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NAVAL UNDERWATER SYSTEMS CENTER NEWPORT RI
NAVAL UNDERWATER SYSTEMS CENTER BRIEF. (U)

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naval underwater systems center brief

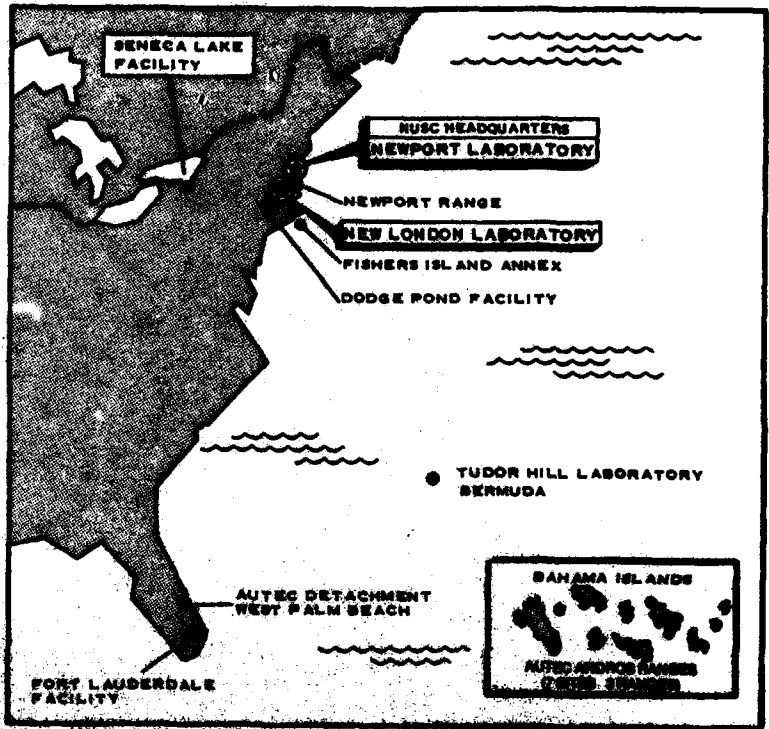
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NAVAL UNDERWATER SYSTEMS CENTER
 Technical Document 5740A

The *Naval Underwater Systems Center Brief*, part of the NUSC Technical Document series, is issued annually to provide a current statement of program work and accomplishments, as well as financial and other statistics, for the year covered.

Prepared by the Technical Information Division (Code 453),
 Naval Underwater Systems Center, Newport, Rhode Island 02840.



Reviewed and Approved:
 10 May 1979

A. S. Mohrman
 A. S. Mohrman
 Captain, U.S. Navy
 Commanding Officer

FOR THE COMMANDER
NAVY
SECRET

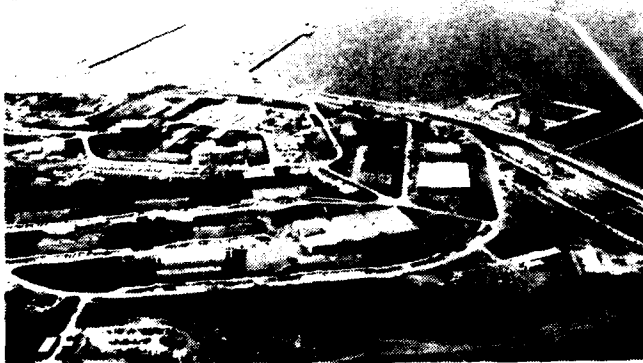
FACILITIES

The Naval Underwater Systems Center comprises two major laboratory complexes — in Newport, Rhode Island, and in New London, Connecticut, with major detachments in Bermuda, West Palm Beach, and the Bahamas. Specific data on these components appear on the pages which follow.

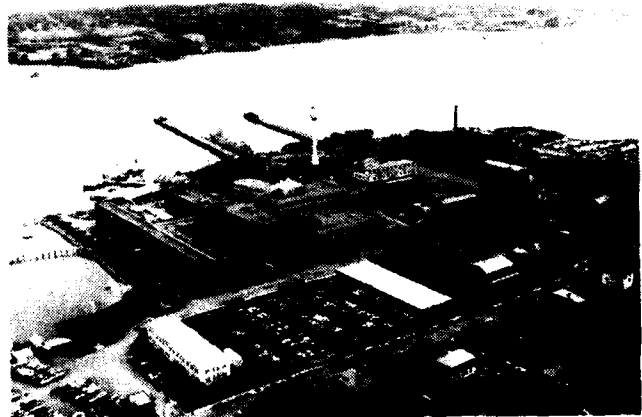
Buildings	
Laboratories	1,070,263 square feet
Administrative	122,785 square feet
Other	866,590 square feet

Acquisition Costs	
Real Property (Classes I & II)	\$70,010,000
Equipment (Classes III & IV)	\$46,355,000

NUSC NEWPORT, RHODE ISLAND



NUSC NEW LONDON, CONNECTICUT



NEWPORT laboratory

This major laboratory complex, and site of NUSC headquarters, is located on Narragansett Bay one mile north of Newport, Rhode Island. Comprising 165 acres of Government-owned land, with adjacent range and docking facilities, it provides major or unique facilities that include:

COMBAT CONTROL SYSTEMS LABORATORIES

Land-Based Evaluation Facility: dedicated to development of Trident submarine command and control system.

