Aviation Forecasts PDT

Program Management Review

19 November 2002
The “End-to-End” PDT

Anticipate Needs of Aviation End Users

Respond to Requirements

Develop Related Services

Evaluate/Verify those Services in FAA and NWS Operational Environments

Implement “Proven” Services in Operations
Our Focus Areas in FY 03

Continuing Tasks:

• Implement ADDS in AWC Operations
• T&E Wx Requirements for FAA Traffic Managers
• Build and Support RTVS Infrastructure
• Implement PDT Algorithms in AWC Operations
Our Focus Areas in FY 03

Proposed New Tasks:

• Volcanic Ash Coordination Tool (VACT)
• Advanced Convective Tool (ACT)
AF PDT’s Many Customers

1) Pilots!

2) Other persons/systems that support weather-related decision-making by pilots:

- air traffic managers
- airline dispatchers
- air traffic controllers
- FSS specialists
- NWS aviation forecasters
- private weather vendors
- commercial flight planning
- FAA automation
Aviation Digital Data Service (ADDS)

Objective

Enable users to access easily, inexpensively, and in friendly formats the results of AWRP applied research.

New URL: adds.aviationweather.gov
ADDS Advanced User Group

Makes recommendations *directly* to AF PDT…
…which then proposes related work to AWRP

Members include:

AOPA, ALPA, SAMA, UAL, Delta, NWS AWC, FAA Flight Standards, private aviation consultant, Purdue Dept. of Av Tech
FY 03 Tasks

Make ADDS fully-operational!
Target Date: July 2003

FAA, NWS, and AF PDT have agreed that ADDS will have ops and exp versions.
Ops Version of ADDS

Supported 24/7 by AWC

Have all functions and “look/feel” of current ADDS --but no exp products

Conform to FAA criteria for Internet providers

Enhancements may require formal notice
Exp Version of ADDS

Supported 8/5 by AF PDT

Has \textit{exp} products and viewing tools

Has all \textit{ops} products and tools--enables comparing \textit{exp} products with \textit{ops} products

Will not necessarily conform to FAA Internet criteria

Enhancements announced via home page
FY 03 Tasks (cont.)

Prepare to Evaluate Utility of ADDS for Interactive Update Briefings by FAA FSSs (FY 04)

Concept for Interactive Briefings

Shared viewing of key ADDS graphics in real-time with interpretation by FSS specialists
Which Would You Prefer?

Hearing this?

CONVECTIVE SIGMET 55C
VALID UNTIL 2055Z
MS
FROM 50NW IGB-30NNE MEI-30W JAN-10WSW SQS-50NW IGB
DVLPG AREA SEV TS MOV FROM 26015KT. TOPS ABV FL450.
HAIL TO 1 IN...WIND GUSTS TO 50 KT POSS.

Or seeing this?
(with interpretation by FSS)

Aviation Forecasts PDT
FAA AWRP PMR
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FY 03 Tasks (cont.)

Enhance Flight Path Tool

Build “application” version

- starts much faster
- enables saving configurations & printing displays

Add airports, nav aids, observations & forecasts

Cover AK
Explore developing (with private sector) capability for Personal Data Assistants to access ADDS

ADDS Team: develop very efficient server and prototype client software

Private Sector: develop client software for marketing

We believe “wireless” applications are critical to ADDS future
FY 03 Tasks (cont.)

Enhance radar page

• WARP mosaic

• Single-site composites with overlays for terrain, VORs, highways, and airports

Implement database mgr (*enhances response time*)
Recent Comments from GA Pilots

“ADDS is an example of *government* at its best.”

“Frankly, I thought I’d never say this about any Web service from the *government*. The Java tools are incredible. I am completely stunned.”
Helicopter Pilots Love ADDS

They report that ADDS’ timely and accurate forecasts of *atmospheric* hazards enhance safety.
Helicopter Pilots Love ADDS

They report that ADDS’ timely and accurate forecasts of *atmospheric* hazards enhance safety.

