

SECTION 2

RESOURCE INFORMATION AND AGENCY PROGRAM UPDATES

The tables in this section summarize budgetary information of the Federal government for Fiscal Years 2004 and 2005. The funds shown are those used to provide meteorological services and associated supporting research that has as its immediate objective the improvement of these services. Fiscal data are current as of the end of July 2004 and are subject to later changes. The data for FY 2005 do not have legislative approval and do not constitute a commitment by the United States Government. The budget data are prepared in compliance with Section 304 of Public Law 87-843, in which Congress directed that an annual horizontal budget be prepared for meteorological programs conducted by the Federal agencies.

AGENCY OBLIGATIONS FOR METEOROLOGICAL OPERATIONS AND SUPPORTING RESEARCH

Table 2.1 contains fiscal information, by agency, for meteorological operations and supporting research. The table shows the funding level for Fiscal Year (FY) 2004 based on Congressional appropriations, the budget request for FY 2005, the percent change, and the individual agencies' percent of the total Federal funding for FY 2004 and FY 2005.

DEPARTMENT OF AGRICULTURE (USDA)

The USDA budget request for FY 2005 is \$39.45 million for operations and supporting research, representing a 16.4 percent decrease from FY 2004. A large portion of this decline was due to changes in budget reporting procedures by the Forest Service. Beginning in 2005, the budget number for "Operations" no longer includes funds for the Forest Service air quality program. USDA operational activities include specialized weather observing networks such as the snow telemetry (SNOTEL) system operated by the Natural Resources Conservation Service (NRCS) and the remote automated weather stations (RAWS) network managed by the Forest Service. The SNOTEL and RAWS networks provide cooperative data for NOAA's river forecast activities, the irrigation water supply estimates, and Bureau of Land Management operations. The Forest Service is also the world leader in

developing emissions factors from fires and modeling its dispersion.

The USDA and the Department of Commerce (DOC) jointly operate a global agricultural weather and information center located in Washington, D.C. This Joint Agricultural Weather Facility operationally monitors global weather conditions and assesses the impacts of growing season weather on crop and livestock production prospects. This information keeps crop and livestock producers, farm organizations, agribusinesses, state and national farm policy-makers, government agencies, and foreign buyers of agricultural products apprised of worldwide weather-related developments and their effects on crops and livestock. Furthermore, tracking weather and crop developments in countries that are either major exporters or importers of agricultural commodities keeps the agricultural sector informed on potential competitors. USDA is also actively involved in drought monitoring efforts in concert with the National Drought Mitigation Center.

For supporting research, USDA funds research projects through the Cooperative State Research, Education and Extension Service (CSREES) that study the impact of climate and weather on food and fiber production. The goal of supporting research is to develop and disseminate information and techniques to ensure an abundance of

high-quality agricultural commodities and products while minimizing the adverse effects of agriculture on the environment. Furthermore, the Agricultural Research Service (ARS) conducts research on how annual variation in weather adversely effects crop and animal production, hydrologic processes, the availability of water from watersheds, and the environmental and economic sustainability of agricultural enterprises.

DEPARTMENT OF COMMERCE (DOC)

All reported DOC meteorological activities are within the National Oceanic and Atmospheric Administration (NOAA). The NOAA FY 2005 total congressional request of \$1.85 billion for meteorological programs represents an increase of 3.6 percent over the FY 2004 appropriated funds. NOAA's FY 2005 operations and supporting research requests for major line office activities are described below:

Weather Services.

The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the U.S., its territories, adjacent waters, and ocean areas for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other gov-

TABLE 2.1 METEOROLOGICAL OPERATIONS AND SUPPORTING RESEARCH COSTS*, BY AGENCY
(Thousands of Dollars)

AGENCY	Operations		% of		Supporting Research		% of		Total		% of	
	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005
Agriculture	16265	12018	-26.1	0.4	30931	27431	-11.3	6.2	47196	39449	-16.4	1.5
Commerce/NOAA(Subtot)	1689189	1768220	4.7	64.7	98672	83377	-15.5	18.8	1787861	1851597	3.6	56.4
NWS	824895	836849	1.4	30.6	20700	20355	-1.7	4.6	845595	857204	1.4	26.7
NESDIS	830266	897881	8.1	32.9	23791	26008	9.3	5.9	854057	923889	8.2	26.9
OAR	3208	0	-100.0	0.0	52525	35358	-32.7	8.0	55733	35358	-36.6	1.8
NOS	17330	20000	15.4	0.7	500	500	0.0	0.1	17830	20500	15.0	0.6
NMAO	13490	13490	0.0	0.5	1156	1156	0.0	0.3	14646	14646	0.0	0.5
Defense(Subtot)	509762	492612	-3.4	18.0	60564	49526	-18.2	11.2	570326	542138	-4.9	18.0
Air Force	292589	294856	0.8	10.8	16098	16526	2.7	3.7	308687	311382	0.9	9.7
DMSP**	16130	16088	-0.3	0.6	3816	918	-75.9	0.2	19946	17006	-14.7	0.6
Navy	137956	139366	1.0	5.1	24590	21400	-13.0	4.8	162546	160766	-1.1	5.1
Army	63087	42302	-32.9	1.5	16060	10682	-33.5	2.4	79147	52984	-33.1	2.5
Homeland Security (Subtot)	14560	17030	17.0	0.6	0	0	0.0	0.0	14560	17030	17.0	0.5
USCG	14560	17030	17.0	0.6	0	0	0.0	0.0	14560	17030	17.0	0.5
Interior/BLM	2400	2400	0.0	0.1	0	0	0.0	0.0	2400	2400	0.0	0.1
Transportation(Subtot)	449368	438146	-2.5	16.0	27782	28445	2.4	6.4	477150	466591	-2.2	15.0
FAA	449368	438146	-2.5	16.0	23782	21495	-9.6	4.9	473150	459641	-2.9	14.9
FHWA	0	0	0.0	0.0	4000	6950	73.8	1.6	4000	6950	73.8	0.1
EPA	0	0	0.0	0.0	8732	9000	3.1	2.0	8732	9000	3.1	0.3
NASA	2204	2544	15.4	0.1	262200	245100	-6.5	55.3	264404	247644	-6.3	8.3
NRC	50	120	140.0	0.0	0	0	0.0	0.0	50	120	140.0	0.0
TOTAL	2683798	2733090	1.8	100.0	488881	442879	4.0	100.0	3172679	3175969	0.1	100.0
% of FY TOTAL	84.6%	86.1%			15.4%	13.9%			100.0%	100.0%		

*The FY 2004 funding reflects Congressionally appropriated funds; the FY 2005 funding reflects the amount requested in the President's FY 2005 budget submission to Congress.

**DMSP is the Defense Meteorological Satellite Program that supports all DOD Components and other government agencies. It is primarily funded and managed by the Air Force.

ernment agencies, the private sector, the public, and the global community. The U.S. is the most severe-weather-prone country on Earth. Each year, Americans cope with an average of 10,000 thunderstorms, 2,500 floods, 1,000 tornadoes, as well as an average of 6 deadly hurricanes. Some 90 percent of all Presidentially-declared disasters are weather related, causing approximately 500 deaths per year and \$11 billion in damage. According to the American Meteorological Society, weather is directly linked to public safety and about one-third of the U.S. economy (about \$3 trillion) is weather sensitive. In 1997-98, seasonal and interannual variations in climate, like El Niño, led to economic impacts on the order of \$25 billion. All of these impacts are further magnified by current socio-economic trends such as population growth in severe-weather-prone areas of the country, drought, and increasing demands for fresh water. In addition, key NOAA customers such as industry, state and local governments, and emergency managers are demanding more reliable and more specific weather, water, and climate information for use in key decision making.

These multiple demands all point to the need to sustain and improve NWS's core observing, forecasting and warning services. The NWS continues to establish and track key service performance improvement goals and has been recognized within and without government as a leader in performance-based management and for actually delivering on the goals it has set. With the FY 2005 budget, the NWS will continue to focus resources toward improving its core performance measures including tornado warning lead time (13 minutes); flash flood warning accuracy (89 percent); winter storm warning accuracy (90 percent); 48 hour hurricane track forecast error (128 nautical miles); aviation ceiling/visibility accuracy (46 percent);

marine wind speed forecast accuracy (60 percent); and marine wave height forecast accuracy (72 percent).

The FY 2005 President's Budget Request supports the funding and program requirements necessary to address established NOAA/NWS strategic goals and sets NWS on a path to achieve its vision: Produce and deliver forecasts that can be trusted; use cutting-edge technologies; provide services in a cost-effective manner; strive to eliminate weather-related fatalities; and improve the economic value of weather information.

- NOAA requests an increase of \$12,269,000 and 0 Full Time Equivalent (FTE) manpower authorizations to fund adjustments to current programs across all accounts in the National Weather Service. The increase will fund the estimated FY 2005 Federal pay raise of 1.5 percent and annualize the FY 2004 pay raise of 4.1 percent. NWS is very labor intensive and depends on pay related adjustments to ensure continuity of services: labor costs comprise approximately 70 percent of the NWS operations budget. The increase will also provide inflationary increases for non-labor activities, including maintenance contracts, utilities, field office lease payments, and rent charges from the General Services Administration.

