David Taylor Research Center

Bethesda, Maryland 20084-5000

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Ship Hydromechanics Department

Technical Report

THE ATHENA RESEARCH SHIP SYSTEM

A DECADE-PLUS OF SERVICE

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The performance of the ATHENA Research Ship System is documented over 13 years of service.

The basic charter for the System was stated by Rear Admiral Geiger at the dedication of ATHENA in January 1976. A brief history of the System is given and its operation is described. Typical programs supported by the ATHENA System are included and some of the more unusual trials are highlighted.

It is concluded that the System has performed in accordance with the charter and has made possible significant contributions to the Navy's technological base.

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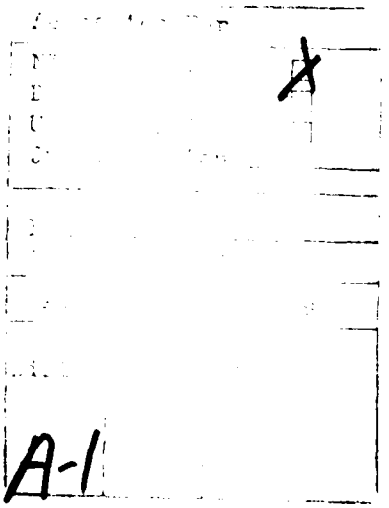

ABSTRACT

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It is concluded that the System has performed in accordance with the charter and has made possible significant contributions to the Navy's technological base.

INTRODUCTION

This report has been prepared to document the performance of the ATHENA Research Ship System over a decade-plus of service. The charter for the System was basically stated by Rear Admiral Robert Geiger, the Chief of Naval Research, on the occasion of the dedication of the USS CHEHALIS as the research vessel "ATHENA". Admiral Geiger's statement essentially provides the unifying theme to what must appear to outside observers as a somewhat random series of tests conducted on a discarded class of Navy ships, the Patrol Gunboats. It is hoped that this report will serve to establish the underlying order that actually exists, reinforce the importance of "hands-on" testing in the development of Navy Systems and alert potential System users to the flexibility and versatility of the ATHENA Research Ship System.

A DEVELOPING NEED

On 19 January 1976, Rear Admiral Robert Geiger, Chief of Naval Research, dedicated the high-speed research vessel "ATHENA" in the Port of Miami. Among other remarks, Admiral Geiger made the following comments:

> *...The conversion of the patrol gun boat USS CHEHALIS into the high speed research and development vessel ATHENA represents the culmination of years of dedicated efforts and cooperation of many naval organizations and individuals. As Chief of Naval Research I feel proud to have been part of the effort that has resulted in this event.*
>
> *The Navy of the future will be a higher speed Navy. A brief review of future trends in ship design shows that a significant number of fleet units will be capable of speeds well in excess of 30 knots. Among these are the 688-class nuclear submarines, hydrofoils, and surface effect ships, to name a few.*

At the present time, we have negligible capability to operate acoustic sensors at speeds in excess of 20 knots. Even more important, we have exhausted the technology base that allowed us to reach this capability. Currently we even lack a comprehensive data base on self-noise of ship-board sonar at higher speeds.

The Navy has requirements for a number of towed systems to operate at about 20 knots with survival capabilities in the 35- to 40-knot range. In addition to these programs, significant development efforts can be foreseen for determining the feasibility of equipping the hydrofoils and surface effect ships with towed sensor suites. Development of advanced towline technology, vortex shedding abatement and improved analytical models are some of the areas that need exploration to meet these future needs.

At the present time, full scale research tests on fleet unit platforms are handicapped severely by the limited number of available units and available test time for research and development. Although the final systems evaluation must be conducted on the end-use platforms; i.e., the ships that in the final analysis must use the sensors, it has been demonstrated that significant advances accrue from the use of platforms dedicated exclusively for these tests.

The immediate application of ATHENA's capability will be in support of the towed mine countermeasures program. Other research commitments include acoustics, a high-speed sensor program, submarine communications, high-speed towed arrays, airborne mine countermeasures as well as programs relating to the reliability and improvement of systems.

In closing, I am confident that ATHENA will be a vital element in replenishing that type of knowledge leading to the most effective instruments and equipment for our fleet. I am reminded that in ancient mythology, ATHENA was the patroness of warriors who attained their victory through prudence, courage and perseverance. I am sure this ship will live up to its namesake. But even more important, we are confident the ATHENA will contribute immeasurably to creating the much needed higher speed technology base.

Thus was born the ATHENA Research Ship System. That System now has been in place for a decade and three years. It thus seems appropriate to pause and inquire whether the ship dedicated by Admiral Geiger and her sister USS GRAND RAPIDS, dedicated as ATHENA II in January 1978, have fulfilled the charter he so clearly stated.

SYSTEM ASSETS

The ATHENA Research Ship System assets consist of the two ships previously mentioned, converted to research vessel (R/V) configuration, and USS DOUGLAS (PG-100), held in inactive ship storage. Figure 1. shows ATHENA and ATHENA II steaming in formation.

