

Aviation Weather Testbed

Dr. David R. Bright
Aviation Weather Center
Chief, Aviation Support Branch
Kansas City, MO





National Centers for Environmental Prediction

"From Sun to Sea"



Vision

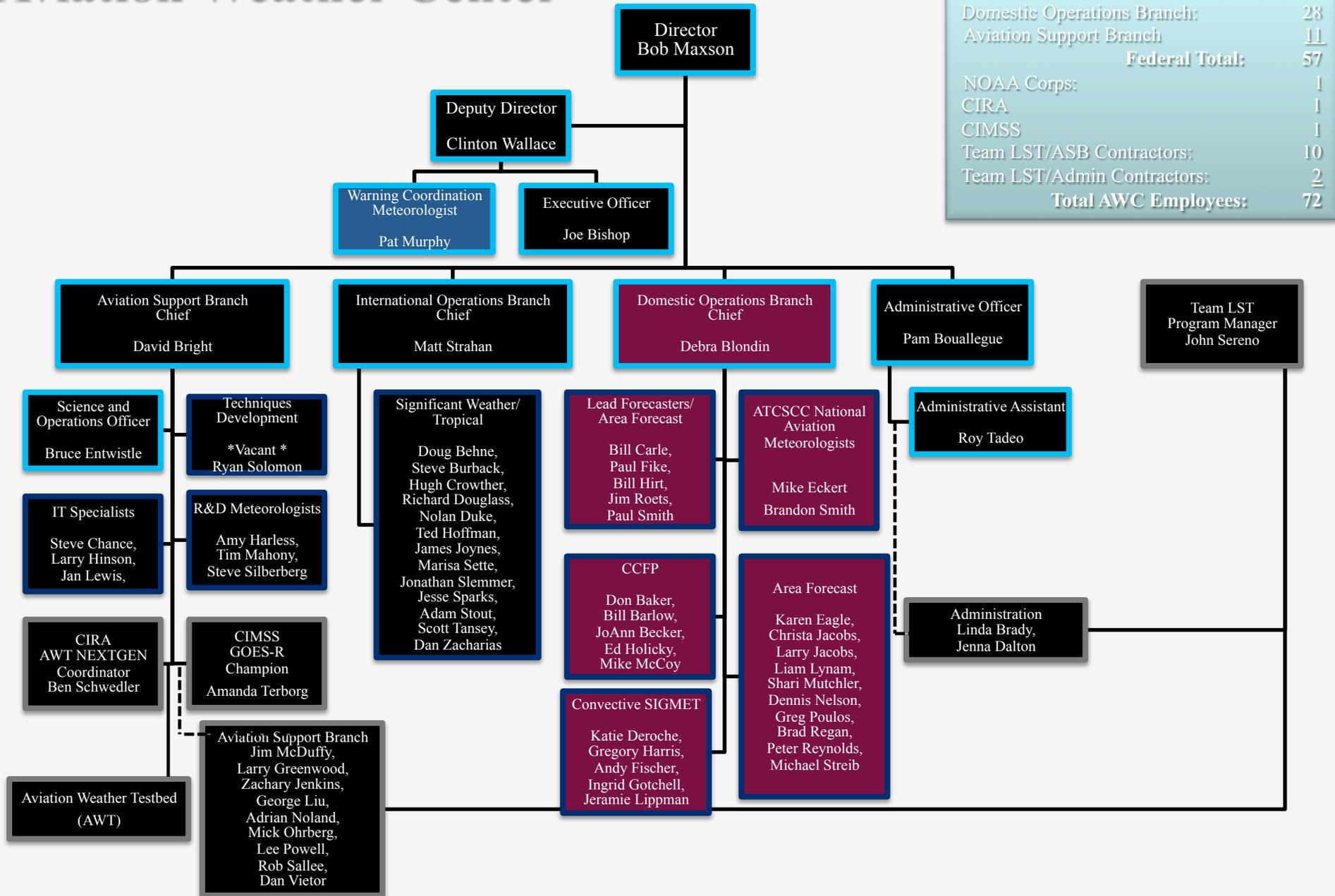
- **To be the trusted authority and leading innovator for aviation weather information.**

Mission

- **The AWC delivers consistent, timely and accurate weather information for the world airspace system. We are a team of highly skilled people dedicated to working with customers and partners to enhance safe and efficient flight**

Aviation Weather Center

Administration:	4
International Operations Branch:	14
Domestic Operations Branch:	28
Aviation Support Branch	11
Federal Total:	57
NOAA Corps:	1
CIRA	1
CIMSS	1
Team LST/ASB Contractors:	10
Team LST/Admin Contractors:	2
Total AWC Employees:	72



AWC's Partners/ Stakeholders

→ FAA

- Command Center**
- Flight Service Stations**
- Research and Development (AWRP)**
- Policy and Requirements**

→ NWS

- CWSUs**
- AAWU**
- WFOs**
- NCEP Centers**
 - SPC, SWPC, TPC, HPC, NCO**

→ USAF

- Weather Agency (AFWA)**
- 15 OWS, Scott AFB**
- Airline Met Services**
- United Kingdom's Meteorological Office**
- Meteorological Service of Canada (MSC)**

AWC Products & Services

U.S. Products (except Alaska and Hawaii)

- Flight Hazard Forecasts and Warnings
 - SIGMET
 - Convective SIGMET
 - AIRMET
 - G-AIRMET
 - Area Forecasts (FA)
 - Low Level Significant Wx
 - Collaborative Convective Forecast Product (CCFP)

Global and Oceanic Products

- Flight Weather Forecasts Maps for the entire World (Airlines)
 - Mid-Level Significant Wx
 - High Level Significant Wx
- Flight Hazard Warnings for Atlantic, Pacific, Gulf of Mex. and Caribbean
 - International SIGMET
 - Tropical Aviation Wx

Automated Aviation Products

- Graphical Turbulence Guidance (GTG)
- Current Icing Product (CIP)
- Forecast Icing Potential (FIP)
- National Conv. Weather Diagnostic/Forecast (NCWF)

Aviation Services

- ADDS: Aviation Digital Data Service
- AviationWeather.gov
- International Flight Folder Documentation Program (IFFDP)

Domestic Operations Branch

→ Five Operational Desks

- FA East, Central, West
- CCFP (Collaborative Convective Forecast Product)
- Convective SIGMET

→ Domestic Products

- SIGMETs – Aviation Warnings
- AIRMETs – Aviation Advisories
- FA – Aviation Area Forecast
- CCFP – NAS Convective Planning Forecast
- SIGWX Low – Significant Low-Level Aviation Graphic

