



Flight Awareness Collaboration Tool

Richard Mogford, Ph.D.
NASA Ames Research Center
Moffett Field, CA

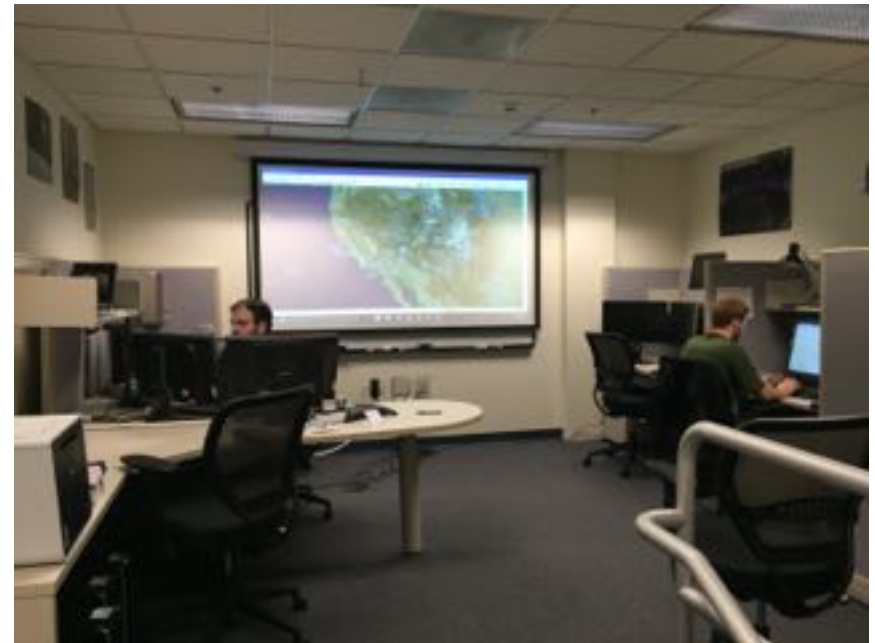


Research Areas



- Created airline operations center (AOC) laboratory to support research
 - At NASA Ames in the Human Systems Integration Division
- Dispatcher human factors
 - Completed human factors study of dispatchers
 - Paper accepted for Human Factors journal
- AOC automation
 - Applied “cognitive computing” systems to airline operations
- Winter weather
 - Developing automation tool to improve flight operations during winter storms
- Turbulence
 - Initiated study on using ground-based acoustic detectors for locating clear air turbulence
 - Prototype system at NASA Langley

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
- IBM described 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



