Overview 1982-'83 Graduate Education in the Navy

Monterey, California: Naval Postgraduate School

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Graduate Education in the NAVY
The past year has been one that has been both stimulating and full of challenges. It has been especially rewarding to observe the visible signs of a renewed sense of pride and professionalism within our Navy. But the past year has also made it clear that there will continue to be strong competitive demands for the federal government's limited resources at a time when we face the challenge of revitalizing and expanding the U.S. Navy.

This environment makes it ever more incumbent upon the leaders of today as well as those of the future to properly manage the resources that have been entrusted to us. Yet how well we manage those resources, write specifications for weapons systems and utilize advancing technology, to the Navy and nation's advantage, all relate to particular aspects of graduate education. For it is only through graduate education that we will be able to continue to produce within the officer corps an adequate number of technically competent professionals not only in the engineering and science areas, but in the areas of information and policy sciences as well. That is the main task of the Naval Postgraduate School and I believe we are meeting that challenge.

Each Annual Report focuses on a different aspect of postgraduate education. The 1980-81 report highlighted the programs of study available at NPS with particular emphasis on their applicability to preparing students for their future role in their services. Last year's report dealt with graduates of the School whose careers demonstrated the requirement for and utilization of officers who had proven their value and leadership through their warfare and subspecialty development. This year's Annual Report combines elements from the two previous years—programs and people. It highlights the programs of study available with emphasis on thesis research that has been conducted by NPS students and recent graduates. Not only do these research efforts challenge and broaden the officers' knowledge base and perspective as they prepare them for leadership roles in the future, but the resulting theses are often used in a meaningful way to increase the efficiency and operational effectiveness of our military forces.

I invite you to review the report and encourage you to send your constructive comments regarding the Naval Postgraduate School to me.
The events of 1982 have once again demonstrated the need for the major military powers of the world to be prepared for a wide range of military action. The international arena is one marked not only by predictable adversary relations such as are found in the Middle East between the U.S. and U.S.S.R., but is also an arena in which remote conflicts can directly involve the U.S. and its allies. It requires an immediate response with forces in being. The conflicts in the Falkland Island and Persian Gulf areas bring home the point that a thoroughly prepared and equipped military force is an indispensable tool for national leaders in their quest to accomplish national goals and protect national interests.

The challenges that such a world present to our military officers are indeed great. They must be prepared to plan, procure and maintain appropriate assets; accurately assess the nature of the threat; understand the limits of military power and the risks involved; and properly manage and lead our forces to maximize the effectiveness of the military when and where needed. These demands are increasing at a time of rapid growth of complex technology and a national shortage of qualified engineers and personnel available to implement the required changes.

Accordingly, there is a great need for sufficient numbers of military officers who have strong operational warfare and specialty experience, coupled with graduate education, to effectively channel available and emerging technology and scarce manpower resources so that our nation can effectively and resolutely deter an increasingly sophisticated threat.

This dual development path is emphasized by the Navy to prepare officers for the responsibilities of command and senior management positions. Graduate education, specifically structured to meet the demands envisioned by community sponsors, leads to increased near term readiness and capability as well as essential long term improvement of the Navy.

The Naval Postgraduate School is meeting the challenge, responsively developing and emphasizing programs to meet evolving DOD requirements. Shortcomings in engineering manpower nationally are countered by increasing emphasis in engineering curricula. For example, the NPS stands eighth nationally in the number of graduate degrees awarded during the academic year 1980 in the field of Electrical Engineering and the Engineering Electronics and Command, Control and Communications curricula were adapted this year to provide educational skills to meet the Navy's recently emphasized requirement in space. Another curriculum modification this past year responded to special Navy needs in the area of nuclear weapons and their effects.

Additionally, the School is especially sensitive to the needs of officers who have been operationally assigned for 5-7 years and now are returning to graduate school, sometimes in areas which differ from their undergraduate experience. Through a unique organization found only at NPS, the team of a Curricular Officer and an Academic Associate personally review each student's undergraduate transcript and structure an individualized, usually multi-disciplinary, program of study leading to completion of curriculum requirements and subspecialty designation in minimum time.
The availability of modern computer facilities, classified material, a comprehensive library, and a quality faculty highly attuned to DOD requirements and interests assures high quality postgraduate education tailored for the military officer. Student educational opportunities at NPS are further enhanced through seminars, field trips and experience tours. The student acquires educational skills not only in the academic environment of the classroom but also in the practical "real world" setting. By operating a full class schedule through the entire year, NPS is able to provide highly qualified, designated subspecialists to the user in minimum time.

The objective is that graduate education will enhance the future professional performance of each officer student through a careful nurturing of educational skills leading to a subspecialty. Promotion statistics show that the selection opportunity for graduate educated officers, especially at the Commander and Captain level, is considerably higher than those for officers without graduate education.

Some graduate education requirements are met at selected civilian universities. These schools conduct educational programs which are not provided at NPS to meet requirements specified by the sponsors for certain subspecialties. This graduate level education is also an essential part of the total effort required by the Navy to meet the challenge of an increasingly sophisticated world.
Each of the Navy's programs of study leads to a specific specialty sub-specialty code that identifies the officer skills in the assignment process. Curricular reviews are conducted by the sponsor and NPS to ensure currency of the programs in meeting the sponsor's educational skill requirements.

Current programs at NPS demonstrate a strong Navy Department of Defense orientation and include:

- Administrative Science
- Acquisitions & Contract
- Systems Inventory
- Logistics Support
- Financial Management
- Manpower Personnel
- Training Analyses
- Organizational Development
- Transportation Management
- Aeronautical Engineering
- Air/Space Systems
- Meteorology
- Anti-Submarine Warfare
- Command, Control, and Communications
- Communications Engineering
- Systems
- Computer Science/Systems
- Electronic Warfare
- Engineering Electronics
- Intelligence
- National Security Affairs
- Nuclear Engineering
- Nuclear Physics
- Weapon & Effects
- Operations Analysis
- Space Operations
- Engineering
- Weapons Systems
- Engineering/Defense
- Underwater Acoustics

Civilian University Programs include:
- Chemistry
- Facilities Engineering
- Forensic Science
- Joint Intelligence
- Law
- Logistic Management
- Naval Construction and Engineering
- Nuclear Effects
- Nuclear Engineering
- Ocean Engineering
- Petroleum Engineering
- Petroleum Management
- Policy/Military
- (Western Hemisphere)
- Public Affairs
- Religion
- Retailing
- Subsistence Technology
- Supply Acquisition and Distribution Management
SECRETARY OF DEFENSE SPEAKS AT NPS


Defending proposed Defense Department spending, Secretary Weinberger said the United States must improve its military capability in order to match the "enormous" emphasis on weaponry by the Soviet Union in recent years. In the last 21 years, he said, the Soviet Union has steadily increased its military spending, "almost all of it offensive oriented."

While at the Naval Postgraduate School, Secretary Weinberger received a briefing on graduate education in the Navy from the Superintendent and Provost.

NAVY SPACE SYMPOSIUM

A three-day Navy Space Symposium was conducted in October 1981 at the Naval Postgraduate School.

Admiral Thomas B. Hayward, then the Chief of Naval Operations, keynoted the event which was jointly sponsored by the Chief of Naval Operations and the National Academy of Sciences.

The objectives of the symposium were to explore the implications of space for future naval operations and to assess the promise of evolving space technology. During the event, it was noted that the Navy is the biggest user of space and is becoming increasingly dependent on space systems for navigation, communications and intelligence gathering.

Symposium attendees included military and civilian experts who were knowledgeable of both the technical and operational aspects of space-based surveillance, communications, navigation and meteorological systems.

During the symposium, Admiral Hayward announced the creation of a new space systems sub-specialty and plans to establish two new space-related curricula at the Naval Postgraduate School.

READINESS COMMAND ELEMENT MONTEREY ESTABLISHED

The Readiness Command Element Monterey (REM) was established at NPS in February 1982, to provide mutual research and analytical support to the United States Readiness Command (USREDCOM) and the Naval Postgraduate School.

Establishment of the REM creates a capability in which joint operational concepts and plans can be analyzed and critiqued through the use of rigorously applied operations research/systems analysis tools and techniques.

Implementation of the REM provides benefits to both USREDCOM and NPS. Among these are: an opportunity to improve the contingency planning and related processes within DOD; near state-of-art technology enhancing the analytical capabilities of USREDCOM and NPS; enhanced hardware, software and personnel support to conduct continued research in such areas as operational Command, Control and Communications; an integrated management, analytical and computer staff to support NPS and USREDCOM analysis, and expanded insights into the application of operational research/systems analysis techniques to real world planning problems of mutual interest.

Under this concept, the NPS Secure Gaming and Computing Laboratory will be shared by USREDCOM and NPS. Lab personnel will provide programming consultation and lab operations support to NPS faculty and students and the REM.
The objective of the Space Systems Engineering curriculum is to provide officers with the theoretical and practical skills required to design and integrate military space payloads with other spacecraft subsystems. Graduates will be prepared to design, develop and manage the acquisition of space communications, navigation, surveillance, electronic warfare and environmental sensing systems.

RADM W.E. Ramsey, USN, The Director of Navy Space Systems Division (OP-943) is the sponsor of the program which commenced in October 1982.

**WEAPONS ENGINEERING (NUCLEAR WEAPONS AND EFFECTS) OPTION**

In response to initiatives by the Chief of Naval Operations and the Defense Nuclear Agency (DNA) for increased education and awareness in the field of nuclear weapons and effects, an option which addresses this need has been established in the Weapons Engineering curriculum.

Officers enrolled in this option will receive instruction in the physics of nuclear weapons, the prompt and residual effects of nuclear explosions, techniques for hardening against nuclear effects, and tactical and strategic considerations relating to nuclear warfare.

With initial funding being provided by DNA, the program is sponsored by RADM F.W. Kelly, USN, Director, Undersea and Strategic Warfare and Nuclear Energy Development Division, the Office of the Chief of Naval Operations (OP-981).

The first section of students entered in October 1982. Upon satisfactory completion of the program, students will be granted a Master of Science in Engineering Science and will be assigned a subspecialty code of XX67.

In addition to this option, the NPS will offer elective courses designed for other curricula, both technical and non-technical, with the aim of increasing awareness of nuclear matters among a large group of officers.
DR. DAVID A. SCHRADY APPOINTED PROVOST/ACADEMIC DEAN

AND NAMED ORSA PRESIDENT-ELECT

Dr. David A. Schrady, who had served as Acting Provost and Academic Dean at the Naval Postgraduate School since the appointment of Provost Jack R. Borsting as Assistant Secretary of Defense (Comptroller) in 1980, was appointed Provost and Academic Dean by the Secretary of the Navy effective September 1, 1982.

Earlier this year Dean Schrady was also elected Vice President/President Elect of the Operations Research Society of America (ORSA). Founded in 1952, ORSA is the principal research society for the field of operations research and has approximately 7,000 members in the United States and internationally.

NEW DEAN OF ACADEMIC ADMINISTRATION APPOINTED

Dr. Gerald H. Lindsey, a professor in the Department of Aeronautics here, was appointed as Dean of Academic Administration effective July 1, 1982, replacing Dean Abraham Sheingold who returned to the Electrical Engineering Department as distinguished professor.

The Dean of Academic Administration has supervisory responsibility for academic evaluations and records, admissions, registrar functions, class scheduling, the library and computer center. He also has primary responsibility for the management of campus-wide computing facilities.

Dr. Lindsey has been teaching at the school since October 1965 in such courses as aircraft and missile design, structural analysis and solid mechanics.

He received his M.S. degree in Mechanical Engineering at Brigham Young University in 1962 and a Ph.D. in Aeronautical Engineering at the California Institute of Technology in 1966.

NPS PROFESSOR ASSIGNED TO WHITE HOUSE STAFF

Dr. Lyle A. Cox, Jr., an assistant professor in the Department of Computer Science, has been assigned to the White House for temporary duty since October 1981.

He is serving as Assistant Director (Technology Applications) in the Office of Planning and Evaluation. In this position, he has been serving as Chief Scientist and Project Manager for the Presidential Agenda Control System and for a policy development support facility project.

