NRL FACT BOOK

"The Navy's Corporate Laboratory"

The NRL Fact Book is a reference source for information about the Naval Research Laboratory (NRL). It is updated and placed on NRL's Web site (http://www.nrl.navy.mil/) annually. It is printed every other year. 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
Personnel Operations Branch (Code 1810)
Naval Research Laboratory
Washington, DC 20375-5320

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

Quick Reference Telephone Numbers

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Hotline	(202) 767-6543	(202) 767-6543	(202) 767-6543	(202) 767-6543	(202) 767-6543
Personnel Locator	(202) 767-3200	(228) 688-3390	(831) 656-4763	(410) 257-4000	(301) 342-3751
DSN	297- or 754-	828	878	—	342
Direct-in-Dialing	767- or 404-	688	656	257	342
Public Affairs	(202) 767-2541	(228) 688-5328	(202) 767-2541	—	(202) 767-2541

Additional telephone numbers are listed on pages 140 and 141.

NRL FACT BOOK

NAVAL RESEARCH LABORATORY
WASHINGTON, DC 20375-5320

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Introduction to the Naval Research Laboratory

Mission

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

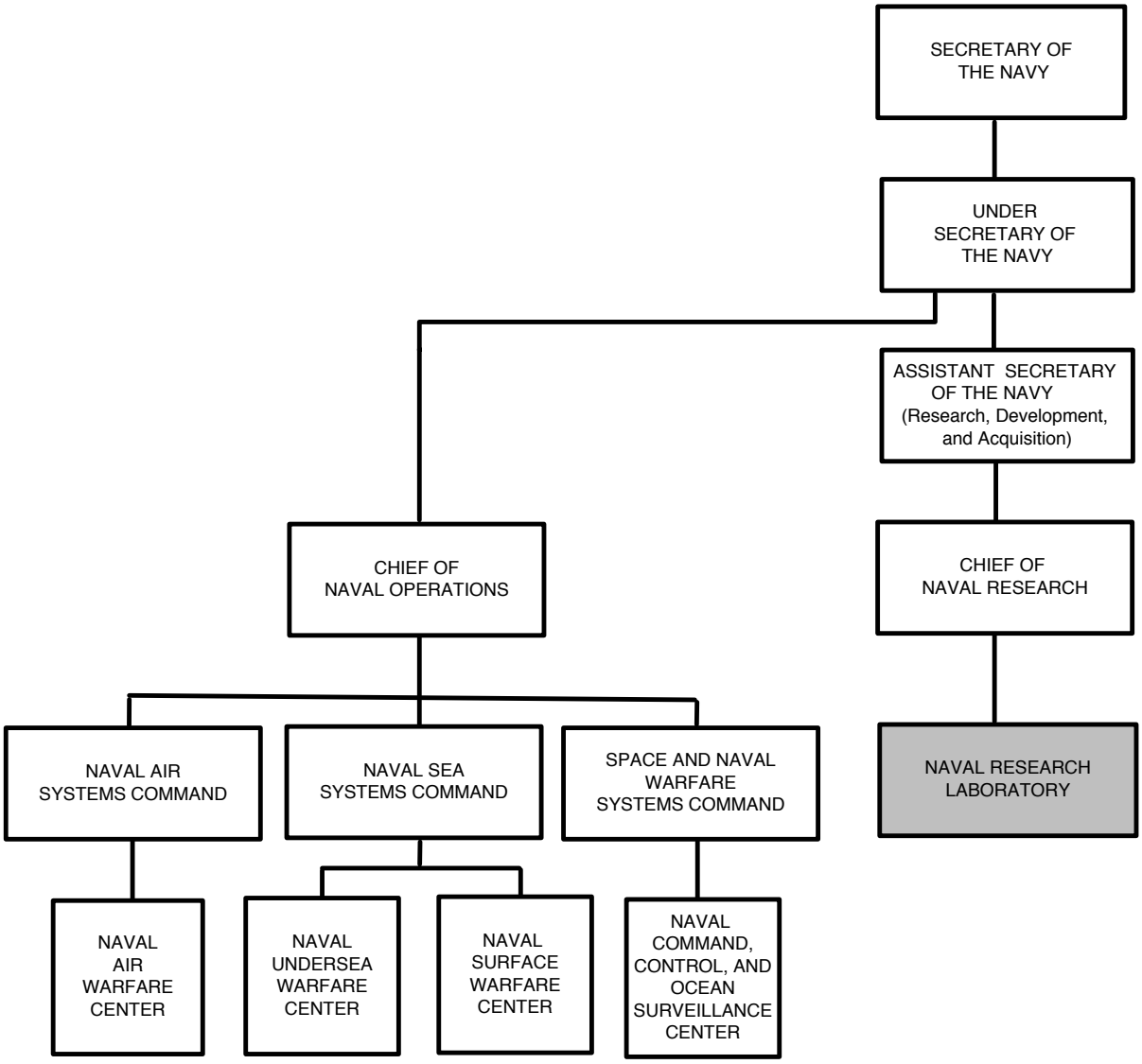
The Naval Research Laboratory

- **Provides primary in-house research for the physical, engineering, space, and environmental sciences;**
- **Provides broadly based exploratory and advanced development programs in response to identified and anticipated Navy and Marine Corps needs;**
- **Provides broad multidisciplinary support to the Naval Warfare Centers;**
- **Provides space and space systems technology development and support; and**
- **Assumes responsibility as the Navy's corporate laboratory.**

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).


SECRETARY OF THE NAVY
UNDER SECRETARY OF THE NAVY
ASSISTANT SECRETARY OF THE NAVY (Research, Development, and Acquisition)
CHIEF OF NAVAL OPERATIONS
CHIEF OF NAVAL RESEARCH
NAVAL AIR SYSTEMS COMMAND
NAVAL SEA SYSTEMS COMMAND
SPACE AND NAVAL WARFARE SYSTEMS COMMAND
NAVAL RESEARCH LABORATORY
NAVAL AIR WARFARE CENTER
NAVAL UNDERSEA WARFARE CENTER
NAVAL SURFACE WARFARE CENTER
NAVAL COMMAND, CONTROL, AND OCEAN SURVEILLANCE CENTER

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. As the corporate laboratory of the Navy, NRL is the principal in-house component in the Office of Naval Research's (ONR) 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 (CRADAs). NRL values this linkage and continues to develop it.

NRL is an important link in the Navy Research, Development, and Acquisition (RD&A) 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 ONR.

NRL Functional Organization

COMMANDING OFFICER
Code 1000
CAPT P.C. Stewart, USN

DIRECTOR OF RESEARCH
Code 1001
Dr. J.A. Montgomery

CHIEF STAFF OFFICER
Code 1002
CDR J.J. Coffey, USN
(Acting)

- Security
- Scientific Development Squadron One (VXS-1)
- MILOPS
- MILPERS
- Management Control and Review
- Inspector General

HUMAN RESOURCES OFFICE
Code 1800
Ms. C.L. Downing
(Acting)

- Equal Employment Opportunity and Manpower
- Staffing and Classification
- Employee Development
- Employee Relations
- Wellness
- Personnel Demonstration Project
- Compensation

BUSINESS OPERATIONS
Code 3000
Mr. D.K. Therning

- Contracts
- Financial Management
- Supply and Information Services
- Research and Development Services
- Chesapeake Bay Section
- Management Information Systems
- Safety

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
- 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. G.M. Borsuk

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

OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY
Code 7000
Dr. E.R. Franchi

- 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
EM/EO/meteorological/oceanographic sensors
Satellite meteorology
Precise space tracking
Radio/infrared astronomy
Infrared sensors and phenomenology
UV sensors and middle atmosphere research
Image processing
VLBI/astrometry
Optical interferometry
Imaging spectrometry
Liquid crystal technology

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
Parallel scientific libraries
Algorithms for massively parallel systems
Digital progressive HDTV for scientific visualization
Adaptive systems: software and devices
Advanced computer networking
Simulation management software for networked high performance computers
Interactive 3D visualization tools and applications
Distributed modeling and simulation (e.g., HLA and FOM development)
Real-time parallel processing
Scalable, parallel computing
Processing graph method for parallel processing
Teraflop scalable shared memory, massively parallel computer architectures

Directed Energy Technology

High-energy lasers
Laser propagation
Solid-state and fiber lasers
High-power microwave sources
RAM accelerators
Pulse detonation engines
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
Radiation effects and satellite survivability
Molecular engineering

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/UAVs
Repeaters/jammers and EO/IR active countermeasures and techniques
Platform signature measurement and management
Threat and EW systems computer modeling and simulations
Visualization
Hardware-in-the-loop and flyable ASM simulators
Missile warning infrared countermeasures
RF environment simulators
EO/IR multispectral/hyperspectral surveillance

Enhanced Maintainability, Reliability, and Survivability Technology

Coatings
Friction/wear reduction
Water additives and cleaners
Fire safety
Laser hardening
Satellite survivability
Corrosion control
Automation for reduced manning
Radiation effects

Mobility fuels
Chemical and biological sensors
Environmental compliance

Environmental Effects on Naval Systems

Meteorological effects on communications
Meteorological effects on weapons, sensors, and platform performance
Air quality in confined spaces
Electromagnetic background in space
Solar and geomagnetic activity
Magnetospheric and space plasma effects
Nonlinear science
Ionospheric behavior
Oceanographic effects on weapons, sensors, and platforms
EM, EO, and acoustic system performance/optimization
Environmental hazard assessment
Contaminant transport
Biosensors
Microbially induced corrosion

Imaging Research/Systems

Remotely sensed signatures analysis
Real-time signal and image processing algorithms/systems
Image data compression methodology
Image fusion
Automatic target recognition
Scene/sensor noise characterization
Image enhancement/noise reduction
Scene classification techniques
Radar and laser imaging systems studies
Coherent/incoherent imaging sensor exploitation
Remote sensing simulation
Hyperspectral imaging
Microwave polarimetry

Information Technology

High-performance, all-optical networking
Antijam communication links
Next-generation, signaled optical network architectures
Integrated voice and data
Information security (INFOSEC)
Voice processing
High performance computing
High performance communications
Requirement specification and analysis
Real-time computing
Wireless mobile networking
Natural environments for distributed simulation
Collaborative engineering environments
Information filtering and fusion
Integrated internet protocol (IP) and asynchronous transfer mode (ATM) multicasting
Reliable multicasting
Wireless networking with directional antennas
Sensor networking
Communication network simulation
Bandwidth management (quality of service)
High assurance software
Distributed network-based battle management
High performance computing supporting uniform and nonuniform memory access with single and multithreaded architectures
Distributed, secure, and mobile information infrastructures
Virtual engineering
Simulation-based virtual reality
Advanced distributed simulation
High-end, progressive HDTV imagery processing and distribution
Defensive information warfare
Virtual reality/mobile augmented reality
Motion adaptation and vestibular research
3D multimodal interaction
Model integration (physical, environmental, biological, psychological) for simulation
Synthetic natural environments for distributed simulation
Command decision support
Data fusion

Marine Geosciences

Marine seismology, including propagation and noise measurement
Geoacoustic modeling in support of acoustic performance prediction
Geomagnetic modeling in support of nonacoustic system performance prediction
Static potential field measurement and analysis (gravity and magnetic) in support of navigation and geodesy
Geotechnology/sediment dynamics affecting mine warfare and mine countermeasures
Foreshore sediment transport
Geospatial information, including advanced seafloor mapping, imaging systems, and innovative object-oriented digital mapping models, techniques, and databases

Materials

Superconductivity
Magnetism
Biological materials
Materials processing
Advanced alloy systems
Solid free-form fabrication
Environmental effects
Energetic materials/explosives
Aerogels and underdense materials
Nanoscale materials
Nondestructive evaluation
Ceramics and composite materials
Thin film synthesis and processing
Electronic and piezoelectric ceramics

Thermoelectric materials
Active materials and smart structures
Computational material science
Paints and coatings
Flammability
Chemical/biological materials
Spintronic materials and half metals
Biomimetic materials
Multifunctional materials

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 intelligence and expert systems
On-scene environmental support system development/nowcasting
Tactical database 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
Dynamic ocean acoustic modeling

Oceanography

Oceanographic instrumentation
Open ocean, littoral, polar, and nearshore oceanographic forecasting
Shallow water oceanographic effects on operations
Modeling, sensors, and data fusion
Bio-optical and fine-scale physical processes
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
Remote sensing of oceanographic parameters
Satellite image analysis

Space Systems and Technology

Space systems architectures and requirements
Advanced payloads and optical communications
Controllers, processors, signal processing, and VLSI
Precision orbit estimation
Onboard autonomous navigation
Satellite ground station engineering and implementation
Tactical communication systems
Spacecraft antenna systems
Launch and on-orbit support
Precise Time and Time Interval (PTTI) technology
Atomic time/frequency standards/instrumentation
Passive and active ranging techniques
Design, fabrication, and testing of spacecraft and hardware
Structural and thermal analysis
Attitude determination and control systems
Reaction control
Propulsion systems
Navigation, tracking, and orbit dynamics
Spaceborne robotics applications

Surveillance and Sensor Technology

Point defense technology
Imaging radars
Surveillance radars
Multifunction RF systems
High-power millimeter-wave radar
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
Ultrawideband technology
Interferometric imagery
Microsensor system
Digital framing reconnaissance canvas
Biologically based sensors
Digital radars and processors

Undersea Technology

Autonomous vehicles
Bathymetric technology
Anechoic coatings
Acoustic holography
Unmanned undersea vehicle dynamics
Weapons launch

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 and sediment acoustics
- 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/3D laser vibrometer facility for studying structural acoustic phenomena for submarine, mine countermeasure, and torpedo systems
- In-air structural acoustics facility with high spatial density nearfield acoustic holography and 3D laser vibrometer measurements and processing systems for diagnosing large structures, including aircraft interiors and rocket payload fairings
- High-powered sound sources and source arrays
- 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 scattering and coherence
- Acoustic communications data acquisition systems and simulation laboratory
- 20-ft by 20-ft by 10-ft deep above-ground salt water acoustic tank facility with environmental control and substantial optical access for studying the acoustics of bubbly media
- State-of-the-art laboratory to study the structural dynamics and performance of high-Q oscillators and other micro-mechanical systems using laser Doppler vibrometers and a super-resolution nearfield scanning optical microscope (NSOM)
- Portable, ocean-deployable synthetic aperture acoustic measurement system, consisting of sources and receivers attached to a robotic carriage that can be positioned precisely at any point along a 100-meter rail using an encoder feedback system, for the collection of high quality scattering cross-sections of mines and the associated clutter data
- 64-channel broadband source-receiver array with time-reversal mirror functionality over a frequency band of 500–3500 Hz to study time-reversal methods
- Autonomous acoustic data acquisition suites to collect data from vertical and horizontal arrays unattended for up to 30 days
- Geoacoustic Model Fabrication Laboratory to fabricate rough topographical surfaces in various materials for acoustic scattering and propagation measurements in water-tank facilities

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

- Optical equipment
  - Confocal Microscope
  - Raman Microscope
  - UV-Visible Absorption Spectrophotometers
  - Transmission Electron Microscope
  - Scanning Electron Microscope
  - Confocal Microscope
  - Microscope/AFM
- Analytical instruments
  - Gas Chromatography Mass Spectrometer
  - HPLC
  - LC/MS/MS System
  - FluroMax-3 Spectrofluorometer
- General facilities
  - X-Ray Scattering
  - Cold room for storage and preparation
  - High-speed ultracentrifuges
  - Inert atmosphere dry box
  - NMR
  - FTIR
  - Ellipsometer
  - Dynamic Mechanical Analyzer
  - Differential scanning Calorimeter
  - Circular Dichroism
  - Minimill Injection Mold Machine
  - Multi Rf Centrifuge
  - Perkin Elmer BioChip Arrayer I
  - Freeze Dry System
  - Affymetrix Gene Chip system

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
- Marine Corrosion Facility (at Key West, FL)
- Fire/Damage Control Test Facility (at Mobile, AL)
- 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
  - Combustion and fire research
  - Alternate and petroleum-derived fuels

- Simulation/modeling
- Synchrotron radiation beam lines (at NSLS, Brookhaven, NY)

Electronics Science and Technology Division (Code 6800)

- Nano- and microelectronics characterization and processing facilities
- Electron-beam nanowriter
- High-resolution transmission electron microscope
- Scanning tunneling microscopy and electro-optical analysis
- Crystal growing facilities including bulk growth, molecular beam epitaxy, and organometallic chemical vapor deposition
- Optical and electrical characterization of materials
- Electronic testing and analysis facilities
- Vacuum electronics engineering facility
- Femtosecond laser facility
- Space solar cell facility
- Power electronics materials characterization and device processing facilities

Information Technology Division (Code 5500)

- Extended Spectrum Experimentation Laboratory
- Robotics & Autonomous Systems Laboratory
- Immersive Simulation Laboratory
- Warfighter Human-Systems Integration Laboratory
- Audio Laboratory
- Mobile and Dynamic Network Laboratory
- Integrated Communications Technology (ICT) Test Lab
- General Electronics Environmental Test Facility
- Key Management Laboratory
- Crypto Technology Laboratory
- Navy Cyber Defense Research Laboratory (NCDRL)
- Communications Security (COMSEC) Laboratory
- Navy Shipboard Communications Testbed
- Virtual Reality Laboratory
- Motion Imagery Laboratory
- Global Information Grid - Evaluation Facility
- Laboratory for Large Data Research
- Distributed Center for High Performance Computing
- Ruth H. Hooker Research Library

Institute for Nanoscience (Code 1100)

- Clean room (5000 sq ft), quiet (4000 sq ft), and ultra-quiet (1000 sq ft) laboratories
  - 35 dB and 25 dB acoustically isolated zones
  - 20°C ± 0.5°C and 0.1°C controlled temperature zones
  - Vibration isolation
    - Vertical (mm, pp) <0.1 @ 70–500 Hz
    - Horizontal (mm, pp) <0.1 @ 70–500 Hz
  - Clean electrical power, free from SCR spikes and other interferences, and < ±10% voltage change
  - <0.5 mG at 60 Hz EMI
  - 45 ± 5% relative humidity
  - Class 100 clean room
  - Source of water meeting ASTM D5127 spec. Type E1.2
- Clean Room Major Equipment
  - Monitoring system (toxic gas, hazmat, temperature)
  - Laminar flow wet benches for localized Class 1/10 ambient in clean room
  - Air purification unit to remove local organic contamination
  - DI water system
  - Wire bonder
  - E-beam writer with active vibration control system
  - Scanning electron microscope
  - Atomic force microscope
  - Metallurgical optical microscopes
  - Surface profiler
  - Mask aligners (2, 1, and 0.2 μm)
  - Electron beam evaporation system
  - Low pressure chemical vapor deposition (LPCVD) system
  - Magnetron sputter deposition system
  - Reactive ion etching systems
  - Dual-beam focused ion beam workstation
  - Optical pattern generating system
  - Plasma-enhanced chemical vapor deposition (PECVD) system
  - Chlorine reactive ion etching system
- Other Major Equipment
  - Transmission electron microscope
  - UHV multi-tip scanning tunneling microscope/nanomanipulator

Laboratory for Computational Physics and Fluid Dynamics (Code 6400)

- 1120-core x86 Cluster
- (3) 64-core SGI Altix Systems
- 184-core x86 Cluster
- 256-core SGI ICE
- 256-processor Opteron Cluster
- More than sixty SGI, Apple, and Intel workstations
- Three-quarter-terabyte RAID disk storage systems
- All computers and workstations have network connections to NICENET and ATDnet 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
- One X-ray diffractometer
- Four Silicon Graphics IRIS workstations
- Protein and peptide chromatography
- Atomic force microscope

Marine Geosciences Division (Code 7400)

Airborne gravimetry, magnetics, and topographic measurements suite coupled with differential GPS yielding position accuracies of < 1.0 meter
100 and 500 kHz sidescan sonar with 2–12 kHz chirp profiler and Cs magnetometer for seafloor characterization/imaging and shallow subbottom profiling
Deep-towed acoustic geophysical system operating at 220–1000 Hz characterizes subseafloor structure including gas clathrate accumulations and dissociation of methane hydrates
Acoustic seafloor classification system operating at 8–50 kHz provides underway, real-time prediction of sediment type and physical properties
Seafloor probes for measuring sediment pore water pressures, permeability, electrical resistivity, acoustic compressional and shear wave velocities and attenuations, and dynamic penetration resistance
100 and 300 kV transmission electron microscopes with environmental cell for study of sediment fabric, especially impact of organic matter
Map data formatting facility compresses map information onto CD-ROM media for masters for use in aircraft digital moving map systems
Positioning, navigation, and timing laboratory
Comprehensive geotechnical and geoacoustics laboratory capability
Airborne electromagnetic (AEM) bathymetry system
Ocean bottom magnetometer system
3D, multispectral, subbottom swath imaging system
Ocean bottom seismographs (OBS)
In situ sediment acoustic measurement system (IS-SAMS)
Instrumented mine shapes to measure hydrodynamics of free-fall in the water column, dynamics of deceleration in seafloor sediments, and rates and depths of scour burial
Hydrothermal plume imaging data acquisition and analysis system
Integrated digital databases analysis and display system for bathymetric, meteorological, oceanographic, geoacoustic, and acoustic data
Stereometric video image processing system for use in foreshore morphology measurement
Sediment gas-content sampler
Acoustic tomographic probes for surf zone sands and gassy muds
Computed tomography (CT) system and real-time radiography unit with a 0–225 keV @ 0–1 mA microfocus X-ray tube and a 225-mm image intensifier
Patented Geospatial Information Data Base (GIDB™) for rapidly accessing disparate geospatial content on the internet. This is the most extensive interconnection of geospatial data that exists. http://dmap.nrlssc.navy.mil
Human-centered display design through the application of human factors principles in the design of geospatial displays (e.g., analysis of clutter in electronic displays)
GPS-based survey vehicles and equipment to measure foreshore and nearshore bathymetry (camera towers, jet ski, and push cart)
Geospatial visualization lab for rapid 2D and 3D graphic and physical visualization, analysis, and prototyping

Marine Meteorology Division (Code 7500)

Real-time METOC data collection and distribution database management system
AN/SMQ-11 shipboard antenna system for retrieving polar-orbiting satellite data
Geostationary satellite data direct readout and polar orbiting satellite data processing center
Supercomputer for numerical weather prediction systems development
Master Environmental Library (MEL) implemented on superworkstations for archiving and distributing real-time and historical atmosphere/ocean databases
Bergen Data Center for extensive file serving and research data backup/archival capability
Data visualization center for developing shipboard briefing tools, displaying observations and model output, and integrating meteorological parameters into tactical simulations
Classified radar and satellite data processing facility
Mobile Atmospheric Aerosol and Radiation Characterization Observatory (MAARCO)
Technical Research Library

Materials Science and Technology Division (Code 6300)

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-aided experimental stress analysis
Crystallite orientation distribution function (CODF)
Class 1000 clean room; processing metallic film
Elevated temperature and structural characterization laboratory
Metallic film deposition systems
Magnetometry
Cryogenic facilities
High-field magnets
High-resolution analytical electron microscope
Isothermal heat treating facility
Vacuum arc melting facility
Vacuum induction melting facility
3-MeV tandem Van de Graaff accelerator
200-keV ion-implantation facility

Microwave device test facility
Excimer laser film deposition facility
Bomen infrared spectrometer facility
Diffuse light scattering facility
Femtosecond laser facility
Surface characterization facility
Accelerator mass spectrometry facility
Carbon-14 dating facility
Laminated object manufacturing system
Thermal analysis characterization suite (TGA/DSC/DMA/DEA/rheometer)
Dielectric characterization facility
Composites processing autoclave
3D ESPI strain measurement system
Biomechanical surrogate fabrication facility

Oceanography Division (Code 7300)

Towed sensor and advanced microstructure profiler systems for studying upper ocean fine and microstructure
Integrated absorption cavity and optical profiler systems for studying ocean optical characteristics
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 hyperspectral optical array
SCI processing facility
Satellite receiving stations for AVHRR, SeaWiFS, and DMSP ocean color processing facility
Environmental scanning electron microscope, confocal laser scanning microscope, and the new Inspect S Low Vacuum Scanning Electron Microscope for detailed studies of biocorrosion in naval materials
Real-time Ocean Observations and Forecast Facility for monitoring and tracking of ocean physical and bio-optical conditions
Slocum Electric Gliders for performing wide-area ocean surveys of temperature, salinity, and optical characteristics
SCANFISH MKII, a towed undulating vehicle system, designed for collecting 3D TS profile data of the water column
Bottom-mounted Shallow water Environmental Profiler in Trawl-safe Real-time configuration (SEPTR) for measuring temperature, salinity, and some optical parameters in addition to current profiles and pressure

Optical Sciences Division (Code 5600)

Optical probes laboratory to study viscoelastic, structural, and transport properties of molecular systems
Short-pulse excitation apparatus for kinetic mechanisms investigations
IR laser facility for optical characterization of semiconductors
Facilities for synthesis and characterization of optical glass compositions and for the fabrication of optical fibers
Silica and IR fluoride/chalcogenide fiber fabrication facilities
Environmental testing of fiber sensors (acoustic, magnetic, electric field, etc.)
Laser diode pumped solid-state lasers
Mid-IR, low-phonon crystal growth facility
Infrared countermeasure techniques laboratory
Mobile, high-precision optical tracker
Indoor IR test range
Computer EO/IR technology/systems simulation center
Field-qualified EO/IR measurement devices
Focal plane array evaluation facility
Facilities for fabricating and testing integrated optical devices
Panchromatic and multi- and hyper-spectral digital imaging processing facilities
NRL P-3 aircraft sensor pallet
Airborne EO/IR and radar sensors
  VNIR through SWIR hyperspectral systems
  VNIR, MWIR, and LWIR high-resolution systems
  Wideband SAR systems
RF and laser data links
High-speed, high-power photodetector characterization
Communication link characterization to >100 Gbps
RF phase noise, noise figure, and network analysis
Ultrahigh-speed A/O converters

Plasma Physics Division (Code 6700)

Mercury, 6 MV, 360 kA, magnetically insulated inductive voltage adder
Gamble II, 1 MV, 1 MA pulsed power generator
HAWK, 1 MA inductive storage facility
PHAROS III, two-beam neodymium-glass laser and target facility
Table-Top Terawatt (T^3) laser system
Table-Top Ti: Sapphire Femtosecond Laser (TFL) system
NIKE krypton fluoride laser facility
Space Physics Simulation Chamber
Plasma Applications Laboratory
Microwave facility for processing of advanced materials (2.45, 35, 83, and 60–120 GHz)
ELECTRA, test bed for high-rep 5 Hz KrF laser
Railgun Materials Testing Facility
Directed Energy Physics Facility

Radar Division (Code 5300)

Shipboard radar research and development test beds:
  AMRFC testbed
  Wideband digital beamforming testbed

AN/SPS-49A(V)1
Airborne research radar facility, including advanced profile high-resolution imaging radar and P-3 (1998) with APS-145 Group 2 and CEC
High-power 94 GHz radar system
Ultrahigh resolution radar system (microwave microscope)
Radar signature calculation facility
Electromagnetic numerical computation facility
Compact range antenna measurement laboratory and nearfield scanner
Space-time adaptive processing (STAP) laboratory
Electronic computer-aided design facility
Clutter research radar
Microwave and RF instrumentation laboratory
Functional materials electromagnetic analysis laboratory
High-bandwidth, high-capacity data recording system

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
SAIL
Hyperspectral imaging, sensors, and processing
Optical remote sensing calibration lab/facility
Navy Prototype Optical Interferometer (NPOI)
NRL/NRAO 74-MHz Very Large Array
Free surface hydrodynamics laboratory
SSM/I processing facility
STEMS system
Volume imaging lidar system
Aerosol and field measurement facility
NRL RP-3A aircraft sensors
Airborne polarimetric microwave imaging radiometer (APMIR)
Airborne Lidar
mm-wave imager
DMSP SSM/I simulator
Interferometric Synthetic Aperture Radar (InSAR)
Flight-level meteorological sensors
Hyperspectral sensor systems (PHILLS)
Mid-wave infrared (MWIR) Indium Antimonide (InSb) imaging system
Long-wave infrared (LWIR) quantum well IR photodetector (QWIP) imaging system

Research and Development Services Division (Code 3500)

Military construction
Research support engineering
Planning
Full range of facility contracting, including construction, architect/engineering services, facilities support, and reserved parking
Transportation
Telephone services
Maintenance and repair of buildings, grounds, and communication and alarm systems
Shops for machining, sheet metal, welding, and plating
Occupational Safety and Health
Environmental
Health Physics

Spacecraft Engineering Department (Code 8200)

Chambers:
Thermal-vacuum
Acoustic reverberation
Facilities:
Spacecraft high-reliability electronic and electrical production facility
Spacecraft electronic systems integration and test facility
Radio frequency (RF) system development facility
RF microcircuit fabrication cleanroom facility
Large tapered horn RF anechoic chamber facility
Frequency Sources Laboratory
Shock and vibration test
Cleanrooms
Spacecraft fabrication and assembly
Fuels testing
Autoclave
Space robotics laboratory
Proximity operations testbed
CAD/CAM
Propulsion system welding
Static loads test
Star tracker characterization
Spacecraft spin balance
Modal analysis
Computational astrodynamic simulation and visualization

Space Science Division (Code 7600)

Development and test facilities for spaceborne instruments to perform astrophysical, solar, upper/middle atmospheric, and space environment sensing
Advanced Level Physics High Altitude extension of the Navy's Operational Global Atmospheric Prediction System (NOGAPS-ALPHA)
Mountain Wave Forecast Model (MWFM)
Spatial Heterodyne Imager for Mesospheric Radicals (SHIMMER), for measuring hydrosyl and polar mesospheric clouds

