

SECTION 2

RESOURCE INFORMATION AND AGENCY PROGRAM UPDATES

The tables in this section summarize budgetary information of the Federal government for fiscal years 2008 and 2009. The funds shown are used to provide meteorological services and associated supporting research that has as its immediate objective service improvement. Fiscal data are current as of the end of September 2008 and are subject to later changes. The data for Fiscal Year (FY) 2009 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 FY 2008 based on Congressional appropriations, the budget request for FY 2009, the percent change, and the individual agencies' percent of the total Federal funding for FY 2008 and FY 2009.

DEPARTMENT OF AGRICULTURE (USDA)

The USDA budget request for FY 2009 is \$45.4 million for operations and supporting research, representing a 9.7 percent decrease from the FY 2008 funding level. This decline was due to a reduction in funding for supporting research. USDA has requested \$29.1 million for research and development programs, a \$5.1 million decrease from 2008. The FY 2009 amount requested for meteorological operations is \$16.3 million, up from \$16.1 million in FY 2008. Operational activities include specialized weather observing networks such as the SNOTEL (SNOW pack TELemetry) 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, 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 affects crop and animal production, hydrologic processes, the availability of water from watersheds, and the envi-

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

AGENCY	Operations			% of FY2009			Supporting Research			% of FY2009			Total			% of FY2008		% of FY2009	
	FY2008	FY2009	%CHG	FY2008	FY2009	%CHG	FY2008	FY2009	%CHG	FY2008	FY2009	%CHG	FY2008	FY2009	%CHG	FY2008	FY2009	TOTAL	TOTAL
Agriculture	16077	16335	1.6	0.5	0.5		34206	29063	-15.0	2.3	2.3		50283	45398	-9.7	1.2	1.0		
Commerce/NOAA(Subtot)	1880870	2113708	12.4	66.1	12.4	66.1	105195	122798	16.7	9.5	9.5		1986065	2236506	12.6	47.5	49.8		
NWS	893345	916743	2.6	28.7	916743	28.7	17151	26234	53.0	2.0	2.0		910496	942977	3.6	21.8	21.0		
NESDIS***	927663	1129504	21.8	35.3	1129504	35.3	26459	28376	7.2	2.2	2.2		954122	1157880	21.4	22.8	25.8		
OAR	0	0	0	0.0	0	0.0	52018	57515	10.6	4.5	4.5		52018	57515	10.6	1.2	1.3		
NOS	25668	28314	10.3	0.9	28314	0.9	500	500	0.0	0.0	0.0		26168	28814	10.1	0.6	0.6		
OMAO	34194	39147	14.5	1.2	39147	1.2	9067	10173	12.2	0.8	0.8		43261	49320	14.0	1.0	1.1		
Defense(Subtot)	648568	625045	-3.6	19.6	625045	19.6	389801	357612	-8.3	27.7	27.7		1038369	982657	-5.4	24.9	21.9		
Air Force***	382535	389453	1.8	12.2	389453	12.2	373484	336816	-9.8	26.1	26.1		756019	726269	-3.9	18.1	16.2		
DMSP**	132964	119092	-10.4	3.7	119092	3.7	0	0	0	0.0	0.0		132964	119092	-10.4	3.2	2.7		
Navy	87370	70890	-18.9	2.2	70890	2.2	2518	9731	286.5	0.8	0.8		89888	80621	-10.3	2.2	1.8		
Army	45699	45610	-0.2	1.4	45610	1.4	13799	11065	-19.8	0.9	0.9		59498	56675	-4.7	1.4	1.3		
Homeland Security (Subtot)	21540	23060	7.1	0.7	23060	0.7	0	0	0.0	0.0	0.0		21540	23060	7.1	0.5	0.5		
USCG	21540	23060	7.1	0.7	23060	0.7	0	0	0.0	0.0	0.0		21540	23060	7.1	0.5	0.5		
Interior/BLM	2400	2400	0.0	0.1	2400	0.1	0	0	0.0	0.0	0.0		2400	2400	0.0	0.1	0.1		
Transportation(Subtot)	381186	408033	7.0	12.8	408033	12.8	32514	38252	17.6	3.0	3.0		413700	446285	7.9	9.9	9.9		
FAA	381186	408033	7.0	12.8	408033	12.8	28314	34052	20.3	2.6	2.6		409500	442085	8.0	9.8	9.9		
FRA	0	0	0.0	0.0	0	0.0	0	0	0.0	0.0	0.0		0	0	0.0	0.0	0.0		
FHWA	0	0	0.0	0.0	0	0.0	4200	4200	0.0	0.3	0.3		4200	4200	0.0	0.1	0.1		
EPA	0	0	0.0	0.0	0	0.0	9000	9000	0.0	0.7	0.7		9000	9000	0.0	0.2	0.2		
NASA	7199	7497	4.1	0.2	7497	0.2	648866	733212	13.0	56.8	56.8		656065	740709	12.9	15.7	16.5		
NRC	120	500	316.7	0.0	500	0.0	0	0	0.0	0.0	0.0		120	500	316.7	0.0	0.0		
TOTAL	2957960	3196578	8.1	100.0	3196578	100.0	1219582	1289937	5.8	100.0	100.0		4177542	4486515	7.4	100.0	100.0		
% of FY TOTAL	70.8%	71.2%			71.2%		29.2%	28.8%					100.0%	100.0%					

*The FY 2008 funding reflects Congressionally appropriated funds; the FY 2009 funding reflects the amount requested in the President's FY 2009 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.

***NESDIS and Air Force budget numbers include the DOC and DOD shares of the NPOESS budget, respectively.

ronmental and economic sustainability of agricultural enterprises.

DEPARTMENT OF COMMERCE (DOC)

The DOC/NOAA budget request for FY 2009 is 2.24 billion (Table 2.1, line 2) for operations and supporting research, representing a 12.6 percent increase from the FY 2008 funding level. The overall DOC increase is mainly the result of increases in NESDIS requested funding. Of the \$2.24 billion in DOC/NOAA funding, the vast majority funds operations (\$2.11 billion) with the rest (\$122.8 million) going to supporting research.

NOAA's NATIONAL WEATHER SERVICE (NWS)

The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States, 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 for use by other government agencies, the private sector, the public, and the global community.

The FY 2009 President's Budget Request supports the funding and program requirements necessary to address established NOAA strategic goals and sets NWS on a path to achieve the following objectives: produce and deliver effective and timely forecasts and warnings that can be trusted in order to protect lives and property; use cutting-edge technologies to provide the best services possible in a cost-effective manner; and improve economic benefits by the timely and accurate dissemination of weather, water, and climate information.

The NWS requested a total of \$943.0 million and 4,640 Full Time Equivalent (FTE) employees to support continued and enhanced operations. The total includes \$9.1 million for Adjustments to Base (ATB), and Net Program Changes of \$50.2 million. The changes are summarized at the subactivity level below and, to be concise, do not include descriptions below \$1.0 million. Descriptions of each request by line item are located in the NOAA FY 2009 Technical Budget.

NWS requested \$9.1 million and 0 FTE to fund ATB across all activity accounts. With this in-

crease, program totals will fund the estimated FY 2009 Federal pay raise and annualize the FY 2008 pay raise through the remainder of the calendar year. Program totals will provide inflationary increases for non-labor activities, including service contracts, utilities, field office lease payments, and rent charges from the General Services Administration.

NWS also requests transfers between appropriations or line offices including:

- \$3.0 million is transferred from Local Warnings & Forecasts to Complete & Sustain NOAA All Hazards Weather Radio resulting in a net 0 change for NWS.
- \$5.9 million is transferred from the U.S. Weather Research Program (USWRP) in NWS to the Office of Atmospheric Research (OAR).

NWS PROGRAM CHANGE HIGHLIGHTS FOR FY 2009:

NWS requested a net increase of \$32.5 million from FY 2008 and 1 FTE for a total request of \$943.0 million and 4,640 FTE.

Operations, Research, and Facilities (ORF)

A net increase of \$31.6 million and 1 FTE above the base is requested in ORF for a total of \$828.1 million and 4,609 FTE.

