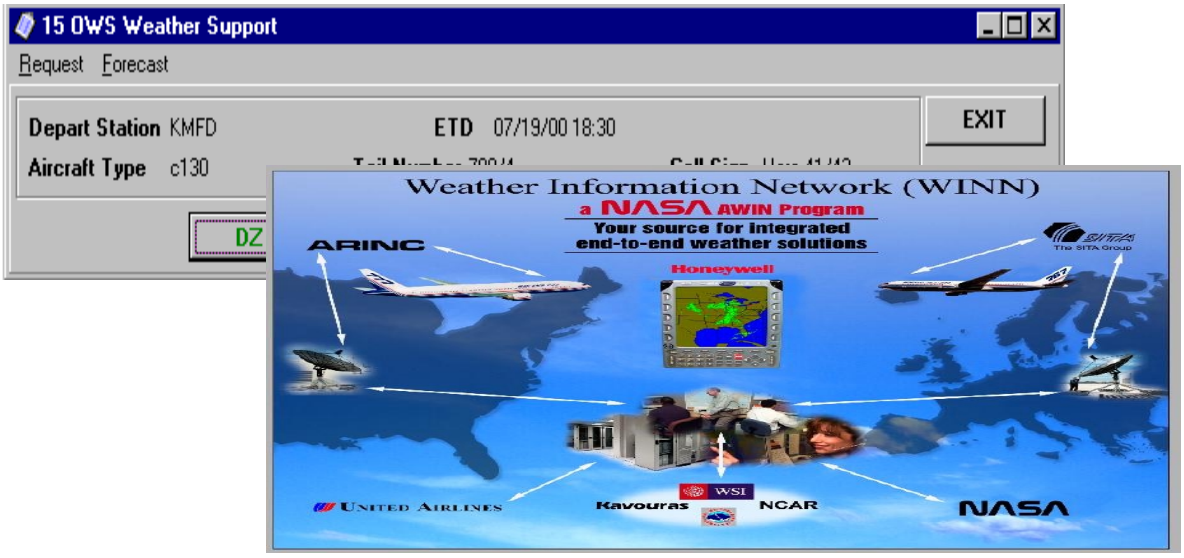
Panel 2 -- Product Dissemination



Moderator: Mr. David Whatley, Program Director, Aviation Weather, Federal Aviation Administration (FAA)

Rapporteurs: Lt Col Kim Waldron, Chief, Strategic Operations Plans, Directorate of Weather, Headquarters, United States Air Force

Mr. Robert J. Dumont, Senior Staff Meteorologist, Office of the Federal Coordinator for Meteorology

Synopsis

This session voiced one common thread (that of getting weather information into the cockpit) and several technical and operational details that need to be addressed. Through the Aviation Safety Program, NASA has defined an initial set of requirements for aviation weather information (AWIN) in the cockpit and assessed the current communications infrastructure. The next steps are to:

- Continue to address issues related to bringing weather information into the cockpit.
- Define an optimal communications system/architecture and the associated technology gaps to realizing weather information in the cockpit communications infrastructure.
- Determine what information is needed and how to display the information in a manner that adds value and doesn't distract the pilot.
- Ensure that both aircrews and dispatchers have access to the same information.

Presenters highlighted the importance of remotely sensing icing and turbulence information and disseminating that information to decision makers in the cockpit and on the ground. The principal limiting factors to getting "weather in the cockpit" are cost, bandwidth, and frequency spectrum. Plans for the replacement for the NEXRAD Information Dissemination Service (NIDS) were also discussed. The new Radar Product Central Collection/Distribution Service (RPCCDS) will multicast products from a central radar server; products will also be available from an FTP server. A 30-day operational demonstration of RPCCDS is planned for September 2000. The FAA presented their two national, high priority dissemination initiatives: (1) improve ground-to-ground weather communications and (2) develop a 2-way Flight Information Services (FIS) data link. In support of these initiatives, the FAA is developing policy in three areas: (1) Internet policy for dissemination of weather information, (2) general policy to provide industry users access to FAA systems data, and (3) FIS policy. Regarding FIS policy, the government intends to make both the National Airspace System (NAS) status information and existing federal meteorological data equally accessible to all users, including service providers. It will also make the VHF radio spectrum available to selected vendors on a competitive basis, and will collaborate with other government agencies, industry, and users to develop common standards and guidelines for FIS services in the cockpit.