International Operations Branch

→ Three Operational Desks

- SGWX Northern Hemisphere
- SGWX Southern Hemisphere
- Tropical Desk

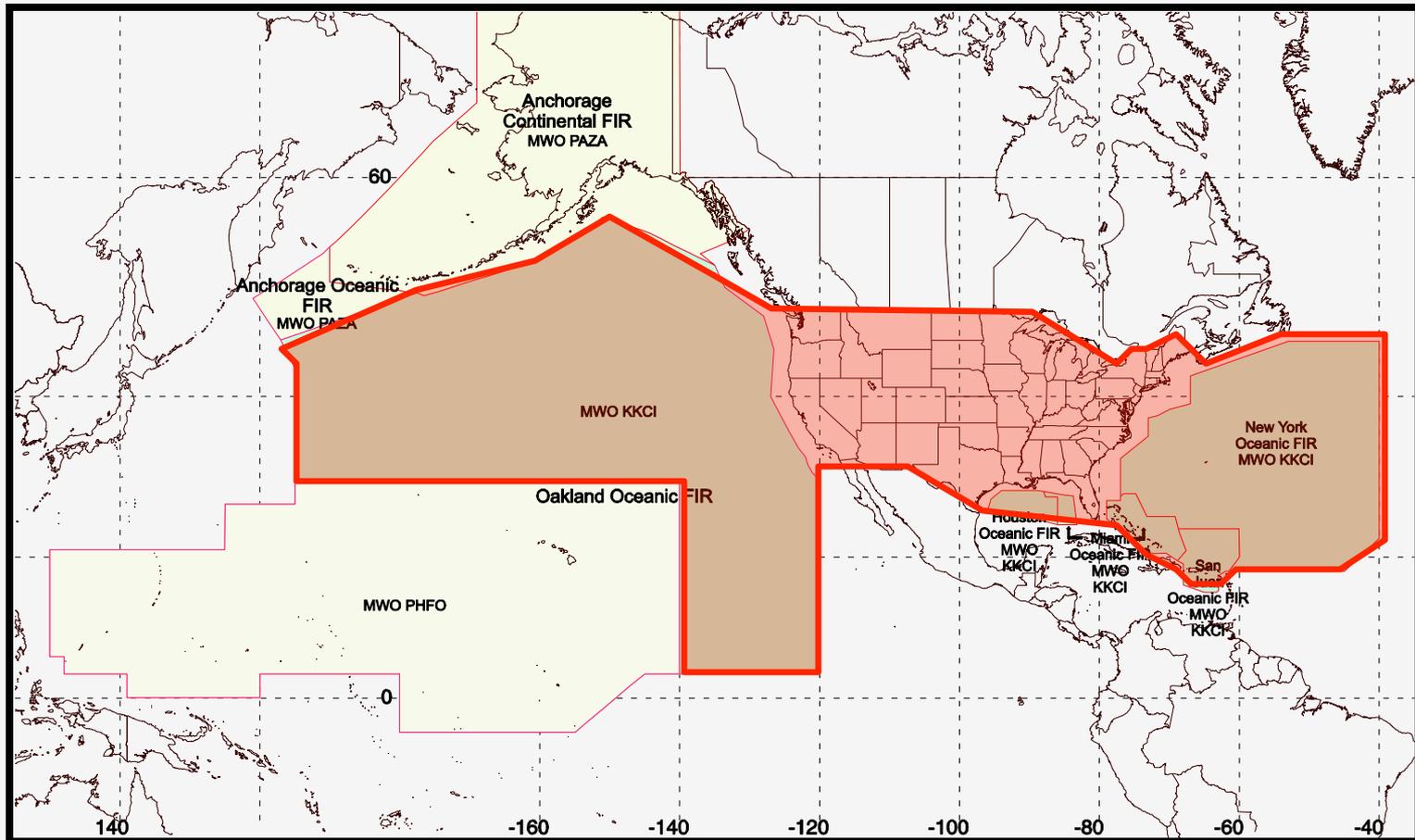
→ Domestic Products

- Significant Weather High
 - Global 24-hour High-Level Forecasts
- Oceanic SIGMETs
 - Aviation Warnings for Atlantic and Pacific
- FACA and FAGX
 - Area forecasts for the Caribbean and Gulf of Mexico

AWC Product Issuances

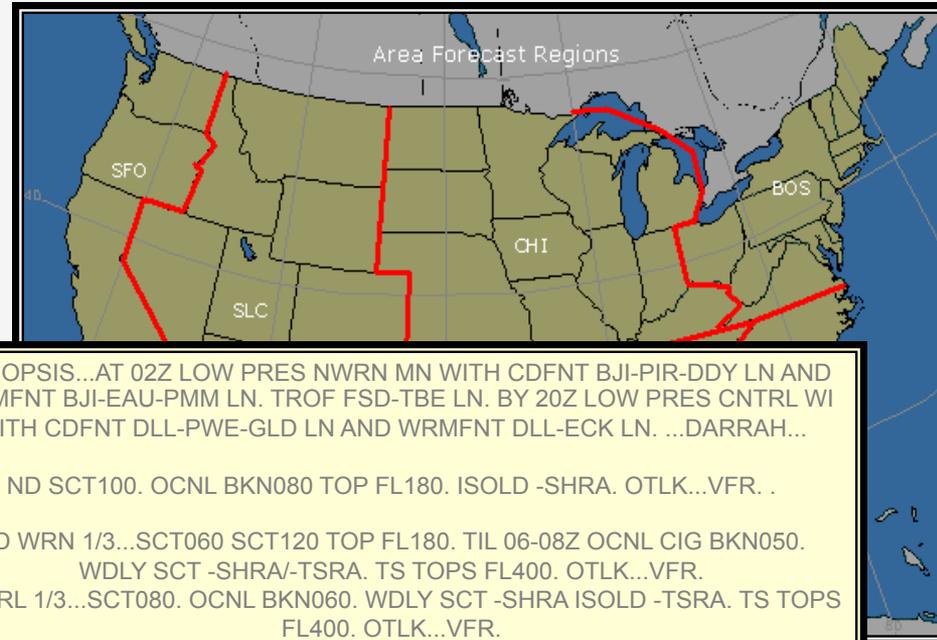
Product	#/Year
Convective SIGMET	30,000
Non-Convective SIGMET	500
Collaborative Convective Forecast Product (CCFP)	25,000
AIRMETs	26,280
Area Forecasts (FA)	6,570
Significant Weather Low	1,460
Significant Weather High	18,890

AWC's Area of Responsibility for Aviation Warnings (SIGMETs)



Area Forecasts, AIRMET & SIGMET

- 15 forecasters 24/7
 - CONUS & Coastal Wtrs
- Text & Graphic Weather Forecasts.
 - AIRMETs
 - 26280 routine issues
 - FA
 - 6570 routine issues
 - SIGMET
 - ~ 500 avg annual
 - Low-Level Graphic
 - 1456 routine issues



SYNOPSIS...AT 02Z LOW PRES NWRN MN WITH CDFNT BJI-PIR-DDY LN AND WRMFNT BJI-EAU-PMM LN. TROF FSD-TBE LN. BY 20Z LOW PRES CNTRL WI WITH CDFNT DLL-PWE-GLD LN AND WRMFNT DLL-ECK LN. ...DARRAH...

ND SCT100. OCNL BKN080 TOP FL180. ISOLD -SHRA. OTLK...VFR. .

SD WRN 1/3...SCT060 SCT120 TOP FL180. TIL 06-08Z OCNL CIG BKN050. WDLY SCT -SHRA/-TSRA. TS TOPS FL400. OTLK...VFR.

CNTRL 1/3...SCT080. OCNL BKN060. WDLY SCT -SHRA ISOLD -TSRA. TS TOPS FL400. OTLK...VFR.

ERN 1/3...SCT100. BY 05-07Z OCNL BKN080 TOP 160. OTLK...VFR SHRA. .

