# JPDO
# Weather IPT
# Observations and Sensors Team
## Friends and Partners Vision Meeting

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# Observational Needs

- More capable, higher resolution weather forecast models require more not fewer observations
- Key observational needs
  - Improved coverage, density and data quality in planetary boundary layer
  - Atmospheric state variable measurements in and beneath clouds
  - Higher density measurements in frontal zones
  - Special measurements supporting unique aviation needs (e.g. de-icing decision support)

# Weather IPT Structure
# Sub Team Responsibilities

## Observations

- Inventory existing programs
- Conduct trades/cost-benefit analysis
- Align programs to support IPT vision
- Determine optimum mix of space-, airborne-, and ground based observation systems
- Review/update observation policies

## Forecasts

- Develop NGATS requirements
- Inventory existing programs
- Conduct trades/cost-benefit analysis
- Align programs to support IPT vision
- Prepare and implement forecast roadmap supporting delivery of probabilistic gridded information

## Dissemination

- Develop NGATS database requirements
- Inventory agency/industry efforts
- Prepare and implement roadmap designed to deliver national weather information network by 2012, with probabilistic capability by 2015
- Work closely with AATS and SA IPTs

## Integration

- Develop NGATS requirements
- Inventory existing programs
- Conduct trades/cost-benefit analysis
- Define and document system interfaces (ICD)
- Create and implement govt/industry roadmap for weather decision support tool development

## Training

- Evaluate agency aviation weather training activities
- Develop and implement policy and procedures to provide weather training for each NGATS decision maker
- Institutionalize weather training and orientation visits to enforce understanding of opertional needs
- Evaluate need for NGATS proficiency requirements

## Mitigation

- Define aircraft specific transformation needs and requirements
  - Turbulence
  - Icing
  - Synthetic Vision
  - Gust Alleviation
  - Vortex Suppression

# Obs & Sensors Sub-Team Composition

- Current organizations represented:
  - FAA & FAA AWRP PDT's
  - NASA Aeronautics and Science Mission Directorates
  - NOAA NWS, NESDIS, OS&TP, FSL & Space Env Lab
  - OFCM
  - MIT Lincoln Laboratory
  - NCAR
  - University of Wisconsin/NOAA CIMSS
- Target, future additions:
  - Private weather vendors
  - Customer organizations (e.g. airlines, GA)

# Unique Aviation Weather Measurement Requirements

The Observations and Sensors Sub-Team supports the full range of aviation weather forecasting, mitigation, and ATS Integration requirements for:

- Detection, characterization and forecast of both severe and non-severe thunderstorms
  - spatial and temporal accuracies sufficient to determine the availability of individual flight routes and thereby the capacity of en route sectors and terminal facilities
- Support for multi-hour ceiling and visibility forecasting
- Convective and clear air turbulence
- Measurements supporting weather dependent adaptation of wake vortex separation standards
- Measurements supporting in-flight icing and ground deicing decisions
- Measurements supporting volcanic eruption, ash cloud detection and drift forecasting

# Key Observing Systems Current and Future

- Space Based
  - Geostationary Environmental Satellites
  - Low/Mid-Earth Orbit Environmental Satellites
- Airborne
  - In-situ sensors
  - On-board weather radars
  - Other remote sensors
- Ground Based
  - Weather Radars
  - Surface Stations
  - Profilers

# Space- based Observations

- Space-based observations underpin numerical weather models today
  - Geostationary Operational Environmental Satellite soundings
  - Polar-orbiting Operational Environmental Satellite soundings
- Satellite observations will play an ever increasing, critical role in populating the aviation weather information network
  - GOES is singularly capable of providing seamless, dense temporal and spatial framework
  - NPOESS will provide higher resolution but incomplete spatial and temporal coverage
  - MEO satellites in both polar and equatorial orbits may possibly address this gap
- Strong advocacy for high resolution profiles of temperature, water vapor, microphysics and chemistry observations from GEO satellites is required

# Satellite Observation Decision Points

- Near Term (now-2008)
  - Adequate GOES-R Sounder Requirements?
  - Identification of additional capabilities needed for GOES and NPOESS, Eg. GEO Lightning, POES Aerosol and Chemistry
- Mid Term (2008-2015)
  - Affect design and planning for future GEO and MEO satellites to ensure high resolution aviation weather observation requirements
- Long Term (2015-2025)
  - Deploy and integrate next-generation satellite systems

# Airborne Observations

- Airborne in situ observations currently fill critical sounding gaps for numerical aviation weather forecast and nowcast models and terminal aerodrome forecasts for severe weather
  - MDCRS
  - TAMDAR
- Increased coverage by airborne observations can help overcome insufficient temporal and spatial resolution of ground and space based systems
  - In situ soundings from more airports needed
  - Source of dense airborne soundings in regions of active and incipient severe weather is a significant gap that needs to be addressed
  - Airborne radar observations need to be integrated
- Trade studies are needed to produce an integrated roadmap for aircraft and ROA/UAV observations needed to fill critical gaps between ground and space-based systems