Operations and Research (O&R)

A net increase of \$28.8 million and 1 FTE above the base is requested in the Operations and Research subactivity, for a total of \$729.8 million and 4,421 FTE.

Local Warnings and Forecasts

\$14.5 million and 0 FTE in net increases above the base, for a total of \$662.6 million and 4,114 FTE, requested under the Local Warnings and Forecasts line item of the Operations and Research subactivity.

- TAO Tropical Moored Buoy Technology Refresh (+0 FTE and +\$1.1 million): NOAA requests an increase of 0 FTE and \$1.1 million to replace obsolete components of the Nation's foremost climate observing system. Total funding required to replace obsolete components for the 55 buoys in this array is \$6.6 million. This effort will be ac-

completed over a six year period beginning in FY 2008.

- Florida/Caribbean Hurricane Data Buoy (Operation and Maintenance) (+0 FTE and +\$3.0 million): NOAA requested an increase of 0 FTEs and \$3.0 million for a total of \$4.4 million to operate and maintain 15 weather data buoys (eight buoys funded under the FY 2006 Hurricane Supplemental Appropriation and seven funded by the FY 2005 Hurricane Supplemental Appropriation) for enhanced real time hurricane data observations and storm monitoring in the Caribbean, Gulf of Mexico, and the Atlantic Ocean to support the NOAA hurricane warning and forecast mission.
- Ocean Sensor Operation and Maintenance (+0 FTE and +\$1.4 million): NOAA requested an increase of 0 FTEs and \$1.4 million for ongoing operation and maintenance of the Congressionally mandated ocean instrumentation which was funded and installed by National Ocean Service "Convert Weather Buoys Initiative." These sensors augment fixed and buoy observational sites. In keeping with NOAA's commitment to increased interoperability and cost effective approach to oceanographic observing, the NOS Convert Weather Buoys Initiative augments existing National Weather Service buoys with oceanographic sensors. This national network of weather observing buoys has been augmented with ocean sensors to measure directional waves and wave heights, and ocean current, temperature, and salinity profiles.
- Ongoing Operations and Maintenance for Systems/equipment Purchased to Meet Requirements of Hurricane Supplemental (+0 FTE and + \$1.2 million): NOAA requested 0 FTE and \$1.2 million to pay on-going operations and maintenance costs for Incident Meteorologist equipment, software support, and communications, ASOS and NWR backup power units, and backup communications for coastal Weather Forecast Offices and Weather Radars.

Central Forecast Guidance

Net increases above the base of \$14.3 million and 1 FTE, for a total of \$67.2 million and 307 FTEs, are requested under the Central Forecast

Guidance line item of the Operations and Research subactivity.

- Hurricane/Environmental Modeling Improvements (+1 FTE and +\$14.3 million): Through the President's Budget Amendment, NOAA requested a total increase of 1 FTE and \$14.3 million for a total of \$14.3 million in FY 2009 to sustain the Administration's commitment to significantly accelerate the improvement in hurricane track and intensity forecasts. Funds are required to increase the research and development necessary to accelerate the improvement in the NOAA Hurricane Forecast System (NHFS), transition and test new capabilities in operations, and operate and maintain the expanded NHFS (including coupled global, hurricane, ocean, wave, and storm surge models). The goal of the hurricane forecast improvement program is to increase accuracy of hurricane track and intensity forecasts, provide for objective forecast guidance and substantially improve the capability to forecast associated storm surge.

System Operations & Maintenance (O&M)

NWS requested \$98.3 million and 188 FTE, which is an increase of \$2.8 million and 0 FTE to support the ongoing operations and maintenance of major NWS observation and processing systems. These systems include the Next Generation Weather Radar (NEXRAD), Automated Surface Observing System (ASOS), Advanced Weather Interactive Processing System (AWIPS)/NOAAPort, and the NWS Telecommunications Gateway System (NWSTG) and its backup. NWS currently operates 121 NEXRAD Systems that utilize Doppler technology and hydrometeorological processing to provide weather radar data for tornado and thunderstorm warnings, air safety, flash flood warnings, and water resource information. The 312 NWS ASOS sites provide reliable 24-hour per day surface weather observations. AWIPS provides an integrated system to display all hydrometeorological data at NWS field offices. The system acquires and processes data from modernized sensors and local sources, provides computational and display functions, provides interactive communication systems, and disseminates weather and flood warnings and forecasts in a rapid and highly reliable manner. The NWSTG

and its backup systems serve as the Nation's hub for the collection and distribution of weather data and products. NWSTG and backup provide national and global real-time exchange services using an automated communication system to collect and distribute a wide range of environmental data such as observations, analyses, forecasts, and warning products.

Procurement, Acquisition, and Construction

A net increase of \$18.6 million and 0 FTE above the base is requested in Procurement, Acquisition, and Construction, for a total of \$114.9 million and 31 FTE.

System Acquisition

A net increase of \$18.4 million and 0 FTE above the base is requested in the System Acquisition subactivity, for a total of \$88.3 million and 31 FTE.

- Weather Radio Improvement Project (+0 FTE and +\$2.9 million): NOAA requested an increase of \$2.9 million and 0 FTE for a total of \$5.7 million to fund the effort to modernize the NOAA Weather Radio All Hazards (NWR) network, replacing obsolete unsupportable broadcast equipment and taking advantage of satellite technology to allow for point to multi-point communications capability and network redundancy and meet Federal Emergency Management Agency (FEMA) needs. This increase will allow the NWS to deploy the NWR Broadcast Management System (BMS). The BMS is a replacement for the Console Replacement System (CRS). Also included is the development of a system that will integrate the NOAA Weather Wire Service (NWWS) into a consolidated network with the BMS. Currently, the contract to maintain the NWWS expires in FY 2009. The current CRS is at its end of life and cannot be supported at the current level due to parts obsolescence. The CRS is a main component of NWR that converts text warning messages into digital voice. This conversion provides the voice warning messages that are broadcast over the NWR to alert the public. It is critical that we address this issue now in order to avert potential outages that might affect our ability to disseminate warnings to the public.

- NOAA Profiler Network (NPN) Conversion (+0 FTE and +\$4.8 million): NOAA requests an increase of 0 FTE and \$4.8 million for a total of \$9.7 million to replace transmitters that interfere with Search and Rescue Satellites and to conduct technology refresh of the 20-year-old network. This increase continues the approved multi-year investment. The Wind Profilers, vertical looking radars installed in 1988, are used as input for numerical weather models that predict clouds, precipitation, and temperature. The data also provide important indicators of where severe weather such as tornadoes and winter storms may form and is used for issuing aviation advisories and wildfire predictions. Research has shown Wind Profiler data improves accuracy and lead times for tornado, severe thunderstorm, flash flood, and winter storm warnings. Thirty-two of the 37 wind profilers are using an experimental transmitter frequency of 404 megahertz (MHz) issued by the National Telecommunications and Information Administration (NTIA). NTIA has given the 404 MHz frequency to search and rescue satellites (SARSAT) and granted the NPN permanent use of 449 MHz. In addition, the European Space Agency began launching a constellation of 30 satellites called Galileo in FY 2006, which also have a SAR capability with an operating frequency of 404 MHz. Thirty operational 404 MHz wind profilers require their transmitters to be converted from 404 to 449 MHz. In addition to the 30 operational sites using 404MHz, there are two 404 MHz wind profilers at the National Reconditioning Center and National Weather Service Training Center (used for testing and training). There are also five wind profilers in the NPN that operate at the non-interfering 449 MHz frequency: three in Alaska, one in Syracuse, New York, and one in Platteville, Colorado. In 2009, the NPN will have been installed for 20 years without any technology refresh during its life cycle. Therefore a second priority is a technology refresh for the entire 37 wind profiler network. This refresh includes replacing the 5 existing 449 MHz profilers, replacing the network's VAX system computers and re-hosting the software on a LINUX platform; improving the telecommunications network, replacing site modems, data collection modems,

and uninterruptible power systems; and providing a major overhaul of site shelters, facility electric distribution, replacement of Radio Acoustic Sounding System components, and upgraded satellite communications equipment.

