



Airspace Technology Demonstration 2 (ATD-2)
Evolving Operational Role (ATC and Operator) with TFDM in the 3T environment
September 4, 2019

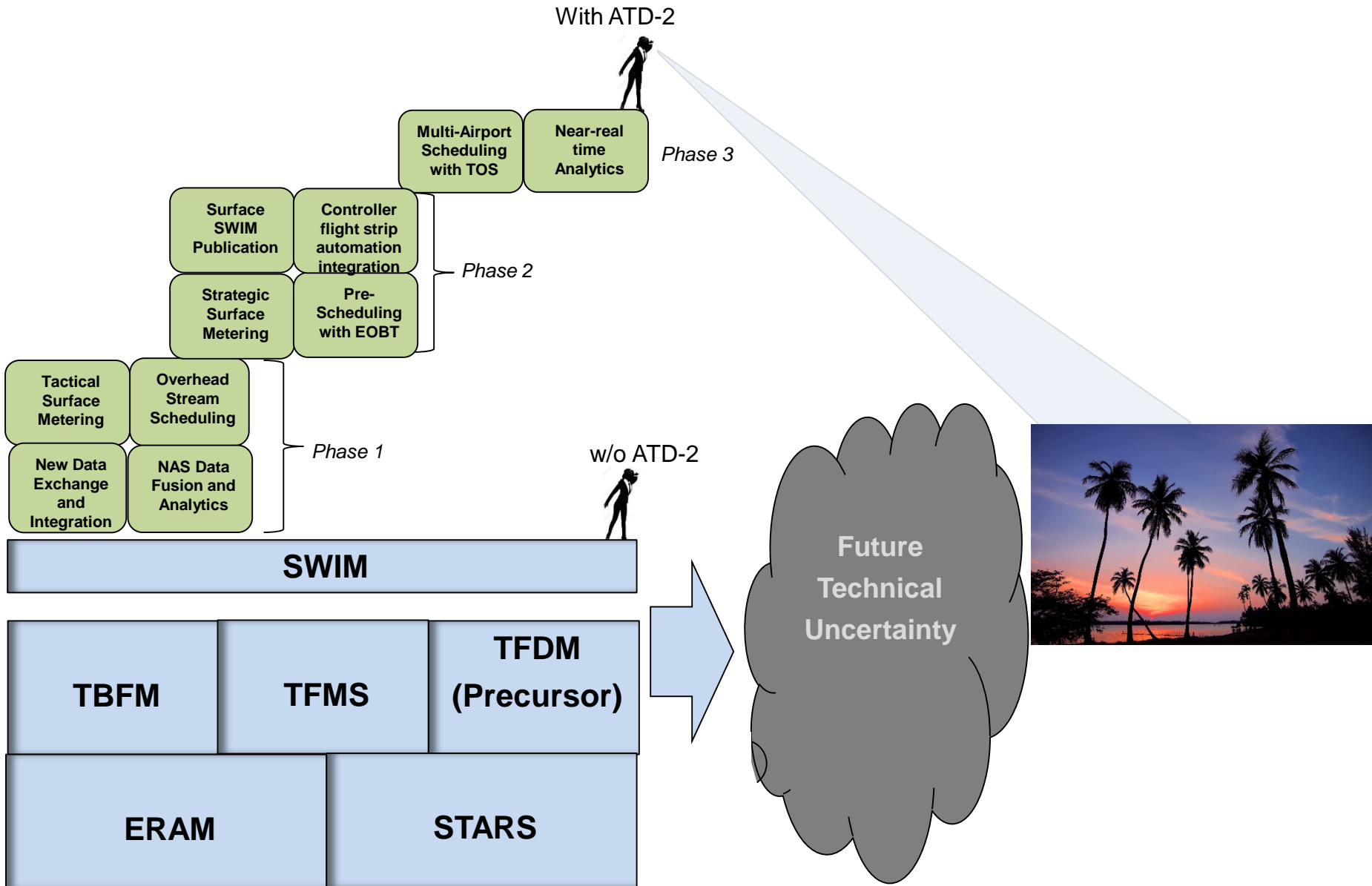
Bob Staudenmeier
Mike Hoprich

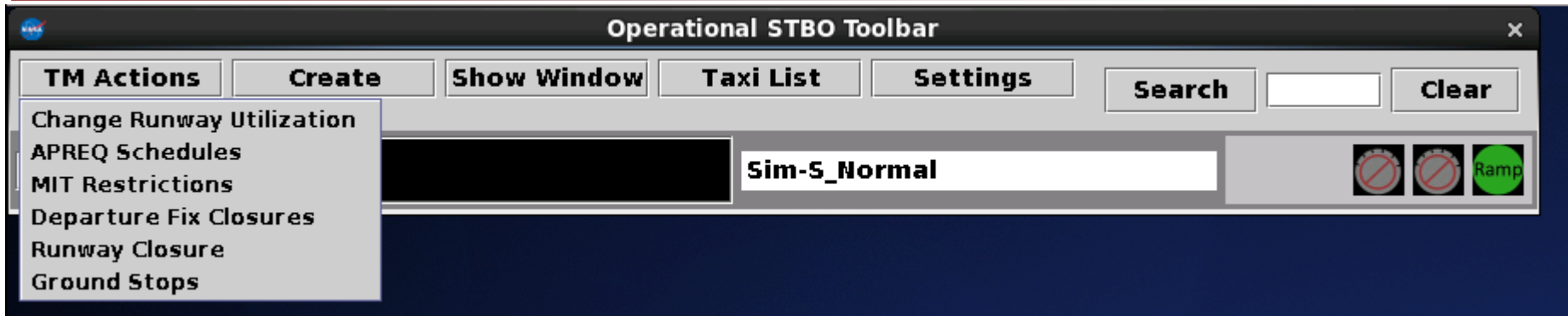


Connections without verbal communication:

1. Tower/Ramp verbal coordination reduced
2. Ramp situational awareness improved
3. Tower to configure surface metering through collaboration with ramp
4. Incoming TMI information gets passed to the ramp and the controllers instantaneously
5. “What If” capability has allowed the tower to sample configuration changes without implementing them
6. Airlines provided EOBT’s through TFMS