Winter Weather



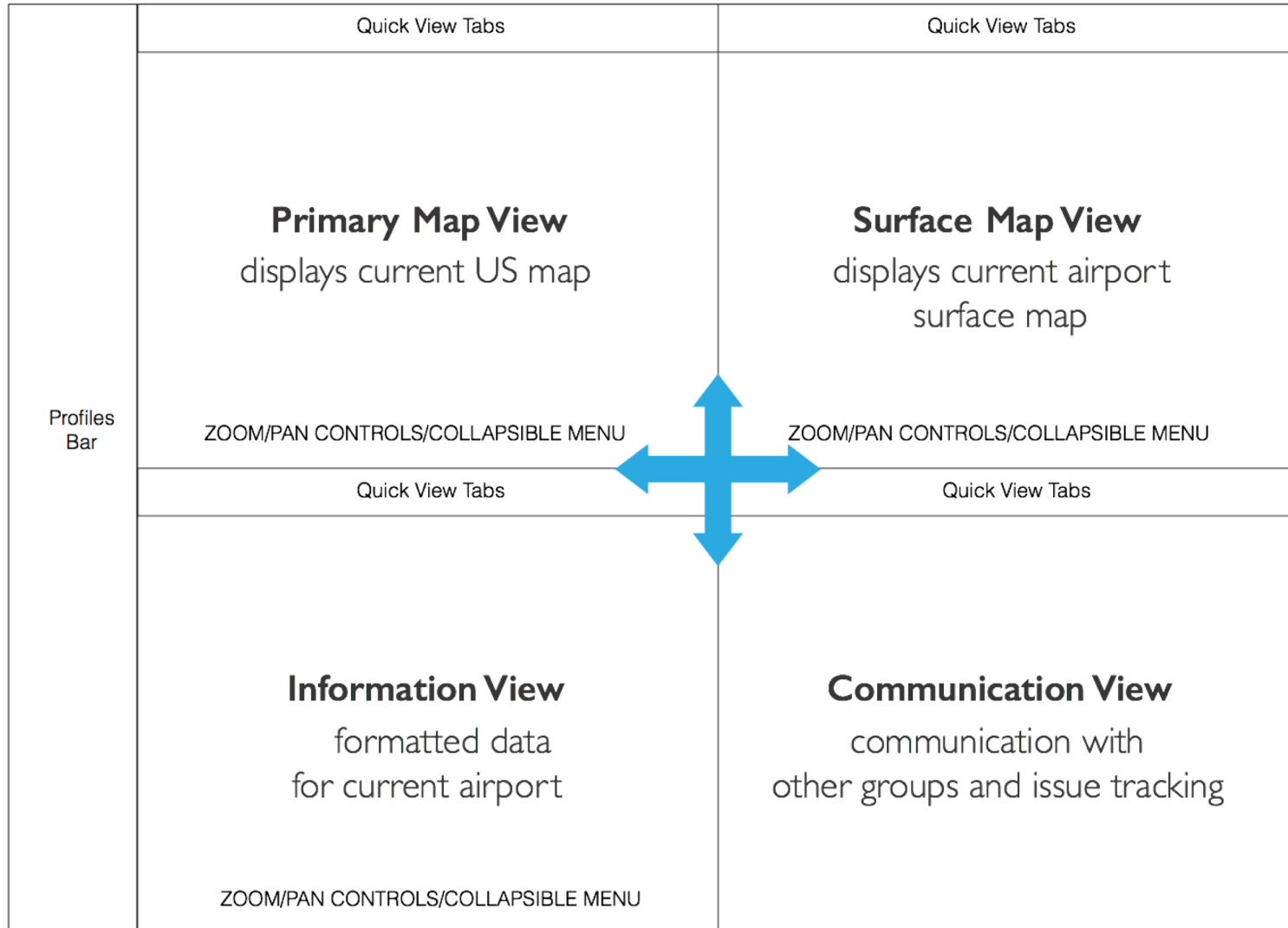
- Developing the “Flight Awareness Collaboration Tool” (FACT)
- Concentrates information about winter weather events on one display
- Includes predictive tool
- Supports collaboration between AOC, air traffic control, airport authority, and de-icing operators
- Software development completed
- Interested in industry input for next stage of FACT
- Has potentially useful features
 - Accesses SWIM data
 - Filters data for geographic area
 - Integrated user interface
 - Focused collaboration tools

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
- Airport runway configuration
- De-icing areas
- Pilot reports (PIREPS)
- Notices to Airmen (NOTAMS)
- 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 with three main sections:

- PRIMARY MAP:** A map of the United States with various airports labeled. A yellow arrow points from the BOS/LGA area on the map to the surface view.
- SURFACE:** A detailed view of the airport surface, showing runways and taxiways. A yellow arrow points from the BOS/LGA area on the map to this view.
- QUEUE:** A list of advisories for Wednesday, 06-10-2015. A yellow arrow points from the 'Send' button in the table to the queue.

ATCSCC ADVISORIES FOR WEDNESDAY, 06-10-2015

#	Control Element	Date	Brief Title	Send
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	ATCSCC ADVZY 160 DCC 06/09/15 Routes RQD /FL ame: FLA_TO_NYMETROS

