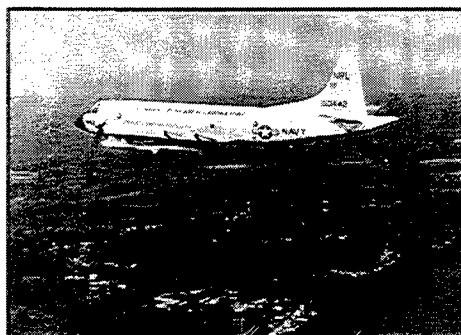
7 MAY 1997

Naval Research Laboratory

Washington, DC 20375-5320 NRL/PU/5230--95-275 July 1995



# 1994-95 FACT BOOK



The NRL Fact Book is prepared as a reference source for information about the Naval Research Laboratory (NRL). Fiscal information, personnel, and organization changes are current as of 25 June 1995. To provide additional information to the reader, a point of contact is listed for each activity.

NRL 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 is furnished on request. Address all such inquiries to:

Human Resources Office  
Staffing Branch (Code 1810)  
Naval Research Laboratory  
Washington, DC 20375-5320

### **On the cover - top to bottom**

The Naval Research Laboratory, Washington, DC, is located on the banks of the Potomac River.

A specially configured NP-3D from NRL's Flight Support Detachment, Naval Air Warfare Center, Patuxent River, Maryland. This NP-3D is flying over NRL's Chesapeake Bay Detachment, Chesapeake Beach, MD.

Radar test site at Building 75, Chesapeake Bay Detachment, Chesapeake Beach, Maryland, showing radar antennas used in various experiments by the Radar Division. See related photo on p. 62.

Aerial view of the Atmospheric Research Laboratory located at Stennis Space Center, Bay St. Louis, Mississippi (NRL-SSC).

The Naval Oceanographic and Atmospheric Research Laboratory is located in Monterey, California (NRL-MRY).



### **Quick Reference Telephone Numbers**

|                   | <b>NRL<br/>WASHINGTON</b> | <b>NRL-<br/>SSC</b> | <b>NRL-<br/>MONTEREY</b> | <b>NRL<br/>CBD</b> |
|-------------------|---------------------------|---------------------|--------------------------|--------------------|
| Hotline           | (202) 767-6543            | (601) 688-5001      | (408) 656-4737           | (202) 767-6543     |
| Personnel Locator | (202) 767-3200            | (601) 688-3390      | (408) 656-4706           | (410) 257-4000     |
| DSN               | 297- or 354-              | 485                 | 878                      | —                  |
| Direct-in-Dialing | 767- or 404-              | 688                 | 656                      | 257                |
| Public Affairs    | (202) 767-2541            | (601) 688-5328      | (408) 656-4708           | —                  |

Additional telephone numbers are listed on pages 148 and 149.

# **1994-95 FACT BOOK**

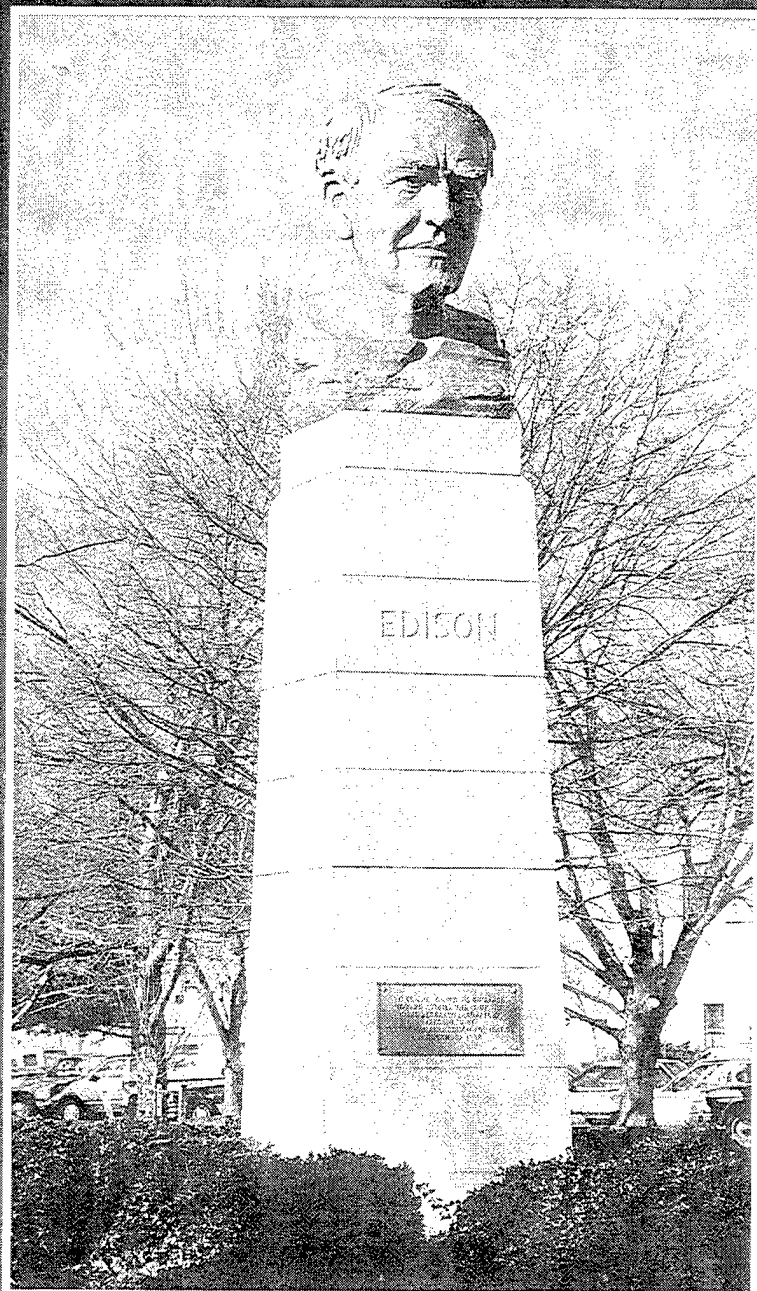
**NAVAL RESEARCH LABORATORY  
WASHINGTON, DC 20375-5320**

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| <b>31</b> | <b>BUSINESS OPERATIONS DIRECTORATE</b>                                        |
| 34        | Associate Director of Research for Business Operations                        |
| 36        | Legal Counsel                                                                 |
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| <b>47</b> | <b>GENERAL SCIENCE AND TECHNOLOGY DIRECTORATE</b>                             |
| 50        | Associate Director of Research for General Science and Technology             |
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| <b>55</b> | <b>WARFARE SYSTEMS AND SENSORS RESEARCH DIRECTORATE</b>                       |
| 58        | Associate Director of Research for Warfare Systems and Sensors Research       |
| 60        | Technical Information Division                                                |
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# Introduction to the Naval Research Laboratory



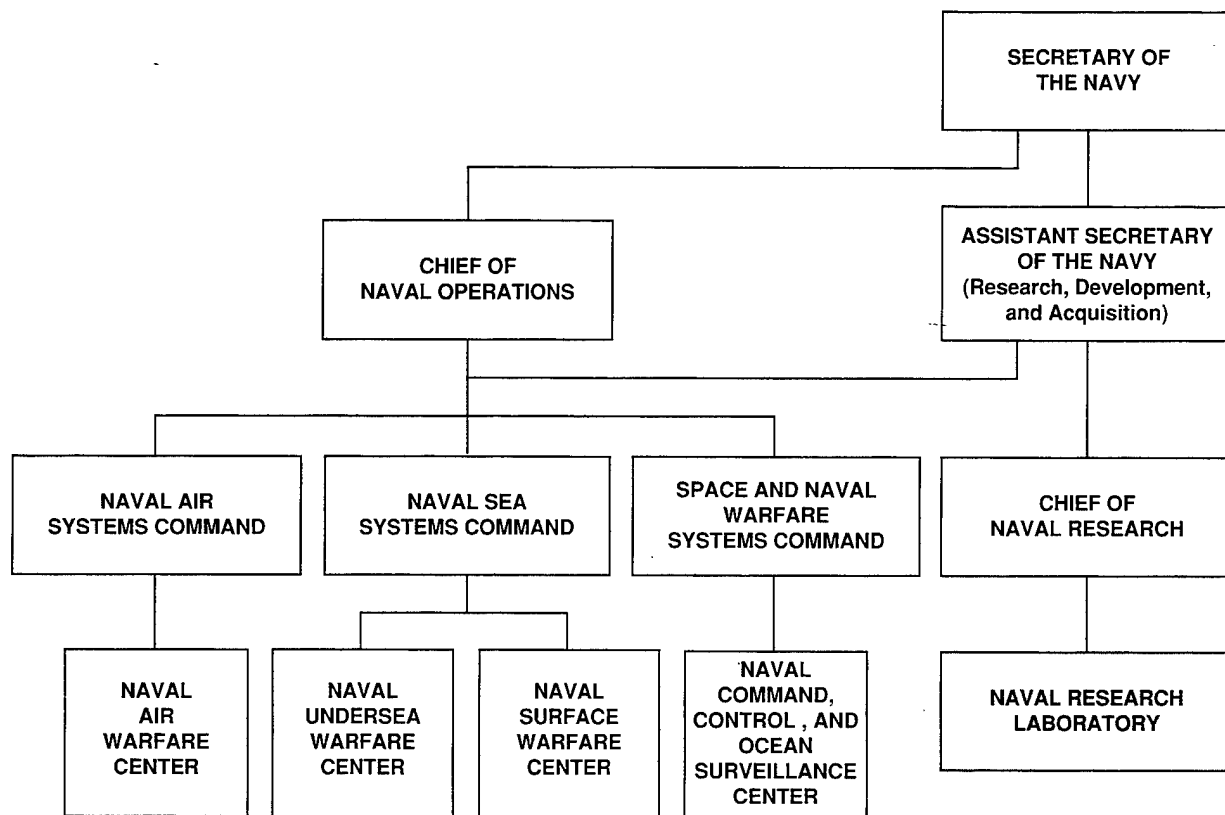
## MISSION

To conduct a broadly based multidisciplinary program of scientific research and advanced technological development directed toward maritime applications of new and improved materials, techniques, equipment, systems, and ocean, atmospheric, and space sciences and related technologies.

The Naval Research Laboratory provides

- Primary in-house research for the physical, engineering, space, and environmental sciences
- Broadly based exploratory and advanced development programs in response to identified and anticipated Navy needs
- Broad multidisciplinary support to the Naval Warfare Centers
- Space and space systems technology development and support







## **The Naval Research Laboratory in the Department of the Navy**

The Naval Research Laboratory is the Department of the Navy's corporate laboratory; it is under the command of the Chief of Naval Research (CNR). As the corporate laboratory of the Navy, NRL is an important component in the Office of Naval Research's effort to meet its science and technology responsibilities.

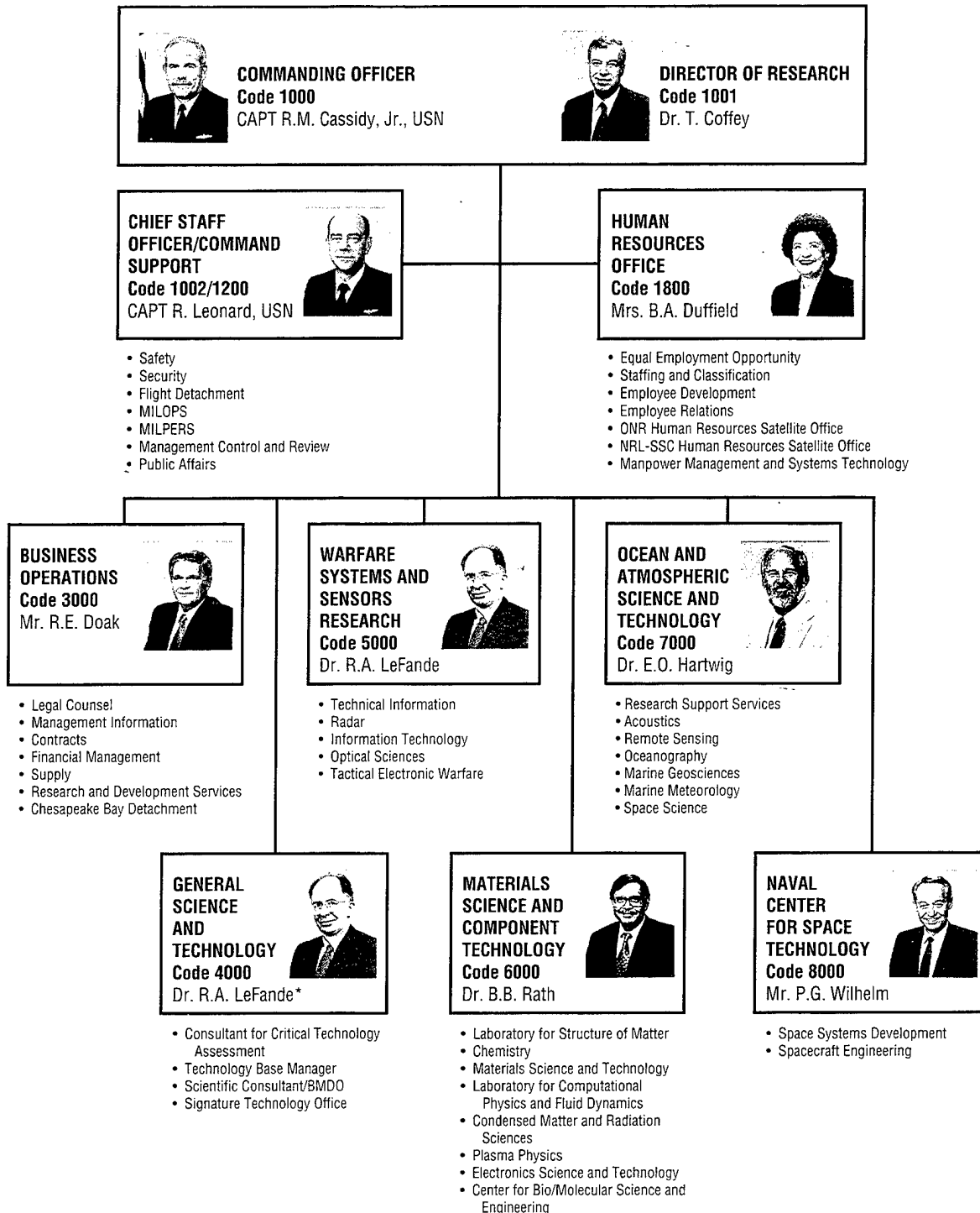
For its basic research effort, the Laboratory receives guidance from the CNR that establishes the level of effort and trend direction. The Laboratory then develops a comprehensive research proposal package that is submitted to the CNR for consideration for Navy basic research support. The total Navy 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 whereby 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 has had a long and fruitful relationship with industry as a collaborator, contractor, and most recently in Cooperative Research and Development Agreements (CRADA). NRL values this linkage and intends for it to continue to develop.

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

# NRL Functional Organization



\*Additional duty

# 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.

## Advanced Radio, Optical, and IR Sensors

- Advanced optical sensors
- EO/MET sensors
- Satellite meteorology
- Precise space tracking
- Radio/Infrared astronomy
- Infrared sensors and phenomenology
- Middle atmosphere research
- Image processing
- VLBI/Astrometry
- Atmospheric effects on low frequency EM communications
- Optical interferometry
- Imaging spectrometry

## 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
- Human-computer interaction
- Intelligent systems for resource allocation, signal identification, operational planning, target classification, and robotics
- Algorithms and utilization of massively parallel computing systems
- Visualization of scientific processes
- High-performance networking
- Machine learning
- Advanced computer networking

## Electronic Electro-optical Device Technology

- Integrated optics
- Radiation-hardened electronics
- Microelectronics
- Microwave and MM wave technology
- Hydrogen masers for GPS
- Aperture syntheses
- Electric field coupling
- Vacuum electronics

## Directed Energy Technology

- High-energy lasers
- Chemical lasers

- Laser propagation
- High-power microwave sources
- Charged-particle devices
- Pulse power
- DE effects

## Electronic Warfare

- EW/C2W/IW systems and technology
- COMINT/SIGINT technology
- EW decision aids, and planning/control systems
- Intercept receivers, signal processing, and identification systems
- Passive direction finders
- Decoys and offboard CM (RF and IR)
- Expendable autonomous vehicles
- Repeaters/jammers and EO/IR active countermeasures and techniques
- Platform signature measurement and management
- Threat and EW systems computer modeling and simulations
- Visualization and virtual reality
- Hardware-in-the-loop and flyable simulators
- Rf environment simulators

## 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 and geomagnetic activity
- Magnetospheric and space plasma effects
- Nonlinear science
- Ionospheric behavior
- Oceanographic effects on weapons, sensors, and platforms

## Imaging Research/Systems

- Remotely sensed signatures analysis

Real-time signal and image processing algorithms/  
systems  
Image data compression methodology  
Image fusion  
Automatic target recognition  
Scene/Sensor noise characterization  
Image enhancement/noise reduction  
Scene classification techniques  
Radar and laser imaging systems studies  
Coherent/Incoherent imaging sensor  
exploitation  
Remote sensing simulation

### **Information Technology**

Antijam communication links  
Network architectures  
Battle management information systems  
Arctic communication links  
Information security (INFOSEC)  
Voice processing

### **Materials**

Superconductivity  
Bio/Molecular engineering  
Materials processing  
Advanced alloy systems  
Rapid solidification technology  
High-temperature materials  
Laser fabrication and processing  
Ceramics and composite materials  
Thin films and coatings  
Metamorphic materials/Smart structures  
Transduction materials  
Computational material science

### **Space Systems and Technology**

Advanced space systems  
Space sensing technology and applications  
Satellite communications  
Spacecraft design, engineering, and integration  
Satellite ground station design  
Navigation and time technology  
Remote sensing, calibration, and research  
Satellite survivability  
Spacecraft power systems technology  
Spacecraft materials  
Radiation effects on spacecraft

### **Surveillance and Sensor Technology**

Point defense technology  
Imaging radars  
Target classification/identification  
Airborne geophysical studies  
Fiber-optic sensor technology  
Undersea target detection/classification

Sonar transducers  
Electromagnetic sensors—gamma ray to rf  
wavelengths  
SQUID for magnetic field detection  
Low observables technology  
Ultra-wideband technology  
VHSIC/MIMIC applications  
Interferometric imagery

### **Undersea Technology**

Autonomous vehicles  
Bathymetric technology  
Anechoic coatings  
Oceanographic instrumentation

### **Oceanography**

Open ocean, regional, and littoral oceanographic  
forecasting  
Shallow water tactical oceanography  
Arctic environmental quality  
In-situ oceanographic sensors and data fusion  
Bio-optical and fine-scale physical processes  
Bio-corrosion  
Environmental simulation  
Coastal scene generation  
Waves, tides, and surf prediction  
Couple model development  
Coastal/ocean bubble-optical characterization

### **Marine Geosciences**

Geoacoustic modeling to support acoustic  
performance prediction  
Marine seismology, including propagation and  
noise  
Geomagnetic modeling to support nonacoustic  
system performance  
Geotechniques/sediment dynamics affecting mine  
warfare and mine countermeasures  
Mapping and charting, including advanced  
seafloor mapping and imaging systems

### **Meteorology**

Air/Sea interaction effects on operations  
Data assimilation techniques  
Global/Regional forecasting  
Tactical system development and application  
Weather effects on targets  
Meteorological tactical decision aids

### **Ocean Acoustics**

Underwater acoustics, including propagation,  
noise, and reverberation  
Fiber-optic acoustic sensors  
Shallow water environmental acoustics and sensor  
systems

Undersea warfare system performance modeling,  
unifying the environment, acoustics, and signal  
processing

Anechoic coatings

Target reflection, diffraction, and scattering

Simulations

Tactical decision aids

Sonar transducers

Metrology



# Major Research Capabilities and Facilities

(Listed alphabetically by organizational unit)

## Acoustics Division (Code 7100)

Large tank instrumented for investigating acoustic echo and radiation 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  
Containerized data processing for acoustic array processing at remote sites and aboard ship  
Large acoustic pool facility, incorporating near-field conformal scanners and acoustic arrays for structural acoustics studies of underwater targets  
High-powered sound source array  
Vertical array with satellite telemetry  
Multiple towed acoustic arrays with up to 144 acoustic channels for measuring directional noise  
Twin underwater towers supporting sources and hydrophone arrays to measure high-frequency propagation, volume, and boundary scattering in shallow water  
High-speed maneuverable towed body with MK-50 and synthetic aperture sonars to measure high-frequency boundary scattering and coherence  
Tactical oceanography simulation laboratory

## Center for Bio/Molecular Science and Engineering (Code 6900)

Optical equipment  
Confocal fluorescent microscope  
CW fluorimeter and microscope  
Excimer laser projection exposure system  
Dektak surface profilometer  
Optical and fluorescence microscopes  
Photon correlation spectrometer  
Picosecond dye laser system  
Raman spectrometers  
Scanning and transmission electron microscope  
SLM fluorimeter (visible through near IR)  
Time resolved fluorimeter (nanosecond)  
UV-visible absorption spectrophotometers  
Analytical instruments  
Atomic force/scanning tunnelling microscope  
Capillary electrophoresis unit  
Contact angle goniometer  
Differential scanning calorimeter

DNA synthesizer; DNA sequencer  
HPLC  
Patch clamp microelectrodes  
Potentiometer for electrochemistry  
General facilities  
Class 100 clean room  
Cold room for storage and preparation  
Controlled shelf temperature lyophilizer  
Silicon graphics IRIS workstation  
Freeze-fracture apparatus  
High speed ultracentrifuges  
Inert atmosphere dry box  
Langmuir-Blodgett film balance

## Chemistry Division (Code 6100)

Synthesis/processing facilities  
Paint formulation and coating  
Functional polymers/elastomers  
Langmuir-Blodgett film  
Surface cleaning  
Thin film deposition/etching with in-situ control  
High temperature chemistry  
Characterization facilities  
General purpose chemical analysis  
Surface diagnostics  
Nanometer scale composition/structure/properties  
Magnetic resonance NDI  
Tribology  
Polymer structure/function  
Special purpose capability  
Environmental monitoring  
Synchrotron interfacial spectroscopy/structure  
Combustion and fire research  
Alternate and petroleum-derived fuels  
Simulation/modeling

## Condensed Matter and Radiation Sciences Division (Code 6600)

Hypervelocity gun ranges  
3-MeV tandem Van de Graaff accelerator  
200-keV ion-implantation facility  
Synchrotron radiation beam lines (at NSLS, Brookhaven, NY)  
Microwave test facility  
Excimer laser film deposition facility  
Bomen infrared spectrometer facility  
Diffuse light scattering facility

## **Electronics Science and Technology Division (Code 6800)**

Nano- and micro-electronics processing facility  
Electron-beam nanowriter  
High-resolution transmission electron microscope  
Scanning tunneling microscopy and electro-optical analysis  
Crystal-growing facilities including bulk growth, molecular beam epitaxy, and organo-metallic chemical vapor deposition  
Optical and electrical characterization of materials  
Electronic testing and analysis facilities  
Vacuum electronics engineering facility

## **Information Technology Division (Code 5500)**

Extensive computer facilities  
Connection machine  
HF modem and channel simulation  
Brandywine antenna range  
Pomomkey test range  
Signal analysis laboratory  
Artificial intelligence computer network  
Distributed simulation and prototyping test bed  
HCI laboratory  
Certification and INFOSEC engineering laboratory  
Virtual reality laboratory  
DOD high performance computing (HPC) distributed resources center  
Thinking machines CM-5E (256 processor nodes, 32 Gbytes memory)  
Thinking machines CM200 (16,000 processor nodes, 2 Gbytes memory)  
Lab-wide network, NICEnet, providing lab-wide computer communication, video services, and gateways to networks and computer systems worldwide  
Satellite dishes for video and data reception  
Microwave antennas receiving ITV from local universities  
File server/archiver system for central file storage of lab-wide data  
Cray Y-MP EL 2/512  
Visualization laboratory  
Lab-wide ADP training facility

## **Laboratory for Computational Physics and Fluid Dynamics (Code 6400)**

INTEL iPSC/860 Touchstone Gamma 32 node supercomputer  
Three IBM RS/6000 high capacity workstation class compute servers  
256 M/byte CONVEX C210 mini-supercomputer

Three DEC 3000/400 AXP workstations  
Two SGI IRIS 4D graphics workstations  
D2 Digital video and animation laboratory  
SUN Microsystems 670MP workstation server  
Over thirty SUN and MACINTOSH personal workstations  
All computers and workstations have network connections to NICEnet allowing access to the NRL CCF, the NRL connection machine, and many other computer resources both internal and external to NRL

## **Laboratory for Structure of Matter (Code 6030)**

Two area detector systems  
Two X-ray diffractometers  
Zymark robotics  
Four silicon graphics IRIS workstations  
Protein and peptide chromatography

## **Marine Geosciences Division (Code 7400)**

Airborne gravimetry, magnetics, and topographic measurement suite coupled with differential GPS yielding position accuracies of <1.0 meter  
Data acquisition and analysis system using Navy's fixed underwater surveillance system (SOSUS) to study earthquakes and whale migration patterns  
Deep-towed acoustic geophysical system operating at 250-650 Hz characterizes seafloor structure including gas clathrate accumulations  
Acoustic seafloor classification system operating at 15-50 kHz provides underway, real-time prediction of sediment type and consistency  
Seafloor probes for measuring sediment pore water pressures and acoustic compressional and shear wave velocities and attenuations  
Transmission electron microscope with environmental cell for study of sediment fabric, especially impact of pollutant adsorption  
Map data formatting facility compresses map information onto compact disk-read only memory media for use in aircraft digital moving map systems  
Magnetic observatory conducts measurements of ambient field and other magnetic phenomena  
Comprehensive geotechnical and geoaoustics laboratory capability  
Airborne ElectroMagnetic (AEM) bathymetry system  
Ocean bottom magnetometer system  
3-D, multi-spectral, subbottom swath imaging system  
Ocean Bottom Seismographs (OBS)

In-Situ Sediment Acoustic Measurement System (ISSAMS)  
 Hydrothermal plume imaging data acquisition and analysis system  
 Integrated digital databases analysis and display system for bathymetric, meteorological, oceanographic, geoacoustic, and acoustic data

### **Marine Meteorology Division (Code 7500)**

Tactical Environmental Support System (TESS(3)) prototype-concurrent 6605 computer  
 SMQ-11 shipboard antenna system for retrieving orbiting imagery  
 Naval Environmental Operational Nowcasting System (NEONS)-implemented on two HP9000/835 computers  
 Numerous PC's and SUN workstation computers  
 Real-time/archived global atmosphere/ocean databases

### **Materials Science and Technology Division (Code 6300)**

Ultrasonic gas atomizer  
 Hot isostatic press  
 Cold 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 systems  
 Nondestructive evaluation laboratory  
 Closed-loop, low- and high-cycle fatigue systems  
 Metallic film deposition systems  
 Magnetometry  
 Mossbauer spectroscopy  
 Cryogenic facilities  
 High-field magnets  
 Marine corrosion facility  
 High-resolution analytical electron microscope  
 Isothermal heat treating facility  
 Vacuum arc melting facility  
 Vacuum induction melting facility

### **Oceanography Division (Code 7300)**

TOWED sensor and advanced microstructure profiler systems for studying upper ocean fine and micro-structure  
 Integrated absorption cavity and optical profiler systems for studying ocean optical characteristics  
 Environmental scanning electron microscope and confocal laser scanning microscope for detailed studies of bio-corrosion in naval materials  
 Self contained bottom mounted upwardlooking acoustic profilers for measuring ocean variability  
 Acoustic doppler profiler for determining ocean currents while under way  
 Fiber optic connection to the Navy's Class 7 large scale computer  
 Remotely operated underwater vehicle (ROV)  
 Unmanned underwater vehicle with optical sensors

### **Optical Sciences Division (Code 5600)**

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 facilities  
 Silica and fluoride fiber-optic fabrication facilities  
 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  
 Laser diode pumped 10 watt 2mm solid state lasers  
 Field-qualified EO/IR measurements devices  
 Focal plane array evaluation facility

### **Plasma Physics Division (Code 6700)**

PAWN, 1-MJ compact inductive storage facility  
 Gamble II high-voltage pulsed power generators  
 PHAROS III, three-beam neodymium-glass laser and target facility  
 1000-J NRL CO<sub>2</sub> laser  
 Table-Top Terawatt (T<sup>3</sup>) laser system

NIKE krypton fluoride laser facility  
 Dense Z-pinch facility  
 High-power relativistic klystron and gyrotron facilities  
 Large volume space chamber  
 Electric mass launchers facility  
 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

### **Radar Division (Code 5300)**

Airborne research radar facility, including advanced profile high resolution imaging radar  
 Ship radar-cross-section computer prediction facility  
 Electromagnetic numerical computation facility  
 Shipboard radar research and development test beds:  
 1. Senrad wideband air surveillance radar facility  
 2. Volume surveillance radar test bed  
 3. Ship self-defense surveillance and engagement demonstration systems  
 Cooperative aircraft identification (IFF) ground station facility  
 Shipboard radar display facility  
 Compact range antenna measurement laboratory  
 Experimental mode-stirred chamber for electromagnetic compatibility qualification  
 CBD fleet radar systems facility  
 Space-time adaptive processing laboratory  
 Electronic computer-aided design facility  
 Clutter research radar

### **Remote Sensing Division (Code 7200)**

Stratified tow channel  
 Millimeter-wave Atmospheric Sounder (MAS)  
 MAS data facility  
 MAS Spacelab instrument  
 Polar ozone and aerosol monitor space sensor  
 Ground-based stratospheric water-vapor monitoring system  
 Digital Image Processing Laboratory (DIPL)  
 SAR processing facility  
 SCI processing facility  
 SEALAB  
 NASE LAB  
 MWO optical interferometer site  
 Navy prototype optical interferometer  
 General purpose image processing  
 Maryland Point Observatory  
 Green Bank interferometer  
 Washington VLBI correlator  
 WVMS NDSC instrument  
 Image working system

IRIS system and processor  
 IR test facility  
 SSM/I processing facility  
 STEMS-II boat  
 STEMS system  
 Ocean tower/platform/ship radar  
 L,S,C,X,K, and W band  
 Ocean tower/lab/platform/ship radiometers  
 6,10,14,19,22,35,37,85,90,140,220 GHz  
 Lidar field system  
 Aerosol and field measurement facility  
 Aerostat and blimp instrument system  
 Visualization Center  
 NRL RP-3A aircraft sensors  
 Airborne Lidar  
 MMW imagers (35,90,140,220 GHz)  
 DMSP SSM/I simulator  
 LFMR SST simulator  
 PRT-5 IR radiometer  
 Imaging real-aperture radar (RAR)  
 X,C bands  
 Precision altimeters  
 X-band, 95 GHz, Lidar  
 Rotating scatterometer  
 Tri-frequency-agile radar (TRIFAR)  
 X-band interferometer  
 Millimeter-wave (95 GHz) radar  
 AXBT  
 Flight-level meteorological sensors  
 Navigation systems  
 INS, GPS  
 PHILL's  
 Shipboard sensor systems  
 Surface met/ocean obs  
 Lidar  
 CTD  
 Thermistor chains  
 STAr (Surface Towed Array)  
 Acoustic doppler velocity profilers

### **Research and Development Services Division (Code 3500)**

Military construction  
 Scientific program  
 ONR facilities support  
 Research support engineering  
 Full range of facility contracting, including construction, architect/engineering services, facilities support, and base operating services  
 Transportation  
 Environmental  
 Planning  
 Maintenance and repair of buildings, grounds, and communication and alarm systems  
 Shops for machining, sheet metal, welding, castings, and plating

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  
 Boat services

### **Spacecraft Engineering Department (Code 8200)**

Thermal-vacuum chambers  
 Acoustic reverberation chamber  
 Shock and vibration test facility  
 Clean-room facilities  
 Spacecraft-fabrication and assembly facility  
 Fuels test facility  
 CAD/CAM facility  
 Automatic welding facility  
 Static loads test facility  
 Spacecraft spin balance facility  
 Modal analysis facility

### **Space Science Division (Code 7600)**

E.O. Hulburt Center for Space Research  
 Development and test facilities for spaceborne 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  
 Backgrounds Data Center (BDC) for analysis and archival storage of BMD-relevant natural backgrounds  
 Low-temperature laboratory  
 Gamma Ray Observatory (OSSE) operations and data analysis center  
 Solar instrument test facility  
 Solar Ultraviolet Spectral Irradiance Monitor (SUSIM) operations and data analysis center

### **Space Systems Development Department (Code 8100)**

Electronic component computer aided design (CAD) facility  
 Payload test facility and processor development laboratory  
 Spacecraft high reliability electronic and electrical production facility

Spacecraft electronic systems integration and test high bay building  
 Spacecraft electrical power systems and battery laboratories  
 Electro-magnetic interference/electro-magnetic compatibility (EMI/EMC) screen room test facility  
 Precision oscillator (clock) test facility  
 Radio frequency (RF) system development facility  
 RF microcircuit fabrication cleanroom facility  
 Large tapered horn RF anechoic chamber facility  
 RF payload development laboratory with anechoic chamber  
 Precision high frequency RF compact range anechoic chamber facility  
 Satellite telemetry, tracking and control facilities  
 Pomonkey field site/large antenna, space communications and research facility  
 Midway Research Center/space communications and research facility

### **Tactical Electronic Warfare Division (Code 5700)**

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 coordination test bed  
 Scale-model analysis facility  
 Wind tunnel for performance measurements of low Reynolds number vehicles  
 Optical integration laboratory  
 Tempest signal-processing laboratory  
 Simulated ship-mast facility  
 Secure supercomputer facility  
 Vehicle development laboratory  
 Visualization laboratory

### **Technical Information Division (Code 5200)**

Imaging center  
 Electronic publishing  
 Research library (1,100 current subscriptions, 170,000 monographs and bound journals, 1,800 rolls of microfilmed journals, 1,170,000

technical reports (225,000 hard copy, 800,000 microfiche, and 110,000 stored as digital page images), and 1,000 microcomputer software packages)

STILAS (Scientific and Technical Information Library Automation System) on-line library catalog

InfoNet campus-wide information system for desktop access to CD-ROM and other locally mounted databases and Internet resources

Microcomputer Software Support Center

Photographic laboratories

Writing, editing, and publications consultation

Graphic design services

Video recording and productions

Video editing suite

Scientific and technical photographers



## NRL Sites and Facilities

| SITE                                                                                    | ACREAGE                                                       |                                 | BUILDINGS/<br>STRUCTURES |
|-----------------------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------|--------------------------|
|                                                                                         | LAND<br>OWNED/LEASED                                          | EASEMENT/<br>LICENSE-<br>PERMIT |                          |
| <b>District of Columbia</b><br>NRL and Artificial Intelligence<br>Center at Bolling AFB | 131/0                                                         | 0/10.24                         | 110/25                   |
| <b>Virginia</b><br>Midway Research Center<br>Quantico                                   | 162/0                                                         |                                 | 9/1                      |
| <b>Maryland</b><br>NRL Flight Support<br>Detachment, NAS<br>Patuxent River*             | Tenant                                                        |                                 |                          |
| Chesapeake Bay Detachment<br>and Dock Facility<br>Chesapeake Beach*                     | 157/0                                                         | 0/0.60                          | 63/87                    |
| Multiple Research Site<br>Tilghman Island*                                              | 2/0                                                           |                                 | 3/3                      |
| Radio Astronomy Observatory<br>Maryland Point*                                          | 24/0                                                          |                                 | 10/16                    |
| Radio Antenna Range<br>USAF Receiver Site<br>Brandywine*                                | 0/0                                                           | 0/22.98                         | 1/0                      |
| Free Space Antenna Range<br>Pomomkey*                                                   | 56/0                                                          | 28.40/0                         | 9/11                     |
| <b>Florida</b><br>Marine Corrosion Facility<br>Key West                                 | Tenant                                                        |                                 |                          |
| <b>California</b><br>NRL Monterey<br>Monterey*                                          | Tenant                                                        |                                 |                          |
| <b>Mississippi</b><br>Stennis Space Center<br>Bay St. Louis*                            | Tenant                                                        |                                 |                          |
| <b>Alabama</b><br>Ex-USS <i>Shadwell</i> (LSD-15)<br>Mobile Bay                         | Tenant<br>Decommissioned 457-ft vessel used for fire research |                                 |                          |

### PROPERTY

**Land:**

Owned 556 acres  
Leased 0 acres

**Buildings:**

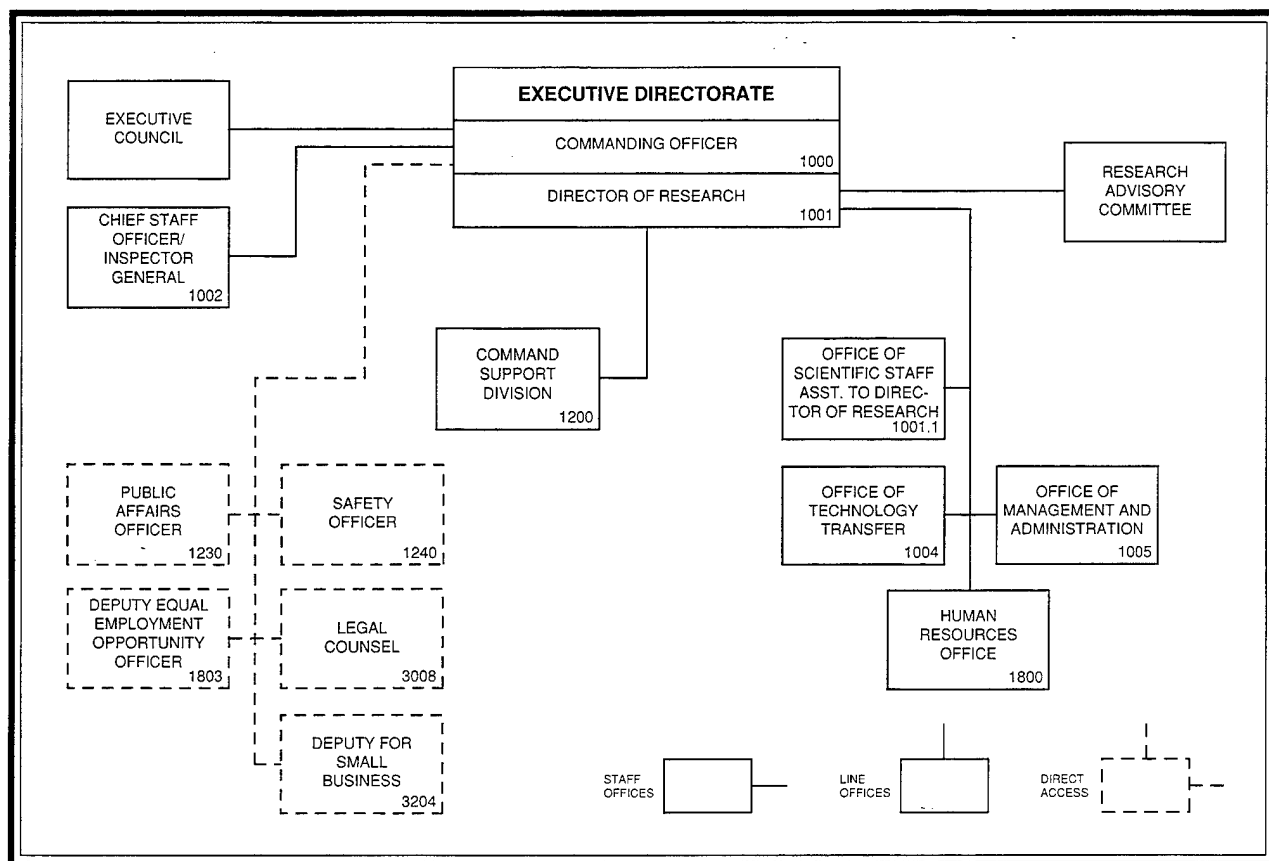
RDT&E 3,219,834 ft<sup>2</sup>  
Administrative 224,564 ft<sup>2</sup>  
Other 422,427 ft<sup>2</sup>

**Replacement Costs:**

Real property – current  
replacement value \$914 million  
Equipment \$256.9 million

\*See maps in the General Information section.

