



National Aeronautics and Space Administration

Flight Awareness Collaboration Tool

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Airline Operations Center



- An airline operations center (AOC) is an airline's global headquarters for aircraft dispatchers and other personnel
- Dispatchers have the authority to originate and terminate flights
- They generate flight plans and monitor flights throughout their routes
- AOCs also provide other functions, such as crew scheduling
- AOCs may be referred to as operations centers, operations control centers, network operations, etc.



AOC Positions

- Dispatchers
- Operations Managers
- Traffic Management Unit
- Crew Schedulers
- Maintenance
- Meteorologists
- Medical Personnel
- (Customer Service)

Dispatcher Responsibilities



- Dispatcher monitors multiple flights throughout all stages of the flight plan - from pre-flight to en route to landing and dispatch cancellation or re-dispatch.
- The pre-flight stage is when the dispatcher determines the weight and balance of the aircraft, the most optimal route to fly, and calculates the fuel required.
- The en route stage is when the dispatcher monitors flight progress and issues any weather or safety information that has not already been shared with the flight deck.
- Convective or winter storm development as well as any FAA traffic management initiatives are some of the information that may be shared with the flight deck.

Dispatcher Workstation



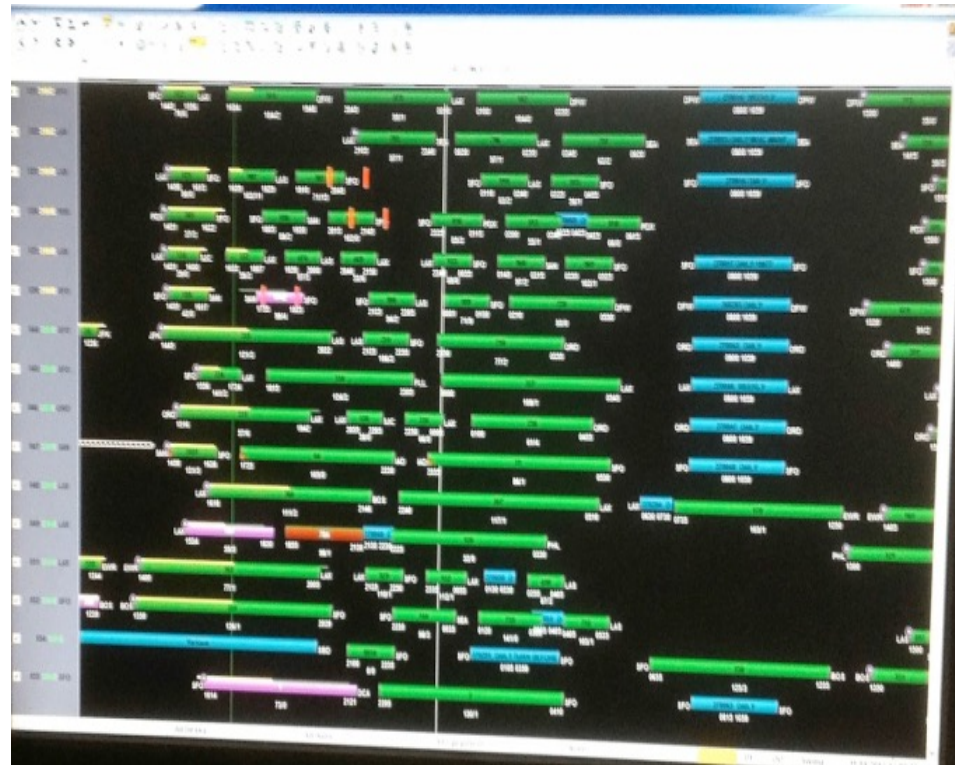
- Left Screen: Tails management
- Middle Screen: Flight Planning, general information, or Aircraft Communications Addressing and Reporting System (ACARS) messaging
- Right Screen: Weather, flight tracking, or any pertinent information
- A phone/air-ground radio is available to receive and dial calls to other personnel in the building and pilots at the airports



Dispatcher Tails Management



- Virgin America uses a Sabre Airline Solutions program to track all of their flights
- Allows users to visually track crews, maintenance, aircraft assignments, passenger/cargo loads



Dispatcher Release



- All of these items are sent to the pilot for review and sign-off

Briefing Package for LAS

Briefings for Flight : VRD 905 on 2013-11-14

File	Product	Time Created	Creator	
	AFP12	Nov 14 2013 4:38PM	Leo BLANCO	save
	OFF	Nov 14 2013 4:54PM	Leo BLANCO	save
	MET	Nov 14 2013 4:54PM	Leo BLANCO	save
	WIND	Nov 14 2013 4:54PM	Leo BLANCO	save
	NOTAM	Nov 14 2013 4:54PM	Leo BLANCO	save
	GRAPH	Nov 14 2013 4:54PM	Leo BLANCO	save
	SIG	Nov 14 2013 4:54PM	Leo BLANCO	save
	TLR	Nov 14 2013 4:54PM	Leo BLANCO	save
	CREW	Nov 14 2013 4:54PM	Leo BLANCO	save

Print All Save All Products

Dispatch Release



- The dispatcher prepares a dispatch release for the upcoming flight (at Virgin America they prepared releases up to one hour in advance).
- Both the captain of the flight and the dispatcher must sign the dispatch release for it to be valid.
- Dispatch release includes all pertinent information (e.g., takeoff and destination alternate airports, pertinent weather, minimum equipment list (MEL) items).

Dispatcher Workload

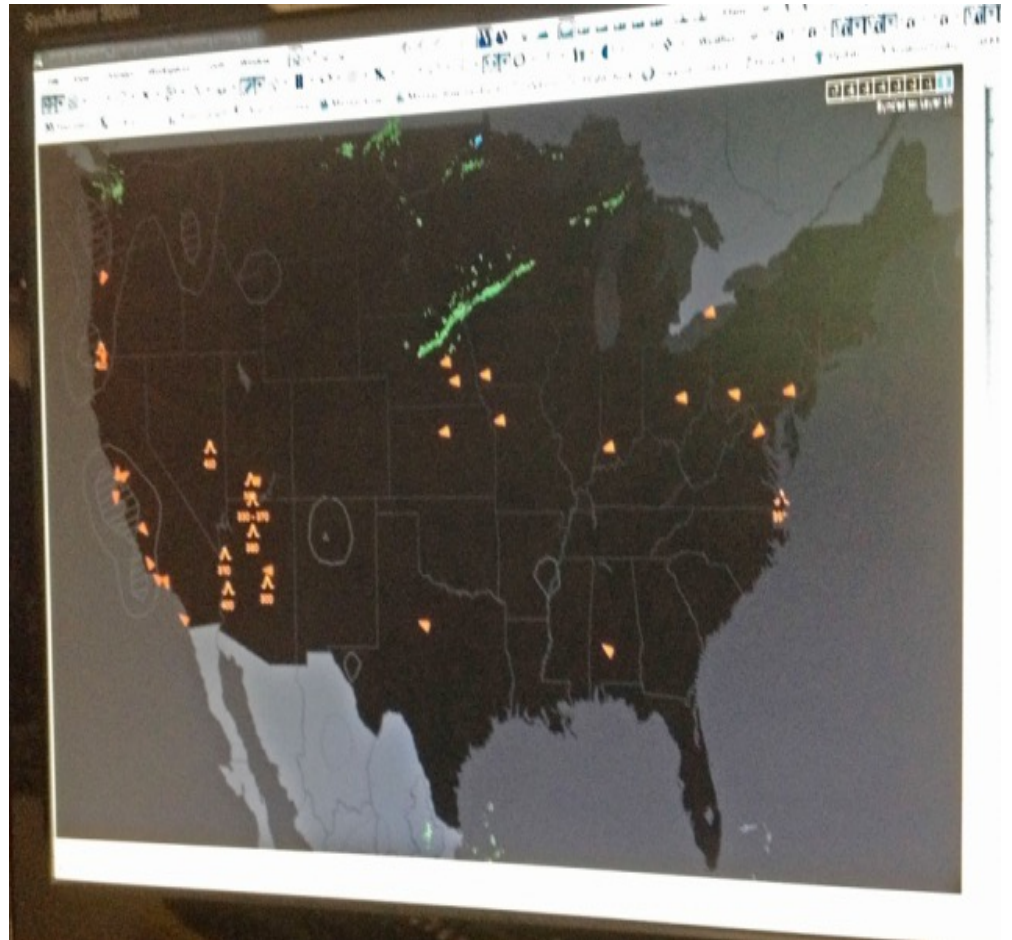


- 20-40+ flights before relief dispatcher arrives
- Relief dispatcher takes flights from all on-duty dispatchers
- Relief dispatch assumes responsibility for operational control of flights that are in multiple stages of progress
- Day shift: ~50 flights between four dispatchers (~13 flights each)