Presentation Summaries:

1. Radar Product Central Collection/Distribution Service (RPCCDS). Mr. Walter Telesetsky, Director, Office of Systems Operations, National Weather Service (NWS) described plans for the central collection and distribution of WSR-88D radar products, which were driven by the National Centers for Environmental Prediction's data requirements for model initialization. NEXRAD Information Dissemination Service (NIDS) vendors have provided products to users since 1992; however, NIDS will be replaced by the RPCCDS and the NOAAPORT Satellite Broadcast when the NIDS agreements expire on December 31, 2000. There is an option to extend the NIDS agreements in 90-day increments if the RPCCDS is not operational. Up to 33 products from each WSR-88D will be delivered via AWIPS to a NWS central radar server. The server will then multicast all products to users and the NWS Telecommunications Gateway (NWSTG) FTP server. Access will be provided through a dedicated T1 line paid for by the user. All centrally collected products will be available, and users will pay incremental costs like the current Family of Services. The total cost to be recovered by user fees is $72,000 annually. Users will also be able to access products in anonymous FTP format through either a dedicated line or through the Internet. Users with dedicated line access will be required to sign an agreement with the NWS and pay the associated fees; no agreement or fees apply to Internet access. A 30-day operational demonstration of RPCCDS is planned for September 2000. The timeliness requirement calls for products to be available from the central radar and FTP server databases in 1 minute or less for 95 percent of the products; for reliability, 95 percent of the radar products generated will be available from both the central radar and FTP servers.

2. Initiatives in Aviation Weather Dissemination. Mr. Richard Heuwinkel, Division Manager, Aviation Weather Policy, Aviation Weather Directorate, Federal Aviation Administration (FAA), highlighted two national, high priority dissemination initiatives:

(1) improve ground-to-ground weather communications and (2) develop a 2-way Flight Information Services (FIS) data link capability. The large ground-to-ground communications infrastructure costs have been a major constraint for both government and industry, but Internet technology promises a cost-effective solution. The FAA is in the process of establishing standards for reliability, accessibility, and security for weather/NOTAM dissemination via the public Internet, together with procedures to determine vendors' compliance with these standards. Vendors who meet the standards will be placed on the FAA list of "Qualified Internet Providers." Vendors can also become Qualified Internet Providers by showing a contractual relationship with end users. If approved by the National Weather Service or the FAA through a separate process, Qualified Internet Providers can also be designated as *Approved Sources* and be listed in a carrier's Part 121/134 Air Carrier Operations Specification. Vendors serving general aviation will not necessarily be *Approved Sources*. The FAA plans to publish the Internet policy as an Advisory Circular with a target date of September 2000. Industry demand for FAA systems data is on the rise. In response, the general FAA policy has been to provide the users access at system ports, and users are responsible for communications costs. The ATA held a meeting in August 1999 and developed a list of users' needs. Access to ITWS data was one of the airline industry's higher priorities, but the data is currently not readily available. A follow-on ATA-hosted workshop is planned for August 2000 to assess progress and plan for the future.

FIS policy addresses responsibilities for government, industry, and users. The government intends to make National Airspace System (NAS) status and existing federal meteorological data equally accessible to all users, including service providers. It will also make VHF radio spectrum available to selected vendors on a competitive basis, and will collaborate with other government agencies, industry, and users to develop common standards and guidelines for FIS services in the cockpit. Industry will provide needed ground infrastructure and avionics to users, provide basic FIS products and services to all properly equipped users at no direct cost to the government, and may provide value-added products for a fee. Users will acquire avionics at their own cost, receive basic products at no cost, and pay for value-added products. Special Committee (SC-195), meeting under the umbrella of RTCA for Flight Information Services Communication (FISC), published RTCA/DS-252, "Minimum Interoperability Standards (MIS) for Automated Meteorological Transmission (AUTOMET)," on January 11, 2000. AUTOMET defines the up-link and down-link message formats and specifies a set of encoding and decoding rules to apply to the message format types. Now SC-195 is working on Minimum Aviation System Performance Standards (MASPS) for Flight Information Services-Broadcast (FIS-B) Data Link, which will provide non-control, advisory information to pilots to operate more safely and efficiently in the NAS. The goal is to publish the MASPS in early 2001. Change 1 to the MASPS will then include further cockpit display guidelines, including the use of colors and symbols, and the development of new broadcast products.

