Remote Oceanic Meteorology Information Operational (ROMIO) Demonstration

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ROMIO Demonstration Team
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Remote Oceanic Meteorology Information Operational (ROMIO) Demonstration

• Sponsored by the Weather Technology in the Cockpit (WTIC) NextGen Weather Research Program

• Collaborative effort between FAA, weather research community, airlines, and airlines inflight entertainment communications (IFEC) providers

• Develop and demonstrate operational strategies for use of rapidly updated satellite and model derived Cloud Top Height (CTH) and Convective Diagnosis Oceanic (CDO) information;
  – On flight deck
  – At Airline Operations Center (AOC) flight dispatch operations
  – At Oceanic Air Route Traffic Control Centers (ARTCC)
  – At Center Weather Service Units (CWSU)
Objective

• Operational demonstration to evaluate the feasibility of uplinking convective storm information to commercial aircraft flying routes over remote and oceanic regions for display on an electronic flight bag (EFB)
  – Identify minimum meteorological information for remote and oceanic regions
  – Conduct cost benefit analysis for both safety and efficiency
Domain for Storm Information Creation

- Scanning area Geostationary Operational Environmental Satellite (GOES)-East (16) and GOES-West satellites
  - Satellite mosaics are created at 15 min intervals using latest data available
  - Provides outside shell of convective cloud top and anvil and not within the cloud
  - Information communicate cloud structure with maximum altitude and where convective hazard associated with strong updrafts / downdrafts are located
GOES-West Sector Sub-Domains
GOES-East Full Disk Scan Domain

• Coverage Domain -180°W to -20°W Longitude and -50°S to 75°N Latitude

GOES-West
Centered over -135° Longitude

GOES-East
Centered over -75° Longitude
CTH / CDO Example and Inputs

Cloud Top Height
Global Convective Diagnosis
Combined Lightning
Overshooting Tops

Input Interest Fields after Membership Function Applied
Weights = 1 or = 3 for Combined Ltg

CDO values ≥ 2 indicate convective hazard exists

Convective Diagnosis Oceanic

NSSL Mosaic Vertically Integrated Liquid
ROMIO Demo Communications

**NCAR**
- GOES West
- GOES EAST (16)

**FTB NEMS**
- SOAP over HTTP/HTTPS (SWIM Compatible)

**AOC**
- Delta (EFB)
- American (EFB)
- United (EFB)

**ARTCC**
- Pan Am (EFB)
- VAR
- SPO

**ACRONYMS**
- AOC – Airline Operations Center
- ARCC – Air Route Traffic Control Center
- DMS – Data Management Service
- EFB – Electronic Flight Bag
- FTB NEMS – Florida Test Bed NAS Enterprise Messaging System
- HP – Hypertext Transfer Protocol
- HTTP – Hypertext Transfer Protocol Secure
- IPDC – In-Flight Entertainment & Connectivity
- ISP – Internet Service Provider
- NCAR – National Center for Atmospheric Research
- SOAP – Simple Object Access Protocol
- SWIM – System Wide Information Management
- TCP/IP – Transmission Control Protocol / Internet Protocol
"Although CDO displayed medium convection, we didn’t encounter any storms that required deviation. However, the information was useful, as we did encounter light turbulence throughout the area depicted as having moderate convection. The CDO information allowed me to pre-brief our flight attendants to plan on being seated while we were in this area, and it worked very well for this purpose. The CTH product seemed to be displaying tops accurately."
Initial Comments on the Surveys

• 27 pilot responses received so far

• Overall, the feedback seems positive (see the following slides)

• High marks for ROMIO in the following areas:
  • Situational awareness (74%)
  • Monitoring weather along the route (74%)
  • Timely weather information (67%)
  • Cabin crew coordination (81%)
60% of pilots deviated or changed altitude to avoid weather in the surveyed flights

40% of the flights involved no weather deviation

Weather deviation distances varied from 5 to 25 nautical miles
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40% of the flights involved no weather deviation

Weather deviation distances varied from 5 to 25 nautical miles
63% of pilots judge the time spent on ROMIO-induced deviations is about the same as with current systems.

Pilot Responses

63% of respondents judge the time spent on ROMIO-induced deviations is about the same as with current systems.
31% judge less time with ROMIO.
54% of pilots consider ROMIO to be more effective in making deviation or flight level changes

Pilot Responses

54% of respondents consider ROMIO to be more effective in making deviation or flight level changes
21% judge ROMIO to be the same
25% judge ROMIO is less effective than the current system
54% of pilots consider ROMIO to improve ability to accomplish task goals

Pilot Responses

54% of respondents consider ROMIO to improve ability to accomplish task goals
31% judge ROMIO to be the same to accomplish tasks goals
15% consider ROMIO information to decrease the success in accomplishing task goals
36% of pilots consider ROMIO to induce less stress and irritation compared to the current system.

- 36% of respondents consider ROMIO to be induce less stress and irritation compared to the current system.
- 50% judge ROMIO to be the same as using the current system.
- 14% consider ROMIO information to increase slightly the stress and irritation compared to the current system.
74% of pilots consider ROMIO to improve situational awareness compared to current system.

Pilot Responses:
- 74% of respondents consider ROMIO to improve situational awareness compared to current system.
- 11% judge ROMIO provides the same situational awareness.
- 15% consider ROMIO information to decrease situational awareness.
74% of pilots consider ROMIO to improve monitoring weather along the route compared to current system

Pilot Responses

74% of respondents consider ROMIO to improve monitoring weather along the route compared to current system
22% judge ROMIO provides the same weather monitoring ability
4% consider ROMIO to decrease weather monitoring ability
67% of pilots consider ROMIO information to improve timely weather information compared to current system

67% of respondents consider ROMIO to be better at providing timely weather information compared to current system
26% judge ROMIO provides the same at providing timely weather information
7% consider ROMIO to decrease the provision of timely weather information
81% of pilots consider ROMIO to improve cabin crew coordination compared to current system

Pilot Responses

81% of respondents consider ROMIO to improve cabin crew coordination compared to current system
15% judge ROMIO provides the same cabin crew coordination
4% consider ROMIO to decrease coordination with cabin crew
72% of pilots consider ROMIO CTH information to be consistent with their observations

72% of respondents consider ROMIO CTH information to be consistent with their observations
28% judge ROMIO CTH information is somewhat consistent with observations
28% of pilots could not make observations
67% of pilots consider ROMIO convective weather location to be consistent with their observations.

Pilot Responses

67% of respondents consider ROMIO convective weather location to be consistent with their observations.
33% judge ROMIO CTH information is somewhat consistent with observations.
28% could not make observations.
53% of pilots consider ROMIO convective weather lateral extend of clouds to be consistent with their observations.

53% of respondents consider ROMIO convective weather lateral extend of clouds to be consistent with their observations.

47% judge ROMIO convective weather lateral extend of clouds is somewhat consistent with observations.

29% could not make observations.
ROMIO Issues

- Limited area of coverage
- Takes long time to load information
- Missing weather events that were visible out the window
- Delta’s Flight Weather Viewer (FWV) had a more complete feature set
- Extra waypoint created that required the pilot to delete it
- Not as helpful as the FWV application
- The lateral boundaries were greater than what was observed; required to verify with the FWV to get a true picture
- ROMIO showed wider areas in red; required comparison with other capabilities to decide the actual avoidance maneuver
Thank You

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