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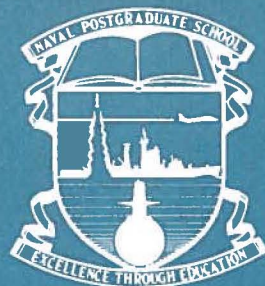
Resident Research Associateships;
Postdoctoral and Senior Research Awards
tenable at the Naval Postgraduate School,
Monterey, California, Administered by the
National Research Council



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RESIDENT RESEARCH ASSOCIATESHIPS

Postdoctoral and Senior Research Awards

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tenable at the
NAVAL POSTGRADUATE SCHOOL
Monterey, California

administered by the
NATIONAL RESEARCH COUNCIL

Resident Research Associateships

Postdoctoral and Senior Research Awards

1989

OPPORTUNITIES FOR RESEARCH

at the

NAVAL POSTGRADUATE SCHOOL
Monterey, California

administered by the
NATIONAL RESEARCH COUNCIL
Washington, DC

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The National Research Council serves as an independent advisor to the federal government on scientific and technical questions of national importance. Established under the congressional charter of the private, nonprofit National Academy of Sciences, the Research Council brings the resources of the entire scientific and technical community to bear on national problems through its volunteer advisory committees. Today the Research Council stands as the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering and is administered jointly by the two academies and the Institute of Medicine. The National Academy of Engineering and the Institute of Medicine were established in 1964 and 1970, respectively, under the charter of the National Academy of Sciences.

The National Research Council has nine major divisions. One of these is the Office of Scientific and Engineering Personnel, which is charged with administering Research Associateships through its Associateship and Fellowship Division.

Foreword

History

The Naval Postgraduate School (NPS) is in its 80th year of providing advanced education for commissioned officers of the United States Navy. When first established as the Postgraduate Department of the U.S. Naval Academy at Annapolis on June 9, 1909, ten officers made up the class, three professors formed the faculty, and marine engineering was the only curriculum.

In 1919, mechanical and electrical engineering were added to the course of instruction. Later, ordnance engineering, radio engineering, and aeronautical engineering were introduced as the Navy continued to recognize its need for officers with technical knowledge. The Postgraduate Department was renamed the United States Naval Postgraduate School but still operated as a part of the Naval Academy.

After the 1945 armistice, the Navy began plans to move the Postgraduate School away from Annapolis and to improve its professional status. Between 1945 and 1948, Congress established the school as a separate activity under its own superintendent; created the office of academic dean; granted the superintendent the authority to award the bachelor's, master's, and doctoral degrees; and approved Monterey as the future home of the school. The Naval Postgraduate School was officially established in Monterey, California, on December 22, 1951.

In 1962, the Chief of Naval Personnel authorized a major internal reorganization of the school, making the Naval Postgraduate School a naval university unified in policy, procedure, and purpose.

In addition to its Naval officer students, NPS has, since 1947, been enrolling officers from the United States Army, Air Force, Coast Guard, Marine Corps, and the National Oceanic and Atmospheric Administration, as well as military officers from allied countries. These officers constitute about 30–40% of the student body. Effective in 1975, civilian employees of the United States Government have been enrolled as regular students.

Since its inception and through December 1986, the School has awarded 6,252 bachelor's degrees, 14,945 master's degrees, and 148 doctoral degrees. Total emphasis since 1973 has been on graduate-level programs.

Faculty and Facilities

About three hundred permanent and adjunct faculty members of the Naval Postgraduate School are organized into eleven academic departments and four interdisciplinary groups:

- Administrative Sciences
- Aeronautics and Astronautics
- Antisubmarine Warfare Academic Group
- Command, Control, and Communication Academic Group
- Computer Science
- Electrical and Computer Engineering
- Electronic Warfare Academic Group
- Mathematics

Mechanical Engineering
Meteorology
National Security Affairs
Oceanography
Operations Research
Physics
Space Systems Academic Group

Approximately 85% of the faculty are civilians of varying professional rank, and 15% are qualified military officers.

Research is currently being conducted in every department and group.

Air-Ocean Sciences Laboratories

The School has an active seagoing research program in oceanography, meteorology, environmental acoustics, and in mapping, charting, and geodesy. Instrumentation aboard the R/V POINT SUR includes CTD (conductivity, temperature, depth) and expendable bathythermograph (XBT) systems, and acoustic Doppler velocity profiler (ADVP), an acoustic (atmospheric) sounder, a micrometeorologically instrumented mast, continuous underway measurements of C and T at 2 m, position (including Global Positioning System and Loran receivers) and surface atmospheric variables, and a contemporary digital data-acquisition system. The Oceanography Department maintains a suite of modern current measuring equipment for experimental use; instruments include Aanderaa current meters, acoustic Doppler profilers, and acoustic releases; drifting buoys of various types are also available. The micrometeorological instrumentation suites are used on aircraft as well as on ship. Other facilities include analysis laboratories for environmental acoustics, mesoscale ocean are also available. The micrometeorological instrumentation suites are used on aircraft as well as on ship. Other facilities include analysis laboratories for environmental acoustics, mesoscale ocean prediction, ocean turbulence, nearshore processes, hydrographic science, satellite remote sensing, and numerical meteorology and oceanography. Access is also provided to supercomputer facilities at NCAR and NRL. Synoptic laboratory facilities include access to both National Meteorological Center (NMC) and Fleet Numerical Oceanography Center (FNOC) numerical analysis and prognoses, real-time satellite data, and surface and upper-air observation capability. An Interactive Digital Environmental Analysis (IDEA) Lab provides modern computer technology and real-time data bases for graduate instruction and research in synoptic oceanography and meteorology, remote sensing fundamentals and applications, and numerical weather prediction. The main components of the system are a VAX 8250 and two Micro-Vax II computers, eight Gould DeAnza image analysis stations, 4 digital GPX work stations (a color plotter, a laser printer, an array processor, and a matrix camera). The source of real-time meteorological data is through a UNIDATA-sponsored contract for commercial satellite downlink. Real-time satellite data are available through links with the Naval Environmental Prediction Research Facility (NEPRF) satellite laboratory, which reviews GOES digital data, and with the Jet Propulsion Laboratory and Scripps Institution of Oceanography, which provide NOAA/AVHRR data for the local area. Use of research vessels and aircraft operated by the Naval Oceanography Office can also be arranged.