- AWIPS Technology Infusion (+0 FTE and +\$6.6 million): NOAA requests an increase of 0 FTE and \$6.6 million for a total of \$19.1 million to invest in new forecaster workstation technology and to develop capabilities necessary to meet the growing demands of society for improved high impact forecast and warning services. These services include on site incident support; provision of services using new dissemination media with the latest graphical display formats; provision of probability information; improved service backup; and forecast collaboration. Evolving NWS services will require capitalizing on new technology and infusing new science and techniques. This will not be possible without a technology infusion of the Advanced Weather Interactive Process System (AWIPS), the key workstation forecasters use at Weather Forecast Offices to integrate, interpret multiple sources of observational and model data, and generate forecast and warning products.
- Weather and Climate Supercomputing (+0 FTE and +\$3.0 million): Through the President's Budget Amendment, NOAA requests an increase of 0 FTE and \$3.0 million for a total of 0 FTE and \$22.1 million for its Weather and Climate Supercomputing program to accelerate planned NOAA hurricane forecasting system improvements in both hurricane track and hurricane intensity forecasts. Funds are required to procure additional High Performance Computing (HPC) necessary to provide higher resolution numerical weather prediction modeling to support the acceleration of improved intensity forecasts.

Construction

NOAA requests \$14.1 million to complete the NOAA Center for Weather and Climate Prediction (NCWCP) and \$12.5 million for Weather Forecast Office (WFO) construction funding to NOAA facilities to support NOAA facility planning requirements for a total of \$26.6 million. Construction subactivity does not have FY 2009 program changes.

NOAA's NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICES (NESDIS)

Proposed funding for FY 2009 includes a decrease in the Polar-Orbiting Satellite Program (POES) of \$48.9 million, a net increase in the Geostationary Satellite Program (GOES) of \$235.2 million, and a request to fund the National Polar-orbiting Operational Environmental Satellite System (NPOESS) at the Nunn-McCurdy Certified program funding level. 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 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 for the POES program is decreasing as it approaches the end of its production cycle with one remaining satellite, NOAA N prime, to be launched. The GOES request includes a decrease of \$7.0 million for the GOES-N series of satellites, and an increase of \$242.2 million for the next generation GOES-R series.

The converged NOAA and Department of Defense (DOD) polar orbiting system (NPOESS) will replace the current NOAA series and the DOD Defense Meteorological Satellite Program (DMSP). A total of \$288.0 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.

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. Included in the budget request is \$53.6 million for the NOAA Data Centers and Information Services sub-activity base operating funds.

NOAA's NATIONAL OCEAN SERVICE (NOS)

Funding provided through the FY 2009 budget will allow for additional expansion of the PORTS program, including continued implementation 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 ongoing operation of the Ocean Systems Test and Evaluation Program (OSTEP), which is a development program for bringing new sensor technology into operations. The FY 2008 budget has 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.

In FY 2008, NOS received funding to upgrade and enhance as many as 45 NWLON with new meteorological sensors. The NWLON has traditionally been an oceanographic observing system; however, NWLON technology allows multiple other sensors to be added, including meteorological sensors such as wind speed/direction/gusts, air temperature, and barometric pressure. These observations provide a significant data source for improving and verifying marine weather forecasts and warnings. Actual verification data for special marine warnings (WFO Sterling) shows a 10% increase in the probability of detection and a ten minute increase in warning lead times, due in part to an increase in marine observations. Navigation data users require a complete picture of their operating environment to make the best safety and efficiency decisions, and local meteorological data is a part of that picture. Optimization of existing observing infrastructure is a cost-effective alternative to establishing new platforms. The additional meteorological data will also improve the accuracy of NWS forecasts of storm surge, marine wind speed, and marine wave heights for use by both the marine navigation and coastal communities when extreme weather events occur. The real-time information can be used by emergency responders to make sound decisions based upon which coastal areas are flooding, which evacuation routes are still viable, and other situations requiring a good understanding of the current state of the physical environment. In FY 2008, NOS received funds to construct additional new NWLON stations to fill critical observation gaps identified by NWS. Initial sites were along

the Gulf Coast. Also, NOS has been hardening additional existing Gulf Coast NWLON stations by constructing elevated strengthened platforms and relocating equipment to them.

NOS operational nowcast/forecast modeling activities are expanding and rely upon NWS Eta model data streams as hydrodynamic model drivers. NOS, in cooperation with NWS and OAR in have developed an operational nowcast/forecast capability for the Great Lakes.

NOAA'S OFFICE OF OCEAN AND ATMOSPHERIC RESEARCH (OAR)

Requested FY 2009 funding for Weather and Air Quality Research (W&AQR) is \$57.5 million—a net increase of \$5.5 million or 10.6 percent more than the FY 2008 appropriation. Increases of \$10.4 million consist of funds to: partially cover inflationary cost increases within base programs (\$0.8 million), transfer management of the U.S. Weather Research Program from NWS back to OAR (\$5.5 million), enhance NOAA's new Unmanned Aircraft Systems (UAS) Program (\$3.0 million), and conduct research to improve operational weather forecasts (\$1.0 million). Proposed decreases of \$4.9 million result from terminating unrequested funding added by Congress to W&AQR in FY 2008, including funds for: the Northern Gulf Institute (\$1.8 million), Science Center for Teaching, Outreach and Research on Meteorology (STORM) (\$0.6 million), Advanced Radar Technologies Feasibility Study (\$0.1 million), Tornado & Hurricane Operations & Research (\$0.8 million), Wind Hazards Reduction Program (\$0.6 million), Coastal & Inland Hurricane Monitoring & Protection Program (\$0.6 million), San Joaquin Valley Ozone Study (\$0.1 million), and Coastal Weather Monitoring for Catastrophic Events (\$0.3 million).

NOAA'S OFFICE OF MARINE AND AVIATION OPERATIONS (OMAO)

OMAO supports meteorological activities by collection of related data from ships and aircraft. The FY 2009 President's Budget includes an increase of \$2.0 million from the FY 2008 appropriation for OMAO that are related to aircraft-supported meteorological data collection.

DEPARTMENT OF DEFENSE (DOD)

The total DOD budget request for FY 2009, including NPOESS funding, is \$982.7 million which represents a funding decrease of 5.4 percent from FY 2008. Specific highlights for each of the military departments are described below:

U.S. AIR FORCE (USAF)

USAF resources for meteorological support fall into several categories: general operations, investment and research, Defense Meteorological Satellite Program (DMSP), and National Polar-orbiting Operational Environmental Satellite System (NPOESS) supporting research. The total Air Force operations and research funding for FY 2009, including DMSP and NPOESS, is \$845.4 million (table 2.1, 10th column, rows 9 & 10).

Operations

The operations support portion of Air Force weather's FY 2009 budget is \$348.6 million (table 2.2, 2nd column, lines 9 & 10) and funds day-to-day environmental support to the Department of Defense, including DMSP operations, 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. Over 4,100 Active and Reserve Component military and civilian personnel (table 2.6) conduct these activities at more than 275 locations worldwide. Approximately 85 percent of personnel specialize in weather; the remainder includes communications, computer, administrative, and logistics specialists.

DMSP operations are a critical 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, National Environmental Satellite, Data, and Information Service, the Navy's Fleet Numerical Meteorology and Oceanography Center, the Naval Oceanographic Office, and Air Force Weather Agency according to interagency agreements.

The Air Force's total projected FY 2009 outlays for DMSP are \$119.1 million (table 2.1, column 2). This funding provides for the operations and sustainment of the on-orbit constellation, as well as integration, test, and flight hardware modifications and replacement to maximize performance and longevity

of the satellites that remain to be launched. DMSP satellites are acquired and launched by the Air Force and funding to operate the satellites on-orbit is transferred by the Air Force to National Oceanic and Atmospheric Administration each year (Table 2.7).