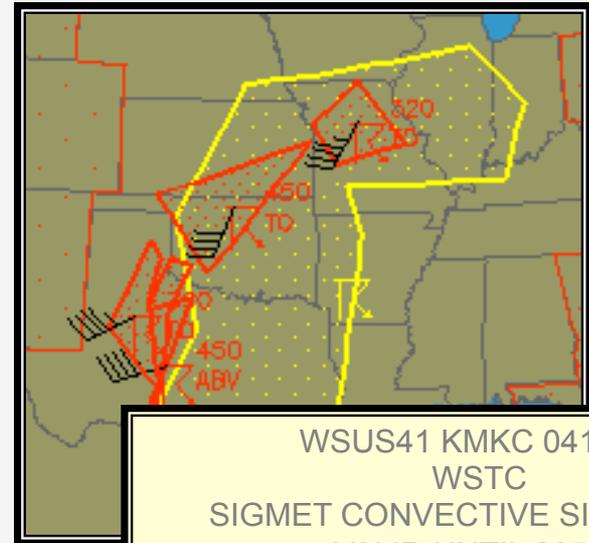
NE PNHNDL...AGL SCT050. TIL 04-06Z ISOLD -SHRA/-TSRA. TS TOPS FL400. OTLK...VFR.

CNTRL AND E...AGL SCT040 BKN080 TOPS LYRD FL180. OCNL CIG OVC030. WDLY SCT -SHRA/-TSRA. TS TOPS FL450. TS POSS SEV.

CNTRL BY 06-08Z SCT030 OCNL CIG BKN020. CONDS SPRDG ACRS RMNDR BY 11-13Z. OTLK...VFR. .

Convective SIGMET

- 5 GS-12 Forecasters
- SIGMET for thunderstorms
 - “Warning” Product
 - Associated Hazards:
Turbulence, Icing, & Wind Shear
- CONUS and coastal waters
- Issued Hourly / Valid for 2 hrs
- ~ 30,000 issued annually

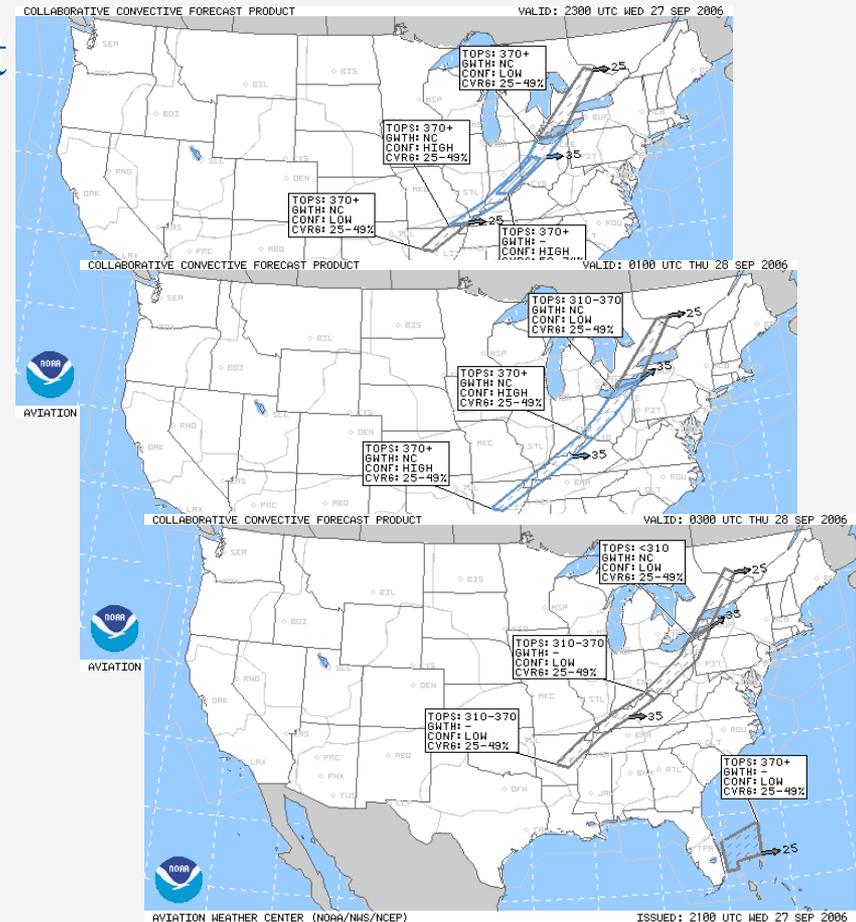


WSUS41 KMKC 041856
WSTC
SIGMET CONVECTIVE SIGMET 85C
VALID UNTIL 2055Z
TX OK
FROM 60SE GAG-50WSW SPS-60NE
JCT-50SSE DLF INTSF LINE SEV TS 40 NM
WIDE MOV FROM 25045KT. TOPS ABV
FL450. TORNADOES...HAIL TO 2 IN...WIND
GUSTS TO 80KT POSS.

OUTLOOK VALID 042055-050055
FROM ORD-FWA-LOU-SGF-LIT-LCH-
LRD-50E DLF-30W ADM-GAG-OVR-ORD
REF WW 22 23.
WST ISSUANCES EXPD.

Collaborative Convective Forecast Product (CCFP)

- 5 Forecasters
- Strategic traffic flow management
- Collaborators:
 - FAA
 - Meteorologists at CWSUs, Airlines, and AWC
 - MSC
- ~ 25,000 Forecast Polygons annually
- New Operational DS Desk (ATCSCC)
- Added new ECFP (Exended Convective Forecast Product – now operational)
 - <http://www.aviatonweather.gov/products/ecfp>



Extended Convective Forecast Product

(ECFP - <http://www.aviationweather.gov/products/ecfp/>)

aviationweather.gov/products/ecfp/

QICP Login Registration info

NOAA's National Weather Service
Aviation Weather Center

Home News Organization

Local forecast by "City, St" or Zip Code
City, St Go

Find us on Facebook
AWC on Facebook

Advisories
SIGMET/AIRMET »
Center Weather

Forecasts
Convection »
Turbulence
Icing
Winds/Temps »
Prog Charts »
TAF / FA »

Observations
PIREPs »
METARs »
Radar »
Satellite »

Java Tools »

Data Services
Text Data Server

Related Information
Home »
Flight Folder
Standard Briefing
Aviation Testbed
Aviation Links

Contact Us
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USA.gov

weather.gov

R20
Developed in AWT;
Operational 15 April 2012

AWC - Extended Convective Forecast Product (ECFP)