Weather



- All own airline flights are displayed as well as any turbulence or weather
- Other airlines flights can be presented



Crew Scheduling



- Handles coordination of aircraft crews
- Monitors the duty time of crew members and adjusts crews accordingly
- Pilots have limited amounts of hours they can work in a week, a month, or a year
- Relays any crew delay information to the appropriate dispatcher

Maintenance



- Responsible for scheduling maintenance at the airport
- Uses Minimum Equipment List (MEL) for each type of aircraft in the fleet
- Receives messages from dispatch and pilots about MEL items
- Has a direct line to the pilot if troubleshooting needed on flight deck

Minimum Equipment List for Maintenance



- This list tells maintenance that the flight will be safe to continue, depending on conditions

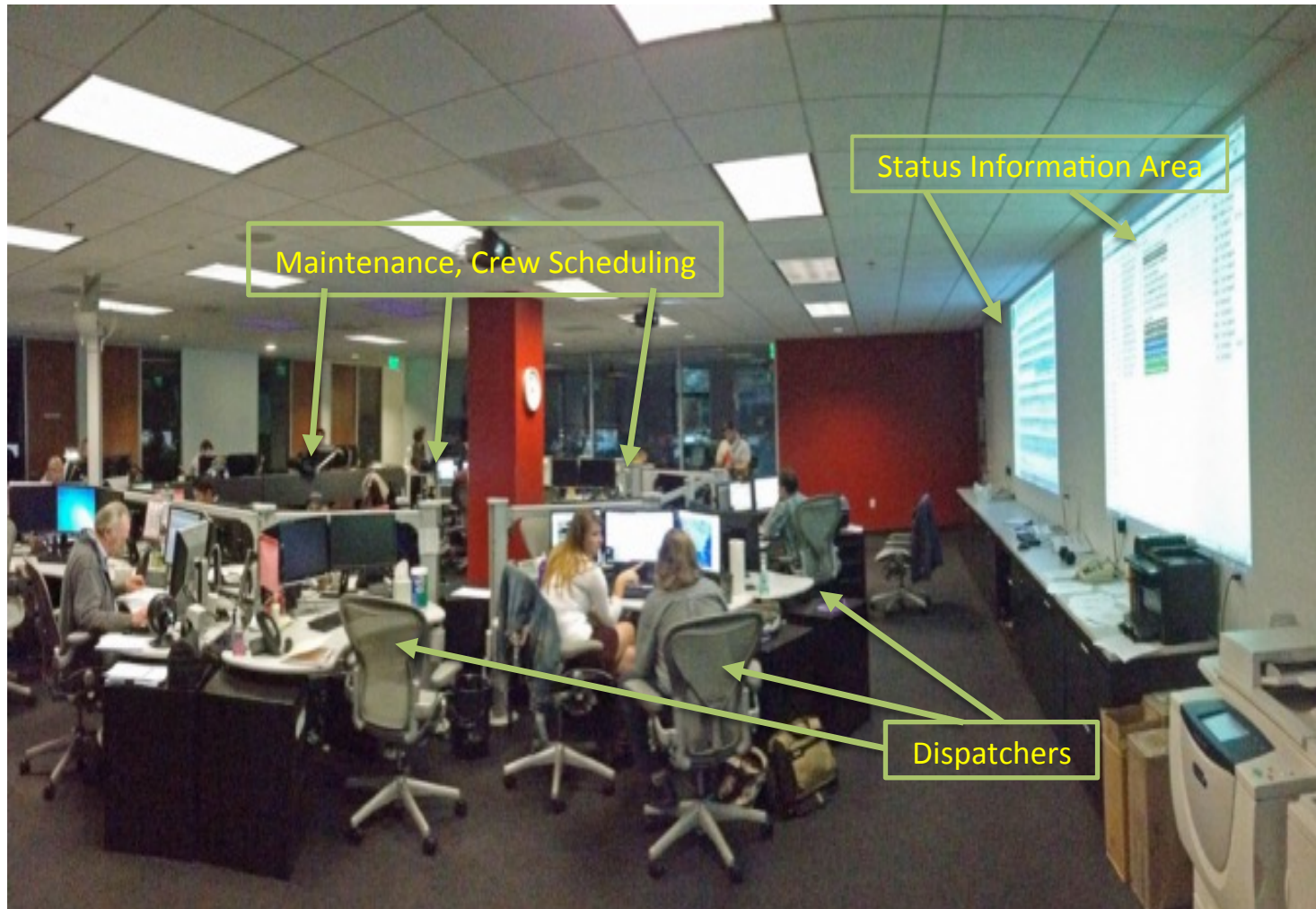
U.S. DEPARTMENT OF TRANSPORTATION		MASTER MINIMUM EQUIPMENT LIST	
FEDERAL AVIATION ADMINISTRATION			
AIRCRAFT: BOEING B-777		REVISION NO: 20	PAGE:
		DATE: 04/14/2014	21-9
SYSTEM & SEQUENCE NUMBERS	ITEM	1.	2. NUMBER INSTALLED
21 AIR CONDITIONING			3. NUMBER REQUIRED FOR DISPATCH
			4. REMARKS OR EXCEPTIONS
-27-16	Flight Deck Equipment Cooling System (777F)	C	1 0
		(M)(O) May be inoperative provided: a) Equipment cooling three-way valve is deactivated closed, and b) Procedures are established and used to verify main deck cargo compartment remains empty or contains only ballast, empty cargo handling equipment (ballast may be loaded in ULDs), or fly away kits. NOTE: Operator MELs must define which items are approved for inclusion in the fly away kits and which materials can be used as ballast.	

Traffic Management Unit



- The AOC Traffic Management Unit watches the National Airspace System closely to monitor delays and holding programs being implemented that would impact the airline
- Provides liaison with the Federal Aviation Administration (FAA)
- Delay information is processed and passed to the dispatcher for each flight impacted
- This position may be combined with the meteorology position in some AOC layouts