Infrared test facility for Spatial Heterodyne Spectroscopy for tropospheric gases (SHIMCAD)
Clean room facilities
High energy radiation detector simulations and design support (SWORD/SMART)
Space science theory group in high-energy neutrinos, cosmic rays, and gamma rays
Gamma Ray Imaging Laboratory (GRIL)
Gamma Ray Large Area Telescope (GLAST) data investigation center
Mobile Imaging and Spectroscopic Threat Identification (MISTI)
X-ray Attitude Camera Testbed (XACT)
Solar instrument test facility
Sun Earth Connection Coronal and Heliospheric Investigation (SECCHI) Payload Operations Center (POC)
Special Sensor Ultraviolet Limb Imager (SSULI) calibration facility
Coronal Physics Explorer (CPEX)
Geocoronal imager: remote sensing solar wind and near-earth plasma interactions by Thompson scattering
Extensive computer-assisted data manipulation and interpretive capabilities for space-data imaging and modeling
UV-EUV facility to validate performance of high resolution UV and EUV detectors for solar and astronomical applications
Extreme Ultraviolet Imaging Spectrometer (EIS)

Space Systems Development Department (Code 8100)

Payload test facility and processor development laboratory
Laser communications and electro-optics laboratories
Tactical Technology Development Laboratory (TTDL)
Precision oscillator (clock) test facility
RF payload development laboratory with anechoic chamber
Precision high-frequency RF compact range anechoic chamber facility
Transportable ground station development, assembly, and test facility
Multiplatform FPGA/ASIC/VLSI development laboratory
Satellite telemetry, tracking, and satellite control at Blossom Point, MD
- L/C/S/X-band fixed antenna resources
- Connectivity to the Air Force Satellite Control Network (AFSCN)

Pomonkey field site—large antenna, space communications, and research facility
Midway Research Center—space communications and research facility
Optical telescope facility

Tactical Electronic Warfare Division (Code 5700)

Visualization Laboratory
Transportable step frequency radar
Vehicle development laboratory
Offboard test platform
Compact antenna range facility
Isolation measurement chamber facility
RFCM techniques chamber facility
Search radar ECM/EA simulator
Low-power anechoic chamber
High power microwave research facility
Electro-optics mobile laboratory
Infrared-electro-optical calibration and characterization laboratory
Infrared missile simulator and development laboratory
Secure supercomputing facility
CBD/Tilghman Island IR field evaluation facility
Ultrashort pulse laser effects research and analysis laboratory
Central target simulator facility
Flying electronic warfare laboratory
High power RF explosive laboratory
Classified support office
Classified material lay-up facility
Classified super computing facilities
RF measurement laboratory
Wet chemistry laboratory
Classified project room
Ultra near field test facility
RF and mm wave laboratory
Optical laboratory
Black laboratory
Paint room
Classified computer room
Human perception laboratory

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	0/10.13	85/28
Virginia			
Midway Research Center Quantico*	162/0	0/0	6/12
Maryland			
NRL Scientific Development Squadron One (VXS-1), NAS Patuxent River*	Tenant		
Chesapeake Bay Section and Dock Facility Chesapeake Beach*	168/0	.6/.02	47/80
Multiple Research Site Tilghman Island*	3/0	0/0	3/3
Radio Antenna Range USAF Receiver Site Brandywine*	0/0	0/0	1/0
Free Space Antenna Range Pomonkey*	55/0	29.4/0	10/10
Blossom Point Satellite Tracking and Command Station Blossom Point*	0/0	0/265	20/24
Florida			
Marine Corrosion Facility Key West	Tenant		
California			
NRL Monterey Monterey*	Tenant		
Mississippi			
Stennis Space Center Bay St. Louis*	Tenant		
Alabama			
Ex-USS *Shadwell* (LSD-15) Mobile Bay	Tenant		
	Decommissioned 457-ft vessel used for fire research		

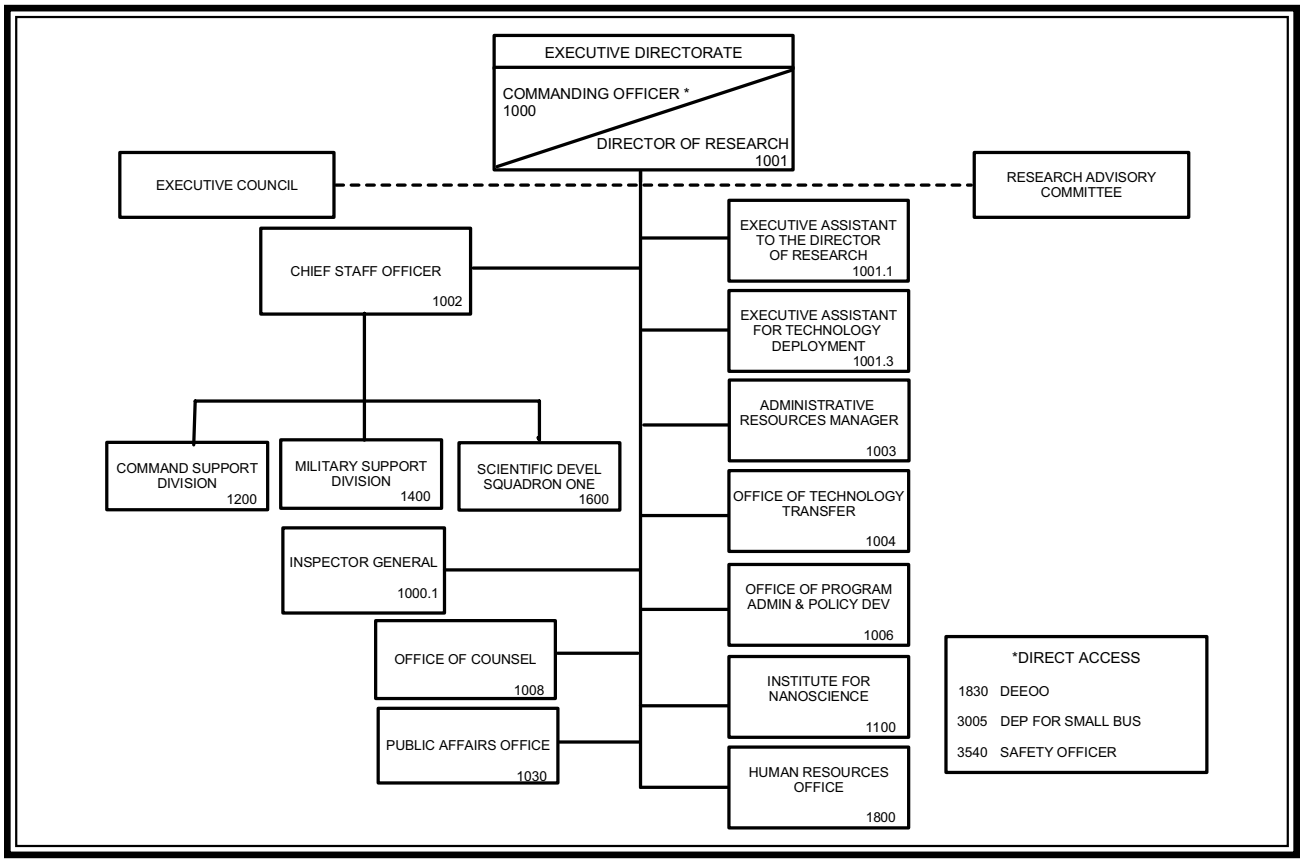
PROPERTY

Land: 824 acres

Buildings:		**Replacement Costs:**	
RDT&E	3,098,754 ft^2	Buildings Plant Replacement Value (PRV)[1]	$1,009.2 million
Administrative	228,067 ft^2	Equipment Costs[2]	$234.6 million
Other	276,711 ft^2		

[1]Per DON Facilities Asset Data System standard cost factors.
[2]Accountable Property
*See maps in the General Information section (page 129).

Executive Directorate



Key Personnel

Name	Title	Code
CAPT P.C. Stewart, USN	Commanding Officer	1000
Dr. J.A. Montgomery	Director of Research	1001
Mr. D.J. DeYoung	Executive Assistant	1001.1
Ms. C.L. Downing	Head, Strategic Workforce Planning	1001.2
Mr. B. Kiviat	Executive Assistant for Technology Deployment	1001.3
Dr. Leo Slater	NRL Historian	1001.15
CDR J.J. Coffey, USN*	Chief Staff Officer/Inspector General	1002/1000.1
Vacant	Deputy Head, Command Support Division/ Deputy Inspector General	1000.11
Ms. A.E. Downing	Command Management Review	1000.12
Mrs. L.T. McDonald	Administrative Resources Manager	1003
Dr. R.C. Manak	Head, Office of Technology Transfer	1004
Ms. L.S. Herrin*	Head, Office of Program Administration and Policy Development	1006
Mr. J.N. McCutcheon	Head, Office of Counsel	1008
Mr. R.L. Thompson	Head, Public Affairs Branch	1030
Dr. Eric Snow	Director, Institute for Nanoscience	1100
CDR J.J. Coffey, USN*	Head, Command Support Division	1200
CDR J.J. Coffey, USN	Head, Military Support Division	1400
CDR D.G. Vance, USN	Commanding Officer, Scientific Development Squadron One (VXS-1)	1600
Ms. C.L. Downing*	Director, Human Resources Office	1800
Ms. L.L. Hill	Deputy Equal Employment Opportunity Officer	1830
Ms. M. Thompson	Deputy for Small Business	3005
Mr. K.J. Pawlovich	Head, Safety Branch	3540

*Acting

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, and 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 Laboratory's 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

Captain Paul C. Stewart, a native of Longmeadow, Massachusetts, graduated cum laude from Hartwick College of Oneonta, New York in May 1983 with a bachelor of science degree in mathematics. He was commissioned an Ensign in 1984 at Officer Candidate School in Newport, Rhode Island.

His first operational assignment was on board USS Constant (MSO 427), home ported in San Diego, California, from 1985 to 1987. Captain Stewart served as First Lieutenant, Supply Officer, Mine Counter Measures Officer and Executive Officer during this tour and qualified as an unrestricted line Surface Warfare Officer. After this sea tour, Captain Stewart was assigned to the Pre-Commissioning Unit Princeton; following extensive Aegis training, he commissioned USS Princeton (CG 59) in February 1989 as the Combat Information Center and Assistant Operations Officer. Princeton participated in combat systems qualification tests and evaluation of the new SPY-1B radar and fired 24 Tomahawk, Harpoon and SM-2 missiles. Princeton then completed several months of workups and training enroute to the Gulf War.

From 1990 to 1992, Captain Stewart was a student at the United States Naval Postgraduate School in Monterey, California where he was awarded a master of science degree in physics (meteorology and oceanography). In 1992, Captain Stewart reported to Naval Pacific Meteorology and Oceanography Center, Pearl Harbor where he qualified as Command Duty Officer and Typhoon Duty Officer; additionally, he served as Technical Services Officer and Fleet Services Officer.

Upon completion of his Department Head tour in Pearl Harbor, Captain Stewart reported to Commander, Cruiser-Destroyer Group Two aboard USS George Washington (CVN 73) as Staff Oceanographer and Assistant Operations Officer The Battle Group participated in extensive operations in the Mediterranean, Adriatic, Red Sea and Arabian Gulf; additionally, he qualified as Fleet Tactical Action Officer.

Following his Battle Group tour, Captain Stewart reported for duty to the Bureau of Naval Personnel in Washington, DC as the assistant Oceanography and Meteorology assignment and placement officer; in 1998, he made the Bureau's transition to Tennessee. In 2000, Captain Stewart reported to the Oceanographer of the Navy as a requirements officer, after which he served as the Special Assistant for Ocean Resources and International Activities to the Assistant Secretary of the Navy (Installations and Environment). From 2002 to 2003, Captain Stewart studied at the National War College where he earned a master of science degree in national security strategy. In Oct 2003, Captain Stewart assumed command as the Commanding Officer/Director of the National Ice Center in Washington, DC. From 2005 to 2008, Captain Stewart served at the Office of Naval Research as the Deputy Director for the Ocean Battlespace Sensing Department and the Division Director of the Ocean, Atmospheric and Space Sensing and Systems Division; additionally he served as the U.S. National Liaison Officer to the NATO Undersea Research Center in La Spezia, Italy. In September 2008, Captain Stewart reported to the Naval Research Laboratory as the prospective Commanding Officer.

Captain Stewart's awards include the Legion of Merit, Meritorious Service Medal with gold star, Navy and Marine Corps Commendation Medal with gold stars in lieu of third award, Navy and Marine Corps Achievement Medal with gold stars in lieu of fourth award, National Defense Service Medal with bronze star, Armed Forces Expeditionary Medal, Southwest Asia Service Medal, Military Outstanding Volunteer Service Medal, NATO Medal, Expert Rifleman Medal, and Expert Pistol Medal.

Director of Research

Dr. John A. Montgomery received his Bachelor of Science degree in physics from North Texas State University in 1967 and his master's degree, also in physics, in 1969. He received his Ph.D. in physics from the Catholic University of America in 1982. As Director of Research at the Naval Research Laboratory, Dr. Montgomery oversees research and development expenditures of approximately $1 billion per year.

Dr. Montgomery joined the Naval Research Laboratory in 1968 as a research physicist in the Advanced Techniques Branch of the Electronic Warfare Division, where he conducted research on a wide range of electronic warfare (EW) topics. In 1980, he was selected to head the Off-Board Countermeasures Branch. In 1985, he was appointed to the Senior Executive Service and was selected as Superintendent of the Tactical Electronic Warfare Division. He has been responsible for numerous systems that have been developed/approved for operational use by the Navy and other services. He has had great impact through the application of advanced technologies to solve unusual or severe operational deficiencies noted during world crises, most recently in the Persian Gulf, in the Kosovo campaign, in Afghanistan, and for Homeland Defense. Dr. Montgomery has accumulated 39 years of civilian service to date at the Naval Research Laboratory.

Dr. Montgomery received the Department of Defense Distinguished Civilian Service Award in 2001. He was recognized with the Department of the Navy Distinguished Civilian Service Award in 1999 and the Department of the Navy Meritorious Civilian Service Award in 1986. As a member of the Senior Executive Service, he received the Presidential Rank of Distinguished Executive award in 1991 and again in 2002, and the Presidential Rank of Meritorious Executive award in 1988, 1999, and again in 2007. He received the Laboratory Director of the Year award given by the Federal Laboratory Consortium in 2006. He also received the 1997 Dr. Arthur E. Bisson Prize for Naval Technology Achievement, awarded by the Chief of Naval Research in 1998. Further, he received the Association of Old Crows (Electronic Defense Association) Joint Services Award in 1993. He was an NRL Edison Scholar, and is a member of Sigma Xi. He served as the U.S. National Leader of The Technical Cooperation Program's multinational Group on Electronic Warfare from 1987 to 2002, and served as its Executive Chairman.

Executive Council

The Executive Council consists of executive, management, and administrative personnel. Executive Council members include the following:

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
Director, Human Resources Office
Public Affairs Officer
Deputy Equal Employment Opportunity Officer
Administrative Resources Manager
Head, Office of Program Administration and Policy Development
Safety Officer
Head, Office of 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 the following:

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

Chief Staff Officer/Inspector General
Code 1002/1000.1/1200

CDR J.J. Coffey, USN
(Acting)

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 Scientific Development Squadron One (VSX-1) (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, waste, and abuse. 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 1030

Mr. R.L. Thompson

The Public Affairs Officer (PAO) advises the Commanding Officer and Director of Research on public affairs matters, including external and internal relations and 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 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).

Deputy Equal Employment Opportunity Officer
Code 1830

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

Office of Technology Transfer

Code 1004

Basic Responsibilities

The Technology Transfer Office (TTO) is responsible for NRL's implementation of the Federal Technology Transfer Act of 1986 (Public Law 99-502). The law requires the transfer of Government innovative technologies to industry for commercialization as products and services for public benefit. TTO negotiates Cooperative Research and Development Agreements (CRADAs) under which NRL investigators collaborate with investigators from industry, academia, state or local governments, or other federal agencies to develop NRL technologies for government and/or commercial use. It markets NRL's patented inventions, negotiates patent license agreements under which the Navy grants a licensee the right to make, use, and sell NRL inventions (in exchange for receiving licensing fees and a percentage of sales), and enforces licenses to assure diligence in commercialization efforts.

Personnel: 6 full-time civilian; 1 part-time civilian, 1 STEP student

Key Personnel

Title	Code
Head, Technology Transfer	1004
Sr. Licensing Associate	1004
Sr. Licensing Associate	1004
Licensing Associate	1004
Management Analyst	1004
Administrative Assistant	1004

Point of contact: Code 1004, (202) 767-7229

Office of Program Administration and Policy Development

Code 1006

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: monitoring and providing background information on technical and policy matters that come under the purview of the DOR; representing NRL, ONR, and/or the Navy on tri-Service or DoD-wide coordination matters; performing special studies or chairing ad hoc study groups regarding program decisions or policy positions; performing special studies involving major NRL programs and resource issues; providing administrative support in the areas of personnel, budget, facilities, equipment, and security; providing executive management information and analyses for various aspects of the S&T program effort; coordinating VIP visits to NRL; managing the NRL directives system; administering the NRL response to Congressional requests; maintaining the NRL R&D achievements file; developing the S&T guidance for monitoring and reporting the NRL S&T program; administering NRL's various postdoctoral fellowship programs; and managing the Facility Modernization Program.

Personnel: 14 full-time civilian

Key Personnel

Title	Code
Head, Office of Program Administration and Policy Development	1006
Head, Program Administration Staff	1006.1
Administrative Officer	1006.2
Head, NRL Facilities Staff	1006.4
Head, Directives Staff	1006.5
Special Assistant	1006.6

Point of contact: Code 1006.2, (202) 767-3370

Office of Counsel

Code 1008

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: 28 full-time civilian

Key Personnel

Title	Code
Head, Office of Counsel	1008
Associate Counsel/General Law	1008.1
Associate Counsel/Intellectual Property	1008.2
Associate Counsel/SSC Legal Matters	1008.3

Point of contact: Code 1008.1, (202) 767-7606

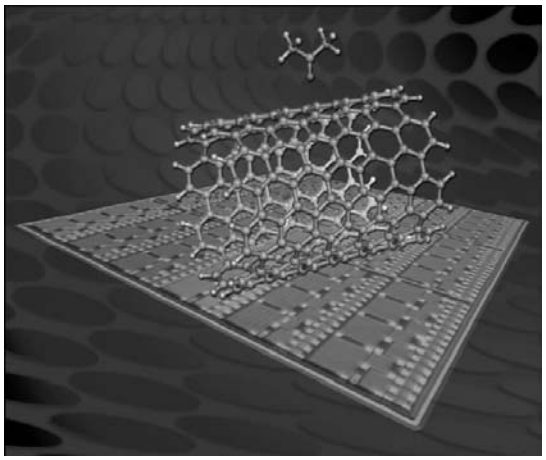
Institute for Nanoscience

Code 1100
Staff Activity Areas

- Interdisciplinary nanoscience that enables:
  - Low power, high-speed electronics
  - Light-weight, high-strength materials
  - Highly sensitive molecular sensors
  - Efficient energy generation and storage

NRL researchers working the the NSI class 100 cleanroom.

Transmission electron microscope located in one of the NSI's environmentally controlled laboratories.



Wafer of carbon nanotube chemical sensors fabricated in the NSI cleanroom.

Code 1100

Basic Responsibilities

The Institute for Nanoscience has two primary responsibilities, to administrator an interdisciplinary research program in nanoscience and to provide NRL scientists with high-quality laboratory space and state-of-the-art nanofabrication facilities.

The mission of the research program is to conduct highly innovative, interdisciplinary research at the intersections of the fields of materials, electronics and biology in the nanometer size domain. The Institute exploits the broad multidisciplinary character of NRL to bring together scientists and engineers with disparate training and backgrounds to attack common goals at the intersection of their respective fields at this length scale. The Institute's S&T programs provide the Navy and DoD with scientific leadership in this complex, emerging area and help to identify opportunities for advances in future Defense technology.

The Institute also operates a new nanoscience research building containing nanofabrication facilities and environmentally-controlled measurement laboratories. The central core of the new building, a 5000-square-foot class-100 cleanroom, has been outfitted with the newest tools to permit nanofabrication, measurement, and testing of devices. In addition to the cleanroom facility, the new building also contains 5000 square feet of controlled-environment laboratory space, which is available to NRL researchers whose experiments are sufficiently demanding to require this space. There are 12 of these laboratories within the new building. They provide shielding from electromagnetic interference and very low floor vibration and acoustic levels. Eight of the laboratories control the temperature to within ± 0.5 °C and four to within ± 0.1 °C.

Personnel: 4 full-time civilian

Key Personnel

Title	Code
Director, Institute for Nanoscience	1100
Position Assistant	1100
Facilities Manager	1100
Facilities Technician	1100

Point of Contact: Code 1100, (202) 767-1804

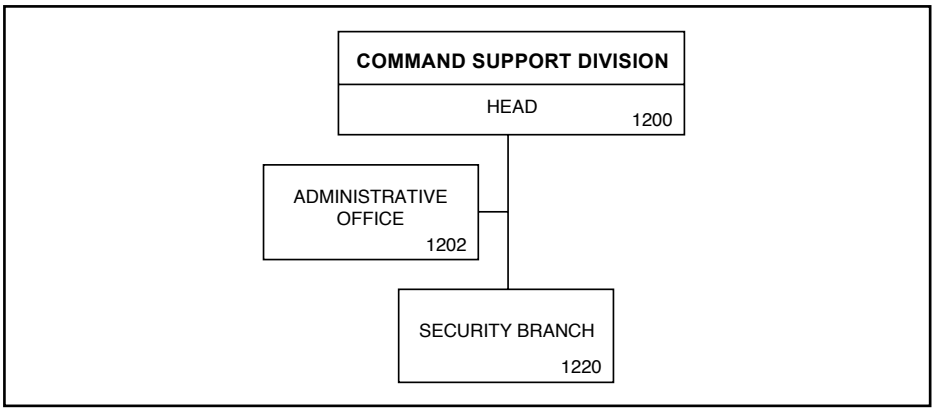
Command Support Division

Code 1200
Staff Activity Areas

- Security

Incoming visitor reception area

Security monitoring



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 IT security programs; and communications service. 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. It provides Supervision of Administrative/Budget functions for the Security Branch, the Military Operations Branch, and the Scientific Development Squadron One (VXS-1).

The Head of the Command Support Division is also the Inspector General. The Inspector General is responsible for day-to-day functioning of the office and its staff; program planning and execution; and providing 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: 36 full-time civilian

Key Personnel

Title	Code
Head, Command Support Division	1200
Administrative Officer	1202
Head, Security Branch	1220
Head, Information Assurance Section	1221
Head, Physical Security Section	1222
Head, Special Security Services	1223
Head, Personnel Security Section	1224
Head, Force Protection/Command Investigator Section	1225
Head, Information Security Section	1226
Head, Communications Security Section	1227
Head, NRL-SSC Security	1228

Point of contact: Code 1202, (202) 767-6987

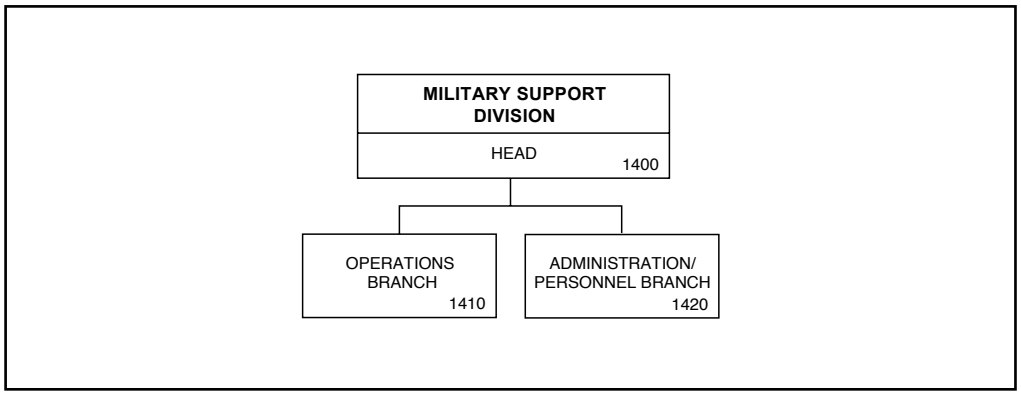
Military Support Division

Code 1400
Staff Activity Areas

- Operations
- Administrative Operations

P-3 airborne research facility

Administration



Basic Responsibilities

The Military Support Division provides military operational and administrative 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 preparing and administering the military operational budget.

Personnel: 1 full-time civilian; 10 military

Key Personnel

Title	Code
Director, Military Support Division	1400
Project Officer	1400
Project Officer	1400
Project Officer	1400
Administrative Officer	1420

Point of contact: Code 1420, (202) 767-2103

Scientific Development Squadron One (VXS-1)

Code 1600
Staff Activity Areas

- Operations
- Administrative Operations
- Aircraft Maintenance
- Safety/NATOPS

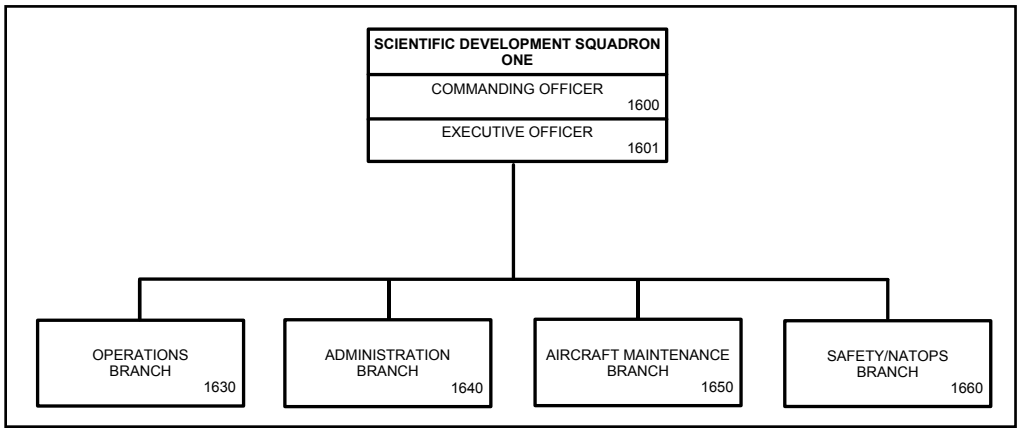
VXS-1 maintains two RC-12 aircraft dedicated to airborne research. They are smaller, more cost-efficient, alternatives to the P-3 Orion. Each aircraft is outfitted with a research electrical load center and has a roll-on roll-off capability which enables it to be equipped with project stations. The RC-12s can support a broad spectrum of project configurations.

Administration

P-3 airborne research facility

Aircraft maintenance

Scientific Development Squadron One hangar



Basic Responsibilities

The Scientific Development Squadron ONE (VXS-1) located at NAS Patuxent River, Maryland, operates and maintains three uniquely configured P-3 Orion aircraft and two C-12 aircraft. The men and women of the squadron provide the Naval Research Laboratory with airborne research platforms, conducting flights world-wide in support of a broad spectrum of projects and experiments. These include magnetic variation mapping, hydroacoustic research, bathymetry, electronic countermeasures, gravity mapping, and radar research. The squadron annually logs approximately 1000 flight hours, and in its 44 years, Scientific Development Squadron ONE (VXS-1) has amassed 66,000 hours of mishap-free flying.

Personnel: 4 full-time civilian; 95 military

Key Personnel

Title	Code
Commanding Officer, VXS-1	1600
Executive Officer	1600.1
Senior Enlisted Advisor	1600.2
Executive Secretary	1600.4
Chief Project Officer	1620
Operations Officer	1630
Administrative Officer	1640
Maintenance Officer	1650
Assistant Maintenance Officer	1650.1
Maintenance/Material Control Officer	1650.2
Safety Officer	1660
NATOPS/Officer	1670
Training Officer	1670.1

Point of contact: Code 1600.4, (301) 342-3751; DSN 342-3751

Human Resources Office

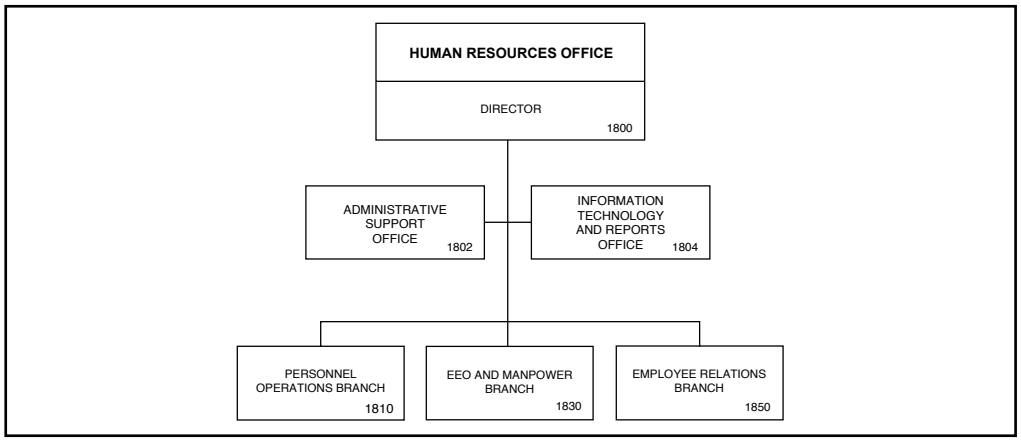
Code 1800
Staff Activity Areas

- Personnel Operations (Staffing and Classification)
- Employee Relations (Employee Development)
- Equal Employment Opportunity and Manpower
- Compensation, Reports, and Demonstration Project
- Information Technology and Reports

EEO and Manpower Branch

Personnel Operations Branch

Employee Relations Branch



Basic Responsibilities

The Human Resources Office (HRO) provides civilian personnel, manpower, and Equal Employment Opportunity (EEO) services to the Naval Research Laboratory. 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, EEO functional areas, manpower management, and morale, welfare, and recreation programs.

