Remote Oceanic Meteorology Information Operational (ROMIO) Demonstration

Provided to: Turbulence Impact Mitigation Workshop 3

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Date: September 6, 2018

ROMIO Demonstration Team
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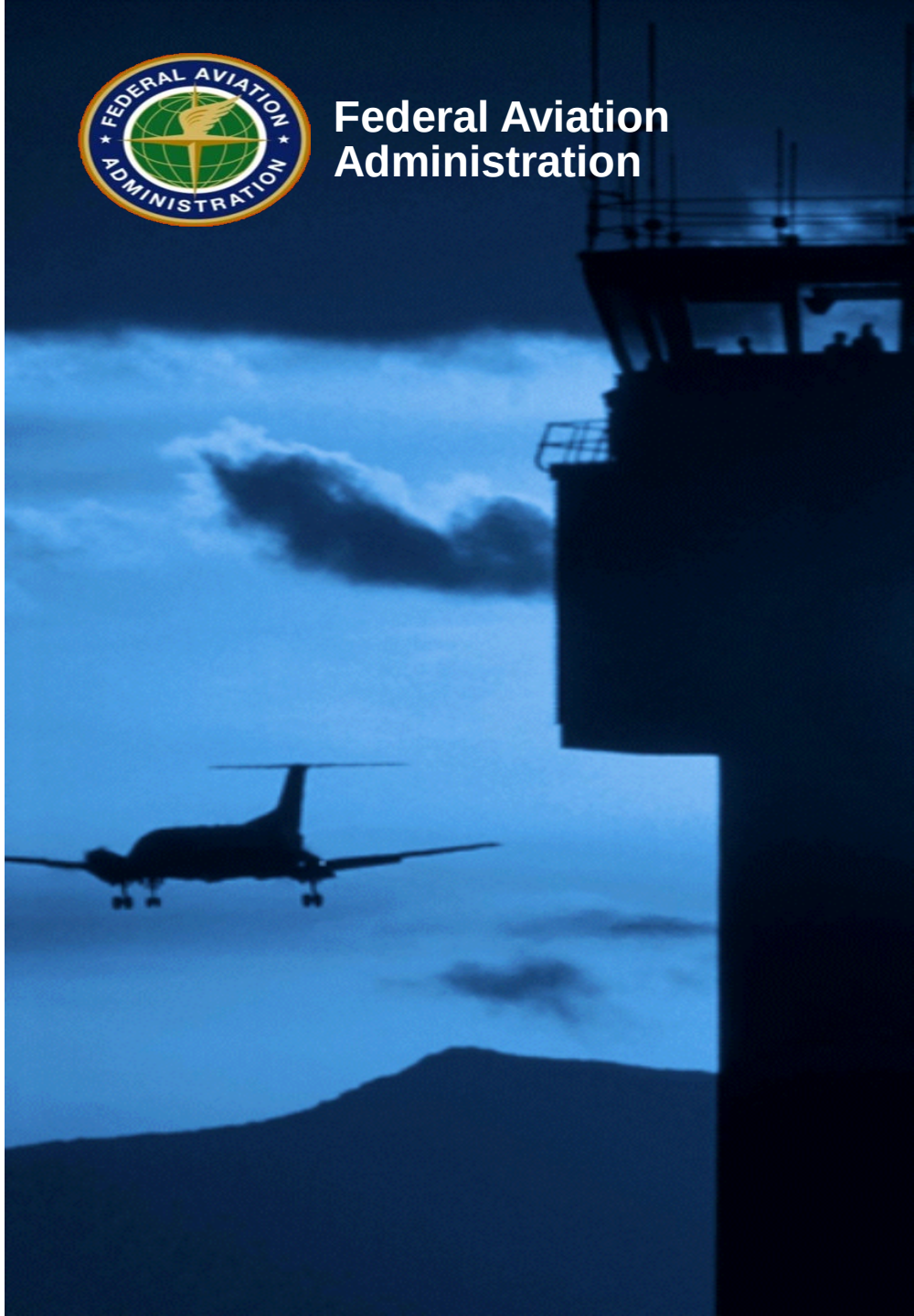


Remote Oceanic Meteorology Information Operational (ROMIO) Demonstration

- **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

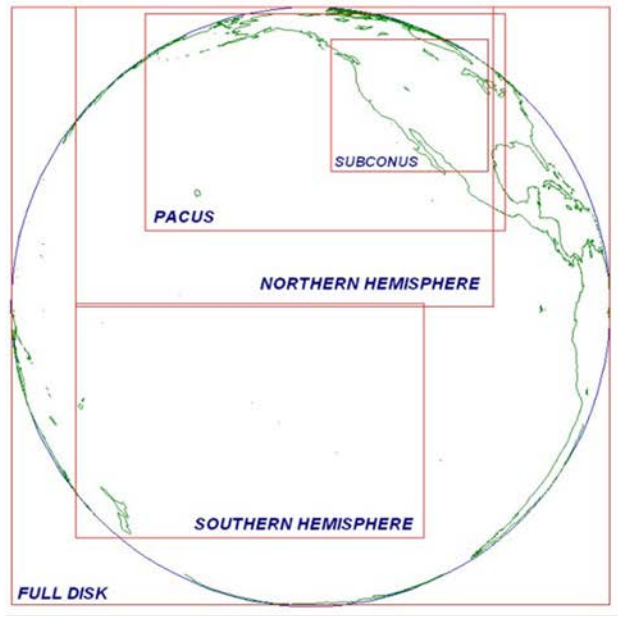
- Operational demonstration to evaluate the feasibility of uplinking convective storm information to commercial aircraft flying routes over remote and oceanic regions for display on an electronic flight bag (EFB)
  - Identify minimum meteorological information for remote and oceanic regions
  - Conduct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

Domain for Storm Information Creation

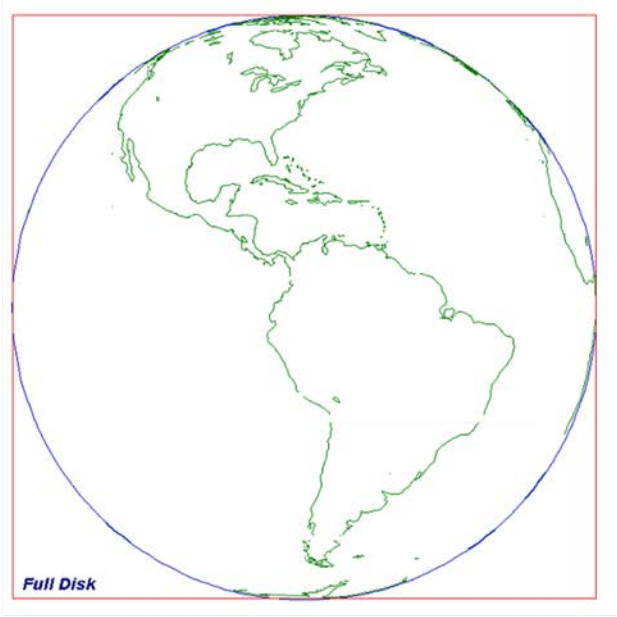
- **Scanning area Geostationary Operational Environmental Satellite (GOES)-East (16) and GOES-West satellites**
  - Satellite mosaics are created at 15 min intervals using latest data available
  - Provides outside shell of convective cloud top and anvil and not within the cloud
  - Information communicate 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**



