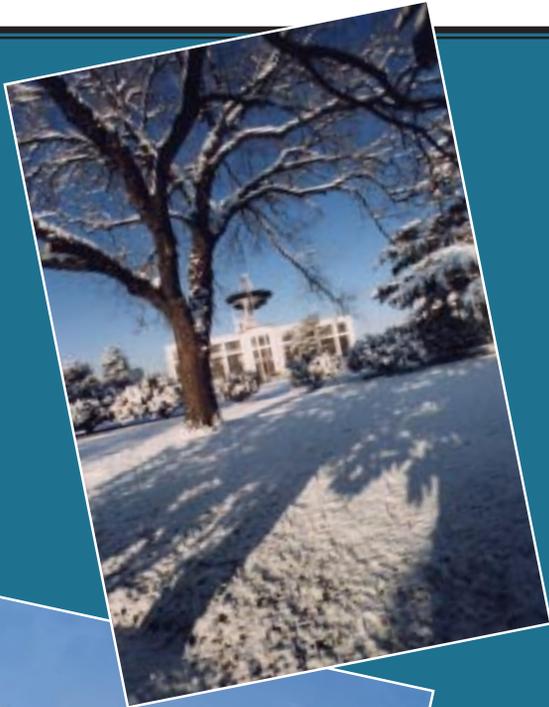




Naval Research Laboratory

Washington, DC 20375-5320 NRL/PU/5230--97-330 July 1997

NRL FACT BOOK



NRL FACT BOOK ★ July 1997

NAVAL RESEARCH LABORATORY

Report Documentation Page

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The NRL Fact Book is prepared every two years as a reference source for information about the Naval Research Laboratory (NRL). 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

Front and back covers:

Seasonal photographs around NRL Washington, DC

NRL's URL: <http://www.nrl.navy.mil/>



Quick Reference Telephone Numbers

	NRL WASHINGTON	NRL- SSC	NRL- MONTEREY	NRL CBD
Hotline	(202) 767-6543	(601) 688-5001	(408) 656-4721	(202) 767-6543
Personnel Locator	(202) 767-3200	(601) 688-3390	(408) 656-4731	(410) 257-4000
DSN	297- or 754-	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 146 and 147.

NRL

FACT

BOOK

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

Contents

1	INTRODUCTION TO THE NAVAL RESEARCH LABORATORY
1	Mission
3	The Naval Research Laboratory in the Department of the Navy
4	NRL Functional Organization
5	Current Research
8	Major Research Capabilities and Facilities
14	NRL Sites and Facilities
15	EXECUTIVE DIRECTORATE
17	Executive Directorate - Commanding Officer and Director of Research
20	Executive Council
21	Research Advisory Committee
25	Office of Program Administration and Policy Development
26	Command Support Division
28	Military Support Division
30	Flight Support Detachment
32	Human Resources Office
35	BUSINESS OPERATIONS DIRECTORATE
38	Associate Director of Research for Business Operations
40	Office of Counsel
41	Management Information Systems Staff
42	Contracting Division
44	Financial Management Division
46	Supply Division
48	Research and Development Services Division
51	SYSTEMS DIRECTORATE
54	Associate Director of Research for Systems
57	Signature Technology Office
58	Technical Information Division
60	Radar Division
62	Information Technology Division
64	Optical Sciences Division
66	Tactical Electronic Warfare Division
69	MATERIALS SCIENCE AND COMPONENT TECHNOLOGY DIRECTORATE
72	Associate Director of Research for Materials Science and Component Technology
75	Laboratory for Structure of Matter
76	Chemistry Division
78	Materials Science and Technology Division
80	Laboratory for Computational Physics and Fluid Dynamics
82	Condensed Matter and Radiation Sciences Division
84	Plasma Physics Division
86	Electronics Science and Technology Division
88	Center for Bio/Molecular Science and Engineering

91	OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE
94	Associate Director of Research for Ocean and Atmospheric Science and Technology Directorate
96	Office of Research Support Services
98	Acoustics Division
100	Remote Sensing Division
102	Oceanography Division
104	Marine Geosciences Division
106	Marine Meteorology Division
108	Space Science Division
111	NAVAL CENTER FOR SPACE TECHNOLOGY
114	Director of Naval Center for Space Technology
116	Space Systems Development Department
118	Spacecraft Engineering Department
120	TECHNICAL OUTPUT, FISCAL, AND PERSONNEL INFORMATION
123	Technical Output
124	Fiscal
128	Personnel Information
130	PROFESSIONAL DEVELOPMENT
131	Programs for NRL Employees
135	Programs for Non-NRL Employees
137	GENERAL INFORMATION
139	Maps
146	Key Personnel

Photos on opposite page - top to bottom

The Naval Research Laboratory is located in Washington, DC, on the east bank of the Potomac River.

The NRL Marine Meteorology Division is located in Monterey, California (NRL-MRY).

The Naval Research Laboratory Detachment is located at Stennis Space Center, Bay St. Louis, Mississippi (NRL-SSC).

Introduction to the Naval Research Laboratory

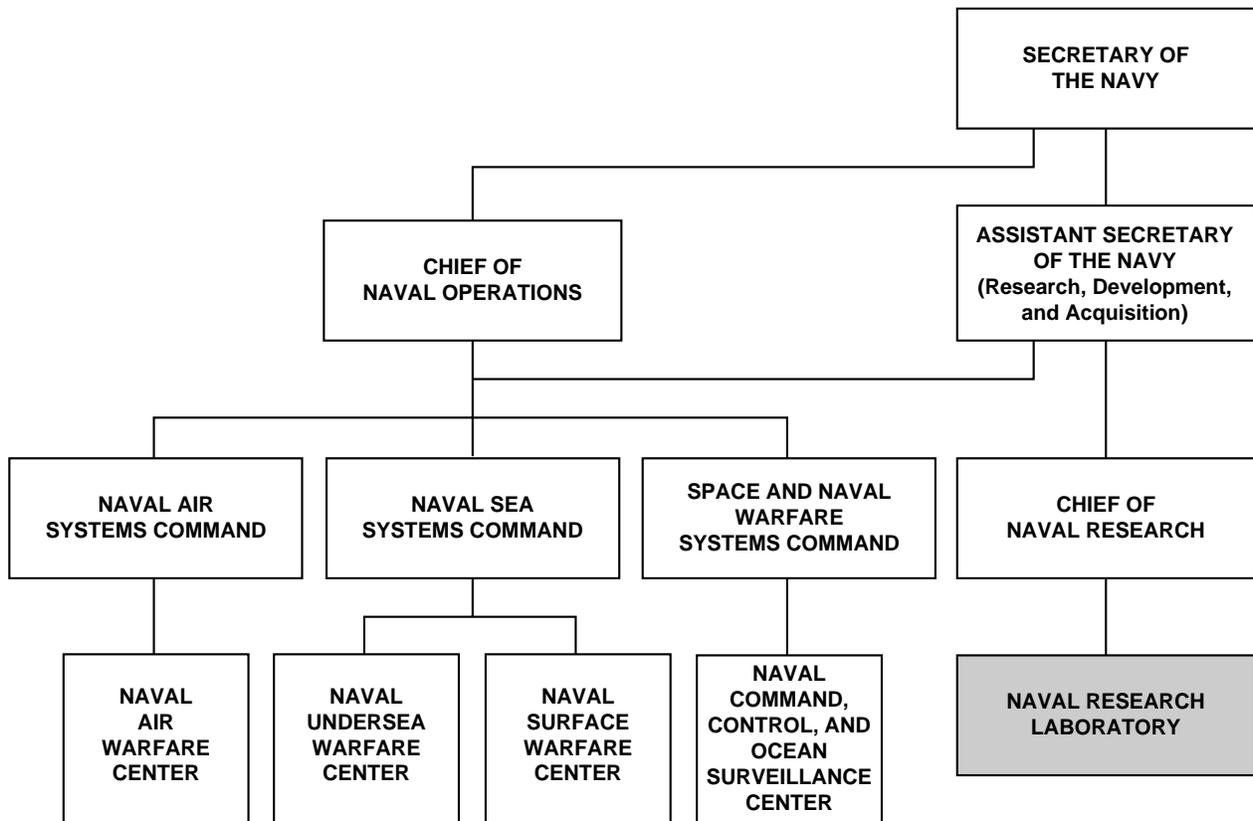
Mission

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 the principle in-house component in the Office of Naval Research's effort to meet its science and technology responsibilities.

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

 COMMANDING OFFICER Code 1000 CAPT B.W. Buckley, USN	 DIRECTOR OF RESEARCH Code 1001 Dr. T. Coffey
---	--

CHIEF STAFF OFFICER Code 1002 CAPT R. Leonard, USN	
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- Safety
- Security
- Flight Detachment
- MILOPS
- MILPERS
- Management Control and Review
- Public Affairs

HUMAN RESOURCES OFFICE Code 1800 Mrs. B.A. Duffield	
--	---

- Equal Employment Opportunity
- Staffing and Classification
- Employee Development
- Employee Relations
- ONR Human Resources Satellite Office

BUSINESS OPERATIONS Code 3000 Mr. R.E. Doak	
--	--

- Legal Counsel
- Management Information
- Contracts
- Financial Management
- Supply
- Research and Development Services
- Chesapeake Bay Section

MATERIALS SCIENCE AND COMPONENT TECHNOLOGY Code 6000 Dr. B.B. Rath	
---	--

- Laboratory for Structure of Matter
- Chemistry
- Materials Science and Technology
- Laboratory for Computational Physics and Fluid Dynamics
- Condensed Matter and Radiation Sciences
- Plasma Physics
- Electronics Science and Technology
- Center for Bio/Molecular Science and Engineering

NAVAL CENTER FOR SPACE TECHNOLOGY Code 8000 Mr. P.G. Wilhelm	
---	--

- Space Systems Development
- Spacecraft Engineering

SYSTEMS Code 5000 Dr. R.A. LeFande	
---	---

- Signature Technology Office
- Technical Information
- Radar
- Information Technology
- Optical Sciences
- Tactical Electronic Warfare

OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY Code 7000 Dr. E.O. Hartwig	
--	---

- Research Support Services
- Acoustics
- Remote Sensing
- Oceanography
- Marine Geosciences
- Marine Meteorology
- Space Science

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
- Simulation management software for networked high performance computers
- Algorithms for incorporating environment and communication systems performance into simulations
- Interactive 3-D visualization tools and applications

Directed Energy Technology

- High-energy lasers
- Chemical lasers
- Laser propagation
- High-power microwave sources
- Charged-particle devices

- Pulse power
- DE effects

Electronic Electro-optical Device Technology

- Integrated optics
- Radiation-hardened electronics
- Nanotechnology
- Microelectronics
- Microwave and MM wave technology
- Hydrogen masers for GPS
- Aperture syntheses
- Electric field coupling
- Vacuum electronics
- Focal plane arrays
- Infrared sensors

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 counter-measures 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
- EO/IR multispectral/hyperspectral surveillance

Enhanced Maintainability, Reliability, and Survivability Technology

- Coatings
- Lubricants and greases
- Water additives and cleaners
- Fire safety
- Laser hardening
- Satellite survivability
- Radiation Effects
- Mobility fuels

Chemical and biological sensors
Environmental compliance

Environmental Effects on Naval Systems

Meteorological effects on electro-magnetic/
electro-optical system performance
Meteorological effects on weapons, sensors, and
platforms
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
Electromagnetic, electro-optical, and acoustic
system performance/optimization
Environmental hazard assessment

Imaging Research/Systems

Remotely sensed signatures analysis
Real-time signal and image processing algo-
rithms/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 exploita-
tion
Remote sensing simulation
Hyperspectral imaging
Microwave polarimetry

Information Technology

Antijam communication links
Network architectures
Integrated voice and data
Battle management information systems
Arctic communication links
Information security (INFOSEC)
Voice processing
High performance computing
High performance communications
Requirement specification and analysis
Real-time computing
Tactical/warfighter's internetworking
Integrated internet protocol (IP) and asynchro-
nous transfer mode (ATM) multicasting
High assurance software
Defensive information warfare

Marine Geosciences

Geoacoustic modeling in support of acoustic
performance prediction
Marine seismology, including propagation and
noise measurement
Geomagnetic modeling in support of
nonacoustic system performance prediction
Geotechnology/sediment dynamics affecting
mine warfare and mine countermeasures
Mapping and charting, including advanced
seafloor mapping, imaging systems, and
compressed charts
Radiation and chemical monitoring

Materials

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

Meteorology

Global, theater, tactical-scale, and on-scene
numerical weather prediction
Data assimilation and physical initialization
Atmospheric predictability and adaptive
observations
Adjoint applications
Marine boundary layer characterization
Air/sea interaction; process studies
Coupled air/ocean/land model development
Tropical cyclone forecasting aids
Satellite data interpretation and application
Aerosol transport modeling
Meteorological applications of artificial intelli-
gence and expert systems
On-scene environmental support system devel-
opment
Tactical data base development and applications
Meteorological tactical decision aids
Meteorological simulation and visualization

Ocean Acoustics

- Underwater acoustics, including propagation, noise, and reverberation
- Fiber-optic acoustic sensor development
- Deep ocean and shallow water environmental acoustic characterization
- Undersea warfare system performance modeling, unifying the environment, acoustics, and signal processing
- Target reflection, diffraction, and scattering
- Acoustic simulations
- Tactical decision aids
- Sonar transducers
- Metrology

Oceanography

- Oceanographic instrumentation
- Open ocean, littoral, and nearshore oceanographic forecasting
- Shallow water oceanographic effects on operations
- Arctic environmental quality
- In-situ oceanographic sensors and data fusion
- Bio-optical and fine-scale physical processes
- Bio-corrosion
- Oceanographic simulation and visualization
- Coastal scene generation
- Waves, tides, and surf prediction
- Coupled model development
- Coastal ocean characterization
- Oceanographic decision aids
- Global, theater, and tactical scale modeling

Space Systems and Technology

- Advanced space systems architectures and requirements
- Systems engineering and analysis
- Mission evaluation and performance assessment
- Spacecraft controllers, processors, and signal processing
- Astrodynamic, mathematical modeling, and simulations
- Surveillance sensing technology and applications
- Satellite communications theory and systems
- Tactical communications systems
- Mobile data collection, processing, and dissemination
- Spacecraft electronics design, engineering, and integration
- Satellite ground station, tracking, telemetry, and control systems design
- Precise time and time interval technology
- Navigation satellite technology and frequency standards

- Remote sensing, calibration, and research
- Spacecraft electrical power and radio frequency systems
- Spacecraft survivability and radiation effects

Surveillance and Sensor Technology

- Point defense technology
- Imaging radars
- Surveillance radars
- Multifunction RF systems
- Target classification/identification
- Airborne geophysical studies
- Fiber-optic sensor technology
- Undersea target detection/classification
- EO/IR multispectral/hyperspectral detection and 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
- Micro-sensor systems

Undersea Technology

- Autonomous vehicles
- Bathymetric technology
- Anechoic coatings
- Acoustic holography



Major Research Capabilities and Facilities

(Listed alphabetically by organizational unit)

Acoustics Division (Code 7100)

Large, sandy-bottom, holographic pool facility for investigating echo characteristics of underwater buried/near bottom 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 acoustic signal processing system
Containerized data processing for acoustic array processing at remote sites and aboard ship
One million gallon, vibration-isolated underwater holographic/3-D laser vibrometer facility for studying structural acoustic phenomena for submarine and mine countermeasure systems
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
Digital Acoustic Buoy Systems (DABS), which can autonomously record data from vertical and/or horizontal acoustic arrays, providing the capability to (1) make long-term ambient noise measurements uncontaminated by the noise of a nearby ship and (2) make single ship propagation measurements

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
GC/MASS spectrometer
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
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/remediation
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
Femtosecond laser facility
Semiconductor assessment facility
Surface characterization facility

Electronics Science and Technology Division (Code 6800)

Nano- and micro-electronics characterization
and processing facilities
Electron-beam nanowriter
High-resolution transmission electron micro-
scope
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 materi-
als
Electronic testing and analysis facilities
Vacuum electronics engineering facility

Information Technology Division (Code 5500)

Extensive computer facilities
HF modem and channel simulation
Brandywine antenna range
Pommonkey test range
Signal analysis laboratory
Artificial intelligence computer network
Distributed simulation and prototyping test bed
HCI laboratory
Certification and INFOSEC engineering labora-
tory
Virtual reality laboratory
DoD High Performance Computing Moderniza-
tion Program (HPCMP) Distributed Center
(DC)
Thinking Machines CM-500e (256 processor
nodes, 32 Gbytes memory)
High-speed ATM network (backbone and to the
desktop)
Distributed file systems with authentication
(Andrew File System/Multi-Resident Andrew
File System (AFS/MRAFS))
Silicon Graphics/Cray Origin2000 (64 processor
nodes, 12 Gbytes memory)
Hewlett-Packard/Convex Exemplar SPP-2000
(64 processor nodes, 16 Gbytes memory)

E-MASS file server (43 Terabytes tertiary storage)
Lab-wide network, NICE net, providing lab-wide
computer communications, 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
Visualization laboratory
Lab-wide ADP training facility

Laboratory for Computational Physics and Fluid Dynamics (Code 6400)

Three INTEL iPSC/860 Touchstone Gamma
supercomputers (32, 64, 128 nodes)
Twelve high-capacity workstation class compute
servers networked together
Six-processor SGI Power Onyx Challenge work-
station
D2 Digital video and animation laboratory
SUN Microsystems 670MP workstation server
Over sixty SUN, SGI, and MACINTOSH work-
stations
Two hundred and ten Gigabyte RAID Disk
Storage System
All computers and workstations have network
connections to NICENET allowing access to the
NRL CCS facilities (including the DoD HPC
resources) 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
Atomic force microscope

Marine Geosciences Division (Code 7400)

Airborne gravimetry, magnetics, and topo-
graphic 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 operat-
ing 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 organics

Map data formatting facility compresses map information onto compact disk-read only memory media for masters for use in aircraft digital moving map systems

Magnetic observatory conducts measurements of ambient field and other magnetic phenomena

Comprehensive geotechnical and geoacoustics 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) for fielding regional and shipboard METOC applications

SMQ-11 shipboard antenna system for retrieving polar-orbiting satellite data

Geostationary satellite data direct readout and processing center

Super-workstations for numerical weather prediction systems development

Master Environmental Library (MEL) implemented on super-workstations for archiving and distributing real-time and historical atmosphere/ocean data bases

Data visualization center for developing shipboard briefing tools, displaying observations and model output, and integrating meteorological parameters into tactical simulations

Materials Science and Technology Division (Code 6300)

Ultrasonic gas atomizer

Hot isostatic press

Cold isostatic press

High-energy, dispersive X-ray analytical system

Electron microprobe, SEM, SAM, 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)

Thermoelectric parametric measurement system

Class 1000 clean room; processing metallic film

Elevated temperature and structural characterization laboratory

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

Remotely operated underwater vehicle (ROV)

Bottom mounted acoustic doppler profilers

Towed hyperspectra optical array

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

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
 Optical and digital image processing facilities
 Silica and IR fluoride/chalcogenide fiber 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
 Laser diode pumped 10 W 2 μm solid state lasers
 Field-qualified EO/IR measurements devices
 Focal plane array evaluation facility
 Mid-IR, low phonon crystal growth facility
 Onyx-based multispectral image processing facility
 Indoor IR test range
 NRL P-3 aircraft sensor pallet
 EO/IR high-resolution sensors
 IRCM
 Common data link
 Infrared countermeasure techniques laboratory
 Multi and hyperspectral sensors and processing

Plasma Physics Division (Code 6700)

PAWN, 1-MJ compact inductive storage facility
 Gamble II high-voltage pulsed power generators
 HAWK, 1 MA inductive storage facility
 PHAROS III, three-beam neodymium-glass laser and target facility
 Table-Top Terawatt (T^3) laser system
 NIKE krypton fluoride laser facility
 Hyperspectral imagers
 High-power relativistic klystron and gyrotron facilities
 Large volume space chamber (2 m \times 5 m)
 Agile mirror radar antenna facility
 Microwave facility for processing of advanced materials (2.45, 35, 94, and 60-120 GHz)

Radar Division (Code 5300)

Airborne research radar facility, including advanced profile high-resolution imaging radar and P3 (1998) with APS-145 Group 2t and CEC
 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)

Polar ozone and aerosol monitor space sensor
 Ground-based stratospheric water-vapor monitoring system
 SAR processing facility
 SCI processing facility
 SEALAB
 NASE LAB
 Hyperspectral imaging, sensor, and processing
 Navy prototype optical interferometer
 Washington VLBI correlator
 WVMS NDSC instrument
 Free surface hydrodynamics laboratory
 Optical remote sensing calibration lab/facility
 IRIS system and processor
 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
 NRL RP-3A aircraft sensors
 Airborne Lidar
 MMW imagers (35,90,140,220 GHz)
 DMSP SSM/I simulator
 LFMRSST 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
Hyperspectral sensor system
Ultra wideband SAR

Research and Development Services Division (Code 3500)

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

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
Special Sensor Ultraviolet Limb Imager (SSULI)
calibration facility
Ultraviolet remote sensing data center
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
Large Angle White Light and Spectrometric
Coronagraph (LASCO) operation and data
analysis
Extreme-ultraviolet Imaging Telescope (EIT)
Middle Atmosphere High Resolution Spec-
trograph Investigation (MAHRSI) to measure
OH and NO in middle atmosphere

Space Systems Development Department (Code 8100)

Payload test facility and processor development
laboratory
Spacecraft high-reliability electronic and electri-
cal production facility
Spacecraft electronic systems integration and
test facility
Spacecraft electrical power systems and battery
laboratories
Tactical Technology Development Laboratory
(TTDL)
Electromagnetic interference/electromagnetic
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
Pomomoy field site/large antenna, space
communications and research facility
Midway Research Center/space communica-
tions 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
NARDIC (Naval Acquisition, Research, and
Development Information Center)
Research library (1,100 current paper subscrip-
tions (with over 300 available electronically),
50,000 monographs, 100,000 bound journals,
8,000 cassettes of microfilmed journals, and
1,250,000 technical reports (1,000,000 micro-
fiche, 200,000 stored as digital images, and
150,000 retained as paper copy)
STILAS (Scientific and Technical Information
Library Automation System) online catalog of
library book, journal, and unclassified reports
holdings and NRL Bibliography 1988 to date,
with built-in links to full document content
residing in TORPEDO or on licensed Web
sites
LAN-based STAR catalog of classified and
unclassified reports holdings seamlessly
linked to the Research Reports Imaging
System storing 200,000 technical reports (10
million pages)
TORPEDO Digital Library Initiative for Web
access to 200 journals, 5,000 reports, 2,000 NRL
press releases, 3,000 NRL-authored articles,
and other documents
InfoWeb Information System and Gateway
(<http://infoweb.nrl.navy.mil>) for single point
of access to: STILAS; TORPEDO; Materials
Safety Data Sheets and other locally mounted
data; hundreds of databases, digital journals,
and other information sources licensed for
NRL and ONR use; and the Contents-to-Go
current awareness/document delivery service
Digital library projects with association, com-
mercial, and government publishers (e.g., the
American Physical Society, Elsevier Science,
and the National Institute of Standards and
Technology)
CRADA with the American Physical Society for

creation of a Web-based archive of the
Physical Review
Consortial relationship with the National
Institute of Standards and Technology, the
NASA Goddard Space Flight Center, and
the National Science Foundation through
the NRL-initiated National Research
Library Alliance
Member of the Coalition for Networked
Information
Photographic laboratories
Writing, editing, and publications consulta-
tion
Graphic design services
Video recording and productions
Video editing suite
Scientific and technical photographers
NRL Exhibit Program; display, design, and
production
Multimedia design and production



