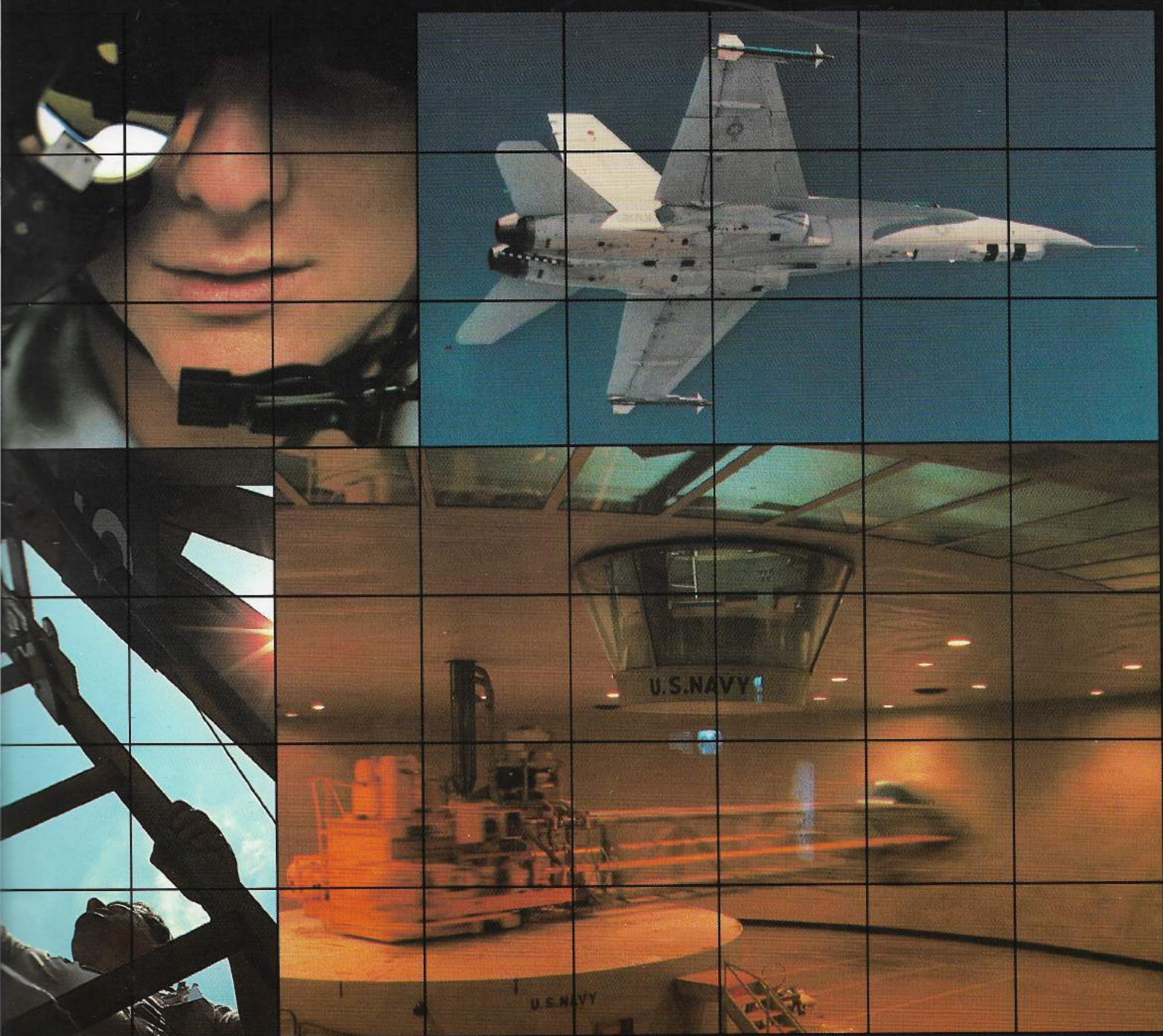
NAVAL AIR DEVELOPMENT CENTER



You are about to make a critical decision—the choice of an organization in which to put your education, background and skills to work. You've invested a great deal of time, money and energy preparing for this moment. Now, you need to match your career and personal goals with the ***right opportunity****. It's a difficult decision.*

Why should you consider us?

- *Immediate responsibility.*
- *Diversity in your work.*
- *Encouragement to learn and broaden your knowledge.*
- *Stimulating association with one of the most talented groups of engineers and scientists* ***anywhere****.*
- *Rewards for your initiative and performance.*

These are some of the reasons you should explore the opportunities at the NAVAL AIR DEVELOPMENT CENTER—NADC.

Read on and you will understand why NADC is like no other career opportunity.

Reviewed and approved August 1986.

Edward J. Sturm, Captain, USN
Commander

NAVAL AIR DEVELOPMENT CENTER

NADC civilian scientists and engineers work with a wide variety of technology areas to satisfy the Navy's need for advanced aircraft systems. The F-14, shown landing on a carrier, is the fleet's primary defense against enemy aircraft. Through efforts here at NADC, the F-14's capabilities are continuously updated.

As the Navy's principal research and development laboratory for aircraft systems, NADC has pioneered or improved upon every aircraft and airborne technology in use by today's fleet. The Center is involved in all the key technology areas associated with **Anti-Submarine Warfare**; **Tactical Aircraft**; **Command, Control and Communications**; and **Battleforce Integration**. Tomorrow's defense challenges will demand increasingly imaginative and complex technical solutions.

