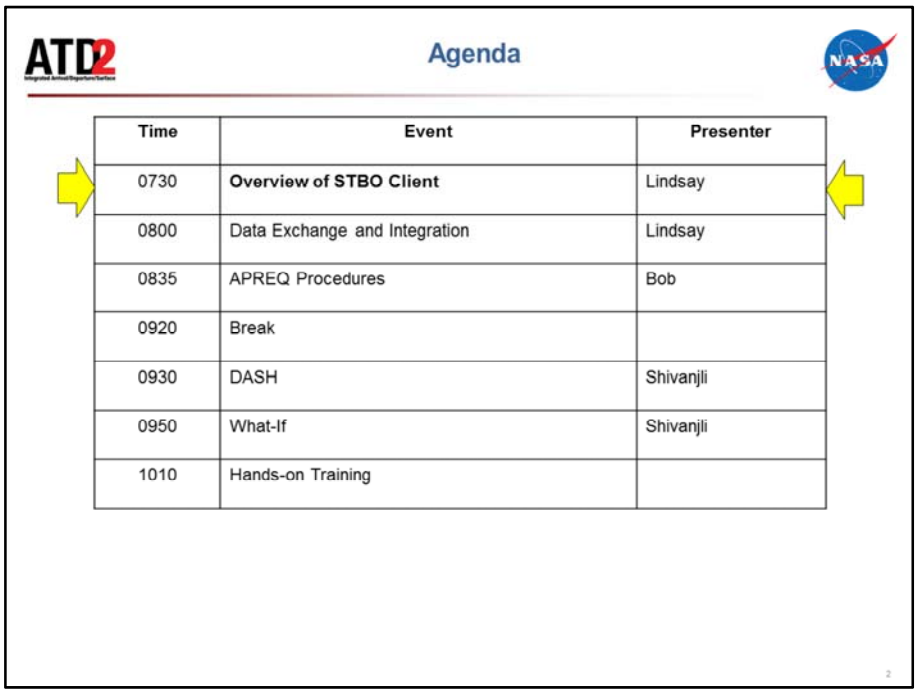
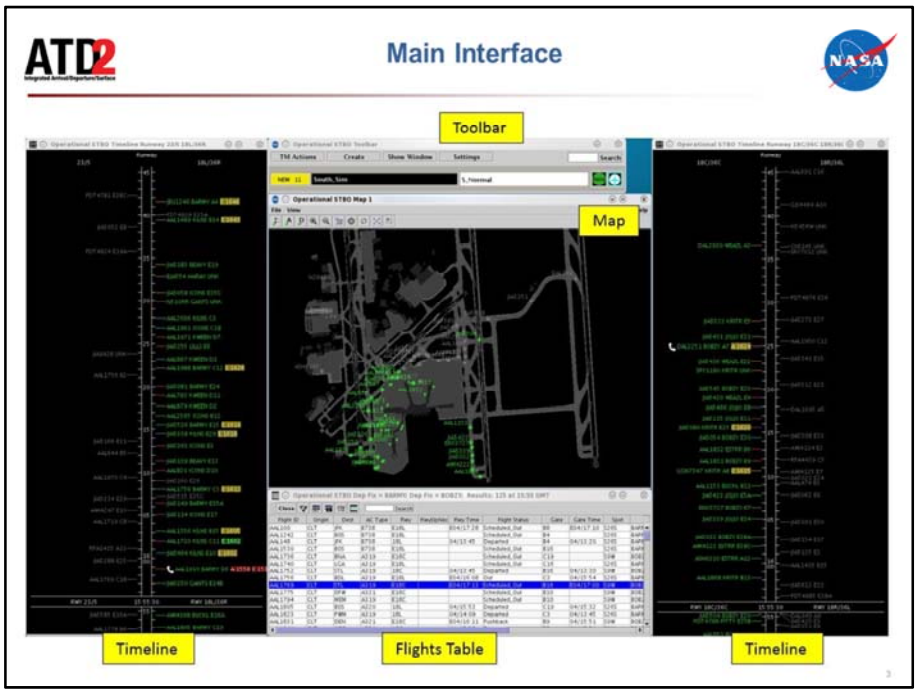
National Aeronautics and Space Administration
NASA
Air Traffic Management Demonstration II (ATD-2)
ATC Tower and TRACON Training
NEXTGEN
CLT
September 25-29, 2017


ATD2
Agenda
NASA
Time
Event
Presenter
0730
Overview of STBO Client
Lindsay
0800
Data Exchange and Integration
Lindsay
0835
APREQ Procedures
Bob
0920
Break
0930
DASH
Shivanjli
0950
What-If
Shivanjli
1010
Hands-on Training



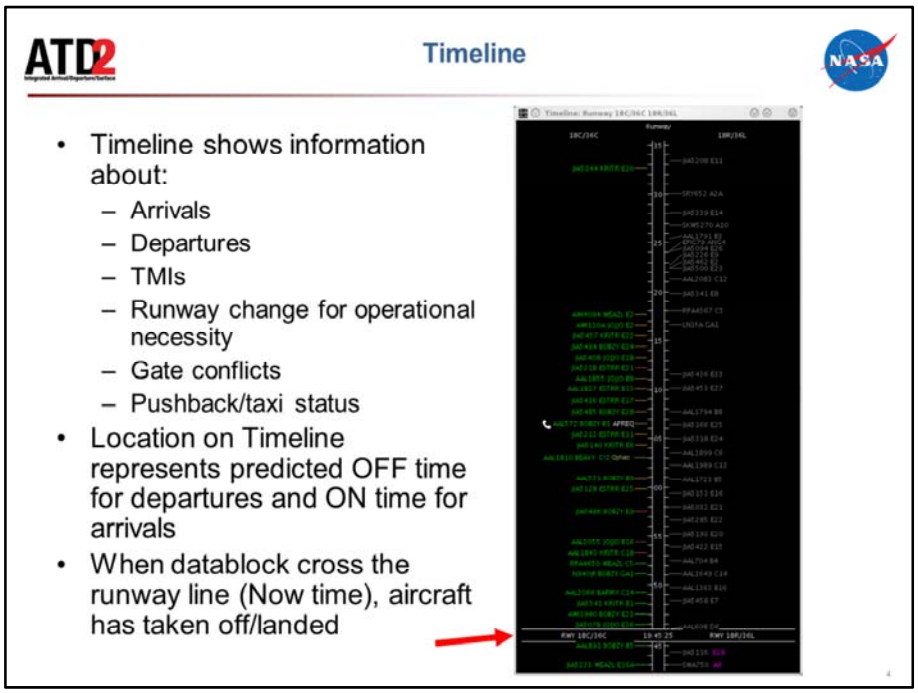
The full interface of the STBO Client is composed of multiple display windows that all serve different purposes and can be configured and arranged however the user wants.

The Toolbar allows the user to interact with the system by adding new display windows, managing current display windows, saving and loading display configurations, searching for flights, scheduling TMIs and airport events, and displaying new notifications to the user.

