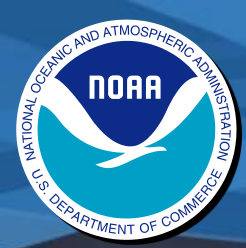


Weather in the NextGen Era- Progress and Challenges Ahead

Mark Miller

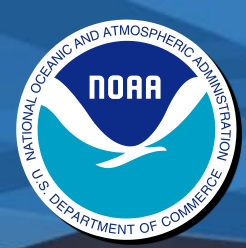
NOAA NextGen Weather Program Manager

July 21, 2010



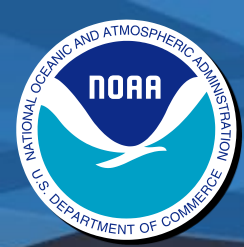
Overview

- **Progress toward an initial operating capability and beyond!**
 - ▣ *Current Status*
 - ▣ *FY10 Capability Evaluation*
 - ▣ *Aligning with NWS Future Service Plans*
 - ▣ *Forecast Process*
 - ▣ *Numerical Model Enhancements*
 - ▣ *RTO*
- **Challenges Ahead**
 - ▣ *The Transition from “NowGen” to NextGen*
 - ▣ *Product Consistency*
 - ▣ *Probabilistic Information*



Current Status

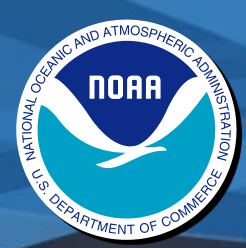
- **Executing first formal year of program**
- **Preparing hardware and communications for FAA-sponsored Capability Evaluation in Sep 2010**
- **Moving towards acquisition in FY11 for a Lead Systems Integrator**
- **Evaluating advanced forecast systems and techniques**



Collaborations

4-D Weather Data Cube

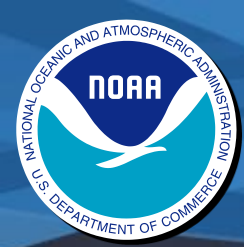
- The FAA and NOAA are jointly developing the 4-D Weather Data Cube (Cube)
- The FAA and NOAA collaborate with many different organizations to show interagency cooperation and demonstrate Cube capability
 - National Weather Service (NWS)
 - NOAA Global Systems Division (GSD)
 - National Center for Atmospheric Research (NCAR)
 - Massachusetts Institute of Technology, Lincoln Labs (MIT/LL)
 - Open Geospatial Consortium (OGC)
 - European Organization for the Safety of Air Navigation (EUROCONTROL)
 - Department of Defense (DoD)



Collaborations

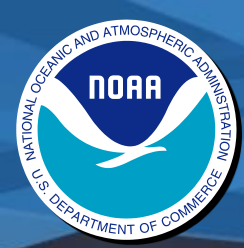
NOAA Aviation Weather Testbed

- **Location:** Aviation Weather Center, Kansas City, MO
- **Purpose:** Test, evaluate, and refine new and emerging weather forecast technologies for eventual inclusion into the National Airspace System
- **FY10 Projects:**
 - *2010 Spring Experiment at the Hazardous Weather Testbed (Convection)*
 - *Volcanic Ash model review and evaluation*
 - *CoSPA and LAMP evaluation (2010 Spring Experiment)*
 - *Interactive Calibration in 4 Dimensions (IC4D) test and refinement*
 - *NextGen Capability Evaluation (September, FAA Tech Center)*
- **Future Projects:**
 - *AWIPS-II OT&E*
 - *Next Generation Turbulence (GTG-N)*



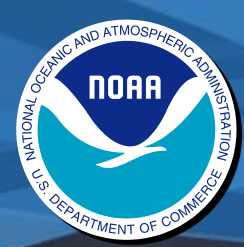
FY10 Capability Evaluation: Objectives

- **Since FY07, annual IT demo conducted to test capabilities and exemplify progress towards Cube development**
- **Objectives of the FY10 Capability Evaluation:**
 - ***Primary: Simulate operational Cube functionality as closely as possible to show how the Cube will operate at Initial Operating Capability (IOC), including all applicable Cube standards and any available hardware and software infrastructure.***
 - ***Secondary: Test performance and security of data dissemination utilizing Cube standards.***