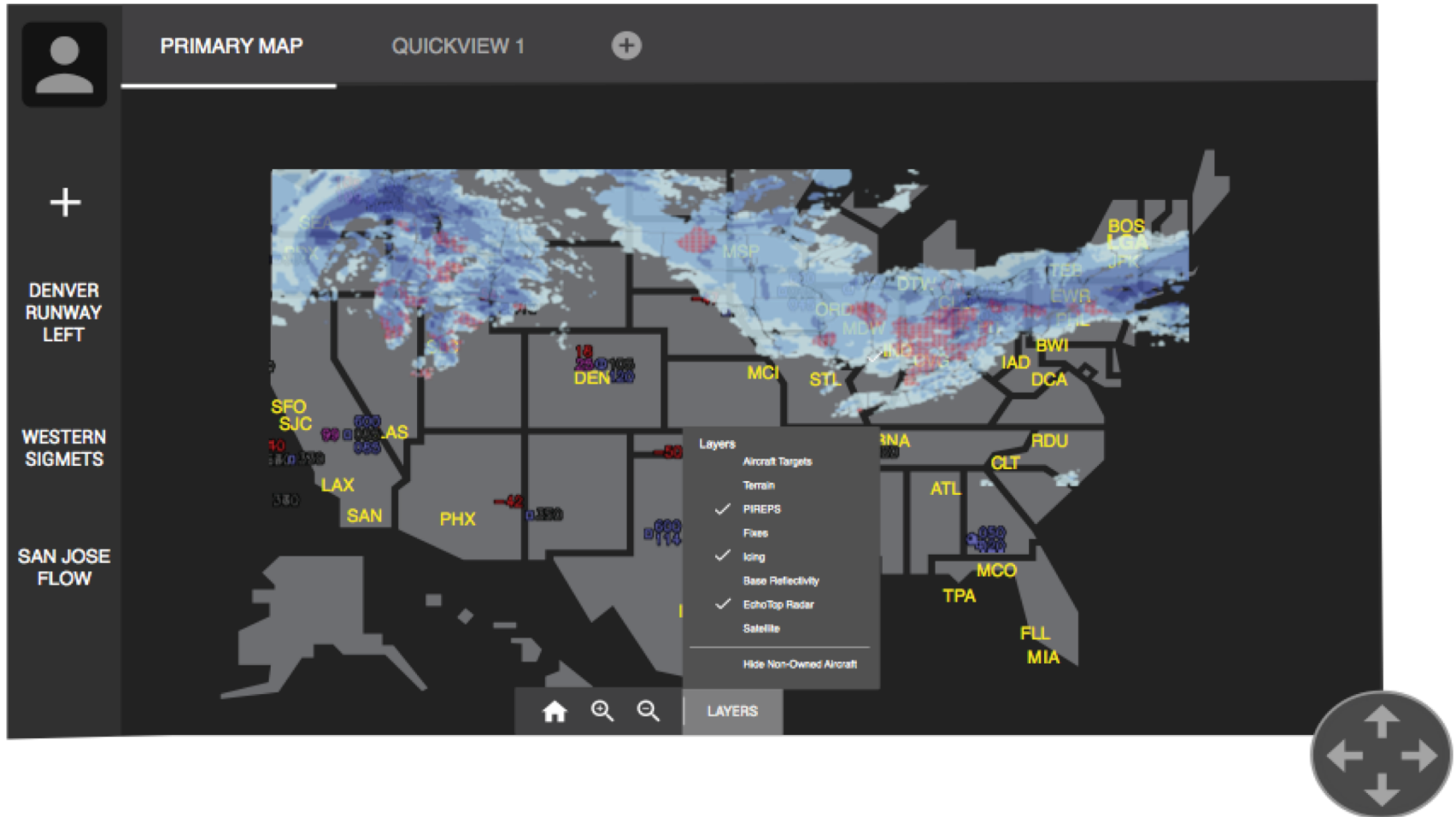
QUEUE:

- LGA: Too many aircraft in de-icing area.** 15:30:02. AUTHOR: mmogford. RESOLVE SHARE DELETE
- JFK: UAL 3740 stall in de-icing area. Expect a 20 min delay.** 11:18:16. AUTHOR: dpeknik. 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 **mmogford:** Let me check and see what our next crew roster says. REPLY

Primary Map View



Surface Map View



The screenshot displays a 'Surface Map View' interface. At the top, there are tabs for 'SURFACE' and 'QUICKVIEW 1'. Below the tabs, a status bar shows 'ARR: 28L / R, DEP: 1L / R' with an information icon. The main map area shows an airport layout with several aircraft icons (white and green) and a yellow truck icon. A '6500' elevation marker is visible on the map. A 'Layers' menu is open, listing the following options:

- ✓ De-Icing Areas
- ✓ Airport Configurations
- ✓ Runway Closure Status
- Braking Action
- ✓ RVR

Below the layers menu, there is a 'Filter Non-Owned Aircraft' option. In the top right corner, a graph titled 'CLT ISR' shows a line plot with the x-axis ranging from 0900 to 1200 and the y-axis from 0 to 60. The graph is labeled 'Last Update: 1215 04/17'. At the bottom left, there is a directional pad for navigation. At the bottom center, there are icons for home, search, and zoom, along with a 'LAYERS' button.