Supporting Research

The total AF research budget for FY 2009 is 336.8 million (table 2.1, column 6) which is comprised of general AF weather and NPOESS funding supporting Research, Development, Test and Evaluation (RDTE) efforts.

Air Force weather's FY 2009 budget request for general RDTE is \$47.3 million (not shown in tables). This amount is an increase in funding over FY 2008 as a result of efforts related to NPOESS infrastructure needs and other transformational initiatives that recapitalize legacy systems, build robust environmental digital data bases, and disseminate data streams to DOD and coalition C2 systems in a machine-to-machine (M2M)/net-centric era. As part of AF Smart Operations 21st Century (AFSO 21), Air Force weather is investing in modernized environmental prediction technologies and global information grid technologies that enhance automation and save manpower. Also, Air Force weather is investing in the following efforts in FY 2009 and beyond: Joint Environmental Toolkit (JET), Weather Research and Forecast (WRF) model, modernizing space weather capabilities, Cloud Depiction and Forecasting System (CDFS) II improvements, advanced MARK IVB use, Tactical Decision Aids, Weather Data Analysis (WDA), and Ensemble Prediction System (EPS). The goals of these efforts are to provide accurate and relevant weather information to warfighters at all levels of operations quicker and more consistently than ever before, within the decision cycle in a manner that facilitates exploiting the current and forecasted weather conditions. Specifically, JET will eliminate redundancies and/or inefficiencies and ultimately extend, consolidate and/or replace the Operational Weather Squadron (OWS) Production System-Phase II (OPS II), the Joint Weather Impacts System (JWIS), the New-Tactical Forecast System (N-TFS), and the weather effects decision aids portion of the Integrated Meteorological System (IMETS). WRF advances, such as with the Land Surface Model and WRF coupling, will improve forecasting performance

in the low levels of the atmosphere. This will allow AF weather forces to provide better forecasts for low-level aircraft operations, the dispersion of aerosol contaminants, and the employment of precision-guided munitions. It also allows for assessment of trafficability for ground forces. Collaboration with U.S. and Allied government and civilian agencies, and modernizing ground-based sensing will result in a robust space sensing capability. Improving CDFS techniques by doubling the resolution, integrating geosynchronous METSATS into the cloud analysis, using a new cloud interpretation scheme, and blending numerical weather prediction with forecast cloud advection techniques will ensure the AF continues as a center of excellence in cloud forecasting. MARK IVB data integration into cloud models will be expanded. Tactical Decision Aids (TDAs) provide warfighters an automated way to "visualize" environmental impacts on operations. These tools which continue to be integrated into C2 systems (e.g., mission planning systems) include Target Acquisition Weapons Software (TAWS), Infrared Target Scene Simulation (IRTSS), and Tri-Service Integrated Weather Effects Decision Aid (T-IWEDA). WDA will provide many of the behind-the-scene tools at the weather production centers necessary for enabling JET to provide decision-quality products and information to warfighters. EPS output will help AF weather personnel to provide better forecasts for the warfighter with increased confidence, particularly at the tactical level. While these all work synergistically to provide warfighters a quantum leap in capability, JET is the most visible piece to decision-makers. JET will exploit data contained in the Virtual Joint Meteorological Oceanographic (METOC) Database via common-user-communications, integrate with joint and coalition command and control and mission planning systems, and provide the machine-to-machine data exchange for assimilating METOC and C4ISR data to meet operational and tactical mission planning and execution requirements.

The FY 2009 DOD R&D budget for NPOESS is \$289.5 million (not shown in table) for the continued development of system architecture, technology, critical sensors, and algorithms. These dollars are applied to both the NPOESS Preparatory Project run by NASA and the NPOESS program being acquired by a tri-agency Integrated Program Office.

U.S. NAVY

The U.S. Navy FY 2009 budget total request for meteorological programs is \$80.6 million (table 2.1, column 10) made up of \$70.9 million for operations and \$9.7 million for supporting research.

Naval Oceanography Program (NOP)

NOP remains a unique, world-class program. Focusing support in the environmentally complex coastal/littoral regions around the globe, Naval METOC personnel (Navy and Marine Corps) are required to provide intelligence preparation of the environment (IPE) for operational decisionmakers by assessing the impact of atmospheric and ocean phenomena on platforms, sensors and weapon systems. Additionally, Navy and Marine Corp METOC personnel provide 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, educated in both sciences and warfighting applications. By teaming with and leveraging the efforts of other agencies and activities, the NOP meets these challenges in a most cost effective manner, providing a full spectrum of products and services with only a small percentage of the Federal weather budget. The NOP is required to provide comprehensive and integrated weather and ocean support worldwide. The Oceanographer/Navigator of the Navy sponsors programs in four closely related disciplines - meteorology, oceanography, geospatial information services, and precise time and astrometry. All are used to protect ships, aircraft, fighting personnel, 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.

Littoral Battlespace Sensing, Fusion, and Integration (LBSF&I)

LBSF&I is the Department of the Navy's principal Intelligence Preparation of the Environment approach for atmospheric and oceanographic data collection, processing, and data/product dissemination to users. LBSF&I will facilitate better tactical decision making by enabling a system of networked sensors to allow information sharing through interoperability

with naval and joint networks and information systems. It addresses critical gaps with respect to environmental data fidelity (in time and space) shown to play a critical role in force disposition and force posture in current and future naval missions. LBSF&I is a critical persistent IPE technology, a key component of the Naval Oceanography Battlespace on Demand framework, and supports the Battlespace Awareness Joint Capability Area through 2025.

Operational Support

Naval METOC support starts with sensing the battlespace without being adversely affected by physical environmental and culminates with weapons arriving on target and enabling personnel to operate 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 METOC products and services. As naval operations in the littoral increase, Naval METOC support is directed towards providing on-scene capabilities to personnel that directly furnish environmental data for sensor, weapon system, and personnel planning and employment. These on-scene capabilities are key elements for enabling the war-fighters to take advantage of the natural environment as part of battlespace management. Owing to the crucial interrelationship of the ocean and the atmosphere, Naval METOC requires various oceanographic products to provide the requisite meteorological services. In addition to aviation and maritime METOC support, Navy and Marine Corps METOC teams provide 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.

Systems Acquisition

Naval METOC systems acquisition is accomplished through the Program Executive Office for Command, Control, Communication, Computers and Intelligence and Space (C4I and Space) in San Diego, California.

Research and Development (R&D)

Naval METOC R&D are cooperatively sponsored by the Oceanographer/Navigator of the Navy

and the Chief of Naval Research. Naval 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/Navigator of the Navy, transition from engineering development to operational naval systems. Such efforts include advances in Naval METOC forecasting capabilities, 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, weapons systems, and platform performance. To realize the opportunities and navigate the challenges ahead, the Department of Navy must have a clear vision of how they will organize, integrate, and transform. "Sea Power 21" is that vision. It will align our efforts, accelerate our progress, and realize the potential of our people. Support to naval operations is provided under the direction of the Commander, Naval Meteorology and Oceanography Command (CNMOC) located at the Stennis Space Center, Mississippi and the Marine Corps advocate for METOC, the Deputy Commandant for Aviation, at Headquarters Marine Corps, Washington, D.C. With the addition of the Naval Oceanography Operations Command the NOP optimizes warfighting recourses, supports safe operations and enhances dominance of the battlespace through superior understanding and exploitation of the environment. The Naval METOC community 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

The U.S. Army estimates a requirement for \$45.6 million for operational support and \$11.1 million for research and development in FY 2009. The total amount of money budgeted for weather support is estimated because the costs to support USAF weather personnel are normally part of the overall G-3 or G-2 operating budget at the Army Com-

mands (ACOMs), Army Service Component Commands (ASCCs), Corps, Division, or Brigade level and are not assigned a specific program element or budget line. Additionally, programs or projects that are assigned a budget line are often part of a larger project's budget and the exact amount of monies spent on meteorological related activities cannot be independently verified. The budget numbers presented in this report represent the best estimate of the Army regarding meteorological related spending over the period of the report. Operational support for FY 2009 is projected to remain approximately even with FY 2008 expenditures and research is estimated to decrease about \$2.7 million from the previous year. Staffing levels remain stable for FY 2009. The \$64M supplemental funding for the AN/TMQ-52 Meteorological Measuring Set – Profiler (MMS-P) programmed in last year's report has not materialized, and the budget data have been adjusted appropriately.