Day 1 – Wed 2 May 2012

Valid: 0000 UTC Wed 2 May 2012 – 0600 UTC Wed 2 May 2012

Day 2 – Thu 3 May 2012

Valid: 0000 UTC Thu 3 May 2012 – 0600 UTC Thu 3 May 2012

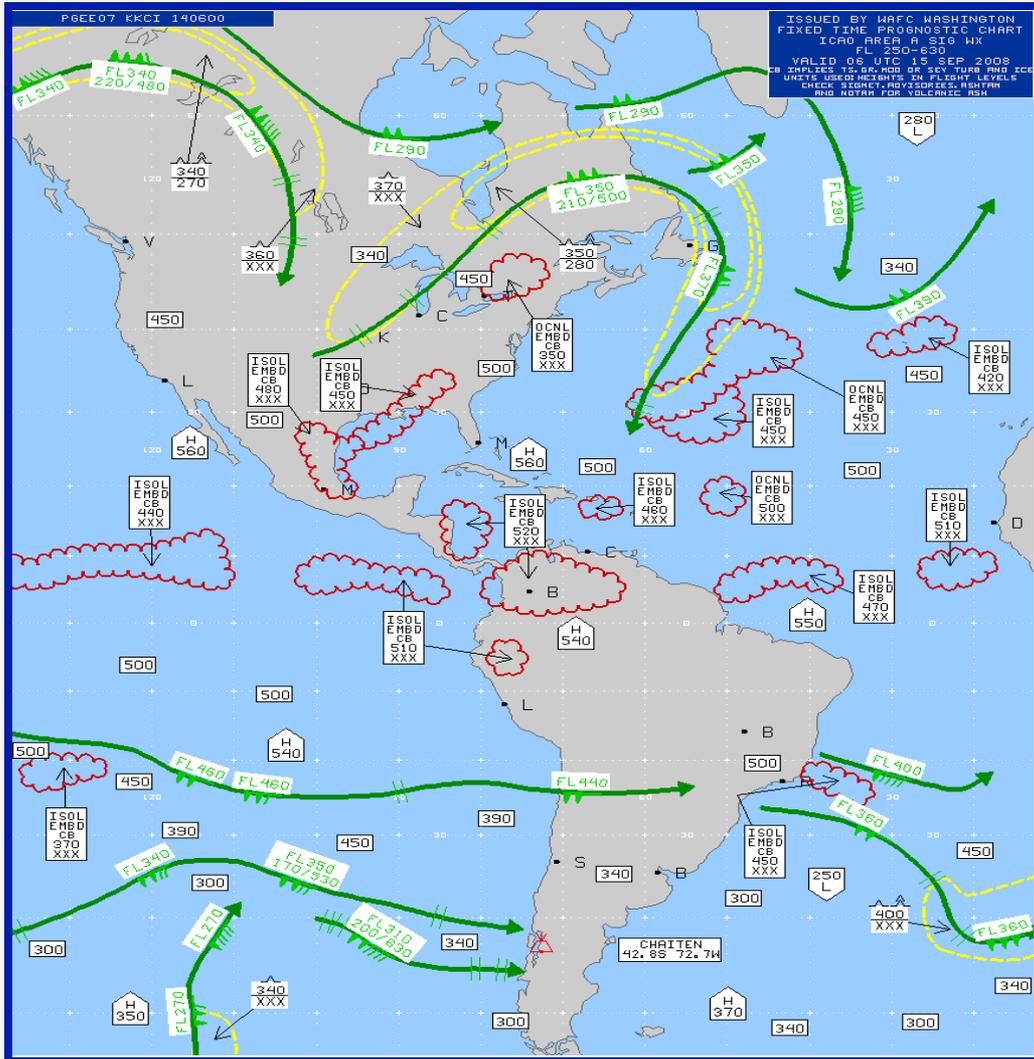
Day 3 – Fri 4 May 2012

Valid: 0000 UTC Fri 4 May 2012 – 0600 UTC Fri 4 May 2012

AWC_bldg_airplane_med.jpg

Show all downloads...

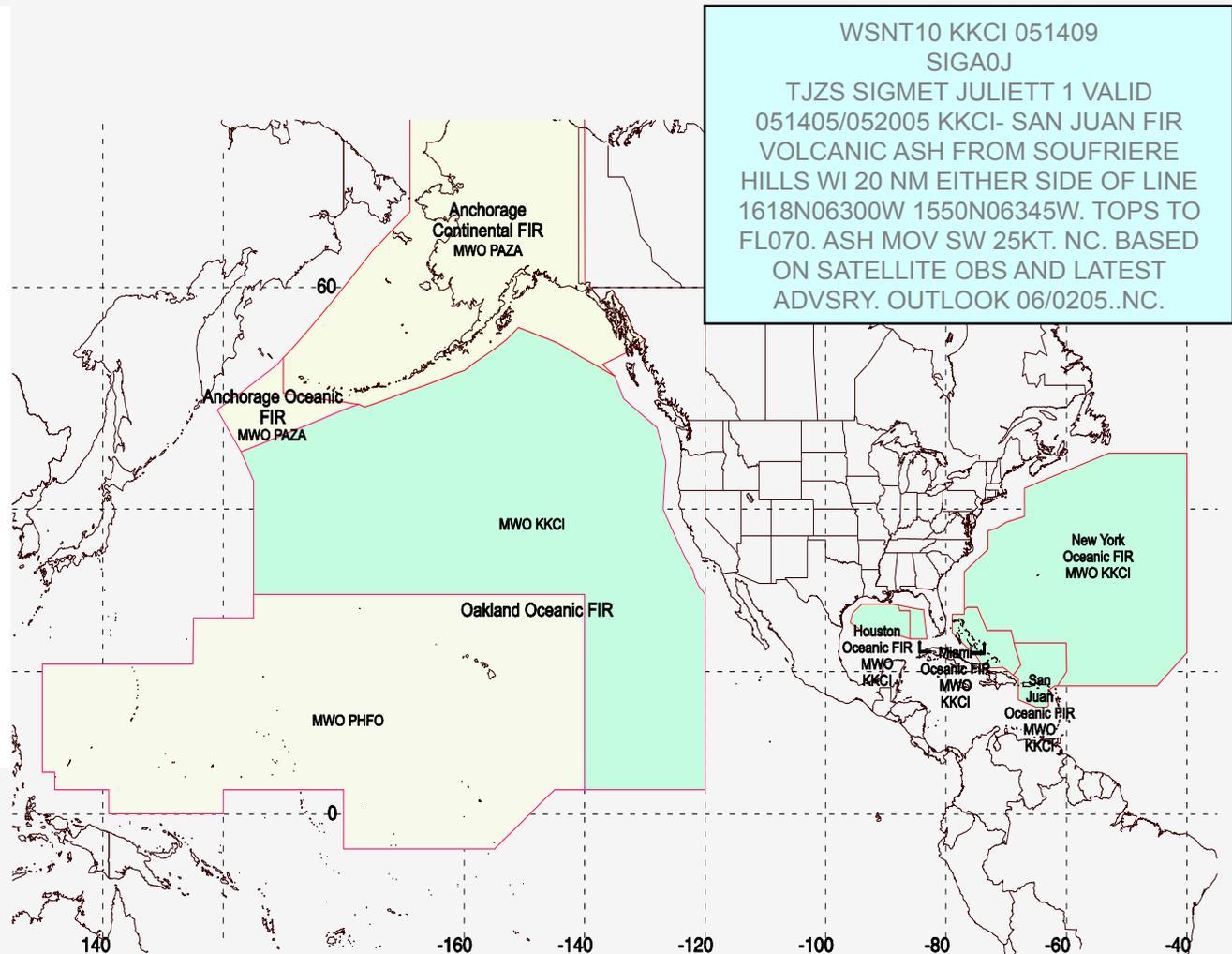
Significant Weather Forecasts



- 8 Forecasters
- Covers FL250 - FL630
- Worldwide forecast
24 hour forecasts
Jet Streams
Thunderstorms
Turbulence
Tropopause Heights
Active Volcanoes
Tropical Cyclones
- 18,980 routine issuances/yr *

