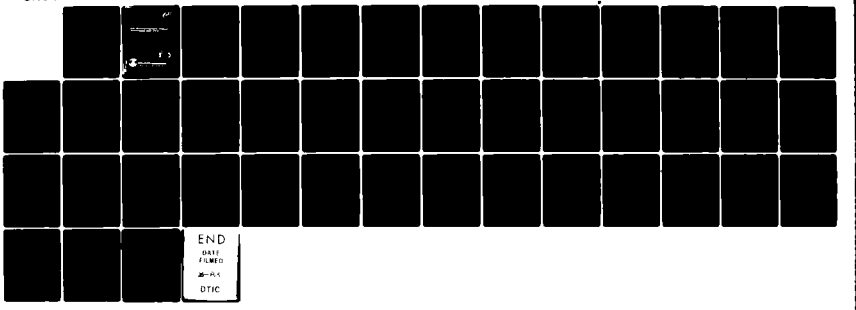
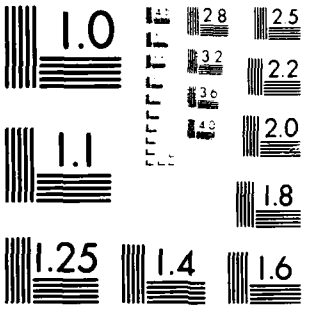
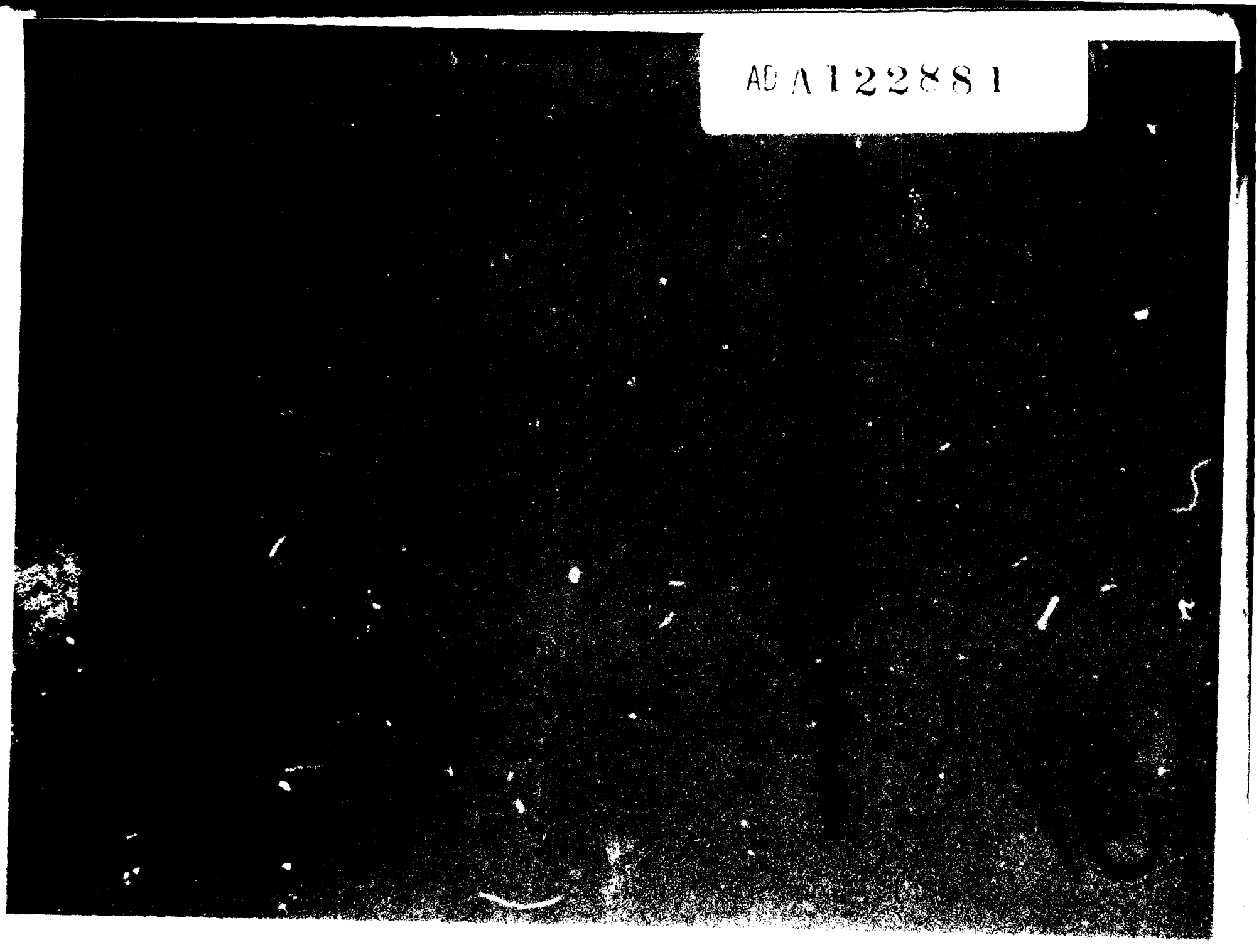
AD-A122 881 NAVAL SURFACE WEAPONS CENTER TECHNOLOGY TRANSFER 1/1
BIENNIAL REPORT (FY81/82)(U) NAVAL SURFACE WEAPONS
CENTER SILVER SPRING MD R D JOHNSON 30 SEP 82
UNCLASSIFIED NSWC/MP-82-468 SBI-AD-F500 111 F/G 15/3 NL



END
DATE FILMED
DTIC





UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NSWC MP 82-468	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) NAVAL SURFACE WEAPONS CENTER TECHNOLOGY TRANSFER BIENNIAL REPORT (FY81/82)		5. TYPE OF REPORT & PERIOD COVERED BIENNIAL; FY81 and FY82
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Ramsey Johnson		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Surface Weapons Center (Code D21) White Oak Silver Spring, Maryland 20910		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS N/A
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE 30 September 1982
		13. NUMBER OF PAGES 44
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Technology Transfer
Navy

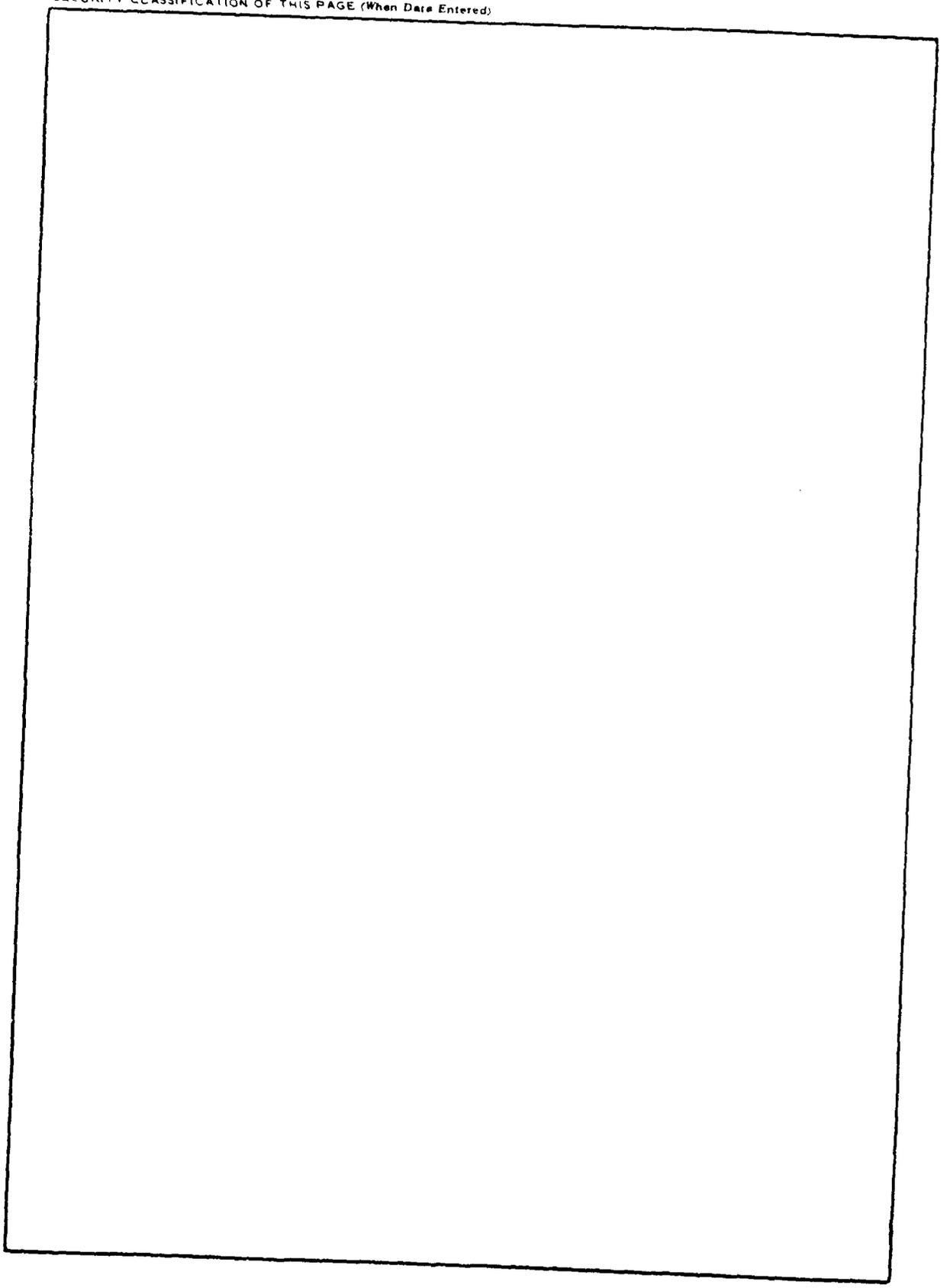
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report describes the Naval Surface Weapons Center Technology Transfer Program and presents narrative summaries of related projects performed during FY81/82. Technology Application Assessment forms and a listing of patents/ Navy cases applicable to this time period are also presented.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-LF-014-6601