NRL Sites and Facilities

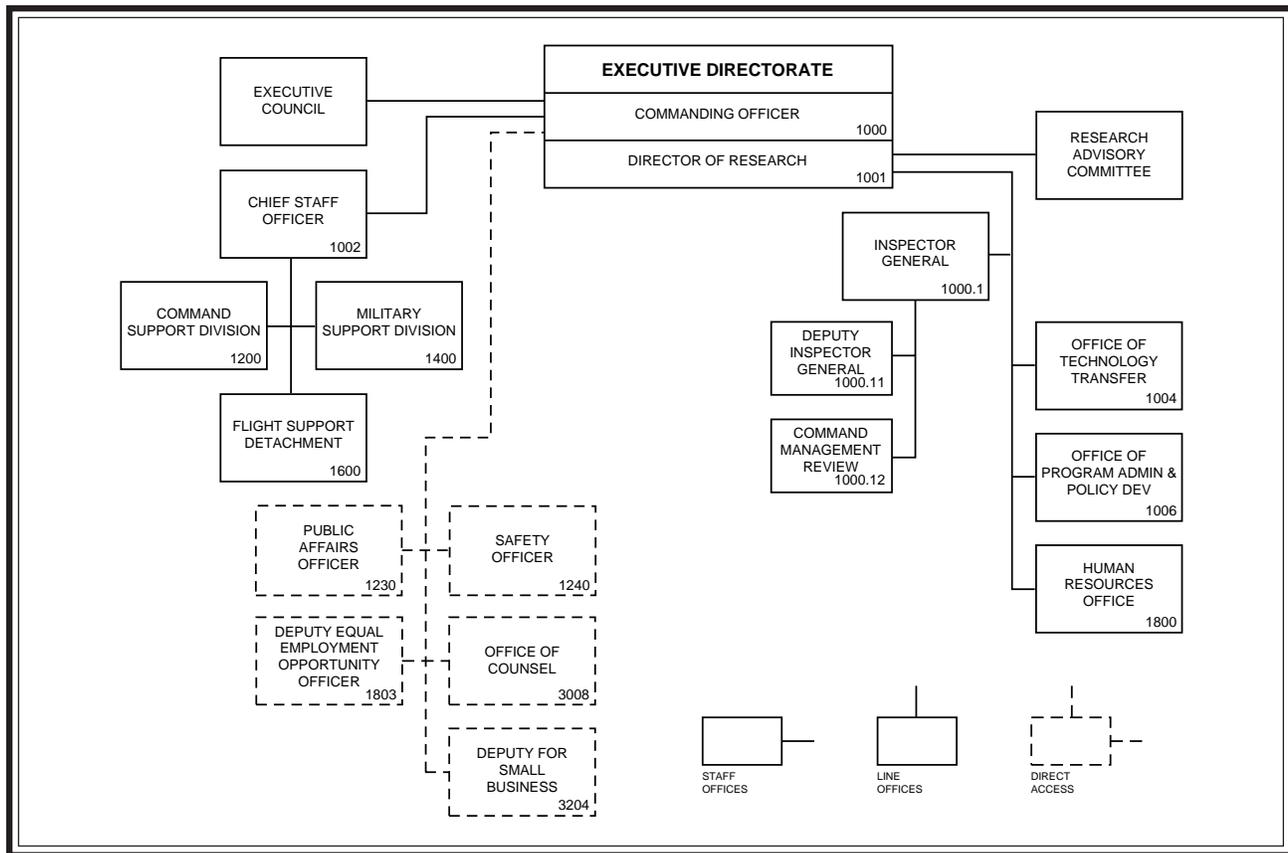
SITE	ACREAGE		BUILDINGS/ STRUCTURES
	LAND OWNED/LEASED	EASEMENT/ LICENSE-PERMIT	
District of Columbia NRL and Artificial Intelligence Center at Bolling AFB	131/0	0/10.24	108/25
Virginia Midway Research Center Quantico	162/0		9/1
Maryland NRL Flight Support Detachment, NAS Patuxent River*	Tenant		
Chesapeake Bay Section and Dock Facility Chesapeake Beach*	157/0	0/0.60	63/87
Multiple Research Site Tilghman Island*	2/0		3/3
Radio Astronomy Observatory Maryland Point*	24/0		10/16
Radio Antenna Range USAF Receiver Site Brandywine*	0/0	0/22.98	1/0
Free Space Antenna Range Pomonkey*	56/0	28.40/0	9/11
Florida Marine Corrosion Facility Key West	Tenant		
California NRL Monterey Monterey*	Tenant		
Mississippi Stennis Space Center Bay St. Louis*	Tenant		
Alabama Ex-USS <i>Shadwell</i> (LSD-15) Mobile Bay	Tenant		
	Decommissioned 457-ft vessel used for fire research		

PROPERTY

Land:		Buildings:		Replacement Costs:	
Owned	556 acres	RDT&E	3,190,418 ft ²	Real property – current	
Leased	0 acres	Administrative	225,812 ft ²	Replacement value	\$938 million
		Other	422,367 ft ²	Equipment	\$256.9 million

*See maps in the General Information section (page 137).

**Executive
Directorate**



Key Personnel

Name	Title	Code
CAPT B.W. Buckley, USN	Commanding Officer	1000
Dr. T. Coffey	Director of Research	1001
CAPT R. Leonard, USN	Chief Staff Officer/Inspector General	1002/1000.1
Mr. J.C. Payne	Head, Command Support Division	1200
Ms. B. Peters	Command Management Review	1000.12
Dr. R.H. Rein	Head, Technology Transfer	1004
Mrs. L.T. McDonald	Head, Office of Program Administration and Policy Development	1006
Mr. R.H. Baturin	Head, Public Affairs Branch	1230
Mr. K.J. King	Head, Safety Branch	1240
CDR R.B. Francisco, USN	Head, Military Support Division	1400
CDR D.R. Dowell, USN	Officer in Charge, Flight Support Detachment	1600
Mrs. B.A. Duffield	Director, Human Resources Office	1800
Ms. D.E. Erwin	Deputy Equal Employment Opportunity Officer	1803
Ms. H.J. Halper	Office of Counsel	3008
Ms. P. Schaefer	Deputy for Small Business	3204

EXECUTIVE DIRECTORATE

Code 1000 and Code 1001

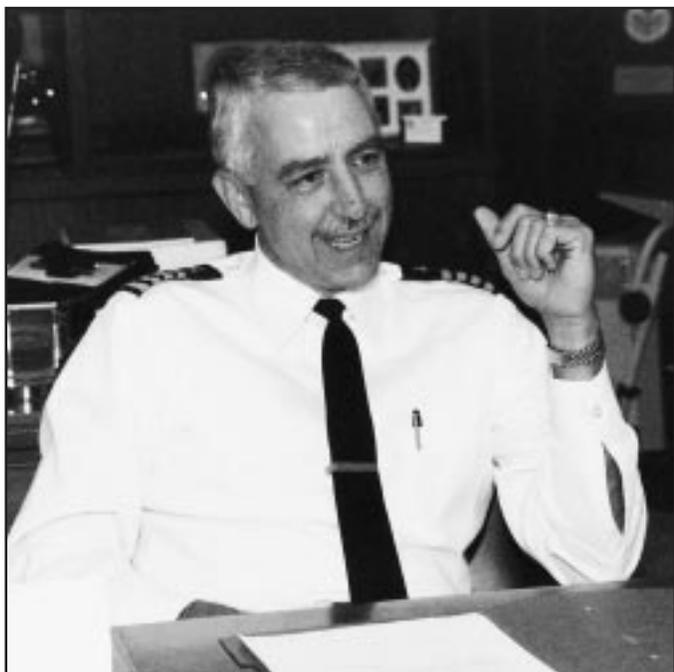
The Commanding Officer (Code 1000) and the Director of Research (Code 1001) share executive responsibility for the management of the Naval Research Laboratory. In accordance with Navy requirements, the Commanding Officer is responsible for the overall management of the Laboratory and exercises the usual 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 three 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



CAPT Bruce W. Buckley, USN, graduated from the United States Naval Academy in 1973. After a brief tour with Fighter Squadron 31 at Naval Air Station Oceana, Virginia, CAPT Buckley entered flight training and was designated a Naval Aviator in December 1974 at Naval Air Station Chase Field, Texas. After completing replacement pilot training in the F-14A at Fighter Squadron 124, he served a fleet assignment as an F-14A pilot in Fighter Squadron 24.

CAPT Buckley has accumulated extensive experience in research, development, engineering, and project management beginning with a

tour on the Joint Test Force of the Air Combat/Air-to-Air Missile Evaluation at Nellis Air Force Base, Nevada. He then attended the Naval Postgraduate School at Monterey, California, where he earned a Master of Science in Electrical Engineering with Distinction. While at postgraduate school, CAPT Buckley was selected to be designated an Aerospace Engineering Duty Officer (AEDO).

As an AEDO, CAPT Buckley has had positions of increasing responsibility in engineering and program management including F/A-18 F404 Project Officer at the Naval Plant Representatives Office, Lynn, Massachusetts; Avionics and Electro-Optics Projects Manager in the F/A-18 Program Management Office, Assistant to the Program Director of Tactical Aircraft Programs, F404 Engine Program Manager, and Program and Policy Branch Head in the Propulsion Division, all at the Naval Air Systems Command, Arlington, Virginia. CAPT Buckley then served in two positions, as the F-14 Aircrew Systems Program Manager and as the Deputy Director of the Research and Engineering Department of the Naval Training Systems Center in Orlando, Florida. Returning to Washington and the Naval Air Systems Command in July 1993, he served as the Director of the Propulsion and Power Division and the Executive Assistant to the Commander, Naval Air Systems Command. CAPT Buckley assumed command of the Naval Research Laboratory on January 26, 1996.

CAPT Buckley's decorations include the Legion of Merit, the Meritorious Service Medal, a Joint Service Commendation, and three Navy Commendations.

CAPT Buckley is married to the former Janice E. Faller of Miami, Florida. The Buckley's reside in Lake Ridge, Virginia, with their two daughters, Michele and Sandra.

Director of Research

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

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

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

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

Dr. Coffey is a fellow of the American Physical Society and of the Washington Academy of Sciences. He has been presented the following awards: Presidential Rank of Meritorious Executive, in 1981; Distinguished Presidential Rank, in 1987; Delmer S. Fahrney Medal, Franklin Institute, in 1991; DoD Distinguished Civilian Service, in 1991; and Distinguished Presidential Rank, in 1994.



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 Program Administration and Policy Development
- 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)

Chief Staff Officer/Inspector General Code 1002/1000.1



CAPT R. LEONARD, USN

The Chief Staff Officer serves as the Deputy to the Commanding Officer and acts for the Commanding Officer in his absence. The Command Support Division (Code 1200), the Military Support Division (Code 1400), and the Flight Support Detachment (NAS Patuxent River, MD, Code 1600) report directly to the Chief Staff Officer. When directed, the Laboratory's Inspector General 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; management practices; 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.

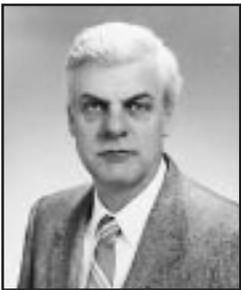
Public Affairs Officer Code 1230



Mr. R.H. BATURIN

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).

Safety Officer Code 1240



Mr. K.J. KING

The Head of the Safety Branch acts as the Safety Officer and is the program manager for Occupational Safety and Health, Explosives Safety, Industrial Hygiene, Hazardous Material Control and Management, Radiological Safety, Non-Ionizing Radiation Safety, and Environmental Protection. The Safety Branch must ensure that the development, implementation, and maintenance of comprehensive safety and environmental compliance programs, in support of the Laboratory's unique areas of research and development, comply with the appropriate federal, state, Navy, and NRL regulations.

Deputy Equal Employment Opportunity Officer Code 1803



Ms. D.E. ERWIN

The Deputy Equal Employment Opportunity Officer (DEEEO) is the EEO program manager and the advisor to the Commanding Officer on all EEO matters. The DEEEO 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 DEEEO 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.

Office of 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 Program Administration and Policy Development

Code 1006



MRS. L.T. McDONALD

Basic Responsibilities

The Office of Program Administration and Policy Development provides managerial, technical, and administrative support to the Director of Research (DOR) in such areas as program and policy development, intra-Navy and inter-Service Science and Technology (S&T) program coordination, liaison with other Navy, DoD and government activities on matters of mutual concern, and support to the Executive Directorate in planning and directing NRL's S&T (6.1, 6.2) program. Specific functions include: monitors and provides background information on technical and policy matters that come under the purview of the DOR; represents NRL, ONR, and/or the Navy on tri-Service or DoD-wide coordination matters; performs special studies or chairs ad hoc study groups regarding program decisions or policy positions; performs special studies involving major NRL programs and resource issues; provides administrative support in the areas of personnel, budget, facilities, equipment, and security; provides executive management information and analyses for various aspects of the S&T program effort; coordinates VIP visits to NRL; manages the NRL directives system; administers the NRL response to Congressional requests; maintains the NRL R&D achievements file; develops the S&T guidance for monitoring and reporting the NRL S&T program; responsible for the administration of NRL's various postdoctoral fellowship programs; and manages the Facility Modernization Program.

Personnel: 24 full-time civilian

Key Personnel

Name	Title	Code
Mrs. L.T. McDonald	Head	1006
Ms. L.S. Herrin	Head, Program Administration Staff	1006.1
Ms. L. Renfro	Head, GLSIP Program	1006.17
Ms. J.V. Kemper	Administrative Officer	1006.2
Mr. R. Leadley	Head, Management Information Staff	1006.3
Mr. E. Rank	Head, NRL Facilities	1006.4
Ms. M.E. Barton	Head, Directives Staff	1006.5

Point of contact: Ms. J.V. Kemper, Code 1006.2, (202) 767-3082

Command Support Division

Code 1200 Staff Activity Areas

- Security
- Public affairs
- Safety
- Fire protection
- Administrative operations

Public affairs



Safety evaluation



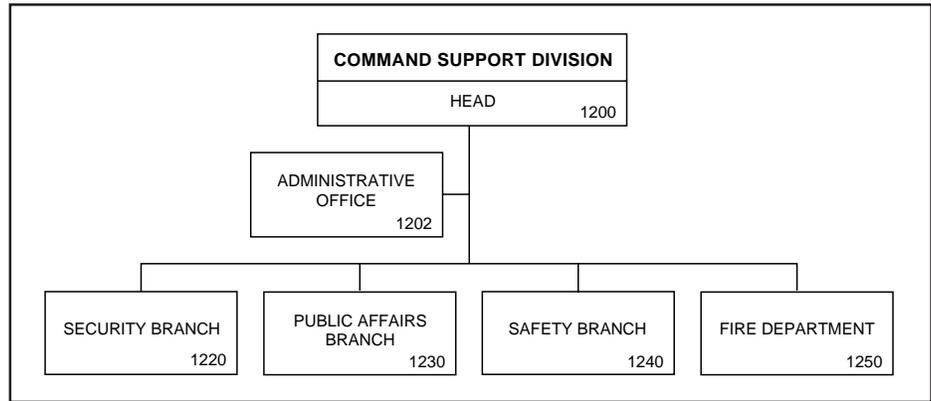
Security monitoring



Incoming visitor's reception area



Mr. J.C. PAYNE



Basic Responsibilities

The Command Support Division provides civilian staff to the Commanding Officer and to the Director of Research. The Division is responsible for the Laboratory's physical, personnel, information, industrial and ADP security programs, communications service, fire protection, occupational safety, health and industrial hygiene, and environmental and public affairs. 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. In addition, administrative/budget supervision over the Military Operations Branch and the Patuxent River Flight Support Detachment is provided.

The Head of the Command Support Division is also the Deputy Inspector General. The Deputy Inspector General is responsible for day-to-day functioning of the office and its staff, program planning and execution and provides interface with outside agencies concerning inspections and audits conducted or to be conducted by NRL. These include Inspector General representatives from ONR, Navy, DoD, and GAO.

Personnel: 146 full-time civilian

Key Personnel

Name	Title	Code
Mr. J.C. Payne	Head	1200
Ms. M.A. Sepety	Administrative Officer	1202
Mr. J.T. Miller	Head, Security Branch	1220
Mr. R. Perry	Head, Information and Personnel Security Services and ADP	1221
Mr. C. Rogers	Head, Classification Management and Control Section	1221.1
Ms. K. Coleman	Head, Personnel Security	1221.2
Chief W.C. Edwards	Head, Guard Force	1222.2
Ms. B. Zuro	Head, Security Administration	1222.3
Mr. J.T. Miller	Head, Special Security Section	1223
Ms. J. Gray	Head, Special Security Office	1223.1
Ms. M. Knight	Head, Special Programs	1223.2
Mr. R.H. Baturin	Head, Public Affairs Office	1230
Mr. K.J. King	Head, Safety Branch	1240
Mr. E. Stillwell	Fire Chief	1250

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

Military Support Division

Code 1400 Staff Activity Areas

- Operations Branch
- Administrative Branch
- Communications Branch



P-3 airborne research facility

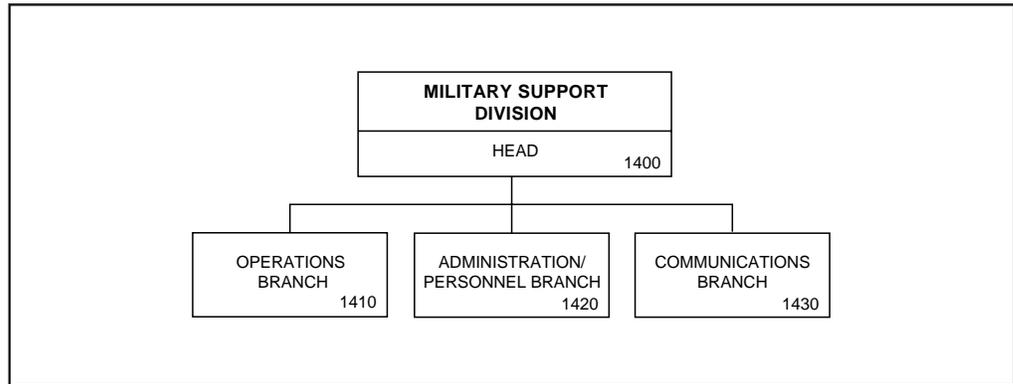
Administration



Administration



CDR R.B. FRANCISCO, USN



Basic Responsibilities

The Military Support Division provides military operational, administrative, and communication services to NRL.

The Operations Branch assists NRL Research Directorates in planning and executing project flight missions; develops deployment schedules and military operational and training objectives; and coordinates the Research Reserve Program within NRL.

The Military Administration Branch is responsible for the coordination and efficient functioning of all military administrative operations for NRL (including site detachments). These duties specifically include: personnel actions, maintenance of personnel records, performance evaluations, awards and training; advising the Chief Staff Officer on manpower matters and organization issues; and preparation and administration of the military operational budget.

The Communications Branch is responsible for processing all incoming and outgoing naval messages, processing requests for frequency allocation and assignment, and assigning radio call signs for users within NRL. The communications center also oversees the COMSEC Security Program and provides CMS support for the Laboratory.

Personnel: 6 full-time civilian; 10 military

Key Personnel

Name	Title	Code
CDR R.B. Francisco, USN	Head	1400
LCDR J.L. Baca, USN	Assistant Military Operations Officer	1410
LT J.O. Trout, USN	Military Administration and Personnel	1420
Mr. W.H. Blaney	Communications/Message Center	1430

Point of contact: YNC M.S. Braschler, USN, Code 1420, (202) 767-6058

Flight Support Detachment

Code 1600 Staff Activity Areas

- Operations
- Administration
- Aircraft maintenance
- Safety/Natops



P-3 airborne research facility



Flight Support Detachment hangar



Administration

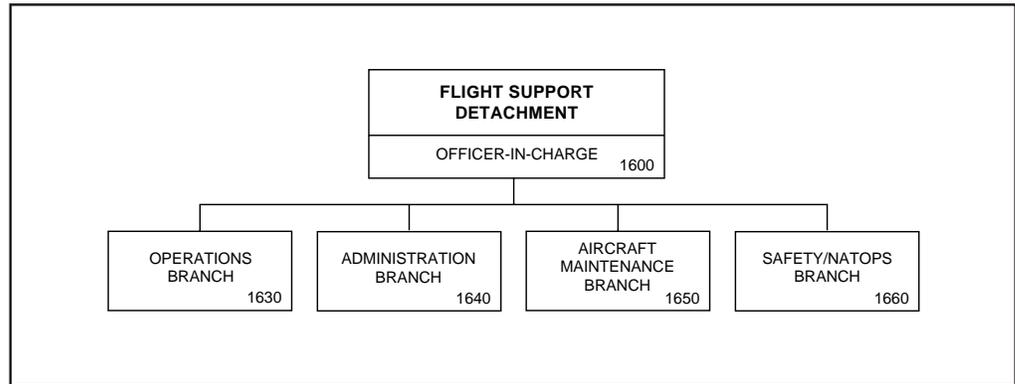


Aircraft maintenance





CDR D.R. DOWELL, USN



Basic Responsibilities

The Flight Support Detachment located at NAS Patuxent River, Maryland, operates and maintains five uniquely configured P-3 Orion aircraft. The men and women of the detachment provide the Naval Research Laboratory with airborne research platforms, conducting flights worldwide in support of a wide spectrum of projects and experiments. These include: magnetic variation mapping, hydroacoustic research, bathymetry, electronic countermeasures, gravity mapping, and radar research. The detachment annually logs over 2,000 flight hours and in its 33 years the Flight Support Detachment has amassed 53,000 hours of accident-free flying.