The attraction of this particular class of ship for research, development, test and evaluation work (RDT&E) centers on a rare combination of performance, size and cost

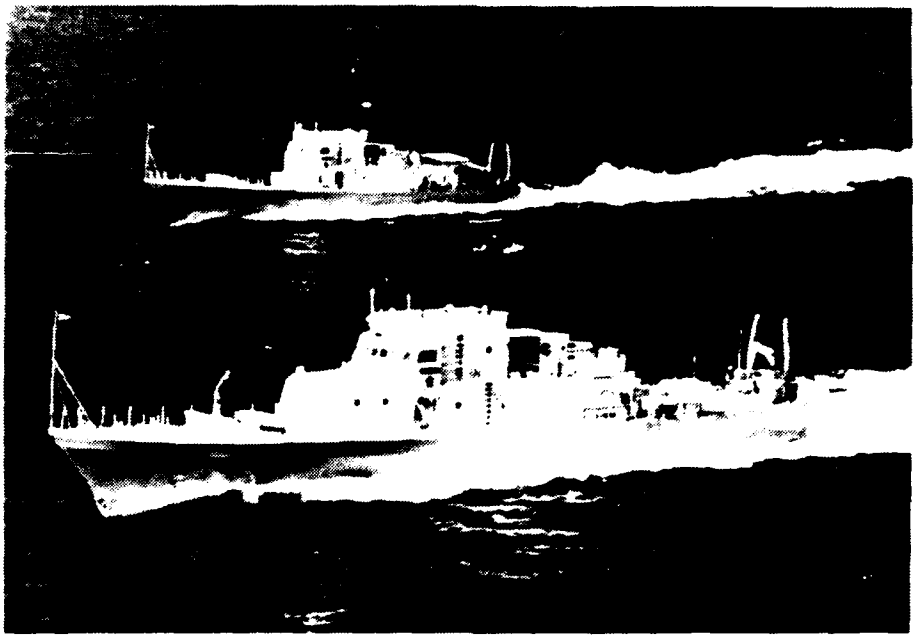

Fig. 1. The Sister Ships ATHENA and ATHENA II steaming in formation (ATHENA in foreground).

characteristics that are still matched by no other vessel. The key features of these ships are shown in Table 1.

TABLE 1. Key features of the converted patrol gunboats

TOP SPEED.....	35+ KNOTS
SHAFT H.P.....	13,000 (TURBINE)
CONSTRUCTION.....	ALL ALUMINUM HULL WITH FIBERGLASS SUPERSTRUCTURE, LOW MAGNETIC SIGNATURE
CREW.....	MINIMUM TO ACCOMPLISH R&D MISSION
AUXILIARY POWER...	APPROXIMATELY 130KW FOR INSTRUMENTATION, DECK MACHINERY, ETC.
RESERVE BUOYANCE..	ADEQUATE TO ACCOMMODATE UP TO 10 TONS OF HANDLING EQUIPMENT & TEST GEAR
MAXIMUM DRAFT.....	9.5 FEET
PROPULSION.....	2 CUMMINS DIESELS(V-12) UP TO 13 KNOTS; 1 GE GAS TURBINE (LM-1500) ABOVE 13 KNOTS; CP PROPELLERS
TOWING CAPABILITY.....	15,000 TO 20,000 LBS @ 25 TO 30 KNOTS
SPACE.....	ELECTRONICS LAB, AFTER DECK SPACE FOR HANDLING GEAR
ACCOMMODATIONS.....	UP TO 20 ENGINEERS AND TECHNICIANS
LENGTH.....	165 FEET
DESIGN DISPLACEMENT...	245 TONS
BEAM.....	23.5 FEET

These ships cruise economically at 12 to 13 knots but yet provide the power to stress developmental gear to its maximum capability. The reserve buoyancy and stability allows equipment of meaningful size to be evaluated. And the low magnetic signature allows the ships to work in close proximity to magnetically sensitive systems.

A BRIEF HISTORY

The first of the ships (formerly CHEHALIS, PG-94) began serving projects in January 1976 after undergoing an extensive conversion during the previous fall and winter. The alterations included the removal of all weapons and weapons support systems, creation of the laboratory area, beefing up the afterdeck to accommodate special winches, installation of state of the art electronic navigational equipments, and habitability improvements.

After conversion, ATHENA was home-ported at the Naval Coastal Systems Center (NCSC) at Panama City, Florida, and began fulfilling project assignments there in connection with mine, mine countermeasure and minesweeping system development.

ATHENA was so successful in its RDT&E support role that its schedule soon filled to capacity. It was clear that a second ship would be needed and, in January, 1978, conversion of GRAND RAPIDS (PG-98) was completed and the R/V ATHENA II was brought on line. At that time, the workloads for the ships were adjusted, with ATHENA taking most acoustically-oriented assignments and ATHENA II handling the assignments relating to mine systems, including the development of new helicopter-deployed minesweeping gear by the Naval Air Systems Command (NAVAIRSYSCOM). The third ship (DOUGLAS, PG-100) was acquired at the same time the ATHENA System accepted GRAND RAPIDS.

The PGs evolved as a result of the Cuban Missile crisis of the early 1960's when a requirement was identified for a high-speed interdictive craft to perform patrol, blockade, surveillance and related Naval support missions. Seventeen ASHEVILLE class PGs were designed and built between 1963 and 1969. The largest coastal patrol craft built for the Navy since World War II, these craft were unique in being the first U.S. Navy ships powered by gas-turbine propulsion systems.