ATD-2 Provides a Unique Vantage Point into the Potential Future NAS





- Traffic Management Action Panel
 - Utility to customize surface operations through restriction management
 - Augments available OIS and TFM data
 - Accessible from the STBO Client Toolbar
 - Schedule, Remove, and Modify TMI events
 - Supported TMI's
 - Runway Utilization
 - APREQ Schedules
 - MIT Restrictions
 - Departure Fix/Departure Gate Closures
 - Runway Closures
 - Ground Stops

STBO TM Actions

Runway Utilization | APREQ Schedule | MIT Restrictions | Dep Fix Closures | Runway Closures | Ground Stops

Add Runway Utilization

VMC IMC

Configuration:

Runway Utilization:

Start Time: (dd/hhmm) Start Now

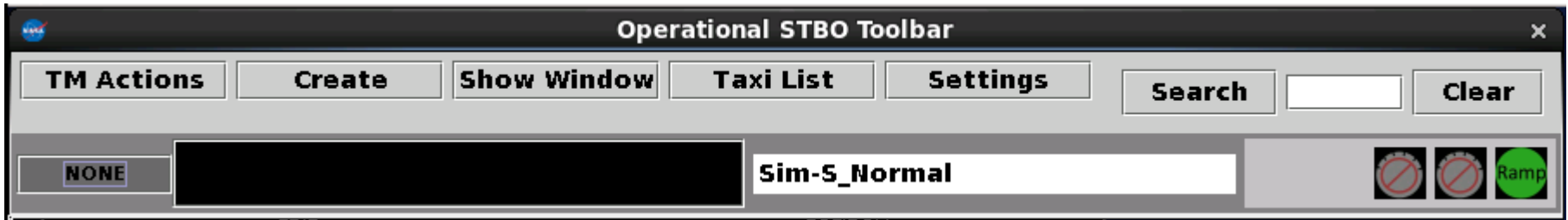
Time	Configuration	Scenario	VMC/IMC
20/0800	North	N_Normal	VMC

Clear All Add Remove Modify Close Window

- Controls the surface arrival departure flow
- VMC/IMC: visual or instrument meteorological conditions
- Configuration: predefined set of runway groupings
- Runway Utilization: playbooks describing how the runways for a given configuration are to be used
- Start Time: time when the TMI becomes active
- End Time is not required because an airport must always have an active configuration, a configuration ends when the next scheduled configuration begins



- Impact to STBO Client
 - Flights will switch runways to reflect the configuration change
 - Toolbar will show active configuration and runway utilization



- Impact to Ramp Traffic Console (RTC) Client
 - Flight will switch runways to reflect the configuration change

STBO TM Actions

Runway Utilization
APREQ Schedule
MIT Restrictions
Dep Fix Closures
Runway Closures
Ground Stops

Add APREQ Schedule

Airport
 Departure Fix
 Departure Gate
 Jet Route

Airport: Select

Start Time: (dd/hhmm) Start Now

End Time: (dd/hhmm) No End Time

Constraints: Set

APREQ Schedule

Resource	Start ▲	End	Source
ATL	20/1100	21/0300	USER
EWR	20/1115	21/0200	OIS
LGA	20/1115	21/0200	OIS
DCA	20/1230	21/0200	OIS
PHL	20/1300	20/2330	OIS
JFK	20/1500	21/0230	OIS
ORD	20/1600	20/1930	OIS

Clear All
Add
Remove
Modify
View Constraints

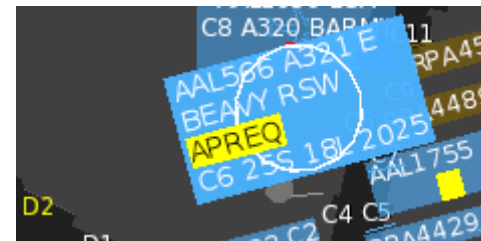
Close Window

- Schedules resources requiring an approval request or call for release
- Select the type of resource to be constrained (Airport, Departure Fix, Jet Route)
- Start Time: time when the TMI begins
- End Time: time when the TMI expires
- Constraints: sub restrictions for a resource

- Impact to STBO Client
 - Flights marked as APREQ constrained on timelines and map



- Impact to RTC Client
 - Flight strips marked as APREQ constrained



STBO TM Actions

Runway Utilization | APREQ Schedule | MIT Restrictions | Dep Fix Closures | Runway Closures | Ground Stops

Add MIT Restrictions

Airport
 Departure Fix
 Departure Gate
 Jet Route

Departure Fix:

MIT Restriction:

Start Time: (dd/hhmm) Start Now

End Time: (dd/hhmm) No End Time

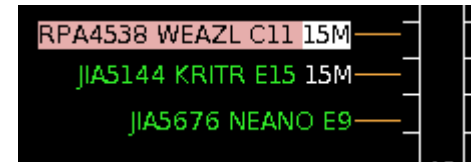
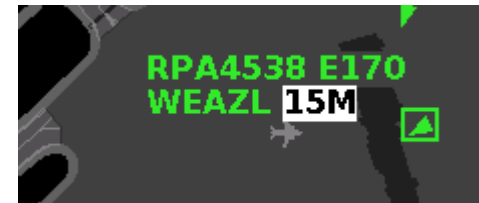
Constraints:

MIT Restrictions

Resource	MIT	Start ▲	End	Source

- Schedules resources subject to Miles in Trail
- Select the type of resource to be constrained (Airport, Departure Fix, Jet Route)
- MIT Restriction: flight separation in nautical miles
- Start Time: time when the TMI begins
- End Time: time when the TMI expires
- Constraints: sub restrictions for a resource

- Impact to STBO Client
 - Display the nautical mile separation next to the flight on the timeline and data block.



- Impact to RTC Client
 - Display the nautical mile separation as part of the flight strip



STBO TM Actions

Runway Utilization | APREQ Schedule | MIT Restrictions | **Dep Fix Closures** | Runway Closures | Ground Stops

Add Dep Fix Closures

Departure Fix **Departure Gate**

Departure Fix:

CDR Flights To:

Start Time: (dd/hhmm) **Start Now**

End Time: (dd/hhmm) **No End Time**

Constraints:

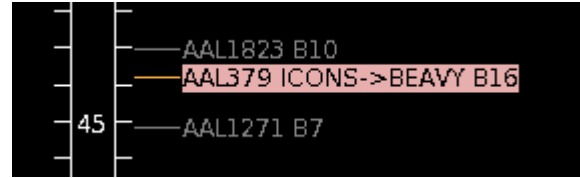
Dep Fix Closures

Fix Closure	Flights to	Start	End	Source

- Schedules departure fix closures
- Departure Fix: name of the departure fix to close
- CDR Flights To: coded departure route, TBD (to be determined) or no alternate specified
- Start Time: time when the TMI begins
- End Time: time when the TMI expires
- Constraints: sub restrictions for a resource



- Impact to STBO Client
 - When CDR is not provided, the flights are rescheduled 2 hours later as there is no valid fix assigned to the flight
 - If a CDR is provided, flights remain at scheduled time on timeline and show FIX → CDR as part of the timeline and map data block



- Impact to RTC Client
 - When CDR is not provided, continues to show closed fix highlighted red on the flight strip
 - When CDR is provided, continues to show previous fix on flight strip highlighted yellow on the flight strip. The flight property dialog shows both the previous and CDR fix.