Trident Central Compile Facility: for development (compiling and executing) of command and control computer programs for Trident submarines.

Systems Certification and Integration Facility: for integrating and certifying the operational readiness of SSN 688 class submarine command and control systems.

Combat Control System Improvement Program Facility: for improving operational and tactical capabilities of attack submarine combat systems, also being used to develop Fire Control System Mk 117.

Fire Control Systems Evaluation Laboratory: for developing and evaluating modifications to submarine in-service fire control systems.

WEAPON LAUNCHING LABORATORIES

Submarine Torpedo Tube Launching Facility: for torpedo firing tests at simulated depths to study improved or developed launcher techniques and to analyze in-service discrepancies.

Surface Vessel Torpedo Tube Laboratory Test Facility: for analysis, development and evaluation of launching hardware and techniques.

ASROC Launcher Laboratory: for analysis of in-service casualties and development and evaluation of equipment changes and alterations.

WEAPONS LABORATORIES

Torpedo Mk 48 Facility: duplicates a Fleet IMA facility; used to support in-service engineering task to validate Mk 48 weapon Engineering Change Proposals.

Missile Engineering Laboratory: provides RDT&E and Fleet readiness support for submarine-launched (non-strategic) missiles.

Experimental Vehicles Laboratory: for integrating advanced weapon and target technology into operational research test vehicles.

Tactical Software Evaluation System Facility: used (1) to conduct software verification and validation during development, and (2) to conduct integration, verification and certification during in service.

Other technology/subsystem laboratories: for RDT&E and operational support of weapon components and subsystems (propulsion, guidance and control, homing systems, hydrodynamics, acoustics, materials, and magnetics laboratories).

NEWPORT UNDERWATER RANGES

This complex, in Narragansett Bay and Rhode Island Sound, is an underwater tracking and sound measurement installation that supports RDT&E in underwater weapons, launchers, exploders, and related equipment and weapon components. The complex consists of three ranges, a firing pier, torpedo launching and retriever ships, a range tracking center, and a range tracking station. A stillwater basin (200 x 400 ft) provides for small boat mooring and range support.

RANGE DEVELOPMENT LABORATORIES

These research and development facilities are used for design, fabrication, test and evaluation of underwater tracking and acoustic measurement range systems, devices, and analysis techniques.

FLEET EXERCISE RECONSTRUCTION FACILITY

This data handling and analysis facility supports Fleet ASW exercises; it provides computerized reconstruction techniques for transforming raw Fleet exercise data into geographic plots and specialized printouts.

NAVY TYPE II STANDARDS LABORATORY

One of seven Type II standards laboratories operated by the U. S. Navy, this laboratory maintains basic measurement standards which serve as references for the working standards at all Navy calibration facilities and DOD contractors. This Newport facility provides this service in the New England area and in the states of New York and New Jersey.

COMPUTER CENTER

The Newport Laboratory's central, multi-purpose data processing facility is a time-sharing multi-programming Control Data Corporation CDC 3300 computer system. It serves statistical, analytical, and simulation studies; information systems applications; and business programs. Its PDP 11/70 operating under UNIX is used as the ARPANET access, and the laboratory is fully interfaced with the large computers at its sister establishments of the David W. Taylor Naval Ship Research and Development Center, Naval Ocean Systems Center, Naval Weapons Center, Naval Research Laboratory, and Naval Surface Weapons Center.

NEW LONDON laboratory

This major laboratory complex in New London, Connecticut, is located on the Thames River one mile north of Long Island Sound and three miles south of the Groton Submarine Base. Comprising 27 acres of Government-owned land, the complex has a 850-foot-long pier that will accommodate ships of 36 foot draft. Major or unique facilities include:

SONAR LABORATORIES:

Transducer Measurements Laboratory: for measuring, testing, and developing transducers for sonar systems.

Scale Model Array and Dome Facility: for rapid, inexpensive acoustic evaluations of sonar spherical arrays and domes for submarine sonar systems.

Thinline Array Facility: for assembly of acoustic and vibration isolation modules.

Transducer Model Shop: for fabricating, and testing prototype transducers.

SSN Sonar Simulation Laboratory: for laboratory testing and evaluation of sonar systems to reduce at-sea testing.

Acoustic Turbulent Water-Flow Tunnel: for investigating turbulence-induced self-noise of hydrophones.

Computer Displays Laboratory: for evaluating sonar display formats to achieve optimum information displays.

Sonar System Computer Facility: a multi-computer facility for developing new digital computer techniques in sonar systems, special signal processing circuits, and new displays.

Software Development Facility: for developing software applications programs to support modernization of current surface ship sonar systems.

Land-Based Integration Test Site: a test facility for integrating new surface ship equipment and software routines in baseline surface ship sonar systems, both in a stand-alone and integrated configuration.