**Executive  
Directorate**



### Key Personnel

| Name                        | Title                                              | Code      |
|-----------------------------|----------------------------------------------------|-----------|
| CAPT R.M. Cassidy, Jr., USN | Commanding Officer                                 | 1000      |
| Dr. T. Coffey               | Director of Research                               | 1001      |
| Mr. K.W. Lackie             | Scientific Staff Assistant to Director of Research | 1001.1    |
| CAPT R. Leonard, USN        | Chief Staff Officer/Inspector General              | 1002/1200 |
| Dr. R.H. Rein               | Head, Technology Transfer                          | 1004      |
| Mrs. M.C. Oliver            | Head, Office of Management and Administration      | 1005      |
| Mr. R.H. Baturin*           | Head, Public Affairs Branch                        | 1230      |
| Mr. K.J. King               | Head, Safety Branch                                | 1240      |
| Mrs. B.A. Duffield          | Director, Human Resources Office                   | 1800      |
| Ms. D.E. Erwin              | Deputy Equal Employment Opportunity Officer        | 1803      |
| Ms. H.J. Halper             | Legal Counsel                                      | 3008      |
| Ms. P. Schaefer             | Deputy for Small Business                          | 3204      |

\*Acting

## 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 requirements, 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 four science and technology directorates and the Naval Center for Space Technology, supported by the Business Operations Directorate and the Executive Directorate. In addition, the Laboratory's operating staffs provide assistance in their special fields to the Commanding Officer and to the Director of Research. The operating staffs are listed on the following pages of this publication.

## **Commanding Officer (Code 1000)**

CAPT Richard M. Cassidy, USN, became the 31st Naval officer to head the Naval Research Laboratory on April 28, 1994. Before coming to NRL, CAPT Cassidy was the Technical Director and Associate Program Manager in the AEGIS Program Office.

Prior to assuming his major program manager duties, CAPT Cassidy served in an extensive number of combat systems engineering assignments in the AEGIS Program. He served as the AEGIS Combat System Engineering Manager where he was responsible for the design, development, and lifetime support to Ticonderoga class cruiser and Arleigh Burke class destroyer combat systems. Prior to that he served as the AEGIS Combat Systems Operations Manager and established the AEGIS FMS case with Japan as well as several battle group and advanced AAW programs. Other ashore assignments included: Director of AAW Special Programs in the Naval Sea Systems Command; DDG 51 Combat System Manager, where he was part of the original project team that designed the Arleigh Burke class; instructor at the Engineering Duty Officer School; and System Engineer at the Joint Tactical Communications Office (TRI-TAC).

CAPT Cassidy's shipboard assignments included the USS Stickell (DD-888) and USS Conyngham (DDG-17). He became an Engineering Duty Officer in 1974.

He is a 1970 graduate of the University of North Carolina where he received a B.A. in Economics. He also holds a Master of Science in Electrical Engineering from the Naval Post Graduate School and a Masters in Business Administration from Farleigh Dickinson University. CAPT Cassidy was selected as the Navy's 1990 representative at the MIT Sloan School Program for Senior Executives.

CAPT Cassidy has been awarded the Legion of Merit, the Defense Meritorious Service Medal, the Meritorious Service Medal (two awards), and the Navy Commendation Medal.

CAPT Cassidy is married to the former Lois Bergman of Annandale, Virginia. The Cassidys reside in Annandale.

## **Director of Research (Code 1001)**

Dr. Timothy Coffey was born in Washington, DC, on June 27, 1941. 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. In 1981, he was awarded the Presidential Rank of Meritorious Executive, in 1987 he received the Distinguished Presidential Rank award, in 1991 was awarded the Delmer S. Fahrney Medal, Franklin Institute, in October 1991 was awarded the DoD Distinguished Civilian Service Award, and in 1994 was awarded the Distinguished Presidential Rank Award.

## Executive Council



The Executive Council consists of executive, management, and administrative personnel. Executive Council meetings are held to provide the Commanding Officer a personal means to relay new policy or changes to current policy that affects all divisions. These meetings also allow 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
- Associate Directors of Research
- Chief Staff Officer
- Director, Naval Center for Space Technology
- Heads of Divisions
- Head, Laboratory for Structure of Matter
- Head, Laboratory for Computational Physics and Fluid Dynamics
- Head, Center for Bio/Molecular Science and Engineering
- Head, Human Resources Office
- Public Affairs Officer
- Deputy Equal Employment Opportunity Officer
- Head, Office of Management and Administration
- Head, Safety Branch
- Head, Management Information Systems Staff
- NRL Counsel

## 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:

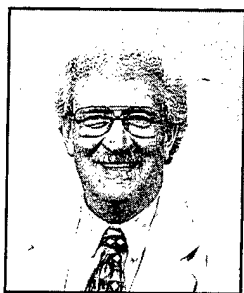
- Director of Research, Chairperson
- Commanding Officer
- Associate Directors of Research
- Chief Staff Officer (Observer)



CAPT R. LEONARD, USN

## **Chief Staff Officer/Inspector General Code 1002**

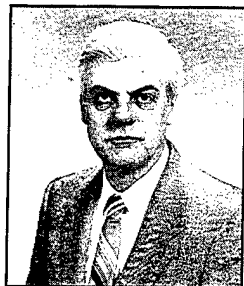
The Chief Staff Officer serves as the Deputy to the Commanding Officer and acts for the Commanding Officer in his absence. The Chief Staff Officer is the Laboratory's Inspector General, and when directed, he investigates, inspects, and/or inquires into matters that affect the operation and efficiency 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.



Mr. R.H. BATURIN\*

## **Public Affairs Officer Code 1230**

The Public Affairs Officer (PAO) advises the Commanding Officer and Director of Research on public affairs matters, including external and internal relations, community outreach, 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 the NRL history and internal information programs. The PAO is also responsible for coordinating all actions within the Laboratory that respond to requirements of the Freedom of Information Act (FOIA).



MR. K.J. KING

## **Safety Officer Code 1240**

The Safety Officer is the program manager for Occupational Safety and Health, Explosives Safety, Industrial Hygiene, Hazardous Material Control and Management, Radiological Safety, and Non-Ionizing Radiation Safety. The Safety Officer must ensure that each program complies with the appropriate federal, state, Navy, and NRL regulations. Specific functions include the development, implementation, and maintenance of comprehensive safety programs in support of the Laboratory's unique areas of research and development.

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\*Acting

## **Deputy Equal Employment Opportunity Officer Code 1803**



Ms. D.E. ERWIN

The Deputy Equal Employment Opportunity Officer (DEEOO) is the EEO program manager and the advisor to the Commanding Officer on all EEO matters. The DEEOO manages the discrimination complaint process and directs the Laboratory's affirmative action plans and special emphasis programs (Federal Women's, Hispanic Employment, African American Employment, Asian-Pacific Islanders, American Indian Employment, Individuals with Disabilities, including Disabled Veterans). The DEEOO recruits quality candidates for those areas when underrepresentation exists. Duties also include reviewing, coordinating, and monitoring implementation of EEO policies and developing local guidance, directives, and implementation procedures for the EEO programs.

## **Legal Counsel Code 3008**



Ms. H.J. HALPER

The Office of Counsel is primarily responsible for providing legal services to NRL's management in all areas of general and administrative law, as well as intellectual property law. The Office reviews all procurement-related actions; reviews NRL scientific papers prior to publication; prepares patent applications and prosecutes the applications through the Patent and Trademark Office; defends against contract protests, other contract litigation, and personnel cases; and advises on other legal matters relating to technology transfer, personnel, fiscal, and environmental law. NRL Counsel also serves as legal advisor to the Commanding Officer and Director of Research.

# Office of Management and Administration

Code 1005



MRS. M.C. OLIVER

## Basic Responsibilities

The Office of Management and Administration provides managerial, technical, and administrative support to the Director of Research in the 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 the Director of Research's correspondence; providing management information and analyses for various aspects of the research program effort; coordinating VIP and foreign visits to NRL; managing NRL facilities; providing Laboratory-wide administrative services, including mail handling and messenger service; 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; coordinating the IR&D Program; developing guidance for and monitoring the NRL S&T Program; providing LAN systems administration and central word processing services to the Directorate; coordinating the NRL-NRC and other Postdoctoral Resident Research Associateship Programs, NRL-U.S. Naval Academy Faculty Co-op Program, Navy ASEE Program, and other special Navy programs; interacting with ONR Headquarters and the Warfare Centers; and assisting in the development of NRL's five-year Plan.

**Personnel:** 60 full-time civilian

## Key Personnel

| Name              | Title                               | Code   |
|-------------------|-------------------------------------|--------|
| Mrs. M.C. Oliver  | Head                                | 1005   |
| Mrs. L.S. Herrin  | Deputy Head                         | 1005.1 |
| Ms. B.J. McDonald | Administrative Officer              | 1005.2 |
| Mr. E. Rank       | NRL Facilities Manager              | 1005.4 |
| Mr. R.C. Spragg   | Head, Management Information Staff  | 1005.5 |
| Ms. M.E. Barton   | Head, Directives Staff              | 1005.6 |
| Ms. J. Hileman    | Head, GLSIP Program                 | 1005.7 |
| Ms. L.T. Warder   | Head, Administrative Services Staff | 1005.8 |

**Point of contact:** Ms. B.J. McDonald, Code 1005.2 (202) 767-3634

# Command Support Division

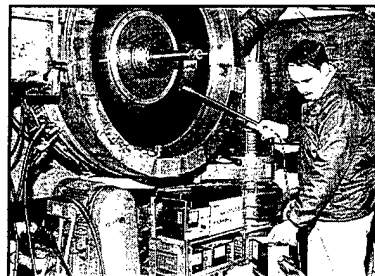
## Code 1200 Staff Activity Areas

- Military Operations
- Security
- Public Affairs
- Safety
- Flight Detachment

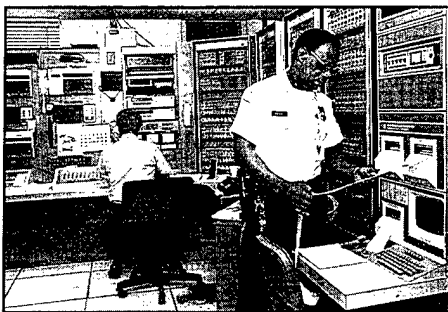
Public affairs



P-3 airborne research facility



Safety evaluation



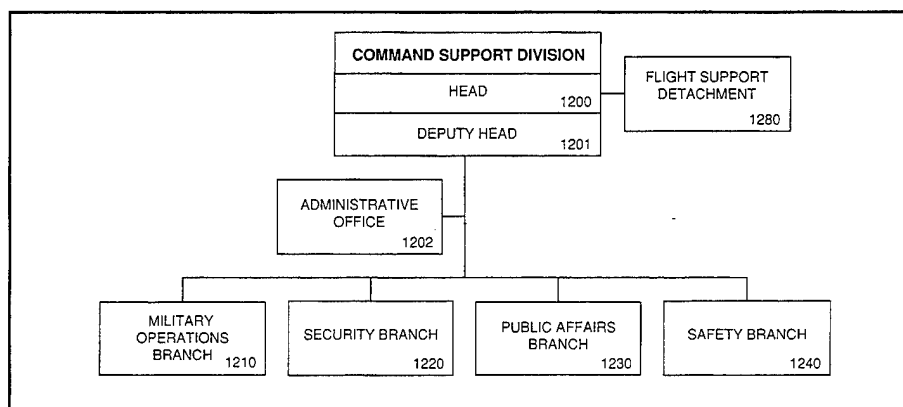
Security monitoring



Incoming visitor's reception area



CAPT R. LEONARD, USN



## Basic Responsibilities

The Command Support Division, under the direction of the Chief Staff Officer, provides military and civilian staff to the Commanding Officer and to the Director of Research for direct research support and assistance in the military aspects of the management of the Laboratory.

The military staff is the liaison with DoD, Navy commands and activities, and the operating forces of the Navy and arranges for air, surface, and subsurface services as required by research and development operations. Coordination of support to the research divisions through the Naval Reserve Units in the Technology Mobilization Program is also coordinated through Code 1200. In addition, direct research support is provided by the Flight Support Detachment, located at NAS Patuxent River, Maryland, which operates and maintains four specially configured P-3 Orion aircraft.

The Division is also responsible for the Laboratory's physical, personnel, information, industrial and ADP security programs, and its communications service, as well as fire protection, occupational health and industrial hygiene, and the public affairs program. It provides intelligence support and support for international cooperative agreements in technology. The Division also coordinates the Laboratory's Management Control Program and provides liaison and coordination for all audit and inspection teams.

**Personnel:** 144 full-time civilian; 149 military

## Key Personnel

| Name                 | Title                                                                                      | Code   |
|----------------------|--------------------------------------------------------------------------------------------|--------|
| CAPT R. Leonard, USN | Head                                                                                       | 1200   |
| Mr. J.C. Payne       | Deputy Head                                                                                | 1201   |
| Ms. M.A. Sepety      | Administrative Officer                                                                     | 1202   |
| Ms. M.S. Rathbun     | Management Control Officer                                                                 | 1203   |
| CDR R.V. Young, USN  | Military Operations Officer                                                                | 1210   |
| LT R.A. Amann, USN   | Military Administration and Personnel                                                      | 1213   |
| Mr. J.R. Gallagher   | Communications/Message Center                                                              | 1215   |
| Mr. J.C. Payne       | Head, Security Branch                                                                      | 1220   |
| Mr. C. Herbert       | Deputy Head, Security Branch                                                               | 1220.1 |
| Mr. C. Rogers        | Head, Classification Management and Control Section                                        | 1221   |
| Dr. J. Miller        | Head, Special Security Office and NRL Scientific and Technical Intelligence Liaison Office | 1225   |
| Mr. C. Herbert       | Head, Personnel and Physical Security Section                                              | 1226   |
| Mr. R.H. Baturin*    | Head, Public Affairs Branch                                                                | 1230   |
| Mr. K.J. King        | Head, Safety Branch                                                                        | 1240   |
| CDR S.S. Smith, USN  | Officer in Charge, Flight Support Detachment                                               | 1280   |

**Point of contact:** Ms. M.A. Sepety, Code 1202 (202) 767-3204

\*Acting

# Human Resources Office

## Code 1800 Staff Activity Areas

- Personnel Operations
- Employee Development
- Employee Relations
- Equal Employment Opportunity
- ONR Satellite HRO
- NRL-SSC Satellite HRO
- Management and Systems Technology



Training Branch



EEO Staff



Employee Relations Branch



Workforce Support and  
Manpower Program



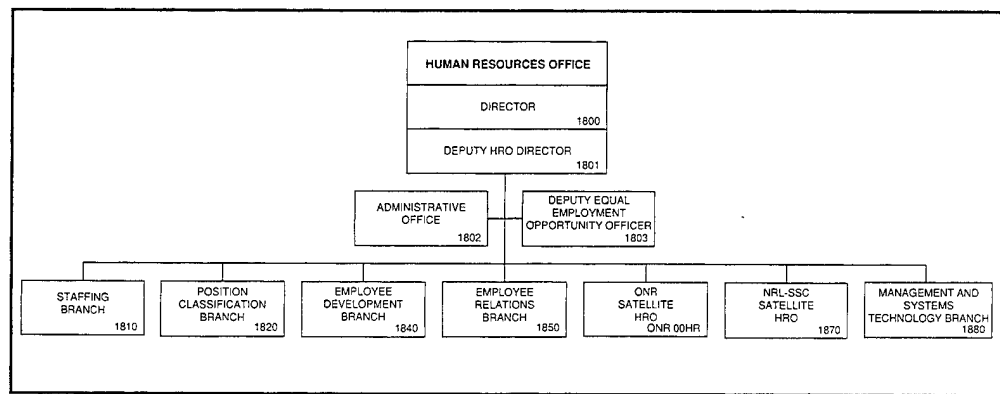
Records Processing Staff



Staffing Branch



MRS. B.A. DUFFIELD



## Basic Responsibilities

The Human Resources Office (HRO) provides civilian personnel and Equal Employment Opportunity (EEO) services to the Office of Naval Research (ONR), the Commander, Naval Meteorology and Oceanography Command (CNMOC), the Naval Oceanographic Office (NAVOCEANO), and the Naval Research Laboratory (NRL). The Human Resources Program provides the full range of operating civilian personnel management in the staffing and placement, position classification, employee relations, labor relations, employee development, and EEO functional areas. At NRL, the Manpower Management and Morale, Welfare, and Recreation Programs are also included. At ONR, the Manpower and Position Management Program is included.

Personnel services are furnished for a civilian complement of approximately 5,200 employees. The Hub Office at NRL-Main Site in Washington, DC, services approximately 3,300 employees as well as provides a centralized capability to perform various managerial, service, and advisory functions in support of satellite office operations and serviced organizations' needs. These include such items as issuance of policy and procedural directives; development, design, and maintenance of automated systems; and monitoring and evaluating product effectiveness to develop and maintain efficient, cost-effective, service-oriented methods.

The Satellite HRO at Stennis Space Center (SSC), Bay St. Louis, Mississippi, services about 1,000 employees of CNMOC and NAVOCEANO and approximately 400 NRL-SSC/Monterey (California) employees. The Satellite HRO at Arlington, Virginia, services about 600 employees of the ONR. Approximately 30 percent of the employees serviced are professional scientists and engineers at senior grade levels up to and including Scientific Technical and Senior Executive Service (SES).

**Personnel:** 93 work years

## Key Personnel

| Name              | Title                                                  | Code     |
|-------------------|--------------------------------------------------------|----------|
| Ms. B.A. Duffield | Director                                               | 1800     |
| Mr. Darryl Schenk | Deputy Director                                        | 1801     |
| Ms. P.L. Hetzler  | Administrative Officer                                 | 1802     |
| Ms. D.E. Erwin    | Deputy Equal Employment Opportunity Officer            | 1803     |
| Ms. C. Downing    | Head, Staffing Branch                                  | 1810     |
| Ms. S. Weston     | Head, Position Classification Branch                   | 1820     |
| Mr. F.W. Robbins  | Head, Employee Development Branch                      | 1840     |
| Ms. J.L. Walker   | Head, Employee Relations Branch                        | 1850     |
| Ms. C. Sherman    | Site Manager, NRL-SSC Human Resources Satellite Office | 1870     |
| Ms. J.M. Sykes    | Head, Management and Systems Technology Branch         | 1880     |
| Ms. M. Aylor      | Site Manager, ONR Human Resources Satellite Office     | ONR 01HR |

**Point of contact:** Ms. P.L. Hetzler, Code 1802 (202) 767-8327

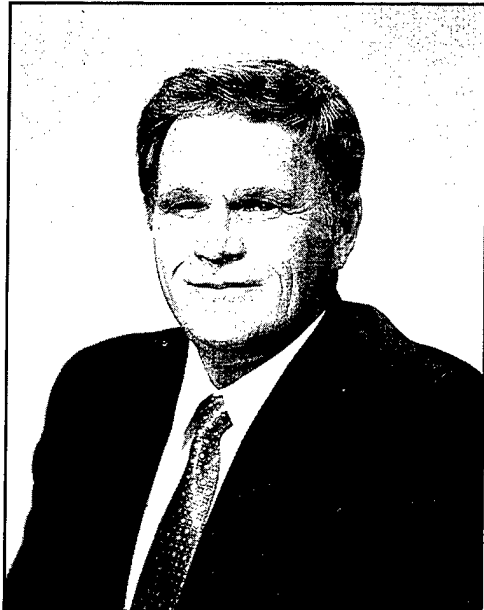
**Business  
Operations  
Directorate**

## **BUSINESS OPERATIONS DIRECTORATE**

**Code 3000**

The Business Operations Directorate provides executive management, policy development, and program administration for business programs needed to support the activities of the scientific directorates. This support is in the areas of legal counsel, manpower management, financial management, supply management, contracting, public works, and management information systems support.

## Associate Director of Research for Business Operations



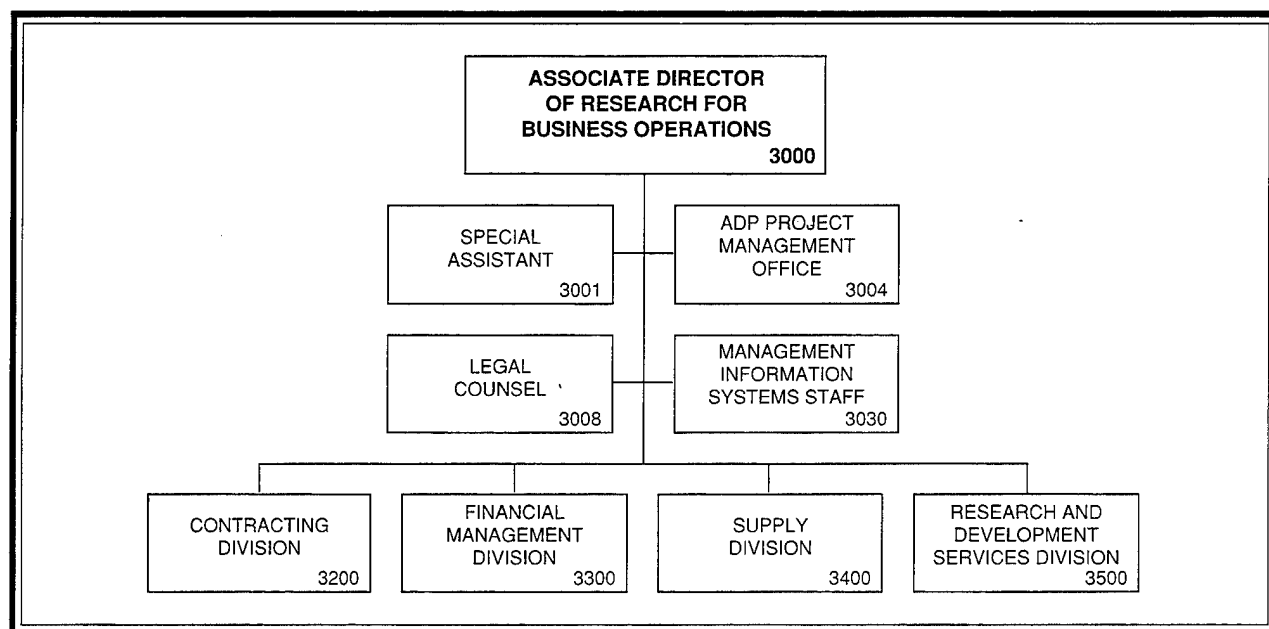
**M**r. R.E. Doak was born in Washington, DC, on January 5, 1941. He graduated from Benjamin Franklin University with a bachelor's degree in accounting in 1964 and a master's degree in business administration in 1966. Mr. Doak is a Certified Public Accountant licensed by the State of Maryland.

Mr. Doak has twenty-six years of diversified experience with the Federal Government performing in various line management positions. He has extensive experience in program management, financial management, contract policy and administration; personnel policy and administration; ADP systems development and operations; and the full spectrum of management

disciplines associated with the development, production, and operational support of major weapon systems.

From 1967 to 1980, Mr. Doak served in several positions with the Navy's Strategic Systems Projects Office. In these positions, he was responsible for the business management operations for the Navy's Fleet Ballistic Missile programs. In 1980, he entered the Senior Executive Service and served as Director of Financial Management with the Bureau of Indian Affairs. From 1981 to 1985, he served as Deputy Director, Plans and Programs, with the Strategic Systems Programs Office. From 1985 to 1989, he served as Deputy Commander with the Space and Naval Warfare Systems Command. In March 1989, Mr. Doak was appointed Associate Director of Research for Business Operations at the Naval Research Laboratory.

Mr. Doak has a consistent record of outstanding performance since entering the Senior Executive Service in 1980. In 1984, he was awarded the Navy Superior Service Award. In 1985 and 1988, he received Navy Rank Awards. In 1986, Mr. Doak received the Presidential Meritorious Executive Rank Award, and in 1988, he received the Presidential Distinguished Executive Rank Award.



### Key Personnel

| Name                | Title                                                  | Code |
|---------------------|--------------------------------------------------------|------|
| Mr. R.E. Doak       | Associate Director of Research for Business Operations | 3000 |
| Ms. G.L. Spisak     | Special Assistant                                      | 3001 |
| Ms. B.L. Hildreth   | ADP Project Management Officer                         | 3004 |
| Ms. H.J. Halper     | Legal Counsel                                          | 3008 |
| Mr. R.L. Guest      | Head, Management Information Systems Staff             | 3030 |
| Mr. J. Ely          | Head, Contracting Division                             | 3200 |
| Mr. D.T. Green      | Comptroller                                            | 3300 |
| Ms. C. Hartman      | Supply Officer, Supply Division                        | 3400 |
| Mr. D.K. Woodington | Director, Research and Development Services Division   | 3500 |

**Point of contact:** Ms. G.L. Spisak, Code 3001 (202) 404-7462

## Legal Counsel

**Code 3008**



Ms. H.J. HALPER

### Basic Responsibilities

The Office of Counsel is responsible for providing legal services to NRL's management in all areas of general, administrative, intellectual property, and technology transfer law. The Office reviews all procurement-related actions; reviews NRL scientific papers prior to publication; prepares patent applications and prosecutes the applications through the Patent and Trademark Office; defends against contract protests, other contract litigation and personnel cases; and advises on other legal matters relating to technology transfer, personnel, fiscal, and environmental law.

NRL Counsel also serves as legal advisor to the Commanding Officer and Director of Research.

**Personnel:** 25 full-time civilian

### Key Personnel

| Name             | Title                     | Code   |
|------------------|---------------------------|--------|
| Ms. H. Halper    | NRL Counsel               | 3008   |
| Mr. C. Steenbuck | Associate Counsel/General | 3008.1 |
| Mr. T. McDonnell | Associate Counsel/Patents | 3008.2 |
| Mr. A. Beede     | Associate Counsel/SSC     | 3008.3 |

**Point of contact:** Ms. P. Schuler, Code 3008 (202) 767-2244

# Management Information Systems Staff

Code 3030



MR. R.L. GUEST

## 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 databases. The Staff Head participates directly with the Commanding Officer, the Director of Research, and the Associate Director for Business Operations in all policy matters pertaining to MIS and business data processing.

**Personnel:** 19 full-time civilian

## Key Personnel

| Name              | Title                              | Code |
|-------------------|------------------------------------|------|
| Mr. R.L. Guest    | Head                               | 3030 |
| Ms. P. Lowery     | Head, Systems Development Section  | 3035 |
| Mr. W.L. Gollaher | Head, Applications Systems Support | 3036 |
| Mrs. D. Martin    | Head, Operations Section           | 3037 |

**Point of contact:** Ms. P. Thompson, Code 3030 (202) 767-2030



Systems Management



Management Information  
Systems Staff



Computer Operations



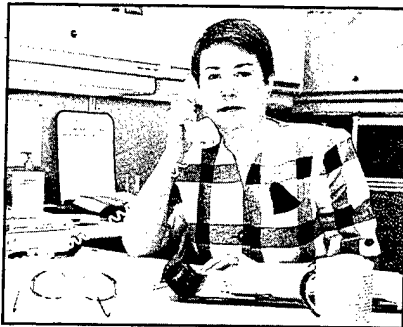
Systems Development

# Contracting Division

## Code 3200

- Advance Acquisition Planning
- Acquisition Strategies
- Acquisition Training
- Contract Negotiations
- Contractual Execution
- Contract Administration
- Acquisition Policy Interpretation and Implementation

Member of Policy and Analysis Branch discussing the changes in DoD regulations



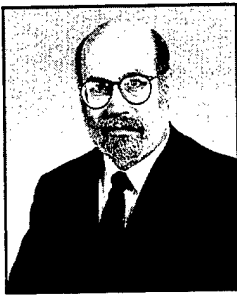
Deputy Division Head conducts staff meeting



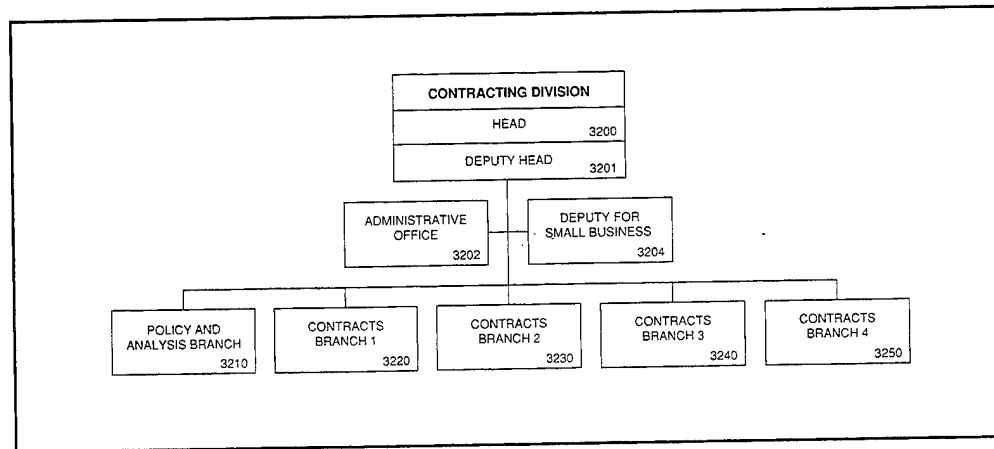
Procurement technicians discuss the Laboratory's Procurement Information Processing System (PIPS)



Contract specialist prepares contract award



Mr. J. Ely



## 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 potential 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 division personnel; and interpreting and implementing acquisition-related Federal Department of Defense and Navy regulations.

**Personnel:** 70 full-time civilian

## Key Personnel

| Name              | Title                      | Code |
|-------------------|----------------------------|------|
| Mr. J. Ely        | Head                       | 3200 |
| Ms. M. Carpenter  | Deputy Head                | 3201 |
| Mrs. J. Price     | Administrative Officer     | 3202 |
| Ms. P. Schaefer   | Deputy for Small Business  | 3204 |
| Mr. J. Waldenfels | Policy and Analysis Branch | 3210 |
| Ms. W. Conaway    | Contracts Branch 1         | 3220 |
| Mr. E. Tunney     | Contracts Branch 2         | 3230 |
| Ms. M. Carpenter  | Contracts Branch 3         | 3240 |
| Mr. J. Adams      | Contracts Branch 4         | 3250 |

**Point of contact:** Mrs. J. Price, Code 3202 (202) 767-3749

# Financial Management Division

## Code 3300

- Travel Administration
- Budget
- Reports and Statistics
- Accounting



The Budget Section provides guidance and instructions for budget preparation and funds administration, and prepares progress reports and special statistical data as required.



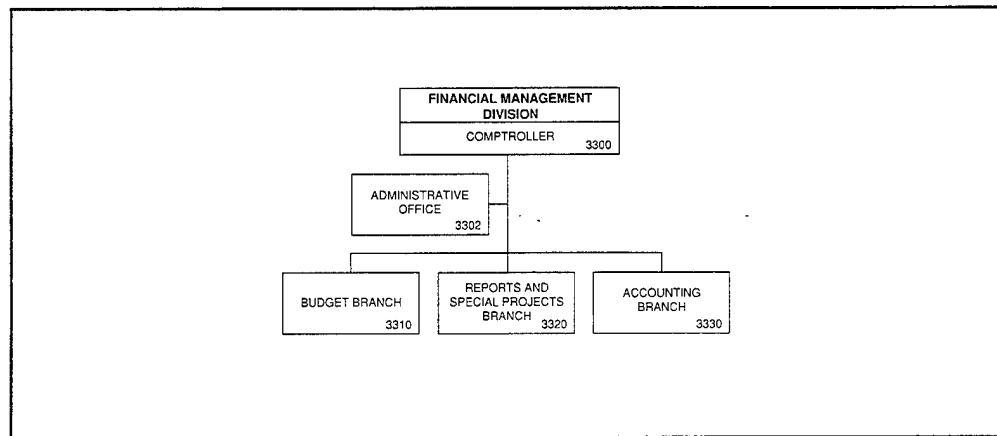
The Accounting Branch performs services essential to the Laboratory including vendor payments, cost accounting, and ledger accounting



The Travel Services Unit processes travel orders and examines travel claims for payment



MR. D.T. GREEN



## 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 services to the Laboratory in budget formulation, funds administration, program and budget analysis, cost accounting, travel administration and reporting. In addition, the Division provides essential information and guidance concerning equipment management.