NPS FACULTY MEMBER APPOINTED ADVISOR TO CNO AND DIRECTOR OF THREAT ASSESSMENT IN DNI

Professor William Reese, who is affiliated with the Physics and National Security Affairs Departments, was invited by the Chief of Naval Operations to join the CNO Executive Panel Science and Technology subpanel in May 1981.

The CNO Executive Panel is an approved advisory committee to the CNO which gives him access to a cross-section of top civilian specialists drawn from industrial, academic and governmental circles. The Science and Technology subpanel primarily considers issues concerning the impact of forefront technology on the Naval Service.

In December 1981, Professor Reese also became a member of a newly constituted working group of the CNO Executive Panel dealing with specific problems of naval warfare.

In addition to serving as an advisor to the CNO, Professor Reese will serve as Director of Threat Assessment for the Director of Naval Intelligence while on a leave of absence from the Naval Postgraduate School.
NEW CHAIRMAN
OF
COMPUTER SCIENCE DEPARTMENT INSTALLED

Dr. David K. Hsiao, an internationally recognized scholar in the area of the design of database computers and systems, systems programming and computer security, was installed as Chairman of the Computer Science Department in July 1982. Dr. Hsiao took over these duties from Professor Gordon H. Bradley who served as Department Chairman for five years.

The author of two books and more than 40 technical papers, Dr. Hsiao was the founder and first editor-in-chief of the journal ACM Transactions on Database Systems.

Prior to his appointment at NPS, he was Professor of Computer and Information Science at Ohio State University and principal investigator in the Laboratory for Database Systems Research.

Dr. Hsiao has been a contractor for the Office of Naval Research for many years and is currently advising the Naval Supply Systems Command on their future database requirements.

PROFESSOR DONALD P. GAVER, JR., NAMED DISTINGUISHED PROFESSOR

Professor Donald P. Gaver, Jr., of the NPS Operations Research Department, received the Distinguished Professor Award at the June 1982 commencement exercises. An internationally recognized leader in the area of applied probability modeling, he was presented the award in recognition of his significant contributions to the fields of applied probability theory and operations research and outstanding service to the Naval Postgraduate School.

Professor Gaver has published nearly 100 papers in more than 20 refereed professional journals. He has further contributed substantially to four books and is co-author of a successful text in Operations Research.

PROFESSOR CLAUDE A. BUSS RECEIVES AWARD FOR TEACHING EXCELLENCE

The Rear Admiral John Jay Schieffelin Award for Excellence in Teaching, presented annually at the June commencement exercises, was awarded to Professor Claude A. Buss of the National Security Affairs Department. A committee of faculty members, appointed by the Superintendent, recommended him for the award after carefully polling NPS students and alumni. In addition to a monetary award made possible by a grant to the Naval Postgraduate School Foundation in memory of RADM Schieffelin, Professor Buss’ name will be added to that of previous winners on a plaque in the School’s Dudley Knox Library.

An expert in Far Eastern Affairs, Professor Buss has extensive experience as a diplomat and consultant in China, Japan, and the Philippines. He is the author of more than a dozen books on these countries.

Professor Gerald G. Brown, of the Naval Postgraduate School Operations Research Department, was awarded the 1982 Menneken Research Award by the NPS Chapter of Sigma Xi, the Scientific Research Society of North America. The award cites Professor Brown’s internationally recognized contributions to the theory of large-scale mathematical optimization as well as his applications of these developments to the actual solution of many complex, real-world problems. Professor Brown was presented the NPS Outstanding Teaching Award in 1976.
Books
Monographs
1981 - 82


Yost, David S., NATO's Strategic Options: Arms Control and Defense, Pergamon, 1981.


Daniel, Donald C. and Herbig, Katherine L., (Eds.), Strategic Military Deception, Pergamon, 1983.


The Naval Postgraduate School, located in Monterey, CA, provides graduate education in a variety of the disciplines of science, engineering, and management, and ranks academically with the best graduate universities in the nation. NPS is fully accredited by the Western Association of Schools and Colleges, with specific engineering curricula accredited by the Accreditation Board for Engineering and Technology, Inc.

The graduate education programs at NPS are designed to produce subspecialists to meet Navy sponsors' requirements as well as those of other services and allied nations. Navy subspecialty program sponsors (e.g., Commander Naval Air Systems Command for Aeronautical Engineering, Oceanographer of the Navy for Oceanography, Office of the Chief of Naval Operations (OP-96) for Operations Research, etc.) monitor subspecialty billet requirements and specify the education skill requirements to be met by NPS programs. The education skill requirements represent the capabilities required of subspecialists and are the curriculum objectives to which NPS education programs are developed.

At present, there are more than 1,300 officers of the U.S. Navy, Marine Corps, Army, Air Force, Coast Guard, National Oceanic and Atmospheric Administration, as well as U.S. Government civilians and officers from 20 allied nations being educated at NPS.
These officer students are enrolled in graduate education programs which generally consist of core courses and advanced level elective or option courses. In a number of programs, U.S. students have the opportunity to utilize classified data and reports as an integral part of their course work. Some programs permit an experience tour at a military activity that provides the student with the opportunity to participate in ongoing work and applications relating to his/her program. All programs include a thesis which requires students to do problem formulation, independent research, problem solution, and presentation.

Student thesis research is conducted under the guidance of NPS faculty members, many of whom are nationally and internationally recognized scholars in their respective fields. As in other leading universities and colleges, NPS faculty members, using modern research facilities and teaching laboratories are continually researching new frontiers, making significant advances to help the nation and Department of Defense successfully to cope with tomorrow’s technological and management challenges.

It is in this stimulating environment that NPS officer students conduct their thesis research efforts. Some examples of the quality and significance of recent student thesis research at NPS are outlined in the following sections.

**ADMINISTRATIVE SCIENCE**

The increasing complexity of all phases of the life cycle of military systems is generating the need for corresponding specialization in management skills. In consonance with this trend the Administrative Science programs are grouped into seven major areas: International, Executive Development Program, Financial Management, Manpower/Personnel Training Analysis, Organizational Development, Decision Support Analysis, and Systems Acquisition/Logistics.

Common educational needs for these programs are met via a Fundamentals Program and a Graduate Program Core. The fundamentals program contains prerequisite knowledge in economic analysis, financial management, organizational systems, quantitative methods, and computer science. The graduate program core includes advanced quantitative methods, public policy processes and analysis, personnel management, information system and strategic management. Additional course work is designed specifically for the individual’s specialization and an applied thesis project.

**International**

This program offers courses specifically adapted to the management needs of the officer, his military service and nation. Distinguished graduates include the former Vice Chief of Naval Operations of the Royal Saudi Arabian Navy.

Recent theses prepared for this curriculum include “Multi-Attribute Utility Theory to Assist Top Level Acquisition Decision Making” by COL Ran Goren, Israeli Air Force, a graduate of the Israeli Air Force Academy. This thesis has potential value to top military management in all services. After graduation in December 1981, COL Goren returned to Headquarters, Israeli Air Force, for duty.

“Executive Jobs and Executive Continuity” completed by MAJ Robert H. Feller, Swiss Army, examined the relationship between Swiss military and civilian executives and the possible transfer of these concepts to executives in the United States. MAJ Feller was assigned to the staff of the Defense Attaché, Embassy of Switzerland, Washington, D.C. after graduation in December 1981.
Executive Development Program

This program prepares future civilian leaders of the Department of the Navy to assume positions of increased managerial responsibility. Three graduates of this program are currently serving in technical directorships: Mr. Brian A. Wilson, a 1977 graduate, Naval Air Integrated Logistics Center, Patuxent River, MD; Mr. Robert S. Buffum, a 1978 graduate, Naval Air Development Center, Warminster, PA; and Mr. Jack F. Lynch, a 1979 graduate, Naval Air Development Center, Patuxent River, MD.

Mr. James D. Engle, a graduate of the University of Cincinnati, prepared his thesis on the subject of “Merit Pay as a Motivator in the Federal Sector.” Sponsored by the Naval Air Systems Command (NAVAIR), this thesis examined the relationship of money motivation and pay-for-performance to theories of worker motivation; made a comparison between the relationships and post-implementation data; discussed the potentials of the system, and identified problems with the program. After graduation in June 1982, Mr. Engle returned to his position at the Pacific Missile Test Center, Point Mugu, CA.

“A Case Study in Technology Transfer: The Development of Real Time Airborne Acoustic Emission Monitoring System for the Detection of Crack Initiation in High Performance Naval Aircraft” was completed by Mr. Richard C. Flowerree, a graduate of San Diego State University. Sponsored by NAVAIR, this thesis assessed the benefits of using acoustic emission technology from both economic and strategic viewpoints and documented the procedures used in the development of a proposed aircraft airborne acoustic emission monitoring system for Navy aircraft to facilitate the adoption of this approach by other naval activities. Following graduation in October 1982, Mr. Flowerree returned to Naval Air Rework Facility, North Island, CA.

Financial Management

This program with students from all services and Navy communities, is sponsored by CNO (OP-92), Naval Supply Systems Command, the Marine Corps, and the Coast Guard. It includes advanced courses in financial control systems, financial management in the Armed Services, both financial and operational auditing, business finance, cost accounting, cost estimation, analytical techniques for financial management, and measurement and evaluation. Thesis topics typically focus on cost-benefit analyses of defense programs, critical appraisals of financial management systems in DOD, internal controls and internal review, financial aspects of defense contracting, and financial management in nonappropriated fund activities. The graduate is qualified for leadership as an activity or command comptroller, financial systems analyst, economic (cost-effectiveness) analyst, and project financial manager.

A December 1981 graduate, LCDR Joseph W. Dyer, Jr., USN, completed a thesis entitled “Analysis of Cost Growth in F-18 Program.” LCDR Dyer, an aeronautical engineering duty officer who graduated from North Carolina State University, was commissioned through Aviation ROC program. Sponsored by the Naval Air Systems Command, his thesis provides a model for the analysis and explanation of cost growth on major systems. A project officer and test pilot at the Naval Air Test Center, Patuxent River, prior to NPS, LCDR Dyer is now stationed at the Naval Weapons Center, China Lake, CA.

“An Assessment of Selected Performance Outcomes Associated With the DOD Capitation Budgeting Demonstration (Pilot) Project (1978-1981)” was prepared by LT Kenneth L. Orloff, MSC, USN, a graduate of George Washington University. This thesis reviews the decision to discontinue capitation budgeting for military hospitals based on a pilot project. LT Orloff, who came to NPS from the Naval School of Health Sciences, Bethesda, MD, concluded that the pilot project was not a fair test from management’s viewpoint. In part, as a result of LT Orloff’s thesis, capitation budgeting is now being reconsidered. After graduation in September 1981, he was assigned to the Bureau of Medicine and Surgery.
**Manpower/Personnel Training Analysis**

The Navy sponsor for this curriculum is VADM L.W. Zech, Jr., Deputy Chief of Naval Operations (Manpower, Personnel and Training). In addition to the Graduate Program Core, MPTA students take coursework in manpower economics, manpower modeling, statistics, military MPT issues, and manpower and training requirements determination. Thesis research has included models for the management of the officer force, compensation, recruiting and retention policies for a larger Navy, and analysis of enlisted/officer attrition and retention. Graduates should become policy analysts (e.g., in OP-01), system managers (e.g., in NMPC) and systems modelers.

Thesis contributions by MPTA students include “Demand and Supply of High Quality Sailors” by LT Wayne Van Doren, USN, a Surface Warfare Officer and graduate of the University of Texas NROTC program. LT Van Doren’s thesis examined the Navy’s requirements for upper mental group, high school graduate, non-prior service males. The thesis recommends changed pay policies which should assist the Navy in obtaining a supply of high quality sailors. He came to NPS from duty aboard USS CARON (DD-970) and was assigned to Department Head School, Newport, after graduation in December 1981.