Personnel: 5 full-time civilian; 95 military

Key Personnel

Name	Title	Code
CDR D.R. Dowell, USN	Officer in Charge	1600
LCDR J.F. Cherra, USN	Assistant Officer in Charge	1600.1
ADCS W. Boldt, USN	Command Senior Chief	1600.2
Ms. B.J. Walter	Executive Secretary	1600.4
LT S.A. Zwolinski, USN	Operations Officer	1630
LT L.G. Belew, USN	Administration Officer	1640
LT D.L. Erlewine, USN	Aircraft Maintenance Officer	1650
AVCM T.E. O'Conner, USN	Maintenance/Material Control Officer	1650.1
LT P.C. Schulz, USN	NATOPS Officer	1660.1
LT J.M. Baillio, USN	Aviation Safety Officer	1660.7A

Point of contact: LT L.G. Belew, USN, Code 1640, (301) 342-4926; DSN 342-4926

Human Resources Office

Code 1800 Staff Activity Areas

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



Training Branch



EEO Staff



Employee Relations Branch



Workforce Support and Manpower Program



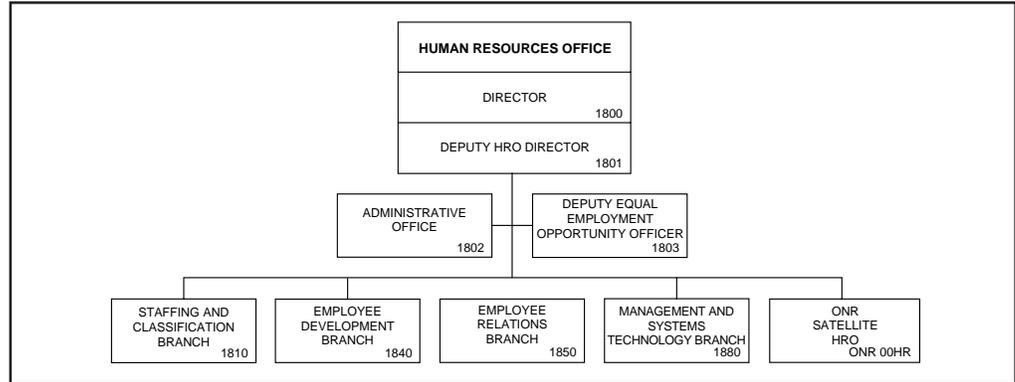
Records Processing Staff



Staffing and Classification 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) 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 3,800 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. 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 Arlington, Virginia, services about 500 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: 89 work years

Key Personnel

Name	Title	Code
Ms. B.A. Duffield	Director	1800
Mr. D. 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 and Classification Branch	1810
Mr. F.W. Robbins	Head, Employee Development Branch	1840
Ms. J.L. Walker	Head, Employee Relations Branch	1850
Ms. J.M. Sykes	Head, Management and Systems Technology Branch	1880
Ms. M. Aylor	Site Manager, ONR Human Resources Satellite Office	ONR 00HR

Point of contact: Ms. T. Mason, Code 1802, (202) 767-3035

**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



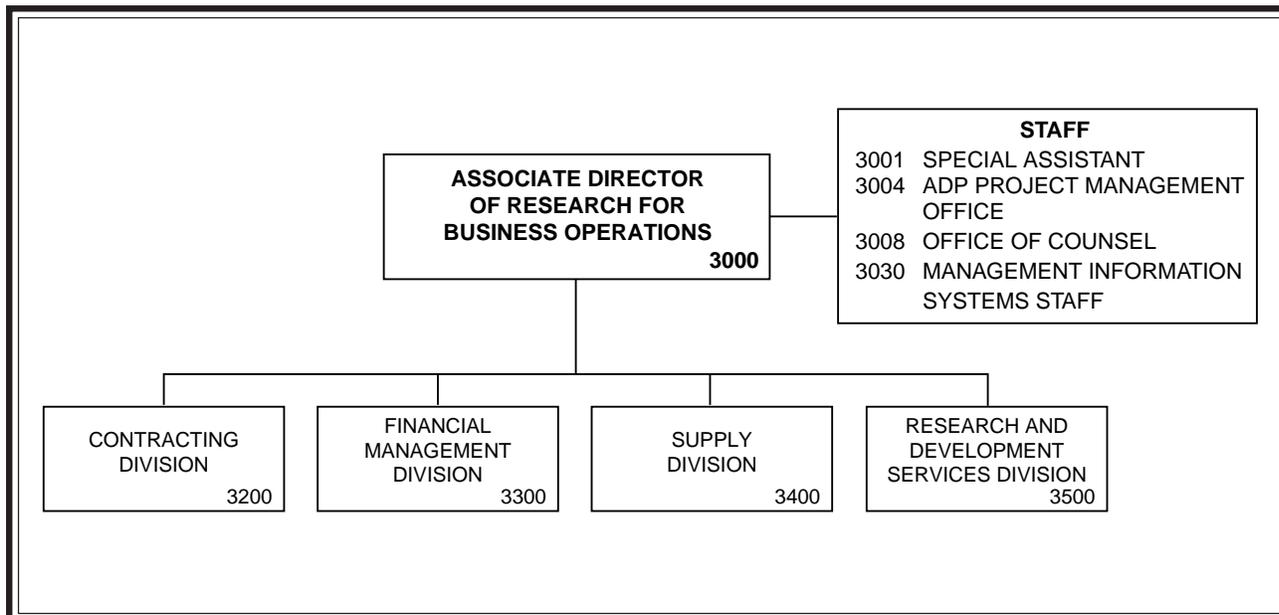
Mr. R.E. Doak [REDACTED]. He graduated from Benjamin Franklin University with a bachelor's degree in accounting in 1964 and a master's degree in business administration in 1966. Mr. Doak is a Certified Public Accountant licensed by the State of Maryland.

Mr. Doak has thirty 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 manage-

ment 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.K. Therning	Comptroller	3300
Ms. C. Hartman	Supply Officer, Supply Division	3400
Mr. S.D. Harrison	Director, Research and Development Services Division	3500

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

Office of 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 Law	3008.1
Mr. T. McDonnell	Associate Counsel/Intellectual Property Law	3008.2
Mr. A. Beede	Associate Counsel/SSC Legal Matters	3008.3

Point of contact: Ms. P. Schuler, Code 3008A, (202) 767-7605

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: 20 full-time civilian; 2 part-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) 767-3726



Management Information
Systems Staff



Computer Operations



Systems Management

Contracting Division

Code 3200

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

Contract specialist prepares contract award



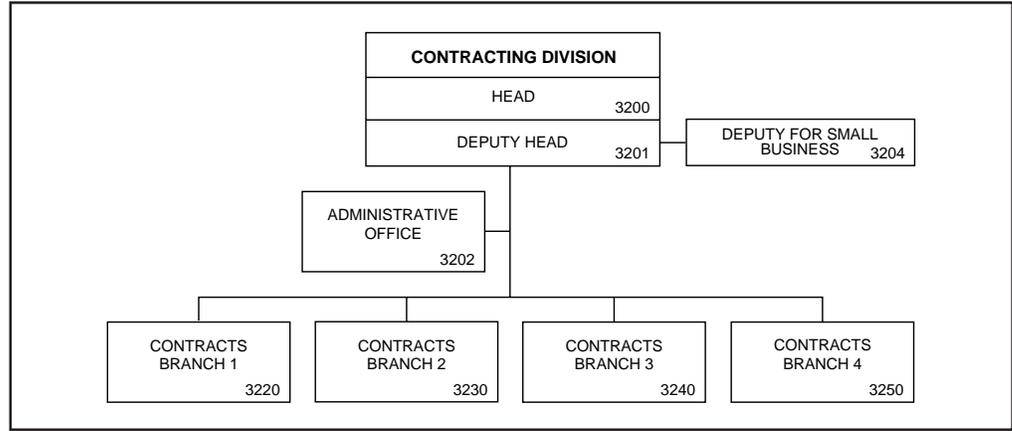
Procurement Information Processing System (PIPS) coordinator consults with procurement technician and PIPS hotline representative



Deputy Division Head conducts staff meeting



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: 62 full-time civilian

Key Personnel

Name	Title	Code
Mr. J. Ely	Head	3200
Ms. M.A. Carpenter	Deputy Head	3201
Ms. J. Halperson	Administrative Officer	3202
Ms. L.M. Byrne	Deputy for Small Business	3204
Ms. W. Cosby	Contracts Branch 1	3220
Mr. E. Tunney	Contracts Branch 2	3230
Ms. M.A. Carpenter	Contracts Branch 3	3240
Mr. J. Adams	Contracts Branch 4	3250

Point of contact: Ms. J. Halperson, Code 3202, (202) 767-3749

Financial Management Division

Code 3300

- Budget
- Reports and Statistics
- Accounting
- Travel Services
- Payroll Liaison



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

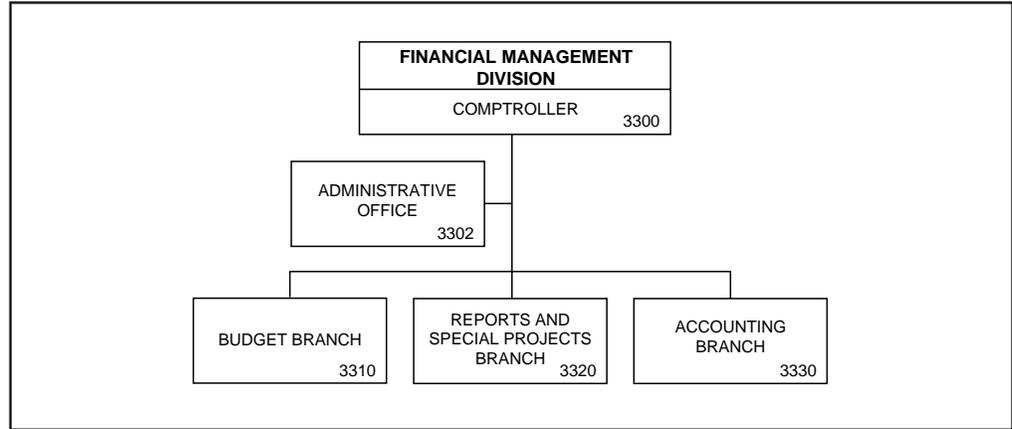
The Accounting Branch performs services essential to the Laboratory that include vendor payments and cost accounting



The Travel Services Unit examines travel claims for payment



Mr. D.K. THERNING



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: 79 full-time civilian

Key Personnel

Name	Title	Code
Mr. D.K. Therning	Comptroller	3300
Ms. A.J. Downs	Administrative Officer	3302
Ms. M.L. Balonis	Head, Budget Branch	3310
Ms. T.F. Sninsky	Head, Reports and Special Projects	3320
Mr. M.C. Mills	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

Supply Division

Code 3400

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

Inspection and delivery preparation for incoming material



Customers and employees at the Supply store



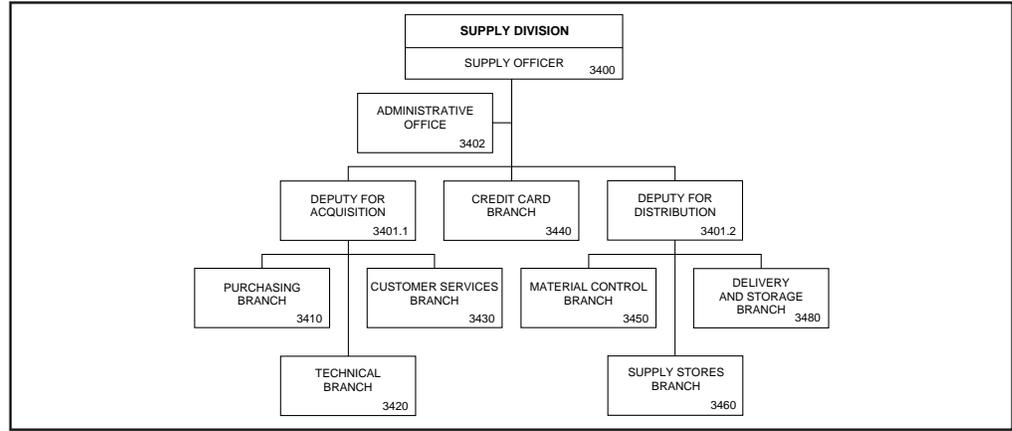
Central Receiving in building 49 warehouse



Bulk storage area at the Supply store



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: 100 full-time civilian

Key Personnel

Name	Title	Code
Ms. C. Hartman	Supply Officer	3400
Mr. J. Booros	Contract Specialist	3401.1
Ms. A. Olson	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
Ms. P. Carter*	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

- Technical Services
- Operations
- Shop Services
- Chesapeake Bay Section
- Administration
- Customer Liaison



Installing fiber optic lines

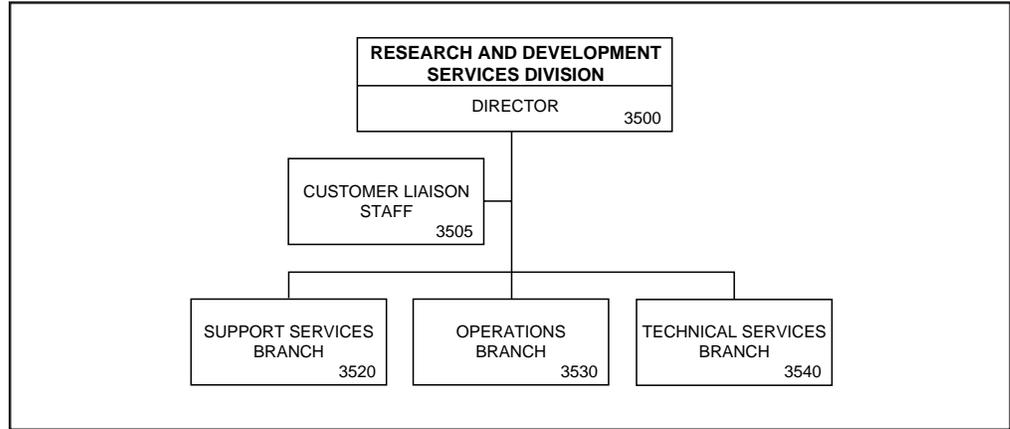
Renovation of Acoustics Division facility



Installing new communication duct lines to service Information Technology Division's renovated Computational Science facility



Mr. S. HARRISON



Basic Responsibilities

The Research and Development Services Division is responsible for the physical plant of the Naval Research Laboratory and subordinate field sites. The responsibilities include military construction, engineering, construction, facility support services, planning, maintenance/repair/operation of all infrastructure systems, and transportation.

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

Personnel: 151 full-time civilian

Key Personnel

Name	Title	Code
Mr. S. Harrison	Director	3500
Mr. P. Le	Customer Liaison Staff	3505
Mr. T. Miller	Customer Liaison Staff	3505
Mr. T. Erwin	Support Services Branch	3520
Ms. L. Jones	Administration Section	3521
Mr. M. Kosky	Chesapeake Bay Section	3522
Mr. J. Headley	Shop Services Section	3523
Mr. F. Regalia	Operations Branch	3530
Mr. M. Schultz	Production Control Section	3531
Mr. K. Hull	Technical Services Branch	3540

Point of contact: Ms. L. Jones, Code 3521, (202) 767-2168

**Systems
Directorate**

SYSTEMS DIRECTORATE

Code 5000

The Systems Directorate applies the tools of basic research, concept exploration, and engineering development to expand operational capabilities and to provide materiel support to Fleet and Marine Corps missions. Emphasis is on technology, devices, systems, and know-how to acquire and move war-fighting information and to deny these capabilities to the enemy. Current activities include:

- New and improved radar systems to detect and identify ever smaller targets in the cluttered littoral environment;
- Optical sensors and related materials to extract elusive objects in complex scenes when both processing time and communications bandwidth are limited;
- Unique optics-based sensors for detection of biochemical warfare agents and pollutants, for monitoring structures and for alternative sensors;
- Advanced electronic support measures techniques for signal detection and identification;
- Electronic warfare systems, techniques, and devices including quick-reaction capabilities;
- Innovative concepts and designs for reduced observables;
- Techniques and devices to disable and/or confuse enemy sensors and information systems;

- Small “intelligent”/autonomous land, sea, or air vehicles to carry sensors, communications relays, or jammers; and

- High performance/high assurance computers with right-the-first-time software and known security characteristics despite commercial off-the-shelf components and connections to public communications media.

Many of these efforts extend from investigations at the frontiers of science to the support of deployed systems in the field, which themselves provide direct feedback and inspiration for applied research and product improvement and/or for quests for new knowledge to expand the available alternatives.

In addition to its wide-ranging multidisciplinary research program, the Directorate provides support to the Corporate Laboratory in shared resources for High Performance Computing and Networking, Technical Information collection and distribution and in coordination of Laboratory-wide efforts in Signature Technology, Counter-Signature Technology, Theater Missile Defense, and the Naval Science Assistance Program.

Associate Director of Research for Systems



Dr. 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.

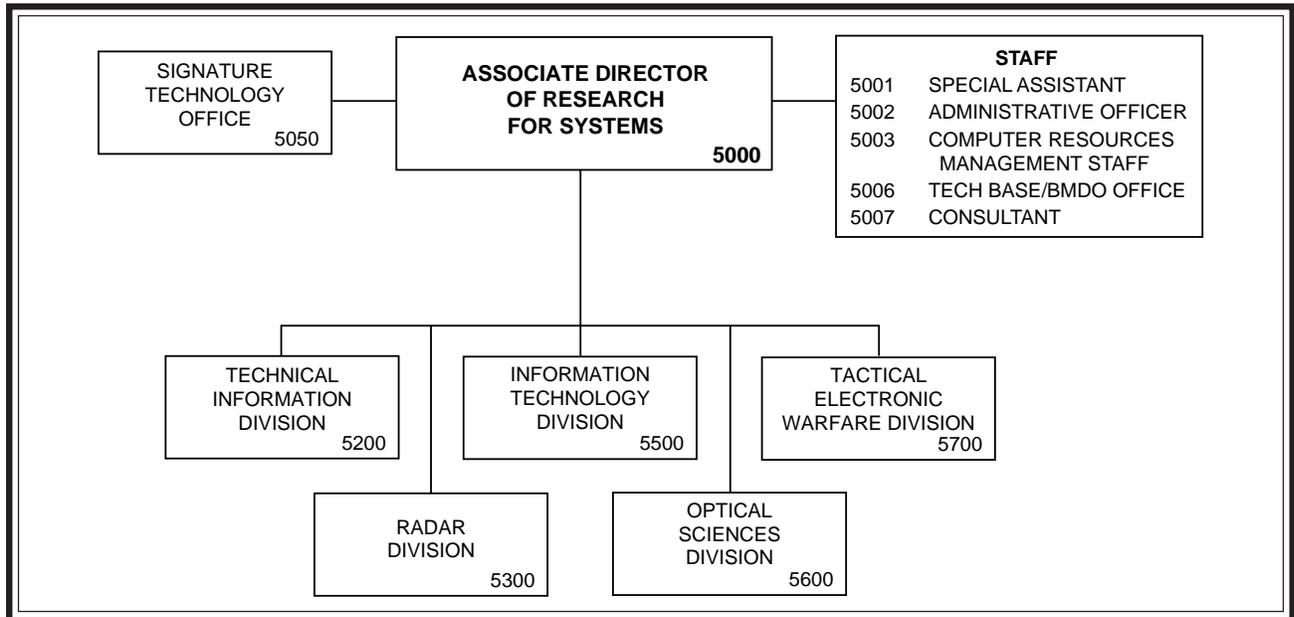
In July of 1965, Dr. LeFande joined the Naval Research Laboratory as a research physicist in the Satellite Communications Branch. He worked on a variety of projects related to the

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 (C³I 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 Systems	5000
Ms. B.J. Turner	Special Assistant	5001
Ms. D. Ernst	Administrative Officer	5002
Ms. K. Howell*	Computer Resources Management Staff	5003
Dr. S. Sacks	Technology Base/Ballistic Missile Defense Organization	5006
Dr. M.I. Skolnik	Consultant	5007
Dr. D.W. Forester	Signature Technology Office	5050
Mr. P. Imhof	Head, Technical Information Division	5200
Dr. G.V. Trunk	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

**Technology Base/Ballistic Missile Defense
(BMD) Office
Code 5006**



DR. S. SACKS

The Head of the Technology Base/BMD Office carries out program management activities pertaining to the Navy, BMD, SBIR, 6.3 A ATD, NSAP, critical technology, and other technology efforts. Mission activities include assurance of technical quality and program relevance, technology philosophy, orientation of the program to priority needs and transition opportunities, and overall coordination of NRL efforts. He is the Laboratory point of contact with the Program Offices for this work.



DR. M.I. SKOLNIK

**Consultant
Code 5007**

The radar consultant provides expert advice, historical perspectives, analyses, and investigations in the field of radar, related systems, phenomenology, and applications to the Systems Directorate, the corporate laboratory, the Navy, and other DoD organizations as requested.

Signature Technology Office

Code 5050



DR. D.W. FORESTER

Basic Responsibilities

The NRL Signature Technology Office (STO) performs research and 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.

Personnel: 15 full-time civilian

Key Personnel

Name	Title	Code
Dr. D.W. Forester	Research Physicist	5050

Point of contact: Ms. N.A. Carpenter, Code 5050A, (202) 767-3116

Technical Information Division

Code 5200

- Navy Acquisition Research and Development and Information Center (NARDIC)
- Research Library and Technical Information Center
- Publications
- Photographic Services
- Graphics Design Services
- Administrative Services
- Exhibits/Multimedia

The Multimedia Center has the capability of authoring/producing multimedia programs. The Center uses two complete multimedia systems with Macromedia Director and Adobe Photoshop and a digital video editing system, the AVID Media Composer 1000.



Library uses a 3.24 GB SPARCStorage RAID array to cache PDF files of the more than 160 journals it networks to NRL/ONR researchers through its Web-based TORPEDO system. In addition, TORPEDO, as the centerpiece of the Library's Digital Library Initiative, provides access to about 5,000 research reports, reprints of publications by NRL authors, and NRL press releases.



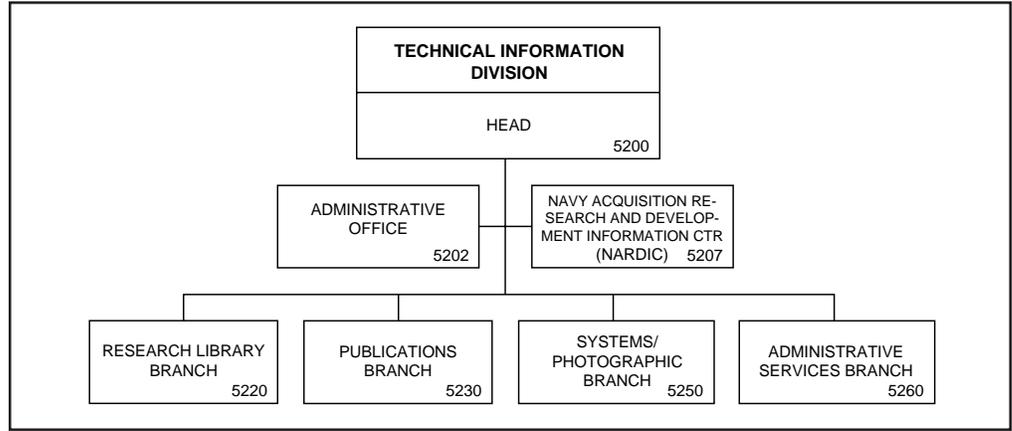
Mail clerks sort mail by directorate and file into bins by organizational codes. Mail is bundled and delivered twice a day.