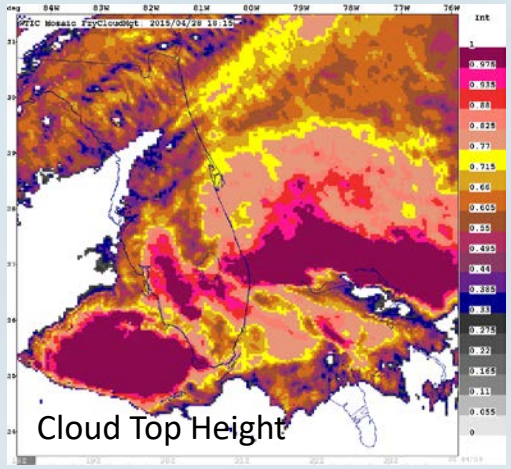
GOES-West
Centered over -135° Longitude

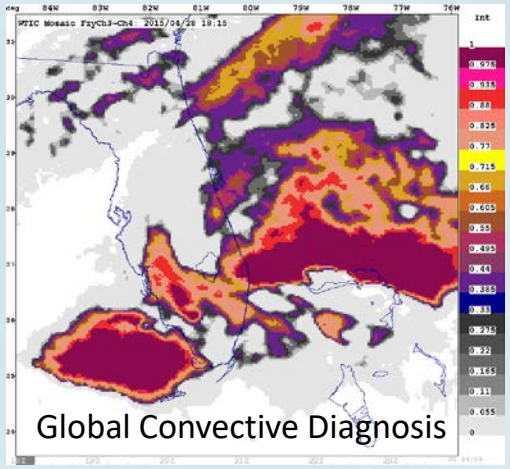


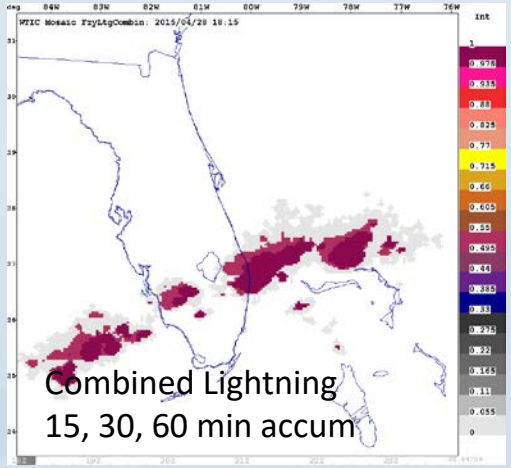
GOES-East
Centered over -75° Longitude

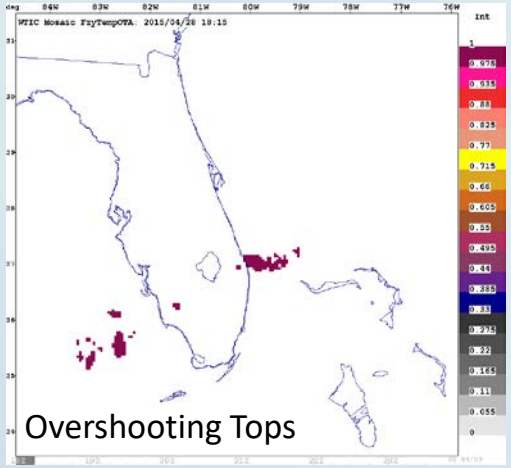
CTH / CDO Example and Inputs

CDO values ≥2 indicate convective hazard exists

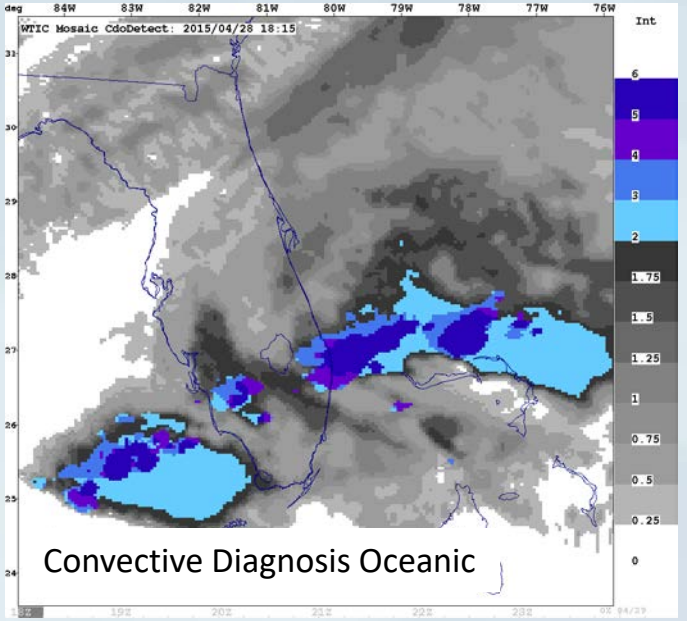

Cloud Top Height


Global Convective Diagnosis

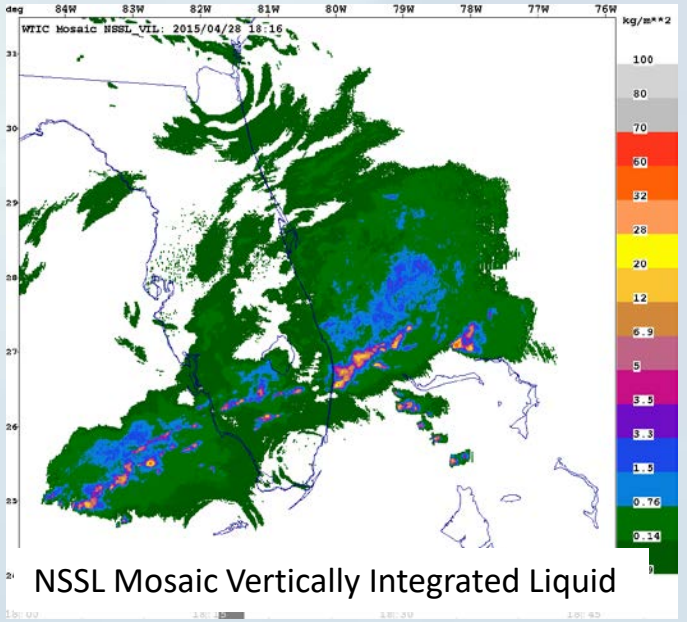

