

EARTH SYSTEM MONITOR

NOAA and the Federal Geographic Data Committee

NOAA data are key components of National Spatial Data Infrastructure

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NOAA is a major participant in the spatial data community, not only because of our map making and geodetic responsibilities, but because almost all our data has location reference information. The Clinton Administration has placed particular emphasis on the infrastructure that will allow users anywhere to access data and information, and NOAA's data holdings are key tools for the scientific and economic health of the United States. President Clinton's April 13, 1994, Executive Order 12906, requires that federal agencies participate in the National Spatial Data Infrastructure (NSDI). The Executive Order encompasses policies, standards, and procedures for

organizations to cooperatively produce and share geospatial data. The vision of the NSDI Strategy Document is: "Current and accurate geospatial data will be readily available to contribute locally, nationally, and globally to economic growth, environmental quality and stability, and social progress" (Figure 1).

The NSDI was a 1994 Federal Government initiative that reached out to an entire community of individuals and organizations who used data relating to places on the Earth's surface. The

basic premise of the NSDI is simple: to provide an easy, consistent way to solve geography-based problems. Many communities want to know how to preserve the quality of life, where to build roads and schools, how to manage utilities, and how to protect drinking water. These basic human needs and many others like them can be addressed through the use of geographic data. Geographic Information Systems (GIS) are computer systems that allow for collecting, storing, analyzing and displaying geographic data.

If these systems were more widespread and easier to use and the data more available, many of these problems could be more easily solved (from *The 1996 NSDI Strategy*, draft version, unpublished. Available online at URL: <http://www.fgdc.gov/strategy/vision.html>).

The Executive Order of 1994 called for three major initiatives to develop the NSDI: 1) creation of a distributed

electronic network of data producers and users, known as the National Geospatial Data Clearinghouse; 2) development of standards for data documentation, collection, and exchange; and 3) promotion of procedures and partnerships to create a national digital geospatial data framework that would include important basic categories of data significant to a broad variety of users.

The Federal Geographic Data Committee (FGDC) is the focal point for NSDI activities and

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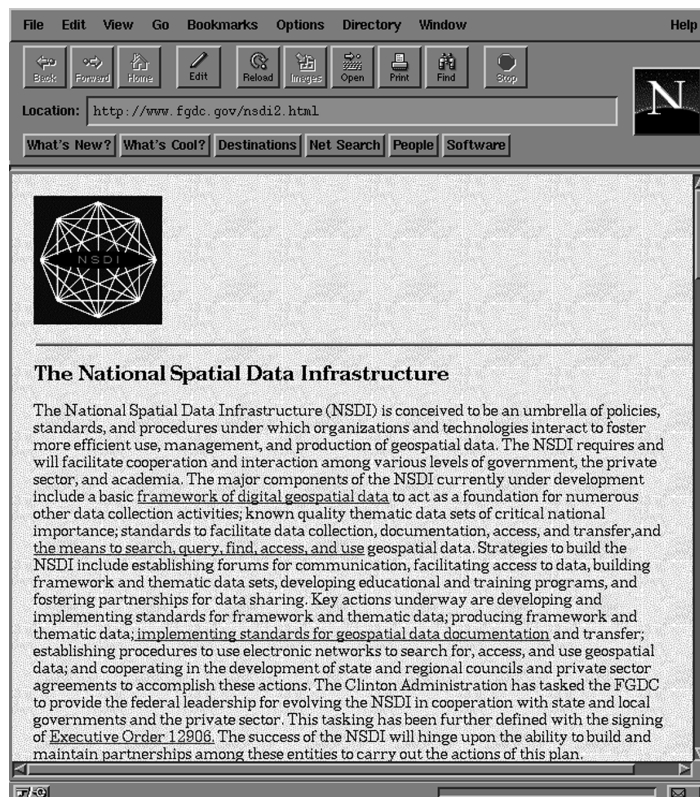
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▲ Figure 1. The National Spatial Data Infrastructure is a Federal government initiative that facilitates the management and production of geospatial data for a wide user community.



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

▲ Table 1. Members of the FGDC steering committee

The Federal Geographic Data Committee	
Chair	
Bruce Babbitt, Secretary of the Interior	
<p>Department of Agriculture Tom Hebert, Deputy Assistant Secretary for Natural Resources and the Environment</p> <p>Department of Commerce Diana H. Josephson, Deputy Under Secretary, National Oceanic and Atmospheric Administration</p> <p>Department of Defense Steven Stockton, Chief Engineering Division, Directorate of Civil Works, U.S. Army Corps of Engineers</p> <p>Dr. Walter Senus, Chief Scientist, National Imagery and Mapping Agency</p> <p>Department of Energy Jay Hakes, Administrator, Energy Information Administration</p> <p>Department of Housing and Urban Development Richard Burk, Director, Community Connection Division</p> <p>Department of the Interior Mark Schaefer, Deputy Assistant Secretary for Water and Science</p> <p>Department of State William B. Wood, The Geographer</p>	<p>Department of Transportation T. R. Lakshmanan, Director, Bureau of Transportation Statistics</p> <p>Environmental Protection Agency Al Pesachowitz, Acting Assistant Administrator for Administration and Resource Management</p> <p>Federal Emergency Management Agency Dennis DeWalt, Deputy Associate Director, Operations Support Directorate</p> <p>Library of Congress Ralph Ehrenberg, Chief, Geography and Map Division</p> <p>National Aeronautics and Space Administration Mike Mann, Deputy Associate Administrator, Mission to Planet Earth</p> <p>National Archives and Records Administration Kenneth Thibodeau, Director, Center for Electronic Records</p> <p>Tennessee Valley Authority Alan Voss, Project Engineer, Geographic Information and Engineering Division</p>

FGDC, from page 1

has assumed leadership in the evolution of the NSDI in cooperation with state and local governments, academia, and the private sector. The FGDC organization is led by Department of Interior Secretary Bruce Babbitt, who is the Chair of the FGDC Steering Committee.

The FGDC organizational structure consists of:

- The FGDC Steering Committee with high level representation from departments and agencies (Table 1);
- The FGDC Coordination Committee with participation by Subcommittee Chairs, Working Group Chairs, and Agency Liaisons;

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- twelve Subcommittees (Base Cartographic Data; Bathymetric; Cadastral; Cultural and Demographic Data; Geodetic Control; Geologic; Ground Transportation; International Boundaries and Sovereignty; Soils; Vegetation; Water; and Wetlands);
- seven Working Groups (Clearinghouse; Earth Cover; Facilities; Historical Data; Framework (dormant); Standards; and Sample Inventory and Monitoring of Natural Resources and the Environment (SIMNRE). Detailed information on the activities of the Subcommittees and Working Groups, can be found online under the FGDC WWW Page (Figure 2) at URL: <http://fgdc.er.usgs.gov/>.

FGDC activities in NOAA and the Department of Commerce

The Department of Commerce (DOC) and NOAA have a strong commitment to the FGDC (Figure 2).

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EARTH SYSTEM MONITOR

The *Earth System Monitor* (ISSN 1068-2678) is published quarterly by the NOAA Environmental Information Services office. Questions, comments, or suggestions for articles, as well as requests for subscriptions and changes of address, should be directed to the Editor, Sheri A. Phillips.

The mailing address for the *Earth System Monitor* is:

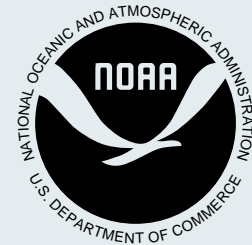
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U.S. DEPARTMENT OF COMMERCE
William M. Daley, Secretary

National Oceanic and Atmospheric Administration
D. James Baker,
Under Secretary and Administrator

NODC exhibits at environmental conferences

National Oceanographic Data Center (NODC) products and services were on display at the American Society for Limnology and Oceanography (ASLO) Aquatic Sciences Meeting held on February 10-14, 1997, at the Sweeney Center in Santa Fe, New Mexico. Meeting participants included scientists, engineers, businesses, and other groups and individuals with interests in freshwater and marine issues and technologies. The NODC exhibit booth, which included information on the newly-released "Gulf of Mexico Hydrographic and Marine Mammal Database" on CD-ROM, was staffed by Don Collins and Andrew Allegra of NODC User Services.

NODC products and services will also be exhibited at the Fourth International Conference on Remote Sensing for Marine and Coastal Environments in Orlando, Florida, on March 17-19, 1997. NOAA's National Environmental Satellite, Data, and Information Service is once again a chief sponsor of the conference. Robert Winokur, NOAA's Assistant Administrator for Satellite and Information Services, will be Master of Ceremonies. Visitors are encouraged to visit the NODC booth and to receive information on NODC products and services, such as exploring access via NODC to historical CoastWatch data. Mary Hollinger and Roger Torstenson of NODC will be assisting at the NOAA/NESDIS exhibit booth.

NGDC scientist lectures in Japan

The National Geophysical Data Center's (NGDC) Dr. Chris Elvidge attended the International Symposium on the Role of Remote Sensing for the Environmental Issues in Arid and Semi-Arid Regions" at Japan's Chiba University Center for Environmental Remote Sensing on January 29-31, 1997. Dr. Elvidge made two presentations: 1) the application of a high spectral resolution vegetation index for estimating percent cover, leaf area index, and evapotranspiration in arid environments, and 2) a review of wildfire observations in Mongolia during April and May of 1996 with data from the Defense Meteorological Satellite Operational Linescan System (DMSP-OLS).