These ships served with distinction in U.S. waters, Vietnam and the Mediterranean. Beginning in 1974, the Navy decided to reduce the active force levels of PGs, thus making available the CHEHALIS, GRAND RAPIDS and DOUGLAS. In 1977 the Navy decided to deactivate all of the ASHEVILLE Class Gunboats. The ships were dispersed to various government agencies, academic institutions and foreign governments. The status and

disposition of the ASHEVILLE Class, as of the date of this report, are shown in Table 2.

Table 2. Current Status of ASHVILLE Class Patrol Gunboats

VESSEL	OWNER	FUNCTION
ASHVILLE (PG 84)	Massachusetts Maritime Academy	Training (now scrapped)
GALLUP (PG 85)	U.S. Navy	Inactive Ship Storage
ANTELOPE (PG 86)	Environmental Protection Agency	Ocean Dump-site Survey
READY (PG 87)	Massachusetts Maritime Academy	Training (now scrapped)
CROCKET (PG 88)	Environmental Protection Agency	*Pollution Monitoring
MARATHON (PG 89)	Massachusetts Maritime Academy	Training (now scrapped)
CANON (PG 90)	US. Navy	Inactive Ship Storage
TACOMA (PG 92)	Columbia	Operational
WELCH (PG 93)	Columbia	Operational
CHEHALIS (PG 94)	David Taylor Research Center	RDT&E
DEFIANCE (PG 95)	Turkey	Operational
BENICA (PG 96)	South Korea	Operational
SURPRISE (PG 97)	Turkey	Operational
GRAND RAPIDS (PG 98)	David Taylor Research Center	RDT&E
BEACON (PG 99)	U.S. Navy	Inactive Ship Storage
DOUGLAS (PG 100)	David Taylor Research Center	Inactive Ship Storage
GREEN BAY (PG 101)	U.S. Navy	Inactive Ship Storage

*After several years of monitoring pollution in the Great Lakes for EPA, the ship was transferred to the Great Lakes Naval and Maritime Museum.

EMPLOYMENT

The very first project undertaken on ATHENA was a test of the AQS-14 sonar system. While it is not always easy to trace the product of RDT&E efforts through the labyrinth of development to a culmination in real world fleet usage, much of the mine system work done on the ATHENAs in the seventies has been passing in the eighties the most realistic of all test in the Persian Gulf.

Operating under a Memorandum of Understanding with DTRC, the Naval Underwater Systems Center (NUSC), uses ATHENA as the platform for Gulf and adjacent Atlantic and Caribbean waters sea tests, developmental efforts and experiments in towed array hydrodynamics, self-induced flow noise reduction, and enhancement of arrays' acoustical performance. Here, too, there is a direct link between the work of scientists in a Navy laboratory (NUSC) and the serious business of combat prevention. Virtually every towed array in use today underwent some or all of its experimental and developmental testing from ATHENA, just as today the same kind of testing is being done on next generation multi-line towed arrays (MLTA).

Possibly the most unusual sea test ever performed, and certainly the most unusual ever conducted from either of the ATHENAs, was the one shown in Figure 2 in which ATHENA II, at her top speed, towed an in-flight MH-53E helicopter backwards to help assess certain of the helo's flight envelope characteristics.

During the thirteen and eleven years respectively in which the ATHENA and ATHENA II have operated, the ships have supported 270 separate sea trials. A list of the individual trials is shown in Appendix A. These have supported efforts as basic as measuring the flowlines and boundary layer characteristics of the ATHENA (figure 3), as a bridge in correlation of the flow and drag characteristics of small scale models with ships of the line, and as currently practical as trimming minesweeping gear in certification for fleet deployment. The ATHENA System has provided the vehicle for developmental testing of all the latest high-speed towed acoustic arrays (figure 4), including the SQR-19, almost all airborne mine hunting, cutting and neutralization equipment, pressure and magnetic sweeps, submarine communications buoys, propeller parameter studies, and a host of other programs, including gathering satellite ground-truth date and help determine why the USS BARBEY (FF 1088) lost its propeller in 1974.

Fig. 2. ATHENA II towing an MH-53E Helicopter backwards to assess certain flight envelope characteristics.

ATHENA usage is not limited exclusively to Navy users. Over the years, contractors such as Westinghouse, Chesapeake Instruments, Bendix Corporation and Gould have mounted major test programs from the platforms.

UNUSUAL FEATURES/VERSATILITY

The ATHENA incorporates an advanced Masker system which allows the ship to operate more quietly than any other ships in the fleet.

Although there are some differences in outfitting and arrangement between ATHENA and ATHENA II, both ships have retained the special size, speed, horsepower and economic characteristics that made them so useful in the first instance. Neither ship has been rigidly confined to a specific kind of project. On the contrary, the vessels can be rigged, modified and reconfigured as necessary to meet almost any requirement a sponsor may have. In this way, both ships are able to maintain optimally active schedules which result in lower ship cost than would otherwise be the case. The savings are passed on to users who enjoy access to a large and capable platform at costs that are usually substantially lower than are available from other ship sources.