Oceanic SIGMETs

- 5 GS-13 Forecasters
- Thunderstorms
- Tropical Cyclones (Hurricanes)
- Severe Icing & Turbulence
- Dust Storms & Sandstorms
- Volcanic Ash



Gulf of Mexico & Caribbean Area Forecasts



- Same five forecasters as Oceanic SIGMETs
- Weather Forecasts primarily for Helicopter Operations
 - Clouds
 - Visibility
 - Thunderstorms
 - Rain/Fog
 - Wind
- 4,000 Operating Oil Platforms
- 30,000 personnel living on oil platforms
- 600 Helicopters
- 1.3 Million flights annually

World Area Forecast Center

- **World Area Forecast System (WAFS)**
 - Formulated by ICAO and the WMO
 - Improve the quality and consistency of enroute guidance provided for international aircraft operations
- **World Area Forecast Centers (WAFC)**
 - **WAFC – Washington**
 - AWC provides Significant Weather Forecasts
 - NCEP Central Operations Provides Wind and Temperature Grids Charts
 - NWS Telecommunications Gateway supports satellite data broadcasts
 - **WAFC – London**
 - Met Office – Exeter

Aviation Digital Data Service

➔ ADDS makes available to the aviation community text, digital and graphical forecasts, analyses, and observations of aviation-related weather variables.

➔ ADDS joint developed

➔ NCAR, GSD, and AWC

➔ Operational 2003

➔ Now averaging

➔ 10 million hits per day

➔ 100 GB per day

➔ Not just a display capability

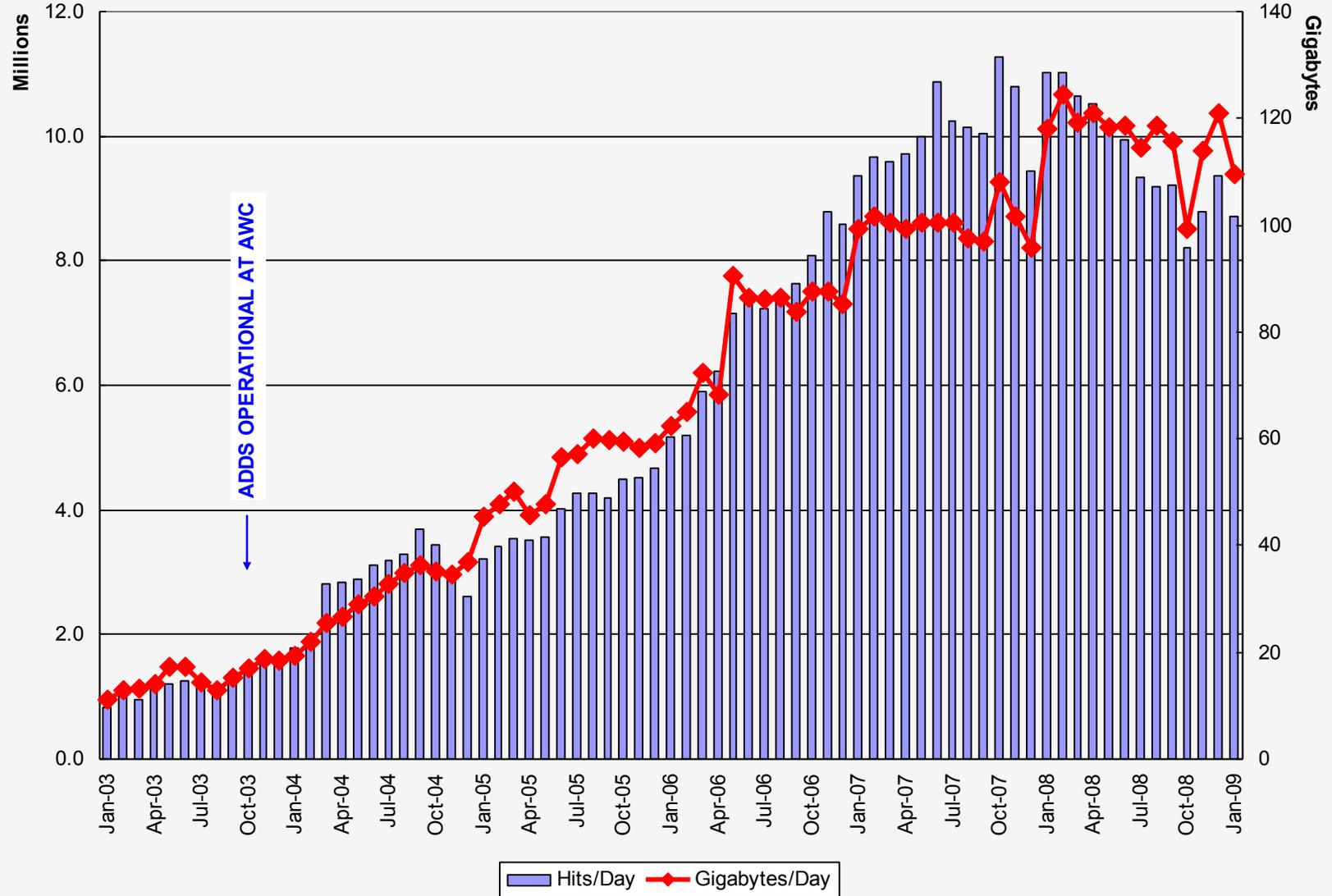
➔ Already has many NEXTGEN data service capabilities

➔ Data service easily capable of supporting JMBL

➔ Has existing capability to support 4D data cube

➔ slices, dices, and returns a subset of data (flight paths or subset cubes)

Extremely Popular

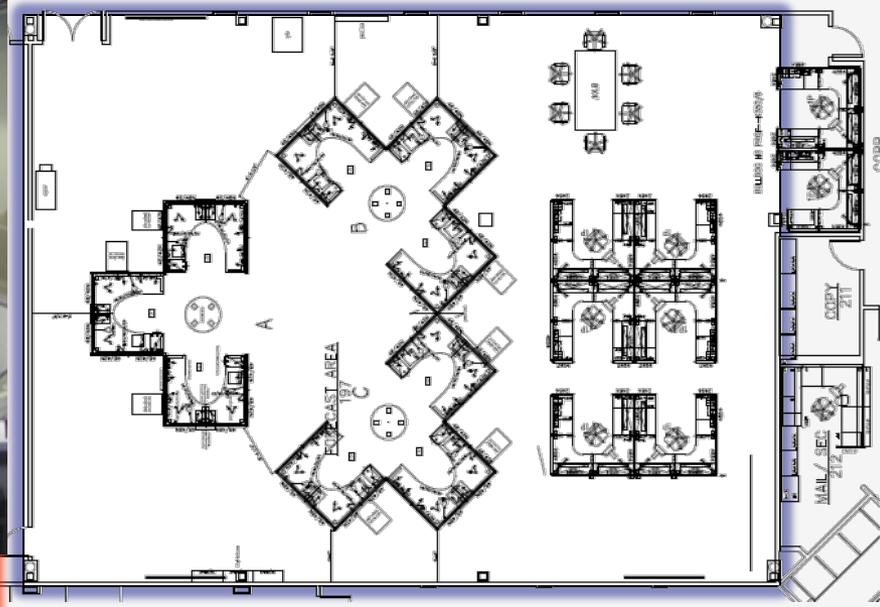
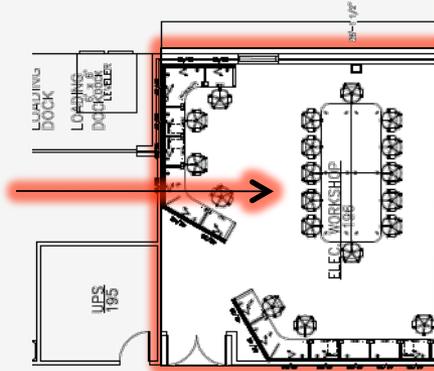