Dr. Elvidge also presented a lecture on "Nighttime Lights of East Asia" at the Japan Remote Sensing Technology Center in Tokyo on February 3, 1997. On Febru-

ary 4, 1997, Dr. Elvidge presented a lecture on "Satellite Inventory of Human Settlements" at the Geographical Survey Institute (GSI) of Japan in Tsukuba. The GSI is working with the United Nations to plan a 1 km resolution global map which will contain thematic layers relevant to environmental monitoring and modelling.

NCDC provides imagery for new storm documentary

Representatives of the Discovery Channel contacted the National Climatic Data Center (NCDC) to request GOES satellite imagery for use in a future television documentary entitled "Storm Warning". The program will focus on the destructive power of Nor'easters, and in particular on the December 1992 storm which had a major impact on the eastern U.S. seaboard. The NCDC provided the network with color-enhanced GOES infrared imagery at six-hour intervals from December 11-13, 1992. The imagery will be incorporated into a movie loop for use in the program. "Storm Warning" is currently scheduled to air in the fall of 1997.

NODC's Ocean Climate Laboratory participates in major conferences

Dr. Margarita Conkright, of the NODC's Ocean Climate Laboratory (OCL), will be presenting a poster session at The Oceanography Society meeting in Seattle, Washington, on April 1-4, 1997. Dr. Conkright will be comparing results from an analysis of *in situ* chlorophyll data to global composites of Coastal Zone Color Scanner satellite data.

Dr. Linda Stathoplos, also of NODC's OCL, will be attending the International Council for the Exploration of the Sea (ICES) symposium entitled "International Symposium on the Temporal Variability of Plankton and Their Physico-Chemical Environment" from March 19-21, 1997 at the Institut für Meereskunde in Kiel, Germany. This symposium is intended to stimulate studies and presentations of long-term time series examinations of phytoplankton and zooplankton ecology and will stress the importance of plankton to marine foodweb dynamics. For further information on this symposium and other upcoming ICES meetings, please see the ICES home page at: <http://www.ices.dk/>.

News briefs

NGDC's SPIDR receives valuable new datasets

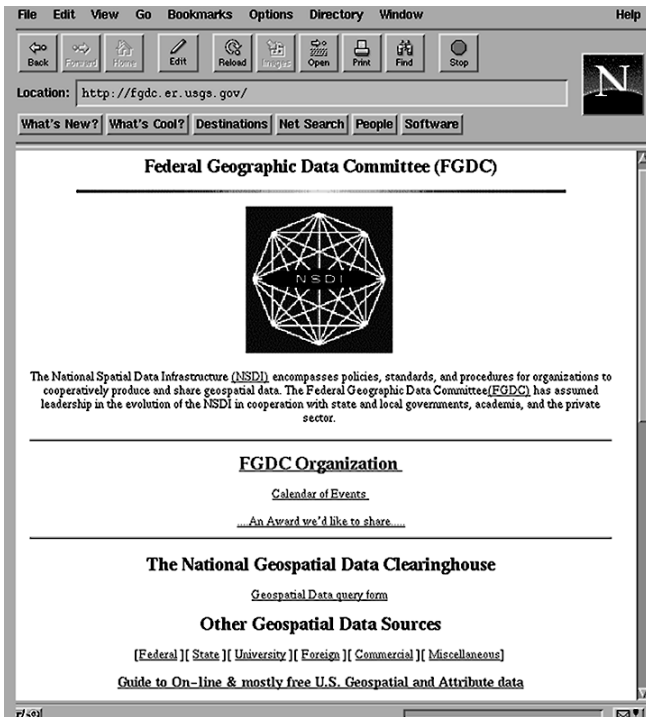
The National Geophysical Data Center (NGDC) has compiled Grahamstown, South African, ionosonde data from January 1973 through October 1996 and added these data to its Space Physics Interactive Data Resource (SPIDR). These data fill a large gap in the worldwide ionospheric monitoring network. For several projects, including the Global Observation Information Network (GOIN), global coverage gives the best results for calculating an ionospheric activity index (i.e., effective sunspot number).

The Instituto Nazionale di Geofisica in Rome, Italy has sent NGDC the 1.0 minute and hourly value data from L'Aquila Geomagnetic Observatories for the years 1992 and 1993. This is the first high resolution geomagnetic data received by the NGDC from Italy. This new data acquisition has been placed in NGDC's geomagnetic archive and in SPIDR. For more information and access to SPIDR, see the NGDC home page at <http://www.ngdc.noaa.gov/>.

Nature article authored in collaborative effort

The NGDC's Robert Webb and colleagues David Rind (National Aeronautics and Space Administration (NASA)), Scott Lehman (University of Colorado), Richard Healy and Daniel Signman (Woods Hole Oceanographic Institution) have authored an article titled "Influence of Ocean Heat Transport on the Climate of the Last Glacial Maximum" that appeared in the February 20, 1997 issue of the scientific journal *Nature*. The paper describes paleoclimate simulations using the NASA-Goddard Institute for Space Studies atmospheric general circulation model to test the effect of maintaining modern levels of heat transfer in the ocean under glacial conditions.

In contrast to previous hypotheses, these experiments indicate that near-modern ocean circulation patterns in the last glacial maximum could be an important mechanism to explain tropical and extratropical glacial cooling reconstructed from new paleoenvironmental proxies. The simulated enhanced global cooling at the last glacial maximum is discussed in terms of global climate sensitivity and implications for future change.



▲ Figure 2. Detailed information on FGDC committees, working groups, and current activities is available online through the FGDC WWW site.

FGDC, from page 2

NOAA Deputy Under Secretary Diana Josephson is the Department of Commerce representative to the FGDC Steering Committee. DOC representatives are the chairs of three FGDC subcommittees: Captain Lewis A. Lapine, NOAA National Geodetic Survey, is Chair of the Federal Geodetic Control Subcommittee. Frank Maloney, NOAA Coast Survey, serves as Chair of the Bathymetric Subcommittee, and Frederick Broome, Bureau of the Census, is chair of the Subcommittee on Cultural and Demographic Data.

Over 30 representatives from the DOC participate in FGDC activities (Figure 3). Most participants are from NOAA, with representatives from CENSUS and the National Institute of Science and Technology. NOAA also contributes funds to the FGDC. The Coastal Information Center in Charleston, South Carolina, contributed over \$100,000 in FY 1996 for the FGDC Competitive Cooperative Agreements Program.

NOAA FGDC Metadata Standard for data descriptions

The NOAA Environmental Services Data Directory has over 8,000 descriptions of NOAA data in FGDC Metadata

Standard format. In mid-1996, the data descriptions were converted from the Directory Interchange Format to the FGDC format in order to meet the requirements of the Executive Order.

New NOAA data descriptions must be written in the NOAA FGDC Metadata Standard Format. (For more details, see the article "NOAA Environmental Services Data Directory" in the December 1996 edition of the *Earth System Monitor*.) Because the NOAA Environmental Services Data Directory is the keystone of the NOAA Server project, data descriptions described in the NOAA FGDC Metadata

Format will be the basis for search, discovery, and access to NOAA data in the future.

NOAA has two tools for generating FGDC Metadata Standard data descriptions:

- the NOAA FGDC Metadata Standard template that can be used with word processing applications to generate text bases data descriptions;
- and the NOAA FGDC Toolkit is a PC-based program that uses a data base management system to store the fields of the data description. A Web-based page will be developed in FY 1997 that will allow NOAA staff to describe data sets using Internet tools.

NOAA Spatial Data Transfer Standard projects

The FGDC Spatial Data Transfer Standard (SDTS) was developed by the FGDC as a tool

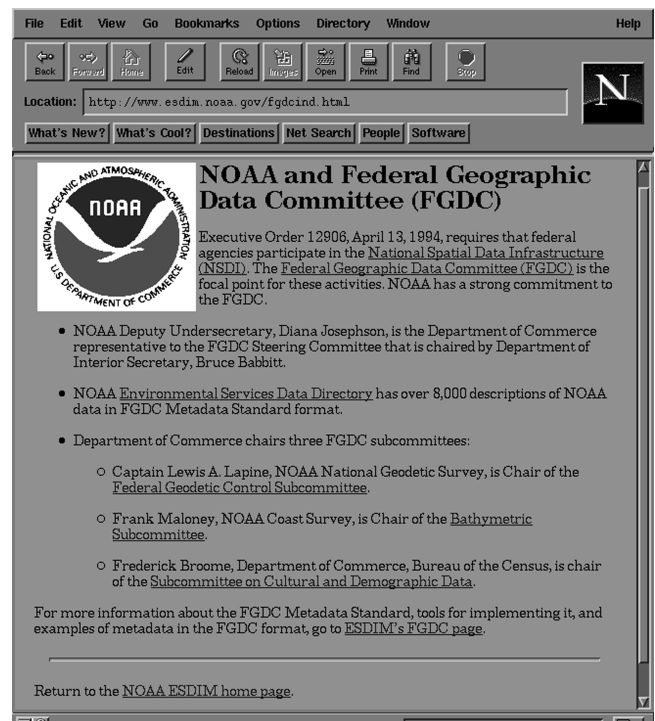
for transferring map, chart, and GIS data between computer applications. For example, if one wanted to transfer a data set from a GRASS GIS application to an ARCInfo GIS application, the process would be: 1) output the data from GRASS in SDTS format; 2) read the SDTS data into ARCInfo. This will be possible when the GIS and other spatial information software vendors develop the SDTS input and output applications for their systems.