In addition to the adjustments to base above, NOAA requests increases to reflect the transfer of two programs from the Office of Oceanic and Atmospheric Research to the NWS:

- NOAA requests \$5,298,000 and 51 FTE in the NWS budget to reflect the transfer of the Space Environment Center (SEC) from the Office of Oceanic and Atmospheric Research (OAR) to the NWS. The SEC will become an official center under the NWS's National Center for Environmental Prediction (NCEP). The SEC provides predictions of the Earth's space environment, which are largely driven by solar phenomenon

that impact the Earth. SEC produces alerts and warnings of space weather events, and provides data in real time to the public. In recognition of the operational nature of these functions, the Administration has concluded that the SEC mission is a valid and necessary component of NOAA's operational environmental modeling and prediction mission. The transfer will place SEC in an operational capacity better suited to meeting the NOAA mission.

- NOAA requests \$5,200,000 and 17 FTE to reflect the transfer of U.S. Weather Research Program (USWRP) from the OAR to NWS.

The focus of USWRP is the short-term transition of research to operations. This transition function can be more effectively implemented in the NWS, where applied research activities can occur side by side with weather forecast operations.

- NOAA also requests a technical adjustment to the current program level of \$7,313,000 to reflect the transfer of Weather Forecast Office (WFO) maintenance funds back to the Operations, Research and Facilities (ORF) account. In FY 2004, these funds were requested in the ORF account, but appropriated in the Procurement, Acquisition and Construction (PAC) account.

- A net increase of \$13,739,000 and 0 FTE over the current program level, is requested for a total of \$611,448,000, and 4,121 FTE under the Local Warnings and Forecasts line item of the Operations and Research subactivity.

- NOAA is requesting \$5,500,000 and 0 FTE over the current program level for a total request of \$5,500,000 for the Air Quality Forecasting Pilot Program. Operational implementation of a NOAA Air Quality Forecast model will provide an initial operating capability for 24-hour ozone forecasts at hourly intervals for the Northeastern U.S.. Mid-term actions will expand the initial operating capability nationwide for ozone forecasts by FY 2009,

and NOAA's longer-term target is for an initial particulate matter forecast capability by FY 2012. Poor air quality leads to health problems and loss of life in the U.S.. One study estimated that annual impacts nationwide are over 40,000 deaths from airborne particulate matter and \$147 billion spent treating air pollution related illnesses (Science, 2002). These losses can be mitigated with accurate and timely air quality forecasts as part of an air management system that provides information needed to change public behavior in advance of predicted poor air quality. In cooperation with the Environmental Protection Agency (EPA) and state and local agencies, NOAA/NWS will provide operational air quality models and generate forecast pollutant concentration fields and provide them to the EPA. EPA will then interpret and disseminate this information to state and local users for eventual application in the public and commercial sectors. In FY 2005, the NWS pilot project aims to achieve 90 percent forecast accuracy for ozone in the Northeast. This goal reflects the ability to predict the onset of poor air quality conditions.

- NOAA is requesting an increase of 0 FTE and \$1,000,000 over the current program level for a total of \$2,300,000 to support THORPEX (The Hemispheric Observing System Research and Predictability Experiment): A Global Atmospheric Research Program. In THORPEX, NOAA partners with the National Aeronautics and Space Administration, the U.S. Navy and the National Science Foundation, as well as Canada, China, France, Germany, India, Japan, Korea, United Kingdom, the Russian Federation, Australia and the European Commission to advance the science of extended range global weather predictability. The NOAA THORPEX program is designed to accelerate the improvement of the Nation's operational three-day to two-

week high impact weather forecasts. The overarching goal of the NOAA THORPEX program is to provide the Nation with 7-14 day weather forecasts that are as reliable and useful as current 2-3 day weather forecasts. This request is a component of the U.S. Weather Research Program (USWRP), and a substantial part of the funds will be spent through competitive grant processes within the USWRP, and will augment the USWRP Collaborations Fund. The THORPEX program will make America's extended weather forecast skill the world leader in a decade. NOAA is requesting an additional \$239,000 over the current program level for the U.S. Weather Research Program to maintain current operations.

- NOAA is requesting an increase of \$2,214,000 and 0 FTE over the current program level for the Space Environment Center (SEC). NOAA has reviewed the operating costs of the SEC and has determined that the SEC can operate at a level of \$7,512,000 and requests this increase to achieve that level of funding. This establishes the funding level necessary to maintain the SEC's products and services.

- NOAA is also requesting an increase of \$4,786,000 and 0 FTE to maintain current operations. This includes several increases, as follows: Local Warnings and Forecasts Base, +\$2,596,000; Alaska Data Buoys, +\$200,000; Facilities Physical Security, +\$1,950,000; and Advanced Hydrological Prediction Services, +\$40,000.

- NOAA requests a net decrease of \$812,000 below current program levels, for a total of \$71,681,000 for the NWS PAC-Systems Acquisition line item.

- NOAA requests an increase of 0 FTE and \$360,000 above current program levels for a total of 0 FTE and \$11,860,000 for the Weather Surveillance Radar-1988 Doppler (WSR-88D) program. This reflects the planned accelerated completion of Open Systems Radar Data Acquisition (ORDA) unit development (125 in FY

2005 for a total of 150); the continuation of full scale development of Dual Polarization technology; and the support given to the development, testing, and transition activities necessary to integrate new observational data sets into NOAA's operational numerical weather prediction systems. Implementation of ORDA will enable the NWS to improve tornado warning lead times from 11 minutes to 15 minutes by FY 2007 through the following improvements: (1) double the range for detection of small tornadoes from 120 kilometers to 240 kilometers, (2) increase coverage area for small tornadoes by 80 percent, and (3) accelerate volume scanning from 5 minutes to 2.5 minutes. When fully implemented (end of FY 2010), dual polarization technology will enable NWS forecasters to provide better rainfall estimates, better identify different forms of precipitation, and provide information on aircraft icing potential. Improvements to data assimilation and modeling systems using WSR-88D data will result in improvements to three-day precipitation forecast accuracy from 26 percent to 29 percent by FY 2009.

- NOAA requests an increase of \$870,000 above current program levels, for a total of \$3,740,000, for the NWS Telecommunications Gateway Legacy Systems Replacement to complete a two year effort to replace the National Weather Service Telecommunications Gateway (NWSTG) switching system and repair and upgrade NWSTG facilities. Installed at NWS Headquarters in 1989, the NWSTG cannot meet current and projected data throughput volumes, and relies on obsolete information system and facilities infrastructure. The increasing data volume associated with higher resolution numerical weather prediction model output and advanced radar products have and will continue to degrade performance, causing long delays in delivery of critical products to field offices, emer-

agency managers, and the general community of users. Data volume associated numerical weather prediction models (NWP), radar, and satellite products will approach 3,500 gigabytes per day by FY 2007, up from 500 gigabytes per day in FY 2003.

The NWSTG is the Nation's weather information communications hub, responsible for the acquisition and distribution of hydrometeorological data for NWS national centers and forecast offices, many Federal agencies including the Department of Defense (DOD), private and commercial partners, the public, and numerous international partners. During FY 2005, NWS will complete server and front-end processor replacement and will address facility deficiencies, including cooling systems and uninterruptible power supply systems. The new NWSTG system will meet a delivery performance target of 10 seconds to process severe weather watches and warnings.

- **Cooperative Observer Network Modernization (COOP):** NOAA is requesting an increase of \$1,400,000 above the current program level to operate and maintain modernized Cooperative Observer sites installed under the High Temperature Resolution Program in FY 2003 and FY 2004 (a total of 460 sites in the Northeastern U.S.). NWS will continue the planning of the COOP Network Modernization, including identification of non-NOAA surface observing networks (mesonets) that meet NWS standards. NWS will also continue to support the central database and processing capability to make high-density surface observations available to its customers. The COOP modernization will eventually provide the U.S. with a network of accurate, near real-time surface weather data (temperature, precipitation, soil moisture) obtained with state-of-the-art measurement, monitoring, and communication equipment. Quality-controlled, higher-density, real-time surface data will improve

temperature forecast skill, river height forecast error, drought monitoring resolution, hydrology planning, and energy optimization for NWS customers. (A Tennessee Valley Authority study found that a one-degree improvement in temperature forecasting could save \$1 billion annually in energy costs.)

- **Coastal Global Ocean Observing System (C-GOOS):** NOAA requests an increase of \$2,000,000 and 0 FTE above the current program level to establish a Coastal-Global Ocean Observing System for the National Weather Service. The C-GOOS is a new initiative, fulfilling the U.S. coastal component of the international GOOS effort, and addresses the mandate of the President's Commission on Ocean Policy and the National Oceanographic Partnership Program to bring together government, industry and academia. NOAA's C-GOOS will add oceanographic sensors to the existing NWS Marine Observational Backbone. The COOP Network Modernization will greatly improve drought monitoring resolution and accuracy.

- **NOAA All Hazards Weather Radio (NAHWR):** NOAA requests a decrease of \$5,442,000 and 0 FTE below the current program level to reflect the completion of an effort to automate the collection and dissemination of civil-emergency messages over NOAA Weather Radio.

