Aviation Weather Research Program (AWRP) Highlights for FPAW

November 19, 2015

Presentation Overview

- **AWRP Mission**
- **Long history of success!**
- **A sampling of current AWRP research initiatives**
- **Biggest challenges ahead**

AWRP Mission

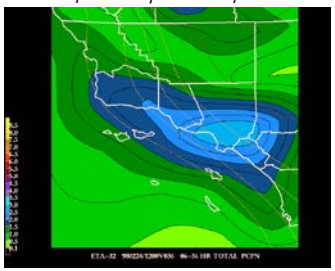
Applied research to minimize the impact of weather on the National Airspace System (NAS)

- The NextGen Implementation Plan contains specific initiatives to support NextGen weather Operational Improvements
- Collaborative, complementary initiatives with NWS to transition legacy capabilities to meet NextGen requirements
- Focused initiatives to help mitigate safety and/or efficiency issues associated with well-documented weather problems

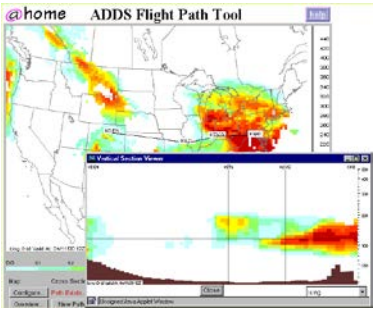
AWRP 15+ Year History of Success

National Convective Wx Forecast, 2001

Rapid Update Cycle (RUC): 40KM, 1998; 20KM, 2002; 13KM, 2005

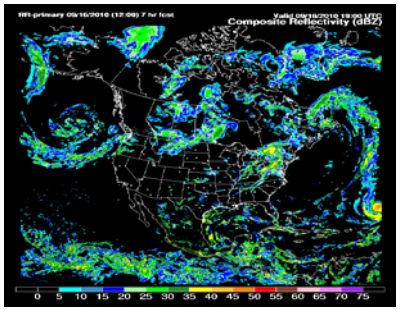


Current Icing Potential (CIP): original implementation, 2002; Forecast Icing Potential (FIP): original implementation, 2004; FIP Severity, 2011; CIP/FIP RAP, 2012; CIP/FIP High Resolution, 2014

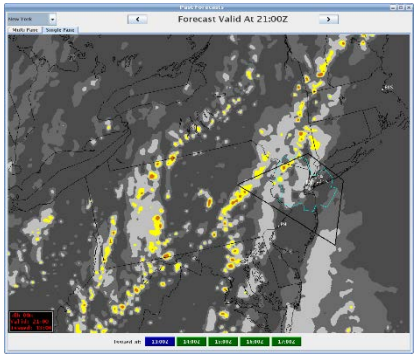


Aviation Digital Data Service (ADDS), 2003

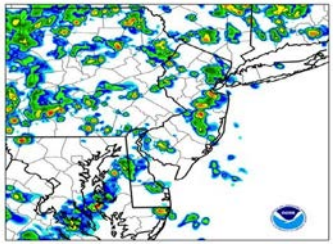
Rapid Refresh (RAP), 2012



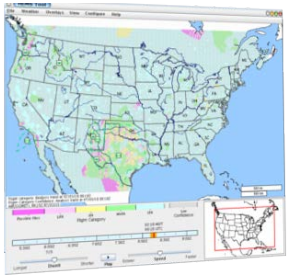
CoSPA, 2011



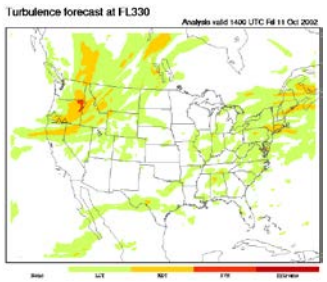
High-Resolution Rapid Refresh (HRRR), 2014



Helicopter Emergency Medical Services (HEMS): Initial Operation on ExADDS, 2007; Operational transition to ADDS, 2015



Graphical Turbulence Guidance (GTG): original implementation, 2003; GTG2 (Mid-Levels), 2010; GTG3 (Mountain Wave, Low Levels), 2015