The Environmental Services Data and Information Management Program has funded SDTS projects in NOAA as pilot activities to gain experience with the conversion of data sets into the SDTS format. NOAA Activities with the FGDC Spatial Data Transfer Standard include the Vector Coastline Data project for the United States (which will serve as a pilot demonstration for the release of NOAA data sets in the SDTS format) and the production of ice climatology data sets in the SDTS format.

Hammer Award from Vice President Gore

In 1996, The Federal Geographic Data Committee and participating agencies were awarded the National

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▲ Figure 3. Over 30 representatives from the Department of Commerce participate in FGDC activities, which are described in this section of the ESDIM WWW site.

The National Polar-orbiting Operational Environmental Satellite System (NPOESS)

U.S. military and civil operational meteorological satellite systems merged in landmark plan

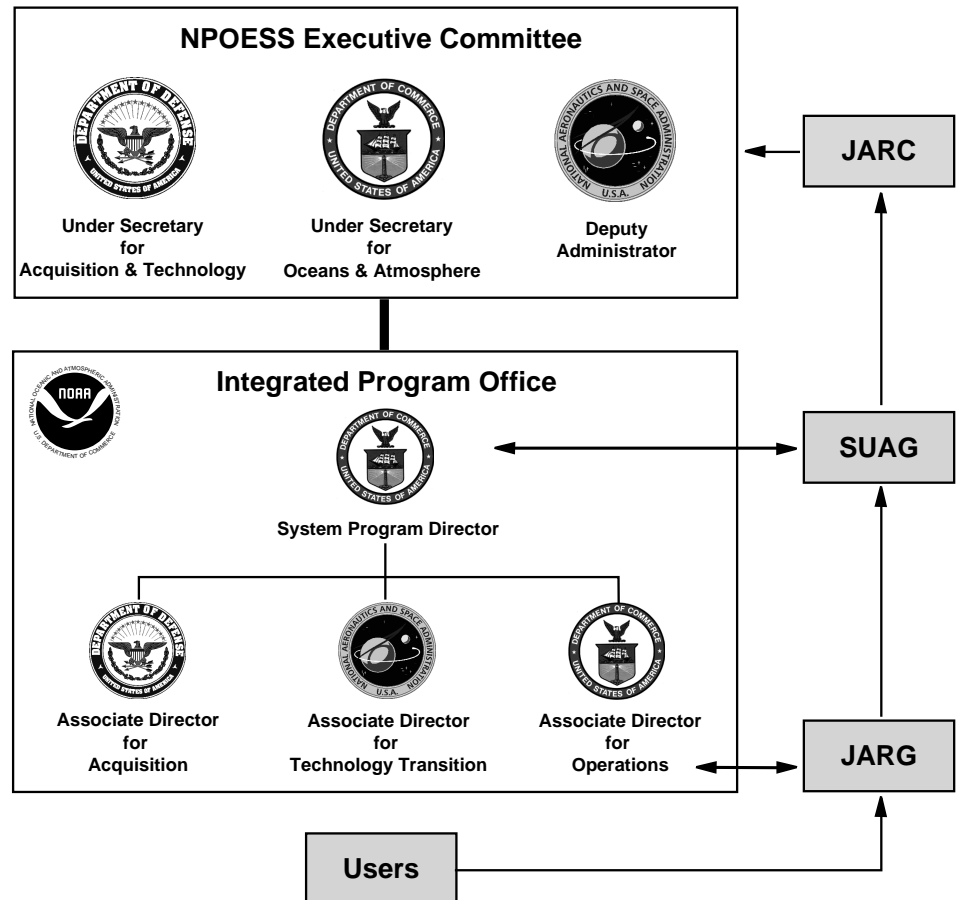
*Donald Blersch
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National Polar-orbiting Operational
Environmental Satellite System*

On May 5, 1994, President Clinton made the landmark decision to merge the Nation's military and civil operational meteorological satellite systems into a single, national system capable of satisfying both civil and national security requirements for space-based remotely sensed environmental data. Convergence of these programs is the most significant change in U.S. operational remote sensing since the launching of the first weather satellite in April 1960, and marks a significant departure from eight previous attempts over the last twenty years to combine these separate programs.

For the first time, the U.S. government is taking an integrated approach to identifying and meeting the operational satellite needs of both the civil and national security communities. The joint program formed at President Clinton's direction is known as the National Polar-orbiting Operational Environmental Satellite System (NPOESS), and it is expected to provide more than \$450 million in savings through 2003, and \$1.7 billion over the life of the program compared to the cost of continuing the planned separate satellite systems within DoD and DOC.

The U.S. government has traditionally maintained two operational weather satellite systems each with a 30-plus year heritage of successful service: The NOAA Polar-orbiting Operational Environmental Satellites (POES), and the Department of Defense's Defense Meteorological Satellite Program (DMSP). Recent changes in world politi-

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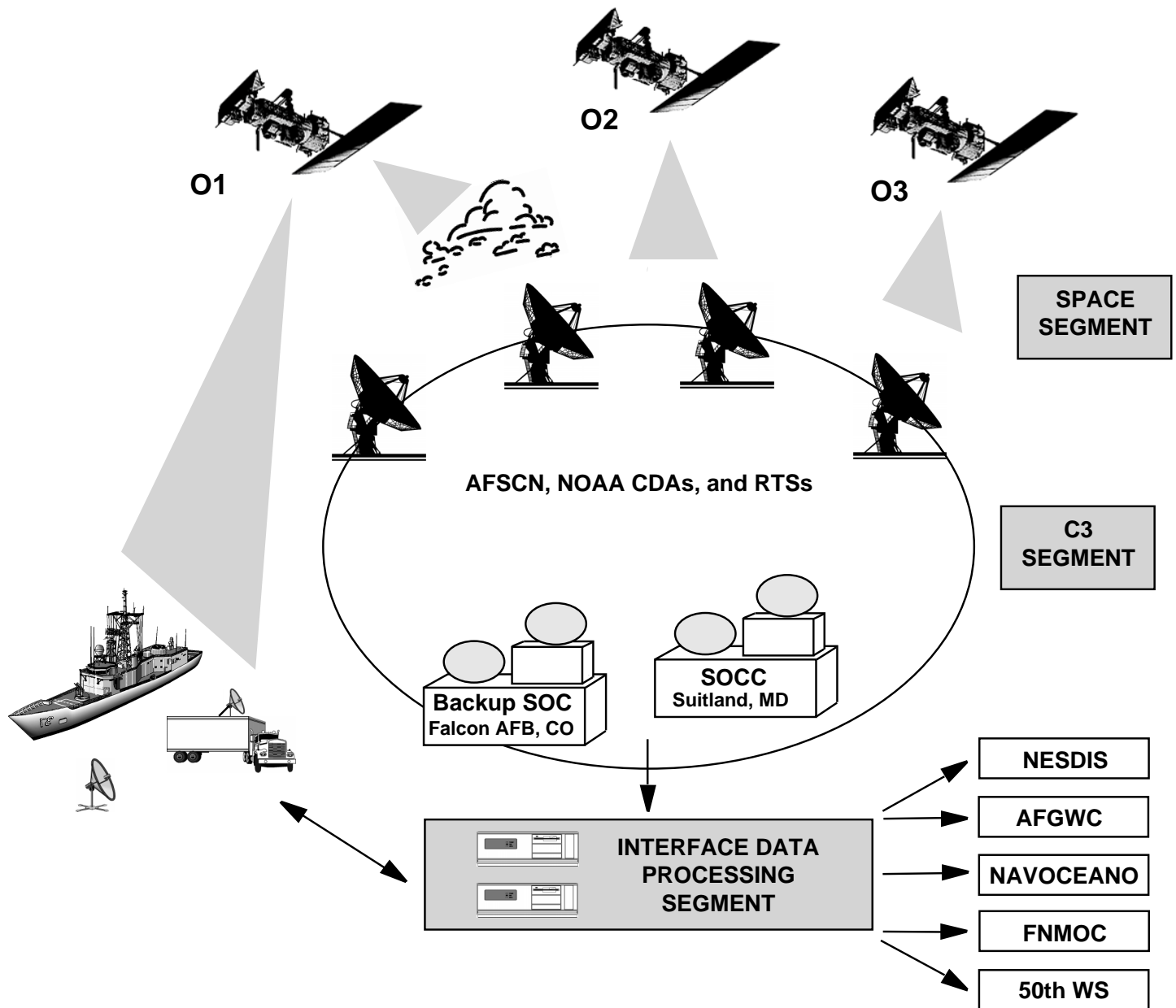
▲ **Figure 1.** The Integrated Program Office concept provides participating agencies with lead responsibility in its functional area, while maintaining an integrated approach. (Acronyms: JARG - Joint Agency Requirements Group; SUAG - Senior Users Advisory Group; JARC - Joint Agency Requirements Council)

cal events and declining agency budgets prompted a re-examination of combining the two systems. In 1993, influenced by increased congressional interest and following recommendations contained in the National Performance Review, NOAA, DoD and the National Aeronautics and Space Administration (NASA) began studying how to converge the two systems. The completed study revealed that a converged system could reduce duplication and bureaucracy, substantially reduce costs and satisfy both civil and military requirements for operational environmental data. This Tri-Agency study formed the basis for the development of the Implementation Plan for a Con-

verged Polar-orbiting Environmental Satellite System, issued in conjunction with the Presidential Decision Directive.