- **NOAA Center for Weather and Climate Prediction (NCWCP):** NOAA requests a decrease of \$7,991,000 and 0 FTE, for a total of \$2,300,000 and 0 FTE to continue project management support for the NCWCP project. The remaining funding will ensure project continuity for work initiated in FY 2004.

Environmental Satellite, Data, and Information Services.

Proposed funding for FY 2005 includes an increase in the Polar-Orbiting Satellite Program of \$24.7 million and an increase in the Geostationary Satellite Program of \$31.8 million. These changes allow

for continuation of procurements to provide the spacecraft and instruments, launch services, and ground systems necessary to assure continuity of environmental satellite coverage. The FY 2005 budget request will maintain a system of polar-orbiting satellites that obtains global data and a system of geostationary satellites that provides near-continuous observations of the Earth's western hemisphere. Funding is included for NOAA's share of the converged NOAA and Department of Defense (DOD) polar-orbiting system that will replace the current NOAA series and the DOD Defense Meteorological Satellite Program (DMSP).

A total of \$4.0 million is requested to continue the Ocean Remote Sensing Program, which began in FY 1995. During the next several years, NOAA will acquire data from foreign and other non-NOAA satellites that will provide measurement of ocean currents, surface winds and waves, subsurface temperature and salinity profiles, ice thickness and flows, and other marine factors.

A total of \$96.5 million is included in the budget request to maintain basic mission satellite services including maintenance and operation of satellite ground facilities; provision of satellite-derived products, including hazards support; and conduct of research to improve the use of satellite data.

\$52.5 million is included in the budget request for the NOAA Data Centers and Information Services subactivity base operating funds.

Ocean Service.

Funding provided through the FY 2005 budget will allow the continuation of the second generation of the NOS CO-OPS advanced data quality control program, the Continuous Operational Real-time Monitoring System (CORMS AI), as well as the continued implementation of its development program of the Ocean Systems Test and Evaluation Program (OSTEP). The FY 2004 budget

allowed for sufficient support to operate the National Water Level Observation Network (NWLON) and for continued growth of the Physical Oceanographic Real-Time System (PORTS). Both the NWLON and PORTS programs have subsets of operational water level stations with meteorological sensors installed for various partners and users, including the NWS.

Under the NOAA-Wide Coastal Storms Initiative (CSI), targeted stations of existing Federal and state tide station networks have been funded to be enhanced with new meteorological sensors. Under a NOAA Ocean Service Partnership Proposal first funded in FY 2002, a subset of the NWLON in the Great Lakes was enhanced with new meteorological sensors and with continuous GPS. Previously, special, water level stations were enhanced with meteorological sensors in the Gulf of Mexico with funding from the NWS Southern Region. In FY 2004, NOS continued to work cooperatively with the NWS National Data Buoy Center to establish common procedures and data streams for meteorological and water level data from NOS and NDBC observing systems. NOS operational nowcast/forecast modeling activities are expanding and rely upon NWS Eta model data streams as hydrodynamic model drivers. Office of Atmospheric Research.

Requested funding for FY 2005 for Weather and Air Quality research is \$35.4 million--a decrease of \$20.4 million or almost 37 percent from the FY 2004 enacted level. Increases consist of a base adjustment of \$0.8 million to partially cover inflationary cost increases. Two major transfers of programs from NOAA Research to the National Weather Service are proposed - the Space Environment Center (\$5.3 million and 51 FTE) and the U.S. Weather Research Program (\$5.2M and 17 FTE). Finally, terminations totaling \$10.8 million are proposed for: Atmospheric Investigation

Regional Modeling Analysis and Prediction (AIRMAP) (\$4.9 million); New England Air Quality Study (\$3.0 million); the "STORM" Program at the University of Northern Iowa (\$0.5 million); Targeted Wind Sensing (\$1.9 million), Remote Sensing Research at the Idaho State University/Boise Center Aerospace Laboratory (\$0.5 million), and East Tennessee Ozone Study (\$0.3 million).

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

The FY 2005 DOC/DOD budget request for NPOESS is \$615.3 million. FY 2005 funds will be used for the continued development of system architecture, technology development efforts, and critical sensor and algorithm development. NPOESS is planned to be launched in FY 2010. This system will exploit advanced hardware and software technologies to produce a more reliable, longer-lived spacecraft with greater mission capability. In addition to new products, NPOESS will also provide a significant reduction (90 minutes to 30 minutes) in the time required to move from sensed to processed data.

NOAA Marine and Aviation Operations (NMAO).

NMAO supports meteorological activities by collection of related data from ships and aircraft. The FY 2005 President's Budget does not include any significant increases or decreases from the FY 2004 appropriation for NMAO that are related to meteorological data collection.

DEPARTMENT OF DEFENSE (DOD)

The DOD total budget request for FY 2005, excluding NPOESS funding, is \$542.1 million which represents a funding decrease of 4.9 percent from FY 2004. Specific highlights for each of the military departments are described below:

U.S. Air Force.

U.S. Air Force (USAF) resources

for meteorological support fall into several categories: general operations, investment and research, Defense Meteorological Satellite Program (DMSP) operations, and DMSP supporting research. The total USAF request for FY 2005, including DMSP, is \$328.4 million.

General Operations: The operations portion of the FY 2005 budget request is \$295 million and funds day-to-day environmental support to the DoD, including the active and reserve components of the Air Force and Army, nine unified commands, and other agencies as directed by the Chief of Staff of the Air Force. Just over 4,900 active duty and reserve component military, civilian, and contract personnel conduct these activities at more than 290 locations worldwide. Approximately 85 percent of personnel specialize in weather; the remainder includes communications, computer, administrative, and logistics specialists.

General Supporting Research: The FY 2005 budget request for supporting research is \$16.5 million. The Air Force continues development of the Space Weather Analysis and Forecast System (SWAFS). This project and other research efforts will investigate the electrodynamics of the Sun and Earth's magnetosphere, ionospheric dynamics, mesoscale meteorology, visible and infrared properties of the environment, and cloud parameterization and prediction.

DMSP Operations: Though funding for DMSP comes from the Air Force, this system is a major source of space-borne meteorological data for the military services and other high-priority DoD programs. DMSP environmental data is also distributed to the National Weather Service (NWS), National Environmental Satellite, Data, and Information Service (NESDIS), the Navy's Fleet Numerical Meteorology and Oceanography Center

(FNMOC), the Naval Oceanographic Office (NAVOCEANO), and Air Force Weather Agency (AFWA) according to the Shared Processing Program agreement.

The DMSP operations and maintenance portion of the FY 2005 budget request is \$16.1 million, the majority of which is for on-orbit satellite operations, long-haul communications, and one dedicated command and control facility. DMSP funds for 120 military and civilian personnel associated with the operation and sustainment of the DMSP command, control, and communications segment.

DMSP Supporting Research: The FY 2005 DoD R&D budget for DMSP is \$0.92 million for the continued development of system architecture, technology, critical sensors, and algorithms.

U.S. Navy.

The U.S. Navy FY 2005 budget request for meteorological programs is \$160.8 million. The request includes \$139.4 million for operational programs and \$21.4 million for supporting research.

The Navy Meteorology and Oceanography (METOC) program is truly unique. Focusing support in the environmentally complex coastal/littoral regions around the globe, Navy METOC is required to provide battlespace awareness for the warfighter by assessing of the impact of weather and ocean phenomena on sensor and weapon systems. Additionally, and just as important, Navy METOC provides for safe flight and navigation in support of Naval, joint, and combined forces operating throughout the world's oceans. This is done with a cadre of highly trained military and civilian personnel, schooled in both the sciences and warfighting applications. By teaming with, and leveraging the efforts of other agencies and activities, Navy METOC meets these challenges in a most cost-effective manner, providing a full spectrum of products and services with only about 5 percent of

the Federal weather budget.

The Navy METOC Program is required to provide comprehensive and integrated weather and ocean support worldwide. The Oceanographer of the Navy sponsors programs in four closely related disciplines - meteorology, oceanography, geospatial information and services, and precise time and astrometry. All are used to protect ships, aircraft, fighting forces, and shore establishments from adverse ocean and weather conditions, and to provide a decisive tactical or strategic edge by exploiting the physical environment to optimize the performance and efficiency of platforms, sensors, and weapons.

Owing to the crucial interrelationship of the oceans and the atmosphere, the Navy requires various oceanographic products to provide the requisite meteorological services. In addition to aviation and marine METOC support, the Navy provides a variety of unique services on demand, such as electro-optical, electro-magnetic and acoustic propagation models and products, METOC-sensitive tactical decision aids, and global sea ice analyses and forecasts.

Support to Navy operations is provided under the direction of the Commander, Naval Meteorology and Oceanography Command located at the Stennis Space Center, Mississippi. Naval METOC support starts with sensing the battlespace physical environment and culminates with weapons arriving on target and personnel operating in the battlespace without being adversely affected by physical environmental phenomena. Operational support for the Navy and Marine Corps includes the day-to-day provision of meteorological and oceanographic (METOC) products and services. As naval operations in the littoral increase, Navy METOC support is directed towards providing on-scene capabilities to personnel that directly furnish environmental data for sensor and weapon system planning and

employment. These on-scene capabilities are key elements for enabling the warfighters to take advantage of the natural environment as part of battlespace management.