Combined Lightning
15, 30, 60 min accum


Overshooting Tops

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

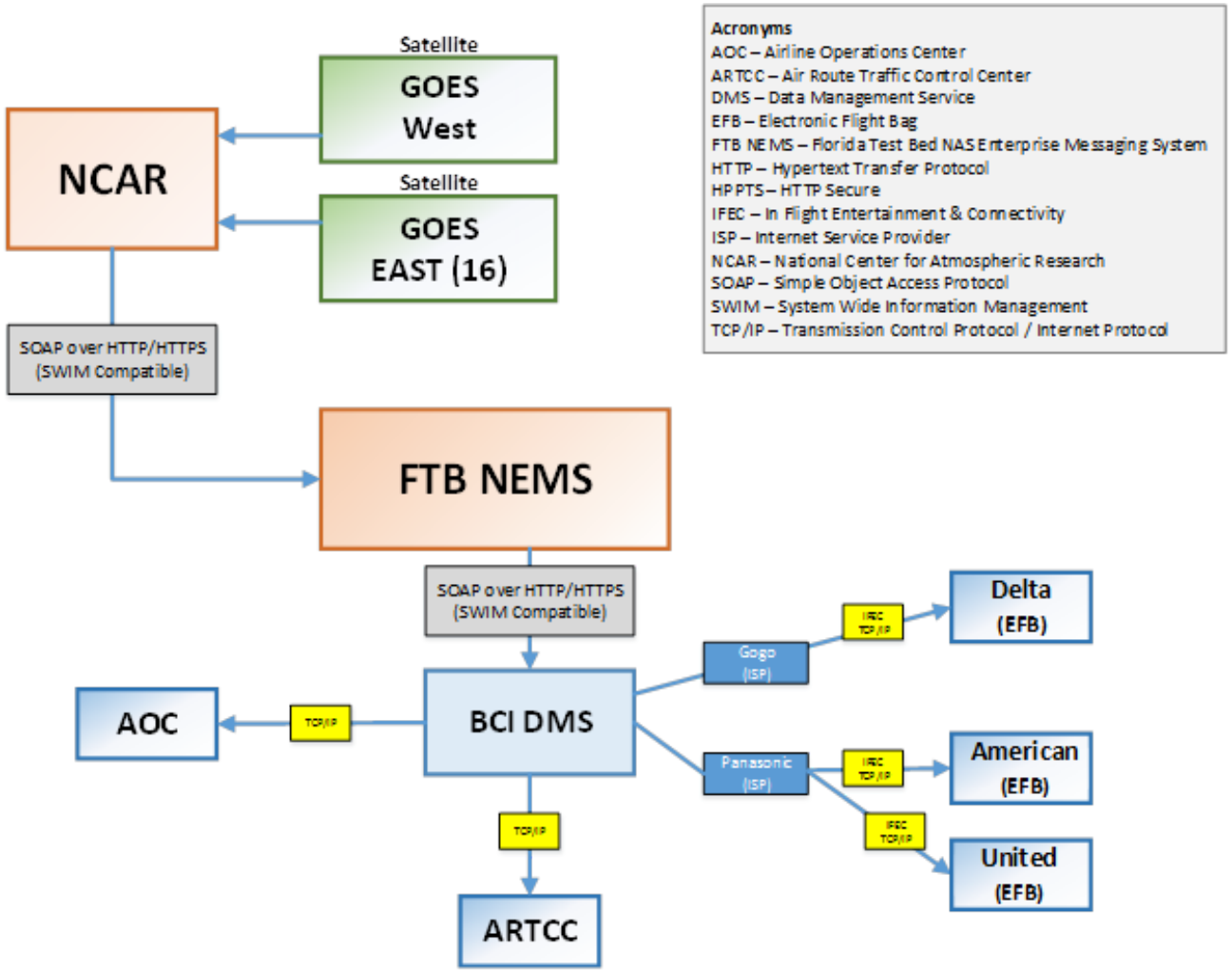


Convective Diagnosis Oceanic

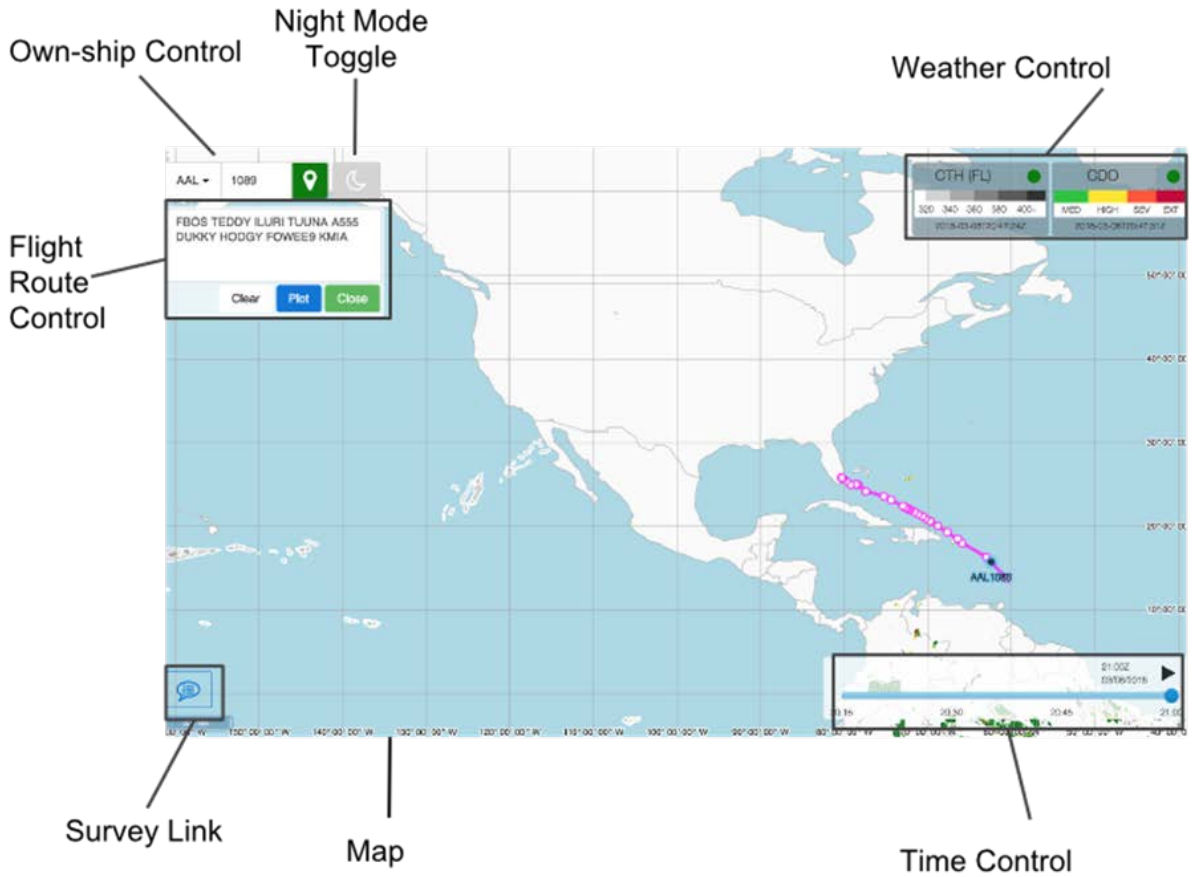


NSSL Mosaic Vertically Integrated Liquid

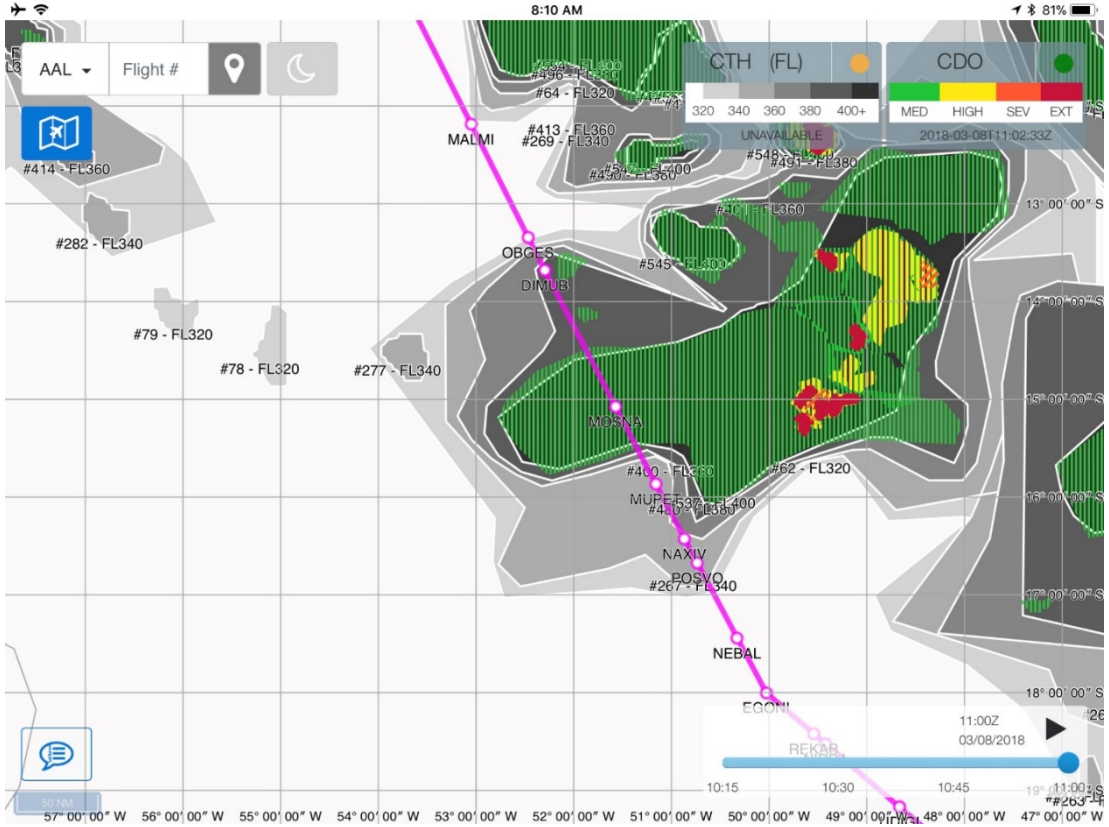
ROMIO Demo Communications



ROMIO Viewer



ROMIO Demo, UAL 845-7, Chicago – Sao Paulo 3-7/8



"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."