The HRO at NRL's main site in Washington, DC, services approximately 2,500 employees and provides a centralized capability to perform managerial, service, and advisory functions in support of field office operations. These include issuing policy and procedural directives; developing, designing, and maintaining automated systems; and monitoring and evaluating product effectiveness to develop and maintain efficient, cost-effective, service-oriented methods.

Personnel: 27 full-time civilian

Key Personnel

Title	Code
Director, Human Resources Office	1800
Administrative Officer	1802
Head, Information Technology and Reports Branch	1804
Head, Personnel Operations Branch	1810
Head, Equal Employment Opportunity and Manpower Branch	1830
Head, Workforce Development and Management Branch	1840
Head, Employee Relations Branch	1850

Point of contact: Code 1802, (202) 404-2797

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 financial management, supply management, contracting, research and development services, and management information systems support.

Associate Director of Research for Business Operations

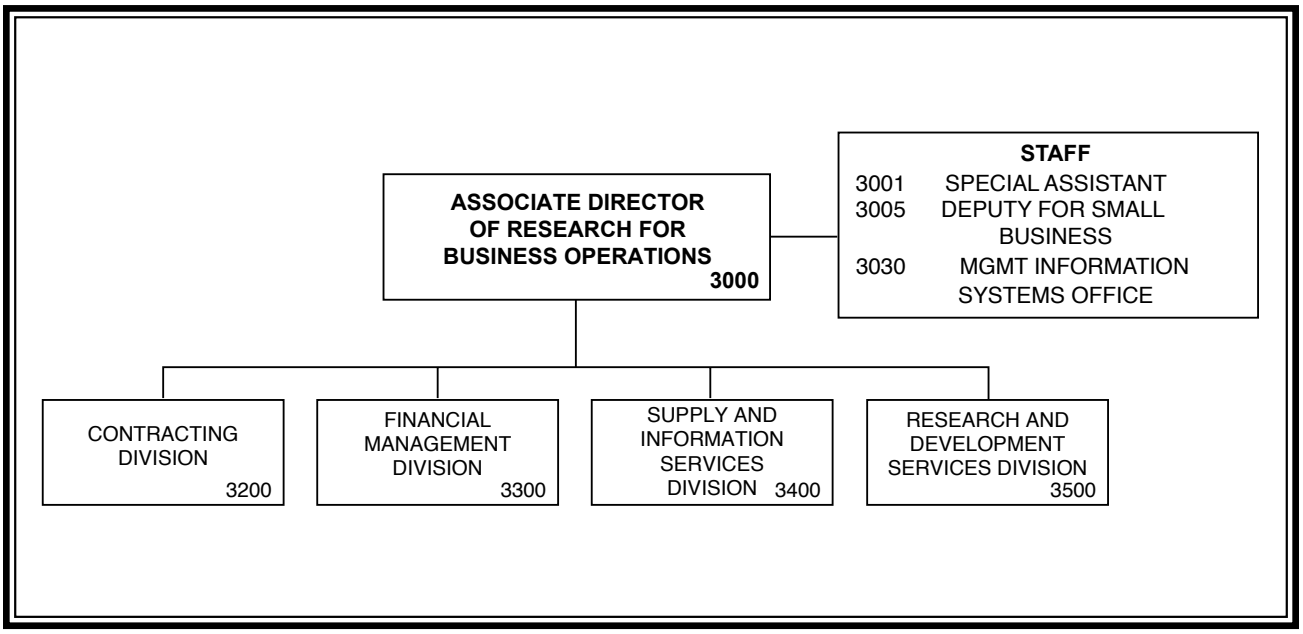
Mr. D.K. Therning was born in Modesto, California. He graduated from Washington State University with a bachelor's degree in finance in 1983 and earned a master's degree in business administration from George Mason University in 1993. Mr. Therning has accumulated extensive experience in the financial business management of research, development, test, and evaluation (RDT&E) activities within the Department of the Navy (DoN) beginning at the Naval Weapons Center, China Lake, California, where he served as a budget analyst in the Public Works Department and then in the Weapons Department. In 1984, he became the Financial Management Advisor to the Ordnance Systems Department. In 1985, under the auspices of the Naval Scientist Training and Exchange Program, he was selected for a one-year assignment in the Office of the Director of Naval Laboratories (DNL), Washington, DC. He remained on the DNL staff as a budget analyst until 1987, when he was appointed Budget Officer of the DNL's seven Navy Industrial Fund R&D laboratories.

As the DoN reorganized the R&D laboratories and T&E activities, Mr. Therning oversaw the financial reorganization of the DNL labs with other activities into the Naval warfare centers. Upon the disestablishment of DNL, Mr. Therning remained in the Space and Naval Warfare Systems Command as the Director of the Defense Business Operations Fund (DBOF) Resources Management Division, with collateral duty as the Financial Manager of the Naval Command, Control, and Ocean Surveillance Center (NCCOSC). During this time, he managed the conversion of nine appropriated fund engineering activities to DBOF and the financial consolidation of these activities with NCCOSC.

In 1995, Mr. Therning served as Head of the Revolving Funds Branch of the Office of the Assistant Secretary of the Navy (Financial Management and Controller), where he was responsible for the budget formulation and execution processes of all DoN DBOF activities, which includes the RDT&E activities, shipyards, aviation depots, ordnance centers, and supply centers.

Mr. Therning was appointed Head, Financial Management Division/Comptroller of NRL in July 1996. Since that time, his responsibilities have increased in the Business Operations Directorate. In October 1996, in addition to leading the Financial Management Division, he assumed responsibilities for the Management Information Systems office. In January 1999, as an additional duty to his role as Comptroller, Mr. Therning was appointed to the newly established position of Deputy Associate Director of Research for Business Operations to assist in the management and administration of the Business Operations Directorate.

Mr. Therning was Acting Associate Director of Research for Business Operations from April 1999 until March 2000, when he was appointed the Associate Director of Research for Business Operations.



Key Personnel

Title	Code
Associate Director of Research for Business Operations	3000
Special Assistant	3001
Deputy for Small Business	3005
Head, Management Information Systems Office	3030
Head, Contracting Division	3200
Head, Financial Management Division	3300
Head, Supply and Information Services Division	3400
Director, Research and Development Services Division	3500

Point of contact: Code 3000A, (202) 404-7461

Contracting Division

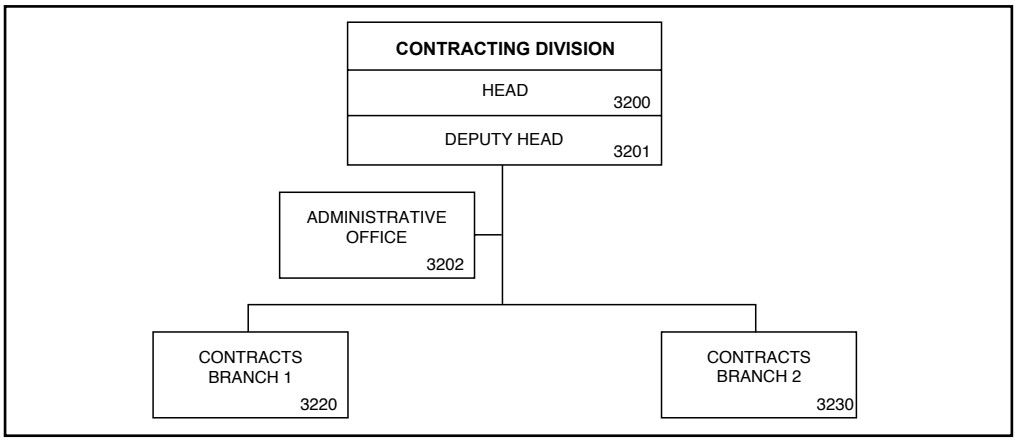
Code 3200
Staff Activity Areas

- Advance Acquisition Planning
- Acquisition Strategies
- Acquisition Training
- Contract Negotiations
- Contractual Execution
- Contract Administration

Division Head conducts staff meeting.

Contract specialists analyze PIPS data.

Division Head reviews contract file with specialist.



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 $100,000. 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: 30 full-time civilian

Key Personnel

Title	Code
Head, Contracting Division	3200
Deputy Head	3201
Administrative Officer	3202
Head, Contracts Branch 1	3220
Head, Contracts Branch 2	3230
Head, Contracts Section, SSC	3235

Point of contact: Code 3202, (202) 767-3749

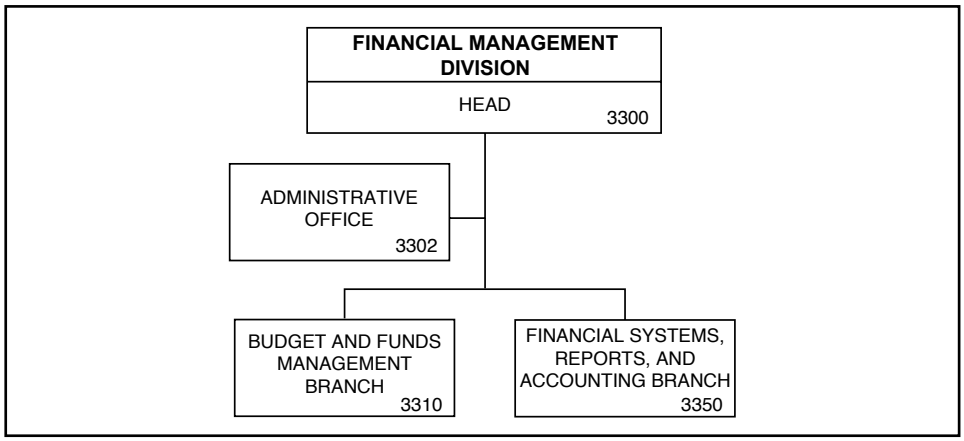
Financial Management Division

Code 3300
Staff Activity Areas

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

The Budget Branch prepares various financial analyses, reports, and studies in response to external data calls and/or management requests.

The Financial Systems, Reports, and Accounting Branch ensures that NRL's financial system satisfies user requirements and is in compliance with applicable rules and regulations, maintains official accounting records, and coordinates efforts with DFAS to complete payment transactions related to NRL business.



Basic Responsibilities

The Financial Management Division (FMD) develops, coordinates, and maintains an integrated system of financial management that provides the Comptroller, Commanding Officer, Director of Research, and other officials of NRL the information and support needed to fulfill the financial and resource management aspects of their responsibilities. FMD translates the NRL program requirements into the financial plan, formulates the NRL budget, monitors and evaluates performance with the budget plan, and provides recommendations and advice to NRL management for corrective actions or strategic program adjustments. FMD maintains the accounting records of NRL's financial and related resources transactions and prepares reports, financial statements, and other documents in support of NRL management needs and/or to comply with external reporting requirements. FMD provides financial management guidance, policies, advice, and documented procedures to ensure that NRL operates in compliance with Navy and DoD regulations and with economy and efficiency. FMD coordinates efforts with the Defense Finance and Accounting Service (DFAS) to complete payment transactions related to NRL business (e.g., the payment of NRL personnel for payroll and travel expenses and the payment to NRL's contractors and vendors for goods and services purchased by NRL). Additionally, FMD develops, operates, and maintains automated business and management information systems supporting the lab-wide administrative and business processes, including financial management, procurement and contracting, stores and inventory, asset management, human resources, facilities, and security.

Personnel: 68 full-time civilian

Key Personnel

Title	Code
Head, Financial Management Division	3300
Administrative Officer	3302
Head, Budget and Funds Management Branch	3310
Head, Corporate Budget Unit	
Head, Internal Budget Unit	
Head, Financial Systems, Reports, and Accounting Branch	3350
Head, Cost Accounting Section	3351
Head, Contracts and Credit Cards Unit	3351.1
Head, Small Purchases and Miscellaneous Docs Unit	3351.2
Head, Financial Services Section	3352
Head, Payroll Services Unit	3352.1
Head, Travel Services Unit	3352.2
Head, Asset Management Unit	3352.3
Head, Accounting Systems and Reports	3353

Point of contact: Code 3302, (202) 767-2950

Supply and Information Services Division

Code 3400
Staff Activity Areas

- Purchasing
- Technical Information Services
- Customer Support and Program Management
- Material Control
- Administrative Services
- Automated Inventory Management System
- Disposal and Storage
- Store Material Issues

Head of the Small Purchase Section reviews purchase order.

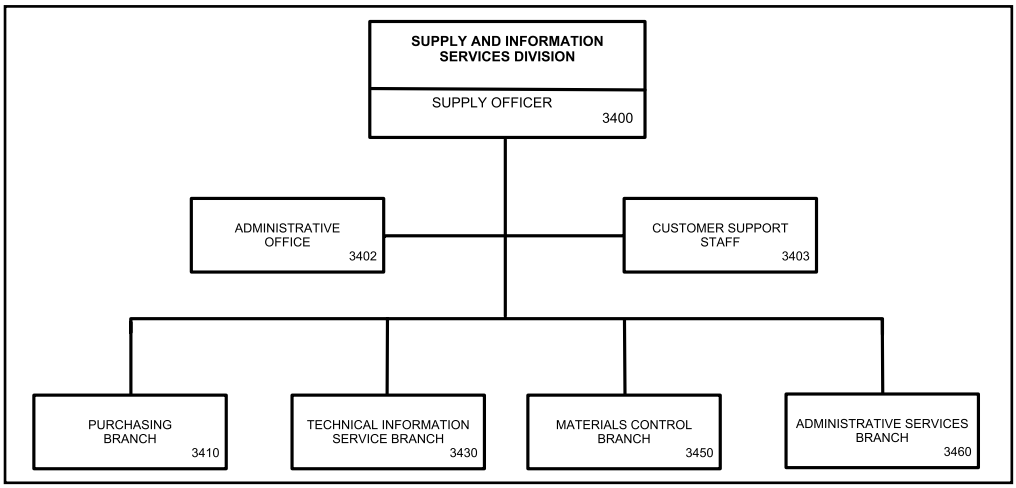
Woodworkers prepare boxes for shipping

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

Customers and employee at the Supply store

Disposal and Storage in Building 49

The Publications staff discusses design ideas for a new publication.



Basic Responsibilities

The Supply and Information Services Division provides the Laboratory and its field activities with contracting, supply management, logistics, administrative, and technical information 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. Services also include publications, visual information, photography, editing, and mailroom services and correspondence management.

Personnel: 102 full-time civilian

Key Personnel

Title	Code
Supply Officer	3400
Administrative Officer	3402
Head, Customer Support Staff	3403
Head, Purchasing Branch	3410
Head, Technical Information Services Branch	3430
Head, Materials Control Branch	3450
Head, Administrative Services Branch	3460

Point of contact: Code 3402, (202) 767-3871

Research and Development Services Division

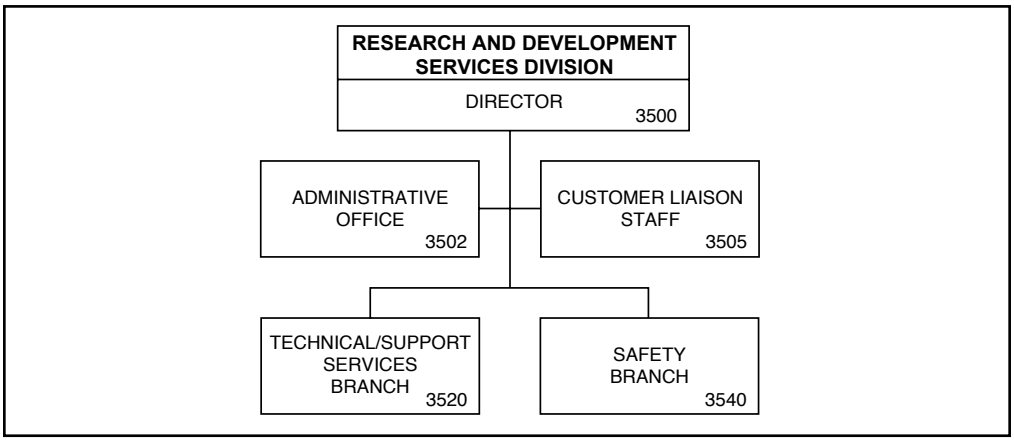
Code 3500
Staff Activity Areas

- Technical/Support Services
- Production Control
- Shop Services
- Chesapeake Bay Section
- Customer Liaison
- Safety
- Environmental
- Health Physics
- Administrative Office
- Telephones

Service Desk – processing service calls

Telephone Office – processing service calls

Machine Shop – fabricating radar pedestal for shipboard operation



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, and coordination of construction; facility support services, planning, maintenance/repair/operation of all infrastructure systems; transportation; and occupational safety, health and industrial hygiene, and environmental safety.

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: 134 full-time civilian

Key Personnel

Title	Code
Director, Research and Development Services Division	3500
Administrative Officer	3502
Head, Customer Liaison Staff	3505
Head, Technical/Support Services Branch	3520
Head, Engineering Section	3521
Head, Chesapeake Bay Section	3522
Head, Shop Services Section	3523
Head, Production Control Section	3524
Head, Safety Branch	3540
Occupational Safety and Health/Industrial Hygiene	3541
Explosives Safety	3542
Health Physics	3544
Environmental	3546

Point of contact: Code 3502, (202) 404-4312

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.

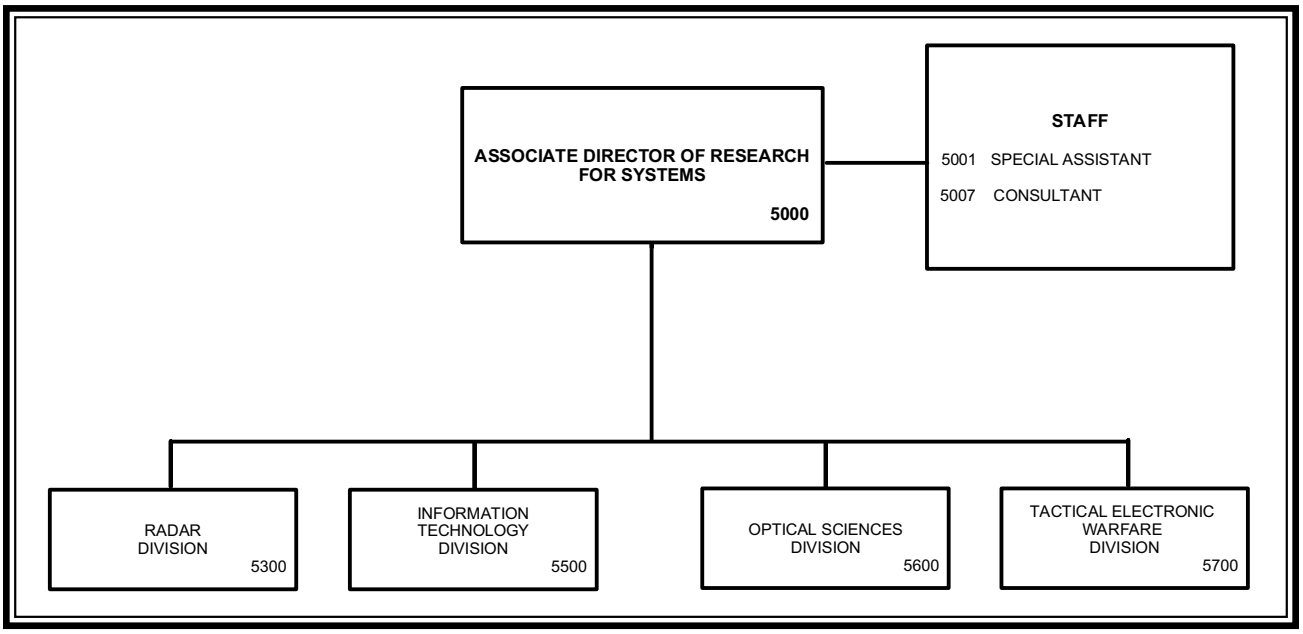
In addition to its wide-ranging multidisciplinary research program, the Directorate provides support to the corporate laboratory in shared resources for high performance computing and networking, technical information collection and distribution, and in coordination of Laboratory-wide efforts in signature technology, counter-signature technology, Theater Missile Defense, and the Naval Science Assistance Program.

Associate Director of Research for Systems

Dr. G.M. Borsuk is the Associate Director of Research for Systems at the Naval Research Laboratory (NRL) in Washington, DC. In this position he provides executive direction and leadership to four major NRL research divisions that conduct a broad multidisciplinary program of scientific research and advanced technological development in the areas of optics, electromagnetics, information technology, and radar. He is responsible for the conduct and effectiveness of research programs conducted within these divisions and for the overall administration of activities throughout the Systems Directorate. He is also the Focus Area Coordinator for all NRL base programs in electronics science and technology. Prior to this appointment, Dr. Borsuk served for 23 years as the Superintendent of the Electronics Science and Technology Division at NRL where he was responsible for the in-house execution of a multidisciplinary program of basic and applied research in electronic materials and structures, solid state devices, vacuum electronics, and circuits. Dr. Borsuk serves as the Office of Naval Research (ONR) representative for electronics basic research to the Office of the Secretary of Defense and is the Navy member to the Tri-Service Scientific Planning Group for Electronics. He was the Navy Deputy Program Manager and Technical Director for the now completed DARPA/Tri-Service MIMIC and MAFET Programs. He was the Department of Defense (DoD) technical representative for Electronics to the Wassenaar Arrangement dealing with export control. He has also served as the DoD representative to the President's National Science and Technology Council's Electronic Materials Working Group.

Dr. Borsuk joined the ITT Electro-Physics Laboratory in Columbia, Maryland, as a staff physicist in 1973, where he worked on the application of charge-coupled devices (CCDs) for imaging and signal processing. In 1976 he joined the Westinghouse Advanced Technology Laboratory in Baltimore, Maryland, developing advanced silicon VLSI integrated circuits and performing device physics research. He performed original work in the design and fabrication of CCDs for signal processing and photodetectors for use with acousto-optic signal processors. He headed the Westinghouse VHSIC effort in advanced sub-micron VLSI device technology. Dr. Borsuk was department manager of Solid State Sciences at the Advanced Technology Laboratory when he left Westinghouse in 1983 to join the Naval Research Laboratory as the Superintendent of the Electronics Science and Technology Division.

Dr. Borsuk received a Ph.D. in physics from Georgetown University in Washington, DC, in 1973. He is a Fellow of the IEEE, a member of the American Physical Society, a member of the AVS, a member of Sigma Xi, and the Navy's Deputy Member to the Advisory Group on Electron Devices (AGED). He has 37 technical publications, four patents, and eleven invention disclosures. He is the recipient of three Presidential Rank Senior Executive Awards, the most recent awarded in 2005. He is also the recipient of the IEEE Frederik Philips Award, the IEEE Harry Diamond Memorial Award, the IEEE Millennium Medal, and an IR-100 Award for his work on high speed CCDs. Dr. Borsuk also served on the editorial board of the IEEE Proceedings.



Key Personnel

Title	Code
Associate Director of Research for Systems	5000
Special Assistant	5001
Consultant	5007
Superintendent, Radar Division	5300
Superintendent, Information Technology Division	5500
Superintendent, Optical Sciences Division	5600
Superintendent, Tactical Electronic Warfare Division	5700
Head, Signature Technology Office	5708

Point of contact: Code 5000A, (202) 767-3324

Radar Division

Code 5300
Staff Activity Areas

AEGIS coordination
Marine Corps/IFF coordination
Electromechanical design
Multifunction RF systems
High-power millimeter-wave radar
Digital array radar

Research Activity Areas

Radar Analysis

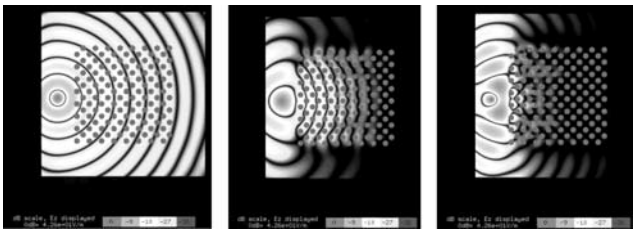
Target signature prediction
Electromagnetics and antennas
Airborne early-warning radar (AEW)
Inverse synthetic aperture radar (ISAR)
Space-time adaptivity
In situ array calibration

Advanced Radar Systems

High-frequency over-the-horizon radar
Signal analysis
Real-time signal processing and equipment
Computer Aided Engineering (CAE)
Electromagnetic Compatibility (EMC)
Electromagnetic Interference (EMI)
Mark XII IFF improvements
Future identification technology

Surveillance Technology

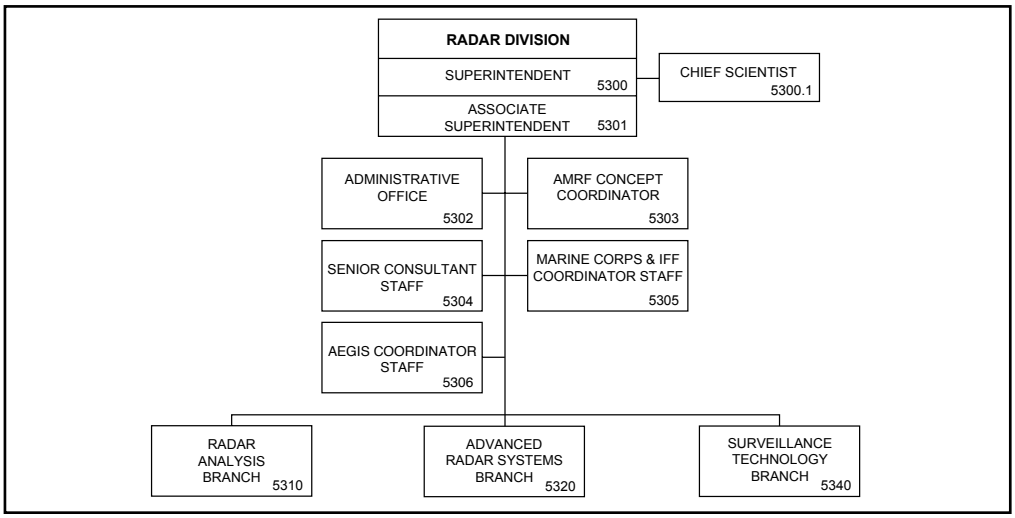
Shipboard surveillance radar
Ship self-defense
Electronic counter-countermeasures
Target signature recognition
Digital T/R modules
Sea clutter characterization
Ultrawideband technology
Dynamic waveform diversity
Information extraction
Ballistic missile defense
Mine detection



(a) (b) (c)

The electromagnetic wave propagation through an Electromagnetic Band Gap (EBG) material: (a) free space, (b) with EBG and at the pass-band frequency (2.0 GHz), and (c) with same EBG at the stop-band frequency (2.7 GHz). Note frequency-dependent propagation characteristics.

The Advanced Multifunction RF Concept (AMRFC) test-bed as a proof-of-principle demonstration system capable of simultaneously transmitting and receiving multiple beams from common transmit and receive array antennas for radar, electronic warfare, and communications.