Navy METOC systems acquisition is accomplished through the Program Executive Office for Command, Control, Communications, Computers and Intelligence and Space (C4I and Space) in San Diego, California. Several major METOC operations support systems are being procured or undergoing upgrades.

Navy METOC Research and Development (R&D) is cooperatively sponsored by the Oceanographer of the Navy and the Chief of Naval Research. This area is not generally system-specific; instead, Navy R&D efforts typically have applications to meteorological, oceanographic, and/or tactical systems. Navy's tabulation of budget data includes R&D funding for basic research, applied research, demonstration and validation, and engineering and manufacturing development.

Projects initiated by the Navy and Marine Corps, under sponsorship of the Oceanographer of the Navy, transition from exploratory development to operational naval systems. Such efforts include advances in the Navy's METOC forecasting capability, enhancements to communications and data compression techniques, further development and improvement of models to better predict METOC parameters in littoral regions, and an improved understanding of the impact these parameters have on sensors, weapon systems, and platform performance.

As the U.S. Navy transforms under SEAPOWER 21, increased emphasis will be placed on the naval force's capabilities for operational maneuverability, precise weapons employment, indefinite sustainment and protection of joint forces. The Navy METOC Community continues to work closely with research developers and operational forces to ensure that naval and

joint force commanders will always have the most accurate, timely, and geo-referenced METOC information available for successful operations.

U.S. Army.

U.S. Army estimates a requirement for \$42.3 million for operational support and \$10.7 million in research and development in FY 2005. The total amount of money budgeted for weather support is estimated because the costs to support the Air Force Combat Weather Teams are normally part of the overall G-3 or G-2 operating budget at the MACOM, Corps, Division, or Brigade level, and do not have their own program element or budget line. Operational support is projected to decrease approximately \$20.8 million over the FY 2004 expenditures, research is estimated to decrease about \$5.4 million from the previous year, and staffing increases moderately. Budget reductions for the Integrated Meteorological System (IMETS) and the Meteorological Measuring Set - Profiler (MMS-P) programs account for the bulk of the projected decreases in operational funding for the Army in this year's report. The \$5.4 million decrease in research and development reflects funding requested but not yet approved for Army Research Laboratory. Approval of these funds would result in an overall R&D budget roughly equal to that of last year. Increases in staffing are a result of a projected increase in ARYMET units within FORSCOM.

Army monies for meteorology are spent in four main areas: support to U.S. Army Artillery Met Sections (ARTYMET), support to U.S. Air Force Combat Weather Teams at Army locations, research and development related to the Army mission, and the development, production, and maintenance of Army meteorological systems.

U.S. Army Major Commands (MACOMs) with Staff Weather Officers and their associated Combat Weather Teams provide the same sup-

port and services to Air Force weather personnel that they normally provide to Army personnel. This support is provided at all levels within the MACOM where Air Force Weather personnel are assigned. Support to Air Force Weather Teams includes the use of facilities to house weather operations, medical support, access to training facilities, office supplies, utilities and maintenance for weather facilities, vehicles and tactical equipment, and funding for official travel. Eighth U.S. Army, U.S. Army Europe, U.S. Army Pacific, Forces Command, and Training and Doctrine Command all provide this support to Air Force weather personnel assigned at the MACOM level and below.

Major portions of MACOM meteorological budgets go to support Artillery Meteorology Sections, also known as ARTYMET Teams, or Met Sections. Artillery Met Sections release weather balloons and track their movement to measure both speed and direction of upper level winds. Wind data are then passed to the U.S. Army Artillery units for firing computations. Artillery Met Sections range in size from six personnel at a Light Division to twelve personnel at a Heavy Division. There are twenty-five Met Sections in the Active Component, with each Met Section averaging four hundred balloon flights per year. There are forty-eight Met Sections in the Army National Guard (ARNG), with each Met Section averaging approximately one hundred balloon flights per year. The ARNG's forty-eight teams employ 288 part-time personnel. Each of the Guardsmen trains an average of 39 days per year, equating to 31 FTE positions for this report. Eighth U.S. Army, U.S. Army Europe, U.S. Army Pacific, Forces Command, and the Army National Guard all support Met Sections.

Training and Doctrine Command supports twenty-four military and civilian personnel at the U.S. Army Artillery School at Fort Sill,

Oklahoma. These personnel train ARTYMET Teams on the use of the AN/TMQ-41

Meteorological Measuring Set. ARTYMET team structures will be changing over the next few years to support the Army's new modularity concept. FORSCOM is already making these changes to its artillery sections, and other MACOMS will follow as their forces transform to the new units of action.

There were only minor variations from last year's budget among the MACOMs for operational support, mainly due to annual cost of living increases. One exception is FORSCOM, which projects an increase of nearly \$3 million from the previous year to support nine additional ARTYMET sections required under Army modularity in FY 2005. Of the \$11.1 million budgeted, \$10.85 million will be used in support of FORSCOM ARTYMET operations and \$264,000 will be spent for supplies and travel for Air Force weather teams supporting FORSCOM units.

The Army Corps of Engineers - Civil Operations has programmed funds in FY 2005 for operational programs and basic research related to meteorology. The Army Corps of Engineers - Military Operations has programmed funding for meteorological research and development efforts related to soil moisture.

Space and Missile Defense Command (SMDC) supports two main meteorological missions. SMDC has funding designated for the operational support at the High Energy Laser Systems Test Facility (HELSTF) for contract services to operate and maintain the instrumentation, equipment, and facilities to support the atmospheric sciences/meteorological mission. SMDC also operates contract support services to operate the Ronald Reagan Missile Defense Test Site for operations support and special weather programs.

Army Materiel Command (AMC) will fund a variety of activities for FY 2005, most of which fall into

research and development and systems acquisition. AMC will fund developmental and testing costs associated with the IMETS. The IMETS budget for FY 2005 underwent a \$11.9 million reduction to fund higher priority needs within the Army. Normal program life cycle issues reduced the Artillery's Profiler budget by \$11.8 million in FY 2005. There was a planned purchase of only 3 Profiler systems in FY 2005, compared to a purchase of 10 systems in the previous year. In addition, the Profiler RDT&E budget came to an end in FY 2004, as Profiler transitioned to its production phase. Other activities within AMC include Army Research Laboratory, Battlefield Environment Division, which will continue to operate an integrated program of both basic and applied research. The Army Research Office will continue basic research activities and will maintain a relatively stable budget in FY 2005. AMC's Field Assistance in Science and Technology (FAST) Activity will fund deployment of new lightweight meteorological systems to test in support of ARTYMET programs.

As a result of changes in the U.S. Army Research Institute of Environmental Medicine (USARIEM) research program for FY 2004, there was a significant reduction in expenditures on weather-related research. That decrease was offset by funding of an SBIR Phase II Plus to expand the capabilities of a Microenvironmental Sensor Package. FY 2005 funding for weather-related research efforts at USARIEM should decrease relative to the FY 2004 Level due to completion of the SBIR.

Headquarters, Department of the Army, Deputy Chief of Staff, G-2 employs two full-time meteorologists for development of meteorological policy; coordination of meteorological support within the Department of the Army and with other Department of Defense and Federal agencies and organizations; Department of the Army

Policy concerning weather; environmental services, and oceanographic support to the Army (less those environmental services functions assigned to the Corps of Engineers); and Department of the Army policy concerning peacetime weather support and point weather warnings. This office also sponsors a company grade Army liaison officer at the Air Force Weather Agency (AFWA) in Omaha, Nebraska, to serve in a consulting role to AFWA. The Air Force provides one full time Staff Weather Officer to serve as a liaison between Air Force Weather and the Army Staff.

DEPARTMENT OF HOMELAND SECURITY (DHS)

On March 1, 2004, the Department of Homeland Security (DHS) assumed primary responsibility for ensuring that emergency response professionals are prepared for any situation in the event of a terrorist attack, natural disaster, or other large-scale emergency. This entails providing a coordinated, comprehensive Federal response to any large-scale crisis and mounting a swift and effective recovery effort. DHS will also prioritize the important issue of citizen preparedness, and educating America's families on how best to prepare their homes for a disaster and tips for citizens on how to respond in a crisis will be given special attention at DHS.

U.S. Coast Guard (USCG).

All of USCG's funding for meteorological programs is for operations support. For FY 2005, the requested funding level is \$17.0 million. (The Coast Guard does not have a specific program and budget for meteorology--all meteorological activities are accomplished as part of general operations.)

The Coast Guard's activities include the collection and dissemination of meteorological and iceberg warning information for the benefit of the marine community. The Coast Guard also collects coastal and marine observations from its shore stations and cut-

ters, and transmits these observations daily to the Navy's Fleet Numerical Meteorology and Oceanography Center and NOAA's National Weather Service. These observations are used by both the Navy and NOAA in generating weather forecasts.