This scope of technological exploration, ranging from submarines to aircraft, makes NADC a truly unique place in which to shape your career. You learn quickly that solving one challenge often produces other, even more complex problems. For example, we continually develop better ways for our nuclear-powered submarines to avoid detection. However, at the same time, we must find technologies that enable our Navy to locate and identify submarines of other countries. We design faster and more capable aircraft to fill critical needs; yet, in doing so, we complicate the fighter/attack capabilities of the aircraft, the safe ejection and survival of the crew and the reconnaissance needs of the mission. Finding the answers to these and other seemingly insurmountable problems creates the exciting world of NADC.

The NADC total development cycle encourages teams of professionals to carry a project from exploratory research through prototype testing. Design of such systems requires integration of diverse specialties, such as acoustics, electromagnetics, aerodynamics, composite materials and human factors engineering. The parameters of projects vary widely. One may require design of an entire major aircraft system while another may only need development or modification of smaller subsystems or components, such as replacing electrical busses with fiber optic cables.

Offshoots of NADC's technological breakthroughs have resulted in commercial spinoffs that enrich the quality of life for everyone. Fire-retardant fibers in clothing

An Electronics Engineer checks out a helicopter surveillance system prior to test flight. Helicopters, such as the NADC-developed LAMPS, play a vital role in detecting enemy submarines.

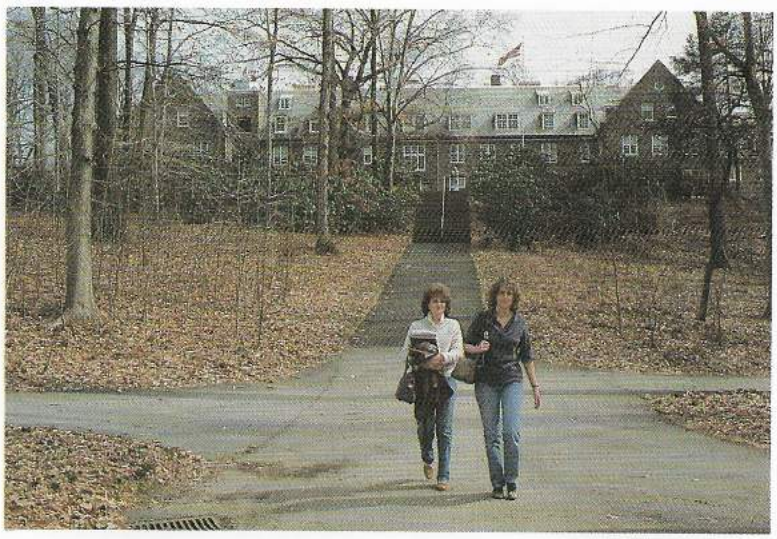
save countless lives; corrosion-preventative compounds extend the lives of our cars and trucks; light-sensitive lenses developed for aircraft crew helmets bring better vision to those with eye defects; diagnosis of illness is more accurate because of acoustic processing techniques built into sophisticated scanning equipment. These are only a few examples of advanced technology continuously flowing from the Center to non-military applications.

The Center's environment is creative, challenging, friendly and informal. Your colleagues include aerospace, electrical, electronic, mechanical and chemical engineers, computer scientists, mathematicians, operations research analysts, physicists and a host of other professionals.

Recent significant additions to the Center's scientific and engineering manpower have enabled NADC to maintain its lead in naval aircraft development. Of the 2,500 civilian employees, 60% are engineers and scientists working in state-of-the-art laboratories with advanced instrumentation and support equipment.

As a member of the NADC technical team, you are assigned immediately to an ongoing program and given **responsibility** quickly. As you gain experience and exposure through the **diversity** offered by these assignments, you may decide to branch out into areas other than the academic discipline for which you have prepared. NADC understands that for engineers and scientists, professional development is a continuing process. You will be encouraged to engage in independent research and development efforts that complement the Center's programs. NADC offers you the rare opportunity to propose, design and execute your own experiments within a diverse range of technological disciplines. **Advancements** from entry level to positions of higher responsibility depend on you and your ability to take on more complex assignments. NADC provides the **challenge**; the rest is up to you.

Our professionals are strongly encouraged to continue their education through a variety of opportunities, ranging from evening graduate courses, both on Center and at local universities, to full-time/full-salary graduate study at leading technical universities.



Pennsylvania State University

Computer technology is critical to most NADC scientific and engineering advances. Our computer system is one of the most capable in the nation's defense establishment. This system and the interfaced analog/digital equipment form the largest hybrid computer complex in existence.

The Center's 8,000-foot runway, aircraft and associated facilities offer you the opportunity to participate in hands-on testing and evaluation of airborne systems.

AIRCRAFT SYSTEMS

The Dynamic Flight Simulator, in which our nation's astronauts trained for the Gemini, Mercury and Apollo programs, reproduces the total G-force environment of modern high-performance aircraft. The test pilot operates and controls this realistic cockpit simulator. The data collected helps to evaluate physiological and psychological reactions to severe stress conditions associated with spinning and stalling.

Developing new aircraft system concepts to strengthen the Navy's capabilities is a major thrust at NADC. The Center's scientists and engineers seek higher standards of performance from existing aircraft and explore advanced designs and technologies for future aircraft. The complexities of modern aircraft development require close coordination of diverse technical teams at NADC as well as with the aerospace industry, the academic community and other governmental agencies.

