

**WRITTEN TESTIMONY OF  
DR. JOHN L. "JACK" HAYES  
ASSISTANT ADMINISTRATOR FOR WEATHER SERVICES AND  
DIRECTOR OF THE NATIONAL WEATHER SERVICE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
U.S. DEPARTMENT OF COMMERCE**

**OVERSIGHT HEARING ON  
PROVIDING AVIATION WEATHER SERVICES TO THE FEDERAL  
AVIATION ADMINISTRATION**

**BEFORE THE  
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT  
COMMITTEE ON SCIENCE AND TECHNOLOGY  
U.S. HOUSE OF REPRESENTATIVES**

**July 16, 2009**

Thank you, Mr. Chairman and Members of the Subcommittee, for this opportunity to testify on the National Weather Service's provision of aviation weather information to the Federal Aviation Administration (FAA). I am Jack Hayes, Assistant Administrator for Weather Services and the Director of the National Weather Service (NWS). The Weather Service is a line office of the National Oceanic and Atmospheric Administration (NOAA), within the Department of Commerce (DOC).

**Background**

The NWS has an extensive infrastructure supporting the development of its products and services. The NWS issues more than a trillion forecasts, and 10,000 warnings annually for protection of life and property and enhancement of the national economy. Every day we process 1.7 billion surface and upper air observations from across the country and around the globe. These data are assimilated into complex computer models providing the backbone of weather information for all — government and private weather forecasters both nationally and internationally. The aviation industry uses this vast array of weather information for flight planning and safety.

The NWS has a long history of providing weather support for aviation dating back to 1914. The Air Commerce Act of 1926 (44 Stat. 568), added specific responsibility for providing weather services to civil aviation. Today, NWS aviation services are focused on meeting the needs of the nation in coordination with our partner, FAA. In 1994, Public Law 103-272 (49 U.S.C. § 44720(a)) directed the Secretary of Commerce to provide weather support for aviation and to give complete consideration to the recommendations of the FAA Administrator in doing so:

“The Administrator of the Federal Aviation Administration shall make recommendations to the Secretary of Commerce on providing meteorological services necessary for the safe and efficient movement of aircraft in air commerce. In providing the services, the Secretary shall cooperate with the Administrator and give complete consideration to those recommendations.”

Today, forecasters across the nation comprise the aviation weather forecast team, including meteorologists at 122 local Weather Forecast Offices, 21 Center Weather Service Units (CWSUs), the Alaska Aviation Weather Unit in Anchorage, Alaska; and the Aviation Weather Center in Kansas City, Missouri.

The Aviation Weather Center operates 24 hours a day, 7 days per week, to provide aviation warnings and forecasts of hazardous flight conditions at all levels within domestic and international air space including turbulence, icing, and convection forecasts. The Collaborative Convective Forecast Product, a graphical representation of expected convective occurrence at 2-, 4-, and 6-hours, is produced by the Aviation Weather Center after collaboration with Meteorological Service of Canada, CWSUs, and meteorological offices of airlines and service providers.

On the local scale, the Weather Forecast Offices provide terminal area forecasts for approximately 625 locations every 6 hours, with additional updates as conditions change. These forecasts consist of the expected weather at a given airport or terminal area and are used primarily by commercial and general aviation pilots. The Alaska Aviation Weather Unit provides specialized products for the unique general aviation community and severe weather conditions in Alaska, and also includes the Anchorage Volcanic Ash Advisory Center, one of nine such advisory centers worldwide.

### **Center Weather Service Unit Support to the FAA**

My testimony today will focus on services provided in support of the FAA by forecasters at our 21 CWSUs. CWSUs were established in 1978 in response to National Transportation Safety Board recommendation A-77-68 resulting from a serious weather-related accident over New Hope, Georgia, which caused numerous fatalities. This recommendation called for the FAA to, "Formulate rules and procedures for the timely dissemination by air traffic controllers of all available severe weather information to inbound and outbound flights in the terminal areas." Based on this recommendation, FAA, with the assistance of NWS, formed the CWSUs.