On October 3, 1994, NOAA, DoD, and NASA created an Integrated Program Office (IPO) to develop, manage, acquire and operate the National Polar-orbiting Operational Environmental Satellite System (NPOESS). As indicated in Figure 1, the IPO is located within NOAA and is headed by a System Program Director responsible to the NPOESS Executive Committee. This Committee, which includes senior representatives from the three agencies, serves as a board of directors to ensure

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▲ **Figure 2.** NPOESS national system architecture. The concept is designed to employ three or more orbital planes (O1-O3) and integrate remote sensing, surface data collection, and search and rescue payloads. NPOESS will utilize existing Air Force Satellite Control Network Automated Remote Tracking Stations (AFSCN ARTS), NOAA Command and Data Acquisition (CDA) tracking stations and other available relay assets. (Acronyms: SOC - Satellite Operations Center; SOCC - Satellite Operation Control Center; C3 - Command, Control, and Communications; NESDIS - National Environmental Satellite, Data, and Information Service; AFGWC - Air Force Global Weather Central; NAVOCEANO - Naval Oceanographic Office; FNMOC - Fleet Numerical Meteorological and Oceanographic Center; 50th WS - 50th Weather Squadron; RTSS - Remote Tracking Stations)

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that the overall program plans meet the needs of the three participating agencies.

As detailed in Figure 1, the Integrated Program Office concept provides each of the participating agencies with lead responsibility for one of three primary functional areas. NOAA has overall responsibility for the converged system and is also responsible for satellite operations. NOAA is also the pri-

mary interface with the international and civil user communities. DoD is responsible to support the IPO for major systems acquisitions including launch support. NASA has a primary responsibility for facilitating the development and incorporation of new cost-effective technologies into the converged system. Although each agency provides certain key personnel in their lead role, each functional division is staffed by tri-agency work teams

to maintain the integrated approach.

As an early step in the convergence process, the command, control, and communications function for DoD's existing DMSP satellites will be combined with the control for NOAA's POES satellites in Suitland, Maryland in 1998. This combination of control functions will coincide with the planned closure of the U.S. Air Force Satellite Operational Control Centers at Fairchild Air Force Base in Washington

and Offutt Air Force Base in Nebraska. This early convergence of command, control, and communications functions for existing satellites is expected to yield additional cost savings and further promote integration of existing programs.

The first converged satellite is expected to be available sometime toward the middle to latter half of the next decade depending on when the current NOAA and DMSP programmed satellite assets are exhausted. Figure 2 details the current national system architecture for the NPOESS program. As presented in Figure 2, NPOESS will provide standard meteorological data and oceanographic, environmental, climatic, space environmental remote sensing information, as well as continue to provide surface data collection and search and rescue capability. The IPO, in consultation with the NOAA and DMSP program offices is also studying additional potential cost effective approaches to maximize user satisfaction during the transition to NPOESS while guaranteeing continued non-interrupted data services.

From a resource perspective, the convergence of civil and military polar-orbiting operational environmental satellites is expected to yield over \$450 million in savings through 2003 and additional savings throughout the life of the system. By combining missions, it is anticipated that under NPOESS the total number of satellites required and their associated ground systems will be significantly reduced. Increased system performance capability over today's systems is also expected from the synergistic effects of combining the now separate polar programs, and through expeditious insertion of new technology.

Savings will accrue in the following primary areas:

- **Development.** Only one system development effort is required for NPOESS. Continuance of the DMSP and POES programs would have required two parallel development efforts to design two new, unique systems (spacecraft, instruments, and ground command and control systems).
- **Number of satellites and launches.** The previously planned follow-on programs to the current DMSP and POES programs were expected to require three U.S. satellites in orbit at any given time

to fulfill their operational missions over their operational lifetimes. Thus, ten satellites were planned to be procured and launched. NPOESS is expected to require only two U.S. satellites in orbit at any given time which necessitates procuring only five satellites over a comparable period.

- **Ground Systems/Operations.** Currently, the DMSP and POES programs are operated from two completely separate ground facilities, or Satellite Operation Control Centers (SOCC). DMSP operations are conducted primarily from the Multi-Purpose Satellite Operations Center (MPSOC), located at Offutt AFB, Nebraska, with additional dedicated backup facilities at Fairchild AFB, Washington. POES operations are conducted at the single NOAA SOCC located in Suitland, Maryland.

"Early Convergence" of the DMSP and POES Operations will occur in the 1998 time period, by consolidating DMSP and POES operations at the NOAA SOCC in Suitland, Maryland, including the establishment of a backup SOCC facility at Falcon AFB, Colorado. This consolidation will be in concert with the planned closures of the MPSOC and Fairchild facilities. Additional savings may result from taking advantage of the economies of colloca-

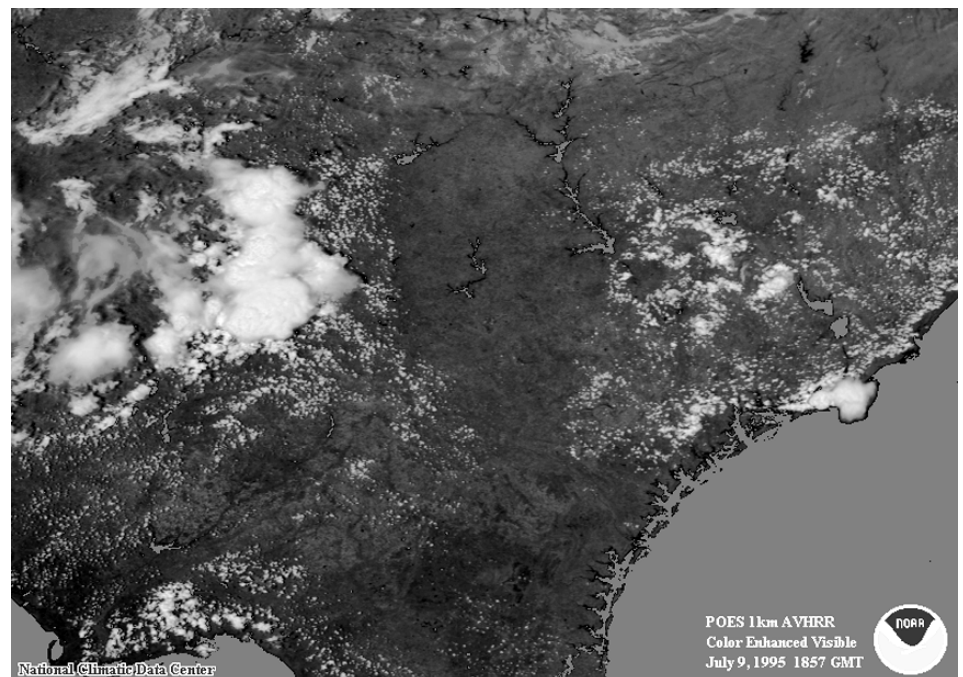
tion of the primary DMSP, POES, and GOES satellite operations at Suitland, post-1998.

Additional savings will also accrue throughout other phases of the program, as described below:

- **European participation.** The NPOESS program will continue and build upon the international cooperation with the European Organization for Meteorological Satellites (EUMETSAT). The POES program plans to provide instrumentation for flight on the EUMETSAT Meteorological Operational Program (METOP-1,-2) satellites and receive European instrumentation for flight on NOAA satellites as part of the Initial Joint Polar-orbiting Operational Satellite program (IJPS).

Under the NPOESS program, a similar subset of the NPOESS instruments are envisioned for flight on METOP-3 series satellites. The possibility of European instrumentation possibly being provided for flight on NPOESS series satellites is also under consideration. Use of the METOP-3 satellite series will increase the coverage and refresh rate of the U.S. weather satellite system (Figure 3) at minimal cost. In addition, the European Meteorological community will receive valu-

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▲ Figure 3. POES satellite image of thunderstorms over northern Georgia. Under the planned international Initial Joint Polar-orbiting Satellite program (IJPS), the U.S. would provide instrumentation for flight aboard Europe's Meteorological Operational Program (METOP) satellites.

The Office of NOAA Corps Operations

Aircraft Operations Center plays critical role in NOAA's environmental mission

Jeanne Kouhestani
NOAA Public Affairs
NOAA/Office of the Under Secretary

Commander Dave Tennesen
NOAA/Office of NOAA Corps Operations

Hurling through the eyewall of a hurricane, buffeted by howling winds, blinding rain, hail, and tornadic updrafts and downdrafts before entering the relative calm of the storm's eye, "hurricane hunter" aircraft probe every wind and pressure change, repeating the grueling experience again and again during the course of a 10-hour flight.

This is perhaps the most visible and dangerous work of NOAA Corps pilots, engineers and crew as they fly with a contingent of scientists aboard NOAA's WP-3D Orion turboprop aircraft. The mission? To collect the research data needed for computer models that predict hurricane intensity and landfall, as well as provide reconnaissance information to forecasters at the National Hurricane Center (Figure 1). Their skill and courage in the sky directly contributes to the safety of Americans living along the vulnerable Atlantic and Gulf coasts.

NOAA's aircraft, like its ships, are highly specialized platforms used to collect the myriad of data that ultimately end up in NESDIS's data centers. Based at the Office of NOAA Corps Operations' Aircraft Operations Center (AOC) in Tampa, Fla., and facilities in Virginia, Maryland and Minnesota, the NOAA fleet includes 14 aircraft.