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: 94 full-time civilian

Key Personnel

Title	Code
Superintendent, Radar Division	5300
Associate Superintendent	5301
Administrative Officer	5302
AMRF Concept Coordinator	5303
Senior Consultant Staff	5304
Marine Corps and IFF Coordinator	5305
AEGIS Coordinator	5306
Head, Radar Analysis Branch	5310
Head, Advanced Radar Systems Branch	5320
Head, Surveillance Technology Branch	5340

Point of contact: Code 5300, (202) 404-2700

Information Technology Division

Code 5500
Research Activity Areas

Freespace Photonics Communications Office

- Extended spectrum communications
- Atmospheric channel effects on photonic transfer
- Studies in marine miraging
- Analog modulation techniques on freespace optical carriers
- Modulating retroreflector based communications
- Signature studies for ISR
- Adaptive optics for freespace optical communications

Navy Center for Applied Research in Artificial Intelligence

- Intelligent decision aids
- Natural language and multimodal interfaces
- Intelligent software agents
- Machine learning and adaptive systems
- Robotics software and computer vision
- Neural networks
- Novel devices/techniques for HCI
- Spatial audio
- Immersive simulation
- Autonomous and adaptive systems
- Case-based reasoning and problem solving methods
- Machine translation technology evaluation

Transmission Technology

- Arctic communication
- Communication system architecture
- Communication antenna/propagation technology
- Communications intercept systems
- Signal analysis systems
- Virtual engineering
- Secure voice technology

Center for High Assurance Computer Systems

- Secure service oriented architectures (SOA) and Secure Enterprise Architectures (SEA)
- Formal specification/verification of system security
- COMSEC application technology
- Technology and solutions to secure networks and databases
- Software engineering for secure systems
- Key management and distribution solutions
- Certification and Accreditation (C&A) methodologies and practices
- Information Systems Security (INFOSEC) Engineering
- Formal methods for requirements specification and verification
- Security product development
- Secure wireless network and wireless sensor technology
- Network security protocol modeling and simulation

Networks and Communication Systems

- Communication system engineering
- Mobile, wireless networking technology
- Bandwidth management (quality of service)
- Joint service tactical networking
- Integration of communication and C2 applications
- Automated testing of highly mobile tactical networks
- Reliable multicast protocols and applications
- Integrated IP and ATM multicasting
- Communication network simulation
- Networking protocols for directional antennas
- Policy-based network management
- Tactical voice-over IP
- Sensor networks
- Fastlane and Taclane crypto testing

Advanced Information Technology

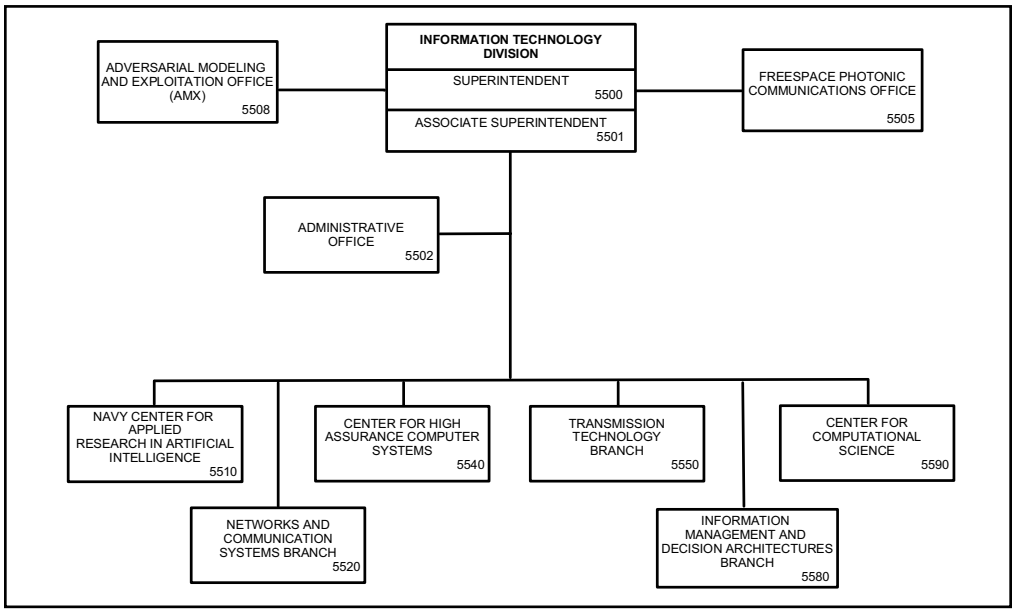
- Software agents for systems command center data fusion
- 3D multimodal interaction
- Distributed modeling and simulation (e.g., HLA, FOM development)
- Natural environments for distributed simulation
- Model integration (physical, environmental, biological, psychological) for simulation
- Spatial feature temporal analysis
- Virtual reality/mobile augmented reality
- Collaborative engineering enterprise
- Deception algorithm research

Center for Computational Science

- Transparent optical network research and design
- Parallel computing
- Scalable high performance computing for Navy and DoD
- Distributed computing environments
- Scientific visualization
- Advanced networking streams
- High-definition video technology
- End user support for information technology and operational networks
- Lab-wide support for web, email, and other information services
- Testbed for Global Information Grid

Ruth H. Hooker Research Library

- Desktop/workbench access to nearly all-relevant scientific resources
- NRL scientific digital archive (TORPEDO Ultra)
- Authoritative database of NRL-produced publications (Online Bibliography)
- Comprehensive literature/citation/classified searches
- Extensive collection of print-based books, journals, and technical reports



Basic Responsibilities

The Information Technology Division conducts research and development programs in the collection, transmission, processing, distribution, and presentation of information to provide a basis for improving military operations, with a focus on Network Centric Warfare. The organization of the Division is directed toward addressing the technologies, architectures, and subsystems necessary to develop future warfare systems and next-generation command, control, communication, computer, intelligence, surveillance, and reconnaissance systems.

Personnel: 204 full-time civilian

Key Personnel

Title	Code
Superintendent/NRL Chief Information Officer	5500
Associate Superintendent	5501
Administrative Officer	5502
Head, Freespace Photonics Communications Office	5505
Head, Adversarial Modeling and Exploitation Office	5508
Director, Navy Center for Applied Research in Artificial Intelligence	5510
Head, Networks and Communication Systems Branch	5520
Director, Center for High Assurance Computer Systems	5540
Head, Transmission Technology Branch	5550
Head, Information Management and Decision Architecture Branch	5580
Director, Center for Computational Science	5590
Chief Librarian, Ruth H. Hooker Research Library	5596

Point of contact: 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

Infrared Materials and Chemical Sensors

Advanced infrared glasses and fibers
IR fiber-optic materials and devices
IR fiber chemical and environmental sensors
IR transmitting windows
Transparent armor material
Planar waveguide devices
IR nonlinear materials

Optical Physics

Laser materials diagnostics
Nonlinear frequency conversion
Optical instrumentation and probes
Optical interactions in semiconductor superlattices and organic solids
Laser-induced reactions
Organic light-emitting devices
Nano-optical and electrical research

Applied Optics

Detection signal processing studies
Optical and IR countermeasures
Ultraviolet component development and UV countermeasures
Multispectral sensors and processing
Missile warning sensor technology
UV, visible, and IR imager development
Framing reconnaissance sensors
Novel optical components
IR Range Facility
IR low observables
Multispectral/hyperspectral/detection algorithms
EO/IR systems analysis
Atmospheric IR measurements
Ship IR signatures
Airborne IR search and track technology

Photonics Technology

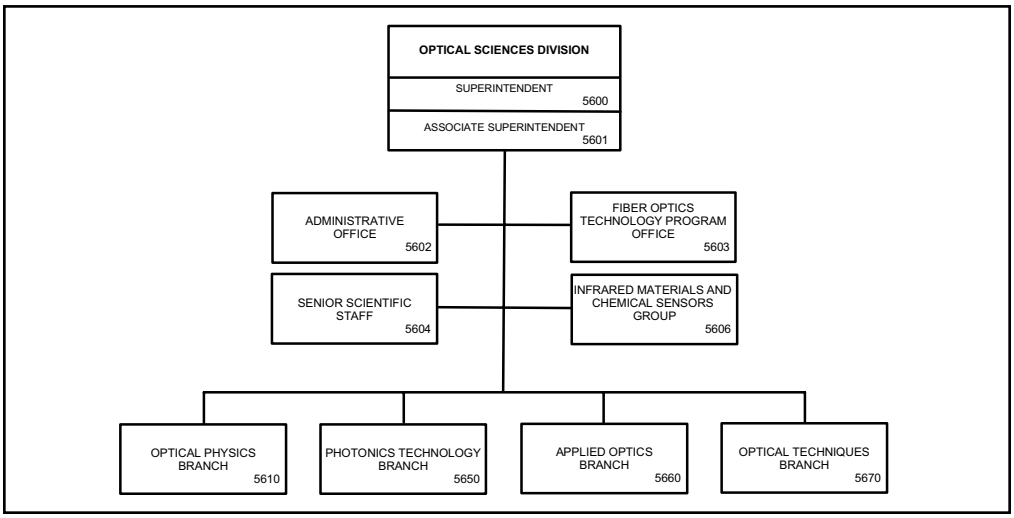
Fiber and solid-state laser/sources
High-speed (<100 fs) optical probing
High-power fiber amplifiers
High-speed fiber-optic communications
Antenna remoting
Free space communication
Photonic control of phased arrays
Optical clocks
Microwave photonics

Optical Techniques

Radiation effects
Fiber lasers/sources and amplifiers
Fiber-optic materials and fabrication
Fiber Bragg grating sensors/systems for smart structures
Fiber-optic sensors/systems (acoustic, magnetic, gyroscopes)
Integrated optics
Optical sources for sensors

Fiber Fabrication Facility for Nonoxide and Specialty Glasses. Unique state-of-the-art draw tower used for fabricating infrared transmitting fiber from specialty glasses under controlled atmospheres using NRL-invented preform and double crucible processes.

The infrared countermeasure (IRCM) Techniques Laboratory provides a comprehensive test bed for all types of infrared (IR) countermeasures against a variety of IR threats. The facility includes advanced countermeasure sources for the testing of advanced CM systems and a two-color multiflare/expendable hardware simulator for testing advanced expendable techniques against multispectral threats. The laboratory also has an extensive modeling and simulation capability for testing of IRCM against both reticle-based and IR focal plane array-based missile seekers.



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

Title	Code
Superintendent, Optical Sciences Division	5600
Associate Superintendent	5601
Administrative Officer	5602
Head, Senior Scientific Staff	5604
Head, Infrared Materials and Chemical Sensors Group	5606
Head, Optical Physics Branch	5610
Head, Photonics Technology Branch	5650
Head, Applied Optics Branch	5660
Head, Optical Techniques Branch	5670

Point of contact: Code 5602, (202) 767-6986

Tactical Electronic Warfare Division

Code 5700
Staff Activity Areas

EW Strategic Planning
Information Warfare Technology Program
Navy Science Assistance Program (NSAP)
Effectiveness of Naval EW Systems (ENEWS)

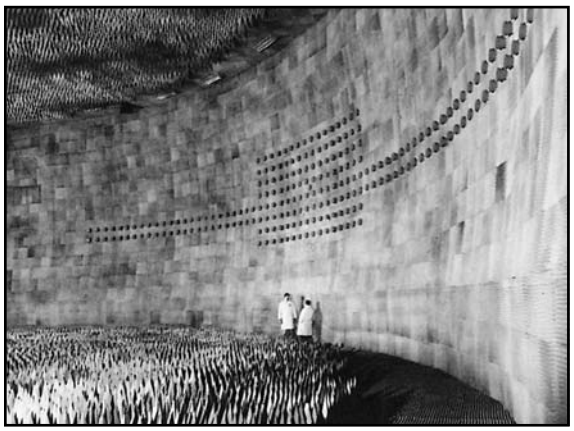
Research Activity Areas

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
Communications CM

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

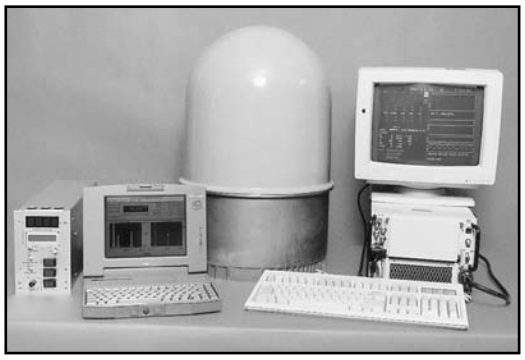


The Central Target Simulator (CTS) Programmable Array is part of a large hardware-in-the-loop simulation facility whose purpose is to test and evaluate electronic warfare systems and techniques used to counter the radar guided missile threat to Navy forces

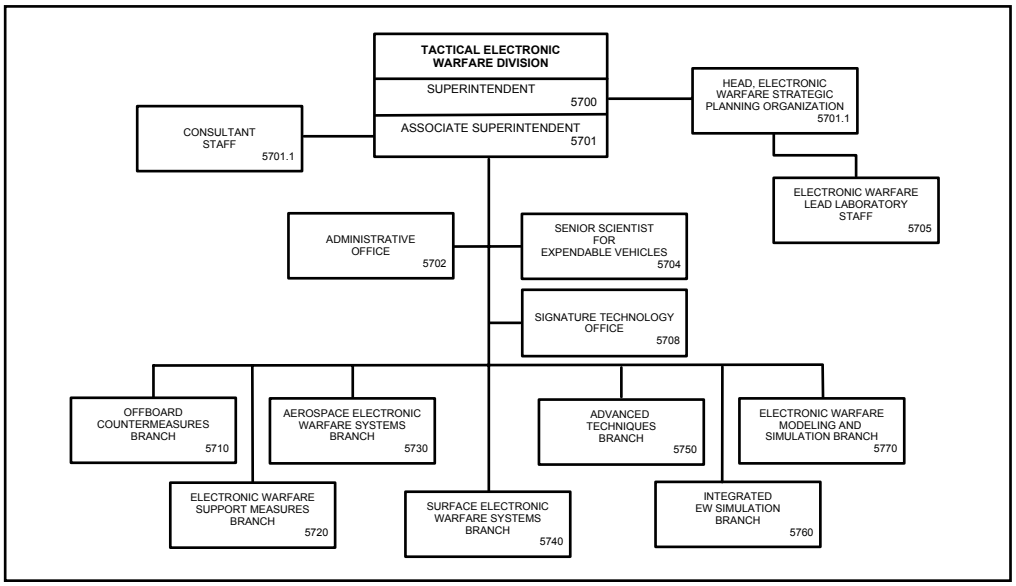
Advanced Techniques
Analysis and modeling simulation
New EW techniques
Experimental systems
EW concepts
Infrared technology

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

Signature Technology Office
Materials research tagging, tracking, and locating systems
Signature and counter-signature control



Using the latest composite, MMIC, 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



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: 237 full-time civilian

Key Personnel

Title	Code
Superintendent, Tactical Electronic Warfare Division	5700
Head, Electronic Warfare Strategic Planning Organization	5700.1
Associate Superintendent	5701
Administrative Officer	5702
Senior Scientist for Expendable Vehicles	5704
Head, Electronic Warfare Lead Laboratory Staff	5705
Head, Signature Technology Office	5708
Head, Offboard Countermeasures Branch	5710
Head, Electronic Warfare Support Measures Branch	5720
Head, Aerospace Electronic Warfare Systems Branch	5730
Head, Surface Electronic Warfare Systems Branch	5740
Head, Advanced Techniques Branch	5750
Head, Integrated Electronic Warfare Simulation Branch	5760
Head, Electronic Warfare Modeling and Simulation Branch	5770

Point of contact: Code 5701, (202) 767-5974

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, invention, 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, composites, microbial effects on material degradations and transformations and energetic materials 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 new and improved materials in natural or radiation environments, and under deleterious conditions such as those associated with the marine environment, neutron or directed energy beam irradiation, or extreme temperatures and pressures, are established. For new materials design, emphasis is placed on protection of the environment.

Additionally, major thrusts are directed in advanced sensing, detection, reactive flow physics, computational physics, and plasma sciences. Areas of particular emphasis include nanoscience and technology, fluid mechanics and hydrodynamics, nuclear weapon effects simulations, high-energy density materials including fuels, propellants, explosives, and 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 was born in Banki, India. 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.

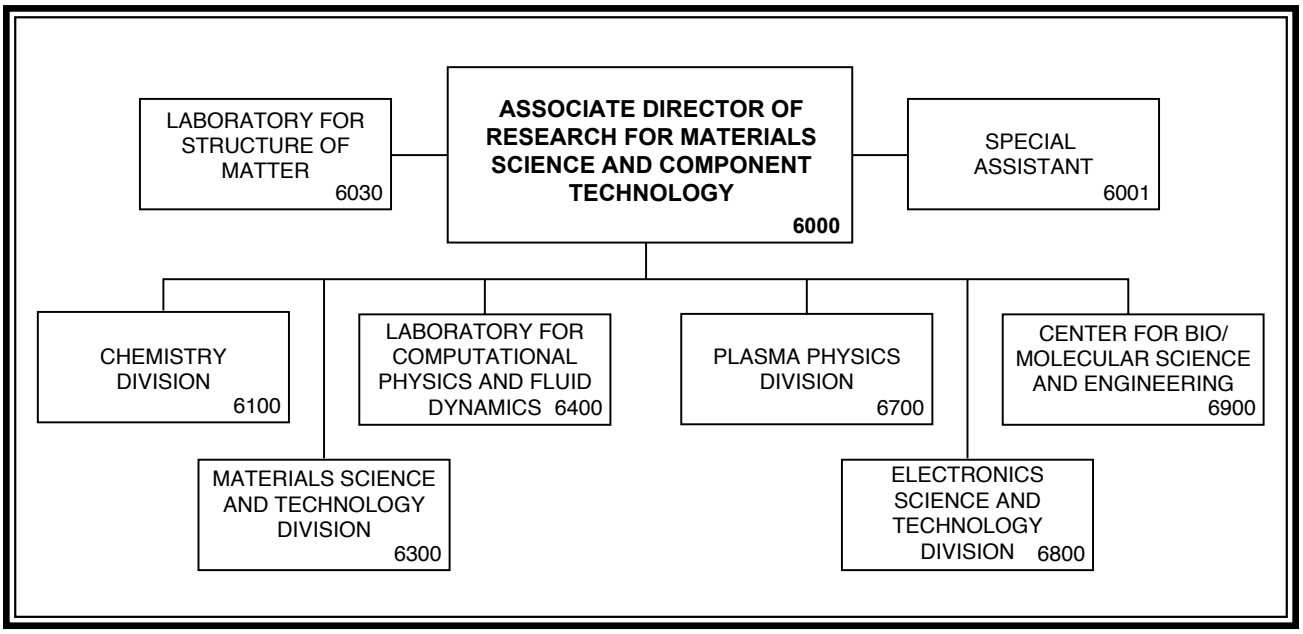
Dr. Rath was Assistant Professor of Metallurgy and Materials Science at Washington State University from 1961 to 1965. From 1965 to 1972, he was with the staff of the Edgar C. Bain Laboratory for fundamental research of the U.S. Steel Corporation. From 1972 to 1976, he headed the Metal Physics Research 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 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, National Science Foundation, Carnegie-Mellon University, University of Virginia, Colorado School of Mines, University of Maryland, University of Connecticut, Florida Atlantic University, Lehigh University, and the University of Florida. He is currently the Navy representative to the DOE Deputy Assistant Secretary's advisory and planning committee on methane hydrates, and the Navy representative to the Indo-U.S. Joint Commission on Science and Technology. He previously served as the Navy representative to the panel of The Technical Cooperation Program (TTCP) countries .

Dr. Rath is a member of the National Academy of Engineering. He is a fellow of the Minerals, Metals and Materials Society (TMS), American Society for Materials-International (ASM), Washington Academy of Sciences, Materials Research Society of India, and the Institute of Materials of the United Kingdom. In 2007, Dr. Rath received an honorary doctorate in engineering from the Michigan Technological University and was elected to deliver the commencement address to the 2007 graduating class. In 2008, he received the Illinois Institute of Technology Mechanical Materials & Aerospace Engineering Department 2008 Alumni Recognition Award.

Dr. Rath has received a number of honors and awards, most recently the Acta Materialia J. Herbert Hollomon Award. His other awards include the DOD Distinguished Civilian Service Award which is presented by the Secretary of Defense for distinguished accomplishments and sustained superior service, the 2005 Fred Saalfeld Award for Outstanding Lifetime Achievement in Science, the Presidential Rank Award for Distinguished Executive (2005), the NRL Lifetime Achievement Award (2004), National Materials Advancement Award from the Federation of Materials Societies (2001), the Presidential Rank of Meritorious Executive Award (1999 and 2004), the S. Chandrasekhar Award and Medal, and the Award of Merit for Group Achievement from the Chief of Naval Research. He received the 1991 George Kimball Burgess Memorial Award, the Charles S. Barrett Medal, and the prestigious TMS Leadership Award for his contributions to Materials Research. The American Society for Materials International and The Metals, Minerals, and Materials Society have jointly recognized him with the TMS/ASM Joint Distinguished Lectureship in Materials & Society Award and the 2001 ASM Distinguished Life Membership Award. He has served as the 2004-2005 President of the American Society for Materials. He also has served as a member of the Boards of Directors/Trustees of TMS, ASM-International, and the Federation of Materials Society (FMS), as a member of the editorial boards of three international materials research journals, and as chairman of several committees of TMS, ASM, FMS, and American Association of Engineering Societies.



Key Personnel

Title	Code
Associate Director of Research for Materials Science and Component Technology	6000
Special Assistant	6001
Chief Scientist, Laboratory for Structure of Matter	6030
Superintendent, Chemistry Division	6100
Superintendent, Materials Science and Technology Division	6300
Chief Scientist and Director, Laboratory for Computational Physics and Fluid Dynamics	6400
Superintendent, Plasma Physics Division	6700
Superintendent, Electronics Science and Technology Division	6800
Director, Center for Bio/Molecular Science and Engineering	6900

Point of contact: Code 6000A, (202) 767-2538

Dr. Jerome Karle, recipient of the 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, and 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

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. More recently, the group is engaged in developing a new computational approach called quantum crystallography for the calculation of the energetic content of molecules as an additional means of describing physical properties.

Personnel: 6 full-time civilian

Key Personnel

Title	Code
Chief Scientist	6030

Point of contact: Code 6030, (202) 767-3496

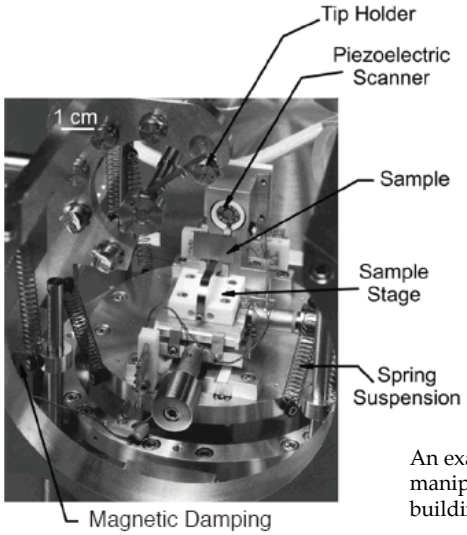
Chemistry Division

Code 6100
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/microbiology
Methane hydrates
Laboratory on a chip
Alternate energy sources

Materials Chemistry
Synthesis and evaluation of innovative polymers
Functional organic coatings
Polymer characterization
Magnetic resonance
Degradation and stabilization mechanisms
High-temperature resins

Center for Corrosion Science and Engineering
Materials failure analysis
Marine coatings
Cathodic protection
Corrosion science
Environmental fracture and fatigue
Corrosion control engineering

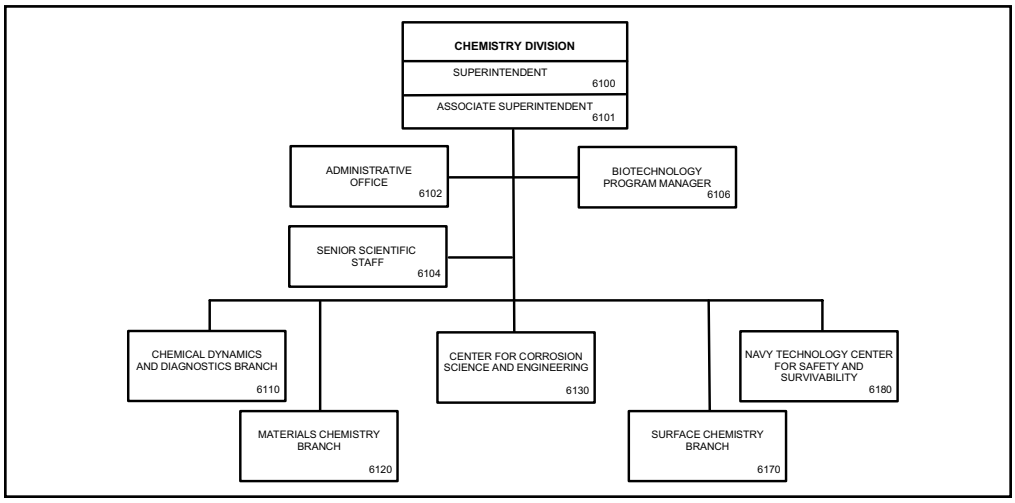


An example of a nanometer characterization and manipulation tool housed in NRL's nanoscience building.

Surface/Interface Chemistry
Tribology
Surface properties of materials
Surface/interface analysis
Chemical/biological sensors
Surface reaction dynamics
Diamond films
Nanostructures
Electrochemistry
Synchrotron radiation applications

Safety and Survivability
Combustion dynamics
Fire protection and suppression
Personnel protection
Modeling and scaling of combustion systems
Mobility fuels

The Key West site of the NRL Center for Corrosion Science and Engineering specializes in understanding and modeling the marine environment's impact on Naval materials. A complete laboratory for the study of corrosion control technologies provides sponsors with prototypical seawater exposure of their systems.



Basic Responsibilities

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

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.

To address problems in corrosion and marine fouling, a Marine Corrosion Facility is located in Key West, Florida. This laboratory resides in an unparalleled site for natural seawater exposure testing and marine related materials evaluation. The tropical climate is ideal for marine exposure testing. Along with the high quality seawater, the location provides small climatic variation and a stable biomass throughout the year.

Personnel: 100 full-time civilian; 2 full-time military; 1 part-time

Key Personnel

Title	Code
Superintendent, Chemistry Division	6100
Associate Superintendent	6101
Administrative Officer	6102
Senior Scientific Staff	6104
Biotechnology Program Manager	6106
Head, Chemical Dynamics and Diagnostics Branch	6110
Head, Materials Chemistry Branch	6120
Head, Center for Corrosion Science and Engineering	6130
Head, Surface Chemistry Branch	6170
Head, Navy Technology Center for Safety and Survivability	6180

Point of contact: Code 6102, (202) 767-2460

Materials Science and Technology Division

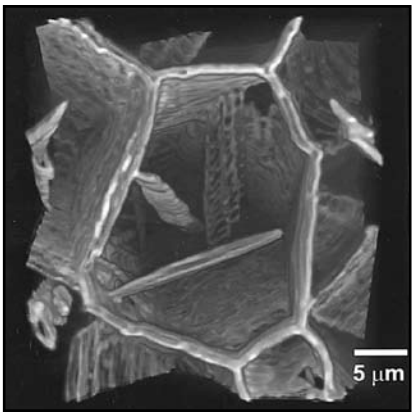
Code 6300
Research Activity Areas

Physical Metallurgy
- Ferrous and intermetallic alloys
- Synthesis/processing of metals
- Welding technology
- Micro/nanostructure characterization

Computational Materials Science
- Condensed matter theory
- Electronic structure of solids and clusters
- Molecular dynamics
- Quantum many-body theory
- Theory of magnetic materials
- Theory of alloys
- Semiconductor and surface physics
- Theoretical studies of phase transitions
- Atomic physics theory

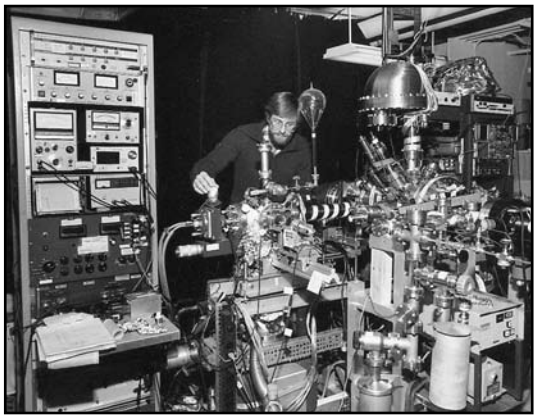
Surface Modification
- Thin film deposition
  - Pulsed laser deposition
  - Ion-beam-assisted deposition
  - Variable balance magnetron sputtering
- Ion engineering
  - Ion implantation
  - Reactive ion etching
- Functional materials
  - Optoelectronics
  - Electroceramics
  - Chemical sensors
- Analysis
  - Surface analysis by accelerator techniques
  - Trace element accelerator mass spectrometry

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

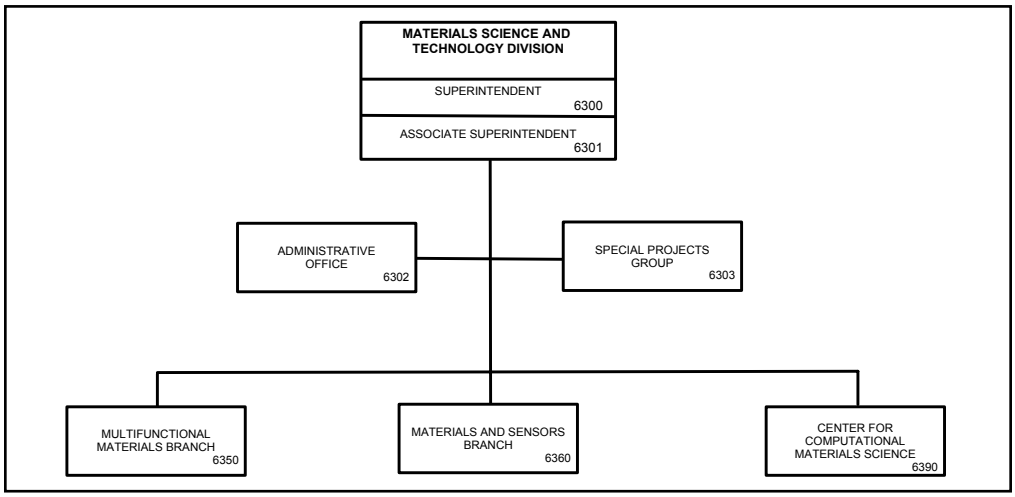


3D reconstruction of cementite precipitates in an austenite grain

Multifunctional Materials
- Composite multifunctional material systems
  - Structure-plus-power
  - Structure-plus-conduction
  - Structure-plus-acoustics
- Corrosion simulation and control
  - Modeling of electrochemical corrosion systems
  - Evaluation of cathodic protection system performance
- Computational modeling of active materials
- Mesoscale material characterization and simulation
  - Image-based modeling
  - Materials by design
- Biochemical surrogates and response simulation
- Synthesis and processing of advanced ceramics
  - High energy density dielectrics
  - Piezoelectrics
- Rapid prototyping



Observing the growth of single crystal magnetic films on semiconductor substrates for electronic applications



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, insulators, composites, and ceramics, including efforts in ferrous alloys, intermetallic compounds, superconducting, dielectric, and magnetic materials, films and coatings, and multifunctional materials systems. The programs encompass advanced synthesis and processing techniques as well as postprocessing techniques to fabricate sensors, devices, structures, and components. A variety of state-of-the-art characterization tools are used to probe the atomic and microstructure nature (composition and structure) of the materials as well as to delineate the fundamental properties of the material or material system. Response of materials and material systems to a variety of external influences (mechanical, chemical, optical, electromagnetic radiation, high-power lasers, temperature, etc.) is integral to the division's programs as well as performance and reliability projections for military service lifetime. The program includes strong theoretical, computational, and simulation efforts to predict, guide, and explain the behavior of materials and materials systems. Studies conducted in the division will provide guidance for the selection, design, certification, and life-cycle management of material in naval vehicles and systems. The diversity of R&D programs in the division is carried out by multidisciplinary teams of materials scientists, metallurgists, ceramists, physicists, chemists, and engineers using the most advanced testing facilities and diagnostic techniques.