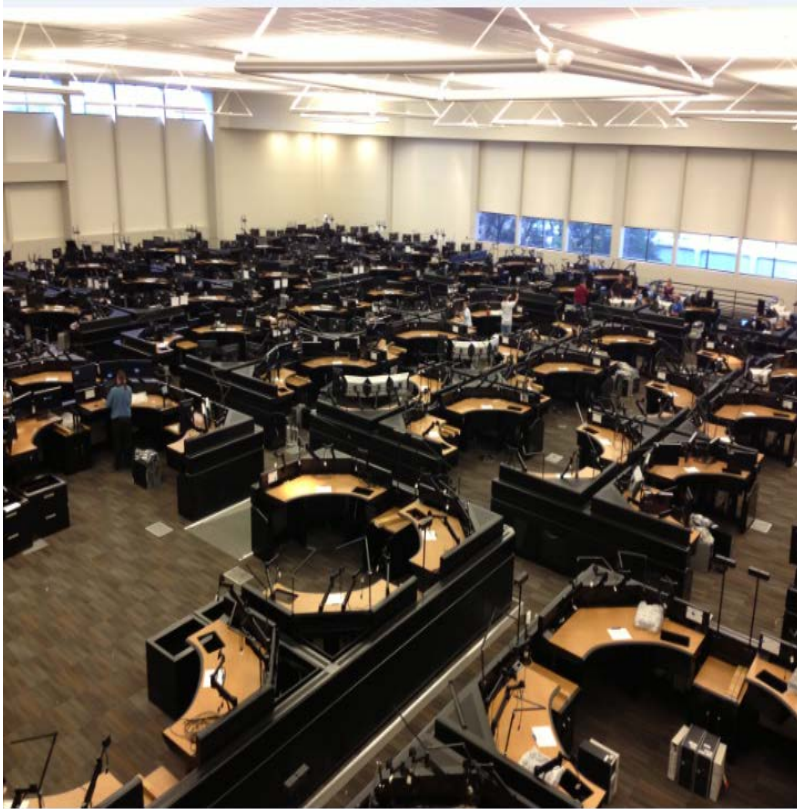
Virgin America AOC



Other Airline Control Centers



American
Airlines



United
Airlines





Medical Personnel

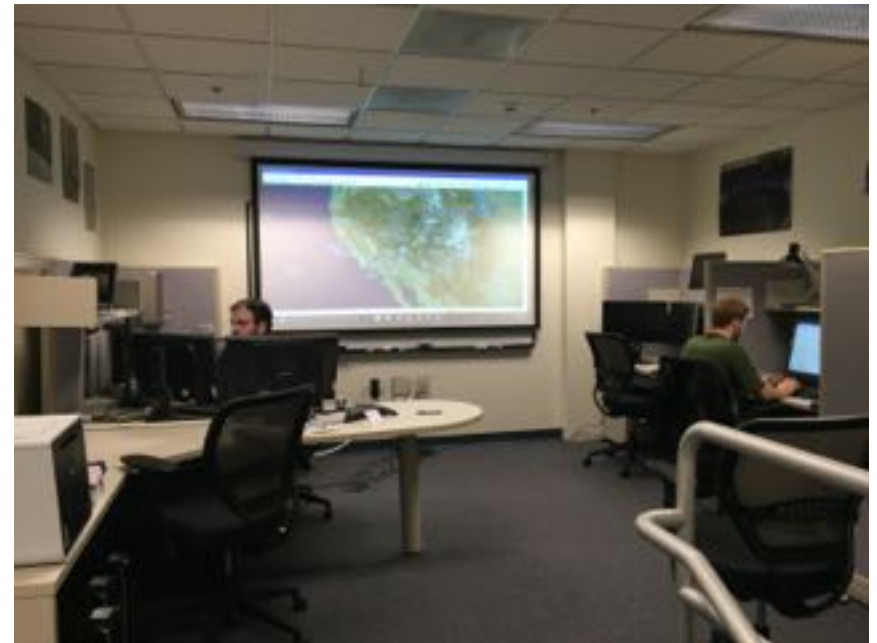
- Answer any calls regarding in-flight medical emergencies
- Doctors are on-call to help with any situation dealing with passengers and flight crew health
- All calls are done via phone and passed to the appropriate dispatcher and flight
- Dispatcher mediates the calls between medical and the flight deck

NASA Research Areas



- AOC automation
 - Applied advanced “cognitive computing” systems to airline operations
 - Objective was to improve access to documents (e.g., FAA Regulations, airline procedures, etc.) and Internet resources
- Winter weather operations
 - Developing automation tool to improve airport operations during winter storms
 - Objective is to reduce cancelations and delays due to winter weather
- Created AOC laboratory to support research
 - At NASA Ames in the Human Systems Integration Division

Airline Operations Research Group (AORG)



Cognitive Computing



- Contracted with IBM for a feasibility study to apply Watson to support the AOC
- Delivered report in December 2015
- Report outlines how Watson could be applied to the AOC to improve access to and interpretation of the large amounts of data needed by dispatchers and other airline personnel



Cognitive Computing



- Cognitive computing systems are trained using artificial intelligence and machine learning algorithms to sense, predict, infer and, in some ways, think
- They can process natural language and unstructured data and learn by experience, much in the same way humans do
- They help human experts make better decisions by penetrating the complexity of “Big Data”
- Cognitive computing systems improve over time as they build knowledge and learn a domain
- By using visual analytics and data visualization techniques, cognitive computers display data in a visually compelling way that enlightens humans and helps them make decisions
- IBM has already developed and demonstrated cognitive computing in industry and medicine

The above is quoted from: <http://www.research.ibm.com/cognitive-computing>

Winter Weather



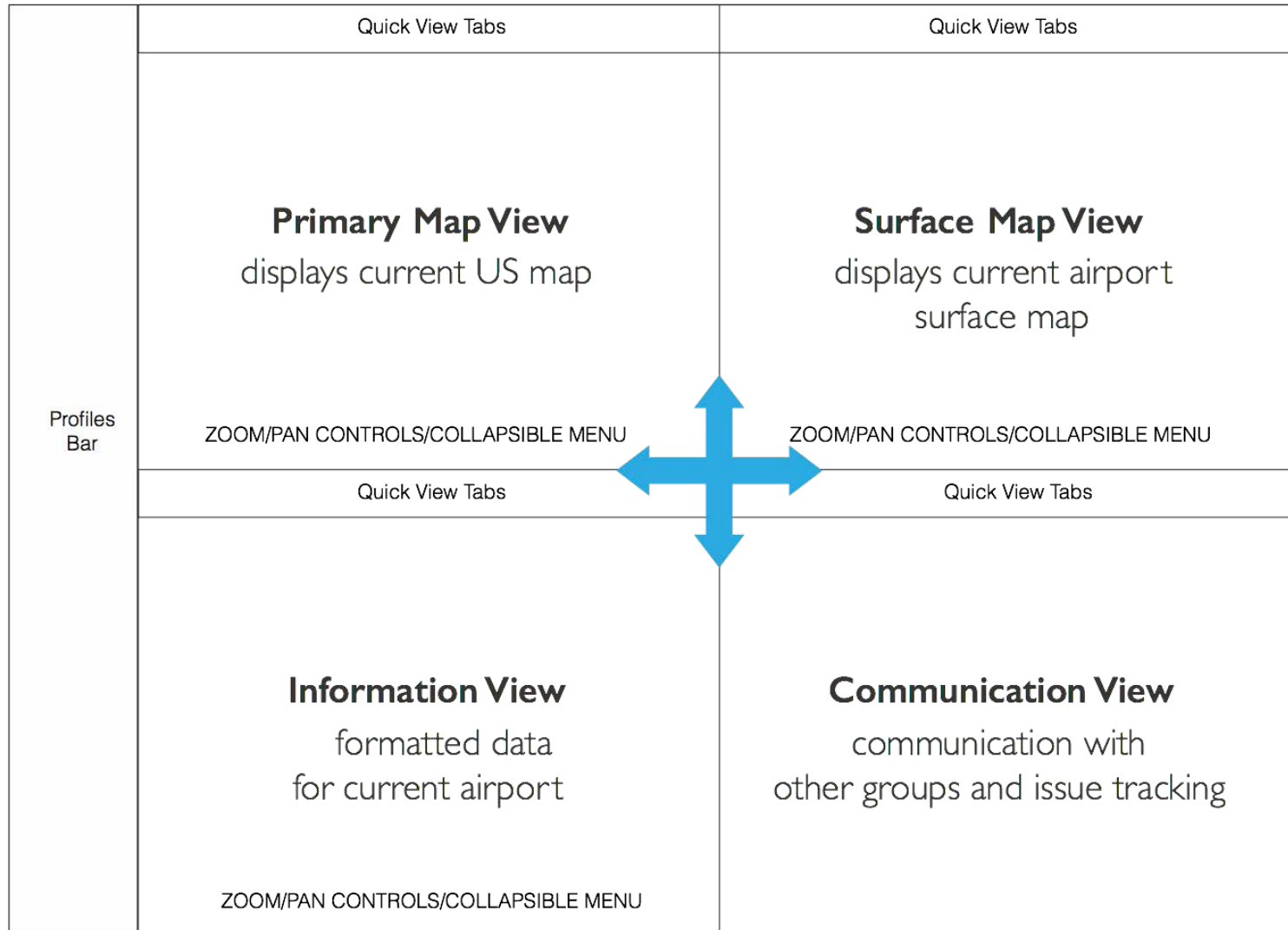
- Developing the “Flight Awareness Collaboration Tool” (FACT)
- Concentrates information about winter weather events on one display
- Includes predictive tools
- Supports collaboration between AOC, air traffic control, airport authority, and de-icing operators
- User interface designed completed and web-based prototype ready
- User group at Detroit airport
- Space Act Agreement with Virgin America to support FACT evaluation
 - Backup AOC located at NASA Ames

FACT Information



- Weather status and forecasts
- Reporting of runway closures for snow/ice treatment
- Runway braking action
- Visual display of surface traffic movement at airport
- Hourly arrival and departure rates
- Airport runway configuration
- De-icing areas
- Notices to Airmen
- Field conditions
- FAA Operational Information System
- Aviation Digital Data Service icing information
- Runway visual range
- Tracking of arrival flights in en route airspace

FACT User Interface Design



FACT User Interface Design



The screenshot displays the FACT User Interface, which is divided into several sections. On the left, there is a sidebar with a user profile icon, a search bar, and a list of locations: DENVER RUNWAY LEFT, WESTERN SIGMETS, and SAN JOSE FLOW. The main area is split into two panels: 'PRIMARY MAP' and 'SURFACE'. The 'PRIMARY MAP' panel shows a map of the United States with various airports labeled. The 'SURFACE' panel shows a detailed view of an airport's surface, with a yellow arrow pointing to a specific area. Below the maps, there is a 'PLANNING' section with a search bar and a table of advisories. The table has columns for '#', 'Control Element', 'Date', 'Brief Title', and 'Sent'. The 'QUEUE' section on the right shows a list of advisories with a search bar and buttons for 'ADD QUEUE ITEM' and 'PRINT REPORT'. A yellow arrow points from the 'QUEUE' section to the 'SURFACE' panel.