Aviation Weather Testbed

The Aviation Weather Testbed (AWT) accelerates science & technology innovations into operations for safe and efficient flight, and is a key player in Developing aviation weather services for NextGen.

New AWT Facility (Completed 2010)

1100 sq ft
Aviation Weather
Testbed Facility



Operations

Testbed History

- **The Aviation Weather Testbed (AWT) primary focus for the past decade has been Research-to-Operations (R→O) for the FAA Aviation Weather Research Program (AWRP)**
 - Transitioned AWRP Research to AWC operations
 - Previously known as the FAA Testbed
- **Beginning in 2010 (following the 2009 UCAR Review), the Testbed has been evolving to engage directly in the science-infusion process for aviation operations**
 - Aviation desk at the 2010 HWT Spring Experiment
 - Hosted the 2011 Traffic Impact Summer Experiment
 - SREF-based dashboard high-impact winter weather support for CDM-WET
 - Hosting the 2012 Summer Experiment

FAA AWRP R→O

→ Four Algorithms developed by NCAR/RAL and fully transitioned to the AWC queued in the approval process

1. Graphical Turbulence Guidance - 2

- Significant upgrade to existing algorithm
- More accurate and extends down to 10,000 ft

2. Forecast Icing Severity

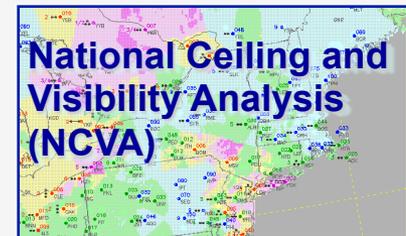
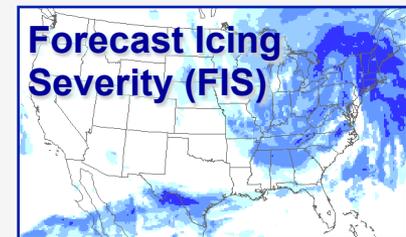
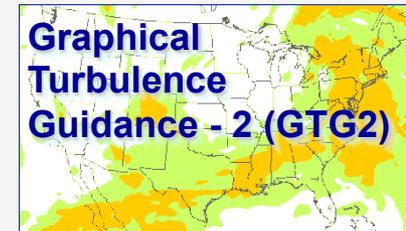
- Significant upgrade to existing algorithm
- Change from Potential to Severity

3. National Ceiling & Visibility Analysis

- New diagnostic algorithm
- Concerns over performance

4. National Convective Weather Forecast - 2

- Significant upgrade to existing algorithm
- Introduces convective probabilities



R→O Success Criteria

Research must meet all these criteria to be transitioned into NWS Operations

Demonstrated Benefits

Improvement in operational forecast and/or analysis quality or decision support

Efficiency

Adherence to time constraints and ease of use needs

Sustainability

Availability of resources to operate, upgrade, and/or provide support

Compatibility

IT compatibility with operational hardware, software, data, communications, etc.

Strategies for Energizing the AWT

- 1. Expand R2O successes: deliver to operations!**
- 2. Strengthen relationships with FAA Aviation Weather Group (Engage in NextGen)**
- 3. Establish new partnerships to ensure broad aviation weather community involvement (e.g., CIRA)**
- 4. Involve NWS operational meteorologists during evaluations of emerging science and technology**
- 5. Involve industry and TFM experts for impact DSS development and testing**
- 6. Expand R2O experimental activities in the AWT (e.g., turbulence, icing, etc.)**
- 7. Complete the AWT Charter!!!**

2011 Aviation Weather Testbed Summer Experiment

~40 Participants from
15 organizations

Three seminars

Eight data sets evaluated

Daily forecasts produced
by each team

18Z-00Z Aviation
Weather Impact Graphic
Day 2-7 Impact Forecast
using NAEFS

Five evaluation forms
completed by each team,
addressed scientific and
operational questions

- June 27 – July 22, 2011
- Visitors: July 11 – July 22



2011 AWT Summer Experiment: Participants

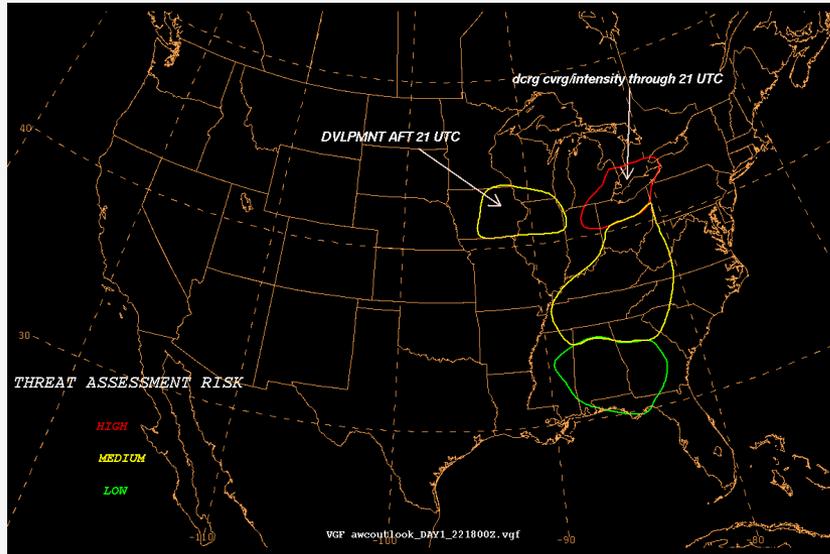


2011 Aviation Weather Testbed Summer Experiment

Data Set	Source	Status	Comments
12-member 4km WRF-ARW Ensemble	DoD/AFWA	Active	18Z start, 36-hour forecast, data starts at 00Z
Derived Traffic Impact Potential	NCAR	Active	Derived from AFWA Ensemble
3km HRRR	GSD	Active	Hourly
Short-Range Ensemble	EMC	Active	Every six hours
Convective NearCast - Satellite	GOES-R/CIMSS	Active	Fifteen minute updates
Convective Initiation - Satellite	GOES-R/CIMSS	Active	Fifteen minute updates
Convective Probability	MDL	Active	NextGen Capability Evaluation
CoSPA	MIT/LL	Active	CCFP first-guess polygons
NAEFS	EMC	Active - AFWA	Every six hours