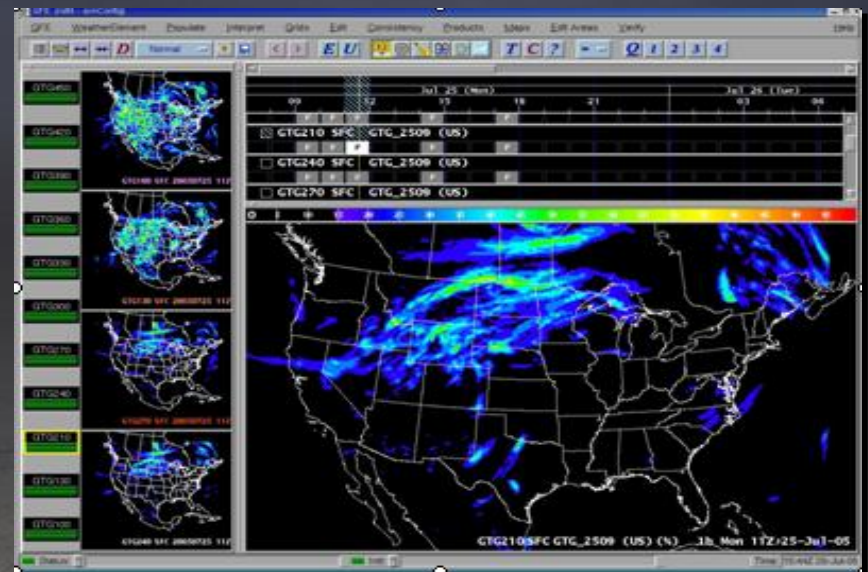
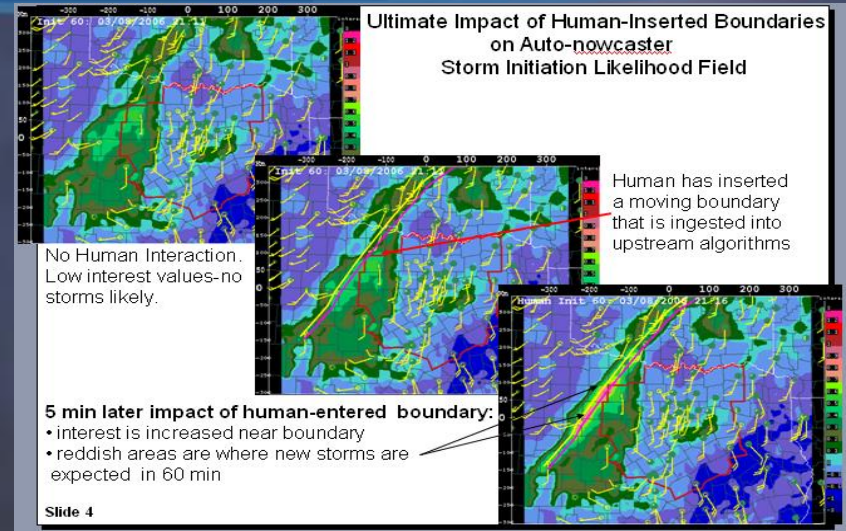
Aligning with NWS Future Service Plans

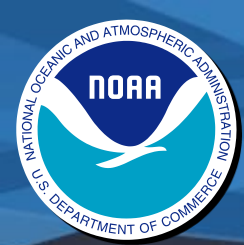
- **NOAA NextGen Weather Program aligning with NWS “Services 2020 – Transformation for the Future”**
- **Services 2020 goals aligned with NextGen, including:**
 - ***Digital information is essential to our future!***
 - Less emphasis on grid editing
 - More user focus
 - Better 4D situational awareness
 - ***Meteorological consistency***
 - Spatial in 3D
 - Temporal
 - ***User consistency***
 - Getting the same weather information from both our public and aviation forecasts
 - Getting the same answer no matter how you access the data



Forecast Process

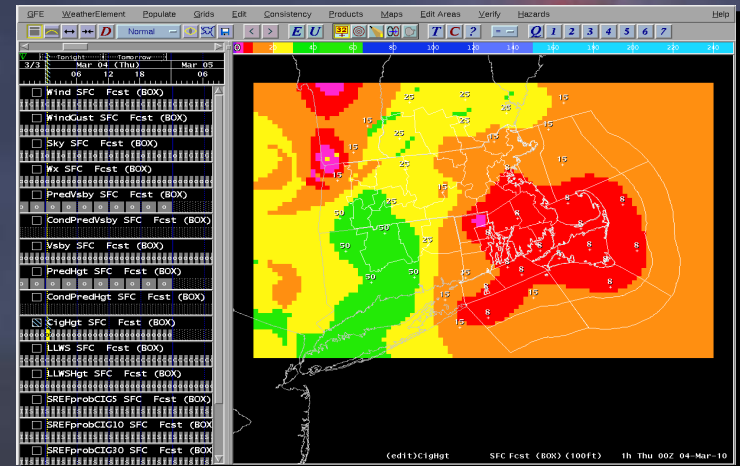
- In the era of high resolution, rapidly updating models, forecaster responsibilities will change
- Some current initiatives:
 - *Autonowcaster – convective initiation*
 - *Interactive Calibration of Aviation Grids in 4 Dimensions or (IC4D) – nudging model output*
- Real progress in the last couple years is the realization that change is no longer a goal, but a necessity!