SONAR RDT&E FIELD ACTIVITIES

Seneca Lake Facility: provides relatively deep water, fixed geometry, and heavy load-handling capability for test and evaluation of large sonar systems and low-frequency transducers.

Dodge Pond Facility: for in-water measurement, calibration, and testing of transducers, arrays, and sonar systems.

Central Test and Evaluation Activity (CTEA), Ft. Lauderdale, Florida: managed by NUSC, this facility is used principally for staging and conducting at-sea T&E of all Navy towed sonar arrays.

OCEAN SCIENCE FACILITIES

Oceanographic Laboratory: for analyzing a wide variety of oceanographic data in the physical, biological, geological, and chemical aspects of oceanography.

Digital Computer Facility: a sea-going digital computer system that can be used ashore or installed on a ship for real-time acquisition and processing of underwater acoustic data.

COMMUNICATIONS/NAVIGATION FACILITIES

Submarine Antenna Test Facility: a field facility on Fishers Island for development and test of submarine mast-mounted and floating wire antennas and integrated communication systems.

Antenna Radiation Pattern Recording Range: for determining antenna radiation characteristics for evaluating and developing submarine antenna systems.

Periscope R&D Test Facilities: for horizontal and vertical attitude periscope R&D and configuration control work.

FISHERS ISLAND RANGES

This test complex consists of the Submarine Antenna Test Facility, Optical Range, Submarine Radio Test Facility, Acoustic Range, a FORACS (Fleet operational readiness accuracy check site), and the on-shore facilities of the BIFI Shallow-water Acoustic Range, located between Block Island and Fishers Island.

COMPUTER CENTER

The New London Laboratory's central data processing facility is a UNIVAC 1108 computer system. It is a resource for systems modeling and analysis of oceanographic data. NALCON connection to all major Navy laboratories is provided via the PDP 11/40.

Scientific Data Analysis Facility: an automated computer facility for editing, reducing, and analyzing large quantities of raw analog data, which now includes two VAX 11/780's and a PDP 11/34 for improved processing of scientific data.

Acoustic Data Analysis Facility: a "walk-in" facility for quick-look processing and analysis of analog data collected on R&D programs.

Instrumentation Development Facility: for research, systems analysis, design, and engineering on instrumentation systems for data acquisition, transmission, storage, and processing.

MAJOR DETACHMENTS

AUTEC ANDROS RANGES, ANDROS ISLAND, BAHAMAS

AUTEC, the Atlantic Undersea Test and Evaluation Center, is a complex of three underwater measurement ranges located in the Tongue of the Ocean (TOTO), off Andros Island, Bahamas. The combination of facilities makes it possible to conduct tests and evaluation of total ASW combat systems. Major facilities include:

WEAPONS RANGE

The weapons range is the only developmental T&E and operational T&E underwater tracking range for ASW system assessments having the required size, operating depth, and accuracy. It occupies an area in the TOTO 5 miles wide, 35 miles long, and 7,000 feet deep. It is instrumented for three-dimensional tracking of test vehicles above, on, and below the water.

ACOUSTICS RANGE

The acoustics range is the only permanent noise-measuring facility on the East Coast, and the only such facility that is part of an ASW T&E facility. Occupying a 5- by 15-mile area near the center of the TOTO, this range is used to detect, record, and analyze hydroacoustic noise generated by surface ships and subsmersibles operating in at-sea conditions.

FORACS

The FORACS (Fleet operational readiness accuracy check site) is unique in that it permits alignment of ASW sensors to be performed at an ASW T&E facility. Occupying a 5- by 5-mile area of the TOTO directly offshore from the main base, the FORACS is used to measure the accuracy of ASW and navigation sensors installed on surface ships, submarines, and helicopters of the operational Fleet.

MAIN BASE

The main base on Andros Island is the center for all on-range operations and the administrative and operational center for the range. The command control building houses the range control, data acquisition, and data processing equipment for all three ranges. The range support shop provides all on-site service facilities normally required by range users.

RANGE CRAFT

Air and marine craft include range ship IX-306, the major torpedo launch platform (with both surface and submerged launching capability); a 100-foot torpedo recovery craft; a UHIN helicopter and two SH-3G helicopters (for torpedo and torpedo-target recovery); and a Fairchild FH227E Cargonaut airplane for regularly scheduled passenger and cargo transport between the ranges and West Palm Beach, Florida.

AUTEC DETACHMENT, WEST PALM BEACH, FLORIDA

The AUTEC Detachment at West Palm Beach, Florida, provides logistic support for the Andros Ranges. The facility is located at Palm Beach International Airport.

TUDOR HILL LABORATORY, BERMUDA

Located on Tudor Hill, Bermuda, with an auxiliary site at High Point Cay, this laboratory houses a NUSC detachment. The work of the laboratory is devoted principally to acoustic research programs. Its facilities are available to any group with requisite clearances and supporting funds.