At NADC, aircraft systems research and development covers the full range of air vehicles: manned, unmanned and lighter-than-air aircraft, as well as missiles and targets. Each program requires the application of multiple technologies and is structured to fulfill a specific operational requirement set by the Navy.

Some of these aircraft systems include:

- **Vertical Lift Aircraft**, such as the JVX and V/STOL, versatile aircraft that can take off and land in a small area.
- **Lighter-than-air** vehicles capable of long endurance and fuel efficiency.
- **Helicopters**, such as LAMPS, multipurpose airborne systems serving as eyes of the fleet for surveillance of threat submarines.
- **ASW** aircraft, such as the land-based P-3 and S-3 (the smaller carrier-based counterpart), flying computer centers for detection and tracking of submarines.
- **Unmanned Air Vehicles** for tactical and training missions where it is impractical to use piloted aircraft. These vehicles fly from 30 feet to 100,000 feet at speeds up to Mach 4.
- **TACAMO**, a complex airborne communications system, providing strategic communications with the deployed naval forces. It is currently flown aboard the EC-130, but developments are underway which will integrate the system into the newly designed Boeing E-6A, as originally proposed by NADC.
- **Tactical Aircraft** encompassing advanced fighter/attack aircraft concepts. The F-14, with its sophisticated Phoenix missile system, is the fleet's foremost defense against enemy aircraft. The F/A-18, a lighter-weight fighter/attack plane, fills a dual role: air-to-air as well as air-to-ground combat. The Navy's primary air-to-surface attack plane, the A-6F, undergoes continuous upgrading to meet expanding needs.

One of the Center's recent accomplishments is the development of the F/A-18 (R)—a reconnaissance version of the fighter/attack aircraft. The idea for quick conversion of the F/A-18 into a highly effective reconnaissance system was conceived and developed at NADC. This aircraft's multi-mission capability saves our nation billions of dollars by enabling one plane to do the job of two. Our engineers and scientists achieved this technological breakthrough by:

- Conceptualizing the idea.
- Designing the process for quick conversion from fighter to reconnaissance and back to fighter.
- Developing the sensors for daytime photographic and nighttime infrared surveillance to be used at extremely high speeds and low altitudes.
- Integrating these sensors with sophisticated avionics while employing good human factors design.
- Laboratory testing the

The F/A-18 (R) is the Navy's most versatile aircraft with attack, fighter and reconnaissance capabilities. NADC conceived and developed the idea of quickly converting the F/A-18 to a reconnaissance aircraft. The project required the integration of diverse technologies such as human factors, avionics, electronics, computer, propulsion, flight control and materials.

A team of our engineers examines the photography equipment in the removable reconnaissance module of the F-14. This module is another example of how NADC enhances the multimission versatility of aircraft.

concept in a simulated flight environment for validation.

- Flight testing the "total package" under operational conditions to ascertain the need for any further modifications.

The success of the F/A-18 (R) is a vivid example of how the Center's project engineers apply diverse technologies to solve complex problems. Building on its achievements, NADC is looking ahead to meet the Navy's needs in the 1990's and beyond. The Center's scientists and engineers now are integrating existing technologies and advancing the state-of-the-art for the next generation aircraft.

At NADC, you can be a part of these exciting challenges.

Aerial targets must realistically simulate threat aircraft in order to accurately evaluate the effectiveness of our Navy's counterattack systems. This BQM-126A aerial target, now in full-scale development, was designed by NADC to achieve 550 knots at sea level, Mach 0.9 at 40,000 feet and engage in intricate maneuvers with a load factor up to 7g's.

SUBSYSTEMS

The P-3 shown here contains acoustic and nonacoustic submarine detection systems and sophisticated computer systems for real-time processing. Located in the prominent tail section is a magnetometer used for magnetic detection of submarines.

Computer Scientists review a simulation of an advanced aircraft software package in one of the Center's laboratories. We are responsible for continuously upgrading software programs needed by the Navy's aircraft.

Every naval aircraft system is made up of intricate sub-systems, which serve as the nerve center of the vehicle. Electronics engineers, computer scientists, aerospace engineers and other professionals at NADC are challenged to conceive new and better subsystems while continually improving on those already in use by the fleet. Following is a sampling of the major subsystems work performed at the Center.

Surveillance Systems use a wide variety of techniques such as infrared photography, radar and sonobuoys to detect an aircraft, ship or submarine. NADC's development of **electro-optic** methods is advanced by developmental work in lasers, acoustics, fiber optics and other sensor technologies.

The P-3 reconnaissance aircraft is the Navy's prime airborne system for submarine detection. Sonobuoys, launched from these P-3's, are highly sensitive acoustic sensors which listen to the sounds generated by submarines and other underwater devices. Other sensors are used to measure ocean water temperature, as well as the speed and direction of water currents and wave motion. The Center also conducts exploration and advanced development of airborne radar, electronic countermeasures and microwave technology.

Navigation Systems employ electro-magnetic, radio frequency and inertial technologies to guide and position aircraft, particularly when there are no landmarks to assist the crew. An inertial system comprised of these sensors measures vehicle acceleration which it then converts into position, velocity and attitude data.

