

FEDERAL COORDINATION AND PLANNING FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

The mission of the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) is to ensure the effective use of Federal meteorological resources by leading the systematic coordination of operational weather requirements, services, and supporting research among the Federal agencies. Its high-level focus includes cross-agency needs and requirements, issues and problems, studies, reports, plans, handbooks, and crosscut reviews, assessments, and analyses.

OFCM operates with policy guidance from the Federal Committee for Meteorological Services and Supporting Research (FCMSSR). The principal work in coordinating meteorological activities and in the preparation and maintenance of OFCM reports, plans, and other documents is accomplished by the OFCM staff with the advice and assistance of the Interdepartmental Committee for Meteorological Services and Supporting Research (ICMSSR) and more than 30 program councils, committees, working groups, and joint action groups, all of whose members are Federal agency representatives.

STATUTORY BASIS FOR THE FEDERAL COORDINATION PROCESS

In 1963, Congress and the Executive Office of the President expressed concern about the adequacy of the coordination of Federal meteorological activities. In response, Congress directed in Section 304 of Public Law 87-843—the Appropriations Act for State, Justice, Commerce, and Related Agencies—that the Bureau of the Budget prepare an annual horizontal budget for all meteorological programs in the Federal agencies. The Bureau of the Budget (now the Office of Management and Budget, OMB) issued a report in 1963 entitled “Survey of Federal Meteorological Activities.” That report described each agency’s program for meteorological services and products and detailed the relationships among the programs of the various agencies. The report revealed close cooperation but little evidence of systematic coordination. Based on its survey, the Bureau of the Budget issued a set of ground rules to be followed in the coordination process. It established a permanent general philosophy for assignment and assessment of agency roles in the field of meteorology and set certain goals to be achieved by the coordination process. The Bureau of the Budget tasked the Department of Commerce (DOC) to establish the coordinating mechanism in concert with the other Federal agencies. It also reaffirmed the concept of having a central agency—the DOC—responsible for providing common meteorological facilities and services and clarified the responsibilities of other agencies for providing meteorological services specific to their mandated missions.

The implementation of these directives by DOC led to the creation of OFCM and the appointment of the first Federal Coordinator for Meteorological Services and Supporting Research (“the Federal Coordinator”). The Federal Committee for Meteorological Services and Supporting Research (FCMSSR) was established in 1964 to provide policy-level agency representation and guidance to the Federal Coordinator in addressing agency priorities, requirements, and issues related to services, operations, and supporting research. The FCMSSR

also resolves agency differences that arise during the coordination of meteorological activities and the preparation of Federal plans.

The FCMSSR comprises representatives of the 15 Federal agencies that engage in meteorological activities or supporting research, have a major need for meteorological services, or set policy and direction for such services and research. These 15 agencies are the Departments of Agriculture, Commerce, Defense, Energy, Homeland Security, the Interior, State, and Transportation; the Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), National Science Foundation (NSF), National Transportation Safety Board, and Nuclear Regulatory Commission; and OMB and the Office of Science and Technology Policy (OSTP). The Under Secretary of Commerce for Oceans and Atmosphere, who is also the Administrator of the National Oceanic and Atmospheric Administration (NOAA), serves as the FCMSSR Chairperson. The full membership of the FCMSSR is shown on the inside cover of this *Federal Plan*.

OFCM COORDINATING INFRASTRUCTURE

Figure 2-OFCM-1 shows the current infrastructure of advisory committees, program councils, working groups, and joint action groups through which OFCM carries out its mission of ensuring the effective use of Federal meteorological resources by coordinating operational weather requirements, services, and supporting research among the Federal agencies. The FCMSSR is shown at the top of the chart, as the policy guidance advisor to the Federal Coordinator.

- The **Interdepartmental Committee for Meteorological Services and Supporting Research** (ICMSSR), which is chaired by the Federal Coordinator, is the primary program management body of the Federal coordinating structure. ICMSSR provides advice to OFCM, implements FCMSSR policies, and oversees the committees and working groups that address observing systems, weather operations and services, operational processing centers, and automated weather information systems. The full membership of ICMSSR is shown on the inside cover of this *Federal Plan*.
- The **Program Councils**, which are directly under the FCMSSR and are each chaired by the Federal Coordinator, coordinate key programs at the highest interagency policy decision-making level, and ensure that the programs meet joint requirements. In addition to establishing policy, the program councils coordinate development and oversee the preparation and implementation of national program plans, which include research and development (R&D), systems development, validation and integration, acquisition strategy, operational concepts, agency roles, and management.
- The **Committees** and their **Working Groups** and **Joint Action Groups** operate at the program and working levels to provide: (1) a forum for each agency to report activities, difficulties, and achievements; (2) a mechanism for coordinated change and problem solving; (3) a medium for collection, documentation, and consolidation of agency requirements and inventories; (4) oversight for coordinated system development; (5) a vehicle for coordinating with other groups; and (6) a mechanism for the preparation of studies, agreements, standards, protocols, reports, and national plans.

Using these multiagency entities, the OFCM pursues the following objectives as the means for achieving its mission:

- Document agency programs and activities in a series of national plans and reports that enable agencies to adjust their individual ongoing programs and provide a means for communicating new ideas and approaches to fulfill requirements.
- Provide structure and programs to promote continuity in the development and coordination of interagency plans and procedures for meteorological services and supporting research activities.
- Prepare analyses, summaries, or evaluations of agency meteorological programs and plans that provide a factual basis for the executive and legislative branches to make appropriate decisions related to the allocation of funds.
- Review Federal weather programs and Federal requirements for meteorological services and supporting research. This review may suggest additions or revisions to current or proposed programs, or identify opportunities for improved efficiency, reliability, or cost avoidance through coordinated actions or integrated programs.