Information View



PLANNING CHARTS QUICKVIEW 1 +

Search

ATCSCC ADVISORIES FOR WEDNESDAY, 06-10-2015

#	Control Element	↓ Date	Brief Title	Send Time
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 Airspace Flow Program CNX	06/10/15 00:13
001	DCC	06/10/2015		06/10/15 00:05

ATCSCC ADVISORIES FOR WEDNESDAY, 06-10-2015

#	Control Element	Date	Brief Title
161	DCC	06/10/2015	
160	DCC	06/10/2015) DCC 06/09/15 Route RQD /FL

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 Search

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

JFK: UAL 3740 stall in de-icing area. Expect a 20 min delay. ✎ LESS ▲
AUTHOR: **dpeknik**
11:18:16 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](#) 📎 REPLY

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. REPLY

Communication View



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...

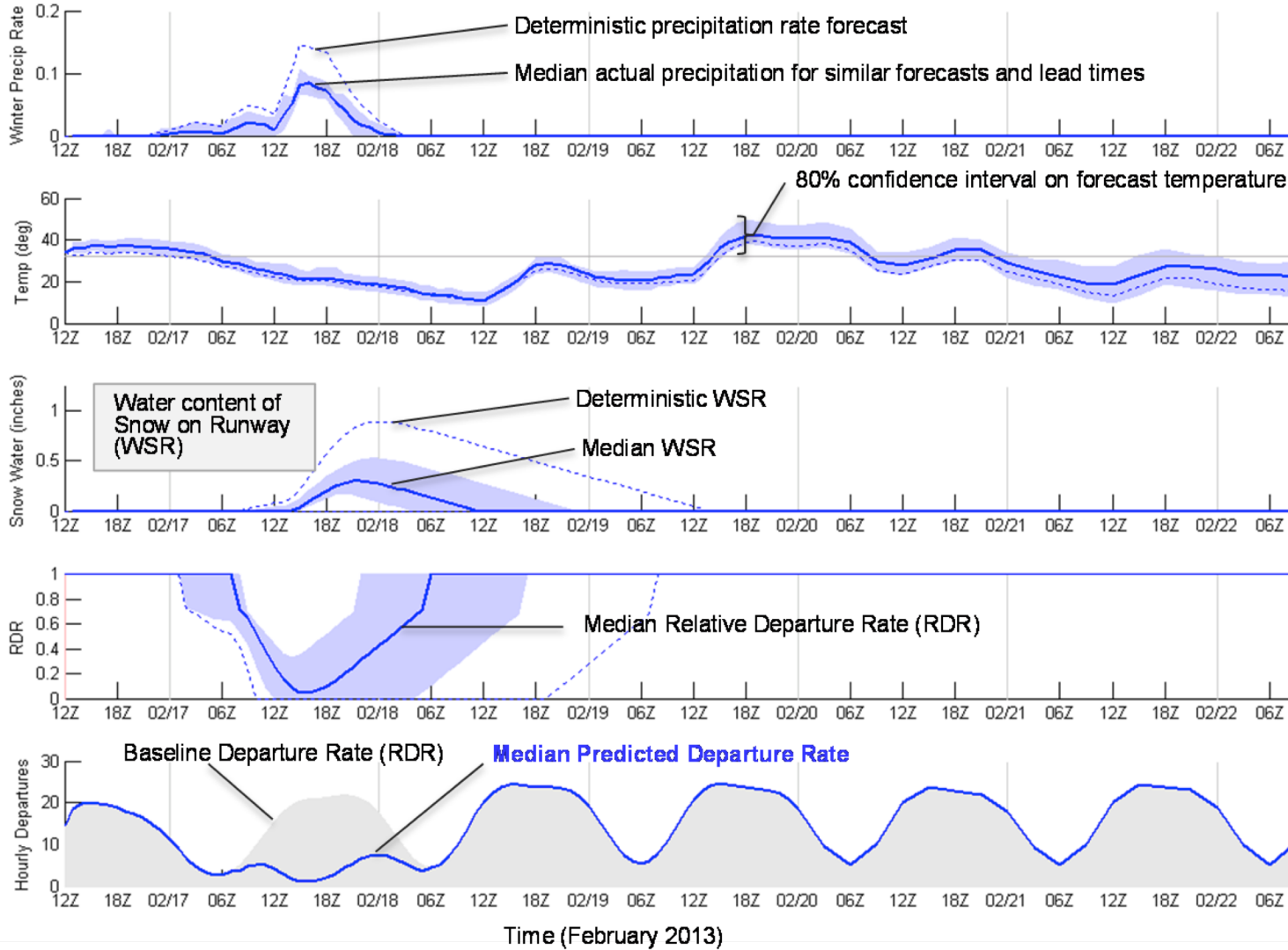


FACT Implementation



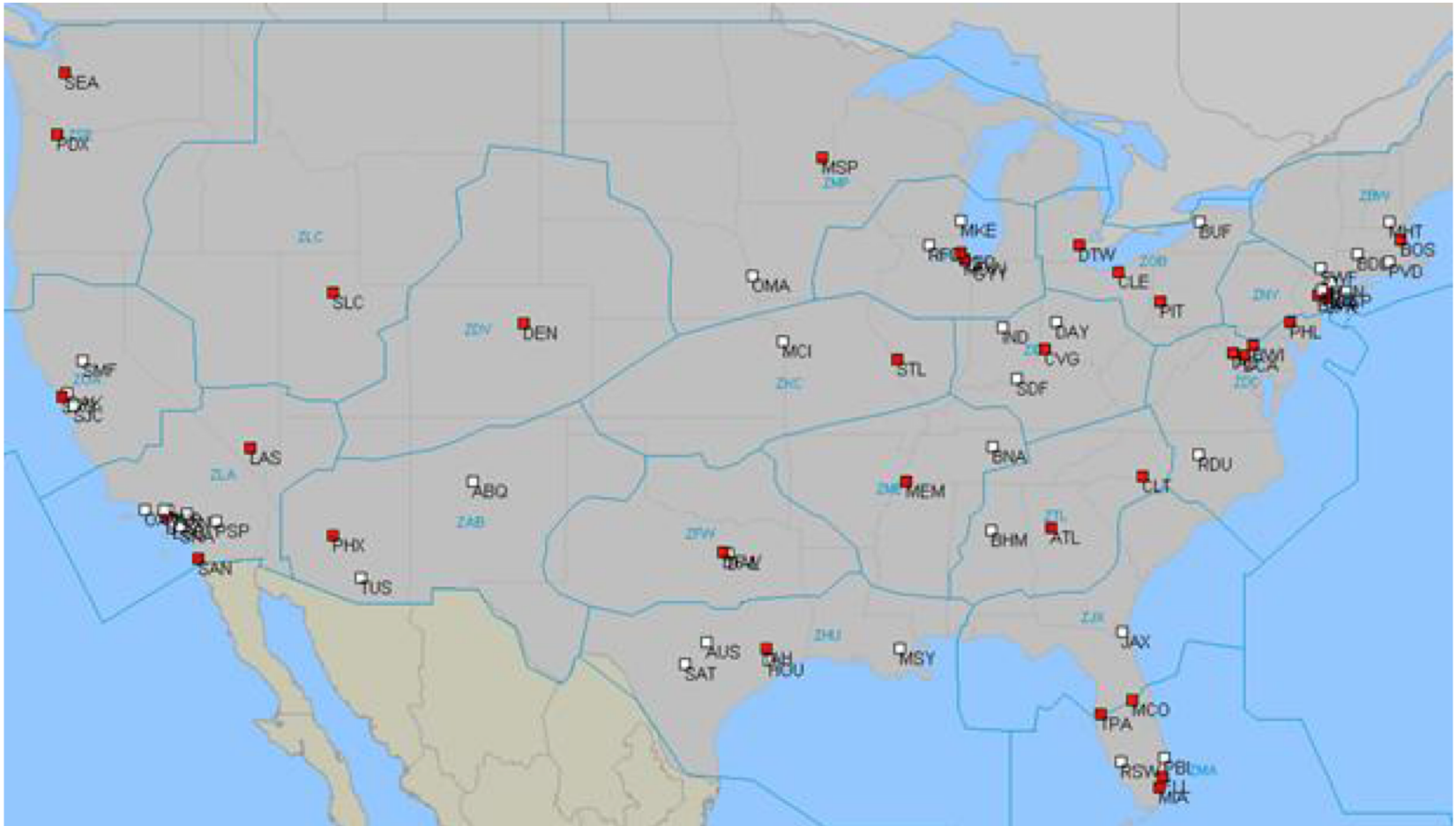
- FACT is a web-based application
- Receives JAVA messages from the FAA System Wide Information Management (SWIM) data repository
- Surface movement data are from surface radar (ASDE-X)
- Data are acquired from web pages and filtered for the Information View
- Predictive tools can be built into FACT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