NADC is developing key components for the Global Positioning System, a satellite-based radio navigation system. This system will use 18 satellites to send navigational signals to more than 120 types of aircraft and ships and make it possible for these to reach precise coordinates on 98 percent of the earth's surface.

Communications Systems strengthen the accurate and timely exchange of data between the air vehicle and information-gathering sensors on land and sea, and on other aircraft. These systems also are necessary for communication between various elements of the battle-force. Advances in computer technology have drastically changed the way such information is transmitted and protected. Not only do people and computers communicate with each other, computers must be able to communicate with other computers. The information received by an airborne computer is processed, analyzed and factored into the other systems that help operate the aircraft.

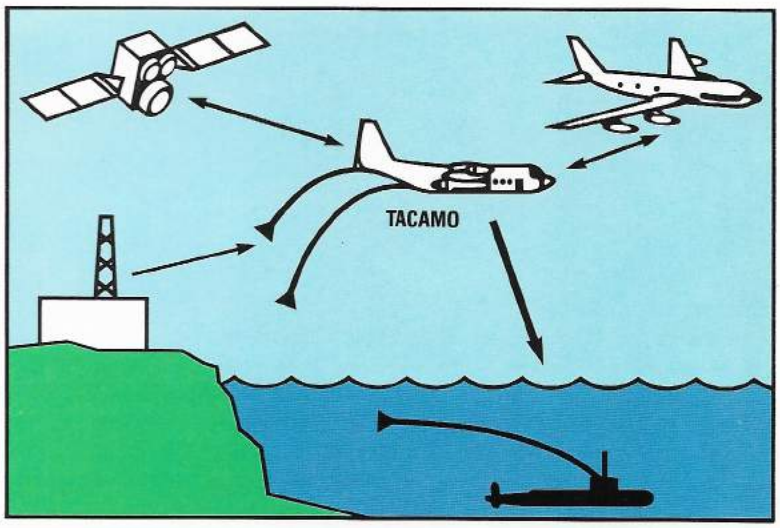
Flight Control Systems. Modern naval aircraft incorporate advanced flight control systems consisting of digital computers, inertial sensors and sophisticated actuators. The flight control system processes pilot inputs and sensor feedback to generate the complex signals required to stabilize and maneuver the aircraft. Planned and ongoing flight control research and development programs require skills in fault-tolerant digital computer architectures, flight-critical software, control synthesis and analysis, computer hardware, and electrohydraulic and electromechanical actuators.

Highly sophisticated non-linear flight control systems, being developed by our engineers, are required to control the flight of the Navy's new high-performance aircraft.

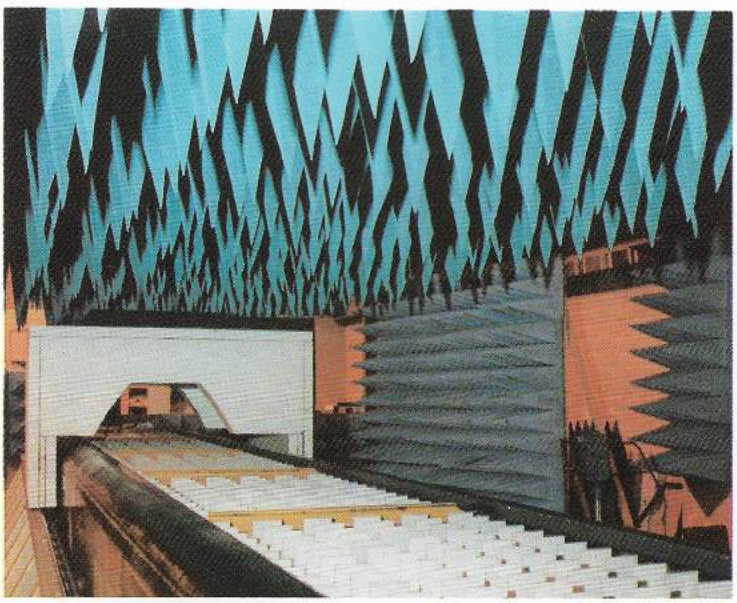
Crew Systems. Research and development concentrates on making the aircrew's flight environment more comfortable, efficient and safe. In the event of an emergency, the aircrew must be able to successfully exit the aircraft and survive in any environmental condition. Crew systems scientists and engineers use facilities such as the dynamic flight simulator, the ejection tower, an environmental chamber and other realistic environments to aid in designing and testing new equipment that provide our nation's aircraft crews with the best chance for survival.

Software Systems play an increasingly integral role in the achievement of NADC program goals. Software engineers at the Center follow an engineering approach to computer software development and use a diverse set of military and commercial computers and programming languages.

Developing these subsystems requires a diverse group of capable and dedicated technical professionals. If your career interests fall into the above areas, we have the opportunity for you.



Depicted is the operation of the Tacamo aircraft with its 5-mile long antenna, in relation to satellites, other aircraft, shore stations and submarines. During a national emergency, the plane can be used to transmit instructions to our Navy's submarines. NADC is responsible for managing and developing this strategic communication program.



The antenna for the HARPS, a lightweight solid-state surveillance radar system, shown here being tested in an anechoic chamber, enables remotely-piloted planes to detect enemy aircraft at great distances. Early warning detection technology developed by NADC gives our fleet a critical advantage in combat situations.

