

NASA Advanced Satellite Aviation Weather Products (ASAP)

Benefits Analysis Status

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Purpose & Scope

- Determine both the quantitative and qualitative improvements to be gained nationally by providing more accurate depictions of aviation weather phenomena through the addition of satellite data to existing AWRP products
- Determine the aviation safety and efficiency improvements to be realized in producing more accurate assessments of flight-level wind fields by tracking water vapor using the next generation of geostationary satellite soundings

ASAP Overview

- Phase I
 - More effectively employ information from current generation satellites in aviation weather products
- Phase II
 - Integrate next generation of satellites and hyperspectral instruments, which will provide dramatic improvements in remote sensing techniques, into aviation weather products

ASAP Overview

- Satellite data are used only marginally to support the NAS
 - Aviation Weather Center uses satellite imagery primarily in traditional, qualitative ways
 - Aviation Weather Research Program (AWRP) has yet to fully develop its capacity to utilize satellite soundings and other quantitative, satellite-derived data
- ASAP is coordinating with AWRP Product Development Teams (PDTs) to infuse current and future satellite sounding data, imagery, and derived products into the weather products

Preliminary Benefits Identification Overview

- ASAP's most immediately tenable improvement areas are:
 - In-flight Icing
 - Turbulence
 - Convection
 - Flight-level Winds
- Areas for future research:
 - Dust, Aerosols and Volcanic Ash
 - Ceiling and Visibility

Preliminary Benefits Identification

In-flight Icing

- Primary benefit is safety
 - Reduce accidents associated with aircraft encountering super-cooled clouds and experiencing rapid accumulation of ice leading to rapid loss in aircraft performance
- Also provide efficiency benefits (primarily for regional airlines operating turboprop aircraft)
 - Re-routes due to severe icing or anti-ice/de-ice equipment failures
 - Go/no-go decisions due to severe icing or inoperative anti-ice/de-ice equipment
 - Implementation of weight restrictions due to one engine inoperative service ceiling requirements

Preliminary Benefits Identification

Turbulence

- Primary benefit is safety
 - Reduce accidents associated with turbulence encounters
 - Initial focus is on Clear Air Turbulence (CAT) and Convection-Induced Turbulence (CIT)
- Also provide efficiency benefits
 - Turbulence avoidance
 - Excessive routing
 - Airspace congestion
 - Airport capacity
 - Turbulence encounters
 - Penetration speed
 - Escape routes
 - Aircraft inspections

Preliminary Benefits Identification Convection

- Significant efficiency improvements
 - Determine arrival fix, departure fix, and airport closures in the terminal environment
 - Avoid implementing the closure prematurely
 - Avoid not being prepared for the beginning or ending of the closure
 - Better recognize when the closure will be prolonged
 - Flight planning based on en route conditions
 - Route and altitude decisions
 - Alternative airport assignments
 - Fuel loadings

Preliminary Benefits Identification

Flight-Level Winds

- Improve airline flight planning and fuel loading decisions
- Improve trajectory predictions within Air Traffic Management decision support tools
 - User Request Evaluation Tool (URET)
 - Conflict probe that identifies potential aircraft-to-aircraft conflicts up to 20 minutes ahead
 - Traffic Management Advisor (TMA)
 - Helps controllers smooth arrivals in the en-route and descent phases and optimizes runway usage
 - Enhanced Traffic Management System (ETMS)
 - Uses flight data to project traffic demands at airports, sectors and fixes throughout the air traffic management system

Next Steps

- Assess potential improvements in AWRP products through detailed discussions with the meteorological community
 - Specify type of improvement anticipated
 - Qualify magnitude of improvement
 - Determine risk or probability of achieving improvement
- Identify applicable set of operational benefits and determine overall magnitude
- Rank improvements based on combination of significance to AWRP products and operational utility