NextGEN

FAA Observing Needs Now and in the Future

Presented to the AMS Forum on Observing the Environment from the Ground Up
March 8, 2016

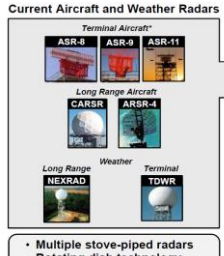
FAA

Overview

- **Highlighting FAA needs in several key areas:**
  - MPAR
  - Airborne Observations
  - NSOC
  - Numerical Modeling improvements
  - Quantification of Benefits for FAA operations

MPAR

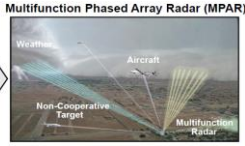
Current Aircraft and Weather Radars



- Multiple stove-piped radars
- Rotating dish technology
- Many nearing end-of-life

*Military equivalents of ASR-8, 9, 11 are GPN-20, 27, 30

Multifunction Phased Array Radar (MPAR)

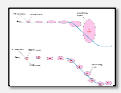


- Has potential to lower cost by
  - Reducing number of radar units
  - Lowering O&M (no moving parts)
  - Streamlining support infrastructure
  - Simplifying training and logistics
  - Open systems procurement and maintenance
- Increased performance benefits

MPAR

Improvements to Current Missions

Air Surveillance



- Mitigates equipage failures to cooperative / dependent aircraft
- Enhanced target acquisition and tracking
  - Smaller RCS detection
  - Improved clutter performance

Weather Observation and Prediction

- Extends high quality wx at small / medium airports
- Icing risk identification
- Hail identification
- Improved forecasts
- Longer lead times for severe weather warnings

Emerging Needs

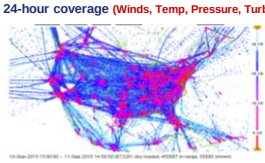
Wind Farm Mitigation

- Broad-spectrum clutter suppression
- Improved low altitude target detection and tracking
- Eliminate weather false-alarms on ATC displays

New User Entrants

- Provides position of non-cooperative targets
- Offers support to avoidance and well clear policies and applications

Airborne Observations Programs
Aircraft Meteorological Reports (AMDAR) [~1970s]/
Meteorological Data Collection and Reporting System (MDCRS) [~1990s]
24-hour coverage (Winds, Temp, Pressure, Turbulence, Water Vapor)



MDCRS – all flight levels

MDCRS – 10,000 ft and below
(large impact on aviation forecast models)

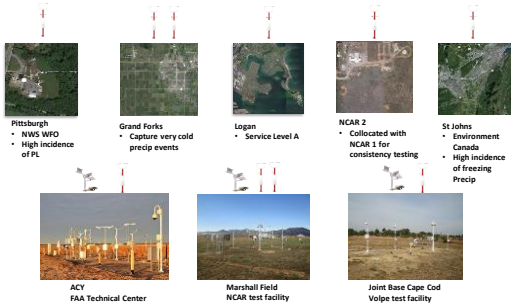
Global AMDAR

Reporting Aircraft (July 2015)
- AMDAR Worldwide: 4551 (13 countries)
- MDCRS USA: 3002 (included in AMDAR #)
- Panasonic (TAMDAR): ~400 under contract
- Water Vapor: 123 USA, 6 Europe
- Turbulence:
  - EDR: (22 Aug-22 Sep) 312 UAL, SWA, DAL
  - WSI (TAPS): >300 AA
  - TAMDAR: ~400 under contract

WOI Program Description

- **WOI technically validates concepts to close high priority ground-based weather observation shortfalls.**
  - **WOI is currently addressing winter weather observing improvements**
- **Today's automated observing systems report rain, snow and freezing rain but do not discriminate and report the occurrence of ice pellets, drizzle, and freezing drizzle which significantly inhibits effective deicing and other winter weather operations.**
- **WOI has executed a concept maturity model that is partnered with industry and repeatable, thus designed to overcome short-comings of previous efforts that attempted to fulfill this original ASOS requirement.**
  - **The WOI effort will level-set the FAA sensor specifications for a Next-Generation Present Weather Sensor.**
- **The current body of work concludes with the delivery of a technical transfer package comprised of sensor performance requirements and meteorological algorithms for investment planning of ASOS integration.**

2015/16 Winter Demonstration



Numerical Modeling

- **Much of this forum will highlight the need for improved data assimilation in numerical models ranging from nested grids to global coverage**
- **FAA's Aviation Weather Research Program (AWRP) continues to support NOAA efforts, especially on updates to RAP and HRRR, as well as ensembles for aviation use.**

Direct tasking from AWRP to NOAA ESRL in 2015:

- **Develop cloud/hydrometeor assimilation from dual-polarization radar for RAP and HRRR.**
- **Test and evaluate direct radial velocity and reflectivity data assimilation for RAP and HRRR.**
- **Assimilation of GOES-based cloud-top cooling data in RAP and HRRR.**
- **Assimilation of lightning data directly within the HRRR to augment radar data.**

Quantification of Benefits

- **In today's challenging budget environment FAA (and other Federal Agencies) pushing hard to quantify the benefits of acquisitions/enhancements:**
  - Quantify cost savings
  - Document safety improvements
- **Some tough questions:**
  - How does more observations directly tie to improving National Airspace (NAS) efficiency?
  - Can NAS decision-making be enhanced by higher resolution models?
  - How does information get to the cockpit for more tactical decisions?

Thank you!

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