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)



FOREWORD

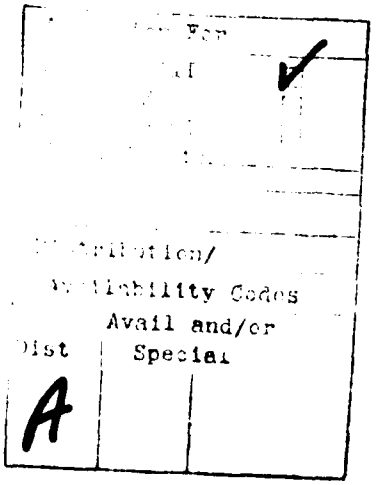
The Naval Surface Weapons Center Technology Transfer Biennial Report (FY81/82) has been prepared in accordance with the format and content specified by the Chief of Naval Material for Navy inputs in meeting the reporting requirements of the Stevenson-Wydler Technology Innovation Act of 1980 (Public Law 96-480).

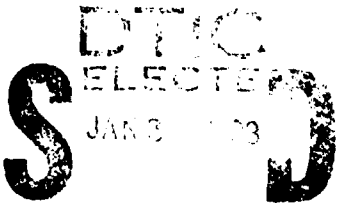
The objectives of Navy technology transfer are (1) transferring technology from military uses to public and private applications; and (2) promoting joint cooperative development programs that address problems of mutual concern to the Navy and other agencies or organizations. In pursuit of these objectives, the Navy transfers technical expertise to other federal agencies; state and local governments; small and large businesses; nonprofit organizations; and such public service organizations as schools, hospitals, and foundations. In addition, technologies that have direct impact on the Navy mission and programs are transferred within, or into, the Navy. Transfers of hardware, software, management practices, and expertise are made in diverse fields, such as analysis and testing, communications, energy, environment, transportation, and marine technology. The Navy Technology Transfer Program provides unique services not available from the private sector and not in competition with that sector.

A substantial portion of the material presented in the Appendices of this report was contributed by technical department staff members engaged in Center technology transfer tasks. Questions concerning this report or requests for additional information should be referred to the Naval Surface Weapons Center, Code D21, Mr. Ramsey D. Johnson, (301)394-1505 or Autovon 290-1505.

Approved by:

D. N. DICK
Advanced Planning Staff





CONTENTS

CONTENTS (Cont.)

1. Organizational Structure for Technology Transfer

a. The technology transfer policy of the Naval Surface Weapons Center (NSWC) is administered within the Advanced Planning Staff (Code D21), which provides advanced planning information on matters impacting the role, mission, and long term commitments of the Center. Policy implementation vehicles include the Center Office of Research and Technology Applications (ORTA) and Navy/Industry Cooperative Research and Development (NICRAD) program participation. Technology transfer functions involve:

(1) coordinating the program internally within the Center.

(2) maintaining external liaison (with the Chief of Naval Material, the Federal Laboratory Consortium for Technology Transfer, the Department of Commerce, other Federal agencies, state and local governments, universities, and private industry).

(3) preparing Technology Application Assessments.

(4) assisting potential user organizations in formulating their problems.

(5) providing and disseminating information on federally owned or originated products, processes, and services having potential application to state and local governments and to private industry.

(6) providing technical assistance in response to requests from state and local governments.

b. The Center's Engineering Department (Technical Publications Division) provides direct support to the Chief of Naval Material (NAVMAT-08DI) in publishing the monthly "Navy Technology Transfer Fact Sheet" which is widely distributed to potential users of Navy technology in business, government, and the military.

c. Funding support of technology transfer activities in FY81 and FY82 as a function of Center Departments is presented below:

	FY81 $K	FY82 $K
(1) Administrative functions		
Advanced Planning Staff	25	30
Technical Publications Division	120	120

(2) Technical functions

Engineering Dept.	41	37
Electronics Systems Dept.	1	75
Weapons Systems Dept.	549	410
Strategic Systems Dept.	320	553
Research & Technology Dept.	348	149
Underwater Systems Dept.	73	127
TOTALS	1477	1501

d. The following technology transfer policy directives are in effect at NSWC:

(1) NAVSWCINST 5700.2 of 23 July 1982; Subj: Office of Research and Technology Applications (ORTA). The purpose of this instruction is to establish the Center ORTA.

(2) NAVSWCINST 3900.1A of 22 Dec 1981; Subj: Navy/Industry Cooperative Research & Development (NICRAD Program). The purpose of this instruction is to set forth procedures for processing NICRAD agreements in accordance with NAVMATINST 3900.14.

e. The Center point-of-contact for ORTA and the NICRAD program is: Mr. Ramsey D. Johnson, Code D21, phone (301) 394-1505/A/V 290-1505.

2. Accomplishments and Current Efforts Summary

a. Narrative summaries of NSWC technology transfer related projects involving FY81 and FY82 effort are presented in Appendix A.

b. Completed technology assessment forms are presented in Appendix B.

3. Information Dissemination and Working Relationships

a. NSWC is a member of the Federal Laboratory Consortium for Technology Transfer, and participates in meetings, symposia and exhibitions related to technology transfer activities involving the Navy, state and local governments, and private industry. NSWC publishes the Navy Technology Transfer Fact Sheet, a monthly newsletter which is widely distributed to potential users of Navy technology in business, government and the military, in direct support of the Chief of Naval Material technology transfer office (NAVMAT-08DI). Center FY81 and FY82 inputs to this document are listed below:

(1) Improved Magnetostrictive Alloys Incorporated in Flow Control Devices
(2) Design for High-Speed Digital Code Demodulator Developed
(3) Method for Driving LEDs at High Speed Patented by Navy
(4) New Optical Fiber Connector Uses Shape Memory Alloy, NITINOL
(5) Electronic Thermostat Designed to Generate Digital Control Signals

(6) Fast, Efficient New Heat Treatment Useful for Wear Resistance
(7) SiC/Aℓ Fusion Welded Using Standard Techniques
(8) Non-Oxidizing Graphite Fiber Coatings Developed
(9) Radiographic Facility Evaluates Thin Plastics, Penetrates Thick Steels
(10) Students See Learning Applied Through Navy Adopt-A-School Program

b. Participation in Significant Technology Transfer Functions

(1) Meeting: Navy Technology Transfer and Pl 96-480
Sponsor: Naval Material Command Headquarters
Date: 12 April 1981
Place: U.S. Naval Academy
Comment: Purpose was to discuss Navy plans for implementing the provisions of Section 11 of PL 96-480, the Stevenson-Wydler Technology Innovation Act of 1980.

(2) Conference and Exhibition: Technology Opportunities for Small Businesses
Sponsor: Senator Charles McC. Mathias, Dept of Commerce, National Science Foundation, SBA, Fed Lab Consortium
Date: 17 June 1981
Place: Baltimore Convention Center
Comment: Displayed selected NSWC technologies of potential interest to small businesses. Joint participation by NSWC's Small Business Office and Technology Transfer Office.