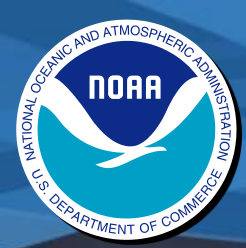
Forecast Process

- NWS Regional Initiative to provide gridded ceiling and visibility
- Several forecast offices in the NWS Eastern Region producing TAFs completely consistent with all NDFD short term grids
- Expanding to other WFOs in the Eastern and Central Region
- Produces important forecast guidance for GA community where no TAF exists today



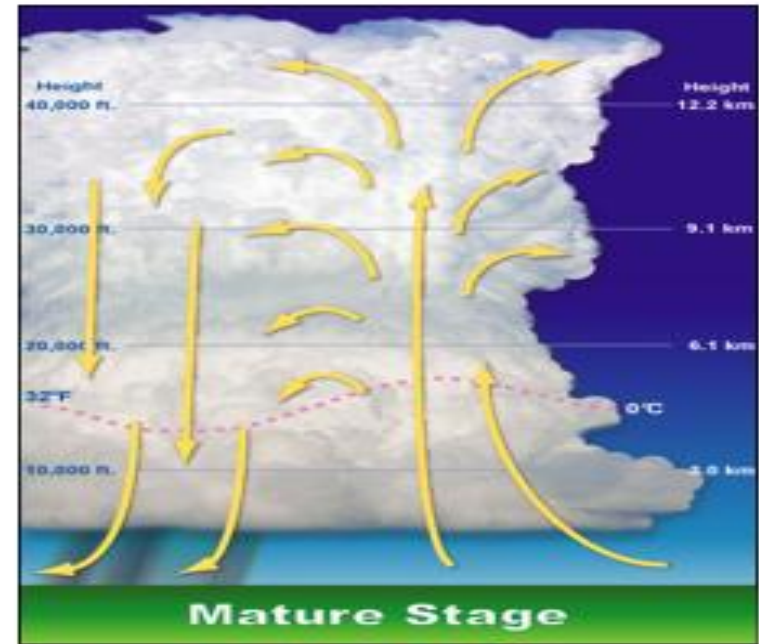
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Products Data Source Processor Issued By Help
TAF
File Edit Options CallToActions
FTW541 KBOS 031952Z AAN
TAF AMD
NEDS 031952Z 0320/0424 03019G31KT 3SM -SN OVC025
FM032100 03019G31KT 6SM -SN OVC008
FM040000 02018KT 3SM -SN OVC008
FM040300 02018KT 2SM -SN OVC015
FM040600 02018KT 2SM -SN OVC015
FM041200 01019G27KT P6SM VCSH OVC050
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```

Station	TAF	MTR	Current Observation 2-h Persistence
KBOS	TAF 17:21	MTR 17:54	tpo cat wnd wx cat wnd wx
KPVD	TAF 17:21	MTR 17:51	tpo cat wnd wx cat wnd wx
KBOS	TAF 17:21	MTR 17:51	tpo cat wnd wx cat wnd wx
KBOS	TAF 17:21	MTR 17:53	tpo cat wnd wx cat wnd wx
KORH	TAF 17:21	MTR 17:54	tpo cat wnd wx cat wnd wx
KMBT	TAF 17:21	MTR 17:53	tpo cat wnd wx cat wnd wx
KFMB	TAF 17:21	MTR 18:15	tpo cat wnd wx cat wnd wx
KHYA	TAF 17:21	MTR 17:56	tpo cat wnd wx cat wnd wx
KACK	TAF 17:21	MTR 17:53	tpo cat wnd wx cat wnd wx



Numerical Model Enhancements

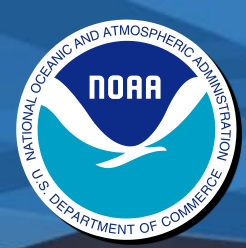
- NextGen requires much improved accuracy in thunderstorm forecasting for 2-12+h forecasts
- NOAA producing High Resolution Rapid Refresh (HRRR) with 3km storm scale resolution
- Transition from Rapid Refresh (RUC) to “operational” HRRR several years away
- CoSPA depends on HRRR