COMPONENT ADVANCEMENTS

The miniature CRT display mounted on a helmet visor provides the pilot with real-time flight data without readjusting his line of sight to an instrument panel. Crews of subsonic and sonic aircraft must be able to respond instantaneously to data processed from sensors. This reduces pilot error or distraction and is but one example of the Center's involvement in human factors engineering.

The sophisticated support systems that gather surveillance information and furnish data to the crew depend on optimum performance of reliable components. Any weak link in this transfer of information between man and machine can nullify a mission's success or jeopardize the safety of the crew. We design components that enable the crew members to respond to the data intelligently and quickly. Surveillance information may dictate a sudden change in the aircraft's flight pattern to evade an enemy missile, or pinpoint the identity of a submarine. A wide range of technologies are applied to insure that this man-machine communications chain operates at peak efficiency under all conditions.

Our engineers and physicists are concentrating on those sensors which apply to **antisubmarine warfare**, **reconnaissance** and **surveillance**. They include radar, sonobuoys and imaging sensors, which operate in the visible, infrared and microwave portions of the electromagnetic spectrum. Some of the novel sensor techniques in which we are involved include **lasers** and **solid state infrared devices**. To increase speed and accuracy, we are exploring the feasibility of replacing existing electrical methods with **fiber optic** cables.

Once the signals reach the processing unit, they are organized, evaluated and converted into information which can be displayed to an operator. A large group of computer scientists, mathematicians and electronics engineers are working with industry to develop even more advanced **processors** which are lighter and much faster than those currently in use.

After the information is processed as prescribed, it is displayed to the operators so they can make decisions relative to the mission. A miniature helmet-mounted display developed at NADC projects all necessary information directly onto the helmet visor enabling the pilot to read the data and, at the same time retain a view of the outside world; there is no need to readjust the line of sight toward the monitor which previously was located in the instrument panel.

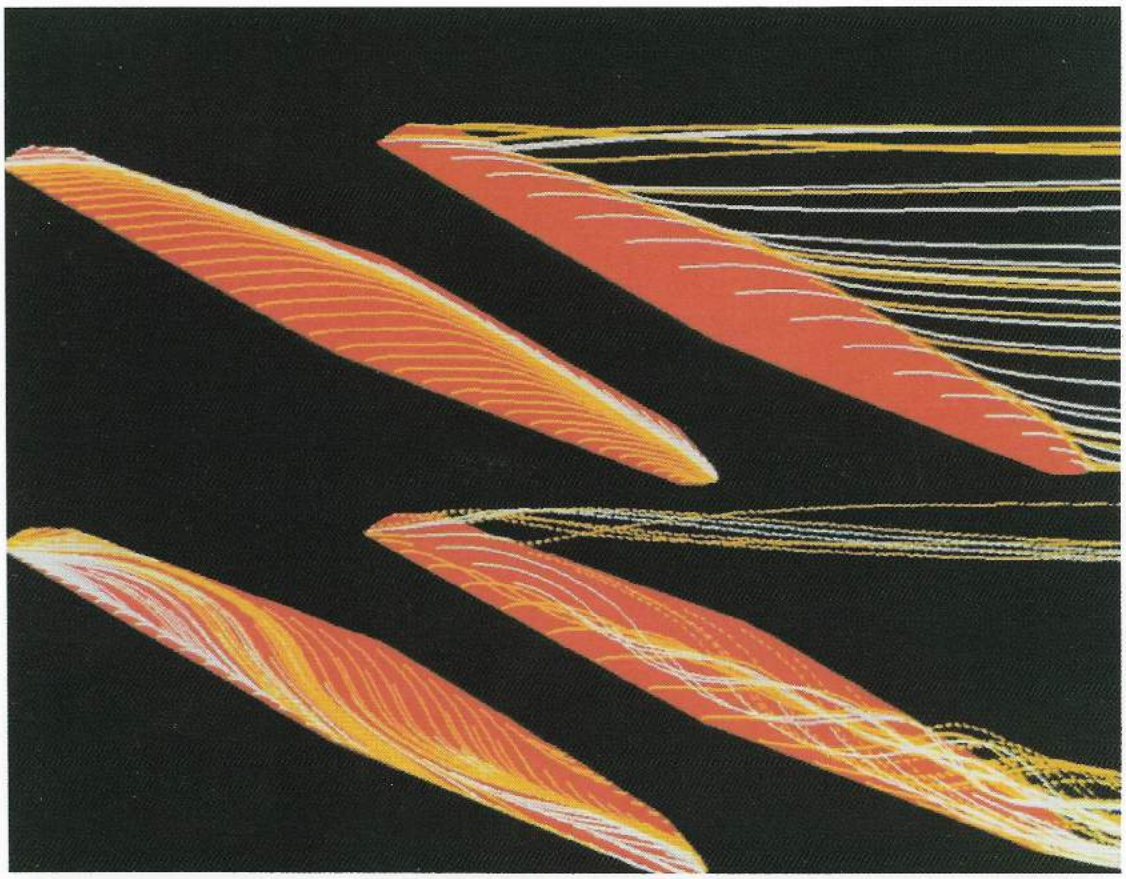
Research in **flat panel technology** will reduce the size of this display device even further, thereby expanding its adaptability to supersonic aircraft where the weight of the helmet is an especially critical factor. Developmental ⅛" deep models, based on liquid crystal technology, have been produced by NADC and are being tested in the laboratories.