Computer Center

The services of the W.R. Church Computer Center are available free to all faculty, staff, and students of the School for use in connection with instruction, research, or administrative activities.

Round-the-clock service is provided on a network of three IBM computers, specifically a 3033 Model AP (a dual-processor configuration with 16 Mbytes of processor storage), a 3033 Model U with 16 Mbytes, and a 4381-13 with 16 Mbytes. The systems share all input/output equipment and auxiliary storage devices, including four paging drums, IBM 3380 and 3350 Direct Access Storage, IBM 3480 and 3420 tape units, and an IBM 3800-3 page printer.

The principal mode of access is from 650 IBM 3270-type terminals or personal computers distributed throughout the academic buildings and attached by coaxial cable to the Center's computers. Full micro-to-mainframe communications support is provided for hard-wired and dial-up linkage. In addition, there are 20 full-graphics display units available for general use.

The system supports two major operating systems: MVS (Multiple Virtual Systems) that runs batch-processing jobs and VM/SP (Virtual Machine) and CMS (Conversational Monitor System) that provides interactive support. The extensive programming facilities include VS FORTRAN, VS COBOL, PL/I Optimizer, BASIC, APL2, Pascal, LISP, and C. Most languages are available in both interactive and batch-processing modes.

The 1988-89 academic year will see the completion of the first phase of a multi-year program to upgrade, expand, and better integrate the various service facilities, including the replacement of the IBM 3033s with a 3090-class system, acquisition of a mini-supercomputer, and interconnection of existing computers and LANs in the academic departments via a campus backbone network. Off-campus communications, presently via BITNET and MILNET/ARPANET, will be expanded to include NSFnet.

Dudley Knox Library

The Dudley Knox Library collections serve the research and instructional needs of NPS students, faculty, and staff. The collections comprise over 895,000 volumes of books, bound periodicals, and research reports in hard copy and microforms and current subscriptions to more than 1,800 periodicals and other serial publications in all NPS curricular fields.

The Reader Services Division provides access to open-literature sources in print and microform and bibliographic access to more than 400 computer databases in fields of curricular interest by means of DIALOG, NEXIS, and RLIN. It also provides interlibrary loan services from other libraries.

The Research Reports and Classified Materials Division is the principal NPS repository for classified and unclassified research reports in hard copy and microfiche with bibliographic access by internal (SABIRS) and external (DTIC, CIRC, and NASA/RECON) database services. Also available is a Selective Dissemination of Information (SDI) Service.

Aeronautical Laboratories

The subsonic aerodynamics laboratory consists of two low-speed, continuous-flow wind tunnels and a large continuous-flow visualization tunnel. The gas-dynamics laboratory contains a shock tube, blow-down supersonic wind tunnel, ramjet, and transonic-cascade model tunnel.

The combustion laboratory consists of an instrumented control room, a propellant evaluation laboratory, a high-pressure air facility, and three test cells. The test cells are equipped for investigating solid rocket propellant, liquid- and solid-fuel ramjet, and gas-turbine combustion. Diagnostic methods in use include high-speed, motion-picture measurements of transmitted and scattered light, holographic apparatus, laser schlieren, and various sampling probes. Image-processing equipment is also available for data retrieval from holograms.

The advanced facilities of the Turbopropulsion Laboratory are in two buildings. The first provides low-speed tests with rectilinear and radial cascades of large dimensions and an axial-flow, three-stage compressor. The second building is used for high-speed testing of research turbomachines. Digital data-acquisition and control equipment for steady-state and real-time flow measurements at up to 100 kHz are available with computer-control reduction and presentation on line. Laser measurements are available, including Q-switched holography and two-channel anemometry. The latter involves automatic data processing and plotting. A hotspin test unit, where disks and propellers can be rotated at speeds up to 50,000 rpm while heated to temperatures of 980°C, is also available.

Computing Facilities and Computer Science Department

In addition to the campus computing center, which provides mainframe computing services to the whole school, the Computer Science Department's facilities provide students and faculty with access to minis and micros for teaching, thesis work, and research. The facilities are composed of a general-purpose laboratory and several individual laboratories for mainstream computer-science areas. These laboratories have their computers interconnected by local-area networks. Currently, the six individual laboratories are Database Systems, Graphics and Video, Software Engineering, Artificial Intelligence, System Architecture, and Microcomputers.

The computers in the department include three VAXs (a 11/785, a 11/780, and a 11/750), three Sun 3/180s, and nearly one hundred microcomputers of different kinds. The department also possesses a large number of terminals, disks, image processors, and other devices, several highly advanced graphic (IRIS) work stations, many intelligent (ISI) work stations, three Symbolics LISP machines, two TI Explorer computers, a number of AI work stations, and an advanced digitizer camera. The department has recently completed an \$800,000 program to upgrade its instructional laboratories.

By way of the local-area networks, all other laboratories are connected to the General Laboratory, which in turn provides gateways to the MILNET, ARPANET, and CSNET. This interconnection permits easy communication within the Department and without the School.

The major software operating systems in the department are Berkeley UNIX and DEC VMS. The languages supported in the systems include C, Lisp, and Prolog, along with Ada, Pascal, and Fortran-77. Commercial versions of Ingres and Oracle database systems have been installed.

Currently, the department has nine full-time, qualified, hardware/software professionals, who oversee the operation of equipment and work closely with faculty and students in support of teaching and research.

Electrical and Computer Engineering Laboratories

The Electrical and Computer Engineering Department Laboratories have excellent facilities in all phases of modern electrical and computer engineering. At present, laboratory facilities are maintained in the following areas: Microwaves and Antennas, Radar, Electronic Warfare, Optical Electronics, Transient Electromagnetics, Sonar Signal Processing, Control Systems, Image Processing, VLSI Design, Digital Systems, and a computer laboratory based on a VAX 11/785. A wide array of microcomputer facilities and language support is available to support such areas as digital signal processing, control simulations, digital circuit simulation, printed circuit board layout, and image processing. There are also extensive service facilities, including a calibration laboratory with a continuous program of calibration and maintenance for laboratory instruments.

In addition to the usual experimental and instructional laboratories, status as a Naval facility enables the Department to utilize a number of modern systems as adjuncts to the laboratory. These include radar, telemetry, sonar, countermeasures, and navigational systems.