A thesis entitled “Toward a 15 Battlegroup Navy: A Supply Side View and Implications for Force Composition and Personnel Quality,” was completed by LCDR Mark Lepick, USN, a Surface Warfare Officer and graduate of the U.S. Naval Academy, and LT Cynthia Yarosh, USN, a graduate of the University of Tennessee and commissioned through the OCS program. This thesis examined the manpower supply issues associated with manning a 15 battlegroup Navy by 1990 and addressed the options available for the Navy to access and retain the quantity and quality of personnel needed through the 1980’s. LCDR Lepick came to NPS from the Staff, Destroyer Squadron 23 and reported to USS BARBOUR COUNTY (LST-1195) as Executive Officer after graduation in June 1982. LT Yarosh, who had previously been on the staff of Commander in Chief, U.S. Naval Forces, Europe, was reassigned to the Naval Military Personnel Command after graduation in June 1982.

**Organizational Development**

The Organizational Development curriculum, sponsored by RADM P.J. Mulloy, USN, Director, Human Resources Management Division (OP-15), focuses on the management of planned organizational change. Key areas of study include leadership and group behavior, interpersonal communication, conflict management, organizational design, managing complex systems, consultation skills, organizational diagnosis, research methods, management education and training, formulating policy, and managing human resource management programs. Thesis research has covered crisis management, military organizational effectiveness, dual-career families, and affirmative action. Graduates are specialists in implementing organizational change.

In their thesis, two U.S. Army officers, CAPT Mark Gettys and CAPT Arthur Maxwell, examined the subject “Organizational Effectiveness: A Comparative Analysis Between Army and Navy Officers.” The thesis identifies the military officer’s perception of an effective military organization. CAPT Gettys, a graduate of the University of Virginia and a student at Fort Benjamin Harrison prior to entering NPS, is now stationed at the Army Readiness Command, Alexandria, VA. A graduate of Presbyterian College, CAPT Maxwell came to NPS from the 102nd Signal Battalion and is now assigned to Fort Ord, CA. Both officers graduated in December 1981.
Analysis
Support
Decision

This area includes three programs and their respective sponsors: Defense Systems Analysis (Marine Corps), Operations Research/Systems Analysis-Business (Department of the Army) and the Management Science Program (Coast Guard). While the specific course work varies, there is a common theme of applied cost-effectiveness analysis for the Marine Corps and Army programs.

The Defense Systems Analysis curriculum specifically prepares Marine Corps officers to deal with complex managerial problems encountered in the material, financial and manpower areas within the Department of Defense. Defense Systems Analysis student research has focused upon, among other things, a conceptual model of the acquisition of foreign-developed weapons systems, and upon alternative material management techniques in the prepositioned war reserve system. Army related research has included an analysis of the use of models and war games for unit training, and combat model statistical procedures.

The Coast Guard Management Science program is designed to meet the Coast Guard's need for officers educated at the graduate level in a broad spectrum of management skills, such as planning, personnel, financial management and systems analysis. Coast Guard students have investigated Coast Guard industrial accounting and retention of middle-level Coast Guard petty officers.

A quantitative model of the effects of detection and civil penalty assessment upon violator compliance in Coast Guard law enforcement programs was developed by LCDR Robin A. Wendt, USCG, in his thesis entitled "Civil Penalty Effectiveness in the U.S. Coast Guard." A graduate of the U.S. Coast Guard Academy, LCDR Wendt was assigned to Coast Guard District Eleven prior to entering NPS. Following graduation in December 1981, he was assigned to Coast Guard Headquarters, Washington, D.C.

Systems Acquisition and Logistics

Programs in this category are Acquisition and Contract Management, Systems Inventory Management, Material Movement, Transportation Management, and Material Logistics Support. They have as a goal the study of system support requirements from acquisition through phaseout. The first three programs are sponsored by RADM A.A. Giordano, SC, USN, Commander Naval Supply Systems Command, while Transportation Management is sponsored by VADM K.J. Carroll, USN, Commander Military Sealift Command. ADM J.G. Williams, Jr., USN, Chief of Naval Material, sponsors the Material Logistics Support curriculum.

The Acquisition and Contract Management curriculum provides knowledge and decision-making abilities for policy formulation, execution and operations within the acquisition and contracting environment. Formal course work is complemented by visits to contractor plants and government offices. Theses project categories include analysis of acquisition/contract management decisions, resolution of current problem or issue and development of a model relative to a decision-making process (e.g., second-sourcing or evaluation of a technique or methodology). Graduates hold leadership positions as contracting officers, policy analysts, and contract managers.

Recent theses prepared by students in Acquisition and Contract Management include "An Analysis of the Effectiveness of the Award-Fee Incentive Provisions in the Full-Scale Development Contract of the F/A-18 Naval Strike Fighter Program" by LCDR Gerald T. Nielsen, SC, USN, a graduate of the University of Nebraska NROTC program. Supported by NAVAIR, this thesis concludes that award-fee provisions were an effective motivator of contractor performance and recommended future use. LCDR Nielsen was previously Supply Officer aboard USS PARRAGUT (DDG-37) and was assigned to the Naval Air Systems Command after graduation in December 1981.

"How Governmental Policies Regarding Strategic and Critical Materials Affect the Acquisition of Major Weapons Systems" was completed by LT Terry L. Bollman, SC, USN, a graduate of the University of Illinois NROTC program. The thesis concluded that a strategic and critical material policy must be adopted and implemented by a singly responsible agency. LCDR Bollman came to NPS from duty as Supply Officer, USS WAINWRIGHT (CG-28) and reported to Naval Air Station, Patuxent River, MD, after graduation in September 1981.

The System Inventory Management curriculum develops skills in material logistics, inventory models, Navy supply systems, financial management, production management, and project management. Typical assignments of graduates include managing inventory control systems at major Navy stock-points.

The Material Movement curriculum develops skills in material logistics, transportation management and transportation policy. Graduates are coordinators in the system directing the movement of material from vendor to government user.

The Transportation Management curriculum provides knowledge and decision-making abilities in material logistics, transportation management, transportation policy, maritime industry structure and ADP acquisition. Typical assignments for graduates are leadership and managerial positions affecting the Military Sealift Command.
The Material Logistics Support curriculum develops skills in materials logistics, production management, project management contracts administration, quality assurance, reliability and maintainability, and logistics engineering. Graduates hold leadership positions in material departments in Navy Supply Centers and Naval Air Rework Facilities.

Thesis projects in the system inventory and material movement areas are generally mutually supportive. Recent research has centered around interfaces between Navy's hardware systems commands and the Navy Supply Systems Command. Specific projects include a study on the transfer of inventory control to the Ships Parts Control Center for items that have been developed and installed in the fleet, the development of a physical distribution system for a large Naval Supply Center to provide wholesale support to its local customers, development of a revised method for acquisition of commercial airlift services, the commercial utilization of landbridge links in water transportation networks, and the current readiness status of Merchant Marine assets in the event of a major mobilization. The following theses are milestones in developing a physical distribution system:

"A Preliminary Analysis of TF 34-100/400 Jet Engines Rework Data in Support of the MRP Systems Implementation at NARF Alameda," was prepared by LT Ernest R. Slaybaugh, USN, a Naval Flight Officer who graduated from Western Michigan University and was assigned to Commander Training Wing One, NAS Meridan, MS, after graduation in December 1981.

"An Analysis of Local Delivery Costs and Times at Naval Supply Center Oakland" was completed by LCDR Dennis G. Allion, SC, USN and LCDR John E. Tufts, SC, USN. A graduate of Michigan State University and OCS, LCDR Allion came to NPS from duty as Material Officer, Supervisor of Shipbuilding, Seattle, and reported to the Naval Material Command Detachment, Riyadh, Saudi Arabia after graduation. LCDR TUFTS was Assistant to the Budget Officer, Naval Supply Systems Command prior to his studies at NPS. After graduation, he was assigned to USS SACRAMENTO (AOE-1). Both officers graduated in June 1982.

The Aeronautical Engineering programs are designed to meet the needs of the Navy's technical managers requiring a background in the design and operation of air warfare systems. The program is sponsored by VADM E.R. Seymour, USN, Commander Naval Air Systems Command.

Officer students are assigned to the Aeronautical Engineering programs to study in one of three curricula: Aeronautical Engineering, Aeronautical Engineering / Avionics, and a newly-instituted program with the Navy Test Pilot School (TPS). In the cooperative NPS/TPS program, students take a core of graduate courses at NPS and then attend the regular TPS program. Upon graduation, the officer receives an M.S.A.E. degree along with his test pilot designation.

During the curricula course of instruction, aerodynamics, structures, propulsion, and flight dynamics are studied in depth. Additionally, the Aeronautical Engineering program includes a comprehensive sequence in aircraft/missile design.
Five major laboratory divisions support instructional and research programs in aerodynamics, gas dynamics, rocket and ramjet propulsion, turbo-machinery and structures. The main laboratory includes extensive instrumentation and data processing capability. The department possesses updated computer facilities with several terminals and graphic/plotting displays. Other research facilities include ballistic ranges for studies of topics such as aircraft survivability, a number of flight simulators for studying man-machine interface, a three-ton surface-effect ship and leased aircraft for an in-flight laboratory.

Thesis research is an integral part of the program in a wide variety of highly technical areas. Thesis topics under investigation include electrostatic modification of fuel spray patterns to allow use of less expensive jet engine fuels, numerical modeling of transonic flow in turbo compressors, analytical studies pointed towards reduction of helicopter noise, survivability enhancement studies for present and future aircraft including survivability and studies in methods to overcome aircrew performance degradation due to platform vibration.

LT Gary S. O'Neill, a Naval Aviator, graduated in June 1982 and did his thesis work in the field of composite materials. He examined the effects of a one-inch diameter hole on a graphite epoxy panel using finite-element techniques. This experimental testing of many configurations confirmed the accuracy of the finite-element analysis in determining proper methods to reinforce such panels. These results provide valuable information for the design of modern aircraft such as the F-18 and AV-8B, which when operated in the combat arena will be subject to damage similar to that simulated in this project. LT O'Neill is a graduate of Georgia Institute of Technology, and was commissioned through the NROTC program. He came to NPS from Helicopter Combat Support Squadron 6, and is now assigned aboard USS OKINAWA (LPH-3).

P-3 survivability enhancement was investigated in a thesis prepared by LT Theodore C. Kleiser III, a Naval Aviator who graduated in September 1981. His thesis examined several aspects of operating P-3 aircraft in its present mission environment and made recommendations for incorporating a specific avionics suite, including a radar jammer, a missile warning detector and an expendables dispenser. Commissioned at OCS, he is a graduate of Shippenberg State College in 1973. He came to NPS from Patrol Squadron 10 and is presently assigned to the Fleet Combat Training Center Atlantic.

MAJ Richard W. Campbell, USMC, a Marine Flight Officer graduated in March 1982. He did his thesis work by conducting an in-depth vulnerability assessment of the A-6 aircraft in a war-at-sea scenario. This resulted in an extensive classified report concerning combat effectiveness of electronic countermeasures utilized by attack aircraft. He is a 1969 graduate of the U.S. Naval Academy, came to NPS from Marine Air Group 12, First Marine Air Wing, and is presently assigned as an instructor at the Naval Academy.
**Air-Ocean Science**

Graduates are provided a thorough understanding of dynamical and physical meteorology and oceanography; basic hydrography; mapping, charting and geodesy principles; and air-ocean synoptic analysis with the qualifications to serve independently as a forecast meteorologist and oceanographer or as a hydrographer. RADM J.B. Mooney, Jr., USN, the Oceanographer of the Navy (OP-952) is the curriculum sponsor. U.S. Navy restricted line officer graduates can expect utilization assignments involving fleet tactical environmental support, major staff offices, environmental forecasting, research and development and other billets.

Student thesis research is conducted in oceanography, meteorology, air-sea interaction, environmental acoustics or optics, or hydrography.

LT Edward F. Steiner and LCDR William A. Butler are restricted line geophysics officer graduates of the Air-Ocean Sciences curriculum who were two of the three finalists for the 1981-82 Oceanographer of the Navy Award for Outstanding Academic Performance in Air-Ocean Sciences. LT Steiner's thesis, advised by Professor Russell Elsberry is entitled "A Study of Sea Surface Temperature Variability" while LCDR Butler's thesis, advised by Professor R. Garwood, is entitled "One-Dimensional Model Predictions of Upper Ocean Temperature Changes Between San Francisco and Hawaii." Both of these theses employed working numerical and dynamical methods for prediction of upper ocean thermal structures, relating directly to acoustic forecasting and antisubmarine warfare problems. LT Steiner reported to NPS from Patrol Squadron 26. A 1974 graduate of the Naval Academy, he currently is stationed at the Naval Eastern Oceanography Center, Norfolk. LCDR Butler graduated from the Naval Academy in 1971 and was assigned to OCEANOUNIT Four prior to NPS. He is currently serving at the Naval Oceanography Command Center, Guam.