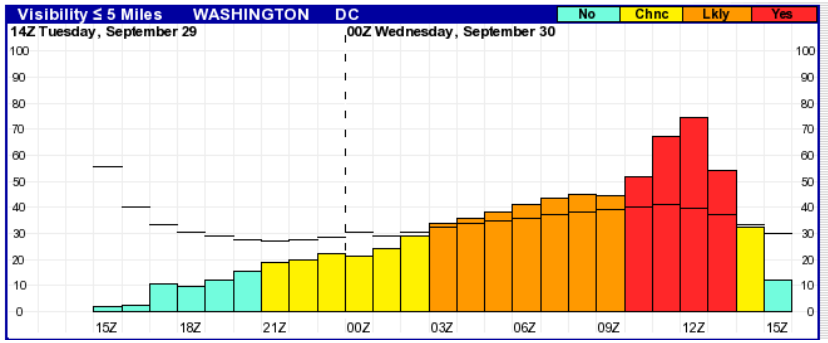


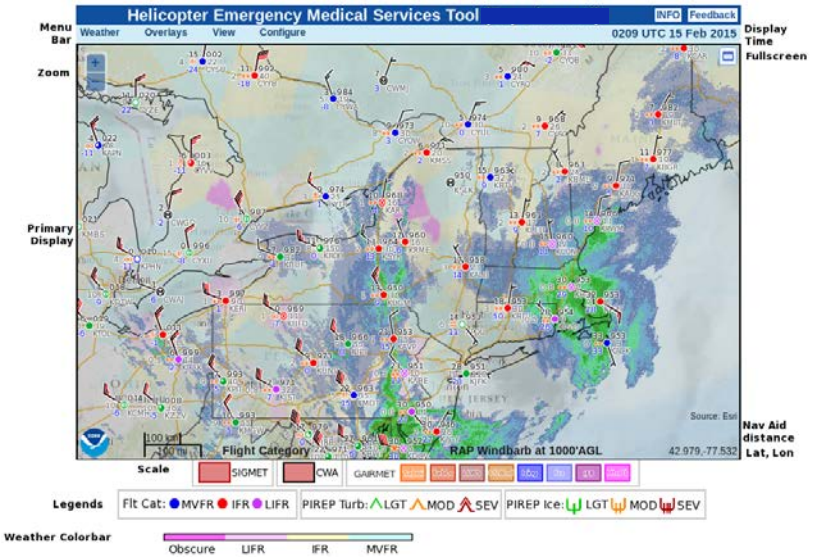
A shout out to our fantastic partners!

…and many more…

Ceiling and Visibility (C&V)

- **Collaboration with NOAA to:**
  - Improve C&V analyses in the form of the Real Time Mesoscale Analysis (RTMA)
  - Improve Localized Aviation MOS Product (LAMP) forecasts
  - Test techniques for forecasters to enhance automated products
  - Integrate improvements into the Helicopter Emergency Medical Services (HEMS) tool, TAFs, and TRACON Area Forecasts