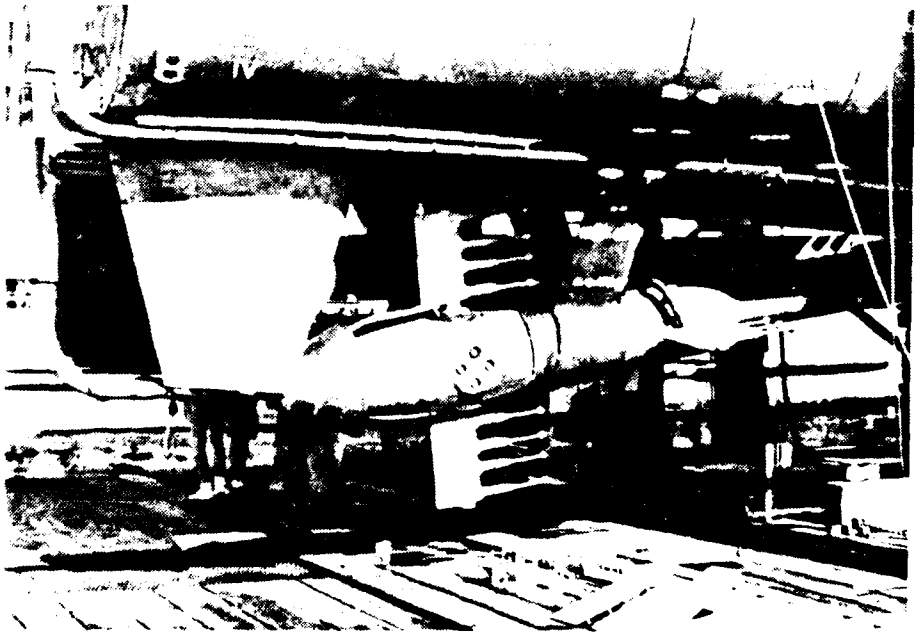

Fig. 3. ATHENA outfitted with pressure rakes in the plane of the starboard propeller. Pressure signals from taps in the rake are led to deck level for measurement. The rake can be rotated about the shaft.

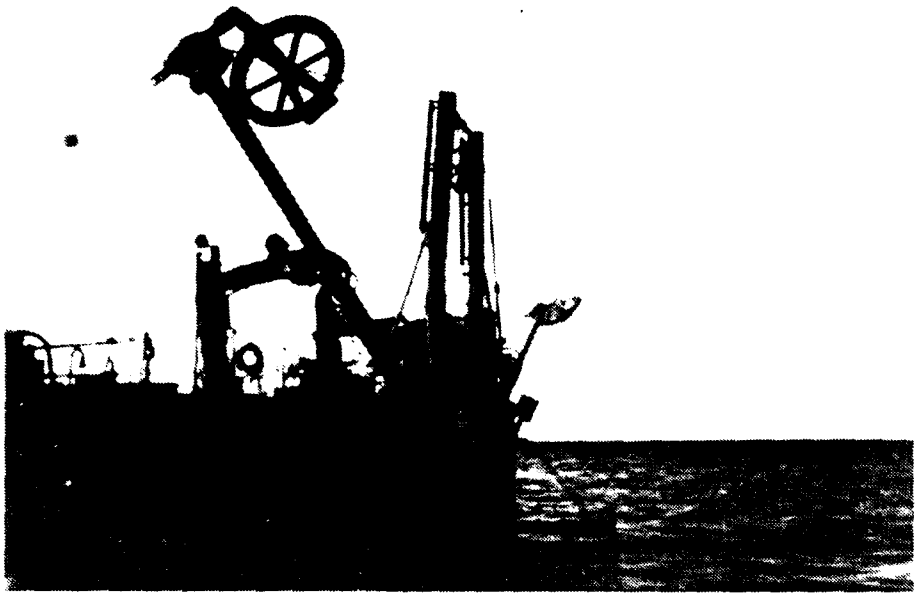

Fig. 4. ATHENA outfitted with twin outboard booms and sheaves. Towed arrays are streamed simultaneously port and starboard to permit direct comparison of competing towed acoustic array design.

THE SYSTEM

At the time the ATHENA System was designed, it was recognized that logistic support of the ships and projects would be as important as the ships themselves. As a result, the ATHENA Research Ship System is exactly that: a SYSTEM that includes the ATHENA System Management office at DTRC, the vessels, docks and dockside facilities at NCSC, the ship operating contractor, and the ability to furnish every service needed to logistically and technically support a sponsor's project. The way it all works is simplicity itself, avoiding the usual bureaucratic rocks and shoals. Prospective sponsors are sent an ATHENA Systems Users Manual[1], that includes detailed ship specifications, layout drawings and a questionnaire that helps to define project objectives, needs and schedule requirements.

The information provided, usually reviewed at a face-to-face meeting with the project sponsor, is used to develop a cost estimate and subsequently to mobilize the assets required to support the trial. These assets include technical, engineering, fabrication and purchasing resources at the System's disposal. Other assets that can be mobilized to support sponsor projects include photographers, divers, welders,

riggers, naval architects, engineers, ship-board winches, shoreside fork lifts and cranes and waterborne and airborne support craft. In this respect, a sponsor himself may provide any or all of the logistic support that does not directly affect the ships, power, structural, navigational or stability capabilities.

The ship's are typically scheduled for at least two weeks of maintenance during each quarter. Considerable flexibility is exercised in scheduling maintenance, however, to accommodate the seemingly capricious nature of RDT&E testing requirements. The complete System, including the vessels and the administrative components, is inspected and reviewed quarterly by the DTRC manager to assure a high state of readiness in all aspects. The ships are dry docked for extensive overhaul and maintenance at least once every three years. Again, considerable flexibility is exercised to accommodate unforeseen or emergency RDT&E trials.