(3) End-of-Project Technology Transfer Demonstration: Powdered Metal Sintering of Jet Vanes
Sponsor: Naval Sea Systems Command
Date: 15 September 1981
Place: Columbus, Ohio
Comment: Project was successful. The final translation of the manufacturing Technology results into an industrial/commercial process will be performed as part of the Vertical Launch System Program. There was considerable industrial participation at the demonstration.

(4) End-of-Project Technology Transfer Demonstration: Injection Molded SLMM Noses
Sponsor: Naval Sea Systems Command
Date: 26 March 1981
Place: Silver Spring, MD
Comment: Project was successful. Results will be implemented with the initiation of production of the SLMM system. Little industrial participation/ interest at technology transfer demonstration.

c. NICRAD Program Policy Agreements in FY81 and FY82.

COMPANY	PROJECT TITLE	EFFECTIVE DATES
(1) Public Technology, Inc.	Evaluation of Navy/DOD R&D for Local Government Applications	10/80 to 8/83
(2) International Minerals & Chemical Corporation	Evaluate Navy Propulsion Requirements	11/80 to 11/83
(3) Texas Instruments	Mine Magnetic Sensor	1/81 to 12/82
(4) General Electric Co.	Advanced Concept Frigate Combat System (Technology Study)	4/81 to 4/84
(5) Lockheed Missiles & Space Co., Inc.	Mine Laying Study	6/81 to 6/82
(6) McDonnell Douglas Astronautics Co.	Mine Delivery/Mine Systems	6/81 to 6/82
(7) Project Engineering, Inc.	Navy R&D Requirements Study	6/81 to 6/84
(8) Bunker Ramo Corporation	SEASIDE Configuration Study	8/81 to 8/84
(9) Gould, Inc.	Mine Systems	8/81 to 8/83
(10) Sylvania Systems Group	ELF Electromagnetic RECO	9/81 to 8/84
(11) Vought Corporation	Stand-Off Rocket Mining System Effectiveness Study	10/81 to 10/84
(12) Westinghouse Electric Co.	Electromagnetic Hypervelocity Launcher Shipboard Close-In Weapons System Study	11/81 to 6/82
(13) Automation Industries, Inc.	Evaluation of PSL/PSA in Combat System Development	1/82 to 12/82

(14) Martin-Marietta Corporation	Anti-Submarine Warfare Weapons Systems; Definition Study	1/82 to 12/84
(15) Draper Laboratory, Inc.	Fire Control Systems for Charged Particle Beams	5/82 to 5/83
(16) Hamilton Standard	Navy R&D Requirements Study	7/82 to 6/85
(17) Westinghouse Electric Co.	Electromagnetic Hypervelocity Launcher Shipboard Close-In Weapons System Study	7/82 to 6/85

d. Inventions and patent disclosures by NSWC in FY81 and FY82 are listed in Appendix C.

e. In support of the Federal Laboratory Consortium/Federal Emergency Management Agency (FLC/FEMA), NSWC provided information in the following areas:

(1) special response capabilities/equipment available for emergency situations.

(2) electromagnetic pulse (EMP) information.

APPENDIX A

NARRATIVE SUMMARIES FOR NSWC FY81/82 TECHNOLOGY TRANSFER RELATED PROJECTS

1. Manufacturing Technology

The Navy Manufacturing Technology Program requires that technology transfer to the private sector as well as to other governmental agencies be a major activity of each funded project. Accordingly, each project is required to have a technology transfer demonstration at the end of the project for the specific purpose of showing, to other potential users or vendors, the technology which has been developed. Additionally, all projects are required to issue a final report. In both instances, efforts are made to disseminate the information to the widest possible audience. Further, each project manager in this program is encouraged to actively communicate with all interested and potentially interested parties during the conduct of the project in order to expedite the transfer of the developing technology. NSWC and the Naval Sea Systems Command participated in the following projects:

a. NITINOL Connectors for Optical Fibers. The increased application of fiber optic systems for shipboard interior communications, navigation, and computer interconnects necessitated developing new methods of producing low cost, high performance interconnect devices. Specific goals of the project included the development of the manufacturing technology to produce NITINOL single-fiber interconnect devices with reliable dimensions and performance for military applications. Limited quantities of prototype were produced and successfully evaluated. The end-of-project technology transfer demonstration was held in September 1980. During FY81, additional connector evaluation was completed and the final report prepared.

b. Graphite-Aluminum Tape and Tooling. Weight and cost reductions are critical factors in the design and materials selections for aerodynamic structures, components, and systems. This technology transfer demonstration is to establish the production process and equipment to manufacture thin-gage graphite-aluminum tape in 3-6 inch widths, and develop the tooling to fabricate this tape into structural shapes and missile system components. The technology transfer demonstrations are presently planned to be held in FY83.

c. Laser Hardening of Cams. This project was to develop production methods for laser hardening/heat treating of critical surfaces of guided missile launching system components. The process uses computer numeric control of laser processing as a replacement for previously used cyanide salt-bath nitride surface hardening process. (Drawbacks of the cyanide process include excessive electrical power consumption, cyanide salt working environment, expense of disposal of salt from the heat treating bath, and potential hazards to the environment.) An end-of-project demonstration was held in September 1980, followed in FY81 by successful completion of the final test and evaluation and distribution of a final report.

2. DOT-STAR Program

a. The Department of Transportation-System for Train Accident Reduction (DOT-STAR) Program at NSWC has developed an on-train monitoring system which will detect imminent derailment conditions and stop the train before a catastrophy can occur. This system detects over-heated wheel bearings (which lead to axle seizure and wheel shear-off) and local derailments (derailment of a single wheel), and applies emergency braking to the train, enabling corrections to be implemented before these conditions lead to a major derailment.

b. The hardware is in the advanced engineering stage of development. During FY81, a twelve month environmental test was conducted in which the system was evaluated on four iron ore cars at the DM & IR Railway Co. in normal operation. As the final test for the system, two (2) of the test cars were intentionally derailed and the other two (2) cars had their wheel bearing degreased to cause overheating. The system performed perfectly during this final test.

c. The Federal Railway Administration provided their last funding investment to the DOT-STAR program in FY81. A paper describing the DOT-STAR system was prepared for and presented at the Mechanical Failures Prevention Group of the National Bureau of Standards to help further disseminate information on the system and perhaps generate additional support for the program. In FY82, NSWC continued to prepare a final program report.

d. Once fully developed, manufactured, and installed on the nations railroad cars, the DOT-STAR system could result in the saving of millions of dollars in property damage each year (not counting the lives saved) by reducing the number of railroad accidents that occur due to over heated wheel bearings and local derailments.

e. Patents and Navy Cases

(1) Patent #3,930,629: Overheated Journal Bearing Derailment Prevention System

(2) Patent #3,929,308: Local Derailment Sensor and Brake Actuator System

(3) Patent #4,029,859: Thermal Sensor and Current Generator

(4) Navy Case 65,209: Railroad Car Hot Box Sensor for Bearings

(5) Navy Case 65,208: Wheel Derailment Sensor for Railroad Cars

(6) Navy Case 65,207: Electrical Connector

3. NASA Magnetometer Project

a. The NASA magnetometer project was initiated to advance the state-of-the-space magnetometer art so that magnetometers of highest stability, sensitivity, and reliability, with minimum noise, power consumption, weight, volume, and cost could be made for low-field space science investigations and for military applications. In 1965, NASA Headquarters requested NSWC(WO) to provide NASA-AMES with magnetic material support on the Apollo Lunar Surface Magnetometer Project. From 1973 to 1979, NASA GODDARD funded additional magnetometer sensor core material research.

b. Basic magnetic material research of the 1950's and early 1960's at NSWC(WO) has today evolved into the tailoring of magnetic material to the solution of a device oriented problem. New low-noise magnetic core materials of high stability were developed for use in the fluxgate magnetometer sensors.

c. Complete fluxgate magnetometer sensors or sensor cores were used on flight magnetometer instrumentation on: Apollo 16, ISEE, Pioneer Venus, Dynamics Explorer, Voyager I and II, MAGSAT, and will be used on the Solar Polar Mission and the Jupiter Orbiter if not cancelled.

d. The magnetometer sensor core technology was transferred to industry in 1981 at the request of NASA Goddard. Infinetics, Inc. of Dover, Delaware, now manufactures the 6-81.3 Moly Permalloy ring cores. It has been recently learned that the Japanese, as well as some U.S. commercial magnetometer manufacturers, have been using the 6-81.3 Moly Permalloy material since the publishing of our first paper on this material as applied to fluxgate magnetometer sensors.

