NASA Research to Support the Airlines

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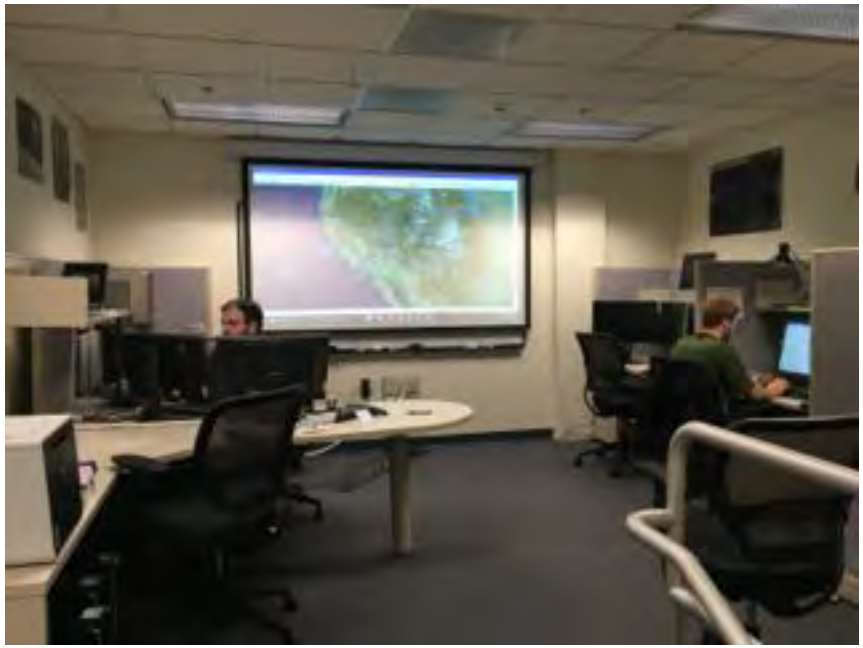
Airline Operations Research Group

- The purpose of the NASA Ames Airline Operations Research Group (AORG) is to perform airline operations research
  - Increase NASA's support of the airlines
- Laboratory created in 2015 in the Human Systems Integration Division
- AORG Projects:
  - Airline Operations Workshop
  - Ramp Incident Data Analysis
  - Turbulence Detection
  - Dispatcher Human Factors Study
  - Airline Operations Forum

Airline Operations Research Group



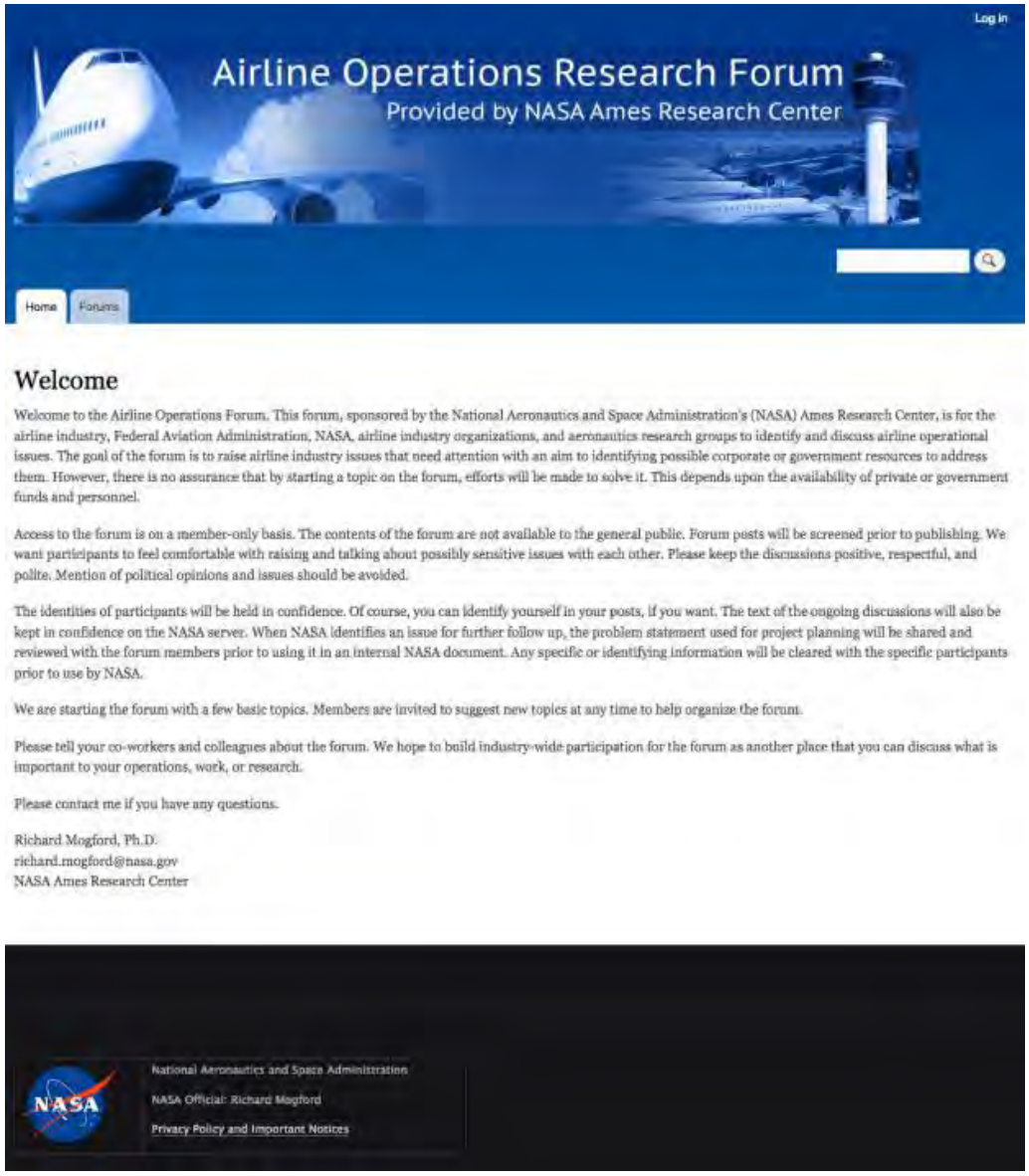
NASA/Industry Collaboration

- Held an Airline Operations Workshop at NASA Ames in August 2016
  - About 200 attendees
  - Focused on NASA, FAA, and private sector innovations to support the airlines (AOC and flight deck)
  - Identified gaps where research is needed
  - Formed partnerships with airline industry
- Research themes
  - AOC simulation
  - Study dispatcher workload, situation awareness, errors
  - Display/system integration
  - Managing/accessing large information databases from multiple sources
  - Preferred routes