Publications Branch staff reviews press sheets for a recent publication



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; 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: 95 full-time civilian

Key Personnel

Name	Title	Code
Mr. P. Imhof	Head	5200
Ms. M.B. Gutierrez	Administrative Officer	5202
Ms. L. Rice	Navy Acquisition Research and Development Information Center (NARDIC)	5207
Ms. L. Stackpole	Head, Research Library Branch	5220
Mr. T. Calderwood	Head, Publications Branch	5230
Mr. J. Lucas	Head, Systems/Photographic Branch	5250
Ms. L. Warder	Head, Administrative Services	5260

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

Radar Division

Code 5300 Staff Activity Areas

Systems research
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)
Mark XII IFF improvements
Future identification technology

Target Characteristics

Ship self defense
Electronic counter-countermeasures
Target signature recognition

Airborne Radar

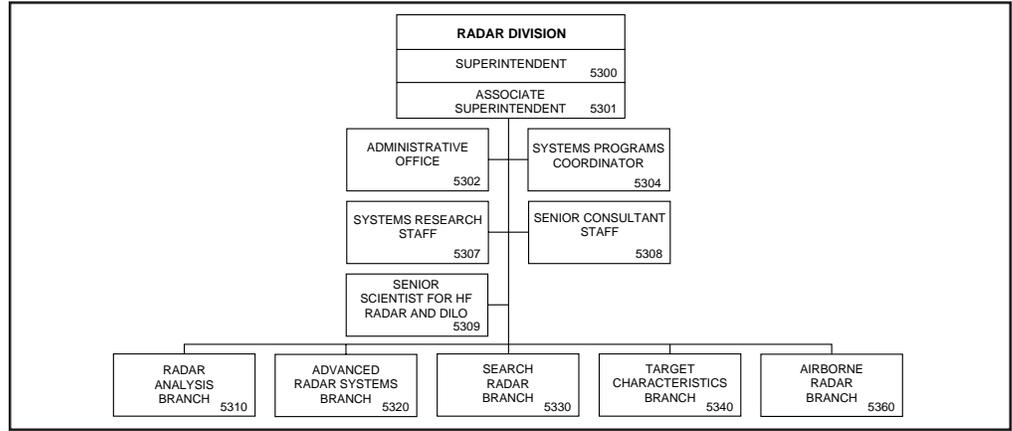
Airborne early-warning radar (AEW)
Inverse synthetic aperture radar (ISAR)
Space-time adaptivity



Radar test site at Building 75, Chesapeake Bay Section (Chesapeake Beach, MD) showing radar antennas used in experimental development by the Radar Division. On the roof, from left to right: experimental 3-D 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. G.V. TRUNK



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: 113 full-time civilian

Key Personnel

Name	Title	Code
Dr. G.V. Trunk	Superintendent	5300
Mr. E.E. Maine	Associate Superintendent	5301
Ms. C. Hill	Administrative Officer	5302
Mr. D.F. Hemenway	Systems Programs Coordinator	5304
Mr. R.T. Ford	Systems Research Staff	5307
Vacant	Senior Consultant Staff	5308
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. T.L. apRhys	Head, Airborne Radar Branch	5360

Point of contact: Dr. G.V. Trunk, Code 5300, (202) 767-2573

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 devices/techniques for HCI
- Voice processing (synthesis, recognition, transmission, etc.)
- Man-in-loop interface evaluation

Communication Systems

- Network design
- Tactical communication system engineering
- Distributed simulation and prototyping
- Integrated voice and data
- Integrated IP and ATM multicasting
- ATM crypto (fastlane) testing
- Tactical/warfighter's internetworking
- NILE (NATO Improved Link Eleven)

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



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

- Formal methods for requirements specification and verification
- Tools for real-time software development

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/C³
- Data fusion technology
- Database management technology
- Real-time parallel processing
- Distributed simulation
- Scalable high performance computing
- Processing graph method
- Signal processing applications
- Image processing
- Virtual reality

Center for Computational Science

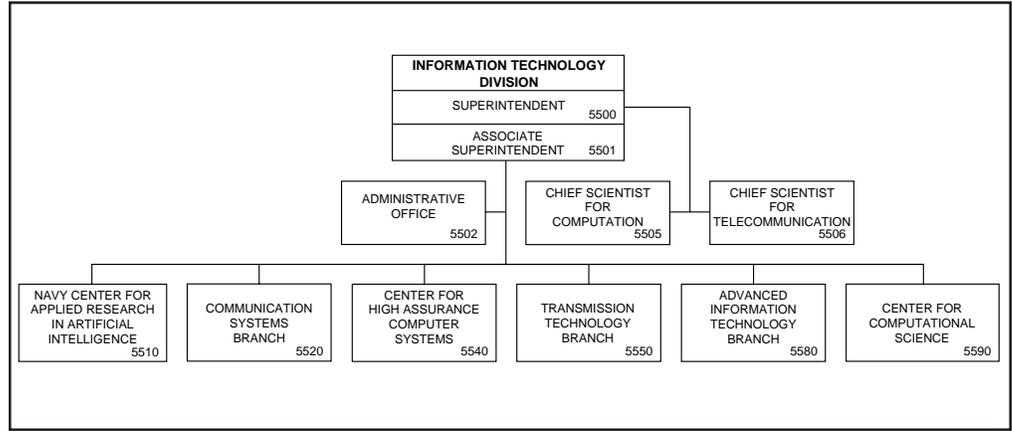
- Network research and design
- Parallel computing
- Scalable high performance computing
- Distributed computing environments
- Scientific visualization
- Advanced ATM/SONET networking



The Thinking Machines, Inc. CM-500e computer has 256 processor nodes with four-pipe vector units each, 32 gigabytes of memory, 400 giga-bytes 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
Mr. J. Lockard	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
Fiber environmental 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

Applied Optics

Detection signal processing studies
Optical and IR countermeasures
Optical technology
Ultraviolet component development and UV countermeasures
Atmospheric optics
Multispectral sensors and processing
Missile warning sensor technology
UV, visible, and IR imager development
Framing reconnaissance sensors



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

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
Multispectral/hyperspectral/detection algorithms
EO/IR systems analysis
Airborne IR search and track technology
Atmospheric IR measurements
Ship IR signatures
High-speed optical networks

Optical Techniques

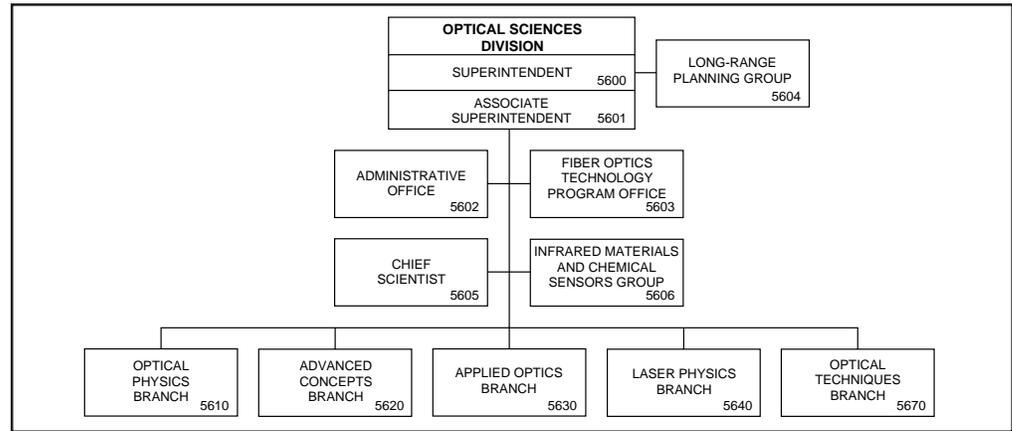
Diode laser applications
Fiber lasers/sources
Optical control of solid-state electronic devices
Integrated optics
Fiber-optic sensors (acoustic, magnetic, electric fields, etc.)
Tunable and short (<100 femto-seconds) optical pulses for high-speed probing of semiconductor materials, superconductors, and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



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



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. I. Aggarwal	Infrared Materials and Chemical Sensors Group	5606
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

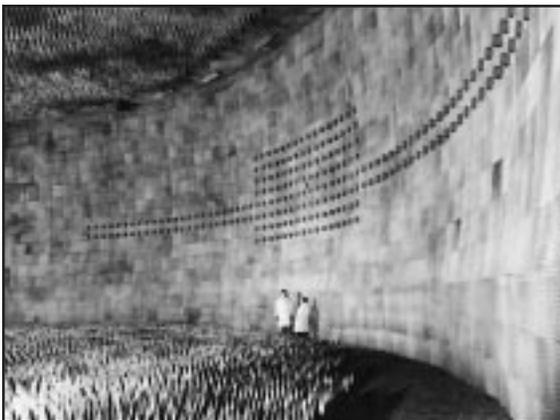
Air systems development
Penetration aids
Power source development
Jamming and deception
Millimeter-wave technology

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

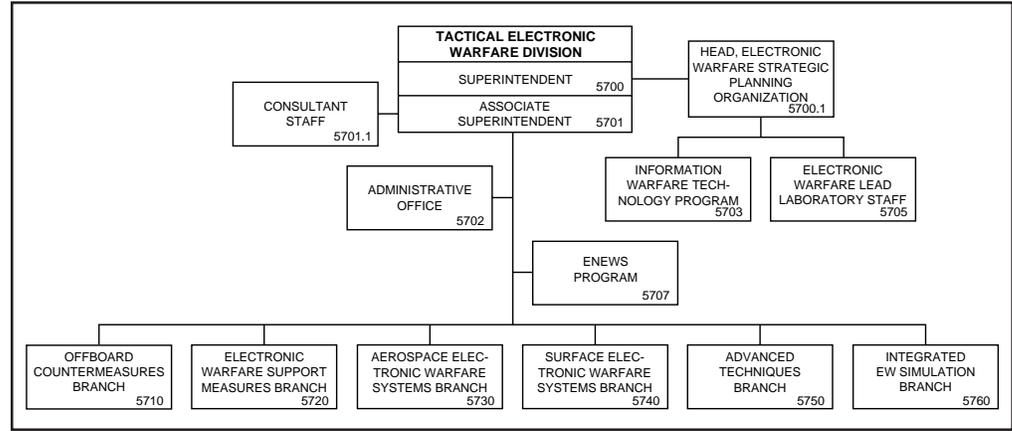


Using the latest composite, MIMIC and processing technologies, the Tactical Electronic Warfare Division has developed a small, lightweight, and inexpensive ESM receiving system for use on frigates, Coast Guard vessels, and various patrol aircraft

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
Dr. W.E. Howell	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
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: Dr. W.E. Howell, 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



Dr. B.B. Rath [REDACTED] 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.

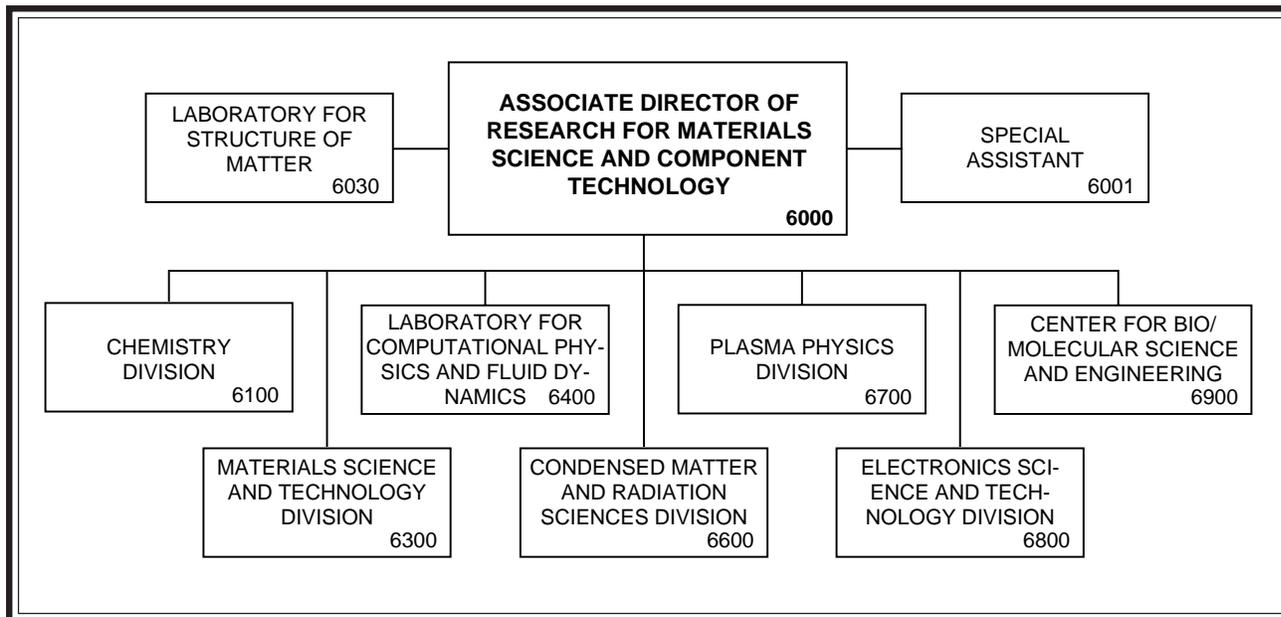
Dr. Rath was Assistant Professor of Metallurgy and Materials Science at Washington State University from 1961 to 1965. From 1965 to 1972, he was with the staff of the Edgar C. Bain Laboratory for fundamental research of the U.S. Steel Corporation. From 1972 to 1976, he headed the Metal Physics Research 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, University of Maryland, Carnegie-Mellon University, and Florida Atlantic University. He serves as the Navy representative and as the National leader to the Materials and Structures 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, Indian Academy of Engineering, and Materials Research Society of India. He has received the 1991 George Kimball Burgess Memorial Award, TMS Leadership 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 Federation 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

The Environment and Biotechnology Program Manager

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).

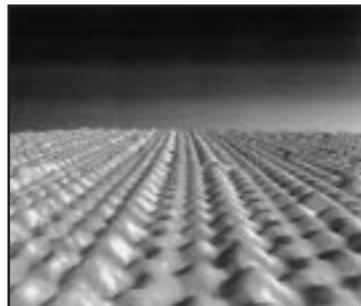
Surface/Interface Chemistry

- 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

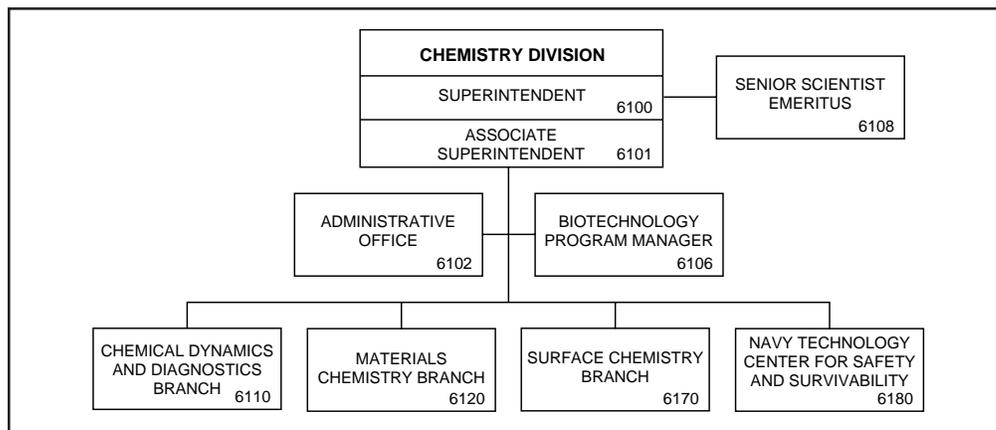
A Chemistry Division prototype explosives detector, based on nuclear quadrupole resonance (NQR), was recognized by the R&D 100 Award, as one of the one hundred most significant inventions in 1995. The 1996 Federal Laboratory Consortium Award for Excellence in Technology Transfer was also bestowed for the transfer of this NRL technology to industry through a licensing agreement.



"Sunrise over Si(114)."
An artistic view of the atomic-scale topography of Si(114) as revealed by scanning tunneling microscopy. The tallest row of atoms are 1.63 nm apart, with the atoms visible along these rows separated by 0.77 nm.



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, environmental chemistry, 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: 101 full-time civilian; 6 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 J.R. Campbell, USN	Biotechnology Program Manager	6106
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
- Synthesis/processing of metals
- Welding technology
- Micro/nano structure characterization

Environmental Effects

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

Material Physics

- Superconducting materials
- Magnetic materials
- Thermoelectric materials
- Nonlinear (chaotic) phenomena

Mechanics of Materials

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



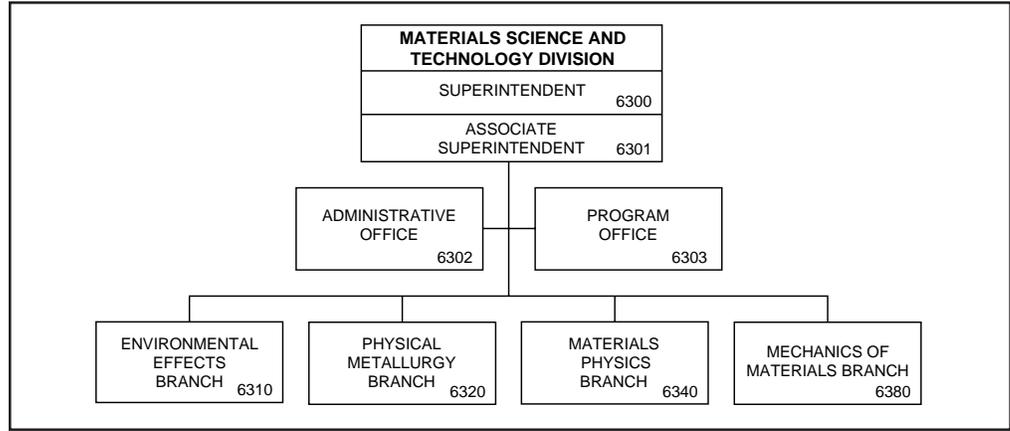
The growth of single crystal magnetic films on semiconductor substrates for electronic applications is observed



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 electrical 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 new and improved functionality and for life-cycle management. 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



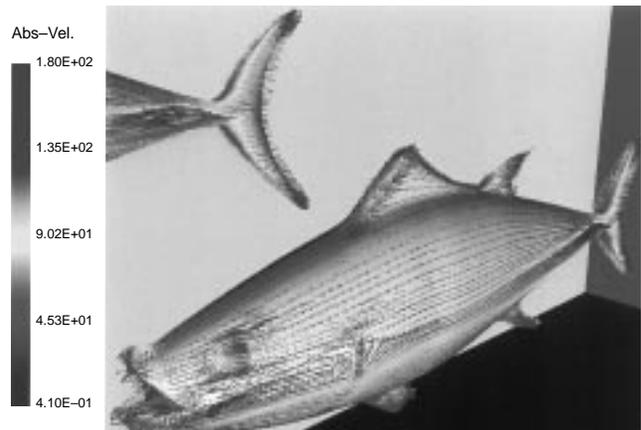
Working at the LCP&FD Intel Touchstone



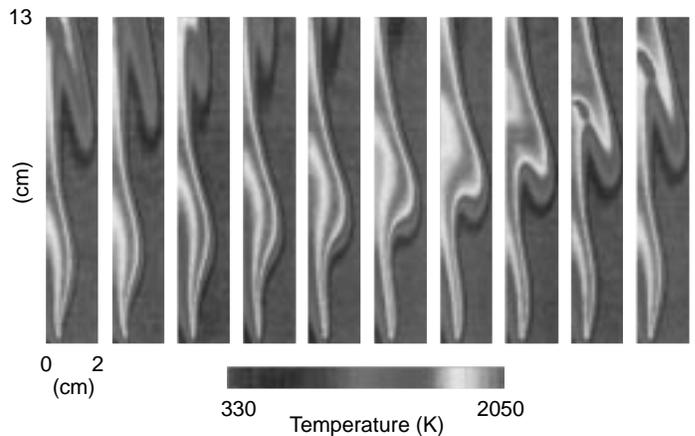
Potential octagon design of a containment facility for open-air detonation of expired and obsolete munitions

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



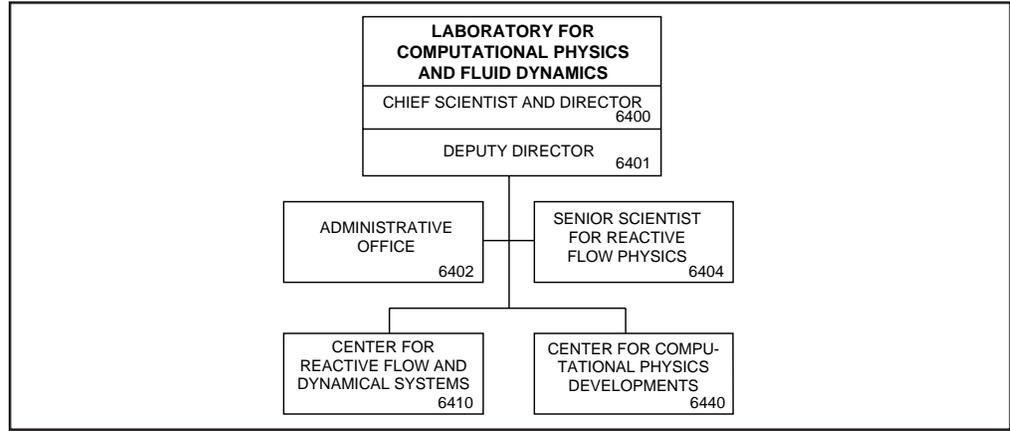
Flow past a swimming tuna with caudal fin oscillation. The velocity vectors on the surface show a low velocity region extending from the mouth along the centerline and a small recirculating region (shown in the inset) near the peduncle region.



Right-hand side of a flickering axisymmetric methane-air diffusion flame. Sequence of temperature contours in time shows clipped off portion of the flame. Interval between frames is 10 ms.



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

- Microelectronics and photonics test bed
- High temperature superconductivity space experiment
- Single event effects
- Radiation tolerant ultra low power micro-electronics
- Ultra-fast charge collection
- Environmental hazard remediation
- Radiation hardened InP solar cells
- Femtosecond laser research
- Radiation effects in microelectronics and photonics
- Material and device damage and hardening

Directed Energy Effects

- High-power microwave effects and counter-measures
- Laser-hardened materials and systems
- Laser point defense
- Nanostructure optics
- High-power laser interactions with materials and systems
- Atomic and molecular interactions with surfaces and interfaces
- Spectroscopy of superconductors



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

Surface Modification

- Thin film deposition (electroceramics, optoelectronics, biomaterials, and polymers)
- Pulsed laser deposition
- Ion beam assisted deposition
- Variable balance magnetron sputtering
- Ion engineering
- Ion implantation
- Reactive ion etching
- Ion milling
- Analysis
- Surface analysis by accelerator techniques
- Trace element accelerator mass spectrometry
- Mechanical loss spectroscopy
- Radiation effects from high-energy charged particle beams

Dynamics of Solids

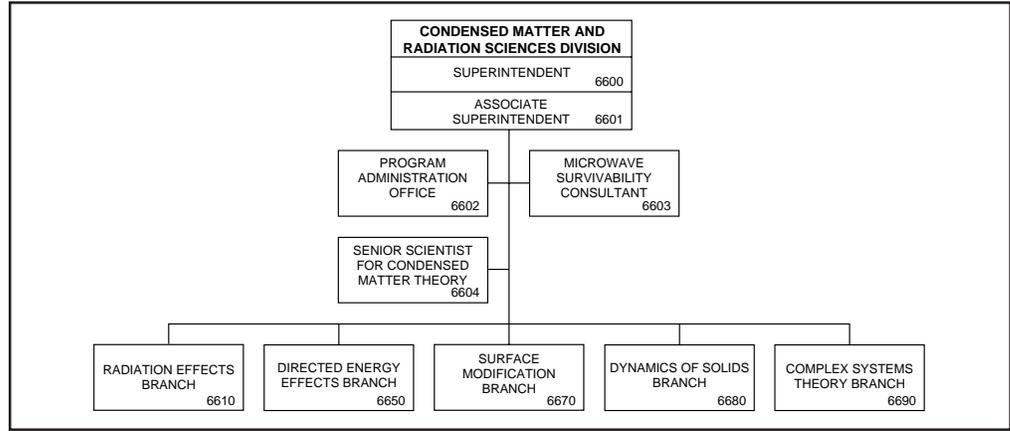
- X-ray sources, optics, and detectors
- X-ray analysis of materials—composition and structure
- Synchrotron radiation applications
- Semiconductor surface science
- Phase transformations
- Shock physics
- Hypervelocity impact
- Radiation effects in microelectronics
- Optical spectroscopy and imaging
- Environmental analysis

Complex System Theory

- Computational condensed matter physics and materials 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: 85 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
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. Papaconstantopoulos	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
- Materials plasma processing
- 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

- Nuclear weapons stockpile stewardship
- Laser fusion, inertial confinement
- Laser-plasma diagnostics
- Megabar high-pressure physics
- KrF laser development
- Strongly coupled plasmas

Charged Particle Physics

- Propagation of high-energy charged particle beams
- Radiation source development
- Electrodeless plasma discharges for lighting
- Hyperspectral imagers
- Applications of modulated electron beams
- Rocket, satellite, and shuttle-borne natural and active experiments

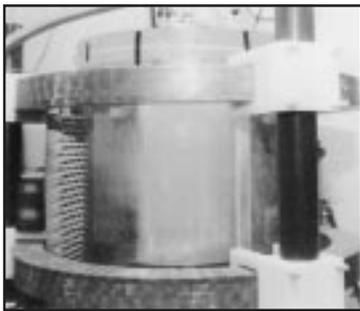
- Laboratory simulation of space plasma processes
- Agile mirror radar antennas
- Atmospheric and ionospheric GPS sensing
- Ionospheric radar diagnostics

Pulsed Power Physics

- Production of intense relativistic electron and ion beams
- Electron and ion beam propagation and focusing
- Light ion beam inertial confinement fusion
- Materials modification by pulsed energy deposition
- Inductive and capacitive energy storage
- Plasma radiator source development

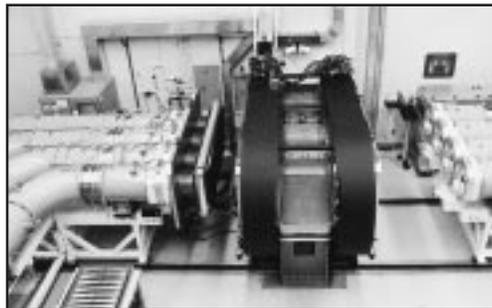
Beam Physics

- Advanced accelerators and radiation sources
- Microwave, plasma, and laser processing of materials
- Microwave sources: Magnicons, gyrotrons, and CARMS
- Ultra-high intensity laser-matter interactions
- Free electron lasers and laser synchrotrons
- Theory and simulation of space and solar plasmas
- Ionospheric modification
- Space weather modeling
- Rocket and space diagnostics
- Damage effects from laser-generated X-rays
- Novel sources for active remote sensing



The Agile Mirror Plasma Antenna represents a new concept in high frequency, electronically steerable radar antennas for future Navy ships. The device

uses a sheet of highly conductive plasma formed in a low density gas to bounce microwaves from a fixed antenna toward a target. The photo shows a 60 cm × 60 cm × 1 cm plasma mirror contained in a low pressure chamber. Eventually such an antenna could provide X-band radar beam steering as well as electronics warfare and communications capabilities for the next generation of small ships.