The fleet is divided into the *Heavy Aircraft Program*, which consists of two P-3s that perform a variety of meteorological, air chemistry, and oceanographic experiments in addition to hurricane research and reconnaissance; the *Light Aircraft Program*, which includes a mix of nine jet, turboprop, and piston-powered single and twin engine aircraft that support a variety of unique

NOAA missions, including nautical and aeronautical charting, fisheries and marine mammal surveys, and snow surveys for flood forecasts; and the *Helicopter Program*, which has three rotorcraft that support hydrography as well as transport scientific personnel and equipment to places otherwise inaccessible due to harsh weather or rugged terrain. NOAA helicopters also conduct marine mammal surveys around the coastal United States and polar bear surveys in Alaska.

NOAA Corps officers and civilians make programs fly

NOAA's aircraft operate in some of the world's most remote and demanding flight regimes over open ocean, mountains, coastal wetlands, Arctic pack ice, and in and around hurricanes and other severe weather with an exemplary safety record. There are no comparable aircraft in the commercial fleet to support NOAA's atmospheric and hurricane surveillance/research programs. Perhaps most importantly, NOAA Corps pilots are the only pilots in the world who are trained and qualified to fly into hurricanes at dangerously low altitudes. These officers also frequently serve as chief scientists on program missions.

NOAA's data collection feats in the sky, however, would not be possible without highly skilled ground support. Much of the scientific instrumentation flown aboard NOAA aircraft is designed, built, assembled, and calibrated by AOC's Systems Engineering Division (SED). SED civilian engineers and technicians, along with AOC fabrication specialists, devise airframe modifications to enable the mounting of sensors, cameras, radars, and other specialized equipment—most recently



▲ Figure 1. An AOC technician mans a P-3 work station during a hurricane flight.

working around the clock to prepare NOAA's newest aircraft acquisition, a G-IV Gulfstream jet, for the upcoming hurricane season. AOC has pioneered many advances in airborne sensor systems and real-time data processing such as the use of forward-and aft-looking Doppler radar systems to map three-dimensional wind fields inside severe storms. Other examples of AOC pioneering work are the adaptations of C-band scatterometers and microwave radiometers for remote sensing in hurricanes.

NOAA's new aircraft

NOAA's new G-IV Gulfstream jet has been transformed by NOAA engineers into a hi-tech meteorological marvel that is the first and only of its kind in the world. The jet will provide scientists with an unparalleled platform for the investigation of processes in the stratosphere through its advanced combination of range, payload, ceiling, sensors and on-board data collection capabilities (Figure 2).

The jet's primary mission is hurricane surveillance. Beginning with the 1997 hurricane season, the jet will complement the work of the P-3s by mapping the steering currents of hurricanes at 45,000 feet. Data from dropwindsondes that measure barometric pressure, temperature, humidity, and wind flow will be transmitted to a satellite, which will then transmit it to

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the National Hurricane Center in Miami and NESDIS's data center in Suitland, Md.

The data resulting from these G-IV flights is expected to help the National Hurricane Center improve hurricane landfall and track forecasts by about 20 percent, 24 hours ahead of time, and to further refine storm intensity forecasts ultimately saving taxpayers millions of dollars in unneeded evacuation costs. In fact, the costs saved from not having to evacuate just one major coastal city will cover the cost of the jet.

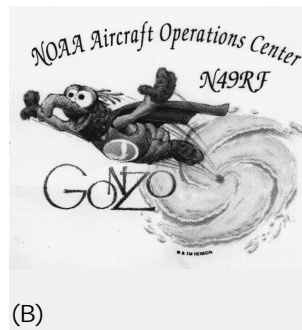
FASTEX

The G-IV recently completed her maiden research mission on the international front, in the Fronts and Atlantic Storm-Track Experiment, or FASTEX, a cooperative program developed by NOAA and the European meteorological community. Both the G-IV and a P-3 participated in this January-February field experiment—which stretched across the Atlantic Ocean between Newfoundland and Ireland—to collect research data on the severe winter storms that move eastward across the ocean and hit western Europe. Ultimately, the findings should lead to better forecasts for the west coasts of both Europe and North America, as well as a better understanding of how oceanic winter storms affect world climate.

FASTEX involved ten foreign countries (Canada, Iceland, Ireland, the United Kingdom, Denmark, Norway, France, Portugal, Spain and the Ukraine), and U.S. participants that included NOAA, the U.S. Navy, the National Center for Atmospheric Research, and university researchers supported by the National Science Foundation. The research platforms used were three turboprop airplanes, including a NOAA P-3; two high-altitude jets, including NOAA's G-IV; four ships, including a U.S. university ship; and other observing systems, such as balloon-borne radiosondes, drifting ocean buoys, and wind profilers.

The G-IV, with its ability to transmit real-time vertical atmospheric profiles, contributed to the study of these storms during their incipient, development, and intensification stages.

The P-3 contributed a French-built dual-beam Doppler radar antenna used



▲ **Figure 2.** The lighter side of hurricane research: NOAA's newest aircraft acquisition, a G-IV Gulfstream jet (A), is adorned with the Muppet character Gonzo (B). Adorning the noses of the P-3s are good-luck mascots Miss Piggy (C) and Kermit the Frog (D) in their aviator get-up, specially designed for NOAA by the creators of the Muppets (Jim Henson, Inc.).

to trace wind and precipitation patterns inside the developing storms, and to analyze mature cyclones at altitudes near or below 10,000 feet.

Coral reef survey

A NOAA Bell helicopter, outfitted with the U.S. Army Corps of Engineers' Scanning Hydrographic Operational Airborne Lidar Survey system (SHOALS), quickly went into action in February to assess the damage to Maryland Shoal after the 600-foot container ship *Houston* ran aground in the Florida Keys National Marine Sanctuary. One square mile of sea floor, divided into three separate areas (Eastern Sambos, Maryland Shoal, and Looe Key), was surveyed and over 200,000 depth soundings were recorded during the flight. This data was delivered to the sanctuary and will help determine the

damage caused by the *Houston*, and provide a baseline on two additional areas of interest where ships have run aground in the past.

This is a perfect example of NOAA's increased efficiency, through SHOALS, in performing the shallow water hydrographic surveys often needed after catastrophic events such as groundings or hurricanes. The economy of the nation is heavily dependent on maritime commerce. Nautical trade, recreation, and tourism depend in turn on accurate nautical charts and surveys for safe navigation. Until recently, charting has depended on survey vessels for water depth and bottom topography information. Now both NOAA Bell 212 helicopters have been uniquely modified to accommodate airborne survey instrumentation (Figure 3).

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NOAA aircraft, from page 9

NGS advances photogrammetry

The National Geodetic Survey (NGS) has obtained an experimental multi-spectral scanner that delineates the shoreline by mapping the thermal differences between water and land. Flying the scanner aboard a NOAA Turbo Commander, NGS researcher Commander Peter Connors, NOAA Corps, recently tested the new technology to tie the multi-spectral imagery to the accuracy of NGS's charting standards. Once perfected, multi-spectral shoreline imagery can be collected whenever the skies are clear, which is usually at night after daytime cumulus clouds have dissipated. Ultimately, this technology will replace the shoreline delineation data now collected by aerial cameras, and NOAA aviators will no longer have to wait for sunlight to fly their air photo missions.

Experimentation at NGS has always emphasized practical applications. NGS Director Captain Lewis Lapine, NOAA Corps, did pioneering research on the precision referencing of aerial photography to the Global Positioning System (GPS). His referencing system tracks and records the flight of NOAA's photogrammetry aircraft to within a few centimeters. A NOAA Cessna Citation, the world's most advanced photogrammetry platform, uses this GPS referencing to locate the photos from

its dual camera operation. This aircraft and its advanced technology have flown charting missions all over North America. In addition, the Citation recently completed a georeferenced photosurvey in the Southwest Pacific, an area never before photographed, using Capt. Lapine's GPS aerial survey technique. Compared to the older, more labor-intensive photogrammetric methods, GPS-referenced photos are a hundred fold improvement. The survey repositioned several islands in the Northern Marianas, including the Farallon de Pajaros—which was adjusted 1.5 nautical miles to the north of its old location. The resulting northerly shift increased the territory of the United States and its fishery rights in that region.

In addition, the geodetic network established by this survey significantly enhanced air navigation accuracy in the Pacific, provided modern shoreline information for nautical charts, and redefined two international maritime boundaries.

Snow surveys help predict flooding

Average annual flood losses total several billion dollars, and this year promises to be no exception. Much of the flooding in the nation is due to spring snowmelt runoff; thus, observed snow water equivalent data are critical to operational flood forecast procedures. Two NOAA aircraft are now fly-

ing snow surveys in the Rocky Mountains and across the upper Midwest east to New England, supplying data for current and future water supply forecasts.

The Gamma Snow survey mission, implemented by the National Weather Service's Office of Hydrology, uses NOAA's Shrike Commander and Turbo Commander twin-engine aircraft to quickly measure, by attenuation of gamma radiation, snow water equivalent along flight lines in selected basins each year. The data are disseminated by the National Weather Service's River Forecast Centers and are critical in issuing river and flood forecasts and in providing hydrometeorological data and products to support water resources managers.

NOAA operates the aircraft to measure over 1,900 tracklines in 27 states and seven Canadian Provinces, covering virtually the entire snow belt of the United States and Southern Canada. The huge expanses that can be measured in minutes using these airborne platforms would require days or weeks using ground-based measurements. The work is demanding, requiring precise navigation along tracklines while flying 500 feet above the ground, often in mountainous terrain.