Hydrodynamics Laboratories

The major research facilities consist of two U-shaped vertical water tunnels, one impulsively started flow tunnel, and one internal-wave channel.

The U-shaped water tunnels are capable of generating a harmonically oscillating flow with a mean current. The smaller of the two tunnels is used for Reynolds numbers up to 50,000. The larger tunnel (35 ft long, 22 ft high, with a cross-section of 3 ft x 4.7 ft) is used for Reynolds numbers up to 1.5×10^6 . It is used primarily for the study of time-dependent flow about bodies, cable strumming, and hydroelastic oscillations. It is the largest tunnel of its type in the world.

The impulsively started flow tunnel is 12 ft high with a cross section of 2 ft by 2 ft. It is used for the study of impulsively started flow about various shapes of bodies. Force measurements and flow visualization can also be made.

The internal-wave channel is 50 ft. long with a cross-section of 4 ft by 5 ft. It is used to tow bodies along the channel at any depth and velocity desired to study internal waves in stably stratified fluids.

The above facilities are connected to a sophisticated computer, digitizer, and electronic control system. Digital data acquisition and control for steady-state and real-time measurements up to 100 kHz are carried out with this system.

Physics Laboratories

The physics laboratories are equipped to carry on research work in acoustics, electro-optics, laser and plasma physics, spectroscopy, geomagnetism, environmental physics, low-temperature nuclear physics, and are developing capabilities in space science and radiation damage.

A 100-MeV electron linear accelerator with a 1-microamp-beam current has been used for nuclear-structure and radiation-damage experiments. Current research includes production of soft x-rays by transition radiation and the production of coherent radiation by the stimulated Cherenkov effect.

A flash x-ray (intensity exceeding 5×10^{10} R/sec) and electron accelerator system support studies of transient radiation effects. X-ray and electron transport codes are available.

The Environmental Physics Group has available a completely instrumented research ship and an instrumented aircraft. Capabilities include aerosol spectra, turbulence, mean meteorological conditions, boundary-layer profiles, and upper-ocean conditions. Digital and analog tape recorders and computer-controlled data-acquisition systems are available for acquisition. Several types of computers and spectral analysis equipment are available for analysis.

The electro-optics laboratory uses imaging and detecting systems from the far-infrared to the visible range, including instrumentation for sea-going experiments in optical propagation. The laser laboratory contains a giant pulse laser and associated detection equipment for the visible spectrum as well as a high-power laser in the IR region.

The laser and plasma laboratory is equipped with high-speed oscilloscopes, plasma diagnostic probes, mass spectrographs, an optical spectrum analyzer, and photographic equipment, in addition to a number of lasers including a Q-switched Nd glass with monitoring accessories.

The spectroscopy equipment includes a high-resolution grating spectrograph, a large-prism spectrograph, and infrared spectrophotometers. The spectroscopic data center contains a comprehensive compilation of the atomic energy levels and spectral lines in the vacuum ultraviolet range.

The acoustics laboratory equipment includes a large anechoic chamber, a small reverberation chamber, and a multiple-unit acoustics laboratory for experimentation in airborne acoustics. Sonar equipment, test and wave tanks, anechoic water tanks, and instrumentation for investigation of underwater sound comprise the underwater acoustics laboratory.

The nuclear physics laboratory is equipped for experiments associated with the course in nuclear physics. Besides basic counters, instrumentation provides for alpha, beta, and gamma absorption measurements, nuclear spectroscopy with pulse-height analysis, and activation using the linear accelerator.

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Introduction

History and Objectives

The National Research Council conducts the Research Associateship Programs in cooperation with sponsoring federal laboratories and research organizations approved for participation.

The Research Council, through its Associateship Programs Office, conducts a national competition to recommend and make awards to outstanding scientists and engineers at recent postdoctoral and experienced senior levels for tenure as guest researchers at participating laboratories. These Programs have been conducted on behalf of a number of federal agencies since 1954.

The objectives of the Programs are (1) to provide postdoctoral scientists and engineers of unusual promise and ability opportunities for research on problems, largely of their own choice, that are compatible with the interests of the sponsoring laboratories and (2) to contribute thereby to the overall efforts of the federal laboratories.

For recent doctoral graduates, the Programs provide an opportunity for concentrated research in association with selected members of the permanent professional laboratory staff, often as a climax to formal career preparation.

For established scientists and engineers, the Programs afford an opportunity for research without the interruptions and distracting assignments of permanent career positions.

Participating laboratories receive a stimulus to their programs by the presence of bright, highly motivated, recent doctoral graduates or senior investigators with established records of research productivity. New ideas, techniques, and approaches to problems contribute to the overall research climate of the laboratories. Indirectly, Associateships also make available to the broader scientific and engineering communities the excellent and often unique research facilities that exist in federal laboratories.

For the 1989 program year, an anticipated 1,000 applications will be received for the nearly 300 new awards to be made in the Associateship Programs.

Associates on Tenure

A Research Associate is a guest researcher, not an employee of the Research Council or of the laboratory. Associateships are analogous to fellowships or similar temporary programs at the postdoctoral level in universities and other organizations. They are not intended to be, or to compete with, permanent professional career positions.

No commitment on the part of an Associate, the sponsoring laboratory, or the Research Council with regard to later employment is implied or should be inferred by the offer or acceptance of an award.

Associates must devote their full-time effort to the research program proposed in their applications and must be in residence at the sponsoring laboratory during the entire period of the Associateship. No period of tenure may be spent in residence at another laboratory or institution. Associates have the status of visiting scientists or engineers but are subject to the general regulations of the laboratory.

No additional monetary aid or other remuneration may be accepted from another appointment, fellowship, or similar grant, except for sabbatical leave, during the period of the Associateship.

Regular or Senior Status and Length of Tenure

Regular Research Associateships are awarded to persons who have held the doctorate less than five years at the time an award is offered and are made initially for one year.

Senior Research Associateships are awarded only to applicants who have held the doctorate five years or more at the time an award is offered. Senior applicants should have research experience that has resulted in significant contributions and recognition as established investigators in their specialized fields. Although awards to Senior Associates are usually for one year, awards for periods of three months or longer may be considered.