OF CM HIGHLIGHTS FOR FISCAL YEAR 2010 AND PLANS FOR FISCAL YEAR 2011

Federal coordination activities during FY 2010 and plans for FY 2011 are discussed here under the Program Council or ICMSSR standing committee that provided oversight of the associated working group or joint action group. During FY 2010, the OFCM staff provided executive secretary and related staff support for more than 25 of these interagency groups, which held more 60 meetings during the year.

National Aviation Weather Program Council

The OFCM continues to participate in the Next Generation Air Transportation System (NextGen) Weather Working Group and the Friends/Partners in Aviation Weather (FPAW). The OFCM also continues to implement the National Aviation Weather Program, and is working with the agencies to advance meteorological standards, improve products, enhance services, and participate in research that contributes to the overall goal of providing the best state-of-the-art information to aviation end users where and when they need it. During FY 2011, the OFCM will be participating in two activities under the Joint Program Development Office (JPDO) for NextGen: the Weather Working Group Executive Committee and the Integrated Surveillance activity.

The Air Domain Awareness (ADA) program is an interagency homeland defense, security, and air transportation initiative that has grown out of the Federal interest in Multifunction Phased Array Radar (MPAR, see discussion below). The Federal Coordinator represented the DOC Deputy Secretary at the ADA Summit in July 2010 and continues to represent DOC in ADA working groups, fostering synergism between ADA and the DOC and NOAA roles supporting environmental awareness and frequency management.

In FY 2010, the OFCM published the *National Aviation Weather Program 10-Year Accident Reduction Initiative Final Report* on the interagency effort, under the National Aviation Weather Program Council, to reduce weather-related fatal accidents. The report describes the goals set for

the initiative, the framework for coordinating plans and programs across multiple agencies, and the actions that marshaled efforts by the Federal agencies, the private sector, academia, and non-governmental organizations to lower the general aviation weather-related accident rate by 49% and air taxi weather-related accident rates by 37%. The report also informed the agencies on areas still needing improvement to further reduce weather-related accidents.

During FY 2011, OFCM will establish a maintenance plan, as appropriate, for weather-related accident reduction gains.

In response to the volcanic ash airspace closure in Europe during 2010, the OFCM and the Working Group on Volcanic Ash coordinated interagency and international assistance to Europe and worked with the NOAA National Weather Service on actions to improve U.S. preparations for a similar event. The Working Group on Volcanic Ash has developed a clear action plan to focus research for improved volcanic ash products and services, primarily for aviation, but exportable to all applications.

During FY 2011 the Committee for Aviation Services and Research will develop an interagency long-term research strategy for volcanic ash observing and plume forecasting. This committee's Working Group on Volcanic Ash will update and maintain the National Volcanic Ash Operations Plan for Aviation, complete a needs assessment review, conduct a crosscut analysis and review of products and services that respond to volcanic ash observation and prediction needs, and support the committee in developing a long-term research strategy

National Operational Processing Centers Program Council (NOPC)

During FY 2010, the OFCM completed transition of the expiring Shared Processing Program to NOPC management. On October 7, 2009, the NOPC implemented the Environmental Satellite Data Annex to the interagency Data Acquisition, Processing, and Exchange (DAPE) Memorandum of Agreement, superseding the Shared Processing Program before its expiration in November 2009. The new annex establishes satellite data management and exchange processes among the five operational processing centers to optimize the Federal investment in environmental satellite data acquisition.

The OFCM continues to host the Committee for Operational Processing Centers (COPC) to facilitate improved processing and backup capabilities for NOAA's National Centers for Environmental Prediction and Office of Satellite Data Processing and Distribution, the Air Force Weather Agency, and the U.S. Navy's Fleet Numerical Meteorology and Oceanography Center and Naval Oceanographic Office. In FY 2010, the agencies with operational processing centers moved to new high-bandwidth communications network to eliminate outdated and unsupported asynchronous transfer mode channels. The COPC network backbone that interconnects the operational processing centers was upgraded in FY 2010 from the Defense Information Switched Network Asynchronous Transfer Mode System (DATMS) to the Defense Information Systems Agency Optical Transport Network (OTN). The new connection increases throughput and link utilization and provides more robust network survivability in catastrophic events like Hurricane Katrina. This upgrade improved the operational processing centers' data communications by up to 250% and established a foundation to meet future needs.

During FY 2011, activities under COPC's Working Group for Cooperative Support and Backup will include three joint action groups. The Joint Action Group for Operational Community Modeling (JAG/OCM) will be enhancing and extending community modeling opportunities. The Joint Action Group for Centralized Communications Management (JAG/CCM) will monitor communications among the operational processing centers in order to project future infrastructure needs and plan capacity increases to meet those needs. The JAG/CCM is working with the Defense Information Systems Agency to clarify the centers' communications investment and operations planning to meet rapidly expanding needs by overseeing network sizing, cost estimates, and analysis across all five centers. The Joint Action Group for Operational Data Acquisition for Assimilation (JAG/ODAA) is developing additional annexes to supplement the DAPE Memorandum of Agreement. It will also organize and conduct the first NOPC Observational Data Conference.