But recently, they asked us to enable ADDS to forecast *oceanic* hazards!
Helicopter Pilots (cont.)
ADDTS Team

Aaron Braeckel, Arnaud Dumont, Shelly Knight, Paddy McCarthy, Greg Thompson, Adrian Wilksch, Rob Weingruber

Young Chun, Lisa Gifford, Jim Frimel, Ward Lemke, Chris Masters, Doug Ohlhorst, Robin Paschall, Greg Pratt, Dennis Rodgers

Steve Danz, Phil Kennedy, Tim Mahony
Tailoring and Evaluating Advanced Convective Products for FAA Traffic Managers
Background

Recognizing that traffic managers need better weather info, FAA prepared document that identifies *unmet needs*
Via interagency agreement, FAA provided document to NWS for comments.

NWS requested that NOAA FSL review document.

Consequently, we were invited to serve on FAA/NWS Core Working Group (CWG).
AF PDT helped prepare project plan and briefed key FAA personnel.

Plan calls for focusing first on tactical convective forecasts to:

- reduce air carrier delays
- exploit automated forecasts developed by Conv. PDT
Background

FAA approved project plan which calls for T&E of advanced *convective* forecasts at Ft Worth ARTCC.

ZFW
Objectives

Tailor for Traffic Managers *graphical* forecasts that *consolidate critical info* in forecasts generated by:

- NWS meteorologists
- algorithms developed by AWRP PDTs

Use RTVS to assess:

- meteorological validity
- operational utility
Objectives (cont.)

Expedite “proven” convective forecasts to operations

• influence how VNTSC implements NCWF on ETMS
• WARP met workstation and briefing terminals?
Why ZFW

ZFW TMU wants to help.

Convection has major impact on ZFW.

ZFW TMU & CWSU have good working relationship.

ZFW CWSU is regarded as “top notch.”
Opportunity to leverage with NWS Southern Region Prototyping and Aviation Collaboration Effort (PACE)

PACE is providing hardware/comms and making CWSU staff available as operations permit.
Why ZFW (cont.)

Ft Worth TMU is well laid-out and spacious.
Why ZFW (cont.)

Success will help reduce number of displays!
Approach

First:

Focus on *tactical* convective forecasts for ZFW TMU and support provided by CWSU

Later:

Explore utility of convective forecasts to local airlines and Flight Service Station (FSS)
Approach (cont.)

Later (cont.):

Explore utility of real-time *collaborative* input by NWS aviation forecasters at:

- an adjacent CWSU (Houston)
- Ft Worth WFO
- AWC
Present Convective Forecasts

Convective SIGMET
CWA & MIS
TCWF & RCWF
NCWF-1

Convective SIGMET Outlook

CCFP-1

0 hrs 1 hr 2 hrs 4 hrs 6 hrs
Accomplishments

Built T&E facility at ZFW--including product generation and display systems

Developed evaluation procedures and instrument

Trained TMU staff

Built initial consolidated product

Developed concepts for simple Route Impact Tool
FX-Connect Architecture that Supports the Fort Worth Test and Evaluation Facility

AWC
FX-C Data Server
FX-C Workstation
- Future collaboration

FSL TMU Web Server
Prototype Products

Value-Added Products

Fort Worth CWSU
FX-C Workstation
- View conventional and advanced data and forecasts
- Add value to CCFP product to be incorporated into TMU (TCHP)
- Collaborate with Houston CWSU

Fort Worth TMU
Web Display

Houston CWSU
FX-C Workstation
- Collaborate with Ft. Worth CWSU

FWSAIR "FORT WORTH AIR ROUTE TRAFFIC CONTROL CENTER"
"FORT WORTH AIR ROUTE TRAFFIC CONTROL CENTER"
"FORT WORTH AIR ROUTE TRAFFIC CONTROL CENTER"
Concept for Initial Strategic Product

Consolidate NCWD/NCWF and Convective SIGMETs

Advect C-SIG polygon with NCWF
Future Work

Keyed to transition of AWRP algorithms through FAA/NWS AWTT process.

Location for T&E of icing, turbulence and C&V?
Building And Supporting RTVS
AF PDT Support for RTVS

Build *Experimental* RTVS and Support It at FSL

- real-time processing
- database management system
- user interface
- tools for aviation forecasters
- quality assessment methods developed by QA PDT

Build *Operational* RTVS and Transfer It to AWC
RTVS Real Time Verification System

Forecast Verification Branch (FVB) is developing a real-time verification system (RTVS) that provides feedback on forecast quality to forecasters, model developers, and managers. FVB also participates in developing and enhancing verification methods.