**Personnel:** 81 full-time civilian

## Key Personnel

| Name              | Title                              | Code |
|-------------------|------------------------------------|------|
| Mr. D.T. Green    | Comptroller                        | 3300 |
| Ms. A.J. Downs    | Administrative Officer             | 3302 |
| Mr. M.C. Mills    | Head, Budget Branch                | 3310 |
| Ms. D. Camp*      | Head, Reports and Special Projects | 3320 |
| Mr. J.V. Thomas   | Head, Accounting Branch            | 3330 |
| Ms. T. Frye       | Head, Travel Services Unit         | 3334 |
| Ms. A. Cutchember | Head, Payroll Liaison Unit         | 3335 |

**Point of contact:** Ms. A.J. Downs, Code 3302 (202) 767-2950

\*Acting

# Supply Division

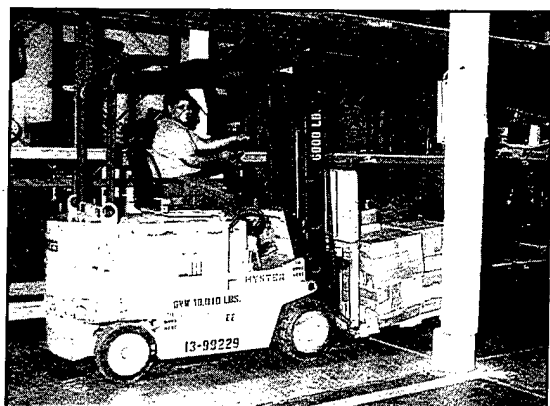
## Code 3400

- Administrative Services
- Customer Liaison
- Automated Inventory Management System
- Purchasing
- Receipt Control
- Material
- Technical

Documentation for the acquisition files are copied by the Contracting Officer



Purchasing agents verify GSA prices on microfiche



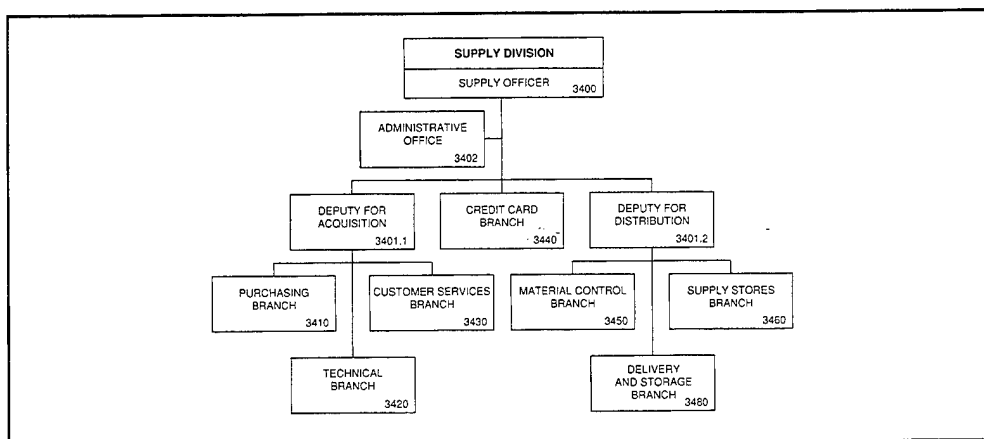
A rigging worker stores material in warehouse storage racks



Credit Card Branch personnel prepares for a regularly scheduled audit



Ms. C. HARTMAN



## 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.

**Personnel:** 125 full-time civilian

## Key Personnel

| Name            | Title                             | Code   |
|-----------------|-----------------------------------|--------|
| Ms. C. Hartman  | Supply Officer                    | 3400   |
| Mr. J. Booros   | Contract Specialist               | 3401.1 |
| Ms. P. Carter   | Administrative Officer            | 3402   |
| Ms. M. Smith    | Head, Purchasing Branch           | 3410   |
| Mr. G. Smith    | Head, Technical Branch            | 3420   |
| Ms. B. Mohammed | Head, Customer Services Branch    | 3430   |
| Ms. K. Hunter   | Head, Credit Card Branch          | 3440   |
| Ms. P. Carter*  | Head, Material Control Branch     | 3450   |
| Ms. E. Woodland | Head, Supply Stores Branch        | 3460   |
| Mr. T. Major    | Head, Delivery and Storage Branch | 3480   |

**Point of contact:** Ms. A. Olson, Code 3402 (202) 767-3871

\*Acting

# Research and Development Services Division

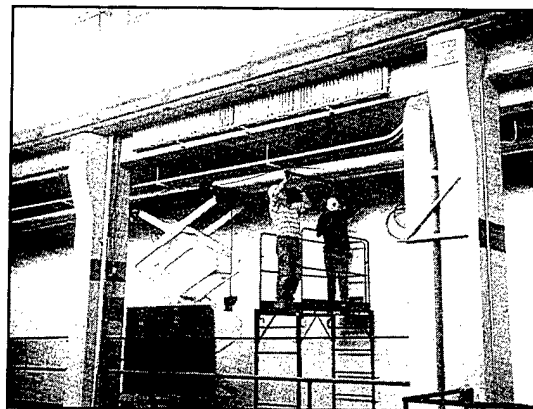
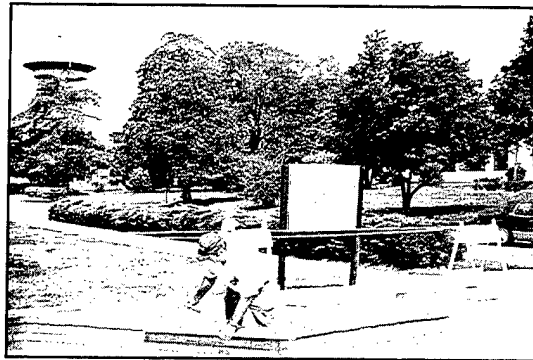
## Code 3500

- Contracts
- Environmental
- Project Management
- Operations
- Administration
- Engineering
- Chesapeake Bay Detachment



Main switch gear undergoing emergency repair

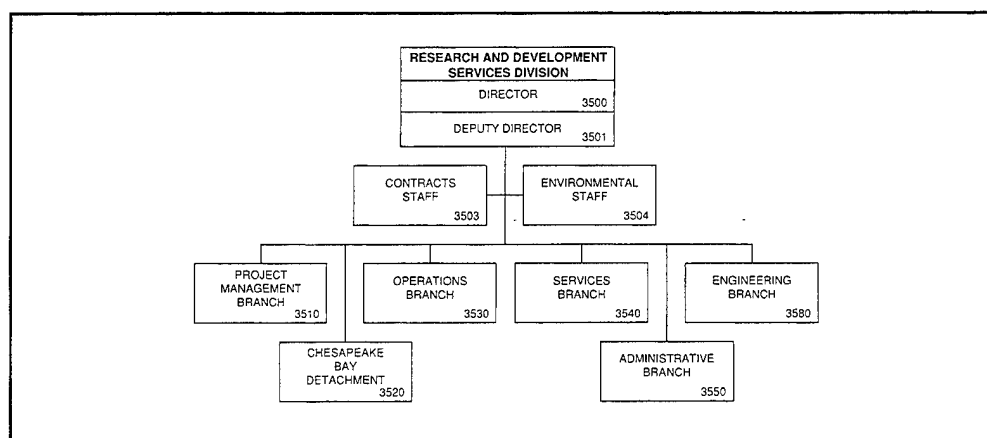
Entrance to Remote Sensing Division under construction



Mezzanine of Remote Sensing Division under construction



MR. D.K. WOODINGTON



## Basic Responsibilities

The Research and Development Services Division is responsible for the physical plant of NRL and subordinate field sites. This includes: military construction, engineering, construction, facility support services, planning, environmental, maintenance/repair/operation of all infrastructure systems, transportation, and vertical transport equipment.

The Division provides engineering and technical assistance to the research divisions in the installation and operation of critical research equipment in support of the research mission.

The Division is responsible for compliance with all environmental regulations and approval authorities required by the command. The Division also supports the Office of Naval Research for all facilities operations and acquisition.

**Personnel:** 186 full-time civilian; 1 military

## Key Personnel

| Name                | Title                     | Code |
|---------------------|---------------------------|------|
| Mr. D.K. Woodington | Director                  | 3500 |
| Mr. S. Harrison     | Deputy Director           | 3501 |
| LT J. Foltz         | Contracts Staff           | 3503 |
| Mr. E. McDaniel     | Environmental Staff       | 3504 |
| Mr. T. Erwin        | Project Management Branch | 3510 |
| Mr. M. Kosky        | Chesapeake Bay Detachment | 3520 |
| Mr. F. Regalia      | Operations Branch         | 3530 |
| Mr. J. Headley      | Services Branch           | 3540 |
| Ms. L. Jones        | Administrative Branch     | 3550 |
| Vacant              | Engineering Branch        | 3580 |

**Point of contact:** Ms. L. Jones, Code 3550 (202) 767-2168

**General  
Science  
and  
Technology  
Directorate**

## **GENERAL SCIENCE AND TECHNOLOGY DIRECTORATE**

**Code 4000**

The General Science and Technology Directorate coordinates and/or manages specific NRL programs that may be multi-disciplinary in nature, may span both divisions and directorates, and may also require special security procedures. It is the Laboratory's focal point within the Navy and DoD for Low Observables Materials and Structures programs. The Directorate conducts or coordinates studies, reviews, and technical assessments in various topical areas. Areas of strong emphasis currently include all aspects of signature control and counter-signature technology, strategic and tactical missile defense, synoptic structure, and quality assurance for both corporate exploratory development programs and joint Space System Technology Programs. The NRL Signature Technology Office and the Critical Technology Assessment Office are contained within the Directorate. Program management activities related to the Navy 6.2 (exploratory development) effort and studies and analyses relating to the Ballistic Missile Defense Organization (BMDO) and other programs are carried out within the Directorate.

## Associate Director of Research for General Science and Technology



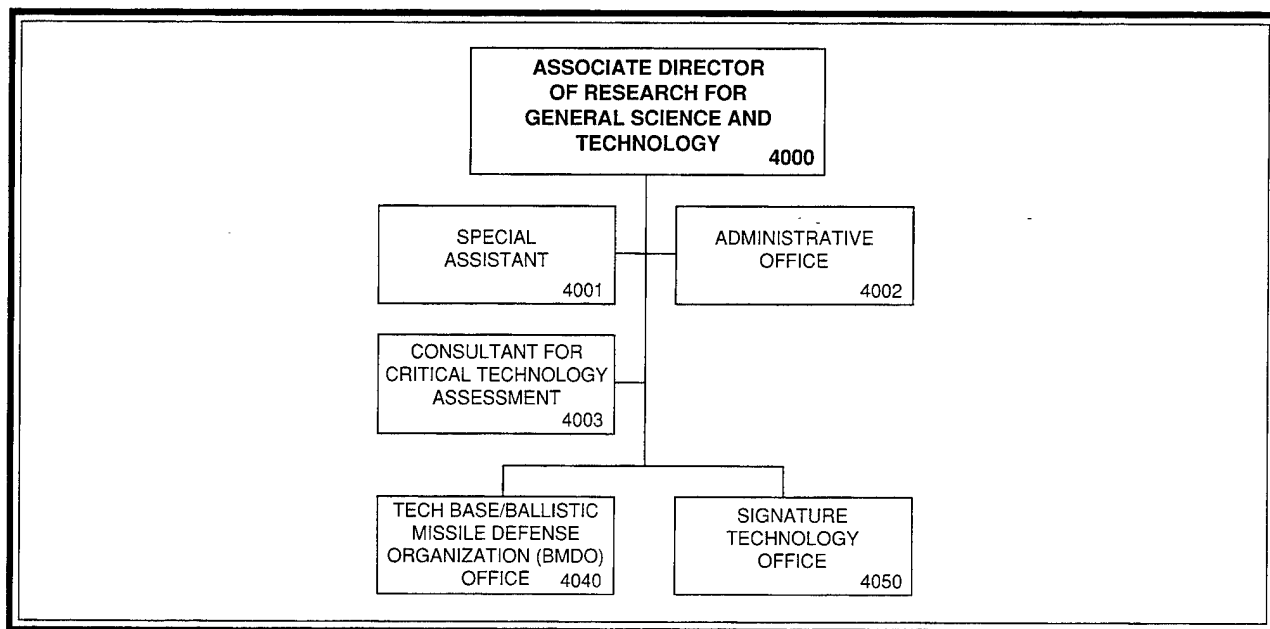
**D**r. R.A. LeFande was born on Staten Island, New York on February 8, 1941. He attended the Brooklyn Technical High School and obtained his undergraduate degree in physics from the University of Rhode Island in 1962. After a brief tour as a telephone equipment engineer with Western Electric Company in New York City, he returned to academic pursuits, earning a Master's degree in physics from the Rutgers University in 1965.

In July of 1965, Dr. LeFande joined the Naval Research Laboratory as a research physicist in the Satellite Communications Branch. He worked on a variety of projects related to the design of waveforms for Naval applications, calibration of antennas and path losses by methods borrowed from radio astronomy, and on the design and acquisition of satellite communication terminals for shipboard and submarine use. By drawing on this work for a thesis topic, he obtained his Ph.D. from the University of Maryland in 1973 in the areas of astronomy and astrophysics.

In 1976, Dr. LeFande became Head of the Special Communications Branch where he nurtured and encouraged a NRL team of scientists and engineers in the development of satellite communications terminals that are now being deployed in the Fleet, and in establishing the scientific understanding and practical design principles that contributed to the selection of waveforms for MILSTAR and other systems.

From 1979 to 1981, Dr. LeFande was Technical Director and System Engineer of the Special Communication Project of the Naval Electronic Systems Command. He oversaw several research and acquisition programs related to submarine communications, which covered the spectrum from extremely low frequencies through optics and included the maintenance and operation of a world-wide network of radio transmitter facilities. After termination of the project and a brief tour as Deputy Director, Research and Technology Group, Dr. LeFande returned to NRL as Superintendent of the Aerospace Systems Division. Here he guided a diverse program of basic applied research in Wide Area Surveillance Systems, Space Warfare, and in related areas of physical science, materials, and device technology. From 1983 to 1990, Dr. LeFande served as Associate Deputy Assistant Secretary of the Navy (C<sup>3</sup>I and Space), providing technical and philosophical advice to eight assistant and deputy assistant secretaries. In this capacity, he took a keen interest in the issues of acquisition management reform and of the appropriate roles and missions of the Laboratory and the other centers in the acquisition process. During this tour, Dr. LeFande was selected as a Legis Fellow and served on the staff of Representative Byron for six months in 1989, working on a variety of issues and legislation related to Armed Services, Science and Technology, Foreign Affairs, and other matters.

Dr. LeFande returned to the Laboratory in October 1990 where he served on the staff of the Director of Research. He was designated Acting Associate Director of Research in February 1991 and Associate Director of Research in February 1992.



### Key Personnel

| Name              | Title                                                             | Code |
|-------------------|-------------------------------------------------------------------|------|
| Dr. R.A. LeFande* | Associate Director of Research for General Science and Technology | 4000 |
| Ms. B.J. Turner   | Special Assistant                                                 | 4001 |
| Ms. D. Ernst      | Administrative Officer                                            | 4002 |
| Mr. L.M. Winslow  | Consultant for Critical Technology Assessment                     | 4003 |
| Dr. S. Sacks      | Technology Base/Ballistic Missile Defense Organization            | 4040 |
| Dr. D.W. Forester | Signature Technology Office                                       | 4050 |

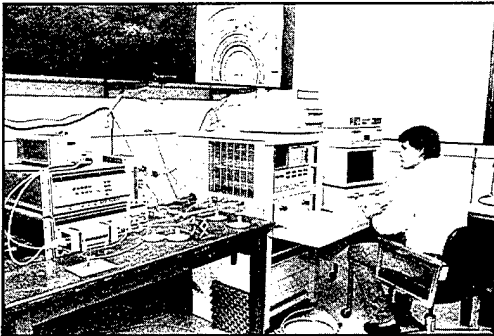
**Point of contact:** Ms. N.H. Sell, Code 4000A (202) 767-3324

\*Additional duty

# General Science and Technology Directorate

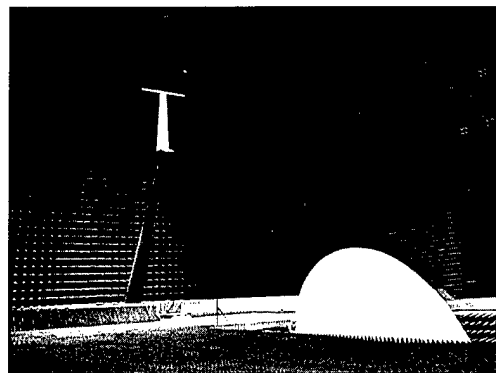
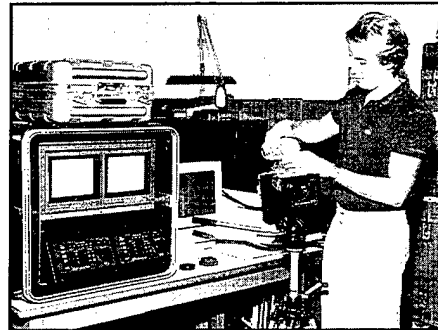
## Code 4000

- Technology Assessment
- Technical Program Management
- Low Observables Programs
- Counter Low Observables
- Multidisciplinary Programs
- Modeling of Signatures
- Field Signature Trials
- Low Observables Materials



Vector network analysis of new low observables materials

Field signature trials



Infrared signatures

## **Consultant for Critical Technology Assessment Office Code 4003**



MR. L.M. WINSLOW

The Critical Technology Assessment Office is tasked by the Assistant Secretary of the Navy (RE&S) via the Navy International Program Office to perform a broad spectrum of interrelated Navy mission-oriented efforts pertaining to international militarily critical technology transfer policy and intelligence assessment issues, involving both control and acquisition aspects. These tasks require the identification and participation of highly qualified individuals throughout the Navy scientific and technical community.

## **Technology Base/Ballistic Missile Defense Organization (BMDO) Office Code 4040**



DR. S. SACKS

The Technology Base Manager carries out program management activities pertaining to the Navy 6.2 (exploratory development), BMD, SBIR, 6.3 A ATD, DMSO, and other technology 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 efforts. The Technology Base Manager is the Laboratory point of contact with the Program Offices for this work.

## **Signature Technology Office Code 4050**



DR. D.W. FORESTER

The NRL Signature Technology Office (STO) manages/coordinates an integrated, comprehensive research and development program at NRL addressing all aspects of signature control and countersignature control as they apply to Navy weapons systems. The STO monitors and evaluates signature control technology development efforts within government and industry and facilitates the incorporation of advanced signature control technologies into present and future Navy systems. It provides a central point of contact for outside agencies on matters concerning the STO program.

**Warfare  
Systems  
and  
Sensors  
Research  
Directorate**

## **WARFARE SYSTEMS AND SENSORS RESEARCH DIRECTORATE**

**Code 5000**

The Warfare Systems and Sensors Research Directorate performs basic research and development for major generic Navy systems. The emphasis is on radar, electronic warfare, optical sensors and materials, and the integration of these primary sensors by communications and battle management systems. The Directorate conducts an extensive experimental program in the field to support the above activities. Programs in systems simulation, human computer interfaces, artificial intelligence, acoustic transducers, and calibration and standards for underwater acoustic devices are pursued in support of research and development for Navy systems. In addition, the Directorate has responsibility for providing specialized computing and computer networking on a Laboratory-wide basis, and the provision of administrative and technical services to support the Laboratory's mission through the operation of the Technical Information Division.

## Associate Director of Research for Warfare Systems and Sensors Research



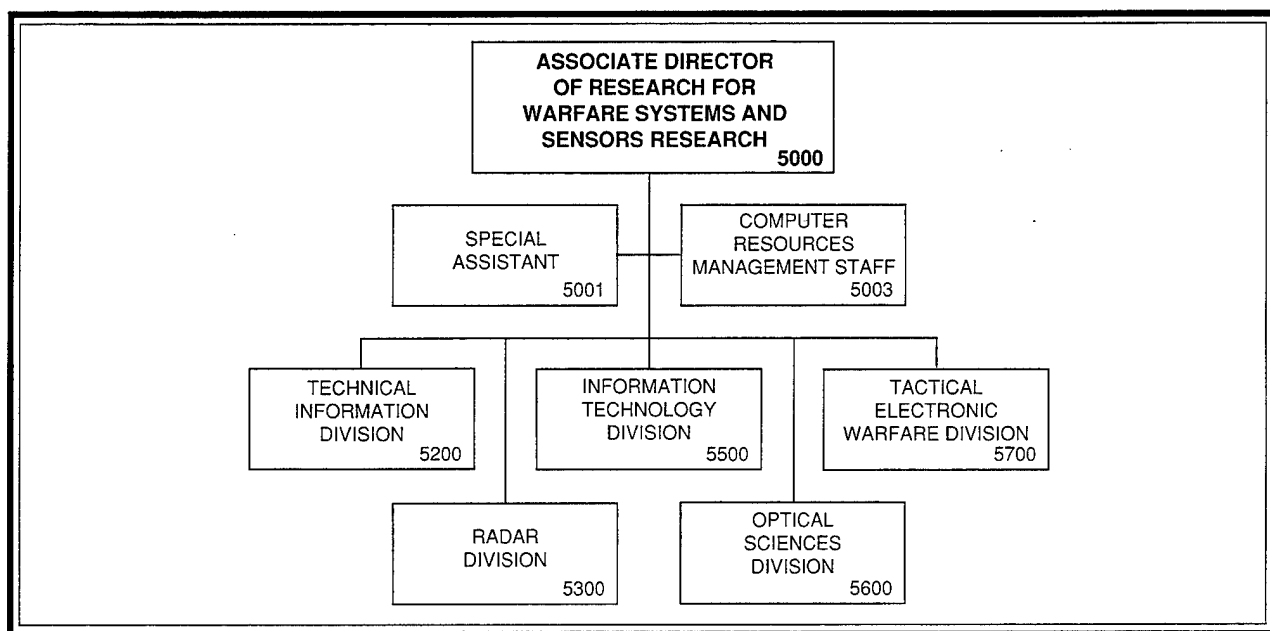
**D**r. R.A. LeFande was born on Staten Island, New York on February 8, 1941. He attended the Brooklyn Technical High School and obtained his undergraduate degree in physics from the University of Rhode Island in 1962. After a brief tour as a telephone equipment engineer with Western Electric Company in New York City, he returned to academic pursuits, earning a Master's degree in physics from the Rutgers University in 1965.

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### Key Personnel

| Name                 | Title                                                                   | Code |
|----------------------|-------------------------------------------------------------------------|------|
| Dr. R.A. LeFande     | Associate Director of Research for Warfare Systems and Sensors Research | 5000 |
| Ms. B.J. Turner      | Special Assistant                                                       | 5001 |
| Ms. H.K. Howell*     | Head, Computer Resources Management Staff                               | 5003 |
| Mr. P. Imhof         | Head, Technical Information Division                                    | 5200 |
| Dr. M.I. Skolnik     | Superintendent, Radar Division                                          | 5300 |
| Dr. R.P. Shumaker    | Superintendent, Information Technology Division                         | 5500 |
| Dr. T.G. Giallorenzi | Superintendent, Optical Sciences Division                               | 5600 |
| Dr. J.A. Montgomery  | Superintendent, Tactical Electronic Warfare Division                    | 5700 |

**Point of contact:** Ms. N.H. Sell, Code 5000A (202) 767-3324

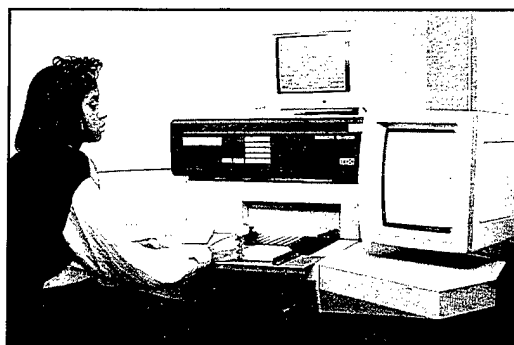
\*Acting

## Technical Information Division

### Code 5200

- Research Library and Technical Information Center
- Microcomputer Software Support Center
- Publications
- Photographic Services
- Graphics Design Services

Editors work directly with authors to provide clear, readable documentation



A computer technician scans reports into the Library's Optical Disk System

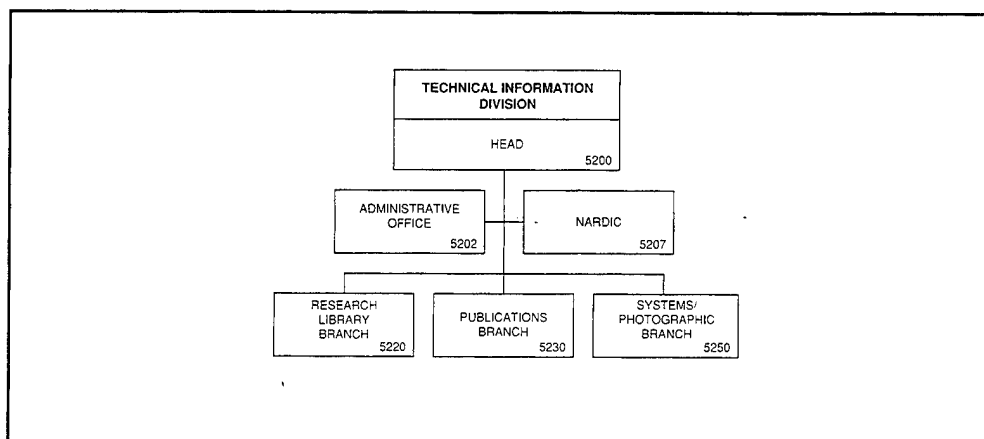
The Imaginator SI workstation provides a high front-end facility for scanning in and manipulating color photographs for conversion to digital format



Operators in the Electronic Imaging Center print images from the computer network



Mr. P. IMHOF



## Basic Responsibilities

The Technical Information Division (TID) provides centralized support to the Laboratory, and sometimes the Office of Naval Research, by collecting, retaining, processing, publishing, presenting, and distributing information in various forms to many audiences.

TID supports the Laboratory by editing and publishing reports and publications; by providing a full range of Library services, including the Microcomputer Software Support Center; by performing specialized scientific and general photographic services, illustration and visual aid services, imaging support, scientific composition, special projects graphics and publishing; and by providing photographic and video data-gathering and editing services.

**Personnel:** 67 full-time civilian

## Key Personnel

| Name               | Title                             | Code |
|--------------------|-----------------------------------|------|
| Mr. P. Imhof       | Head                              | 5200 |
| Ms. M.B. Gutierrez | Administrative Officer            | 5202 |
| Ms. L. Stackpole   | Head, Research Library Branch     | 5220 |
| Mr. T. Calderwood  | Head, Publications Branch         | 5230 |
| Mr. J. Lucas       | Head, Systems/Photographic Branch | 5250 |

**Point of contact:** Ms. M.B. Gutierrez, Code 5202 (202) 767-3370

# Radar Division

## Code 5300 Staff Activity Areas

Systems research  
Electromagnetic propagation  
Electromechanical design

## Research Activity Areas

### Radar Analysis

Radar systems  
Target signature prediction  
Electromagnetics and antennas

### Advanced Radar Systems

High-frequency over-the-horizon radar  
Signal analysis  
Signal processing and equipment  
Computer Aided Design (CAD)

### Search Radar

Shipboard surveillance radar  
Electromagnetic Compatibility/  
Electromagnetic Interference (EMC/EMI)

### Target Characteristics

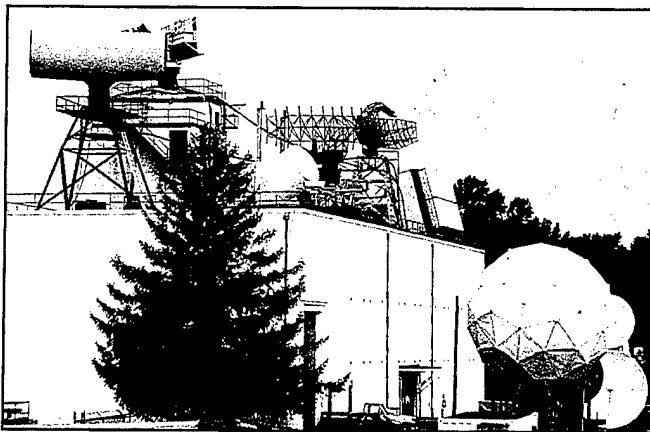
Ship self defense  
Electronic counter-countermeasures  
Target signature recognition

### Identification Systems

Combat aircraft identification  
Mark XII IFF improvements  
Future identification technology

### Airborne Radar

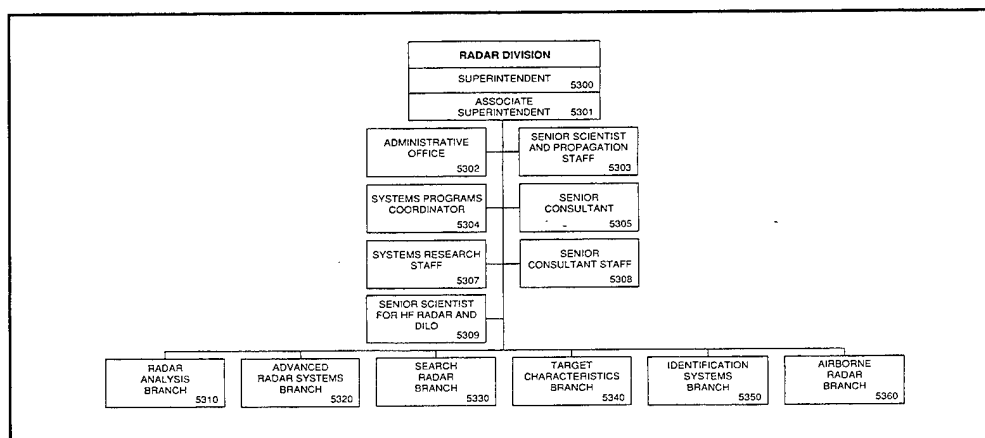
Airborne early-warning radar (AEW)  
Inverse synthetic aperture radar (ISAR)  
Space-time adaptivity



Radar test site at Building 75, Chesapeake Bay Detachment (Chesapeake Beach, MD) showing radar antennas used in experimental development by the Radar Division. On the roof, from left to right: experimental 3D elevation phase scanned antenna for SENRAD, an experimental L-Band system; a directed mirror antenna (DMAR); and antennas for the SPS-49, SPS-10, IFF, SPS-40, and the fixed array surveillance radar (FASR). On the ground from left to right are antennas for: SPQ-9(I) advanced development model (in radome); a high resolution X-band clutter radar; and the high range resolution monopulse (HRRM) system.



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:** 150 full-time civilian

## Key Personnel

| Name                | Title                                        | Code |
|---------------------|----------------------------------------------|------|
| Dr. M.I. Skolnik    | Superintendent                               | 5300 |
| Dr. G.V. Trunk      | Associate Superintendent                     | 5301 |
| Mrs. C. Hill        | Administrative Officer                       | 5302 |
| Dr. L.B. Wetzel     | Senior Scientist and Head, Propagation Staff | 5303 |
| Mr. I.D. Olin       | Senior Consultant                            | 5305 |
| Mr. J.M. Headrick   | Senior Scientist for HF Radar and DILO       | 5309 |
| Mr. P.K. Hughes II* | Head, Radar Analysis Branch                  | 5310 |
| Mr. J.P. Letellier  | Head, Advanced Radar Systems Branch          | 5320 |
| Mr. J. Pavco        | Head, Search Radar Branch                    | 5330 |
| Dr. B.H. Cantrell   | Head, Target Characteristics Branch          | 5340 |
| Mr. C.M. Veronda    | Head, Identification Systems Branch          | 5350 |
| Mr. T.L. apRhys     | Head, Airborne Radar Branch                  | 5360 |

**Point of contact:** Dr. G.V. Trunk, Code 5301 (202) 767-2573

\*Acting

# Information Technology Division

## Code 5500 Research Activity Areas

### Navy Center for Applied Research in Artificial Intelligence

- Case-based reasoning
- Natural language interfaces
- Intelligent tutoring
- Machine learning
- Robotics software and computer vision
- Neural networks
- Novel interaction techniques
- Devices/techniques for HCI
- Voice processing (synthesis, recognition, transmission, etc.)
- Man-in-loop interface evaluation

### Communication Systems

- Network design
- Tactical communication system engineering
- Modulation, coding, and waveform design
- Satellite communication system technology
- Distributed simulation and prototyping

### Center for High Assurance Computer Systems

- Security architecture
- Formal specification/verification of system security
- COMSEC application technology
- Secure networks
- Secure databases
- Software engineering for secure systems
- Key management and distribution
- Certification and Infosec Engineering
- Formal methods for requirements specification and verification
- Tools for real-time software development



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

### Transmission Technology

- Arctic communication
- Submarine communication technology
- Communication system architecture
- Communication antenna/propagation technology
- Communications intercept systems
- Signal analysis systems

### Advanced Information Technology

- Command decision support
- Parallel computing
- Battle management/C<sup>3</sup>
- Data fusion technology
- Database management technology
- Real-time parallel processing
- Distributed simulation
- Scalable high performance computing
- Processing graph method
- Signal processing applications
- Advanced ATM/SONET networking
- Image processing
- Virtual reality

### Center for Computational Science

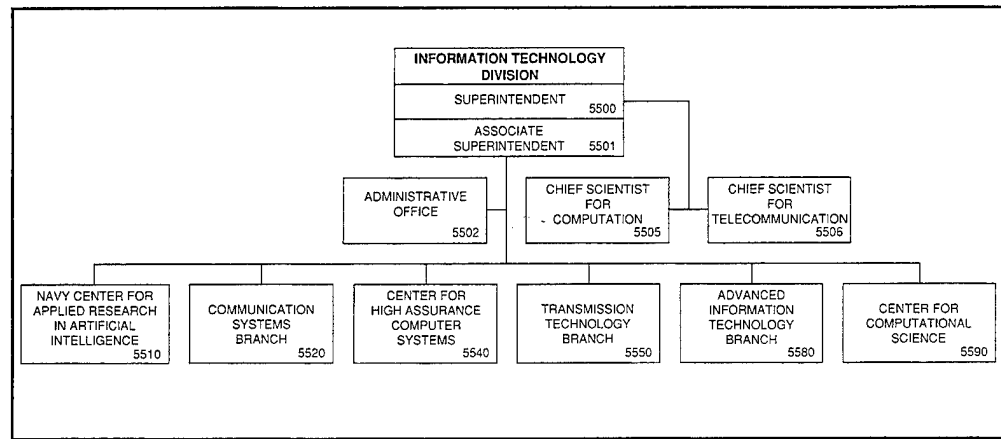
- Network research and design
- Parallel computing
- Scalable high performance computing
- Distributed computing environments
- Scientific visualization



The Thinking Machines, Inc. CM-5E computer has 256 processor nodes with four-pipe vector units each, 32 gigabytes of memory, 100 gigabytes of disk array storage, and 40 gigaflops/64-bit peak performance



DR. R.P. SHUMAKER



## Basic Responsibilities

The Information Technology Division conducts research and development programs in the collection, transmission, and processing of information to provide a basis for improving 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 battleforce warfare systems.