FULFILLING THE CHARTER

In its baker's dozen plus one half years of operation, the ATHENA System has more than fulfilled the Charter announced by Admiral Geiger. Among the accomplishments that have been possible with the ATHENA platforms, are the following:

- Significant advances in reduction of flow induced noise and survivability of towed passive acoustic arrays.
- Development of an airborne AN/37U-1 automatic deployment system for the MK 103 gear (in Techeval).
- Significant advancement of minehunting/neutralization technology.
- Contribution to the final development of various air towed pressure/magnetic minesweep apparatuses.
- Development of an advanced, self correcting anti-kiting towline with proven performance to 30 knots.
- Proofing the hydrodynamic performance of submarine towed communications buoys.
- Significant advancement of surface ship underwater radiated noise technology.
- Propeller inflow/wake studies and correlation of model and full-scale boundary layer characteristics.

To summarize, the ATHENA System has been satisfying the needs of the naval establishment and private industry for sea test platforms for more than a dozen years.

* Heffner, James A. and Shelton M. Gay, Jr; "ATHENA Research Ship Systems - Users Guide"; Report DTRC/SHD-1263-01; May 1988; David Taylor Research Center, Bethesda, MD 20084-54000.

The platforms and underlying administrative system have proven so versatile and useful that the Navy is actively investigating pulling the additional ships remaining in inactive ship storage for support of other Navy programs. DOUGLAS will begin to earn her keep when she is activated to serve as the test bed for the Integrated Warship System Demonstration Program.

ACKNOWLEDGEMENTS

The author here wishes to acknowledge the foresight and provident planning by a number of individuals and organizations. The contributions of Mr. Reece Folb, who with others first recognized the need for non-combatant vessels to support the at-sea developmental testing of Navy systems and components, is worthy of special note.

The support of all the users of the ATHENA System is also gratefully acknowledged. Many of the users have contributed significantly to upgrading the operational capabilities of the vessels both in ship performance and special test gear. Among the sponsors special thanks are due the Naval Air Systems Command, the Naval Underwater Systems Center, the Naval coastal Systems Center, and the David Taylor Research Center.

APPENDIX A

LISTING OF RDT&E TRIALS

CONDUCTED ABOARD THE ATHENAS

1976 THROUGH 1989

Project Number*	Program	Organization	Type System
76-1	AWS-14 Testing	NCSC	Countermeasure System
76-2	Fathom Fairing - Subcom	DTNSRDC	Communication Buoys
76-3	Double Venture and Dual Threat	DTNSRDC	Cable Body System
76-4	Variable Depth Pendants	DTNSRDC	Cable Body System
76-5	MK 103	NCSC	Countermeasure System
77-1	Bendix Sphere	Bendix	
77-2	ONR Array	ONR	Sonar System
77-3	Ship Speed Log Calibration	DTNSRDC	Data Gathering
77-4	Surface Double Alpha	NCSC	Countermeasure System
77-5	Depth Control Depressor Evaluation	DTNSRDC	Cable Body System
77-6	MK 103	NCSC	Countermeasure System
77-7	Double Alpha	NCSC	Countermeasure System
77-8	Wake Rake Tests	DTNSRDC	Data Gathering
77-9	Wake Rake Tests	DTNSRDC	Data Gathering
77-10	Towed Depressor Trials	DTNSRDC	Cable Body System
77-11	MK 103 Trim Trials	NCSC	Countermeasure System
77-12	AWS-14 Trials	NCSC	Countermeasure System
78-1	AWS-14 Trials	NCSC	
78-3	MK 103 Trim Trials	NCSC	Countermeasure System
78-4	Abrasive Sweep	NCSC	Cable Body System
78-5	Depth Control System	DTNSRDC	Cable Body System
78-6	104 Tether Test	NCSC	Countermeasure System
78-7	Float Pendant	NCSC	Data Gathering
78-7A	Night Vision	NCSC	Data Gathering
78-9	SIAS	DTNSRDC	Communication Buoy
78-10	Depressor Trials	ONR/DTNSRDC	Cable Body System
78-11	ASTD	Gould, Inc.	Sonar System
78-13	Depth Controlled/Rapid Deployment	DTNSRDC	Cable Body System
78-15	High Frequency Radiated Noise	NAVSEA	Sonar System
78-17	Self Rotating Disk Endurance	DTNSRDC	Data Gathering
78-18	Satellite Tracking	NOAA	Satellite Data Acq.
78-19	LMS	NCSC	Countermeasure System
79-1	Special Projects	NCSC	
79-2	SIAS	NCSC	Communication Buoys
79-3	Depth-Controlled/Rapid Deployment	DTNSRDC	Cable Body System
79-4	MK 103 Trim	NCSC	Countermeasure System
79-5	Propeller Parameter Trials	DTNSRDC	Data Gathering
79-6	Masker Installation and Evaluation	DTNSRDC/NUSC/ONR	Ship Silencing System
79-7	Truncated Towline	DTNSRDC	Cable Body System
79-8	Satellite Tracking	NOAA	Satellite Data Acq.
79-9	Depressor Towed Array System	NUSC	Sonar System
79-10	ONR Towed Array Trial	DTNSRDC/ONR	Sonar System
79-11	Rescheduled		
79-12	LMS	NCSC	Countermeasure System

* The first two digits indicate the year of the trial.