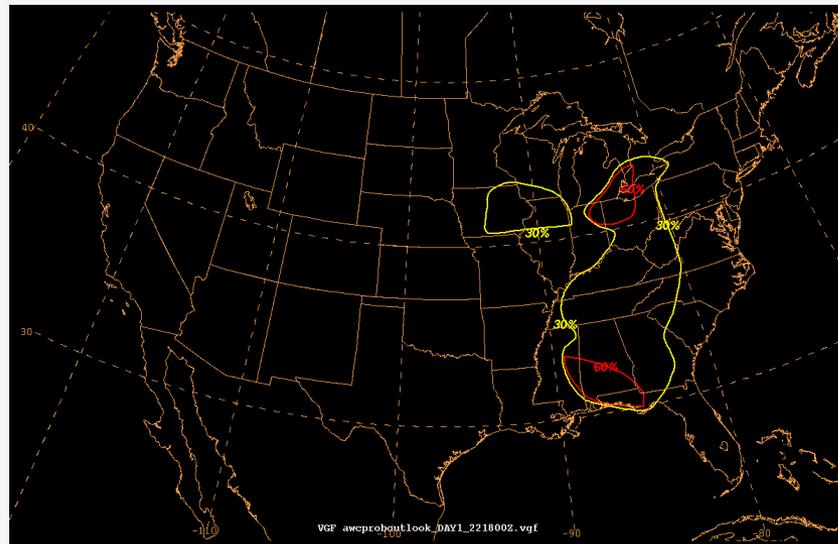
Example Forecasts: July 22nd, 2011

Estimated Weather Delays: ~1500



Aviation Weather Impact Graphic (18-00Z)

Format of graphic not
required – teams free to
create what is needed



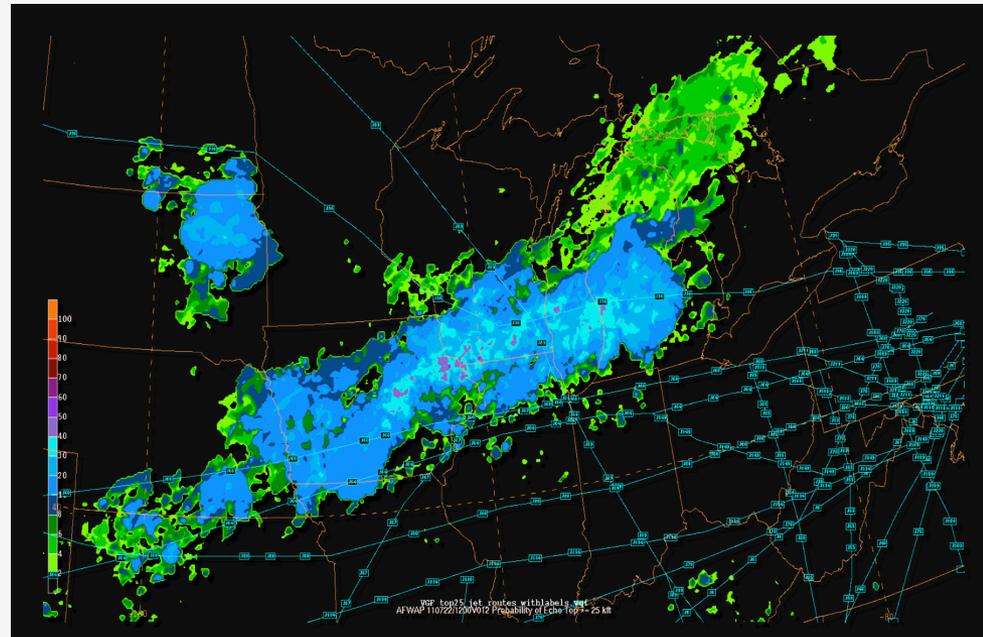
Exceedance Probability Graphic

Contours at 30% and 60%

Experiment Survey

Results: Data Evaluation

- Can high resolution models provide insight into forecasts for aviation weather traffic flow impact?
- Yes! However...
- Amount of data is overwhelming
- Day-to-day performance not clear
- Each model offered predictive skill, but not consistently in any one area

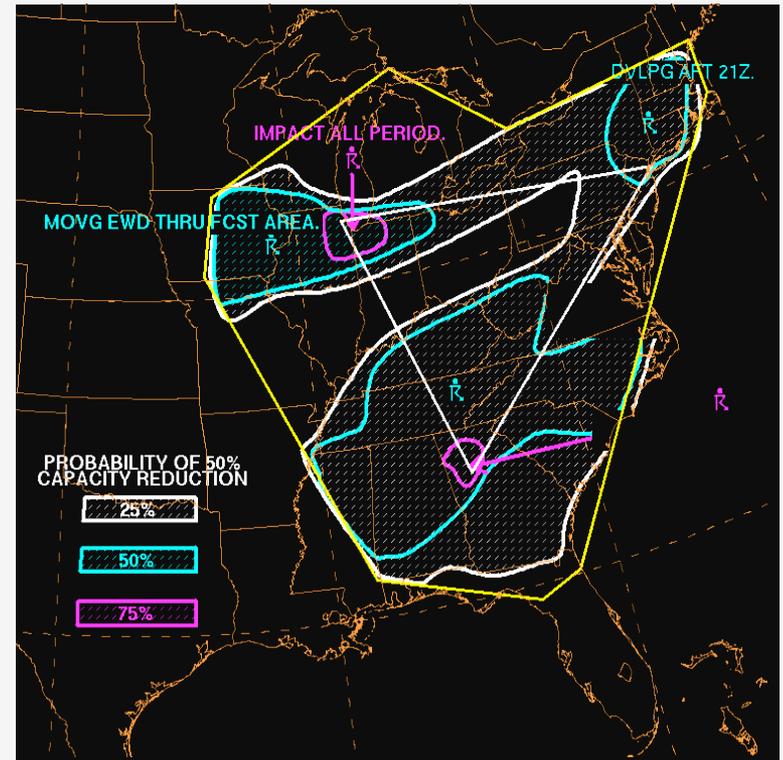


AFWA Probability of Echo Tops \geq 25 kft with Top 25 Jet Routes

Experiment Survey

Results: Forecast Evaluation

- How effective are the forecast graphics for communicating weather risk to a national air traffic manager?
- Less “meteorology” and more “impact” needed
- Keep the graphics very simple
- Difficult to translate weather information (boundaries, etc.) into expected impact