The Coast Guard also disseminates a variety of weather forecast products and warnings to the marine community via radio transmissions. Coast Guard shore stations often serve as sites for NWS automated coastal weather stations, and the National Data Buoy Center provides logistics support in deploying and maintaining NOAA offshore weather buoys.

The International Ice Patrol conducts iceberg surveillance operations and provides warnings to mariners on the presence of icebergs in the North Atlantic shipping lanes. Coast Guard efforts in meteorological operations and services have not changed significantly during recent years.

DEPARTMENT OF THE INTERIOR (DOI)

The total DOI/BLM weather funding request for FY 2005 is \$2.4 million. This amount is for meteorological operations and the support of the Bureau of Land Management (BLM) Remote Automatic Weather Station (RAWS) program. An additional \$1.1 million is recovered each year through reimbursable accounts with participating agencies. Normal operations and maintenance of the RAWS program is approximately \$900,000 yearly. (This includes travel, transportation, utilities, services, supplies, equipment and other non-labor costs.) Changes in FY 2004 amounts reflect corrected budget information.

Support of the RAWS program by the BLM will continue in FY 2005, as part of the Wildland Fire Agencies' participation in Fire Weather activities and the National Fire Danger Rating System (NFDRS). In addition to upgrading and maintaining fixed-site RAWS, the BLM will address increas-

ing demand for the use of mobile units for both fire and non-fire applications. Continued efforts will be made to achieve an optimum balance of fixed and mobile RAWS resources and support. Cooperation between DOI agencies and the USDA Forest Service regarding combined meteorological requirements for the National Wildland Fire support functions is ongoing. Interagency RAWS activity is coordinated at a working group level with representation by all participants, and will continue to implement NFDRS standards to ensure the protection of both life and property from wildland fires.

DEPARTMENT OF TRANSPORTATION (DOT)

The DOT total budget request for FY 2005 is \$466.6 million which represents a funding decrease of 2.2 percent from FY 2004. The meteorological programs for the Federal Aviation Administration and the Federal Highway Administration, for FY 2005, are described below.

Federal Aviation Administration (FAA).

For 2005, FAA has requested a total \$459.6 million for the Aviation Weather Programs including acquisition of new systems, operations and support, and supporting research. The actual funding for aviation weather in FY 2004 was \$473.2 million. The \$13.5 million decrease in FY 2005 constitutes a 2.9 percent reduction in total funding. The changes are comprised of a) decreases in acquisitions of \$20.1 million (-21.5 percent) to \$73.1 million, as systems are maturing to field operations and some budgetary fluctuations; b) increases in operations and support of \$9.0 million (+2.5 percent) to \$361.0 million, reflecting salary increases for air traffic specialists and maintenance personnel and in logistics; and c) a decrease for aviation weather research of \$23.7 million to a total of \$21.5 million.

The funding changes reflect major

progress in the aviation weather programs bringing much automation to the collection of weather observations from remote sensors, to the dissemination of weather products, graphics and decision making information available for use by the air traffic facilities, pilots, the aviation industry and general aviation users. Specific programs that will see a change in funding greater than \$2 million are listed below:

Programs Changes	(\$ Millions)
• Systems Acquisition:	
•• Integrated Terminal Weather System (ITWS)	+3.4
•• Terminal Doppler Weather Radar (TDWR)	+5.3
•• Low Level Windshear Advisory System (LLWAS)	+2.7
•• Weather and Radar Processor (WARP)	-3.8
• Operations Support:	
•• Equipment Maintenance	2.0
•• Flight Service Stations (FSS)	3.9
• Research:	
•• Aviation Weather Research Program (AWRP)	-2.3

The AWRP will continue research into understanding the geophysical phenomenon in the atmosphere and around airports that present hazardous conditions for aircraft operations. Among these are in-flight icing, turbulence, visibility, ceiling, convective activity, tornadoes, etc. Additional work will be done to improve models, develop better graphics for decision making information, and the impacts of space weather.

Reimbursables and Interagency Fund Transfers (information consistent with Table 2-7).

The FAA will reimburse NOAA \$39.2 million for FY 2004. Included in those funds are development of enhancements and operational support associated with the WSR-88D, ASOS maintenance, the Center Weather Service Units at all Air Route Traffic Control Centers, the World Area Forecast System, meteorology instruc-

tors at the FAA, and studies and OFCM support. The FAA will reimburse the DOD a total of \$3.2M for supporting research.

Federal Highway Administration (FHWA).

The total FHWA request for surface transportation weather programs in FY 2005, is \$6.95 million, all of which will be used for supporting research and special programs.

In 1999, the FHWA began documenting road weather data requirements, which have served as the basis for the majority of work in this area. This work includes addressing the technical aspects of the road transportation system (including environmental data collection, processing and dissemination) as well as the institutional challenges associated with system implementation.

These institutional challenges encompassed coordination within state and local Departments of Transportation (DOTs) as well as across the transportation and meteorological communities. With regard to technical areas of interest, data collection efforts will include increased coverage of atmospheric and road condition observations, as well as incorporation of road weather data (e.g., pavement and subsurface observations) into broader meteorological observation networks. Better processing includes the application of higher resolution weather models and the development of road condition prediction models (e.g., heat balance models) that are needed to develop the appropriate road weather information.

A new DOT initiative entitled the Nationwide Surface Transportation Weather Observing System, or *Clarus* for short, will develop and demonstrate a regional road weather observing network and, ultimately, nationwide data sharing capabilities. *Clarus* will allow agencies to share quality controlled environmental data, ultimately improving forecasts and

value-added weather information products, as well as supporting anytime, anywhere road weather information for all road and transit users.

A multi-year effort has been undertaken by the FHWA in cooperation with six national laboratories to prototype and field test advanced decision support tools for winter maintenance managers. The Maintenance Decision Support System (MDSS) prototype is a decision support tool that integrates relevant road weather forecasts, coded rules of practice for winter maintenance operations, and maintenance resource data to provide managers with customized road treatment recommendations. The first functional MDSS prototype was demonstrated in Iowa in early 2003. During winter 2003-2004, the MDSS prototype was successfully deployed in a second demonstration. The current focus of the MDSS project is targeted enhancements to benefit other surface transportation sectors, and deployment assistance to assure successful technology transfer to the private sector, who can incorporate MDSS modules into their product lines.

The FHWA is researching how transportation management centers (TMCs) around the country integrate road weather information into their operations. The FHWA is documenting the types of road weather information received by TMCs, the means of information delivery, how information needs change as the severity of a weather event increases, and how that information impacts traffic management decisions. The FHWA is also investigating several other aspects of traffic management with respect to adverse weather, including traffic signal timing, traffic simulation modeling, and freeway operations. These efforts will help FHWA advance the state-of-the-practice in weather-responsive traffic management.

These efforts described above, as well as future activities captured in

the Road Weather Management program plan will be examined within the context of two key reports published in early 2004, and described below.

In 2002, the FHWA asked the National Research Council (NRC) Board of Atmospheric Sciences & Climate to examine what needs to be done from the research, development, and technology transfer perspectives to improve the production and delivery of weather-related information for the nation's roadways. In March 2004, the NRC released a report, "Where the Weather Meets the Road: A Research Agenda for Improving Road Weather Services," that recommended the creation of a focused, national road weather research program lead by FHWA that brings together the transportation and meteorological communities, identifies research priorities, and implements new scientific and technological advances. NRC recommendations included making better use of existing road weather information and technologies to increase capabilities for transportation research, establishing a nationwide real-time road weather observing system, developing observing capabilities to assess the accuracy of road weather forecasts, improving environmental sensor technologies, and developing new means to effectively communicate road weather information to a wide range of users.

To strengthen relationships between the meteorological and surface transportation communities, the FHWA Road Weather Management Program also co-sponsored the American Meteorological Society (AMS) Policy Forum on Weather and Highways in November 2003, to discuss provision of weather information to improve highway operations, development of strategies to effectively respond to weather information, and policy issues related to effective application of weather services to the management of the nation's highway system.

The forum brought together nearly 100 representatives from public, private, and academic sectors at Federal, state, and local levels. The report resulting from the forum, "Weather and Highways: Report of a Policy Forum," included several recommendations including long-term congressional funding to develop a national road weather research, development, and applications program; close coordination of Federal and state DOTs to improve the safety and efficiency of highways during adverse weather; and establishing a national road weather data collection, processing, and dissemination system.

Based upon recommendations in the AMS and NRC reports, the FHWA has partnered with the National Oceanic and Atmospheric Administration (NOAA) to achieve shared goals for a safer and more efficient surface transportation system. By working together the agencies can take advantage of the other's investments and expertise as well as promote improved surface transportation weather training, products, and services. A near-term goal of the new partnership is the introduction of new products, services and training to improve the application of weather information to surface transportation operations. Significant investments beyond current budget levels will be needed to address all of the recommendations in the two reports.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

All of the EPA's funding of meteorological programs is for supporting research. The anticipated funding level in FY 2005 for directed meteorological research is \$9.0 million, which is slightly more than the final FY 2004 funding level of \$8.7 million.