ATCSCC ADVISORIES FOR WEDNESDAY, 06-10-2015

#	Control Element	Date	Brief Title	Sent
004	FCAA16	06/10/2015	CDM Airspace Flow Program CNX	06/10/15 00:18
003	ATL/ZTL	06/10/2015	CDM Ground Delay Program	06/10/15 00:14
002	LGA/ZNY	06/10/2015	CDM Ground Delay Program CNX	06/10/15 00:13
001	DCC	06/10/2015	Reroute Cancellation	06/10/15 00:05

ATCSCC ADVISORIES FOR WEDNESDAY, 06-10-2015

#	Control Element	Date	Brief Title
161	DCC	06/09/2015	Reroute Cancellation
160	DCC	06/09/2015	Reroute Cancellation

QUEUE

LGA: Too many aircraft in de-icing area.
AUTHOR: rmogford
15:30:02
RESOLVE SHARE DELETE

JFK: UAL 3740 stall in de-icing area. Expect a 20 min delay.
AUTHOR: dpeknik
11:18:16
SHARED WITH:
RESOLVE SHARE DELETE

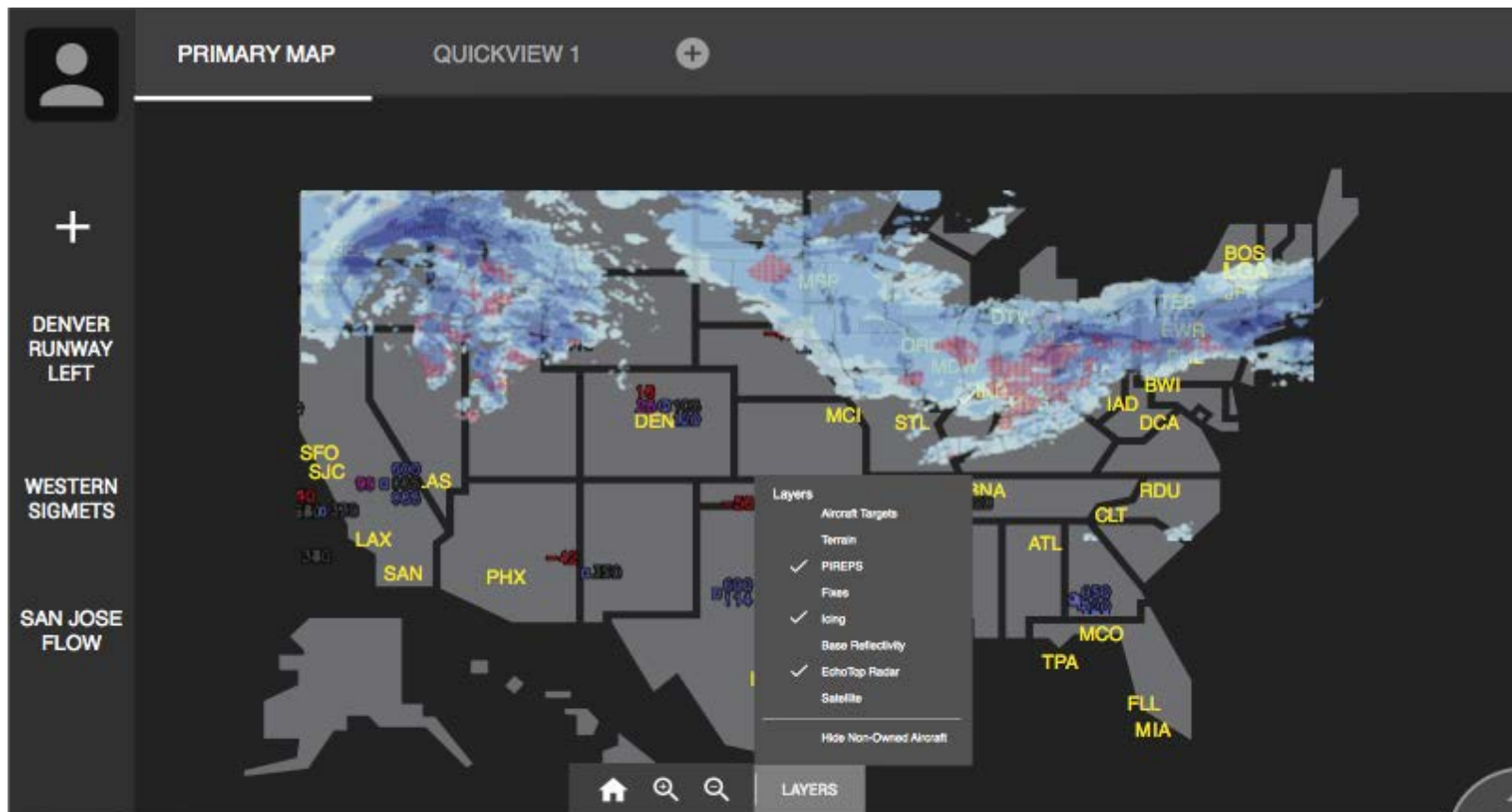
Comments:

13:30:45 dpeknik: There seems to be a stall in the de-icing area. Can we set a delay? "I'll do the calls if needed." attachment REPLY

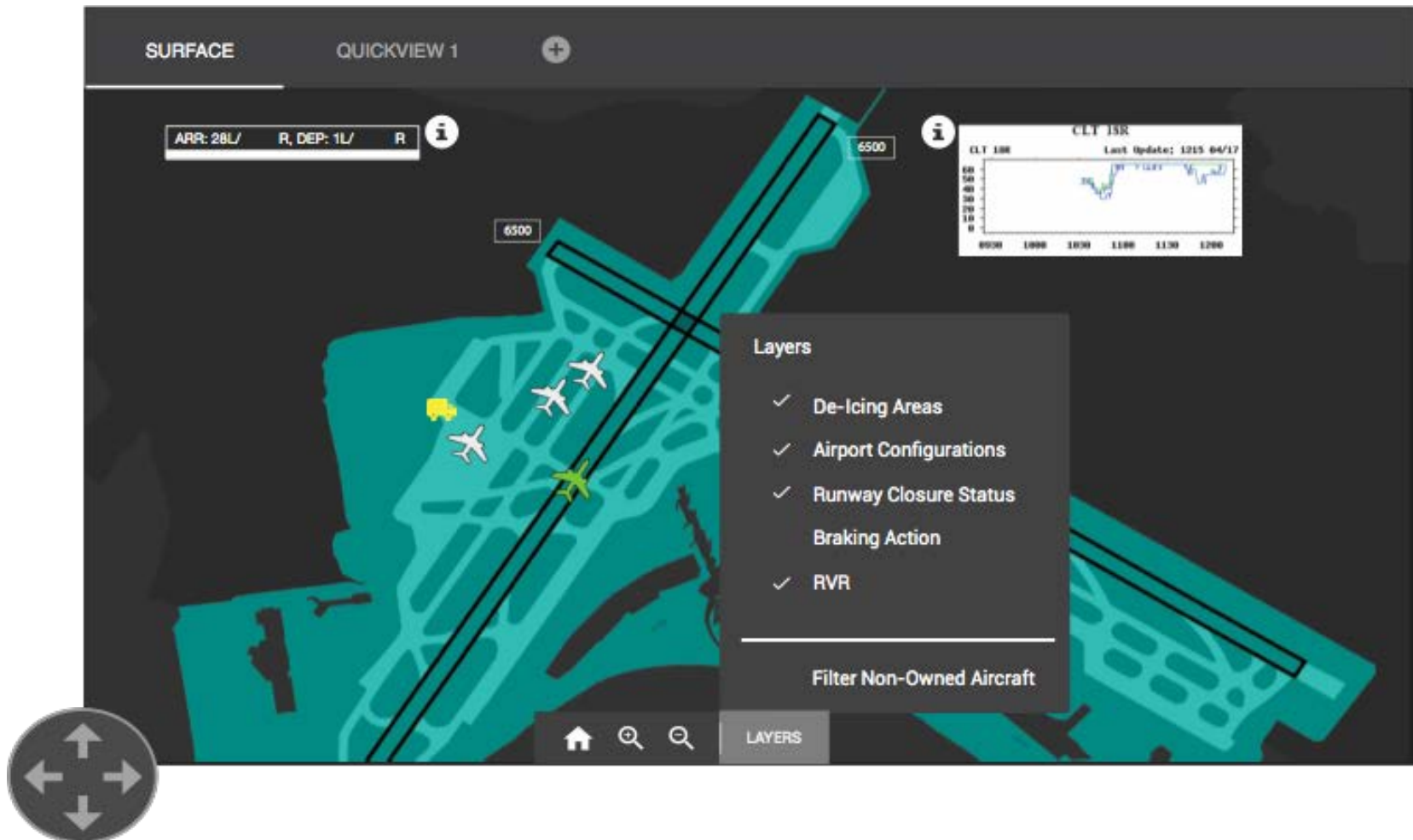
13:42:34 eleong: I say go for it.