NWS forecasters at CWSUs provide weather advisories and forecasts to the FAA, and advise and consult with air traffic controllers, which helps to maintain a safe and efficient national airspace. The CWSUs are located at each of the 21 FAA Air Route Traffic Control Centers (ARTCC). CWSU meteorologists provide weather advisories valid for two hours or less describing areas of hazardous weather in progress or forecast to develop; forecasts for up to 12 hours describing areas of weather that may impact air traffic operations; twice daily face-to-face briefings; and on-demand consultations to

ARTCC traffic managers. CWSU meteorologists also provide remote briefings telephonically, as needed, to FAA Terminal Radar Approach Control and control tower personnel, and they train controllers on the interpretation of weather information.

Under an interagency agreement, the FAA provides basic equipment, communications, space, and supplies for the CWSUs, and currently reimburses the NWS about \$12 million per year. Based on local requirements, CWSUs operate 16 hours per day, typically between 5:00 a.m. and 9:30 p.m. local time, seven days a week, when air traffic is at its peak. If weather conditions pose a threat to an ARTCC's area of responsibility, our CWSU forecasters may work additional hours to support the ARTCCs.

### **Recent History of NWS and FAA Interactions to Improve CWSU Services**

In 2005, the FAA provided NWS with feedback that service improvements from CWSUs were needed. In 2006, NWS proposed changes to CWSU services, which were not accepted by the FAA. The FAA determined the requirements for CWSU services were not well defined and needed to be solidified before any changes to CWSU services were made.

In January 2008, FAA provided a requirements document to the NWS for CWSU services. The requirements included an increase in coverage to 24 hours a day service 7 days per week, improved product and service consistency, and a national situational awareness for weather. The FAA requested the NWS provide service solutions for three CWSU business models: a single site model; a regional model (more than one CWSU, but less than the current 21); and a model reflecting the current structure of 21 CWSUs. The NWS submitted its initial response to FAA in May 2008.

In September 2008, FAA determined that although there were positive elements in each of the three business models, none of models were acceptable and all were too costly. In their responding letter to NWS, FAA stated they did not require direct, face-to-face contact at each of their ARTCCs and they would support an approach utilizing two CWSUs. FAA agreed to work with NWS to further refine the CWSU requirements, with a final response from the NWS expected by the end of 2008. In October 2008, FAA and NWS worked together to revise the CWSU requirements to reflect the FAA's request to reduce costs and consolidate 20 CWSUs in the lower 48 states into two centers, leaving the Alaska CWSU as it is. The NWS prepared an updated response by December 2008, but did not provide it to FAA until June 2009 which allowed for review and consideration by the new Administration.

### **Overview of the NWS Response to the FAA for CWSU Services**

The NWS's revised response proposes to meet FAA requirements by developing the capability to provide CWSU support from two centers in the lower 48 states. The response calls for development and demonstration test of a prototype. As a point of emphasis, a critical component of our response, and a prerequisite before any decision is made to change the operational structure of NWS CWSU support, is to demonstrate the

capability of meeting FAA requirements from two centers with no degradation of aviation weather services and, at a minimum, no impact to safety. If the demonstration is successful, the response plans for a consolidation of 20 CWSUs in the lower 48 states into two centers: one in Kansas City, Missouri, collocated with the Aviation Weather Center; and the other collocated at the National Centers for Environmental Prediction in the Washington, D.C. area. Each of these centers would serve as an operational backup for the other, should those services be necessary. The response also introduces a suite of new national forecast guidance products to emphasize consistency across the National Airspace System to meet the revised FAA requirements. We and the FAA believe this will enhance aviation safety.

We will work collaboratively with the FAA to plan, run, and evaluate a prototype, referred to as a demonstration/validation, to ensure the proposed structure for aviation services does not degrade aviation weather services. The Board on Atmospheric Sciences and Climate (BASC) of the National Academy of Sciences has agreed to oversee and evaluate the results of the demonstration/validation. The NWS believes this outside, unbiased group of experts is critical for determining the feasibility and prudence of moving to any revised CWSU structure while ensuring no degradation of service.

The FAA has stated face-to-face services and briefings from NWS forecasters at the ARTCCs are no longer required. The NWS believes new technology can be leveraged to allow remote service and improve consistency. Our response also provides for remote briefing services to FAA Terminal Radar Approach Control and control tower personnel, which are currently not collocated with CWSUs but have routine interactions with NWS forecasters. However, a rigorous demonstration of any new technology, products, and services must be conducted and independently evaluated before we modify our current structure. We will not proceed with any change that would jeopardize safety.