Currently, increased attention is being paid to the effects of airborne toxins and fine particulate matter on human health. In addition, to promote excellence in environmental science

and engineering, EPA established a national fellowship program and substantially increased its support for investigator-initiated research grants. The increase in funding for grants (with reliance on quality science and peer review) and for graduate fellowships (to support the education and careers of future scientists) will provide for a more balanced, long-term capital investment in improved environmental research and development.

The funding for the grants program will remain about the same in FY 2005, as in FY 2004. This program will fund research in areas including ecological assessment, air quality, environmental fate and treatment of toxins and hazardous wastes, effects of global climate change on air quality, and exploratory research. The portion of these grants that will be awarded for meteorological research during FY 2005 cannot be foreseen, but it is probable that the grant awards will increase the base amount of \$9.0 million listed above for directed meteorological research.

In collaboration with NOAA, EPA is continuing its development and evaluation of air quality dispersion models for air pollutants on all temporal and spatial scales as mandated by the Clean Air Act as amended in 1990. Research will focus on indoor, urban, mesoscale, regional, and multimedia models, which will be used to develop air pollution control strategies, and human and ecosystem exposure assessments. There will be increased emphasis placed on meteorological research into regional and urban formation and transport of air contaminants in support of the revisions to the National Ambient Air Quality Standards and homeland security. Increased efficiency of computation and interpretation of results are being made possible by means of supercomputing and scientific visualization techniques.

NATIONAL AERONAUTICS

AND SPACE ADMINISTRATION (NASA)

For FY 2005, NASA requests a total of \$247.6 million. The majority of this funding (\$245.1 million) is for supporting research.

These funding levels are composed of the estimated meteorology share of the supporting research and analysis programs as well as Earth Observing System (EOS) and Earth Probe instruments, EOS science, and the EOS Data Information System elements of the NASA Office of Earth Science budget. In parallel with deploying EOS, NASA Earth Science Enterprise is looking ahead to determine what will be the important Earth science questions in the next decade, and which require NASA's leadership to be answered. Drawing on existing reports of the National Academy of Sciences and the state of progress in current scientific endeavors, ESE developed a Research Strategy for 2000-2010. This strategy articulates a hierarchy of one overarching question, five broad subordinate questions and twenty-three detailed questions. For each, the Research Strategy defines the observational requirements, which in turn provide the basis for definition of candidate missions to be pursued. An early, high priority in this time frame is the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Program (NPP), which will serve to provide continuity with the Terra and Aqua missions as well as a demonstration of instruments for the converged weather satellite program. NASA and the Integrated Program Office (IPO) jointly fund the NPP mission. The IPO consists of representation from the three agencies participating in NPOESS: NASA, the National Oceanic and Atmospheric Administration, and the Air Force. NASA plans to continue to work towards the success of the EOS Terra, AQUA, AURA and IceSAT missions. In addition, NASA

plans to deliver a functioning data and information system to support the processing, archival, and distribution of data products from these missions.

NASA also funds a \$71.3 million program of weather-related research for aviation safety.

NUCLEAR REGULATORY COMMISSION (NRC)

The NRC planned expenditure of \$120,000 in FY 2005, is for meteorological operations to continue technical assistance for the analysis of atmospheric dispersion for routine and postulated accidental releases from nuclear facilities, and the review of proposed sites for possible construction of new nuclear power plants.

The meteorological support program in the NRC is focused primarily on analyzing and utilizing meteorological data in atmospheric transport and dispersion models. These models provide insight on plume pathways in the near- and far-fields for building wake and dispersion characteristics to perform dose calculations on postulated releases to the environment. Meteorological information is used as input to the probabilistic safety assessment, the assessment of the radiological impacts of routine releases from normal operations, the assessment of other (non-radiological) hazards that may impact safe operation of the facility, and the assessment of design or operational changes proposed for the facility.

Additionally, after a hiatus of some 25 years, the nuclear power industry has expressed an interest in seeking site approvals for new nuclear power plants. Three early site permit applications have been received and are currently under review. These reviews will also consider regional climatology and local meteorology. In addition to its internal review activities, the NRC may seek assistance from other Federal agencies to support its safety reviews.

AGENCY FUNDING BY BUDGET CATEGORY

Table 2.2 depicts how the agencies plan to obligate their funds for meteorological operations broken down by "budget category." The two major categories are "Operations Support" and "Systems Acquisition." To a large degree, these categories correspond to non-hardware costs (Operations Support) and hardware costs (Systems Acquisition). For agency convenience in identifying small components that do not fit into these two major categories, a third category is added called "Special Programs."

Programs that provide support to several government agencies such as the Air Force's DMSP are listed on a separate line.

In FY 2005, Operational Costs requested are \$2.73 billion with a total of \$1.76 billion (64.5 percent) for Operations Support, \$948 million (34.7 percent) for Systems Acquisition, and \$23.2 million (0.8 percent) for Special Programs.

Table 2.3 describes how the agencies plan to obligate their funds for meteorological supporting research according to budget

categories. The agencies' supporting research budgets are subdivided along similar lines--Research and Development (non-hardware), Systems Development (hardware), and Special Programs (for those items that do not easily fit into the two major categories).

For FY 2005, agencies will obligate a total of \$442.9 million in Supporting Research funds in the following manner: \$365 million (82.4 percent) to research and development and \$78.0 million (17.6 percent) to Systems Development.

AGENCY FUNDING BY SERVICE CATEGORY

Table 2.4 summarizes how the agencies plan to obligate operational funds for basic and specialized meteorological services; Table 2.5 is a similar breakout for supporting research funds.

Table 2.4 reveals the distribution of FY 2005 operational funds: basic meteorology services receiving 60.8 percent; aviation 19.9 percent; marine 4.6 percent; agriculture/forestry 0.5 percent; general military services 14.0 percent; and other specialized services accounting for 0.3 percent. Table 2.5 shows the distribution of supporting research funds among the services with basic meteorology receiving 19.1 percent, aviation 21.3 percent, marine 4.9 percent, agriculture and forestry 6.2 percent, general military 5.6 percent, and the remaining 42.8 percent dedicated to other meteorological services.

The definitions of specialized and basic services are described below:

Basic Services.

Basic services provide products that meet the common needs of all users and include the products needed by the general public in their everyday activities and for the protection of lives and property. "Basic" services include the programs and activities that do not fall under one of the specialized services.

Specialized Meteorological Services.

Aviation Services. Those services and facilities established to meet the requirements of general, commercial, and military aviation.

Marine Services. Those services and facilities established to meet the requirements of the DOC, DOD, and DOT on the high seas, on coastal and inland waters, and for boating activities in coastal and inland waters. The civil programs which are directly related to services solely for marine uses and military programs supporting fleet, amphibious, and sea-borne

units (including carrier-based aviation and fleet missile systems) are included.

Agriculture and Forestry Services. Those services and facilities established to meet the requirements of the agricultural industries and Federal, state, and local agencies charged with the protection and maintenance of the nation's forests.

General Military Services. Those services and facilities established to meet the requirements of military user commands and their component elements. Programs and services which are part of basic, aviation, marine, or other specialized services are not included.

Other Specialized Services. Those services and facilities established to meet meteorological requirements that cannot be classified under one of the preceding categories; such as, space operations, urban air pollution, global climate change, and water management.

PERSONNEL ENGAGED IN METEOROLOGICAL OPERATIONS

Table 2.6 depicts agency staff resources in meteorological opera-

tions. The total agency staff resources requested for FY 2005 is 14,620. This

total represents a decrease of 1.1 percent from FY 2004.

TABLE 2.2 AGENCY OPERATIONAL COSTS, BY BUDGET CATEGORY
(Thousands of Dollars)

AGENCY	Operations Support		Systems Acquisition		Special Programs		Total		% of FY2005 TOTAL
	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	
Agriculture	16265	12018	0	0	0	0	16265	12018	-26.1
Commerce/NOAA(Subtot)	904824	929119	750268	820579	34097	18522	1689189	1768220	4.7
NWS	722015	749778	71789	71681	31091	15390	824895	836849	1.4
NESDIS	150667	147737	678479	748898	1120	1246	830266	897881	8.1
OAR	3208	0	0	0	0	0	3208	0	-100.0
NOS	16600	19270	0	0	730	730	17330	20000	15.4
NMAO	12334	12334	0	0	1156	1156	13490	13490	0.0
Defense(Subtot)	434035.5	438275.5	75104	53698	622	638	509761.5	492611.5	-3.4
Air Force	249661	249799	42928	45057	0	0	292589	294856	0.8
DMSP*	16130	16088	0	0	0	0	16130	16088	-0.3
Navy	137154	138551	802	815	0	0	137956	139366	1.0
Army	31090.5	33837.5	31374	7826	622	638	63086.5	42301.5	-32.9
Homeland Security (Subtot)	14560	17030	0	0	0	0	14560	17030	17.0
USCG	14560	17030	0	0	0	0	14560	17030	17.0
Interior/BLM	2400	2400	0	0	0	0	2400	2400	0.0
Transportation(Subtot)	352047	361011	93135	73099	4186	4036	449368	438146	-2.5
FAA	352047	361011	93135	73099	4186	4036	449368	438146	-2.5
FHWA	0	0	0	0	0	0	0	0	0.0
EPA	0	0	0	0	0	0	0	0	0.0
NASA	1766	2324	438	220	0	0	2204	2544	15.4
NRC	50	120	0	0	0	0	50	120	140.0
TOTAL	1725948	1762297.5	918945.0	947596	38905	23196.0	2683797.5	2733089.5	1.8
% of FY TOTAL	64.3%	64.5%	34.2%	34.7%	1.4%	0.8%	100.0%	100.0%	

*DMSP is the Defense Meteorological Satellite Program that supports all DOD Components and other government agencies. It is primarily funded and managed by the Air Force.