The Timelines provide information about the predicted OFF times for departures, predicted ON times for arrivals, gate conflicts, and TMIs that aircraft are subject to. They can be displayed to show flight-specific information in the Timeline datablocks.

The Map displays surface surveillance data and provides a visual representation of aircraft current positions. The map also displays runway closures and can be set up to display flight-specific information in the map datablocks.

The Flights Table is a list of all known arrivals and departures for the airport. The list can be sorted and filtered according to the user's preference, and information columns can be moved, sorted, added, and removed.



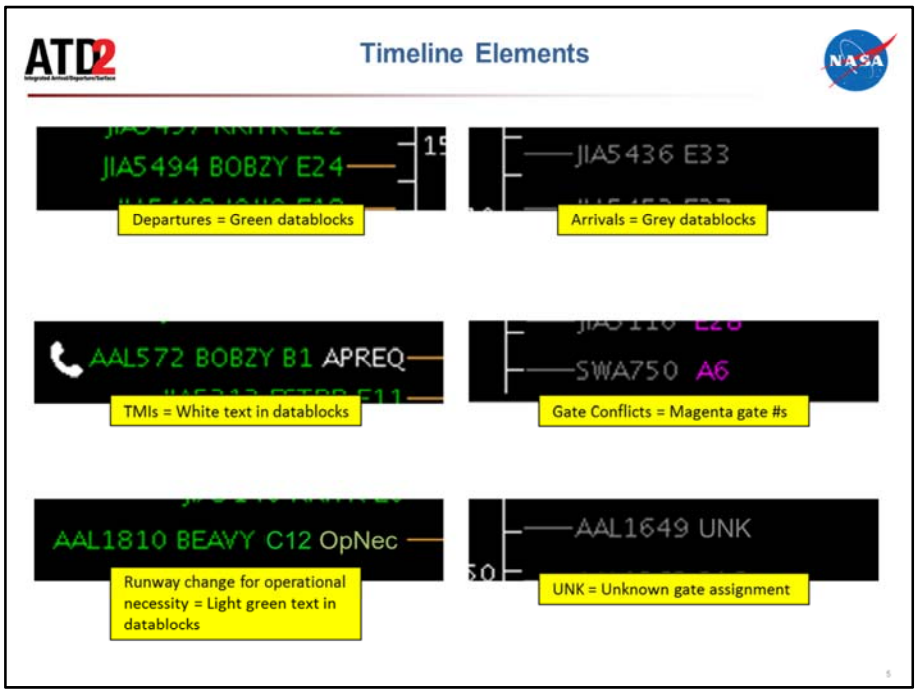
The Timeline is set up to display flight positions, resource labels (e.g., “18C/36C”) at the top and bottom of the display, the type of resource (e.g., “Runway” at the top of the timeline or “RWY” at the bottom), and the now time. The timeline also provides information about arrivals, departures, TMIs, runway assignments and changes for operational necessity, gate conflicts, and pushback and taxi status.

The position on the timeline is the prediction the tactical scheduler generates of OFF time for departures and ON time for arrivals. For departures, this is either the TTOT, CTOT or EFTT.

- EFTT is only provided for APREQs that have yet to be negotiated with Center.

- TTOT is a prediction of OFF. It can be equal to CTOT (the controlled departure time from ATC) for APREQ and EDCT flights.

When flight datablocks cross the resource line with the Now time, arrivals have landed and departures have taken off.



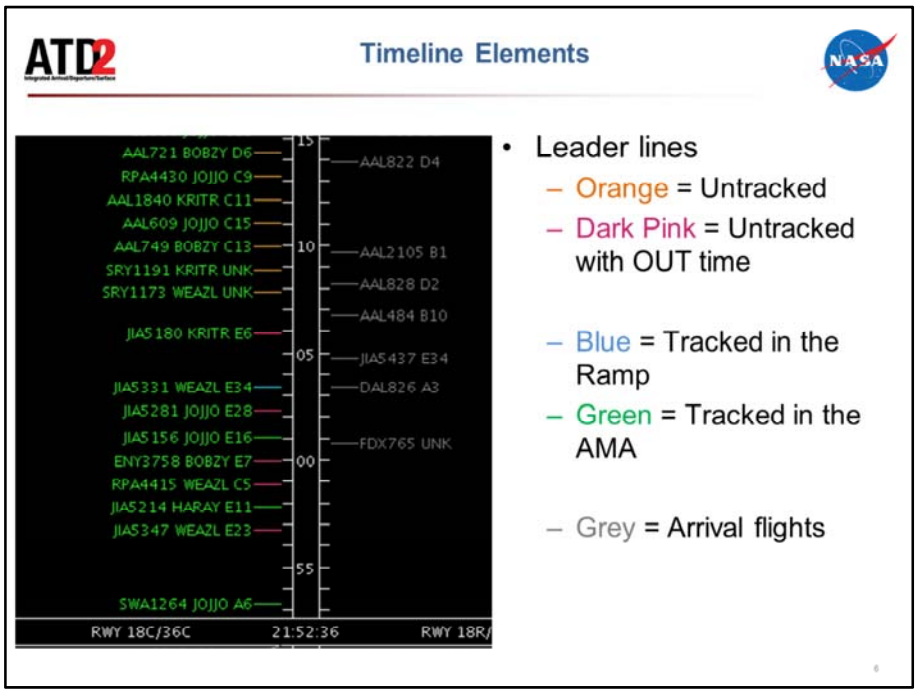
When the timeline is configured by arrivals and departures, arrival flights are displayed in grey and departure flights are displayed in green.

APREQ flights have additional symbology (e.g., the telephone icon displayed here), but all TMI information is displayed in white text. APREQ and EDCT times are also displayed on the Timeline in white text once the system has the times.

When parking gates are selected to be displayed on the Timeline, unknown parking gate assignments are displayed as “UNK”. When gate conflicts are selected to be displayed on the Timeline, the parking gate number is colored magenta for flights with gate conflicts.

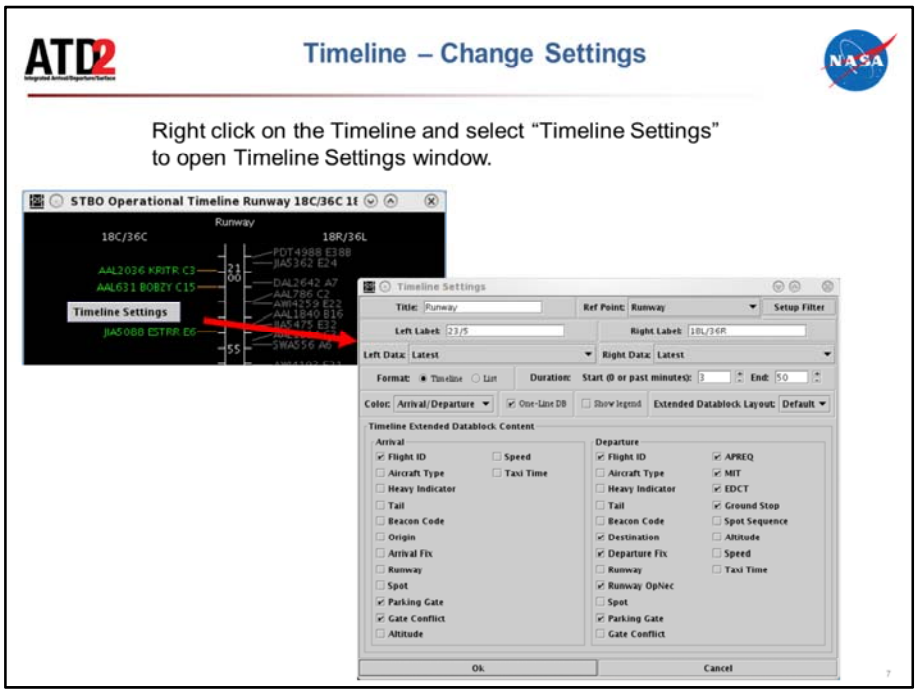
When ramp inputs a requested change of runway assignment for operational necessity, the flight datablock moves to the new runway assignment and “OpNec” is written in light green text on the datablock.