**Air-Ocean Tactical Environmental Support**

This relatively new program, designed for U.S. Navy unrestricted line officers, provides a thorough working knowledge of air-ocean science and those operations-analysis principles applicable to the prediction atmospheric, oceanic, acoustic, and optical conditions in support of all aspects of naval operations including the ASW, EW, and C2 problems. Primary emphasis is placed on the understanding of the impact of the environment (the atmosphere, ocean and their interface) on weapon systems, sensors and platforms. RADM J.B. Mooney, Jr., USN, the Oceanographer of the Navy (OP-952), is the sponsor. Graduates can expect utilization assignments involving fleet tactical environmental support, major staff offices, environmental forecasting, research and development and other billets.

Because the Air-Ocean Tactical Environmental Support curriculum is relatively new, a significant number of students have not yet completed the program. Two officers currently enrolled are LT Albert R. Hochevar, USN, and LT Jean-Francois Soubrier, French Navy. A 1977 graduate of the Naval Academy, LT Hochevar ranked first in a class of 973, and earned a B.S. degree in Oceanography. After attending Nuclear Power and Submarine Schools from 1977-79, LT Hochevar reported to NPS from the USS JOHN MARSHALL (SSN-611) and will graduate in December 1983. His area of interest for thesis research includes ocean turbulence and antisubmarine warfare.

LT Soubrier is the first international officer to be admitted to this curriculum. Entering in the fall of 1981, he is scheduled to graduate in September 1983. LT Soubrier is planning to do his thesis research on the physical oceanography of Biscaye Bay using synthetic aperture radar (SAR) images from the SEASAT satellite together with ocean thermal structure and related atmospheric and sea-surface temperature data. Prior to enrolling at NPS, LT Soubrier was an instructor at the Naval School of Brest.

In the new NPS Weather Briefing Lab, Professor F.R. Williams (background) and doctoral student CAPT A.R. Schaffer, USAF, test equipment used to generate and present forecast briefs that simulate operational weather briefs.
Hydrographic Sciences

Graduates have integrated the scientific principles of oceanography with the practical engineering procedures of hydrography: the science of the measurement, description, and charting of the sea floor with special reference to navigation marine operations. The curriculum includes geodesy, geophysics, hydrography, photogrammetry, and cartography. The National Oceanic and Atmospheric Administration (NOAA), the Defense Mapping Agency, and the Oceanographer of the Navy are co-sponsors. Research topics include applications of global positioning system satellite receivers to hydrographic surveying, determining changes in elevation of the earth’s crust using long-term tidal measurements, modeling of hydrographic surveys, laser bathymetric analysis, and error analysis of positioning systems.

The Hydrographic Sciences program, now a fully recognized curriculum, was initially available starting in 1978 as an option to the Oceanography program. This eight-quarter program is currently populated by students from the Defense Mapping Agency, the Naval Oceanographic Office, NOAA, and officers from the international community.

A graduate of this program is LT Virginia E. Newell, NOAA, who completed her studies in September 1981. She received a B.A. from University of Maine. Her thesis, co-authored by LCDR Donald D. Winter, NOAA, was entitled “Application of the Global Positioning System to Nearshore Hydrographic Surveys.” The Global Positioning System is an extremely high precision, satellite-based electronic navigational system which will revolutionize the hydrography sciences. Previously assigned to the Atlantic Marine Center Coast Mapping Division, Norfolk, VA, LT Newell’s current duty station is NOAA Ship WHITING.

Meteorology

Graduates are provided with the technical expertise to analyze atmospheric data for support of all aspects of weather-dependent operations. The program, sponsored by RADM J.B. Mooney, USN, the Oceanographer of the Navy (OP-952), consists of courses in dynamical and physical meteorology, a sequence in meteorological analysis and forecasting, and numerical modeling and prediction.

Meteorological research areas include the numerical modeling on both global and regional scales for atmosphere and ocean; tropical meteorology with emphasis on monsoons and cyclones; the marine and boundary as it involves turbulence, electro-magnetic/electro optical propagation and applications of remote sensing; and synoptic studies at all latitudes in both hemispheres.
OCEANOGRAPHY

Graduates are provided a firm understanding of physical and dynamical oceanography, underwater acoustics, and air-sea interaction and their application to oceanographic support of military operations. Methods of ocean prediction are emphasized. The program is sponsored by RADM J.B. Mooney, Jr., USN, the Oceanographer of the Navy (OP-952).

Oceanographic research areas include underwater acoustics and related topics such as thermal fronts and fine structure both in temperate waters and in the Arctic, acoustic effects of oceanic mixed layers, predictive models of the oceanic mixed layer deepening and cooling and the resultant effect on long-range sound prediction, the use of in situ and satellite observations to analyze and predict oceanic fronts, eddies and other variable phenomena. Other research areas are satellite oceanography, synoptic oceanography, numerical ocean prediction, ocean circulation, tides, breaking waves, and ocean optics.

A graduate of this program is LT Laurent Monsaingeon, French Navy, who completed his studies in September 1981 and returned to the French Navy. He took additional courses in the area of Operations Research to broaden his educational and technical background. His thesis, co-advised by Professors C.N. Mooers and Robert Burke, is entitled "Ocean Thermal Analysis and Related Naval Operational Considerations in the Ionian Sea — June 1980." For this thesis LT Monsaingeon analyzed oceanographic and meteorological data, including satellite remote sensing data, from a NATO exercise, using contemporary dynamical and statistical methods to characterize the extraordinary oceanic variability of the Ionian Sea. From this effort, he developed recommended procedures for performing on-the-scene oceanic analyses in support of tactical operations. His present position involves developing operational ocean prediction capability for the French Navy.

ANTISUBMARINE WARFARE

The employment of combat systems in Antisubmarine Warfare (ASW) involves complex man-machine interactions; it includes sonar, radar, weapons, communication and information systems. The interdisciplinary ASW curriculum is centered around the study of the systems used in Antisubmarine Warfare and integrates mathematics, physics, acoustics, electrical engineering, oceanography, operations analysis, human factors, computer science and meteorology.

In conjunction with thesis research which evaluates the acoustic differences of missile hits or misses, LCDR Thomas S. Zysk conducted an experiment with the Naval Ocean Systems Center (NOSC), San Diego, in which a 100-ton, armor-plated, Vietnam vintage monitor was exploded at the NOSC range at San Clemente Island.
The academic content divides into four major discipline areas: Electrical Engineering with emphasis on signal processing; Underwater Acoustics with emphasis on signal propagation and detection; Operations Analysis with emphasis on tactical application and decision analysis, and Air Ocean Environment with emphasis on the air/ocean interface and environmental factors affecting sound in the sea. The program is sponsored by RADM R.A. Martini, USN, Director, Antisubmarine Warfare program (OP-951). The graduates of the curriculum are utilized in ASW operational billets both afloat and ashore and in billets involving the design, development and evaluation of tactics employing operational ASW systems.

Research projects associated with the Antisubmarine Warfare curriculum reflect the operational emphasis of this program. Some examples of student thesis research in this curriculum are described below.

LCDR Thomas S. Zysk, a Surface Warfare Officer, graduated in March 1982. LCDR Zysk's thesis, advised by Professors Douglas Neil and Neagle Forrest, was on over-the-horizon damage assessment utilizing acoustic transients. He conducted a large-scale experiment to obtain realistic and reliable data and contributed toward the solution of long-range battle problems. LCDR Zysk is a 1970 graduate of the U.S. Naval Academy. He came to NPS from the USS HOIST (ARS-40) and is presently assigned as the Executive Officer, USS TRIPPE (FF-1075).

LCDR Ronald A. Dibble and LCDR Maurice M. McNeil, both Naval Aviators, graduated in September 1981. Their thesis, entitled "Screen Evaluation Aid for Tactical Commanders II", continued research efforts on a computerized tactical decision aid for ASW commanders. Their work, dubbed SEATAC, is programmed for an HP-9845 desktop computer and is presently undergoing evaluation on the USS DOWNES (FF-1070). LCDR Dibble is a 1969 graduate of the U.S. Naval Academy. He came to NPS from Helicopter Squadron 6 and is presently assigned to the Naval Air Systems Command as an Aeronautical Engineering Duty Officer. LCDR McNeil is also a 1969 graduate of the U.S. Naval Academy. He came to NPS from Helicopter Antisubmarine Squadron, Light 36 and is presently assigned to Helicopter Antisubmarine Squadron, Light 23.

COMMAND, CONTROL, 
COMMUNICATIONS

Modern military operations are characterized by ever more sophisticated weaponry, wide area sensors and electronic communications. Exploitation of these resources to achieve effective military command requires rapid assimilation of vast amounts of data, prompt decision making involving diverse considerations, and timely dissemination of orders and useful and accurate information. The curriculum examines relevant basic technologies and their integration into effective military command and control systems.

The 18-month academic program is interdisciplinary and comprises four main areas of study — professional, operations analysis, computer applications, and communications and sensors. The overall objective of the program is to provide officers and DOD civilian equivalents, through graduate education, with a comprehensive operational and technical understanding in the field of Command, Control and Communications systems as applied to joint and combined military operations at the national and unified command levels.

The curriculum is guided by a Joint Program Sponsor Group, chaired by Dr. Donald Latham, the Deputy Undersecretary of Defense for Communications, Command, Control and Intelligence and with membership representing the Defense Intelligence Agency, National Security Agency, Defense Communications Agency, and Joint Chiefs of Staff, as well as the Services. Graduates can expect utilization assignments in their parent service C1 billets, major command billets, or in the National Military Command System.
Recently the curriculum has been changed to allow each officer to select an area of specialization, i.e. National Security Affairs, Management, Computer applications, Communications and Sensors, or Tactical Analysis. This focuses courses and research on the area that the officer believes to have highest career impact.

The NPS Secure Gaming and Computing Laboratory provides a crucial integrative experience by making it possible for students and faculty to engage in simulated command and control exercises and experiments. A recent agreement with the U.S. Readiness Command at MacDill AFB, Florida, will upgrade the computing resources in the Laboratory and established the Readiness Command Element, Monterey (REM) at NPS. The REM was established at NPS to provide mutual research and analytical support to USREDCOM and the NPS, creating a capability in which joint operational concepts and plans can be analyzed and critiqued through the use of rigorously applied operations research/systems analysis tools and techniques. The intent of USREDCOM is to support and generate analyses of joint operational plans and exercises while NPS provides a high technology facility for academic and educational work in war gaming, command and control and associated areas.

A March 1982 graduate, Mr. Thomas R. Malarkey of the National Security Agency (NSA), was given the JCS C3 Award for Academic Achievement for his thesis "An Investigation of the Application of Voice Input/Output Technology in the Community On-line Intelligence System (COINS) Network Control Center." This work entailed building a prototype system for both voice output of warning of failures and voice input of commands to reestablish control from anywhere in the COINS Control Center at NSA. A prototype system was tested in the NPS C3 laboratory with encouraging results. Mr. Malarkey is now at NSA in charge of research in implementation of this and other improvements to the COINS intelligence data base network. He received a letter from the Chairman of the Joint Chiefs of Staff complimenting him on this work. NPS is moving towards full participation on the COINS network.

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COMMUNICATIONS AND ELECTRONICS

The complex electronic equipment aboard ship and space platforms and in shore activities entails sophisticated research, development and acquisition efforts which require a thorough knowledge of fundamentals and advanced systems concepts. NPS offers comprehensive programs in electronics and communications which provide the requisite background to effectively lead efforts involving design, procurement, use and maintenance of existing and future systems.