4. Magnetometer Sensors for the British

A NASA program, International Solar Polar Mission (ISPM), was arranged with the European Space Research Organization (ESRO) whereby two separate spacecraft would be launched into different flight paths so that each passed a pole of Jupiter and continued on to pass a pole of the Sun. NSWC, already working with NASA Goddard, was to provide magnetometer sensor ring-cores to NASA Goddard for the NASA spacecraft magnetic experiment. The ERSO spacecraft magnetic experiment was the responsibility of the Imperial College of Science and Technology, London, England. NSWC was requested to supply complete fluxgate ring-core magnetometer sensors for the ERSO magnetic experiment. Prototype and flight sensors were constructed and shipped to Imperial College for this purpose. The magnetometer sensors contained slight modifications to the standard sensor design previously used for Apollo 16 Lunar Magnetometer and the ISEE and Pioneer Venus magnetometer experiments. The ERSO space craft is scheduled to be launched from the NASA Shuttle sometime in the mid 1980's.

5. Photographic System for Auto Occupancy and Vehicle Identification

This project was performed for the Department of Transportation, Federal Highway Administration (FHWA) and originated from FHWA requirements for auto occupancy counts for evaluation of car-pooling, ride sharing, high-occupancy-vehicle facility enforcement. This study involved continued development of a photosystem for auto occupancy counting and vehicle identification. The system operates automatically at roadside and photographs the interiors of vehicles passing the control point. The system includes a 16mm pulse camera with infrared film, and infrared flash synchronized to the camera and an optical vehicle sensor which trips the camera when a vehicle passes the station. Work was completed and reported to the FHWA in FY81.

6. GPS Geodetic Receiver System

a. Using the signals from the Global Positioning System (NAVSTAR) Satellites, the GPS Geodetic Receiver System will provide remote realtime point positioning approaching one meter accuracy in four to six hours of on-site operation vs 24 to 36 hours using the Navy Navigation Satellite System (TRANSIT). Relative position determination between two sites 100 to 250 kilometers apart will approach two centimeters in accuracy after approximately four hours on site, and four meter positioning accuracy will be typical when the Receiver System is used on a low dynamic survey vessel or aircraft. These are the requirements the sponsors - Department of Interior (U.S. Geological Survey), Department of Commerce (NOAA - National Geodetic Survey), Defense Mapping Agency - have placed on the Receiver System.

b. NSWC was selected to direct the Receiver System development due to its previous geodetic work with TRANSIT and continued work with GPS. NSWC is developing in-house the software for the Receiver System. Since the Receiver System is software controlled, it can be readily adapted for various geodetic survey applications. Texas Instruments, Inc., has the contract to deliver in November 1982 the first prototype Receiver System, with the remaining nine preproduction Receiver Systems delivered six months later.

7. U.S. Coast Guard Diving Equipment Program

The objective of this FY81 project was to bring U.S. Coast Guard diving equipment and procedures into conformance with Navy standards. The program consisted of a survey of Coast Guard diving equipment, selection and procurement of approved equipment, and technical support in the operation of the Coast Guard diving program. Effort centered on the selection and procurement of surface supplied and SCUBA equipment. An air supply system was designed and procured, and a Mk 12 Diving System was procured for the Coast Guard Force Dive Team.

8. Boom Mooring System

a. The purpose of this project was to manufacture, assemble and package 12 boom mooring systems for use by the U.S. Coast Guard on open water oil spill cleanup operations. The Oil Containment Boom Mooring System (OCBMS) is a heavy-duty system developed by NSWC to handle large-scale oil spills, particularly in tidal currents and choppy water. The OCBMS can be used on the open sea in depths up to 200 feet. A mooring leg consists of an anchor, anchor chain, wire ropes, polypropylene lines, and buoys. The mooring system uses a number of these mooring legs to anchor oil containment boom in place against seas, current, and wind. The mooring legs are packaged and approved for military air, land, and sea transportation. The Coast Guard system was developed from the Navy system with few changes so that it will meet the specific needs of the U.S. Coast Guard.

b. A complete layout and system control is published in Operation and Maintenance Manual for Oil Containment Boom and Mooring System No. S-5400-AA-OHB-00-0.

9. Vena Cava Filter

NSWC provided materials and technical consultation to the Massachusetts Institute of Technology to develop the processing and performance of NITINOL alloys for vena cava filters. The wire devices help prevent pulmonary embolisms by simple catheter introduction of a shape memory alloy filter into the vena cava; the devices can be emplaced within the body without requiring surgery. Two firms have considered production of the device.

10. Shape Memory Alloy Seals for Geothermal Applications

Rockwell International funded NSWC in FY81 to provide material and guidance for improved seals to withstand geothermal environments and temperatures. NITINOL provides a corrosion and abrasion resistant seal material for down hole use in the brine and particle-laden underground, superheated geothermal wells, and oil wells. Tests in two-inch diameter pipe flanges at specified temperature and pressure were successfully completed and reported to the company.

11. Under-Ice Oil Detection by Radar

a. The U.S. Coast Guard funded this project to conduct an analysis to determine if the Resonance Scattering Theory (RST), developed at NSWC, could be used to detect the presence (and identify the composition) of oil layers under ice via radar backscattered echoes. This scenario could occur from an oil spill in in-covered arctic waters. To assess the extent of a spill, radar sensors carried by airborne vehicles would ping on the ice and gather reflected data. This data base, analyzed via RST, serves to detect the presence and identify the composition of a liquid layer possibly present between the ice and water.

b. An analytical study performed in FY81 showed that by analyzing the (radar) reflection coefficient of an ice-oil bilaminar system separating air from water, as per the RST, it is feasible to detect the presence of the hidden layer (if present) and determine its composition (dielectric constant) and thickness. A report was submitted to the Coast Guard and a paper published in the Journal of Applied Physics.

12. Nuclear Power Plant Seismic Evaluation

a. In FY81 and FY82, NSWC provided structural expertise to the Nuclear Regulatory Commission (NRC), in the review of the Final Safety Analysis Report (FSAR) in conjunction with operating license applications at the following nuclear power plant sites: (1) Midland, Michigan; (2) Waterford, Louisiana; and (3) Commanche Peak, Texas. At the FSAR stage, the applicant describes with specific engineering data the design conclusions and details of Category I Structures, Systems, and Components. Demonstration of compliance to applicable NRC regulations and requirements, in all aspects of design, analysis, fabrication, and erection of Category I Structures and Systems, is a prerequisite for approval of the FSAR. On completion of the FSAR review, evaluation, and approval, the applicant receives an operating license for commercial plant operation. In addition to the FSAR reviews, NSWC also participated in safety reviews for the following type of plant designs; (1) a standard nuclear steam supply system plant design submitted by a vendor; and (2) a standard Balance of Plant design submitted by a utility applicant or an architect-engineer firm.

b. Specific NSWC support to NRC has included:

(1) Review and evaluation of the FSAR in accordance with the NRC acceptance criteria.

(2) Preparation of preliminary safety evaluation reports.

(3) Participation in meetings with applicants and NRC staff to discuss and resolve open issues and assess additional information submitted by the applicant.

(4) Audits of structural designs.

(5) Preparation affidavits and testimonies involving Category I structures.

c. NSWC has also issued and completed a contract to Butler Analysis, Inc. to prepare a preprocessor program to convert an acceleration time history on a rigid base to a forcing time history distributed over a cylinder modeled two ways; first as a shell, then as a stick model. A set of user instructions was delivered and an executable program was tested on an NSWC computer.

d. At present, NSWC is in the process of issuing a contract which will extend the use of Nastran in performing seismic analysis by the direct transient, modal transient, direct frequency response methods. Within the constraints of the necessary dynamic modeling, the code will be capable of accepting the finite element specifications provided by the user and yield displacement, accelerations, and element forces at specified points and time. Element stresses at the centroid of specified elements as a function of time can also be obtained. Deformed plots of structural response as well as X-Y plots of the stresses at specified points and time will also be provided. The final report will include a technical description of the code, the basic theory, and a users manual section.

13. GEOMAP Program

a. The GEOMAP program, prepared by NSWC for the Department of Commerce in FY81, is a collection of FORTRAN subroutines for projecting orbital data and/or contouring oceanographic data on a world map. The map can be drawn using the cylindrical equidistant (plate-carree) projection, the mercator projection, or the azimuthal equidistant (polar) projection.

b. The program is written in extended FORTRAN IV, and runs under the Scope 3.4 operating system on a CDC 6700 computer at NSWC, Dahlgren, Virginia. The input to GEOMAP consists of several data cards for each map or maps to be produced, together with control cards for specifying the output devices and attaching files containing the data to be processed.

c. The output from GEOMAP consists of computer listings and graphic plots. The principal plot is a map of the world showing the projected tracks of the satellite and the values of one or more functions associated with the satellite at each position, and/or contours of a rectangular array specified by the user. The function values can be printed along the track, or they can be plotted normal to the track.

d. The world-map plots may be obtained from any one of the following devices:

(1) Calcomp

(2) Quickplotter

(3) Dicomed D48B (replaces SD-4060)

(4) Textronix 4051

14. Computer Science Program

In May 1981 an NSWC technical staff member was detailed as a full-time faculty member to Mary Washington College (MWC) in Fredericksburg, VA for a period of one year. He has significantly contributed to the computer science program at MWC in teaching and curriculum development. At the request of MWC, his assignment was extended for a second year (through May 1983).