**Personnel:** 195 full-time civilian

## Key Personnel

| Name               | Title                                                                 | Code |
|--------------------|-----------------------------------------------------------------------|------|
| Dr. R.P. Shumaker  | Superintendent                                                        | 5500 |
| Mr. W.D. Long      | Associate Superintendent                                              | 5501 |
| Ms. J. Saunders    | Administrative Officer                                                | 5502 |
| Vacant             | Chief Scientist for Computation                                       | 5505 |
| Vacant             | Chief Scientist for Telecommunication                                 | 5506 |
| Dr. A.L. Meyrowitz | Director, Navy Center for Applied Research in Artificial Intelligence | 5510 |
| Mr. E.L. Althouse  | Head, Communication Systems Branch                                    | 5520 |
| Dr. J.D. McLean    | Director, Center for High Assurance Computer Systems                  | 5540 |
| Mr. E.J. Kennedy   | Head, Transmission Technology Branch                                  | 5550 |
| Dr. S.K. Numrich   | Head, Advanced Information Technology Branch                          | 5580 |
| Ms. H.K. Howell    | Center for Computational Science                                      | 5590 |

**Point of contact:** Mr. W.D. Long, Code 5501 (202) 767-2954

# Optical Sciences Division

## Code 5600 Staff Activity Areas

Program analysis and development  
Special systems analysis  
Technical study groups

Technical contract monitoring  
Theoretical studies

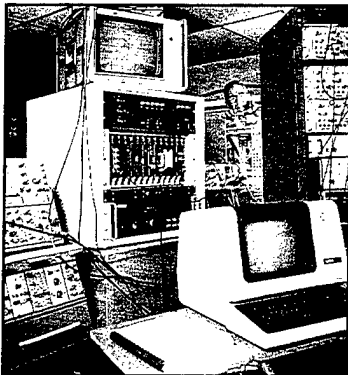
## Research Activity Areas

### Fiber Optics Technology

Advanced infrared glasses and fibers  
Fiber-optic materials and fabrication  
Fiber chemical sensors

### Optical Physics

Laser materials diagnostics  
Nonlinear frequency conversion  
Optical instrumentation and probes  
Radiation effects  
Fiber-optic materials and fabrication  
Sensors for smart structures  
Fiber lasers and amplifiers  
Optical seeker studies  
Optical interactions in semiconductor superlattices and organic solids



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

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



### Applied Optics

Detection signal processing studies  
Optical and IR countermeasures  
Optical technology  
Ultraviolet component development and UV countermeasures  
Atmospheric optics  
Propagation studies  
Laser radar  
Optical imager development

### Laser Physics

Molecular and chemical laser physics  
Interferometry  
Laser chemical kinetics  
Diode laser pumped solid-state lasers  
Electrically driven lasers  
Laser-induced reactions  
Nonlinear frequency conversion  
Beam cleanup technology  
Solid-state laser development

### Advanced Concepts

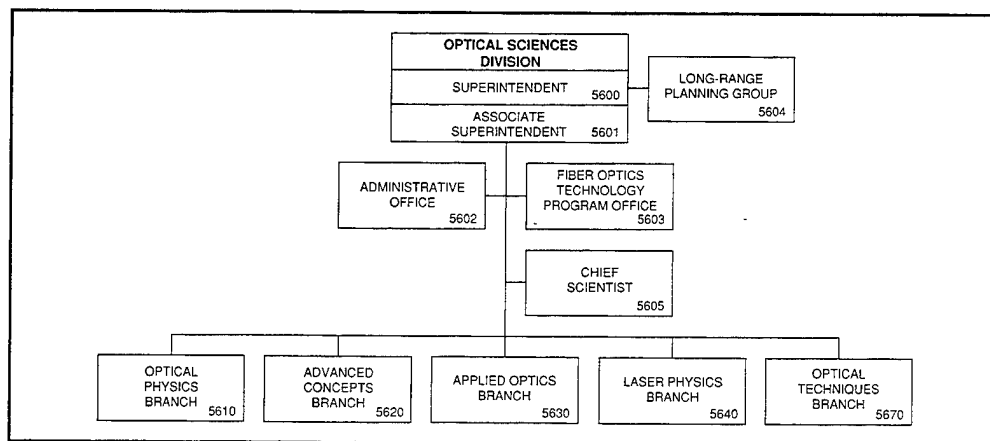
IR low observables  
IR space surveillance systems  
EO/IR systems analysis  
Airborne IR search and track technology  
Atmospheric IR measurements  
Ship IR signatures  
High-speed optical networks

### Optical Techniques

Diode laser applications  
Fiber lasers/sources  
Optical control of solid-state electronic devices  
Integrated optics  
Fiber-optic sensors (acoustic, magnetic, electric fields, etc.)  
Tunable and short (<100 femto-seconds) optical pulses for high-speed probing of semiconductor materials, superconductors, and other materials  
High-power laser diode amplifier



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, fiber-optic sensor systems, 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:** 137 full-time civilian

## Key Personnel

| Name                  | Title                                        | Code |
|-----------------------|----------------------------------------------|------|
| Dr. T.G. Giallorenzi  | Superintendent                               | 5600 |
| Mr. J.M. McMahon*     | Associate Superintendent                     | 5601 |
| Ms. V. Short-Williams | Administrative Officer                       | 5602 |
| Mr. G. Cogdell        | Head, Fiber Optics Technology Program Office | 5603 |
| Dr. M. Kruer          | Long-Range Planning Group                    | 5604 |
| Dr. R.A. Patten       | Long-Range Planning Group                    | 5604 |
| Dr. L. Esterowitz     | Chief Scientist                              | 5605 |
| Dr. A.J. Campillo     | Head, Optical Physics Branch                 | 5610 |
| Dr. J.C. Kershenstein | Head, Advanced Concepts Branch               | 5620 |
| Dr. R.A. Patten       | Head, Applied Optics Branch                  | 5630 |
| Dr. B. Feldman        | Head, Laser Physics Branch                   | 5640 |
| Dr. J. Weller         | Head, Optical Techniques Branch              | 5670 |

**Point of contact:** Ms. V. Short-Williams, Code 5602 (202) 767-2855

\*Acting

# Tactical Electronic Warfare Division

## Code 5700 Staff Activity Areas

EW strategic planning  
Information Warfare Technology Program  
EW lead laboratory coordinator

Communications CM group  
Effectiveness of Naval EW Systems (ENEWS)  
Facility operations unit

## Research Activity Areas

### Offboard Countermeasures

Expendable technology and devices  
Unmanned air vehicles  
Offboard payloads  
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

### Electronic Warfare Support Measures

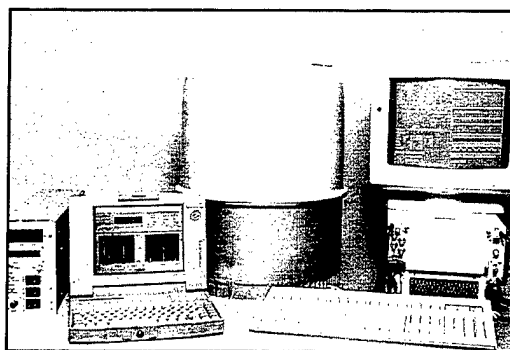
Intercept systems and direction finders  
RF signal simulators  
Systems integration  
Command and control interfaces  
Signal processing

### Advanced Techniques

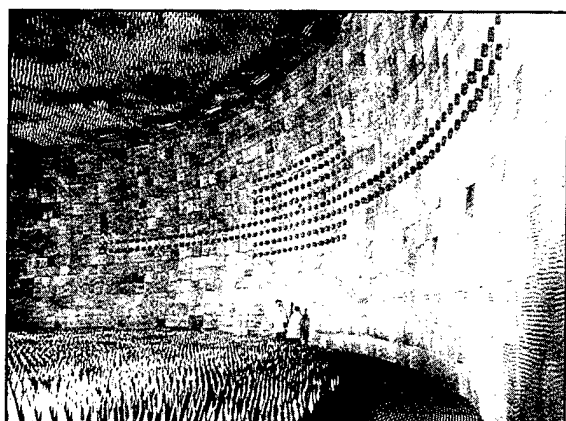
Analysis and modeling simulation  
New EW techniques  
Experimental systems  
EW concepts  
Infrared technology

### Integrated EW Simulation

Hardware-in-the-loop simulation  
Data management technology  
Flyable ASM seeker simulators  
Foreign military equipment exploitation



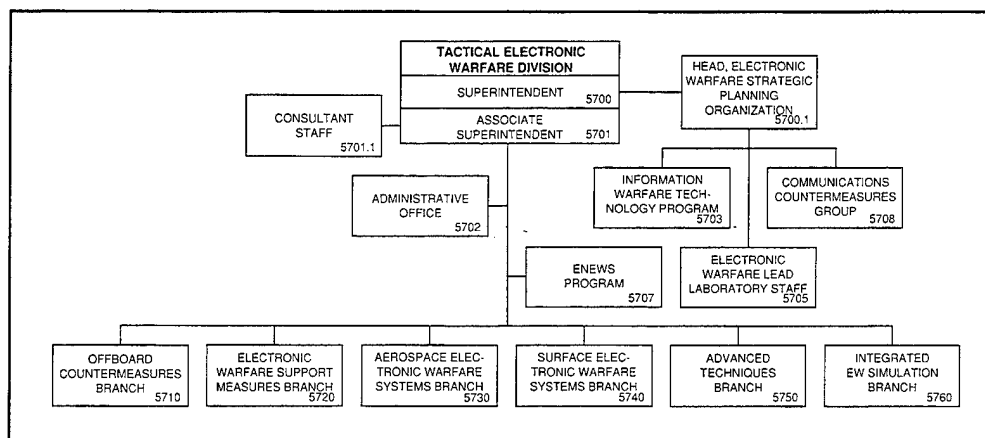
Using the latest composite, MIMIC and processing technologies, the Tactical Electronic Warfare Division has developed a small, lightweight, and inexpensive ESM receiving system for use on frigates, Coast Guard vessels, and various patrol aircraft



The Central Target Simulator (CTS) Programmable Array is part of a large hardware-in-the-loop simulation facility whose purpose is to test and evaluate electronic warfare systems and techniques used to counter the radar guided missile threat to Navy forces



DR. J.A. MONTGOMERY



## Basic Responsibilities

The Tactical Electronic Warfare Division (TEWD) 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 determining and improving the effectiveness of these systems.

**Personnel:** 272 full-time civilian

## Key Personnel

| Name                | Title                                                    | Code   |
|---------------------|----------------------------------------------------------|--------|
| Dr. J.A. Montgomery | Superintendent                                           | 5700   |
| Dr. C.H. Heider     | Head, Electronic Warfare Strategic Planning Organization | 5700.1 |
| Mr. H.W. Zwack      | Associate Superintendent/Head                            | 5701   |
| Ms. J.C. Johnson*   | Administrative Officer                                   | 5702   |
| Mr. T. Jones        | Manager, Information Warfare Technology Program          | 5703   |
| Mr. T.J. Jesswein   | Head, Electronic Warfare Lead Laboratory Staff           | 5705   |
| Dr. A.N. Duckworth  | Manager, ENEWS Program                                   | 5707   |
| Mr. W.W. Everett    | Head, Communications Countermeasures Group               | 5708   |
| Dr. F.J. Klemm      | Head, Offboard Countermeasures Branch                    | 5710   |
| Mr. R.D. Oxley*     | Head, Electronic Warfare Support Measures Branch         | 5720   |
| Dr. C.H. Heider*    | Head, Aerospace Electronic Warfare Systems Branch        | 5730   |
| Dr. J.P. Lawrence   | Head, Surface Electronic Warfare Systems Branch          | 5740   |
| Dr. G.E. Friedman   | Head, Advanced Techniques Branch                         | 5750   |
| Mr. A.A. DiMattesa  | Head, Integrated EW Simulation Branch                    | 5760   |

**Point of contact:** Mr. H.W. Zwack, Code 5701 (202) 767-3622

\*Acting

**Materials  
Science  
and  
Component  
Technology  
Directorate**

## **MATERIALS SCIENCE AND COMPONENT TECHNOLOGY DIRECTORATE**

**Code 6000**

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 for advanced platforms, electronics, sensors, and photonics. The program includes investigations of a broad spectrum of materials including insulators, semiconductors, superconductors, metals and alloys, optical materials, polymers, plastics, and artificially structured bio/molecular 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 synthesis, processing, 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.

Additionally, major thrusts are directed in advanced space sensing, reactive flow physics, computational physics, and plasma sciences. Areas of particular emphasis include fluid mechanics and hydrodynamics, nuclear weapon effects simulations, high-energy density storage devices, interactions of various types of radiation with matter, survivability of materials and components, and directed energy devices.

## Associate Director of Research for Materials Science and Component Technology



**D**r. B.B. Rath was born in Banki, India, on October 28, 1934. He received a 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.

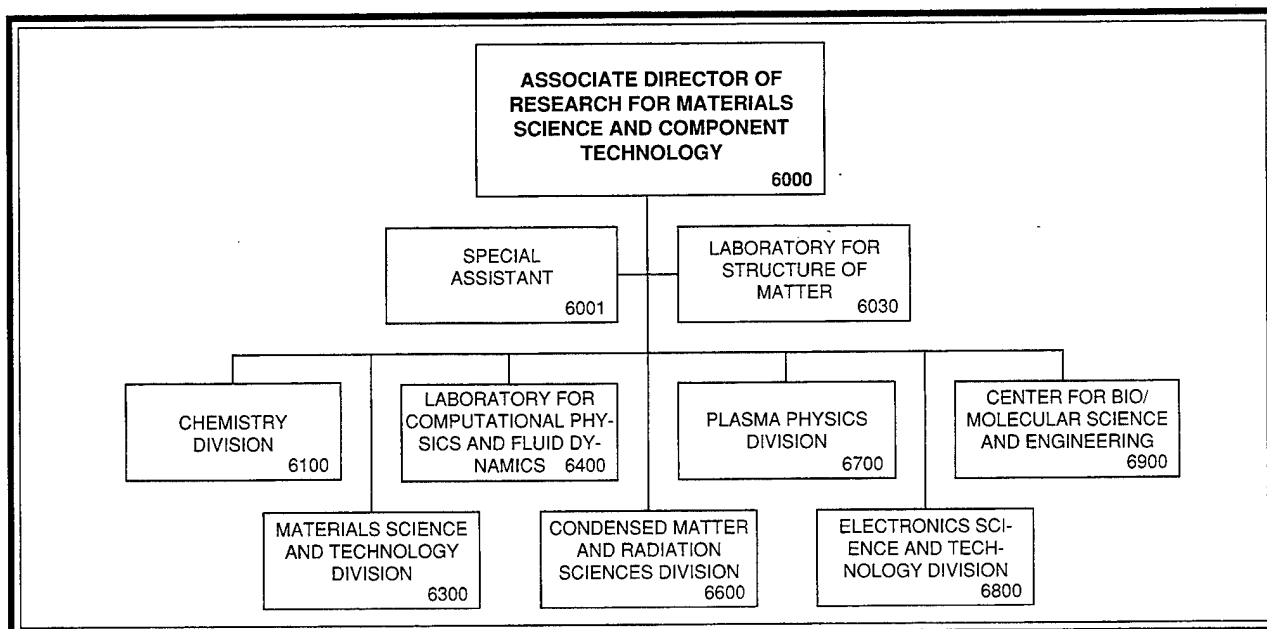
Dr. Rath was Assistant Professor of Metallurgy and Materials Science at Washington State University from 1961 to 1965. From 1965 to 1972, he was with the staff of the Edgar C. Bain Laboratory for fundamental research of the U.S. Steel Corporation. From 1972 to 1976, he headed the Metal Physics Research Group 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, the University of Maryland, and the Colorado School of Mines. Dr. Rath served as Superintendent of the Materials 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 relationships in metallic systems. He has published over 140 papers in these fields and edited several books and conference proceedings.

Dr. Rath serves on several planning, review, and advisory boards for both the Navy and the Department of Defense, as well as for the National Materials Advisory Board of the National Academy of Sciences, Carnegie-Mellon University, University of Virginia, Colorado School of Mines, University of Pittsburgh, University of Connecticut, and Florida Atlantic University. He serves as the Navy representative and is elected as Executive chair to the Materials Subgroup of The Technical Cooperation Program (TTCP) countries and the Indo-U.S. Joint Commission on Science and Technology.

Dr. Rath is a fellow of the Minerals, Metals, and Materials Society (TMS), American Society for Materials-International (ASM), Washington Academy of Sciences, and Materials Research Society of India. He has received the 1991 George Kimball Burgess Memorial Award and the Charles S. Barrett Medal for his contributions to Materials Research. He has served as chairperson of several technical committees of TMS, ASM, and AAES, and serves in the editorial boards of three international materials research journals. He is a member of the Board of Trustees of ASM-International and the American Association of Engineering Societies, and Board of Directors of The Materials Society (TMS).

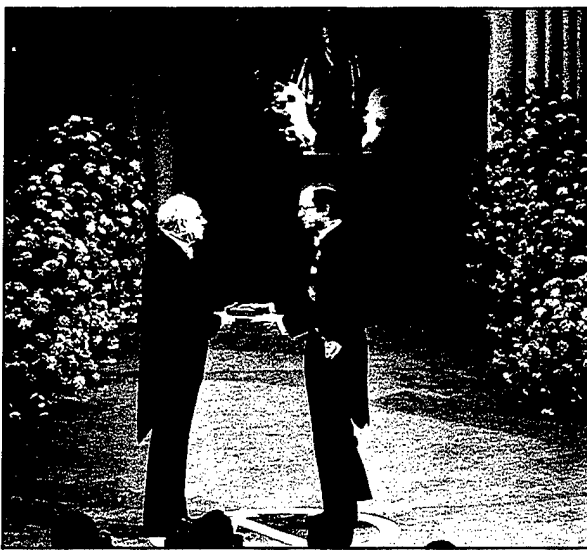


### Key Personnel

| Name            | Title                                                                                 | Code |
|-----------------|---------------------------------------------------------------------------------------|------|
| Dr. B.B. Rath   | Associate Director of Research for Materials Science and Component Technology         | 6000 |
| Mr. R.A. Gray   | Special Assistant                                                                     | 6001 |
| 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. J.P. Boris  | Chief Scientist and Director, Laboratory for Computational Physics and Fluid Dynamics | 6400 |
| Dr. D.J. Nagel  | Superintendent, Condensed Matter and Radiation Sciences Division                      | 6600 |
| Dr. S. Ossakow  | Superintendent, Plasma Physics Division                                               | 6700 |
| Dr. G.M. Borsuk | Superintendent, Electronics Science and Technology Division                           | 6800 |
| Dr. J. Schnur   | Director, Center for Bio/Molecular Science and Engineering                            | 6900 |

**Point of contact:** Mrs. J. Smithwick, Code 6000A (202) 767-2538

**Dr. Jerome Karle recipient of  
1985 Nobel Prize in Chemistry**



Dr. Jerome Karle's research has been concerned with diffraction theory and its application to the determination of atomic arrangements in various states of aggregation, gases, liquids, amorphous solids, fibers, and macromolecules. This research has resulted in new techniques for structure determination and a broad variety of applications. His work in crystal structure analysis was recognized by the 1985 Nobel Prize in Chemistry.

Dr. Karle is a Fellow of the American Physical Society, a member of the National Academy of Sciences, and the American Philosophical Society. He has served as president of the International Union of Crystallography, and is a member of a number of other professional societies. He has been chairman of the Chemistry Section of the National Academy of Sciences. Some time ago, he was a Professorial Lecturer in the University College of the University of Maryland and a Visiting Professor at the University of Kiel in Germany. He has also lectured at many international schools and symposia and has served on a number of international scientific organizations.

# Laboratory for Structure of Matter

Code 6030



DR. J. KARLE

## 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:** 12 full-time civilian

## Key Personnel

| Name         | Title           | Code |
|--------------|-----------------|------|
| Dr. J. Karle | Chief Scientist | 6030 |

**Point of contact:** Mrs. M. Williams, Code 6030 (202) 767-3496

# Chemistry Division

**Code 6100**

## **Staff Activity Areas**

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
- Environmental chemistry

### **Materials Chemistry**

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



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.



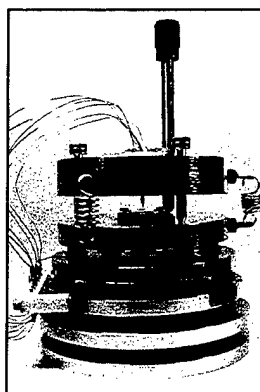
Phthalonitrile-based resins under development in the Chemistry Division shows outstanding flame resistance. Flame resistant, phthalonitrile-based composite (held by the bottom prongs, glowing in flame) relative to an epoxy composite (held by the top prongs, burning in the flame).

### **Surface/Interface Chemistry**

- Tribology
- Surface properties of materials
- Surface/interface analysis
- Chemical microdetectors
- Surface reaction dynamics
- High-temperature chemistry
- Diamond films
- Beam-enhanced chemistry
- Electrochemistry
- Chemical sensors

### **Combustion and Fuels**

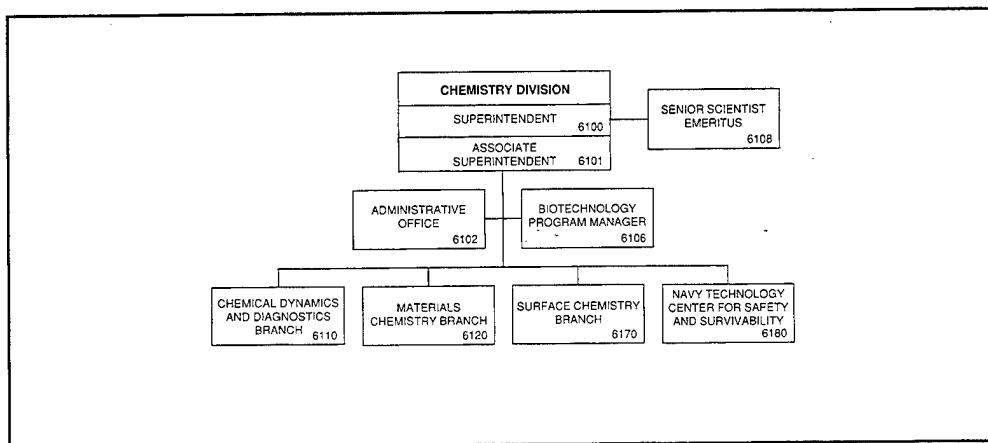
- Distillate fuels research
- Combustion dynamics
- Fire protection and suppression
- Personnel protection
- Modeling and scaling of combustion systems
- Chemical and biological defense
- Safety and survivability
- Corrosion prevention
- Solution chemistry



A scanning tunneling microscope designed and built in the Chemistry Division for the study of the atomic structure of surfaces in air



Dr. J.S. MURDAY



## Basic Responsibilities

The Chemistry Division conducts basic research, applied research, and development studies in the broad fields of chemical diagnostics, reaction rate control, materials chemistry, surface and interface chemistry, environment, and ship safety and survivability. Specialized programs within these fields include chemical vapor precursors, coatings, functional polymers/elastomers, clusters, controlled release of energy, chemical sensors, physical and chemical characterization of surfaces, properties of nanometer structures, tribology, chemical vapor deposition/etching, atmosphere analysis and control, environmental protection/reclamation, prevention/control of fires, mobility fuels, and solution chemistry.

To enhance protection of Navy personnel and platforms from damage and injury in peace and wartime, the Navy Technology Center for Safety and Survivability performs RDT&E on fire and personnel protection, fuels, chemical defense, submarine atmospheres, and damage control aspects of ship and aircraft survivability; supports Navy and Marine Corps requirements in these areas; and acts as a focus for technology transfer in safety and survivability.

**Personnel:** 96 full-time civilian; 2 full-time military

## Key Personnel

| Name                   | Title                                                     | Code  |
|------------------------|-----------------------------------------------------------|-------|
| Dr. J.S. Murday        | Superintendent                                            | 6100  |
| Dr. D. Sheehan*        | Associate Superintendent                                  | 6101  |
| Ms. B.L. Russell       | Administrative Officer                                    | 6102  |
| CAPT W.W. Schultz, USN | Biotechnology Program Manager                             | 6106  |
| CAPT S. Snyder, USN    | Biotechnology Program                                     | 6106A |
| Dr. H.W. Carhart       | Senior Scientist, Emeritus                                | 6108  |
| Dr. J. McDonald        | Head, Chemical Dynamics and Diagnostics Branch            | 6110  |
| Dr. D. Sheehan         | Head, Materials Chemistry Branch                          | 6120  |
| Dr. D.L. Venezky       | Head, Surface Chemistry Branch                            | 6170  |
| Dr. F.W. Williams      | Head, Navy Technology Center for Safety and Survivability | 6180  |

**Point of contact:** Ms. B. Russell, Code 6102 (202) 767-2460

\*Acting

# Materials Science and Technology Division

## Code 6300 Research Activity Areas

### Physical Metallurgy

- Ferrous and intermetallic alloys
- Particulate and fiber synthesis/processing
- Welding technology
- Micro/nano structure characterization

### Environmental Effects

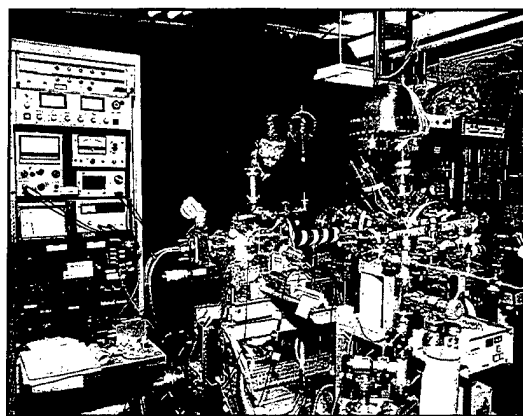
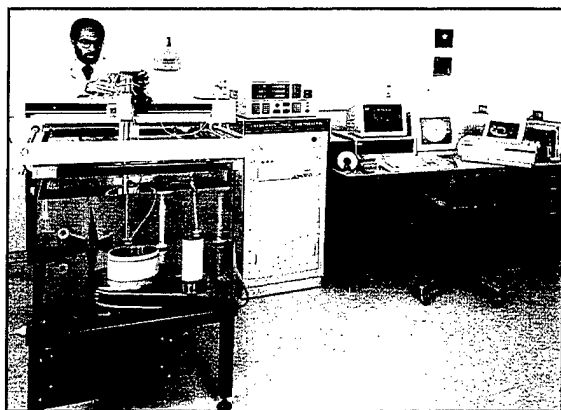
- Corrosion science
- Corrosion engineering
- Materials failure analysis
- Coatings

### Material Physics

- Superconducting materials
- Magnetic materials
- Electronic properties
- Nonlinear (chaotic) phenomena

### Mechanics of Materials

- Mechanics of metallic, composite, and ceramic materials
- Non-destructive evaluation
- Smart materials/structures
- Synthesis and processing of ceramic materials

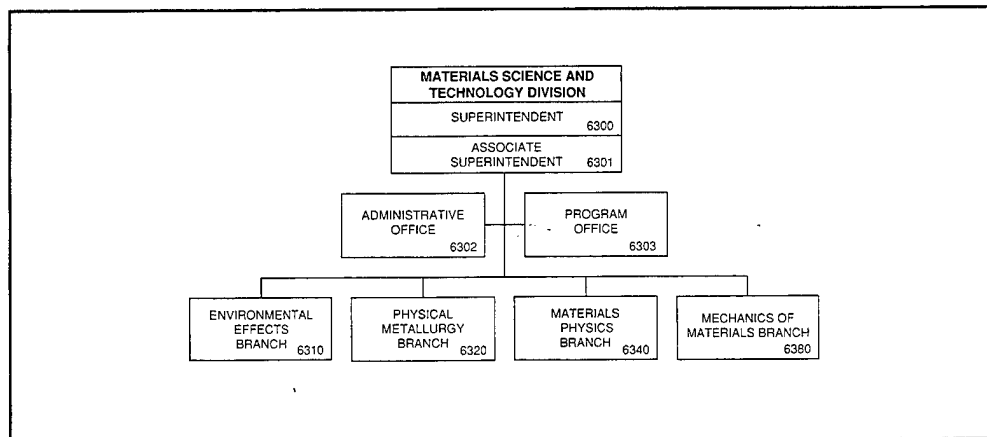


The growth of single crystal magnetic films on semiconductor substrates for electronic applications is observed

Ultrasonic imaging and analysis system for nondestructive inspection of irregular objects and simple bodies of revolution. The computer-interactive automated system provides acoustic images of bodies fabricated from metals or composites in real time, with visual indicators of defects that may be present.



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:** 130 full-time civilian

## Key Personnel

| Name               | Title                               | Code |
|--------------------|-------------------------------------|------|
| Dr. D.U. Gubser    | Superintendent                      | 6300 |
| Dr. D.J. Michel    | Associate Superintendent            | 6301 |
| Mrs. S.A. McIntire | Administrative Officer              | 6302 |
| Dr. S.C. Sanday    | Program Office                      | 6303 |
| Mr. E.D. Thomas    | Head, Environmental Effects Branch  | 6310 |
| Dr. E.A. Metzbower | Head, Physical Metallurgy Branch    | 6320 |
| Dr. S.A. Wolf      | Head, Materials Physics Branch      | 6340 |
| Dr. R. Badaliance  | Head, Mechanics of Materials Branch | 6380 |

**Point of contact:** Ms. M. Daley, Code 6300A (202) 767-2926

# Laboratory for Computational Physics and Fluid Dynamics

## Code 6400 Research Activity Areas

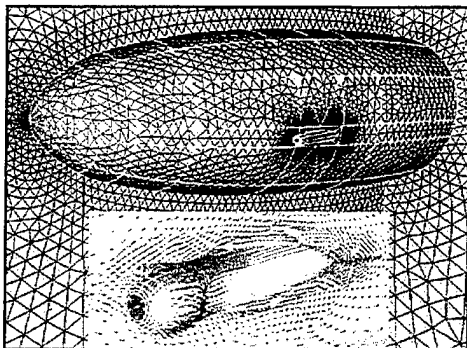
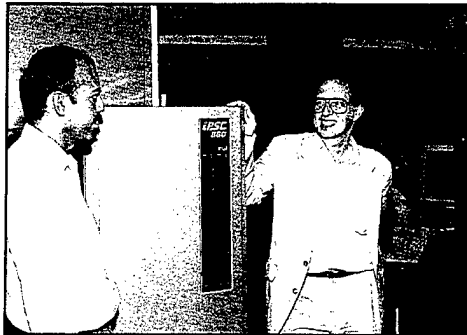
### Reactive Flows

- Fluid dynamics in combustion
- Turbulence in compressible flows
- Multiphase flows
- Molecular dynamics of energetic materials
- Theoretical quantum chemistry
- Turbulent jets and wakes
- Turbulence modeling
- Computational hydrodynamics

### Computational Physics Developments

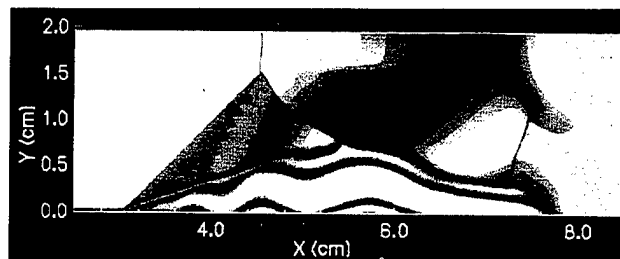
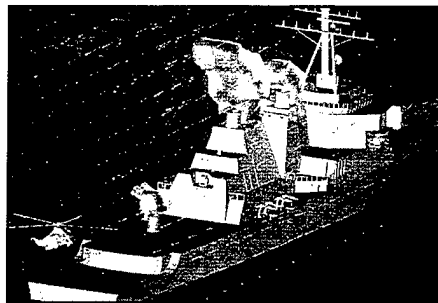
- Laser plasma interactions
- Inertial confinement fusion
- Solar physics modeling
- Dynamical gridding algorithms
- Advanced graphical and parallel processing systems
- Electromagnetic and acoustic scattering
- Battle management and data fusion
- Bubble dynamics

Working at the LCP&FD Intel Touchstone



Surface definition and velocity vectors during launch of a torpedo from a submarine. The simulation was performed using FEFLOIC, an implicit incompressible flow solver using adaptive unstructured grids. This represents a new capability for computing launch dynamics and the trajectory of underwater weapons and vehicles.

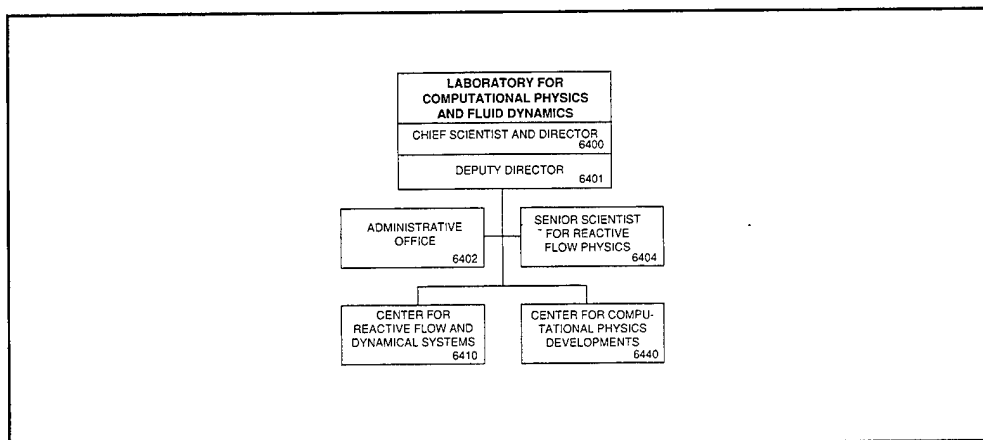
The unsteady velocity and temperature field over a Burke (DDG-51) class destroyer interacting with the downwash created by the main rotor blades of a hovering helicopter. Simulations performed on an Intel iPSC/860 and Intel Paragon. Velocity vectors show magnitude and direction of the flow field. Temperature isocontours show regions of hot exhaust gases and cooler gases.



When a shock propagates down a tube, it creates a boundary layer at the wall. When this shock reflects from the end wall, back into the boundary layer, a complex lambda shock structure may develop. This figure shows pressure contours for a computation on the CM-5 of a reflected shock (moving from the right, to the left) propagating into a boundary layer. The light area on the left side is the once-shocked material, in which there is a small boundary layer near the wall. The complex structure that results contains many shocks and shear layers. Near the end wall, the material has a high temperature and essentially zero velocity.