Additional flight information can be configured to display on the timeline flight datablocks (see slide 7).



Leader lines are useful for determining the status/position of the flight on the surface.

- Orange leader lines show untracked departure flights that are scheduled but have not yet pushed off the gate (no OUT time)
- Dark pink leader lines show untracked departure flights that have pushed back from the gate (have an OUT time)
- Blue leader lines are for tracked departure flights that are still in the ramp area
- Green leader lines are for tracked departure flights that are in the AMA
- Grey leader lines are for arrival flights

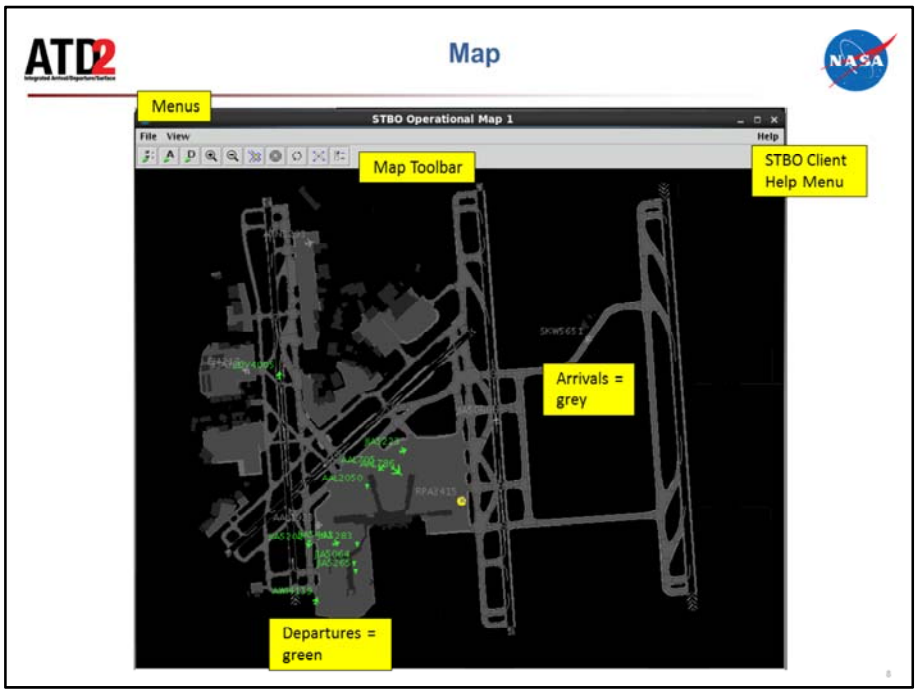


Timeline display windows are not limited to showing information about arrivals and departures to the runway. Timelines can be configured for other resources (or reference points), to input different data, to have color coding beyond that of arrivals and departures, be filtered to display select information, and can be shown in list format rather than as a timeline. Timelines can also be configured to show a variety of information in the datablocks about arrival and departure flights.

To open the Timelines Settings window, right click anywhere on the timeline background (anywhere not on a flight datablock) and select "Timeline Settings."

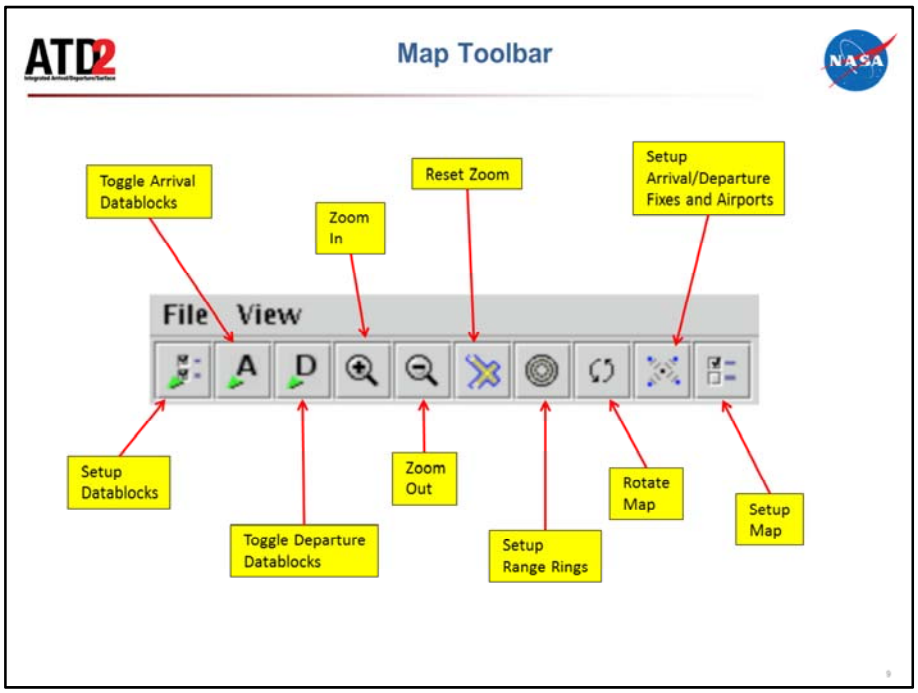
The duration of the Timeline display can be configured to any interval of the user's choice. The user also has the ability to left or right click on the center column of the Timeline and drag the Timeline up or down and look further into the timeline's past or future. When dragging the Timeline, the interval remains the same, but the start and end times will differ. For example, lets say the Timeline is displaying a 53-minute interval of time that starts 3 minutes in the past and ends 50 minutes into the future. If you click and drag the timeline down 10 minutes, the Timeline will keep displaying a 53-minute interval, but the start and end time for the timeline

display will now be from 7 minutes into the future to 60 minutes into the future.



STBO Client Map consists of dropdown menus (which will not be covered in these slides since most of the functions are found elsewhere on the GUI), a Map toolbar, STBO Client Help menu, and flight positions on the surface. Flight positions are collected from surface surveillance.

Like on the Timeline, departure flights are displayed in green and arrival flights are displayed in grey. Gate conflicts appear as magenta parking gates.