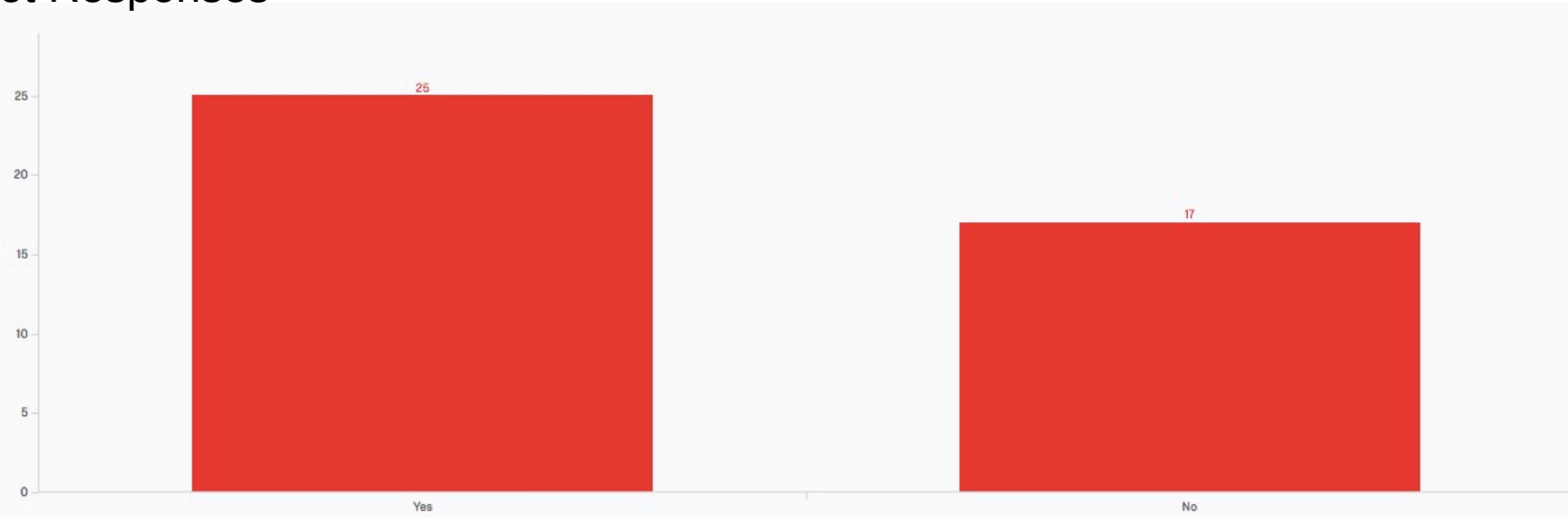
Initial Comments on the Surveys

- 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

Pilot Responses



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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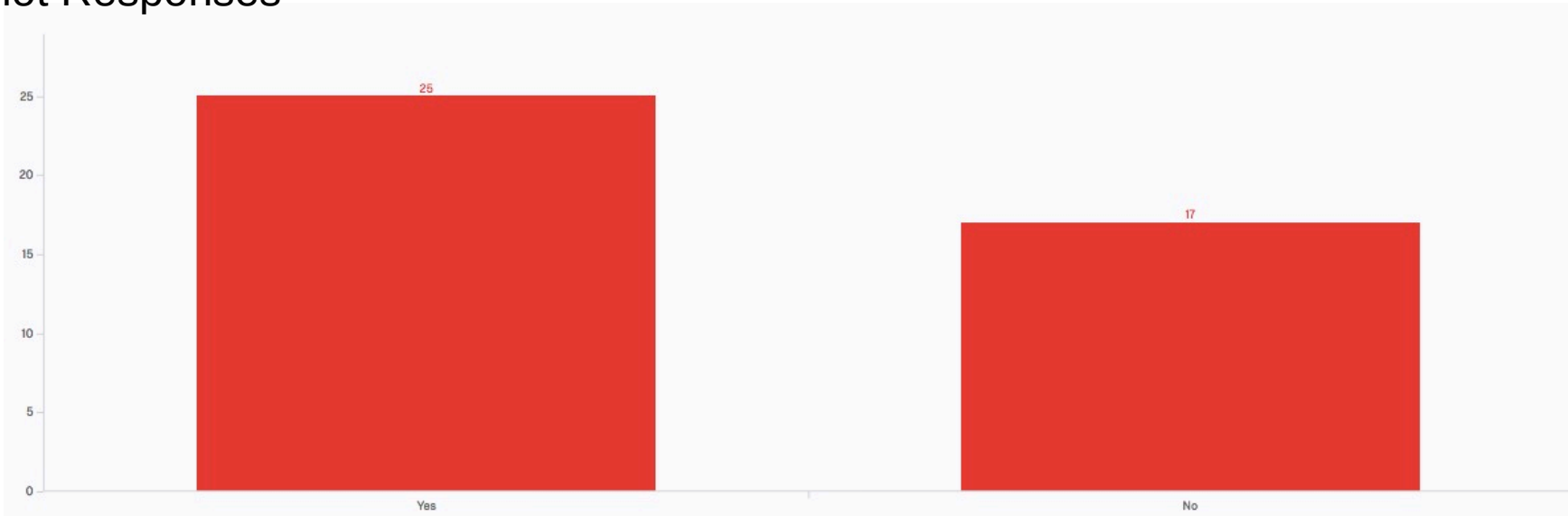
Pilot Responses



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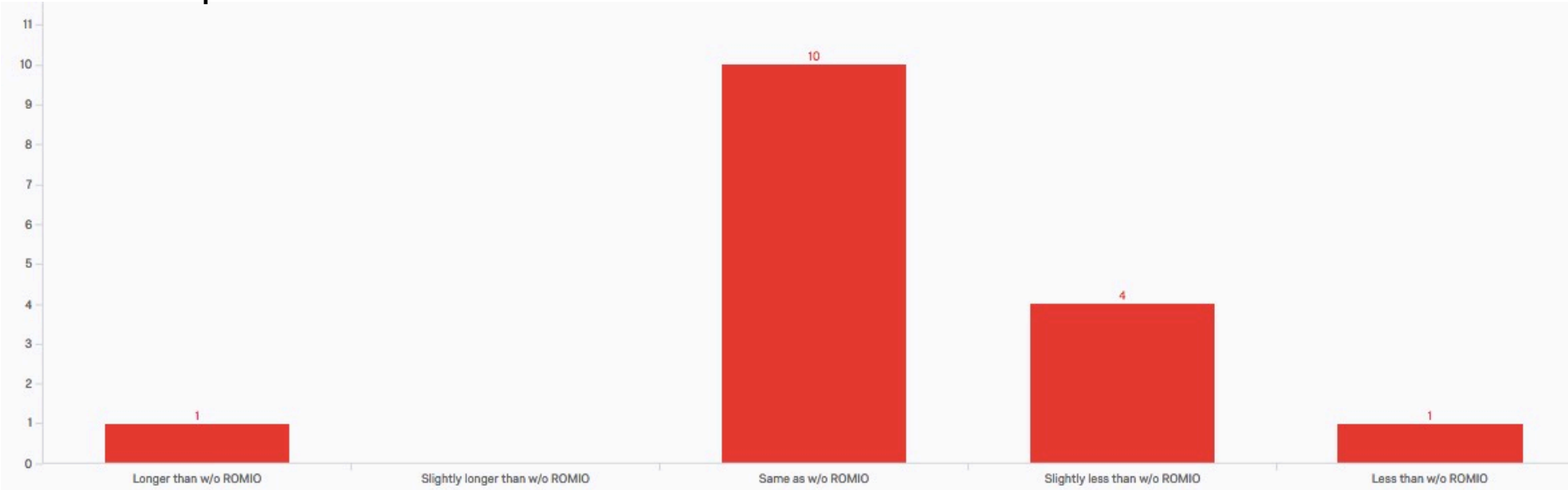
Weather deviation distances varied from 5 to 25 nautical miles

63% of pilots judge the time spent on ROMIO-induced deviations is about the same as with current systems