Satellite information, which shows only the extent of snow cover, can provide some indication of the timing of flooding, but the aircraft-collected snow water equivalent data enables prediction of the extent of flooding. Knowing the amount of water in the snow cover helps the hydrologist provide flood warnings and forecasts weeks or months in advance of the snow melt, providing enough lead time to save lives and property. The snow survey mission contributes to warning and prediction services that save hundreds of millions of dollars annually.

The versatile Twin Otter

NOAA's DeHavilland Twin Otters have long been considered the most versatile platforms in the NOAA aircraft inventory. The marine mammals aerial surveys flown by the Twin Otters in support of the National Marine Fisheries Service (NMFS) have been essential for habitat protection and restoration programs (Figure 4).



▲ Figure 3. A NOAA Bell helicopter conducts a shallow water survey using the new SHOALS system.

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NEXRAD evolution progress

Federal agencies update the Weather Surveillance Radar-1988 Doppler (WSR-88D) system

Robert Saffle
Office of Systems Development
NOAA/National Weather Service

The potential for mass destruction and loss of life in future weather events continues to be enormous. As a nation, the United States experiences more severe local storms and flooding than any other country in the world. Eighty-five percent of all presidentially declared disasters result from significant weather events. In a typical year, the United States can expect a staggering assault by the elements: some 10,000 violent thunderstorms, 5000 floods, 1000 tornadoes, and several hurricanes. Along with periods of severe drought, hard winters, and heat waves, these events translate into considerable loss of life and annual property damages estimated in billions of dollars.

The most deadly weather events—tornadoes, severe thunderstorms, and flash floods—are the most difficult to detect and forecast. A very important tool in the forecast process for these phenomena is the Next Generation Weather Radar (NEXRAD) which has been developed as part of the National Weather Service (NWS) modernization and associated restructuring (MAR) program.

The NWS is engaged in a continuing tri-Agency project with its NEXRAD partners, the Department of Defense and the Federal Aviation Administration, to evolve the Weather Surveillance Radar-1988 Doppler (WSR-88D) system (Figure 1). This system evolution, or NEXRAD Product Improvement (NPI), is planned to meet changing mission requirements, to maintain cost effective operations, and to take advantage of advances in hydrometeorological science and technology. An example of a NEXRAD meteorological product utilizing WSR-88D reflectivity data is shown in Figure 2.

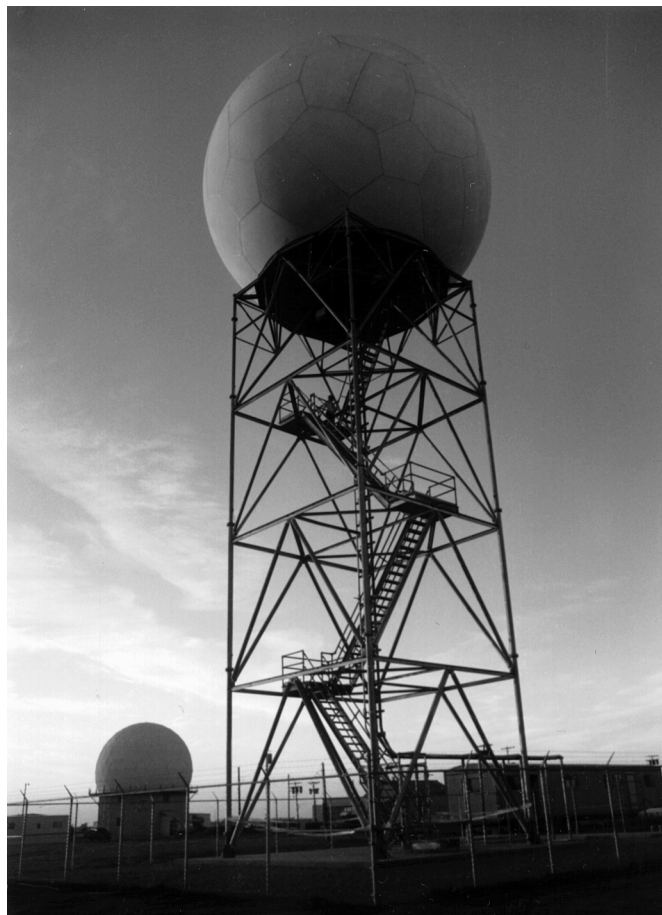
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Currently, the Agencies are involved in a project to rehost the operational WSR-88D functionality from the existing, proprietary computer platform to an Open Systems compliant, standards based workstation platform taking advantage of multiple vendor, Commercial-Off-the-Shelf (COTS) components.

Work is presently underway at NWS Headquarters (NWSH), the NOAA National Severe Storms Laboratory (NSSL) and the WSR-88D Operational Support Facility (OSF) on a wide array of tasks to accomplish this project. Figure 3 illustrates the type of work the NSSL is currently performing. Overall management of the Open Systems effort is led by the NWS Office of Systems Development (OSD) as part of the NPI Project.

Project management has coordinated the documentation of operational requirements that reflect the Agencies' current plans for using weather radar data, in conjunction with other aspects of their modernized weather systems, to support their various forecast, watch and warning missions. This document, the "Tri-Agency Requirements (TAR) for Operational Use of Weather Radar Data," has been submitted for final approval to the NEXRAD agencies. The draft TAR is being used to guide the development of system level requirements and prototype software. Development efforts will adapt, as needed, to modifications to the requirements that result from the review process.

The major processing components of NEXRAD will evolve concurrently,



▲ Figure 1. The NEXRAD site at the Operations Support Facility (OSF) in Norman, Oklahoma. (Photo courtesy of Tim O'Bannon, NWS/NEXRAD OSF).

but with differing development time tables. The Open Radar Product Generation (ORPG) subsystem will be fielded first (starting in 1999), followed by the Open Radar Data Acquisition (ORDA) subsystem (beginning in 2001). The NEXRAD product request and display workstation (the Principal User Processor, or PUP) will be rehosted to an open platform (OPUP) in the same time frame as the ORPG. The functionality of the PUPs will also be integrated into the Agencies' modernized forecasting platforms, e.g., the Advanced Weather Interactive Processing System (AWIPS) for the NWS offices and the Weather and Radar Processor (WARP) for FAA Air Route Traffic Control Centers. The existing users of RPG products will continue to be supported in their current configurations for as long as necessary.

– continued on page 12

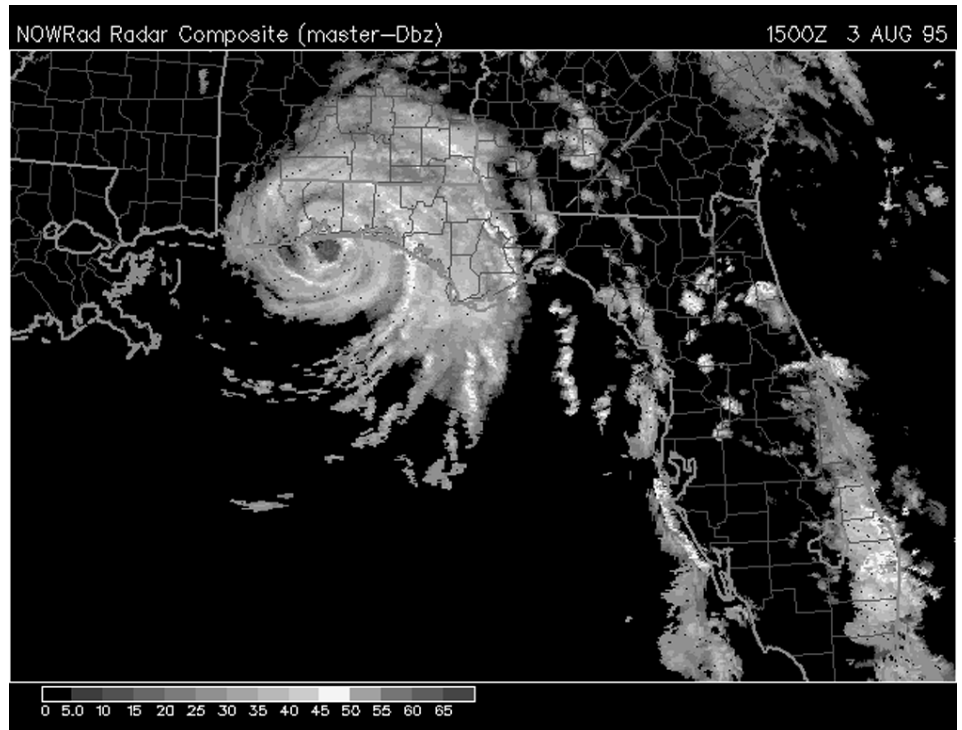
NEXRAD, from page 11

Project management has conducted tri-Agency workshops to focus activities on system requirements definition for the ORPG and on involving the larger meteorological weather radar engineering community in issues related to the ORDA. An ORPG system requirements workshop was held in May 1996 at Norman, Oklahoma with topics including COTS equipment, methodology for defining performance and capacity requirements, agency-specific operational concepts, external drivers on requirements, and prioritization of requirements. The first draft of the ORPG System/Subsystem Specifications (SSS) has been reviewed and comments are being addressed in a second draft.

An ORDA workshop was held in July 1996 at Norman, Oklahoma to solicit and discuss ideas from the community of meteorological radar engineers on designing the open systems rehost of the RDA subsystem. Leading radar engineers from a broad spectrum of organizations (NSSL, the OSF, MIT Lincoln Laboratory, Phillips Laboratory, National Center for Atmospheric Research, Forecast Systems Laboratory, MITRE Corporation, and Mitretek Systems) gave presentations or provided papers on their current work in advanced weather radar design and signal processing. These presentations were followed by round table discussions on which features of current research activities might be relevant to ORDA design, NSSL's initial plans for the ORDA design and system architecture, and signal processing and host computer capacity sizing for the first field implementation of the ORDA.