13:42:34 rmogford: Let me check and see what our next crew roster says. REPLY

Primary Map View



Surface Map View



Information View



PLANNING CHARTS QUICKVIEW 1 +

ATCSCC ADVISORIES FOR WEDNESDAY, 06-10-2015

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ATCSCC ADVISORIES FOR WEDNESDAY, 06-10-2015

#	Control Element	Date	Brief Title
161	DCC	06/10/2015	
160	DCC	06/10/2015	

Quicklinks

✓

FAA OIS

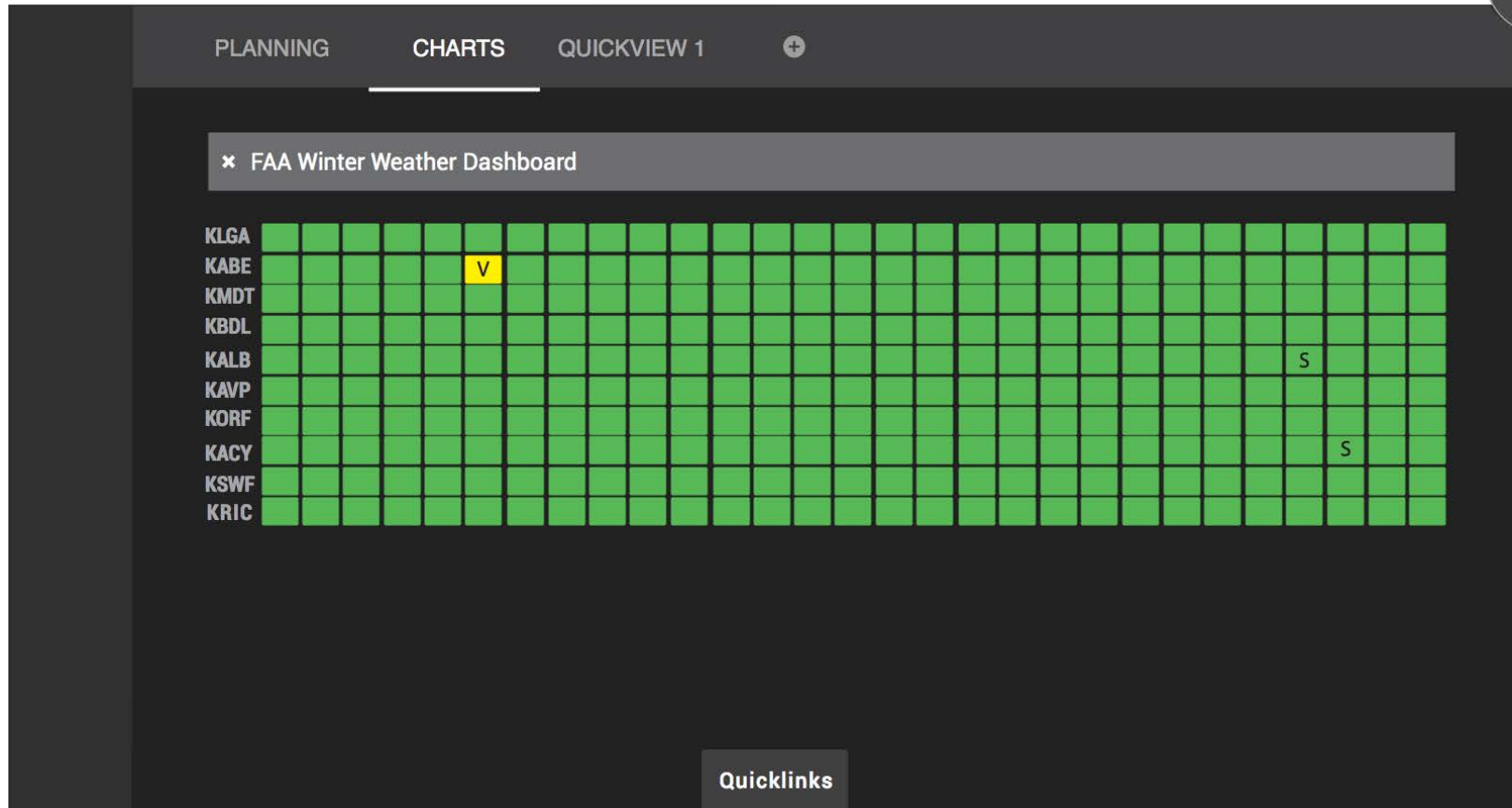
Aviation Weather Center

FAA NOTAMs

WWACM

Quicklinks

Name: FLA_TO_NYMETROS
Constrained area: ZJX/ZMA



Communication View



MY QUEUE **FACT CHAT** +

[ADD QUEUE ITEM](#) [PRINT REPORT](#)

LGA: Too many aircraft in de-icing area.

MORE ▾

15:30:02 AUTHOR: **rmogford**

[RESOLVE](#) [SHARE](#) [DELETE](#)

JFK: UAL 3740 stall in de-icing area. Expect a 20 min delay.

LESS ▲

11:18:16 AUTHOR: **dpeknik**
SHARED WITH:

[RESOLVE](#) [SHARE](#) [DELETE](#)

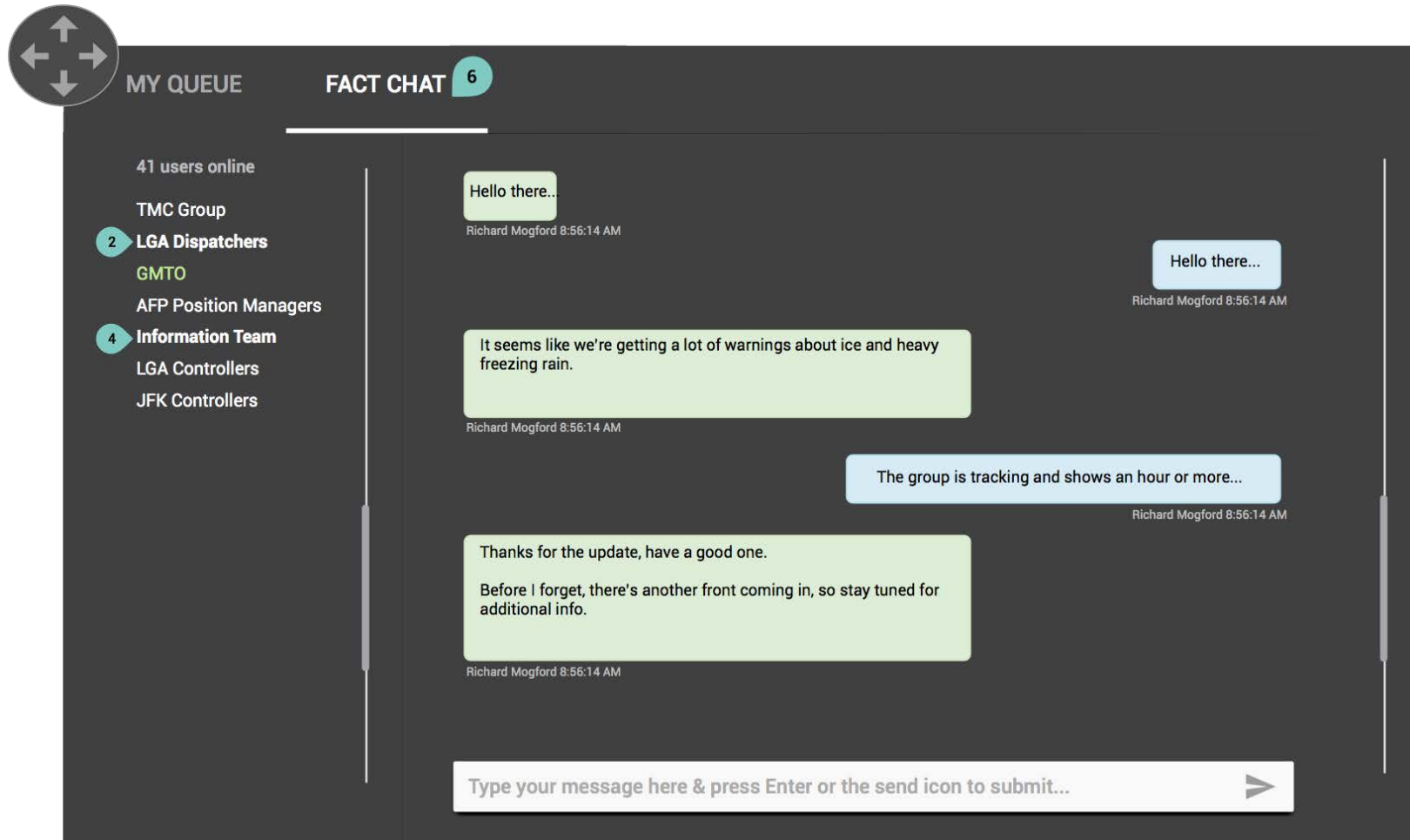
Comments:

13:30:45 **dpeknik:** Not sure how to deal with this one, any suggestions?
Here's the procedure. [attachment](#)

13:42:34 **eleong:** That's an old document I believe,

13:42:34 **rmogford:** I'll update and send a new document to the team.

Communication View



The interface is a dark-themed chat application. At the top left is a circular icon with four arrows pointing up, down, left, and right. Below it, the left sidebar contains a list of users and groups. The main chat area displays a conversation with three messages. The input field at the bottom is a white bar with a grey send button icon on the right.

MY QUEUE

FACT CHAT 6

41 users online

- TMC Group
- 2 LGA Dispatchers
- GMTO
- AFP Position Managers
- 4 Information Team
- LGA Controllers
- JFK Controllers

Hello there...

Richard Mogford 8:56:14 AM

Hello there...

Richard Mogford 8:56:14 AM

It seems like we're getting a lot of warnings about ice and heavy freezing rain.

Richard Mogford 8:56:14 AM

The group is tracking and shows an hour or more...

Richard Mogford 8:56:14 AM

Thanks for the update, have a good one.

Before I forget, there's another front coming in, so stay tuned for additional info.

Richard Mogford 8:56:14 AM

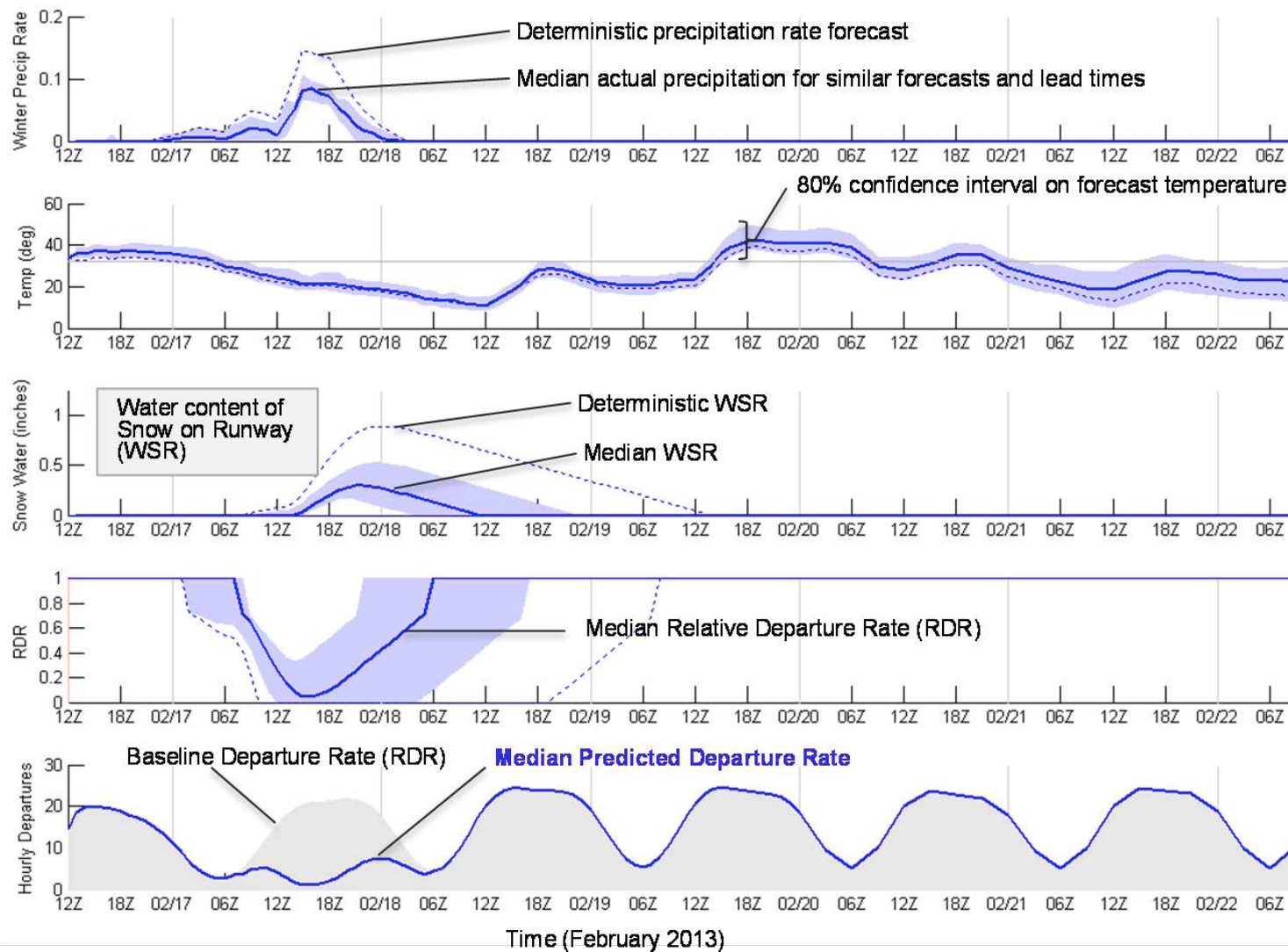
Type your message here & press Enter or the send icon to submit...