Under certain conditions, extensions may be granted to allow Associates to bring their research to a reasonable stage of completion. However, extensions are not automatically granted, and applicants are advised to plan their research programs to conform to the length of tenure stated above.

Research Opportunities at the Naval Postgraduate School (NPS)

This booklet contains abstracts, or research opportunities, that describe areas of research in which Associateships may be awarded at the Naval Postgraduate School (NPS).

NPS provides the funds for this program and furnishes all necessary support services, facilities, and equipment for the approved research program of each Associate.

While every effort has been made by NPS to provide opportunities of ample scope and relevance, the publication of any opportunity in this booklet does not guarantee that it will be available at the time awards are offered. Changes and/or deletions may occur following publication because of temporary lack of equipment, laboratory renovation, staffing already sufficient to meet research goals, or a lack of funding.

Research Adviser and Laboratory Program Representative

A Research Adviser is a scientist or engineer at NPS with whom an Associate works most closely. An Adviser is, in effect, a surrogate of the Research Council in monitoring an Associate, and all matters related to an Associate's research program fall under his or her purview.

The Laboratory Program Representative is a professional staff member who is responsible for managing NPS's Research Associateship program and for assisting an Associate with all administrative aspects of tenure:

Dr. Gilbert T. Howard
Director, Research Administration
Code 012
NAVAL POSTGRADUATE SCHOOL
Monterey, California 93943
Telephone: (408) 646-2098

Research Proposal

Each applicant must submit a research proposal that relates to a specific research opportunity at NPS. A proposal must be the original work of an applicant and be approved by an Adviser listed with the opportunity.

Before writing a proposal, however, an applicant is advised to communicate directly with the Adviser, who can provide more specific information on current research and available technical facilities and offer scientific support of proposal development.

Laboratory/Center Review

Each applicant's proposal must be approved by one of the Advisers listed in this booklet and endorsed by the Program Committee of NPS to be eligible for an award.

The endorsement affirms that the proposal is compatible with NPS's interests and that adequate programmatic support will be available if an award is offered.

NPS's action on the proposal, together with a copy of the Adviser's comments, will be provided directly to the applicant by the Program Representative.

No applicant will be eligible for further consideration until the Associateship Programs Office has been advised by NPS that his or her proposal has been approved by an Adviser and endorsed by the Program Committee. Otherwise, the Associateship Programs Office will assume that the proposal is not of sufficient current interest to NPS or that support facilities cannot be made available.

Since the final review of applications is conducted by special panels appointed by the Research Council, all applicants should note that endorsement by an Adviser or laboratory, while essential to the application process, does not imply or guarantee an award by the Research Council.

The Panel Review

The Associateship Programs Office receives all application materials and supporting documents and conducts the competitive evaluations of applications.

Evaluations are conducted at specific times throughout the year by special panels convened for this purpose. Panelists are chosen to review applications on the basis of their stature and experience in the fields of science and engineering, and their evaluations become the basis from which awards are made on behalf of NPS.

Applicants are recommended for awards only after this open, national competition, in which the panels rank candidates on the basis of quality alone.

Final ranking in order of quality and the recommendation of applicants for awards are the exclusive prerogatives of the panels, and only notification by the Associateship Programs Office of an applicant's status in the competition is authoritative.

Consideration

Qualified applicants will receive consideration without regard to race, creed, color, age, sex, or national origin.

Citizenship

Opportunities at NPS are open to all citizens of the United States and to citizens of other countries who have full command of the English language.

Visa Requirements

Non-U.S. nationals who are offered awards must have valid visas throughout tenure. Only Exchange Visitor and Immigrant Visas are acceptable to the Research Council. If an awardee chooses to apply for an Exchange Visitor Visa, sponsorship must be by the National Research Council. If he or she chooses to apply for an Immigrant Visa, the Research Council will not be involved in the procedure.

Education and Experience

Awardees must hold the Ph.D., Sc.D., or other earned research doctoral degree recognized in U.S. academic circles as equivalent to the Ph.D. or must present acceptable evidence of having completed all the formal academic requirements for one of these degrees before tenure may begin. Applicants must have demonstrated superior ability for creative research.

An applicant's training and research experience may be in any appropriate discipline or combination of disciplines required for the proposed research.

Stipend

An Associate receives a stipend from the Research Council while carrying out his or her proposed research. The current annual stipend for a Regular Associate is \$35,000. An appropriately higher stipend will be offered to Senior Associates.

This stipend is subject to adjustments from time to time in accordance with general national guidelines pertaining to scientists and engineers.

Following current salary practices in certain professional fields that are experiencing a short supply of new doctoral graduates, a stipend supplement may be allotted by the Research Council to awardees in those disciplines.

For the 1989 program year, supplements of up to \$5,000 may be added to the basic stipend of Regular Associates holding recognized doctoral degrees in engineering and computer science.

The Research Council is required by the U.S. Tax Code to withhold an amount from the stipends of non-resident aliens who hold Exchange Visitor (J-1) Visas. Exchange Visitors are advised that approximately 30% per month will be withheld from stipends and reported to the U.S. Internal Revenue Service annually.

Applicants are cautioned against entering into any agreement or understanding with individual Advisers or other laboratory personnel for additional funding or other remuneration for work as an Associate.

Stipends for Associates are limited to the amounts and by the conditions set forth above, and any other arrangement, formal or informal, between an applicant and laboratory personnel for additional monies or other considerations is strictly prohibited by the Research Council.

Initiation of Tenure

Sufficient time must be allowed between the offer of an award and the beginning of tenure to enable the Associateship Programs Office and NPS to complete all necessary administrative procedures.

The date on which tenure may begin is negotiated on an individual basis, normally within six months of the award. The starting date may be delayed by mutual agreement of NPS, the Associate, and the Associateship Programs Office but cannot be later than 12 months from the date on which the award was originally offered.

If this condition cannot be met, a new application, including a newly approved Research proposal, must be submitted to the Associateship Programs Office and will be judged without prejudice in the next competition.

Prior Affiliation with the Laboratory

A primary objective of the Associateship Programs is to provide a mechanism for new ideas and sources of stimulation to be brought to the sponsoring laboratory. Thus, persons with recent prior affiliation with a specific laboratory may not be eligible to apply for an Associateship there.

Prior affiliation includes direct employment relationships either with the laboratory or with a contractor whose work is performed there. A long-term consulting relationship usually makes the applicant ineligible.