Whether your interest is in the development of a major aircraft system or a small component such as a computer chip, you'll find a satisfying career at NADC.

Shown is an actual test ejection from an aircraft.

This 150-foot ejection tower, one of the Center's research facilities, measures human response to the G-forces encountered in ejecting from high-performance aircraft.

EMERGING TECHNOLOGIES



These computer-generated airflow patterns simulate oblique wing aerodynamics. The Center currently is pursuing this novel approach to aircraft wing configuration, which increases performance and extends the range of subsonic aircraft.

NADC is committed to pushing technology to its outer limits. Meeting the needs of today's naval aviation is not enough; future problems must be anticipated and innovative solutions discovered.

NADC originated the concept of replacing conventional aircraft materials with lighter-weight, stronger and low-maintenance **composites**. Today, composites such as graphic epoxies make up a significant portion of naval aircraft. The Center's teams of materials, aerospace, mechanical and electronics engineers now are exploring exotic materials and structures to create the technological base for aircraft of the 21st Century.

In cooperation with NASA, the Center's **aerodynamics** and **flight control** engineers are advancing oblique wing technology. This novel approach to aircraft configuration is based on the asymmetrical positioning of the wings, which significantly increases the range of high-performance aircraft by reducing drag at subsonic speeds. Oblique wing technology is expected to be operational in the 1990's.

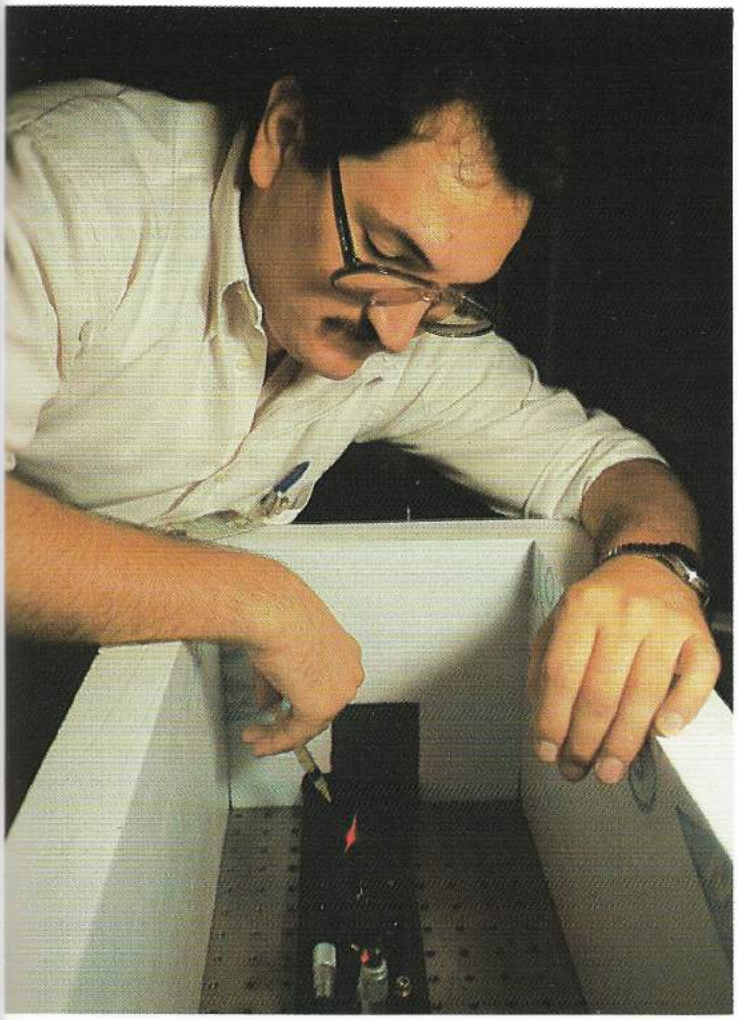
Improving **sensor technology** involves the Center's physicists, chemists, electronics engineers and computer scientists. Since submarines are becoming quieter, the quality of sensors must constantly be upgraded. To counter the effects of electronic interferences on transmittal and processing capabilities of sensors, NADC scientists and engineers are exploring more advanced nonacoustic sensors, such as magnetic detectors. Basic research into this problem led to the selection of Xenon gas, a natural element that occurs in the atmosphere, for use in remote magnetic detection. Studies are underway to ascertain how changes in the Xenon atom under laser irradiation can be applied to the detection of underwater objects. Such remote techniques will improve the quality of data reception from sensors by eliminating interferences from the aircraft's own magnetic properties.

Microcomputer technology is another important area of investigation at the Center. The engineers and computer scientists are able to gain hands-on working experience by applying these technologies to reduce the size, weight and power requirements of various microcomputer systems used as part of the total aircraft system.