DEPARTURE DETAILS	
Tail:	N315PE
P-Time:	2035
EOBT:	2035
TOBT:	
TMAT:	
APREQ:	
EDCT:	
MIT:	
Departure fix:	BEAVY
Previous fix:	ICONS

STBO TM Actions
_ □ ×

Runway Utilization APREQ Schedule MIT Restrictions Dep Fix Closures **Runway Closures** Ground Stops

Add Runway Closures

Runway:

Start Time: (dd/hhmm) **Start Now**

End Time: (dd/hhmm) **No End Time**

Runway Closures

Closed Runway	Start ▲	End	Source

Clear All Add Remove Modify

Close Window

- Schedules runway closures
- Opposites are automatically closed
- Runway: list of runways for the given airport
- Start Time: time when the TMI begins
- End Time: time when the TMI expires

STBO TM Actions

Runway Utilization | APREQ Schedule | MIT Restrictions | Dep Fix Closures | Runway Closures | **Ground Stops**

Add Ground Stops

Airport: **Select**

Start Time: (dd/hhmm) **Start Now**

End Time: (dd/hhmm) **No End Time**

Constraints: **Set**

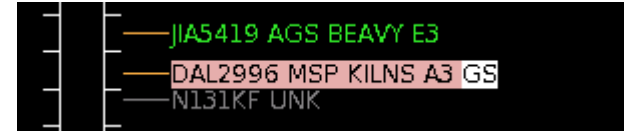
Ground Stops

Airport	Start ▲	End	Source
MCO	20/1559	20/1730	TFM

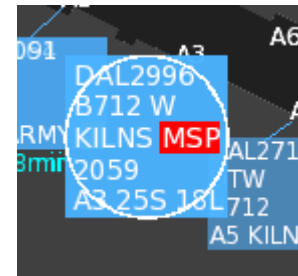
Clear All **Add** **Remove** **Modify** **View Constraints** **Close Window**

- Schedules ground stop programs
- Select the airport running the ground stop program
- Start Time: time when the TMI begins
- End Time: time when the TMI expires
- Constraints: sub restrictions for a resource

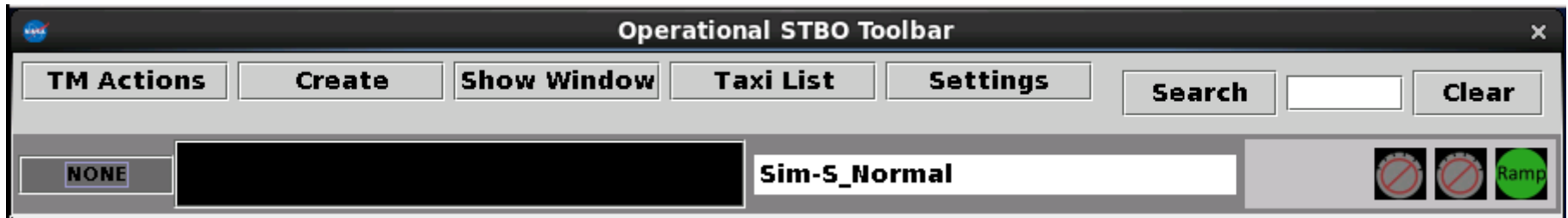
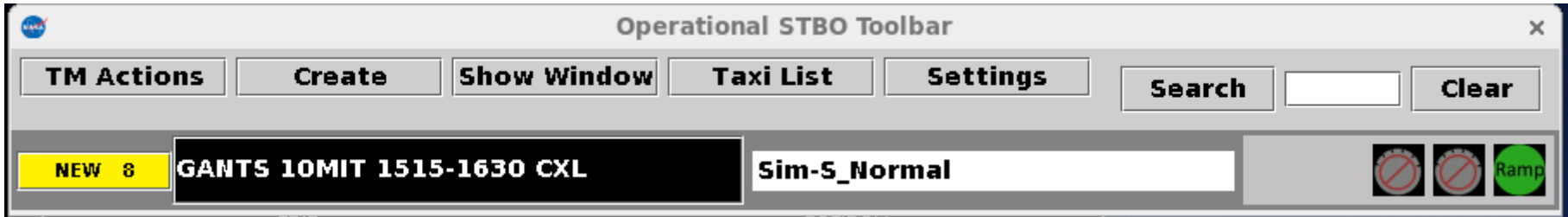
- Impact to STBO Client
 - If no end time is provided, the flight is removed from scheduling and disappears from the timeline
 - If an end time is provided, the flight will show 'GS' next to the timeline and map data blocks



- Impact to RTC Client
 - The flight strip will show the destination airport highlighted in red



- Integrated into the RTC and STBO toolbars
- Supports acknowledgement of TMI changes
 - Click the yellow button labeled “New #” to acknowledge updates.
 - Button will display as “None” if no updates to acknowledge
- Provides quick view of updates
 - Indicator of unacknowledged TMI’s
 - Time-sharing view of unacknowledged TMI’s
- Detailed table view of TMI’s