15. Tourmaline Gages

a. The original tourmaline gage was designed and developed at Woods Hole Oceanographic Institute during WW II under Navy contract. These gages are used in the measurement of shock wave phenomena from underwater explosions. After the war the scientists formed Crystal Research Company to market the gage; the company closed in 1972. NSWC purchased the company assets and began producing gages to fill the void left by the defunct company. Improvements have been made to the gages as technology changes so dictated.

b. NSWC constructs and calibrates the gages which are sold at fixed price to various research activities including other agencies of the U.S. Government as well as private industry. Gages and related information are exchanged with foreign governments with whom the U.S. has information exchange agreements. Gage purchasers include: Jet Research, Arlington, Texas; Naval Research Laboratory; and Elda Trading Corp., New York.

16. Hydrogen Gas Generator

Based on previous NSWC experience in the development of hydrogen gas generators as power supplies for actuators and fluidic sequencers, the Department of Interior, Geological Survey funded NSWC to develop such a power supply for an underwater cavitation erosion gun. A prototype generator was developed in FY82 and will be tested underwater at a contractor site if funding continues in FY83.

17. Tagged Booster Explosive

In FY81 the Aerospace Corporation funded NSWC for support in tagged booster explosives investigations. The purpose of adding taggants to booster explosives is to provide means to trace the source of

explosives to most recent legal owner. This project was involved with testing to determine the compatibility of candidate taggant materials (and their components) to determine whether or not mixing/storing the the taggants with the booster explosive was safe and caused no degradation of the explosive. The test of choice was the Vacuum Thermal Compatibility test (developed at NSWC) in which compatibility between a material and explosive is determined by comparing the amount of gas evolved by the material and the explosive separately with the amount of gas evolved by a 1:1 mixture of the material/explosive all at a specified temperature and time period. The compatibility of 3M targets encapsulated with parylene has been determined and compared with the results of previous compatibility tests, with unencapsulated 3M taggants. All tests have been completed and the results reported to Aerospace Corporation.

18. TAO Degaussing Coil Design

George G. Sharp, Inc. funded NSWC to provide the initial design for the degaussing coil system for a new class of fleet oilers (the TAO). The design consisted of degaussing coil locations and ampere-turn requirements and was completed and submitted to the company in FY81.

19. Spanish Sea Control Ship Degaussing Coil Design

During FY82, NSWC provided technical assistance and guidance to the EMS Development Corporation of Farmingdale, New York, in the area of the degaussing coil design for the Spanish Sea Control Ship. EMS contacted NSWC and requested support in this area. Authorization to perform the task was obtained through the Department of State and Department of Defense since it involved a service provided by the Federal Government to a foreign government through a private contractor. The actual degaussing system design was performed after receiving the applicable ship drawings and other information from EMS. The design consisted of locations and ampere-turn requirements for all the degaussing coils to be installed on the ship. Several ship modifications required a review of the design with no subsequent changes. The project was completed upon delivery of the design to EMS in March 1982.

20. Prompt Gamma Testing of Electronics

NSWC provides prompt gamma irradiation testing services to Department of Defense and private industry, as well as providing consultation on electronics hardening against nuclear radiation. New high density integrated electronics are particularly susceptible to ionizing radiation from nuclear sources. Prompt gamma is very effective in upsetting digital electronics such as microprocessors and computers. Designers use a variety of approaches to harden against these effects. Testing circuits, components, and materials in representative environments is an integral part of the design process. In FY81 and FY82 NSWC provided such testing support to several organizations (Westinghouse, K-Tech, and the Department of Energy).

21. Doppler Station Positioning

The Department of Commerce (National Geodetic Survey) funded NSWC for support in investigating plate tectonics motion. The task involved determination of a set of satellite station positions for specific time intervals during the period January 1973 through December 1979. A single gravity field and reference system are used in order to produce a uniform set of positions. The data has been processed and the station locations determined. Analysis of the data indicates the need for a third-order ionospheric correction.

22. Computer Assist

This is a continuing cooperative effort with the Catholic University of America for which NSWC provides computer assistance for the development of an improved data base and predictive capabilities in heavy ion stopping powers and ion-induced K-shell ionization probabilities. It has applications in materials modification through ion implantation and surface layer alloying and ion materials analysis through ion-induced X-ray production.

23. Positron Lifetime Study

This is a research study funded by NASA (Langley Research Center) directed towards nondestructive evaluation of composite materials; it involves the extension of the technique from the study of fatigue in metals to the study of moisture in polymer resins. Positrons emitted from a suitable radioactive source enter a specimen of resin matrix composite or other polymeric material; they interact with negative electrons in the host material to produce annihilation gamma rays. The time between positron injection and emission of the gamma rays (on the order of a few nanoseconds) has been shown to be dependent on the amount of absorbed moisture in the specimen. This technique is being studied for potential use in monitoring environmentally absorbed moisture (in resin-matrix composites) that can affect mechanical properties. NSWC has provided computer data analysis support in FY81 and FY82.

24. Acoustic Facility Services

NSWC provides technical support and services to other government activities and private concerns for underwater equipment testing and analysis at its Brighton Dam Acoustic Facility. In FY81, NSWC supported the National Oceanic and Atmospheric Administration in conducting echo reduction and insertion loss measurements on rubberized panels.

25. Facility Host/Tenant Support

a. Solomons, MD - In FY81, NSWC supported the National Oceanographic and Atmospheric Administration (NOAA) and the Johns Hopkins University/ Applied Physics Lab in host/tenant agreements at Solomons, MD. The support included pier space, [illegible] space, utility services, and manpower assistance under funding provided by the tenants.

b. Similar services were provided to NOAA at the NSWC Ft. Lauderdale Test Facility in FY82. At this site NOAA has installed a computer controlled data acquisition system in an oceanside structure. NSWC personnel have planted a transducer on an underwater cable in order that NOAA personnel can monitor gulf stream current affects on acoustic signals.

26. Radiographic Inspection of Fuel Cell Insulators

The Brunswick Corporation funded NSWC in FY81 and FY82 to perform radiographic inspection in the nozzle/fuel cell bonding area of the space shuttle propulsion system. A double-film, two-level exposure technique is used to assess the bond at specified intervals around the periphery of the assemblies. The effort will continue into FY83.

27. ADCAP Environmental Tests

The Westinghouse Oceanic Division funded NSWC in FY82 to provide environment simulation facilities for testing the Advanced Capability (ADCAP) nose assembly for a torpedo design. NSWC personnel operated the simulation equipment and Westinghouse monitored test specimen performance.

28. DOT Container Tests

At the request of the Department of Transportation, NSWC performed test and evaluation of specified hazardous shipping containers to determine their suitability in meeting DOT specifications for special shipping containers. The work was performed in FY81 and FY82 and consisted of drop tests, repeated impact tests, dimensional checks, and pressure and strength tests. Test results have been reported to DOT.

29. Preproduction 30mm Ammunition Testing

a. The project originated with Honeywell Corporation to determine if preproduction ammunition would function in a Navy gun system for which the ammunition was intended for use. If deficiencies were then discovered, the contractor could correct them prior to producing production items for sale to the Navy.

b. The contractor funded NSWC to fire samples of the preproduction ammunition in a Navy gun; internal and external ballistic aspects of the ammunition were measured and assessed by NSWC personnel. At test conclusion, NSWC provided the contractor with data indicating whether or not performance was satisfactory for service acceptance.

30. Recovery Canister Test

a. The first of two parachute recovery test canisters has been completed for Norden Systems. This allows Norden's developmental round to be gun fired and recovered for evaluation. The second parachute recovery system should be completed in FY83 once the results of the first test are analyzed. Once the two test rounds have been completed

by NSWC, the remaining recovery rounds (if needed) will probably be accomplished by Norden Systems. The parachute recovery system has been used during the past ten years at NSWC for recovery of gun launched hardware during the development of the 5" and 8" Guided Projectiles. The design and hardware to fabricate the recovery system is not unique and within the state of the art.

b. During three on-board meetings with Norden Systems personnel, the complete parachute recovery system was reviewed including design drawings, hardware, and the fabrication/assembly area at NSWC. The usefulness of the recovery system to Norden Systems will be assessed once their developmental round is fired utilizing the recovery system. If the recovery system is 100 percent operational, Norden's test hardware will be recovered and analyzed.