The workshop discussions produced a high degree of consensus in all areas of the ORDA design and development. The workshop recommendations will be formalized as part of the ORDA portion of the Open Systems Project Plan and explicitly addressed in design activities. A follow-up workshop will be held later to provide more detailed guidance reflecting the experience gained from the early phase of ORDA development.

A large amount of technical development has already been accomplished for the ORPG workstation software (led by NSSL) and for a more robust com-

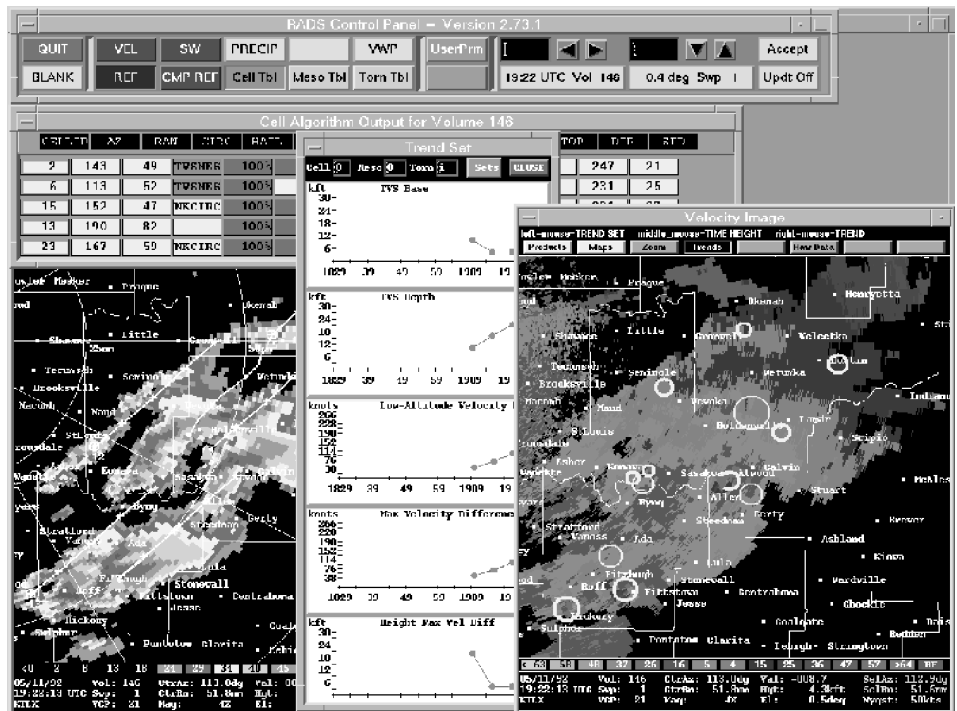


▲ Figure 2. Reflectivity data collected by the WSR-88D system was utilized to generate this image of Hurricane Erin over the Gulf Coast on August 3, 1995.

munications infrastructure for distributing base data and products (led by NWS/OSD). The OSF is providing Systems Engineering oversight and hardware specification for the development activities and is also engaged in the

complex process of transitioning from current system support to being able to support the new systems. NWSH is leading the procurement and field implementation tasks.

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▲ Figure 3. In support of NEXRAD agencies, the National Severe Storms Laboratory developed the WSR-88D Algorithm Testing and Display System (WATADS), which displays WSR-88D base data and executes and displays algorithm output.

ESDIM: Forging alliances in the interest of data rescue

For nearly a quarter of a century, from January 1966 to December 1990, researchers at 1345 meteorological stations across the Soviet Union (Figure 1) dedicated a part of each snowy-season day wielding measuring rods and balances to observe snow. Researchers logged mean and average snow height, number of days per month with snow cover, degree of snow or ice coverage, snow density, and snow water equivalent, and noted special features and structure of the snow, mostly for populated areas in the mid-latitudes, but also for regions of the high Arctic. In the process, they built an invaluable edifice of climatological knowledge that might be valued not only in terms of record length and geographical breadth, but also in terms of the growing need for such data as indicators of climate change.

By 1993, as science funding dried in a changing Soviet political climate, cryospheric scientists at the National Snow and Ice Data Center (NSIDC) and elsewhere began to fear for the preservation of these and comparable data records. The bottom line: data maintained on decaying paper at scattered sites are short-lived and essentially unavailable for general study. These urgencies prompted NOAA's Environmental Services, Data, and Information Management (ESDIM) program to begin funding data rescue efforts. NSIDC also committed significant resources to the data conservation effort, contributing to workshops in 1993, 1994 and 1995 focused on cryospheric data preservation priorities.

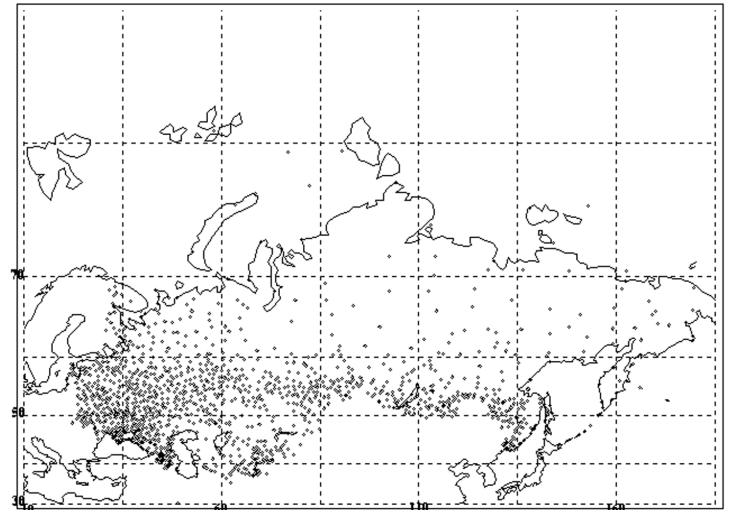
Since then, 34 data sets containing information on snow, ice, glaciers, and arctic meteorology have been "rescued" from file cabinets and field notebooks, and made electronically available through NSIDC, thanks to ESDIM funding and collaborations with such organizations and agencies as NATO, WMO, NSF, and NASA.

At an average annual cost of \$54 thousand, environmental data primarily from the former Soviet Union have been digitized, formatted, quality checked, documented, analyzed, and staged for ftp pickup or published on CD-ROM. The response? NSIDC has received 356 requests for ESDIM-funded

data sets in addition to online accesses, between October 1993 and October 1996. Twelve of these data sets are presently available through the NGDC GOLD system, and NSIDC receives substantial numbers of "hits" to its WWW site through NOAA. Data sets distributed by NSIDC include the "Former Soviet Union Hydrological Snow Surveys, 1966-1990". The meteorological logs of snow observations described above were hand-digitized in Moscow under the direction of Professor Alexander Krenke of the Russian Academy of Sciences.

But, as sometimes happens with hand-digitized analog records, degradation of the original records and human error can introduce missing or inaccurate data values. For instance, within these data, several stations in the high Arctic showed no snow during the winter months, when in fact this is highly unlikely. With ESDIM support, NSIDC staff began exploratory data analysis to identify incongruent trends and discontinuities within the data. Out-of-range values were identified and, where possible, correction algorithms were developed. After processing, the database was made available through NSIDC's web site with online subsetting tools that allow users to select data by station latitude and longitude, or by month and day.

ESDIM projects are characterized by collaboration. For example, NSIDC joined with the Polar Science Center (PSC) at the University of Washington, Seattle, and the Arctic and Antarctic Research Institute (AARI), St. Petersburg, Russia to develop the recently released CD-ROM containing "Arctic Ocean Snow and Meteorological Observations from Drifting Stations". Continuously from 1950 until 1991, the



▲ Figure 1. The locations of 1345 meteorological stations that contributed to the "Former Soviet Union Hydrological Snow Surveys, 1966-1990" data set distributed by NSIDC.

USSR maintained two, and sometimes three drifting ice stations on ice floes manned for an average of 2.4 years. In addition to supporting scientific studies, these camps operated as synoptic meteorological stations reporting position, surface weather, atmospheric soundings, solar radiation, and snow conditions. The primary source for these data were the original meteorological log books, archived at AARI.

To ready these data for wider use by scientists, AARI digitized, organized, and quality checked the data. PSC further organized and quality checked the data, linearly interpolating position data where necessary to fill gaps among the sporadic observations of early years, and processed all observations into the daily averaged "combined" data files. NSIDC prepared files and documentation for CD-ROM production, and distributes the CD-ROM. A menu-driven data display and visualization software package from NGDC called GeoVu is included on the CD-ROM.

The alliances of talent and resources fostered under ESDIM have combined to successfully realize a number of data rescue goals in just a few short years. Yet much remains to be accomplished and the urgency, as time passes, remains undiminished. While some data sets are moving off the endangered lists, some projects, specifically in the area of permafrost data, are

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FGDC, from page 4

Performance Review "Hammer" Award (Figure 3). Led by Vice President Al Gore, the National Performance Review recognizes those Federal organizations that contribute to building an efficient government. The Hammer Award is a frame containing a wooden-handled hammer and a handwritten message from the Vice President, "Thanks for helping build a government that works better and costs less."