National Space Weather Program Council

Based on a request in August 2008 to the National Space Weather Program Council from OSTP, the OFCM sponsored and formed the Committee for Space Environmental Sensor Mitigation Options (CSESMO) and its four supporting joint action groups. The overall study included 75 experts from 19 different Federal offices or agencies. The tasks assigned to the CSESMO included developing options and recommendations to continue solar wind monitoring and mitigate the loss of most space environmental sensing capability from the reconfigured National Polar-orbiting Operational Environmental Satellite System (NPOESS). During FY 2009, the CSESMO delivered an interagency-coordinated set of options and a recommended approach to sustain solar wind observations critical to averting adverse space weather effects. The CSESMO also delivered a coordinated mitigation strategy to provide robust space weather observing capabilities to replace those lost from NPOESS. This capability can be used to protect the reliability and effectiveness of the Global Positioning System (GPS), all satellite communications, U.S. ballistic missile defense, and satellite and manned spaceflight safety. The committee briefed its findings and recommendations to OSTP, OMB, and National Security Council staff, and OFCM prepared written reports based on both presentations.

In November 2009, the CSESMO delivered the last of five deliverables to OSTP, completing all its assigned tasks on time. Overall, the CSESMO reports have given OSTP a coordinated, interagency consensus set of options, recommendations, and preliminary cost estimates. These constitute solid steps toward resolving the significant risk to the electric power grid and potentially trillions of dollars in losses from lack of timely warning of a major geomagnetic storm. The CSESMO deliverables led to a provision in the FY 2011 President's Budget for satellite programs to support solar wind monitoring vital to timely geomagnetic storm warnings. Specifically, the FY2011 President's Budget includes \$128M for two critical space-based observing systems.

In June 2010, the National Space Weather Program Council, through the OFCM, sponsored, planned, and hosted the annual Space Weather Enterprise Forum (SWEF) to share information among Federal agency stakeholders and extend education and outreach to a wider community. The 2010 SWEF brought together more than 230 experts and stakeholders from government, science, and industry, including international participants. Media coverage and outreach surpassed that of the preceding three annual forums combined and dramatically raised awareness

of space weather and its effects—the first step in creating a more resilient society and economy. The OFCM report on the forum documents the key outcomes, which highlight needs for more education and outreach, improved planning and exercises, improvements in transitioning research results to operations, and expanded international collaboration.

Also during FY 2010, the OFCM completed, obtained OMB clearance, and published an updated National Space Weather Program (NSWP) Strategic Plan. This new plan sets directions for the next decade and will help the Nation prepare for the next solar cycle maximum. The Federal Emergency Management Agency (FEMA) became a member of the NSWP in FY 2010, building on ties of FEMA's Region VIII office with NOAA's Space Weather Prediction Center. FEMA's participation will strengthen overall NSWP and homeland security efforts to prepare for and mitigate the risks from solar storms.

NSWP activities planned for FY 2011 include the next SWEF in June 2011. The Committee for Space Weather has the following activities planned: (1) develop and implement a Strategic Communications Plan with focus on preparation for and mitigation of risks associated with the upcoming solar-cycle maximum, (2) develop and implement an action plan (near-term actions pending results from the National Research Council's Decadal Survey in heliophysics, still in progress), (3) initiate development of the new NSWP Implementation Plan, and (4) continue as executive agent for implementing the recommendations from the 2006 independent assessment report on the NSWP and for actions approved by the National Space Weather Program Council.

Executive Council for Multifunction Phased Array Radar

With the growing Federal interest in and potential for significant Federal resource commitments to MPAR, the OFCM in FY 2009 established the Executive Council for MPAR as a vehicle for senior leadership from NOAA, Department of Homeland Security, Federal Aviation Administration, Air Force, Navy, and the Department of Defense Research and Engineering office to coordinate agency activities and provide guidance for the Working Group for MPAR (WG/MPAR). The Council met for the first time in December 2008.

In November 2009, OFCM sponsored MPAR Symposium II, which had the theme "Moving Forward with Risk Reduction for Cost Effective Service Improvements." Held in Norman, Oklahoma, the symposium was attended by 230 experts from the Federal government, academia, and the private sector. The symposium delivered an effective exchange of technical information on MPAR, providing a wide community update on phased array radar technology, technical challenges, programmatic challenges, and development of a reasonable way to move forward on risk reduction. All of the symposium objectives were achieved. Featured speakers included representatives from OMB and the Joint Program Development Office for NextGen. Significant action items from the symposium included the following:

- Complete a preliminary cost-benefit analysis
- Complete a mission needs assessment
- Identify technical challenges and develop a unified R&D plan
- Investigate the MPAR relationship to the JPDO-coordinated Integrated Surveillance CONOPS

- Determine an appropriate MPAR management approach and its tie to JPDO-recommended, integrated surveillance governance process
- Exploit leveraging opportunities
- Address radio frequency spectrum allocation issues

After the MPAR Symposium II, the MPAR Executive Council met in December 2009 to review the symposium results and action items and map out near-term interagency actions in response. During FY 2011, activities planned for the MPAR Executive Council and the Working Group on MPAR (WG/MPAR) include (1) coordinating and publishing the Unified R&D Plan recommended by the symposium, (2) establishing an MPAR Risk Reduction Office and pursuing coordinated risk reduction activities, (3) planning an MPAR Symposium III for November 2011, (4) working with the NOAA Joint Radar Planning Team, and (5) converting the Executive Council to an OFCM Program Council and realigning the WG/MPAR to report to that council, rather than to the ICMSSR's Standing Committee on Cooperative Research.