The consolidated CWSU structure would reduce NWS staff from 84 to 50. Any affected NWS CWSU employee who wishes to continue to work for the NWS will have the option of doing so. We have reviewed our staffing model and are confident we can absorb the 34 positions through normal attrition.

Our 42 month schedule for transition to a consolidated CWSU structure includes a planning phase, a nine-month period for the demonstration/validation, followed by transition to the new structure provided the demonstration/validation demonstrates no degradation of aviation weather services and aviation safety is enhanced. During the nine-month demonstration/validation period, current weather support will remain unchanged.

### **Ongoing Improvements to CWSU Services**

While working with FAA to define future CWSU services, over the past 18 months we have been working to improve the consistency and quality of existing CWSU aviation weather services. Improvements to our aviation weather services include improved weather information with new graphic capabilities, a more concentrated focus on

National Airspace System weather impacts, and improved consistency between forecasts across multiple ARTCCs. We also are improving our customer service by increasing CWSU meteorologists' understanding of air traffic flow management and FAA operations, initiating proactive communication to controllers, towers, and others in air traffic management, and improving access and usefulness of CWSUs internet presence. We have implemented a methodology to measure weather impact on air traffic across 35 major airports, customized forecast criteria to specific airports to meet specific ARTCC needs, and are conducting CWSU site reviews. These site visits are conducted jointly by NWS and FAA management. Thirteen site reviews are complete and eight more will be done by September 2009. Taken together, we believe these are significant steps that have already improved weather services to our ARTCC partners.

### **Weather Information in the Next Generation Air Transportation System**

The Next Generation Air Transportation System (NextGen) is intended to meet projected 2025 U.S. air transportation needs — significant growth in air traffic is projected. Given that weather is a factor in 70 percent of air traffic delays, NOAA is actively involved in NextGen through its participation on the Joint Planning and Development Office (JPDO) Board and in providing leadership for the JPDO Weather Working Group.

NOAA recognizes the NextGen will result in a system-wide air traffic management transformation that will affect the manner by which weather-related information is collected, managed, disseminated, and used in decision-making. The robust integration of weather data envisioned by the FAA will improve the efficiency and effectiveness of airspace use and airport throughput, and is expected to reduce the impacts to our nation's travelers and businesses when weather is a factor. To that end, NOAA is working with FAA to fully integrate NOAA's weather information and services improvements into NextGen development to meet requirements for the transformation and ensure NOAA's contributions are compatible with NextGen decision support, dissemination, and display systems. The NWS response to restructure CWSU support provides key links to NextGen and will ensure interoperability of any revised CWSU support structure during the NextGen era. NWS planners will work closely with the FAA during any CWSU restructure to ensure a linkage into the NextGen program.

The vision of NextGen requires NOAA to develop a four dimensional grid of environmental data (referred to as the "4D Weather Cube") with fine scale forecasts of wind, temperature, cloud heights, visibility and thunderstorms. There are scientific challenges we must address to meet this vision. For example, we are developing the capability to forecast the development of a thunderstorm within airport airspace 30 minutes before it starts. Thunderstorms are a significant cause of air traffic delays. By forecasting the beginning of thunderstorms, we can provide greater advance notice, and air traffic managers can change aircraft routes and headings before the threat appears, which will mitigate the impact through the system, resulting in less impact to passengers and businesses. Forecasting the beginning of thunderstorms is a difficult scientific challenge, requiring greater sensing of the atmosphere through satellites, radars, and other methods, as well as higher resolution forecast models. NOAA is focused on meeting the

scientific challenges associated with developing earlier thunderstorm forecasts, as well as improving forecasts for cloud heights and visibility, two other weather-related threats that impact aviation operations.

Another key component of the 4D Weather Cube will be probabilistic information that will help FAA decision-makers make more informed, risk-based decisions when appropriate. The probabilistic 4D Weather Cube will support both tactical decision-making (radar, 1-6 hour thunderstorm forecasts, observations, emergency support) and strategic decision-making (six to 30-hour forecasts of key parameters including icing, turbulence, convection, and winter weather ground support forecasts). The vision of the 4D Weather Cube is to support aircraft specific, runway specific, trajectory specific information as early as possible in the planning phase. The NWS vision is to issue “Warnings-on-Forecast” in four dimensions when probabilities of certain hazards exceed user agreed upon probabilistic thresholds within hazard areas. The key take-away for operations is to avoid the hazard areas.

