# NextGen Weather Processor (NWP)

Presented to: REDAC NAS Ops Subcommittee

Presented by: AJM-33

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# Outline

- Background on NextGen Weather
  - Program status
  - Consolidation of FAA weather functionality
  - Improvements with NextGen weather

### NextGen Weather Processor

- System architecture
- Process for change
- Research priorities
- Alignment with ANG Weather

### • Suggestions for "R to O" Efficiency



## Weather in Air Traffic Operations

AIR SURVEILLANCE RADAR -

WEATHER SYSTEMS

PROCESSOR (ASR-WSP)

STANDARD TERMINAL

AUTOMATION REPLACEMENT

SYSTEM (STARS)

LND RY:4

INTEGRATED DISPLAY

SYSTEM (IDS)

DEP RY

#### Wx Sensors









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#### **NAS User Systems**



WARP BRIEFING TERMINAL (WARP BT)



FLIGHT SERVICES

**USER DISPLAY SYSTEM** 

(ATOP, DOTS+)



EN ROUTE AUTOMATION MODERNIZATION (ERAM)



TRAFFIC FLOW MANAGEMENT SYSTEM (TFMS)



FLIGHT INFORMATION SYSTEM – BROADCAST (FIS-B)

#### Wx Systems



WEATHER AND RADAR PROCESSOR (WARP)



CORRIDOR INTEGRATED WEATHER SYSTEM (CIWS)



INTEGRATED TERMINAL WEATHER SYSTEM (ITWS)



## **NextGen Weather Architecture**





## **NextGen Weather Systems Roadmap**



**NWP Work Package 3** 

**NextGen Weather Processor** 



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# **Improved NWP Coverage**

Large domain expansion





## **Improved Weather Displays**

#### **Workstations**



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**Phones** 

## **Improvements with NextGen Weather**

#### http://www.faa.gov/nextgen/programs/weather/

Federal Av Administra	FAA Home Jobs tion <sup>•</sup> Traffic Data & Research Licenses & Certif	News Search ficates Re	About FAA	A-Z Index Policies Ti	FAA for You Search raining & Testing
NextGen Weather 🛶	FAA Home ► NextGen ► NextGen Programs ► NextGen W	/eather			
NextGen Weather Processor	Print < Share				
Common Support Services - Weather	NextGen weather				
NextGen Weather Architecture	The NextGen Weather Program is a critical part of		1900		
Strategic Traffic Flow Management Support	NextGen as it helps reduce the impact of weather on aviation, resulting in safer, more efficient and predictable dav-to-dav National Airspace System				
FAQ: Weather Delay	(NAS) operations.		-		
Aviation Weather Research Program	NextGen Weather harnesses massive computing power, unprecedented advances in numerical weather forecasting, translation of weather information into airspace constraints, and modernized information management services. With this powerful combination, NextGen Weather can provide tailored aviation weather products within the NAS, helping controllers and operators develop reliable flight plans, make better decisions, and improve on-time performance.	Storm clouds	over LaGuardia a	airport in New Yor	tk. The New York area
	The flying public will experience less weather delay, including fewer departure and arrival delays, reduced number of flight cancellations and refueling stops, and c	has some of i © Richard Fe overall increas	the highest weath rris ed dependabilit	ner-related air traf y in flight sched	fic delays in the US. ules.

NextGen Weather is accomplished through collaboration between FAA, NOAA, and NASA.



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## **NextGen Weather Processor Architecture**



- Modular product generation architecture
  - Individual algorithms plug into PG Bus
  - Easy to replace, add, share algorithms

#### **Raytheon U-frame** platform also used for AWIPS-II

NOAA National Weather Service display system

Opportunity to efficiently collaborate with NOAA, NASA





## **NWP Product Generation Bus**





## NextGen Weather Processor Process for Change



Developers will have access to: Relevant NWP source code Programming interface description, tools Testbed where solution can be developed Complete test environment Set of test cases



# **NextGen Weather Research Priorities**

#### • Short-term needs (NWP Work Package 1)

- Winter 2-8 hr calibration
- Forecast Confidence
- NASA shared priority:
  - Recalibration of Convective Weather Avoidance Model

### • Mid-term needs (NWP Work Package 2)

- Offshore Precipitation Capability
- Terminal Winds in support of TBFM, AAR
  - Rapid update, 0-2 hr predictions
- Icing (dual pol + model)
- 2-8 hr Convective Weather Avoidance Polygons
- Improved 3-4 hr predictions (Blending improvements)

### Long-term needs (future work package)

Further development capitalizing on & aligning with NWP



# **Existing Alignment with ANG Weather**

NextGen Weather Gaps	Existing ANG Weather Research			
Users require Forecast Confidence	0-8 hr Forecast Confidence			
CONUS+ radar coverage gaps	Offshore Precipitation Capability			
Reduced 3-4 hr forecast accuracy	*Blending enhancements			
Winter 2-8hr calibration needed	Under consideration			

Excellent coordination with ANG Weather Convection lead

\* Need to ensure Blending enhancements are suitable for use in NextGen Weather Processor



# Further Alignment Using NWP Test Reference System

NextGen Weather Products	<b>Existing ANG Weather Research</b>		
0-8 hr snow/mix/rain prediction	Terminal Area Icing		
0-2 hr snow/mix/rain in Alaska	Alaska Icing Forecast		
0-8 hr precip, echo tops	Derive SIGMETS from grids		
CONUS+ coverage to Puerto Rico	Implement international radars		
HRRR used, but only covers CONUS	0-24 hr HRRR ensembles		
Icing tops/bottoms (NEXRAD dual-pol)	3-D radar icing algorithm		
Radar data quality (NEXRAD dual-pol)	Dual-pol false radar returns		
Terminal Winds (top 34 TRACONs)	TRACON wind compression		
Growth Trends (25 sec update rate)	Tactical (Convective) Turbulence		
Any NextGen Weather products	WTIC [FIS-B, ARINC]		

NWP test data now being generated via the NWP Test Reference System



# Suggestions for "R to O" Efficiency

- Formalize AJM coordination to address functionality gaps
  - AJV, ANG, NOAA, NASA, REDAC
- Use scientific peer review instead of independent verification
- Develop common NextGen Weather Processor (NWP) test platform based on test reference system and later NWP operational system
  - Multi-agency collaboration: FAA, NOAA, NASA, DOD
  - Secure: accessed only by sponsored developers
  - Common API: algorithms are "plug and play"
  - Incorporate as part of existing plan for managing NextGen Weather Processor evolution







# **NextGen Weather Systems**



**NextGen Weather Processor** 

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