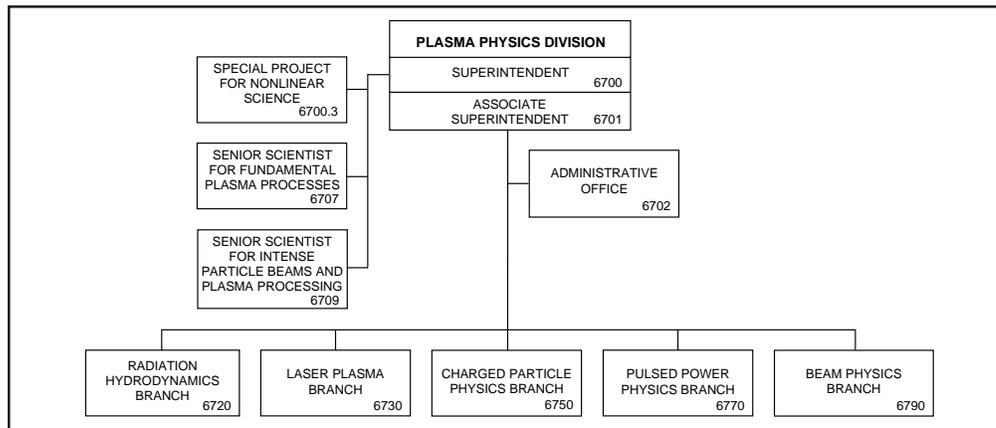


The NIKE Krypton Fluoride (KrF) Laser is in operation to study the physics issues of Direct Drive Inertial Confinement Fusion (ICF) for defense and energy applications. Direct Drive with a KrF laser is a very attractive approach

to ICF owing to its simplicity, inherent high efficiency, and very high-beam uniformity. The NIKE laser illuminates a flat target with intensities of up to $2 \times 10^{14} \text{ W/cm}^2$ 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 produces a 248 nm laser beam with total energy exceeding 5 kJ.



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 discharge, and space plasmas, intense electron and ion beams and photon sources, atomic physics, pulsed power sources, laser physics, advanced spectral diagnostics, and nonlinear systems. 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; free electron lasers and other advanced radiation sources; advanced accelerator concepts; and relativistic electron beam propagation. Areas of experimental interest include: relativistic electron beams, laser-plasma, laser-electron beam, and laser-matter interactions, thermonuclear fusion, electromagnetic wave generation, the generation of intense electron and ion beams, microwave reflection from a sheet plasma (agile mirror), high-frequency microwave processing of ceramic materials, advanced accelerator development, inductive energy storage, laboratory simulation of space plasma phenomena, and in-situ and remote sensing 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

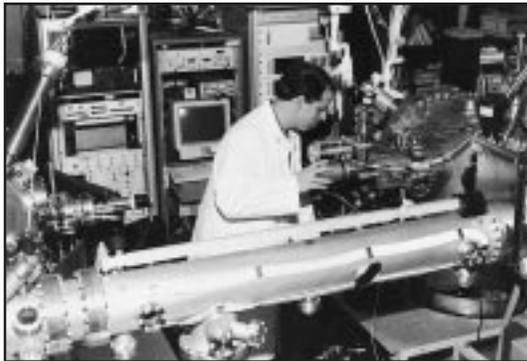
Code 6800 Research Activity Areas

Electronic Materials

- Preparation and development of magnetic, dielectric, optical, and semiconductor materials
- Electrical, optical, and magneto-optical studies of semiconductor microstructures and nanostructures, 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 micro- and nano-surfaces and interface structures
- High-temperature superconductors



The EPICENTER specializes in molecular beam epitaxial growth of nanostructures created by alternating layers of narrow bandgap materials made available from four ultrahigh vacuum chambers. These structures are expected to improve the performance of far-infrared detectors, mid-wave lasers, and superhigh frequency transistors and resonant tunneling diodes. Here a scientist in the Electronics Science and Technology Division is shown creating a structure using high vacuum, chamber-to-chamber sample transfer.

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

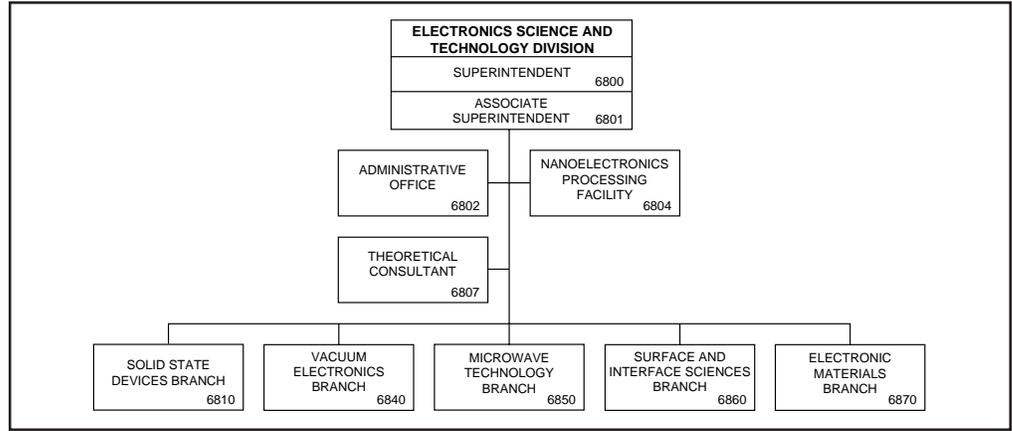
- Microwave and millimeter power amplifier research and development
- Cathode research and development
- Thermionic energy conversion
- Field emission arrays
- Vacuum electronic devices
- Tube fabrication and support technology



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.



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, micro- and nano- structure 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. Sleger	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. Sleger, Code 6801, (202) 767-3894

Center for Bio/Molecular Science and Engineering

Code 6900 Research Activity Areas

Biologically Derived Microstructures

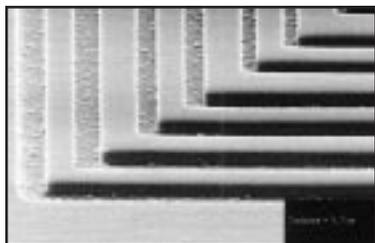
Self-assembly, molecular machining
Synthetic membranes, molecular printing
Nanocomposites
Tailored electronic materials
Low observables

Biosensors

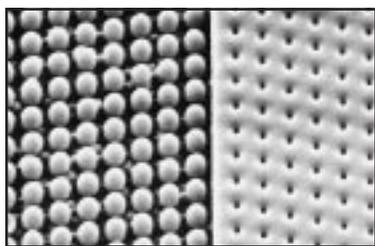
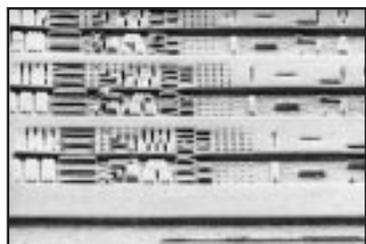
Binding polypeptides
Cell-based biosensor
DNA biosensor
Fiber-optic biosensor
Flow immunosensor
Array-based sensors

Combat Casualty Care

Wound repair, angiogenic implants
Liposome encapsulated hemoglobin
Red cell lyophilization
Blood contacting materials



Injection molded patterned micro-textured biopolymers are being fabricated from silicon templates, using lithographic tools. These biomaterials are being explored for use in devices, which incorporate biomolecules (antibodies and DNA) and biological cells for sensor and tissue engineering applications.



Environmental Quality

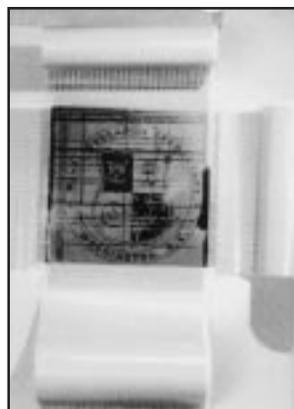
Oil/bilgewater separation
Soil/groundwater explosives detection
Antifouling paint, controlled release
Polyurethanase degradation
Antisense DNA
Heavy-metal detection
Heavy-metal cleanup

Polymers and Liquid Crystals

Ferroelectric liquid crystals
Advanced materials/information processing
Flexible displays, noninvasive alignment technique

Surfaces and Interfaces

Uncooled IR detectors/imagers
Submicron resists and microlithography
Specifically activated thin films
Neuronal patterning



NRL logo shown on a Flexible Liquid Crystal display. The resolution of the image is 100 dpi. The display is rugged, portable, and light weight. The applications being considered include handheld map reader and curved displays for cockpits.



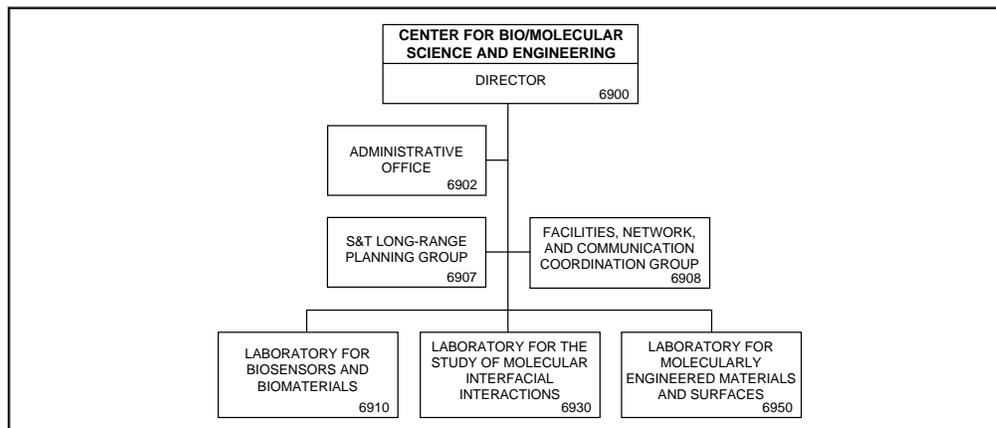
Portable flow immunosensor developed for on-site analysis of environmental contaminants in groundwater and soil



Electron micrograph of lipid tubules, showing one complete lipid bilayer surrounded by a helically wrapped partial bilayer. These self-assembled microstructures have applications that include controlled release, field emitting cathodes, and electronic obscuration for low observables.



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 first to gain a fundamental understanding of the relationship between molecular architecture and the function of materials, then apply this knowledge to solve problems for the Navy and DoD community. 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 electro-optical engineering.

Personnel: 38 permanent civilian

Key Personnel

Name	Title	Code
Dr. J.M. Schnur	Director	6900
Ms. A. Kusterbeck	Assistant 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. M. Shorb, Code 6902, (202) 404-6042

**Ocean and
Atmospheric
Science and
Technology
Directorate**

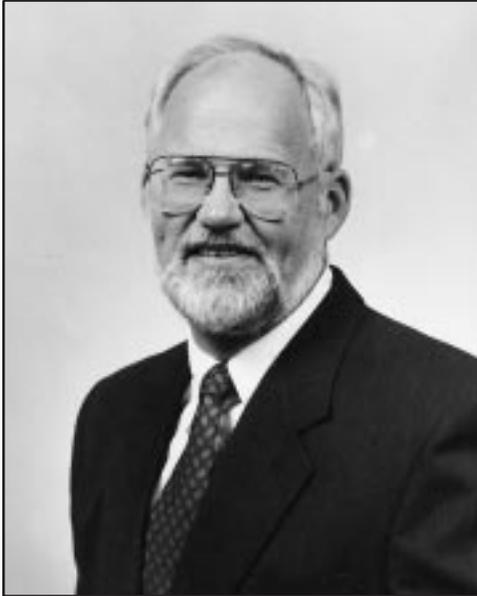
OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE

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 coastal and open ocean dynamics and prediction, coastal and open ocean processes, 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



Dr. E.O. Hartwig [REDACTED] 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

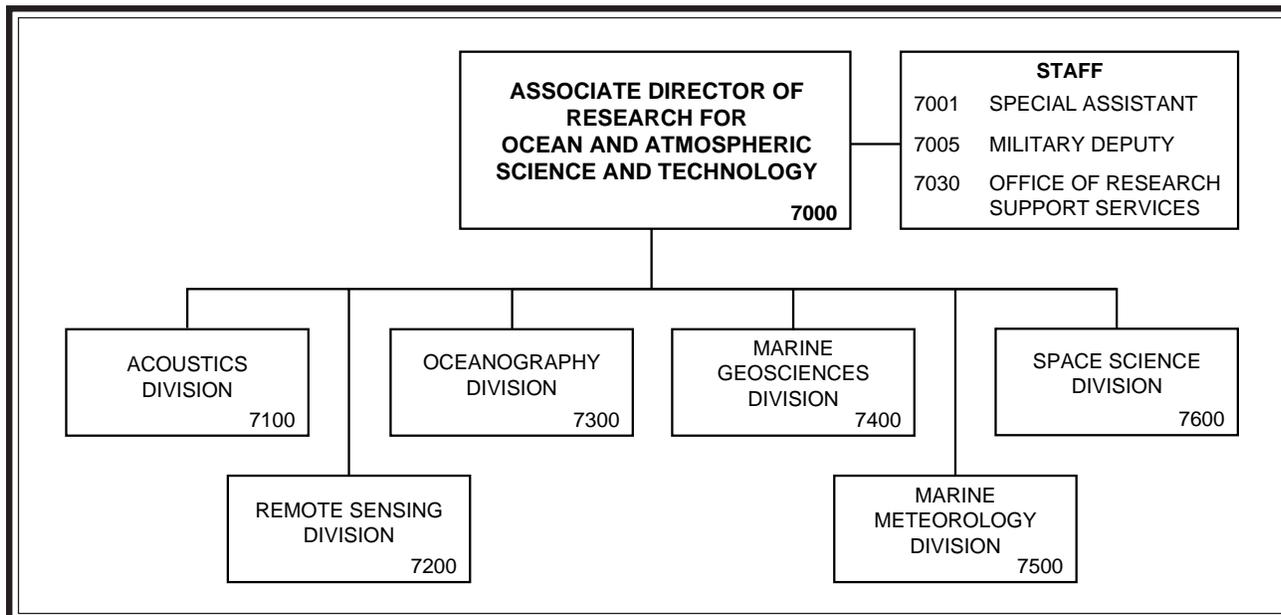
Chesapeake Bay and its outflow region, in active collaboration with many institutions and scientists. The efforts sought to understand the biological dynamics associated with the Bay's flow regimes, and studied the underlying water column and benthic biological processes resulting in the onset of the 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, working with the Oceanographer of the Navy, developed and implemented the Navy's academic research vessel rebuild program, which has resulted in fewer, more capable oceanographic vessels for the next millinium.

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 D. Markham	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
CDR R.T. Barock	Military Deputy	7205
Dr. W.B. Moseley	Superintendent, Oceanography Division	7300
CDR C.J. Hall	Military Deputy	7305
Dr. H.C. Eppert, Jr.	Superintendent, Marine Geosciences Division	7400
LCDR J.C. Church	Military Deputy	7405
Dr. P.E. Merilees	Superintendent, Marine Meteorology Division	7500
LCDR C. Springer	Military Deputy	7505
Dr. H. Gursky	Superintendent, Space Science Division	7600

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

Office of Research Support Services

Code 7030 Staff Activity Areas

Public Affairs Office

- Community relations
- Exhibits
- News releases
- Information
- Conference coordination, video teleconferencing
- Freedom of Information Act

Safety/Environmental Office

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

Special Programs Office

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

Security Office

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

Technical Information Office

- Scientific and technical information management
- Technical and classified library
- Technical editing, illustration, reproduction (color and black and white), printing
- Visual information, photographic services

Operations Services Branch

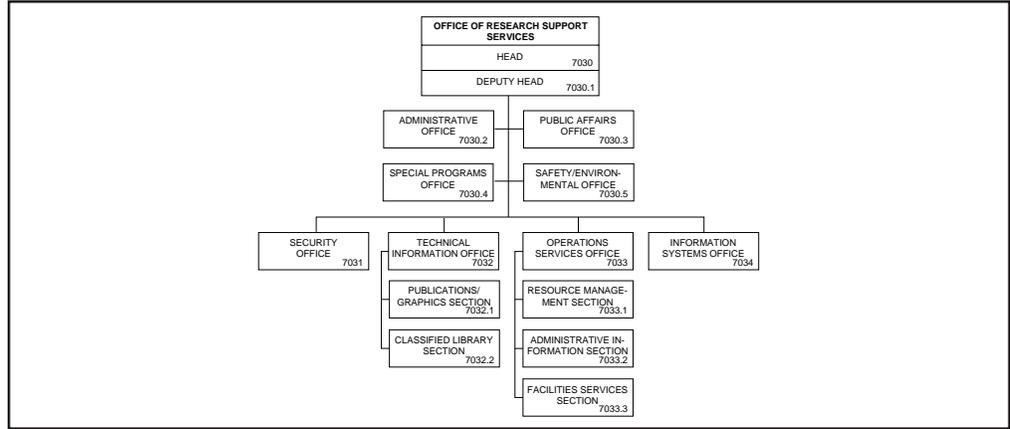
- Directives, reports, forms
- Mail management
- Navy message center
- Classified material control
- Facilities planning
- Vehicles
- Shipment via FedEx and common carriers

Information Systems Office

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



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: 51 full-time civilian

Key Personnel

Name	Title	Code
Mr. G.R. Bower	Head	7030
Mr. C.W. Mueller	Deputy Head	7030.1
Mr. C.W. Mueller*	Administrative Officer	7030.2
Ms. S.A. Carbonaro	Head, Public Affairs Office	7030.3
Vacant	Head, Special Programs Office	7030.4
Mr. K.H. Geistfeld	Head, Safety/Environmental Office	7030.5
Mr. R.H. Swanton	Head, Security Office	7031
Ms. S.A. Carbonaro*	Head, Technical Information Office	7032
Ms. M.H. Banker	Supervisory Visual Information Specialist	7032.1
Ms. L.H. Jenkins	Supervisory Technical Information Specialist	7032.2
Mr. C.W. Mueller*	Head, Operations Services Office	7033
Ms. C.C. Wilkinson	Supervisory Supply Technician	7033.1
Ms. K.E. Klein	Supervisory Mail and File Clerk	7033.2
Mr. W.B. Eslick	Facilities Manager	7033.3
Mr. R.W. Burke	Head, Information Systems Office	7034

Point of contact: Mr. G.R. Bower, Code 7030, (601) 688-4010; DSN 485-4010

*Acting

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

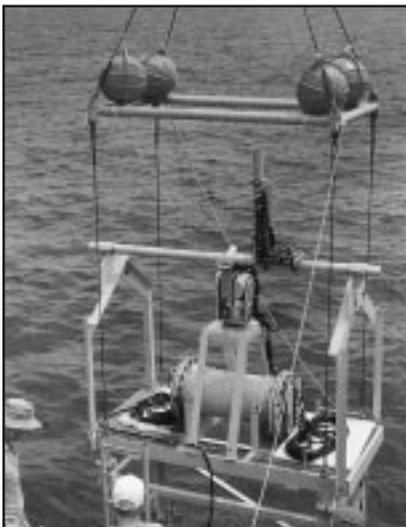
Low-frequency monostatic and multistatic reverberation
Shallow-water active acoustic surveillance
Models of signal and noise fields
Sensor fusion
Ocean tomography
Noise cancellation

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



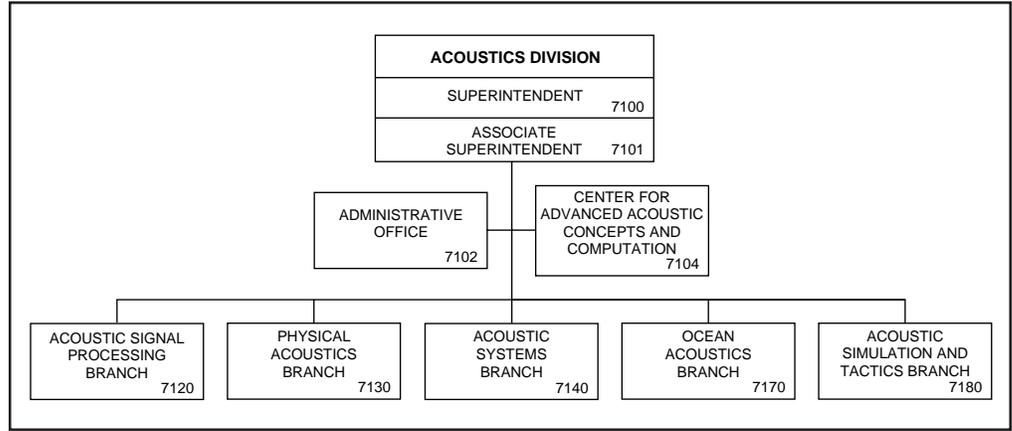
Deployment of high-frequency acoustics tower



Structural acoustic studies in the one-million gallon Acoustic Holographic 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: 133 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. 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

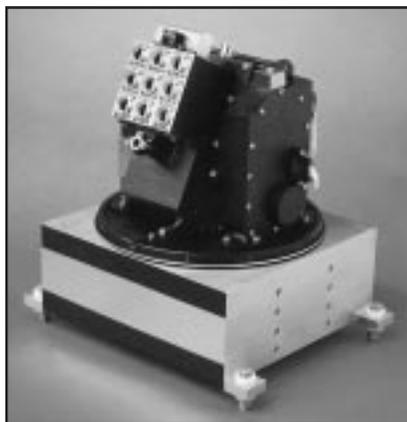
- SAR
- Imaging RAR
- Passive microwave imagers
- CCDs and focal plane arrays
- Fabry-Perot spectrometers
- Imaging spectrometers
- Optical interferometers
- Spaceborne and airborne systems

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



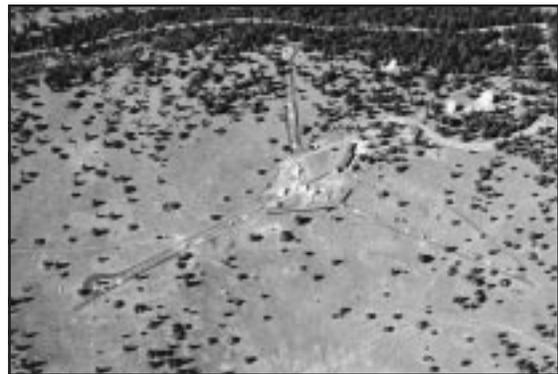
Optical Head Assembly (OHA) of the Polar Ozone and Aerosol Measurement (POAM-II) experiment payload

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

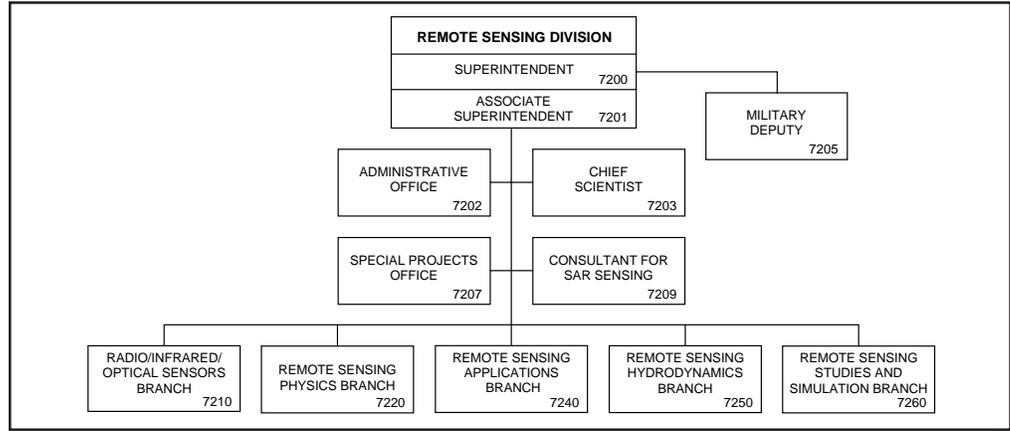
- Remotely sensed signatures analysis/simulation
- Real-time signal and image processing algorithm/systems
- Image data compression methodology
- Image fusion
- Automatic target recognition
- Scene/sensor noise characterization
- Image enhancement/noise reduction
- Scene classification techniques
- Radar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



The Navy Prototype Optical Interferometer produces the highest angular resolution images ever made at optical wavelengths. Its four astrometric elements (the rectangular huts) provide extremely precise star positions for use by the U.S. Naval Observatory in navigation and time keeping. The imaging elements are mounted on piers extending out the "Y" configuration. Light from all the telescopes is carried down evacuated pipes and combined in the optics laboratory to produce images of stellar surfaces.