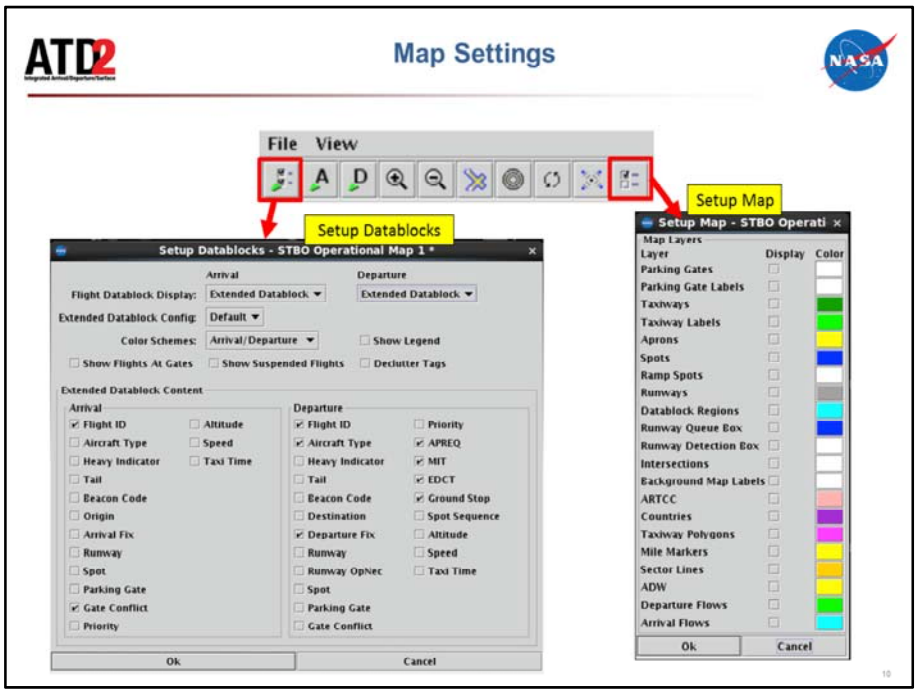


There are several functions available to the user on the Map toolbar. The labels above are what appear on the hover tooltips feature for each button. From left to right:

- Setup Datablocks: opens a settings window for making adjustments to how all Map datablocks are displayed (see slide 10)
- Toggle Arrival Datablocks: toggle between no DB, ACID only DB, and Extended DB
- Toggle Departure Datablocks: toggle between no DB, ACID only DB, and Extended DB
- Zoom In: zoom in on the map
- Zoom Out: zoom out on the map
- Reset Zoom: return to the default map zoom level
- Setup Range Rings: opens settings window to set interval for range ring spacing, show range rings, show distance labels for each range ring, and set the max distance to show range rings
- Rotate Map: select one of four orientations for the map (0°, 90°, 180°, 270°) – note: choosing the orientation the map is currently on will result in no rotation
- Setup Arrival/Departure Fixes and Airports: add specific fixes and

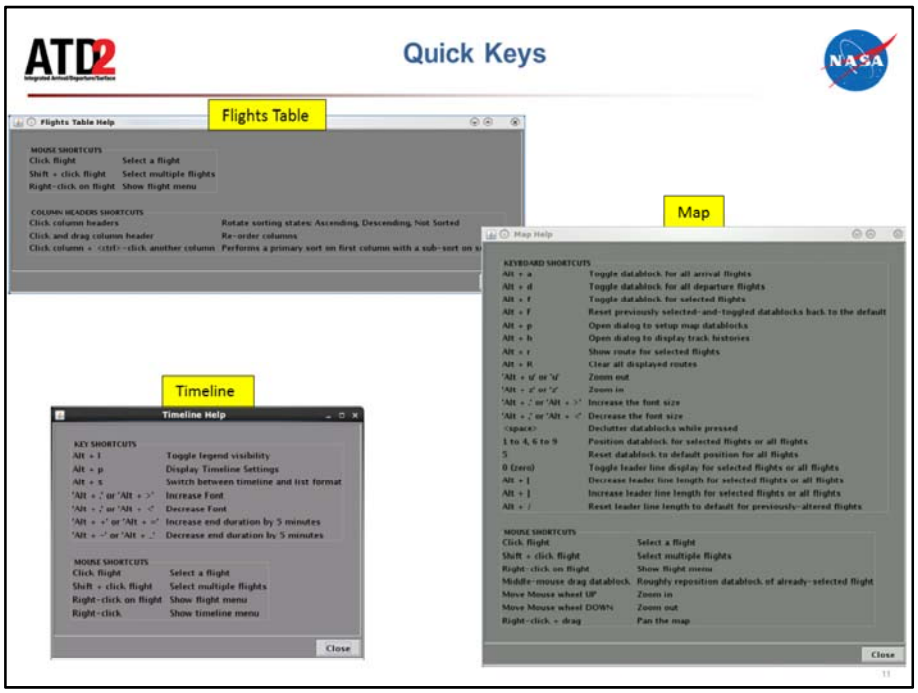
airports to the display, overlay TRACON map onto airport map

- Setup Map: opens a window to change settings for showing or hiding labels, shapes, and other items on the map (see slide 10)



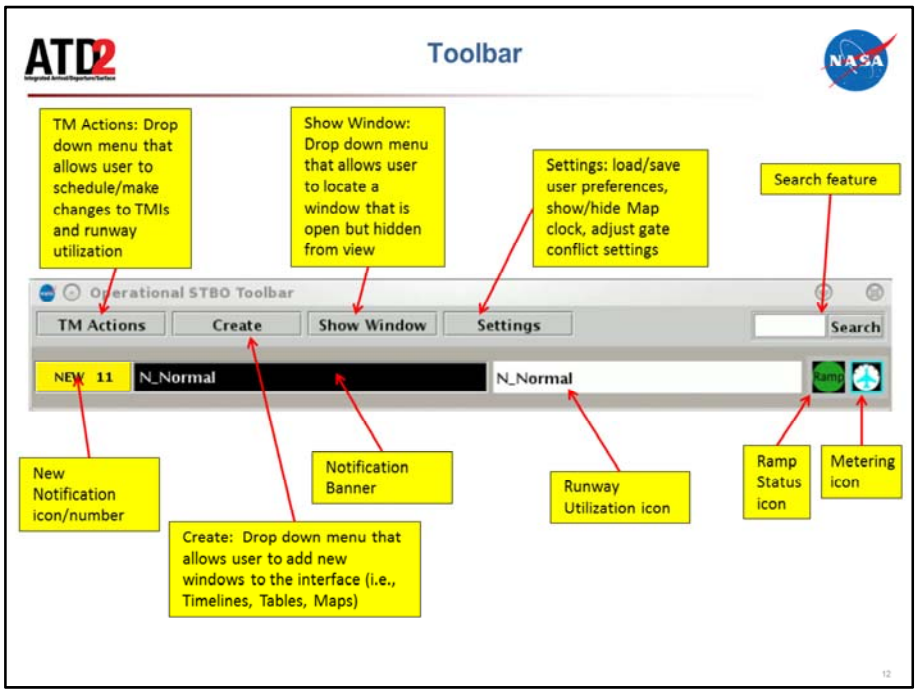
The Setup Datablocks button on the Map toolbar opens a window that enables changing the settings for what items are displayed on arrival and departure datablocks, as well as setting up how aircraft icons are color coded, showing (untracked) flights at the gate, and other display filters.