Engineering Electronics and Communications Engineering Curricula

The Engineering Electronics and Communications Engineering curricula are designed to establish a broad background of engineering knowledge leading to advanced studies in one of four areas: communications systems; guidance, navigation and control systems; radar, electro-optic and electronic warfare systems; and tactical digital systems. Classroom work is supplemented by extensive laboratory experience and by an active seminar series in which military and industrial leaders provide an operationally relevant perspective on current topics of interest. In thesis projects, officers apply their engineering skills to problems related to military electronics and communications systems.

The sponsor of the Engineering Electronics curriculum is RADM G.B. Shick, USN, Commander, Naval Electronic Systems Command; RADM W.D. Smith, USN, Director, Naval Communications Division (OP-941) is the sponsor of the Communications Engineering curriculum. Both programs are nominally nine quarters in length but can be shortened for officers with strong electrical engineering backgrounds. Graduates can expect utilization assignments in major staff offices in the office of the Chief of Naval Operations, in the various Systems Commands and in communications activities.

A December 1981 graduate of the Communications Engineering curriculum is CAPT Ronald K. Burns, a U.S. Marine Corps Officer who came to NPS from the Third Marine Division, Fleet Marine Force. His undergraduate degree was in Electrical Engineering from the Georgia Institute of Technology in 1974. CAPT Burns' thesis, performed under the supervision of Professor Rudolph Panholzer, was titled "A Fiber Optic Ring for Distributed Computing." This effort demonstrated the feasibility of using fiber optic technology to link multiple-microprocessor systems. CAPT Burns was assigned to Headquarters, U.S. Marine Corps upon graduation.

LCDR Norman E. Huston, a Navy Special Warfare Officer, was stationed at the Navy Amphibious School, Coronado, CA before entering NPS. He graduated from the University of Wisconsin in 1971 with a B.S. in Electrical Engineering and earned the degree Electrical Engineer while enrolled in the Engineering Electronics curriculum at NPS. His thesis, "Shift and Scale Invariant Preprocessor," was advised by Professor Lonnie Wilson. This is a direct application to electronic warfare by its use for radar ship classification. The signal processing algorithm that was developed provides a scale invariance property which makes the target signature invariant to aspect angle. This approach, which was applied to range only signatures, alleviates the problem of signature degradation due to target orientation. After graduation in December 1981, LDCR Huston was assigned to Underwater Demolition Team 22, Little Creek, VA.

LCDR David J. Klich, USN, a Surface Warfare Officer, served in USS CONQUEST (MSO-688) prior to entering NPS. A 1969 graduate of Virginia Polytechnic Institute with a B.S. in Electrical Engineering, he was awarded his Ph.D upon completion of the Communications Engineering program at NPS. LCDR Klich's dissertation under Professor Sydney Parker was entitled "Efficient Multichannel Auto-Regressive Modeling in Time and Frequency Domain." This work is applicable to electronic system modeling and parameter identification and could be used for automated testing and fault isolation of computer controlled systems. Following graduation in March 1982, LCDR Klich is now serving as Executive Officer, USS EDWARD MCDONNELL (FF-1043).
The objective of the Electronic Warfare Systems Technology (EWST) curriculum is to provide officers thoroughly knowledgeable in the technical and operational aspects of both the art and science of EW as a vital, integral part of modern warfare. This is accomplished through an interdisciplinary effort involving seven departments including: Physics, Mathematics, Computer Science, Operations Research, National Security Affairs, Meteorology and Electrical Engineering. The disciplines they represent are mutually supportive. Typical courses are electro-optic systems and countermeasures, operations analysis for electronic warfare, electronic warfare computer applications, and electronic warfare systems. The classroom theory is supplemented by field trips to Navy laboratories and industrial plants involved in acquiring and producing typical systems. Additionally, the requirement for individual thesis work gives the student the opportunity to apply the knowledge acquired to the solution of a meaningful Navy problem.

The sponsors of this program are RADM G.B. Shick, USN, Commander, Naval Electronic Systems Command, and COMMODORE H.L. Webster, USN, Director, Electronic Warfare Division (OP-944). Graduates can expect utilization tour assignments to various Systems Commands, OP-944 and Fleet staffs. The program is eight quarters in length.

An example of student thesis research is that of LCDR James C. Griffin, a Naval Flight Officer, who was stationed at NAS Whidbey Island prior to entering NPS. He received his B.A. from the University of Florida in 1968. His thesis at NPS, "The Use of the Integrated Refractive Effects Prediction system (IREPS) in Tactical Electronic Warfare Over-Ocean Mission Planning," conducted under the guidance of Professor Gordon Schacher, resulted in an IREPS-based mission planning aid that integrates environmental information into the planning process. In recognition of his distinguished achievements while at NPS, LCDR Griffin was awarded the Naval Electronic Systems Command EW Honor Award. After graduation in September 1981, he was assigned to Tactical Electronic Warfare Squadron 133.

Telecommunications Systems Management

This interdisciplinary program provides officers with technical and managerial skills required to conceive, develop and implement new operational concepts, doctrines and procedures associated with the management of telecommunications resources. The services and communities served include Unrestricted Line, Naval Security Group, and the Coast Guard, as well as a wide variety of allied officers and DOD civilians.

This breadth is satisfied by a program comprised of a basic core, a graduate core and emphasis sequence. The basic core includes mathematics, financial management, economics, computer science, organizational sciences, communications and electronics technology. The officer builds on these basics a conceptual framework for telecommunication systems via advanced work in computer science, cost performance analysis, acquisition management, personnel management, and information systems analysis and design. The emphasis sequence includes the current status of naval telecommunications technology and facilities operations, management planning and control, information systems, and telecommunication industry analysis. A major element of the sequence is a two-week field trip to the major telecommunications facilities in Hawaii.

The sponsor of this program is RADM W.D. Smith, USN, Director, Naval Communications Division (OP-941). Graduates can expect utilization assignments to various communications stations as well as various Systems Commands.

Recently LCDR Nancy Brown, an Unrestricted Line Officer who came to NPS from the Naval Telecommunications Command, completed research on the organizational level's responsibilities to perform maintenance. She earned her B.A. degree from Stephens College in 1973. Her thesis at NPS, "Improving the Electronics Repair Capabilities in the Fleet," examined the impact that an increase in the organizational level's responsibilities would have on the various maintenance levels in the Navy. She concluded that the resources at the organizational level are not being fully utilized as a consequence of the current philosophy that the organizational level should only replace modular components, that the rest of the necessary maintenance should be performed at the depot, and that an intermediate level is not needed. Such philosophy is contrary to the concept of platform self-sufficiency which is vital to the maximization of surface ship effectiveness. LCDR Brown graduated in March 1982 and reported for duty to the Defense Commercial Communications Office.
COMPUTER TECHNOLOGY

The use of computers in all facets of Navy operations has generated a need for competent, well-educated computer professionals within the officer corps. The need for effective computer system design and efficient system usage in the Navy is unquestioned. A computer science or computer systems subspecialist must be able to deal with all phases of computer system development and to direct the utilization of these systems in their operating environment. As the cost of software development and maintenance rises and the proliferation of relatively inexpensive hardware continues, the properly educated naval officer is becoming an increasingly valuable asset.

Computer Science

This program combines a core of software and hardware theory and applications with studies in mathematics, probability, statistics, operations research, and electronics. Officer graduates of the curriculum possess skills in software design methodologies, computer system design and computer methodologies, computer system design and computer architectures. Option areas include tactical computer systems, computer software, and military data processing. Elective courses in the option area support a thesis emphasizing military applications or research in the computer field. The services and communities served include Unrestricted Line, Supply, Engineering Duty Officer, Naval Security Group, and Intelligence as well as a wide variety of allied officers and DOD civilians.

An example of computer science student research is the thesis of MAJ William McElyea, USMC, a 1968 graduate of Brown University and commissioned through OCS. His thesis dealt with the design of a concurrency control mechanism which is intended to correctly coordinate the execution of transactions in distributed data base management systems. With the widespread acceptance of these distributed data base systems, it is expected that this research will directly benefit all military services. MAJ McElyea was stationed at Headquarters, U.S. Marine Corps following graduation in June 1982.

Another recent thesis by LT Richard Holdcroft, USN, a Surface Warfare Officer, and LT Darrell Shoop, USN, a Naval Aviator, involves a performance evaluation of the IAPX 432 micro-mainframe computer. The architecture of this processor is of the newest, very large-scale integrated (VLSI) type, presently not used in military applications. In order to measure the IAPX 432 system's performance, LT Holdcroft, a 1976 University of Nebraska ROTC graduate, and LT Shoop, a 1972 graduate of North Carolina Wesleyan and commissioned through the ROC program, had to develop several imaginative software and hardware tools, which will be of general use and available for future performance evaluation of other systems. Their research, sponsored by PMS 400, the AEGIS weapons system project, is being used to demonstrate that commercial VLSI technology is appropriate and cost effective for use in military combat systems. Previously stationed aboard the USS LANG (FF-1060), LT Holdcroft reported to Department Head School, Surface Warfare Officer School Command after graduation from NPS in June 1982. LT Shoop came to NPS from HELANTSUBRON 30 and was assigned to the Computer Science Department, Carnegie-Mellon University, to work on shipboard application of computers after graduation in June 1982.

Computer Systems

This interdisciplinary program provides officers with the technical and managerial skills required to design, implement, and operate information systems/decision support systems. The services and communities served include the Unrestricted Line, Supply, Medical Service Corps, Civil Engineering Corps, Naval Security Group, Intelligence, as well as a wide variety of allied officers and DOD civilians.
This breadth of interests and needs is satisfied by a program comprised of a basic core, a graduate core and an emphasis sequence. The basic core includes financial management, economics, computer science, organizational sciences, mathematics, and computer systems management. The officer builds on these basics a conceptual framework for information systems / decision support systems via advanced work in computer science, cost-performance analysis, acquisition management, manpower / personnel management, and systems analysis and design. An emphasis sequence is chosen from computer center and network operations; tactical systems; management planning and control; and information and teleprocessing systems and networks. A major project / thesis is also completed as part of the program.

The primary curriculum sponsor is RADM J.W. Nyquist, USN, Office of the CNO (OP-942). Secondary sponsors include RADM P.E. Sutherland, USN, Commander, Naval Data Automation Command, also a user of many of the computer systems graduates. Most computer systems billets involve the design and use of information and decision support systems in the non-tactical area including OPNAV, NMPC, NAVDAC, NARDACS, WWMCCS, Navy Supply Centers, and Fleet Commanders.

Faculty research has focused on software engineering management, ADP systems auditing, decision support systems for ill-structured problems, acquisition of computer systems and improved productivity in the use of information systems. The major project / thesis is a relatively new addition to the computer systems curriculum which has concentrated primarily on "real world" problem solving. Students have acted as consultants to Navy ADP user activities providing those activities faculty-directed support across a spectrum of ADP related topics.

A recent thesis effort in the computer systems area by CAPT Ray Hodgson, USA, and LCDR Stephen Tody, USN, a Surface Warfare Officer, concerns the projection of maximum software maintenance manning levels. CAPT Hodgson, a 1973 graduate of Kansas State ROTC, came to NPS from the 29th Army Support Group, while LCDR Tody, a 1970 graduate of Trinity College and OCS, had served aboard the USS PEORIA (LST-1183). In performing the thesis research, using all available data, a relationship between present software development cost curves and maximum maintenance manning cost levels was derived, and a historical measure of manning and cost levels was developed. This research effort has enormous potential for DOD in allowing development of reliable estimates of life cycle maintenance manning requirements for large software systems. These estimates will result in a considerable savings, since software maintenance costs represent approximately 70 percent of total software life cycle costs. CAPT Hodgson, who graduated in October 1982, is stationed at the Army Computer Systems Command, Fort Belvoir, VA, while LCDR Tody, who graduated in June 1982, is assigned to the Office of the Chief of Naval Operations (OP-11).
The rapidly changing political, military, and economic world environments generate a need for military officers to be technically proficient in the National Security and Intelligence arenas. The field of national security encompasses both the national defense and foreign relations of the United States and is concerned with the generation of national strength and its employment in international relations. The study of national security affairs thus extends to all factors which shape defense policy in the United States and other nations of the world.