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: 109 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
CDR R.T. Barock	Military Deputy	7205
Dr. D.T. Chen	Special Projects Office	7207
Dr. S.A. Mango	Consultant for SAR Sensing	7209
Dr. L. Rickard	Head, Radio/Infrared/Optical Sensors Branch	7210
Dr. R. Bevilacqua	Head, Remote Sensing Physics Branch	7220
Dr. R.J. Holyer*	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

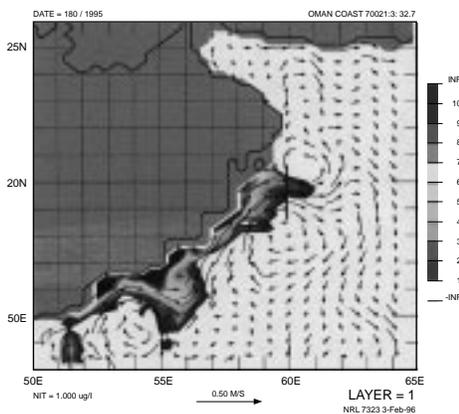
Research Activity Areas

Ocean Dynamics and Prediction

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



Optical mooring equipment for shallow water showing attenuation and absorption meters and irradiance sensors

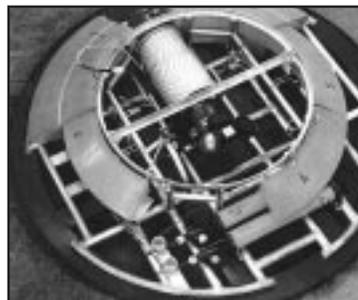


Forced Upper Ocean Dynamics—Nitrogen and Currents—June 29, 1995. Plot of coupled biophysical model currents superimposed with contours of nitrate for same time period as satellite image. Model, forced by daily operational winds, produces filament similar to observed.

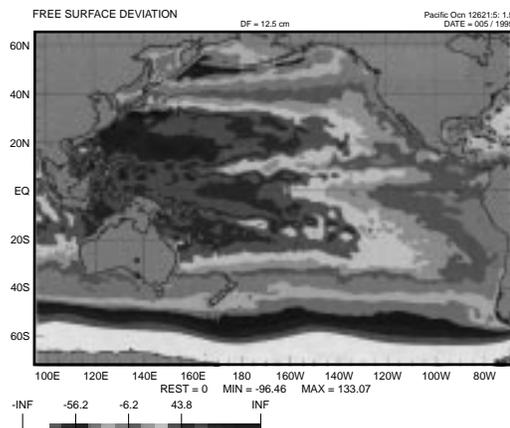
Ocean Sciences

- Mesoscale dynamics
- Coupled systems
 - Air sea interaction
 - Biodynamics
 - Bio-optical models

- Small scale dynamics
 - Small scale turbulence
 - Bubbles/waves
 - Optics



NRL's ten 300 kHz ADCPs are matched with trawl-resistant bottom mounts. This photo shows a bottom mount with its exterior fiberglass shell and some internal buoyancy segments removed. The internal recording instruments collect frequent profiles of horizontal current for intervals of up to several months. A wave and tide gauge may also be included in the housing. With an operating depth of 300 m, the instruments permit operations nearly everywhere on the world's continental shelves.



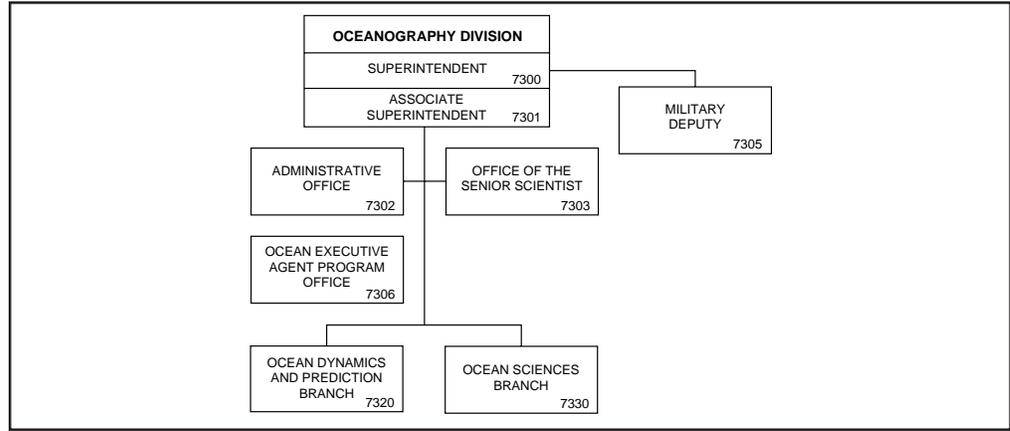
NRL layered ocean model output of sea surface height for Pacific Ocean, 5 January 1995. This model has been transitioned to FNMOC.



Forced Upper Ocean Dynamics—Satellite SST Image—June 23, 1995. Image reveals cold, nutrient rich, upwelled water being advected offshore by filament. White line depicts cruise track, which was adjusted in real time using onboard receiving station.



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. I.S. DeSpain	Administrative Officer	7302
Dr. B.J. Little	Senior Scientist	7303
CDR C.J. Hall	Military Deputy	7305
Dr. G.W. Heburn	Head, Ocean Executive Agent Program Office	7306
Dr. J.M. Harding	Head, Ocean Dynamics and Prediction Branch	7320
Dr. A.W. Green	Head, Ocean Sciences Branch	7330

Point of contact: Mrs. I.S. DeSpain, Code 7302, (601) 688-4114; DSN 485-4114

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

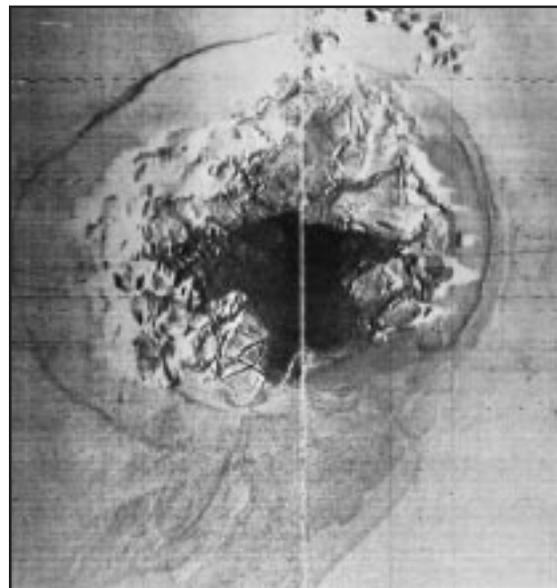
- Digital database design
- Digital product analysis and standardization
- Data compression techniques and exploitation
- Hydrographic survey techniques
- Bathymetry extraction techniques from remote and acoustic imagery
- Utility software development for digital mapping databases

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



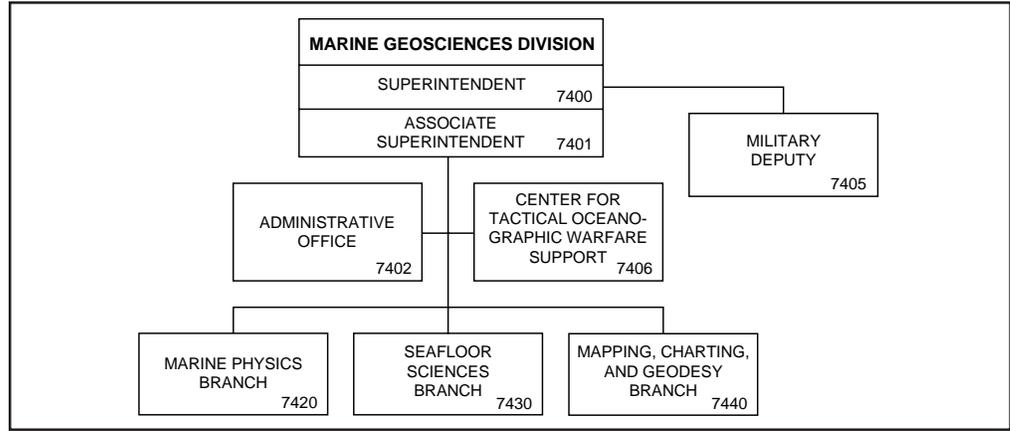
ORCA hydrographic data collection system undergoing vehicle trials—completed successfully in Pensacola, Florida, 1996



Side scan sonar (30 kHz, 40 m above seafloor) image of 1 km diameter Hakon Mosby mud volcano located at 72°N in 1250 m water depth on continental slope west of Barents Sea. Collected from Russian research vessel "Professor Logachev" on 1996 NRL-led Russian-American-Norwegian expedition. Central seafloor area (dark area) was found to be covered with methane hydrate. Small circular objects are mud mounds. Outer arcuate structures are faults inside which the erupted mud is sinking.



DR. H.C. EPERT, JR.



Basic Responsibilities

The Marine Geosciences Division has responsibility for planning and executing a broad spectrum research, development, and technology 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), National Image and Mapping Agency (NIMA), 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 NIMA. 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: 90 full-time civilian; 1 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; DSN 485-4660

Marine Meteorology Division

Code 7500 Research Activity Areas

Numerical Weather Prediction

- Global
- Mesoscale
- On-scene
- Large eddy simulation
- Boundary layer
- Coastal
- Massively parallel computing
- Coupled ocean/atmosphere/wave
- Tropical cyclones
- Aerosols

Data Assimilation

- Optimum interpolation
- Variational analysis
- Quality control
- Synthetic soundings
- Remotely sensed data
- Physical initialization
- Direct radiance assimilation

Shipboard Support

- Tactical Environmental Support System
- Data fusion
- Visualization
- Port studies
- Typhoon havens
- Forecaster handbooks
- Expert systems
- CD-ROMs

Satellite Data/Imagery

- Automated cloud classification
- Satellite imagery analysis
- Case study development
- Multisensor data fusion
- Tropical cyclone intensity
- Water vapor-tracked winds
- Cloud-tracked winds

Decision Aids

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

Model Simulation



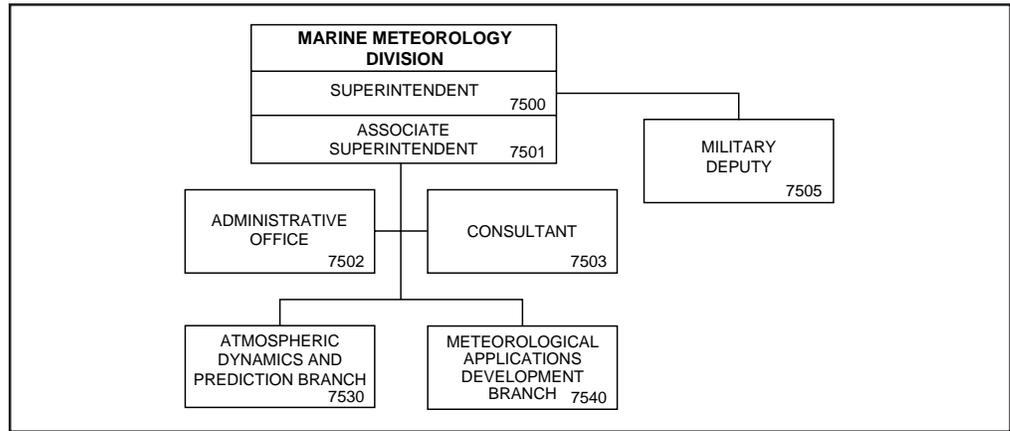
Verifying Satellite Imagery



Model simulation of a coastally trapped wind reversal, as evidenced by the low-level clouds moving north along the California coast. The 24-hr forecast made using NRL's numerical mesoscale prediction system (COAMPS) is shown on the left, and the verifying satellite imagery is shown on the right.



Dr. P.E. MERILEES



Basic Responsibilities

The Marine Meteorology Division conducts basic and applied research in the atmospheric sciences. Basic research includes work in air-sea interaction process studies, atmospheric predictability, and aerosols. Applied research spans the gamut from development of both central-site and on-scene analysis/forecast systems, to the development of tactical decision aids for operations or weapons systems support. 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 mesoscale forecast models that form the backbone of the Navy's worldwide weather forecasting capability. In addition, NRL-MRY is the lead laboratory for the Tactical Environmental Support System, an on-scene environmental diagnosis/forecast system. Specialties of the Division include numerical weather prediction, data assimilation and quality control, marine boundary layer processes, environmental decision aids, database management, and satellite data interpretation and application.

Personnel: 63 full-time civilian; 6 full-time military

Key Personnel

Name	Title	Code
Dr. P.E. Merilees	Superintendent	7500
Mr. S.W. Payne	Associate Superintendent	7501
Ms. C. Marks	Administrative Officer	7502
Ms. P. Phoebus	Consultant	7503
LCDR C. Springer	Military Deputy	7505
Dr. R.M. Hodur*	Head, Atmospheric Dynamics and Prediction Branch	7530
Dr. T.L. Tsui	Head, Meteorological Applications Development Branch	7540

Point of contact: Dr. P.E. Merilees, Code 7500, (408) 656-4721; DSN 878-4721

*Acting

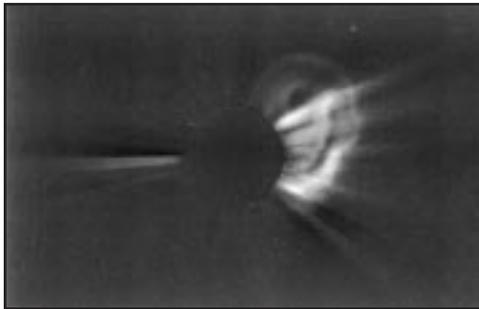
Space Science Division

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 SOHO/LASCO solar coronagraph image showing the progress of a coronal mass ejection (CME), which occurred on October 5, 1996. CMEs travel outward from the sun with velocities on the order of 1000 km/s and frequently interact with the earth's magnetosphere resulting in geomagnetic disturbances.



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

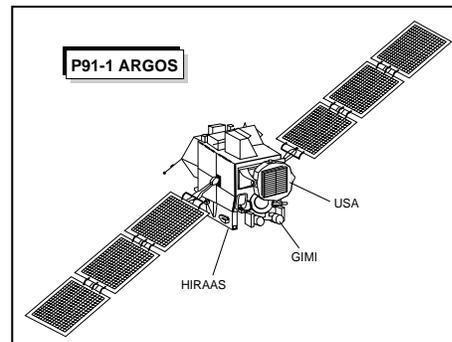
Solar Physics

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

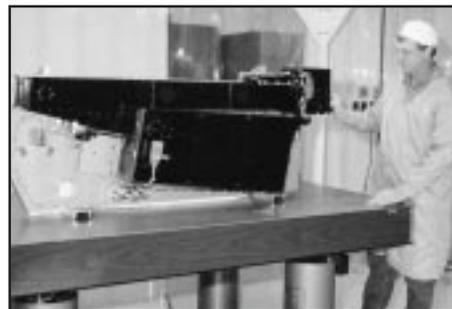
Solar-Terrestrial Relationships

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

Three Space Science Division experiments flew 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



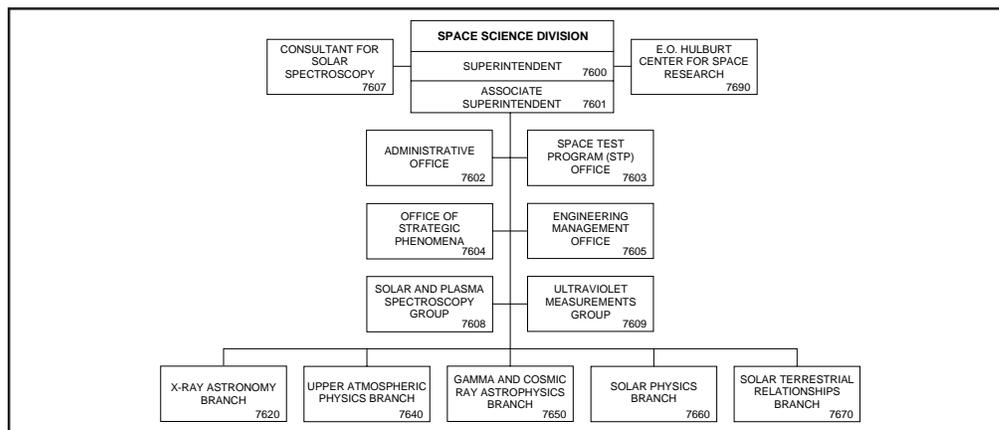
that will investigate the use of exotic astrophysical objects for autonomous time and position measurements.



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 km) 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. F.J. Giovane	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. U. Feldman	Head, Solar and Plasma Spectroscopy Group	7608
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

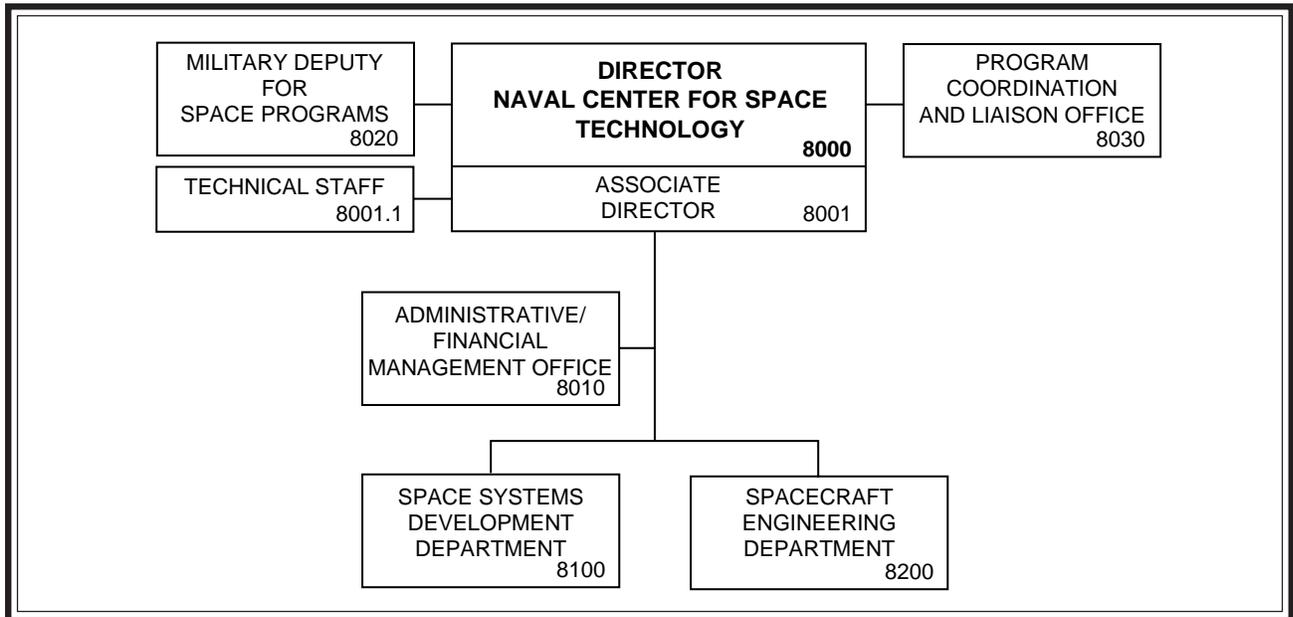


Mr. P.G. Wilhelm He attended Purdue University, where he received a B.S.E.E. degree in 1957. By 1961, he had completed all the course work for an M.S.E. degree from George Washington University.

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, and in 1997 was elected to the National Academy of Engineering. Mr. Wilhelm is also the first recipient of a new NRL award, the R.L. Easton Award, for excellence in engineering.