Research contracts with universities that provide support for graduate students or faculty who perform research on campus are not ordinarily considered to be disqualifying.

Reapplication

Persons who have previously held an Associateship may apply for another award only if a period of at least two years will have elapsed between termination of the first award and the proposed tenure of a second.

Persons who have previously applied for an Associateship, but who were not recommended for an award by the panels, may reapply after one year.

Candidates who were recommended for an award by the panels, but who were not offered an award because of funding or other limitations, may reapply at any time without a mandatory waiting period.

Taxes and Insurance

As a guest investigator, an Associate is, in effect, self-employed. All arrangements for payment of income taxes are the responsibility of the individual Associate, who is advised to become familiar with the relevant sections of the current tax codes.

The Research Council is required by the U.S. Tax Code to withhold an amount from the stipends of non-resident aliens who hold Exchange Visitor (J-1) Visas. Exchange Visitors are advised that approximately 30% per month will be withheld from stipends and reported to the U.S. Internal Revenue Service annually.

Job-related injury or death is covered by insurance (workmen's-compensation type). A group health insurance program is required for Associates and is optional for dependents.

Relocation and Travel

A suitable relocation reimbursement will be determined for each awardee. Details will be provided at the time of the award.

Funds are also available for limited professional travel during tenure, provided such travel is approved in advance by the Associate's Adviser, the NPS Program Representative, and the Associateship Programs Office.

Publication

Since an Associate's later scientific and technical career will be judged by others, publication in the accepted open technical literature is highly encouraged.

Publications should include a statement indicating that the research was conducted while the author held a National Research Council Research Associateship.

Application Procedure

Detailed information on procedures and all necessary application materials and supporting documents are available on request from the

Associateship Programs – GR 430-A
National Research Council
2101 Constitution Avenue NW
Washington, DC 20418

All deadlines for the receipt of application materials are strictly observed by NPS and the Associateship Programs Office. No allowances or exceptions are made for late submissions.

Application materials from previous competitions may not be used.

Panel Review Schedule

Although applications for NPS Research Associateships are accepted throughout the year, they are evaluated by the panels only during February and October.

February Review

To be eligible for review in February, completed application materials must be postmarked no later than January 15, 1989, and received by the Associateship Programs Office no later than January 25, 1989. Supporting documents must be received by February 15, 1989.

October Review

To be eligible for review in October, completed application materials must be postmarked no later than August 15, 1989, and received by the Associateship Programs Office no later than August 25, 1989. Supporting documents must be received by October 1, 1989.

Application Materials

Submit the following to the Associateship Programs Office:

Signed Application
Office Card
Research Proposal (1 Copy)
Previous and Current Research

Supporting Documents

Have the following sent directly to the Associateship Programs Office:

For Regular Applicants

Official transcripts of all graduate and undergraduate credits.
Four Reference Reports from the respondents listed on the Application.
Only official Reference Reports may be used.

For Senior Applicants

Transcripts are not required of Senior applicants.
The Associateship Programs Office will accept letters of reference in lieu of Reference Reports. Senior applicants should endeavor to include some letters of reference from individuals who are not co-employees.

Laboratory/Center Documents

Submit the following directly to the Laboratory/Center Research Adviser:

Research Proposal (1 Copy)
Laboratory/Center Review (1 Set)

The Adviser will review the proposal and forward it to the Program Committee for review.

Notification of Awards

Awards are made only by the National Research Council. The endorsement of an application and Research proposal by NPS, while essential to the application and review processes, does not constitute an agreement or obligation to confer an award.

A review board, drawn from members of the Research Council panels, determines a cutoff score immediately following the evaluation of applications at the review.

Applicants who score below the cutoff score cannot be considered further for an award and are so notified within two to four weeks.

Applicants who score above the cutoff score are recommended for awards by the board. These applicants are notified of the board's action as early as possible and are offered awards or alternate status to the extent of available facilities and funding by NPS.

Acceptances and declinations must be made directly to the Associateship Programs Office of the National Research Council.

Opportunities for Research

Atmospheric Dynamics

R.T. Williams

62.10.00.01

Theoretical and numerical studies are in progress on large-scale motion systems in the atmosphere. Current interests include (1) frontal dynamics, (2) theoretical and numerical studies of the summer and winter monsoons, (3) simple modeling of dynamic processes in variable mean flows, (4) modeling of the influence of topography on fronts and cyclones.

Marine Atmospheric Boundary-Layer Studies

K.L. Davidson

62.10.00.02

Observational studies on the turbulent and optical properties of the atmospheric boundary layer over sea and ice surfaces are in progress. Investigations focus on relating wind stress to radar-measured surface properties and on the processes responsible for equilibrium aerosol distributions as well as for variations of the well-mixed layer depth and inversion strength. Aircraft and buoy measurements are used in the observational program. A three-axis Doppler acoustic sounder system is part of the measurement systems and a Doppler radar wind profiler is being added. Satellite imagery is being related to both surface-layer wind and aerosol-generation conditions. An extensive shipboard measurement system has been developed and is used on different ships. In 1983, 1984, and 1987 shipboard and aircraft observations were conducted in the Marginal Ice Zone of the East Greenland Sea. Polar and midlatitude observations are scheduled for the spring of 1988 and the fall of 1989.

Turbomachines and Propulsion

R.P. Shreeve M.F. Platzer

62.10.00.03

Experimental and analytical studies that aim to obtain an improved understanding and better analytical descriptions of steady and unsteady flow phenomena in turbomachines are of interest. Subsonic and transonic cascade rigs and research compressors, and a transonic-axial turbine test rig are used for measurements. Laser diagnostic and fast-response probing techniques have been developed using laboratory-dedicated computer systems. Cascade analysis and unsteady Euler codes for wave rotor flows have been developed in-house. Codes developed by NASA and others are used in conjunction with experimental studies. Specific interests include (1) transonic compressor aerodynamics, flow analysis, and blading concepts; (2) prediction, detection, and analysis of blade flutter; (3) tip clearance and secondary flow effects in axial stages; (4) prediction of stall; (5) flow in radial diffusers; (6) flows within and design and performance prediction of wave rotor devices; and (7) steady and unsteady jet aerodynamics.