Personnel: 110 full-time civilian

Key Personnel

Title	Code
Superintendent, Materials Science and Technology Division	6300
Senior Scientist	6300.1
Associate Superintendent	6301
Administrative Officer	6302
Head, Special Projects Group	6303
Head, Multifunctional Materials Branch	6350
Head, Materials and Sensors Branch	6360
Head, Center for Computational Materials Science	6390

Point of contact: Code 6302, (202) 767-2458

Laboratory for Computational Physics and Fluid Dynamics

Code 6400
Research Activity Areas

Reactive Flows

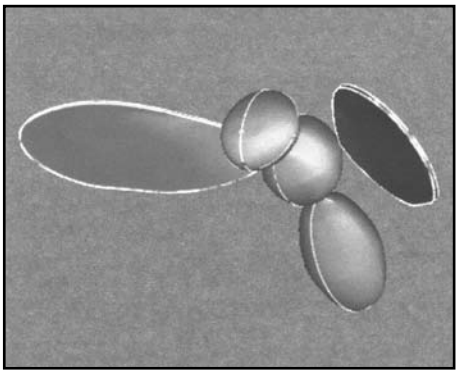
Fluid dynamics in combustion
Turbulence in compressible flows
Multiphase flows
Turbulent jets and wakes
Turbulence modeling
Computational hydrodynamics
Propulsion systems analysis
Contaminant transport modelling
Fire and explosion mitigation

Computational Physics Developments

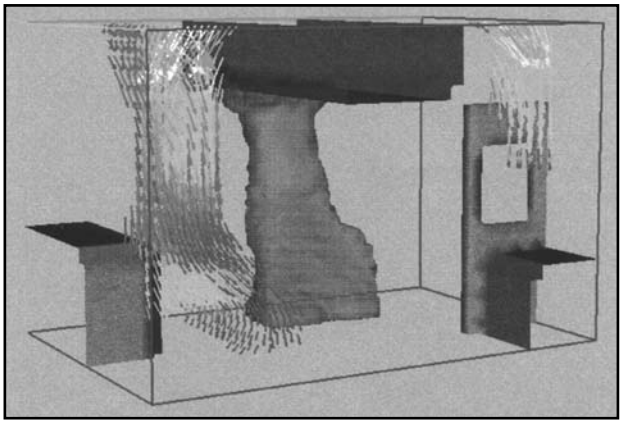
Laser plasma interactions
Inertial confinement fusion
Solar physics modeling
Dynamical gridding algorithms
Advanced graphical and parallel processing systems
Electromagnetic and acoustic scattering
Microfluidics
Fluid structure interaction
Shock and blast containment

Olive (32P) and Snuffy (24P) — Origins at work

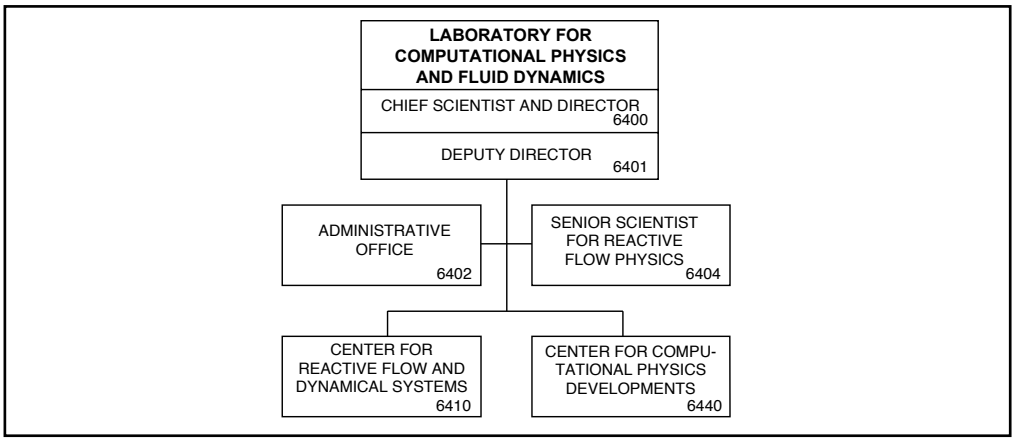
This figure shows a contaminant cloud from a FAST3D-CT simulation of downtown Chicago using a $360 \times 360 \times 55$ grid (6 m resolution). A 3 m/s wind off the lake from the left blows contaminant across a portion of the detailed urban geometry. The contaminant is lofted rapidly above the tops of the majority of the buildings due to their geometrical effect.



Unstructured grid technology has been used to obtain the surface pressure distribution on a hovering fruitfly *Drosophila*. Such computations are being carried out to gain insights into unsteady force production in nature that may guide in the design of insect-like autonomous air vehicles for the Navy.



Water-mist trajectories and temperature distributions during the suppression of a fire inside a complex ship compartment. Simulations and experiments have shown that using fine water-mist can significantly reduce the amount of water needed for fire suppression.



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: 22 full-time civilian

Key Personnel

Title	Code
Chief Scientist and Director	6400
Administrative Officer	6402
Senior Scientist for Reactive Flow Physics	6404
Head, Center for Reactive Flow and Dynamical Systems	6410
Head, Center for Computational Physics Developments	6440

Point of contact: Code 6402, (202) 767-6581

Plasma Physics Division

Code 6700
Research Activity Areas

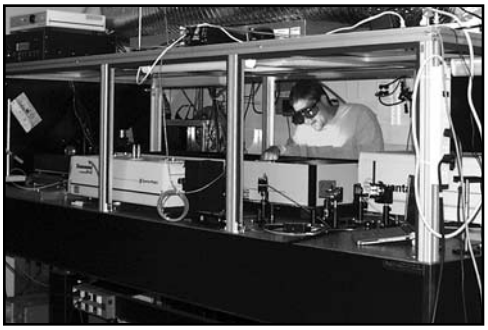
Radiation Hydrodynamics
Radiation hydrodynamics of Z-pinches and laser-produced plasmas
X-ray source development
Cluster dynamics in intense laser fields
X-ray channeling and propagation
Plasma kinetics for directed energy and fusion applications
Plasma discharge physics
Dense plasma atomic physics, equation of state
Numerical simulation of high-density plasma

Laser Plasma
Nuclear weapons stockpile stewardship
Laser fusion, inertial confinement
Megabar high-pressure physics
Rep-rate KrF laser development
Strongly coupled plasmas
Laser fusion technology
Laser fusion energy

Charged Particle Physics
Electrodeless plasma discharges for lighting
Applications of modulated electron beams
Rocket, satellite, and shuttle-borne natural and active experiments
Laboratory simulation of space plasma processes
Large-area plasma processing sources
Atmospheric and ionospheric GPS sensing
Ionospheric effects on communications
Electromagnetic launchers
Radiation belt remediation

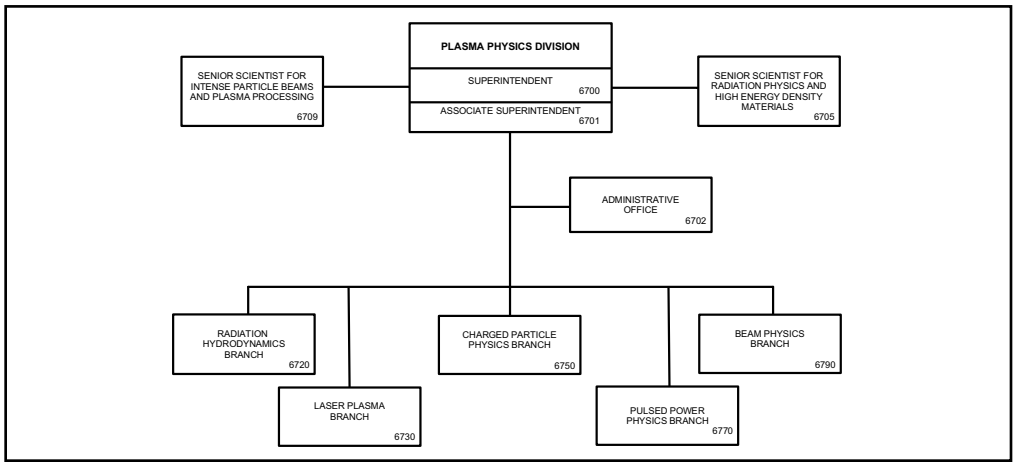
Pulsed Power Physics
Production, focusing, and propagation of intense electron and ion beams
High-power, pulsed radiography
Plasma radiator and bremsstrahlung diode source development
Capacitive and inductive energy storage
Nuclear weapons effects simulation
Electromagnetic launchers
Detection of Special Nuclear Materials

Beam Physics
Advanced accelerators and radiation sources
Microwave, plasma, and laser processing of materials
Microwave sources: Magnicons and gyrotrons
Nonlinear dynamics of coupled lasers
Ultrahigh-intensity laser-matter interactions
Free electron lasers and laser synchrotrons
Theory and simulation of space and solar plasmas
Global ionospheric modeling
Space weather modeling
Laser propagation in the atmosphere
Underwater laser interactions



The NRL Ti:Sapphire Femtosecond Laser (TFL) currently operates at 50 fsec, 10 TW and provides a facility to conduct research in intense laser-plasma interactions, ultrashort intense laser propagation in the atmosphere, remote sensing of chem/bio agents, and laser induced electrical discharges.

The Nike is the world's largest krypton fluoride (KrF) laser. Its operation is funded by the U.S. Department of Energy to explore physics issues for laser fusion. Shown is the propagation bay where 56 short-duration (4–5 ns) beams are directed by mirrors first to the electron-beam-pumped amplifiers and then to the target facility. The Nike KrF system achieves extremely uniform high-intensity illumination of planar targets by overlapping numerous smoothed laser beams. Typical experiments include studies of the ablative acceleration of matter to high velocities (100 km/sec) and studies of the reaction of materials to very high pressures (10 million atmospheres) produced by the laser light.



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; inertial confinement fusion; atomic physics; plasma processing; nonlinear dynamics and chaos; free electron lasers and other advanced radiation sources; advanced accelerator concepts; and atmospheric laser propagation. Areas of experimental interest include laser-plasma, laser-electron beam, and laser-matter interactions, high-energy laser weapons, laser shock hydrodynamics, thermonuclear fusion, electromagnetic wave generation, the generation of intense electron and ion beams, large-area plasma processing sources, electromagnetic launchers, high-frequency microwave processing of ceramic and metallic materials, advanced accelerator development, inductive energy storage, laboratory simulation of space plasma phenomena, high altitude chemical releases, and in situ and remote sensing space plasma measurements.

Personnel: 97 full-time civilian

Key Personnel

Title	Code
Superintendent, Plasma Physics Division	6700
Associate Superintendent	6701
Administrative Officer	6702
Senior Scientist, Directed Energy Physics	6703
Senior Scientist, Radiation Physics and High Energy Density Materials	6705
Senior Scientist, Intense Particle Beams and Plasma Processing	6709
Head, Radiation Hydrodynamics Branch	6720
Head, Laser Plasma Branch	6730
Head, Charged Particle Physics Branch	6750
Head, Pulsed Power Physics Branch	6770
Head, Beam Physics Branch	6790

Point of contact: 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 including micro- and nanostructures
Electrical, optical, and magneto-optical studies of semiconductor microstructures and nanostructures, superlattices, surfaces, and interfaces
Impurity and defect studies
Surface research and interface physics
Theoretical solid state physics

Microwave Technology
Microwave and millimeter-wave integrated circuits and components research
High-frequency device design, simulation, and fabrication
Reliability and failure physics of electronic devices and circuits
High-temperature superconductors

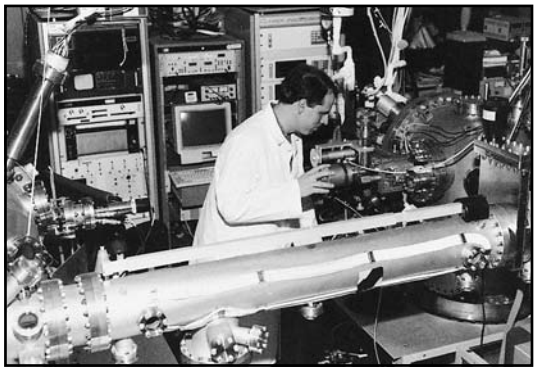
Power Electronics
Power device design, simulation, and fabrication
High-voltage/high-temperature power device and components research
Growth and characterization of wide bandgap and thin film materials for power devices
Wafer bonding for power devices and novel substrates
Reliability and failure physics of power devices

Nanoelectronics
Characterization of nanosurfaces and interfaces
Nanoelectronic device research and fabrication
Processing research for nanometric devices

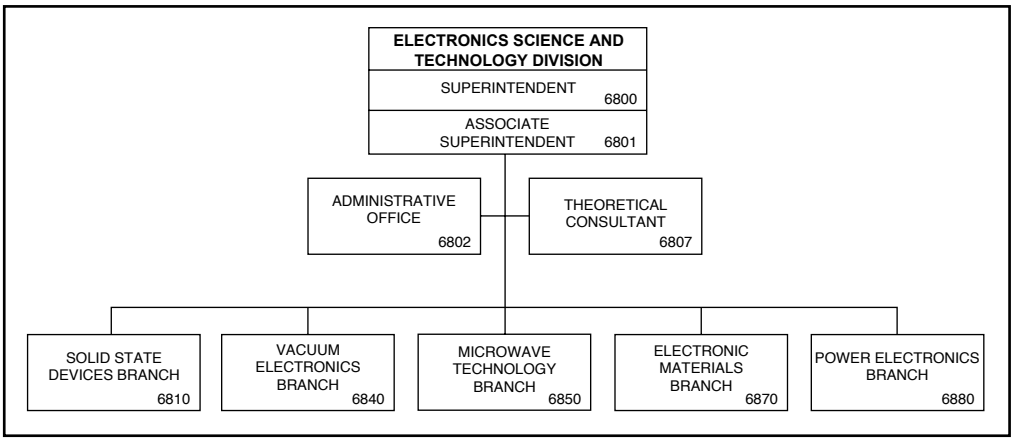
Radiation Effects
Space experiments and satellite survivability
Single event and total ionizing dose effects
Radiation tolerant ultralow-power microelectronics/design and test
Ultrafast charge collection
Environmental hazard remediation
Advanced photovoltaic technologies
Femtosecond laser research
Radiation effects in microelectronics and photonics

Solid State Devices
Solid state optical sensors
Hardening of electronic devices, circuits, and optoelectronic sensors
Very far infrared photodiodes/arrays
Microelectronics device research and fabrication
Solid state circuits research
Signal processing research

Vacuum Electronics
Compact microwave and millimeter-wave power amplifier research and development
Cathode research and development
Materials development for RF electronics applications
Electron emission science
High power millimeter-wave components: fabrication and cooling technology
Techniques for high data rate digital communications



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, midwave lasers, and superhigh frequency transistors and resonant tunneling diodes. Here a scientist creates a structure using high-vacuum, chamber-to-chamber sample transfer.



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 nanostructure electronics, microwave techniques, microelectronic device research and fabrication, vacuum electronics, and cryoelectronics, including superconductors. The activities of the Division integrate device research with basic materials investigations and with systems research and development needs.

Personnel: 92 full-time civilian

Key Personnel

Title	Code
Superintendent, Electronics Science and Technology Division	6800
Associate Superintendent	6801
Administrative Officer	6802
Theoretical Consultant	6807
Head, Solid State Devices Branch	6810
Head, Vacuum Electronics Branch	6840
Head, Microwave Technology Branch	6850
Head, Electronic Materials Branch	6870
Senior Scientist for Nanoelectronics	6877
Head, Power Electronics Branch	6880

Point of contact: Code 6801, (202) 767-3894

Center for Bio/Molecular Science and Engineering

Code 6900
Research Activity Areas

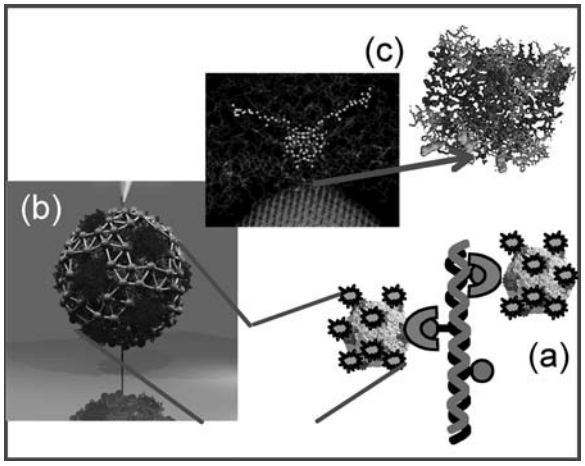
Biologically Derived Microstructures
Self-assembly, molecular machining
Synthetic membranes
Nanocomposites
Tailored electronic materials
Low observables
Molecular engineering, biomimetic materials
Molecular imprinting
Viral scaffolds
Multifunctional decontamination coatings

Biosensors
Binding polypeptides and proteins
Cell-based biosensor
DNA biosensor
Fiber-optic biosensor
Flow immunosensor
Array-based sensors
Optical biosensor
Microfluidics

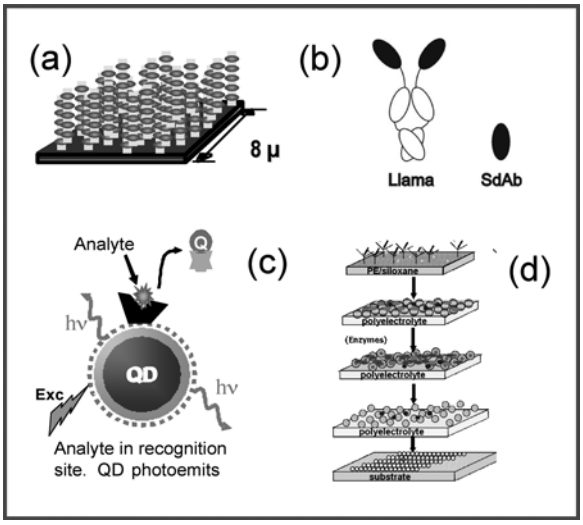
Novel Materials
Soil/groundwater explosives detection
Antifouling paint, controlled release
Single chain antibodies
Liquid crystal nanoparticles
Liquid crystal elastomers
Nano and menoporous materials
Quantum dot and protein conjugates
Biomimetric materials

Molecular Biology
Genomics and proteomics of marine bacteria
Tissue engineering
Gene arrays, biomarkers
System and synthetic biology

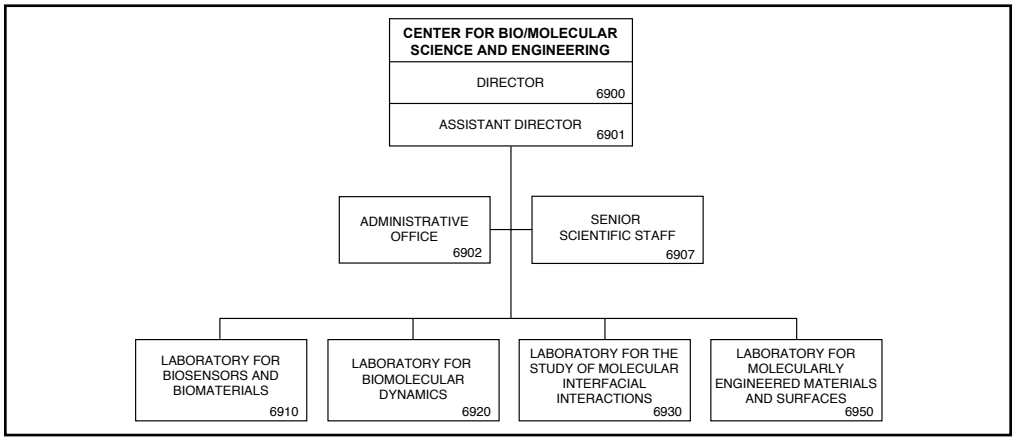
Energy Harvesting
Biomaterials for charge storage
Ocean floor biofuel cell
Photo induced electron transfer



Proteins and viruses as scaffolds for (a) chem/bio nanosensors and (b) nanoscale electronics and (c) photovoltaic devices.



Novel approaches to chem/bio detection and decontamination: (a) sequence based pathogen detection, (b) heat stable single domain antibody, (c) Quantum dot FRET based analyte recognition and (d) multilayer assembly assenbly based decontamination coating.



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 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: 49 full-time civilian

Key Personnel

Title	Code
Director, Center for Bio/Molecular Science and Engineering	6900
Assistant Director	6901
Administrative Officer	6902
Head, Senior Scientific Staff	6907
Head, Laboratory for Biosensors and Biomaterials	6910
Head, Laboratory for Biomolecular Dynamics	6920
Head, Laboratory for the Study of Molecular Interfacial Interactions	6930
Head, Laboratory for Molecularly Engineered Materials and Surfaces	6950

Point of contact: Code 6902, (202) 404-6012

Ocean and Atmospheric Science and Technology Directorate

OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE

Code 7000

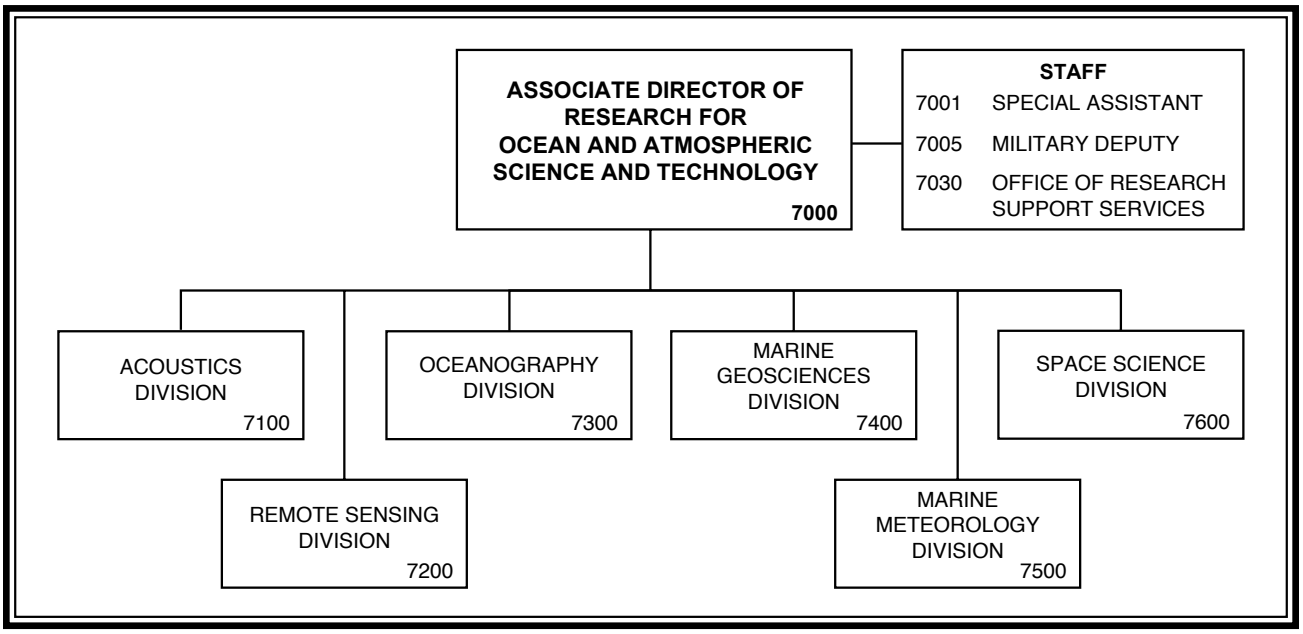
The Ocean and Atmospheric Science and Technology Directorate performs research and development in the fields of acoustics, remote sensing, oceanography, marine geosciences, marine meteorology, and space science. Areas of emphasis in acoustics include advanced acoustic concepts and computation, acoustic 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 and hydrodynamics, remote sensing simulation, and imaging systems. Areas of emphasis in oceanography include coastal and open ocean dynamics, ocean modeling and prediction, coastal and open ocean processes, remote sensing applications to oceanography, and marine biocorrosion processes. Areas of emphasis in marine geosciences include marine physics, seafloor sciences, geospatial information science and technology, and mapping, charting, and geodesy. Areas of emphasis in marine meteorology include atmospheric dynamics for theater-wide, tactical scale prediction systems and forecast support, and meterological applications development. Areas of emphasis in space science include middle and upper atmosphere physics, solar terrestrial relationships, solar physics, and higher energy astronomy. Senior naval officers are assigned as military advisors 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

Dr. E.R. Franchi was born in Huntington, New York. He graduated from Clarkson University in 1968, with a Bachelor of Science degree in mathematics. He received his Master of Science (1970) and Ph.D. (1973) degrees both in applied mathematics from Rensselaer Polytechnic Institute. After completing his graduate studies, Dr. Franchi accepted a research position with Bolt, Beranek, and Newman where he performed validation studies of underwater acoustic propagation and noise models.

Dr. Franchi joined the Naval Research Laboratory in 1975 as a research mathematician in the Acoustics Division. In this position, he conducted and directed research in low frequency acoustic reverberation and scattering, including design and conduct of field experiments, development of signal processing techniques, data analysis and interpretation, computer prediction models, and active sonar performance studies. In 1986, he was named Head of the Acoustic Systems Branch where he was responsible for programs that emphasized theoretical, experimental, and computational research to understand the physical mechanisms of acoustic propagation, scattering, and ambient noise that control the design and performance of large- aperture passive sonar systems, low frequency active sonar systems, and shallow water sonar systems. In July 1988, Dr. Franchi was appointed to the Senior Executive Service and selected as the Associate Technical Director of the Naval Ocean Research and Development Activity (NORDA) and its Director of Ocean Acoustics and Technology. The Directorate conducted basic, exploratory, and advanced research and development and program management in the areas of acoustic model development and simulation, ocean acoustics measurements, and ocean engineering in support of all undersea warfare missions. In October 1992, the Directorate became the Center for Environmental Acoustics in the Acoustics Division of the Naval Research Laboratory, with Dr. Franchi as Director. Dr. Franchi was selected to the position of Superintendent of the Acoustics Division in October 1993. The Division conducts basic, exploratory, and applied research and development in areas of acoustic modeling and simulation, ocean acoustics measurements, acoustic systems development, acoustic signal processing, and physical acoustics. He was responsible for the technical/scientific management, direction, and administration of programs with a total budget in excess of $25M, and for efficient management of division resources including the activities of approximately 110 civilian personnel. He served as Acting Associate Director of Research for the Ocean and Atmospheric Science and Technology Directorate from October 2001 to May 2002 and from June 2007 to April 2008. In April 2008, he was selected as the Associate Director.

Dr. Franchi received the Presidential Rank Award of Meritorious Executive in 2003. He has over 35 years experience in underwater acoustics research and is the author/co-author of over 35 publications. He is recognized as an authority on underwater acoustic scattering and reverberation and has played major roles in Navy low frequency active sonar programs as both performer and advisor/consultant. He served as the U.S. National Leader of the Technical Cooperation Program's multinational Panel on ASW Systems and Technology from 1996 to 2002, and has served as its Panel Chairman from 2003 to the present. He represents the United States to the NATO Undersea Research Centre Scientific Committee of National Representatives. He was elected to Pi Mu Epsilon, the Honorary National Mathematics Society, while an undergraduate at Clarkson University. Dr. Franchi is a member of the Acoustical Society of America and past member of the Mathematical Association of America.



Key Personnel

Title	Code
Associate Director of Research for Ocean and Atmospheric Science and Technology	7000
Special Assistant	7001
Military Deputy	7005
Head, Ship Support Group	7008
Head, Office of Research Support Services	7030
Superintendent, Acoustics Division	7100
Naval Science (Acoustic) Research Coordinator	7105
Superintendent, Remote Sensing Division	7200
Military Deputy	7205
Superintendent, Oceanography Division	7300
Military Deputy	7305
Superintendent, Marine Geosciences Division	7400
Military Deputy	7405
Superintendent, Marine Meteorology Division	7500
Military Deputy	7505
Superintendent, Space Science Division	7600
Space Test Program Officer	7603

Point of contact: Code 7000A, (202) 404-8174

Office of Research Support Services (NRL-SSC)

Code 7030
Staff Activity Areas

Office of Research Support
Conference coordination, video teleconferencing
Directives, reports, forms

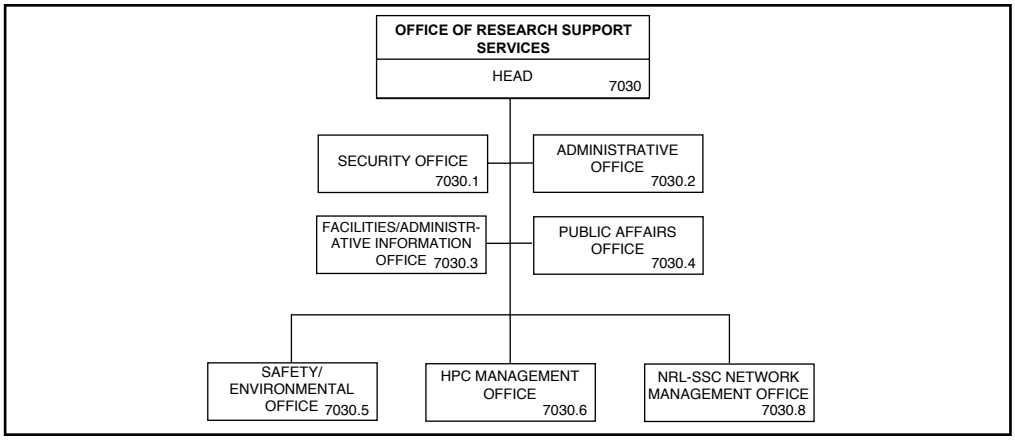
Facilities Office
Facilities planning and maintenance
Vehicles

HPC Management Office
Supercomputing interface management

Safety/Environmental Office
Industrial/laboratory safety
Specialized safety training
Hazard abatement
Mishap prevention
Hazardous materials program
Hazardous waste disposal

Public Affairs Office
Community relations
News releases
Exhibits
Information
Freedom of Information Act

NRL-SSC Network Management Office
Data communications
Data networking
Computer network maintenance



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 multicommand issues, and safety and disaster control measures.