TABLE 2.3 AGENCY SUPPORTING RESEARCH COSTS, BY BUDGET CATEGORY
(Thousands of Dollars)

AGENCY	Research & Development		Systems Development		Special Programs		Total		% of FY2005 TOTAL
	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	
Agriculture	30931	27431	0	0	0	0	30931	27431	-11.3
Commerce/NOAA(Subtot)	78732	66137	19940	17240	0	0	98672	83377	-15.5
NWS	3130	5485	17570	14870	0	0	20700	20355	-1.7
NESDIS	23791	26008	0	0	0	0	23791	26008	9.3
OAR	50655	33488	1870	1870	0	0	52525	35358	-32.7
NOS	0	0	500	500	0	0	500	500	0.0
NMAO	1156	1156	0	0	0	0	1156	1156	0.0
Defense(Subtot)	40650	32082	19914	17444	0	0	60564	49526	-18.2
Air Force	0	0	16098	16526	0	0	16098	16526	2.7
DMSF*	0	0	3816	918	0	0	3816	918	-75.9
Navy	24590	21400	0	0	0	0	24590	21400	-13.0
Army	16060	10682	0	0	0	0	16060	10682	-33.5
Homeland Security (Subtot)	0	0	0	0	0	0	0	0	0.0
USCG	0	0	0	0	0	0	0	0	0.0
Interior/BLM	0	0	0	0	0	0	0	0	0.0
Transportation(Subtot)	27782	28445	0	0	0	0	27782	28445	2.4
FAA	23782	21495	0	0	0	0	23782	21495	-9.6
FHWA	4000	6950	0	0	0	0	4000	6950	73.8
EPA	8732	9000	0	0	0	0	8732	9000	3.1
NASA	214400	201800	47800	43300	0	0	262200	245100	-6.5
NRC	0	0	0	0	0	0	0	0	0.0
TOTAL	401227	364895	87654	77984	0	0	488881	442879	-9.4
% of FY TOTAL	82.1%	82.4%	17.9%	17.6%	0.0%	0.0%	100.0%	100.0%	

*DMSF is the Defense Meteorological Satellite Program that supports all DOD Components and other government agencies. It is primarily funded and managed by the Air Force.

TABLE 2.4 AGENCY OPERATIONAL COSTS, BY SERVICE
(Thousands of Dollars)

AGENCY	Basic Meteorology		Aviation		Marine		Agriculture & Forestry		General Military		Other		Total	
	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005
Agriculture Commerce/NOAA(Subtot)	0	0	0	0	0	0	16265	12018	0	0	0	0	16265	12018
NWS	1560221	1636180	63030	63700	62730	68340	0	0	0	0	3208	0	1689189	1768220
NESDIS	716465	724809	63030	63700	45400	48340	0	0	0	0	0	0	824895	836849
OAR	830266	897881	0	0	0	0	0	0	0	0	0	0	830266	897881
NOS	0	0	0	0	0	0	0	0	0	0	3208	0	3208	0
NMAO	13490	13490	0	0	17330	20000	0	0	0	0	0	0	17330	20000
Defense(Air Force)	23956	24200	40973	41392	39869	40277	0	0	397652	379357	7312	7386	509761.5	492611.5
DMSP-Navy	0	0	0	0	0	0	0	0	292589	294856	0	0	292589	294856
Army	23866	24110	40973	41392	39869	40277	0	0	16130	16088	0	0	16130	16088
Homeland Security (Subtot)	90	90	0	0	0	0	0	0	25936	26201	7312	7386	137956	139366
USCG	0	0	0.0	0	14560	17030	0	0	62997	42212	0	0	63086.5	42301.5
Interior/BLM	0	0	0	0	14560	17030	0	0	0	0	0	0	14560	17030
Transportation(FAA)	0	0	0	0	0	0	2400	2400	0	0	0	0	2400	2400
FHWA	0	0	449368	438146	0	0	0	0	0	0	0	0	449368	438146
EPA	0	0	449368	438146	0	0	0	0	0	0	0	0	449368	438146
NASA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRC	0	0	0	0	0	0	0	0	2204	2544	0	0	2204	2544
TOTAL	50	120	553371	543238	117159	125647	18665	14418	399856	381901	10520	7386	2683797.5	2733089.5
% of FY TOTAL	59.0%	60.8%	20.6%	19.9%	4.4%	4.6%	0.7%	0.5%	14.9%	14.0%	0.4%	0.3%	100.0%	100.0%

*DMSP is the Defense Meteorological Satellite Program that supports all DOD Components and other government agencies. It is primarily funded and managed by the Air Force.

TABLE 2.5 AGENCY SUPPORTING RESEARCH COSTS, BY SERVICE
(Thousands of Dollars)

AGENCY	Basic Meteorology		Aviation		Marine		Agriculture & Forestry		General Military		Other		Total	
	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005	FY2004	FY2005
Agriculture Commerce/NOAA(Subtot)	0	0	0	0	0	0	30931	27431	0	0	0	0	30931	27431
NWS	96547	81252	1625	1625	500	500	0	0	0	0	0	0	96672	83377
NESDIS	20700	20355	0	0	0	0	0	0	0	0	0	0	20700	20355
OAR	23791	26008	0	0	0	0	0	0	0	0	0	0	23791	26008
NOS	50900	33733	1625	1625	500	500	0	0	0	0	0	0	52525	35358
NMAO	0	0	0	0	500	500	0	0	0	0	0	0	500	500
Defense(Subtot)	1156	1156	0	0	0	0	0	0	0	0	0	0	1156	1156
Air Force	4813	3479	0	0	24590	21400	0	0	31161	24647	0	0	60564	49526
DMSP-	0	0	0	0	0	0	0	0	16098	16526	0	0	16098	16526
Navy	0	0	0	0	0	0	0	0	3816	918	0	0	3816	918
Army	4813	3479	0	0	24590	21400	0	0	11247	7203	0	0	24590	21400
Homeland Security (Subtot)	0	0	0	0	0	0	0	0	0.0	0.0	0	0	16060	10682
USCG	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interior/BLM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transportation(Subtot)	0	0	23782	21495	0	0	0	0	0	0	4000	6950	27782	28445
FAA	0	0	23782	21495	0	0	0	0	0	0	0	0	23782	21495
FHWA	0	0	0	0	0	0	0	0	0	0	4000	6950	4000	6950
EPA	0	0	0	0	0	0	0	0	0	0	8732	9000	8732	9000
NASA	0	0	71300	71300	0	0	0	0	0	0	190900	173800	262200	245100
NRC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	101360	84731	96707	94420	25090	21900	30931	27431	31161	24647	203632	189750	488881	442879
% of FY TOTAL	20.7%	19.1%	19.8%	21.3%	5.1%	4.9%	6.3%	6.2%	6.4%	5.6%	41.7%	42.8%	100.0%	100.0%

*DMSP is the Defense Meteorological Satellite Program that supports all DOD Components and other government agencies. It is primarily funded and managed by the Air Force.

TABLE 2.6 PERSONNEL ENGAGED IN METEOROLOGICAL OPERATIONS
(Units are Full Time Equivalent Staff Years)*

<u>AGENCY</u>	<u>FY 2004</u>	<u>FY 2005</u>	<u>% CHANGE</u>	<u>% of FY 2005 TOTAL</u>
Agriculture	236	229	-3.1	1.6
Commerce/NOAA (Subtotal)	5,787	5,716	-1.2	39.1
NWS	4,725	4,654	-1.5	31.8
NESDIS	870	870	0.0	6.0
OAR	32	32	0.0	0.2
NOS	106	106	0.0	0.7
NMAO	54	54	0.0	0.4
Defense	5,123	5,055	-1.3	34.6
Air Force (Subtotal)	3,314	3,221	-2.9	22.0
Air Force Weather	3,195	3,101	-3.0	21.2
DMSP	119	120	0.8	0.8
Navy	1,524	1,494	-2.0	10.2
Army	285	340	16.2	2.3
Homeland Security (Subtotal)	108	108	0.0	3.0
USCG	108	108	0.0	3.0
Interior/BLM (Subtotal)	28	28	0.0	0.2
Interior	26	26	0.0	0.2
Reimbursed**	2	2	0.0	0.0
Transportation (Subtotal)	3,608	3,590	-0.5	24.6
FAA	3,605	3,587	-0.5	24.5
FHWA	3	3	0.0	0.0
EPA	0	0	0.0	0.0
NASA	0	0	0.0	0.0
NRC	1	2	50.0	0.0
TOTAL	14,783	14,620	-1.1	100.0

* Numbers of personnel are rounded to nearest whole number.