FACT Implementation

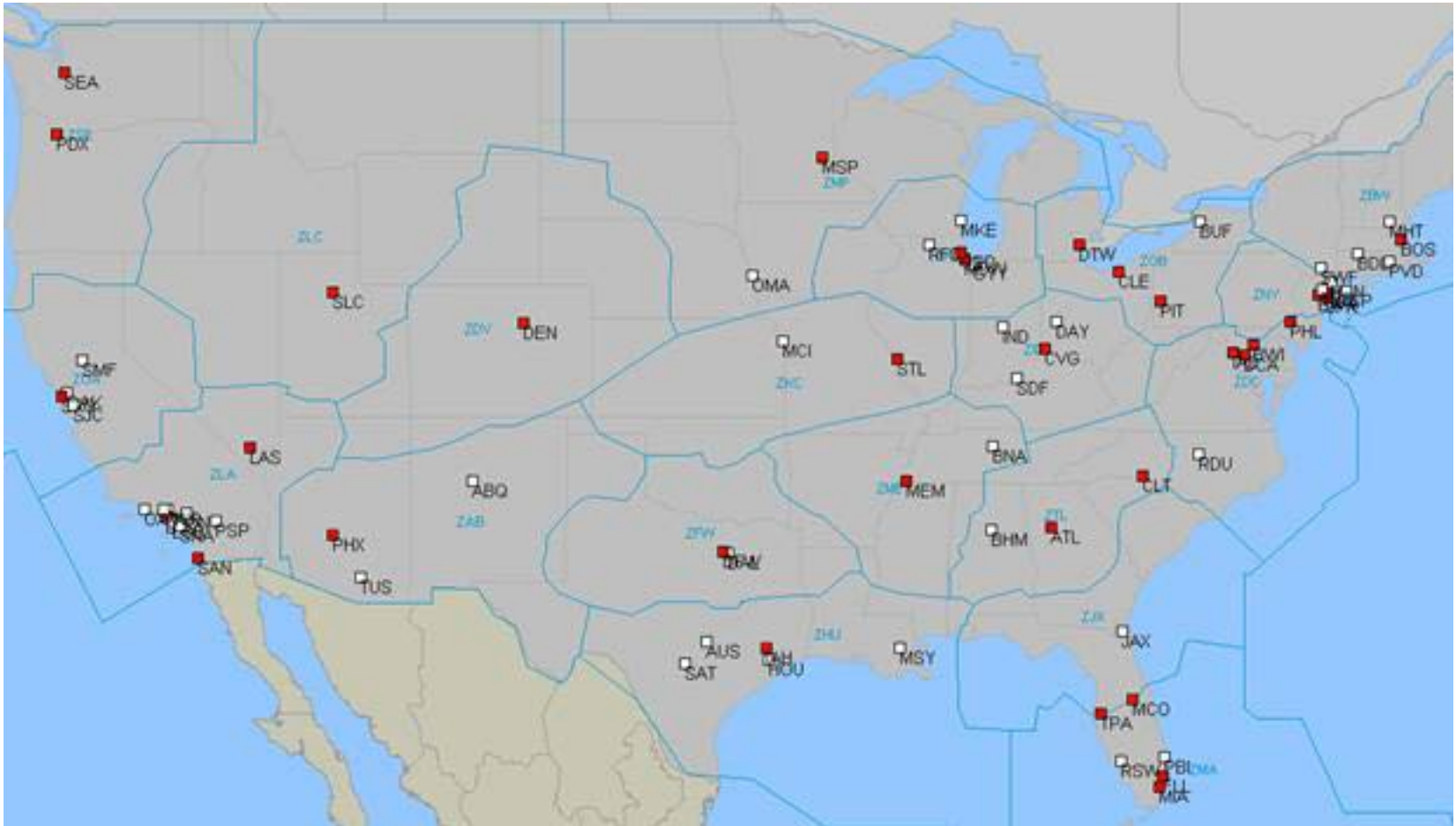


- FACT is a web-based application
- Receives JAVA messages from the FAA System Wide Information Management (SWIM) data repository
- Surface movement data are from ASDE-X
- Data are acquired from web pages and tailored for the Information View
- Predictive tools will be built into FACT
- First one competed is Metron's Winter Weather Airport Capacity Model (WWACM)
 - Predicts changes in airport departure rates from weather reports

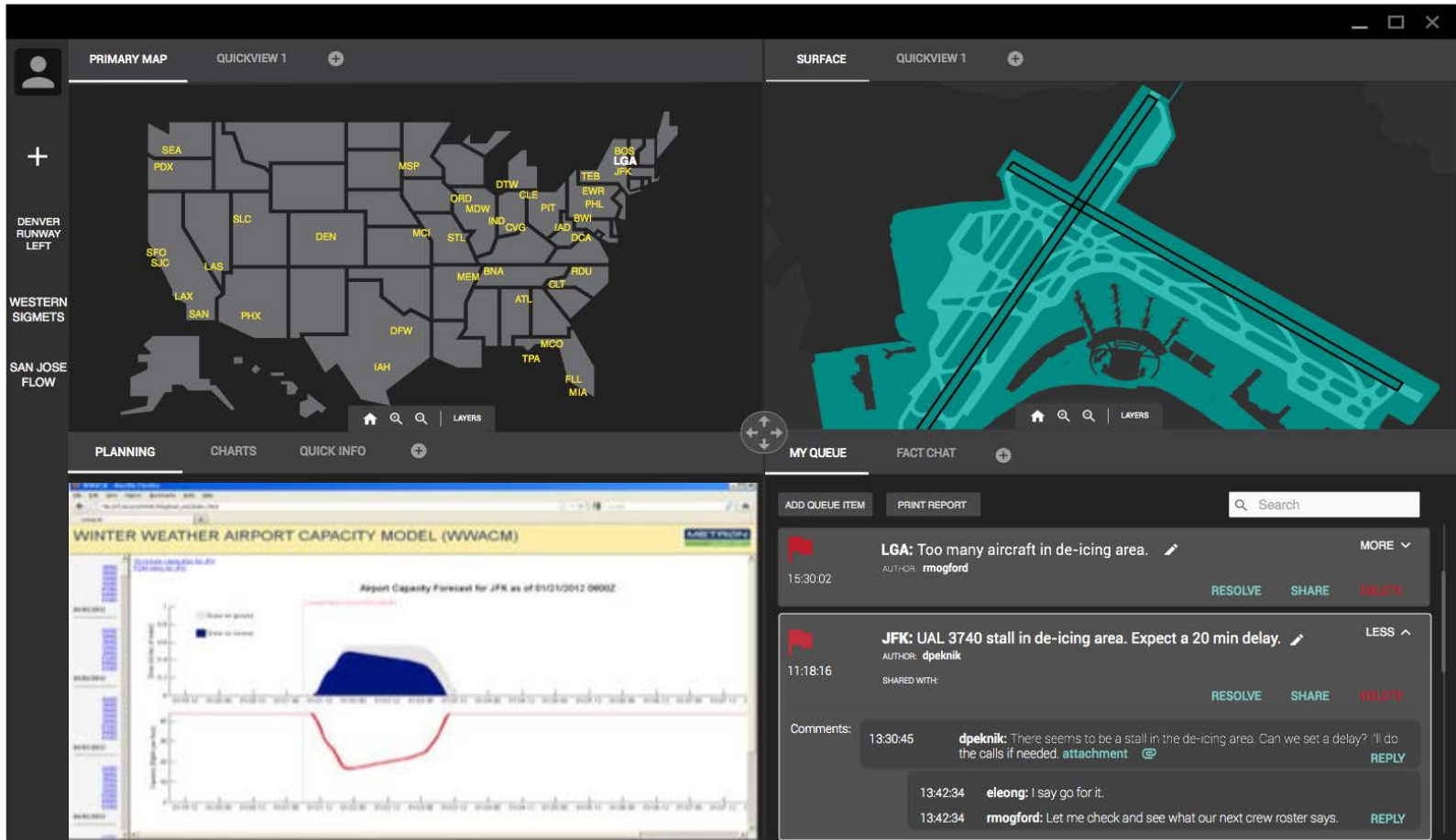
WWACM



WWACM for BOS for February 16, 2013



FACT WWACM Design



FACT Prototype



+

Default

Full Map View

+

Layers

Map data ©2016 Google, INEGI | Terms of Use

Arr. 19L/19R/25L Dep: 19L or 19R or 25R

Layers

Map data ©2016 Google | Terms of Use | Report a map error

Planning

Charts

Search

ADVISORIES FOR MONDAY, 08-01-2016

#	CTRL ELEMENT	BRIEF TITLE
101	ZDC	DCINTERNATIONALDEPARTURES
100	DCC/ZDC	ZDCSWAPSTATEMENTFYI
099	FCAOB1	CDM
098	FCAA08	CDM
097	DCC	OPERATIONS
096	FCAA08	CDM
095	FCAOB1	CDM

New advisory received. ATCSCC ADVZY 001 NOC 08/01/2016 ANS FORECAST FOR SUN JUL 31