3. Dissemination: Methods and Products. Lt Col Kim Waldron, Chief, Strategic Operations Plans, Directorate of Weather, Headquarters, United States Air Force, described the responsibilities of Air Force Weather (AFW) with regard to weather data

collection and dissemination. AFW collects observations worldwide and transmits them via the Automated Weather Network to an accessible database. AFW creates and disseminates forecasts and bulletins and exchanges weather data (satellite, radar, etc.) with users through a number of dedicated and common-user communications systems. The Strategic Communications Program (SCOMP), which includes leased lines, secure and non-secure Internet, satellite, and asynchronous transfer mode (ATM) communications systems, links the Air Force Weather Agency (AFWA) with its customers around the world. The Very Small Aperture Terminal provides a satellite communications capability between AFWA and both fixed and remote locations. Bandwidth is a constraint for using standard Air Force communications systems. The Air Force's operational weather squadrons (OWS) provide Internet-based tailored regional weather support. Weather products include both graphics and alphanumerics and can either be pulled from the web site (customer initiated) or pushed to the user at a certain time (OWS initiated). They can also be automatically routed when a new product arrives, faxed (computer-to-computer or computer-to-fax), or e-mailed (to unit or individual accounts). The Product Highlight Dissemination Server disseminates point weather warnings (PWW) to customers. The system can contact customers through work/home/cell phone numbers and pagers and provides an automatic printout of notification results. The Product Highlight Product Generation Suite (PGS) was developed to aid in flight weather briefings. The computer auto-populates the briefing form as a first guess and then allows the forecaster to adjust and tailor the completion of the form. Passwords are required for all commercial connections, and an encryption capability is in the works. Two initiatives that are ongoing include providing a direct link of data/graphics into the cockpit and getting data from the weather database into the user's database. AFW is writing a proposal to integrate weather into the Airborne Broadcast Intelligence (ABI) program. Notionally, weather products and data will be broadcast to the ABI processor onboard the aircraft. The ABI software will then ingest the input and make the products/data available through icons on the cockpit display. The Joint Weather Impacts System (JWIS) is being developed to provide a weather node to feed data into command and control (C2) systems. JWIS will use an interactive, dynamic, web-based interface to support operational and tactical-level planning/decision making, mission rehearsal, and training.

4. Remote Sensing of Inflight Icing Conditions. Dr. Charles C. Ryerson, Cold Regions Research and Engineering Laboratory (CRREL), Engineering Research and Development Center, U.S. Army Corps of Engineers, described an emerging capability for remote detection and dissemination of tactical inflight structural icing information and sought proponency for more rapid development and fielding of the capability. Icing forecasts (3-6 hours) can unnecessarily restrict and cancel tactical flights because of the nature of icing conditions. Areas of icing are generally small, and forecasts do not have sufficient granularity to accurately depict icing conditions. Also, icing presents the greatest threat to low, slow aircraft (operating below 20,000 feet), laminar flow airfoils, and rotorcraft. The solution to this complex problem is to remotely sense icing conditions ahead of the aircraft and to disseminate icing information to both the ground and the cockpit as a tactical decision aid to improve safety. Technologies are being developed for both ground-based and airborne systems. The ground-based system, using a multi-band radar

and a multi-band radiometer, would protect the terminal/airfield area, and an airborne microwave radiometer could provide the technology to protect the aircraft in flight. Partners in the development effort include NASA, FAA, DOD, NOAA, NCAR, industry, and universities with coordination from the Meteorological Service of Canada. NASA currently has a 5-year plan for a ground-based system and a 10-year plan for an airborne system. A ground-based radiometer evaluation is planned for FY01. FAA/NCAR have a 7-year FAA In-flight Aircraft Icing Plan, which includes building a ground-based radar. CRREL plans to coordinate with NASA/FAA to integrate DOD requirements and to develop a concept evaluation program. There are a number of technical issues (cost, size, range, resolution, accuracy, etc.) and operational issues (cockpit integration, hazard characterization, etc.) to overcome, but a prototype ground system should be available in the next few years. An airborne system should be available in 2-5 years depending upon funding. Also, a possible DARPA program is on the horizon to address thunderstorms, icing, turbulence, visibility, and wires--an Aviation Hazard Avoidance System (AHAS).