Support functions include security, public affairs, safety, high performance computer management, and support services to include management, administration, and facilities.

Personnel: 9 full-time civilian

Key Personnel

Title	Code
Head, Office of Research Support Services	7030
Administrative Officer	7030.2
Head, Facilities Office	7030.3
Public Affairs Office	7030.4
Safety/Environmental Officer	7030.5
HPC Management Office	7030.6
NRL-SSC Network Management Office	7030.8

Point of contact: Code 7030, (228) 688-4010; DSN 828-4010

Acoustics Division

Code 7100
Staff Activity Areas

Special programs management

System concepts and studies

Research Activity Areas

Acoustic Signal Processing

Random media propagation
Limits of acoustic array performance
Underwater acoustic communications
Undersea noise signal characterization and modeling
Surf zone noise generation
Shallow water acoustic surveillance methods
Geophysical inversion
Matched field processing and inversion
High-frequency acoustic flow visualization

Physical Acoustics

Structural acoustics
Active sound control
Fiber-optic acoustic sensors
Acoustics of coatings
Dynamics of complex structures
Target strength/radiation modeling
Acoustic transduction
Inverse scattering
Nanomicrostructure dynamics

The acoustic source-receiver array (ASRA) contains twelve sources/receivers. The purpose is to conduct multiple-input multiple-output (MIMO) underwater acoustic communications experiments.

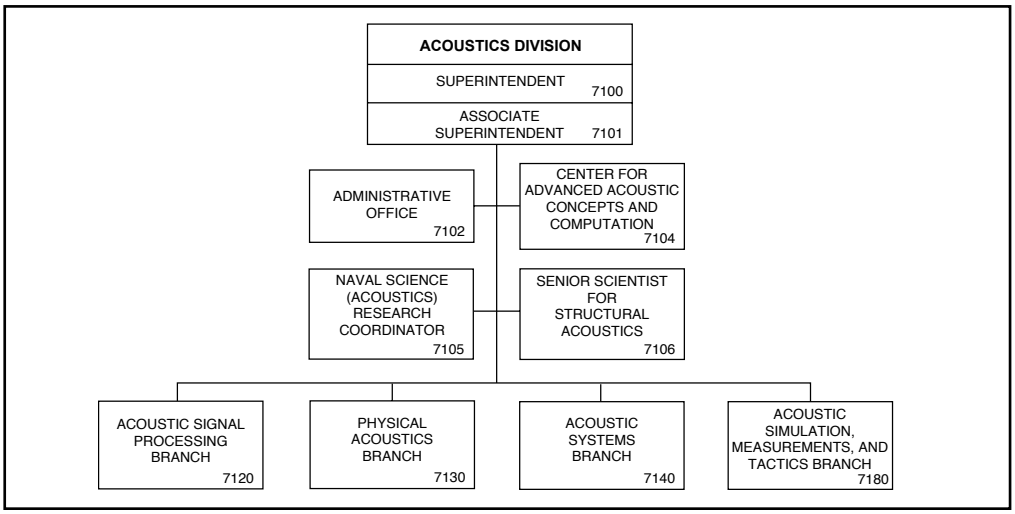
Acoustic Systems

Ocean boundary scattering
Shallow water active classification
Statistical characterization of reverberation
Active sonar performance modeling
Matched field processing
Acoustic inversion techniques
Acoustic propagation
Nonlinear signal propagation
Acoustics of bubbly media

Acoustic Simulation, Measurements, and Tactics

Coupled dynamic ocean and acoustic modeling
Ocean acoustic propagation and scattering models
Ocean ambient noise models and simulation
Supercomputer and scalable acoustic models
Fleet application acoustic models
Environmental acoustic assessments and characterizations
High-frequency seafloor and ocean acoustic measurements
Coastal acoustic measurements and studies
Biologic ocean volume reverberation measurements
Multisensor system optimization
Tactical oceanography simulations and databases
Warfare effectiveness studies and optimizations

Structural acoustic studies in the one-million-gallon Acoustic Holographic Pool Facility



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

Key Personnel

Title	Code
Superintendent, Acoustics Division	7100
Associate Superintendent	7101
Administrative Officer	7102
Head, Center for Advanced Acoustic Concepts and Computation	7104
Naval Science (Acoustics) Research Coordinator	7105
Senior Scientist for Structural Acoustics	7106
Head, Acoustic Signal Processing Branch	7120
Head, Physical Acoustics Branch	7130
Head, Acoustic Systems Branch	7140
Head, Acoustic Simulation, Measurements, and Tactics Branch	7180

Point of contact: Code 7100, (202) 767-3482

Remote Sensing Division

Code 7200
Research Activity Areas

Remote Sensing

Sensors
- SAR
- Imaging radar
- Passive microwave imagers
- CCDs and focal plane arrays
- Thermal IR cameras
- Fabry-Perot spectrometers
- Imaging spectrometers
- Radio interferometers
- Optical interferometers
- Adaptive optics
- Lidar
- Spaceborne and airborne systems

Areas
- Radiative transfer modeling
- Coastal oceans
- Marine ocean boundary layer
- Polar ice
- Middle atmosphere
- Global ocean phenomenology
- Environmental change
- Ocean surface wind vector
- Ionosphere
- Data assimilation

Astrophysics

- Optical interferometry
- Radio interferometry
- Fundamental astrometry and reference frames
- Fundamental astrophysics
- Star formation
- Stellar atmospheres and envelopes
- Interstellar medium, interstellar scattering pulsars
- Low-frequency astronomy

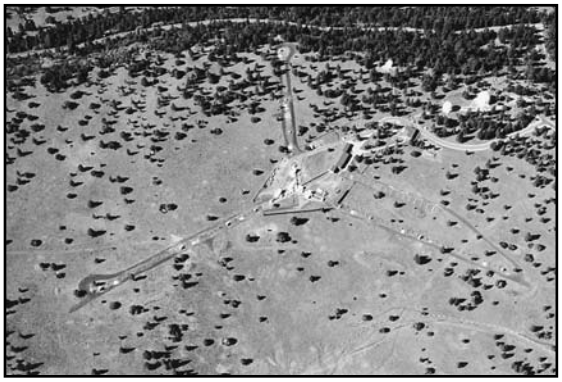
The WindSat polarimetric radiometer prior to spacecraft integration.

Physics of Atmospheric/Ocean Interaction

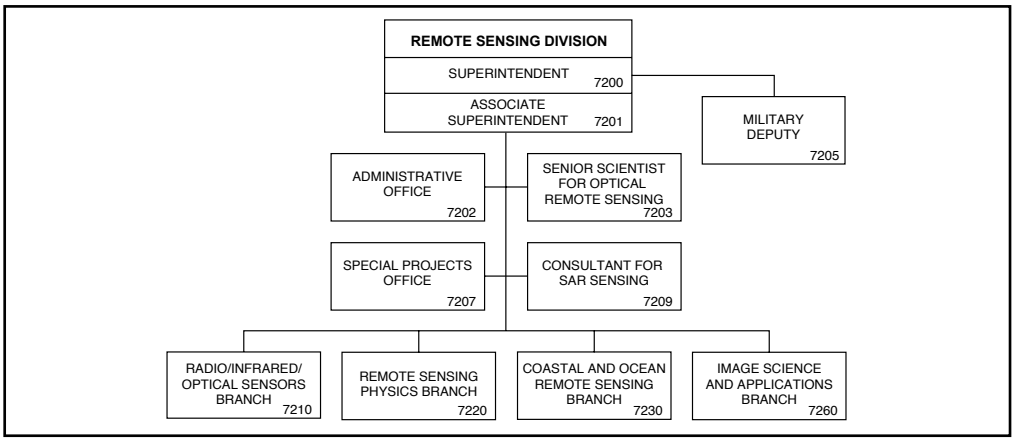
- Mesoscale, fine-structure, and microstructure
- Aerosol and cloud physics
- Mixed layer and thermocline applications
- Sea-truth towed instrumentation techniques
- Turbulent jets and wakes
- Nonlinear and breaking ocean waves
- Stratified and rotating flows
- Turbulence modeling
- Boundary layer hydrodynamics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

Imaging Research/Systems

- 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.



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, in the near-Earth environment, and in deep space. The research, both theoretical and experimental, deals with discovering and understanding the basic physical principles and mechanisms that give rise to target and background emission and to absorption and emission by 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: 97 full-time civilian; 1 full-time military

Key Personnel

Title	Code
Superintendent, Remote Sensing Division	7200
Associate Superintendent	7201
Administrative Officer	7202
Military Deputy	7205
Consultant for SAR Sensing	7209
Head, Radio/Infrared/Optical Sensors Branch	7210
Head, Remote Sensing Physics Branch	7220
Head, Coastal and Ocean Remote Sensing Branch	7230
Head, Image Science and Applications Branch	7260

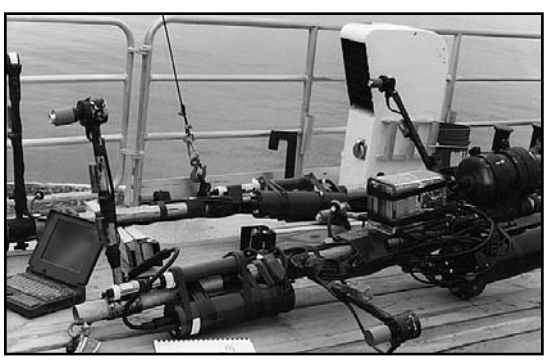
Point of contact: Code 7200, (202) 767-2351

Oceanography Division

Code 7300
Research Activity Areas

Ocean Dynamics and Prediction

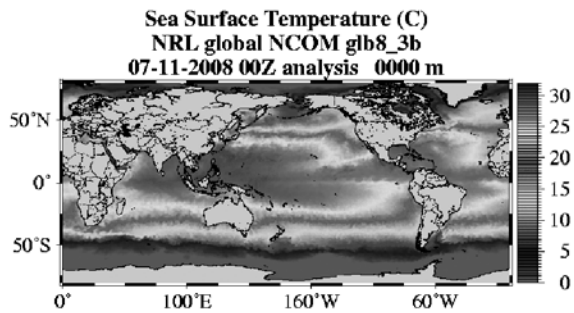
- Circulation
  - Global resolution of circulation and meso-scale fields
  - Littoral circulation at the coast, bays, and estuaries
  - Satellite observation processing and assimilation
  - UUV adaptive sampling
  - Observation system simulation experiments
  - Ice concentration and ice drift
  - Tidal currents and heights
- Surface effects
  - Surface wave effects globally and into bays
  - Wave breaking
  - Mixed layer dynamics
  - Swell propagation and dynamics
  - Phase averaged wave evolution
  - Phase resolved wave dynamics
- Nearshore
  - Wave breaking at the shore
  - Rip currents at the shore
  - Tidal currents and heights into rivers
  - Nonlinear wave interaction
  - Sensor deployment optimization
- Acoustic effects
  - Sound speed variation for acoustic propagation
  - Internal waves, solitons, and bores for beam focusing
  - Wave bubble entrainment and noise generation



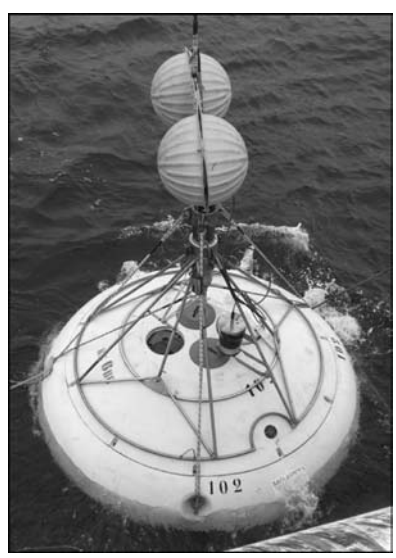
Optical mooring equipment for shallow water showing attenuation and absorption meters and irradiance sensors

Ocean Sciences

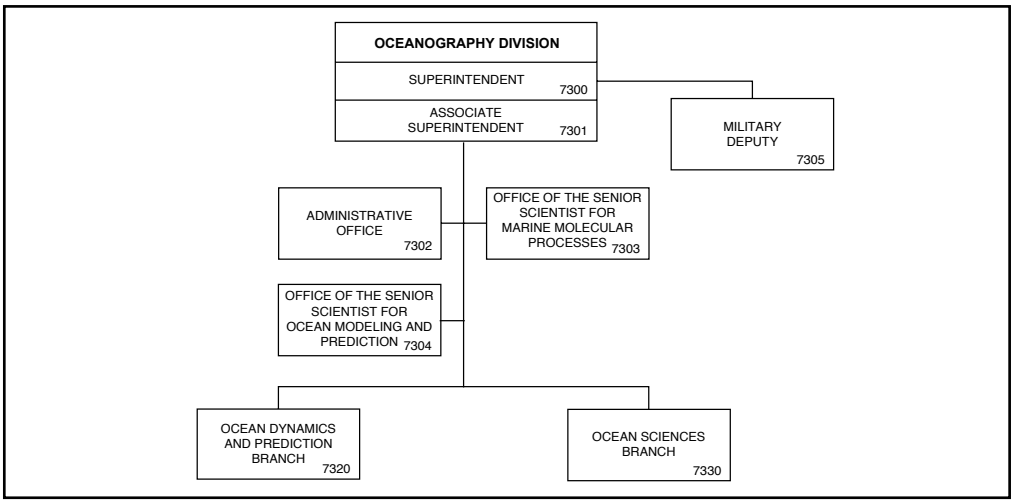
- Dynamical processes
  - Coastal current systems
  - Waves and bubbles
- Coupled systems
  - Air/ocean/acoustic coupling
  - Coupled bio/optical/physical processes
- Remote sensing applications
  - Color/hyperspectral signatures
  - Ocean optics
  - Microbiologically influenced corrosion
  - Metal microbe interaction



Global Sea Surface Temperature from the Navy Coastal Ocean Model (NCOM) for 11 July 2008. The model is operational at NAVOCEANO.



The SEPTR (Shallow water Environmental Profiler in Trawl-safe Real-time configuration) consists of an acoustic Doppler current profiler (ADCP), a Wave-Tide Gauge, two acoustic releases, and a buoy, controlled by a winch within the trawl-resistant bottom mount, that houses conductivity, temperature, and depth (CTD) sensors which are profiled between the bottom unit and ocean surface multiple times per day.



Basic Responsibilities

The Oceanography Division conducts basic and applied research in description and modeling of biological, physical, and dynamical processes in open ocean, regional, and littoral areas; in exploitation of satellite, airborne, and in situ sensors for environmental characterization; and in investigation and application of microbial processes to Navy problems. The oceanographic research is both theoretical and experimental in nature and is focused on understanding and modeling ocean, coastal, and littoral area hydro/thermodynamics, circulation, waves, ice dynamics, air-sea exchange, optics, and small and microscale processes. Analytical methods and algorithms are developed to provide quantitative retrieval of geophysical parameters of Navy interest from state-of-the-art sensor systems. The Division work includes analysis of biological processes that mediate and control optical properties of the oceans, coastal, and littoral regions, and microbially induced corrosion/metal microbe interaction. The Division programs are designed to be responsive to and to anticipate Naval needs. Transition of Division products to the DoD, Navy systems developers, operational Navy, and civilian (dual use) programs is a primary goal. The Division's programs are coordinated and interactive with other NRL programs and activities, ONR's research programs, and other government agencies involved in oceanographic activities. The Division also collaborates and cooperates with scientists from the academic community and other U.S. and foreign laboratories.

Personnel: 79 full-time civilian; 1 full-time military

Key Personnel

Title	Code
Superintendent, Oceanography Division	7300
Associate Superintendent	7301
Administrative Officer	7302
Office of the Senior Scientist for Marine Molecular Processes	7303
Office of the Senior Scientist for Ocean Modeling and Prediction	7304
Military Deputy	7305
Head, Ocean Dynamics and Prediction Branch	7320
Head, Ocean Sciences Branch	7330

Point of contact: Code 7302, (228) 688-4114; DSN 828-4114

Marine Geosciences Division

Code 7400
Research Activity Areas

Marine Geology
Sedimentary processes
Sediment microstructure
Pore fluid flow
Diapirism, volcanism, faulting, mass movement
Biogenic and thermogenic methane
Hydrate distribution, formation, and dissociation
Small scale granular/fluid dynamics

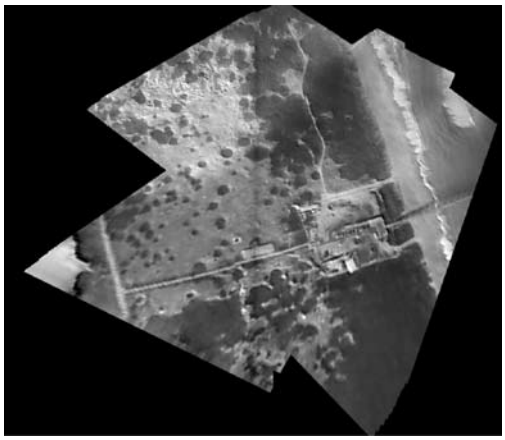
Marine Geophysics
Seismic wave propagation
Physics of low-frequency acoustic propagation
Acoustic energy interaction with topography and inhomogeneities
Gravimetry and geodesy
Geomagnetic modeling

Marine Geotechnique
Acoustic seafloor characterization
Geoacoustic modeling
Geotechnical properties and behavior of sediments
Measurement and modeling of high-frequency acoustic propagation and scattering
Mine burial processes
Marine biogeochemistry
- Animal-microbe-sediment interactions
- Early sediment diagenesis

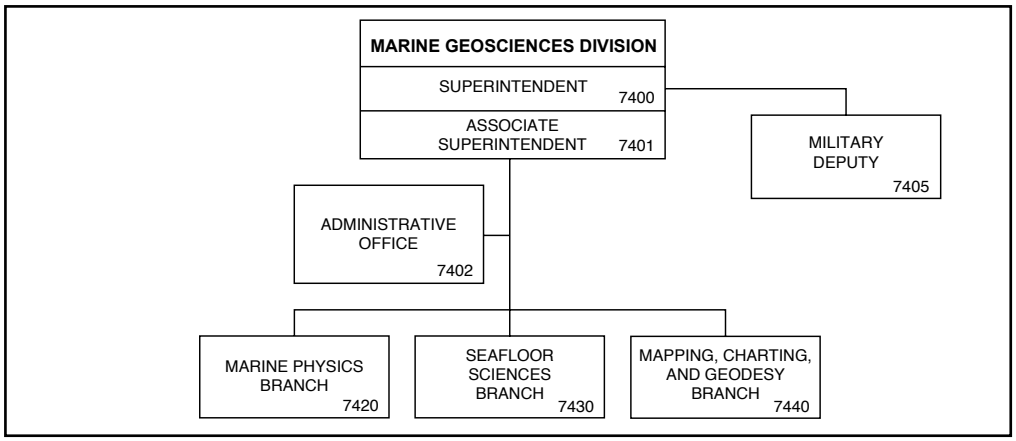
Sedimentary microbial respiration of manganese and iron

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
Modeling of nearshore morphodynamics
Geospatial portal design with 2D and 3D interfaces
Characterization of the littoral from airborne platforms

In Situ and Laboratory Sensors
High-resolution subseafloor 2D and 3D seismic imaging
Laser/hyperspectral bathymetry/topography
Swath acoustic backscatter imaging
Sediment pore water pressure, permeability, and undrained shear strength
Compressional and shear wave velocity and attenuation
Airborne geophysics, gravity, and magnetics
Seafloor magnetic fluctuation
Sediment microfabric change with pore fluid and/or gas change
Instrumented mine shapes
Bottom currents and pressure fluctuations



Georectified mosaic of Field Research Facility in Duck, NC automatically created from the video of a Raven Unmanned Aircraft System (UAS). Efficient mapping algorithms have been developed to create rectified movies to allow exploitation of this type video to determine littoral processes including waves, currents, and bathymetry.



Basic Responsibilities

The Marine Geosciences Division conducts a broadly based, multidisciplinary program of scientific research, technology development, and applied research in marine geosciences, geospatial information and systems, and related technoligies. Scientific research investigates fundamental seafloor geological and biogeochemical processes within ocean basins and littoral regions including adjacent land areas. Emphasis is placed on the development of models, sensors, techniques, and systems to exploit this knowledge. Work emphasizes (1) quantitatively predicting the effects of the seafloor on performance of Naval systems and operations and (2) techniques to rapidly acquire, process, fuse, and analyze geospatial, geoacoustical, and geotechnical information to meet existing and future digital data base requirements of the Chief of Naval Operations, the National Geospatial-Intelligence Agency (NGA), and other national users.

As the Navy's subject matter expert (SME) in the areas of MC&G and Geospatial Information and Services (GI&S), the Division provides vital technical support to the Oceanographer/Navigator of the Navy (N84), the NGA, and the Tri-Services community. NRL also contributes to the development of leading edge geospatial technology by reviewing emerging GI&S standards and products, as well as by enhancing naval systems with embedded geospatial information technology. DMAP Team products like the Geospatial Information Data Base (GIDB) serve a vital role in addressing Navy's ever-growing requirements for GI&S.

Close coordination and interaction with Commander, Naval Oceanography and Meteorology (CNMOC), Naval Oceanographic Office (NAVOCEANO), CNO, ONR, Systems Commands, Warfare Center, NGA, and other DoD and national organizations is essential to the success of Division programs, with transition of Division technology to systems developers and to 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: 70 full-time civilian; 2 full-time military

Key Personnel

Title	Code
Superintendent, Marine Geosciences Division	7400
Associate Superintendent	7401
Administrative Officer	7402
Military Deputy	7405
Head, Marine Physics Branch	7420
Head, Seafloor Sciences Branch	7430
Head, Mapping, Charting, and Geodesy Branch	7440

Point of contact: Code 7402, (228) 688-4660; DSN 828-4660

Marine Meteorology Division

Code 7500
Research Activity Areas

Atmospheric Dynamics and Prediction
- Global
- Mesoscale
- Tactical scale
- Large eddy simulation
- Boundary layer
- Land surface
- Coastal
- Urban effects
- Massively parallel computing
- Coupled ocean/atmosphere
- Tropical cyclones
- Aerosols
- Topographically forced flow
- Predictability
- Ensembles
- Advanced numerical methods

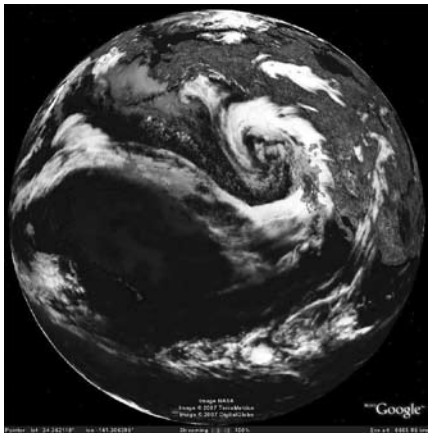
Data Assimilation
- Hybrid techniques
- 3D and 4D variational analysis
- Ensemble Transform Kalman Filter (ETKF)
- Quality control
- Tropical cyclone initialization
- Remotely sensed data
- Adjoint applications
- Direct radiance assimilation
- Radar data assimilation
- Targeted observations
- Aerosol assimilation
- UAV data assimilation

Tactical Environmental Support
- Rapid environmental assessment
- Through-the-sensor measurements
- Atmospheric impact on weapons systems
- Data fusion
- Nowcasting
- Visualization
- Port studies
- Typhoon havens
- Forecaster handbooks
- Expert systems
- Aviation risk assessment

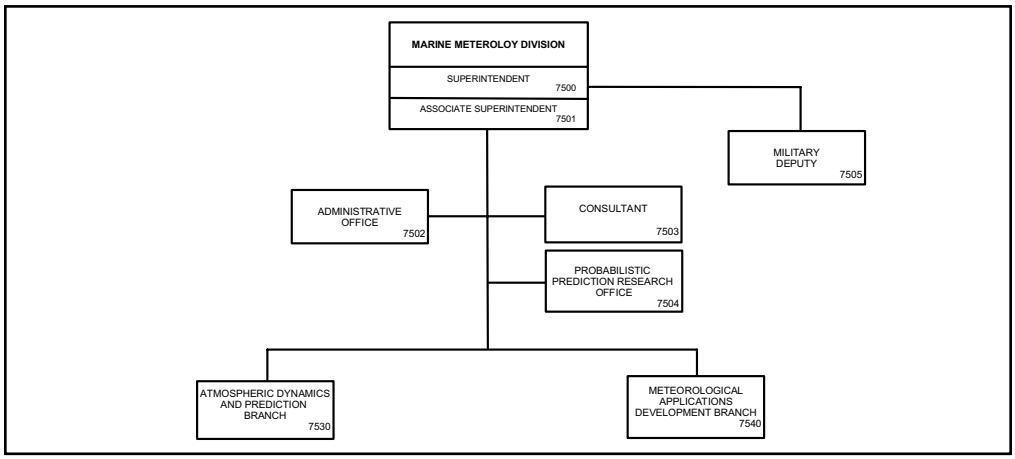
Atmospheric Physics
- Air-sea interaction
- Cloud microphysics
- Radiative transfer
- Aerosol characterization
- Tropical cyclone structure

Satellite Data/Imagery
- Automated cloud properties
- Sensor calibration/validation
- Satellite imagery analysis and enhancement
- Case study development
- Multisensor data fusion
- Tropical cyclone characterization
- Feature-tracked winds
- Dust/aerosols
- Rain rate and snow cover
- Nighttime environmental analysis
- NPOESS preparation
- Tactical meteorology

Decision Aids
- Refractivity/ducting
- Ceiling/visibility
- Fog/turbulence/icing
- Electromagnetic propagation
- Electro-optical propagation
- Tropical cyclones/consensus forecasts
- Quantifying uncertainty



NRL's Marine Meteorology Division is collaborating with Google™ to provide near-real time global cloud information for integration into the interactive Google Earth™ weather layers. The data is a blended combination of geostationary sensor data, augmented by low-earth orbiting satellite data over the poles and other missing regions to provide updated fields every hour at roughly 4-km resolution at the equator.



Basic Responsibilities

The Marine Meteorology Division conducts a basic and applied research and development program designed to improve the basic understanding of atmospheric processes that impact Fleet operations and to develop information systems that analyze, simulate, predict, and interpret the structure and behavior of these processes and their effect on naval weapons systems. Basic and applied research includes work in air-sea interaction, aerosol characterization, atmospheric turbulence, orographically forced flow, atmospheric predictability, targeted observations, advanced data assimilation, ensemble prediction, tropical dynamics, and atmospheric physics. Research and development ranges from development of atmospheric analysis/forecast systems and satellite data products to the development of tactical decision aids for operations support. Interdisciplinary research supports the development of coupled analysis/forecast systems, including components for ocean, wave, land surface, aerosol, chemistry, and middle atmosphere prediction. NRL-Monterey (NRL-MRY) is co-located with the Fleet Numerical Meteorology and Oceanography Center (FNMOC) and has developed and transitioned to FNMOC the data assimilation, global and mesoscale forecast models, and satellite applications products that form the backbone of the Navy's worldwide environmental forecasting capability. Specialties of the Division include numerical weather prediction, data assimilation, tropical cyclones, marine boundary layer processes, aerosols, rapid environmental assesssment, environmental decision aids, and satellite data analysis, interpretation, and application.