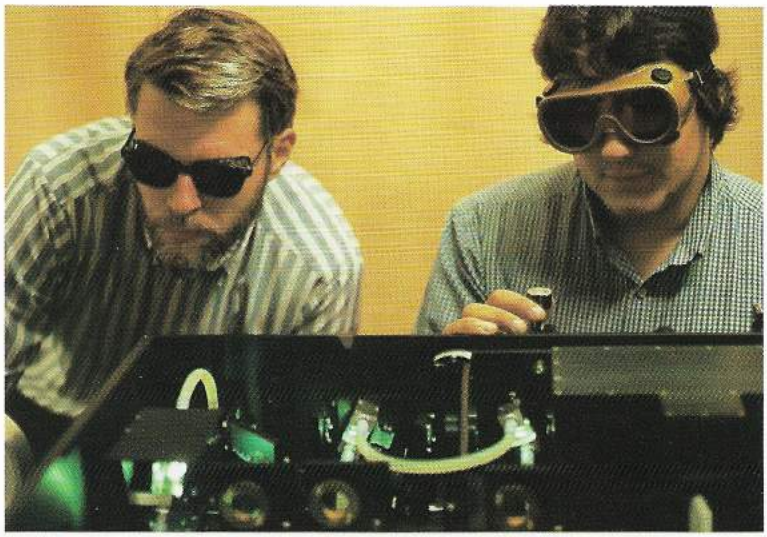
Software development for advanced naval aviation systems is a major activity at NADC. Equally important is the development and use of new software technology, including new programming languages, requirements and design methods, software engineering environments and program generators.

The **Very High Speed Integrated Circuit** (VHSIC) program will advance computer circuit technology needed in the 1990's to retain the technological superiority of the U.S. weapon systems. We are introducing VHSIC technology into operational systems to enable Navy aircraft and other weapon systems to process large amounts of data in real time and to perform functions previously considered impossible. Hands-on VHSIC design projects are conducted using the latest CAE/VLSI engineering work stations and CAD/CAM tools available.

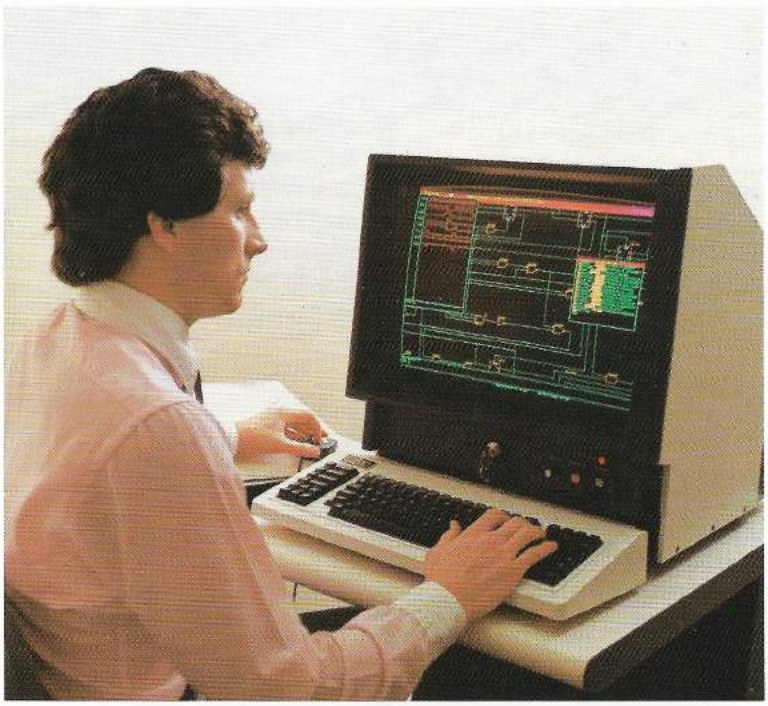
Advances in **memory technology** are designed to increase the storage capacity of computers, thus allowing more information to be processed. **Magnetic bubble technology** is helping to store more data in smaller computers.



Optical physicists evaluate the spectral content of a dye laser. Improved laser technology is studied for potential application to advanced sensor techniques.



A computer engineer analyzes a circuit design. Development of the Very High Speed Integrated Circuit (VHSIC) program at NADC will lead to significantly increased performance by our nation's defense system in the 1990's.



A physicist injects laser light into optical fibers during development of a hydroplane. Lasers and fiber optics are exciting research areas in acoustic and nonacoustic detection.

After the sensors and computers have transmitted, processed and displayed the information, ultimate responsibility for action belongs to the crew aboard the aircraft. In order to reduce possible errors, pilot/crew workload and decision-making time, exciting work is underway in **artificial intelligence**. This provides the crew with the comprehensive guidance necessary for consistent and error-free decisions.

This last decade has witnessed advances that dramatically influence the course of naval aviation. The emerging technologies described in these pages are only a sampling of the research and development being conducted at NADC. For the Center's scientists and engineers, and for professionals like you, the opportunities are unlimited.

A Stimulating Lifestyle

Combine gently rolling hills with superb skiing, swimming and sailing, blend an outstanding array of theaters, historic sites, museums and antique shops with quaint, informal restaurants or chic dining, and you have just begun to taste the pleasures of Bucks County–the home of NADC.

More than 50 high-tech companies selected this locale for their facilities because of these exciting cultural and recreational advantages. The area also provides clean air, a wide choice of affordable housing, and good schools. NADC is adjacent to Philadelphia and within 90 minutes of New York. Living close to the Center in an urban, suburban or rural setting, you can enjoy a special quality of life **every** day.