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 and numerical capabilities that 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 including submarine and aerospace applications, atmospheric and solar geophysics, magnetoplasma dynamics for laboratory and space applications, application of parallel processing to large-scale problems such as unstructured grid generation for complex flows and target tracking and correlation for battle management, 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 analytical and computational 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 and computational 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:** 26 full-time civilian

## Key Personnel

| Name                  | Title                                                | Code |
|-----------------------|------------------------------------------------------|------|
| Dr. J.P. Boris        | Chief Scientist and Director                         | 6400 |
| Dr. W.C. Sandberg     | Deputy Director                                      | 6401 |
| Mrs. C. Adams         | Administrative Officer                               | 6402 |
| Dr. E.S. Oran         | Senior Scientist for Reactive Flow Physics           | 6404 |
| Dr. K. Kailasanath    | Head, Center for Reactive Flow and Dynamical Systems | 6410 |
| Mr. J.H. Gardner, Jr. | Head, Center for Computational Physics Developments  | 6440 |

**Point of contact:** Mrs. C. Adams, Code 6402 (202) 767-6581

# Condensed Matter and Radiation Sciences Division

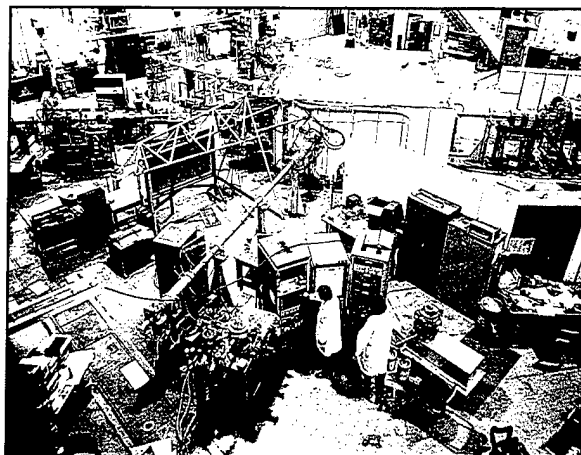
## Code 6600 Research Activity Areas

### Radiation Effects

- Space experiments
- High-temperature superconductivity space experiment
- Microelectronics and photonics test bed
- Solar cells
- Nuclear radiation detection
- Satellite survivability
- Single-event upsets
- Device and material damage and hardening
- Ultrafast charge collection
- Synchronized laser facility
- Environmental nuclear radiation

### Directed Energy Effects

- High-power microwave effects
- Laser-hardened materials and systems
- Interaction of laser and microwave radiation with materials and systems
- Solid-state spectroscopy
- Atomic and molecular interactions with surfaces and interfaces



An elevated view showing the NRL 3 MeV Tandem Van de Graaff Accelerator and associated beam lines

### Surface Modification

- Modification of surfaces by ion implantation
- Deposition of thin films by ion beam-assisted deposition and pulsed laser deposition
- Radiation effects from high energy charged particle beams
- Surface analyses by accelerator-based techniques
- ECR microwave plasma etching
- 200-keV ion implantation systems
- 3-MeV tandem ion accelerator

### Dynamics of Solids

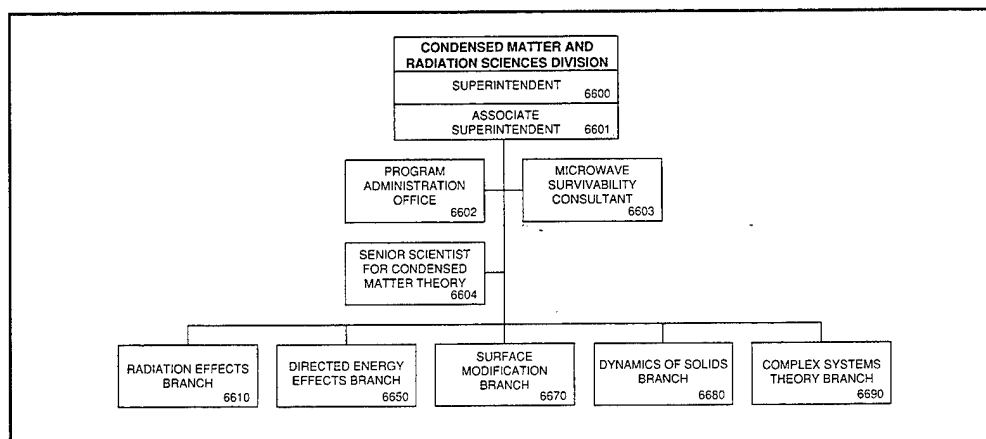
- X-ray sources, optics, and detectors
- X-ray analysis of materials – composition and structure
- Plasma spectroscopy
- Synchrotron radiation applications
- Semiconductor surface science
- Phase transformations
- Shock physics
- Hypervelocity impact
- Radiation effects in microelectronics
- Synchronized laser facility

### Complex System Theory

- Computational condensed matter physics and material science
- Applications of electronic structure theory to solids and clusters
- Molecular dynamics
- Quantum many-body theory
- Theory of alloys
- Superconductivity theory
- Theoretical studies of phase transitions
- Atomic physics theory



Dr. D.J. NAGEL



## Basic Responsibilities

The Condensed Matter and Radiation Sciences Division conducts broad programs 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. Radiation damage produced in materials, components, subsystems, and systems by radiation, ranging from microwave and laser beams through charged and neutral particle beams in the megavolt region, is studied. Techniques for the use of radiation for beneficial modification and characterization 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:** 96 full-time civilian

## Key Personnel

| Name                          | Title                                        | Code |
|-------------------------------|----------------------------------------------|------|
| Dr. D.J. Nagel                | Superintendent                               | 6600 |
| Dr. R.W. Holst                | Associate Superintendent                     | 6601 |
| Ms. B. Murphy                 | Head, Program Administration Office          | 6602 |
| Dr. J.W. Butler               | Microwave Survivability Consultant           | 6603 |
| Dr. W.E. Pickett              | Senior Scientist for Condensed Matter Theory | 6604 |
| Mr. J.C. Ritter               | Head, Radiation Effects Branch               | 6610 |
| Dr. T.J. Wieting              | Head, Directed Energy Effects Branch         | 6650 |
| Dr. G.K. Hubler               | Head, Surface Modification Branch            | 6670 |
| Dr. M.I. Bell                 | Head, Dynamics of Solids Branch              | 6680 |
| Dr. D.A. Papaconstantoupoulos | Head, Complex Systems Theory Branch          | 6690 |

**Point of contact:** Ms. B. Murphy, Code 6602 (202) 767-3407

# Plasma Physics Division

## Code 6700 Research Activity Areas

### Radiation Hydrodynamics

- Pulsed-power radiation source and power-flow development
- X-ray laser modeling
- Dense plasma atomic structure, processes, and equations of state
- Radiation hydrodynamics of dense Z-pinch and laser-produced plasmas
- Plasma-radiation diagnostics
- Numerical simulation of high-density plasma

### Laser Plasma

- Laser-plasma interaction
- Laser fusion, inertial confinement
- Laser-plasma diagnostics
- Laser-driven X-ray lasers
- KrF laser development
- Strongly coupled plasmas

### Charged Particle Physics

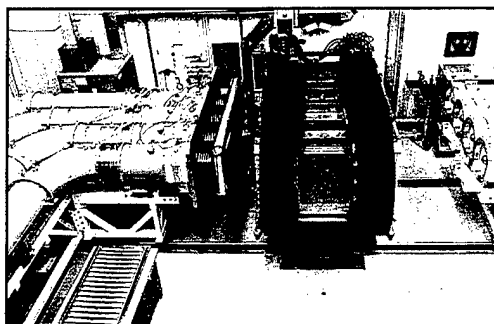
- Charged particle beam generation
- Propagation of high-energy charged particle beams
- Radiation source development
- Plasma channels in air
- Experimental study of plasma chemistry
- Railgun physics
- Applications of modulated electron beams
- Rocket, satellite, and shuttle-borne natural and active experiments
- Laboratory simulation of space plasma processes

### Pulsed Power Physics

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

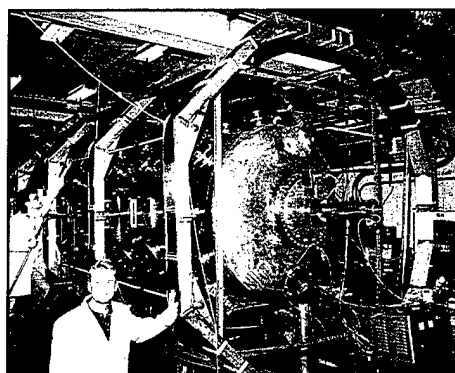
### Beam Physics

- High-quality electron beams
- Wake field accelerators
- Application of high-current relativistic electron beams to microwave and millimeter wave generation, e.g., gyrotrons, short-pulse FEL, and CARM
- Plasma microwave electronics
- Plasma processing
- Solar-plasma processes
- Theoretical and numerical simulation of ionospheric and magnetospheric phenomena
- Ionospheric-magnetospheric coupling



The NIKE Krypton Fluoride (KrF) Laser is under development to study the physics issues of Direct Drive Inertial Confinement Fusion (ICF) for defense and energy applications. Direct Drive with a KrF laser is a very attractive approach to ICF owing to its simplicity, inherent high efficiency, and very high beam

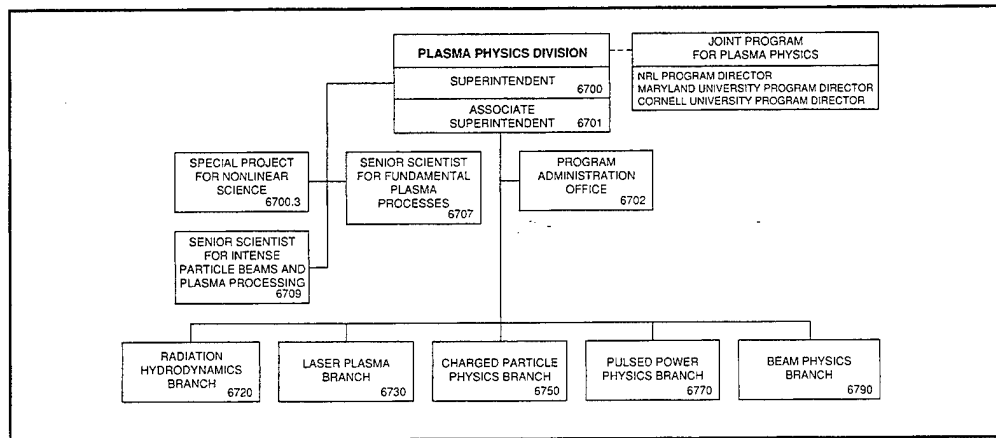
uniformity. The NIKE laser will illuminate a flat target with intensities of up to  $2 \times 10^{14}$  W/cm<sup>2</sup> and beam nonuniformities of less than 0.25%. This photograph shows the largest amplifier in the laser. Light enters and exits the amplifier cell through the square aperture near the center of the photo. Amplification is achieved by exciting the krypton/fluorine mixture gas in the cell with two large area electron beams. One of the electron beam emitters (cathode) is in an exposed position to the left of the cell. The amplifier will produce a 248 nm laser beam with total energy exceeding 5 kJ.



A 1.8-m diameter, 5-m long stainless steel space chamber capable of being pumped to  $\sim 5 \times 10^{-7}$  torr is used for simulating space conditions in the laboratory. Multi-turn coils allow up to 100 gauss DC magnetic fields (500 gauss pulsed) to be imposed along the tank axis. Some of the experiments performed on this chamber include testing of spacecraft diagnostics, plasma production from several plasma guns, high voltage spacecraft charging/discharging effects, and simulation of non-linear ion dynamics in the earth's magnetotail.



Dr. S.L. OSSAKOW



## Basic Responsibilities

The Plasma Physics Division conducts a broad theoretical and experimental program of basic and applied research in plasma physics, laboratory and space plasmas, 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; nuclear weapons effects; thermonuclear plasma confinement; atomic physics; plasma processing; nonlinear dynamics and chaos; 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, electric mass launchers, microwave reflection from a sheet plasma (agile mirror), high frequency microwave processing of ceramic materials, advanced accelerator development, inductive energy storage, the interaction of charged particle beams with the atmosphere, and in-situ space plasma measurements.

**Personnel:** 115 full-time civilian

## Key Personnel

| Name               | Title                                                          | Code   |
|--------------------|----------------------------------------------------------------|--------|
| Dr. S.L. Ossakow   | Superintendent                                                 | 6700   |
| Dr. V.L. Patel     | Associate Superintendent                                       | 6701   |
| Dr. P. Palmadesso  | Head, Special Project for Nonlinear Science                    | 6700.3 |
| Vacant             | Administrative Officer                                         | 6702   |
| Dr. W. Manheimer   | Senior Scientist, Fundamental Plasma Processes                 | 6707   |
| Dr. M. Lampe       | Senior Scientist, Intense Particle Beams and Plasma Processing | 6709   |
| Dr. J. Davis       | Head, Radiation Hydrodynamics Branch                           | 6720   |
| Dr. S. Bodner      | Head, Laser Plasma Branch                                      | 6730   |
| Dr. R. Meger       | Head, Charged Particle Physics Branch                          | 6750   |
| Dr. G. Cooperstein | Head, Pulsed Power Physics Branch                              | 6770   |
| Dr. P. Sprangle    | Head, Beam Physics Branch                                      | 6790   |

**Point of contact:** Dr. V.L. Patel, Code 6701 (202) 767-2997

# Electronics Science and Technology Division

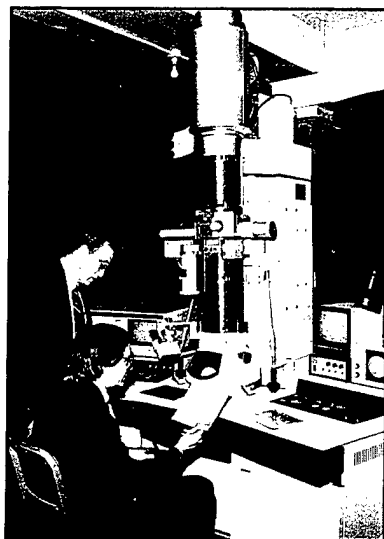
## Code 6800 Research Activity Areas

### Electronic Materials

- Preparation and development of magnetic, dielectric, optical, and semiconductor materials
- 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 and Interface Sciences

- Metal organic chemical vapor deposition
- Surface and interface physics
- Vacuum surface research
- Processing research for nanometric electronics
- Growth and characterization of surfaces and interfaces
- High-temperature superconductors



Scientists in the Electronics Science and Technology Division are developing semiconductor superlattice materials for state-of-the-art opto-electronic devices. Here a molecular beam epitaxy team is using a high resolution electron microscope to determine heteroepitaxial interface abruptness on an atomic level.

### Microwave Technology

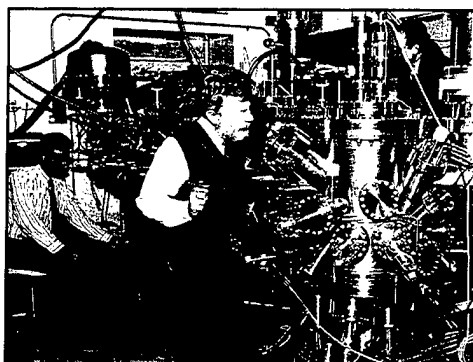
- Microwave, millimeter-wave, and submillimeter-wave component and circuit research
- Microwave and millimeter-wave integrated circuits
- Surface acoustic wave devices
- High-frequency device design, simulation, and fabrication
- Ion implantation technology
- Reliability and failure physics of electronic devices and circuits

### 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

### Vacuum Electronics

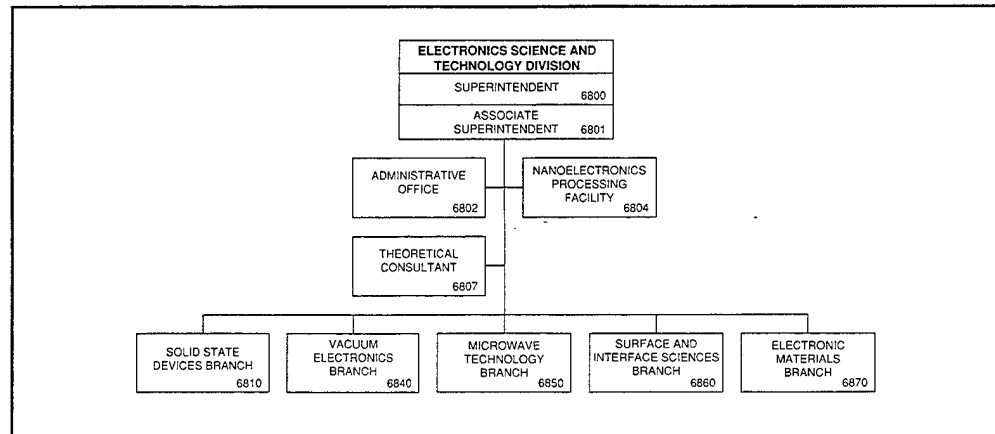
- Microwave and millimeter power amplifier research and development
- Cathode research and development
- Thermionic energy conversion
- Field emission arrays
- Vacuum electronic devices
- Tube fabrication and support technology



Silicon germanium molecular beam epitaxial growth for advanced microelectronic structures



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:** 148 full-time civilian

## Key Personnel

| Name               | Title                                       | Code |
|--------------------|---------------------------------------------|------|
| Dr. G.M. Borsuk    | Superintendent                              | 6800 |
| Dr. K. Slegger     | Associate Superintendent                    | 6801 |
| Ms. B. Fleming     | Administrative Officer                      | 6802 |
| Dr. C.R.K. Marrian | Head, Nanoelectronics Processing Facility   | 6804 |
| Dr. K.L. Ngai      | Theoretical Consultant                      | 6807 |
| Dr. J.M. Killiany  | Head, Solid State Devices Branch            | 6810 |
| Dr. R.K. Parker    | Head, Vacuum Electronics Branch             | 6840 |
| Dr. D. Webb        | Head, Microwave Technology Branch           | 6850 |
| Dr. M. Peckerar    | Head, Surface and Interface Sciences Branch | 6860 |
| Dr. N.D. Wilsey    | Head, Electronic Materials Branch           | 6870 |

**Point of contact:** Dr. K. Slegger, Code 6801 (202) 767-3894

# Center for Bio/Molecular Science and Engineering

## Code 6900 Research Activity Areas

### Biologically Derived Microstructures

Self-assembly, molecular machining  
Synthetic membranes, molecular printing  
Nanocomposites  
Tubulin  
Rhapsosomes  
Resilin

### Biosensors

Binding polypeptides  
Cell-based biosensor  
DNA biosensor  
Fiber optic biosensor  
Flow immunosensor

### Combat Casualty Care

Wound repair, angiogenic implants  
Liposome encapsulated hemoglobin  
Red cell lyophilization

### Environmental Quality

Antifouling paint, controlled release  
Polyurethane degradation  
Antisense DNA

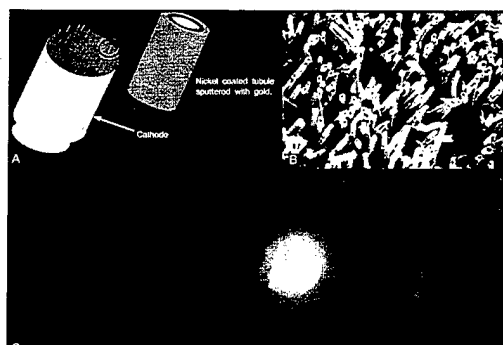
### Polymers and Liquid Crystals

Ferromagnetic liquid crystals  
Advanced materials/information processing

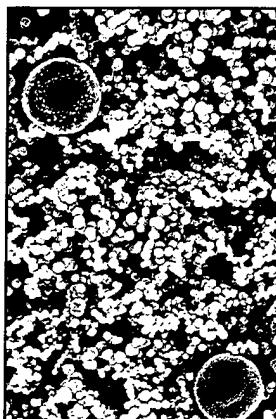
### Surfaces and Interfaces

Submicron resists and microlithography  
Specifically activated thin films  
Neuronal patterning

Center scientists looking at high  
resolution patterns



Tubule-based field emission. (A) Schematic of design for tubule-based field emitting cathode. (B) Electron micrograph of a tubule-based cathode. The total area of the emitting surface is  $\sim 0.75 \text{ cm}^2$ . (C) Photograph of the emission from tubule-based cathode. A phosphor plate intercepts the beam current and produces the image where emission nonuniformities are readily noted. For the conditions shown in the photograph, the phosphor response is nonlinear.

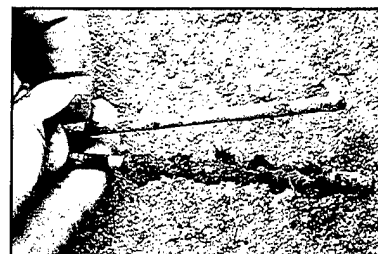


Liposomes containing hemoglobin (LEH) are small in comparison to human red cells. LEH is now manufactured in large scale and has been proven to carry oxygen effectively.



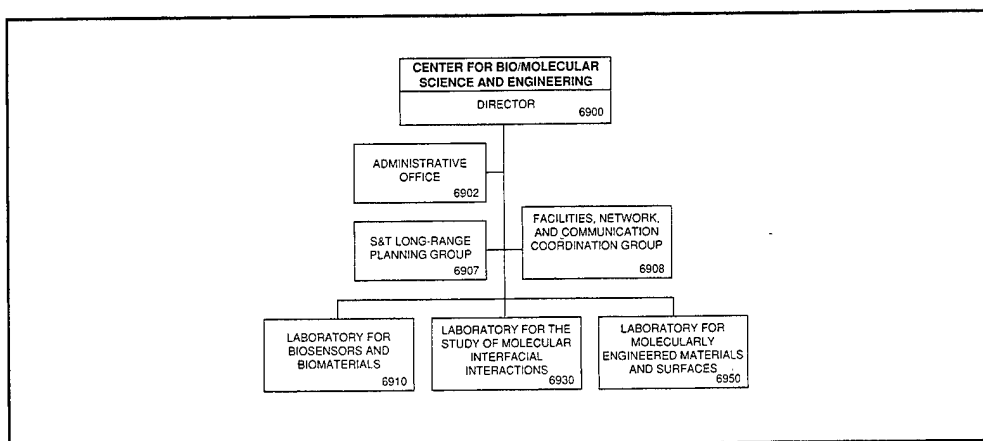
Biotechnology and advanced fiber optics have been married to create an ultra-sensitive chemical detection system. The fiber optic biosensor has proven to be usable for detection of pollutants, biological warfare agents, and diagnosis of infectious disease.

Self-assembled microstructures and novel controlled release techniques are being incorporated into antifouling paints for improved environmental quality





Dr. J.M. SCHNUR



## Basic Responsibilities

The Center for Bio/Molecular Science and Engineering is using the tools of modern biology, physics, chemistry, and engineering to develop advanced materials and sensors. The long-term research goal is to gain a fundamental understanding of the relationship between molecular architecture and the functioning of materials. The key theme is the study of complex bio/molecular systems with the aim of understanding how "nature" has approached the solution of difficult structural and sensing problems. Technological areas currently being studied include molecular and microstructure design, molecular biology, self-assembly, controlled release and encapsulation, and surface patterning and modification. Much of the research deals with the self-assembly of lipids, proteins, and liquid crystals into complex microstructures for use in advanced material applications, and the harnessing of the recognition functions of proteins and cells for the development of advanced sensors. A highly multidisciplinary staff is required in order to pursue these research and development programs. The Center provides a stimulating environment for cross disciplinary programs in the areas of immunology, biochemistry, electrochemistry, inorganic and polymer chemistry, microbiology, microlithography, photochemistry, biophysics, spectroscopy, advanced diagnostics, organic synthesis, and electrooptical engineering.

**Personnel:** 38 permanent civilian; 3 full-time military

## Key Personnel

| Name              | Title                                                          | Code |
|-------------------|----------------------------------------------------------------|------|
| Dr. J.M. Schnur   | Director                                                       | 6900 |
| Dr. F.S. Ligler   | Laboratory for Biosensors and Biomaterials                     | 6910 |
| Dr. B.P. Gaber    | Laboratory for the Study of Molecular Interfacial Interactions | 6930 |
| Dr. R. Shashidhar | Laboratory for Molecularly Engineered Materials and Surfaces   | 6950 |

**Point of contact:** Ms. L.M. Kondracki, Code 6902 (202) 404-6015

**Ocean and  
Atmospheric  
Science and  
Technology  
Directorate**

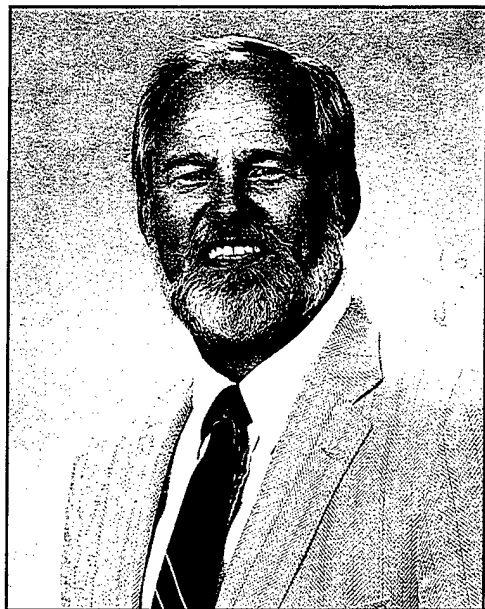
## **OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE**

### **Code 7000**

The Ocean and Atmospheric Science and Technology Directorate performs research in the fields of acoustics, remote sensing, oceanography, marine geosciences, marine meteorology, and space science. Areas of emphasis in acoustics include advanced acoustic concepts and computation, environmental acoustics, acoustic signal processing, physical acoustics, acoustic systems, ocean acoustics, and acoustic simulation and tactics. Areas of emphasis in remote sensing include radio, infrared, and optical sensors, remote sensing physics, imaging systems and research, and remote sensing applications. Areas of emphasis in oceanography include ocean dynamics and prediction, ocean sciences, small scale phenomenology, and ocean technology. Areas of emphasis in marine geosciences include marine physics, seafloor sciences, and mapping, charting, and geodesy. Areas

of emphasis in marine meteorology include prediction systems and forecast support. Areas of emphasis in space science include ultraviolet measurements, X-ray astronomy, upper atmospheric physics, gamma and cosmic rays, solar physics, and solar terrestrial relationships. Senior naval officers are assigned as military deputies to help maintain the directorate focus on operational Navy and other DoD requirements in these areas of emphasis. The directorate is responsible for administrative and technical support to major activities in Washington, DC, Stennis Space Center, Mississippi, and Monterey, California.

## Associate Director of Research for Ocean and Atmospheric Science and Technology Directorate



**D**r. E.O. Hartwig was born in Cincinnati, Ohio on November 22, 1946. He obtained his B.S. degree in biological sciences from the University of Texas at El Paso in 1968, and his Ph.D. from Scripps Institution of Oceanography in 1974. After completing his graduate studies, Dr. Hartwig accepted a position as a researcher at the Scottish Marine Biological Association (SMBA) in Oban, Scotland, where he established a sea-going experimental marine microbiological effort.

In 1975, Dr. Hartwig returned to the U.S., accepting a position at the Chesapeake Bay Institute of Johns Hopkins University. His shallow water research concentrated on the Chesapeake Bay and its outflow region, in active collaboration

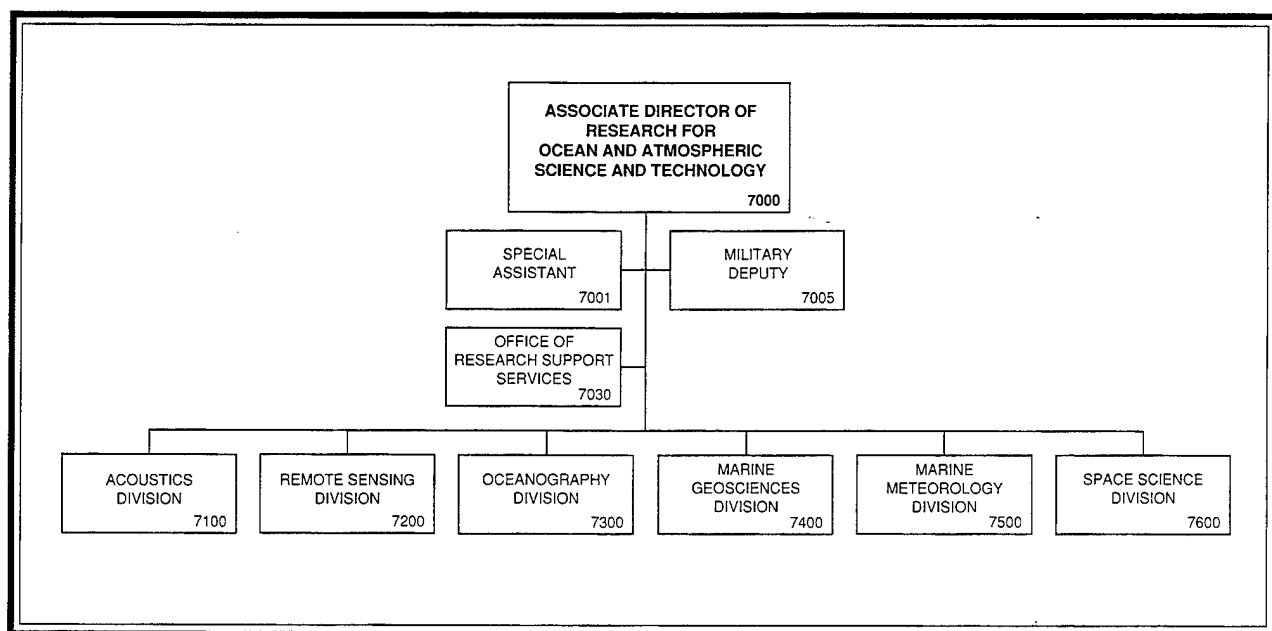
with many institutions and scientists. The efforts sought to understand the biological dynamics associated with the Bay's flow regimes, and studied the underlying water column and benthic biological processes resulting in the onset of the seasonal summer anoxia of the bay.

In 1978, Dr. Hartwig accepted a position at Marine Ecological Consultants (MEC), where his research centered on understanding the "before operations" environment at a nuclear generating station. In 1980, Dr. Hartwig accepted a position at the Lawrence Berkeley Laboratory (LBL) at the University of California at Berkeley to head up the biological component of a research team studying the concept of a proposed Ocean Thermal Energy Conversion (OTEC) plant. His work involved extensive interactions with engineers on the operating characteristics of the plant and physical oceanographers modeling flow regimes around the plant and to be generated by the plant.

Following his research at LBL, Dr. Hartwig joined the Office of Naval Research in 1982 as a scientific officer in the Oceanic Chemistry/Biology Program. When the program was split into an Oceanic Chemistry and Oceanic Biology Program, Dr. Hartwig became Program Manager of the Oceanic Biology Program. Here, Dr. Hartwig developed several major interdisciplinary research initiatives for the Navy.

In 1987, Dr. Hartwig was selected as Director of Ocean Sciences at ONR. He enhanced both university interactions with Ocean Sciences and the stature of ONR Ocean Science scientific officers and program managers in the Federal Government.

Dr. Hartwig joined NRL in October 1992 as Associate Director of Research for Ocean and Atmospheric Science and Technology.



### Key Personnel

| Name                 | Title                                                                           | Code |
|----------------------|---------------------------------------------------------------------------------|------|
| Dr. E.O. Hartwig     | Associate Director of Research for Ocean and Atmospheric Science and Technology | 7000 |
| Mrs. C.C. Thorowgood | Special Assistant                                                               | 7001 |
| CDR P. Ranelli       | Military Deputy                                                                 | 7005 |
| Mr. G.R. Bower       | Head, Office of Research Support Services                                       | 7030 |
| Dr. E.R. Franchi     | Superintendent, Acoustics Division                                              | 7100 |
| Dr. P. Schwartz*     | Superintendent, Remote Sensing Division                                         | 7200 |
| LCDR J.E. Curtis     | Military Deputy                                                                 | 7205 |
| Dr. W.B. Moseley     | Superintendent, Oceanography Division                                           | 7300 |
| CDR J.E. Johnson     | Military Deputy                                                                 | 7305 |
| Dr. H.C. Eppert, Jr. | Superintendent, Marine Geosciences Division                                     | 7400 |
| LCDR J.C. Church     | Military Deputy                                                                 | 7405 |
| Mr. S. Payne*        | Superintendent, Marine Meteorology Division                                     | 7500 |
| CDR R.G. Handlers    | Military Deputy                                                                 | 7505 |
| Dr. H. Gursky        | Superintendent, Space Science Division                                          | 7600 |

**Point of contact:** Mrs. Velma Stiverson, Code 7000A (202) 404-8174

\*Acting

# Office of Research Support Services

## Code 7030 Staff Activity Areas

### Command Support Branch

#### Security

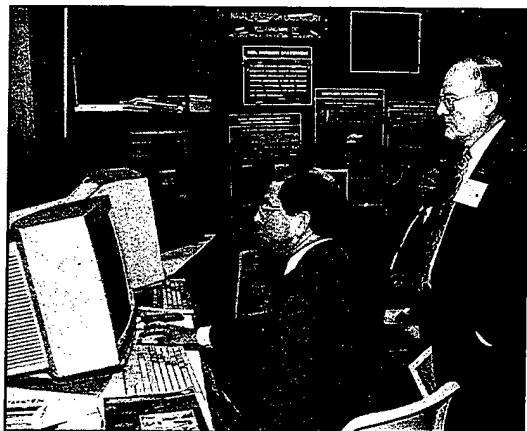
- Information security
- Physical security
- Industrial security
- AIS security
- Personnel security
- Classification
- SCIF management
- Security investigations

#### Public Affairs

- Community relations
- Exhibits
- News releases
- Information
- Conference coordination

#### Safety

- Industrial/laboratory safety
- Specialized safety training
- Hazard abatement
- Mishap prevention
- Hazardous materials program



The NRL SSC exhibit travels to scientific conferences/meetings throughout the United States, displaying NRL's latest research

### Technical Information Branch

- Scientific and technical information management
- Conference coordination, video teleconferencing
- Technical and classified library
- Technical editing, illustration, reproduction (color and b&w), printing
- Visual information, photographic services

### Operations Services Branch

- Freedom of Information Act
- Directives, reports, forms
- Shipment via FedEx and common carriers
- Mail management
- Navy message center
- Classified material control
- Facilities planning
- Vehicles

### Information Systems

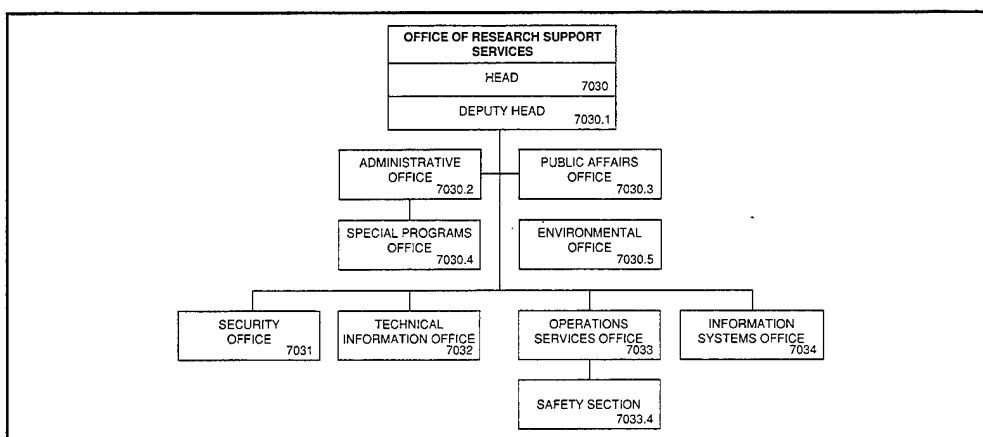
- Data communications
- Data networking
- Computer network maintenance
- Consulting and planning
- Supercomputing interface management
- Advanced communications testbed

### Special Programs

- Patents
- Licensing
- CRADA
- Technology Transfer
- AMP Summer Scholars
- IR&D



MR. G.R. BOWER



## Basic Responsibilities

The Office of Research Support Services is responsible for the operational and management support necessary for the day-to-day operations at NRL Stennis Space Center, Mississippi (NRL SSC). The Head of NRL SSC acts for the Commanding Officer in dealing with local naval, federal, and civil activities and personnel on matters relating to NRL SSC support activities and facilities, community, and multi-command issues, and safety and disaster control measures.

Support functions include security, public affairs, safety, information systems, and support services to include management and administration, facilities, technical information, and special programs (NSAP, STILO, Technology Transfer, etc.)

**Personnel:** 55 full-time civilian

## Key Personnel

| Name                 | Title                              | Code   |
|----------------------|------------------------------------|--------|
| Mr. G.R. Bower       | Head                               | 7030   |
| Mr. C.W. Mueller     | Deputy Head                        | 7030.1 |
| Mr. R.O. Dreifus     | Administrative Officer             | 7030.2 |
| Ms. B.P. Rotundo     | Head, Public Affairs Office        | 7030.3 |
| Mr. G.E. Stanford    | Head, Special Programs Office      | 7030.4 |
| Ms. D. Van Wyckhouse | Environmental Assistant            | 7030.5 |
| Mr. J.L. Carbonaro   | Head, Security Office              | 7031   |
| Ms. S.A. Liddell     | Head, Technical Information Office | 7032   |
| Mr. G.F. Foozer      | Head, Operations Services Office   | 7033   |
| Mr. A.W. Elkins      | Head, Safety Section               | 7033.4 |
| Mr. R.W. Burke       | Head, Information Systems Office   | 7034   |

**Point of contact:** Mr. G.R. Bower, Code 7030 (601) 688-4010

# Acoustics Division

## Code 7100 Staff Activity Areas

Special programs management  
System concepts and studies

*USN Journal of Underwater Acoustics*

## Research Activity Areas

### Acoustic Signal Processing

Geophysical inversion  
Airborne sensor systems  
Shallow water random media propagation  
Time angle spread of bottom interacting signals  
Ambient noise decomposition and modeling  
Shallow water acoustic surveillance methods  
Matched field processing and inversion  
Arctic acoustic systems

### Physical Acoustics

Structural acoustics  
Reflection, diffraction, scattering by bodies  
Target strength modeling  
Fiber-optic acoustic sensors  
Acoustics of coatings  
Hydrodynamic/acoustic interaction with elastic bodies

### Acoustic Systems

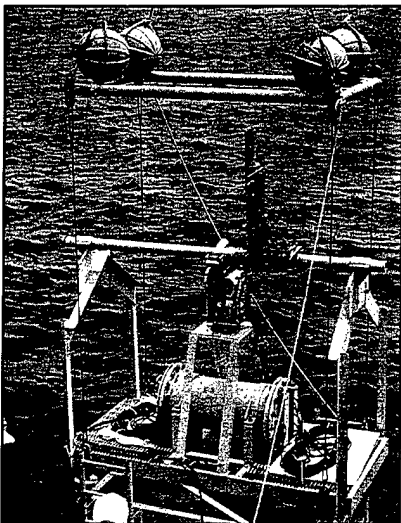
Propagation, coherence, and wave-front behavior  
Large-scale spatial and temporal integration  
Low-frequency monostatic and multistatic reverberation  
Shallow-water active acoustic surveillance  
Models of signal and noise fields  
Sensor fusion  
Ocean tomography  
Noise cancellation

### Ocean Acoustics

Arctic environmental acoustics  
Shallow-water acoustics  
Environmental impact on acoustic transients  
High-frequency acoustics  
Biologic volume reverberation  
Seafloor scattering  
Ambient noise measurements and models

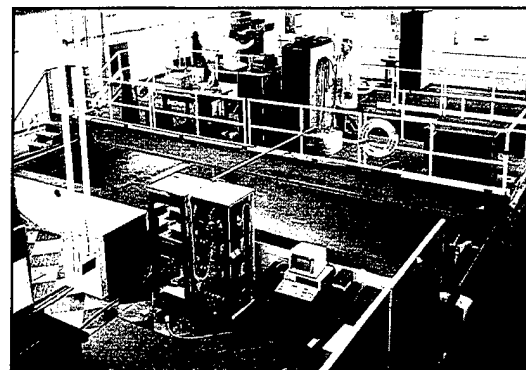
### Acoustic Simulation and Tactics

Seismo-acoustic wave propagation  
Stochastic propagation and noise models  
Simulations  
Environmental assessments  
Very-low frequency acoustics  
Tactical decision aids



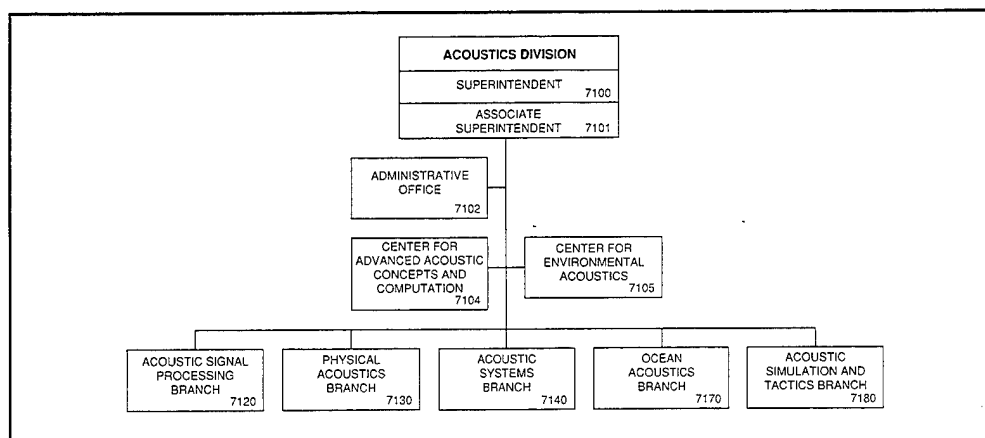
Deployment of high frequency  
acoustics tower

Structural acoustics studies  
in the instrumented  
NRL pool facility





Dr. E.R. FRANCHI



## Basic Responsibilities

The Acoustics Division conducts basic and applied research in undersea physics. 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; structural acoustics; large area assessment techniques; and development of processing systems and techniques. Also included are basic and applied research in simulations and tactics as influenced by the environment. The Division program is interactive with the ONR Contract Research Program and other research laboratories, both U.S. and foreign.