The Tudor Hill Laboratory is extensively outfitted with analog and digital data acquisition, processing and analysis equipment. The Laboratory is also the terminal for a number of underwater acoustic installations varying in depth from 700 m to 13000 m and covering a broad frequency range. A research ship is part of the Tudor Hill Laboratory complex, permitting at-sea support for the programs being carried out in the Bermuda area.

PROGRAM WORK

INTEGRATED SYSTEMS. Involvement in the conceptual design phase of new submarine combat systems to meet FY 1980 needs. Technical direction agent for development of a federated combat system for the late 1980s and beyond. (These programs draw upon Centerwide resources.)

COMBAT CONTROL. Development of improved techniques and advanced system concepts for submarine combat systems. Development, operation, and maintenance of large scale computer facilities for use in combat control system technology programs for SSNs. Development of Tomahawk, Harpoon, and Torpedo Mk 48 fire control systems and integration of these into the Mk 113 and Mk 117 fire control systems. Exploratory and advanced development and systems engineering of next-generation submarine combat control systems. Design and development of integrated computer architecture. Testing, integration, and certification of the Trident CCS. System integration and certification of the SSN 688 class CCS. Principal development activity for the Mk 117 and Mk 118 fire control systems. Operational systems development for the Mk 113 fire control system. Life cycle support for submarine combat systems.

WEAPON SYSTEMS. Candidate TDA for the ASW standoff weapon. Life-cycle support, management, and improvement for all submarine-launched weapons. Full responsibility for the Torpedo Mk 48. Research and development efforts in torpedo subsystem technologies: propulsion; guidance and control; transducer arrays; hydrodynamics; structures. Block manager for undersea warfare programs: weapon silencing, hydrodynamics, and structures; propulsion and power sources; improved performance undersea vehicles. Research, development, and Fleet support of ASW targets. Research and development for advanced lightweight torpedo program elements: propulsion; targets. Integration and support of missiles for submarine missions: SUBROC; Harpoon; Tomahawk.

LAUNCHERS. Research, development, and support for submarine and surface ship torpedo tubes. Design and development of helicopter-borne systems for the launching and recovery of exercise weapons and targets. Design and development of torpedo ejection systems. Design and development of weapon loading and handling systems. Life-cycle support of surface ship ASW missile launchers.

SONARS. Technical development and integration of all major submarine sonar systems (lead laboratory for AN/BQQ-5, AN/BQQ-6, SADS, RAPLOC,

ISPE, STASS). Acoustic communications systems development (lead laboratory for IACS). Principal development activity for the FBM sonar operational trainer and lead laboratory for the BQQ-5 and -6 trainers. Towed sonar array technology and systems development, including lead laboratory for towed array exploratory development and small-diameter array advanced development. Development of operational guidelines and operating doctrine for submarine sonar systems. Development of advanced acoustic warfare systems. Development of improvements to major surface ship sonars. Collection of environmental data to provide in-situ mode prediction and assessment for major sonar systems. Upgrade of a major variable depth sonar system. Systems engineering support to LAMPS. Integration of ASW combat system. Measurement and analysis of surface ship noise. Study of sonar dome rubber windows. Target detection, localization, classification, and tracking improvements. Life-cycle logistic support for major sonar systems. Development of systems to exploit reliable acoustic paths. Underwater acoustic studies in shallow and deep water. Ocean emplantment engineering, oceanographic measurements, and data analysis.

SUBMARINE ELECTROMAGNETICS. Programs of applied research, system analysis, development, testing, and evaluation leading to improved submarine EM communications, encompassing EMC techniques and satellites, antennas, navigation, surveillance, periscopes, and electronic warfare systems.

UNDERSEA RANGES. Management, operation, and development of AUTEC range facilities. Development of fixed and mobile undersea ranges for tracking, acoustic measurement, sonar calibration, and target strength measurement. Technical direction and conduct of WSAT, submarine COT/INSURV, and other platform evaluation programs. Advisor to DoD, Navy commands, and foreign governments on underwater range technology. Management and operation of East Coast FORACS and mobile tracking ranges.

ADDITIONAL FLEET SUPPORT. Fleet exercise support, exercise reconstruction and analysis, Fleet advisory services and technical support. System accuracy and effectiveness studies for submarine and surface ship accuracy trials, and sonar certifications and groomings.

MAJOR ACCOMPLISHMENTS FY 1977-1978

INTEGRATED SYSTEMS. Participated in conceptual design phase of new submarine combat systems in support of CNO and NAVSEA sponsors. Supported SECNAV-chartered submarine alternative studies. NUSC assigned responsibility as technical direction agent for the development of a federated combat system for submarines of the late 1980s and beyond.

WEAPONS. Assumed full responsibility for in-service support and further development of the Torpedo Mk 48. A recent accomplishment under the follow-on test and evaluation (FOTE) program was certification of certain SSN 637 class submarines as targets; firings made on such target submarines substantially increase Fleet confidence in the weapon. NUSC was named lead laboratory for the Mk 48 major improvement initiative, designated ADCAP. Began work as candidate technical direction agent for the ASW standoff weapon program. Provided management and technical support to NAVSEA in preparation for ASW standoff weapon RFP. Expanded availability of Mk 30 mobile ASW target for Fleet training.