Airline Operations Research Forum

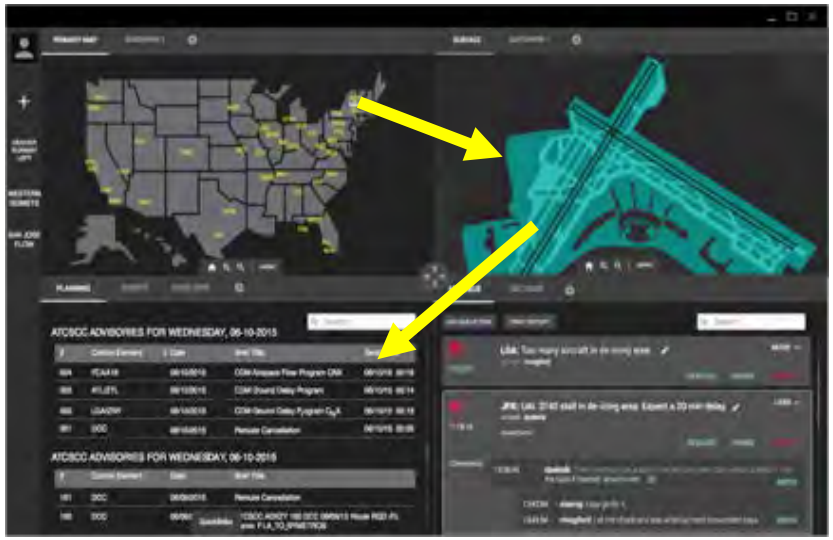
- The need for a collaborative online environment was suggested as a follow up to the Airline Operations Forum
- The AORG is creating the Airline Operations Forum to support discussion of industry problems
- NASA researchers will participate to review posts and suggest solutions
- The forum is membership access only (not open to the general public)
- It is moderated by NASA personnel and securely hosted on NASA servers
- The forum goes live on November 3, 2017

Airline Operations Research Forum

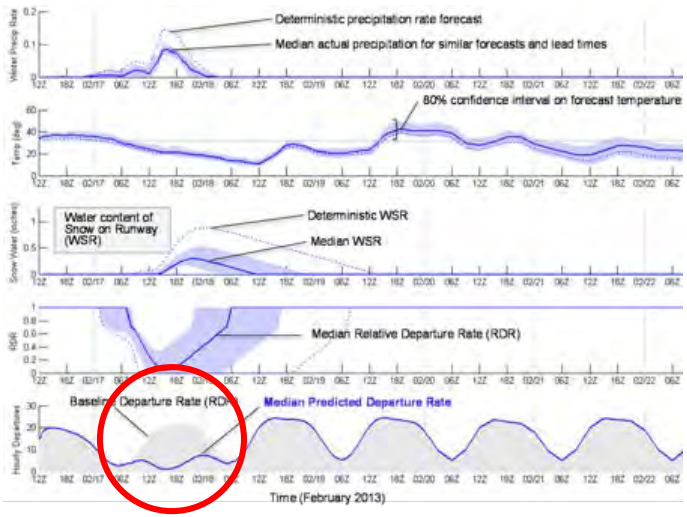


Flight Awareness Collaboration Tool

- Developing the “Flight Awareness Collaboration Tool” (FACT)
- Concentrates information about winter weather events on one display
- Includes predictive tools
- Supports collaboration between airline operations center, air traffic control, airport authority, and de-icing operators