**Personnel:** 141 full-time civilian

## Key Personnel

| Name                | Title                                        | Code |
|---------------------|----------------------------------------------|------|
| Dr. E.R. Franchi    | Superintendent                               | 7100 |
| Vacant              | Associate Superintendent                     | 7101 |
| Mrs. N.J. Beauchamp | Administrative Officer                       | 7102 |
| Dr. E.R. Franchi    | Director, Center for Environmental Acoustics | 7105 |
| Dr. M.H. Orr        | Head, Acoustic Signal Processing Branch      | 7120 |
| Dr. J.A. Bucaro     | Head, Physical Acoustics Branch              | 7130 |
| Mr. L.B. Palmer     | Head, Acoustic Systems Branch                | 7140 |
| Dr. D.J. Ramsdale   | Head, Ocean Acoustics Branch                 | 7170 |
| Dr. S.A. Chin-Bing* | Head, Acoustic Simulation and Tactics Branch | 7180 |

**Point of contact:** Dr. E.R. Franchi, Code 7100 (202) 767-3482

\*Acting

# Remote Sensing Division

## Code 7200 Research Activity Areas

### Remote Sensing

#### Sensors

- SAR
- Imaging RAR
- Passive microwave imagers
- CCDs and focal plane arrays
- Fabry-Perot spectrometers
- Imaging spectrometers
- Optical interferometers
- Spaceborne and airborne systems

#### Areas

- Radiative transfer modeling
- Coastal oceans
- Marine ocean boundary layer
- Polar ice
- Middle atmosphere
- Ionosphere and space environment
- Global ocean phenomenology
- Environmental change

### Astrophysics

- Optical interferometry
- Radio interferometry
- Fundamental astrometry and reference frames
- Star formation
- Stellar atmospheres and envelopes
- Interstellar medium, interstellar scattering
- Pulsars
- Galactic structure and activity

### Physics of Atmospheric/Ocean Interaction

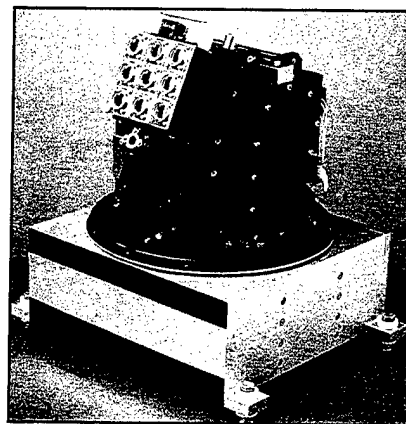
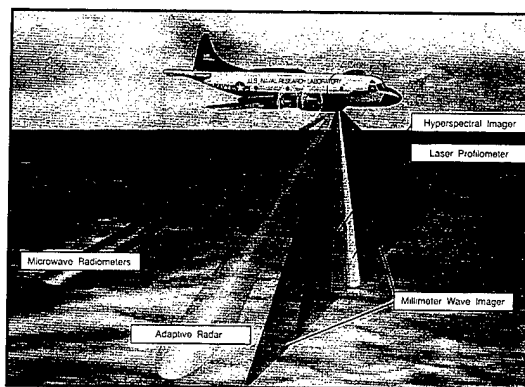
- Mesoscale, fine-structure, and microstructure
- Aerosol and cloud physics
- Mixed layer and thermocline applications
- Sea-truth towed instrumentation techniques
- Turbulent jets and wakes
- Nonlinear and breaking ocean waves
- Stratified and rotating flows
- Turbulence modeling
- Boundary layer hydrodynamics
- Marine hydrodynamics
- Computational hydrodynamics

### Imaging Research/System

- Remotely sensed signatures analysis/simulation
- Real-time signal and image processing algorithm/systems
- Image data compression methodology
- Image fusion
- Automatic target recognition
- Scene/sensor noise characterization
- Image enhancement/noise reduction
- Scene classification techniques
- Radar and laser imaging systems studies
- Coherent/incoherent imaging sensor exploitation
- Numerical modeling simulation
- Environmental imagery analysis

No single sensor characterizes the environmental problem. Responsive Airborne Sensor Testbed for Environmental Research - Joint Program (RASTER-J) is a program to demonstrate the utility of fusing data from a multi-sensor airborne platform. Such a platform could provide

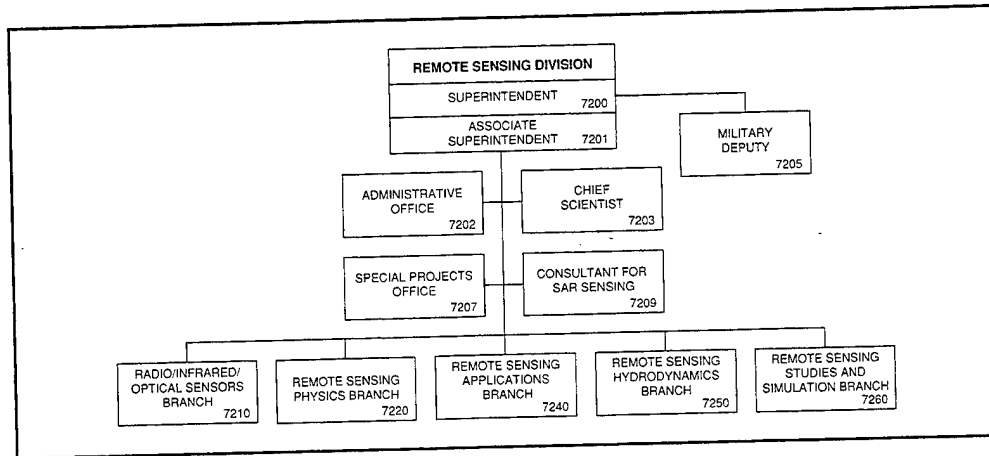
rapid response in evaluating and solving environmental emergencies. Potential applications are global climate change, pollution prevention, compliance, conservation, installation restoration, and technology transfer.



Optical Head Assembly (OHA) of the Polar Ozone and Aerosol Measurement (POAM-II) experiment payload



DR. P.R. SCHWARTZ



## Basic Responsibilities

The Remote Sensing Division conducts a program of basic research, science, and applications aimed at the development of new concepts for sensors and imaging systems for objects and targets on the Earth and in the near-Earth environment, as well as in deep space. The research, both theoretical and experimental, deals with discovering and understanding the basic physical principles and mechanisms that give rise to the background environmental emission and targets of interest and to absorption and emission mechanisms of the intervening medium. The accomplishment of this research requires the development of sensor systems technology. The development effort includes active and passive sensor systems to be used for the study and analysis of the physical characteristics of phenomena that give rise to naturally occurring background radiation, such as that caused by the Earth's atmosphere and oceans, as well as man-made or induced phenomena such as ship/submarine hydrodynamic effects. The research includes theory, laboratory, and field experiments leading to ground-based, airborne or space systems for use in such areas as remote sensing, astrometry, astrophysics, surveillance, nonacoustic ASW, and improved meteorological support systems for the operational Navy. Special emphasis is given to developing space-based platforms and exploiting existing space systems.

**Personnel:** 117 full-time civilian

## Key Personnel

| Name                | Title                                       | Code |
|---------------------|---------------------------------------------|------|
| Dr. P.R. Schwartz*  | Superintendent                              | 7200 |
| Mr. G.W. Hoskins    | Associate Superintendent                    | 7201 |
| Mrs. M.K. Smith     | Administrative Officer                      | 7202 |
| LCDR J.E. Curtis    | Military Deputy                             | 7205 |
| Dr. D.T. Chen       | Special Projects Office                     | 7207 |
| Dr. S.A. Mango      | Consultant for SAR Sensing                  | 7209 |
| Dr. L.J. Rickard    | Head, Radio/Infrared/Optical Sensors Branch | 7210 |
| Dr. P.R. Schwartz   | Head, Remote Sensing Physics Branch         | 7220 |
| Mr. A.E. Pressman   | Head, Remote Sensing Applications Branch    | 7240 |
| Dr. R. Mied         | Head, Remote Sensing Hydrodynamics Branch   | 7250 |
| Dr. G.A. Keramidas* | Head, Studies and Simulation Branch         | 7260 |

**Point of contact:** Dr. P.R. Schwartz, Code 7200 (202) 767-2351

\*Acting

# Oceanography Division

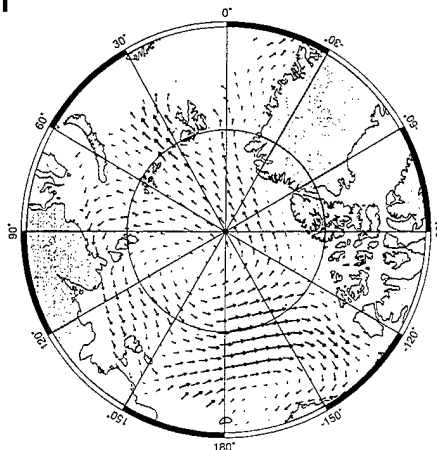
## Code 7300 Staff Activity Areas

Special studies

## Research Activity Areas

### Ocean Dynamics and Prediction

- Ocean prediction
  - Large scale
  - Arctic
  - Shipboard
  - Data assimilation
  - Coastal and semi-enclosed sea
- Ocean observing system simulation
- Coastal scene generation

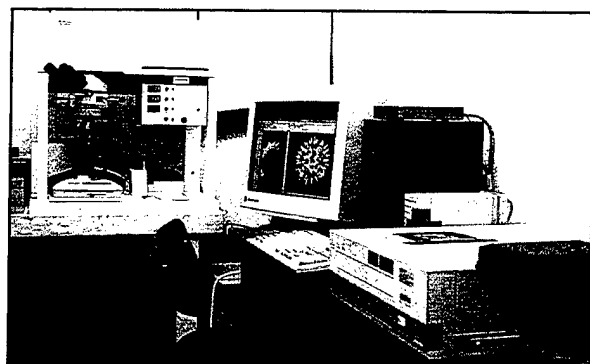
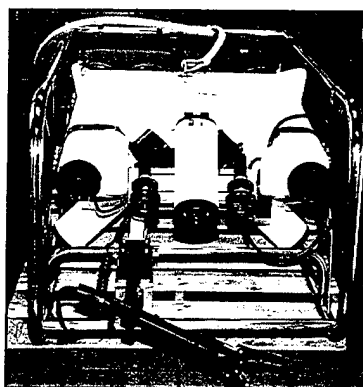


Prediction of polar ice drift for July 15, 1992 by the NRL PiPs Model (polar ice prediction)

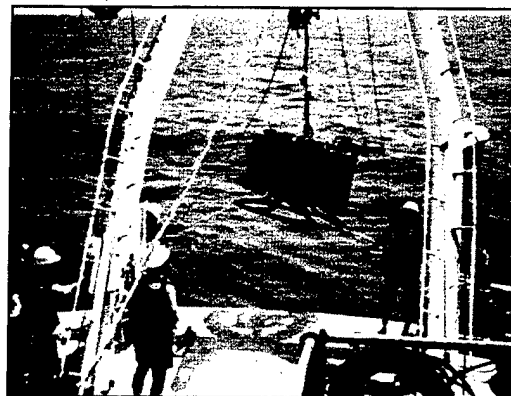
### Ocean Sciences

- Mesoscale dynamics
- Coupled systems
  - Air sea interaction
  - Biodynamics
  - Bio-optical models
- Small scale dynamics
  - Small scale turbulence
  - Bubbles/waves
  - Optics

The Ocean Sciences Branch remotely operated underwater vehicle



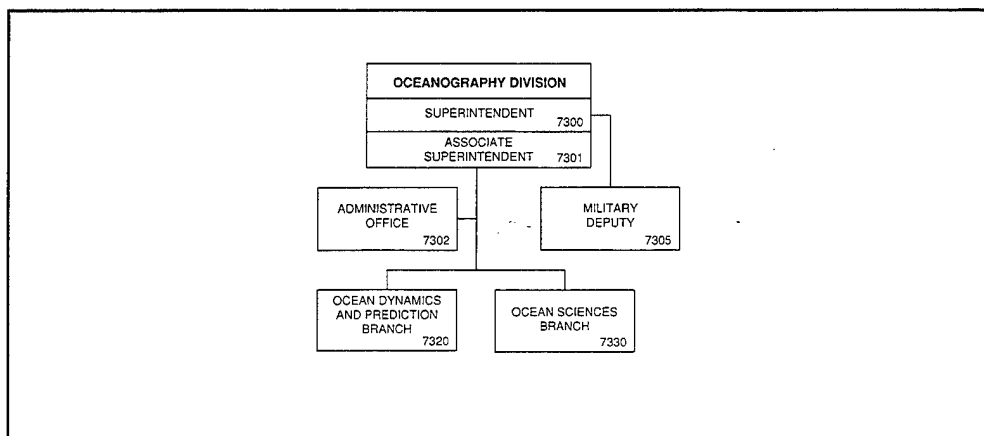
The Ocean Sciences Branch confocal laser scanning microscope used in studies of microbiologically influenced corrosion and material degradation



The Ocean Sciences Branch optical sensor and water sampling bottles being deployed



DR. W.B. MOSELEY



## Basic Responsibilities

The Oceanography Division conducts basic and applied research in biological, chemical, dynamical, and physical processes of the ocean and marine boundary layer, and ocean engineering efforts in deployable environmental data acquisition and processing systems. The oceanographic research is both theoretical and experimental in nature and is focused on understanding ocean hydro/thermodynamics, ocean circulation, ice dynamics, air-sea exchanges, ocean optics, small- and micro-scale turbulence, bioluminescence, and microbially induced corrosion. The Division programs are designed to be responsive to, and to anticipate, naval needs. Key to this is extensive interaction with the Warfare Centers, CNO, and the Fleet and substantial participation in Navy R&D planning groups. Transition of Division products to system developers and the operational Navy is a primary goal. The Division program is coordinated and interactive with other NRL programs and activities, ONR's Research Program Department, and other government agencies involved in oceanographic activities. The Division collaborates and cooperates with scientists from the academic community and other U.S. and foreign laboratories.

**Personnel:** 74 full-time civilian; 1 full-time military

## Key Personnel

| Name               | Title                                      | Code |
|--------------------|--------------------------------------------|------|
| Dr. W.B. Moseley   | Superintendent                             | 7300 |
| Dr. E.M. Stanley   | Associate Superintendent                   | 7301 |
| Mrs. Iris DeSpain  | Administrative Officer                     | 7302 |
| CDR J.E. Johnson   | Military Deputy                            | 7305 |
| Dr. J.W. McCaffrey | Head, Ocean Dynamics and Prediction Branch | 7320 |
| Dr. A.W. Green     | Head, Ocean Sciences Branch                | 7330 |

**Point of contact:** Mrs. Iris DeSpain, Code 7302 (601) 688-4114

# Marine Geosciences Division

## Code 7400 Research Activity Areas

### Marine Geology

- Sedimentary processes
- Pore fluid flow
- Diapirism, volcanism, faulting, mass movement
- Sediment geochemistry

### Marine Geophysics

- Seismic wave propagation
- Earthquake seismology
- Physics of low-frequency acoustic propagation
- Acoustic energy interaction with topography and inhomogeneities
- Detection, localization, and characterization of events
- Geomagnetic modeling

### Marine Geotechnique

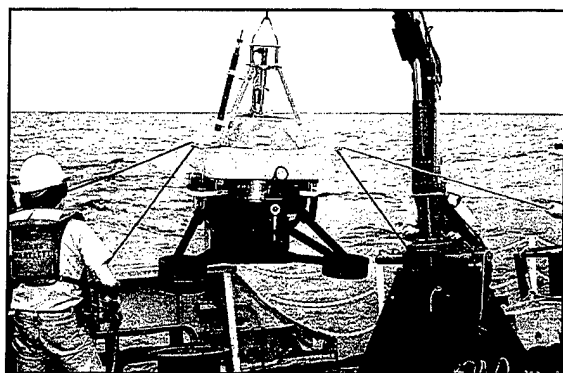
- Sediment classification
- Sediment microfabric
- Geoacoustic modeling
- Geotechnical properties of sediments

### Mapping and Charting

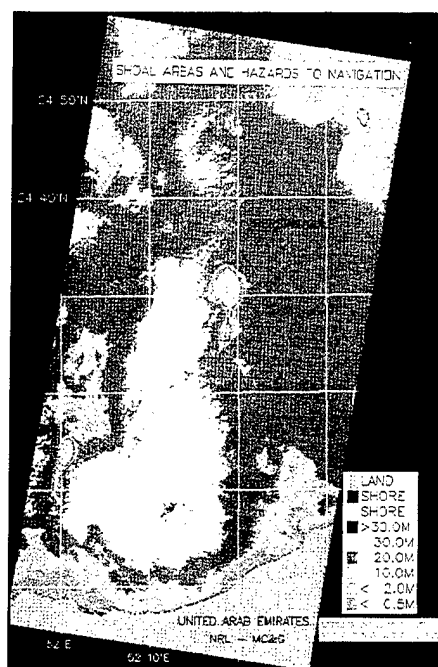
- Digital database design
- Digital product analysis and standardization
- Data compression techniques and exploitation
- Hydrographic survey techniques
- Bathymetry extraction techniques from remote and acoustic imagery
- Utility software development for digital mapping databases

### In situ and Laboratory Sensors

- High-resolution subseafloor 2-D and 3-D seismic imaging
- Swath acoustic backscatter imaging
- Sediment pore water pressure
- Compressional and shear wave velocity
- Airborne electromagnetics
- Seafloor magnetic fluctuation
- Sediment microfabric change with pore fluid change



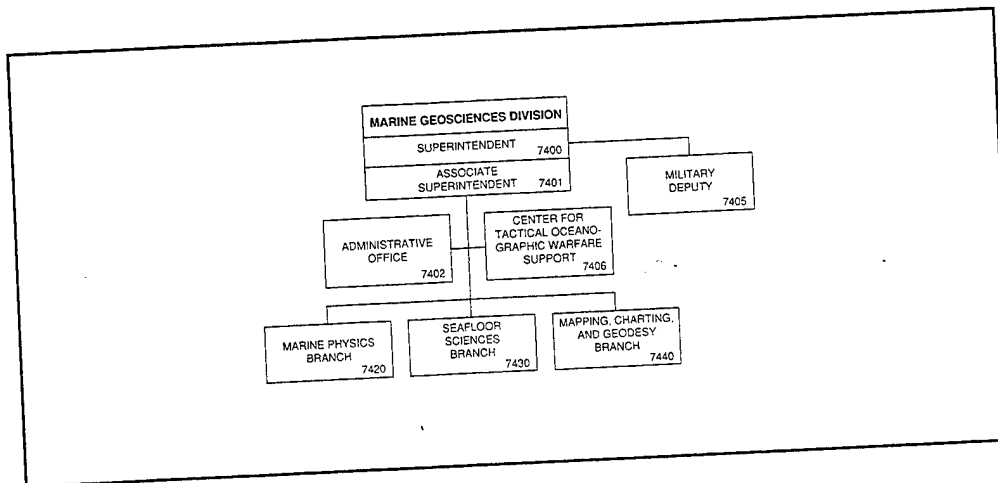
Ocean bottom seismometer being deployed



Remotely sensed shoal detection and remote bathymetry



DR. H.C. EPPERT, JR.



## Basic Responsibilities

The Marine Geosciences Division has responsibility for planning and executing a broad spectrum research, development, technology and engineering program in marine geology, geophysics, geoacoustics, geotechniques, and mapping, charting, and geodesy (MC&G). The program is designed to provide necessary digital databases, geoacoustic and geophysical models, and simulations to support training, system design, performance prediction, and operational needs of the Navy.

The applied portion of the program is directed toward (1) quantitatively predicting the effects of the seafloor and associated geophysical, geomorphological, and geoacoustic variability on performance of present and emerging naval systems, operations, and plans, and (2) developing technology and techniques to rapidly acquire, process, and analyze MC&G (gravity, magnetics, and bathymetry) and other types of geological, geophysical, and geoacoustic information to meet existing digital database requirements of the Chief of Naval Operations (CNO), Defense Mapping Agency (DMA), and system commands.

The Division serves as the focal point in the Navy and Marine Corps for assessing and identifying MC&G requirements, including prototype digital MC&G products and product coordination. The program is keyed to and responsive to priorities identified by NRL, Office of Naval Research, CNO, the System Commands, and DMA. Close coordination and interaction with the Warfare Centers is essential to the success of this program with transition of Division products to system developers and the operational Navy a primary goal. The Division program is coordinated and interactive with other NRL programs and activities, ONR's Research Program Department, NOAA, USGS, NSF, and other government agencies involved in seafloor activities. The Division collaborates and cooperates with scientists from the academic community, other U.S. and foreign laboratories, and industry.

**Personnel:** 99 full-time civilian; 4 full-time military

## Key Personnel

| Name                 | Title                                                   | Code |
|----------------------|---------------------------------------------------------|------|
| Dr. H.C. Eppert, Jr. | Superintendent                                          | 7400 |
| Dr. P.J. Valent      | Associate Superintendent                                | 7401 |
| Mr. F.H. Conner      | Administrative Officer                                  | 7402 |
| LCDR J.C. Church     | Military Deputy                                         | 7405 |
| Mr. K.M. Ferer       | Head, Center for Tactical Oceanographic Warfare Support | 7406 |
| Mr. H.S. Fleming     | Head, Marine Physics Branch                             | 7420 |
| Mr. S.G. Tooma       | Head, Seafloor Sciences Branch                          | 7430 |
| Mr. M.M. Harris      | Head, Mapping, Charting, and Geodesy Branch             | 7440 |

**Point of contact:** Mr. F.H. Conner, Code 7402 (601) 688-4660

# Marine Meteorology Division

## Code 7500 Staff Activity Areas

Project Reliance  
Program management

## Research Activity Areas

### Numerical Weather Prediction

- Global
- Regional
- Large eddy simulation
- Boundary layer
- Coastal
- Massively parallel computing
- Coupled ocean/atmosphere
- Arctic leads
- Tropical cyclones

### Data Assimilation

- Optimum interpolation
- Objective analysis
- Quality control
- Synthetic soundings
- Remotely sensed data

### Shipboard Support

- Port studies
- Typhoon havens
- Forecaster handbooks
- Expert systems
- CD-ROMs

### Satellite Data/Imagery

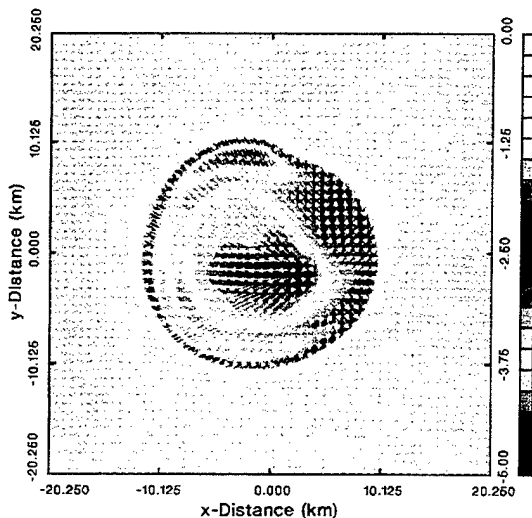
- Cloud classification
- Visual interpretation
- Case study development
- Automated interpretation
- Aerosols

### Tactical Systems

- Tactical Environmental Support System
- Data fusion
- Visualization

### Decision Aids

- Refractivity
- Strike warfare
- Ship routing
- Fog/turbulence/icing
- Electro-optical



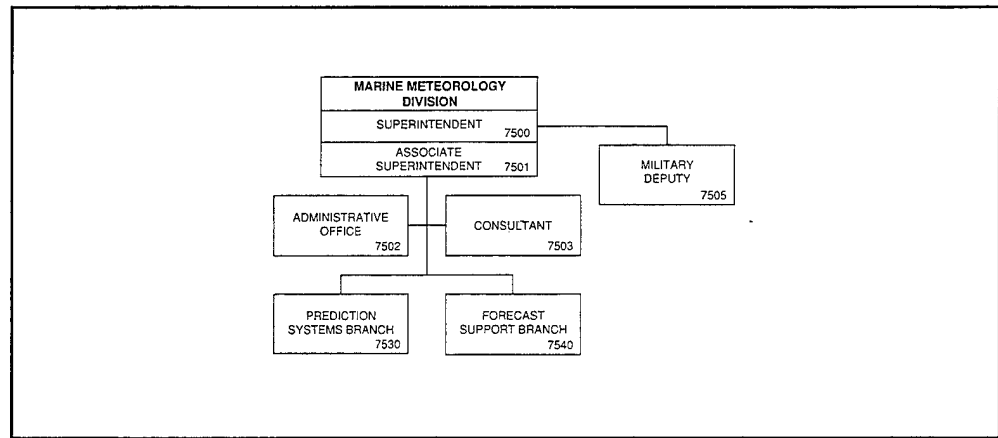
Computer simulation of near-surface temperature changes under a mature convective cloud; arrows represent wind direction and speed, and show expansion of cold pool of air. (Original color output displays 21 color gradations in blue-green-yellow-red.)

Computer prediction of coastal and overwater winds and buoyant instability with verifying wind observations (dark-stable, light-neutral, clear-unstable)





Mr. S.W. PAYNE



## Basic Responsibilities

The Marine Meteorology Division conducts basic and applied research in meteorology. Basic research includes work in air-sea interaction process studies, ocean-atmosphere teleconnections, and arctic studies. Applied research spans the gamut from development of both central-site and shipboard forecast models and aids, to the development of tactical aids for operations or weapons systems. NRL-Monterey (NRL-MRY) is co-located with the Fleet Numerical Meteorology and Oceanography Center (FNMOC) and has developed and transitioned to FNMOC the global and regional forecast models that form the backbone of the Navy's world-wide weather forecasting capability. In addition, NRL-MRY is lead laboratory for the third phase of the Tactical Environmental Support System, a shipboard-based environmental diagnosis/forecast system. Specialties of the Division include numerical weather prediction, data assimilation and quality control, environmental decision aids, data base management, and satellite imagery interpretation.

**Personnel:** 63 full-time civilian; 1 full-time military

## Key Personnel

| Name              | Title                           | Code |
|-------------------|---------------------------------|------|
| Mr. S.W. Payne*   | Superintendent                  | 7500 |
| Mr. S.W. Payne    | Associate Superintendent        | 7501 |
| Vacant            | Administrative Officer          | 7502 |
| CDR R.G. Handlers | Military Deputy                 | 7505 |
| Dr. S.W. Chang    | Head, Prediction Systems Branch | 7530 |
| Dr. T.L. Tsui     | Head, Forecast Support Branch   | 7540 |

**Point of contact:** Mr. S.W. Payne, Code 7500 (408) 656-4721; DSN 878-4721

\*Acting

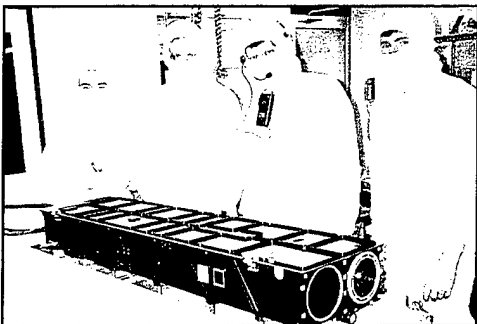
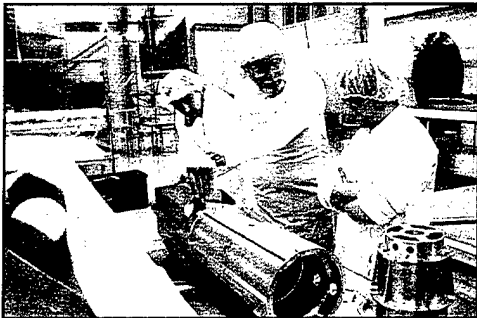
# Space Science Division

## Code 7600 Research Activity Areas

### Space Weather and Atmospheric Physics

Remote sensing of the ionosphere and thermosphere  
Middle atmospheric investigations  
Global modeling  
Upper atmospheric physics  
Space astronomy  
X-ray observation, analysis, and theory of space astronomical sources  
Ultraviolet astronomy  
Gamma-ray astrophysics, solar-flare gamma rays, and space cosmic ray particle environment

NRL engineer works with Belgian colleagues on the Extreme Ultraviolet Imaging Telescope (EIT). EIT will picture the sun's inner corona from the ESA/NASA Solar and Heliospheric Observatory (SOHO).



French and English colleagues assist NRL scientists preparing the LASCO wide-field coronagraph for flight on SOHO

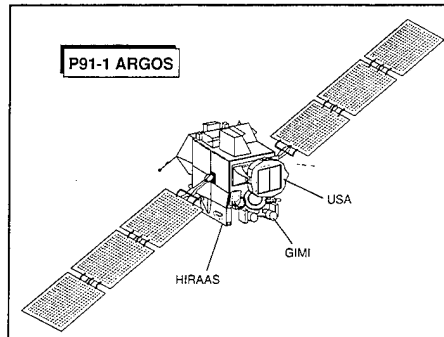
### Solar Physics

Solar ultraviolet and visible light spectroscopy and photometry from rockets, satellites, and the Space Shuttle

### Solar-Terrestrial Relationships

Solar X-ray/EUV plasma diagnostics; coronal effects on Earth

Three Space Science Division experiments will fly on the Air Force STP ARGOS satellite in 1996. HIRAAS contains three ultraviolet spectroscopic instruments to study the earth's thermosphere and ionosphere. GIMI consists of two electronic imaging cameras tuned to different EUV/FUV wavelength bands to obtain global data on the upper atmosphere as well as stars. USA is an X-ray timing and navigation experiment



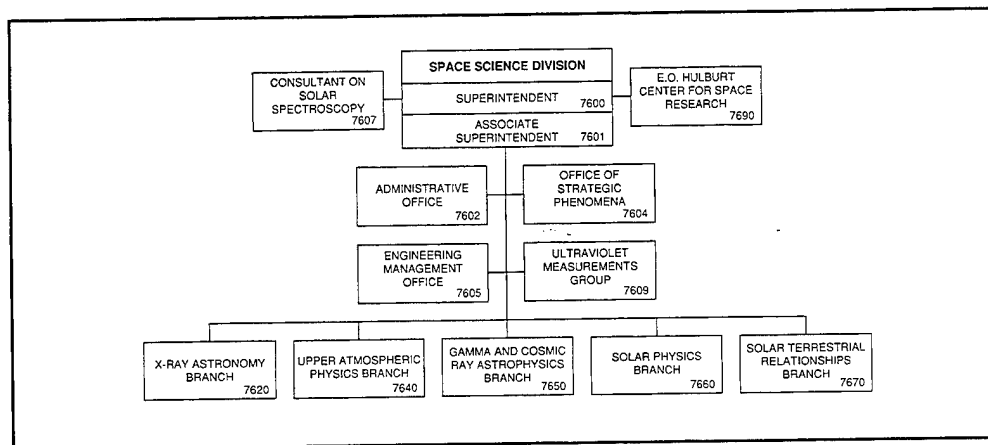
that will investigate the use of exotic astrophysical objects for autonomous time and position measurements.



The Middle Atmosphere High Resolution Spectrograph Investigation (MAHRSI) is an ultraviolet spectroscopy experiment developed in the Space Science Division as a Space Shuttle deployed payload. On Shuttle flight STS-66 in November 1994, MAHRSI provided the first global maps of hydroxyl (OH) and measured the gases in the middle atmosphere (35-120 kilometers) that control the global distribution of ozone.



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. Research results are of importance to radio communications, to use of the space environment, to weather prediction, and to the 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:** 121 full-time civilian

## Key Personnel

| Name                | Title                                                              | Code |
|---------------------|--------------------------------------------------------------------|------|
| Dr. H. Gursky       | Superintendent                                                     | 7600 |
| Dr. R.G. Groshans   | Associate Superintendent                                           | 7601 |
| Mrs. B.M. Shea      | Administrative Officer                                             | 7602 |
| Dr. H.M. Heckathorn | Director, Office of Strategic Phenomena                            | 7604 |
| Mr. J. Vrancik      | Engineering Management Officer                                     | 7605 |
| Dr. G. Carruthers   | Head, Ultraviolet Measurements Group                               | 7609 |
| Mr. G.G. Fritz      | Head, X-Ray Astronomy Branch                                       | 7620 |
| Dr. R.R. Meier      | Head, Upper Atmospheric Physics Branch                             | 7640 |
| Dr. J.D. Kurfess    | Head, Gamma and Cosmic Ray Astrophysics Branch                     | 7650 |
| Dr. G.E. Brueckner  | Head, Solar Physics Branch                                         | 7660 |
| Dr. G.A. Doschek    | Head, Solar Terrestrial Relationships Branch                       | 7670 |
| Dr. H. Gursky*      | Chief Scientist, E.O. Hulburt Center for Space Research            | 7690 |
| Dr. H. Friedman     | Chief Scientist (Emeritus), E.O. Hulburt Center for Space Research | 7690 |

**Point of contact:** Mrs. B.M. Shea, Code 7602 (202) 767-3631

\*Additional duty

**Naval Center  
for Space  
Technology**

## NAVAL CENTER FOR SPACE TECHNOLOGY

Code 8000

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 operational 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.