Project Number	Program	Organization	Type System
79-13	Hammer Acoustics	DTNSRDC	Data Gathering
79-14	TOAD	DTNSRDC	Data Gathering
80-1	MK 103 Trim	NCSC	Countermeasure System
80-2	Depth Controlled/Rapid Deployment	DTNSRDC	Cable Body System
80-3	LMS	NCSC	Countermeasure System
80-4	Trimode	NCSC	Countermeasure System
80-5	Special Projects	NCSC	Data Gathering
80-6	Pressure Magnetic	NCSC	Cable Body System
80-7	TOAD	DTNSRDC	Data Gathering
80-8	AN/SLQ-25	NCSC	Countermeasure System
80-9	SIAS	DTNSRDC	Communication Buoy
80-10	Hammer Acoustics	DTNSRDC	Data Gathering
80-11	AQS-14	NCSC	Countermeasure System
80-12	Magnetic Noise	NCSC	Countermeasure System
80-13	Ground Towed Array	Gould, Inc.	Sonar System
80-14	ONR/Gould Towed Array	ONR	Sonar System
80-15	Masker	DTNSRDC	Ship Silencing System
81-1	MK 103 Trim	NCSC	Countermeasure System
81-2	AN/ALQ-166 (XN-1)	NCSC	Countermeasure System
81-3	Abrasive Sweep Wire	NCSC	Cable Body System
81-4	Multimode	NCSC	Countermeasure System
81-5	SIAS	DTNSRDC	Communication Buoy
81-6	*ONR/EDO Towed Array*	ONR	Sonar System
81-7	Cancelled		
81-8	TOAD	DTNSRDC	Data Gathering
81-10	Advanced Magnetic Sweep	NCSC	Countermeasure System
81-12	Vibration Trials	DTNSRDC	Ship Silencing System
81-13	TBE-16	NUSC	Sonar System
81-14	ONR/Gould Towed Array	ONR	Sonar System
81-15	CAM Development	DTNSRDC	Ship Silencing System
82-1	Double Alpha MK 103 Trim	NCSC	Countermeasure System
82-2	Multimode	NCSC	Countermeasure System
82-3	CD/RDMS	DTNSRDC	Cable Body System
82-4	Integrated Towline	DTNSRDC	Cable Body System
82-5	CD/RDMS (Tech. Eval.)	NCSC	Cable Body System
82-6	CAM	DTNSRDC	Ship Silencing System
82-7	TEX	NUSC	Sonar System
82-8	SIAS	DTNSRDC	Communication Buoy
82-9	TOAD (Cancelled)		
82-10	Magnetic Environmental Measuring	NCSC	Data Gathering
82-11	SonarTechnology Program	NCSC	Sonar System
82-12	TB-16 Improvement	NUSC	Sonar System
82-13	MH53E Tow Test	NCSC	Data Gathering

Project Number	Program	Organization	Type System
82-14	High Speed Acoustic Source Test	NCSC	Sonar System
82-15	AN/AQS-17	NCSC	Countermeasure System
82-16	LMS	NCSC	Countermeasure System
82-17	Wpns Target (Cancelled) Signature		
82-18	LMS AN/ALQ-166	NCSC	Countermeasure System
83-1	Double Alpha	NCSC	Countermeasure System
83-2	Multimode (Cancelled)	NCSC	
83-3	CD/RDMS Container	DTNSRDC	Cable Body System
83-4	Towline Development	DTNSRDC	Cable Body System
83-5	CD/RDMS Tech. Eval.	NCSC	Cable Body System
83-6	CAM	DTNSRDC	Ship Silencing System
83-7	TBX	NUSC/CTEA	Sonar System
83-8	Impart - 83 (Cancelled)	NUSC/CTEA	
83-9	Low Wave Number (Cancelled)	NUSC/CTEA	
83-10	Closed Loop (Cancelled)	NUSC/CTEA	
83-11	AN/SLQ-25	NCSC	Countermeasure System
83-12	LMS NA/AL-166	NCSC	Countermeasure System
83-13	MK 103 TRIM (Cancelled)	NCSC	Countermeasure System
83-14	MOD 44 Center	NCSC	Cable Body System
83-15	Extended Sensor Project	NUSC/CTEA	Sonar System
83-16	Advance Mine Sonar Sys. (Cancelled)	Draper Labs	
83-17	BsR - 15 Array	NAVSEA	Sonar System
83-18	Radiated Noise	NUSC/CTEA	Sonar System
83-19	Log Cal	NUSC/CTEA	Data Gathering
83-20	Gould (Cancelled)	Gould, Inc.	
83-21	AQS-17	NCSC	Countermeasure System
83-22	Arms Towed Cable	NCSC	Countermeasure System
83-23	Scripps Vim Project (Cancelled)	CTEA/Scripps	
83-24	TBX Array	Bendix	Sonar System
84-1	A/N 37U-1 (Tech. Eval.)	NCSC	Countermeasure System
84-2	A/N AL9-160	NCSC	Countermeasure System
84-3	Abrasive Sweeps	NCSC	Cable Body System
84-4	A/N AL9-166 (Tech. Eval.)	NCSC	Countermeasure System
84-5	A/N AQS-17	NCSC	Countermeasure System
84-6	CD/RDMS	DTNSRDC	Countermeasure System
84-7	TB-16	NUSC	Sonar System
84-8	TBX	NUSC	Sonar System
84-9	Reduced Diameter Array	NUSC	Sonar System
84-10	Advanced Magnetic Sweep	NCSC	Countermeasure System
84-11	AN/SQR-19A	GOULD	Sonar System
84-12	MH53 Helicopter Tow	NAVAIR	Data Gathering
84-13	Cancelled		
84-14	Wake Survey	NCSC	Countermeasure System
84-15	CST-EX117	NCSC	Countermeasure System