Army monies for meteorology are spent in four main areas: support to U.S. Army Artillery Meteorology Sections (ARTYMET), support to USAF weather personnel at Army locations, research and development related to the Army mission, and the development, production, and maintenance of Army meteorological systems.

ASCCs with Staff Weather Officers and their associated weather personnel provide the same support and services to these forces that they normally provide to Army personnel. This support 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 (TRADOC) all provide this support to AF weather personnel assigned at the ACOM level and below.

Major portions of ACOMs and ASCCs meteorological expenditures support Artillery Meteorology Sections, also known as ARTYMET Teams, or Met Sections. 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. 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 (USAFAS) at Fort Sill, OK. These personnel train ARTYMET Teams on the use of the AN/TMQ-41 Meteorological Measuring Set and the AN/TMQ-52 Meteorological Measuring Set - Profiler. ARTYMET team structures will be changing over the next few years to support the Army's new modularity concept. No attempt has been made to convert the part-time Army National Guard ARTYMET Teams into full time equivalents.

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. The USAF provides one full time Staff Weather Officer to serve as a liaison between the AF and the Army Staff.

Forces Command (FORSCOM) will program approximately \$300,000 in FY09 for meteorological operations support. FORSCOM and subordinate units do not budget directly for Air Force Weather teams, but provide some support for them on an as-needed basis from general operations and maintenance budgets. FY08 budget numbers for artillery were carried forward as an estimate for FY09 as artillery budget numbers were not available for this report.

TRADOC programmed approximately \$2.6M for FY08 for meteorological services and plans to fund \$3.1M for FY09. The majority of these TRADOC funds, a total of \$2.4M, are planned for operations support related to training development, instructor/support personnel, logistics (expendable supplies), and repair costs on artillery meteorological systems at the USAFAS.

As a result of the previous two years (FY06-07) of investment in creating training development products, there were no training development costs

in FY08. Training development costs will increase to approximately \$100K in FY09. This cost increase is due to a technical manual's rewrite and a software upgrade. Training development cost is estimated to increase from \$100K FY09 to \$300K FY10. Expected future cost for training development are classroom modernization, equipment upgrade and innovative training devices.

Instructor/Support personnel costs (~\$1.71M) in FY08 are the result of USAFAS at Fort Sill, OK employing 30 personnel to conduct training using the AN/TMQ-41 Meteorological Measuring Set (MMS) and the AN/TMQ-52A Meteorological Measuring Set-Profiler (MMS-P). Additionally, this cost includes the requirement to fund five contract instructors to support the increased number of soldiers dictated by the Army's modular design. This is an increase from FY07 by ~\$283K due to the addition of three instructors (two contractors and one enlisted soldier). Instructor/Support personnel costs are expected to increase to (~\$2,2M) in FY09 as a result of USAFAS at Fort Sill, OK, employing 31 personnel to conduct training using the AN/TMQ-41 Meteorological Measuring Set (MMS) and the AN/TMQ-52A Meteorological Measuring Set-Profiler (MMS-P).

Logistics/supply costs (\$160K) for FY08 are a result of the increased number of soldiers trained over the year. We expect logistics/supply costs to increase to (~\$190.5K) in FY 09 due to supplies for meteorological sounding equipment to support live fire and training at Fort Sill.

Repair costs (\$260K) in FY08 will decrease for AN/TMQ-41 due to the depletion of parts. Costs associated with AN/TMQ-52A Meteorological Measuring Set-Profiler (MMS-P) will increase due maintaining and operating a second MMS-Profiler system. Overall cost is expected to decrease from \$260K to \$160K in FY09.

TRADOC also programmed \$76K in FY08 to fund a TRADOC Capabilities Manager (TCM) position for the Army's Integrated Meteorological System (IMETS). This position falls under the TRADOC Program Integration Office – All Source Analysis System (TPIO-ASAS) at the US Army Intelligence Center and School (USAICS) at Ft Huachuca, AZ. TPIO-ASAS has programmed \$78K for this same position in FY09. Additionally, in FY09, Fort Hua-

chuca has programmed an additional \$149K to fund for a Chief of the Army Weather Proponent Office, a newly created office and position at Fort Huachuca.

TRADOC transferred \$153K in FY08 to Air Combat Command for the maintenance and service of five Army Automated Surface Observing Sensor (ASOS) systems and two Army pole-mounted Tactical Meteorological Observing Systems (TMOS) at Fort Rucker, AL. Contract maintenance and service costs have been programmed to increase to ~\$160K in FY09.

Army Materiel Command (AMC) will fund a variety of activities for FY09, most of which fall into research and development and systems acquisition. There has been no programmed Integrated Meteorological System (IMETS) funding line since FY05; however, there have been 3 sources of funding available to the IMETS Project Office - DA restored Other Procurement Army (OPA) funding via Program Manager Intelligence Fusion, Distributed Common Ground System - Army (DCGS-A) OPA, and DCGS-A R&D. FY08 OPA funds were used for the continued production, fielding, and support of IMETS and new development for DCGS-A Weather Services. Northrop Grumman Corporation (Tacoma/Lakewood, WA) is the primary contractor supporting the OPA effort. R&D funding supports the development of new capabilities, the testing & integration of IMETS capabilities into the DCGS-A, and to integrate the Air Force Joint Environmental Toolkit (JET) software into the IMETS/DCGS-A. The Army Research Laboratory (ARL) and the New Mexico State University (NMSU) Physical Sciences Laboratory (PSL) partner on IMETS development and technology insertion efforts. IMETS Project Office closed on 30 September 2007 to become DCGS-A Weather Services. Future funding for DCGS-A Weather Services (IMETS) will come from DCGS-A program funding. Maintenance and support for the fielded IMETS, until the systems are replaced by DCGS-A, is an unresolved issue. Future development of DCGS-A Weather Services will include a joint effort with PD Digital Topographic Support Systems (DTSS) to build a combined weather/terrain spin-out (TWSO) system as a risk-reduction step towards the full production DCGS-A Weather Services. The TWSO will combine the architecture of DCGS-A Ver 4 with the AF joint environmental toolkit (JET) software module

to provide a net-centric weather capability replacing all Program of Record (POR) IMETS systems by FY12. The anticipated \$64M supplemental funding for the FY08 Profiler Program was not realized as of this writing and has been backed out of both the FY08 and FY09 budget projections.

The FY08 budget for meteorological support in Eighth U.S. Army decreased significantly from FY07 primarily due to the completed acquisition and fielding of 20 automated weather systems (includes 4-year warranty), using \$1.825M in FY07 funds (HQDA funded Eighth Army initiative). FY08 budget activity of \$190,000 provided steady state operational support for meteorological services by Army ARTYMET (\$322,000) and Air Force (\$40,000) units. The FY09 Air Force budget is projected to increase to \$85,000 to account for increased TDY costs to support Army units, and a planned computer lifecycle upgrade. Meanwhile, the ARTYMET budget will increase to \$356,000 to account for operating costs for an additional Army ARTYMET AN/TMQ-52 Profiler System that 210th Fires Brigade expects to field in FY09.

The USARPAC budget for Army Meteorological support will slightly increase for FY08/09. The 25ID(L), supported by the 25th Air Support Operations Squadron (ASOS), received an increased estimate for FY08 IMETS-V and IMETS-L sustainment funds. In addition, a new MTOE for USARPAC's Operational Command Post authorizes an IMETS-L system for USARPAC—which will require sustainment funding. ARTYMET personnel levels remain the same, but costs increased due to the 2.2% pay raise for military personnel.

Space and Missile Defense Command (SMDC) supports several 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.