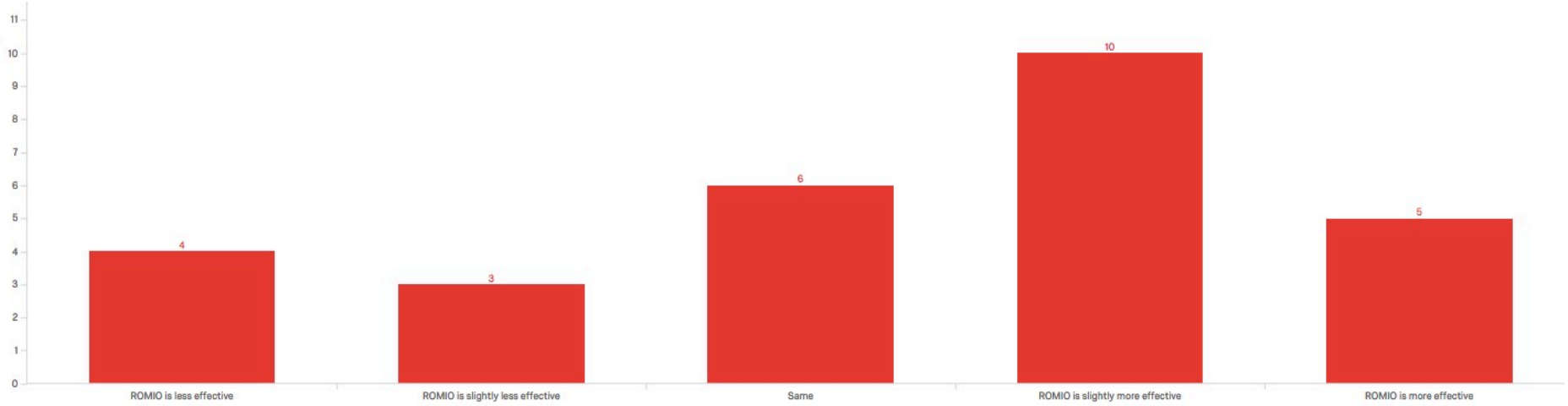
Pilot Responses



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

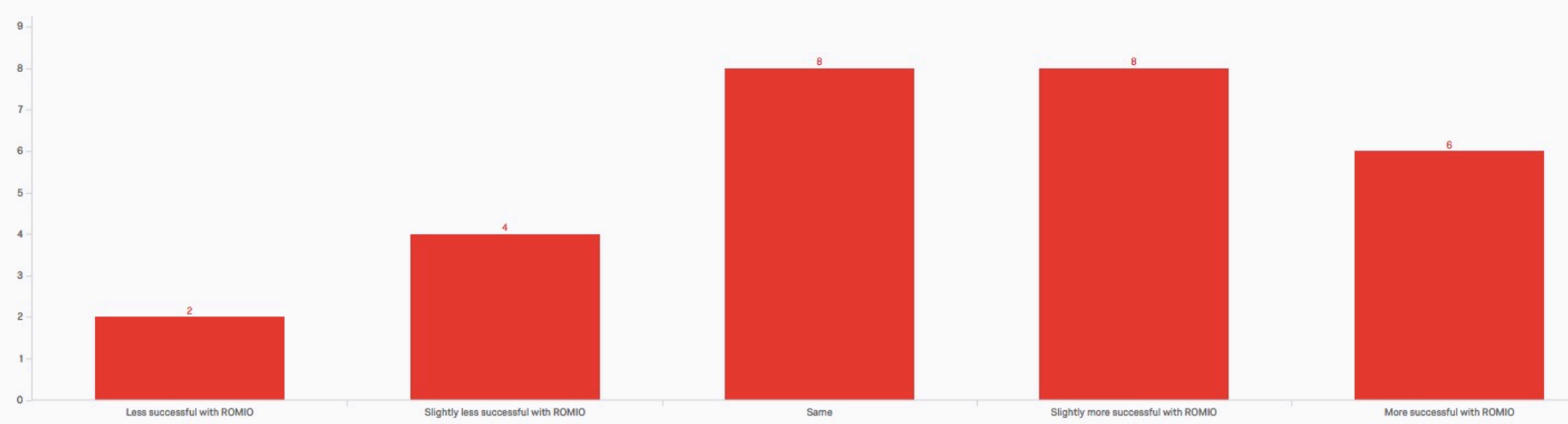
Pilot Responses



54% of respondents consider ROMIO to be more effective in making deviation or flight level changes
21% judge ROMIO to the 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