Crosscutting Activities under the ICMSSR

OFCM activities described under this heading are relevant to two or more of ICMSSR standing committees (see Figure 2-OFCM-1) or are overseen directly by ICMSSR.

Interdepartmental Hurricane Conference and Tropical Cyclone/Winter Storm R&D

The ICMSSR Standing Committee on Environmental Services, Operations, and Research Needs (CESORN) oversees the Working Group on Hurricane and Winter Storms Operations. The Committee on Cooperative Research coordinates hurricane-related R&D through the Working Group on Tropical Cyclone Research.

The Working Group on Hurricane and Winter Storms Operations completed changes and coordination for the 2010 National Hurricane Operations Plan, which was published ahead of schedule on April 21. The updated plan was therefore ready well in advance of the 2010 hurricane season, enabling agencies to prepare for a potentially active season. The FEMA Lessons Learned Information Sharing electronic newsletter cited the plan, thereby reaching 55,300 subscribers directly as part of an aggressive campaign to prepare the nation for what was predicted to be an active hurricane season. Activities planned for FY 2011 include publishing an updated National Winter Storms Operations Plan, publishing the 2011 National Hurricane Operations Plan, and planning and executing an Interdepartmental Winter Storms Workshop.

During 2011, the Working Group on Tropical Cyclone Research will focus on assessing its 2010 snapshot of interagency R&D activities and publishing the results. The working group will also participate in NOAA's Hurricane Forecasting Improvement Project.

Each year, OFCM hosts an Interdepartmental Hurricane Conference (IHC) to provide a forum for the Federal agencies responsible for hurricane operations and/or supporting R&D, together with representatives of the user communities such as emergency management. IHC participants review the Nation's tropical cyclone forecasting and warning program and make recommendations to improve the program. The 64th IHC was held in Savannah, Georgia, on

March 1-4, 2010. This year's theme was *Meeting Operational Needs through Comprehensive Tropical Cyclone R&D*. For the 11th consecutive year, about 200 personnel attended, including representatives from eight Federal agencies: DOC/NOAA, Department of Defense (Navy, Air Force, Army Corps of Engineers), NASA, NSF, Department of Homeland Security (Headquarters Science and Technology, FEMA), Federal Aviation Administration (FAA), Department of the Interior (U.S. Geological Survey and the Minerals Management Service), and Department of Agriculture. Attendees also included representatives from academia, industry, and the emergency management community. Craig Fugate, FEMA Administrator, provided opening remarks to focus the conference on the ultimate goal of saving lives and protecting property. All conference objectives were achieved, and the participants identified action items to strengthen the linkages between tropical cyclone research and the needs of the operational centers. Another action item is to integrate the expertise of social scientists to improve the hurricane warning program. The 64th IHC provided a highly effective interagency update and technical exchange on improving the hurricane warning system, strengthening partnership approaches for improving services, and sharpening the focus on research-to-operations linkages. The action item from the social sciences panel provided additional impetus for the OFCM mini-workshop on social science, held in early May, 2010. An indirect outcome of this IHC was raising hurricane awareness in the Savannah region, which has a local media audience of more than 250,000. The IHC participants produced an analysis of tropical cyclone R&D activities linked to operational priorities, such as improving storm intensity forecasts and continuing to improve the 48-hour track forecast accuracy. (Hurricane track accuracy has improved by 46%—more than 60 nautical miles—over the past 10 years.)

Scientific/Technical Skill Shortages

During FY 2010, OFCM staff analyzed the results from two 2009 mini-workshops on existing and anticipated science and technology skill shortages. The first workshop was held in April 2009 and engaged agency subject matter experts in the areas of radar meteorology, space weather, atmospheric transport and diffusion, boundary layer meteorology, satellite remote sensing global, and regional numerical weather prediction modeling and data assimilation. The second workshop, in September 2009, engaged experts from the fields of agricultural meteorology and climatology, wildland fire weather, marine meteorology, and tropical cyclone operations and research.

The resulting report, *An Initial Inquiry into Meteorological Data Assimilation and Numerical Modeling Skills within the Federal Government*, summarized the arguments and evidence that the decline in personnel with data assimilation and numerical modeling skills is likely to continue, even while the demand is expected to increase. To meet the anticipated shortfall in supply, improvements in academic training are necessary. The report also recommends management process improvements to maintain necessary skill sets.

Requirements for the Joint Polar Satellite System (JPSS)

The JPSS program is intended to replace the canceled NPOESS program. During FY 2010, the OFCM staff supported development of the JPSS Level 1 Requirements Document, delivering a coordinated document in time to keep this new \$12 billion program with high congressional visibility moving forward.

Committee on Environmental Services, Operations, and Research Needs

As illustrated by the list of working groups and joint action groups that fall under this committee in Figure 2-OFCM-1, OFCM's CESORN covers a wide range of basic meteorological services and supporting research.

Disaster Impact Assessments and Plans: Weather and Water Data

NOAA National Weather Service flood forecasting operations save thousands of lives and reduce injuries and property damage by billions of dollars annually. But this process, which depends on data from thousands of USGS streamgages and NOAA meteorological stations, usually does not provide data coverage sufficient to adequately document the extensive impacts of a major storm or flood or enable understanding of small-scale, localized processes. As a result, network observations have for many years been supplemented by *post-storm surveys and studies* of rainfall, flood marks, and wind damage to fill in observational gaps and obtain a more complete spatial coverage. These efforts contribute to the determination of the intensity and magnitude of storms and, in many cases, help to determine the extent of damage for use in Presidential disaster declarations. The additional data collected after hurricane landfall is also used in validating modeling efforts with both emergency management models (e.g., FEMA's HAZUS) and hurricane storm surge models (e.g., NOAA's SLOSH). These models are used in real time to assist decision makers in evacuation decisions and procedures. Post-storm data are also used to update FEMA Flood Insurance Rate Maps, revise building materials and construction standards, and improve forecasting models. The National Institute of Science and Technology and various State agencies use the data for purposes such as improving building codes and construction practices.