Weather in the data cube will contain a constantly refreshed source of critical information, keeping the eyes of all decision makers on target. All of the data will be network-enabled, using common standards and architectures. Network-enabled information access will foster a private-public partnership to keep the National Airspace System as efficient and safe as possible. Weather information in digital forms can “speak” from machine to machine, supporting the NextGen vision of integrating current and future sources of weather data. NWS efforts to build the 4D Weather Cube will include working closely with partners to ensure a fully unidirectional approach to National Airspace System support.

Finally, the NWS forecaster will remain a key component of the future forecast system supporting the FAA. The NWS forecaster will continue to assist FAA traffic managers and decision makers, alerting them of rapidly changing conditions and the impacts on operations and safety.

The vision described above and the service improvements envisioned are still under development. Today, aviation products are generally in textual and graphic formats and their development is very labor intensive. Over the next 5 years, aviation elements will become available in digital as well as textual and graphical formats as we move forward towards the NextGen era. Furthermore, advances in the automation and rapidly updated (hourly) forecast routines of convective, low ceiling and visibility, icing, turbulence and wind in a digital environment will enable the NWS to focus our forecasters on improving decision support services to the FAA by allowing the forecaster to focus not only on the weather, but how the weather will potentially impact aircraft operations. These science and technology enablers, together with attention to risk management, will evolve CWSU products and services over the next 5 years and into the NextGen era. The anticipated advances in the science and technology underpinning aviation weather support will enable evolution of CWSU products and services to make them more effective.

## **GAO Review of Aviation Weather Restructuring**

Late last week we received the Government Accounting Office (GAO) Draft Report: “*Review of Aviation Weather Restructuring.*” We are reviewing the draft and will develop our action plan once the final report is completed. We believe our response to the FAA for CWSU services addresses some of the key recommendations in the draft GAO report. For example, our response to FAA includes, as the centerpiece, a nine-month demonstration/validation. The planning, execution, and evaluation of this demonstration/validation will be overseen by the BASC to ensure involvement of stakeholders and an unbiased review to ensure no degradation of aviation weather services. The current 21 CWSUs will continue to operate during that period. Our response to FAA also highlights the importance of aligning organizational changes with NextGen initiatives. We have been working with our representative to the NextGen JPDO to ensure the NWS connection to NextGen. In addition, I serve on the JPDO Executive Weather Working Group, where I highlight important NextGen weather issues for discussion with other members of the board including representatives from the Department of Defense, FAA, and the National Aeronautics and Space Administration. Consistent with the GAO report, the NWS agrees there must be a linkage between the CWSUs and NextGen. I believe we have taken the necessary first steps to ensure this, and we will continue to incorporate NextGen concepts into our CWSU plans.

We also agree with the need to establish baseline performance measures, as stated by the GAO. NWS is now collecting data on four of the five standards developed by FAA and proposed by NWS, to establish a baseline. Methods by which to measure the fifth proposed standard (forecast accuracy) will be reviewed by FAA and NWS. These measures are critical data points to allow the BASC to evaluate the demonstration/validation and to determine its success. The FAA also recommended that NWS identify in our proposal additional performance measures that involve proposed products and services. To address this, NWS has identified eight additional performance measures which are listed in our response to FAA.

## **Conclusion**

Much has changed since the CWSUs were first established in 1978. The science and our understanding and ability to observe, analyze, and predict the weather has improved tremendously; new technology to support our products and services continues to evolve. We believe a disciplined test of new service alternatives incorporating the best and newest science and technology has the potential to improve air traffic management and provide the capabilities needed in NextGen. We believe new 21<sup>st</sup> century technologies provide a viable option for remote weather support. We will support a change of the current operational model after a successful demonstration/validation shows no there would be no degradation in current services. The NWS mission is to provide weather forecasts and warnings for the protection of lives and property and enhancement of the national economy. We will not take any steps that would jeopardize our ability to deliver life-saving weather information. It is our goal to help the FAA ensure the National Airspace System remains safe, efficient, and cost effective for the people of this country.