** "Reimbursed" are personnel funded by other agencies.

INTERAGENCY FUND TRANSFERS

Table 2.7 summarizes the reimbursement of funds from one agency to another during FY 2004. Agencies routinely enter into reimbursable agreements when they determine that one agency can provide the service more efficiently and effectively than the other. While specific amounts may vary from year-to-year, the pattern shown is essentially stable and reflects a significant level of interagency cooperation.

Department of Commerce. NWS will reimburse DOT \$2,500 for Alaska housing utilities. NASA will receive \$22,000 for stratospheric studies. NESDIS will transfer a total of \$164 million to NASA for procurement and launches of polar-orbiting (\$74 million) and geostationary (\$90 million) satellites.

Department of Defense. The Air Force will reimburse DOC a total of \$4.16 million for operations [e.g., OFCM support (\$140,000), Lightning Data (\$676,000), NCEP operations (\$14,000), Shared Processing Network (\$101,000), WSR-88D support (\$2,382,000), HAWCNET support (\$70,000), COMET training development (\$175,000), geomagnetic data (\$156,000), and IPO support (\$216,000)] and \$227,000 to UPOS for supporting research. In addition, the Air Force will reimburse NASA \$160,000 for technical data and USGS \$250,000 for the purchase of a magnetometer. The Navy will reimburse DOC \$344,000 for basic climatologi-

cal analysis and forecasting, and interagency coordination. The Army reimbursements to DOC/NOAA include \$450,000 from COE to NWS for maintaining precipitation reporting stations. The Army TRADOC will also reimburse the AF Air Combat Command \$60,000 for operations and maintenance of weather systems. Finally, the U.S. Geological Survey will be reimbursed by COE \$510,000 for operations and maintenance of hydrologic and precipitation reporting stations.

Department of Transportation. The FAA will reimburse NOAA \$39.2 million for FY 2004. Included in those funds are development of enhancements and operational support associated with the WSR-88D, ASOS maintenance, the Center Weather Service Units at all Air Route Traffic Control Centers, the World Area Forecast System, meteorology instructors at the FAA, and studies and OFCM support.

The FAA will reimburse the Air Force a total of \$2,800,000 and the Navy \$446,000 for supporting research.

National Aeronautics and Space Administration (NASA). The Air Force will be reimbursed a total of \$2.373 million--\$2.204 million for observations, forecasts, and operations/maintenance of weather infrastructure and replacement of upper air systems at Trans-Atlantic Abort Landing Sites and \$169 million for operation and maintenance of weather towers at Edwards AFB, CA. NOAA's

NWS and OAR will receive \$15,000 and \$59,000 respectfully for upper air analysis and research; National Data Buoy Center will receive reimbursements of \$133,000 for the operation of two data buoys.

Environmental Protection Agency (EPA). NOAA's Air Resources Laboratory (ARL) will receive \$6.5 million for development, evaluation, and application of air quality dispersion models; and for provision of meteorological expertise and guidance for EPA policy development activities.

Nuclear Regulatory Commission (NRC). The NRC enjoys a unique relationship with the DOE as a result of the Energy Reorganization Act of 1974. The act realigned the Atomic Energy Commission into a regulatory organization-NRC and a research and promotional organization-ERDA (which was subsequently absorbed into DOE). As a result, the NRC has access to the DOE national laboratories for technical assistance activities. This assistance, while not a reimbursable agreement, results in the transfer of funds from NRC for specific technical assistance by DOE laboratories. In FY 2004, the NRC expects to task DOE laboratories and the National Oceanic and Atmospheric Administration's National Climatic Data Center at a funding level of \$50,000.

FACILITIES/LOCATIONS FOR TAKING METEOROLOGICAL OBSERVATIONS

Table 2.8 indicates the number of facilities/locations or platforms at

which the Federal agencies carry out (or supervise) the taking of various

types of meteorological observations.

TABLE 2.7 INTERAGENCY FUND TRANSFERS FOR METEOROLOGICAL OPERATIONS AND SUPPORTING RESEARCH

<u>Agency Funds Transferred from:</u>	<u>Agency Funds Transferred to:</u>	<u>FY 2004 Funds (\$K)</u>	
		<u>Operations</u>	<u>Supporting Research</u>
Commerce/NOAA	DOT/USCG	2.5	
	NASA (Polar satellite acquisition)	74,000	
	NASA (Geo satellite acquisition)	90,000	
	NASA Stratospheric Research		22
Defense/Air Force	DOC/NOAA/OFCM	140	
	DOC/NOAA/OAR/SEC	156	
	DOC/NOAA/LDS	676	
	DOC/NOAA/NCEP	14	
	DOC/NOAA/SPN	101	
	DOC/NOAA/NWS		2,382
	DOC/NOAA/NWS	70	
	DOC/NOAA/COMET		175
	DOC/NOAA/OGP/UPOS		227
	DOC/NOAA/NESDIS/IPO	216	
	DOI/USGS	250	
	NASA	160	
Defense/Navy	DOC/NOAA/NCDC	179	
	DOC/NOAA/OFCM	165	
Defense/Army	DOC/NOAA/NWS	450	
	DOI/USGS	510	
	DOD/USAF/ACC	60	
Transportation/FAA	DOC/NOAA	31,840	7,404
	DOD/USAF		2,800
	DOD/USN		446
NASA	DOD/USAF/45th SW	2,204	
	DOD/USAF/Edwards AFB	169	
	DOC/NOAA/NDBC	133	
	DOC/NOAA/NWS		15
	DOC/NOAA/OAR/FSL		59
EPA	DOC/NOAA/ARL		6,500
NRC	DOE/PNNL	50	

TABLE 2.8 FACILITIES/LOCATIONS FOR TAKING METEOROLOGICAL OBSERVATIONS

TYPE OF OBSERVATION/AGENCY	No. of Locations (FY 2004)	TYPE OF OBSERVATION/AGENCY	No. of Locations (FY 2004)
<u>Surface, land</u>		<u>Upper air, rocket</u>	
Commerce (all types)	841	Army (U.S. & Overseas)	2
Air Force (U.S. & Overseas)	130	<u>Doppler weather radar (WSR-88D) sites</u>	
Navy (U.S. & Overseas)	72	Commerce (NWS)	120
Army (U.S. & Overseas)	39	Air Force (U.S. & Overseas)	29
Marine Corps (U.S. & Overseas)	13	Army (U.S. & Overseas)	2
Transportation (Flight Service Stn)	8	Transportation	12
Transportation (Lim Aviation Wx Rptg Stn)	114	<u>Doppler weather radar (Not WSR-88D) sites</u>	
Transportation (Contract Wx Obsg Stn)	189	Air Force (Transportable)	3
Transportation (Auto Wx Obsg Stn)	198	Army	2
Transportation (Road Wx Obsg Stn)	2,149	Navy (Fixed)	9
Transportation (Auto Sfc Obsg Sys, fielded)	569	Marine Corps (Mobile)	10
Homeland Security (USCG Coastal)	50	<u>Off-site WSR-88D Processors (PUPs)</u>	
Interior	470	Commerce (NWS)	0 (use AWIPS)
Agriculture	1412	Air Force	140
NASA	1	Navy	24
<u>Surface, marine</u>		Army	5
Commerce (SEAS-equipped ships)	140	Marine Corps (U.S. & Overseas)	9
Commerce (Coastal-Marine Autom Network)	65	Transportation	25
Commerce (NOAA/NOS/PORTS)	6	NASA	1
Commerce (Buoys--moored)	64	<u>Airport Terminal Doppler weather radars</u>	
Commerce (Buoys--drifting)	21	Transportation (Commissioned)	45
Commerce (Buoys--large navigation)	10	Army (not airfield--Test Range/USAREUR)	2
Commerce (Water-level gauges)	*175	<u>Conventional radar (non-Doppler) sites</u>	
*Number of which have meteorology sensors	59	Commerce (NWS)	0
Navy (Ships with met personnel)	29	Commerce (at FAA sites)	27
Navy (Ships without met personnel)	289	Air Force, Fixed (U.S. & Overseas)	3
Homeland Security (USCG Cutters)	231	Air Force, Remote Displays	2
NASA	2	Air Force, Mobile Units	17
<u>Upper air, balloon</u>		Marine Corps, Mobile units	15
Commerce (U.S.)	86	Transportation (FAA (WSP))	34
Commerce (Foreign, Cooperative)	22	<u>Weather reconnaissance (No. of aircraft)</u>	
Air Force, Fixed (U.S. & Overseas)	12	Commerce (NOAA)	3
Air Force, Mobile	23	Air Force Reserve Command (AFRC)	10
Army, Fixed (U.S. & Overseas)	10	<u>Geostationary meteorological satellites (No. operating)</u>	
Army, Mobile	95	Commerce (planned config of 2)	2
Navy, Fixed (U.S. & Overseas)	16	<u>Polar meteorological satellites (No. operating)</u>	
Navy, Mobile(U.S. & Overseas)	46	Commerce (planned config of 2)	2
Navy, Ships	29	Air Force	4
Marine Corps, Mobile	10	Navy GFO	(1 in orbit, status TBD)
NASA (U.S.)	1		
<u>Atmospheric Profilers</u>			
Army	7		
NASA	1		