Key Personnel

Name	Title	Code
Mr. P.G. Wilhelm	Director, Naval Center for Space Technology	8000
Mr. F.V. Hellrich	Associate Director	8001
Mrs. B.L. Fleming	Head, Administrative/Financial Management Office	8010
Vacant	Military Deputy for Space Programs	8020
Mr. P. Regeon	Head, Program Coordination and Liaison Office	8030
Mr. R.E. Eisenhauer	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

Space Systems Development Department

Code 8100

Research Activity Areas

Advanced Space Systems Technologies

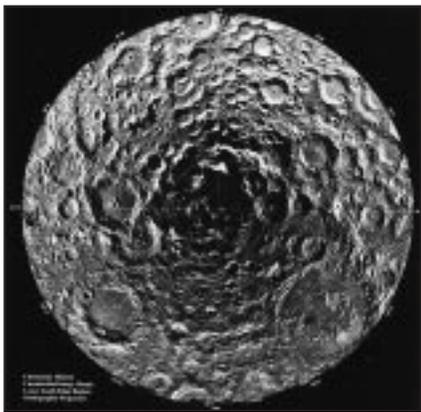
- Space systems architectures and requirements
- Advanced payloads and optical systems
- Controllers, processors, and signal processing
- Data management systems and equipment
- Embedded algorithms and software

Astrodynamics

- Orbit determination, performance assessment and verification
- Computer simulation of space systems
- Orbit and attitude dynamics
- Autonomous navigation, star catalog development
- GPS space applications and geolocation systems
- Mission analysis, operations and satellite coverage studies

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



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 Systems Development

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

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

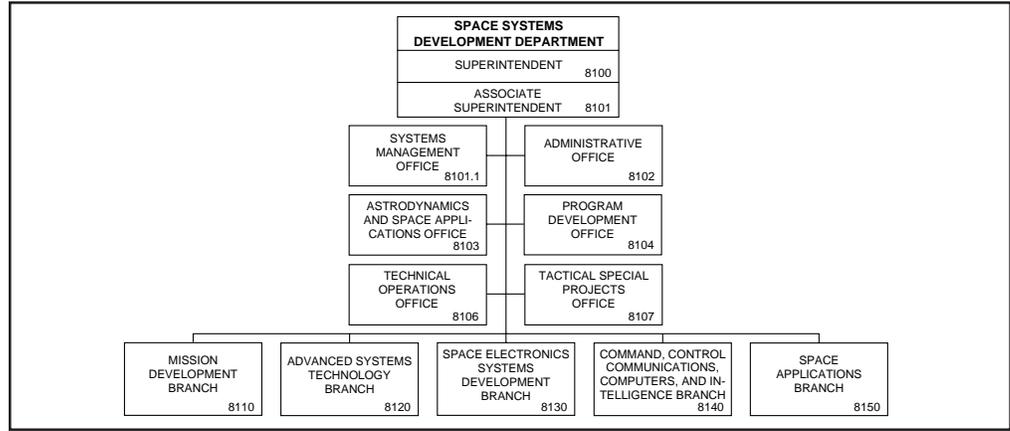
- Advanced navigation satellite technology
- Precise Time and Time Interval (PTTI) technology
- Atomic- time/frequency standards/instrumentation
- Passive and active ranging techniques
- Detection and precision tracking of orbiting objects from space and ground



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: 267 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
Dr. R. Dasenbrock	Head, Astrodynamics and Space Applications Office	8103
Mr. B.J. Lamb	Head, Program Development Office	8104
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

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

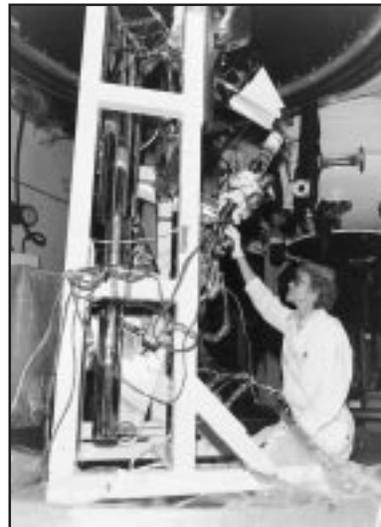
- Spacecraft structural design
- Spacecraft environmental testing
- Structural and thermal analysis
- Materials research
- Flexible space structures research



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

Control Systems

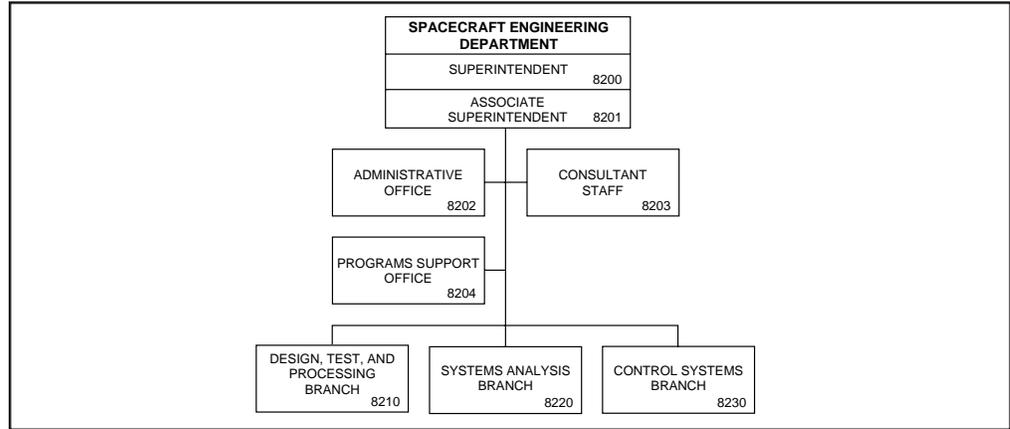
- Attitude control systems
- Reaction control systems
- Propulsion systems
- Flight operations support
- Orbit dynamics
- Expert systems
- Spaceborne applications of robotics



Ball-screw actuator being readied for vacuum-chamber test



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
Vacant	Associate Superintendent	8201
Ms. C. Gross	Administrative Officer	8202
Ms. C. Warner*	Programs Support Office	8204
Mr. J.A. Hauser, II	Head, Design, Test, and Processing Branch	8210
Mr. M.A. Brown	Head, Systems Analysis Branch	8220
Mr. S.A. 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 1995 and 1996 presented below represent the output of NRL facilities in Washington, DC; Bay St. Louis, Mississippi; and Monterey, California.

In addition to the output listed, NRL scientists made more than 1,423 oral presentations during 1995 and 1,380 oral presentations during 1996.

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.

Calendar Year 1995

Type of Contribution	Unclassified	Classified	Total
Articles in periodicals, chapters in books, and papers in published proceedings	1,041	0	1,041*
NRL Formal Reports	38	13	51
NRL Memorandum Reports	119	27	146
Books	0	0	0
Patents granted	78	0	78
Statutory Invention Registrations (SIRs)	8	0	8

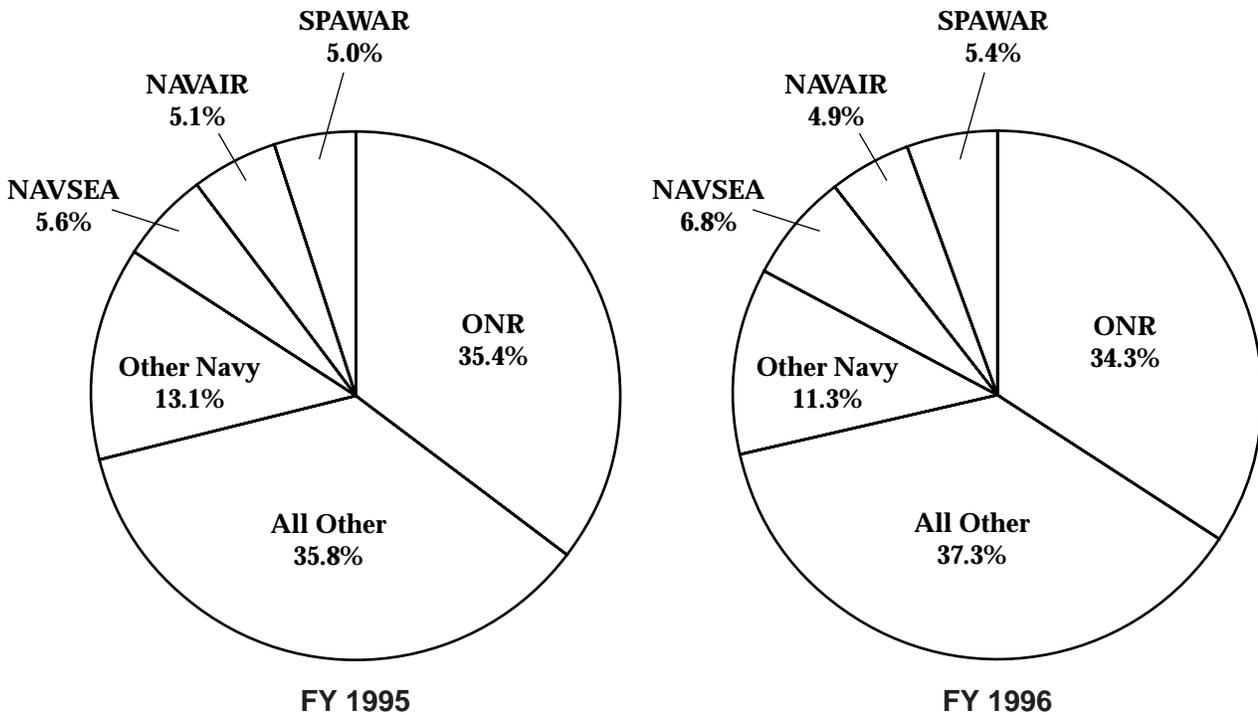
Calendar Year 1996

Type of Contribution	Unclassified	Classified	Total
Articles in periodicals, chapters in books, and papers in published proceedings	1,133	0	1,133**
NRL Formal Reports	26	16	42
NRL Memorandum Reports	106	24	130
Books	0	0	0
Patents granted	67	0	67
Statutory Invention Registrations (SIRs)	5	0	5

*This is a provisional total based on information available to the Ruth H. Hooker Research Library and Technical Information Center on January 10, 1996. Additional publications carrying a 1995 publication date are anticipated.

**This is a provisional total based on information available to the Ruth H. Hooker Research Library and Technical Information Center on January 10, 1997. Additional publications carrying a 1996 publication date are anticipated.

FY 1995/96 Sources of New Funds (Actual)

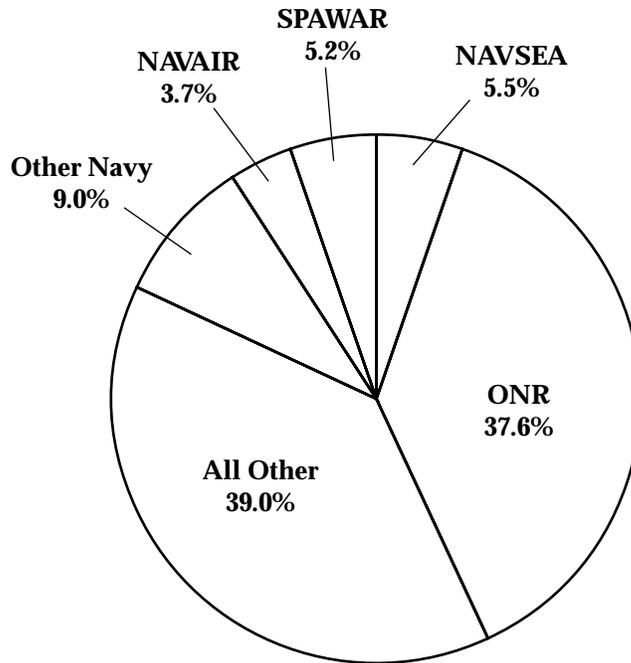


Source of Funds (%)

FY 1995	\$M		
	Reimbursable	Direct Cite	Total
Office of Naval Research (ONR)	206.1	58.6	264.6
Naval Sea Systems Command (NAVSEA)	31.3	11.0	42.3
Space and Naval Warfare Systems Command (SPAWAR)	23.9	13.1	37.0
Naval Air Systems Command (NAVAIR)	24.9	13.1	38.0
Other Navy	60.5	37.3	97.8
All Other	<u>141.2</u>	<u>125.9</u>	<u>267.1</u>
Total Funds	487.8	259.0	746.8

FY 1996	\$M		
	Reimbursable	Direct Cite	Total
Office of Naval Research (ONR)	212.3	50.7	263.0
Naval Sea Systems Command (NAVSEA)	36.1	16.4	52.5
Space and Naval Warfare Systems Command (SPAWAR)	23.9	17.7	41.6
Naval Air Systems Command (NAVAIR)	21.0	16.9	37.9
Other Navy	49.5	37.1	86.6
All Other	<u>155.0</u>	<u>131.2</u>	<u>286.2</u>
Total Funds	497.8	270.0	767.8

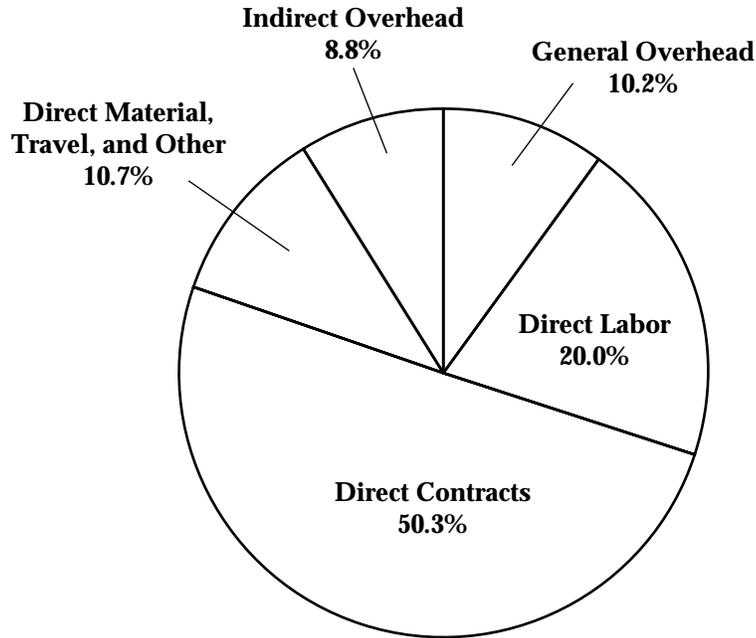
FY 1997 Sources of New Funds (Plan)



Source of Funds (%)

FY 1997	\$M		Total
	Reimbursable	Direct Cite	
Office of Naval Research (ONR)	239.0	53.0	292.0
Naval Sea Systems Command (NAVSEA)	33.8	9.2	43.0
Space and Naval Warfare Systems Command (SPAWAR)	25.5	14.7	40.2
Naval Air Systems Command (NAVAIR)	18.8	10.0	28.8
Other Navy	38.2	31.8	70.0
All Other	<u>169.9</u>	<u>134.1</u>	<u>304.0</u>
Total Funds	525.2	252.8	778.0

FY 1997 Distribution of New Funds (Plan)

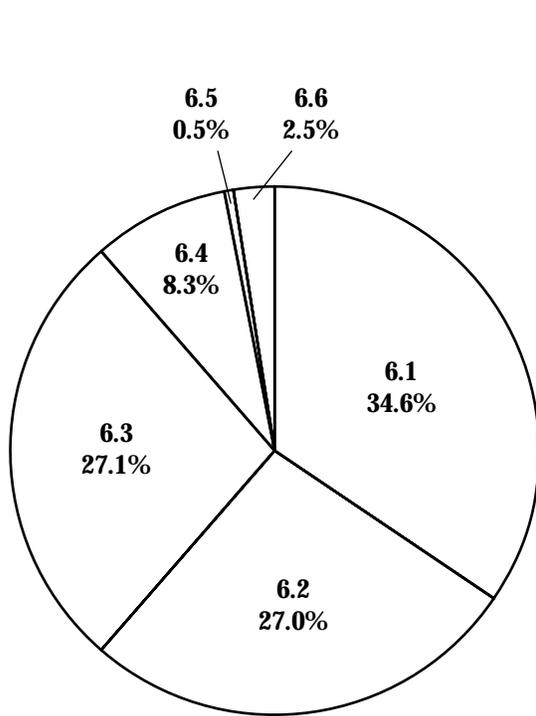


Distribution of Funds (%)

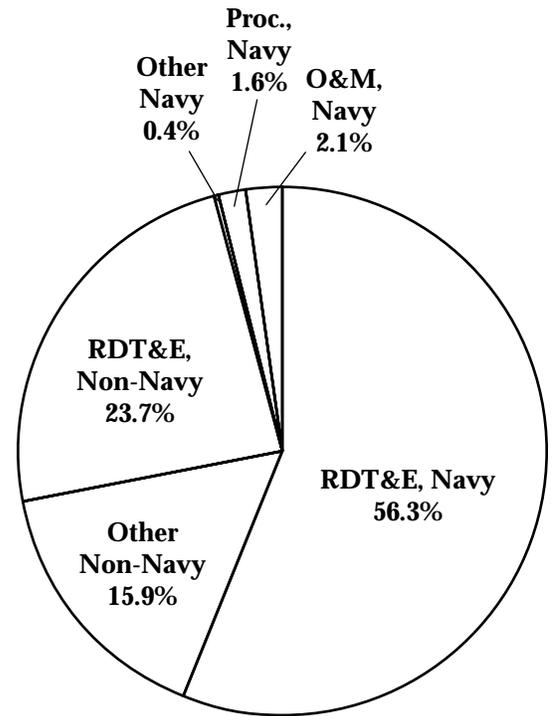
	\$M
Direct Labor	155.4
General Overhead	79.7
Indirect Overhead	68.6
Direct Material, Travel, and Other	83.4
Direct Contracts*	<u>390.9</u>
Total Funds	778.0

*Direct contracts include reimbursable and direct citation funding.

FY 1997 Reimbursable New Funds by Category (Plan)



Distribution of RDT&E, Navy (%)
(\$295.4)



Distribution of Reimbursable (%)
(\$525.1)

Category	\$M		Total
	Navy	Non-Navy	
6.1 Research	99.1	3.3	102.4
6.2 Exploratory Development	86.7	22.0	108.7
6.3 Advanced Development	77.6	84.1	161.7
6.4 Engineering Development	20.4	5.8	26.2
6.5 Management and Support	3.2	0.9	4.1
6.6 Operational Systems Development	<u>8.4</u>	<u>8.1</u>	<u>16.5</u>
Subtotal RDT&E	295.4	124.2	419.6
Operation and Maintenance	11.3	2.1	13.4
Procurement	8.6	27.2	35.8
Other	<u>2.2</u>	<u>54.1</u>	<u>56.3</u>
Total Reimbursable Funds	317.5	207.6	525.1

Personnel Information*

Civilian

Full-Time, Permanent (FTP)	
Graded	2914
Ungraded	<u>142</u>
Total	3056

Temporary, Part-Time, Intermittent (TPTI)	
TPTI	<u>303</u>

Total Civilian 3359

Graded FTP Breakdown	
Scientists, Engineers, and SES	1695
Administrative—Professional	83
Administrative—Management	354
Technicians	343
Other-Clerical	304
Other-General	<u>135</u>
Total	2914

Civilian Budgeted
End-Strength 3356

Military

Officers	49
Enlisted	<u>138</u>

Total Military 187
Military Allowance 188

On-Board	Total Military	Total Civilian	FTP	TPTI	FTP Ungraded	FTP Graded
3546	187	3359	3056	303	142	2914

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

	1992	1993	1994	1995	1996
Research divisions	5.1	5.8	9.4	9.8	7.3
Nonresearch areas	9.2	8.4	9.1	9.2	9.8
Entire Laboratory	6.2	6.5	9.3	9.6	7.9

Highest Academic Degrees Held by Permanent Employees

Bachelors	659
Masters	456
Doctorates	875

*Military numbers are current as of 1 July 1997; figures include all NRL sites.
All other numbers are current as of 12 February 1997; figures include all NRL 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 1996, under the auspices of the Employee Development Branch, NRL employees participated in about 4,534 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. Partici-

pants in this program work 24 hours each work-week 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.

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 Dr. Ralph Surette 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) 767-6207 or Dr. Debra Rolison at (202) 767-3617.)

- **Sigma Xi**, the Scientific Research Society, encourages and acknowledges original investigation in scientific research. 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 leadership research at NRL by presenting awards annually in pure and applied science to outstanding NRL staff members. The NRL-Edison 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. Dave Godbey at (202) 404-1200.)

- 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 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 and

procedures for the program. (Contact Dominic Panciarelli at (202) 767-2541 or Natalie Gibbs at (202) 767-3034.)

- The Charlotte Moore-Sitterly Chapter of **Federally Employed Women, Inc.** (FEW) was chartered at NRL in 1993. FEW is an international organization of federally employed women and men 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 subcommittees. (Contact Dr. Jeanie Osborn at (202) 767-3885.)

- Employees interested in developing effective self-expression, listening, thinking, and leadership potential are invited to join either of two NRL chapters of **Toastmasters International**, the Thomas Edison Club or the Forum Club. Members of these clubs, who possess diverse career backgrounds and talents, 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 Azmi Alkurd (Thomas Edison Club) at (202) 404-1587 or Mike Fromm (Forum Club) at (202) 404-1389.)

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. (Contact Dr. Richard Rein, Code 1004 at (202) 767-7230.)

Technology Base

- 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 increased opportunities for Navy R&D laboratory/center personnel to go to sea for several days to gain first-hand insight into operational factors affecting system design, performance, and operations on a variety of ships.

For further information on the Technology Base Programs, contact Dr. Stephen Sacks, Code 5006, (202) 767-3666.

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, discrimi-

nation 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**) 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; hot tubs; saunas; classes in five different types of martial arts; aerobics exercise; swimming, water aerobics, and water walking. 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 **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 **Consortium for Oceanographic Research and Education (CORE) 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 **National Defense Science and Engineering 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. Lesley Renfro at (202) 404-7450.

- 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

The student programs are tailored to the undergraduate and graduate students to provide employment opportunities and work experience in naval research. These programs are designed to attract applicants for student and full professional employment in fields such as engineering, physics, mathematics, and computer science. The student employment programs are designed to help students and the educational institutions gain a better understanding of NRL's research, its challenges, and its opportunities. The employment programs for college students include the following:

- The **Student Career Experience Program** (formerly known as Cooperative Education Program) employs students in study-related occupations. The program is conducted in accordance with a planned schedule and a working agreement between NRL, the educational institution, and the student. Primary focus is on students pursuing bachelor degrees in engineering, computer science, or the physical sciences.

- The **Student Temporary Employment Program (STEP)** enables students to earn a salary while continuing their studies and offers them valuable work experience.

- The **Student Employment Program** employs students for the summer in paraprofessional and technician positions in engineering, physical sciences, computer sciences, and mathematics.

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

For additional information on these undergraduate and graduate student programs, contact (202) 767-8313.

High School Programs

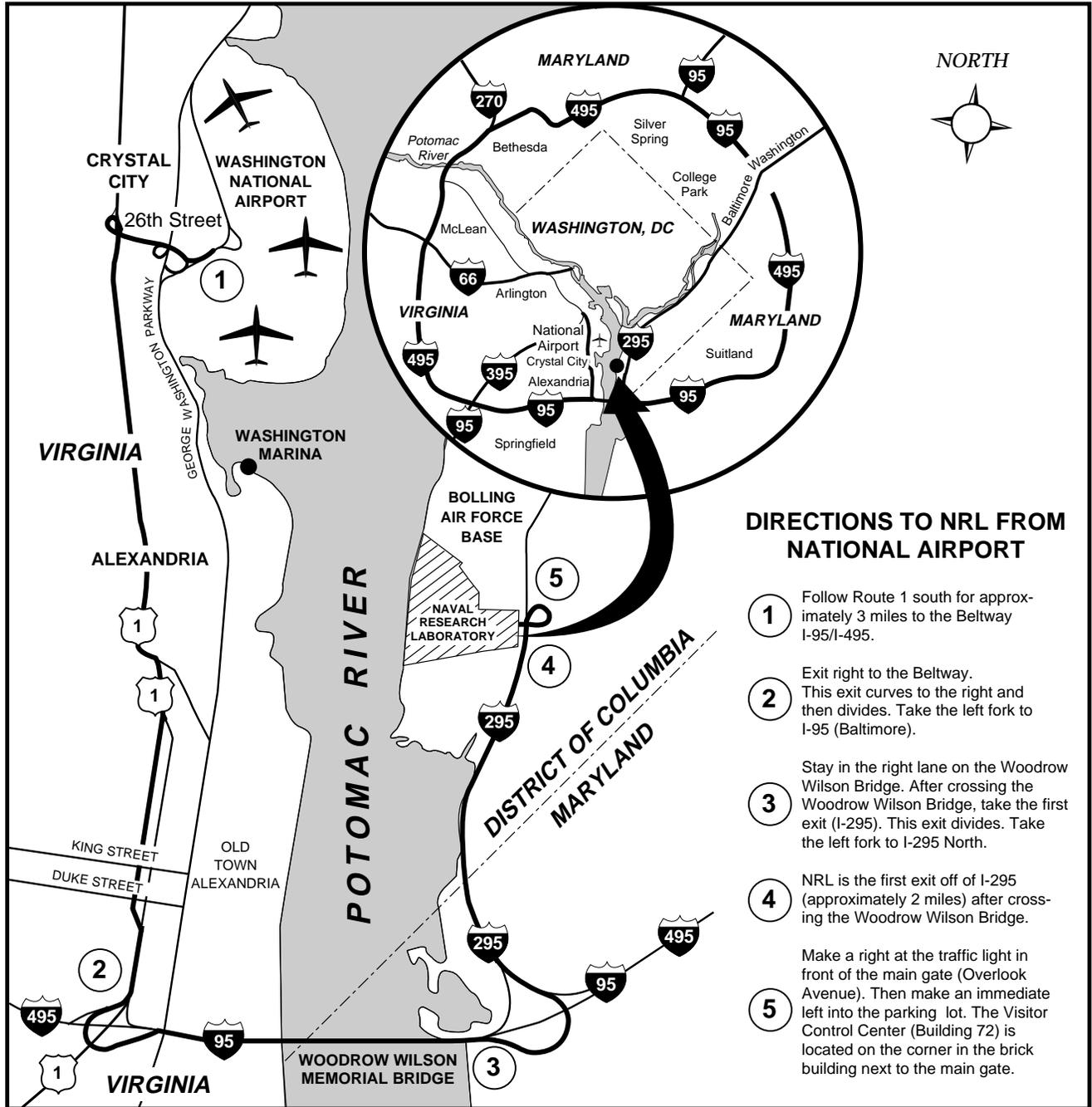
- The **DoD Science & Engineering Apprenticeship Program (SEAP)** employs high school juniors and seniors to serve for eight weeks as junior research associates. Under the direction of a mentor, students gain a better understanding of research, its challenges, and its opportunities through participation 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.