Project Number	Program	Organization	Type System
84-16	Cancelled		
84-17	Cancelled		
84-18	TBX Array	BENDIX	Sonar System
84-19	Cancelled		
84-20	AN/SQR-19	GOULD	Sonar System
84-21	TB-16	GOULD	Sonar System
84-22	MAP	NCSC	Countermeasure System
85-1	AMRS	NCSC	Countermeasure System
85-2	Fleet Readiness	NCSC	Data Gathering
85-3	Surtass (Cancelled)	NAVSEA/TATEF	
85-4	TB-16 Explo. Dev.	NUSC/TATEF	Sonar System
85-5	TASTrt - 83 (Cancelled)	NUSC/TATEF	Sonar System
85-6	A/N 37U-1 (Cancelled)	DTNSRDC	
85-7	SIAS	DTNSRDC	Communication Buoy
85-8	CST-EXI	NCSC	Countermeasure System
85-9	EEL (Cancelled)	NUSC/TATEF	
85-10	CNO J-689 (Cancelled)	NSWC	
85-11	AN/SQR-19 (Cancelled)	GOULD	
85-12	MAP	DTNSRDC	Countermeasure System
85-13	Reduced Diameter Array	NOSC/TATEF	Countermeasure System
85-14	MAP (Cancelled)	BENDIX	
85-15	A/N 37U-1	NCSC	Countermeasure System
85-16	EEL Noise	NUSC/TATEF	Sonar System
85-17	AN/ALQ-166	NCSC	Countermeasure System
85-18	MAP	NCSC	Countermeasure System
85-19	TB-23	NUSC/TATEF	
85-20	MH 53 Tow	NCSC	Data Gathering
85-21	SQR-19	NAVSEA	Sonar System
85-22	Task Light	NCSC	Data Gathering
85-23	Plane Guard	NCSC	Data Gathering
85-24	ADCAP Tech. Eval.	NUSC	Data Gathering
85-25	Mine ID Test	NCSC	Countermeasure System
85-26	AQS-14	NCSC	Countermeasure System
86-1	A/N 37U-1	NCSC	Countermeasure System
86-2	Fleet Readiness	NCSC	Data Gathering
86-3	AMRS	NCSC	Data Gathering
86-4	PlaneGuard	NCSC	Data Gathering
86-5	MK 116 Tech. Eval.	NUSC/TATEF	Data Gathering
86-6	TB-23	NUSC/TATEF	Sonar System
86-7	AN/SQR-19	NUSC/TATEF	Sonar System
86-8	SIAS	DTNSRDC	Data Gathering
86-9	MLTA	NUSC/TATEF	Sonar System
86-10	TAST	NUSC/TATEF	Sonar System
86-11	AMNEM/AQS-14	NCSC	Countermeasure System

Project Number	Program	Organization	Type System
86-12	MAP	NCSC	Countermeasure System
86-13	CST-ExI	NCSC	Countermeasure System
86-14	ESP IV	NUSC/TATEF	Sonar System
86-15	EEL	NUSC/TATEF	Sonar System
86-16	ADCAP Tech. Eval.	NUSC	Data Gathering
86-17	TARP	NUSC/TATEF	Sonar System
86-18	Wake Characterization	NCSC	Countermeasure System
87-1	Fleet Readiness	NCSC	Data Gathering
87-2	A/N 37U-1	NCSC	Data Gathering
87-3	Air-to-Air Transfers	NCSC	DataGathering
87-4	AMND	NCSC	Countermeasure System
87-5	TB-16B	NUSC/TATEF	Sonar System
87-6	TARP	NUSC/TATEF	Sonar System
87-7	MAP	NCSC	Countermeasure System
87-8	ASW DEMO (Cancelled)	DTNSRDC	Data Gathering
87-9	TB-16B	NUSC/TATEF	Sonar System
87-10	TB-23	NUSC/TATEF	Sonar System
87-11	SQR-19	NUSC/TATEF	Sonar System
87-12	MAP	NCSC	Countermeasure System
87-13	MLTA	NUSC/TATEF	Sonar System
87-14	TARP	NUSC/TATEF	Sonar System
87-15	EEL	NUSC/TATEF	Sonar System
87-16	ESP V	NUSC/TATEF	Sonar System
87-17	MLTA	NUSC/TATEF	Sonar System
87-18	TARP	NUSC/TATEF	Sonar System
87-19	AOTA	NUSC/TATEF	Sonar System
87-20	SSTD	NCSC	Countermeasure System
87-21	AOTA	NUSC/TATEF	Sonar System
87-22	AN/AQS-14	NCSC	Countermeasure System
87-23	SUBCOM	DTNSRDC	Communication Buoy
87-24	TB-16	NUSC/TATEF	Sonar System
87-25	Operation Mayport	NCSC	Data Gathering
87-26	106 Effectiveness	NCSC	Countermeasure System
87-27	MK-106	NCSC	Countermeasure System
87-28	MK-103	NCSC	Countermeasure System
87-29	AMNS	NCSC	Countermeasure System
87-30	AMNS	NCSC	Countermeasure System
87-31	Hyperfix Mod 4	NCSC	Countermeasure System
87-32	Task Lights	NCSC	Data Gathering
87-33	Midnight	NCSC	Data Gathering
87-34	Pinger Drop Test	NCSC	Data Gathering
87-35	ROV	NCSC	Data Gathering
88-1	AMNS	NCSC	Countermeasure System
88-2	MK-103	NCSC	Countermeasure System