SUBMARINE SONARS. Successfully completed TECHEVAL for the AN/BQQ-5 sonar system. Evaluated operating guidelines for the AN/BQQ-5 during OPEVAL. Conducted AN/BQQ-5 low frequency array and production towed array sea trials. Delivered two shipboard AN/BQQ-6 systems to the land-based evaluation facility for testing. Integrated the AN/BQQ-6 with other subsystems of the command and control system. Established the concept of an integrated at-sea/on-shore SSBN sonar operational training (SOT) system involving three developmental programs: onboard trainer (AN/BQR-T4), on-shore operational trainer (the SOT), and training material and data feedback program (SOTAP). Assumed responsibilities as lead laboratory for the AN/BQR-T4, and as principal development agent for the SOT (the first unit of which has been built). Achieved significant progress in developing a lightweight, compliant-tube baffle for wide-aperture, passive ranging applications.

COMBAT CONTROL SYSTEMS. Technical direction agent for the Combat Control System Improvement Program (formerly SIAC Program). The new equipment for this program is being incorporated into a basic Mk 117 fire control system; OPEVAL was completed in August 1978. Production hardware for both the SSN 688 class (700 on) forward fit and the SSN 594/637 backfit is being delivered.

RANGES. Demonstrated concepts for a mobile tracking range and a mobile sonar calibration range. Established feasibility for a highly accurate submarine velocity or motion measurement system, a shallow water tracking

range concept, and a large area acoustic multilateration tracking concept. Achieved full scheduling and utilization of the AUTEK range facilities in support of Fleet and R&D ASW programs. Conceived and implemented a mutual services/mini-war program to address coordination, communication, and control problems in combined ASW operations involving air, surface, and submarine forces.

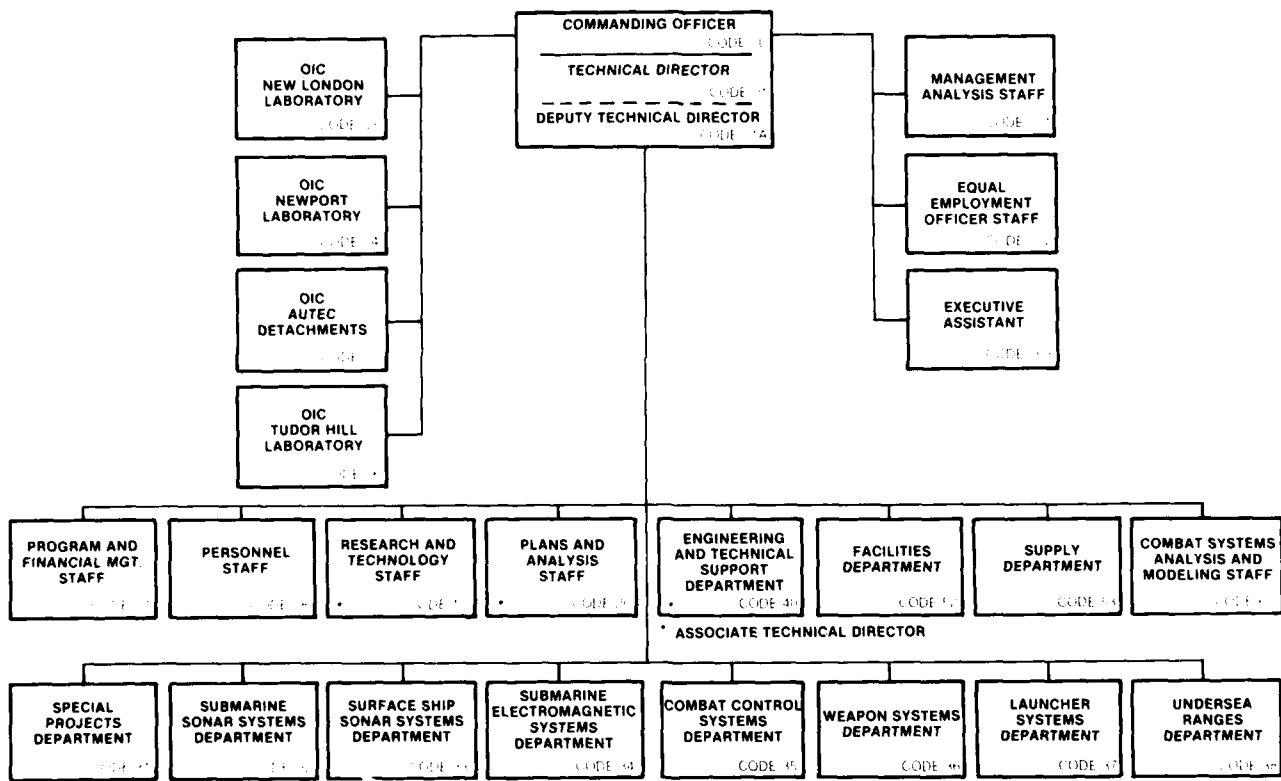
SURFACE SHIP SONARS. Began work as technical direction agent (TDA) for various elements of NAVSEA's advanced surface sonar program. Successfully completed TECHEVAL and OPEVAL of AN/SQS-53 passive equipment cabinet; developed and tested software for SIMAS sonar prediction/mode selection equipment; and conducted TECHEVAL and OPEVAL for the SIMAS equipment (all under the AN/SQS-53 sonar improvement program). Successfully tested (in the laboratory and at sea) advanced development models of the acoustic intercept receiver (AIR) and threat recognition processor (TRP). Assumed TDA responsibility for the sensor integration and display sharing (SIAD) program, and coordinated preparation of an NDCP for the ASW control system (both under the ASW combat system integration program). Completed design certification testing on the first production AN/SQR-18A sonar system. Completed DT-IV and OT-IV at-sea testing on the AN/SQR-18A, resulting in OPTEVFOR recommending approval for service use.