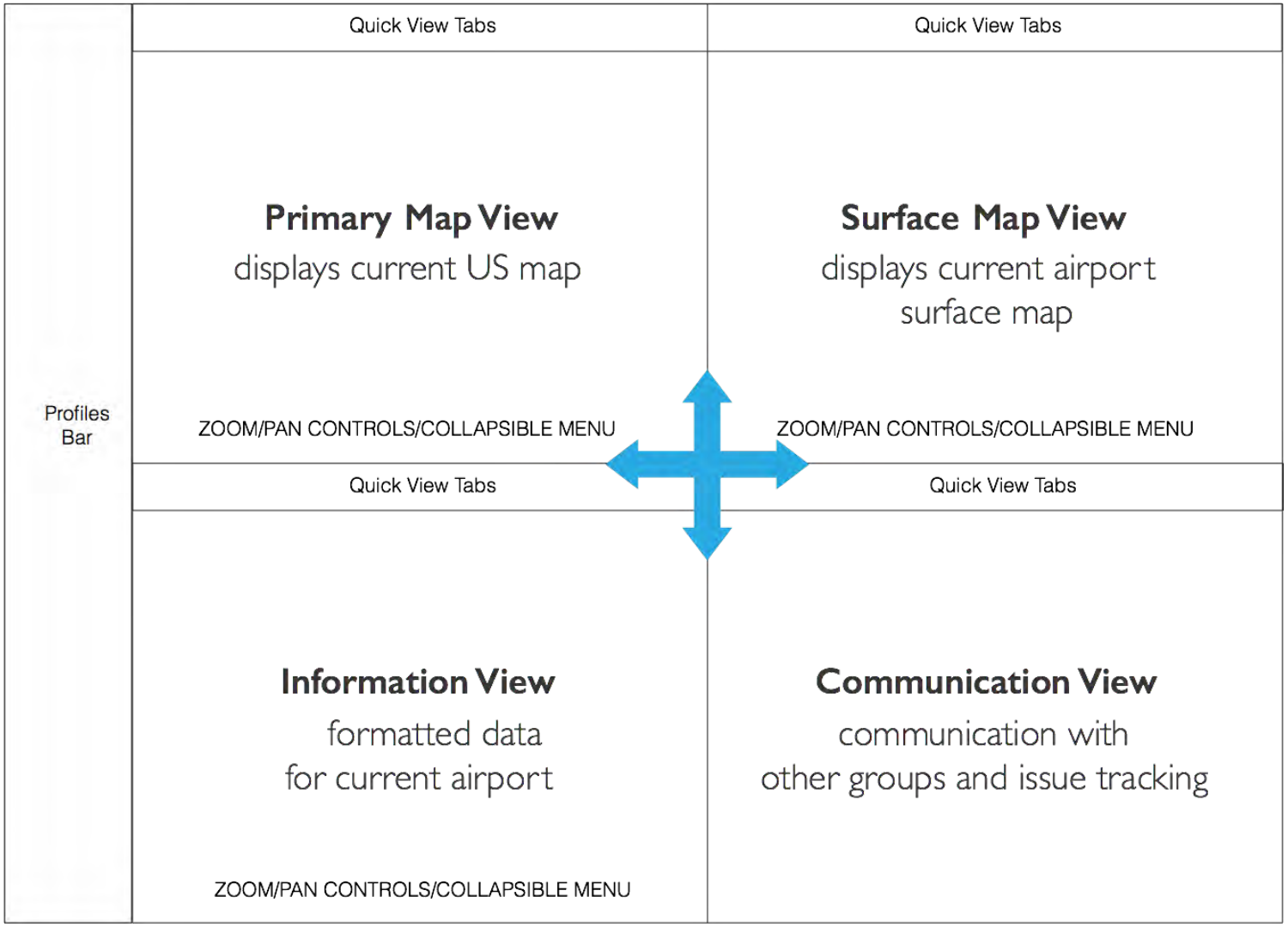


FACT Screen

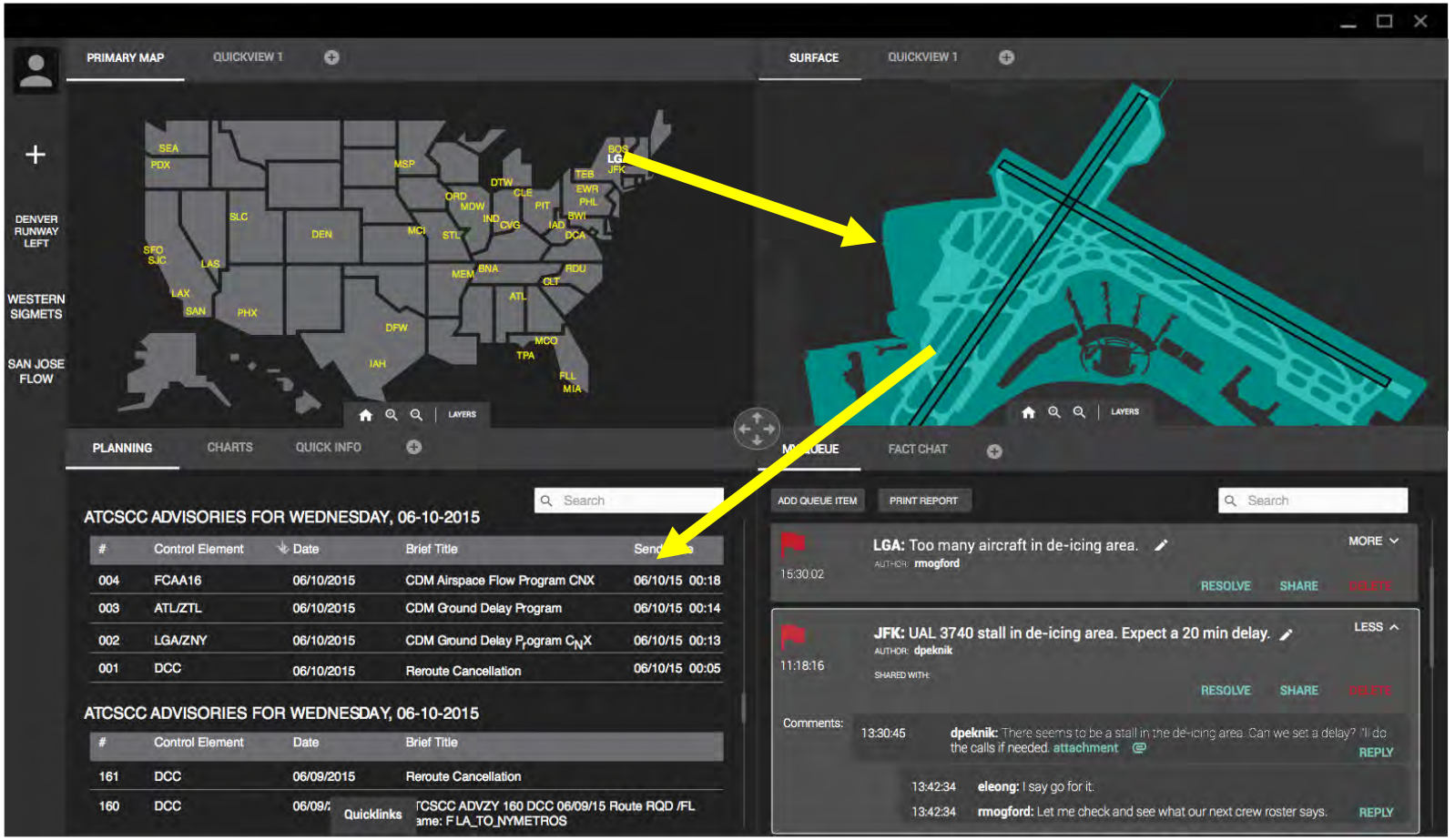


Winter Weather Airport Capacity Model