Today, post-storm surveys and traditional observing networks can be greatly augmented by pre-event deployment of small, self-contained instruments in spatially dense, temporary networks to monitor the event directly and continuously. Clusters of self-logging pressure transducers and real-time rapid-deployment gages monitor waves and water-levels and anemometers and truck-mounted Doppler radars monitor wind speed and direction at rapid intervals. These data describe the evolution of storms and floods with unprecedented spatial and temporal detail, particularly floods of coastal waters and wetlands. The resulting data can be used to (1) develop more accurate and robust wind, storm-surge, and flood models; (2) derive better structure design criteria and building codes; and (3) improve warning systems.

The need for a national plan for disaster impact assessments stems from recognition by several Federal agencies that they were gathering complementary and, in some cases, overlapping and duplicate weather and water data for significant storm events. These agencies desired to improve the efficiency of their individual data collection efforts, leverage the efforts of others, and share these data through an organized, inter-agency disaster impact assessment process. In 2010 the Federal Coordinator established the Working Group for Disaster Impact Assessments and Plans: Weather and Water Data (WG/DIAP) to update and expand on the 2003 *National Post-Storm Data Acquisition Plan* by addressing not only post-storm activities but also these new technologies to pre-deploy, increase the density of, and harden observation systems, thereby providing the capability to collect and disseminate real-time data of relevance to those who forecast the events and manage Federal, State, and local response and recovery. In October 2010,

OFCM published the report from the WG/DIAP, the *National Plan for Disaster Impact Assessments: Weather and Water Data* (NPDIA). The new plan documents the types of data required, the acquisition processes, and the coordinating procedures to be used leading up to, during, and following a significant storm event. The storm events addressed in the NPDIA include land-falling tropical cyclones (hurricanes/typhoons and tropical storms), coastal extra-tropical storms (Nor'easters), severe convective outbreaks (tornadoes and windstorms), riverine and flash flooding, tsunamis, coastal and lake waves, and wind waves. The plan includes data requirements and acquisition capabilities of participating agencies, event response procedures and initiation criteria, coordination procedures, contact information, and data archival procedures. An agency response to a particular event is the responsibility of the individual agency according to its mission requirements, data needs, and available resources.

During FY 2010 and continuing in FY 2011, the OFCM continues to coordinate, as required, timely post-storm data acquisition surveys in response to natural disasters and other agency requirements, including aerial support from the Civil Air Patrol. Under the five-year Umbrella Agreement and an FY 2010 funding agreement between the OFCM and the U.S. Air Force for up to \$21,000 in reimbursable support, the Civil Air Patrol flew 3 missions in support of glacial lake damming assessments in Alaska. Civil Air Patrol support for data acquisition surveys will continue in FY 2011 at a planned level of \$21,000. During FY 2011, the OFCM will work with the Air Force to develop a new umbrella agreement for Civil Air Patrol support for FY 2012-2016.

Hydrometeorological Needs Assessment

In September and December 2008, the OFCM conducted two mini-workshops on hydrometeorological needs. These workshops brought together the relevant Federal agencies to discuss: (1) programs and initiatives in the agencies; (2) product suites and services, both current and experimental; (3) needs and requirements; (4) potential benefits from improved products and services; (5) challenges and gaps in products and services; (6) research underway, opportunities, and plans to meet identified gaps; (7) processes for transitioning research into operational applications; and (8) related education and outreach activities. The second workshop produced 73 operational and research needs and requirements in six categories: (1) observations, (2) modeling and forecasts, (3) education, (4) data access, (5) climate, and (6) analysis. During FY 2010, OFCM published the report, *Crosscutting Assessment of Hydrometeorological Needs—Summary Report of Two Mini-Workshops*, (FCM-R30-2010) to document the results of the workshops.

Joint Action Group on Lightning Detection Systems (JAG/LDS)

The JAG/LDS completed its tasks with publication of the report, *Federal Lightning Capabilities Requirements*. This report documents the interagency collection and prioritization of lightning data and the research needed to support a consolidated NOAA/NWS contracting effort, which can provide significant cost savings over individual agency purchases of this safety-critical information.

Wildland Fire Weather

Wildland fires have both direct and indirect effects on the urban environment. Indirect effects include degraded air quality and consequent health effects, as well as reduced visibility for both air and surface transportation. In FY 2008, the Joint Action Group for the National Wildland Fire Weather Needs Assessment, responding to a request from the Western Governors' Association, completed a needs assessment report. The needs assessment identified 47 specific needs in nine functional areas: (1) data collection, integrity, processing, and archival; (2) fire weather research and development; (3) forecast products and services; (4) modeling, prediction, and data assimilation; (5) information dissemination and technologies; (6) education, training, outreach, partnering, and collaboration; (7) user response, decision support, and resulting user impacts; (8) funding and human resources (crosscutting); and (9) socioeconomic factors.

The OFCM subsequently began developing a compilation of existing and planned Federal capabilities to meet these needs, as a first step toward identifying gaps in such capabilities. Work on this portfolio of Federal and associated governmental and fire weather capabilities, covering all nine functional areas used in the needs assessment, continued during FY 2010. Plans for FY 2011 include publishing a report on the portfolio of capabilities and establishing a working group whose fire weather-related activities will complement and support the existing interagency wildland fire management coordination infrastructure.