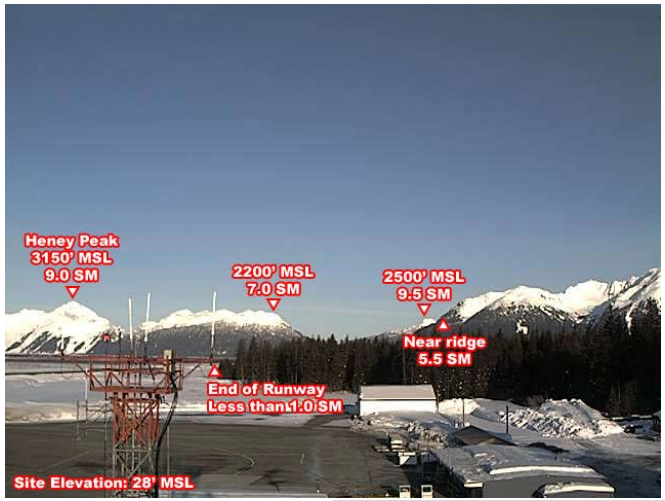


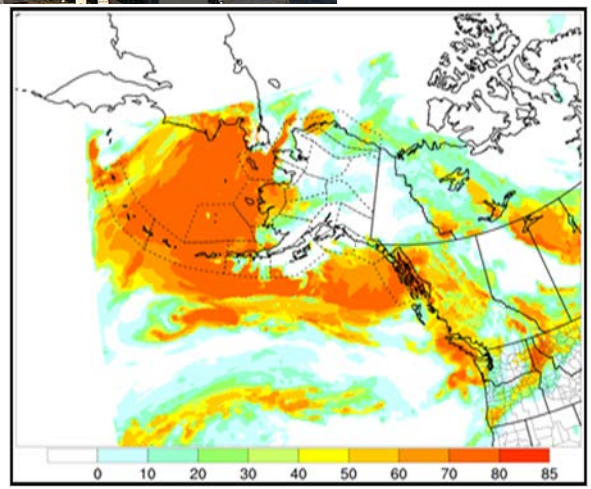
Alaska Specific Initiatives

- **Even with sophisticated weather applications in the cockpit, NTSB statistics show GA accident rates are not falling. Inadvertent VFR to IMC, especially in AK, still a big problem**
- **AWRP looking at specific applications to address GA accident issues in AK**
  - **CONUS specific products such as GTG and CIP/FIP will not perform well over AK due to model resolution and available observational data**
  - **New products will leverage different data sets and better address forecast uncertainty**
  - **Critical need to improve first guess and analysis fields for many aviation impact variables**

Alaska Specific Initiatives

- **Ceiling and Visibility Analysis for Alaska (CVA-AK)—collaboration with NCAR, MIT/LL and Alaskan Aviation Weather Unit (NWS) to:**
  - — Develop automated C&V analysis product combining surface observations and information from satellites and weather cameras
  - — Use as input for numerical model initialization
- **Icing Product Alaska**





Numerical Modeling

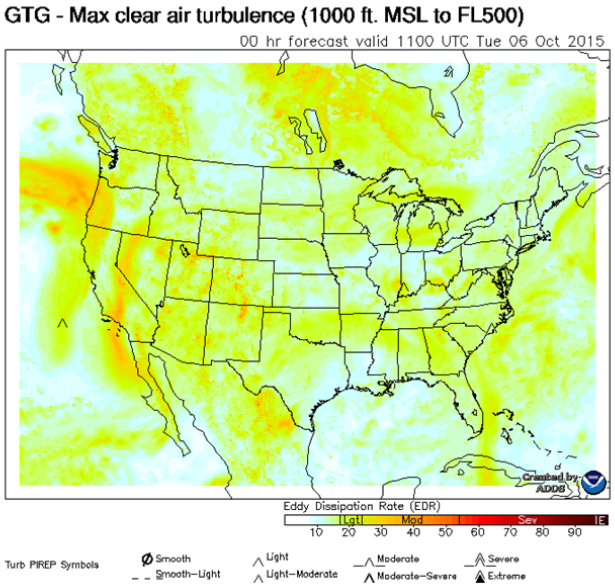
- Supporting NOAA GSD efforts to improve model resolution, accuracy, and refresh rates via advancements in model physics, nested grids, and data assimilation on operational models
- Supporting research and evaluation of new modeling capabilities that have a viable path to NCEP operations including ensembles, global resolution improvements, and more…
- Developed and supported operational implementation of 3km High Resolution Rapid Refresh (HRRR) and RAP v2 at NCEP NCO
- Quantifying benefits of current and future model enhancements to the National Airspace System