31. Guided Missile WDU-17/B Warhead Acceptance Test

NSWC maintains instrumented warhead test facilities which are available to other government activities and private industry. In FY81 the Whittaker Corporation funded NSWC to ballistically test the guided missile WDU-17/B warhead. The ballistic acceptance test consisted of obtaining rod characterization data which included spatial distribution of the discrete rods and average rod velocities. Metal target plates spaced at various radii were used to map the rod distribution. High speed photography and electronic velocity screens were used to determine average rod velocities.

32. High Explosive Impact Sensitivity Tests

NSWC provides explosive facilities testing support to other government agencies and private industry. In FY81 and FY82, the Department of Energy (Lawrence Livermore National Labs) funded NSWC to conduct impact tests to determine the sensitivity of various explosives.

33. Motor Magnetic Tests

In FY81 and FY82, NSWC measured the magnetic moments of two permanent magnet electric motors for Cincinnati Milacron. The measurements were used to determine if the motors met Federal regulations for shipment on commercial aircraft. The measurements were made using the same facilities that measure the magnetic moments of satellites.

34. Undersea Weapons Tank and Hydroballistics Facility Tests

NSWC provides underwater and hydroballistic testing facilities, including instrumentation and data analysis, to federal agencies and private industry. The Undersea Weapons Tank is 100 feet deep and 50 feet in diameter; the Hydroballistics Tank (100 feet long, 35 feet wide, and 75 feet deep) provides for observation and measurement of objects undergoing high speed water entry and exit. Test services were provided in FY81 and FY82 for Woods Hole Oceanographic Institution, the National Oceanic and Atmospheric Administration, and several industrial users including Sanders Associates, Magnavox Corporation, and Bunker Ramo.

35. Well Head Tests

Well heads are concrete and steel structures remaining from abandoned off-shore oil well drilling sites; they rise to a height of several feet from the ocean floor. Most countries require that abandoned oil well components be removed from the seabed. Typically, well heads are severed below the ocean bottom and the freed portions are then recovered. An explosive charge detonated inside the well head casing is the usual removal method. The Department of Interior, U.S. Geological Survey funded NSWC to assess the environmental impact of these explosions so that standards can be set for this use of explosives in the oil industry. Field tests were conducted in which explosive charges were placed in large, half-scale pipes and detonated to observe environmental effects; results were reported to the Geological Survey. NSWC TR 81-149 entitled "Fish-Kill Ranges for Oil Well Severance Explosions" was also prepared for the Geological Survey.

36. PBXW-109 Cylinders

In FY81 the Department of Energy (Lawrence Livermore National Labs) funded NSWC to process and cast bare explosive charges of PBXW-109. The plastic bonded explosive cylinders were manufactured and shipped to LLNL for testing, as requested.

37. Porpoise Tags

In FY81 the Department of Commerce (Southwest Fisheries Center) funded NSWC to utilize its in-house plastics molding facilities to produce a limited number of porpoise tags. After redesign and selection of new plastic material, the tags were injection molded and delivered to Southwest Fisheries. NSWC was requested to perform this work because commercial injection molding companies are not interested in small prototype production, and the NSWC plastics laboratory is designed for only such type work.

APPENDIX B

NSWC FY82 TECHNOLOGY APPLICATION ASSESSMENT FORMS

TECHNOLOGY APPLICATION ASSESSMENT

Date: 9/10/82
CUFT #:
LAB #: NSWC-TAA-82-001

1. Laboratory Naval Surface Weapons Center

2. Contact (ORTA) Ramsey D. Johnson
Phone 394-1505 Autovon 290-1505
(301)

3. Address Silver Spring, MD 20910 (Code D21)

4. Technology Name NITINOL Connectors for Optical Fibers

Descriptors: Metalworking
Communications
Fiberoptics

Applications:

5. Technology Type: (a) Process (b) apparatus (c) material (d) service (e) study (f) other:

6. Users (a) Federal Government (b) State Government (c) Local Government (d) Small ind. (e) Medium ind. (f) Large ind. (g) Consultant (h) other:

7. Potential Support: exclusive license, (consulting,) joint venture, drawings, tooling, computer prog., economic study, training, adaptive eng., other:

8. What Problem Does It Solve and How? Development of fiber optic communication systems mandated need for low cost, high performance interconnect devices for single fibers of small diameter. Materials and device manufacturing processes developed for five-mil diameter optical fibers.

9. Other Uses:

10. Main Advantages: Low cost, high performance.

11. Production Information: High technology, medium to high capitalization cost, special materials required.

12. Descriptive Literature: NITINOL Interconnect Device for Optical Fiber Waveguides
NAVSEA Report No. S562-78/Technical Report NSWC TR 81-1[illegible]
(UNCLASSIFIED)

13. Literature Available From: NTIS (ADA 108278)

TECHNOLOGY APPLICATION ASSESSMENT

Date: 9/2/82
CUFT #:
LAB #: NSWC-TAA-82-002

1. Laboratory Naval Surface Weapons Center

2. Contact (ORTA) Ramsey D. Johnson
Phone 394-1505 Autovon 290-1505
(301)

3. Address Silver Spring, MD 20910 (Code D21)

4. Technology Name Shape Memory Alloy Seals for Geothermal Applications

5. Technology Type: (a) Process (b) apparatus (c) material (d) service (e) study (f) other:

Descriptors: Seals, Pumps, NITINOL, Geothermal

Applications: Energy from geothermal sources, Oil wells, Pump Seals

6. Users (a) Federal Government (b) State Government (c) Local Government (d) Small ind. (e) Medium ind. (f) Large ind. (g) Consultant (h) other:

7. Potential Support: exclusive license, (consulting,) joint venture, drawings, tooling, computer prog., economic study, training, adaptive eng., other: Materials

8. What Problem Does It Solve and How? Provides corrosion and abrasion resistant seal material for down-hole use in geothermal and oil wells.

9. Other Uses:

10. Main Advantages: Corrosion and abrasion resistance in the brine and partical laden underground, superheated geothermal energy sources.

11. Production Information: Test data available

12. Descriptive Literature:

13. Literature Available From: David Goldstein, Code R32, (301)394-2468
Naval Surface Weapons Center
White Oak, Silver Spring, MD 20910

TECHNOLOGY APPLICATION ASSESSMENT

Date: 9/2/82
CUFT #:
LAB #: NSWC-TAA-82-003

1. Laboratory Naval Surface Weapons Center

2. Contact (ORTA) Kelsey B. Johnson
Phone 394-1515 Autovon 290-1505
(301)

3. Address Silver Spring, MD 20910 (Code D21)

4. Technology Name Vena Cava Filter

5. Technology Type: (a) Process (b) apparatus (c) material (d) service (e) study (f) other:

Descriptors: Blood Clots
Filters
Heart Attacks
Vena Cava

Applications: Coronary Attack and stroke prevention

6. Users (a) Federal Government (b) State Government (c) Local Government (d) Small ind. (e) Medium ind. (f) Large ind. (g) Consultant (h) other: Hospitals

7. Potential Support: exclusive license, (consulting,) joint venture, drawings, tooling, computer prog., economic study, training, adaptive eng., other:

8. What Problem Does It Solve and How? Prevents pulmonary embolisms by simple catheter introduction of a shape memory alloy filter into the vena cava.

9. Other Uses: Biomedical devices

10. Main Advantages: Wire devices can be emplaced within the body without requiring surgery.

11. Production Information:

12. Descriptive Literature:

13. Literature Available From: David Goldstein, Code R32
Naval Surface Weapons Center
White Oak, Silver Spring, MD 20910

TECHNOLOGY APPLICATION ASSESSMENT

Date: 9/7/82
CUFT #:
LAB #: NSWC-TAA-82-004

1. Laboratory Naval Surface Weapons Center

2. Contact (ORTA) Ramsey D. Johnson
Phone 394-1505 Autovon 290-1505
(301)

3. Address Silver Spring, MD 20910 (Code D21)

4. Technology Name Boom Mooring System

5. Technology Type: (a) Process (b) apparatus (c) material (d) service (e) study (f) other:

Descriptors: Oil Boom Mooring System

Applications: Oil Spill Clean up

6. Users (a) Federal Government (b) State Government (c) Local Government (d) Small ind. (e) Medium ind. (f) Large ind. (g) Consultant (h) other:

7. Potential Support: exclusive license, consulting, joint venture, drawings, tooling, computer prog., economic study, training, adaptive eng., other:

8. What Problem Does It Solve and How? This program provides the U.S. Coast Guard with necessary equipment to assist in offshore oil pollution clean up.