Workshop on the Social Sciences in Meteorological Services Delivery

In response to an action item from the 64th IHC, subsequently approved by ICMSSR, the OFCM organized an interagency exploratory mini-workshop on ways that the social sciences could contribute to more effective delivery of meteorological services. The workshop, which was held on May 3-4, 2010, was titled "Framing the Questions, Addressing the Needs: Moving to Incorporate Social Science into Meteorological Operations." Speakers included representatives from the NOAA National Weather Service, Air Force, Navy, Army Corps of Engineers, FEMA, USGS, Department of Energy, Nuclear Regulatory Commission, Federal Highway Administration, FAA, and NSF.

The OFCM assessed the results of the very informative and fruitful discussions from this workshop, presented the results to the ICMSSR in June 2010, and documented the outcome in a summary report, *Framing the Questions, Addressing the Needs: Moving to Incorporate Social Science into Meteorological Operations/Services*. Plans for FY 2011 include establishing a new Working Group for Social Science, under the CESORN, to address the recommendations from the mini-workshop and facilitate integration of social science results into meteorological products and services.

Urban Meteorology and Atmospheric Transport and Diffusion R&D

Based on the September 2004 OFCM report, *Federal Research Needs and Priorities for Atmospheric Transport and Diffusion Modeling*, the OFCM developed an atmospheric transport and diffusion (ATD) implementation strategy for those recommendations in the report for which OFCM had primary responsibility. This implementation strategy has three parts: (1) working with the agencies to identify and improve a baseline set of national ATD modeling capabilities,

(2) helping the agencies implement a common framework for model development and evaluation, and (3) recommending criteria for multifunctional joint urban test beds. To implement this strategy, the OFCM formed the Joint Action Group for Joint Urban Test Beds (JAG/JUTB) under the Working Group for Urban Meteorology (WG/UM).

During FY 2010, the JAG/JUTB continued work on an operational concept document for multifunctional joint urban test beds intended to provide services and data to model developers, test and evaluation personnel, and other users and stakeholders. The operational concept document includes capabilities and benefits, management structure, infrastructure requirements, selection process, implementation framework, definitions, and characteristics of urban scales. Joint urban test beds will support the following functional areas: severe weather (e.g., hurricanes, tornadoes, heat waves and cold spells, and drought), wildland fire weather, emergency response/homeland security (dispersion of hazardous materials), climate, air quality (e.g., particulate matter aerosols), and water quality (e.g., deposition of airborne contaminants on water sources and waterborne transport of contaminants).

For FY 2011, the goals of the JAG/JUTB are to finalize criteria for establishing urban test beds and establish a JUTB Prototype Model Site in National Capital Region. This model site will provide a proof of concept for the operational concepts and criteria. The experience gained through its operation will provide for further refinement of the operational concept document.

On July 13-15, 2010, the OFCM cosponsored the annual George Mason University ATD Modeling Conference. The theme of this conference was enhancing model capabilities and improving the understanding of how hazardous airborne materials disperse in urban environments. In a panel session organized by the OFCM, the panel moderator and five panel members gave presentations, from both scientific and operational perspectives, on quantifying the uncertainty in ATD modeling results and predictions based on such models.

FY 2011 plans for the WG/UM include work to facilitate ATD model development, evaluation, and application. The series of ATD workshops and forums will be continued. In light of the Deepwater Horizon oil spill, the WG/UM will begin advocating for and advancing capabilities for coupled ocean-atmosphere dispersion modeling.

Working Group for Test Bed Coordination (WG/TBC)

Among CESORN plans for FY 2011 is establishing of a new working group to bring together representatives from current and emerging test bed activities, such as the Joint Urban Test Bed, Joint Hurricane Test Bed, Developmental Test Bed Center, Aviation Test Bed, Space Weather Test Bed, and Hydrometeorology Test Bed. The objectives for this WG/TBC are to facilitate exchange of science, technology, and best practices including verification, validation, and evaluation techniques; identify common problem areas and potential solutions, and facilitate common frameworks to the greatest extent possible, with the goal of fostering transition to an eventual Earth System framework.

Exploration of Products and Services Innovations

CESORN plans for FY 2011 also include exploration of innovations in two areas: a “5D Environmental Data Cloud” and new approaches for representing forecast uncertainty.

The five dimensions of the 5D Environmental Data Cloud are the three spatial dimensions, one time dimension, and one dimension for enumerating multiple variables. The planned effort will explore the 5D data concept and assess its relevance for a range of environmental/meteorological products and services in applications including aviation weather, weather information for surface transportation, wildland fire weather, observing systems, and end-user decision-support systems. Objectives include assessing applicability across the agencies involved in these application areas and developing a framework for pursuing 5D data cloud implementation.

The objectives for innovative representation of forecast uncertainty include exploring concepts for the use, presentation, and understanding of forecast uncertainty in meteorological modeling and prediction systems and in end-users' decision-making processes.