5. NASA Aviation Safety Program, Weather Accident Prevention Project, Dissemination Panel Session. Dr. Ron Colantonio, Aviation Safety Program Office, NASA Glenn Research Center, described the technical approach that NASA is taking to develop the communications architecture to provide aviation weather information (AWIN) to the cockpit and to provide automated PIREPS (EPIREPS) to the ground. They have defined an initial set of AWIN requirements (which will be updated yearly) and assessed the current communications infrastructure, to include emerging aviation data links for weather. The next step is to define an optimal communications system/architecture and the associated technology gaps to realizing that architecture. Research and development efforts will then be focused on closing those gaps, and a NASA/FAA communications working group is addressing these efforts and other system issues. In the future, NASA plans to integrate their results with requirements from other industry studies and also plans to develop communications requirements for EPIREPS in conjunction with the aviation community and the FAA. The overall goal/objective is to identify the optimal next-generation weather communications architecture/system(s) for 2007 through 2015, with supporting analyses that enable timely, accurate dissemination of high quality, intuitive weather information in the cockpit for both general aviation and commercial aircraft. SAIC has completed a 2-year study, using the NAS Architecture 4.0 as a baseline. The objective was then to define a sub-architecture within the baseline to provide weather in the cockpit. This architecture will also be updated on a yearly basis in coordination with the FAA. Preliminary results from the architecture study envision a hybrid communications architecture that includes space (satellite), air, and ground segments. NASA has also contracted with MIT/Lincoln Laboratories to investigate and identify optimal format standards (protocols) to provide weather information in the cockpit, and that report is available. In the future, NASA plans to develop and advocate consistent data format standards for AWIN data exchange, assess current communications standards and protocols, and develop near-term and next-generation communications standards and protocols. NASA is also looking at the types of technologies that are needed, and is currently evaluating S-DARS (Satellite Digital Audio Radio Services), which provides high-rate, low-cost data via AM/FM radio transmissions worldwide. In September 1999, Phase I of the evaluation was successfully conducted in

Johannesburg, South Africa, using a general aviation (Cessna 172) aircraft. In Phase II, planned for December 2000, NASA is working with American Airlines to conduct an evaluation, using the WorldSpace AsiaStar satellite and operational 777's flying Chicago-Tokyo and Chicago-Hong Kong routes. In Phase III, a demonstration in U.S. is planned for FY01. The goal is to do a national demonstration of AWIN and Datalink capabilities in FY02 and an international demonstration in FY04. In summary, NASA is focused on providing weather in the cockpit and to do that they need to define the communications requirements and architecture to make it happen. NASA is working very closely with the FAA, and Dr. Colantonio concluded with the thought that there should be applicability to the DOD as well.