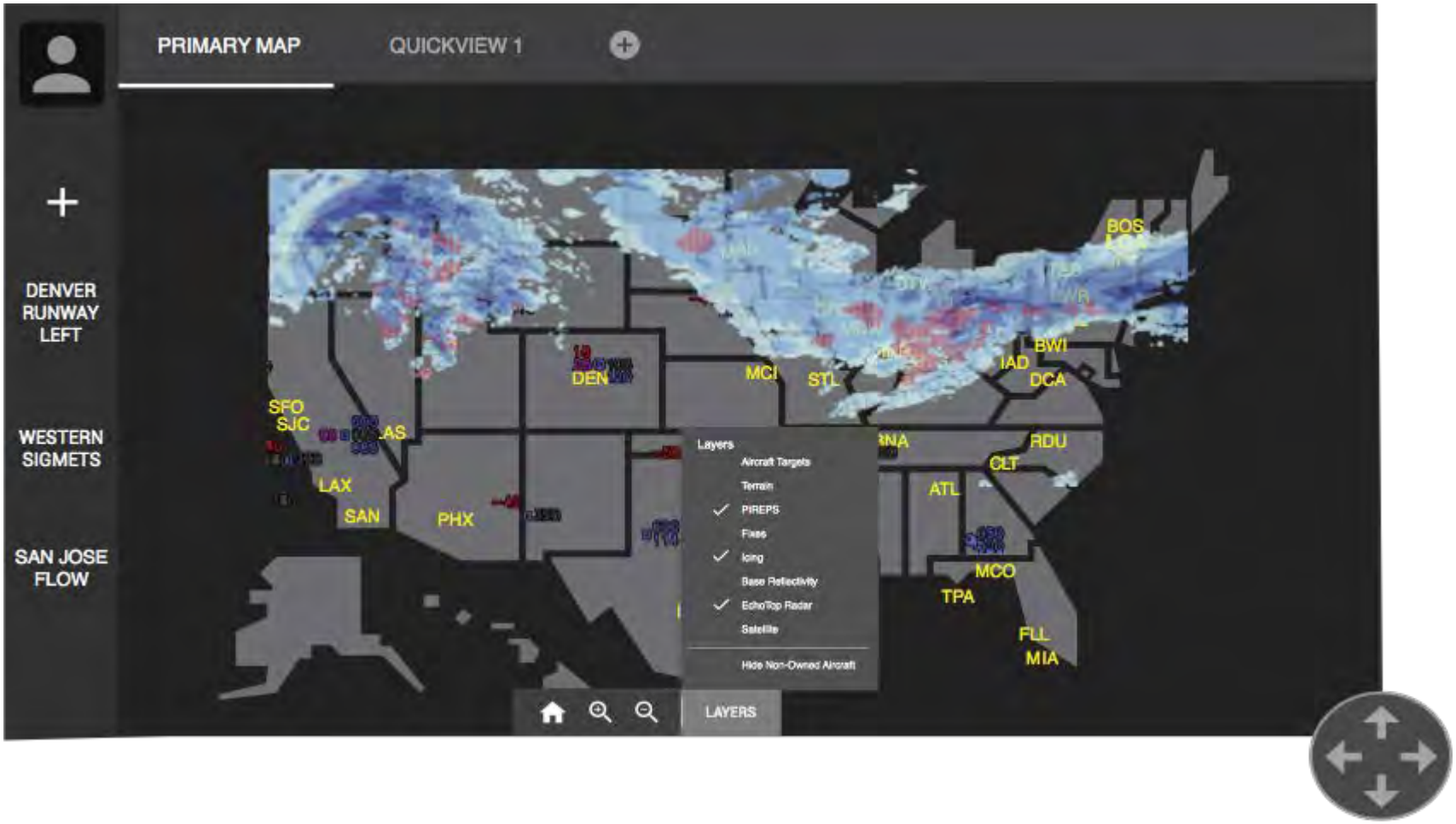
FACT User Interface Design



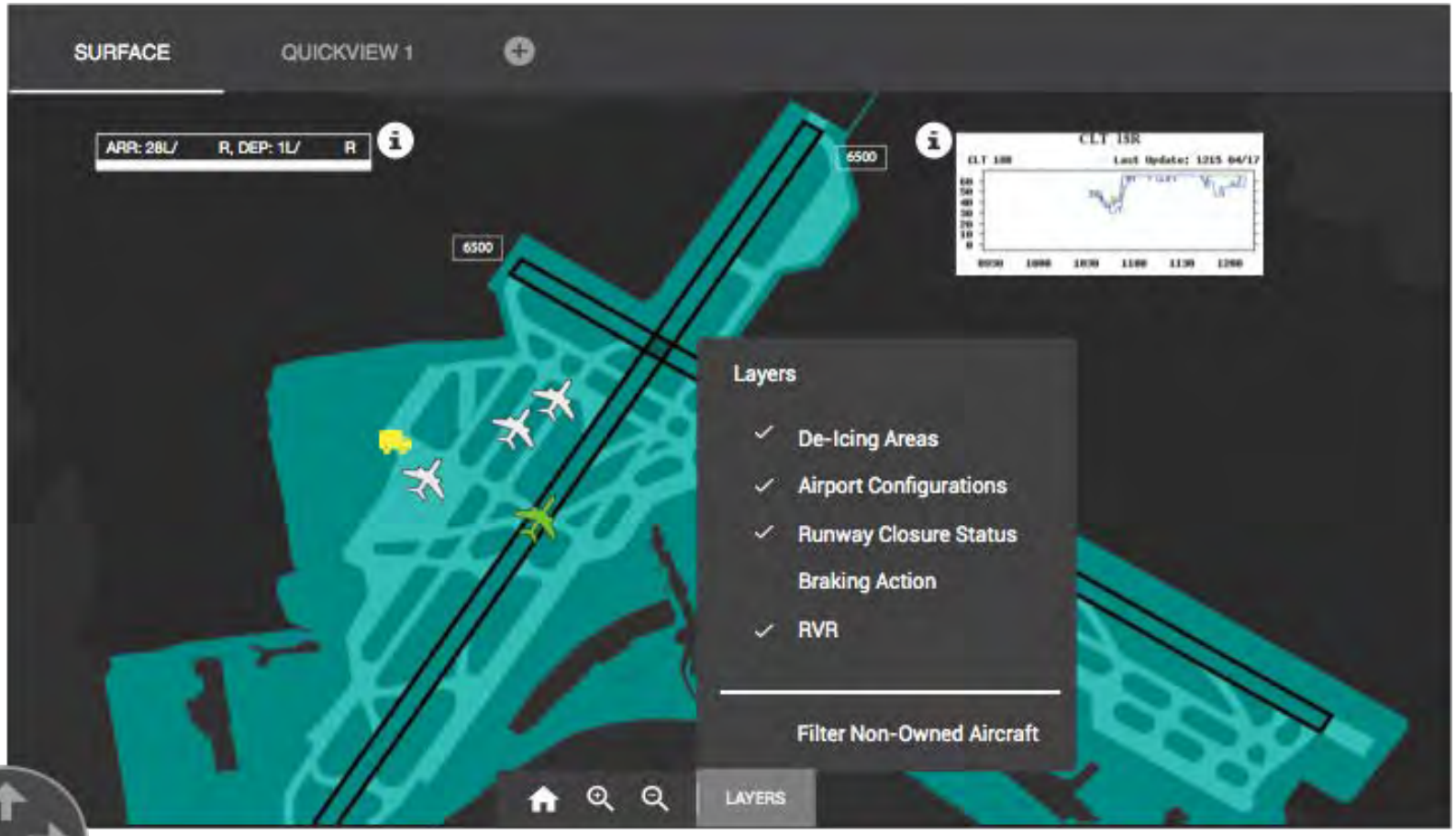
FACT User Interface Design



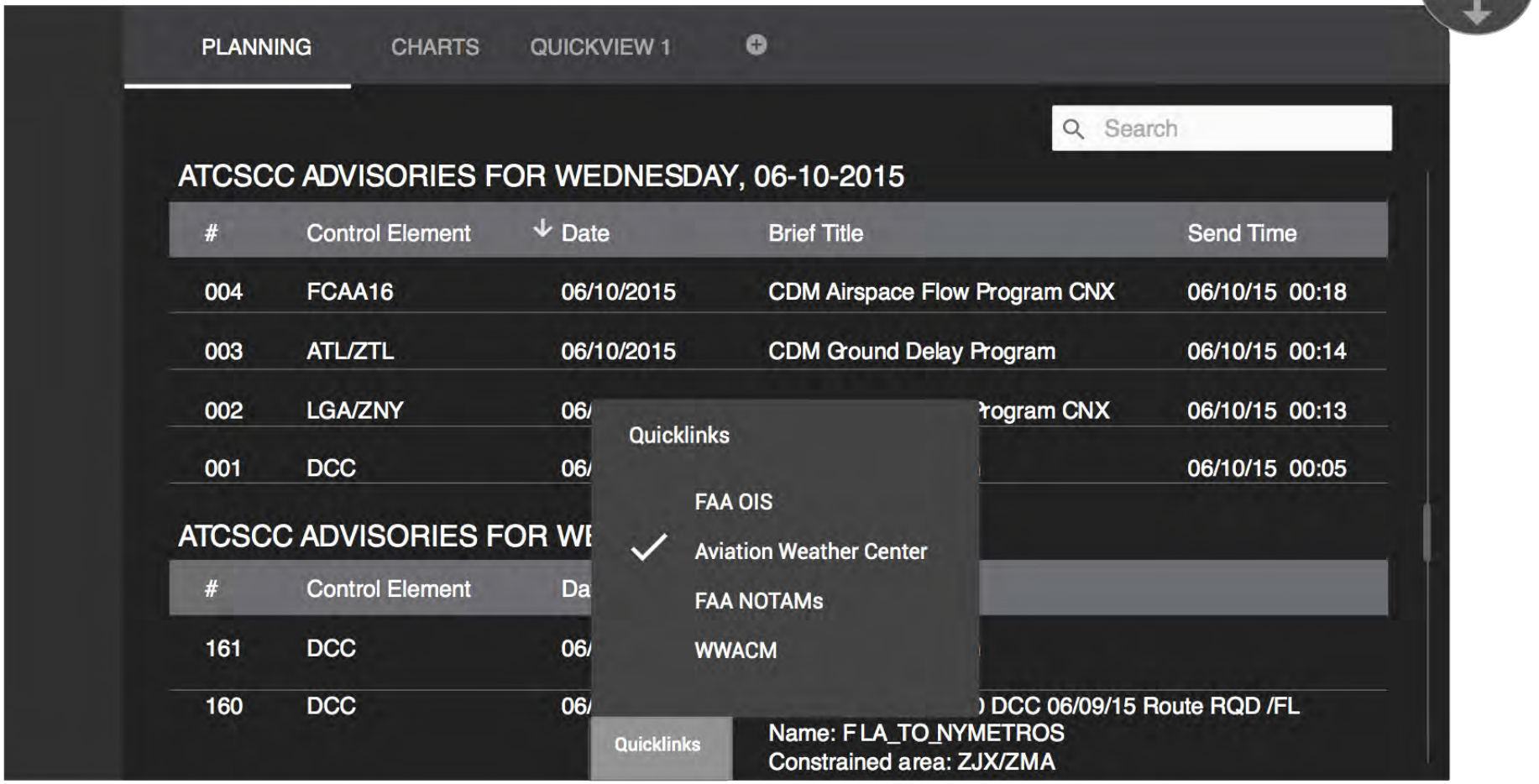