For the USARIEM research program in FY08, there was an increase in expenditures on weather-related research. It is anticipated that FY09 fund-

ing for weather-related research efforts at the U.S. Army Research Institute of Environmental Medicine (USARIEM) will decrease relative to the FY 08 Level.

DEPARTMENT OF HOMELAND SECURITY (DHS)

U.S. COAST GUARD (USCG)

All of USCG's funding for meteorological programs is for operations support. For FY 2009, the requested funding level is \$23.1 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 cutters, 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 INTERIOR (DOI)

The total DOI/BLM weather funding request for FY 2009 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.)

Support of the RAWS program by the BLM will continue in FY 2009, 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 increasing 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 FY2009 is \$446.3 million by far the most going to the Federal Aviation Administration (FAA). The meteorological programs for the FAA and the Federal Highway Administration are described below.

FEDERAL AVIATION ADMINISTRATION (FAA)

For 2009, FAA requested a total \$442.1 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 2008 was \$409.5 million. For FY 2009, FAA requested \$32.6 million more representing an 8 percent increase in total funding. The changes are comprised of:

An increase in systems acquisitions of \$31.6 million to \$123.3 million, reflecting new and increased programs for NextGen (see below);

A decrease in operations support of \$1.1 million to \$279.1 million reflecting a decrease in federal personnel in the automated flight service station operations as a result of the A-76 contract award; and

An increase for aviation weather research of \$5.7 million to a total of \$34.1 million (Table 2.5).

The funding changes reflect major initiatives in the aviation weather programs in support of the Next Generation (NextGen) National Air Transport System to bring increased and enhanced 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.

The Aviation Weather Research Program will continue research into understanding the geophysical phenomena in the atmosphere and around airports that present hazardous conditions for aircraft operations. Among these hazards 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 understanding the impacts of space weather on aviation.

FEDERAL HIGHWAY ADMINISTRATION (FHWA)

The total FHWA request for surface transportation weather programs in FY 2009 is \$4.2 million, all of which will be used for supporting research.

In 1999, the FHWA began documenting road weather data requirements, and this has served as the basis for the majority of work and research in this area. This work, some of which is described below, 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.

Addressing these institutional challenges has helped foster 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 have included 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. This road weather information

will enable more effective decision making, leading to a safer and more efficient surface transportation system.

A U.S. DOT initiative entitled Clarus will develop, demonstrate and support deployment of a nationwide surface transportation weather observing and forecasting system, and ultimately foster nationwide data sharing capabilities. Clarus will allow agencies to share quality-checked 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 and operators.

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 and during the winter season of 2003-2004. During the winter season of 2004-2005, the MDSS prototype was successfully deployed in a third demonstration in Colorado and in early 2006; this product was declared a "market ready technology." By 2007, 21 state transportation agencies were using or developing MDSS tools. The current focus of the MDSS project is to continue to build on current outreach program activities such as sponsoring annual stakeholder meetings, conducting product "Road Shows" and Demonstration Showcases, facilitating technology transfers to the private sector, providing assistance to public agencies in writing request for proposals, and participating in informational conferences. The project team also plans to conduct a series of benefit/cost analyses to produce "hard" financial data that can be used to support investing in such a system and exploring the potential of expanding the functionality of MDSS beyond winter maintenance to include such activities as non-winter road maintenance, construction, and traffic management.

In 2006, the FHWA completed a study on how Traffic Management Centers (TMCs) around the country integrate road weather information into

their operations. The FHWA documented 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. Based on the findings of this study, the FHWA initiated a project in 2007 to develop a self-assessment guide to help TMCs evaluate their weather information integration needs and assist them in developing weather integration plans. The FHWA is also conducting analyses and developing models to quantify the impacts of various weather events on driver behavior and highway traffic, working to incorporate weather and pavement condition data into traffic analysis tools, as well as investigating a variety of weather-responsive traffic management strategies such as changing traffic signal timing in response to weather and posting weather-related messages on variable message signs. These efforts will help FHWA advance the state-of-the-practice in weather-responsive traffic management.

The 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 road-ways. In March 2004, the NRC released a report, *Where the Weather Meets the Road: A Research Agenda for Improving Road Weather Services*, which recommended the creation of a focused, national road weather research program led by FHWA that brings together the transportation and meteorological communities, identifies research priorities, and implements new scientific and technological advances. The 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. Most, if not all of these recommendations, have been incorporated into the roadmap that is being used to guide the activities of the Road Weather Management Program.

To strengthen relationships between the meteorological and surface transportation communities, the FHWA Road Weather Management Program and the American Meteorological Society (AMS) co-sponsored a Policy Forum on Weather and Highways in November 2003. The objective was to discuss the provision of weather information to improve highway operations, the development of strategies to effectively respond to weather information, and the 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*, contained 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 the recommendations that were made in the AMS and NRC reports, the FHWA and the National Oceanic and Atmospheric Administration (NOAA) signed a memorandum of understanding (MOU) in July of 2005 to enable the two agencies to work together to achieve shared goals for a safer and more efficient surface transportation system. By working together, these two agencies will be able to take advantage of each other's investments and expertise, as well as promote improved surface transportation weather training, products, and services. A near-term goal of this partnership will be the introduction of new products, services and training to improve the application of weather information to surface transportation operations.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

All of the EPA's funding of meteorological and air quality programs is for supporting research.

The anticipated funding level in FY 2009 for directed meteorological research is \$9.0 million which is the same funding level as in FY 2008.

Continued attention is being paid to the effects of airborne toxins and fine particulate matter on human health, on the effect of climate change on air quality, and the impact on ecosystems. 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 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 2009 as in FY 2008.

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 2009 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 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 urban, mesoscale, regional, and multimedia models, which will be used to develop air pollution control strategies, human and ecosystem exposure assessments, and air quality forecasting. 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 2009, NASA requests a total of almost \$740.7 million. Nearly all of NASA funding in meteorology is for supporting research. The NASA Earth Science Division (ESD) budget consists of seven programs: Earth Systematic Missions, Earth Science Pathfinder, Research, Applied Sciences, Multi-Mission Operations, Technology and Education and Outreach. The funding levels represent the estimated meteorology share of the supporting research and analysis programs within the ESD budget. The Earth Systematic Missions program contributes to the Systems Development line in the budget request; the other six programs contribute to the Research and Development line.

NUCLEAR REGULATORY COMMISSION (NRC)

The NRC planned expenditure of \$500,000 in FY 2009 is for meteorological operations to continue technical assistance for the analysis of atmospheric dispersion for routine and postulated accidental releases from nuclear facilities; for preparation of guidance on meteorological issues in licensing actions; and for 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 approvals for new nuclear power plants. Numerous early site permit, combined license, and design certification 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 DMSF are listed on a separate line.

In FY 2009, total Operational Costs requested are \$3.19 billion with a total of \$1.78 billion for Operations Support, \$1.37 billion for Systems Ac-

quisition, and \$42.1 million for Special Programs.

Table 2.3 describes how the agencies plan to obligate their funds for meteorological supporting research also broken down by budget categories. The agencies’ supporting research budgets are subdivided along similar lines of operational funding--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 2009, agencies will obligate a total of \$1.29 billion in Supporting Research funds in the following manner: \$589.0 million to research and development and \$700.4 million to Systems Development.