6. Users/Industry. Mr. Joe Luisi, Manager, Meteorology, Delta Airlines, described Delta's Atlanta-based meteorological operations. Delta has 18 meteorologists, who are tasked to provide timely and accurate weather information for Delta's 2700 flight segments around the world. The meteorology department, which is divided into two sections--surface and upper air, is strategically located in the Operational Control Center (OCC). The OCC contains 17 departments on the floor to facilitate operational coordination and planning. In addition, four meetings per day are conducted with all 17 departments, and the meteorology department leads off those meetings. The surface meteorology section produces terminal forecasts for all domestic hub locations and is principally concerned with ceiling/visibility and deicing conditions because of the economic considerations. When ceiling/visibility fall below 2000 ft/2 mi, dispatchers add additional fuel, which produces additional costs. Deicing also has economic ramifications. Atlanta is the largest hub in the world and supports around 700 arrivals and 700 departures per day. Between the hours of 4-6 p.m., Delta alone supports about 60 arrivals and departures per hour, and they only have the capability to de-ice 20 aircraft per hour. As a result, the surface meteorology section is being asked to make deicing forecasts out to 12-24 hours in advance. Hurricane season also presents a major challenge; 25 of the major cities that Delta serves are along the coastline. If a hurricane is going to impact one of the major cities, Delta requires 48 hours lead time to ensure that they can properly plan to serve their customers. The need for better turbulence forecasts was also highlighted. Each year, Delta has about $1 million in claims from flight attendants due to turbulence. Delta meteorologists are developing new, color-coded turbulence products, and they are working to get color printers at their stations to disseminate the information. The ultimate goal is to get these graphics into the cockpit in the next 4-5 years. South America is an important area for Delta, and poor communications, volcanic ash, high runway elevations, and the ITCZ make meteorological support a challenge. In response, Delta has developed a physiographic and topographic climatology course to improve the situational awareness of the crews and dispatchers. Delta meteorologists also closely monitor volcanic activity around the world, particularly that which impacts Delta's routes over the northern Pacific. Delta is also working to get turbulence and water vapor sensors on their aircraft to provide quantitative turbulence and raob-type information, respectively. Initially, water vapor sensors will be installed on Delta's 757's in the next 6 months. Again, the ultimate goal is to get all this information into the cockpit.

Product Dissemination:
Radar Product Central Collection/Distribution Service (RPCCDS)

Walter Telesetsky
Director, Office of Systems Operations
National Weather Service

ABSTRACT

The presentation describes the plans for the National Weather Service central collection of radar products and distribution via the RPCCDS to allow the termination of the NEXRAD Information Dissemination Service (NIDS) agreements with three private sector vendors.

The NIDS will be replaced by the RPCCDS and the NOAAPORT satellite broadcast. The NIDS agreements have been extended until December 31, 2000. A 30-day operational demonstration will be conducted to certify the operational readiness of the RPCCDS. The agreements will be further extended in 90-day increments only if the RPCCDS is not operational by that date.

The central radar servers will offer both a multicast broadcast service of all radar products or a FTP access. Dedicated access to either requires a T1 line. Users of either service will be required to sign a Family of Services agreement for the new Radar Product Service and pay a one-time and annual fee (waived for Federal government users). The FTP server will also be accessible over Internet. No agreement or fees apply to Internet access.

Product Dissemination:
Initiatives in Aviation Weather Dissemination

Richard Heuwinkel
Division Manager, Aviation Weather Policy
Aviation Weather Directorate
Federal Aviation Administration (FAA)

ABSTRACT

The presentation highlights two national, high priority, weather dissemination initiatives: (1) improve ground-to-ground weather communications, and (2) develop a 2-way Flight Information Services (FIS) data link capability.

The large ground-to-ground communications infrastructure costs have been a major constraint for both government and industry. However, Internet technology promises a cost-effective solution. The FAA is in the process of establishing standards for reliability, accessibility, and security for weather/NOTAM dissemination via the public Internet, together with procedures to determine vendor compliance with these standards. Vendors who meet the standards will be placed on an FAA list of Qualified Internet Providers. The FAA plans to publish an Internet Policy as an Advisory Circular with a target date of September 2000. Industry demand for data from FAA systems is on the rise. The Integrated Terminal Weather System (ITWS) is a case in point. Access to ITWS data is one of the airlines higher priorities. An Air Transport Association (ATA)-hosted workshop is planned for August 2000 to address this issue.

Flight Information Services (FIS) policy addresses responsibilities for government, industry and users. The government intends to make National Airspace System (NAS) status and existing federal meteorological data equally accessible to all users, including service providers; similarly, VHF radio spectrum will be made available to selected vendors on a competitive basis; and other government agencies, industry, and users will be collaborated with to develop common standards and guidelines for FIS services in the cockpit. Industry will provide needed ground infrastructure and avionics to users, provide basic FIS products and services to all properly equipped users at no cost to the government, and may provide value-added products for a fee. Users will acquire avionics at their own cost, receive basic products at no cost, and pay for value-added products. The involvement of the Radio Technical Commission for Aeronautics (RTCA) is described. A Minimum Aviation System Performance Standard (MASPS) for Flight Information Services-Broadcast (FIS-B) Data Link is under development; the goal is to publish the MASPS in early 2001. Change 1 to the MASPS will include further cockpit display guidelines, including the use of colors and symbols, and the development of new broadcast products.