Committee for Integrated Observing Systems (CIOS)

National Network of Weather and Climate Observing Networks

The Federal meteorological community embarked on a significant new initiative for climate observing networks in FY 2009 in response to growing interest in climate trends and the 2009 publication of a National Research Council (NRC) report, cosponsored by the OFCM, entitled *Observing Weather and Climate from the Ground Up—A Nationwide Network of Networks*. In brief, the theme of this report was that the United States enjoys an effective synoptic-scale weather observing network, but society demands increasingly finer-scale weather and climate information to meet urgent needs such as predictions of atmospheric dispersion of chemical, biological, and radiological hazards from accidental releases or terrorist acts and severe weather warnings and nowcasts for urban communities. At the same time, spurred by inexpensive electronics and increasingly higher-bandwidth communications, State and local governments, corporations, academic institutions, and individuals have deployed a rapidly growing array of individual sensors and sensor networks in patchwork fashion across the country. Much of the data from these systems remain unknown or inaccessible to a wider audience of potential users.

In response to the recommendations of the NRC report, the OFCM crafted an initial framework for Federal action and gathered the stakeholder agencies in two foundational meetings held in May and July, 2009, to share information and begin developing a coordinated way forward. A refocused OFCM-sponsored Committee for Integrated Observing Systems (CIOS) provided the venue for these meetings and now oversees refinement and implementation of an overarching national strategy to integrate observational networks and systems and increase the effectiveness of current and planned capabilities.

As a result of the foundational and subsequent meetings of the CIOS, the community established the Network of Weather and Climate Observing Networks (NOWCON) initiative. In August, 2009, the Committee reported its activities to the ICMSSR and proposed NOWCON as the way ahead. The ICMSSR concurred, supported the NOWCON initiative, and approved a cochair arrangement with NOAA, DOD, DOT, and EPA representatives.

The CIOS met on November 30, 2009, and agreed on a general division of responsibility among various sectors (Federal agencies, academia, industry, individuals, State and local government,

nongovernmental organizations, and others) for each of the 15 recommendations in the NRC report. The following goals and priorities were established:

- Within 2 years, develop an inventory of observing systems, facilitate standards for observing systems to participate in the national network, develop an approach for quality assurance, explore opportunities for an integration pilot project, and develop approaches for cooperation with non-Federal stakeholders.
- Within 3 years, explore gaps, opportunities, and technologies for improving mesoscale monitoring and prediction.
- Within 4 years, develop the justification and a practical framework for cooperation, collaboration, and investment in observing systems.

At this meeting, the CIOS also approved establishment of two joint action groups and developed tasks and deliverables for them:

- The Joint Action Group on Architecture and Data Management (JAG/ADM) was tasked to survey current constructs, investigate options, and develop a concept for a flexible, extensible infrastructure of observing networks. The JAG/ADM is continuing to work on these tasks.
- The Joint Action Group on Metadata (JAG/MD) was tasked to survey existing practices and develop a flexible metadata specification or family of specifications. Near the end of FY 2010, the JAG/MD recommended a metadata standard, and the CIOS agreed in principle to work in that direction.

CIOS activities planned for FY 2011 include the following:

- Continue to address the recommendations of the NRC report and facilitate the implementation of actions that respond to the challenges in that report.
- Develop a national strategy to implement a NOWCON that is driven by validated needs and requirements.
- Working with the JAG/MD, develop a standardized, coordinated approach to metadata for the NOWCON.
- Working with the JAG/ADM, develop a coordinated architecture and data management approach for NOWCON.
- Coordinate as appropriate with the U.S. Group on Earth Observations and the NOAA Observing Systems Council.
- Interact with the American Meteorological Society (AMS) Ad hoc Network of Networks Study Group as appropriate to synchronize Federal and private sector planning and activities related to NOWCON implementation.

Unmanned Aerial Systems (UAS)

Another area of CIOS activity during FY 2011 will be to plan and execute an exploratory mini-workshop on the utilization of UAS in environmental monitoring and research. The purpose of

the mini-workshop will be to exchange information, review lessons learned from agencies operating UAS, and identify roadblocks as well as opportunities for future collaboration and coordination. The work is expected to complement the activities of the Task Force for Unmanned Systems under the Subcommittee on Ocean Science and Technology, which is part of the National Science and Technology Council structure. The outcome of the mini-workshop will help determine whether a new Working Group for Unmanned Aerial Systems is needed within the coordinating infrastructure.

Working Group for Remote Sensing

This new working group, which will also be overseen by CIOS, will have the following tasks:

- Facilitate information exchange and coordinated development of agency needs, requirements, and priorities for remote sensing capability, including environmental satellites, suborbital systems, GPSMet, radars (excluding MPAR), and other systems
- Plan and execute an exploratory mini-workshop to develop recommendations and potential courses of action to identify and address remote sensing capability gaps.

Committee on Climate Analysis, Monitoring, and Services

The OFCM supported the U.S. Climate Change Science Program (CCSP), now the U.S. Global Change Research Program (USGCRP), and actively served on the CCSP Education Interagency Working Group (EdIWG) which developed the Climate Literacy Framework. The framework was lauded by the CCSP Acting Director as “essential principles that should be included in climate science education efforts” and was then sent to OSTP for its consideration and attention. The EdIWG also authored the “Education, Training, and Public Awareness Chapter” in the UN Framework Convention on Climate Change Climate Action Report #5.

During FY 2010, the Committee for Climate Analysis, Monitoring, and Services continued work on its project examining the impact of climate-related extreme events and the observation and modeling capability available to understand and predict these events. Planned activities for FY 2011 include further development, as required, of needs and requirements for climate-related products and services.

Committee on Cooperative Research

Working Group on Tropical Cyclone Research

See heading above for Interdepartmental Hurricane Conference and Tropical Cyclone R&D, under Crosscutting Activities under the ICMMSR.