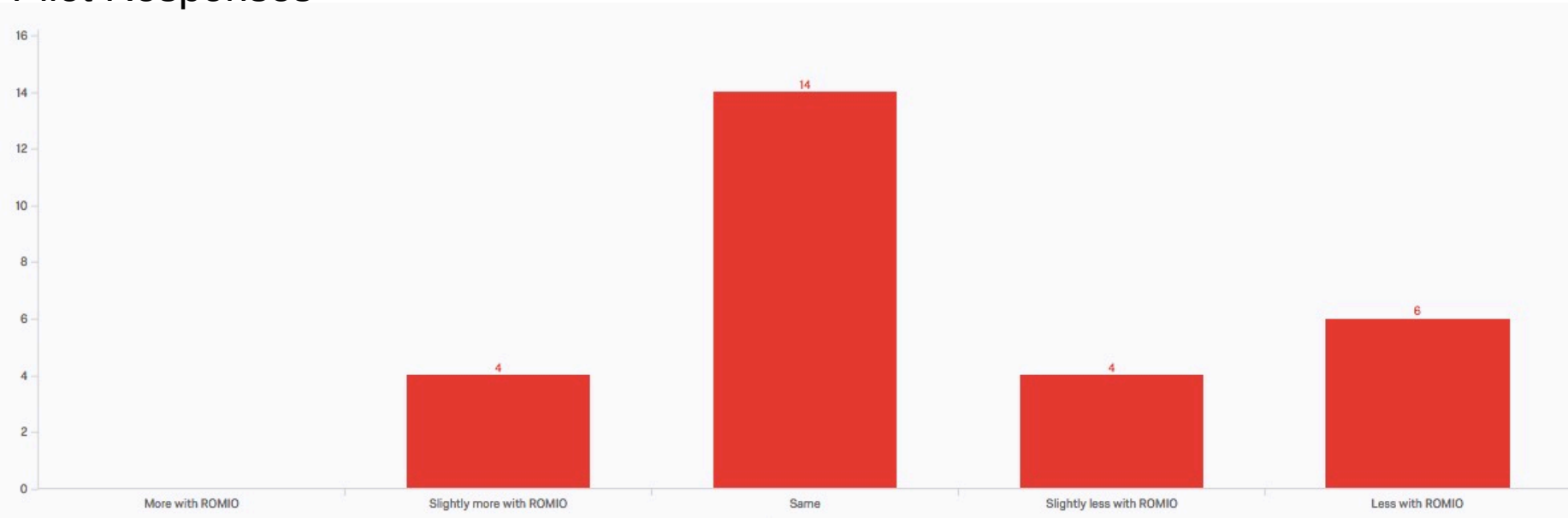
Pilot Responses



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

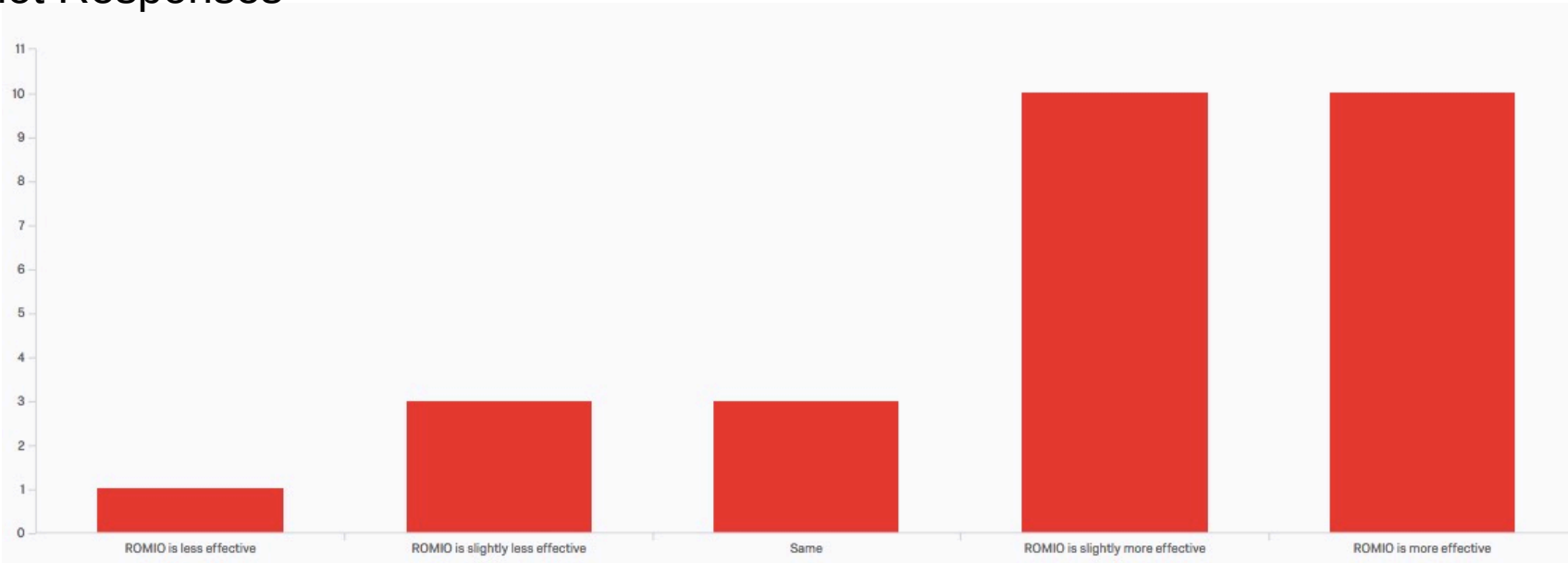
Pilot Responses



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

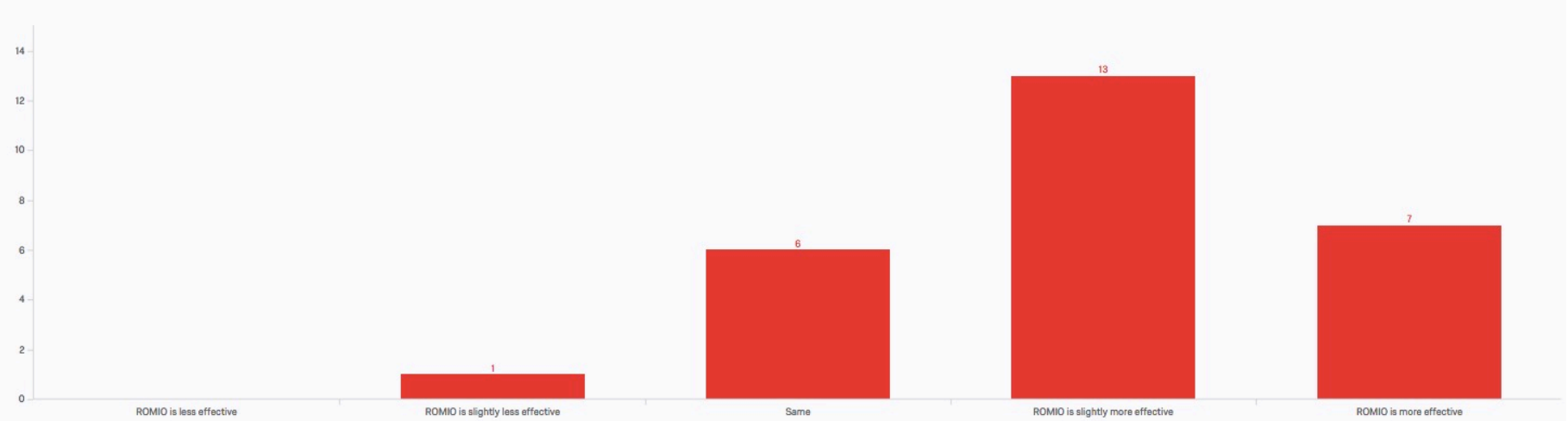
Pilot Responses



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 decreases situational awareness

74% of pilots consider ROMIO to improve monitoring weather along the route compared to current system