National Security Affairs

The National Security Affairs programs consist of both geographical area and functional specialty curricula. Area studies programs focus on the security affairs of specific regions of the world as well as on all major power security interests vis-a-vis the region concerned. The geographical areas include the Middle East, Africa, South Asia; the Far East, Southeast Asia, Pacific; and Europe and the Soviet Union. The programs are taught in conjunction with the Defense Language Institute (DLI) at the Presidio of Monterey. They include 12 months of academic instruction at the NPS and 6 to 12 months of language at the DLI. The majority of students in these curricula are Army and Air Force officers. The Army sponsor is the Chief of Staff, U.S. Army (Deputy for Operations and Plans), LTG W.R. Richardson, USA. Army graduates are designated as Foreign Area Officers and are assigned world-wide to Army FAO billets. The Chief of Staff, U.S. Air Force (Assistant for Intelligence), MGEN J.B. Marks, USAF, sponsors Air Force students who are usually assigned as attaches in the country they have studied.

The functional programs focus on the conduct of U.S. security affairs. They relate to national military policy and the defense planning process as well as to the conduct of multilateral relations and participation in international security organizations. The curricula include studies in international organizations and negotiations as well as strategic planning. These programs normally are 18 months in length and include a thesis. The preponderance of students in these curricula are naval officers. The Navy sponsor is RADM S.H. Packer, USN, Acting Deputy Chief of Naval Operations (Plans, Policy, and Operations). Navy graduates can expect utilization assignments on the Joint Staff and within the Navy Department in Washington, D.C. as well as with Unified Command headquarters staffs and Navy afloat staffs. Student thesis research efforts include the following:
LT Joseph F. Bonchard graduated in September 1981. He did his thesis on "United States Interest in China: Beyond the China Card", dealing with the development of long-term relations with China and U.S. interest in the security of China. He graduated with distinction and was awarded the United States Naval Institute Award. A Burke Scholar, he is a 1976 graduate of the U.S. Naval Academy and winner of the 1979 Pacific Fleet Junior Officer Ship-handling Competition. He reported to NPS from the USS LOCKWOOD (FF-1064). LT Bonchard is presently attending Stanford University pursuing doctoral studies.

MAJ Owen F. Jensen, USAF, who will graduate in December 1982, is completing a thesis on "Atmospheric Threat to North America - Renewed Perceptions of Vulnerability." The thesis examines the drawdown in North America air defense capability from a high point in the 1950's and attempts to show how a renewed threat has been recognized by national leadership and what vulnerabilities exist in various scenarios. MAJ Jensen is a 1969 graduate of the University of Illinois and came to NPS from NORAD Headquarters. His next assignment will be as Assistant Air Force Attache to Canada.

CAPT Kerry L. Cailteux, USA, is preparing a thesis on "Patterns of Elite Politics in Saudi Arabia." A 1975 graduate of the U.S. Military Academy, he came to NPS from the Foreign Area Officer Course at Fort Bragg, NC. CAPT Cailteux will graduate in December 1982 and will be stationed with the Foreign Area Officer detachment in Tunis, Tunisia.

Mr. William Casey (left), Director of the Central Intelligence Agency, accompanied by NPS Provost David R. Schrady during recent visit to NPS.

Intelligence Program

The Intelligence program consists of a defense technology, security affairs, and analytical and management sequence. It is designed primarily to address the special problems of scientific and technical intelligence. It emphasizes technical literacy, quantitative techniques, substantive research methods, and primary concepts of resource management.

The Intelligence curriculum sponsor is CAPT C.F. Hoffman, USN, Commander, Naval Intelligence Command. Naval officer graduates are primarily unrestricted line officers who can expect utilization assignments as subspecialists within the intelligence community.

Two recent theses in this program examined various aspects of the Soviet military forces. LCDR Christopher F. Glanzmann, a Surface Warfare Officer and December 1981 graduate of NPS, investigated "The Soviet Naval Buildup in the Indian Ocean During 1980" following the takeover of the United States Embassy in Iran. His research revealed that the force levels and types of units deployed to the Indian Ocean during that period established a number of precedents for both the Soviet and U.S. navies. LCDR Glanzmann is a 1971 graduate of Villanova University. He came to NPS from Air Antisubmarine Squadron 37 and is presently assigned to the Office of the Chief of Naval Operations.

LCDR Jay R. Kistler, a Naval Flight Officer, graduated in March 1982. His thesis was an examination of the ASW search potential of the Soviet Bear F MOD 3 long-range patrol aircraft. A graduate of Auburn University, LCDR Kistler came to NPS from Patrol Squadron 26 and is presently assigned to Fleet Air Reconnaissance Squadron One. He was awarded the United States Naval Institute Award upon graduation from NPS.

Special Support Facility

Supporting all school programs and research is the NPS Special Support Facility which makes Special Intelligence and other highly classified material available for student and faculty use. Increasing use of this facility has resulted in more in-depth use of such data and the publication of special theses for authorized audiences.
The Naval Engineering Program, the original postgraduate education program in the United States Navy, concentrates on technological advancement in the field of Mechanical Engineering as applied to Navy requirements. The sponsor of this program is VADM E.B. Fowler, USN, Commander, Naval Sea Systems Command. Graduates can expect utilization assignments in the fleet, in key facilities supporting the fleet, and in various Systems Commands. The current eight-quarter program in Naval Engineering provides a rigorous core of technical education with option paths in the areas of fluid mechanics, heat transfer, marine engineering, nuclear engineering, materials science, and solid mechanics. During the past year, research in the fluid mechanics area paid immediate dividends to a variety of user agencies such as Naval Civil Engineering Laboratory, Fort Hueneme, and the Naval Sea Systems Command.

Very significant research results concerning understanding the evolution of trailing vortices from submerged bodies in an ocean environment were developed by LCDR Steven Johnson, a Surface Warfare Officer. LCDR Johnson received his B.S. from the U.S. Naval Academy in 1974 and came to NPS following duty onboard USS DWIGHT D. EISENHOWER (CVN-69). He graduated in June 1982 and was reassigned to Department Head School at SWOS in Newport, RI.

Recent research on ball-obturated spinning tubular projectiles, in conjunction with efforts at the Naval Weapons Center, China Lake, CA could lead to an advanced projectile of enhanced range and/or reduced on-target dispersion. The 1982 work by LT William Bry, a Naval Engineering Duty Officer, under the guidance of Professor Bud Nunn, provided additional insight into the aerodynamic forces on such a projectile during the ball opening transition interval. LT Bry received his B.S. from Wofford College in 1974. He served on-board USS LANG (FF-1060) prior to attending NPS, graduated in March 1982 and currently is assigned to the Puget Sound Naval Shipyard, WA.

Thesis research by LT Joseph L. Paquette, in developing an interactive computer program for the preliminary design and analysis of marine reduction gears was enthusiastically welcomed by the Naval Sea Systems Command both for the quality of the work and for the initiation of research effort in an area of intense Navy interest. LT Paquette, a Naval Engineering Duty Officer who received his B.S.S.E. degree from the Naval Academy in 1976, served in the USS DAHLGREN (DDG-43) prior to entering NPS. He graduated in March 1982 and is now assigned to the Supervisor of Shipbuilding, 15th Naval District.

In the materials science option area, the thermo-mechanical processing of high-magnesium content Al-Mg alloys is under study in pursuit of increased efficacy in the fabrication and use of lightweight, high-strength alloys for aircraft and ship superstructures. The thermo-mechanical processing of high-carbon bearing steels for tougher armor plate and longer lived bearings is also underway. Studies by LT Wallace Elger into the reaction of welded cast HY 130 plate undergoing explosive bulge testing continued the NPS research into solving the metallurgical problems encountered in this steel. LT Elger is a Naval Engineering Duty Officer who obtained his B.S.M.E. degree from the Naval Academy in 1974. Prior to his assignment at NPS, he was attached to the NROTC Unit at Miami University of Ohio. Following graduation from NPS in December 1981, LT Elger was assigned to the Philadelphia Naval Shipyard.
The complexity of problems in military force structuring, weapons acquisition and evaluation, manpower planning, logistics, and strategic and tactical operations generates a need for officers with competence in operations research and systems analysis. The Operations Analysis curriculum is an eight-quarter program designed to prepare military analysts to meet these challenges. The program is sponsored by RADM William F. McCauley, USN, Director, Systems Analysis Division (OP-96) and is the oldest and most comprehensive graduate program in operations research in the country.

The curriculum includes courses in probability and statistics, systems analysis, mathematical programming, stochastic processes, human factors, and simulation and analysis of warfare. Students select elective courses from one of six special interest areas: naval warfare, land combat, systems analysis, human factors, logistics, and advanced modeling.

In the fifth quarter, students select a DOD organization where an active operations research program is ongoing and spend a six-week tour working as a team member of their study effort. Experience tour locations include offices of the Joint Chiefs of Staff and the Chief of Naval Operations, Marine Corps and Coast Guard Headquarters, Fleet and Force Commander staffs, Operational Test and Evaluation Forces, Naval Systems Commands, Naval Ocean Systems Center, and Center for Naval Analyses, among others. The value of the experience tour is recognized by both curriculum sponsors and the participating organizations. A further benefit is that feedback provided to the faculty regarding operations research problems of current interest in the fleet. Experience tours often lead students into areas that are subsequently analyzed in their thesis research.

Faculty research in the Operations Research Department covers a wide spectrum of interests. Current areas include manpower modeling, large-scale optimization, command and control, combat modeling and simulation, voice recognition technology, and tactical use of microcomputers. The faculty are actively involved in the recent establishment of the Readiness Command Element, Monterey, in cooperation with the U.S. Readiness Command (USREDCOM). Students are also actively involved in research projects.
LT Michael Agor, a U.S. Navy Submariner, selected the naval warfare option which emphasizes analysis of fleet operations and tactics. In research for his thesis, he analyzed data from exercise engagements between nuclear submarines and carrier battle groups and developed optimal decision guidelines for deployment of ASW screening ships. In recognition of the quality and applicability of his thesis, LT Agor was awarded the Military Operations Research Society of America Award for Graduate Research. A 1976 graduate of the U.S. Naval Academy, he came to NPS from the Gold crew of the USS ULYSSES S. GRANT (SSBN-631) and was assigned as a department head on another SSBN upon graduation from NPS in October 1982.

LT Robin Felix, a U.S. Navy Cryptologic Officer, came to NPS from the Naval Security Group Detachment at Kami Seya, Japan. An engineering science major from Dartmouth College, LT Felix has specialized in applying operation research techniques to problems in estimating emitter position from radio direction finding intercepts. He graduated in October 1982 and is serving as the Security Group Division Officer on USS FIFE (DD-991), an OUTBOARD equipped Spruance-class destroyer, where he is able to apply the results of his studies to critical naval operations.

LCDR Michael Finley, Supply Corps Officer with previous experience in both surface line and nuclear submarine duty, is a 1973 graduate and mathematics major from Cornell University. LCDR Finley developed microcomputer based network optimization algorithms as his thesis work and presented some of his work in this competitive research area at the Operations Research Society of America meeting in Detroit in April 1982. The presentation, attended by many well-known researchers, authors, and research sponsors, was enthusiastically received. For his overall academic achievement, LCDR Finley was awarded the Chief of Naval Operations Awards for Excellence in Operations Research. LCDR Finley has been serving as assistant supply officer on USS NIMITZ (CVN-68) since his graduation in October 1982.

As weapons systems become increasingly complex, the need to keep pace with rapidly emerging technologies which govern the development and operation of these systems becomes ever more urgent. It is essential that officers possess a range of basic scientific and engineering knowledge in areas such as electronics, controls, lasers, electro-optics, computer systems, communications, radars, sonars, signal processing, material science, explosives and propellants, plasmas, and nuclear science, in order to operate, manage, and command these complex combat systems optimally.

**Weapons Systems**

The Weapons Systems Engineering and Weapons Systems Science curricula are identical for the first five quarters. This interdisciplinary core portion of the program provides the basic mathematical, scientific and engineering skills required of all Weapons Engineering subspecialists. The graduate options in the curricula address engineering, communications, radar, computers, sensors and surveillance, weapons effects, and systems design and integration. The curricula differ in the thrust of the area of in-depth specialization and in the orientation of the research and thesis.