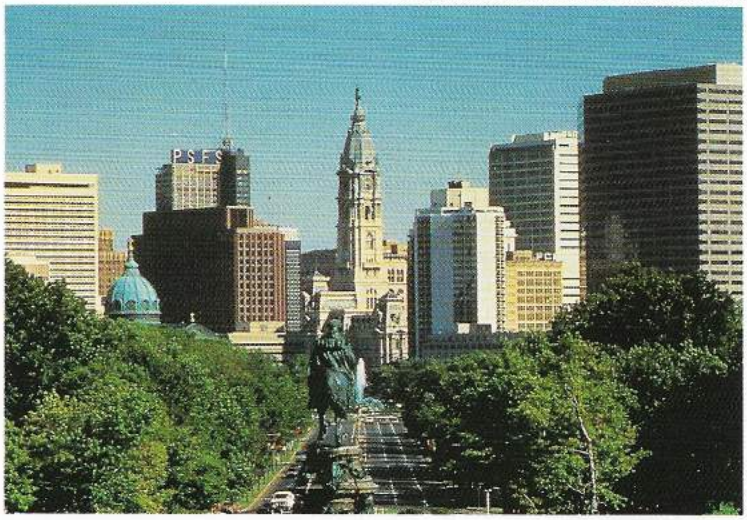
Educational Opportunities

NADC encourages you to continue your education through a variety of career development programs. In addition to graduate engineering courses conducted at the Center by Penn State University, there are opportunities to attend numerous local well-known institutions, such as the University of Pennsylvania, Lehigh, St. Joseph's, Temple, Villanova and Drexel. You may further your professional career through seminars, conferences and a variety of courses. The Center also sponsors a limited number of full-time academic fellowships for graduate-level studies at educational institutions throughout the United States.

A People-Oriented Setting

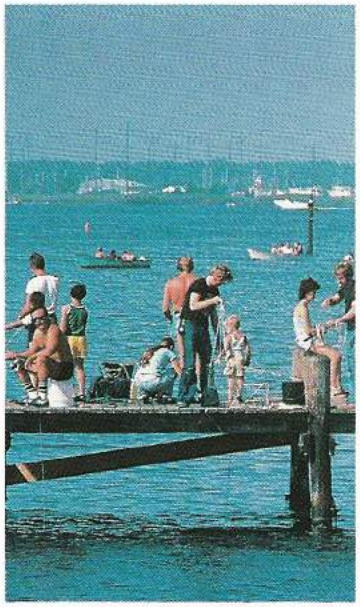
NADC recognizes that its greatest asset is its people–the men and women responsible for contributing to a history of successful aircraft development. A host of social, recreational, athletic, professional and charitable opportunities and organizations are offered for Center employees to get involved, to stay in shape and to develop their full potential.

Philadelphia Convention and Visitors' Bureau



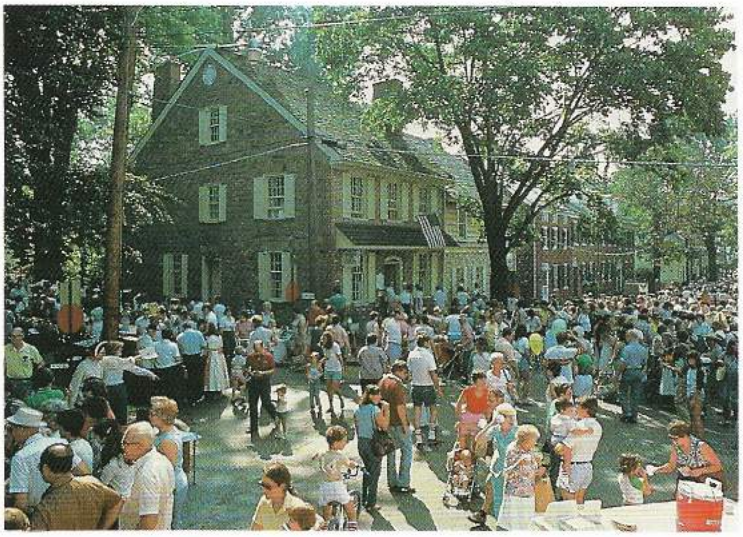
Historic Philadelphia offers you every conceivable cultural and entertainment opportunity, from the world famous Philadelphia Orchestra to excellent restaurants, nightspots and museums. The Philadelphia area abounds with an impressive array of professional and collegiate sporting events.

New Jersey Travel and Tourism

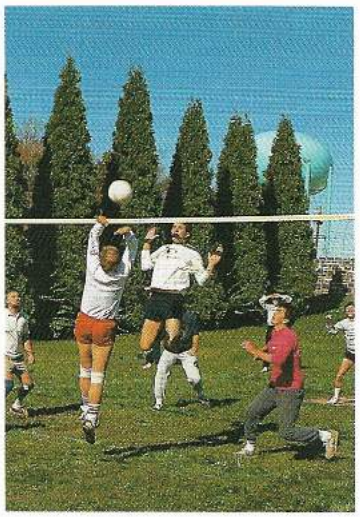


Fishing is one of the many pleasures associated with the scenic New Jersey coastal resorts–a great way to relax and soak up the sunshine.

Bucks County Historic Tourist Commission



The quaint Bucks County area is alive with fairs, festivals, craft and antique shows held every month of the year–great opportunities to meet friends, shop and explore the surrounding countryside.



The Center's employees have organized numerous ongoing sports and social activities catering to every type of interest.

We are located in the Philadelphia suburbs and less than two hours away from the excitement of New York City, Atlantic City and the Pocono Mountains.

- An Equal Opportunity Employer
- U.S. Citizenship is required
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