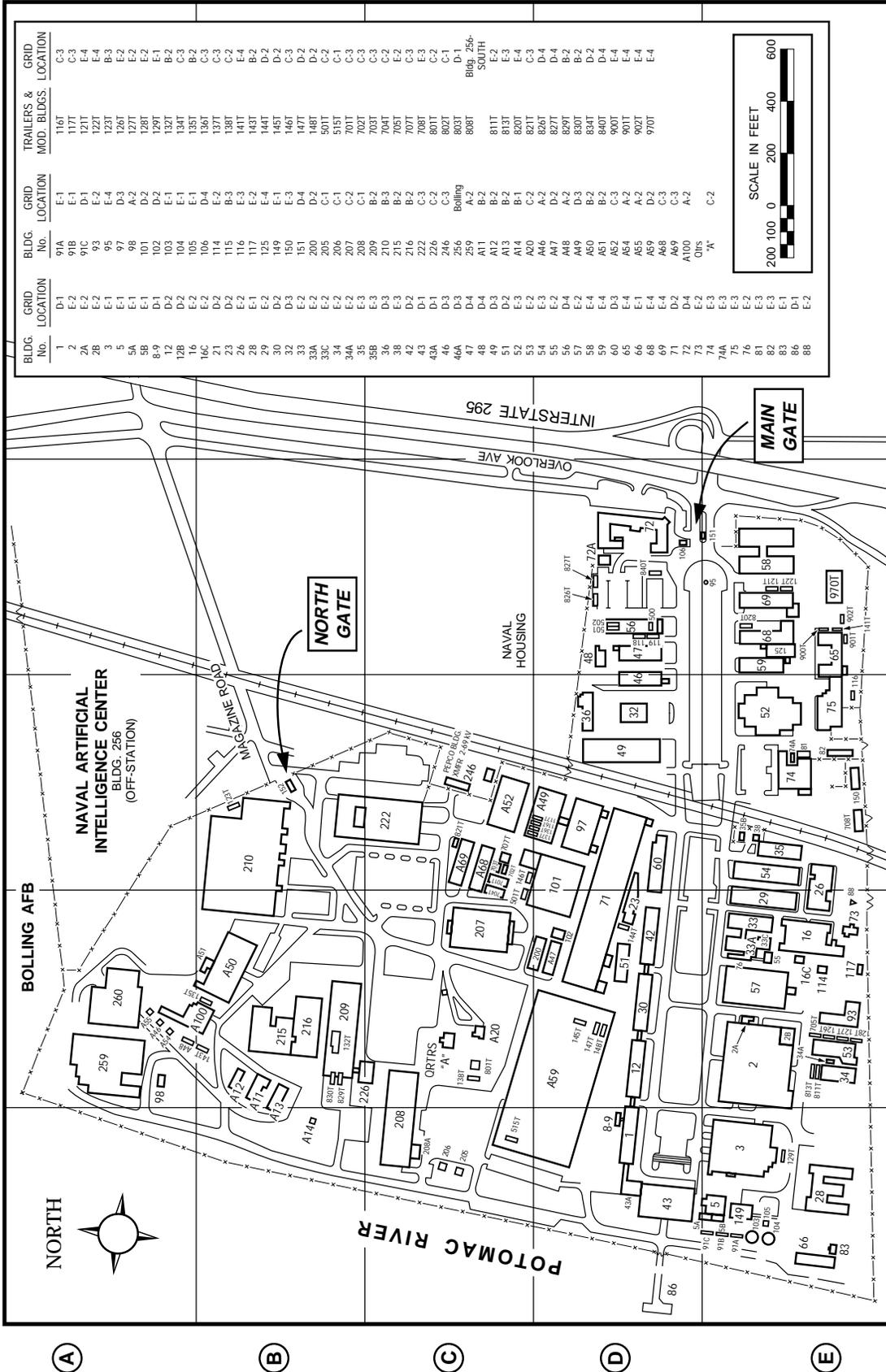
General Information

Naval Research Laboratory (Washington, DC)

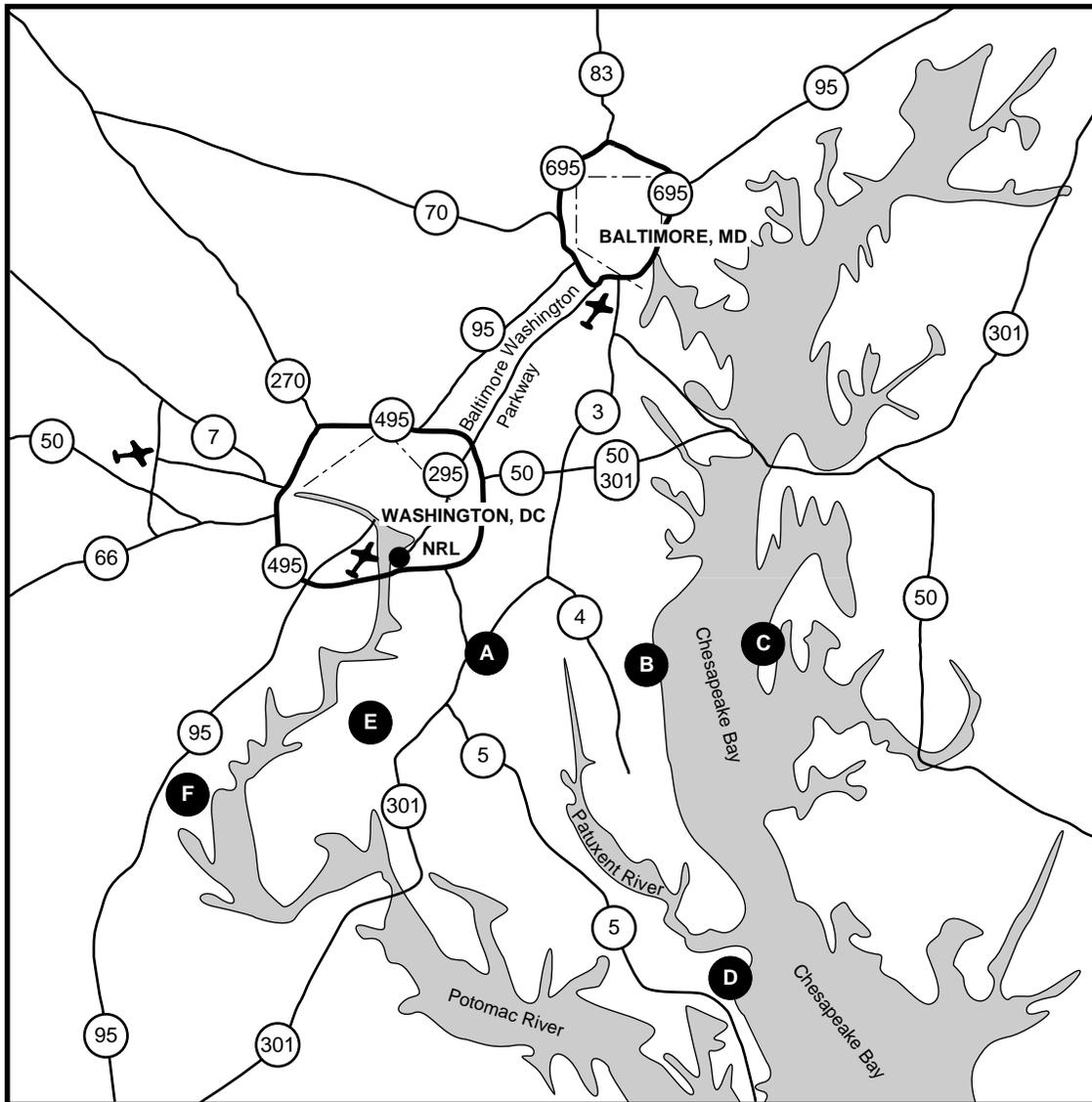


Naval Research Laboratory
4555 Overlook Avenue, SW
Washington, DC 20375-5320
(202) 767-3200

Location of Buildings at NRL Washington

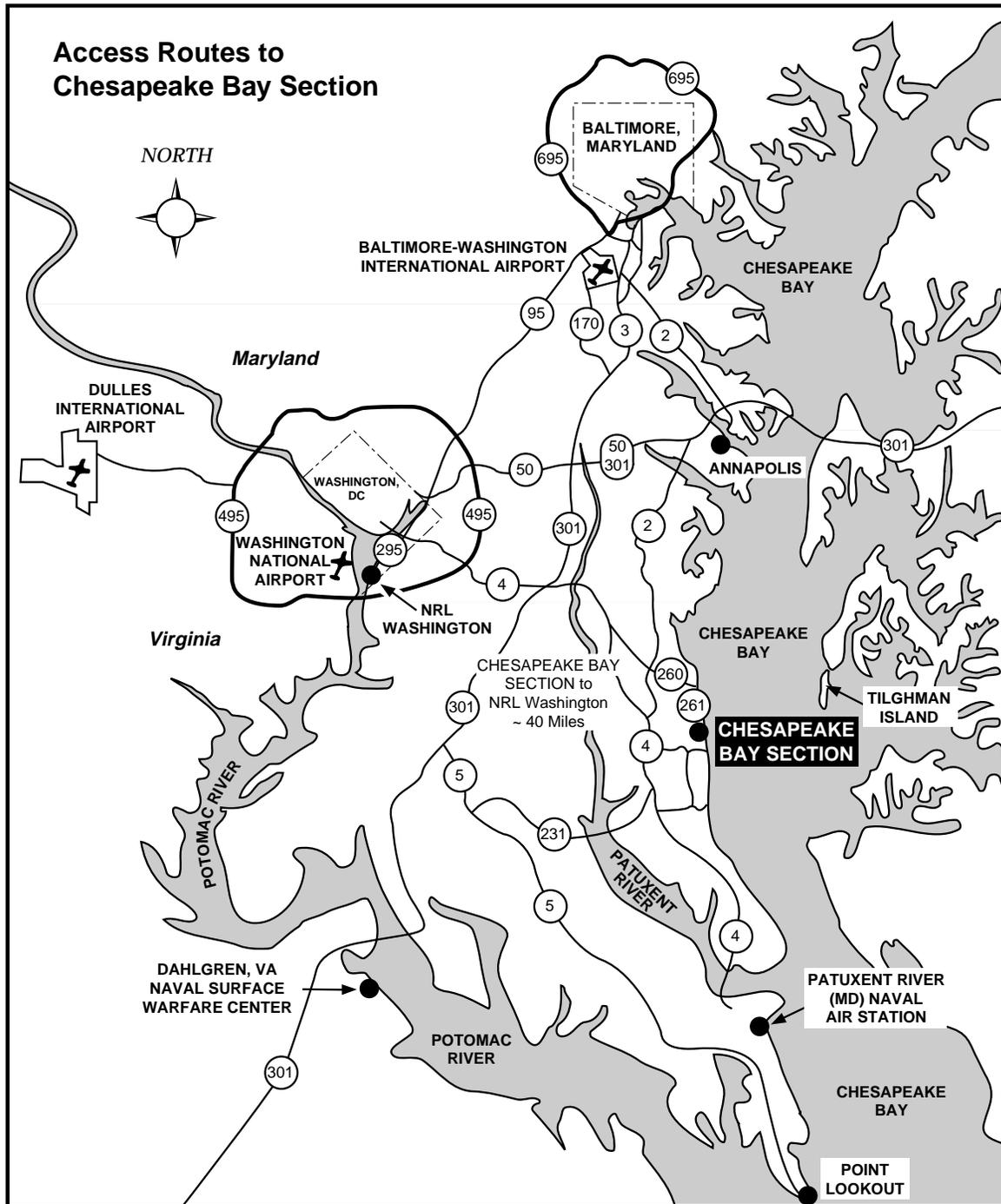


Location of Field Sites in the NRL Washington Area



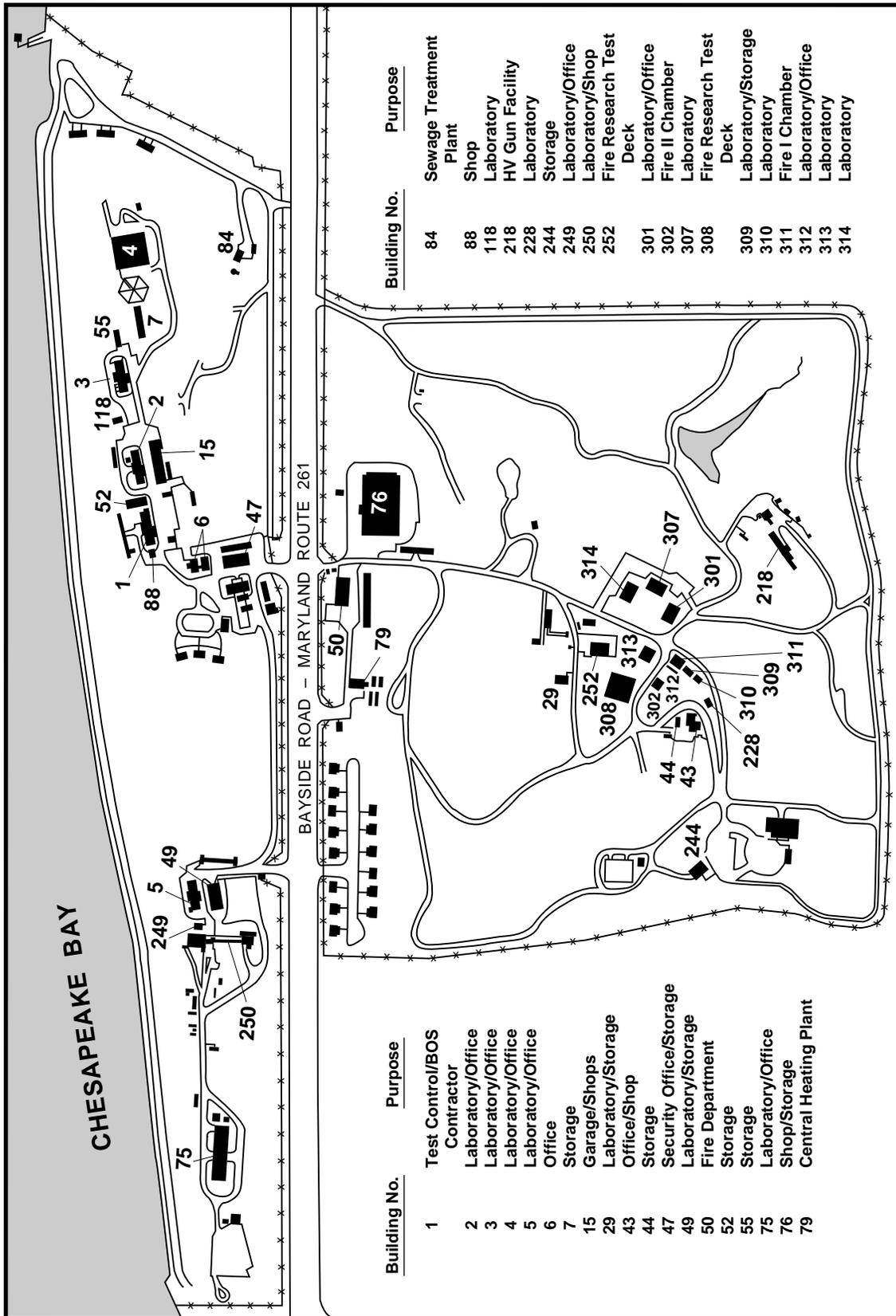
Location	Approximate Mileage from NRL Washington	Cognizant Code
A - Brandywine, MD	28	5500
B - Chesapeake Bay Section, Chesapeake Beach, MD	40	3522
C - Tilghman Island, MD	110	3522
D - Patuxent River (MD) Naval Air Station	64	1600
E - Pomonkey, MD	20	8106
F - Midway Research Center, Quantico, VA	38	8140

Chesapeake Bay Section (Chesapeake Beach, Maryland)

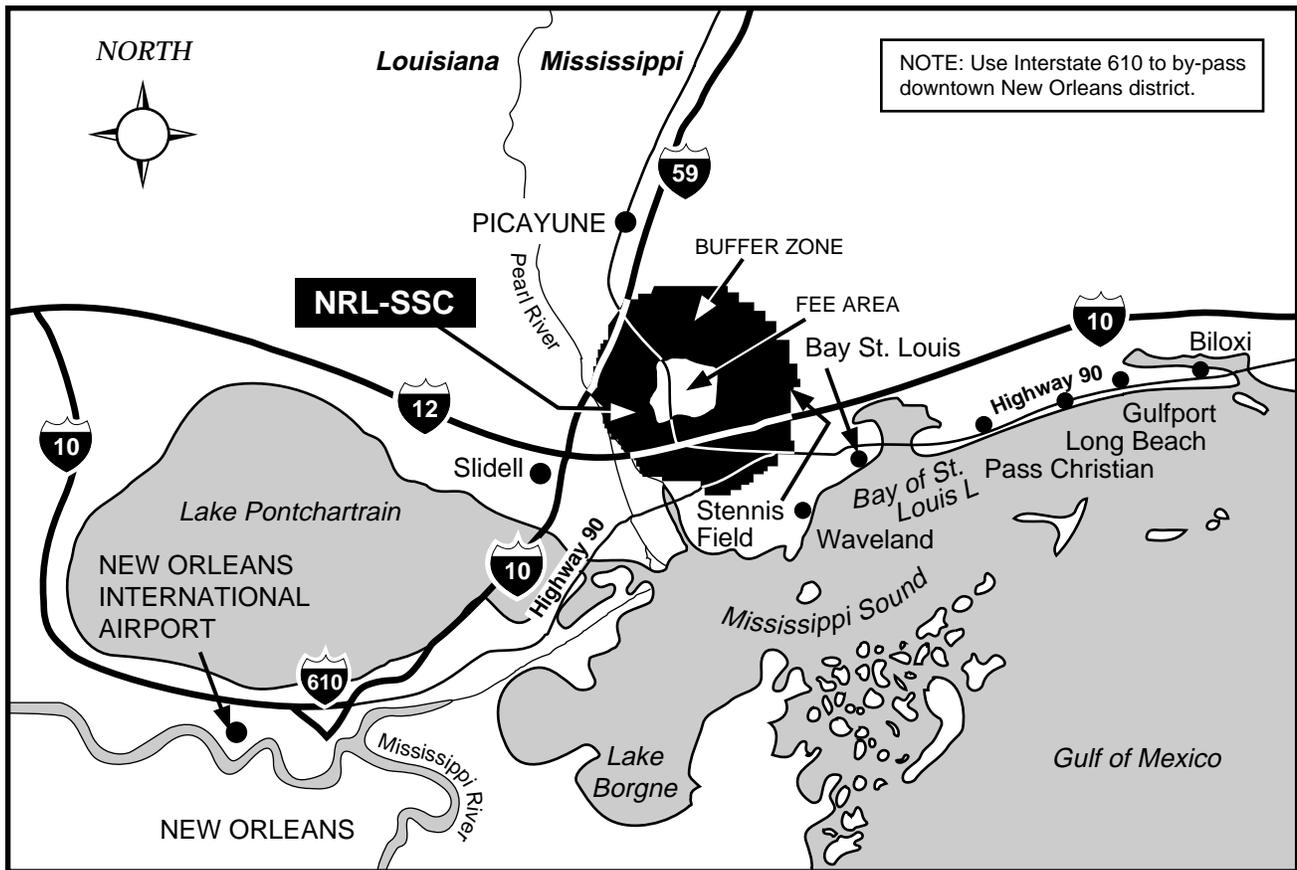


Naval Research Laboratory
 Chesapeake Bay Section
 5813 Bayside Road
 Chesapeake Beach, MD 20732
 (301) 257-4004

Location of Buildings at the Chesapeake Bay Section

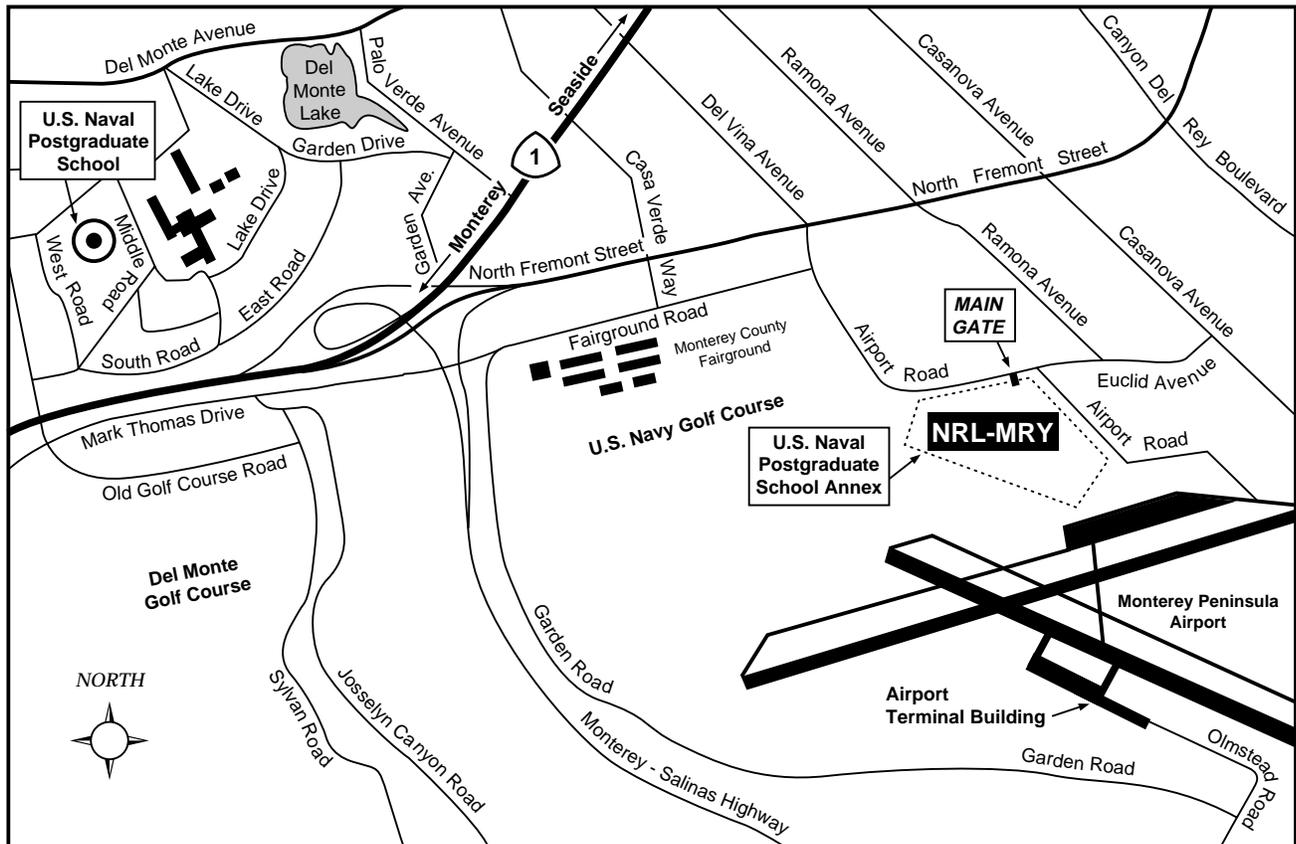


John C. Stennis Space Center (Stennis Space Center, Mississippi)



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
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Key Personnel

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Code

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The cooperation and assistance of others on the staffs of the Publications Branch, the Systems/Photographic Branch, and the Central Mail Processing Unit are also acknowledged and appreciated.

REVIEWED AND APPROVED

A handwritten signature in black ink, appearing to read "B.W. Buckley".

**CAPT B.W. Buckley, USN
Commanding Officer**

July 1997

Approved for public release; distribution is unlimited.

NRL
FACT
BOOK