The Setup Map button on the Map toolbar opens a window that enables changing the labels, shapes, and other items on the map (e.g., selecting the “ADW” checkbox displays the physical boundary for the ADW on the map).



Some users prefer to use quick key functions to navigate through the interface and interact with it. Some quick key functions exist in the system today.

The Map toolbar currently uses hover tooltips to display the button labels. Menu tooltips will be added to the system to describe some of the quick keys.

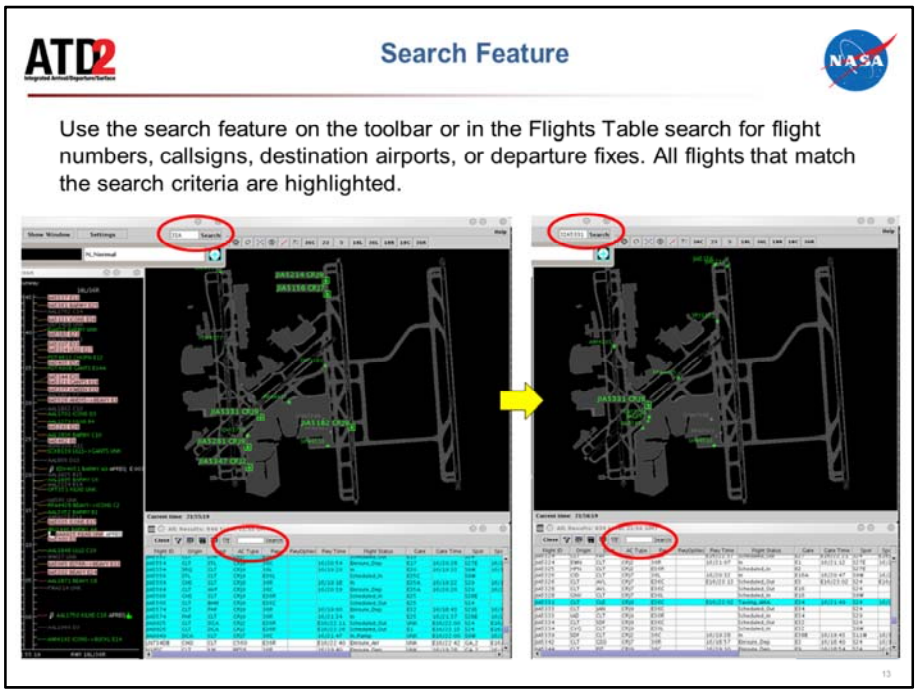


There are several functions available to the user on the Toolbar. From left to right:

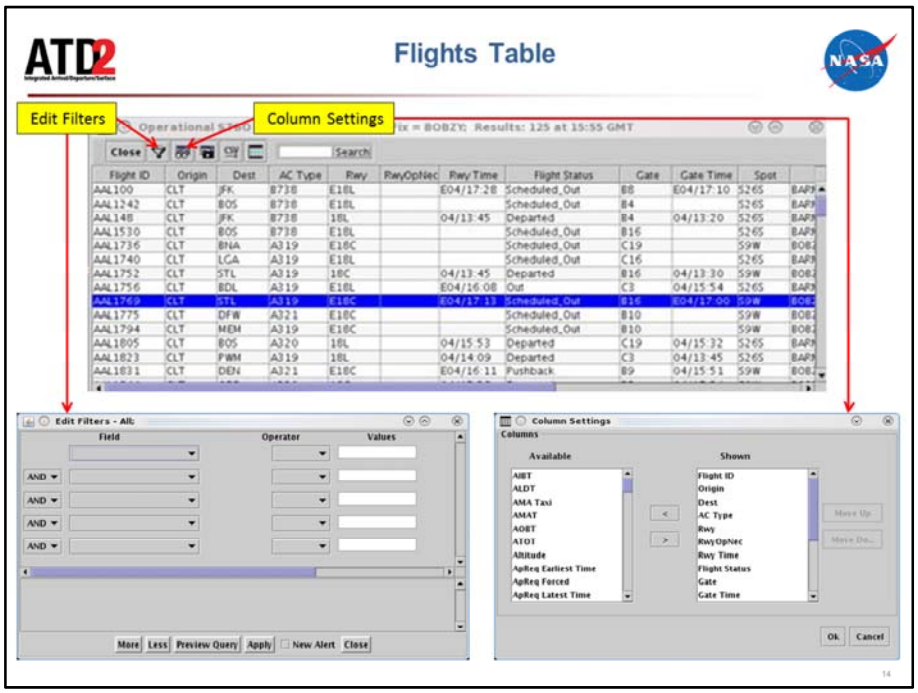
- TM Actions: dropdown menu that allows user to schedule/make changes to TMIs and runway utilization
- New Notification Icon/Number: displays in yellow with the number of new notifications when new notifications are populated in the notification window. When there are no new notifications, this icon is grey with the number "0" displayed.
- Notification Banner: this banner cycles through the new notifications in the notification table. Once notifications are cleared/acknowledged, the banner is blank. Only new notifications are displayed. Clicking on the banner populates the notification window.
- Create: drop down menu that allows user to add new windows to the interface (i.e., timelines, tables, maps, load graphs)
- Show Window: drop down menu that allows user to locate a window that is open but hidden from view beneath other windows
- Settings: button that opens a window to allow users to save the current display configuration for the whole STBO Client or to load a previously saved configurations
- Search Feature: search for a flight either by entering the full callsign or numbers only
- Ramp Status Icon: shows when the Ramp is open, pending closure, or

closed.

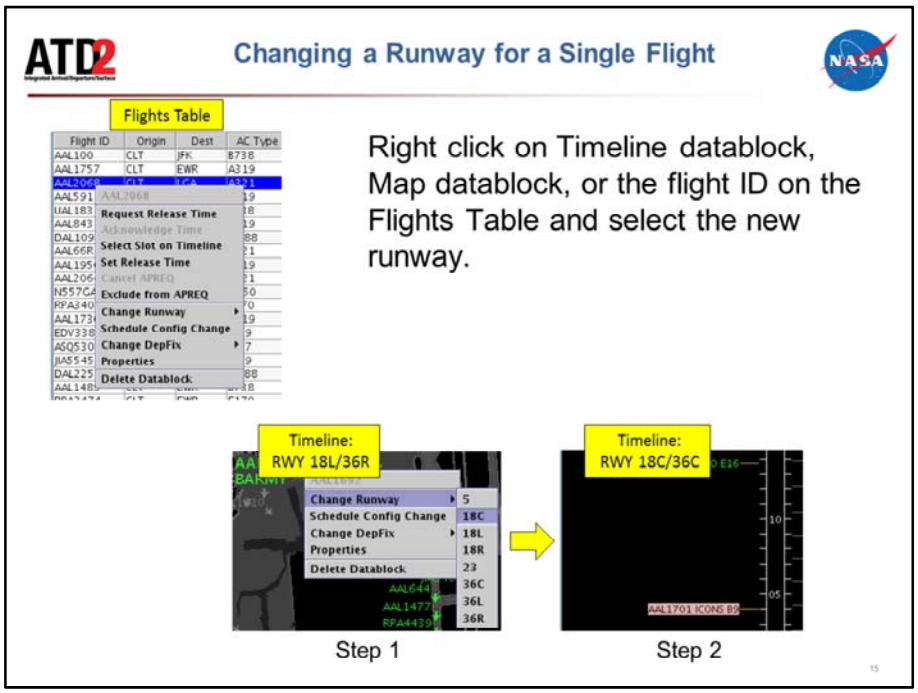
- Flow Icon: provides situational awareness for the airport runway configurations and runway utilization.