093 DCC FCA

My Queue

FACT Chat

ADD QUEUE ITEM

PRINT REPORT

TOO MANY AIRCRAFT IN THE DE-ICING AREA

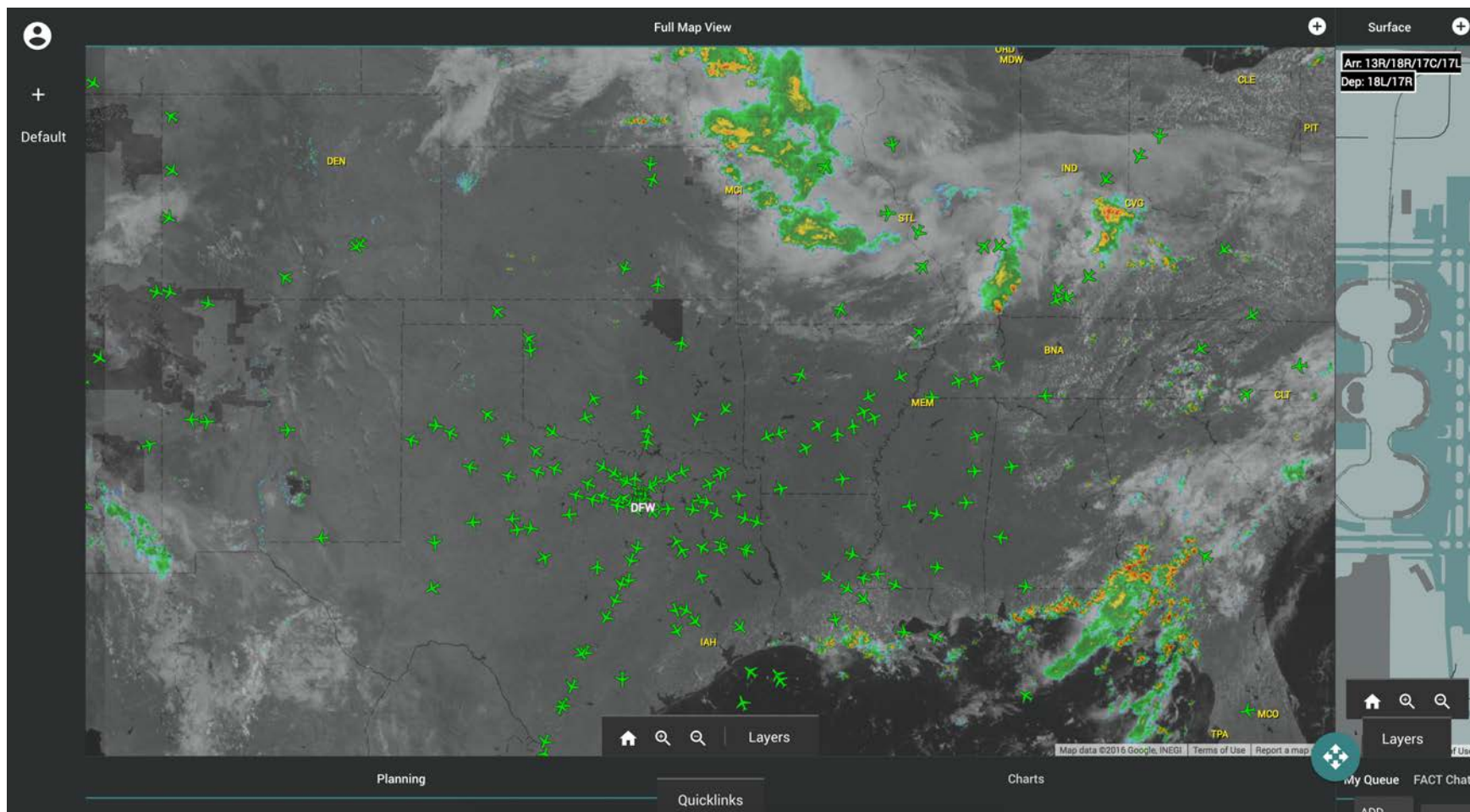
MORE

RESOLVE

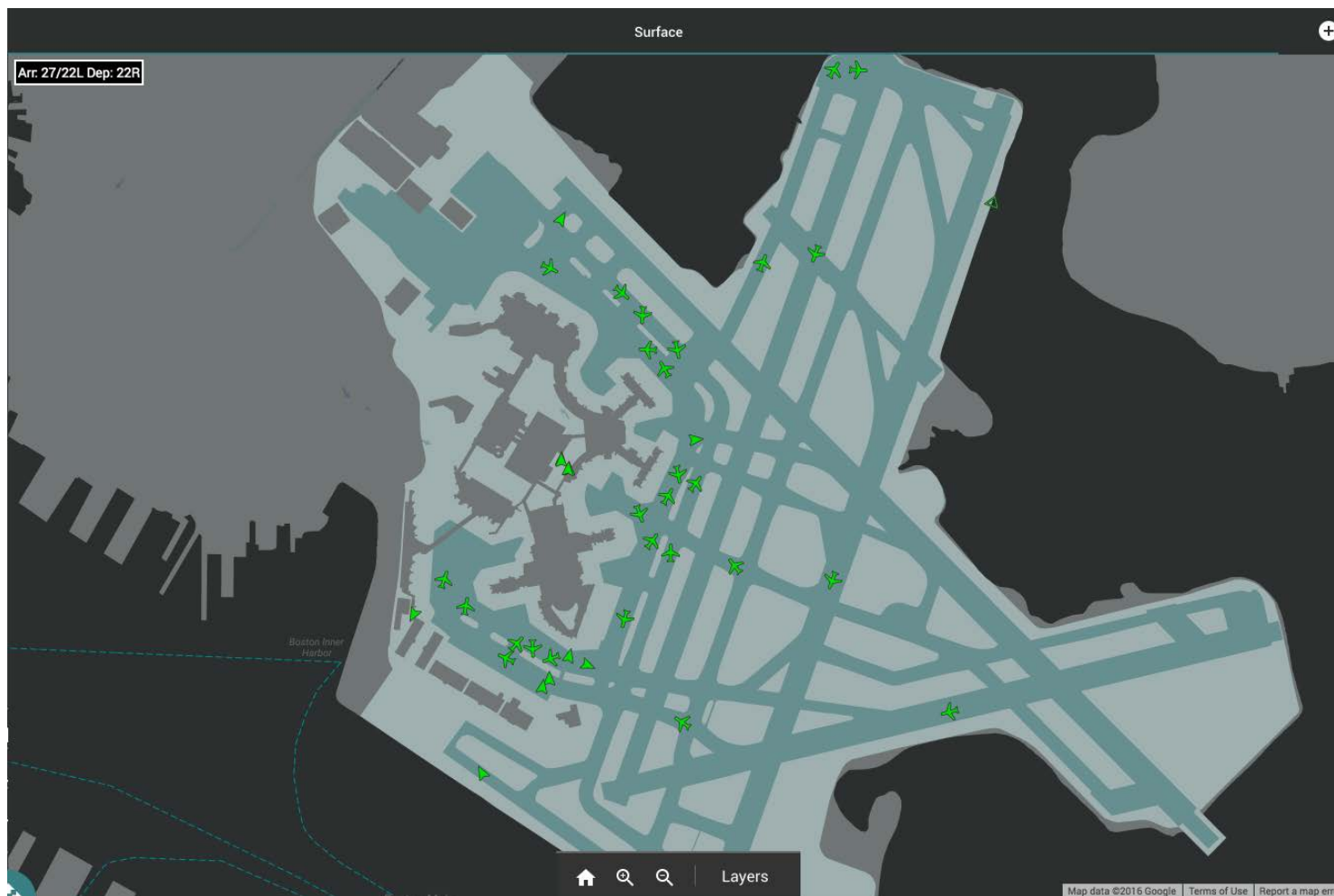
SHARE

DELETE

FACT Prototype



FACT Prototype



FACT Prototype



Search

ADVISORIES FOR MONDAY, 08-01-2016

#	CTRL ELEMENT	BRIEF TITLE
101	ZDC	DCINTERNATIONALDEPARTURES

EVENT TIME 01/1900 020500
CONSTRAINED FACILITIES ZDC
DC METRO INTERNATIONAL DEPARTURES CAN ANTICIPATE PROBABLE USE OF
JERES J220 MICAH TRANSITION INTO ZBW FOR FLIGHTS TO NATOTS THIS IS
DUE TO WEATHER ANTICIPATED IN EASTERN ZNY AND ZDC FOR THE AFTERNOON
EFFECTIVE TIME 01/1637 02/0500
16/08/01 1637 DCCOPS1xstn20

100	DCC/ZDC	ZDCSWAPSTATEMENTFYI
099	FCAOB1	CDM
098	FCAA08	CDM
097	DCC	OPERATIONS
096	FCAA08	CDM
095	FCAOB1	CDM
094	DCC	FCA
093	DCC	FCA
092	BWI/ZDC	CDM

Quicklinks

FACT Prototype



TOO MANY AIRCRAFT IN THE DE-ICING AREA 

LESS ^

RESOLVE

SHARE

DELETE

CREATED DATE: 2016-06-14T00:40:02.000Z

MODIFIED DATE: 2016-08-01T16:44:15.297Z

AUTHOR: admin

SHARED WITH:

F.A.C.T

NOTES:

NOTES ARE EMPTY FOR THIS ITEM

COMMENTS:

00:40:27Z admin (Me) test

REPLY

00:40:34Z admin (Me) test

REPLY

21:32:56Z admin (Me) asdfasdfasdf

REPLY

ADD A COMMENT

FACT Progress



- Web-based prototype will be completed by the end of September 2016
- Plan to demonstrate FACT to airlines and airports to seek feedback
- Will make modifications and improvements
- FACT platform will be used to host automation tools (e.g., predicting airport capacity, managing snow removal)
- Create AOC simulator at NASA Ames to evaluate FACT
- Evaluate FACT in operational settings

NASA/Industry Collaboration



- Held an Airline Operations Workshop at NASA Ames in August 2016
 - Around 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
 - Focus on the airlines and airline software vendors
- Research themes
 - AOC simulation
 - Display/system proliferation

AORG Plans



- FACT could be an example of how to integrate information for a specific task
- FACT could be a good platform for automation tools
- Currently exploring how to integrate and display a wider range of information for the dispatcher