Operational (tools and methods in the field)
- FSL RTVS
- AWC RTVS

Experimental (tools and methods in development)
- ACARS-RUC
- AAWU
- CCFP
- Ceiling and Visibility
- Convection
- CWD
- IHOP
- Precipitation
- TMU
- Turbulence

Reference
- Product Monitor
- Publications
- Contact Us

Try it… You’ll like it!

Robust and Reliable

http://www-ad.fsl.noaa.gov/fvb/rtvs/
Implementing AWRP Algorithms Operationally at NWS AWC
AWRP Algorithms at AWC

AWC Ops: NCWF, CIP

AWC Testbed: ITFA, FIP

May 2003: CIP-2, NCWF-2, cloud top diagnostic

May 2004: National C&V, oceanic convection

May 2005: FIP-2, oceanic turbulence
Volcanic Ash Coordination Tool (Proposed)
Objective

Enable.....

*Anchorage ARTCC CWSU*
*AAWU Volcanic Ash Advisory Center*
*Alaska Volcano Observatory*

.....to view identical data and collaborate in real-time to generate *time-critical* forecasts for ash.
Aviation Operations Problem

More than 200 flights cross the N. Pacific daily w/ 20K folks and 6K tons of cargo.

100 “active” volcanoes may emit ash in that airspace.

Ash:aircraft :: sodium:water

Mt Cleveland (1730 m)
Rare Clear Day--30 Volcanoes Visible

Courtesy of AVO
Encounters with ash during past 20 years have been dangerous, costly, and far-reaching.

**Danger**: Engine failure, loss of visibility, loss of critical instruments

**Cost**: 100 jet aircraft damaged ($250M) world-wide. Airports closed and planes grounded for days.

**Extent**: Engines have failed 600 miles away and damage has occurred 1800 miles away.
Forecasting Problem

Immediate:

Determine if plume is high enough to affect jet routes.

Ongoing:

Determine where winds will carry ash and how long it will stay airborne.
Potential Benefits of VACT

Forecasts that are more accurate and consistent

Achieved via shared situational awareness and real time collaboration among participants

Support T&E of volcanic ash products developed by Oceanic Weather PDT
VACT Infrastructure

Will use FSL’s FX-Connect display system:

- enables participants at various locations to view and interact with identical data in real-time
- offers full-suite of obs, fcsts, and workstation tools
- resides outside of ops firewalls
- offers advanced features--collaboration, slide shows, chat facility, and Web images
Key Products

Satellite images ("split channel")

Wind forecasts made by models

Output generated by ash dispersion models: CANERM, VAFTAD, PUFF

PIREPs

New products developed by Oceanic Weather PDT
Leveraging

VACT will use FX-Connect display system developed by NOAA.

NWS AK Region has offered to pay for hardware and communications.
Advanced Convective Tool (Proposed)
Why Probabilistic Forecasts

Accurate *explicit* forecasts of convection are not possible now.

Enable FAA traffic mgrs (in concert with air carriers) to “manage” risk based on ops costs.

Some users want NWS fcsts to include “confidence.”
Why Probabilistic Forecasts (cont.)

Recent study by Ross Keith (Australia) showed that probabilistic forecasts (coupled with accurate cost estimates from airlines) may have considerable value.

Current CCFP has a “probabilistic” component.
Proposed Tasks

Work w/ AWC to develop/test concepts for generating 0-6 hr probabilistic gridded fcsts of convection & cloud top height based on automation & forecaster input.

Explore calibrating those forecasts.

Work with Quality Assessment PDT to explore and test methods of assessing operational utility.
Approach

Use FSL’s Graphical Forecast Editor (key part of NWS Interactive Forecast Preparation System) to:

• ingest relevant grids
• enable forecasters to add value to those grids
• generate gridded probabilistic forecasts
• generate consistent text products (later)
Why GFE

Highly-configurable for location and ingesting grids

Suite of tools to edit objects generated from grids

 Automatically modifies underlying grids in response to editing

Routines that enable users to develop “smart tools” to operate on grids
Leveraging

Task will benefit from robust GFE developed by NOAA/FSL.

AWC will provide .25 FTE of software development. Developer will spend considerable time working at FSL with GFE Team.