Control of Robust Systems

D.J. Collins

62.10.00.04

Theoretical work on robustness continues in the field of control theory. Analysis of robustness is based on consideration of singular-value analysis of

the return-difference matrix. Eigenvector methods are also used. This research concerns integrated control systems for aircraft and damage-tolerant control systems with readaptive gains.

Numerical Weather Prediction

R.T. Williams

62.10.00.05

Numerical modeling studies are being carried out to improve prediction of atmospheric phenomena. Modeling topics range from improved numerical techniques (finite difference, finite element, spectral) to the treatment of mountains.

Large-Scale Optimization

G.G. Brown

62.10.00.06

Theoretical and empirical research is continuing on preparation, solution, and interpretation of large-scale optimization models. An advanced experimental computational test bed is available for dealing with very large linear, nonlinear, and mixed-integer models, as well as models inviting relaxation, decomposition, and basis factorization. Applications are provided by many industrial and governmental agencies, yielding diverse material for contemporary optimization research. Selected applications of sufficient importance are undertaken with extensive staff support from the sponsor.

Stochastic-Systems Analysis

D.P. Gaver

62.10.00.07

Research is being conducted on the application of probability theory and methods of statistical inference and data analysis to a variety of problems. There is emphasis on furnishing sound and useful information to decision-makers charged with allocating resources. Current and anticipated activities are in the following areas: performance evaluation of computer and communications systems using both models and empirical data; analysis of reliability, availability, and maintenance scheduling for mechanical and electrical equipment and perhaps computer software, including effects of human error; studies of organization and operation of complex logistics and repair systems subject to abrupt changes in demand and other disruptions such as combat; an investigation and design of procedures for classifying and tracking objects in motion when traditional Gaussian-linear assumptions are questionable; the problems of properly pooling data from disparate sources is considered. Other problem areas will be addressed as the need arises. Mathematical and computational methods, including Monte Carlo simulation, are used cooperatively; good computing facilities are available. Visitors and collaborators from other institutions are frequently present.

Time-Dependent Flow about Bluff Bodies

T. Sarpkaya

62.10.00.08

Experimental and analytical studies are in progress on impulsively-started and harmonically oscillating flow about various smooth and rough bluff bodies. In addition, basic/applied research on porous flexible bodies (a parachute) and on the migration of vortices in homogeneous and density-stratified media is being actively pursued. The objective of these investigations is a better description of resistance and dynamic response in time-dependent flows and the evolution of the vortex wake. Experiments are carried out in various water tunnels and towing tanks through the use of extensive data acquisition systems and computers. Analytical work involves the development of various types of discrete vortex models and the solution of the Navier-Stokes equations.

Current interests include (1) sinusoidally-oscillating flow about cylinders, (2) determination of the motion of separation points and the strength of vortices, (3) development of a discrete vortex model for unsteady flows, (4) flow about parachutes and the phenomenon of parachute collapse, (5) internal waves generated by vortices and self-propelled bodies, and (6) the hydroelastic response of flexible bodies in time-dependent flows.

Multivariate Time-Series Modeling and Analysis

P.A.W. Lewis

62.10.00.09

Techniques for the statistical analysis and modeling of multivariate stochastic phenomena are being developed, in particular as they relate to large data bases and measurements in which the usual normality assumptions may not be valid. A particular objective is to be able to simulate the phenomena on a digital computer. An example of current interest is a set of meteorological measurements, taken over a 15-year period, of wind speed, wind velocity, pressure, ocean-surface temperature, dew point, and cloud cover. Another area of interest is the multivariate point processes and time series that arise in computer performance evaluation and measurement. Simple models for time-series with exponential and gamma-marginal distributions have been developed, and work is continuing to broaden their scope and applicability. Excellent graphics and computing facilities are available.

Acoustic Imaging Techniques

J.P. Powers

62.10.00.10

Research is being conducted on computer-aided techniques of image formation and media characterization using acoustic and ultrasonic waves. Simulated acoustic fields can be modeled and studied on a mainframe computer, minicomputer, or microcomputer as appropriate. Experimentally generated fields can be measured with a scanning probe in a water tank at frequencies ranging from 1 MHz to 15 MHz. Image processing and other multidimensional data processing equipment is available. Areas of interest include computer-efficient models for scalar wave propagation in lossless and lossy media, computer simulation of acoustic and ultrasonic tomography studies, experimental measurement of acoustic field amplitude and phase for the purpose of model verification, and image and data processing techniques.

Multiple-Valued Logic Circuits

J.T. Butler

62.10.00.11

Most digital circuits use two logic levels to carry information. However, if multiple-valued signals-levels are used, extremely compact circuits can be achieved. Prototype circuits and embedded four-valued circuits have demonstrated this. For example, Japanese researchers have fabricated a multiplier IC comparable to binary ICs in all ways except that it occupies one-half the chip area and dissipates half the power. Dutch researchers have developed multiple-valued circuits in CCD where logic levels are encoded as charge. In this technology, there is a significant reduction in chip area. Because these technologies are so new there are no established design algorithms or CAD tools. The objective of our research is to develop the necessary algorithmic and automated design techniques. The current focus is on PLA design and the cost-table approach. Our project is being done in collaboration with Dutch researchers; consequently, there is close cooperation with scientists who are doing IC fabrication.

Combustion Studies in Propulsion

D.W. Netzer

62.10.00.12

Experimental and analytical studies are directed at the combustion processes in propulsion devices. Two-phase flow phenomena in the combustion of solid rocket propellants are being investigated using high-speed motion pictures, laser schlieren, measurements of scattered laser light at the entrance and exit of the exhaust nozzle, and a pulsed laser and holocamera. Techniques for the automatic retrieval of particle-size data from the holograms are also being developed. Both three-dimensional modeling and experiments are being conducted to understand better the effects of fuel composition, combustor geometry, and operating conditions on the performance of solid fuel ramjets. Metallized fuels are studied in both motor and two-dimensional slab configurations. The effects of fuel composition, smoke-suppressant fuel additives, and operating conditions on emitted pollutants (soot, NO_x) are being experimentally investigated using light-transmission, light-scattering, and sampling-probe measurements in a small, gas-turbine combustor.

Computer Simulation of the Ion Bombardment of Surfaces

D.E. Harrison, Jr.