WWACM



WWACM for BOS for February 16, 2013

WWACM



The 77 airports included in WWACM

FACT WWACM Design



The screenshot displays the FACT WWACM interface, which is divided into several sections:

- PRIMARY MAP:** A map of the United States showing various airports and flight paths. The map is labeled with airport codes such as SEA, PDX, SFO, LAS, LAX, SAN, PHX, DEN, MCI, STL, MEM, BNA, DFW, IAH, ORD, MDW, IND, CNG, DTW, CLE, PIT, EWR, PHL, BOS, LGA, JFK, TEB, BWI, DCA, RDU, ATL, MCO, TPA, and FLL/MIA.
- SURFACE:** A detailed view of an airport's surface, showing runways, taxiways, and other infrastructure. The surface is highlighted in a teal color.
- PLANNING:** A section containing a chart titled "WINTER WEATHER AIRPORT CAPACITY MODEL (WWACM)". The chart shows the "Airport Capacity Forecast for JFK as of 01/21/2012 0600Z". The chart has two data series: "Show as ground" (represented by a blue area) and "Show as delay" (represented by a red line). The x-axis represents time in 15-minute intervals, and the y-axis represents the number of aircraft.
- MY QUEUE:** A section containing a "FACT CHAT" with a search bar and a list of items. The items are:

- Item 1:** "LGA: Too many aircraft in de-icing area." by user **rmogford** at 15:30:02. Actions: RESOLVE, SHARE, DELETE.
- Item 2:** "JFK: UAL 3740 stall in de-icing area. Expect a 20 min delay." by user **dpeknik** at 11:18:16. Actions: 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](#)