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

AGENCY	Operations Support		Systems Acquisition		Special Programs		Total		% of FY2009 TOTAL
	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	
Agriculture	16077	16335	0	0	0	0	16077	16335	1.6
Commerce/NOAA(Subtot)	991717	1003949	843671	1073979	45482	35780	1880870	2113708	12.4
NWS	790781	810298	67430	79841	35134	26604	893345	916743	2.6
NESDIS***	152516	136916	775147	992588	0	0	927663	1129504	21.8
OAR	0	0	0	0	0	0	0	0	0.0
NOS	25668	28314	0	0	0	0	25668	28314	10.3
OMAO	22752	28421	1094	1550	10348	9176	34194	39147	14.5
Defense(Subtot)	463116	450526	184801	173853	651	666	648568	625045	-3.6
Air Force***	328530	329323	54005	60130	0	0	382535	389453	1.8
DMSP*	17125	19304	115839	99788	0	0	132964	119092	-10.4
Navy	85623	69472	1747	1418	0	0	87370	70890	-18.9
Army	31838	32427	13210	12517	651	666	45699	45610	-0.2
Homeland Security (Subtot)	21540	23060	0	0	0	0	21540	23060	7.1
USCG	21540	23060	0	0	0	0	21540	23060	7.1
Interior/BLM	2400	2400	0	0	0	0	2400	2400	0.0
Transportation(Subtot)	280170	279089	91738	123308	9278	5636	381186	408033	7.0
FAA	280170	279089	91738	123308	9278	5636	381186	408033	7.0
FRA	0	0	0	0	0	0	0	0	0.0
FHWA	0	0	0	0	0	0	0	0	0.0
EPA	0	0	0	0	0	0	0	0	0.0
NASA	7199	7497	0	0	0	0	7199	7497	4.1
NRC	120	500	0	0	0	0	120	500	316.7
TOTAL	1782339	1783356	1120210	1371140	55411	42082	2957960	3196578	8.1
% of FY TOTAL	60.3%	55.8%	37.9%	42.9%	1.9%	1.3%	100.0%	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.

***NESDIS and Air Force budget numbers also include the DOC and DOD shares of the NPOESS budget, respectively.

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

AGENCY	Research & Development		Systems Development		Special Programs		Total		% of FY2009 TOTAL
	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	
Agriculture	34206	29063	0	0	0	0	34206	29063	-15.0
Commerce/NOAA(Subtot)	101826	113086	2869	9212	500	500	105195	122798	16.7
NWS	15201	17822	1950	8412	0	0	17151	26234	53.0
NESDIS	26459	28376	0	0	0	0	26459	28376	7.2
OAR	51099	56715	919	800	0	0	52018	57515	10.6
NOS	0	0	0	0	500	500	500	500	0.0
OMAO	9067	10173	0	0	0	0	9067	10173	12.2
Defense(Subtot)	30075	37765	359726	319847	0	0	389801	357612	-8.3
Air Force***	13758	16969	359726	319847	0	0	373484	336816	-9.8
DMSP*	0	0	0	0	0	0	0	0	0.0
Navy	2518	9731	0	0	0	0	2518	9731	286.5
Army	13799	11065	0	0	0	0	13799	11065	-19.8
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)	32514	38252	0	0	0	0	32514	38252	17.6
FAA	28314	34052	0	0	0	0	28314	34052	20.3
FRA	0	0	0	0	0	0	0	0	0.0
FHWA	4200	4200	0	0	0	0	4200	4200	0.0
EPA	9000	9000	0	0	0	0	9000	9000	0.0
NASA	326335	361883	322531	371329	0	0	648866	733212	13.0
NRC	0	0	0	0	0	0	0	0	0.0
TOTAL	533956	589049	685126	700388	500	500	1219582	1289937	5.8
% of FY TOTAL	43.8%	45.7%	56.2%	54.3%	0.0%	0.0%	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.

***Air Force budget numbers also include the DOD share of the NPOESS budget

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 2009 operational funds: basic meteorology services receiving 63.1 percent; aviation 14.0 percent; marine 3.9 percent; agriculture/ forestry 0.6 percent; general military services 17.8 percent; and other specialized services accounting for 0.6 percent.

Table 2.5 shows the distribution of supporting research funds among the services with basic meteorology receiving 10.3 percent, aviation 2.7 percent, marine 0.8 percent, agriculture and forestry 2.3 percent, general military 26.1 percent, and the remaining 57.9 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.

Aviation Services. Those services and facilities established to meet the requirements of gen-

eral, 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.

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

AGENCY	Basic		Aviation		Marine		Agriculture & Forestry		General Military		Other		Total	
	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009
Agriculture	0	0	0	0	0	0	16077	16335	0	0	0	0	16077	16335
Commerce/NOAA(Subtot)	1772031	2003774	17622	18678	80869	82080	0	0	0	0	10348	9176	1880870	2113708
NWS	821616	845849	16528	17128	55201	53766	0	0	0	0	0	0	893345	916743
NESDIS**	927663	1129504	0	0	0	0	0	0	0	0	0	0	927663	1129504
OAR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NOS	0	0	0	0	25668	28314	0	0	0	0	0	0	25668	28314
OMAO	22752	28421	1094	1550	0	0	0	0	0	0	10348	9176	34194	39147
Defense(Subtot)	14853	12051	26211	21267	25337	20558	0	0	577798	567624	4369	3545	648568	625045
Air Force***	0	0	0	0	0	0	0	0	382535	389453	0	0	382535	389453
DMSP*	0	0	0	0	0	0	0	0	132964	119092	0	0	132964	119092
Navy	14853	12051	26211	21267	25337	20558	0	0	16600	13469	4369	3545	87370	70890
Army	0	0	0	0	0	0	0	0	45699	45610	0	0	45699	45610
Homeland Security (Subtot)	0	0	0	0	21540	23060	0	0	0	0	0	0	21540	23060
USCG	0	0	0	0	21540	23060	0	0	0	0	0	0	21540	23060
Interior/BLM	0	0	0	0	0	0	2400	2400	0	0	0	0	2400	2400
Transportation(Subtot)	0	0	381186	408033	0	0	0	0	0	0	0	0	381186	408033
FAA	0	0	381186	408033	0	0	0	0	0	0	0	0	381186	408033
FRA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FHWA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EPA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NASA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRC	120	500	0	0	0	0	0	0	0	0	7199	7497	7199	7497
TOTAL	1787004	2016325	425019	447978	127746	125698	18477	18735	577798	567624	21916	20218	2957960	3196578
% of FY TOTAL	60.4%	63.1%	14.4%	14.0%	4.3%	3.9%	0.6%	0.6%	19.5%	17.8%	0.7%	0.6%	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.
***NESDIS and Air Force budget numbers also include the DOC and DOD share of the NPOESS budget, respectively.

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

AGENCY	Basic		Aviation		Marine		Agriculture & Forestry		General Military		Other		Total	
	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009	FY2008	FY2009
Agriculture	0	0	0	0	0	0	34206	29063	0	0	0	0	34206	29063
Commerce/NOAA(Subtot)	104169	121798	526	500	500	500	0	0	0	0	0	0	105195	122798
NWS	17151	26234	0	0	0	0	0	0	0	0	0	0	17151	26234
NESDIS	26459	28376	0	0	0	0	0	0	0	0	0	0	26459	28376
OAR	51492	57015	526	500	0	0	0	0	0	0	0	0	52018	57515
NOS	0	0	0	0	500	500	0	0	0	0	0	0	500	500
OMAO	9067	10173	0	0	0	0	0	0	0	0	0	0	9067	10173.3
Defense(Subtot)	13378	10741	0	0	2518	9731	0	0	373905	337140	0	0	389801	357612
Air Force***	0	0	0	0	0	0	0	0	373484	336816	0	0	373484	336816
DMSP*	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Navy	0	0	0	0	2518	9731	0	0	0	0	0	0	2518	9731
Army	13378	10741	0	0	0	0	0	0	421	324	0	0	13799	11065
Homeland Security (Subtot)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	28314	34052	0	0	0	0	0	0	0	0	32514	38252
FAA	0	0	28314	34052	0	0	0	0	0	0	0	0	28314	34052
FRA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FHWA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EPA	0	0	0	0	0	0	0	0	0	0	0	0	4200	4200
NASA	0	0	0	0	0	0	0	0	0	0	0	0	9000	9000
NRC	0	0	0	0	0	0	0	0	0	0	0	0	648866	733212
TOTAL	117547	132539	28840	34552	3018	10231	34206	29063	373905	337140	662066	746412	1219582	1289937
% of FY TOTAL	9.6%	10.3%	2.4%	2.7%	0.2%	0.8%	2.8%	2.3%	30.7%	26.1%	54.3%	57.9%	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.
***Air Force budget numbers also include the DOD share of the NPOESS budget

PERSONNEL ENGAGED IN METEOROLOGICAL OPERATIONS

Table 2.6 depicts agency staff resources in meteorological operations. The total agency staff resources requested for FY 2009 is 11,286. This total represents a decrease of almost one percent from FY 2008. FAA's significant decrease

in federal personnel from previous reports reflects completion of the phase down of federal flight service briefers as private contract personnel assumed briefing duties.