62.10.00.13

Continuous-time/multiple-interaction computer-simulation studies of ion-surface interactions that lead to ion scattering, atom ejection, and ion-beam mixing in metal and semiconductor targets are in progress or under development. The research program divides naturally into two areas: (1) fundamental studies of scattering, atom ejection, and target-damage mechanisms; and (2) interpretations of experimental data on scattering, ejection, and target damage obtained from clean or chemically reacted surfaces. Research projects that exploit correlations between simulation and theory or between simulation and experimental data are encouraged. Opportunities exist for close collaboration with industrial experimental groups who use ion-bombardment techniques to study reactive ion etching and other surface problems.

Nearshore Wave Processes

E.B. Thornton

62.10.00.14

Analytic, numerical, and observational studies of waves and wave-induced processes in the nearshore are in progress. Models describing wave transformation, nearshore currents, and sediment transport are being developed. Emphasis is given to describing the processes in terms of either probability density functions or spectra. Time variability in the wave-forcing field is considered in order to examine the modulation of the short-wave (sea-swell) processes by the long waves (surf beat and edge waves). The models are compared with a comprehensive data base acquired over the past decade, including the Nearshore Sediment Transport Studies (NSTS). Large-scale field experiments are planned for FY 1986 and FY 1987.

Approximation Theory and Computer Aided Geometric Design

R.H. Franke

62.10.00.15

Research in interpolation/approximation of surfaces from scattered data is in progress. The primary application is the objective analysis of meteorological data, although the general problem is also considered. The meteorological data is of varied quality and, in some cases, the errors are correlated as well. Investigation of suitable new methods and specification of parameters for present methods are under study. In some instances, similar ideas are used in

Computer Aided Geometric Design (CAGD), therefore applications in this area are being investigated.

Database Computers

D.K-M. Hsiao

62.10.00.16

Research and experimentation are still in progress on the functionality, performance, capacity and portability of database computers for very large databases. In studying functionality, our research and experimentation focus on multilingual and real-time database systems. Conventional database systems are neither multilingual (since they are single-model-and-single-language systems) nor real-time (since they cannot meet the time constraints of the real-time database managements and processing). In studying performance and capacity, our research and experimentation strive for a certain parallel architecture of database processors and database stores known as the multibackend architecture. Unlike the conventional database computer, which is either mainframe-based or single-backend, the high-performance, great capacity, and cost-effective database computer may well be a parallel computer with tens and even hundreds of database processor-store backends. In studying portability, our research and experimentation emphasize the running and operation of our multilingual and multibackend database computer with a wide variety of operating systems and their underlying hardware. System features and performance factors that affect the portability of the computer are to be identified. Contemporary operating systems (such as Unix, VMS and ALS) and popular hardware (such as the MicroVAX and the 32-bit microprocessor-based workstation) are used as the operating environments for the portability study. The goal of these research and experimentation efforts is to come up with the architecture of a new kind of database computers for very large databases that cost-effectively yields new functionality, high performance, great capacity, and wide portability.

Unsteady Aircraft Aerodynamics

M.F. Platzer

62.10.00.17

A center for high-alpha unsteady aerodynamics is being established under the auspices of the Navy-NASA Joint Institute of Aeronautics. The advanced experimental and computational facilities of the Naval Postgraduate School and NASA Ames Research Center are available for cooperative research programs. It is proposed to concentrate the investigations related to high speed flows in the NASA Ames facilities and low speed flows at NPS. Access to the state-of-the-art instrumentation, such as specialized hot-wires and transducers, LDV, holographic interferometry, dedicated microcomputers and supercomputers is available. Development of advanced experimental and computational techniques to determine the unsteady flow fields at high angles of attack are in progress. Experimental and analytical studies are in progress to obtain an improved understanding of unsteady flow phenomena occurring on fixed wing and rotary wing aircraft. Studies are in progress to investigate the attainment of high lift on fighter aircraft through the use of unsteady aerodynamic effects. Also studies are in progress to understand the compressibility effects on dynamic stall. It is of interest to understand and control the unsteady separation at high angles of attack.

Statistical Mechanics Application of Biological Intelligence to Command, Control, and Communications (C³) Systems

L. Ingber

62.10.00.18

Most studies of neural and neural-like systems have focused on emergent collective properties of large numbers of microscopic units. However, when details of microscopic interactions are coarse-grained, the utility of directly studying the aggregated mesoscopic scale of interactions becomes apparent. This has been demonstrated by a series of papers by this investigator, using methods of nonlinear nonequilibrium statistical mechanics developed in the late 1970s, i.e., developing nonlinear path-integral Lagrangians. Detailed properties of human neocortical phenomena, e.g., a derivation of the 7 ± 2 rule of short-term memory, its stability and duration, and spatial-temporal properties of EEG phenomena can be explicitly calculated and shown to agree favorably with empirical evidence. This mesoscopic scale is important, not only to achieve pattern recognition or to academically test the analysis of the microscopic scale, but, indeed, it is to be respected as a potential source of command and control over the microscopic scale in both the brain, e.g., as a pre-attentive filter and processor of patterned information, and in other large-scale systems, e.g., in command, control, and communications (C³) systems. Therefore we are studying the two-way flow of information between microscopic and mesoscopic scales for such systems to better understand or design efficient algorithms for processing information. At present, this project involves simulation of the interactive processing between these scales, using a C-language code to build a statistical mechanical neural computer, and the fitting of Lagrangians to combat simulation data, using an adaption of fast simulated annealing.

Naval Applications of Physical Acoustics

S.L. Garrett

62.10.00.19

This research group is concerned with fiber optic vibroacoustic sensor systems and thermoacoustic heat engines. Interferometric sensors using optical fibers have a great advantage in detectability over conventional sensors and can support many sensors over great distances using very little power. However, the optical fibers themselves are neither very sensitive nor selective. Our research in this area concentrates on the design of differential sensors to provide common mode rejection of unwanted signals while exploiting optical and mechanical leverage to enhance response to the signals of interest. Applications include seismic sensors, hydrophones, and angular encoders and "smart skins" for aerospace applications. Our thermoacoustic engine research primarily involves the development of a thermoacoustic refrigerator for space applications (STAR/NASA/G-337), which will be flown on the Shuttle in 1989. This type of refrigerator has several disadvantages over conventional cryocoolers in space, since it has no sliding seals, low vibration levels, and a high coefficient-of-performance. Other thermoacoustic engine applications, such as miniature cryocoolers, a high heat flow/low delta-T refrigerator, and thermoacoustic sound sources for active sonar, are currently under development.