Reported	Event Type	Description	Event Start	Event End	Details
5/16/18 1523	Fix	GIPPR 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	GANTS 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	PEKNN 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	KILNS 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	RUNIE 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	LILLS 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	BARMY 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1523	Fix	MERIL 7MIT	5/16/18 1515	5/16/18 1630	OIS: EXCL PROP TURBO
5/16/18 1508	TMI	APREQ to JFK	5/16/18 1500	5/17/18 0200	OIS: INCL JET BARMY KILNS
5/16/18 1441	TMI	APREQ to PHL	5/16/18 1130	5/16/18 1441	Cancelled
5/16/18 1410	Fix	BUCKL OPENED	5/16/18 1410		OIS: EXCL PROP TURBO
5/16/18 1410	Fix	BUCKL CLOSED	5/16/18 1319	5/16/18 1410	Cancelled
5/16/18 1410	Fix	TREAL OPENED	5/16/18 1410		OIS: EXCL PROP TURBO
5/16/18 1410	Fix	TREAL CLOSED	5/16/18 1319	5/16/18 1410	Cancelled
5/16/18 1410	Fix	ANDYS OPENED	5/16/18 1410		OIS: EXCL PROP TURBO
5/16/18 1410	Fix	ANDYS CLOSED	5/16/18 1319	5/16/18 1410	Cancelled

- Open detailed view by single clicking the time-shared text area on the toolbar
- Selecting any row will acknowledge all TMI's
- Colors
 - White: TMI has been acknowledged by the user
 - Yellow: TMI has been changed and waiting user acknowledgement
 - Blue: TMI expired before the scheduled end time

What-If STBO Toolbar

TM Actions Create Show Window Tab List Settings Reset What-if Search Clear

NEW 78 APREQ to JFK 1015-0200 N.BE/A/T-36C

What-If STBO Arr/Dep = Departure; Has EDCT = Yes; Has AOFF = No; Gate = ...