9. Other Uses: None

10. Main Advantages: Heavy-duty System suited for use in tidal currents and choppy water; open sea use in depths to 200 feet.

11. Production Information: Low technology; small capitalization; most components are commercially available items.

12. Descriptive Literature: Skimming Barrier System Operation and Maintenance Manual COMDTINST M16465.26 (DOT, USCG) (UNCLASSIFIED)

13. Literature Available From: U.S. Coast Guard (GEOE)
2100 2nd St. S.W.
Washington, D.C. 20593

TECHNOLOGY APPLICATION ASSESSMENT

Date: 8/23/82
CUFT #:
LAB #: NSWC-TAA-82-005

1. Laboratory Naval Surface Weapons Center

2. Contact (ORTA) Ramsey D. Johnson
Phone 394-1505 Autovon 290-1505
(301)

3. Address Silver Spring, MD 20910 (Code D21)

4. Technology Name Tourmaline Gage

5. Technology Type: (a) Process (b) apparatus (c) material (d) service (e) study (f) other:

Descriptors: Gages
Transducers
Sensor

Applications: Measurement of pressure from underwater explosions

6. Users (a) Federal Government (b) State Government (c) Local Government (d) Small ind. (e) Medium ind. (f) Large ind. (g) Consultant (h) other:

7. Potential Support: exclusive license, consulting, joint venture, drawings, tooling, computer prog., economic study, training, adaptive eng., other:

8. What Problem Does It Solve and How? Provides an accurate, rugged, and reliable sensor to measure the transient pressure from underwater explosions. It is a piezoelectric device that converts to voltage suitable for recording on oscilloscopes or magnetic tape.

9. Other Uses:

10. Main Advantages: Accurate, rugged reliable

11. Production Information: Medium technology; low capitalization costs; high-quality tourmaline difficult to obtain.

12. Descriptive Literature: Report will be available in late 1982.

13. Literature Available From:

TECHNOLOGY APPLICATION ASSESSMENT

Date: 8/23/82
CUFT #:
LAB #: NSWC-TAA-82-006

1. Laboratory Naval Surface Weapons Center

2. Contact (ORTA) Ramsey D. Johnson
Phone 394-1505 Autovon 290-1505
(301)

3. Address Silver Spring, MD 20910 (Code D21)

4. Technology Name Hydro Facilities

5. Technology Type: (a) Process (b) apparatus (c) material (d) service (e) study (f) other: Service

Descriptors: Test Facilities
Hydroballistic Tank
Undersea Weapons Tank

Applications: Development
Testing Support

6. Users (a) Federal Government (b) State Government (c) Local Government (d) Small ind. (e) Medium ind. (f) Large ind. (g) Consultant (h) other:

7. Potential Support: exclusive license, (consulting,) joint venture, drawings, tooling, computer prog., economic study, training, adaptive eng., other: Service

8. What Problem Does It Solve and How? Underwater and hydroballistics test facilities, instrumentation and data analysis are provided using the two unique facilities at NSWC. The Undersea Weapons Tank is 100 feet deep and 50 feet in diameter with a retrieving platform and portholes at eight levels. The Hydroballistic Facility is 100 feet long, 35 feet wide, and 75 feet deep with the capability of drawing a vacuum above the water surface.

9. Other Uses:

10. Main Advantages: The filtered water and portholes in both facilities allow observation of tests.

11. Production Information:

12. Descriptive Literature: Brochures for both facilities

13. Literature Available From: H. K. Steves, Code U23, (301)394-1918
Naval Surface Weapons Center
White Oak, Silver Spring, MD 20910

TECHNOLOGY APPLICATION ASSESSMENT

Date: 9/10/82
CUFT #:
LAB #: NSWC-TAA-82-007

1. Laboratory Naval Surface Weapons Center

2. Contact (ORTA) Ramsey D. Johnson
Phone 394-1505 Autovon 290-1505
(301)

3. Address Silver Spring, MD 20910 (Code D21)

4. Technology Name Laser Hardening of Cams

5. Technology Type: (a) Process (b) apparatus (c) material (d) service (e) study (f) other:

Descriptors: Lasers
Metalworking
CAM

Applications: Metalprocessing

6. Users (a) Federal Government (b) State Government (c) Local Government (d) Small ind. (e) Medium ind. (f) Large ind. (g) Consultant (h) other:

7. Potential Support: exclusive license, (consulting,) joint venture, drawings, tooling, computer prog., economic study, training, adaptive eng., other:

8. What Problem Does It Solve and How? Process uses CNC control of laser processing as a replacement for cyanide salt-bath nitriding surface hardening process.

9. Other Uses: Other metalworking and heat treating operations with lasers.

10. Main Advantages: Lower energy utilization, lower cost, faster turn-around, avoid handling and disposal of cyanide salt materials.

11. Production Information: Medium capitalization costs, high technology

12. Descriptive Literature: Laser Transformation Hardening of Firing Zone Cut Out CAMS

13. Literature Available From: NTIS (ADA 105498) NAVSEA Report No. S555-79 (UNCLASSIFIED)

APPENDIX C

NSWC INVENTIONS AND PATENTS IN FY81/82

	TECHNOLOGICAL AREA	NAVY CASE OR PATENT NO.	TITLE AND PURPOSE	POTENTIAL COMMERCIAL APPLICATIONS
1.	Material Science	65,695	Process for stretching thin materials	Metal forming
2.	Machine Assembling	64,465	Ball Bearing Vacuum Fixture	Machine parts industry
3.	Ship Propulsion	64,016	Tunne wedge for decreasing shipboard fuel consumption	Small boat industry
4.	Accelerometer	4,342,228	Angular accelerometer for determining rotational acceleration	Aircraft industry
5.	Geophysical	63,971	Low power driver for flux gate magnetometer	Geophysical exploration
6.	Explosives	64,048	Light actuated electroexplosive device	Construction and mining
7.	Electrical (Material)	64,857	A method of determining the geometry and material composition of a dielectric	Useful in the exploration of oil
8.	Electrical	62,840	A digital M of N correlation device for increasing the speed at which pulse compression is accomplished	Useful in the communications industry
9.	Electrical (Semi-conductor Devices)	60,425	A semiconductor device for detecting electromagnetic radiation in two distinct spectral regions	Useful in the communications industry
10.	Electrical (Semi-conductor Devices)	62,713	Improved fabrication of crosstie memory	Useful in the computer industry

	TECHNOLOGICAL AREA	NAVY CASE OR PATENT NO.	TITLE AND PURPOSE	POTENTIAL COMMERCIAL APPLICATIONS
11.	Electrical	4,249,422	An apparatus and method for for determing the material properties characterizing a fluid contained in a cavity inside a solid	Useful in the exploration of oils
12.	Polymer Ch· istry	63,594	Acetylene-terminated dianil monomer. The monomer can be polymerized to a thermally stable and electrically conductive polymer	Semiconductors
13.	Laser Chemistry	64,551	Separation of hydrogen isotopes	Obtaining deuterium
14.	Polymer Chemistry	64,665	Cis-trans fluoropolyol	Castings, coatings, and adhesives
15.	Laser Chemistry	65,237	Separation of carbon isotopes	Obtaining carbon-13
16.	Organic Chemistry	65,302	Synthesis of alkenols	Preparation of nitrate esters useful in explosives and propellants
17.	Metallurgy	65,540	Composite superconductors	Motors and magnets
18.	Polymer Chemistry	64,140	Fluorinated diacrylic esters and polymers therefrom	Coatings
19.	Polymer Chemistry	65,488	Polymers from Acetylene-terminated dianil monomer	Semiconductors
20.	Explosive Warhead Ignition Means	64,673	Monolithic multipoint warhead initiator	All ignition systems for warheads may utilize this invention
21.	Method for Loading Plastic Bonded Explosives	64,672	Ultrasonic loading method for extrudable plastic bonded explosives	Method of producing plastic bonded explosives