# Airborne Observation Decision Points

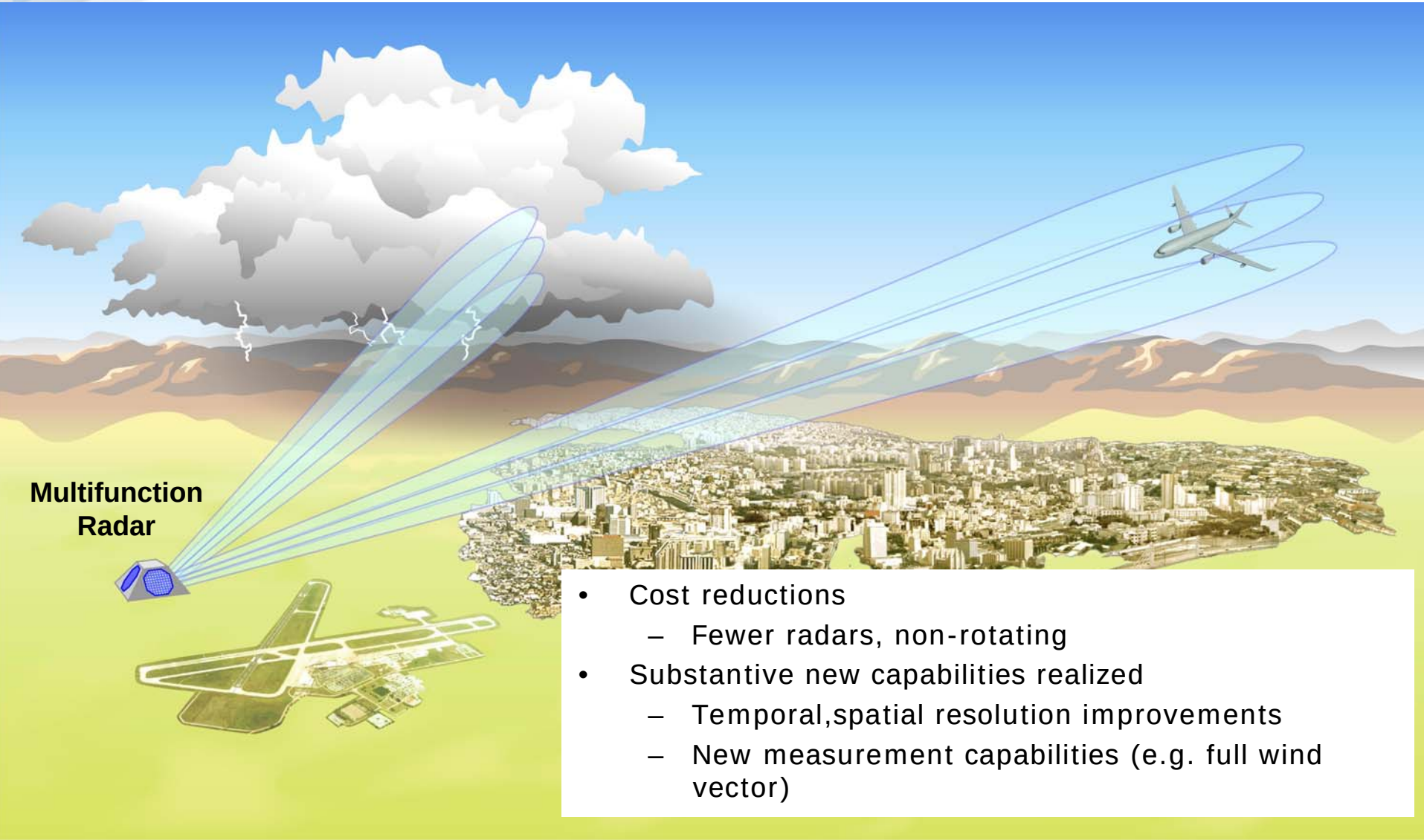
- Near Term (now-2008)
  - Significantly expand AMDAR profiling observations
  - Develop airborne observation strategy to fill critical gaps between ground and space-based profiling architecture
  - Study adequacy of airborne radar observations for integration with ground-based radar observations
- Mid Term (2008-2015)
  - Airborne technology development to fill atmospheric profile observation gaps for numerical weather prediction and nowcasts, E.g., severe weather, icing, turbulence, volcanic ash
  - Commence acquisition of capability
- Long Term (2015-2025)
  - Deploy and integrate aircraft and ROA/UAV sensors

# Surveillance Radar Network

- Ground based weather radar networks are an essential part of today's severe weather observing system
  - NEXRAD
  - TDWR
  - ASR-9/ASR-11 Weather Processors
- Changing surveillance paradigms will force substantial evolution by 2025
  - Cooperative ATC surveillance
  - Homeland defense air situational awareness
  - Enhanced weather radar
- An integrated roadmap for the sustainment, evolution and replacement of today's ground based surveillance radar network is required

# Multifunction Surveillance Radar






- Cost reductions
  - Fewer radars, non-rotating
- Substantive new capabilities realized
  - Temporal,spatial resolution improvements
  - New measurement capabilities (e.g. full wind vector)

# Surveillance Radar Network Decision Points

- Near Term (now-2008)
  - Future surveillance architecture
  - Sustainment and evolution programs for existing radar networks
  - OFCM multifunction phased array radar R&D plan
  - CASA “dense boundary layer radar network” concept
- Mid Term (2008-2015)
  - Execute sustainment and evolution programs
  - Commence acquisition of replacement network(s)
- Long Term (2015-2025)
  - Deploy and integrate replacment networks

# Summary of Obs Priorities

- Optimize obs and sensor acquisition strategies by obtaining JPDO support for obs team trade studies
- Realize Potential Near Term Successes
  - GOES R sounder adequacy
  - TAMDAR expansion throughout CONUS
  - DOD satellite data for volcanic early warning
  - National Radar Network Plan