The search function is located on the STBO Client Toolbar and Flights Table. It can be used to locate groups of flights from the same carrier or to locate individual flights. To search, type the flight number, callsign, destination airport, or departure fix in to the search textbox. When typing begins, the search feature will highlight all flights that match the first character (the first image). As more characters are entered, the number of flights that match the search will narrow (the second image).



The Flights Table provides a list of scheduled flights for the airport. The column headings on the list can be traded out and moved around in the “Column Settings” window. The list of flights displayed can be adjusted by using the “Edit Filters” window and adding filter parameters.



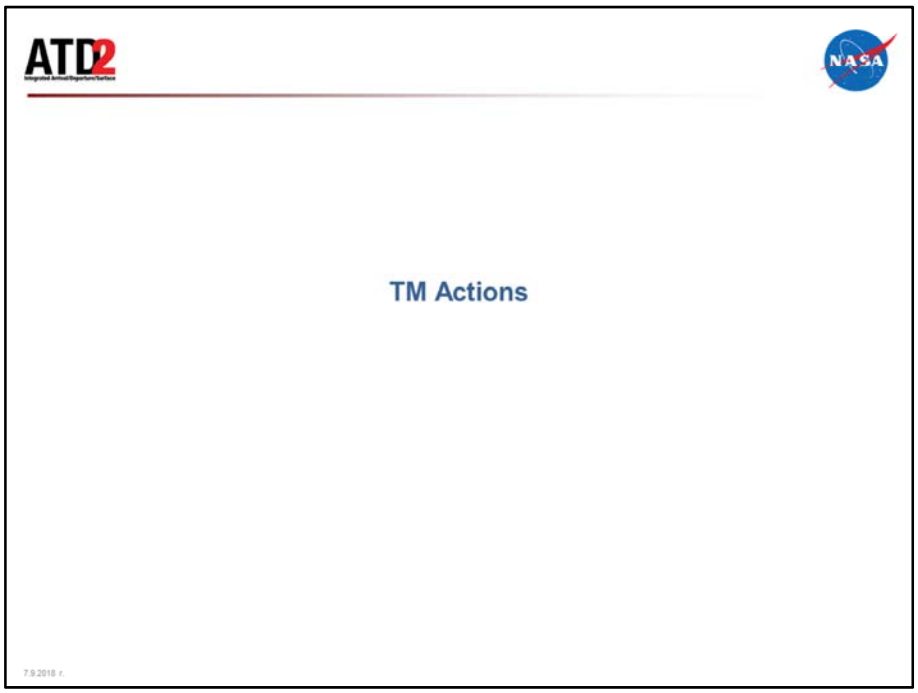
To change the runway for a single flight:

- Step 1: right click on the flight ID on either the Timeline or Flights Table
- Step 2: choose “Change Runway”
- Step 3: choose a runway from the drop down menu. The flight’s timeline datablock will automatically move to the Timeline for the new runway assignment. Ramp is automatically notified of the change.

Runway changes for multiple flights can be completed at once. To do this, select multiple flights, then follow the above steps 1-3. Multi-flight runway change can only be completed for groups of flights whose runway assignment is being changed to the same runway.

The same procedures can be used to change the departure fix for a single flight:

- Step 1: right click on the flight ID on either the Timeline or Flights Table
- Step 2: choose “Change DepFix”
- Step 3: choose a departure fix from the drop down menu. The flight’s timeline datablock and Flights Table will automatically update with the new departure fix assignment. Ramp is automatically notified of the change.


ATD2
NASA
TM Actions
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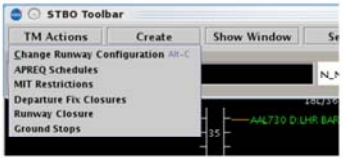
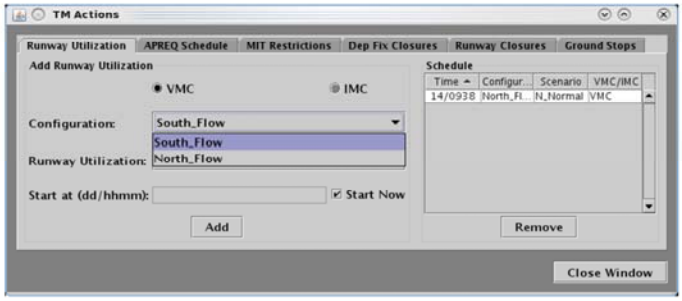
Changing Runway Utilization in STBO Client

- Click on TM Actions menu
  - select "Change Runway Configuration"

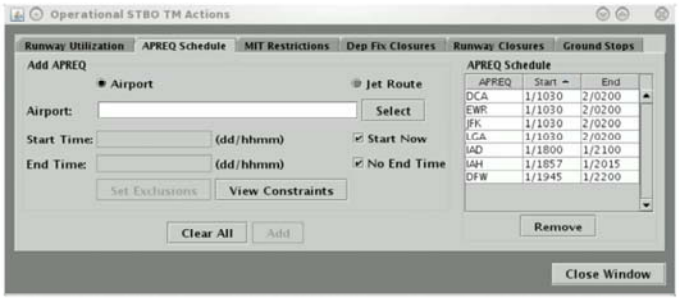


- "Runway Utilization" tab is pre-selected
- Fill in information and "Add" to the schedule



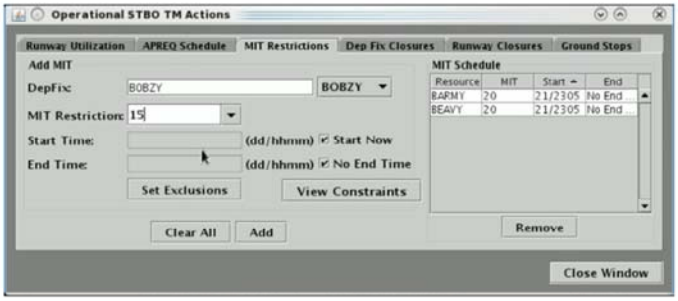
Adding APREQs into STBO Client

- Select “APREQ Schedules” tab
- Fill in information and “Add” to the schedule
- You can set and preview exclusions too