Working Group on Weather Information for Surface Transportation (WG/WIST)

The OFCM continued to advance weather services and research and development (R&D) activities supporting the surface transportation community, building on its December 2002 publication, *Weather Information for Surface Transportation--National Needs Assessment Report*. During FY 2010, the OFCM participated in the Transportation Research Board’s annual meeting and continued to support the agencies’ activities related to weather information and

intelligent transportation systems. Activities planned for the WG/WIST in FY 2011 include (1) integrating planetary boundary layer activities and advances to improve road weather capability, (2) coordinating with CIOS on observing systems and activities, and (3) balancing road/highway observation system efforts with additional focus on products and services for transportation system managers and users.

Planetary Boundary Layer

A new focus area for the Committee on Cooperative Research during FY 2011 will be on research needed to improve scientific understanding of the planetary boundary layer, in order to improve products and services for a range of applications (i.e., OFCM service categories) including weather information for surface transportation, wildland fire smoke management, and atmospheric dispersion modeling for airborne chemical, biological, radiological, nuclear, and explosive materials. The environmental modeling aspect of this activity will not include numerical weather prediction models such as the global and mesoscale models used by the operational processing centers (see section above on NOPC) but will instead focus on facilitating information exchange and coordinated development of agency needs, requirements, and priorities to improve modeling capabilities for dispersion, including coupled ocean-atmosphere dispersion models, fire weather and smoke, and volcanic ash.

Committee on Environmental Information Systems and Communications (CEISC)

FY 2011 activities planned for the CEISC include exploring development of a solution for PKI /certificate security needs, exploring and developing a coordinated and unified approach to Open Geospatial Consortium (OGC) standards for meteorological information services, exploring the communications and information systems issues related to the 5D Environmental Data Cloud (see discussion above under “Exploration of Products and Services Innovations”), and support the CIOS on the information services and communications aspects of the NOWCON initiative.

Working Group on Frequency Management

During FY 2011, this CEISC working group will review radio spectrum requirements for meteorological operations and services of Federal agencies, then update its white paper documenting current issues in spectrum management and proposing resolutions for them.

Working Group on Meteorological Codes

FY 2010 activities for this working group, which will continue in FY 2011, focused on coordinating standardization efforts and improvements in meteorological codes and data formats as required, e.g., XML and GRIB2 data formats.

OFCM EXTERNAL COLLABORATIONS

NAS/NRC Board on Atmospheric Sciences and Climate

The OFCM continued its mutually beneficial interactions with the National Academies’ National Research Council (NRC). The Federal Coordinator continued to participate in NRC Board on

Atmospheric Sciences and Climate (BASC) strategic planning workshops and regularly scheduled meetings. The OFCM expects to continue to participate in BASC meetings and workshops in FY 2011.

Committee on Environment and Natural Resources (CENR)

CENR Principals. The Federal Coordinator served as a member of CENR, a committee of the National Science and Technology Council, during FY 2010 and will continue to serve in FY 2011. This committee has been renamed the “Committee on Environment, Natural Resources, and Sustainability” (CENRS).

Subcommittee on Disaster Reduction. The OFCM has been an active participant in the work of the CENR Subcommittee on Disaster Reduction (SDR). SDR has developed Grand Challenges for Disaster Reduction, a set of implementation plans to improve the nation’s capacity to prevent and recover from disasters. Space weather was identified as one of the SDR’s Grand Challenges and, in FY 2007, SDR requested that the OFCM, through the National Space Weather Program, lead the effort to develop the Space Weather Implementation Plan, discussed above under activities of the National Space Weather Program Council.

American Meteorological Society (AMS)

The OFCM supports AMS activities by participating in AMS conferences and workshops and other environmental science education and outreach programs. In FY 2010, the OFCM presented two papers at the 90th AMS Annual Meeting in Atlanta, Georgia, and continued its scholarship support and collaboration with the ad hoc group on NOWCON and with the AMS public-private partnership initiative.

International Collaboration

OFCM international collaborations during FY 2010 included the 64th IHC and the 2010 Space Weather Enterprise Forum. Plans for international collaboration during FY 2011 include the 65th IHC and the 2011 Space Weather Enterprise Forum. The WG/Volcanic Ash will be supporting FAA participation in the International Volcanic Ash Task Force, which was established after the Iceland volcano eruption in summer of 2010 disrupted European air traffic.

FY 2010 OFCM PUBLICATIONS

The following publications were prepared in hard copy and/or were added to OFCM’s web site (www.ofcm.gov) during FY 2010.

OFCM Publication	Date	Number
<i>PLANS</i>		
National Severe Local Storms Operations Plan	November 2010	FCM-P11-2010
National Hurricane Operations Plan	May 2010	FCM-P12-2010
National Winter Storms Operations Plan	November 2010	FCM-P13-2010
The National Space Weather Program: Strategic Plan	June 2010	FCM-P30-2010
National Plan for Disaster Impact Assessments: Weather and Water Data	November 2010	FCM-P33-2010
<i>REPORTS</i>		
Exploratory Mini-Workshop Summary Report (Framing the Questions—Addressing the Needs: Moving to Incorporate Social Science Results into Meteorological Operations/Services)	August 2010	FCM-R28-2010
An Initial Inquiry into Meteorological Data Assimilation and Numerical Modeling Skills within the Federal Government	September 2010	FCM-R29-2010
Crosscutting Assessment of Hydrometeorological Needs—Summary Report of Two Mini-Workshops	September 2010	FCM-R30-2010
National Aviation Weather Program 10-Year Accident Reduction Initiative —Final Report	September 2010	FCM-R31-2010