What-If STBO Timeline Runway 23/5 18L/36R

What-If STBO Map 1

What-If STBO Timeline Runway 18C/36C 18R/36L

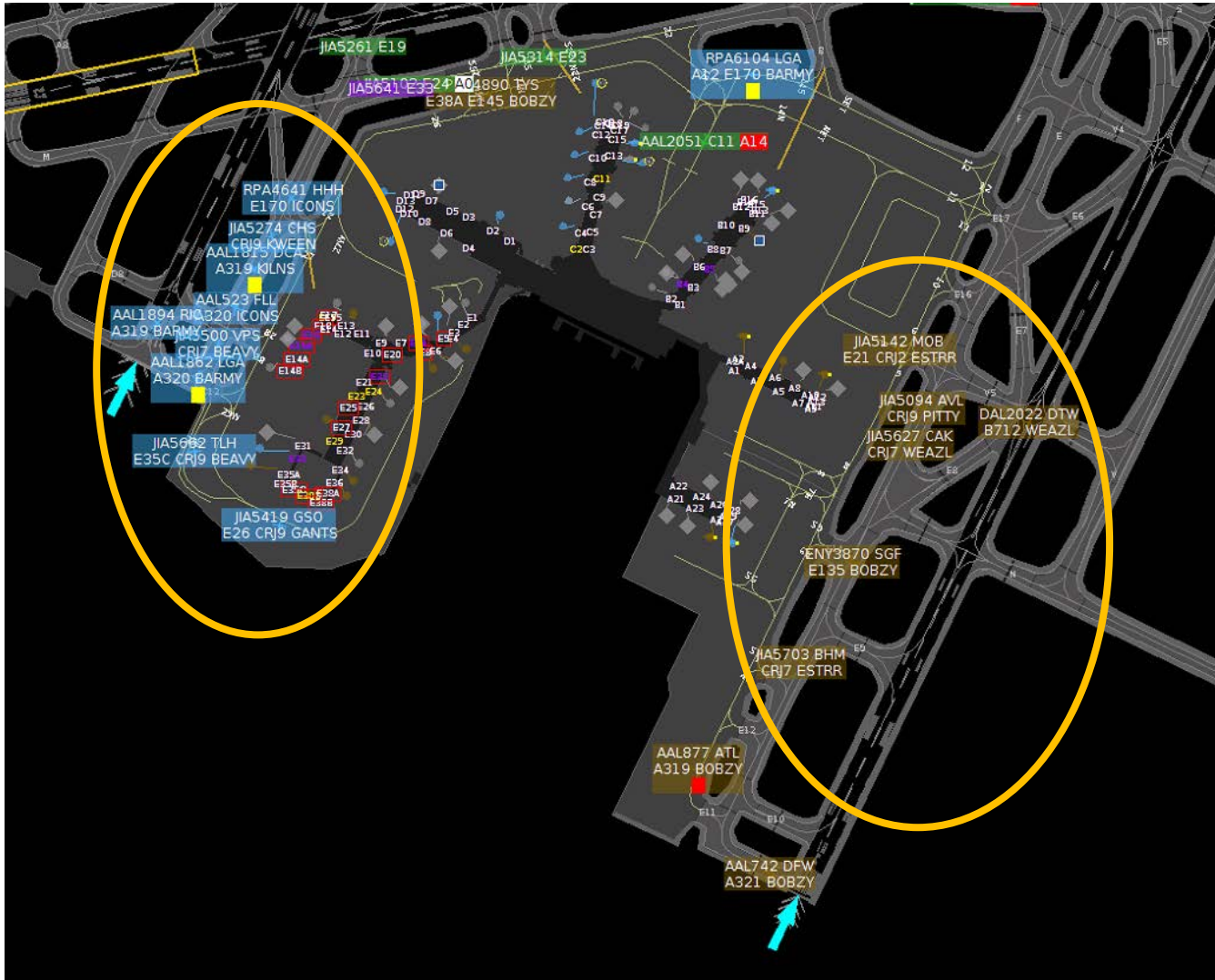
File View Help

Last updated: 14:20:50 GMT

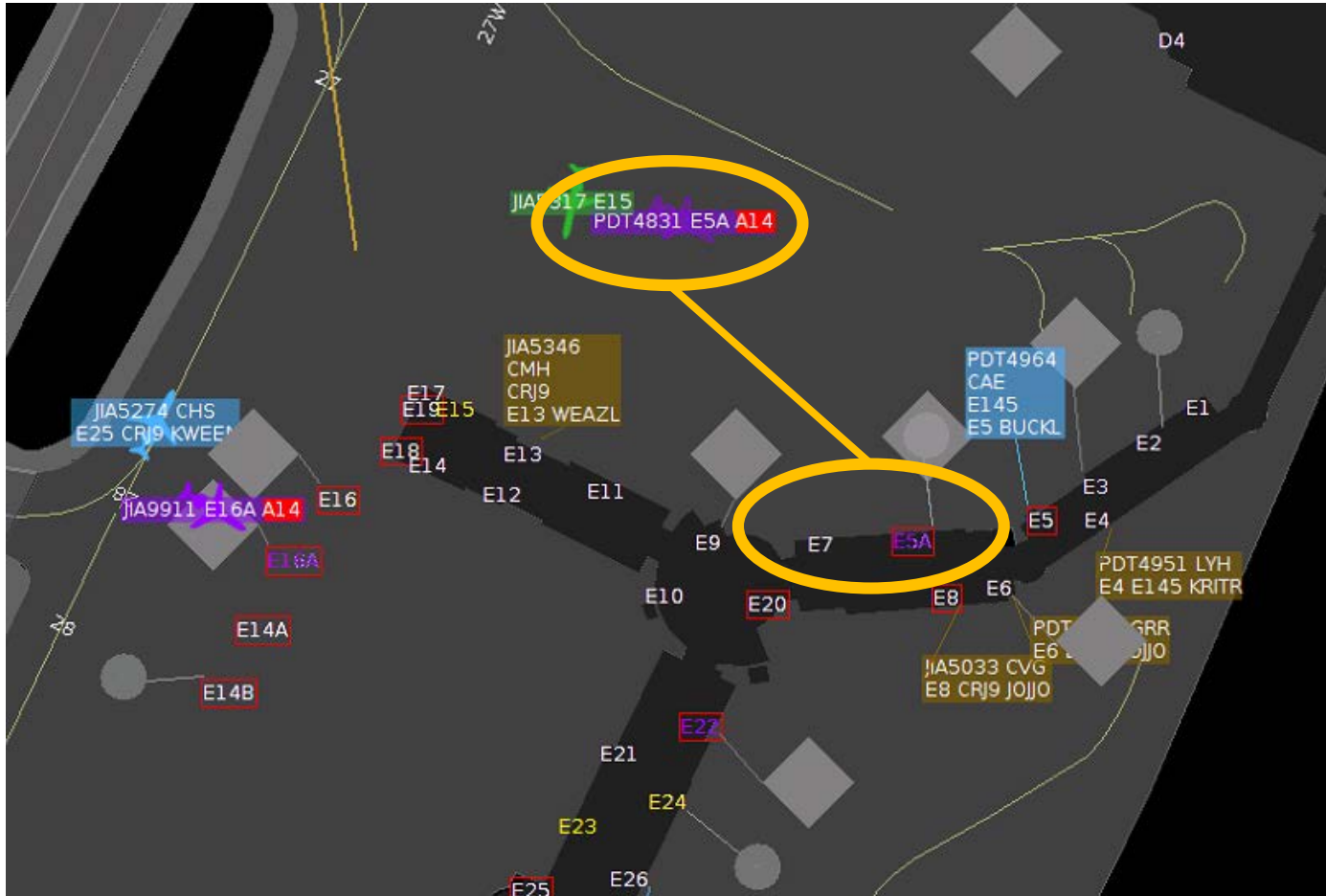
Flight ID	Dest	Dep Fix	AC Type	Gate	Flight Status	TORT	APREQ	EDCT	Rwy	Rwy Time
JBU218	JFK	BARMY	E190	A22	Scheduled_Out		APREQ		E36R	E16/14:47
AAL1598	LGA	BARMY	A321	C12	Scheduled_Out		APREQ		E36R	E16/14:55
DAL2536	JFK	BARMY	B712	A5	Scheduled_Out		APREQ		E36R	E16/15:01
SKW5445	ORD	JOJO	E75L	A27	Scheduled_Out		APREQ		E36C	E16/15:02
DAL2609	ATL	BOBZY	B712	A1	Scheduled_Out		APREQ		E36C	E16/15:15
EDY3381	LGA	BARMY	CRJ9	A7	Scheduled_Out		APREQ		E36R	E16/15:06

Settings What-If STBO Arr/Dep ... =What-If STBO All; Re... What-If STBO Arr/Dep ... What-If STBO Timeline... What-If STBO Timeline... What-If STBO Map 1 [What-If STBO Map 2] Fri Aug 16, 14:20:51

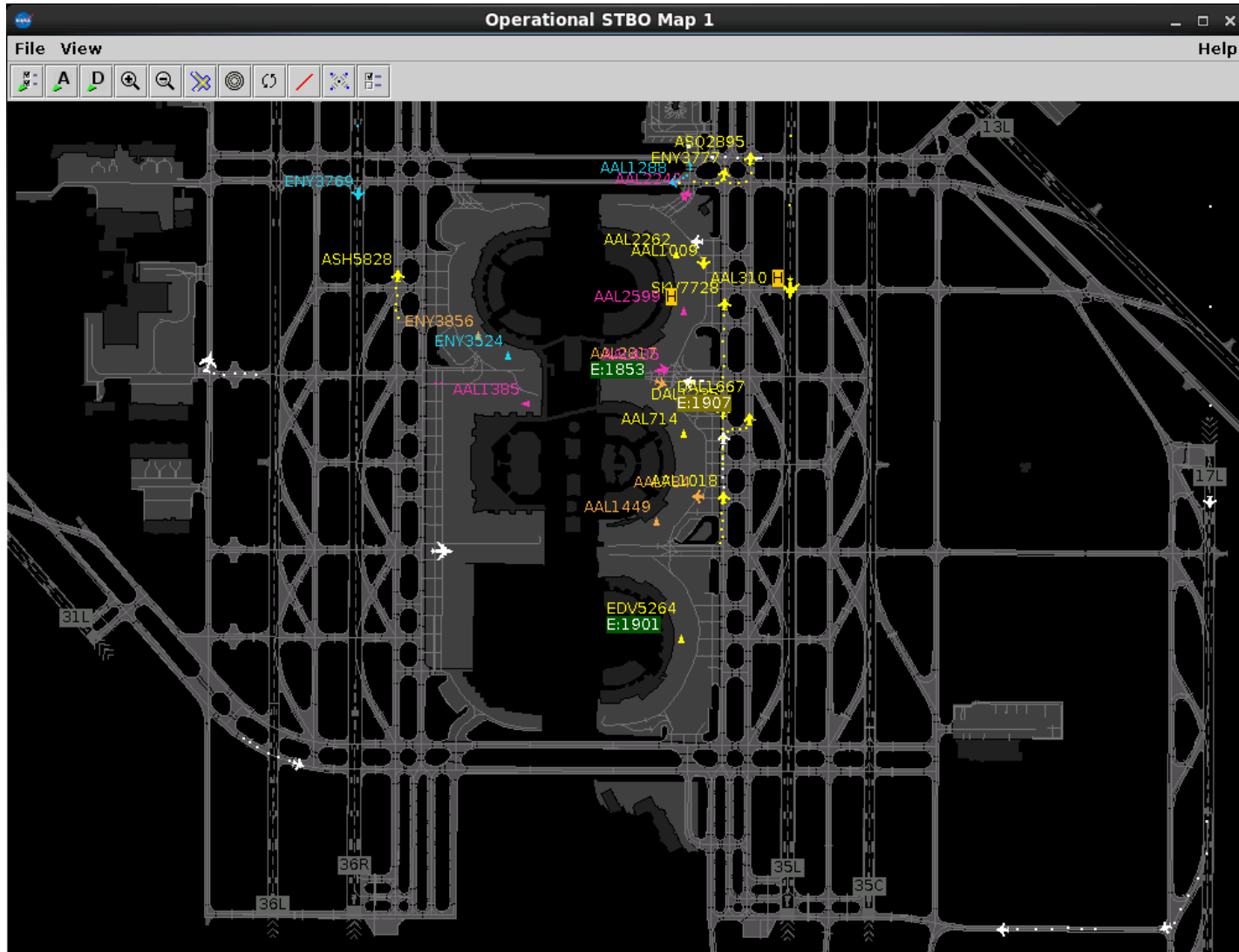
Flight strips color coded by runway assignment