The Weapons Systems Engineering curriculum provides an in-depth optional sequence of elective courses including advanced control systems, advanced military communications theory, tactical missile design, radars and electronic countermeasure systems, and computer applications to military systems.

The Weapons Systems Science curriculum places graduate emphasis in engineering physics and its applications. Advanced studies include electro-optics and laser systems and applications, remote sensors and surveillance systems, propagation phenomena, and advanced weapons and weapons effects. The sponsor of these curricula is VADM E.B. Fowler, USN, Commander of the Naval Sea Systems Command.

Some examples of thesis research by officers in these programs illustrate the applications of this education to relevant problems. LCDR Lewis K. Athow, a Surface Warfare Officer who graduated in June 1982, concentrated his thesis research on damage assessment expected from an explosion in a confined space like a compartment of a ship where there is little or no venting. The long-range application of his work will be in the areas of designing new warheads and building ships capable of withstanding certain sized warhead explo-
sions. LCDR Athow is a 1969 graduate of University of Idaho NROTC. He came to NPS from USS R.K. TURNER (CG-20) and is presently assigned to the USS LEFTWICH (DD-984) as Executive Officer.

CAPT Thomas Dempsey, USMC, graduated in March 1982. CAPT Dempsey's thesis was a micro-processor based program to determine survivability of close air support aircraft. His research incorporated within its program logic, the dynamics of surface-to-air missiles and anti-air warfare launch and firing envelopes, radar multipath effects, and the probabilities of clear line-of-sight for three basic terrain/vegetation types normally encountered in a Marine close air support mission. CAPT Dempsey is a 1975 graduate of the U.S. Naval Academy. He came to NPS from First Marine Air Wing and is presently assigned to the Weapons Department at the Naval Academy.

Underwater Acoustics

The Underwater Acoustics curriculum provides specific coverage of areas in undersea warfare such as propagation of sound in the sea, transducer theory, signal processing electronics, oceanography, and noise and vibration control. Courses are drawn principally from the fields of physics, electrical engineering and mathematics. Although broadly based, the emphasis is on underwater acoustics and signal processing applications in undersea warfare to permit the graduate to address current and future military problems associated with underwater acoustics systems.

This program is jointly sponsored by VADM E.B. Fowler, USN, Commander, Naval Sea Systems Command and RADM G.B. Schick, USN, Commander, Naval Electronics Systems Command. Graduates of this curriculum occupy billets involving the design, development, operational test and evaluation, and in the aforementioned Systems Commands and in Navy laboratories.

In addition to U.S. Naval officers, a number of allied officers participate in this program each year. Their thesis work is of great benefit not only to their parent country but also to the U.S. Navy.

An example of student thesis research is that of CDR Yngvar Tronstad, Norwegian Navy, who graduated in June 1981. He did his thesis on the effect of scattering and absorption of noise from a cavitating noise source in the subsurface ocean layer, which was needed to investigate the performance of a passive homing torpedo used against shallow draft surface ships. This research confirmed the importance of having a search depth below the bubble-dominated subsurface layer and a variable speed capability during the attack phase. CDR Tronstad has returned to Norway and is assigned to duty in undersea warfare research and development projects.
Off-Campus Self-Study Courses
for Academic Credit

U.S. military personnel at sea and shore stations around the world are enrolled for academic credit in graduate preparatory self-study courses made available by NPS through the Office of Continuing Education. Course completions occur weekly in oceanography, meteorology, electrical engineering, mechanical engineering, mathematics, physics, probability and statistics, accounting, management, and other disciplines taught at NPS.

Military personnel complete these courses off campus primarily to prepare for fully-funded graduate education, but selection for graduate education is not a prerequisite to receive these courses. Successful completion for credit of selected groups of these courses may improve a Navy officer's APC code, enhance the likelihood of assignment into a graduate curriculum of choice at NPS, permit more effective tours in full-time graduate study by validating completed courses, and broaden the educational base of participants.

Officers may take these courses for review only. It is possible to validate courses at NPS which were taken for review in this program, if required skills can be demonstrated after entry into NPS. Students at NPS who have completed some of these courses consistently report an easier transition into graduate study and enhanced performance resulting directly from their off-campus self-study efforts.

Course descriptions, enrollment forms, and other program information is provided in the NPS Catalog of Self-Study Courses which is shipped to all ships and stations annually. Copies are available on request from the Office of Continuing Education (Code 500), Autovon 878-2558.

Short Courses/Conferences

NPS delivers approximately 30 short courses annually to requesting activities on a reimbursable basis. Nearly half of these courses are delivered off-campus at a sponsor's site. Examples of courses and sponsors are Practical Comptrollership (Navy Comptroller), Systems Acquisition and Program Management (Naval Weapons Center; Pacific Missile Test Center), Aircraft Combat Survivability (Naval Air Systems Command) and Environmental Effects on Ocean Acoustics (Commander Oceanographic Systems, Pacific).

Approximately 60 conferences are held annually at NPS. Examples of conferences and their sponsors are Navy Space Symposium (Office of the Chief of Naval Operations (OP-943)), Navy Tactical Computer Users Group (Naval Sea Systems Command), C5 Countermeasures (Office of the Chief of Naval Operations (OP-94)), Strategic Systems Conference (American Institute of Aeronautics and Astronautics), NATO Armaments Meeting (Office of Deputy Chief of Staff of the Army for Research Development Acquisition), Infrared Information Symposium (Office of Naval Research) and Undersea Surveillance Symposium (Defense Advanced Research Projects Agency).

Counseling

Approximately 6,000 responses to requests for educational counseling are processed annually in the CE office. These counseling responsibilities are shared by curricular officers so that officers who call or write can have direct contact with NPS officer staff members who manage the curricular programs. Additional counseling with regard to Academic Profile Code scores and officers' academic transcripts is provided by the Office of Academic Administration (Autovon 878-2391). Officers may obtain educational counseling service by calling the CE office or a curricular officer at NPS.
Aviation Safety Programs

The Postgraduate School’s Aviation Safety Programs faculty and staff conduct professional programs in the safety disciplines for United States Navy, Marine Corps, sister-service, allied service, and United States Department of Defense civilian safety personnel. Authorized programs include: (1) a six-week course for officers manning or designated to man such billets in Regular Navy or Marine Corps air squadrons; (2) a special four-week Survey of Aviation Safety (SAS) offered once a year to Navy or Marine Corps Reserve Officers; and (3) an intensive eight-day Aviation Safety Command (ASC) course offered seven times a year to air squadron Commanding Officers and prospective Commanding Officers.

The program consists of some 185 hours of instruction in aircraft accident prevention and investigation, engineering, medicine, psychology, and law, chosen to prepare squadron safety department heads and aviation safety officers to assist their Commanding Officers in conducting aggressive accident prevention programs. Some 350 officers complete this course each year.

The SAS program allows Naval and Marine Corps Reserve squadron personnel to attend the survey program. Attendance is limited to 35 officers.

The ASC program provides squadron Commanding Officers an orientation in the philosophies, and practices of effective command safety programs. Some 300 Commanding Officers, Executive Officers, and prospective squadron COs and XO/NCOs attend the ASC program each year.

Aviation Safety Programs cooperates with the Postgraduate School’s Department of Aeronautics in conducting a System Safety Management and Engineering Course required of all candidates for aeronautical engineering degrees; the course is also available as an elective to degree candidates in other technical fields. Emphasis is placed on the philosophy of systems safety, with application to the current military standard, as illustrated through examples and case studies. An off-campus version of the systems safety course, developed under the sponsorship of Naval Air System Command, has been presented at activities such as Naval Air Development Center, Naval Weapons Center, Pacific Missile Test Center, and Naval Air Test Center.

Defense Resources Management Education Center

The Defense Resources Management Education Center (DRMEC) is an activity of the U.S. Department of Defense. The Center is jointly sponsored by the Assistant Secretary of Defense (Comptroller), the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics), the Assistant Secretary of Defense (International Security Affairs), and the Director, Program Analysis and Evaluation. The Secretary of the Navy is the Executive Agent for the Center and the Superintendent of the Naval Postgraduate School is the Director. Dr. John E. Dawson is the Executive Director.

Based upon a program of research related to the defense resources management education, DRMEC continues to provide a variety of resource management courses designed to enhance the understanding, competence, and capabilities of U.S. and foreign military and civilian personnel in the development, operation, and maintenance of DOD and other government management systems. Emphasis is on analytical concepts and techniques drawn from the disciplines of management decision theory, economics, and quantitative methods as they apply to the allocation and utilization of financial, logistic, and manpower resources.

During Fiscal Year 1982, more than 300 U.S. students participated in five four-week Defense Resources Management Courses in residence in Monterey, as well as three two-week mobile courses taught at the Defense Logistics Agency, Memphis TN; the U.S. Marine Corps Development and Education Command, Quantico, VA; and the Naval Air Station, San Diego, CA. Also during Fiscal Year 1982, more than 230 international students from 35 countries received instruction through courses taught in residence in Monterey. Resident courses included two eleven-week International Defense Management Courses, and one four-week Senior International Defense Management Course for 59 admirals, generals, and ministerial level civilians from 29 nations.

Since its inception in 1965 DRMEC has conducted courses in defense management for approximately 9,200 U.S. participants and almost 4,500 international students from 74 nations.
Rear Admiral Ekelund graduated from the U.S. Naval Academy in 1949. He received a Master of Science in Systems Analysis from the University of Rochester. He has also attended the Armed Forces Staff College.

Rear Admiral Ekelund earned Warfare Specialties in Submarine and Surface Warfare. He has served in a variety of billets both ashore and afloat including command of USS GRAYBACK (SSG 574), Chief of Staff to Commander Naval Forces Vietnam, and command of USS ALBANY (CG 10). Significant duty ashore has included assignments in Strategic Warfare Analysis and as the Dean of Academics at the Naval War College. Previous flag assignments have been as the Deputy Director of Naval Education and Training and duty with the Central Intelligence Agency. In his last assignment before reporting to Monterey, Rear Admiral Ekelund served as Commander, South Atlantic Force, U.S. Atlantic Fleet.

Dean Schrady’s education was in the field of operations research and he received his doctorate from Case Institute of Technology. Prior to this assignment he had been a faculty member in the Department of Operations Research, Chairman of the Department of Operations Research and Administrative Sciences, and subsequently Dean of Academic Planning, Dean of the Information and Policy Sciences Division, and Acting Provost and Academic Dean. With the exception of a year as Associate Director of the Operations Research Program in the Office of Naval Research in Washington, D.C., Dr. Schrady has been on the Faculty of the Naval Postgraduate School since 1965.

Dr. Schrady was elected this year to the position Vice President/President Elect of the Operations Research Society of America, after having been Treasurer of the Society 1976-79. He is also a past president of the Military Operations Research Society.
KEY PERSONNEL
AT THE
NAVAL POSTGRADUATE SCHOOL

Rear Admiral J.J. Ekelund, USN
Superintendent
David A. Schrady, Ph.D.
Provost and Academic Dean

William M. Tolles, Ph.D.
Dean of Research and Dean of Science and Engineering

W. Max Woods, Ph.D.
Acting Dean of Information and Policy Sciences/Dean of Educational Development and Director of Continuing Education

John N. Dyer, Ph.D.
Acting Dean of Academic Planning

Gerald H. Lindsey, Ph.D.
Dean of Academic Administration

CAPT Matthew F. Pasztalaniec, USN
Director of Programs

CAPT James M. Webster, USN
Director of Military Operations

CAPT Robert Lewis, USN
Director of Aviation Safety Programs

CDR Karl H. Kaefer, USN
Manager of Civilian University Programs

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Mathematics
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Mechanical Engineering
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Robert J. Renard, Ph.D.

National Security Affairs
Sherman W. Blandin, Ph.D.

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Operations Research
Kneale T. Marshall, Ph.D.

Physics
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Robert N. Forrest, Ph.D.

Command, Control and Communications Group
Michael G. Sovereign, Ph.D.

Electronic Warfare Group
John M. Bouldry, M.S.