Personnel: 69 full-time civilian; 1 full-time military

Key Personnel

Title	Code
Superintendent, Marine Meteorology Division	7500
Associate Superintendent	7501
Administrative Officer	7502
Lead Scientist, Probabilistic Prediction Research Office	7504
Military Deputy	7505
Head, Atmospheric Dynamics and Prediction Branch	7530
Head, Meteorological Applications Development Branch	7540

Point of contact: Code 7500, (831) 656-4721; DSN 878-4721

Space Science Division

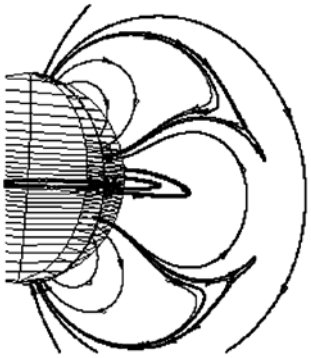
Code 7600
Research Activity Areas

Space Weather and Atmospheric Physics

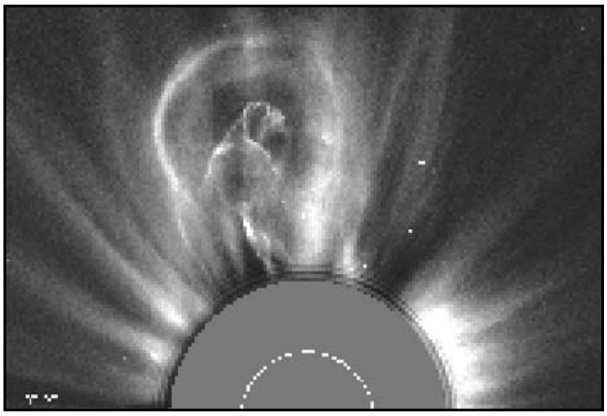
Remote sensing of the ionosphere and thermosphere
Middle atmospheric investigations
Global modeling
Upper atmospheric physics

Space Astronomy

X-ray observation, analysis, and theory of space astronomical sources
Gamma-ray astrophysics, solar-flare gamma rays, and space cosmic ray particle environment
Gamma-ray Large Area Space Telescope (GLAST) NASA space mission



The Solar Theory Group has simulated the overall magnetic field in the Sun's corona and demonstrated the formation of coronal mass ejections following field reconnection



A coronal mass ejection emerging from the Sun as a large, spherical region of hot gas and entrapped magnetic field

Solar Physics

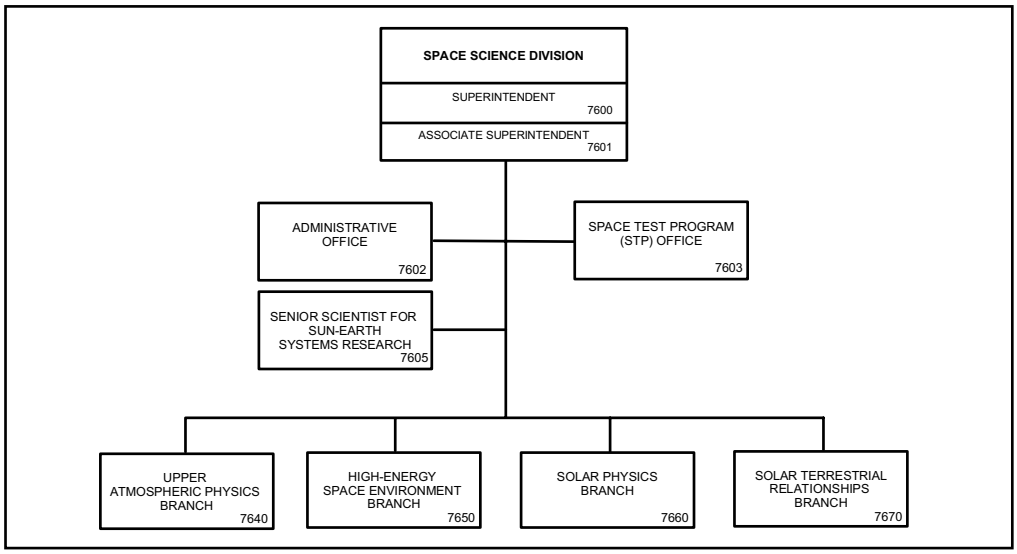
Solar ultraviolet and visible light spectroscopy and photometry from rockets, satellites, and the Space Shuttle
Extreme-ultraviolet Imaging Spectrometer (EIS)
Sun Earth Connection Coronal and Heliospheric Investigation (SECCHI) for the Stereo Mission

Solar-Terrestrial Relationships

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

SHIMMER being readied for flight on the Space Shuttle. SHIMMER, a Michelson Interferometer, will map the globe in atmospheric trace compounds.

A Black Brant rocket being readied for flight at the White Sands Missile Range. The rocket is carrying NRL's advanced spectrometer for studying stars at soft X-ray wavelengths.



Basic Responsibilities

The Space Science Division conducts a broad-spectrum RDT&E program in solar-terrestrial physics, astrophysics, upper/middle atmospheric science, and astronomy. Instruments to be flown on satellites, sounding rockets and balloons, and ground-based facilities and mathematical models are conceived and developed. Researchers apply these and other capabilities to the study of the atmospheres of the Sun and Earth, including solar activity and its effects on the Earth's ionosphere, upper atmosphere, and middle atmosphere; laboratory astrophysics; and the unique physics and properties of celestial sources. The science is important to orbital tracking, radio communications, and navigation that affect the operation of ships and aircraft, utilitization of the near-space and space environment of the Earth, and the fundamental understanding of natural radiation and geophysical phenomena.

Personnel: 75 full-time civilian; 1 full-time military

Key Personnel

Title	Code
Superintendent, Space Sciences Division	7600
Associate Superintendent	7601
Administrative Officer	7602
Space Test Program Officer, Kirtland AFB, NM	7603
Head, Sun-Earth Systems Research	7605
Head, Upper Atmospheric Physics Branch	7640
Head, High-Energy Space Environment Branch	7650
Head, Solar Physics Branch	7660
Head, Solar Terrestrial Relationships Branch	7670

Point of contact: Code 7602, (202) 767-3248

Naval Center for Space Technology

NAVAL CENTER FOR SPACE TECHNOLOGY

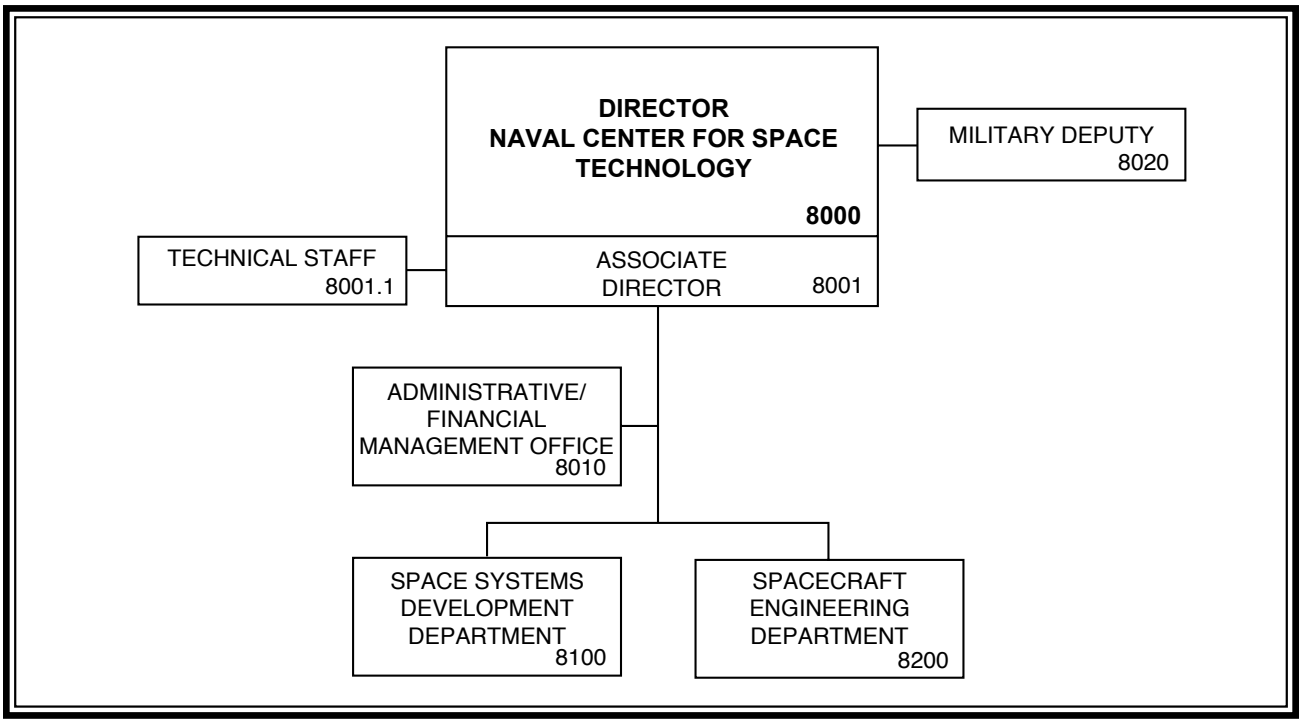
Code 8000

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 performs basic and applied research through advanced development in all areas of interest to the Navy space program. The Center develops 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, performing system engineering to allocate design requirements to subsystems, and performing 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** was born in New York City. 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 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 more than 92 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 DoD Distinguished Civilian Service Award, the Presidential Meritorious Executive Award, the Presidential Distinguished Rank 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, the Rotary National Stellar Award, the NRL Lifetime Achievement Award, and in May 1999, Mr. Wilhelm received the American Institute of Aeronautics and Astronautics (AIAA) Goddard Astronautics 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 was elected to the National Academy of Engineering. Mr. Wilhelm is also the first recipient of the R.L. Easton Award for excellence in engineering.



Key Personnel

Title	Code
Director, Naval Center for Space Technology	8000
Associate Director	8001
Technical Staff	8001
Head, Administrative/Financial Management Office	8010
Military Deputy	8020
Superintendent, Space Systems Development Department	8100
Superintendent, Spacecraft Engineering Department	8200

Point of contact: Code 8010, (202) 767-6550

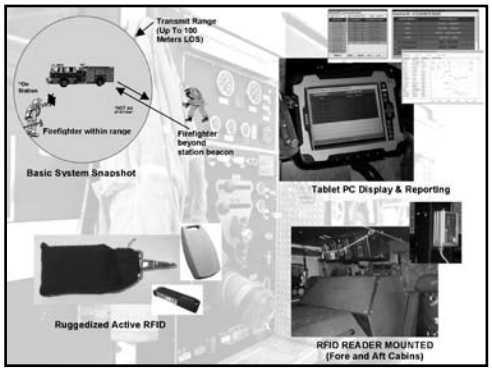
Space Systems Development Department

Code 8100
Research Activity Areas

Advanced Space/Airborne/Ground Systems Technologies
Space systems architectures and requirements
Advanced payloads and optical communications
Controllers, processors, signal processing, and VLSI data management systems and equipment
Embedded algorithms and software
Satellite laser ranging

Astrodynamics
Precision orbit estimation
Onboard autonomous navigation
Onboard orbit propagation
GPS space navigation
Satellite coverage and mission analysis
Geolocation systems
Orbit dynamics
Interplanetary navigation

Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
Communications theory and systems
Satellite ground station engineering and implementation
Transportable and fixed ground antenna systems
High-speed fixed and mobile ground data collection, processing, and dissemination systems
Tactical communication systems



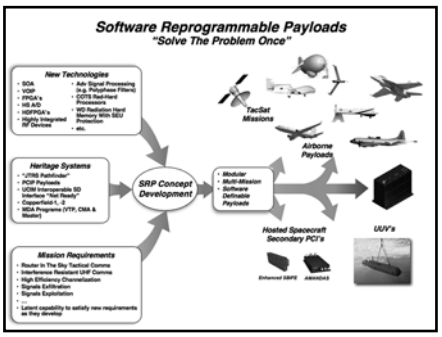
NRL's Naval Center for Space Technology (NCST) is beginning final phases of a program to wirelessly identify and report firefighter identities and locations for the Fire Department of New York City (FDNY). This program is applying Active Radio Frequency Identification (Active-RFID) technologies to answer the questions: "Which firefighters got on the apparatus to respond to an incident?" and "Which firefighters are at the incident?" RFID tags programmed with unique identifiers are affixed to firefighter "bunker gear" coats to facilitate automated identification activities. Future efforts could include embedding other information such as badge number and health-related information including blood types and medical histories. The tags have communication ranges up to 100 meters (line of sight).

Space and Airborne Payload Development
Space and airborne system payload concept definition, design, and implementation including hardware and software
Detailed electrical/electronic design of electronic and electromechanical payload and systems and components
Design and verification of real-time embedded multiprocessor software
Payload antenna systems
Space and airborne payload fabrication, test, and integration
Launch and on-orbit payload support

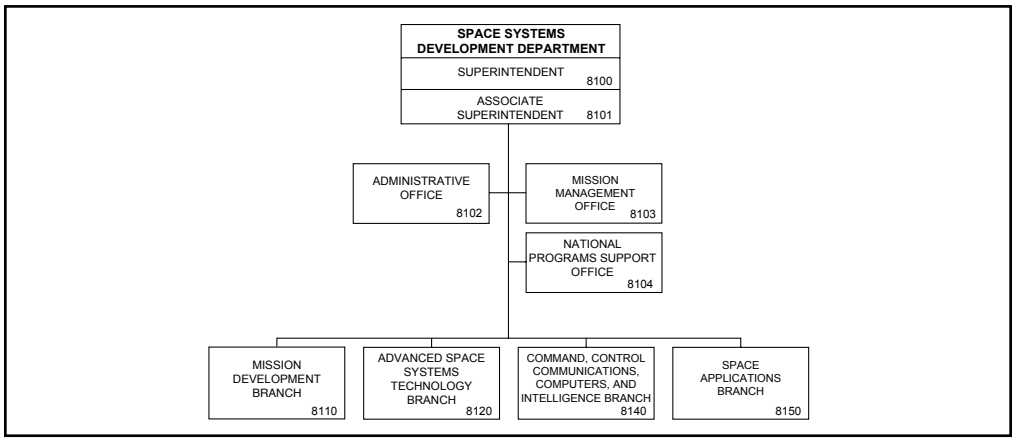
Laser Communications Research
Ship-to-ship laser communications
Space-to-ground laser communications
Satellite laser ranging for precise orbit determination

Space and Airborne 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
Precision tracking of orbiting objects from space/ground
National and International standards for timekeeping/Universal Coordinated Time/UTC (NRL)



NRL's Space Systems Development Department has been an innovator in software reconfigurable payload design for thirty years. NRL's work began with tactical radio terminals and basic spacecraft transceiver systems, continued through the JCIT tactical radio, continuing on to NTM (National Technical Means) hardware and software. Most recently, the Copperfield-2 system (on aircraft, TACSAT-1, and TACSAT-2) continues to validate the model for programmability by implementing new features rapidly using Software Reprogrammable Payloads (SRP) technology.



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 Command, Control, Communications, Computers, and Intelligence, Surveillance, and Reconnaissance hardware and software solutions to space, airborne, and ground applications 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, airborne, and ground system. These development responsibilities extend across the entire space/airborne/ground spectrum of hardware, software, and advanced technologies, including digital processing and control, analog systems, power, communications, payload command and telemetry, radio frequency, optical, payload, and electromechanical systems, as well as systems engineering.

Personnel: 128 full-time civilian; 1 part-time civilian; 18 student civilian; 1 intermittent civilian

Key Personnel

Title	Code
Superintendent, Space Systems Development Department	8100
Associate Superintendent	8101
Administrative Officer	8102
Head, Mission Management Office	8103
Head, National Programs Support Office	8104
Head, Mission Development Branch	8110
Head, Advanced Space Systems Technology Branch	8120
Head, Command, Control, Communications, Computers, and Intelligence Branch	8140
Head, Space Applications Branch	8150

Point of contact: Code 8102, (202) 767-0432

Spacecraft Engineering Department

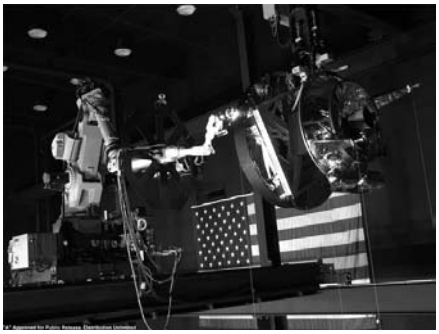
Code 8200
Research Activity Areas

Design, Test, and Processing
Design, fabrication, and testing of spacecraft and hardware
Preliminary and detailed design, fabrication, testing, and integration onto launch vehicle
Systems engineering for new spacecraft proposals
Start-to-finish responsibility for NCST spacecraft mechanical systems

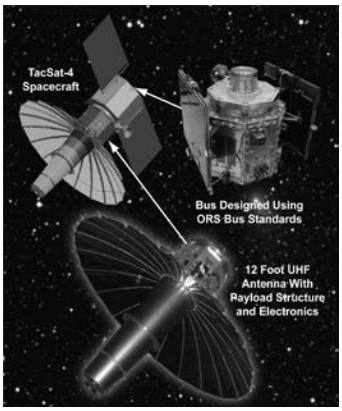
Space Mechanical Systems Development
Research and development in spacecraft technology
Conceptual design trade studies
Integrated engineering design and analysis
Structural and thermal design and analysis
Development and transition of prototype hardware
Development and integration of experimental pay loads
Mission integration and development

Control Systems
Attitude determination and control systems
Precision pointing
Optical line-of-sight stabilization
Propulsion systems
Precision cleaning and component testing
Propellent and pressurization systems
Hydraulic and pneumatics control
Test systems and services
Analytical design and mission planning
Navigation, tracking, and orbit dynamics
Expert systems
Flight operations support
Computer simulation
Computer animation
Robotics systems engineering
Proximity operations
Autonomous servicing
Autonomous inspection
End effector design
Compliance control
Trajectory planning
Machine vision
Fault detection, isolation, and recovery

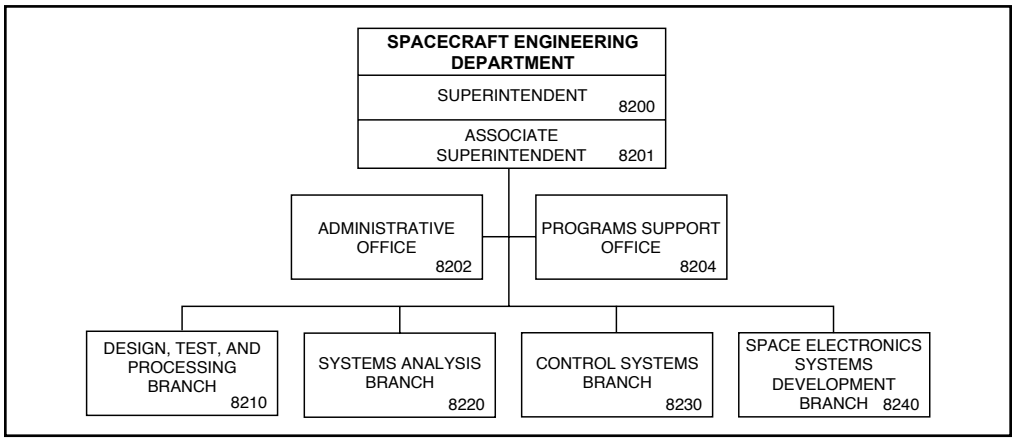
Space Electronic Systems Development
Space system concept definition, design, and implementation including hardware and software
Detailed electrical/electronic design of electronic and electromechanical systems and components
Implementation of real-time flight software and embedded command, control, and telemetry software
Design and verification of real-time embedded multiprocessor software
Spacecraft antenna systems
Space systems fabrication, test, and integration
Launch and on-orbit support
Space test systems and electronic launch support equipment
Space TT&C and control systems
Space communication systems



The Space Robotics Laboratory employs two six-degree-of-freedom robotic manipulators to perform realistic orbital and attitude motion simulations for proximity operations of spacecraft. This facility enables hardware-in the-loop testing of machine vision systems, capture mechanisms and autonomous guidance, navigation, and control algorithms. The resulting technologies will benefit future DoD space missions involving autonomous rendezvous and capture.



TacSat-4 is a Navy-led joint mission to provide operationally relevant capabilities and enable Operationally Responsive Space (ORS). TacSat-4 provides 10 ultra high frequency channels that can be used for any combination of communications, data exfiltration, or Blue Force tracking. Notably, TacSat-4 provides communications on-the-move with legacy radios and provides a wideband "MOUS-like" channel for early testing. The unique orbit augments geosynchronous communications by allowing near-global, but not continuous, coverage including the high latitudes. TacSat-4 also advances ORS development areas including spacecraft bus standards, long dwell orbits, dynamic tasking, and net-centric operations. TacSat-4 spacecraft will be completed in Fall 2008 for launch in Fall 2009.



Basic Responsibilities

The Spacecraft Engineering Department (SED) is the focal point for the Navy's capability to design and build spacecraft. Activities range from concept and feasibility planning to on-orbit IOC for NRL's space systems.

The SED provides spacecraft bus expertise for the Navy and maintains an active in-house capability to develop satellites; manages Navy space programs through engineering support and technical direction; in concert with the Space Systems Development Department, designs, assembles and tests spacecraft and space experiments, including all aspects of space, launch, and ground support; analyzes and designs structures, mechanisms, and a variety of control systems, including attitude, propulsion, reaction, and thermal; integrates satellite designs, launch vehicles, and satellite-to-boost stages; functions as a prototype laboratory to ensure that designs can be transferred to industry and incorporated into subsequent satellite hardware builds; and consults with the Navy Program Office on technical issues involving spacecraft architecture, acquisition, and operation.

Personnel: 109 full-time civilian; 1 part-time civilian; 12 student civilian; 1 intermittent civilian

Key Personnel

Title	Code
Superintendent, Spacecraft Engineering Department	8200
Associate Superintendent	8201
Administrative Officer	8202
Head, Programs Support Office	8204
Head, Design, Test, and Processing Branch	8210
Head, Space Mechanical Systems Development Branch	8220
Head, Control Systems Branch	8230
Head, Space Electronics Systems Development Branch	8240

Point of contact: Code 8202, 767-6412

Technical Output, Fiscal, and Personnel Information

Technical Output

Publications, Presentations, and Patents

The Navy continues to be a pioneer in science and engineering 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 2006 and 2007 presented below represent the output of NRL facilities in Washington, DC; Bay St. Louis, Mississippi; and Monterey, California.

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 (CRADAs) 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 2006

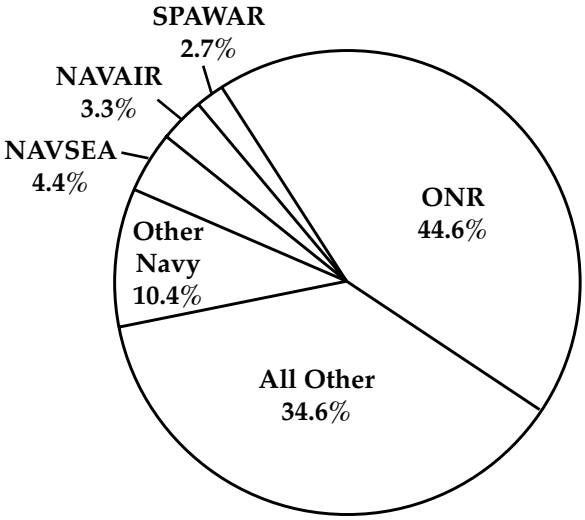
Type of Contribution	Unclassified	Classified	Total
Articles in periodicals, chapters in books, and papers in published proceedings	1,047	0	1,047*
Oral Presentations	1331		1331
NRL Formal Reports	11	3	14
NRL Memorandum Reports	71	3	74
Books	0	0	0
Patents granted			54
Statutory Invention Registrations (SIRs)			0

Calendar Year 2007

Type of Contribution	Unclassified	Classified	Total
Articles in periodicals, chapters in books, and papers in published proceedings	1,030	0	1,030*
Oral Presentations	1316		1316
NRL Formal Reports	12	2	14
NRL Memorandum Reports	56	3	59
Books	0	0	0
Patents granted			56
Statutory Invention Registrations (SIRs)	1		1

* This is a provisional total based on information available to the Ruth H. Hooker Research Library on August 1, 2008. Total includes non-refereed SPIE (International Society for Optical Engineering) and MRS (Materials Research Society) proceedings.

FY 2007 Sources of New Funds (Actual)

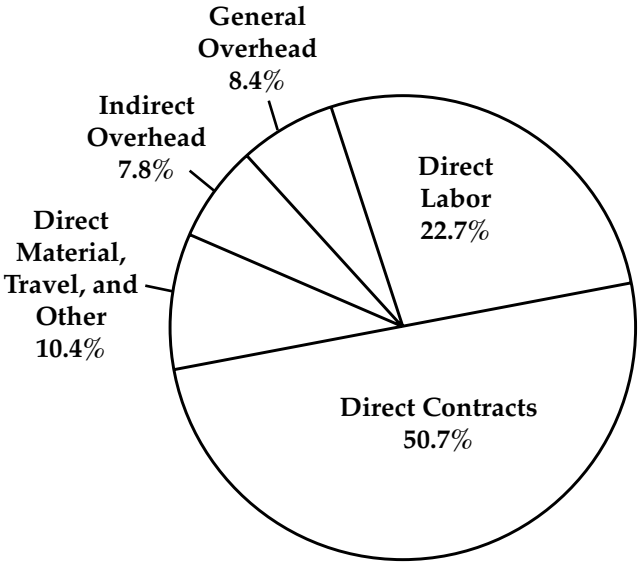


FY 2007

Source of Funds (%)

FY 2007	Reimbursable	$M Direct Cite	Total
Office of Naval Research (ONR)	305.3	110.2	415.5
Naval Sea Systems Command (NAVSEA)	22.9	17.9	40.8
Space and Naval Warfare Systems Command (SPAWAR)	20.6	4.9	25.5
Naval Air Systems Command (NAVAIR)	4.5	25.8	30.3
Other Navy	66.9	30.3	97.1
All Other	221.6	100.5	322.1
Total Funds	641.8	289.6	931.4

FY 2007 Uses of Funds

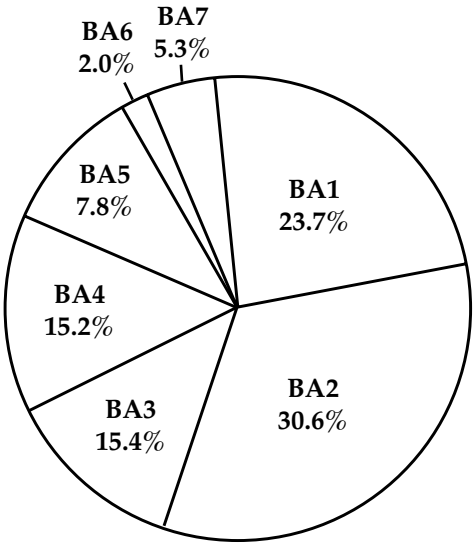


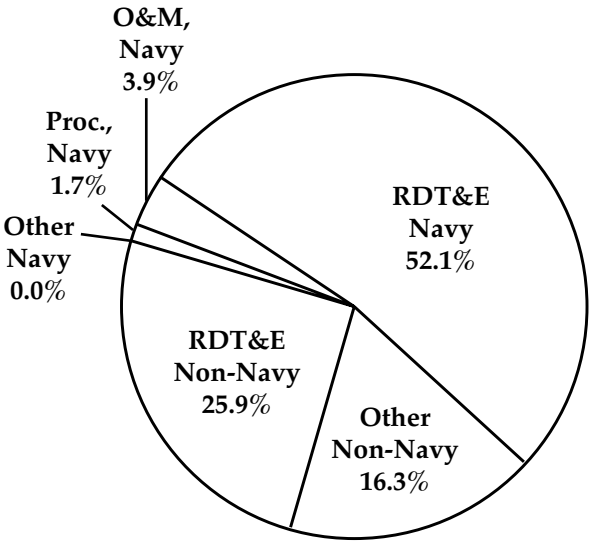
FY 2007
Distribution of Funds (%)

	$M
Direct Labor	204.2
General Overhead	75.9
Indirect Overhead	69.9
Direct Material, Travel, and Other	93.9
Direct Contracts	457.0
Total Costs*	901.0

*Costs based on CFO statements; direct contracts include costs for reimbursably-funded contracts and obligations for direct cite-funded contracts.

FY 2007 Total New Funds by Category





FY 2007

Distribution of RDT&E, Navy (%) ($485.3)	Distribution of Total (%) ($931.4)		
		$M	
Category	**Navy**	**Non-Navy**	**Total**
BA1 Basic Research	115.0	4.5	119.6
BA2 Applied Research	148.7	29.2	177.8
BA3 Advanced Technology Development	74.9	118.0	192.9
BA4 Advanced Component Development Prototypes	73.7	17.5	91.2
BA5 System Development and Demonstration	37.7	3.9	41.6
BA6 RDT&E Management Support	9.8	52.2	61.9
BA7 Operational System Development	25.5	16.3	41.8
Subtotal RDT&E	485.3	241.6	726.9
Operations and Maintenance	36.6	16.3	52.9
Procurement	16.0	42.9	58.9
Other	0.0	92.7	92.7
Total New Funds	537.9	393.4	931.4

Personnel Information*

Civilian On-Board

Full-Time, Permanent (FTP)	
Graded	2,136
Ungraded	94
Total	2,230
Temporary, Part-Time, Intermittent (TPTI)	
TPTI	250
Total Civilian	2,480

FTP Breakdown	
Scientific/Engineering Professional	1,419
Scientific/Engineering Technical	93
Administrative Specialist/Professional	340
Administrative Support	249
Senior Executive Service	19
Scientific or Professional	16
General Schedule	0
Total	2,136

Military On-Board

Officers	38
Enlisted	79
Total Military On-Board	117
(Military Allowance)	109

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

	2002	2003	2004	2005	2006	2007
Research divisions	6.1	6.0	6.8	7.2	9.5	8.5
Nonresearch areas	8.9	8.2	8.2	8.5	11.0	13.7
Entire Laboratory	6.6	6.4	6.5	7.4	9.7	9.6

Highest Academic Degrees Held by Civilian Permanent Employees

Bachelors	532
Masters	328
Doctorates	778

* All data is as of 30 September 2007 unless otherwise noted.

Professional Development

Professional Development

NRL has established programs for the professional and personal development of its employees so that 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

NRL employees participate in hundreds of individual training events throughout the year. Many of these are presented under the auspices of the Human Resources Office as in-house courses on diverse technical subjects, computer software, and management techniques.

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-level programs. Tuition for training is paid by NRL. The formal programs offered by NRL are described below.