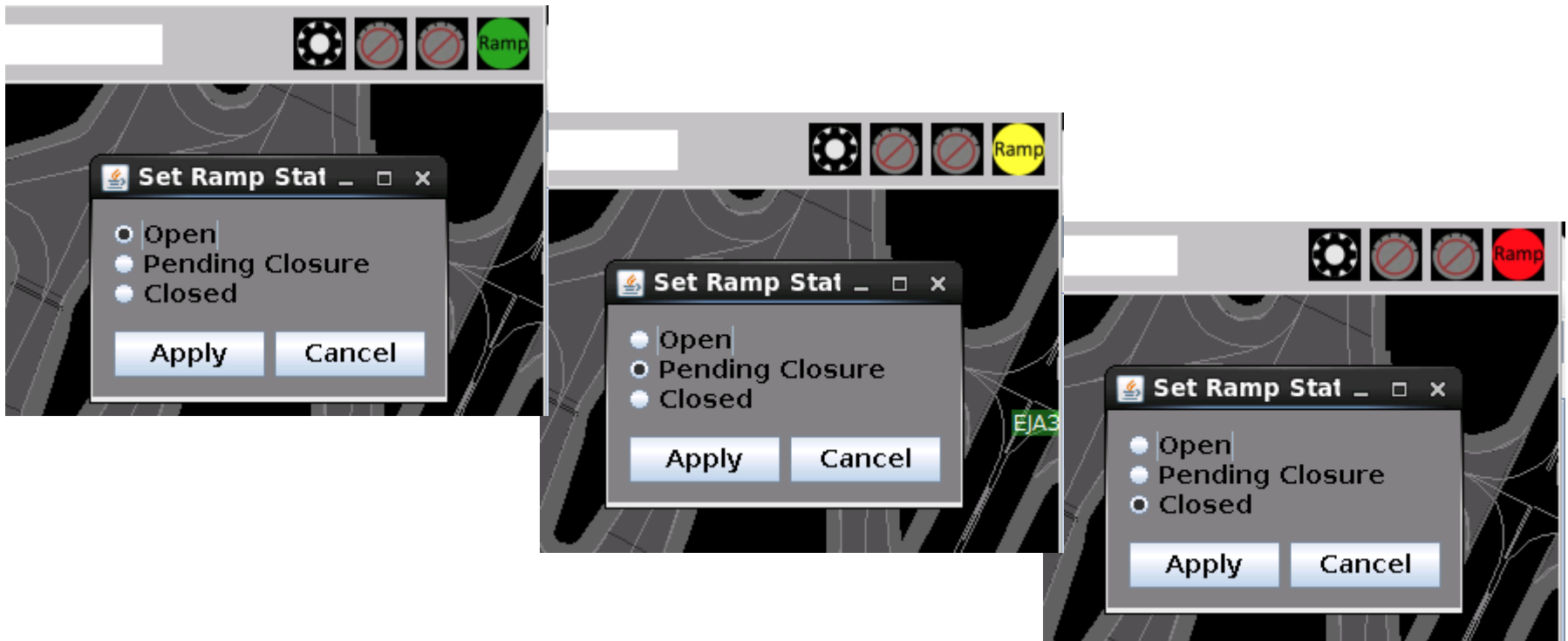
- Automatic detection of gate conflicts
- Conflicts show as a purple flight strip and gate label