Information about the NSDI and the FGDC can be found on the WWW at these URLs:

- for NSDI - <http://www.fgdc.gov/nsdi2.html>
- for FGDC - <http://fgdc.er.usgs.gov/>

For information about NOAA FGDC activities, see the FGDC section of the Environmental Services WWW Page at <http://www.esdim.noaa.gov/>. ■



▲ Figure 3. Members of The Federal Geographic Data Committee and participating agencies were awarded the National Performance Review "Hammer" Award in 1996.

NOAA aircraft, from page 10

The AOC reconfigured one of the Twin Otters to support the Office of Atmospheric Research's Air Research Laboratory's Southern Oxidant Study in 1995. This project was a ground and aircraft-based experiment designed to investigate the emissions, transport, and eventual fate of tropospheric ozone and its precursors. Data collected using the Twin Otter is being used to determine the magnitude and nature of pollutants in the survey area, and the rate of removal of pollutant species and oxidation products at the earth's surface.

Promoting navigational safety

Aerial charts produced by NOAA are the original navigational resource for America's pilots, and provide coverage for the entire United States. With them, pilots can fly safely coast-to-coast by referencing the aircraft's position to ground features. Visually verifying aeronautical chart accuracy from the air is done through the Flight Edit Program of the National Ocean Service (NOS).

Cartographers from NOS's Office of Aeronautical Charting draw from an immense amount of collected information as they create America's aerial navigation products. Old charts, comments by users, government regulations, various aeronautical information

and obstacle databases, and commercial road atlases are just some of the sources of information used to create and update accurate aeronautical charts.

But it's essential to regularly observe the charts from the air. The pilots in the Flight Edit program canvas the continental United States, covering, in five to six years, every square mile of the nation. From the air, Flight Edit pilots are the "eyes" of the cartographer, verifying incomplete or ambiguous data, discovering new obstacles to air naviga-

tion, and evaluating the charts from an aviator's perspective. Aerial cameras are used to take "stereo" photographs of obstacles, which cartographers later use to determine the hazards' heights and features' locations. NOS maintains a computer database of every tower's height in the United States in excess of 200 feet above ground level. The Flight Edit program assists NOS cartographers in keeping that safety-critical database updated and accurate.

- continued on page 16



▲ Figure 4. Twin Otter (DHC-6) in flight over Alaska.

NGDC releases new publication in tsunami series

Tsunamis are a series of waves generated by an impulsive disturbance in the ocean or in a small, connected body of water. These waves sometimes inflict severe damage to property and pose a threat to life in coastal communities. The National Geophysical Data Center (NGDC) and the collocated World Data Center-A for Solid Earth Geophysics have compiled a unique set of tsunami-related products as part of a continuing program to support the interests of seismologists, engineers, oceanographers, and the general public. These data products include technical publications, photographs, and historic tsunami data.

The NGDC is pleased to announce the third in a series of informative publications about tsunamis written by James F. Lander, titled *Tsunamis Affecting Alaska, 1737-1996*. The catalog describes all known tsunamis that have affected Alaska in historic time, expanding the information first provided in *United States Tsunamis, 1690-1988*. Detailed descriptive information is included to better characterize the tsunami hazard. The text is illustrated with pictures, tables, marigram records, and other figures. A separate section is included for the Prince William Sound event of 1964. The 195-page publication is available in soft cover format.

Contact: NGDC

NCDC report on west coast flooding available online

The National Climatic Data Center (NCDC) has completed Technical Report 97-01, *The Winter of 1996-97 West Coast Flooding*, and made it available via NCDC's home page. The report utilizes information previously compiled and available through the NCDC site, and has added additional details. The report includes a narrative describing the event, data tables of precipitation amounts, color analyses and plotted maps, and an infrared image of an incoming storm system.

Contact: NCDC

NGDC online images used in educational WWW site

Dr. Don Reed, Department of Geology at San Jose State University, received permission from the NGDC to utilize NGDC-generated images in illustrating parts of his online course in general oceanography. The course site links to the NGDC web site in several places and uses

Data products and services

NGDC images of microfossils, global relief, and bathymetry. Dr. Reed's site is one of a growing number of online courses including illustrations and exercises available through the Internet. This site is located at URL: <http://geosun1.sjsu.edu/~dreed/105.html>.

Contact: NGDC

NODC announces Gulf of Mexico Hydrographic Data on CD-ROM

The National Oceanographic Data Center (NODC) is pleased to announce the release of "Gulf of Mexico Hydrographic Data" on CD-ROM. The CD-ROM contains both hydrographic data (CTD, XBT, and bottle) and a marine mammals sightings database collected in the Gulf of Mexico over a period covering 1987-1995, under the auspices of Texas A&M University and the Texas Institute of Oceanography.

These data were collected and prepared as part of two U.S. Minerals Management-sponsored programs: the Ship of Opportunity Program (includes CTD, XBT, and bottle data collected from 1987-1995) and the concurrent Gulf Cetacean Program (includes CTD, XBT, and the Marine Mammals Database from 1992-1994). Data on the CD-ROM are separated according to their respective study, and are further subdivided according to parameter type, which includes raw data, bottle data, XBT data, processed data, geopotential anomaly calculations, and data format information files. Detailed information on methodology, data formats, and contact points are available in a READ.ME file incorporated on the CD-ROM.

Contact: NODC

Billion dollar U.S. weather disaster report updated

The NCDC has updated its report on weather-related disasters of 1980-1997 which resulted in overall damages/costs of at least \$1 billion dollars. The report includes 28 events, with five occurring in the period of January 1996 to January 1997. Nineteen events occurred from August of 1992 to January of 1997 (approximately one per quarter) with total damages of approximately \$90 billion dollars and 833 event-related deaths.

The recent increase in frequency can be attributed to a number of factors such as: increasing populations in higher risk areas, possible changes in U.S. weather patterns, and to inflation. The online version of the report (accessible via NCDC's home page) includes links to special reports on some of the events.

Contact: NCDC

NGDC presents scientific and educational slide sets

The NGDC has developed a number of instructive and informative slide sets depicting geologic and space events and research in paleoclimatology. Subjects include: earthquakes (general and specific damage), tsunamis, volcanic eruptions and features, landslides, faults, erosional landforms and seismic creep. A set of 52 slides depicts auras and other lights viewed from space (as collected by DMSP satellites). The paleoclimatology series includes a set of slides documenting coral paleoclimatology and sets documenting low-latitude ice cores, polar ice cores, and rock varnish.

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NOAA Environmental Services Data Directory
301-713-0572
(Gerry Barton)
Fax: 301-713-1249

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WWW: <http://www.esdim.noaa.gov/#data-products>

NOAA Central Library

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Fax: 301-713-4599

E-mail: reference@nodc.noaa.gov
WWW: <http://www.lib.noaa.gov/>

NPOESS, from page 7

able data from the U.S. instruments on both the METOP and U.S. satellites.

- **Capability.** By combining the DMSP and POES programs, not only will the capability of the current systems be preserved, but the Integrated Program Office (IPO) will be able to increase the total satellite system performance through synergism.

- **Management.** NPOESS is managed under the tri-agency IPO. As such, the government/contractor program management staff required is approximately half of what would be required for two separate Program Offices under the old DMSP and POES programs. Furthermore, the System Program Director (SPD) can influence the utilization of existing assets (DMSP and POES satellites) to achieve additional cost savings.

Pending tri-agency Executive Committee (Excom) approval, in mid-March 1997, these approaches will also include the optimization of the NPOESS acquisition to make best use of production and on-orbit assets, to reduce risk on critical sensor payloads and algorithms, and to provide satisfaction to users while better leveraging civil, government, and international payload and spacecraft developments.

The merger of the NOAA and DMSP meteorological satellite systems into a single, national system capable of satisfying both civil and national security requirements for space based remotely sensed environmental data represents a significant and exciting change in the way the United States acquires, manages, and operates environmental satellites. The U.S. and international community will continue to benefit from this new way of doing business well into the next century. The agencies and other associated participants involved are well on their way to creating a system that will cost less and be more responsive to user demands. ■

NEXRAD, from page 12

There were two extensive sessions consisting of papers, speakers, and interactive workstation demonstrations which addressed the mission and progress of this NPI effort at the annual AMS Conference in Long Beach, California in February 1997. This session was part of the Thirteenth International Conference on Interactive Information and Processing Systems.

For further information, please call Bob Saffle, NWS NEXRAD Product Improvement Project Manager (NWS/OSD, Silver Spring, MD), at 301-713-0304 x111, or send e-mail to robert.saffle@noaa.gov. For further information on the Internet, please note that the NPI home page is at <http://isl715.nws.noaa.gov:12530/Nexrad/>, the NWS Modernization home page is at <http://www.nws.noaa.gov/modernize/> and the NWS WSR-88D OSF home page is at <http://www.osf.noaa.gov>. ■

NOAA Aircraft, from page 14

NOAA's multi-disciplinary approach to meeting its pivotal responsibilities as an environmental science agency poses the challenge that the Aircraft Operations Center must meet: to provide capable mission-ready aircraft to the scientific community wherever they are required. The AOC has proven its capabilities time and time again, helping NOAA carry out its diverse environmental mandate while operating safely under some of the world's most demanding flight regimes. ■

ESDIM data rescue, from page 13

still not funded. In answer, NSIDC and the International Permafrost Association (IPA) are cooperating to produce and archive permafrost data from around the world.

NSIDC's data offerings are listed or are available for direct access at <http://www-nsidc.colorado.edu>, or e-mail NSIDC User Services Office at: nsidc@kryos.colorado.edu (Phone: 303-492-6199).

—Florence Fetterer

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