FACT Prototype



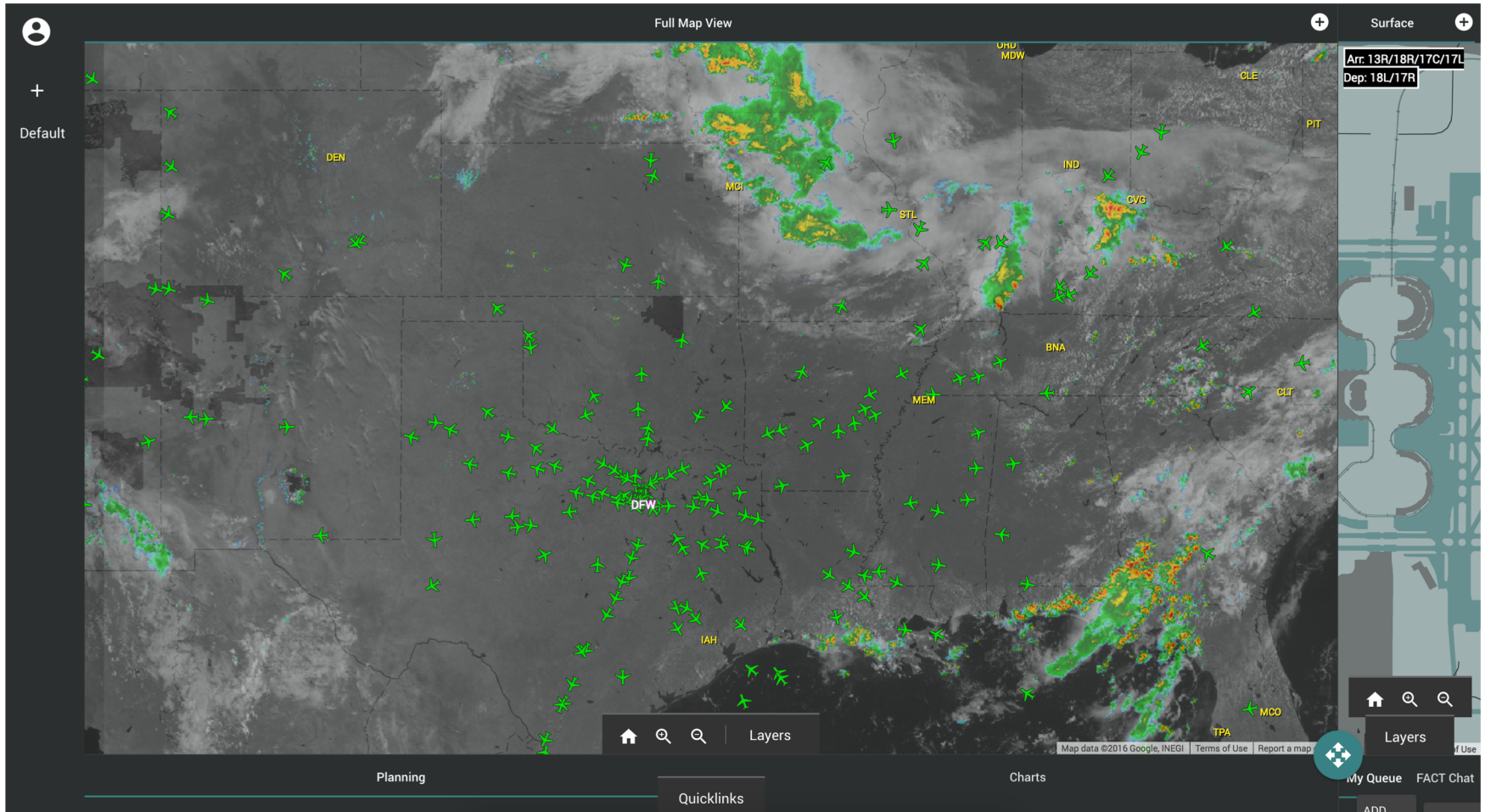
The interface is divided into several sections:

- Top Left:** User profile icon, a plus sign, and the text "Default".
- Top Right:** "Surface" view header with a plus icon.
- Map Area:** Two map panels. The left panel is labeled "Full Map View" and shows a regional map with green aircraft icons and labels for "SFO", "SJC", and "LAS". The right panel shows a detailed airport terminal layout with green flight paths and aircraft icons. A tooltip above the right map reads "Arr: 19L/19R/25L Dep: 19L or 19R or 25R".
- Map Controls:** Home, search, and zoom icons are present on both map panels. A central compass icon is shared between them.
- Bottom Left:** "Planning" section with a search bar and a table of advisories.
- Bottom Center:** "Charts" section.
- Bottom Right:** "My Queue" section with "ADD QUEUE ITEM" and "PRINT REPORT" buttons, and a "FACT Chat" section with a red flag icon and a message: "TOO MANY AIRCRAFT IN THE DE-ICING AREA".