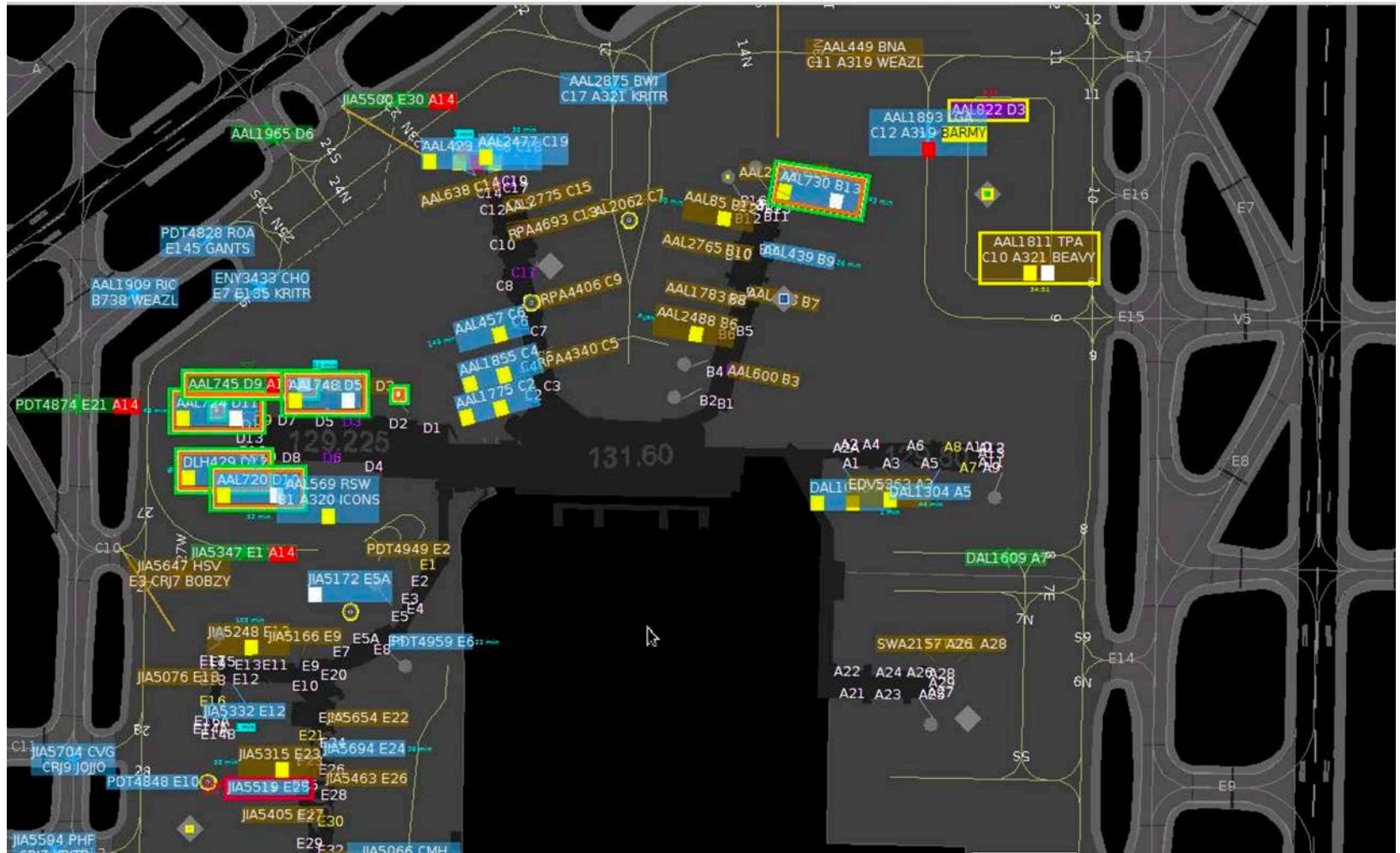


Flight data tags color coded by departure fix



- Schedules and notification of ramp closures
- Does not directly impact flight scheduling
- Used to notify of impending weather or other emergency events







Last updated: 21:03:41 GMT

LILLS	KWEEN	ICONS	BEAVY	ESTRR	BOBZY	JOJO	WEAZL	KRITR
-	-	-	-	10	10	-	-	-
2	1	6	2	4	7	->WEAZL	->TBD	->TBD
2	1	6	2	4	7	0	0	0
2	1	6	2	4	7	0	0	0
	AAL672	JIA5383 AAL677	AAL1609	AAL778 AAL1756	AAL1017 AAL2003 AAL2687			



- ATD-2 and Advanced Electronic Flight Strips (AEFS) began two-way real-time data sharing at CLT on 9/20/2018. This is going well!
- AEFS sends information from controllers back to ATD-2, which shares this on the TTP SWIM feed

AAL2068		B	RMY3	KCLT	B	RMY3	RDU	J55	HPW	1836	18L	LC					
▶ A321/L	P1820	BA	J191	PXT	KORRY4	KLGA											
049	350	KLGA	C8						1837								
Priority	EMRG	ONR	V	MA	H/S	RTN	APREQ	SWAP	STOP	NoCLR	NoDP	FRC	PTT	FR	Pen	Eraser	Clear
EOBT 1820		TOBT 1828		AOBT 1830		TMAT 1836		AMAT 1830		ETD 1833							

ATD-2 Times: EOBT, TOBT, AOBT, TMAT, AMAT, ETD (TTOT)

- As controllers make updates, you get them on TTP SWIM! 

AEFS Gate Conflict



The screenshot displays the ATD2 software interface for managing flight arrivals and departures. The main window shows a list of flights with columns for flight number, airline, origin, destination, and gate. A large red 'X' is drawn over the central portion of the screen, indicating a gate conflict. The interface includes various toolbars and panels for flight details and gate assignments.

Flight #	Airline	Origin	Destination	Gate	Status
AAL2040	BO	BOBZY4	KCLT BOBZY4 TNSLY LEAVI	1925	1935
B738/L	BO	P1856	OZZZI1 KATL		
920			KATL B8		

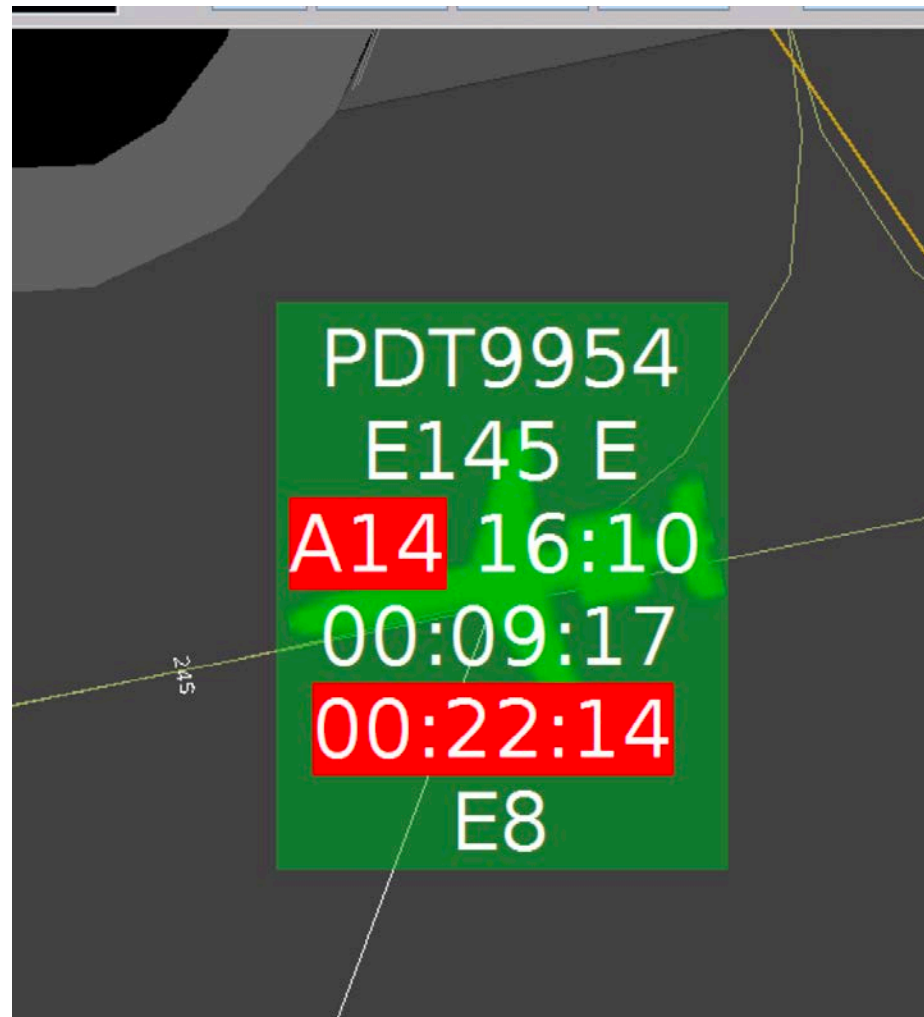
Additional flight details shown in the interface include:

- Priority:** EMBG, CBR, V, SA, WS, RTN, APDQ, SWAP, NoCLR, NoGP, FRC, PTT, FR, Pen, Eraser, Clear
- Timing:** EOBT 1856, TOBT 1915, AOBT, TMAT 1925, AMAT, ETD 1941
- Search Results:**
 - JIA532 CRJ 36L 615 X
 - N44101 Q300 36R 0A1 X
 - JIA5312 CRJ7 36L 677 X
 - AAL1605 A321 36R C13 X
 - JIA5224 CRJ7 36L 616 X
 - EJA772 CL5 36L 6A1 X
 - AAL627 A321 36R B8 X
 - JIA3035 CRJ7 36L E23 X
 - AAL1754 A319 36L C6 X
 - AAL893 A319 36R C4 X

A handwritten note at the bottom right of the screen reads: "Please do Not Adjust Angle of...".



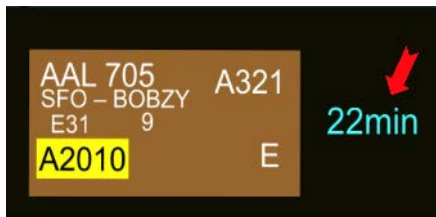
- Lesson: Substantial calibration is required
 - ATD-2 scheduler required buffers that go beyond existing FAA requirements
 - The ATD-2 team considers the ‘tuning’ stable and near-optimal (from a system wide perspective) based upon analysis and ATC & Operator input
- Positive feedback on pre-scheduling with EOBT
 - From ZTL, TFDM, AAL and DAL
- Allowing a smaller buffer for flights with EOBTs encouraged greater Operators participation since pre-scheduling began
- ZTL has periodically allowed fully automated scheduling in IDAC
 - This reflects confidence in the OFF time predictions/compliance from CLT
 - ATD-2 **machine** scheduler predictions to FAA TBFM **machine** scheduling, with the TMCs at ZTL and CLT supervising this operation, and results published on SWIM TTP
 - Area where there appears to be universal agreement on increased automation






- Questions?

- Target Movement Area Entry Times (TMATs) are important both for surface metering and to make overhead stream slot reservation



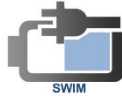
- How long can I **hold at the gate** and still make my APREQ or EDCT time?

Airline and Airport Operators will gain access to these data elements through TTP SWIM 

- “TargetedOffBlockTime”
- “TargetMovementAreaEntryTime”

ATC to Operator

- Real-time traffic management initiatives
- Airport configuration coordination
- Runway intent information



Ramp Tool Colors and Symbology



Arrivals are green



After pushback, engine symbol indicates spool up state



757 aircraft has blue and white border



Sector ownership



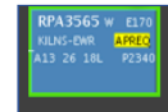
Westbound departures are brown, eastbound are blue



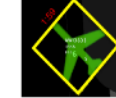
Hollow icon (if no surveillance)



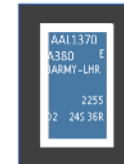
Heavy aircraft has orange and white border



Priority flight has green border

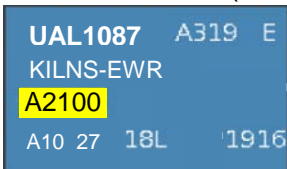


A flight assigned to the hardstand has yellow border

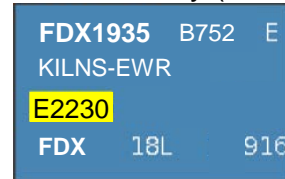


Super type aircraft has thick white border

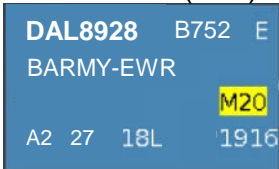
Call for release (APREQ)



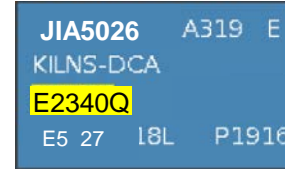
Ground delay (EDCT)



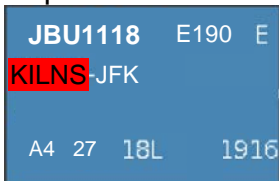
Miles in trail (MIT)



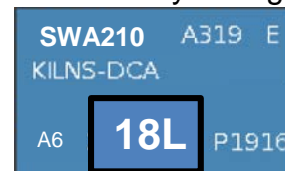
APREQ + EDCT



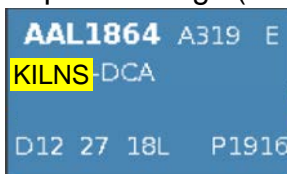
Dep Fix closure



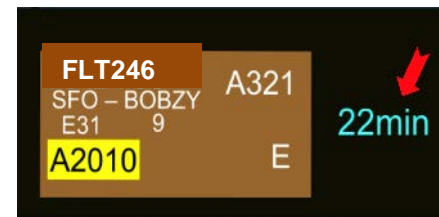
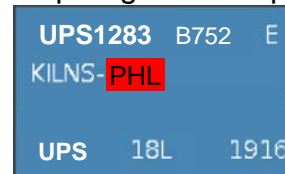
ATC runway change



Dep Fix change (CDR)



Airport ground stop



- How long can I **hold at the gate** and still make my APREQ or EDCT time?