	TECHNOLOGICAL AREA	NAVY CASE OR PATENT NO.	TITLE AND PURPOSE	POTENTIAL COMMERCIAL APPLICATIONS
22.	Two Stage Shaped Charge	65,693	Tandem conic/self forging fragment lined shaped charge	Shaped charges for underwater explosives
23.	Hydrophones and Sound Sensors	64,933	Long line hydrophones	Underwater sound systems
24.	Inorganic Chemistry	4,231,891	A composition and method for generating fluorine and gaseous fluorine containing compounds	To generate fluorine and fluorine containing compounds
25.	Optical Alignment	63,071	Multidirectional translator mechanism	Use in laser tracking systems
26.	Transducers	65.487	Conversion of magnetic energy into mechanical energy and vice versa	Transducers, sonic delay lines, and sonic filters, etc.
27.	Batteries	65,536	Stabilized nickel-zinc battery	Extremely high potential for use in electric cars and storage of electricity (performance far exceeds previous batteries)
28.	Paints	4,286,988	Copper base antifouling paints with PH control	Antifouling paint for ships and boats
29.	Magnetostrictive Materials	4,308,474	Rare earth-iron magnetostrictive materials and devices using these materials	Transducers, sonic delay lines, and frequency control devices
30.	Method of Sealing High Pressure Gas Container	4,255,916	Method of charging and hermetically sealing high pressure gas container	Chemical industry and welding industry
31.	High Pressure Gas Container	4,258,739	Hermetically sealed high pressure gas container	Same as above
32.	Coatings and Coverings	65,564	Manufacture of boots for aircraft to prevent surface erosion	Aircraft industry and marine industry

	TECHNOLOGICAL AREA	NAVY CASE OR PATENT NO.	TITLE AND PURPOSE	POTENTIAL COMMERCIAL APPLICATIONS
33.	Metallurgy	64,952	Preparation of Al-Li and Al-Mg alloys by rapid crystallization under high specific pressure	High density lightweight alloys and structural materials for motor vehicles
34.	Semiconductors	65,598	Sensitized epitaxial infrared detector	IR Detection Devices
35.	Semiconductors	65,605	Fabrication of Schottky barrier devices on $PbCl_2$-sensitized $PbS_{0.5}Se_{0.5}$ epitaxial films	IR Detection Devices
36.	Adhesives	4,336,367	Epoxy adhesive composition	As an underwater adhesive
37.	Steam Valves	66,332	Isolation steam valve with atmospheric vent and relief capability (valve provides for operating personnel safety)	Power plants and ship engine room
38.	Test Instrument	66,324	Method of measuring material characteristics (predetermines acoustic properties of a material)	Machine tool industry
39.	Instrument for Detecting Leaks	65,660	Leak detector (arrangement to detect leakage into a fuel oil system)	Power plants, airplanes, and ships
40.	Lasers	65,224	Liquid filled variable capacitor (storage high peak power from moderate power source for use with lasers)	Lasers
41.	Sprinkler Valve	63,962	Sprinkler valve (used with fire extinguisher system)	Sprinkler systems in ships and industrial and commercial buildings

	TECHNOLOGICAL AREA	NAVY CASE OR PATENT NO.	TITLE AND PURPOSE	POTENTIAL COMMERCIAL APPLICATIONS
42.	Ordnance Disposal	65,596	Range clearance by enhancing oxidation of ferrous ordnance in-situ (destroys unexploded bombs, etc.)	Clearance of former military ordnance ranges
43.	Machinery; Test Equipment	4,342,228	Angular accelerometer (measures rotation rate change)	Laboratory equipment; machinery manufacture
44.	Electronics	4,330,932	Process for preparing isolation junctions in thin-film semiconductors utilizing shadow masked deposition to form graded-side mesas	Computers and communication
45.	Electronics	4,301,418	Magnetostrictive power amplified (used in exploiting the anisotropic magnetoresistance effect in ferromagnetic thin-film)	Communications
46.	Laser Adaptive Transmission Systems	65,544	A laser beam phase measurement and control system (to measure the optical phase distribution in the traverse plane of a laser beam)	The device is useful in electron and X-R microscopy, and also for optical testing of instruments
47.	Microwave Amplitude Commutation Feed Devices	66,367	A coaxial waveguide commutation feed network for use with a scanning circular phase array antenna (to interface an improved coaxial waveguide commutation feed network to a scanning circular phase array antenna while maintaining broad band operation)	Application in radar or communication systems where a scanning or rotatable directional antenna beam is desired

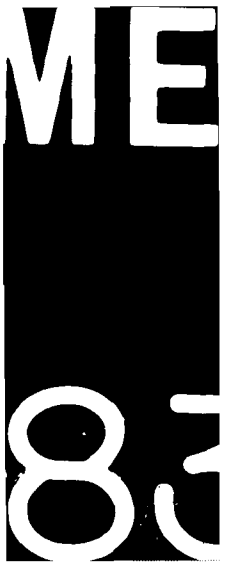
	TECHNOLOGICAL AREA	NAVY CASE OR PATENT NO.	TITLE AND PURPOSE	POTENTIAL COMMERCIAL APPLICATIONS
48.	Radiation Hardened Circuitry	66,215	A communication interface and system for radiation recovery of a microprocessor portion thereof (to allow circumvention of a microprocessor after radiation thereof by prompt gamma radiation)	Applicable when recovery of control of a microprocessor is desired after being exposed to radiation
49.	Electronic Compasses	65,934	Digital compass having a ratiometric bearing processor (to configure a digital compass to include a bearing processor that uses ratiometric commutation techniques to compute bearing)	A low-powered, general purpose compass and direction indicator
50.	Detection and Discrimination of Targets in a Marine Environment	64,709	An enhanced clutter suppression apparatus for use with an infrared search and surveillance system (to examine infrared scanning data in the form of digitized video and identify targets by the level of video corresponding thereto)	Useful to enhance the operation of image detection devices including image processors
51.	Magnetics Storage Devices	65,661	Crosstie random access memory element and a process for the fabrication thereof (to fabricate a non-volatile random memory element having a high bit rate that is fast and low in cost for use in computers, or with microprocessors and signal processors)	The memory element can be used with existing or future computer systems and improve their performance/cost figure of merit

TECHNOLOGICAL AREA	NAVY CASE OR PATENT NO.	TITLE AND PURPOSE	POTENTIAL COMMERCIAL APPLICATIONS
52. Magnetic Storage Devices	66,780	Crosstie random access memory element having associated read/write circuitry (to configure circuitry for reading and/or writing at a particular location in a crosstie random access memory element)	The memory element and read/write circuitry can be used with existing or future computer systems and improve their performance/cost figure of merit
53. Magnetic Storage Devices	66,781	Crosstie random access memory system (to arrange the associated circuitry of a crosstie memory element so as to be integrated on a single substrate therewith)	The crosstie random access memory system can be used with existing or future computer systems and improve their performance/cost figure of merit
54. Test Instruments	66,235	Two layer hydraulic analogy method for testing supersonic gas flows with shock waves (to simulate thermodynamic property specific heat ratio for testing supersonic devices with models in hydraulic medium)	Preliminary design study of devices that generate shockwaves, such as airfoils, rotating blades, compressors, etc.
55. Gun Siliencers	66,450	Foam filled muzzle blast reducing device (to reduce noise from large caliber guns)	Very limited, if any commercial applications. Applicable to attenuation of noise from very large guns
56. Radiation Detectors	65,562	Radiation detector and method of opaquing the mica window (to extend life of Geiger-mueller tube)	Geiger-mueller tubes
57. Magnetic Holders	66,088	Magnetic ships hog line holder (to facilitate servicing and maintenance of ship hulls)	Ship maintenance, scaling of structures and attachment of articles to structures
58. Gas Manifolds	65,603	Four bar manifold (to provide even gas distribution to cutting torch)	Flame cutting of metal burning bar torches

	TECHNOLOGICAL AREA	NAVY CASE OR PATENT NO.	TITLE AND PURPOSE	POTENTIAL COMMERCIAL APPLICATIONS
59.	Metallurgy	65,264	Fabrication of graded Sic/Al and G/Al composites for use in the first wall of a controlled thermonuclear reactor (high temperature composite)	Thermonuclear reactor on any high temperature use composite metal structure
60.	Metallurgy	65,304	Preparation of SiC/Al composites from scrap (novel method to utilize scrap material)	Commercial method of preparing metal composite
61.	Chemical	66,064	Improved process for the preparation of dimethylmethyl-enedinitramine (new chemical process)	Commercial process for preparing explosives and gunpowder
62.	Chemical	66,063	New plasticizer for nitropolymers (new material)	Explosives and gunpowder
63.	Wheel Bearing Suspension System	66,304	Temperature sensor for wheel bearings (to sense overheated wheel bearings)	Train wheel bearings and suspension systems
64.	Electrical	66,303	Electrical connector (to fabricate improved connector)	Electrical connector
65.	Electrical	65,207	Electrical connector (to fabricate improved connector)	Electrical connector
66.	Wheel Bearing Suspension System	65,209	Hot box sensor (to sense over-heated bearing before destruction)	Train wheel bearing suspension system

Copies

1
1
1
1
1
1
1
1
1
1


ME
8