FACT Primary Map View



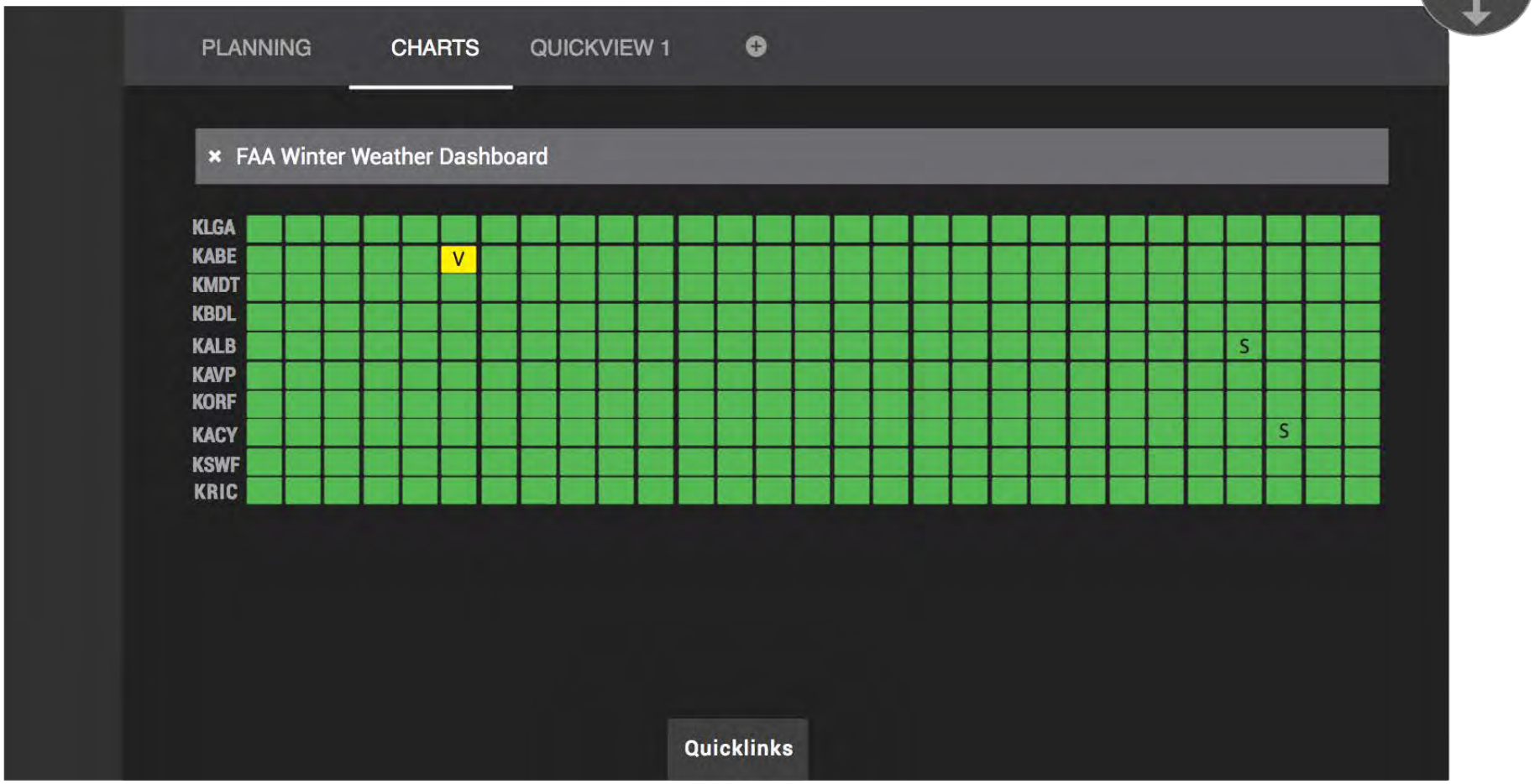
FACT Surface Map View



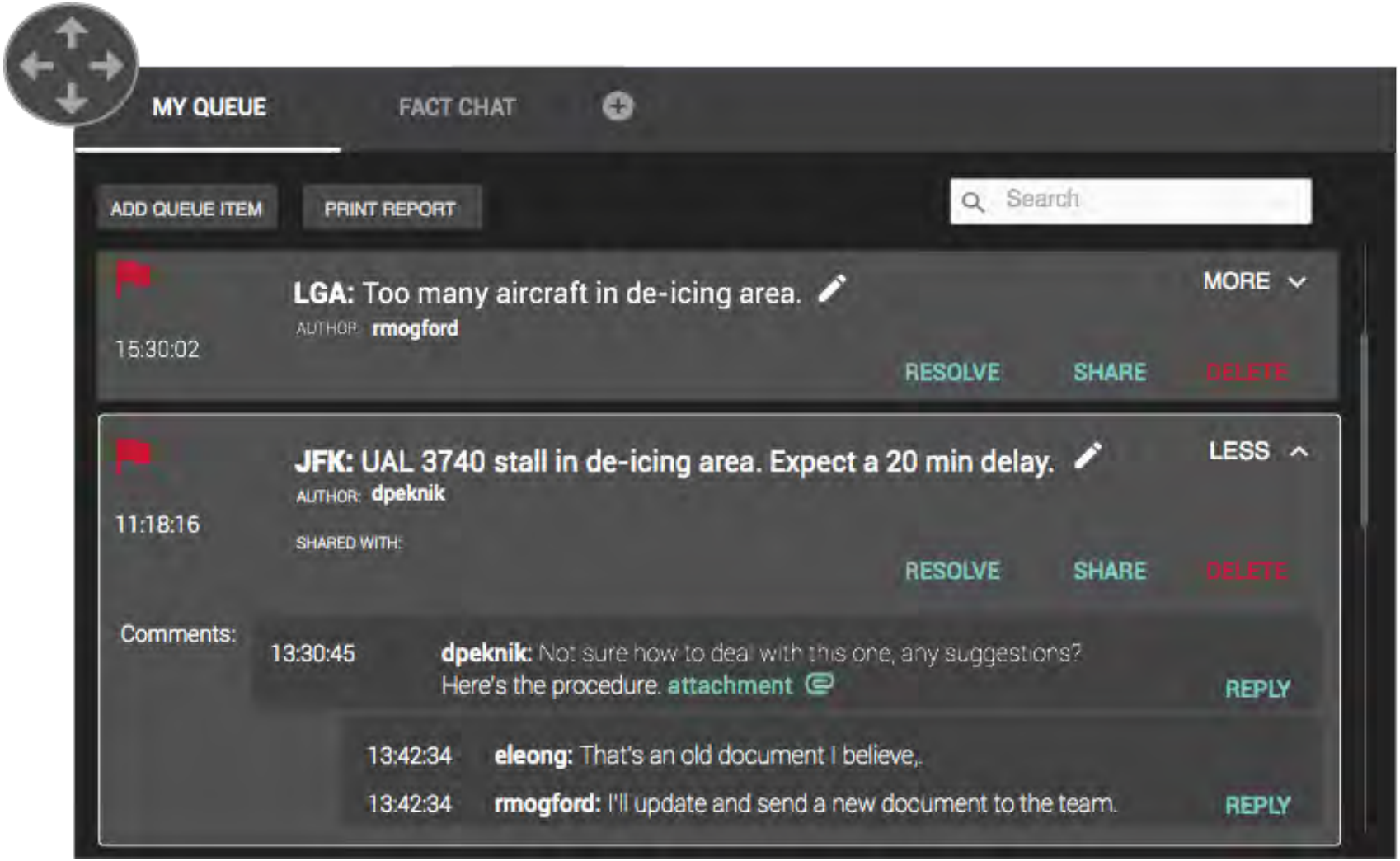
FACT Information View