Index of Research Advisers

Telephone inquiries concerning technical details of specific Research Opportunities can be made of individuals listed below.

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**National Research Council
1989 Research Associateship Programs**

Alphabetical by Acronym

Listed below are the organizations that participate in the Research Associateship Programs. In some instances, the organizations comprise individual laboratories whose application criteria differ from those of the parent organization, and these laboratories are listed separately. Otherwise, it may be understood that an organization accepts Regular, Senior, and/or Foreign applicants in all of its laboratories.

Organization	Accepts the Following Applicants			Application Deadlines
	Regular	Senior	Foreign	
AERO THE AEROSPACE CORPORATION	Yes	Yes	No	Jan 15 Apr 15 Aug 15
AFRRI ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE	Yes	Yes	Yes	Jan 15 Apr 15 Aug 15
AFSC AIR FORCE SYSTEMS COMMAND	Yes	Yes	Yes	Jan 15 Apr 15 Aug 15
AMRDC U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND				
Armed Forces Research Institute for Medical Science	Yes	Yes	Yes	Jan 15 Aug 15
Walter Reed Army Institute of Research	Yes	Yes	Yes	Jan 15 Aug 15

Organization	Accepts the Following Applicants			Application Deadlines
	Regular	Senior	Foreign	
AMRDC (Continued)				
U. S. Army Medical Research Institute of Infectious Diseases	Yes	Yes	Yes	Jan 15 Aug 15
U.S. Army Aeromedical Research Laboratory	Yes	Yes	No	Jan 15 Aug 15
U.S. Army Medical Research Institute of Chemical Defense	Yes	Yes	No	Jan 15 Aug 15
U.S. Army Research Institute of Environmental Medicine	Yes	Yes	Yes	Jan 15 Aug 15
Letterman Army Institute of Research	Yes	Yes	Yes	Jan 15 Aug 15
U.S. Army Institute of Surgical Research	Yes	Yes	Yes	Jan 15 Aug 15
ARDEC				
U.S. Army Armament Research, Development, and Engineering Center	Yes	Yes	No	Jan 15 Apr 15 Aug 15
ARI				
U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES	Yes	Yes	In Selected Areas	Jan 15 Apr 15 Aug 15
ASL				
U.S. ARMY ATMOSPHERIC SCIENCES LABORATORY	Yes	Yes	No	Jan 15 Apr 15 Aug 15
BRL				
U.S. ARMY BALLISTIC RESEARCH LABORATORY	Yes	Yes	No	Jan 15 Apr 15 Aug 15
CID				
CENTER FOR INFECTIOUS DISEASES	Yes	Yes	Yes	Jan 15 Apr 15 Aug 15
CRDEC				
U.S. Army Chemical Research, Development, and Engineering Center	Yes	Yes	No	Jan 15 Apr 15 Aug 15
EPA				
U.S. ENVIRONMENTAL PROTECTION AGENCY	Yes	Yes	Yes	Jan 15 Apr 15 Aug 15
ETDL				
U.S. ARMY ELECTRONICS TECHNOLOGY AND DEVICES LABORATORY	Yes	Yes	No	Jan 15 Apr 15 Aug 15
HDL				
U.S. ARMY HARRY DIAMOND LABORATORIES	Yes	Yes	No	Jan 15 Apr 15 Aug 15
MICOM				
U.S. ARMY MISSILE COMMAND	Yes	Yes	Yes	Jan 15 Apr 15 Aug 15
NADC				
NAVAL AIR DEVELOPMENT CENTER	Yes	Yes	Yes	Jan 15 Apr 15 Aug 15

Organization	Accepts the Following Applicants			Application Deadlines
	Regular	Senior	Foreign	
NASA NATIONAL AERONAUTICS AND SPACE ADMINISTRATION				
Ames Research Center	Yes	Yes	In Selected Areas	Dec 15 Apr 15 Aug 15
Dryden Flight Research Facility				
Earth Resources Laboratory	Yes	Yes	Yes	Dec 15 Apr 15 Aug 15
Goddard Space Flight Center	Yes	Yes	Yes	Dec 15 Apr 15 Aug 15
Goddard Institute for Space Studies				
Wallops Flight Facility				
Jet Propulsion Laboratory	Yes	Yes	Yes	Dec 15 Apr 15 Aug 15
Lyndon B. Johnson Space Center	Yes	Yes	Yes	Dec 15 Apr 15 Aug 15
Langley Research Center	Yes	Yes	In Selected Areas	Dec 15 Apr 15 Aug 15
Lewis Research Center	Yes	Yes	In Selected Areas	Dec 15 Apr 15 Aug 15
George C. Marshall Space Flight Center	Yes	Yes	In Selected Areas	Dec 15 Apr 15 Aug 15
NBS NATIONAL BUREAU OF STANDARDS				
	Yes	No	No	Jan 15
NIH NATIONAL INSTITUTES OF HEALTH				
	Yes	No	No	Jan 15 Apr 15 Aug 15
NIOSH NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH				
Cincinnati, Ohio	Yes	Yes	Yes	Jan 15 Apr 15 Aug 15
Morgantown, West Virginia				Jan 15
NMRDC NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND				
Naval Submarine Medical Research Laboratory	Yes	Yes	Yes	Jan 15
	Yes	Yes	No	
NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION				
	Yes	Yes	Yes	Jan 15
NORDA NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY				
	Yes	No	No	Jan 15 Aug 15
NOSC NAVAL OCEAN SYSTEMS CENTER				
	Yes	Yes	No	Jan 15 Apr 15 Aug 15

Organization	Accepts the Following Applicants			Application Deadlines
	Regular	Senior	Foreign	
NPS NAVAL POSTGRADUATE SCHOOL	Yes	Yes	Yes	Jan 15 Aug 15
NRL NAVAL RESEARCH LABORATORY	Yes	No	No	Jan 15 Apr 15
SERI SOLAR ENERGY RESEARCH INSTITUTE	Yes	Yes	Yes	Jan 15 Aug 15
USGS U.S. GEOLOGICAL SURVEY	Yes	No	No	Jan 15

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