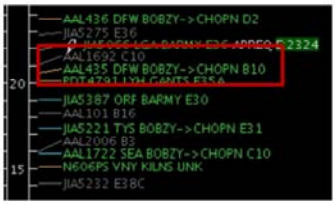
Adding MITs into STBO Client

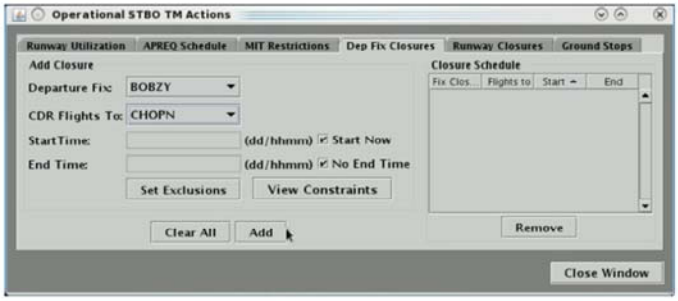
- Select “MIT Restrictions” tab
- Fill in information and “Add” to the schedule
- You can set and preview exclusions too



Adding DepFix Closures into STBO Client

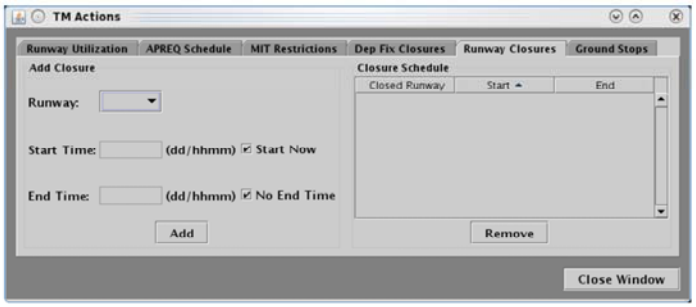
- Select “Dep Fix Closures” tab
- Fill in information and “Add” to the schedule
- You can set and preview exclusions too

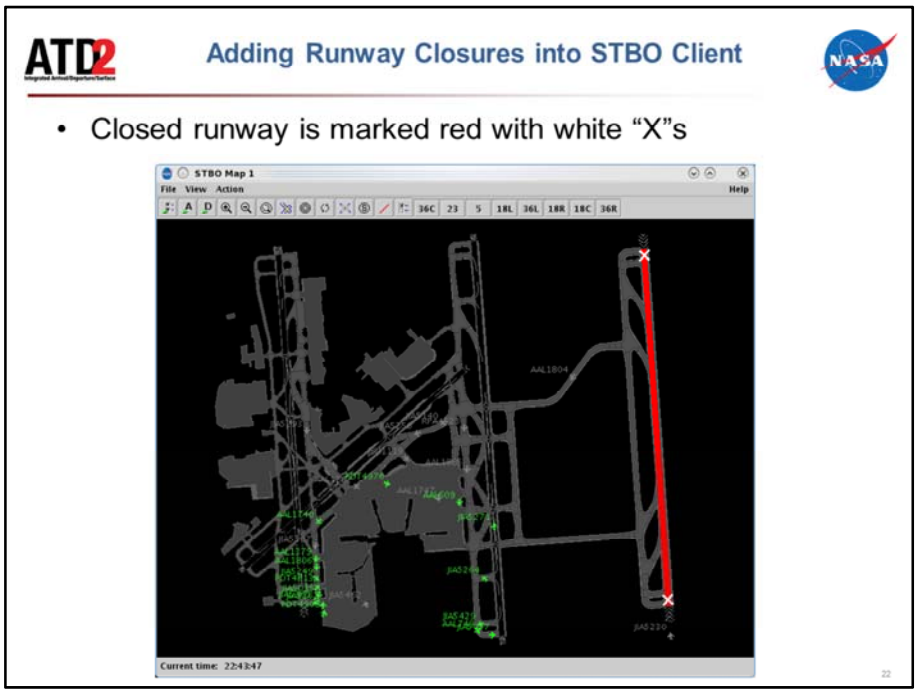




Adding Runway Closures into STBO Client

- Select “Runway Closures” tab
- Fill in information and “Add” to the schedule

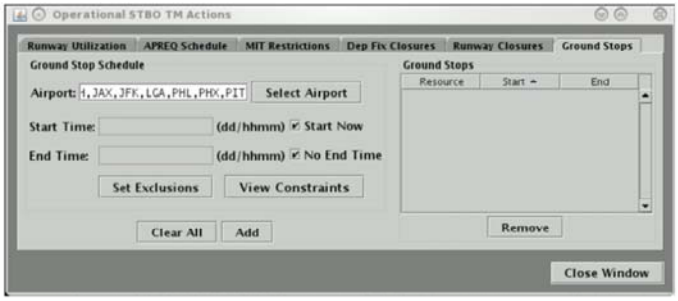




The closed runway is marked red with white “X”s at either end.

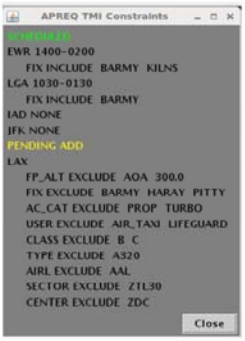
Adding Ground Stops into STBO Client

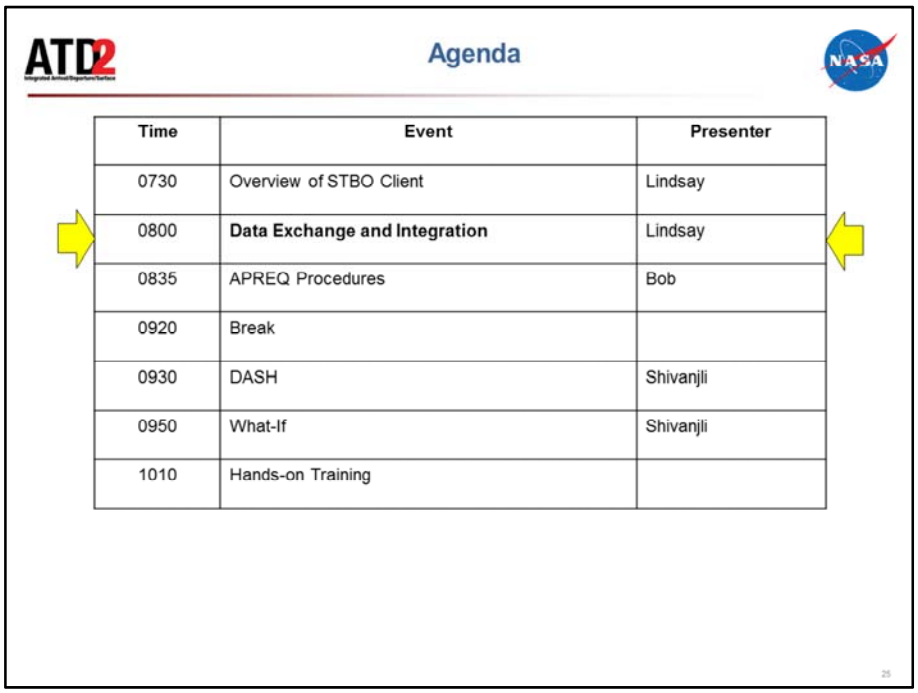
- Select “Ground Stops” tab
- Fill in information and “Add” to the schedule
- You can set and preview exclusions too