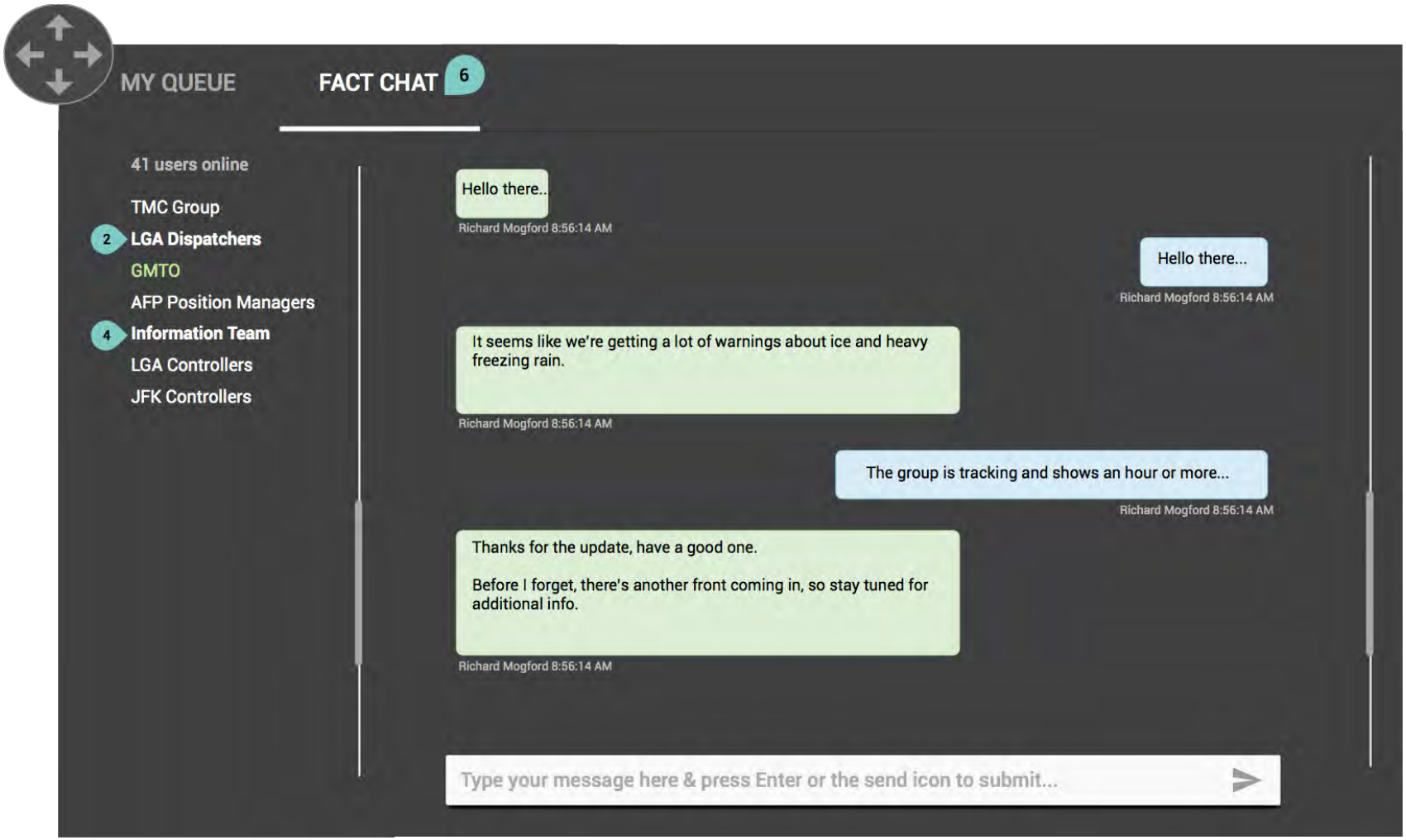
FACT Information View (Graphical)



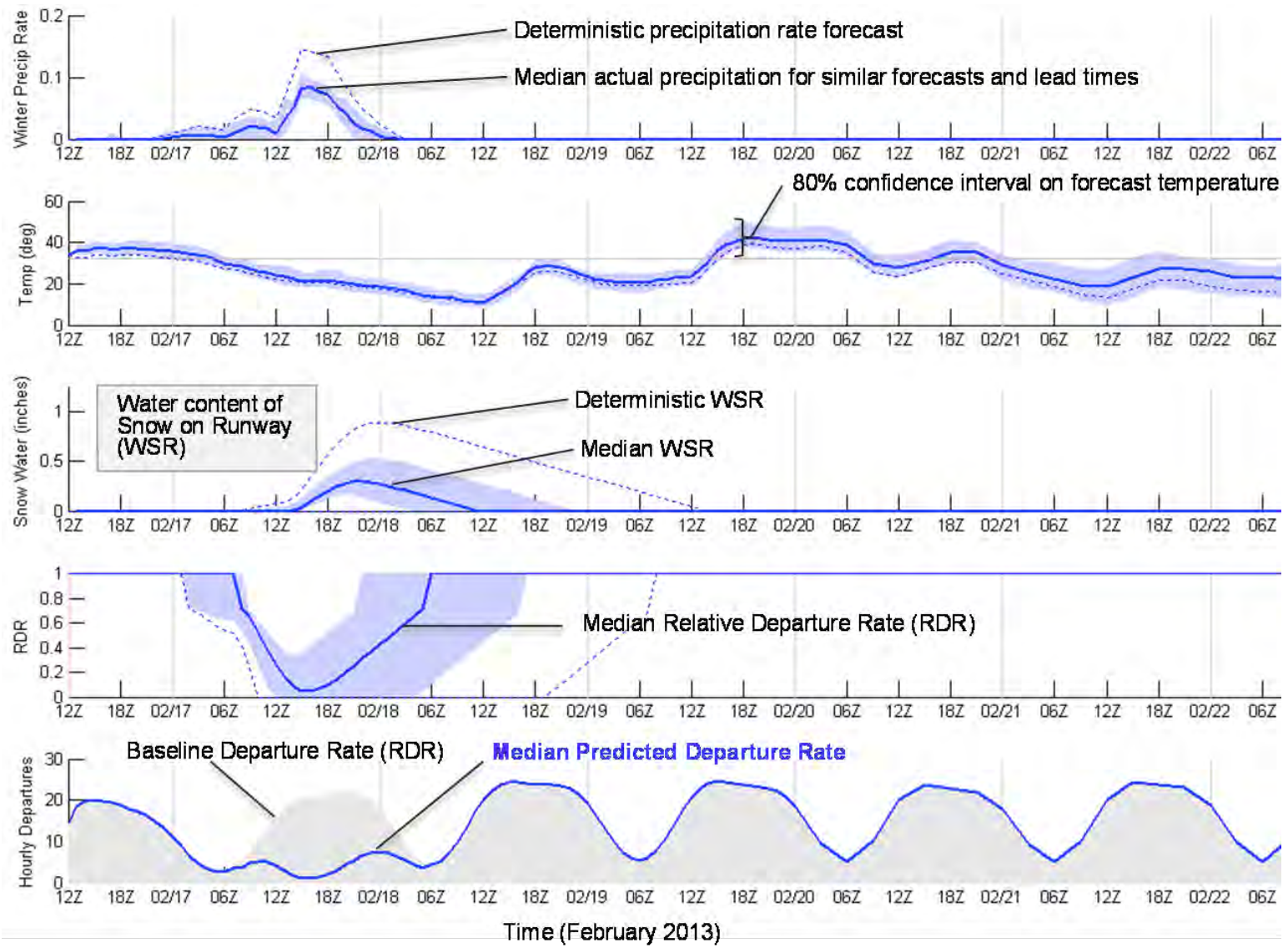
FACT Communication View (MyQueue)