Project Number	Program	Organization	Type System
88-3	TB-16	NUSC/TATEF	Sonar System
88-4	MAP	NCSC	Countermeasure System
88-5	MAP	NCSC	Countermeasure System
88-6	SSTD	NCSC	Countermeasure System
88-7	Fleet Readiness	NCSC	Data Gathering
88-8	Fleet Readiness	NCSC	Data Gathering
88-9	Fleet Readiness	NCSC	Data Gathering
88-10	Fleet Readiness	NCSC	Data Gathering
88-11	Fleet Readiness	NCSC	Data Gathering
88-12	ESP V/TARP IIA	NUSC/TATEF	Sonar System
88-13	TARP IIB	NUSC/TATEF	Sonar System
88-14	TARP MINI IV	NUSC/TATEF	Sonar System
88-15	TARP III	NUSC/TATEF	Sonar System
88-16	SUBCOM	DTRC	Communication Buoy
88-17	AOTA II	NUSC	Data Gathering
88-18	MADOM	NCSC	Data Gathering
88-19	ROV	NCSC	Data Gathering
88-20	Fleet Mod CutterTest	NCSC	Data Gathering
88-21	MH 53E AMCM	NCSC	Data Gathering
88-22	GALL	DTRC	Data Gathering
88-23	A/N STU-1	NCSC	Countermeasure System
88-24	Mixie Cable Test	NCSC	Countermeasure System
88-25	TARP/TB-23	NUSC/TATEF	Sonar System
88-26	MISS	DTRC	Data Gathering
88-27	CVA-62	DTRC	Data Gathering
88-28	KINGFISHER	NCSC	Data Gathering
88-29	KINGFISHER II	NCSC	Data Gathering
88-30	KINGFISHER III	NCSC	Data Gathering
88-31	RMES	NUSC/TATEF	Sonar System
88-32	TB-23	NUSC/TATEF	Sonar System
88-33	Cancelled		
88-34	Sea Squat	NCSC	Data Gathering
88-35	FLEET X-89	FLTDECGRUALT	Data Gathering
88-36	SUBGUARD	SUBLANT	Data Gathering
88-37	AN/SQQ-32	NCSC	Countermeasure System
89-1	SJ-U	NAVAIR/NCSC	Countermeasure System
89-2	RMES	NUSC/TATEF	Sonar System
89-3	TB-23	NUSC/TATEF	Towed Array
89-4	TARP	NUSC/TATEF	Towed Array
89-5	AOTA	NUSC/TATEF	Optical Fiber Array
89-6	SSTD	NUSC/TATEF	Torpedo Defense
89-7	TB-16	NUSC/TATEF	Towed Array
89-8	SUBGUARD	SUBLANT/NSAP	Submarine Guard
89-9	TOWLINE DEV.	NAVAIR/DTRC	Data Gathering
89-10	AN/ALQ-166	NAVAIR/NCSC	Countermeasure System

Project Number	Program	Organization	Type System
89-11	MK-103	NAVAIR/NCSC	Mine Sweep
89-12	AMNS	NAVAIR/NCSC	Countermeasure System
89-13	AN/AQS-14	NAVAIR/NCSC	Sonar System
89-14	ROV	NAVAIR/NCSC	Remote Vehicle
89-15	FLEET MOD CUTTER TEST	NCSC	Data Gathering
89-16	ADCAP	NUSC/NP	Gather Gathering
89-17	SSTD	NCSC	Torpedo Defense
89-18	TARP	NUSC/TATEF	Towed Array
89-19	PMTC	PMTC	Surveillance
89-20	AMNSYS	NAVAIR/NCSC	Countermeasure System
89-21	NIR	NCSC	Range Development
89-22	SQR-19	NUSC/TATEF	Towed Array
89-23	LITTON	LITTON	Towed Array
89-24	SOURCE	DTRC	Towed Acoustic Source
89-25	FLEET MOD	NCSC	Data Gathering
89-26	NIR-2 (Cancelled)	NUSC	Range Development
89-27	BLT	NUSC/TATEF	Towed Array
89-28	89-I	NUSC/TATEF	Sonar System
89-29	TWIN LINE	NUSC/TATEF	Towed Array
89-30	TAIP/DART	NUSC/TATEF	Towed Array
89-31	SUBCOM	DTRC	Submarine Communications
89-32	TB-23	NUSC/TATEF	Towed Array
89-33	TB-12X	NUSC/TATEF	Towed Array
89-34	MISS	DTRC	Towline Development
89-35	37-U	NAVAIR/DTRC	Countermeasure System
89-36	AMNS	NAVAIR/NCSC	Countermeasure System

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