ADVANCED SUBMARINE WEAPON STOWAGE/LAUNCH. Initiated development of an integrated weapon loading, handling, stowage, and leveling system that increases weapon capacity aboard submarines without increasing their size, and which simplifies the weapon launch process.

ELF SYSTEMS. Successfully demonstrated a new submarine satellite communications concept developed at NUSC—an expendable buoy designed for launch by a submerged submarine via its standard signal ejector tube. This buoy system will provide the submarine force with a viable and effective communications capability. ELF receivers were deployed on two fast attack submarines in four Fleet exercises, with messages received by ELF while the ships were operating at speed and depth during the exercises. In addition, an ELF communications demonstration was conducted on an operational FBM.

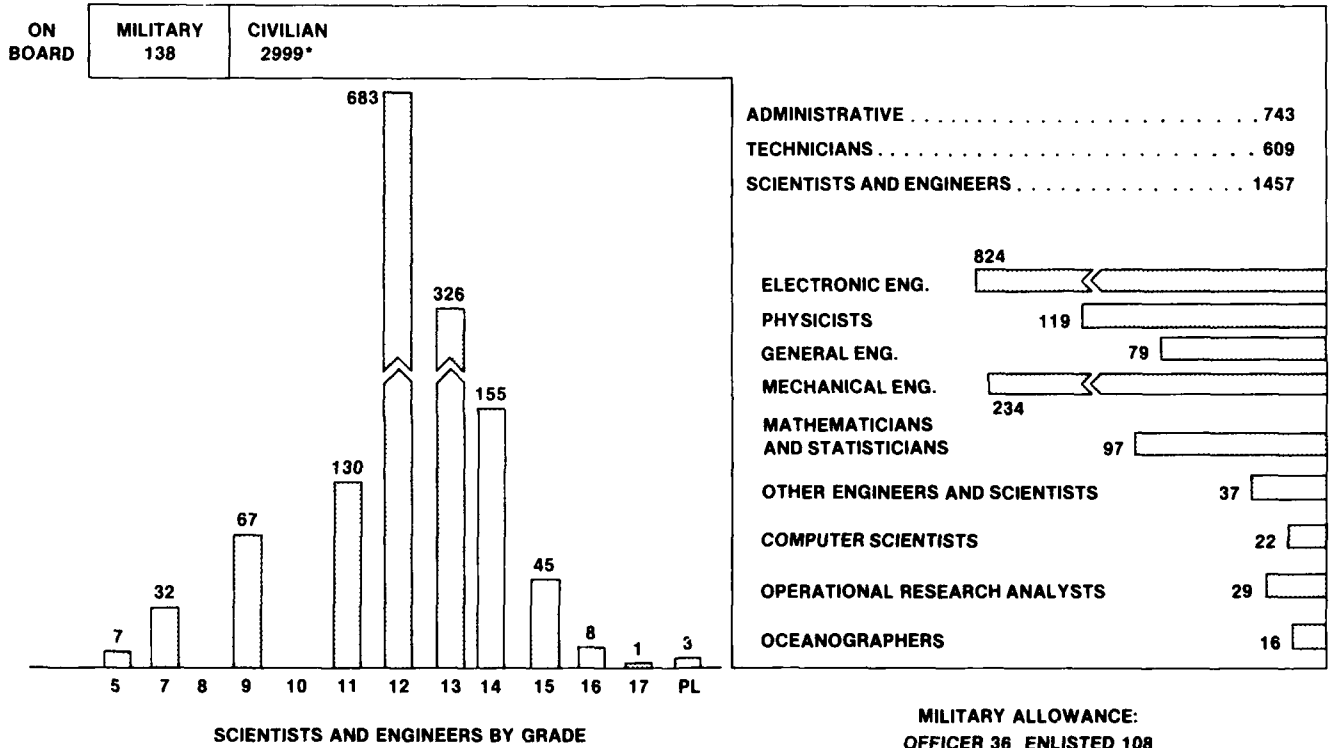
OCEAN FRONTS. Developed (and was named block manager for) a five-year multi-organization block program to study the effects of ocean fronts and eddies on transmission of underwater acoustic energy, and the resulting influence on tactical ASW sensor performance and ASW operations.