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Aeronautical Engineering
CDR William M. Siegel, USN

Air Ocean Sciences
CDR Carl Ihli

Command, Control and Communications
LTCOL Jeffrey W. Johnson, USAF

Computer Science/Systems
CDR John J. Pfeiffer

Electronics/Communications
CDR Andrew T. Sosnicky, USN

Naval Engineering
CDR Alan J. Johnson, USN

Naval Intelligence
CAPT Larry N. Schuetz, USN

Operations Research/Systems Analysis
CDR Barry G. Swanson, USN

Weapons Engineering
CDR Herbert B. Shaw, III, USN

Antisubmarine Warfare
CDR Stephen M. Pribula, USN
DISTINGUISHED ALUMNI

In the history of the Naval Postgraduate School nearly 600 officers
who have completed a curricular program at NPS have attained flag
rank. The following is a list of those on active duty as of 1 April 1982.

Admiral James D. Watkins
Admiral George E. Kinsey II
Admiral Harry T. Train, II
Vice Admiral Lee Baggett, Jr.
Vice Admiral Edward S. Brigger
Vice Admiral Wayne E. Caldwell, USCG
Vice Admiral Kent J. Carroll
Vice Admiral "M" Stover Holcomb
Vice Admiral Thomas J. Kilcline
Vice Admiral Gordon R. Nagle
Vice Admiral William H. Rowden
Vice Admiral James L. Sanderson
Vice Admiral Ernest R. Seymour
Vice Admiral Edward C. Waller, III
Vice Admiral Robert L. Walters
Rear Admiral Theodore A. Almattod, Jr.
Rear Admiral David M. Allweg
Rear Admiral Henry D. Arnold
Rear Admiral Stanley R. Arthur
Rear Admiral James W. Austin
Rear Admiral Robert G. Austin
Rear Admiral Warren E. Aust
Rear Admiral Richard C. Avri
Rear Admiral Edwin A. Barriman
Rear Admiral Joseph B. Barth, Jr.
Rear Admiral John R. Batchet
Rear Admiral John D. Beecher
Rear Admiral Ralph G. Bird
Rear Admiral Wayne D. Bodensteiner
Rear Admiral James E. Busey
Rear Admiral John L. Butte, Jr.
Brigadier General William D. Carson, Jr., USMC

Rear Admiral Edward W. Carter III
Rear Admiral Lawrence C. Chambers
Rear Admiral Ming E. Chang
Rear Admiral Glenwood Clark, Jr.
Major General Clayton L. Comfort, USMC

Rear Admiral Byron W. Compion, Jr.
Rear Admiral Donald L. Conner
Rear Admiral Peter C. Conrad
Rear Admiral John D. Cortes, USCG
Rear Admiral George W. Davis, Jr.
Rear Admiral Henry J. Davis, Jr.
Rear Admiral Tyler F. Dithan
Rear Admiral Paul W. Dillingham, Jr.
Rear Admiral Robert F. Dunon
Rear Admiral Crawford A. Easterling
Rear Admiral Scott W. Ehret
Rear Admiral Donald L. Felt
Rear Admiral Richard R. Fontaine
Rear Admiral Joseph F. Frick
Rear Admiral George M. Furlong, Jr.
Rear Admiral Ralph M. Gompley
Rear Admiral Paul C. Hibsho, Jr.
Rear Admiral Richard J. Grich
Rear Admiral William A. Guerek
Rear Admiral Benjamin T. Hucker
Rear Admiral Warren C. Ham, Jr.
Rear Admiral David L. Harlow
Rear Admiral Pauline M. Harrison
Rear Admiral Ralph H. Hedges
Rear Admiral Peter M. Hekman
Rear Admiral Albert J. Herberger
Rear Admiral Hobby F. Hollingsworth, USCG
Brigadier General Joseph H. Hopkins, USMC

Rear Admiral Stephen J. Houstelle
Rear Admiral Thomas J. Hughes, Jr.
Rear Admiral Dempster M. Jackson
Rear Admiral Roger D. Johnson
Rear Admiral Fred W. Johnston, Jr.
Rear Admiral Donald J. Jones
Rear Admiral William A. Kearns, Jr.
Rear Admiral Cecil J. Kamaf
Brigadier General Hugh T. Kern, USMC
Rear Admiral Robert E. Kirby
Rear Admiral Verne W. Klein
Rear Admiral Arthur K. Knutzen
Rear Admiral Leland S. Kolmorgen
Rear Admiral Paul A. Lauterbach, Jr.
Brigadier General George H. Leech, USMC
Rear Admiral Glen W. Lenox
Rear Admiral Lee L. Levenson
Rear Admiral Walter M. Locke
Rear Admiral Kleber S. Masterson, Jr.
Rear Admiral John C. Mckeeh
Rear Admiral James K. McCailld, Jr.
Rear Admiral Paul F. McCarthy, Jr.
Rear Admiral William E. McGarrch, Jr.
Rear Admiral Joseph MeccaU, III
Rear Admiral Wayne E. Meyer
Rear Admiral Richard A. Miller
Rear Admiral Charles J. Moore
Rear Admiral Virgil W. Moore
Rear Admiral Kendell E. Morenceville
Rear Admiral Paul J. Mulloy
Rear Admiral Henry C. Muetin
Rear Admiral Ronald E. Norm
Rear Admiral Byron B. Newell, Jr.
Rear Admiral John W. Nuytten
Rear Admiral Samuel H. Packard, II
Rear Admiral Frederick P. Palmer
Rear Admiral Walter T. Piotti, Jr.
Rear Admiral Steen A. Pompilio
Rear Admiral Charles D. Prindle
Rear Admiral Donald F. Reaves
Rear Admiral Conrad J. Rorrie
Brigadier General Eugene R. Russell, USMC

Rear Admiral Louis R. Sarandy
Rear Admiral Harry C. Schrader, Jr.
Rear Admiral Milton J. Schulz, Jr.
Rear Admiral James E. Service
Rear Admiral George H. Shick, Jr.
Rear Admiral William G. Skimmermore
Rear Admiral Carol C. Smith, Jr.
Rear Admiral William B. Smith
Rear Admiral Paul H. Spees
Rear Admiral Paul E. Sutherland, Jr.
Rear Admiral Sayre A. Switzerhu
Rear Admiral James T. Taylor
Rear Admiral Jerry O. Tuttle
Rear Admiral Norman C. Ventke, USCG
Rear Admiral William A. Walsh
Rear Admiral Thomas M. Ward, Jr.
Rear Admiral Thomas C. Watson, Jr.
Rear Admiral Joseph B. Wilkinson, Jr.
Rear Admiral Allen D. Williams
Rear Admiral Louis A. Williams
Rear Admiral Donald E. Wilson
Rear Admiral John G. Weidler
Rear Admiral William C. Wyal, III
Brigadier General John J. Yeomock, USA
Rear Admiral William M. Zehet

SELECTED

Commodore Henry F. Boyle, Jr.
Commodore Dennis M. Brooks
Commodore Richard F. Donnelly
Commodore David Patrick Donohue
Commodore James F. Dreyer, Jr.
Commodore William J. Finneran
Commodore James M. Glenn
Commodore Oakley E. Oshorn
Commodore Robert S. Greens
Commodore Myron V. Hickita
Commodore Gerald L. Hinde
Commodore Robert H. Sloan
Commodore Roger D. Smond
Commodore Richard F. Ursick
Commodore John C. Weaver
Commodore Hugh L. Webber
Commodore Daniel J. Wolkendorf
Commodore William H. Zehet

NPS ALUMNI
ADM James D. Watkins, USN
Chief of Naval Operations
MR. WILLIAM R. BAILEY
Retired as Vice President — Law and Secretary, Armco; A.B., Yale University, 1939; L.L.B., University of Virginia Law School, 1947; formerly associated with Breed, Abbott and Morgan law firm, New York City; served on University of Virginia Law Review Editorial Board.

THE HONORABLE NORMAN D. DICKS
Representative of the Sixth Congressional District of the State of Washington since 1976; B.A., University of Washington, 1963; J.D., University of Washington, 1968; Member of the House Appropriations Committee.

LIEUTENANT GENERAL ROBERT G. GARD, USA (RET)
Director, Bologna (Italy) Center, Johns Hopkins School of Advanced International Studies; retired from active duty in 1981 after serving as President, National Defense University from 1977; B.S., U.S. Military Academy, 1950; M.S., Harvard University, 1956; Ph.D., Harvard University, 1961; graduate of U.S. Army Command and General Staff College in 1962.

DR. KERMIT O. HANSON
Dean Emeritus, School and Graduate School of Business Administration, University of Washington; A.B., Luther College, Iowa, 1938; M.S., Iowa State University, 1940; Ph.D. in Economics, Iowa State University, 1950; Honorary D.Sc, Luther College Iowa, 1981; former President American Assembly of Collegiate Schools of Business.

DR. GERALD J. LIEBERMAN
Vice Provost and Dean of Graduate Studies and Research, Professor Statistics and Operations Research, Stanford University; B.M.E., Cooper Union, 1948; A.M., Columbia University, 1949; Ph.D., Stanford University, 1953; past President of the Institute of Management Sciences.

DR. NANCY R. MANN
Professor, Department of Biomathematics, University of California Los Angeles (UCLA); retired as Project Manager, Reliability and Statistics, Rockwell International; B.A., UCLA, 1948; M.A., UCLA, 1949; Ph.D., UCLA, 1965.
DR. RUSSELL R. O'NEILL

Dean of the School of Engineering and Applied Science, UCLA since 1974; B.S., University of California, Berkeley, 1938; M.S., 1940; Ph.D., University of California, Los Angeles in Engineering, 1956; Fellow, College of Fellows Institute for the Advancement of Engineering; Chairman, National Research Council Maritime Transportation Research Board.

DR. DAVID S. POTTER

Vice President and Group Executive in charge of Public Affairs Group, General Motors Corporation; B.S., Yale University, 1945; Ph.D. in Physics, University of Washington, 1951; U.S. Navy from 1943 to 1946; Former Assistant Secretary of the Navy for Research and Development and Under Secretary of the Navy.

ADMIRAL JAMES S. RUSSELL, USN (RET) — CHAIRMAN

Retired from active duty on 1 April 1965 after serving as Commander in Chief, Allied Forces, Southern Europe for over three years; B.S., U.S. Naval Academy, 1926; Naval Postgraduate School, 1933; M.S., California Institute of Technology, 1935; part time consultant for Boeing Company.

DR. JOHN B. SLAUGHTER

Director, National Science Foundation; B.S., Kansas State University, 1956; M.S., University of California, Los Angeles, 1961; Ph.D., University of California, San Diego, 1971; Former Academic Vice President and Provost, Washington State University.

ADMIRAL ALFRED J. WHITTLE, JR., USN (RET)

Retired from active duty on 1 July 1981 after serving as Chief of Naval Material from August 1978; B.S., U.S. Naval Academy, 1945; graduate of Nuclear Power School, 1960; attended the Institute of Defense Analysis, Arlington, Virginia; consultant for Lockheed Corporation; Director of Sippian Ocean Systems, The Bird Johnson Company and management advisory committee of Center for Naval Analyses.

THE HONORABLE ROBERT C. WILSON

Founder and member, Washington Industrial Team; former Representative of Forty-First Congressional District of California (1953-81), was ranking Republican member of the House Armed Services Committee and the House Select Committee on Intelligence; attended San Diego State College (1933-35) and Otis Art Institute, Los Angeles.
The Naval Postgraduate School Foundation, Inc. was founded in 1970 by personnel in the local area who desired to provide support to the School, its people, programs and traditions. That desire has manifested itself in several ways including the expansion of the sailing club and the acceptance of both funds and equipments and other activities to further the School’s goals.

The Foundation also rewarded academic excellence at the professional level:

The Rear Admiral John Jay Schieffelin Award for Excellence in Teaching was presented to Professor Claude A. Buss of the Department of National Security Affairs.

The William R. Church Award for outstanding Achievement in the study of Mathematics was won by Captain R.J. Linhart, Jr., USMC, a student in the Operations Research Department.

The Carl E. Mennen Fellowship for Scientific Naval Research was awarded to Mr. Mukesh Turakhia of Montana State University whose doctoral research is directed toward the development of a device for simulating shipboard condensers.

A memorial fund established in honor of the late Dr. H. Paul Ecker, Executive Director of the Defense Resources Management Education Center, has been used to refurbish and enhance a library within the Center.

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