Scale = 15 km

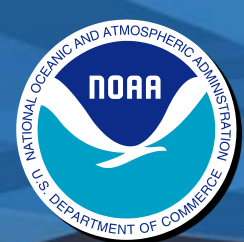
13-km gridpoint spacing

3-km gridpoint spacing



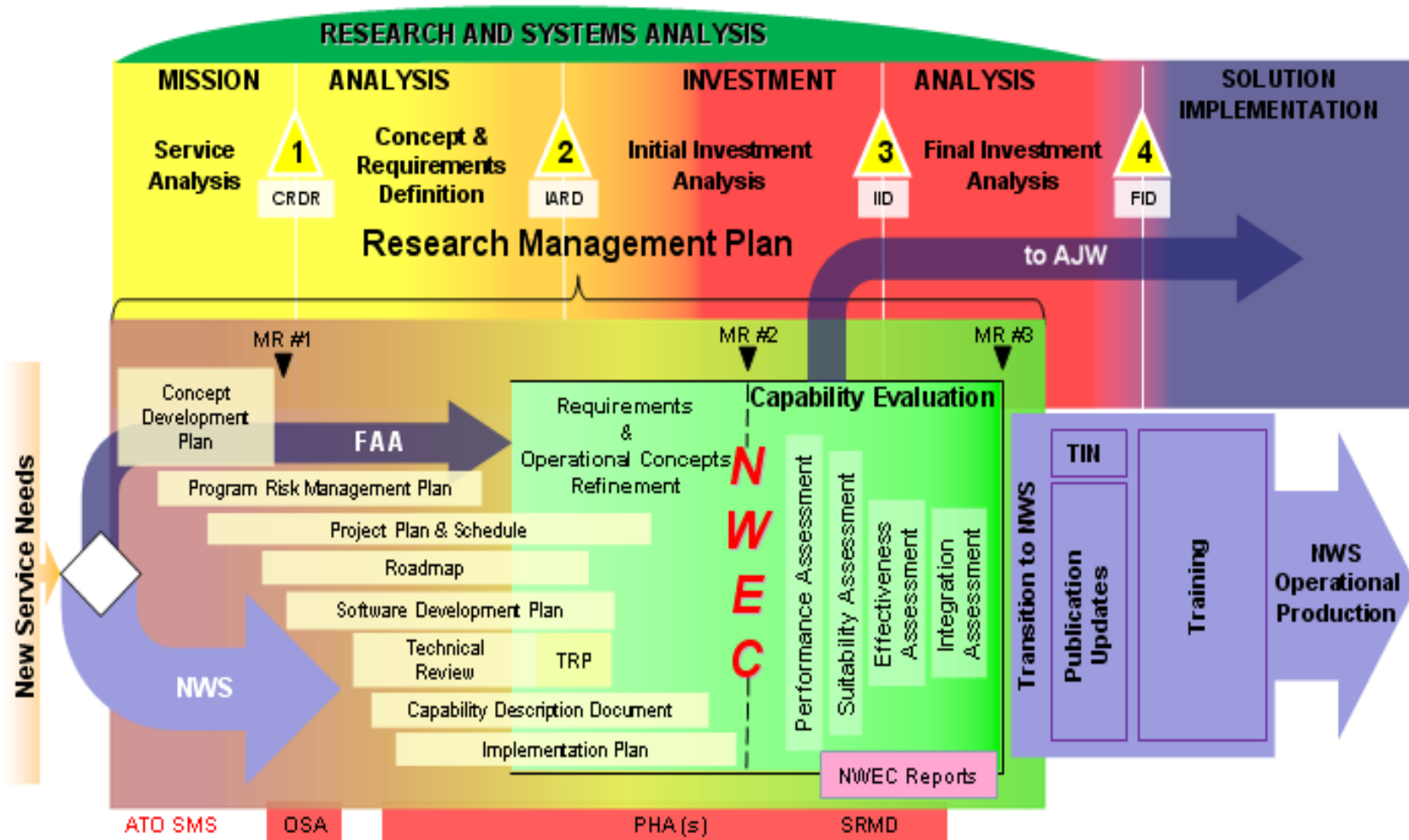
Transitioning Research to Operations

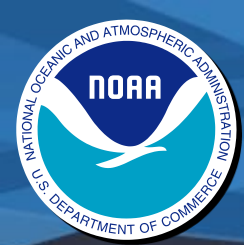
- **RTO is a refinement of a prior transition process (AWTT) which is designed to:**
 - ***Move mature weather capabilities into operational production more effectively and efficiently***
 - ***Meet the intent of a Vicki Cox - Jack Hayes agreement to develop a "joint" FAA-NWS research transition process***
 - ***Respond to a DOT IG recommendation to expand NASA's research transition team concept to NextGen weather program initiatives***



RTO Process Diagram

The RTO Process Diagram



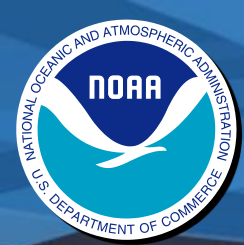


Challenges: From “NowGen” to NextGen

- Do we have to change the FARs and other regulations to meet NextGen requirements?
- Today’s forecast operations cannot meet these requirements!