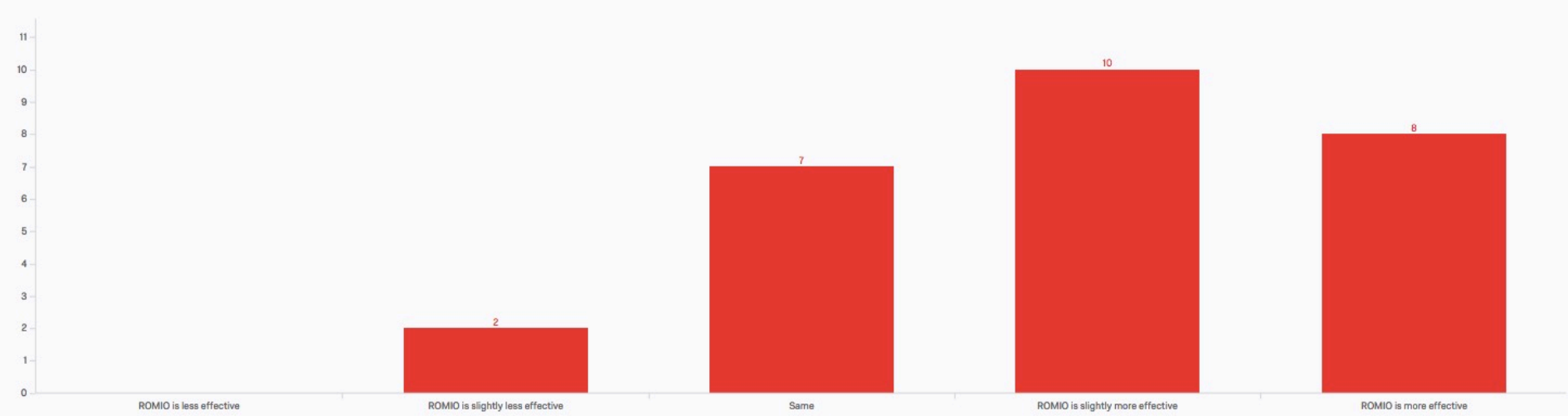
Pilot Responses



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

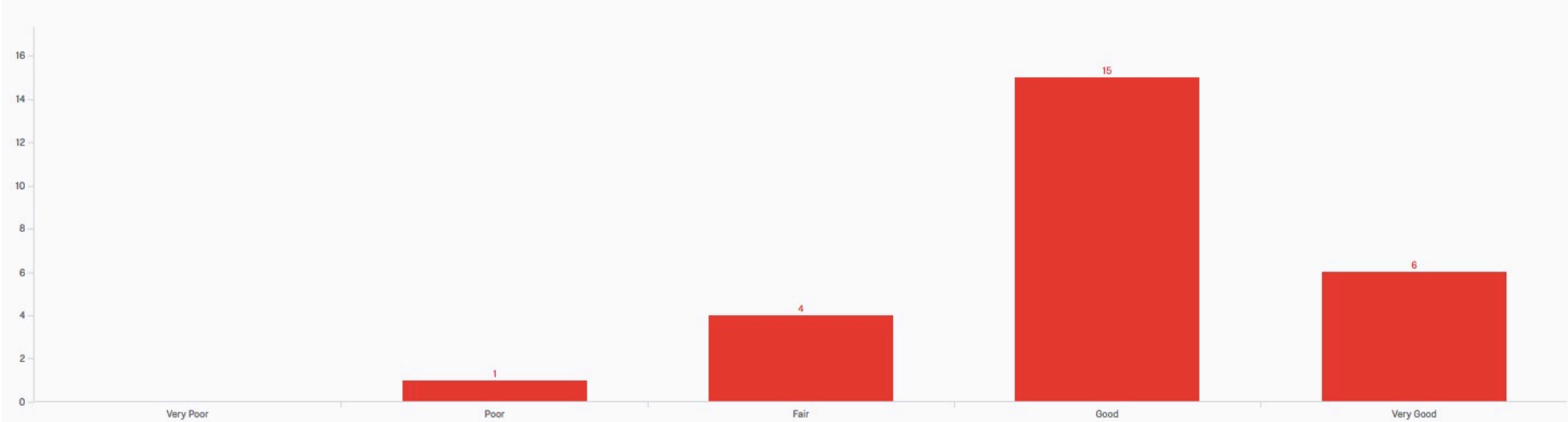
Pilot Responses



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

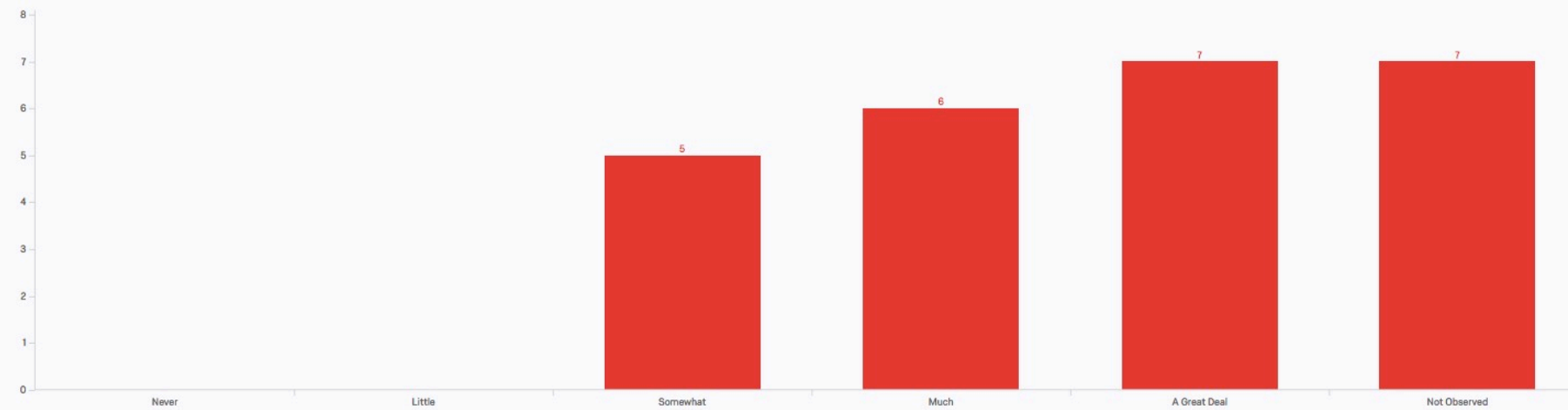
Pilot Responses



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

Pilot Responses

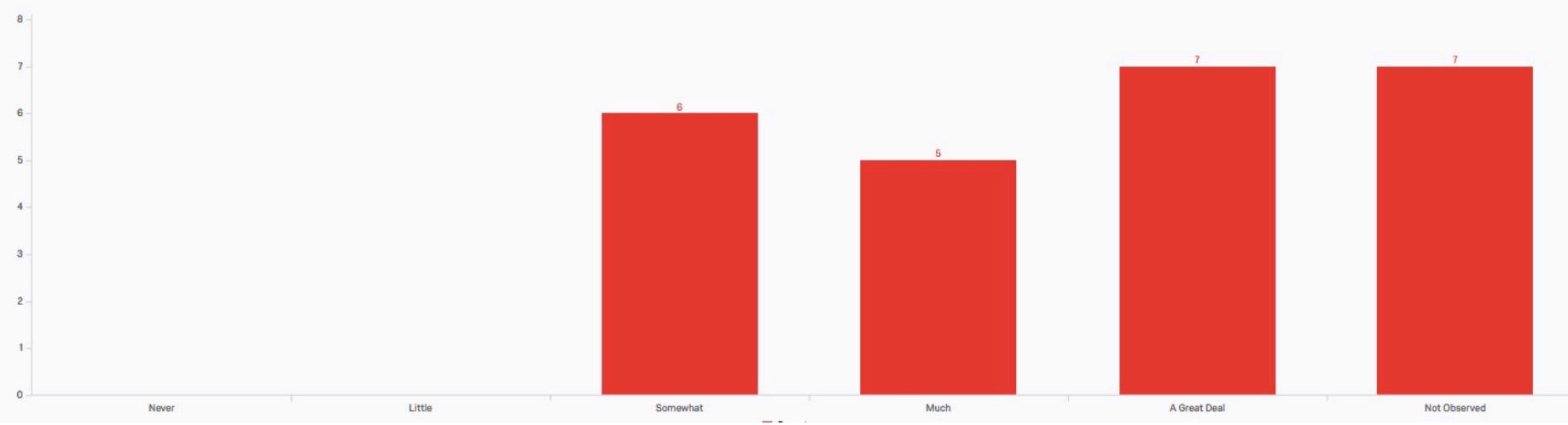


72% of respondents consider ROMIO CTH information to be consistent with their observations
28% judge ROMIO CTH information is **somewhat consistent** with observations