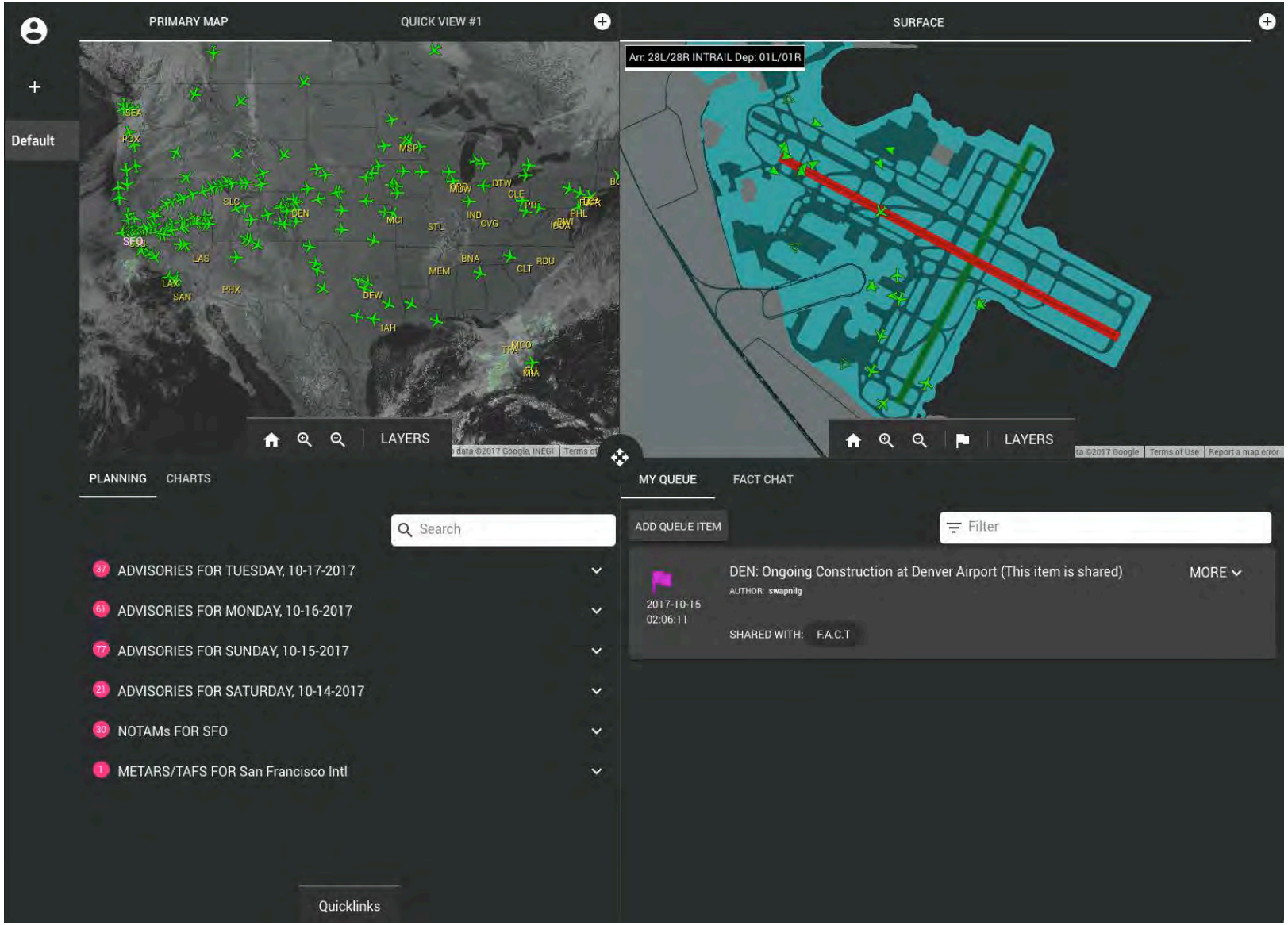
FACT Communication View (Chat)



Winter Weather Airport Capacity Model



FACT Prototype



FACT Status

- User interface designed and web-based prototype development completed
- Showing FACT to airlines to request feedback on functionality and user interface design
- Developing a cooperative work agreement with United Airlines for use of FACT
- FACT is available to be integrated into existing tools

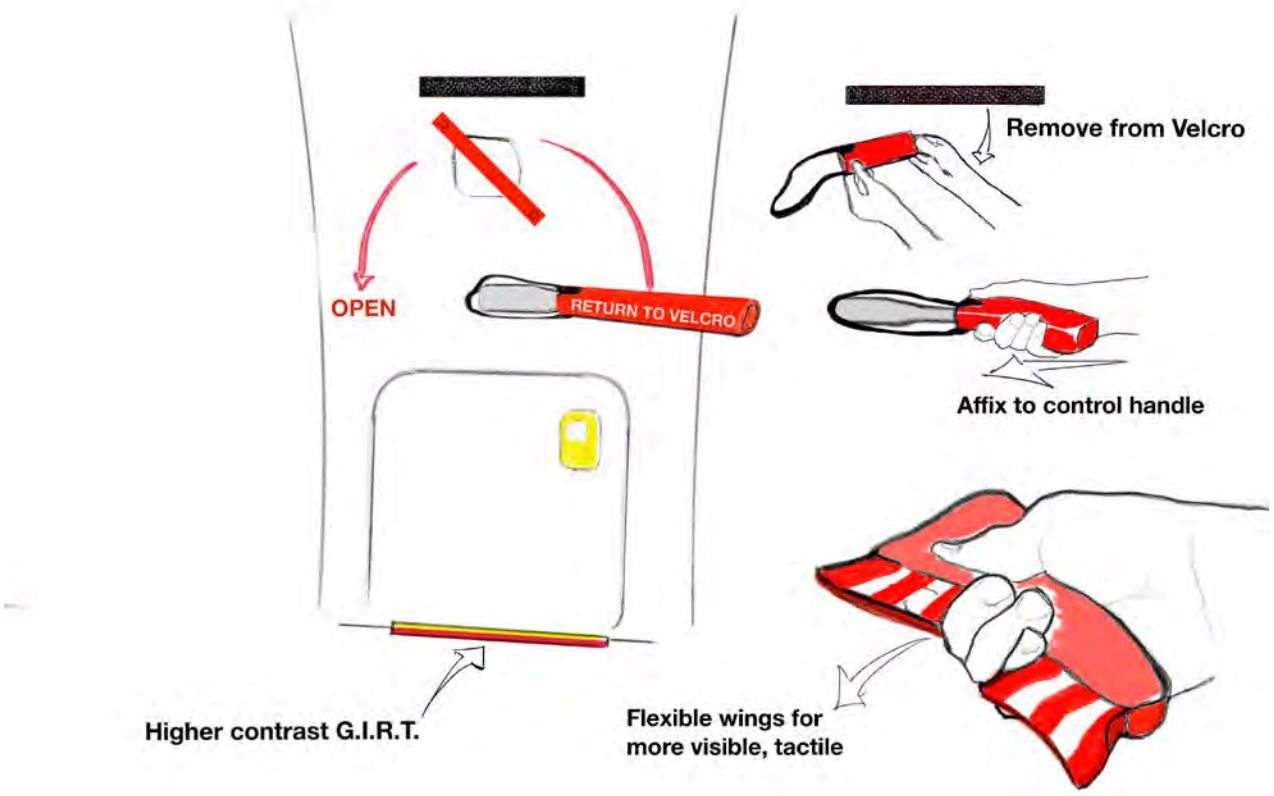
Inadvertent Door Slide Activation

- The AORG investigated inadvertent door slide activations
- May occur if cabin crew does not disarm doors upon arrival
- If the slide partially deploys, the resulting disruption can be costly due to maintenance and schedule delays
- Initial design of a door handle cover “reminder” solution has been drafted for consideration

Door Slide Mechanism (Boeing 737)

Door slide is armed by hooking a bar (1) under clips (2) on cabin floor. Red strap (3) is fastened over the window to alert jet bridge personnel that the door is armed. Bar is removed from clips to disarm.