Product Dissemination:
Methods and Products

Lt Col Kim Waldron, USAF
Chief, Strategic Operations Plans
Directorate of Weather
Headquarters, United States Air Force

ABSTRACT

Air Force Weather (AFW) utilizes a full range of dedicated and common user, unclassified and secure, communication systems to meet their diverse dissemination requirements. Dedicated communication circuits includes the Automated Weather Distribution System for graphics and alphanumeric data and the Very Small Aperture Terminal (VSAT) system which provides connectivity to weather units deployed to support war-fighter operations worldwide. Common user systems include telephones, faxes, and an increasing use of internet connectivity (web sites).

Data and product dissemination has two primary components--between weather units and from weather units to their supporting customers. The data exchange between weather units has extremely large bandwidth requirements for meteorological satellite data and numerical weather prediction model output. Customer dissemination provides a different set of challenges, including connectivity to remote locations, into command and control systems, and airborne updates. AFW has many ongoing initiatives to ensure a flexible and reliable capability, with adequate bandwidth, to wherever our warfighting customers require.

Product Dissemination:
Remote Sensing of In-flight Icing Conditions

Dr. Charles C. Ryerson
Research Physical Scientist
U.S. Army Cold Regions Research and Engineering Laboratory (CRREL)

ABSTRACT

NASA, the FAA, DoD, and NOAA have teamed with industry and academia to develop a capability to detect icing conditions ahead of aircraft using onboard or ground-based remote sensing systems. The goal of the program is to provide pilots with sufficient information to allow avoidance of icing. Information displayed to the pilot, as a measure of icing potential, will be useful in assessing the risk of entering the sensed conditions. This requires measurement and mapping of cloud microphysical parameters, especially cloud and precipitation liquid water content, droplet size and temperature, with range. Remote measurement of cloud microphysical conditions using radar and microwave radiometers has been studied for years. However, this is the largest focused program devoted to remotely detecting aircraft icing conditions with either ground-based or airborne sensors. Primary funding sources are NASA Aerospace Operations Systems, the FAA Aviation Weather Research Program and William J. Hughes Technical Center, and the DoD's Army Corps of Engineers Cold Regions Research and Engineering Laboratory. This presentation explains the goals and accomplishments of this program, and how intended final products will contribute to aviation safety.

Product Dissemination:
NASA Weather Accident Prevention Project

Dr. Renato (Ron) Colantonio
Project Manager, Weather Accident Prevention Project
Glenn Research Center (NASA)

ABSTRACT

In 1997 a national goal was announced to reduce the fatal accident rate for aviation by 80% within ten years. NASA immediately responded with a major program planning effort to define appropriate research areas to be conducted in partnership with the Federal Aviation Administration (FAA), Department of Defense (DOD), other government agencies, Industry, and academia. One such research area focused on developing enabling technologies that could reduce accidents where weather was the attributing cause of or one of the precursors to an accident.

The NASA Aviation Safety Program's Weather Information Communication (WINCOMM) element will develop enabling communication technologies and system concepts that will provide accurate, timely and intuitive weather information to pilots. WINCOMM will define the communications requirements associated with delivering weather information to the appropriate aviation users and assess the current aviation communications infrastructure and its ability to support current and future weather product. WINCOMM will develop in collaboration with the FAA advanced communications systems, along with supporting standards and protocols definition, to ensure the efficient implementation of advanced weather products. An investigation of current communications technologies and their ability to address identified technology gaps via appropriate enhancement will be performed. Appropriate ground and, where necessary, airborne experiments will be performed to demonstrate new data links and validate new and modified communications technologies and weather products for accelerated implementation.

Product Dissemination:
Weather Support at Delta Airlines

Joe Luisi
Manager, Meteorology
Delta Airlines

ABSTRACT

The Meteorology department provides Delta Air Lines with timely and accurate weather data through collaborative and collective resources. The data supports the decision process of the Flight Superintendents and flight crewmembers to meet corporate goals in terms of safety, reliability, and cost. Forecast of ceilings/visibility, precipitation, turbulence, volcanic ash are prepared by our 18 professional aviation meteorologists.