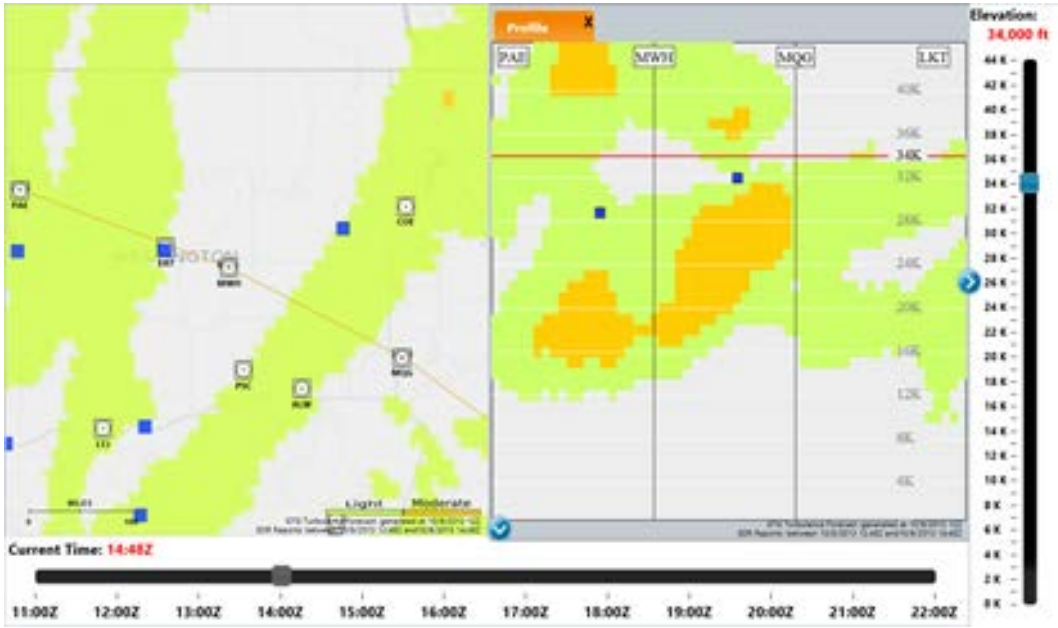
Aviation specific research efforts funded at nearly $8 million over the last 5 years

Turbulence

- Graphical Turbulence Guidance (GTG) upgrades include mountain wave turbulence and low level turbulence diagnostics. Operational on aviationweather.gov
- Develop and evaluate additional turbulence forecast capabilities including convectively induced turbulence (CIT), Alaska-specific and Global coverage products
- Research to enhance the operational capability to remotely sense turbulence (i.e., with satellites and radar)
- In collaboration with Delta Air Lines, provided dispatch and flight crew access to turbulence forecasts and EDR data for strategic and tactical decision making

Turbulence


GTG - Max clear air turbulence (1000 ft. MSL to FL500)
00 hr forecast valid 1100 UTC Tue 06 Oct 2015
Created by: ADDS
Eddy Dissipation Rate (EDR)
Lgtl
Mod
Sev
10 20 30 40 50 60 70 80 90
Turb PIREP Symbols
Smooth
Smooth–Light
Light
Light–Moderate
Moderate
Moderate–Severe
Severe
Extreme


Profile
PAE
MWH
MQG
LKT
Elevation:
34,000 ft
Current Time: 14:48Z
11:00Z
12:00Z
13:00Z
14:00Z
15:00Z
16:00Z
17:00Z
18:00Z
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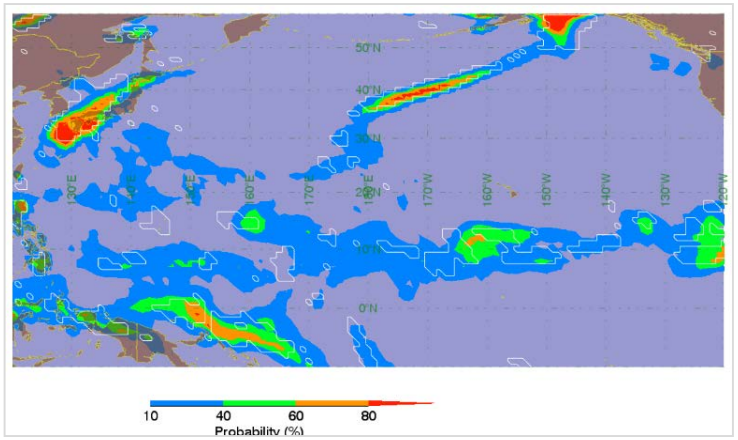
Convective Storms