TABLE 2.6 PERSONNEL ENGAGED IN METEOROLOGICAL OPERATIONS

(Units are Full time Equivalent Staff Years)*

AGENCY	FY2008	FY 2009	%CHG	% of FY 2009
				TOTAL
Agriculture	130	132	1.5	1.2
Commerce/NOAA (sub-total)	5790	5791	0.0	51.3
NWS	4639	4640	0.0	41.1
NESDIS (sub-total)	889	889	0.0	7.9
NESDIS	831	831	0.0	7.4
Reimbursed	58	58	0.0	0.5
OAR	32	32	0.0	0.3
NOS	119	119	0.0	1.1
OMAO	111	111	0.0	1.0
Defense(Subtotal)	5044	4935	-2.2	43.7
Air Force(Subtotal)	4261	4171	-2.1	37.0
AFW	4142	4052	-2.2	35.9
DMSP	119	119	0.0	1.1
Navy	413	399	-3.4	3.5
Army	370	365	-1.4	3.2
Homeland Security-USCG	108	108	0.0	1.0
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)	239	248	3.8	2.2
FHWA	4	4	0.0	0.0
FAA	235	244	3.8	2.2
EPA	0	0	0.0	0.0
NASA	42.1	42.7	0.0	0.4
NRC	2	2	0.0	0.0
TOTAL	11383	11286	-0.8	99.0

** "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 2008. Agencies routinely enter into reimbursable agreements when they determine that one agency can

provide the activity more 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.

TABLE 2.7 INTERAGENCY FUND TRANSFERS FOR METEOROLOGICAL OPERATIONS AND SUPPORTING RESEARCH

Agency Funds Transferred from:	Agency Funds Transferred to:	FY 2008 Funds (\$K) Estimated or Planned		
		Operations	Supporting Research	
USDA/Forest Service DoD/Air Force	NOAA	10		
	NOAA (for DMSP)	11500		
	DOC/NOAA/NWS		200	
	DOC/NOAA/NWS	5332		
	DOC/NOAA/NWS		138	
	DOC/NOAA/NWS	440		
	DOC/NOAA/NWS	710		
	OFCM	140		
	OFCM	30		
	DOC/NOAA/NESOIS/IPO (for DMSP)	232		
	USGS (Dept of Interior)	450		
	NASA	220		
	DOC/NOAA/SEC	258		
	NSF/UCAR		772	
	NSF/NCAR		2526	
	NSF/NCAR		710	
	NSF/NCAR		475	
	NASA		630	
		OPM	15	
		GSA	125	
DoD/Army	NOAA	103		
	COE (CW) to NWS	570		
	COE (CW) to USGS	534		
	Air Combat Command (ACC)	78		
	Air Combat Command (ACC)	78		
	ARO to NSF		11	
DoD/Navy	DOC	81		
	DOC	189		
NASA	DoD/USAF/45th Space Wing	1505		
	DoD/USAF/Edwards AFB	105		
	DOC/NOAA/NDBC	103		
	DOC/NOAA/SMG	1807		
FAA	DOC/NOAA (equipment)	39400		
	DOC/NOAA (instructors)	1101		

FACILITIES/LOCATIONS FOR TAKING METEOROLOGICAL OBSERVATIONS

Table 2.8 shows the number of facilities/ locations or platforms at which the federal agencies carry out or supervise the taking of various types of meteorological observations. As of August 2008, the Army does not use upper-air rocket sensors anymore.

TABLE 2.8 FACILITIES/LOCATIONS FOR TAKING METEOROLOGICAL OBSERVATIONS

TYPE OF OBSERVATION by AGENCY	No. of 2008 Locations
Surface, land	
Commerce (all types)	841
Air Force (U.S. & Overseas)	162
Navy (U.S. & Overseas)	68
Marine Corps (U.S. & Overseas)	13
Army (U.S. & Overseas)	24
Transportation (FAA Contract Wx Obsg Stn)	133
Transportation (FAA Auto Wx Obsg Stn)	168
Transportation (FAA Auto Sfc Obsg Sys, fielded)	580
Transportation (FHWA-Road Wx Obsg Stn)	2017
Homeland Security (USCG Coastal)	50
Interior	470
Agriculture	1886
NASA (all types)	46
Sub-total	6458
Surface, marine	
Commerce (SEAS-equipped ships)	622
Commerce (Coastal-Marine Autom Network)	56
Commerce (NOAA/NOS/PORTS)	18
Commerce (PORTS only meteorological stations)	50
Commerce (Buoys--moored)	98
Commerce (Buoys--drifting)	21
Commerce (Buoys--large navigation)	10
Commerce (Water-level gauges)	200
Commerce (Water-level gauges with meteorology sensors)	116
Navy (Ships with met personnel)	29
Navy (Ships without met personnel)	251
Homeland Security (USCG Cutters)	252
NASA (Buoys - moored)	2
Sub-total	1725
Upper air, balloon	
Commerce (U.S.)	102
Commerce (Foreign, Cooperative)	22
Air Force, Fixed (U.S. & Overseas)	12
Air Force, Mobile	15
Army, Fixed (U.S. & Overseas)	18
Army, Mobile (U.S. and Overseas)	85
Navy, Fixed (U.S. & Overseas)	0
Navy, Mobile(U.S. & Overseas)	10
Navy, Ships	29
Marine Corps, Mobile	10
NASA (U.S. and Overseas)	4
Sub-total	307
Atmospheric Profilers	
Air Force (Eastern Range) (915 MHz)	5
Air Force (Eastern Range) (SODARS)	5
Air Force (Western Range) (915 MHz)	5
Air Force (Western Range) (50 MHz)	1
Air Force (Western Range SODARS)	2
Army	9
NASA (50 MHz)	1
Sub-total	28

TYPE OF OBSERVATION by AGENCY	No. of 2008 Locations
Doppler weather radar (WSR-88D) sites	
Commerce (NWS)	121
Air Force (U.S. & Overseas)	26
Army (US and Overseas)	2
Transportation (Off CONUS)	12
Sub-total	161
Doppler weather radar (Not WSR-88D) sites	
Air Force (Fixed)	9
Army	1
Navy (Fixed)	9
Marine Corps (Mobile)	10
Marine Corps (Fixed)	1
Sub-total	30
Airport Terminal Doppler weather radars	
Transportation (Commissioned)	47
Army (not airfield--Test Range/USAREUR)	4
Sub-total	51
Conventional radar (non-Doppler) sites	
Commerce (NWS)	2
Commerce (at FAA sites)	27
Air Force, Mobile Units	23
Army (U.S. and Overseas)	3
Transportation (FAA (WSP))	39
Sub-total	94
Total Radars	672
Off-site WSR-88D Principle User Processors (PUPs)	
Air Force (OPUPs only)	97
Marine Corps (U.S. & Overseas)	9
Army	1
Transportation	25
NASA (KSC/AMU)	1
Sub-total	133
Weather reconnaissance Aircraft	
Commerce (OMAO)	3
Air Force Reserve Command (AFRC)	10
Sub-total	13
Geostationary meteorological satellites (No. operating)	
Commerce (2 primary, 1 standby, 1 servicing South America)	4
Polar meteorological satellites (No. operating)	
Commerce (2 primary - one US; one European, 3 standby)	5
Air Force (2 primary, 3 standby)	5
Navy (WINDSAT and GFO)	2
Sub-total	12
Electric Field Mills (Surface)	
NASA (KSC)	31
Stennis	2
Sub-total	33
Lightning Detection Systems	
Air Force (Eastern Range) (Cloud - Ground)	1
Air Force (Eastern Range) (National Lightning)	1