3.8 Implementing ADDS Operationally at the NWS Aviation Weather Center

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1. Introduction

The Aviation Digital Data Service (ADDS) enables pilots and other aviation decision-makers (e.g., airline dispatchers) to acquire accurate, timely, and user-friendly weather information via the Internet. That information includes up-to-the-minute observations, conventional forecast products, and interactive graphical forecasts of turbulence, icing, and thunderstorms based on state-of-the-art algorithms.

ADDS is being developed by the National Center for Atmospheric Research (NCAR) Research Applications Program (RAP), National Oceanic and Atmospheric Administration (NOAA) Forecast Systems Laboratory (FSL), and National Weather Service (NWS) Aviation Weather Center (AWC) under the auspices of the Federal Aviation Administration (FAA) Product Development Team (PDT) for Aviation Forecasts and Quality Assessment (AF&QA). Funding is provided by the FAA Aviation Weather Research Program (AWRP; Kulesa et al. (2002)).

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The first version of ADDS (implemented in 1997) made grids of aviation-impact variables available to private sector providers. Responding to requests by pilots, the PDT soon began to add user-friendly pregenerated and interactive graphics designed to enhance flight safety and airspace efficiency. ADDS also displays "experimental" forecasts generated by algorithms developed by the FAA AWRP and has become the primary vehicle by which aviation decision-makers view those forecasts. As new products and viewing capability have been added, the number of users has grown dramatically. ADDS now averages about 100,000 product accesses each day. For additional information refer to Sherretz et al. (2000) and the ADDS site at **http://adds.aviationweather.noaa.gov**.

2. How ADDS Benefits Aviation

The primary benefit of ADDS is that its accurate, timely, and user-friendly weather observations, warnings and forecasts enhance flight safety and efficiency. For example, ADDS enables decision-makers to identify airspace that is impacted by hazardous weather or is favorable for flying.

ADDS users are very vocal and have provided many accolades about the utility of ADDS to operations. A couple of examples provided by General Aviation (GA) pilots regarding safety

are: "ADDS makes flying much safer;" and "ADDS is a real contribution to safety. It should be promoted far and wide."

Despite the resounding success of ADDS (as evidenced by user feedback), ADDS has remained "experimental" and is being maintained by NCAR and FSL with some support by AWC. The PDT believes (and the FAA AWRP and NWS concur) that ADDS should become operational as soon as feasible. Indeed, ADDS is sufficiently mature (in terms of number and breadth of products and number of users) to warrant operational status. When the NWS assumes full responsibility for maintaining ADDS, the PDT will be free from maintenance responsibilities and able to develop an advanced version of ADDS that exploits rapidly evolving technology for generating, disseminating, and displaying products. Finally, the ADDS Advanced User Group has recommended that ADDS become operational. Among the members of this group are the Airline Owner's and Pilots Association (AOPA) Air Safety Foundation (ASF), Airline Pilot's Association (ALPA), United Airlines, American Dispatcher's Federation (ADF), National Association of Air Traffic Specialists (NAATS), Small Aviation Manufacturing Association (SAMA), FAA Flight Standards, US Air Force, and Purdue Aviation Technology Department. The group makes recommendations directly to the AF&QA PDT--which then proposes related work to the FAA AWRP.

3. Challenges

Transferring ADDS from NCAR and FSL to AWC is very challenging. A key task is to ensure that ADDS will be very reliable. This requires enabling ADDS to acquire all of its input data from AWC (instead of NCAR and FSL), enabling its software to conform (as feasible) to "standards" adopted by AWC, providing effective familiarization via face-to-face training and documentation, and providing software tools to monitor the "health" of ADDS and to alert AWC operations staff when failures occur. The PDT needs to identify the products for the operational version and ensure (as appropriate) that those products do not conflict with existing operational products. It also needs to install appropriate security software and implement a software "environment" that will enable fixes that AWC makes to the operational version to become part of future versions.

A critical aspect to ensuring success is AWC's commitment to operate and maintain ADDS.

4. Approach and Schedule

The proposed approach (which has not received final approval by the FAA and NWS) for implementing ADDS operationally at AWC is to deploy *operational* and *experimental* versions. The PDT has begun work this year and expects to complete the operational implementation in Fiscal Year 2003.