- Global-scale probabilistic convection forecast guidance out to 36 hours to support strategic planning of transoceanic flights in coordination with World Area Forecast Centers (WAFC)
- Increasing skill and continuity of 1–4 hour forecasts of VIL and echo tops by using new blending methods combining numerical weather model and extrapolation forecasts
- Refining techniques to improve the 0–6 hour prediction of convective initiation critical for NAS planning and operations
- Identified potential opportunities and key shortfalls associated with improved lightning threat awareness for airport operations

Convective Storms

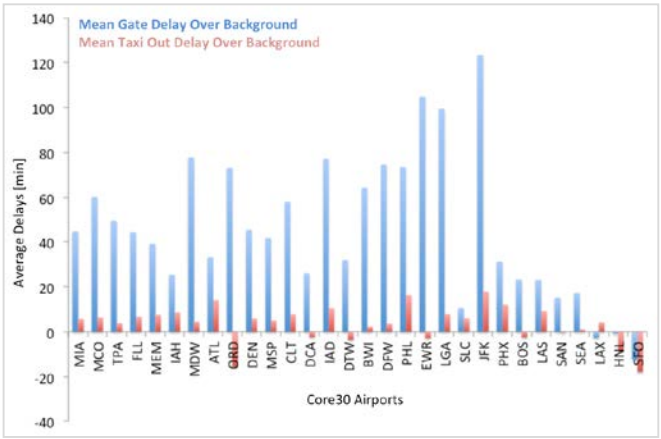
Oceanic

Probabilistic 24-hour forecast of convection for the Pacific. The white contours are actual areas of precipitation at the valid time.



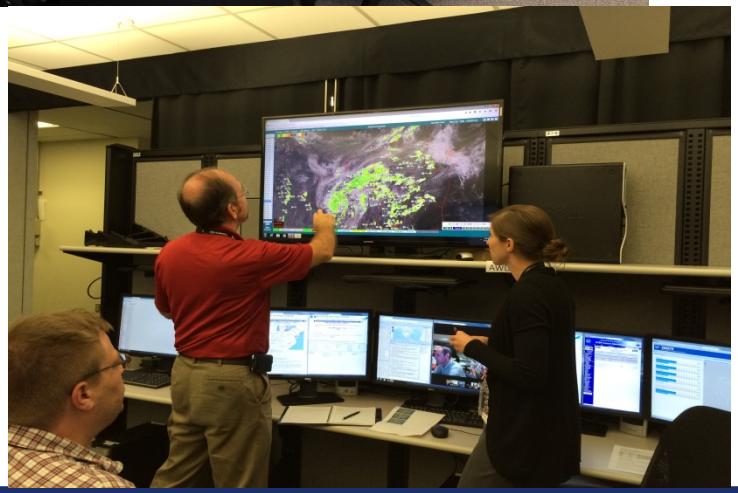
Lightning

Mean gate departure and taxi out delays due to ramp closures for which average background delays were subtracted.



Aviation Weather Demonstration and Evaluation Services (AWDE)

- Core capability providing aviation weather demonstration and evaluation services
- Supports program managers with data to reduce programmatic risks, aids in the definition and validation of requirements
- Provides a laboratory capability to perform HITLs and other technical evaluations, often in collaboration with Aviation Weather Center Testbed
- Provides access to SMEs in Human Factors, Engineering, Meteorology, Computer Science and Aviation Users



Challenges

- **Uncertainty—**Complex challenges need to be better clarified regarding not only uncertainty attributes of weather products but also the ability of NAS decision makers to apply uncertainty information.
- **UAS, Commercial space travel, and future capabilities—** How good do forecasts of the future have to be? How good is good enough?
- **Role of Human forecaster versus need for automation—** Improvements to automation changing the role of the human forecaster for aviation (Decision support expertise?)
- **Integration**—translated weather information into decisions and decision support tools

Thanks for your support!

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