28% of pilots could not make observations

67% of pilots consider ROMIO convective weather location to be consistent with their observations

Pilot Responses

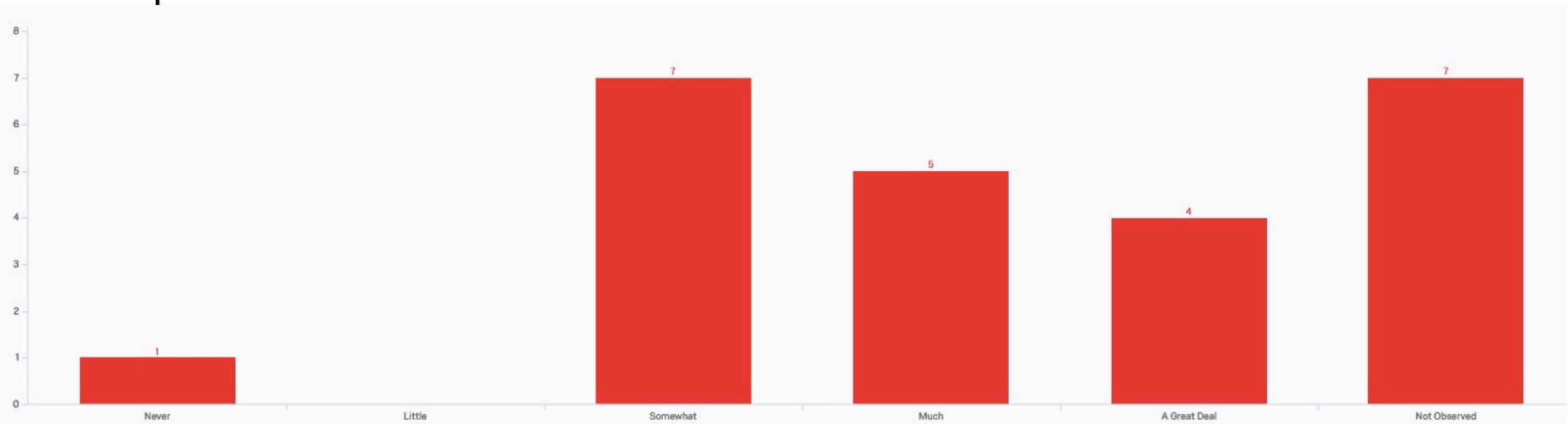


67% of respondents consider ROMIO convective weather **location** to be consistent with their observations
33% judge ROMIO CTH information is somewhat consistent with observations

28% could not make observations

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

Pilot Responses



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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