ORGANIZATION



PERSONNEL DATA

31 DECEMBER 1978



*Includes temporary, part time, intermittent (summer employees excluded)

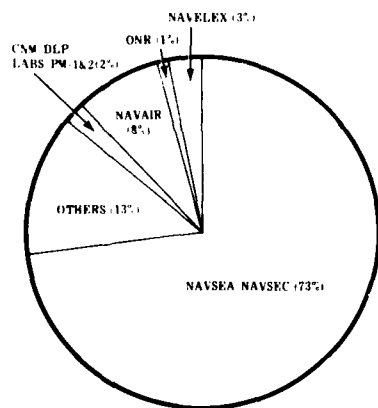
SOURCE OF FUNDS

\$ MILLIONS

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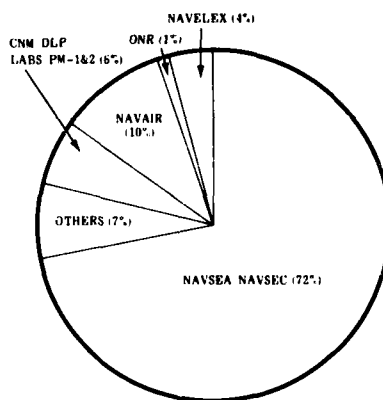
FY 1978

ACTUAL \$282.340



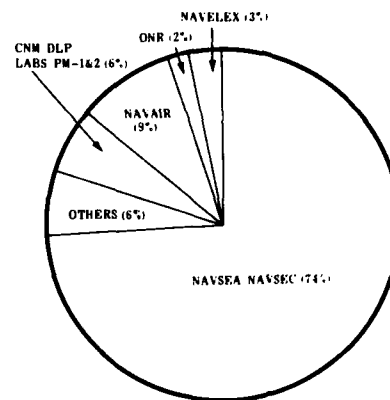
FY 1979

ESTIMATED \$317.341



FY 1980

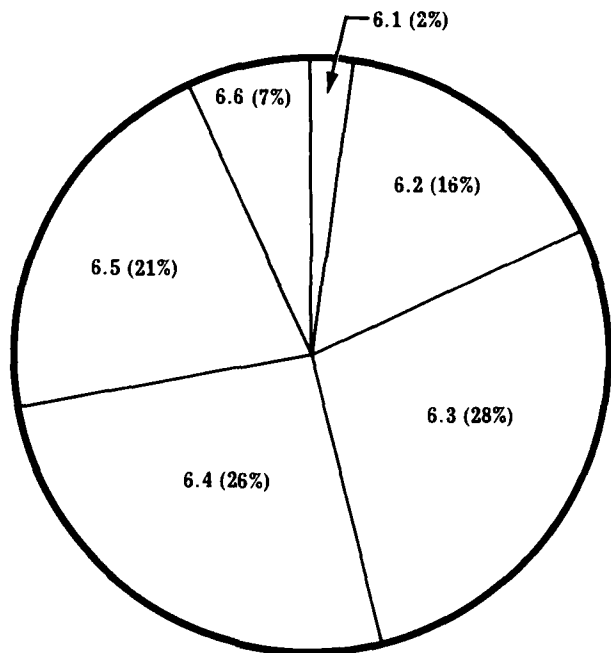
ESTIMATED \$330.678



RDT&E FUNDS BY CATEGORY

\$ MILLIONS
ESTIMATED FY 1979

NOR



6.1 RESEARCH	\$ 2.295
6.2 EXPLORATORY DEVELOPMENT	24.998
6.3 ADVANCED DEVELOPMENT	45.356
6.4 ENGINEERING DEVELOPMENT	40.891
6.5 MANAGEMENT & SUPPORT	32.602
6.6 OPERATIONAL SYSTEMS DEVELOPMENT	10.749