Graduate Programs

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

• The **Edison Memorial Graduate Training Program** enables employees to pursue advanced studies in their fields at local universities. Participants in this program work 24 hours each workweek and pursue their studies during the other 16 hours. The criteria for eligibility include a minimum of one year of service at NRL, a bachelor's or master's degree in an appropriate field, and professional standing in keeping with the candidate's opportunities and experience.

• To be eligible for the **Select Graduate Training Program**, employees must have a college degree in an appropriate field and must have demonstrated ability and aptitude for advanced training. Students accepted in this program devote a full academic year to graduate study. While attending school, they receive one half of their salary; and NRL pays for tuition, books, and laboratory expenses.

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

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 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 performance through counseling to resolve problems such as family and work-related stress and relationship difficulties, and behavioral, emotional, and substance abuse problems that may adversely impact job performance. C/RS provides confidential assessments and short-term counseling, training workshops, and referrals to additional resources in the community. (Contact MSW, LGSW at (202) 767-6857, NRL Washington, DC; (228) 688-5726, NRL Stennis Space Center; 1-800-523-5668, NRL Monterey).

• The **NRL Women in Science and Engineering (WISE) Network** is an open-membership network of scientists and engineers who meet periodically to discuss issues of common interest, host speakers, and address and sponsor projects to benefit NRL's S&T community. The primary goals of the NRL WISE Network, a merger of the NRL Women's S&T Network and the NRL WISE Chapter, are to encourage and promote professional growth among NRL scientists and engineers. One of the most successful projects initiated and sponsored by this group is the Mentor Program, which was institutionalized to provide an environment for personal and professional growth at NRL. Another recent project focused on addressing issues concerning the quality of life for scientists and engineers at NRL.

The **NRL WISE Network** holds regular brown bag luncheon meetings open to all NRL female and male scientists and engineers, including contractors and postdoctoral associates. (Contact the NRL WISE Network secretary at (202) 404-4389; or the NRL WISE Network president at (202) 767-5697.)

• **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, with several hundred members, recognizes leadership research at NRL by presenting awards annually in pure and applied science to outstanding NRL staff members. This year the chapter has initiated a Young Investigator Award to be presented to an outstanding young NRL researcher. 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 (202) 404-8626.)

• 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 provides the policy and procedures for the program. (Contact the Employee Relations Branch at (202) 767-2957.)

• 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 (202) 767-3846.)

• Employees interested in developing effective self-expression, listening, thinking, and leadership potential are invited to join the Forum Club, a chapter of **Toastmasters International**. Members of this club possess diverse career backgrounds and talents and 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. (Forum Club: contact (202) 404-4670.)

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 Human Resources Office (HRO) at NRL offers to all employees **short courses** in a variety of program areas; Laboratory employees may attend these courses at nongovernment facilities as well. Interagency courses in management, personnel, finance, supervisory development, clerical skills, and other areas are also available.

Technology Base

• 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 (202) 767-2945.

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 disability. The EEO office's major functions include affirmative action in employment, discrimination complaint process, EEO training, advice and guidance to management on EEO policy, and the following special emphasis programs: the Federal Women's Program, the Hispanic Employment Program, the African American Employment Program, the Individuals with Disabilities Employment Program, the Asian American/Pacific Islander Employment Program, and the American Indian-Alaskan Native Employment Program.

The management and planning of diversity issues and the special emphasis programs are accomplished through the NRL Diversity Committee. The Diversity Committee serves as an advisory committee to the Commanding Officer and recomends policies, programs, and activities that encourage advancement and self-improvement for all employees. The committee educates NRL employees on diversity issues by sponsoring awareness programs and special workshops on quality of life issues pertaining to women, minorities, and persons with disabilities. They also aid in Community Outreach efforts. (Contact the EEO Office at (202) 767-2486).

In addition, the EEO Office handles the Federal Employment Opportunity Recruitment Program (FEORP). The FEORP is designed to establish, maintain, and update targeted recruitment programs to increase participation of minorities through innovative internal and external recruitment. Furthermore, it fosters relationships with minority and women's institutions and organizations.

Other Activities

• The **Community Outreach Program** fosters programs that benefit 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 African American History Month art and essay contests for local schools, student tours of NRL, and an annual holiday party for neighborhood children. Through this program NRL has 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 the **Amateur Radio Club** which is devoted to amateur and related radio communications and is open to licensed radio operators as well as others interested in radio. The wide spectrum of club activities range from vintage radio to satellite communications. A club station is available for use by all members. The club conducts annual nationally coordinated Field Day (simulated emergency) operations. The **Recreation Club** accommodates the varied interests of NRL's employees with its numerous facilities, such as a 25-yard, 6-lane indoor swimming pool; basketball and volleyball courts; a weight room; an exercise room; table tennis; a meeting room; hot tub and sauna.

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 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 the above programs, contact (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 state or local government or an educational institution to the federal government (or vice versa) to improve public services rendered by all levels of government.

Undergraduate and Graduate Student Programs

The student programs are tailored to 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, oceanography, meteorology, 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's 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 **Summer 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 Student Programs

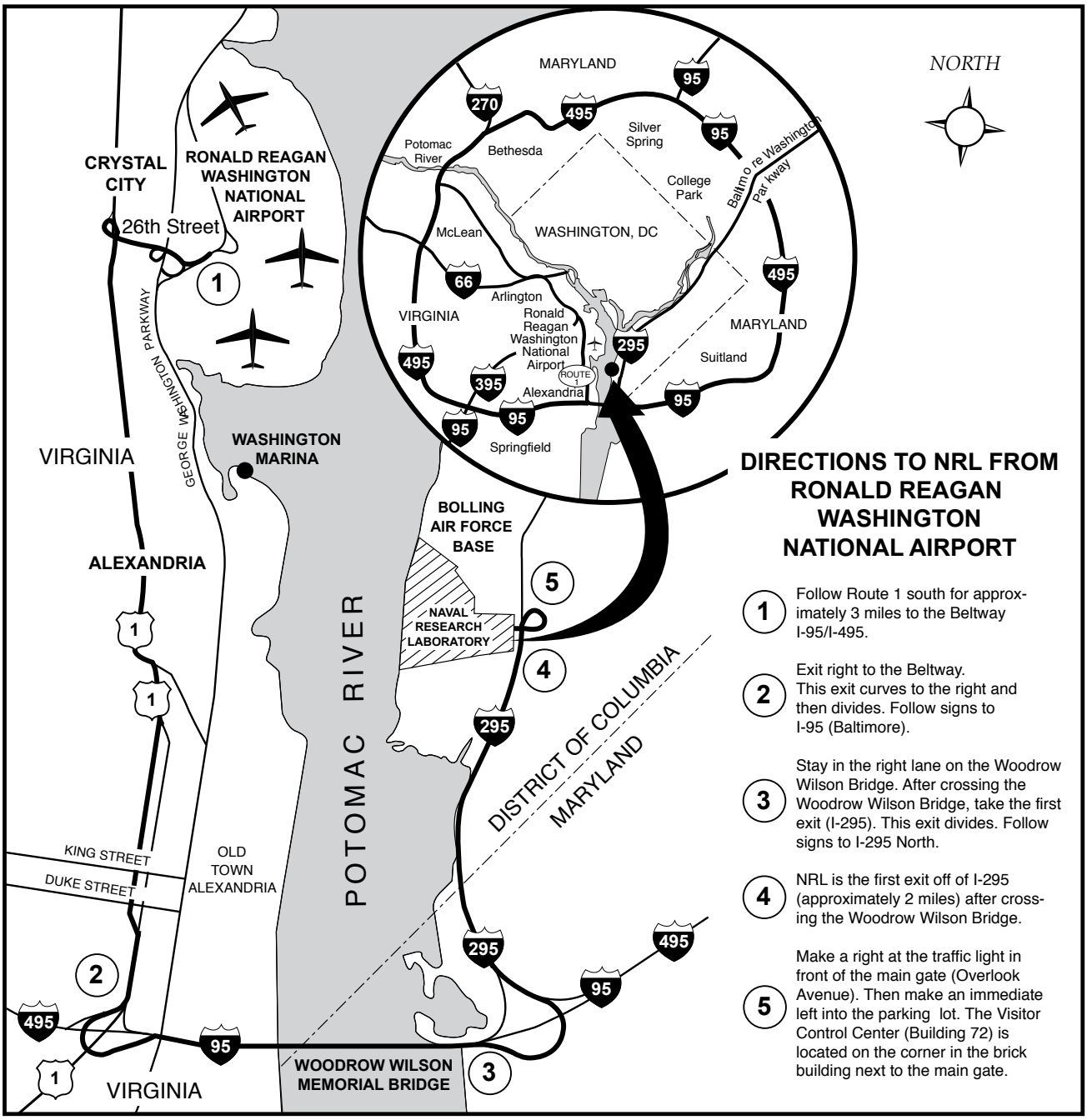
• The **DoD Science & Engineering Apprentice Program** (SEAP) employs high school juniors and seniors to serve for eight weeks as junior research associates. Under the direction of a mentor, students gain a better understanding of research, its challenges, and its opportunities through participation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

Prospective mentors desiring additional information on this program, please contact the Employee Relations Branch at (202) 767-2957.

Students desiring additional information on this program may call the American Society for Engineering Education Coordinator's Office at (202) 331-3509.

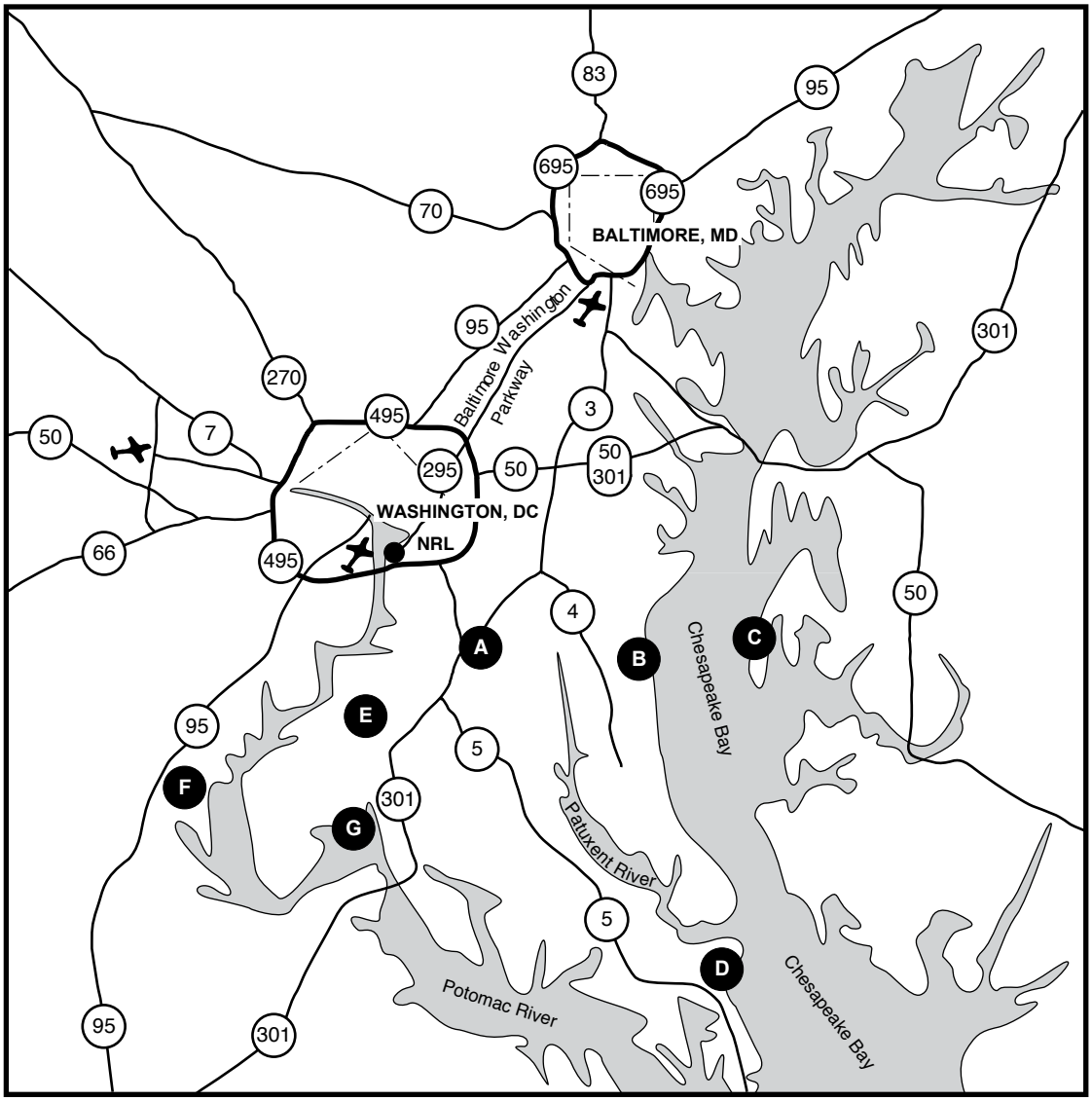
General Information

Naval Research Laboratory
(Washington, DC)



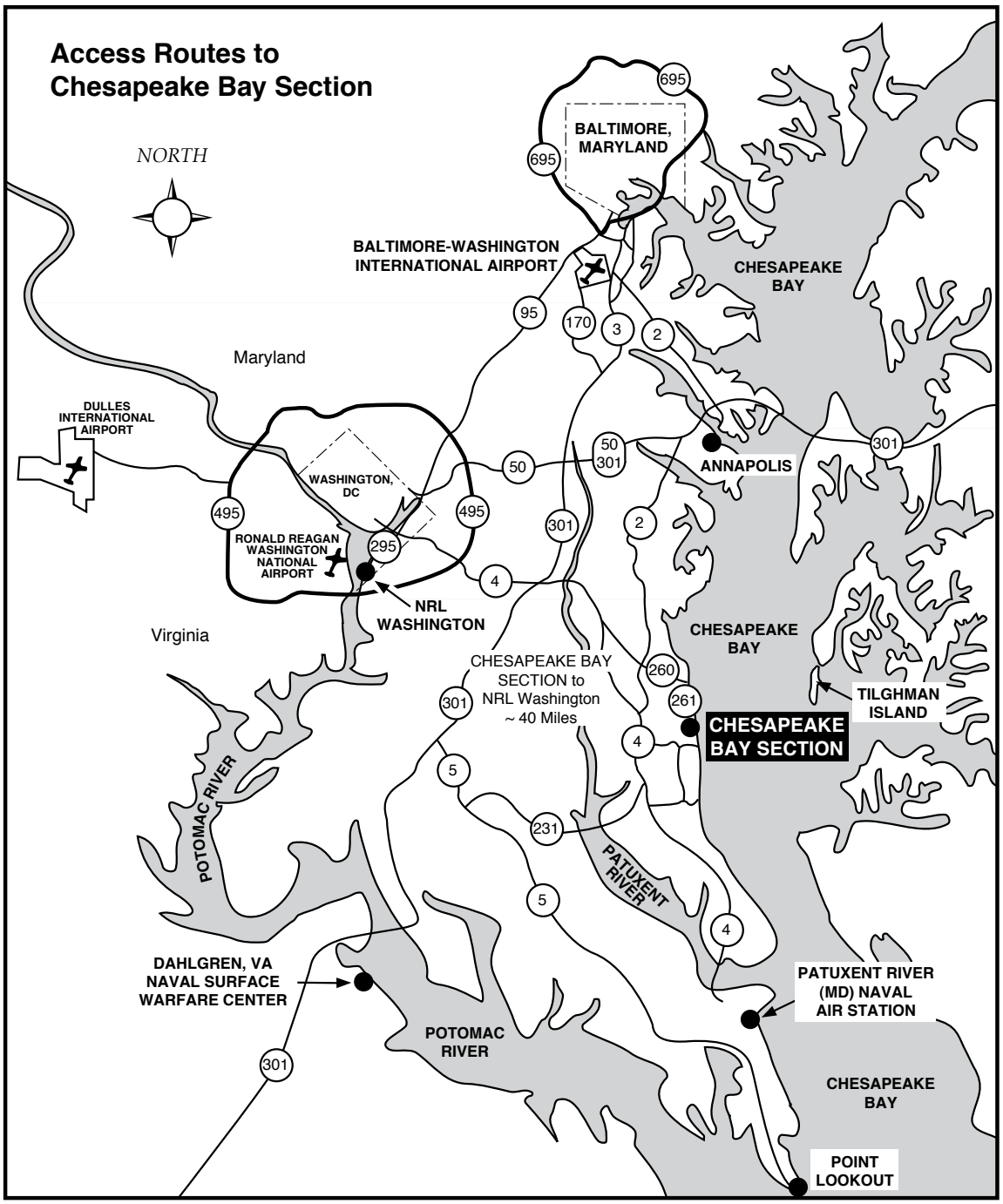
Naval Research Laboratory
4555 Overlook Avenue, SW
Washington, DC 20375-5320
(202) 767-3200 – DSN 297-3200

Location of Field Sites in the NRL Washington Area



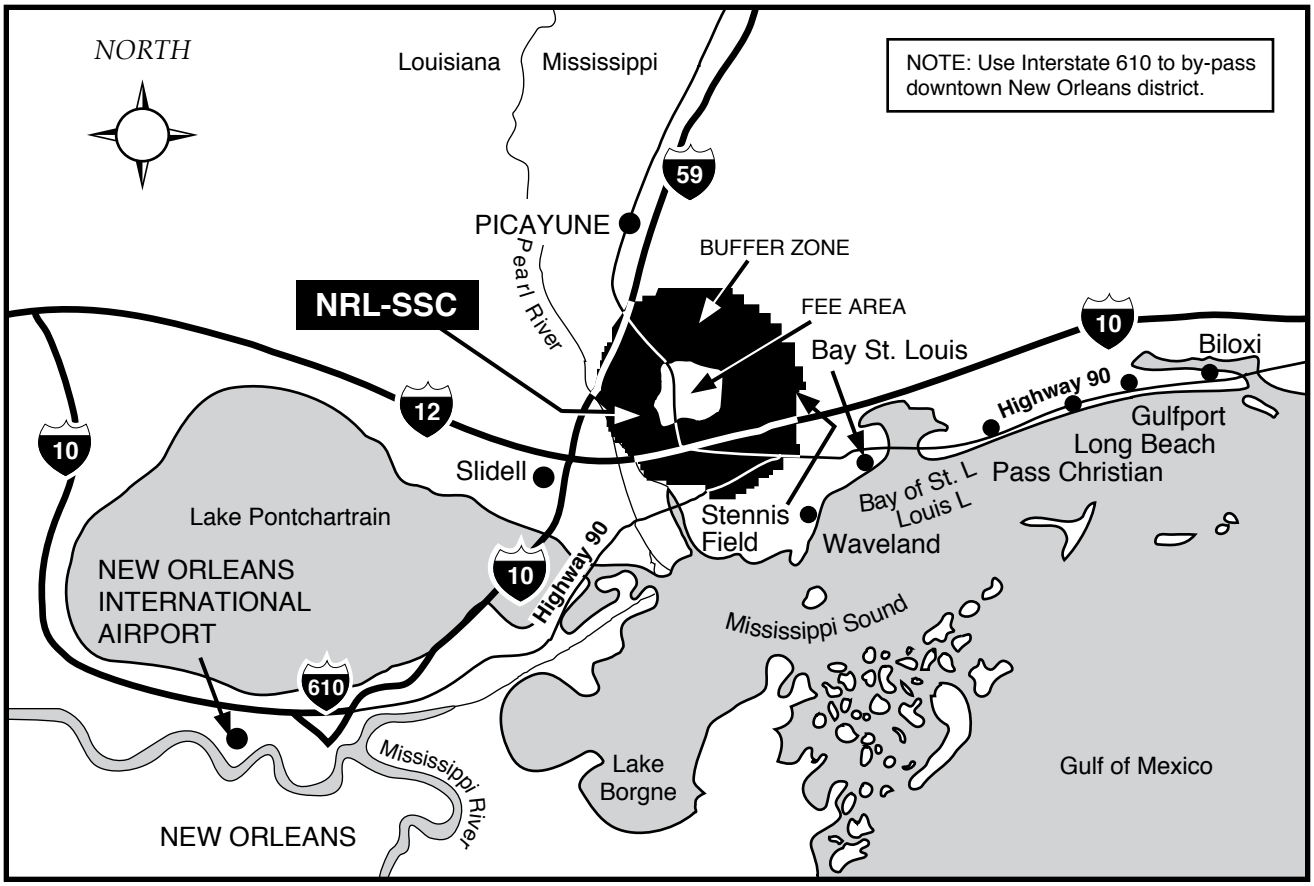
		Location	Approximate Mileage from NRL Washington	Cognizant Code
A	–	Brandywine, MD	28	3520
B	–	Chesapeake Bay Section, Chesapeake Beach, MD	40	3522
C	–	Tilghman Island, MD	110	3522
D	–	Patuxent River (MD) Naval Air Station	64	1600
E	–	Pomonkey, MD	20	8124
F	–	Midway Research Center, Quantico, VA	38	8140
G	–	Blossom Point, MD	40	8140

Chesapeake Bay Section
(Chesapeake Beach, Maryland)



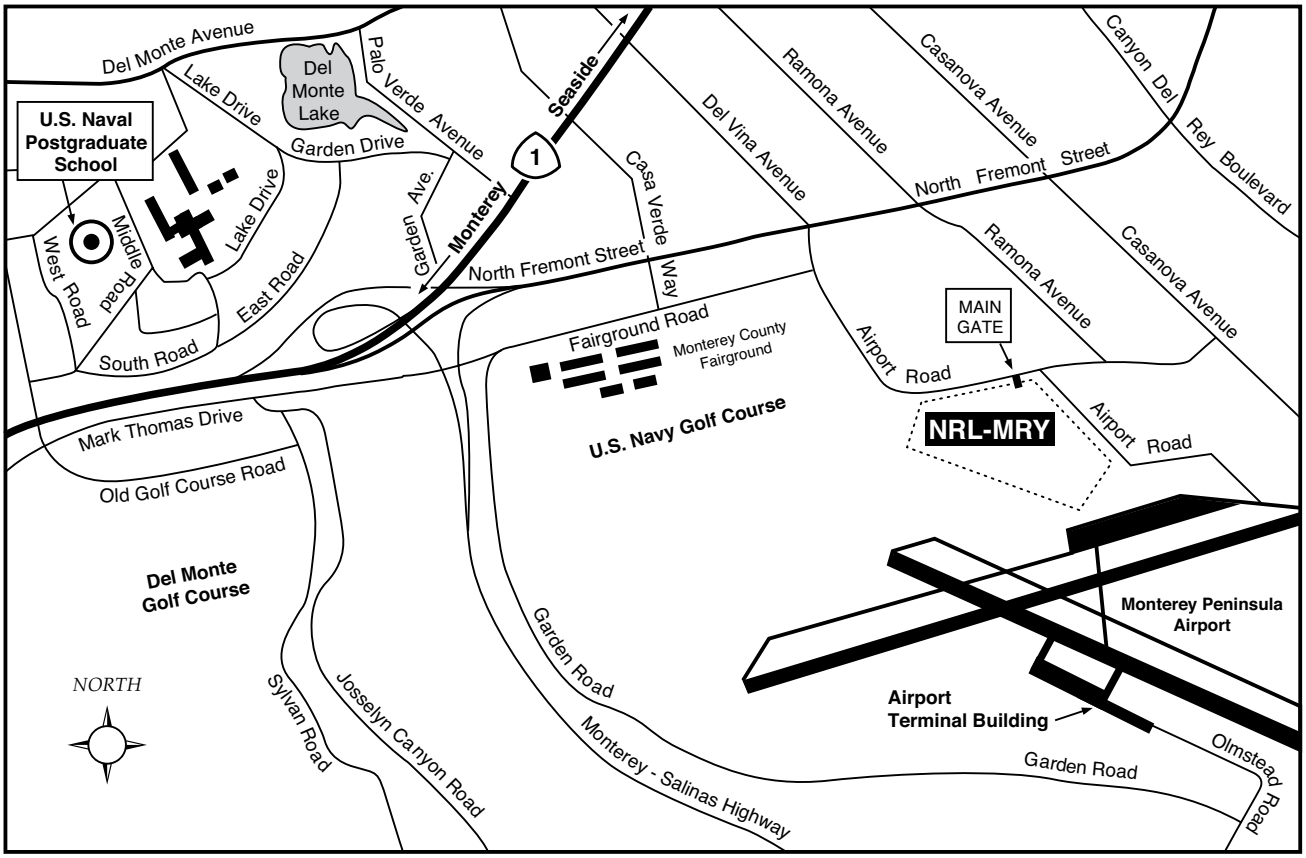
Naval Research Laboratory
Chesapeake Bay Section
5813 Bayside Road
Chesapeake Beach, MD 20732
(301) 257-4002

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



Naval Research Laboratory
John C. Stennis Space Center
Stennis Space Center, MS 39529-5004
(228) 688-3390

Naval Research Laboratory Monterey
(Monterey, California)



Naval Research Laboratory
Marine Meterology Division
7 Grace Hopper Avenue
Monterey, CA 93943-5502
(831) 656-4721

Key Personnel

DSN: NRL Washington 297- or 754-; NRL/SSC 828-; NRL/Monterey 878-; NRL FSD/Patuxent River 342-

Code		Telephone
	EXECUTIVE DIRECTORATE	
1000	Commanding Officer	(202) 767-3403
1000.1	Inspector Genera	(202) 767-3621
1001	Director of Research	(202) 767-3301
1001.1	Executive Assistant	(202) 767-2445
1001.2	Head, Strategic Workforce Planning	(202) 767-3421
1001.3	Executive Assistant for Technology Deployment	(202) 767-0851
1002	Chief Staff Officer	(202) 767-3621
1003	Administrative Resources Manager	(202) 767-3091
1004	Head, Office of Technology Transfer	(202) 767-3083
1006	Head, Office of Program Administration and Policy Development	(202) 767-1312
1008	Head, Office of Counsel	(202) 767-2244
1030	Head, Public Affairs Branch	(202) 767-2541
1100	Director, Institute for Nanoscience	(202) 767-1803
1200	Head, Command Support Division	(202) 767-3621
1220	Head, Security Branch	(202) 767-0793
1400	Head, Military Support Division	(202) 767-2273
1600	Commanding Officer, Scientific Development Squadron One (PAX River NAS)	(301) 342-3751
1800	Director, Human Resources Office	(202) 767-8322
1830	Deputy Equal Employment Opportunity Officer	(202) 767-8390
3005	Deputy for Small Business	(202) 767-0666
3540	Head, Safety Branch	(202) 767-2232
	BUSINESS OPERATIONS DIRECTORATE	
3000	Associate Director of Research for Business Operations	(202) 767-2371
3005	Deputy for Small Business	(202) 767-0666
3030	Head, Management Information Systems Office	(202) 404-3659
3200	Head, Contracting Division	(202) 767-5227
3300	Head, Financial Management Division	(202) 767-3405
3400	Head, Supply and Information Services Division	(202) 767-3446
3500	Director, Research and Development Services Division	(202) 404-4054
	SYSTEMS DIRECTORATE	
5000	Associate Director of Research for Systems	(202) 767-3525
5007	Consultant	(202) 404-4004
5300	Superintendent, Radar Division	(202) 404-2700
5500	Superintendent, Information Technology Division/NRL Chief Information Officer*	(202) 767-2903
5600	Superintendent, Optical Sciences Division	(202) 767-3171
5700	Superintendent, Tactical Electronic Warfare Division	(202) 767-6278
	MATERIALS SCIENCE AND COMPONENT TECHNOLOGY DIRECTORATE	
6000	Associate Director of Research for Materials Science and Component Technology	(202) 767-3566
6030	Chief Scientist, Laboratory for Structure of Matter	(202) 767-2665
6100	Superintendent, Chemistry Division	(202) 767-3026
6300	Superintendent, Materials Science and Technology Division	(202) 767-2926
6400	Chief Scientist and Director, Laboratory for Computational Physics and Fluid Dynamics	(202) 767-3055
6700	Superintendent, Plasma Physics Division	(202) 767-2723
6800	Superintendent, Electronics Science and Technology Division	(202) 767-3693
6900	Director, Center for Bio/Molecular Science and Engineering	(202) 404-6000

*Additional duty

DSN: NRL Washington 297- or 754-; NRL/SSC 828-; NRL/Monterey 878-; NRL FSD/Patuxent River 342-

Code		Telephone

OCEAN AND ATMOSPHERIC SCIENCE AND TECHNOLOGY DIRECTORATE

7000	Associate Director of Research for Ocean and Atmospheric Science and Technology	(202) 404-8690
7005	Military Deputy	(202) 404-8162
7030	Head, Office of Research Support Services	(228) 688-4650
7100	Superintendent, Acoustics Division	(202) 767-3482
7105	Naval Science (Acoustics) Research Coordinator	(202) 767-3643
7200	Superintendent, Remote Sensing Division	(202) 404-7877
7205	Military Deputy	(202) 767-4132
7300	Superintendent, Oceanography Division	(228) 688-4670
7305	Military Deputy	(228) 688-4013
7400	Superintendent, Marine Geosciences Division	(228) 688-4650
7405	Military Deputy	(228) 688-5404
7500	Superintendent, Marine Meteorology Division	(831) 656-4721
7505	Military Deputy	(831) 656-4782
7600	Superintendent, Space Science Division	(202) 767-1312
7603	Space Test Program Officer	(505) 846-8704

NAVAL CENTER FOR SPACE TECHNOLOGY

8000	Director, Naval Center for Space Technology	(202) 767-6547
8100	Superintendent, Space Systems Development Department	(202) 767-0410
8200	Superintendent, Spacecraft Engineering Department	(202) 767-6411

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Paul C. Stewart, Captain, USN
Commanding Officer

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