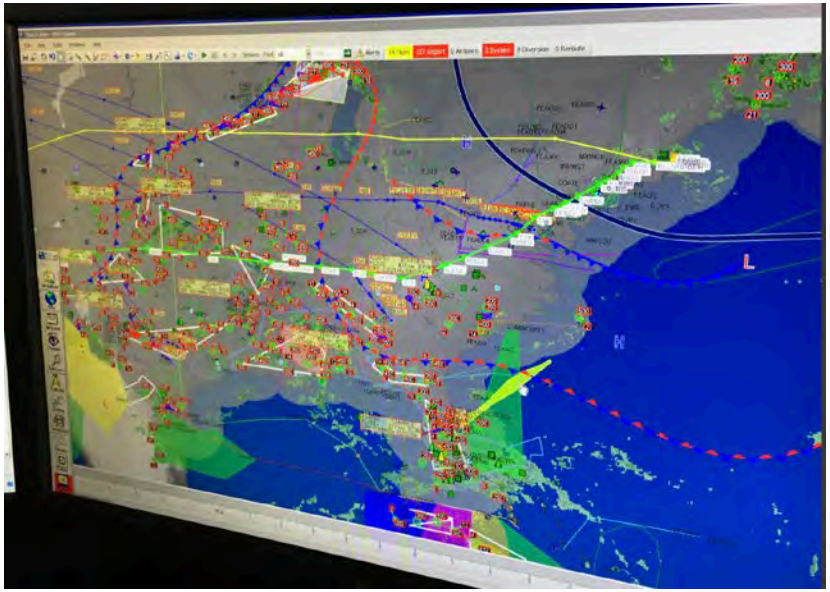
Door Slide Sleeve



Add a red fabric sleeve that slips over the door handle when crew member arms the door slide. Crew member will feel the cover when they start to open the door if the slide is still armed.

Human Factors Study

- Completed a human factors evaluation of dispatch operations at three major airlines
  - Documented dispatcher tasks and work environment
  - Discussed current methods of assessing dispatcher workload
  - Reviewed typical situation and planning displays
  - One of the first studies of its kind



Turbulence Detection Study

- Initiated a study at the University Corporation for Atmospheric Research (UCAR) on turbulence
  - Clear air turbulence is a major problem and causes injuries and damage
  - NASA Langley has a prototype ground-based system for locating turbulence out to 300 km using acoustic arrays
  - Initiated a study with UCAR to evaluate the feasibility of an acoustic system
  - Early indications support Langley approach
  - Report due mid-2018

Infrasonic array installed at NASA Langley

Ramp Incident Research

- Worldwide, ramp incidents cause damage to vehicles and aircraft and cost airlines about $10 billion each year
- Ramp is a very busy area with multiple vehicles and personnel operating on under time pressure
- NASA analyzed several years of ramp incident data for a major airline
- Most frequent events:
  1. Tow bar shear pin breakage
  2. Damage to aircraft by provisioning trucks
  3. Damage to aircraft by belt loader positioning
- Highest out of service costs resulted from:
  1. Towing/pushback
  2. Vehicle movement
  3. Cargo operations
- The AORG will be continuing the analysis of ramp activities

Ramp Incident Data

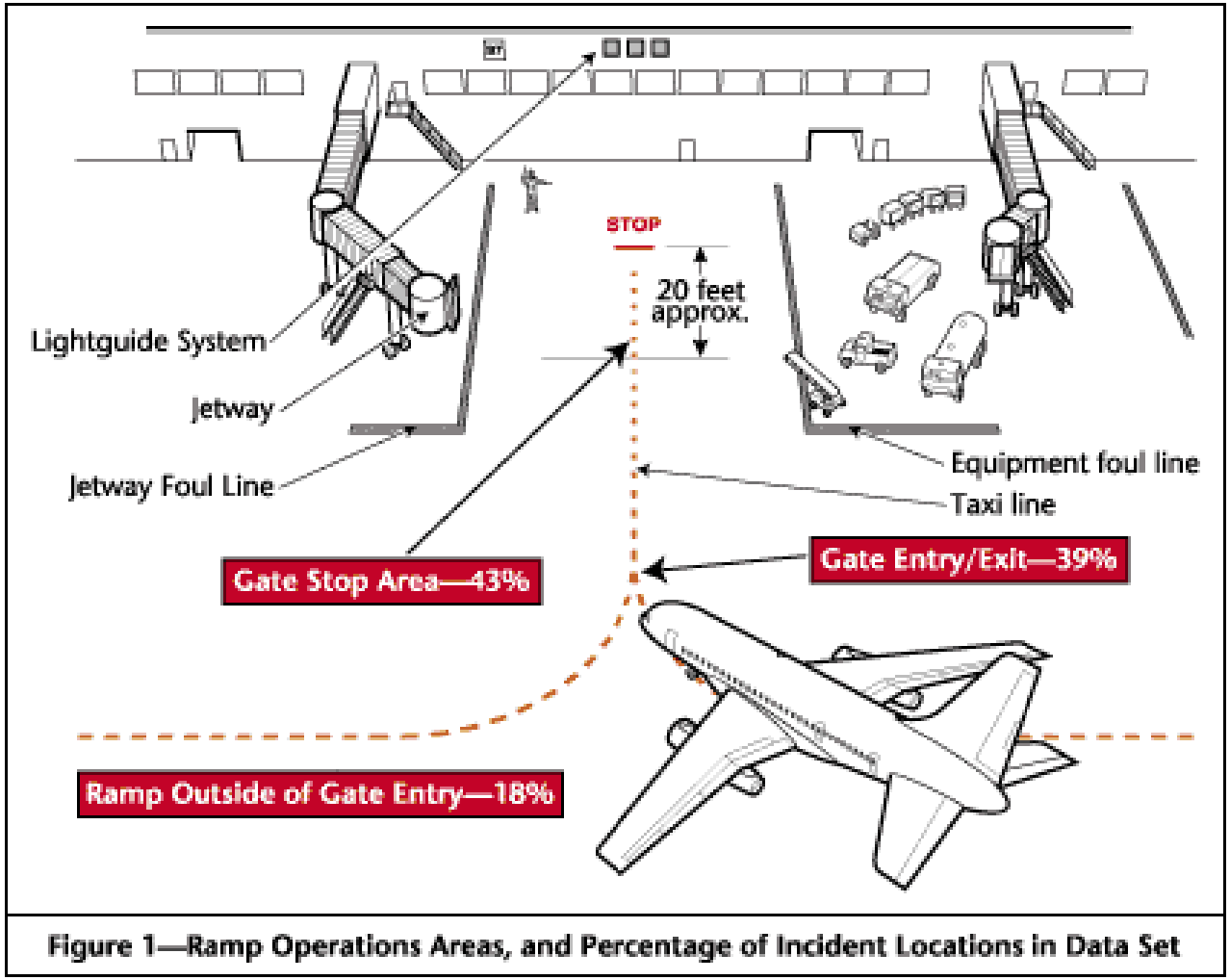


Figure 1—Ramp Operations Areas, and Percentage of Incident Locations in Data Set

Accident Percentages in Aircraft Clearance Zones

(from Aviation Reporting Safety System data)

Questions?

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