TOTAL RDT&E \$156.891

FUNDS BY TYPE

\$ MILLIONS

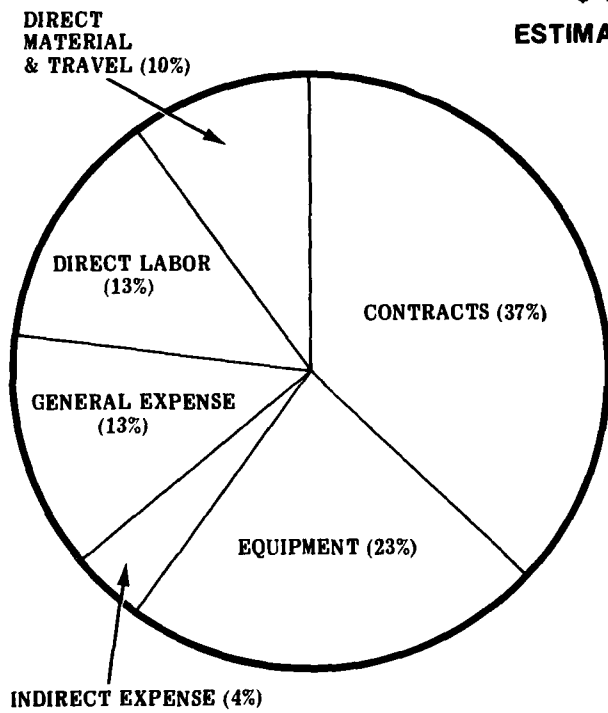
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	FY 1978		FY 1979		FY 1980	
	ACTUAL TOTAL \$	% OF	ESTIMATED TOTAL \$	% OF	ESTIMATED TOTAL \$	% OF
RDT&E,N						
6.1 RESEARCH	\$ 2.138	1%	\$ 2.295	1%	\$ 2.226	1%
6.2 EXPLORATORY DEVELOPMENT	20.887	7%	24.998	8%	23.951	7%
6.3 ADVANCED DEVELOPMENT	27.311	10%	45.356	14%	60.926	18%
6.4 ENGINEERING DEVELOPMENT	31.358	11%	40.891	13%	41.385	12%
6.5 MANAGEMENT & SUPPORT	21.700	8%	32.602	10%	35.050	11%
6.6 OPERATIONAL SYSTEMS DEVELOPMENT	12.122	4%	10.749	4%	9.419	3%
SUBTOTAL, RDT&E	\$ 115.516	41%	\$ 156.891	50%	\$ 172.957	52%
OMN (OPERATIONS AND MAINTENANCE, NAVY)	\$ 62.983	22%	\$ 86.021	27%	\$ 82.449	25%
OPN (OTHER PROCUREMENT, NAVY)	32.164	11%	25.758	8%	24.806	8%
SCN (SHIPBUILDING AND CONVERSION, NAVY)	25.414	9%	19.721	6%	22.782	7%
WPN (WEAPON PROCUREMENT, NAVY)	30.834	11%	19.540	6%	18.242	5%
NIF (NAVY INDUSTRIAL FUND)	7.487	3%	3.836	1%	4.267	1%
MISCELLANEOUS NON-RDT&E	7.942	3%	5.574	2%	5.175	2%
SUBTOTAL, NON-RDT&E	\$ 166.824	59%	\$ 160.450	50%	\$ 157.721	48%
GRAND TOTAL	\$ 282.340	100%	\$ 317.341	100%	\$ 330.678	100%

DISTRIBUTION OF FUNDS

\$ MILLIONS
ESTIMATED FY 1979

NOR



DIRECT LABOR	\$	41.104
DIRECT MATERIAL AND TRAVEL		30.509
CONTRACTS		116.394
EQUIPMENT		72.573
INDIRECT EXPENSE		14.680
GENERAL EXPENSE		42.081

TOTAL \$ 317.341

FUNCTIONS AND RESPONSIBILITIES

The Naval Underwater Systems Center shall conduct in-house research and shall establish and maintain primary in-house development, test, evaluation and in-service engineering support capability for the following Navy and Marine Corps products:

PRODUCT AREA / PRODUCT LINES

CNM PRODUCT AREA

NUSC PRODUCT LINE

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Acoustical search and surveillance systems/equipment 2. Acoustic countermeasures and decoys 3. Command and control 4. Communication systems/equipment 5. Fire control systems 6. Launchers 7. Navigation 8. Navy strategic systems 9. Torpedoes and torpedo countermeasures 10. Combat systems integration | <ol style="list-style-type: none"> a. Submarine sonars a. Submarine systems a. Submarine systems, with support of NOSC for devices, components and subsystems (DC&SS) a. Submarine acoustic systems b. Systems architect and integration for submarine communications (with support of NOSC for DC&SS) c. Submarine systems (except for those in NOSC's mission area) a. Submarine systems a. Submarine systems a. Submarine sonar navigation systems b. Systems architect and integration for submarine navigation (with support of NADC and NOSC for DC&SS) a. Supporting submarine systems a. Submarine launched torpedoes b. Torpedo components and subsystems c. Submarine torpedo servicing and handling d. Torpedo countermeasures a. Submarine systems |
|--|--|

11. EM/EO/IR search, reconnaissance and surveillance systems/equipment

12. Naval targets
13. Special sensors
14. Environmental

- a. Submarine systems architect and integration (with support of NOSC for DC&SS)
- b. Submarine systems (except for those assigned to NOSC)
- a. ASW
- a. Submarine
- a. Systems architect and integration for submarine based environmental measurement and prediction systems
- b. Assess the influence of submarines upon the environment
- c. Environmental investigations and modeling in support of submarines and submarine operations

SPECIALTY PRODUCT

CNM PRODUCT AREA

NUSC PRODUCT LINE

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Acoustical search and surveillance systems/equipment 2. Acoustic countermeasures and decoys 3. Major range development and operation 4. Other | <ol style="list-style-type: none"> a. Surface ship sonars b. Surveillance systems (principal lab - NOSC) a. Surface ship a. AUTECH b. Mobile ranges a. Computer software life cycle maintenance support function for submarines |
|---|---|

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