## Director of Naval Center for Space Technology

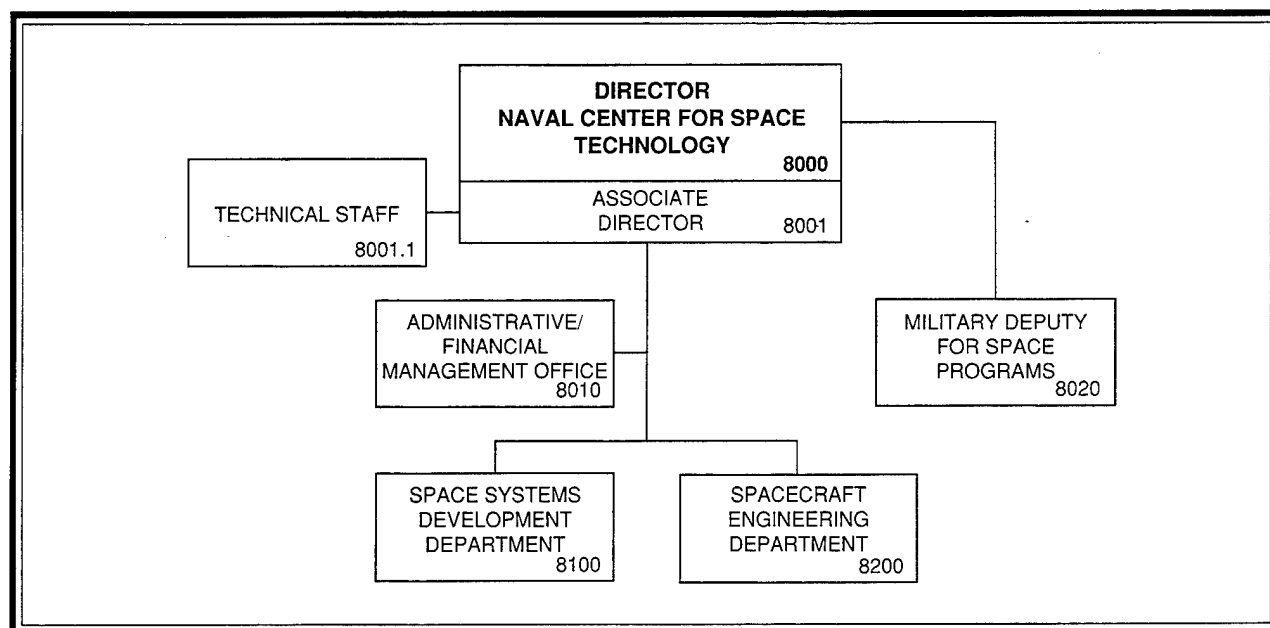


**M**r. P.G. Wilhelm was born in New York City on July 26, 1935. He attended Purdue University, where he received a B.S.E.E. degree in 1957. By 1961, he had completed all the course work for an M.S.E. degree from George Washington University.

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 82 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, the NRL E.O. Hulburt Annual Science and Engineering Award, the Dexter Conrad Award, and the Rotary National Stellar Award. He also has been elected a Fellow of the Washington Academy of Sciences and a 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                                   | 8001 |
| Mrs. L.T. McDonald  | Head, Administrative/Financial Management Office     | 8010 |
| Vacant              | Military Deputy for Space Programs                   | 8020 |
| Mr. R.E. Eisenhower | Superintendent, Space Systems Development Department | 8100 |
| Mr. H.E. Senasack*  | Superintendent, Spacecraft Engineering Department    | 8200 |

**Point of contact:** Mr. F.V. Hellrich, Code 8001 (202) 767-6549

\*Acting

# Space Systems Development Department

## Code 8100 Research Activity Areas

### Advanced Space Systems Technologies

- Space systems architectures and requirements
- Advanced payloads and optical systems
- Controllers, processors, and signal processing
- Data management systems and equipment
- Embedded algorithms and software

### Astrodynamics

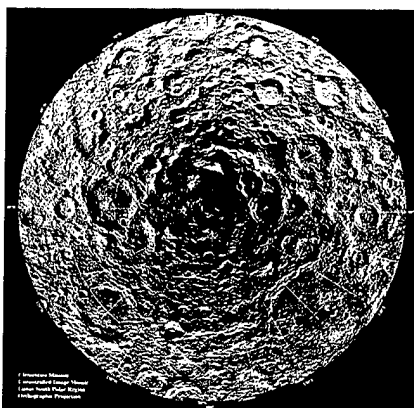
- Mathematical modeling, algorithms, and simulations
- Astrodynamics and attitude dynamics

### Command, Control, Communications, Computers, and Intelligence

- Communications theory and systems
- Tracking, telemetry, and control systems
- Spacecraft test systems and satellite simulators
- Antenna systems
- High-speed fixed and mobile ground data collection, processing, and dissemination systems
- Tactical communication systems

### Space Electronic Systems Development

- Detailed electrical/electronic design
- Space systems fabrication, test, and integration
- Launch and on orbit support
- Test equipment and ground support equipment



A mosaic covering the Moon's south polar region with 200 meter resolution was assembled by the U.S. Geological Survey from over 1500 Clementine images. These images provide better resolution than previously available for the Moon's higher latitude regions and for most of its far side. Similar mosaics for the entire lunar surface can be assembled. The Clementine images provide the first opportunity not only to

determine precise relative locations for all resolvable features on the lunar surface, but also to define an accurate, absolute reference grid for the entire lunar surface. The Clementine Program was sponsored by the Ballistic Missile Defense Organization and managed by the Naval Center for Space Technology. The spacecraft was designed, built, and operated by NCST.

### Space Electronic Warfare

- Design criteria for counter-surveillance and counter-targeting
- Data search, analysis, and synthesis of information related to special sensor performance

### Space Mission Development

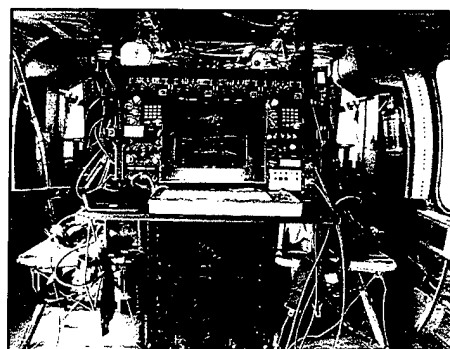
- Mission development and requirements definition
- Systems engineering and analysis
- Concepts of operations and mission simulations
- Mission evaluation and performance assessments

### Space Surveillance, Navigation and Time

- Advanced navigation satellite technology
- Precise Time and Time Interval (PTTI) technology
- Atomic time/frequency standards/instrumentation
- Passive and active ranging techniques
- Detection and precision tracking of orbiting objects from space and ground

### Ballistic Missile Defense

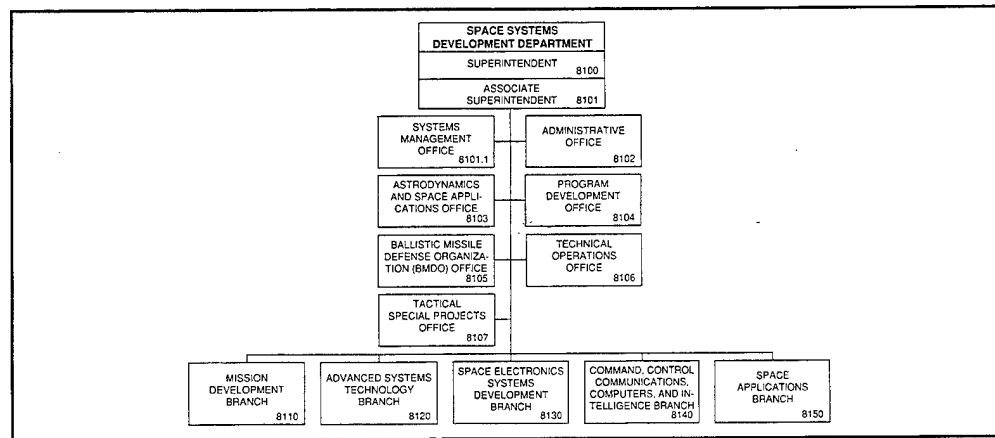
- Flight experiments, satellites, and ground stations for space-based defense initiatives



The Army Airborne Command and Control System (A2C2S), shown here installed in a U.S. Army UH60 helicopter, is a transportable console, capable of simultaneously receiving and processing intelligence reports from various broadcasts and fusing these with imagery from JSTARS, FLIRS, and digital cameras. The console allows for tactical data links connectivity to many ground and airborne platforms providing the tactical user with the flexibility to operate in all tactical environments without additional equipment. The console, developed by Code 8140, was sponsored by Army Aviation and tested at Desert Hammer 6, NTC-94-7.



Mr. R.E. Eisenhauer



## Basic Responsibilities

The Space Systems Development Department (SSDD) is the space and ground support systems research and development organization of the Naval Center for Space Technology. The primary objective of the SSDD is to develop space systems to respond to Navy, DoD, and national mission requirements with improved performance, capacity, reliability, efficiency, and/or life cycle cost. The Department must derive system requirements from the mission, develop architectures in response to these requirements, and design and develop systems, subsystems, equipment, and implementation technologies to achieve the optimized, integrated operational space and ground system. These development responsibilities extend across the entire space/ground spectrum of hardware, software, and advanced technologies, including digital processing and control, analog systems, power, communications, command and telemetry, radio frequency, optical, payload, and electromechanical systems, as well as systems engineering.

**Personnel:** 275 full-time civilian

## Key Personnel

| Name                | Title                                                                      | Code   |
|---------------------|----------------------------------------------------------------------------|--------|
| Mr. R.E. Eisenhauer | Superintendent                                                             | 8100   |
| Mr. F.E. Betz       | Associate Superintendent                                                   | 8101   |
| Mr. M.T. Powell     | Head, Systems Management Office                                            | 8101.1 |
| Ms. D.L. Elliott    | Administrative Officer                                                     | 8102   |
| Mr. B. Kaufman      | Head, Astrodynamics and Space Applications Office                          | 8103   |
| Mr. B.J. Lamb       | Head, Program Development Office                                           | 8104   |
| Mr. R. Perram       | Head, Ballistic Missile Defense Organization                               | 8105   |
| Mr. P. Nicholson    | Head, Technical Operations Office                                          | 8106   |
| Mr. T. Fisher       | Head, Tactical Special Projects Office                                     | 8107   |
| Mr. A.J. Fox        | Head, Mission Development Branch                                           | 8110   |
| Mr. G.E. Price      | Head, Advanced Systems Technology Branch                                   | 8120   |
| Mr. G.E. Flach      | Head, Space Electronic Systems Development Branch                          | 8130   |
| Mr. G. Cooper*      | Head, Command, Control, Communications, Computers, and Intelligence Branch | 8140   |
| Mr. R.L. Beard      | Head, Space Applications Branch                                            | 8150   |

**Point of contact:** Ms. D.L. Elliott, Code 8102 (202) 767-0432

\*Acting

# Spacecraft Engineering Department

## Code 8200 Research Activity Areas

### Design, Test, and Processing

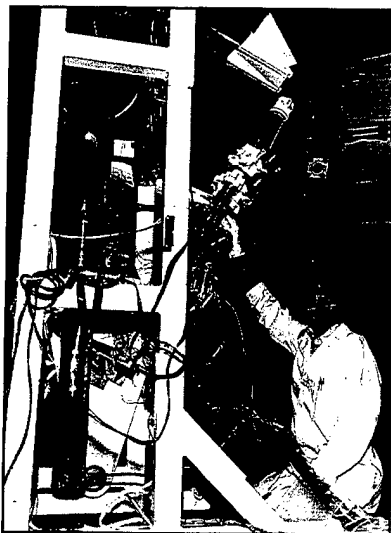
- Launch vehicle integration
- Spacecraft manufacturing
- Spacecraft design
- Spacecraft test and production planning
- Spacecraft assembly and processing
- Spacecraft environmental testing
- Spacecraft mechanical functional testing

### Systems Analysis

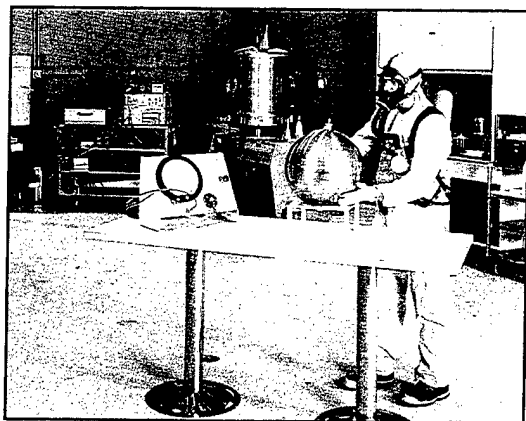
- Spacecraft structural design
- Spacecraft environmental testing
- Structural and thermal analysis
- Materials research
- Flexible space structures research

### Control Systems

- Attitude control systems
- Reaction control systems
- Propulsion systems
- Flight operations support
- Orbit dynamics
- Expert systems
- Spaceborne applications of robotics



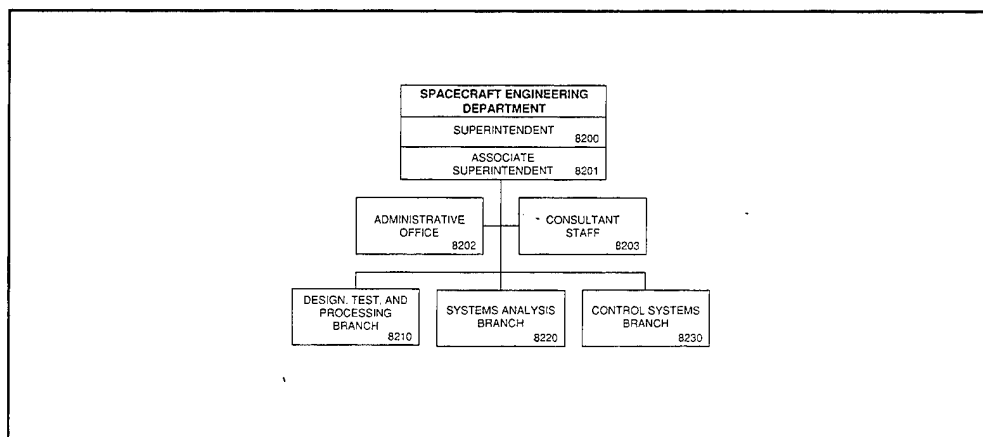
Ball-screw actuator being readied for vacuum-chamber test



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



MR. H.E. SENASACK, JR.



## Basic Responsibilities

The Spacecraft Engineering Department (SED) is the focal point for the Navy's in-house spacecraft bus capability. Activities of the SED range from concept and feasibility planning, through the on-orbit IOC for the Navy Space Systems. Design, assembly and test activities are performed in teamwork with the Space Systems Development Department. 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 Program Manager for Navy Programs. In this role, system engineering and technical directions are provided to Navy Space Programs while maintaining an active in-house satellite development capability. The SED performs as a prototype laboratory in this role and pursues the program to ensure that designs are transferable to industry for additional satellite hardware builds. Following an NRL build, the SED supports the Navy Program Office by providing experienced expert technical consultation.

**Personnel:** 84 full-time civilian

## Key Personnel

| Name                    | Title                                     | Code |
|-------------------------|-------------------------------------------|------|
| Mr. H.E. Senasack, Jr.* | Superintendent                            | 8200 |
| Mr. H.E. Senasack, Jr.  | Associate Superintendent                  | 8201 |
| Mrs. C. Warner          | Administrative Officer                    | 8202 |
| Mr. L. Sentiger         | Consultant Staff                          | 8203 |
| Mr. J. Hauser*          | Head, Design, Test, and Processing Branch | 8210 |
| Mr. M. Brown            | Head, Systems Analysis Branch             | 8220 |
| Mr. S. Hollander        | Head, Control Systems Branch              | 8230 |

**Point of contact:** Mr. H.E. Senasack, Jr., Code 8200 (202) 767-6411

\*Acting

**Technical  
Output,  
Fiscal, and  
Personnel  
Information**

# Technical Output

## Publications, Presentations, and Patents

The Navy continues to be a pioneer in initiating new developments and a leader in applying these advancements to military requirements. The primary means of informing the scientific and engineering community of the advances made at NRL is through the Laboratory's technical output—reports, articles in scientific journals, contributions to books, papers presented to scientific societies and topical conferences, patents, and inventions.

The figures for Calendar Years 1993 and 1994 presented below represent the output of NRL facilities in Washington, DC; Orlando, Florida; Bay St. Louis, Mississippi; and Monterey, California.

In addition to the output listed, NRL scientists made more than 1,300 oral presentations during 1993 and 1,467 oral presentations during 1994.

A complete listing of the publications by NRL authors appears in the *Bibliography of NRL Publications*, a separate annual publication.

In 1986, Congress enacted the Federal Technology Transfer Act in an effort to encourage the commercial use of technology developed in Federal laboratories. The Act allows Government inventors and the laboratories where they work to share the royalties generated by commercial licensing of their inventions. Also, the Act encourages the establishment of cooperative research and development agreements between laboratories such as NRL and nonfederal entities such as state and local governments, universities, and business corporations. Such cooperative R&D agreements can include the allocation in advance of patent rights on any inventions made under the joint research effort.

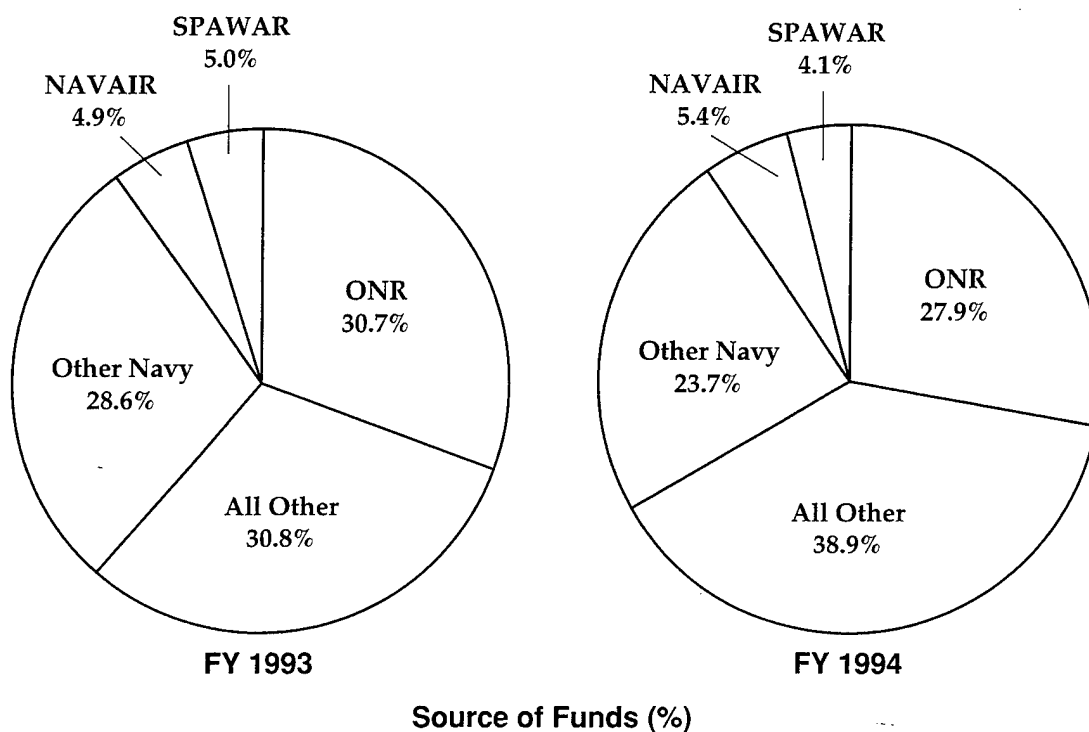
The 1986 Act has given additional impetus to the Laboratory's efforts to patent important inventions arising out of its various research programs.

| Type of Contribution                                                               | <u>Calendar Year 1993</u> |            |        |
|------------------------------------------------------------------------------------|---------------------------|------------|--------|
|                                                                                    | Unclassified              | Classified | Total  |
| Articles in periodicals, chapters in books,<br>and papers in published proceedings | 1,226                     | 0          | 1,226* |
| NRL Formal Reports                                                                 | 54                        | 32         | 86     |
| NRL Memorandum Reports                                                             | 144                       | 23         | 167    |
| Other NRL Reports and NRL Publications                                             | 26                        | 18         | 44     |
| Books                                                                              | 2                         | 0          | 2      |
| Patents granted                                                                    | 81                        | 0          | 81     |
| Statutory Invention Registrations (SIRs)                                           | 7                         | 0          | 7      |

| Type of Contribution                                                               | <u>Calendar Year 1994</u> |            |        |
|------------------------------------------------------------------------------------|---------------------------|------------|--------|
|                                                                                    | Unclassified              | Classified | Total  |
| Articles in periodicals, chapters in books,<br>and papers in published proceedings | 1,345                     | 0          | 1,345* |
| NRL Formal Reports                                                                 | 39                        | 19         | 58     |
| NRL Memorandum Reports                                                             | 133                       | 27         | 160    |
| Other NRL Reports and NRL Publications                                             | 38                        | 22         | 63     |
| Books                                                                              | 1                         | 0          | 1      |
| Patents granted                                                                    | 90                        | 0          | 90     |
| Statutory Invention Registrations (SIRs)                                           | 4                         | 0          | 4      |

\*This total is based on information available to the Ruth H. Hooker Research Library and Technical Information Center on May 17, 1995.

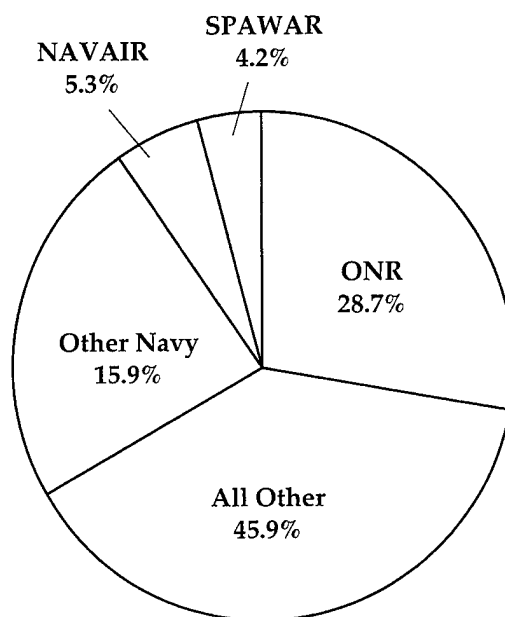
## FY 1993/94 Sources of New Funds (Actual)



| <u>FY 1993</u>                                   | <u>Reimbursable</u> | <u>\$M</u><br><u>Direct Cite</u> | <u>Total</u> |
|--------------------------------------------------|---------------------|----------------------------------|--------------|
| Office of Naval Research (ONR)                   | 203.1               | 45.4                             | 248.5        |
| Space and Naval Warfare Systems Command (SPAWAR) | 28.3                | 12.3                             | 40.6         |
| Naval Air Systems Command (NAVAIR)               | 27.8                | 12.2                             | 40.0         |
| Other Navy                                       | 153.6               | 78.5                             | 232.1        |
| All Other                                        | <u>140.3</u>        | <u>109.3</u>                     | <u>249.6</u> |
| Total Funds                                      | 553.1               | 257.7                            | 810.8        |

| <u>FY 1994</u>                                   | <u>Reimbursable</u> | <u>\$M</u><br><u>Direct Cite</u> | <u>Total</u> |
|--------------------------------------------------|---------------------|----------------------------------|--------------|
| Office of Naval Research (ONR)                   | 182.7               | 42.3                             | 225.0        |
| Space and Naval Warfare Systems Command (SPAWAR) | 25.7                | 7.4                              | 33.2         |
| Naval Air Systems Command (NAVAIR)               | 23.6                | 19.8                             | 43.3         |
| Other Navy                                       | 128.1               | 63.6                             | 191.7        |
| All Other                                        | <u>146.8</u>        | <u>167.4</u>                     | <u>314.2</u> |
| Total Funds                                      | 506.9               | 300.5                            | 807.4        |

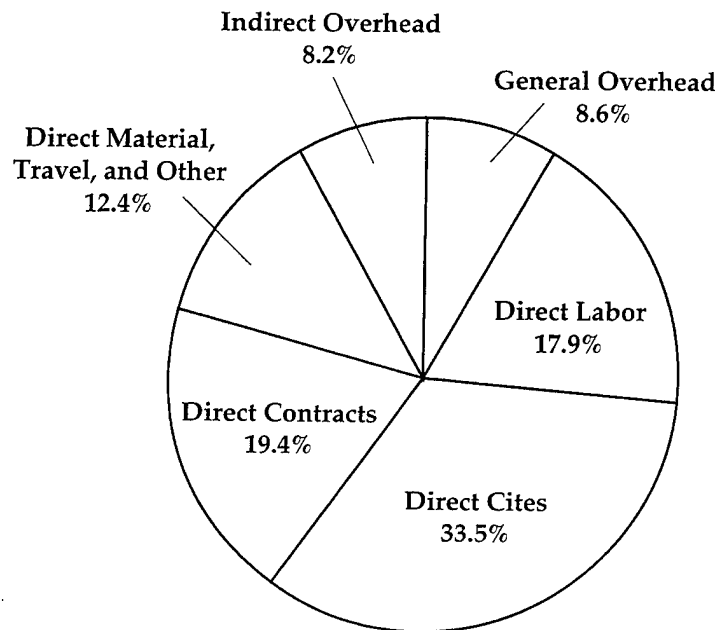
## FY 1995 Sources of New Funds (Plan)



**Source of Funds (%)**

| <u>FY 1995</u>                                   | <u>\$M</u>          |                    | <u>Total</u> |
|--------------------------------------------------|---------------------|--------------------|--------------|
|                                                  | <u>Reimbursable</u> | <u>Direct Cite</u> |              |
| Office of Naval Research (ONR)                   | 206.8               | 40.6               | 247.4        |
| Space and Naval Warfare Systems Command (SPAWAR) | 29.1                | 7.1                | 36.2         |
| Naval Air Systems Command (NAVAIR)               | 26.7                | 18.9               | 45.6         |
| Other Navy                                       | 109.0               | 27.9               | 136.9        |
| All Other                                        | <u>202.2</u>        | <u>193.4</u>       | <u>395.6</u> |
| Total Funds                                      | 573.8               | 287.9              | 861.7        |

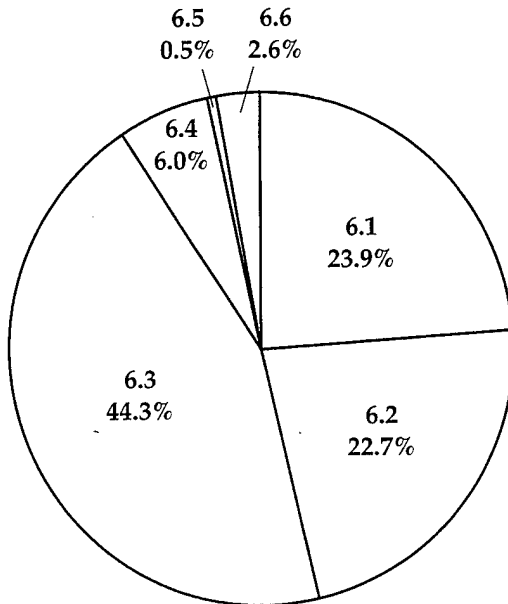
## FY 1995 Distribution of New Funds (Plan)



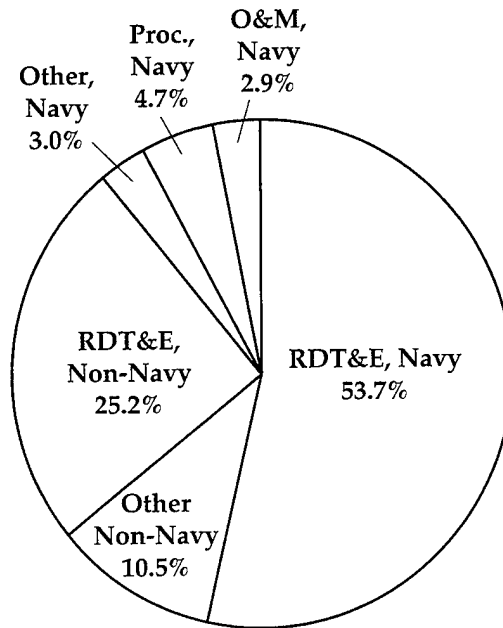
**Distribution of Funds (%)**

|                                    | <u>\$M</u>   |
|------------------------------------|--------------|
| Direct Labor                       | 154.6        |
| General Overhead                   | 74.0         |
| Indirect Overhead                  | 70.9         |
| Direct Material, Travel, and Other | 107.1        |
| Direct Contracts                   | 167.2        |
| Direct Cites                       | <u>287.9</u> |
| Total Funds                        | 861.7        |

## FY 1995 Reimbursable New Funds by Category (Plan)



**Distribution of RDT&E, Navy (%)**  
(\$327.1)



**Distribution of Reimbursable (%)**  
(\$538.3)

| <u>Category</u>                     | <u>\$M</u>  |                 | <u>Total</u> |
|-------------------------------------|-------------|-----------------|--------------|
|                                     | <u>Navy</u> | <u>Non-Navy</u> |              |
| 6.1 Research                        | 106.5       | 1.5             | 108.0        |
| 6.2 Exploratory Development         | 83.0        | 19.8            | 102.9        |
| 6.3 Advanced Development            | 83.5        | 116.7           | 200.2        |
| 6.4 Engineering Development         | 25.8        | 1.5             | 27.3         |
| 6.5 Management and Support          | 1.5         | 1.0             | 2.5          |
| 6.6 Operational Systems Development | <u>7.6</u>  | <u>4.3</u>      | <u>11.9</u>  |
| Subtotal RDT&E                      | 307.9       | 144.9           | 452.8        |
| Operation and Maintenance           | 16.5        | 1.7             | 18.2         |
| Procurement                         | 26.9        | 7.2             | 34.1         |
| Other                               | <u>17.2</u> | <u>51.5</u>     | <u>68.7</u>  |
| Total Reimbursable Funds            | 368.5       | 205.3           | 573.8        |

## Personnel Information\*

### Civilian

|                            |            |
|----------------------------|------------|
| Full-Time, Permanent (FTP) |            |
| Graded                     | 3090       |
| Ungraded                   | <u>158</u> |
| Total                      | 3248       |

Temporary, Part-Time, Intermittent (TPTI)

|                |            |
|----------------|------------|
| TPTI           | <u>319</u> |
| Total Civilian | 3567       |

#### Graded FTP Breakdown

|                                |            |
|--------------------------------|------------|
| Scientists, Engineers, and SES | 1726       |
| Administrative—Professional    | 83         |
| Administrative—Management      | 393        |
| Technicians                    | 400        |
| Other-Clerical                 | 349        |
| Other-General                  | <u>139</u> |
| Total                          | 3090       |

|                                   |      |
|-----------------------------------|------|
| Civilian Budgeted<br>End-Strength | 3630 |
|-----------------------------------|------|

### Military

|          |           |
|----------|-----------|
| Officers | 49        |
| Enlisted | <u>91</u> |

|                    |     |
|--------------------|-----|
| Total Military     | 140 |
| Military Allowance | 141 |

|                 |                       |                       |            |             |                     |                   |
|-----------------|-----------------------|-----------------------|------------|-------------|---------------------|-------------------|
| <u>On-Board</u> | <u>Total Military</u> | <u>Total Civilian</u> | <u>FTP</u> | <u>TPTI</u> | <u>FTP Ungraded</u> | <u>FTP Graded</u> |
| 3761            | 194                   | 3567                  | 3248       | 319         | 158                 | 3090              |

### Annual Civilian Turnover Rate (%) (permanent employees only)

|                    | <u>1990</u> | <u>1991</u> | <u>1992</u> | <u>1993</u> | <u>1994</u> |
|--------------------|-------------|-------------|-------------|-------------|-------------|
| Research divisions | 7.7         | 8.0         | 5.1         | 5.8         | 9.4         |
| Nonresearch areas  | 14.6        | 11.9        | 9.2         | 8.4         | 9.1         |
| Entire Laboratory  | 9.6         | 9.7         | 6.2         | 6.5         | 9.3         |

### Highest Academic Degrees Held by Permanent Employees

|            |     |
|------------|-----|
| Bachelors  | 708 |
| Masters    | 474 |
| Doctorates | 862 |

\*As of 25 July 1995; figures include NRL at all sites.

**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 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 1994, under the auspices of the Employee Development Branch, NRL employees participated in about 5,500 individual training events. Many of these were presented as either videotaped or on-site instructed courses on diverse technical subjects, management techniques, and enhancement of such personal skills as efficient use of time, speed reading, memory improvement, and interpersonal communications. Courses are also available by means of computer-based training (CBT) and live television courses that are viewed nationwide.

One common study procedure is for employees to work full time at the Laboratory while taking job-related scientific courses at universities and schools in the Washington area. The training ranges from a single course to full graduate and postgraduate programs. Tuition for training is paid by NRL. The formal programs offered by NRL are described below.

#### Graduate Programs

- **The Advanced Graduate Research Program** (formerly the Sabbatical Study Program, which began in 1964) enables selected professional employees to devote full time to research or pursue work in their own or a related field for one year at an institution or research facility of their choice without the loss of regular salary, leave, or fringe benefits. NRL pays all educational costs, travel, and moving expenses for the employee and dependents. Criteria for eligibility include professional stature consistent with the applicant's opportunities and experience, a satisfactory program of study, and acceptance by the facility selected by the applicant. The program is open to paraprofessional (and above) employees who have completed six years of Federal service, four years of which are required at NRL.

- **The Edison Memorial Graduate Training Program** enables employees to pursue advanced studies in their fields at local universities. Participants in this program work 24 hours each workweek

and pursue their studies during the other 16 hours. 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 Training Program**, employees must have a college degree in an appropriate field and must have demonstrated ability and aptitude for advanced training. Students accepted in this program 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.

- **The Naval Postgraduate School (NPS)**, located in Monterey, California, provides graduate programs to enhance the technical preparation of Naval officers and civilian employees who serve the Navy in the fields of science, engineering, operations analysis, and management. It awards a master of arts degree in national security affairs and a

master of science degree in many technical disciplines. In addition, a doctor of philosophy degree may be earned in select fields of science and engineering.

NRL employees desiring to pursue graduate studies at NPS may apply for a maximum of six quarters away from NRL, with thesis work accomplished at NRL. Specific programs are described in the NPS catalog. Participants will continue to receive full pay and benefits during the period of study.

- 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.

## Professional Development

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

- **The Congressional Fellowship Program**, sponsored by the American Political Science Association, 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 LEGIS Fellows Program** provides assignments for personnel whose current or prospective positions may require working knowledge of the operations of the Congress. The Fellows receive instruction and hands-on experience in a Congressional office through training/developmental activities such as seminars, intensive briefings, and assignments on the staff of a member, committee, or support agency of the Congress in Washington, DC.

- **The Counseling Referral Service (C/RS)** helps employees to achieve optimal job perfor-

mance through counseling and resolution of problems such as family, stress and anxiety, behavioral, emotional, and alcohol- or drug- related problems that may adversely impact job performance.

C/RS provides confidential assessments and short-term counseling, as well as training workshops and referrals to additional resources in the community. (Contact Robert Power at (202) 767-6857.)

- A chartered chapter of **Women in Science and Engineering (WISE)** was established at NRL in 1983. Informal monthly luncheons and seminars are scheduled to inform scientists and engineers of women's research at NRL and to provide an informal environment for members to practice their presentations. WISE also sponsors a colloquium series to feature outstanding women scientists. (Contact Dr. Wendy Fuller-Mora at (202) 767-2793, Dr. Debra Rolison at (202) 767-3617, or Dr. Cha-Mei Tang at (202) 767-4148.)

- **Sigma Xi**, the Scientific Research Society, encourages and acknowledges original investigation in pure and applied science. As an honor society for research scientists, individuals who have demonstrated the ability to perform original research are elected to membership in local chapters. The NRL-Edison Chapter, comprised of approximately 600 members, recognizes original research by presenting awards annually in pure and applied science to outstanding NRL staff members. The chapter also sponsors lectures at NRL on a wide range of scientific topics for the entire NRL community. These lectures are delivered by scientists from all over the nation and the world. The highlight of the Sigma Xi lecture series is the Edison Memorial Lecture, traditionally featuring a Nobel laureate. (Contact Dr. Robert Pellenbarg at (202) 767-2479 or 2002.)

- **The NRL Mentor Program** was established to provide an innovative approach to professional and career training and an environment for personal and professional growth. It is open to all permanent NRL employees in all job series and at all sites. Mentorees are matched with successful, experienced colleagues with more technical and/or managerial experience, who can provide them with the knowledge and skills needed to maximize their contribution to the success of their immediate organization, to NRL, to the Navy, and to their chosen career fields. The ultimate goal of the program is to increase job productivity, creativity, and satisfaction through better communication, understanding, and training. NRL Instruction 12400.1 established the NRL Mentor Program, and it provides the policy

cedures for the program. (Contact Susan Rich at (202) 767-3567 or Pat Tatem at (202) 767-3121.)