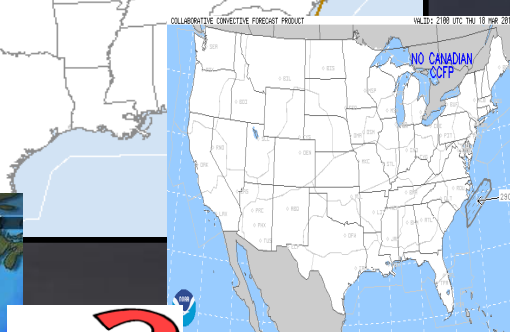
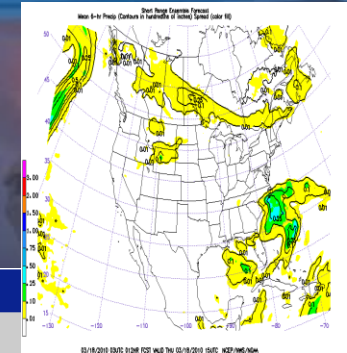
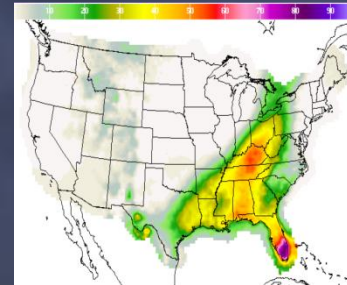
	<u>Terminal</u>		<u>Non-Terminal (TBO)</u>				<u>Global</u>	
	Refresh Rate	Latency	Convective		Other Wx		Refresh	Latency
			Refresh	Latency	Refresh	Latency		
0-2 hrs	15 min	5 min	7.5 min	7.5 min	30 min	30 min	Every 3 hrs	60 min
2-4 hrs	20 min	7.5 min	30 min	30 min	30 min	30 min	Every 3 hrs	60 min
4-10 hrs	30 min	30 min	60 min	30 min	60 min	30 min	Every 3 hrs	60 min
10-24 hrs	Every 3 hrs	30 min	Every 3 hrs	60 min	Every 3 hrs	60 min	Every 3 hrs	120 min
24-26 hrs	Every 6 hrs	60 min	Every 6 hrs	90 min	Every 6 hrs	90 min	Every 6 hrs	120 min
60hrs-14 days	Every 24 hrs	2 hrs after model run time	Every 24 hrs	2 hrs after model run time	Every 24 hrs	2 hrs after model run time	Every 24 hrs	2 hrs after model run time
Climatology	Monthly	One Day	Monthly	One Day	Monthly	One Day	Monthly	One Day

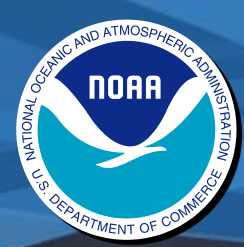
Approx of some of the FOC NextGen requirements



Challenges: Product Consistency

- A huge challenge for NOAA/NWS (and no doubt the Private Sector) as they serve many customer needs
- Weather consumers are barraged by weather data... the easy answer is to plan for the worst
- The “SAS” definition specifies ATM decision-makers only
- SAS R&D is slow to get started, but must progress





Challenges: Probabilistic Information

"I believe..."

From the JPDO Weather ConOps: "Uncertainty in meteorological phenomena that have significant impact on system capacity is managed through the use of probabilistic forecasts. These forecasts are in a quantitative format, covering location (three-dimensional space), timing, intensity, and the probability of ALL possible outcomes..."

30%

We must work toward common definitions of words that express uncertainty

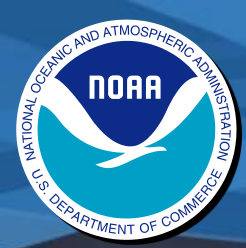
Aviation decisions are deterministic

"numerous"

"likely"

"There is a high Probability..."

"This model Indicates..."



Summary

- **NOAA is making steady progress moving towards NOAA's Cube IOC in 2013**
- **A majority of the resources have been allocated to building the Cube IT infrastructure and toward the Capability Evaluations**
- **Slower, but steady progress is also being made to populate the Cube and tackle the significant challenges associated with the forecast process and the SAS**