The operational version of ADDS will have the identical "look and feel" of the current version of ADDS and be fully managed by AWC and supported 24x7. It will include all the products in the current version of ADDS except those that have not been granted "operational" status by the FAA/NWS Aviation Weather Technology Transfer (AWTT) Board. The Integrated Turbulence Forecasting Algorithm (ITFA; Sharman et. al. (2002)) is an example of such a product. The Java tools (i.e., Flight Path Tool, product viewers, and observation viewers) will be included. The operational version will also conform to the criteria for reliability, security, accessibility, and archiving in the forthcoming FAA Advisory Circular (AC) on disseminating weather information via the public Internet. Finally, the operational version will link to the experimental version.

This approach will ensure that the operational version will offer significant advantages (e.g., ease-of-use, flexibility, and rapid response) that the current version of ADDS offers compared to

other existing methods of acquiring aviation weather information via the Internet.

Future enhancements to the operational version will require approval by the Team Leader of the FAA AWRP and the NWS Chief of Aviation Services. Some enhancements may require approval by the AWTT Board. The FAA and NWS will determine if aviation users must be formally notified regarding any enhancements.

The experimental version of ADDS will contain all of the products and capability (e.g., viewing methods) that the current version contains, thereby enabling users to compare experimental and operational products. Experimental products will include (but may not be limited to) those products that have been granted experimental status by the AWTT Board and new model output that has not been declared operational by the NWS. This version will not be required to conform to criterion for reliability set forth by the FAA AC on Qualified Internet Communications Providers (QICP), thereby enabling ADDS developers to make enhancements without being overly concerned about reliability. The site will link to the operational version, announce enhancements informally, and encourage users to provide feedback.

Those experimental products and viewing methods that show utility to aviation users within a reasonable length of time will be transferred to the operational version. Those that do not will be removed for additional development or burial.

Readers may question why pilots would use the operational version of ADDS if the experimental version includes everything on the operational version, in addition to experimental products and advanced viewing methods. While the PDT will certainly encourage pilots to use the experimental version (and provide feedback), the operational version (as an FAA-approved QICP) will be considerably more reliable. Aviation advocacy groups are encouraging the FAA to approve QICPs as authorized sources for pilots to obtain weather information as required by Federal Aviation Regulation.

5. Recent Progress

Significant progress has been made toward implementing ADDS operationally, as follows:

- Enabled ADDS to acquire all input data from AWC instead of NCAR and FSL.
- Enabled ADDS to generate all products (except those that are experimental) at AWC. Earlier versions of ADDS generated some products at NCAR.
- Upgraded ADDS hardware to “server-class” machines (with dual GHz processors, redundant power supplies, and hot-swappable disk drives) and implemented dual data-ingest machines with automatic failover.
- Developed and implemented an initial version of software that monitors ADDS data ingest and product generation processes.
- Switched the ADDS operating system from Debian Linux to Red Hat Linux. This was done because AWC support staff is familiar with Red Hat. ADDS was originally developed with Debian because it makes it easier to perform remote upgrades and has tools that facilitate upgrades by automatically locating dependent software via the Web and implementing it.

6. Remaining Tasks

A key task during the rest of Fiscal Year 2002 is to carefully monitor ADDS and make fixes as necessary to ensure that reliability meets the criteria set forth by the QICP AC. The criterion for reliability is that any outage should not last for more than 10 minutes, and the total time for

outages should not exceed 30 minutes in any continuous 3-month period.

Other tasks include:

- Acquire hardware for the operational version of ADDS.

- Identify (in conjunction with the FAA and NWS) the portions of the current version of ADDS that will constitute the operational version and configure that version accordingly.

- Enable the operational version of ADDS to conform to criteria for accessibility and security set forth by the QICP AC. The criterion for accessibility (which refers to turnaround time at a provider's facility--and which we anticipate that ADDS will readily meet) states that a provider initiate transmission of requested data to all users within two minutes. The criterion for security refers to maintaining data integrity and providing site authentication.

- Enable ADDS to conform to the QICP AC recommendation for archiving. This entails developing capability to "reproduce" the specific data requested by individual users for at least 15 days following the request. Our approach will be to archive all products and "record" which products each user requests and those products that ADDS sends in response.

- Prepare documentation (operational and software) that will assist AWC staff to fully support the operational version.

- Familiarize AWC staff with ADDS software and hardware. Assist (for a reasonable--but limited--time) AWC staff with software issues as they arise after ADDS becomes operational.

- Implement the same development environment at AWC that NCAR and FSL use, thereby ensuring that AWC "fixes" have a path to future versions.

7. Acknowledgment

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8. References

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