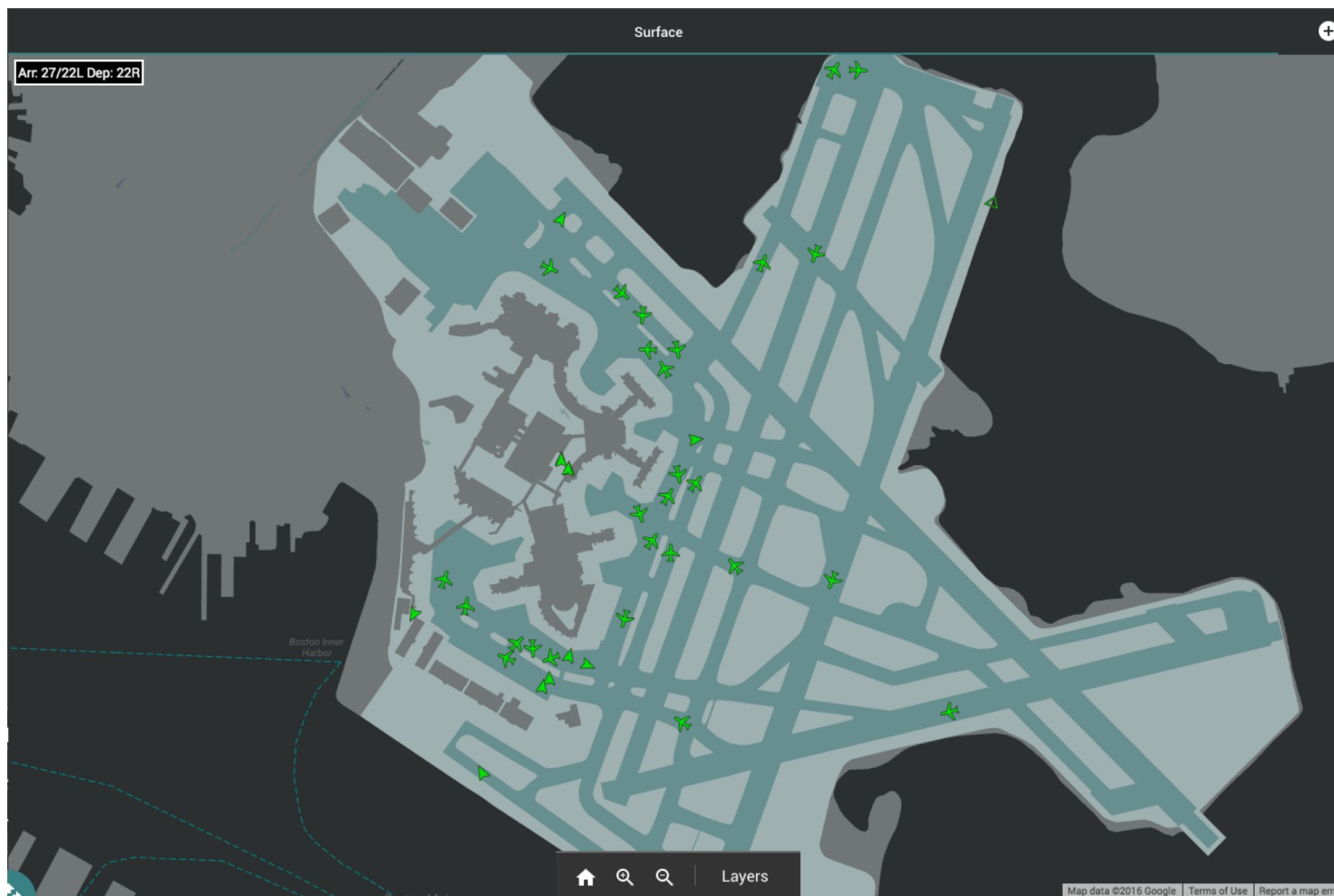
#	CTRL ELEMENT	BRIEF TITLE
101	ZDC	DCINTERNATIONALDEPARTURES
100	DCC/ZDC	ZDCSWAPSTATEMENTFYI
099	FCAOB1	CDM
098	FCAA08	CDM
097	DCC	OPERATIONS
096	FCAA08	CDM
095	FCAOB1	CDM
093	DCC	FCA

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

Primary Map View



Surface Map View



Information View



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 DCCOPSlxstn20

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

My Queue Messaging



 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](#)

Chat Window



MY QUEUE **FACT CHAT** 7

F.A.C.T

FACT 2

Dispatchers 1

Airport Authority 1

Horizon Air 1

United Airlines 2

hi
swapnilg 00:09:32.770Z

these messages will be loaded automatically
swapnilg 00:17:55.579Z

Test
ksotto 18:44:25.056Z

Hello Kenji!
codye 18:44:36.024Z

Hey Kenji, I just sent you a new message!
codye 18:48:16.262Z

unread chat test 1
swapnilg 19:48:35.458Z

unread chat test 2
swapnilg 19:49:01.301Z

Test
ksotto 19:20:07.115Z

Type your message here & press Enter to submit... ➤

FACT Status



- Web-based prototype is ready
- Partner with an airline for further tailoring and development
- FACT platform could be used to host automation tools (e.g., predicting airport capacity, managing snow removal)
- FACT could be extended to include convective weather, low visibility, and other air traffic problems
- Focuses on disruption management and recovery
- Good example of accessing and integrating web-based information