The Charlotte Moore-Sitterly Chapter of **Nationally Employed Women, Inc. (FEW)** was created at NRL in 1993. FEW is an international organization of federally employed women and whose purpose is to eliminate sex discrimination and sexual harassment and enhance career opportunities for women in government. FEW works closely with other Federal agencies and organizations, including the Office of Personnel Management, Equal Employment Opportunity Commission, and Federal Women's Program committees. (Contact Chris Thorowgood at (202) 767-3121.)

- Employees interested in developing effective self-expression, listening, thinking, and leadership potential are invited to join either of two NRL chapters of **Toastmasters International**. Members of these clubs, who possess diverse career backgrounds and talents, meet three times a month in an effort to learn to communicate not by rules but by practice in an atmosphere of understanding and helpful fellowship. NRL's Commanding Officer and the Director of Research endorse Toastmasters, and the Employee Development Branch pays for membership and educational materials for those employees whose supervisors see a need for their active training in public speaking or communication skills. (Contact Kathleen Parrish at (202) 767-2782.)

## Continuing Education

NRL employees take government sponsored college courses (undergraduate and graduate) in order to improve their skills and keep abreast of current developments in their fields.

- 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. Inter-agency courses in management, personnel, finance, supervisory development, clerical skills, and other areas are also available.

## Other Programs

- The **Brookings Institution** offers a variety of seminars and conferences devoted to research,

education, and publication on important issues of domestic and foreign policy.

- **OPM's Management Development Center** offers one- and two-week courses in intensive policy and management training for government managers and executives.

- **The Council for Excellence in Government Program** offers a year-long leadership development opportunity to enhance the ability of mid-level federal executives to lead the high-performance organizations that will successfully reinvent government.

## Technology Transfer

- **The Office of Research and Technology Applications Program (ORTA)** ensures the full use of the results of the Nation's federal investment in research and development by transferring federally owned or originated technology to state and local governments and the private sector.

- **The Navy Science Assistance Program (NSAP)** establishes an information loop between the Fleet and the R&D shore establishments to expedite technology transfer to the user. The program addresses operational problems, focuses resources to solve specific technical problems, and develops a nucleus of senior scientific personnel familiar with the impact of current research and system performance on military operations.

- **The Scientist to Sea Program (STSP)** provides opportunities for Navy R&D laboratory/center personnel to go to sea to gain first-hand insight into operational factors affecting system design, performance, and operations on a variety of ships. Inquiries concerning NRL's technology transfer programs should be made to Dr. Richard Rein (Code 1004) at (202) 767-3744. Inquiries concerning NSAP or STSP programs should be made to Dr. George Abraham (Code 4043) at (202) 767-3521.

## Equal Employment Opportunity (EEO) Programs

Equal employment opportunity is a fundamental NRL policy for all persons, regardless of race, color, sex, religion, national origin, age, or physical/mental handicap. The EEO office's major functions include affirmative action in employment, discrimination complaint process, EEO training, advice and

guidance to management on EEO policy, and the following special emphasis programs:

- **The Federal Women's Program (FWP)** supports and enhances employment and advancement opportunities for women and addresses issues that affect women in the workplace. It sponsors a chapter of Women in Science and Engineering (WISE) to recognize outstanding female scientists and engineers. Distinguished women scientists are guest lecturers at quarterly presentations.
- **The Hispanic Employment Program (HEP)** focuses on working with supervisors, managers, and subcommittees to recruit and place qualified Hispanics. The program is involved with Hispanic community organizations and local schools and provides activities specifically designed to offer information on employment and advanced education opportunities to Hispanics.
- **The African-American Employment Program (AAEP)** concentrates on recruiting, developing, and advancing African-American employees throughout NRL. It also encourages employees to achieve their maximum potential. The AAEP sponsors awareness programs with distinguished persons as guest lecturers.
- **The Individuals with Disabilities Program (IWD)** assists management to improve employment and advancement opportunities for qualified disabled employees. It also advises on accommodations necessary for disabled persons. The IWD recruits disabled students from colleges and universities for summer, co-op, and permanent positions in engineering and science.
- **The Asian-American/Pacific Islander Program (API)** identifies areas of concern regarding the recruitment, selection, advancement, retention, and utilization of API employees throughout NRL. The program interacts with API professional/community organizations to address employment concerns.
- **The Federal Employment Opportunity Recruitment Program (FEORP)** is designed to establish, maintain, and update targeted recruitment programs to reduce the conspicuous absence or manifest imbalance categories of NRL employment through innovative internal and external recruitment. In addition, it fosters relationships with minority and women's institutions and organizations.

Special programs are held during the year to promote an awareness of the contributions and

capabilities of women and minorities. (Contact the EEO office at (202) 767-2486 for all EEO programs.)

## Other Activities

- **The Community Outreach Program** traditionally has used its extensive resources to foster programs that provide benefits to students and other community citizens. Volunteer employees assist with and judge science fairs, give lectures, tutor, mentor, coach, and serve as classroom resource teachers. The program also sponsors Black History Month art and essay contests for local schools, student tours of NRL, a student Toastmasters Youth Leadership Program, an annual Christmas party for neighborhood children, an annual collection for Children's Hospital, a surplus equipment transfer program, and an annual book drive to support school libraries. Through this program NRL has active partnerships with four District of Columbia public schools. (Contact the Public Affairs Office at (202) 767-2541.)
- Other programs that enhance the development of NRL employees include four computer user groups (**IBM PC**, **Mac**, **NeXT**, and **Sun**), the **Microcomputer Software Support Center**, and the **Amateur Radio Club**. The **Recreation Club** accommodates the varied interests of NRL's employees with its numerous facilities, such as a refurbished 25-yard, 6-lane indoor swimming pool; basketball and volleyball courts; a weight room and exercise area; table tennis; meeting room; softball and basketball leagues; jacuzzi whirlpool; saunas; classes in five different types of martial arts; aerobics exercise; swimming and water walking; and specialized sports clubs (running, skiing, biking, and golfing). The **Showboaters**, a nonprofit drama group that presents live theater for the enjoyment of NRL and the community, performs two major productions each year in addition to occasional performances at Laboratory functions and benefits for local charities. Though based at NRL, membership in Showboaters is not limited to NRL employees.



## Programs for Non-NRL Employees

Several programs have been established 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 the Laboratory's 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 the Laboratory's 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 Associateship 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. The Office of Naval Research offers the associate post-tenure research grants tenable at an academic institution.

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

- The most recent addition to NRL's postdoctoral program family is the **Joint Oceanographic Institutions (JOI) Postdoctoral Fellowship Program**. Administered in much the same way as the other two, this program selects associates to conduct research in ocean and atmospheric sciences only. The aim is to recruit more scientists and engineers in these specialized areas.

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

- 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 leading 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.

For further information about these five programs, please contact Mrs. Jessica Hileman at (202) 767-3865.

- The **Professional Development Program for Ensigns** assigns newly commissioned Ensigns who are awaiting future training to NRL, working in areas of their own choosing commensurate with their academic qualifications. These young officers provide a fruitful summer of research assistance, while gaining valuable experience in the Navy's R&D program.

For more information, contact the Military Administrative Office at (202) 767-2103.

### Professional Appointments

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

- **Consultants and experts** are employed because they are outstanding in their fields of specialization, or because they possess ability of a rare nature and could not normally be employed as regular civil servants.

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

## High School/Undergraduate/Graduate College Student Programs

Several programs are tailored to the undergraduate and graduate that provide employment and work experience in naval research. These are designed to attract applicants for student and full professional employment in the Laboratory's shortage category positions, such as engineers, physicists, mathematicians, and computer scientists. The student employment programs build 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 high school and college students include the following:

- 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 **Clerical Cooperative Education Program** employs students interested in pursuing careers in the clerical occupation. Students work part-time during the school year and full-time during school breaks.

- The **Federal Junior Fellowship Program** hires needy 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.

- 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 half-time basis to assist in scientific work related to their academic program.

For additional information, contact Cindy Stiles at (202) 767-3030.

## High School Programs

- The **DoD Science & Engineering Apprentice Program (SEAP)** employs high school juniors and seniors to serve for eight weeks as junior research associates. Under the direction of a mentor, students gain a better understanding of research, its challenges, and its opportunities 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 achievement test scores. The NRL program is the lead program and the largest in DoD.

For additional information on these programs, please contact the Employee Development Branch (Code 1840) at (202) 767-2956.

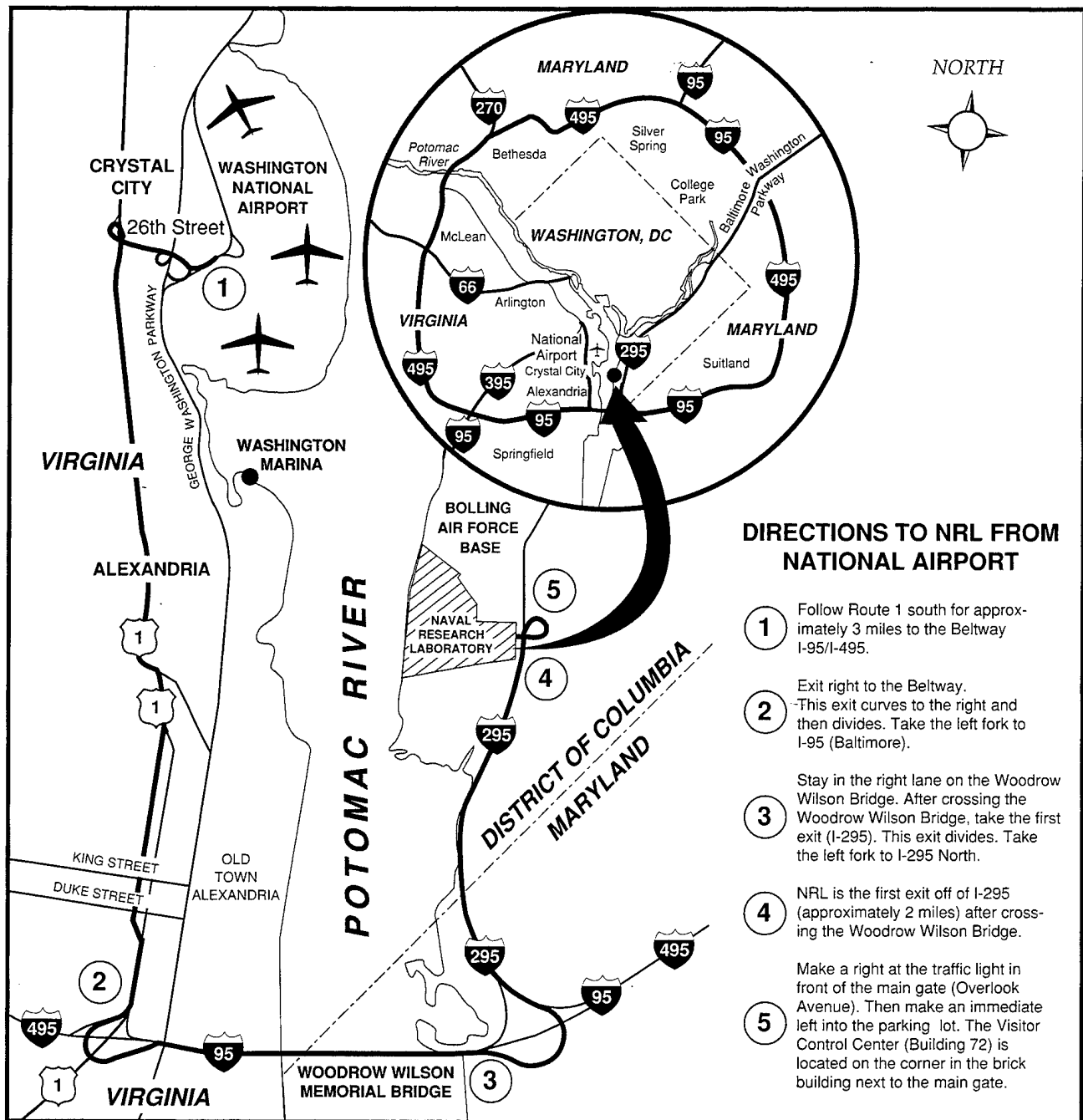




**General  
Information**

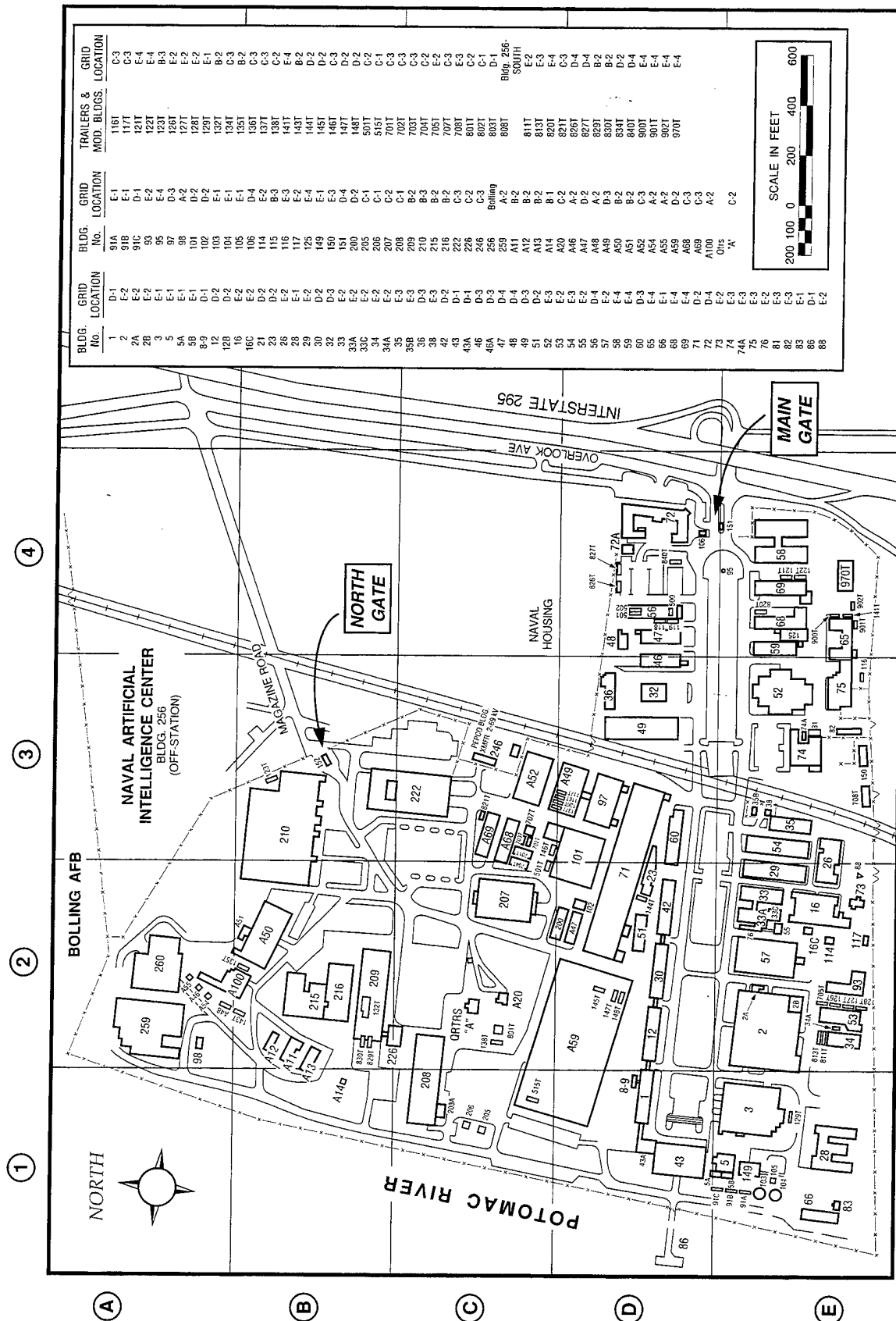


# Naval Research Laboratory (Washington, DC)

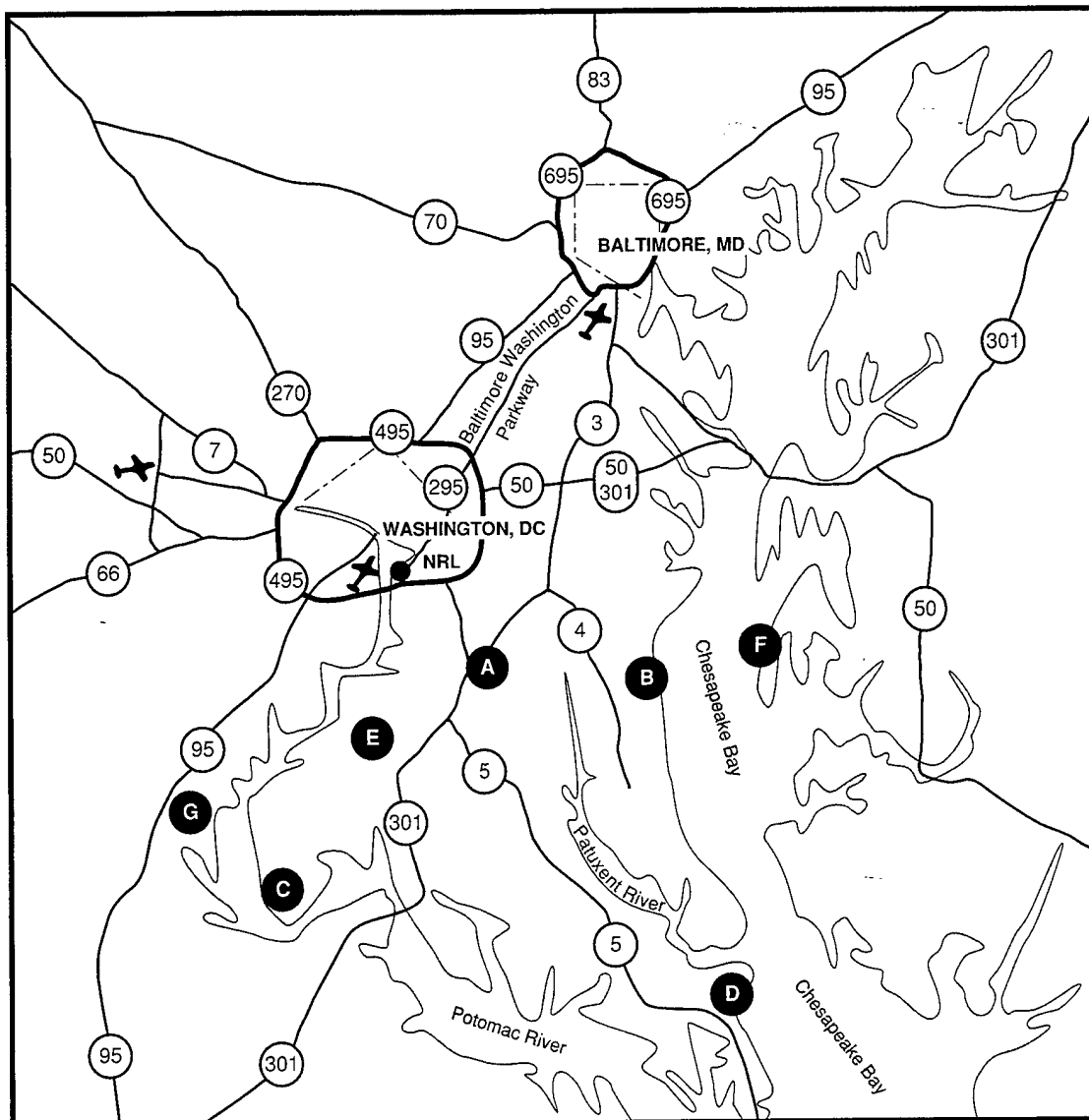


Naval Research Laboratory  
4555 Overlook Avenue, SW  
Washington, DC 20375-5320  
(202) 767-3200

# Location of Buildings at NRL Washington

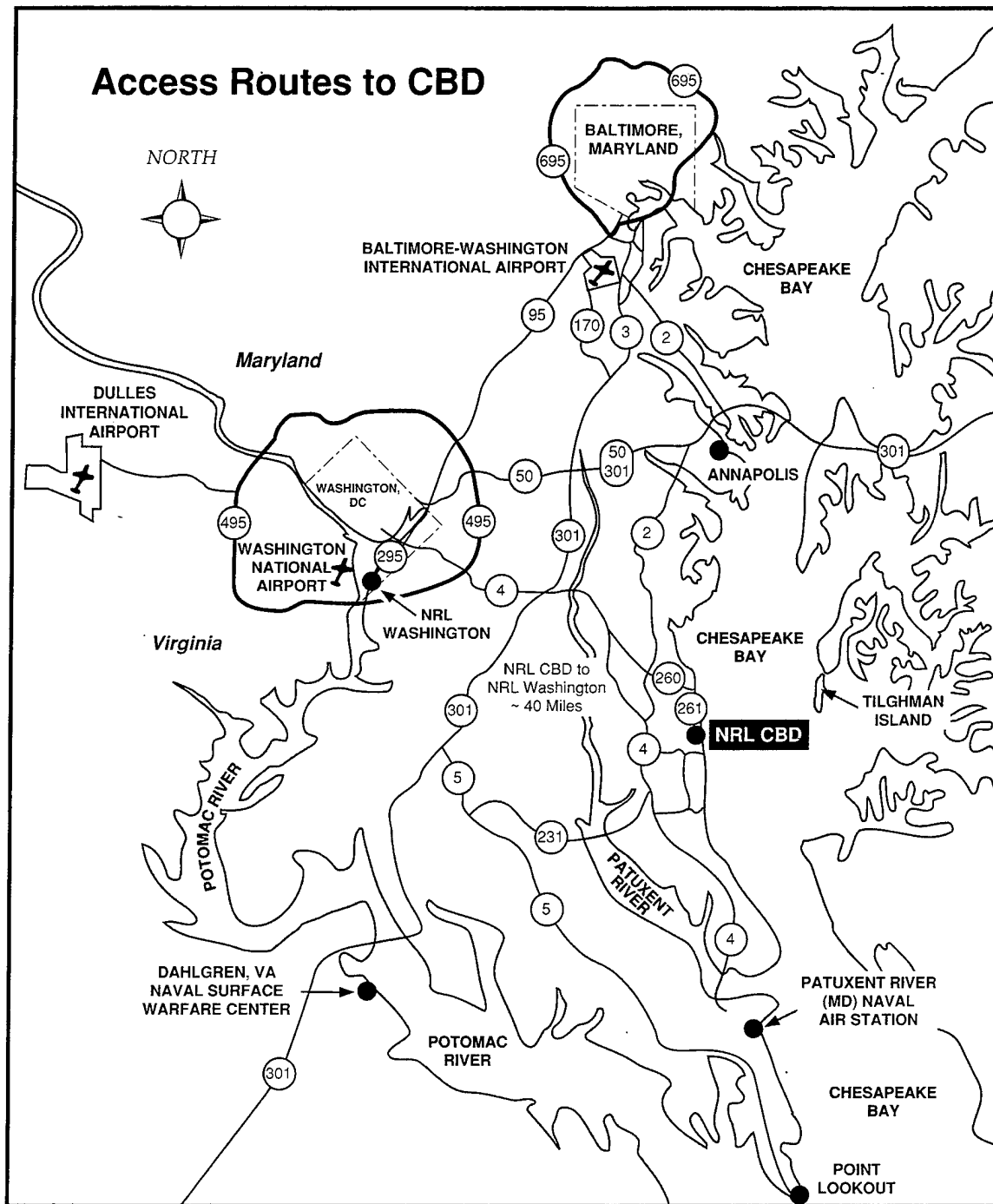


## Location of Field Sites in the NRL Washington Area



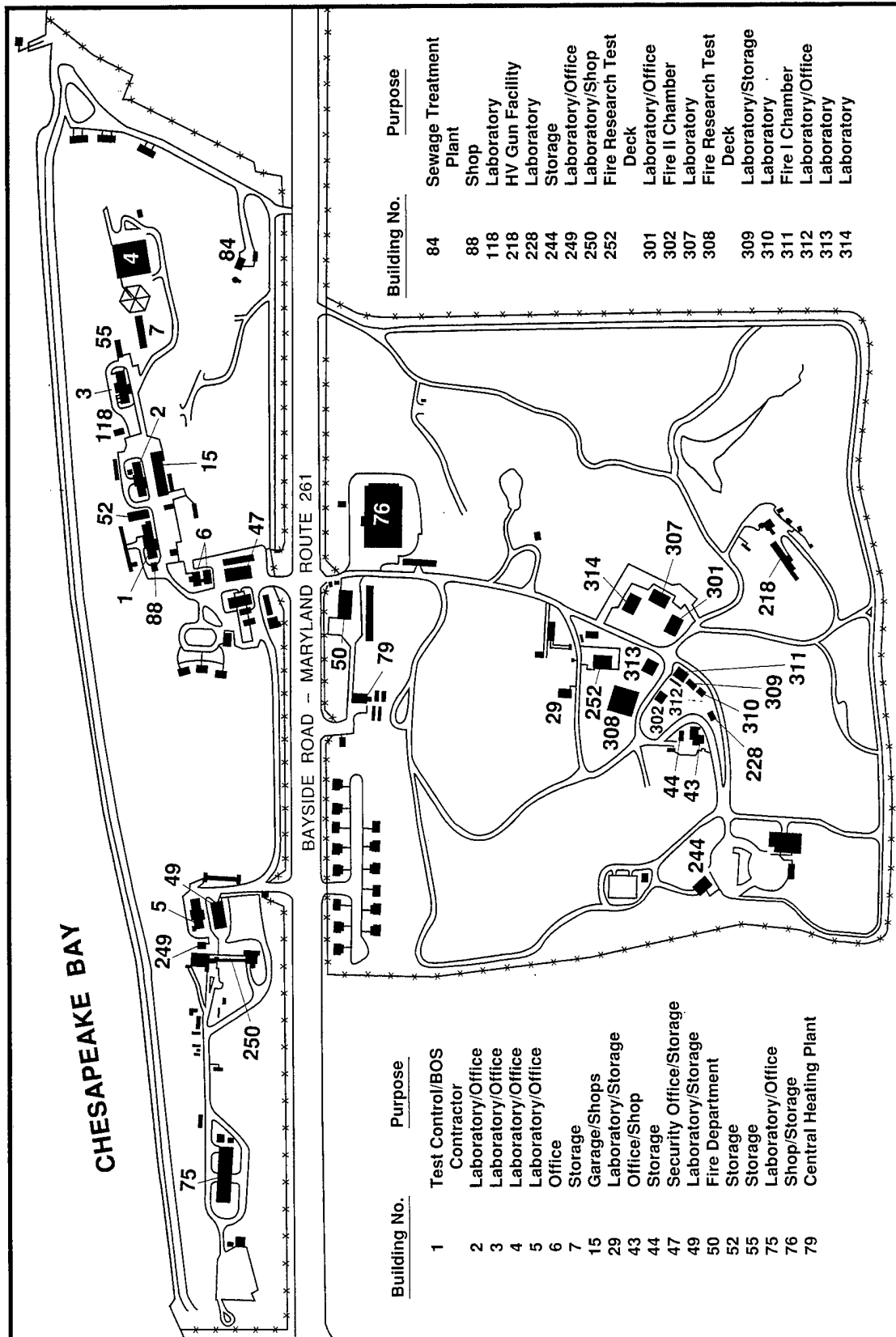
| <u>Location</u>                                           | <u>Approximate<br/>Mileage from<br/>NRL Washington</u> | <u>Cognizant<br/>Code</u> |
|-----------------------------------------------------------|--------------------------------------------------------|---------------------------|
| A - Brandywine, MD                                        | 28                                                     | 5500                      |
| B - Chesapeake Bay Detachment (CBD), Chesapeake Beach, MD | 40                                                     | 3520                      |
| C - Maryland Point (MD) Observatory                       | 45                                                     | 7210                      |
| D - Patuxent River (MD) Naval Air Station                 | 64                                                     | 1280                      |
| E - Pomonkey, MD                                          | 20                                                     | 8106                      |
| F - Tilghman Island, MD                                   | 110                                                    | 3520                      |
| G - Midway Research Center, Quantico, VA                  | 38                                                     | 8140                      |

## Chesapeake Bay Detachment (Chesapeake Beach, Maryland)

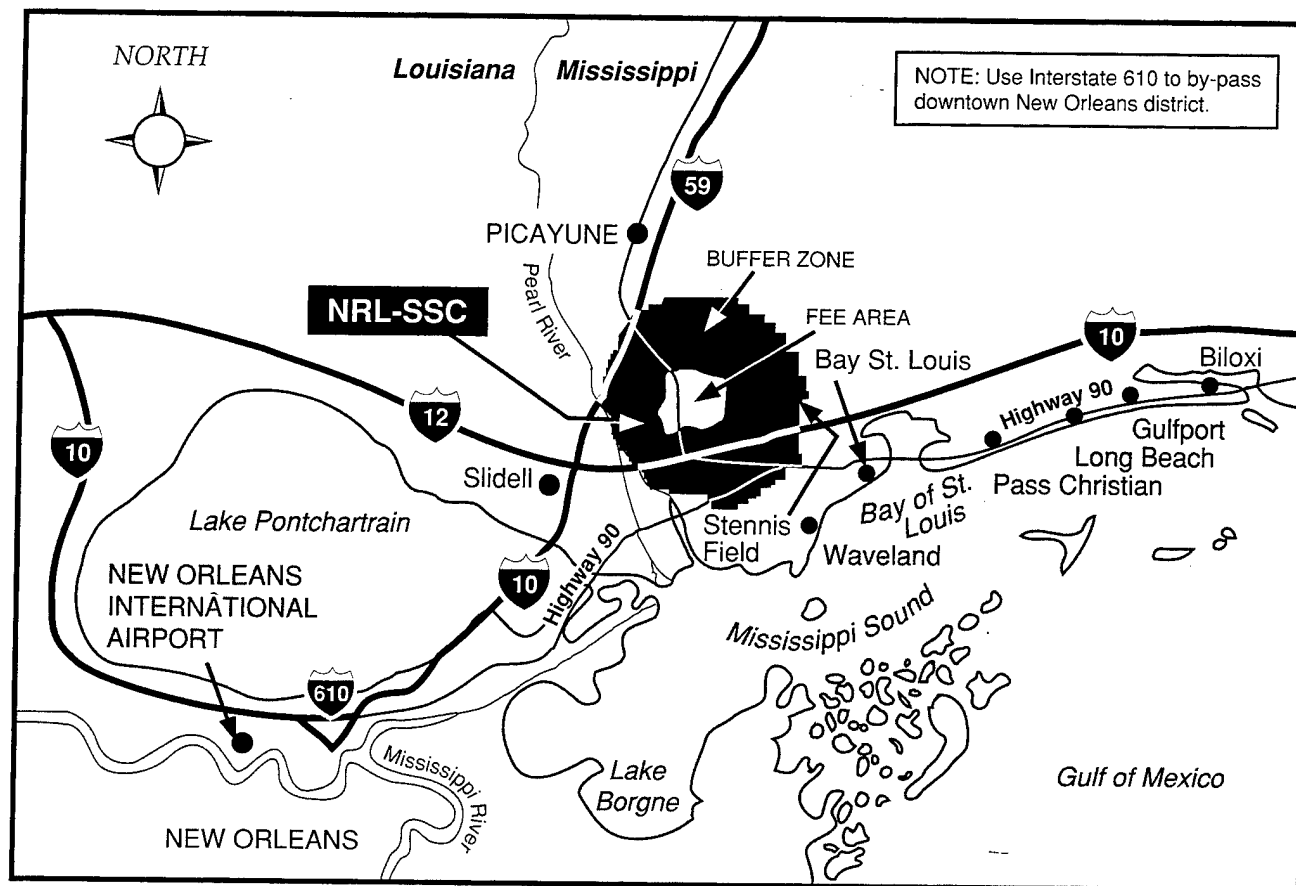


Naval Research Laboratory  
Chesapeake Bay Detachment  
5813 Bayside Road  
Chesapeake Beach, MD 20732  
(301) 257-4004

## Location of Buildings at the Chesapeake Bay Detachment

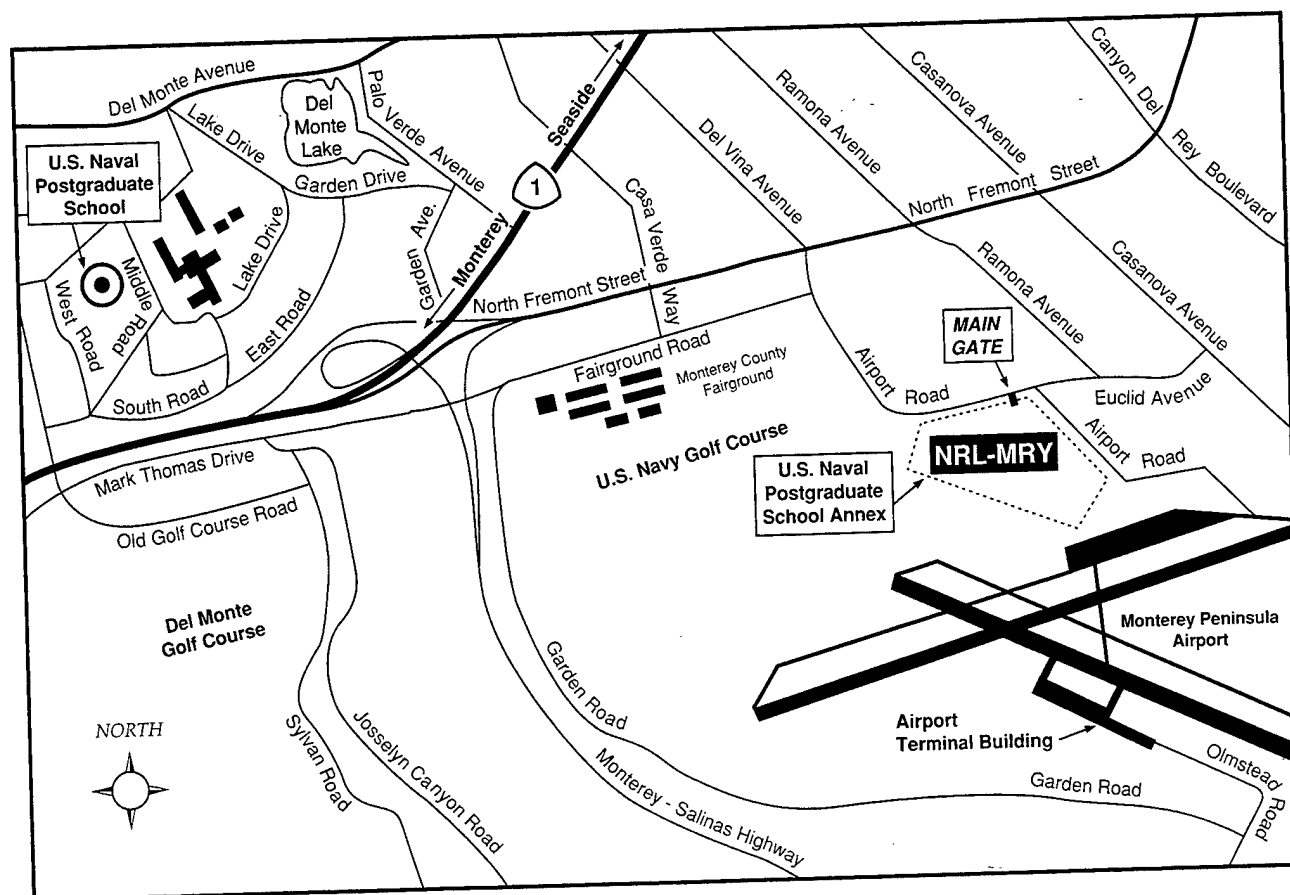


# John C. Stennis Space Center (Stennis Space Center, Mississippi)



Naval Research Laboratory  
John C. Stennis Space Center  
Stennis Space Center, MS 39529-5000  
(601) 688-3390

# Naval Research Laboratory Monterey (Monterey, California)



Naval Research Laboratory  
Marine Meteorology Division  
Monterey, CA 93943-5006  
(408) 656-4706

# Key Personnel

DSN: NRL Washington 297- or 354-; NRL/SSC 485-; NRL/Monterey 878-

| Code                                                          |                                                                                          |                             | Telephone      |
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*Jan D. Morrow*

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REVIEWED AND APPROVED

*R.M. Cassidy*

CAPT R.M. Cassidy, USN  
Commanding Officer

July 1995