Experiment Results: Conclusions

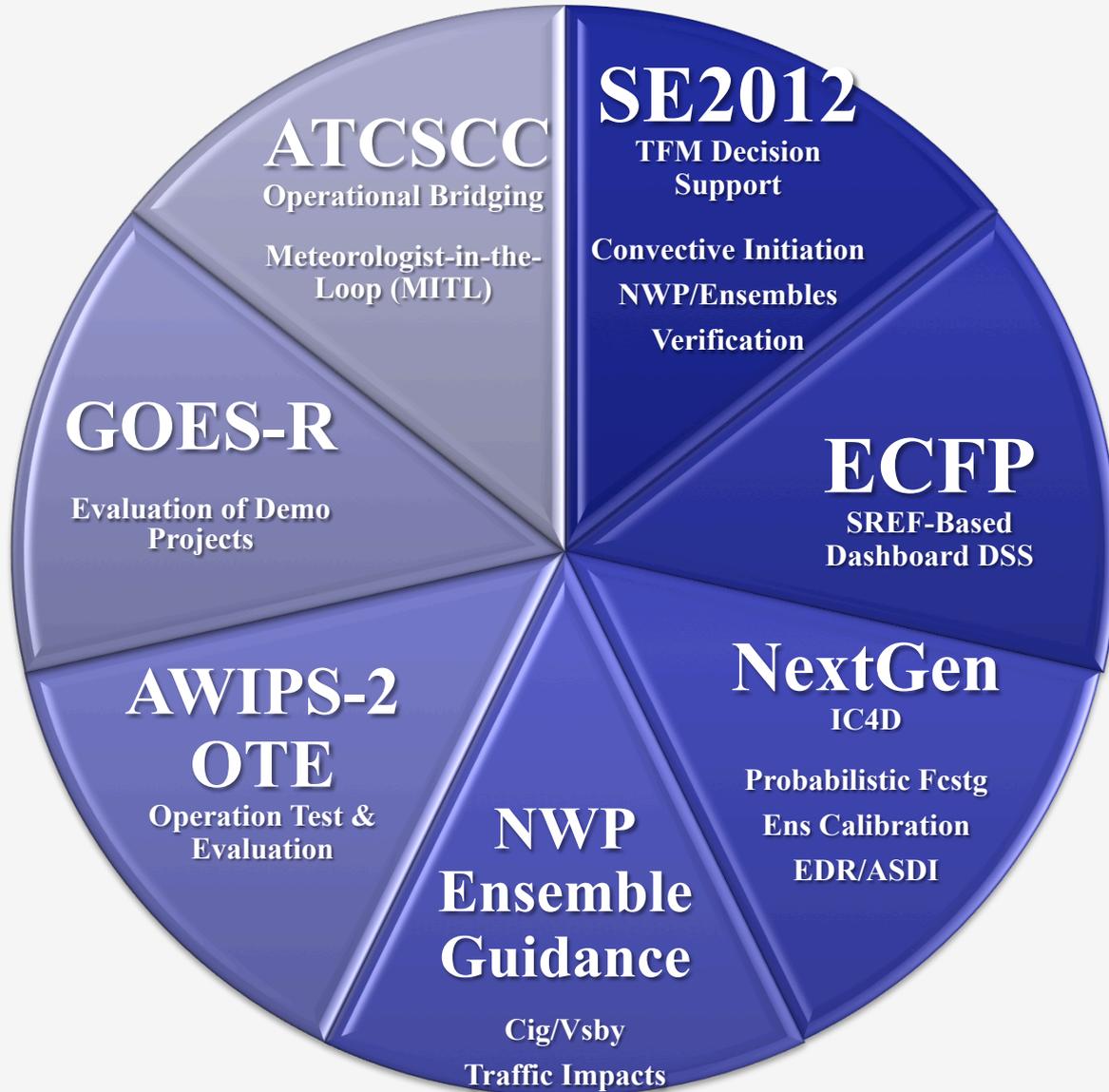
→ Experimental Forecasts:

- “Traffic light” green/yellow/red threat assessment was major theme
- Small time windows (~2 hours) per forecast better than six hour block
- Graphical outlook favored over graphics and text together

→ Experimental Data:

- Data mining tools for specific features a necessity, especially from ensemble models
- All data sets showed some forecast value
- Traffic impact information added value to forecast
- GOES-R Nearcast valuable for convective initiation, needs a enhanced display

Ongoing AWT Projects



ECFP

Extended Convective Forecast Product

Operational: 15 April 2012



Aviation Winter Weather Dashboard (Experimental)



[Product Description Document](#) [Product Survey](#)

Description:

The Aviation Winter Weather Dashboard is an experimental product hosted at the [Aviation Weather Testbed](#), located at the [NOAA Aviation Weather Center](#). The purpose of the dashboard is to provide a decision support tool to alert operational meteorologists and air traffic managers to potential winter weather impacts at major airports.

- [HPC Winter Weather Products](#)
- [National Heavy Snow Discussion](#)
- [HPC Probabilistic Winter Precipitation Guidance](#)
- [SPC Short-Range Ensemble Products](#)
- [SPC Short-Range Ensemble Phase Charts](#)
- [AWC Terminal Area Forecasts](#)

Legend: Impact type: S=Snow, F=Freezing Rain, V=Visibility. Mouseover colored box for airport group impact criteria.
 Green = Nominal impact Yellow = Slight impact Orange = Moderate impact Red = High impact

Last update: 2012-01-20-14:06 UTC Approximate next update time: 2012012020 UTC SREF model initialization date: 2012012009 UTC Next SREF update: 2012012015 UTC

	20/12	20/15	20/18	20/21	21/00	21/03	21/06	21/09	21/12	21/15	21/18	21/21	22/00	22/03	22/06	22/09	22/12	22/15	22/18	22/21	23/00	23/03	23/06	23/09	23/12	23/15	23/18	23/21	24/00	
DEN																														
SLC	S	S	S	S			S	S	S	S	S	S	S	S	S	S	S					S		S	S	S	S	S	S	
MSP	S	S	S	S														S	S											
BOS										S	S	S	S																	
DTW					SV	SV	S																				S	S	S	S
MDW			SV	S	SV	S		S	S	S																	S	S		
ORD			SV	SV	SV	S	S	S	S	S													S				S	S	S	
EWR							S	S	S	S																				
LGA								S	S	S	S																			
JFK								S	S	S	S																			
IAD							S																							
BWI							S	S	F																					
PHL								S	SF	S																				
DCA							S																							
SEA									S	S	S	S	S	S	S	S	S	S	S	S	S			S	S	S	S	S	S	
CLT																														
MEM																														
DFW																														
ATL																														
LAS																														
IAH																														
MIA																														
FLL																														
LAX																														

AWT Summer Experiment 2012 Planning

- **Dates: June 4th – June 15th 2012**
- **Focus: Evaluate new and emerging data sets and issue an experimental “Aviation Weather Statement”**
- **Purpose: Industry reps and FAA operators interact directly with AWC forecasters and external researchers to create new forecast product**
- **Key questions: How to handle uncertainty in models? Is the proposed AWS format adequate for NAS planning?**

2012 AWT Summer Experiment

→ June 4th – June 15th, 2012

→ Four desks: Two focused on traffic flow management DSS; one on GOES-R proxy products; one on high-res models and ensemble evaluation

→ Links to NextGEN Capability Evaluation

2012 AWT Summer Experiment and the Remainder of the Year

- **Storm Scale Ensemble of Opportunity (SSEO)**
 - Ceiling and visibility guidance at high-resolution; Turbulence
- **AFWA Ensemble (now operational)**
- **Data:**
 - Eddy Dissipation Rate (EDR)
 - Aircraft Situation Display to Industry (ASDI)
- **Impact-based verification (real-time)**
 - Partnering with NOAA/GSD & DTC
- **Global data sets**
 - NAEFS & GEFS; Global Graphic Turbulence Guidance (GTG, NCAR)
- **Training**
 - Bring the operational forecaster along

<http://testbed.aviationweather.gov>

David.Bright@noaa.gov

**Aviation Weather Center
Aviation Weather Testbed**