Exclusions

- Fill in any necessary information
- “Apply” to the restriction
- Preview exclusions

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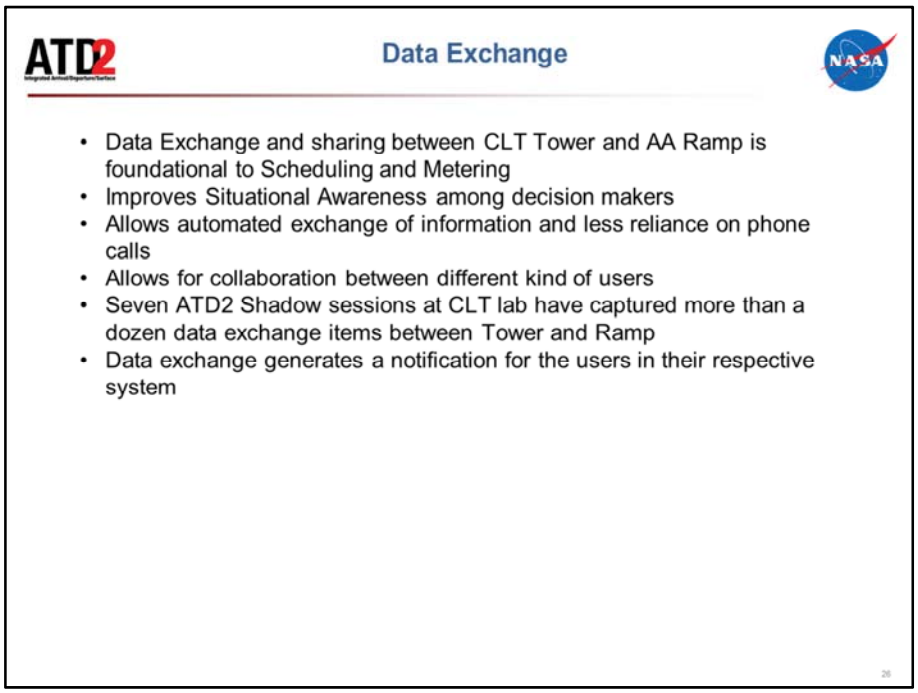
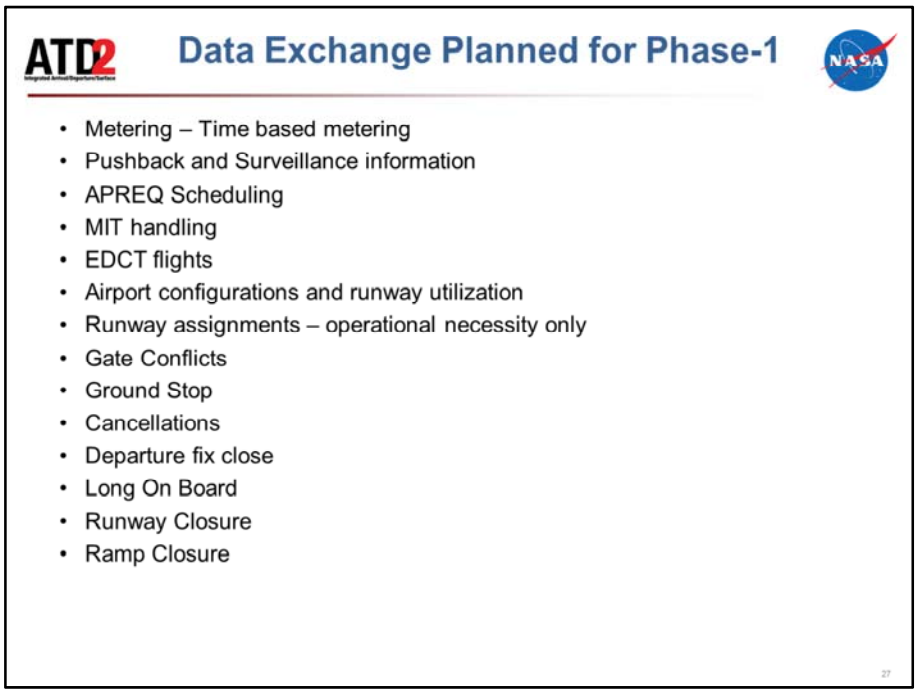


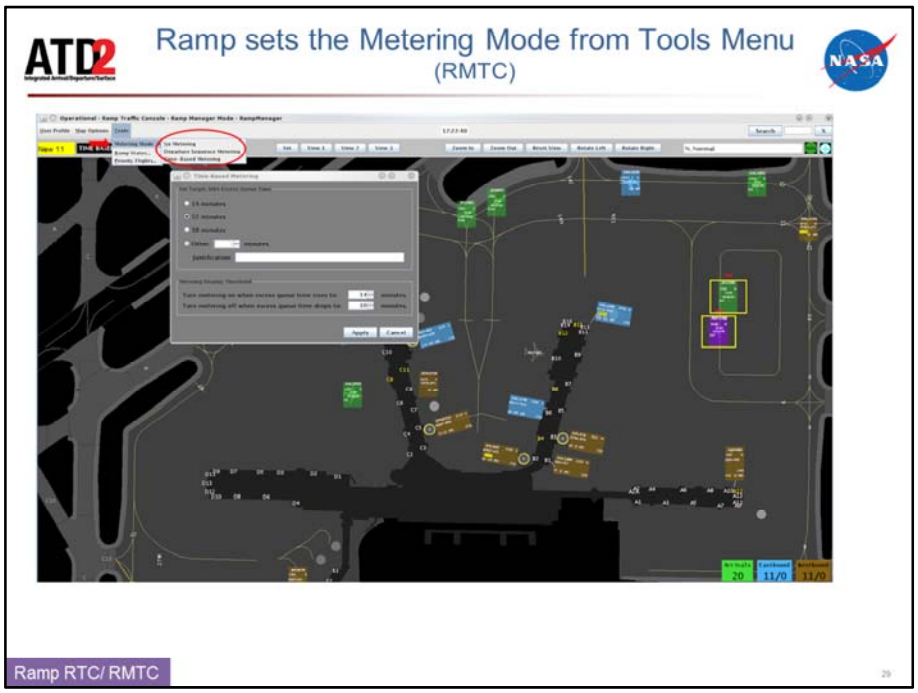
Data exchange is the key to information sharing between the Ramp and Tower and is likely to improve situational awareness. Many of these exchanges will remove the over reliance on phone calls and hopefully make the process a lot more efficient and streamlined. It also puts the onus on one party to make inputs into the system so that it is effectively disseminated among others. Even though pilots are not getting any new ATD-2 technologies, many of the changes in their procedures are included here



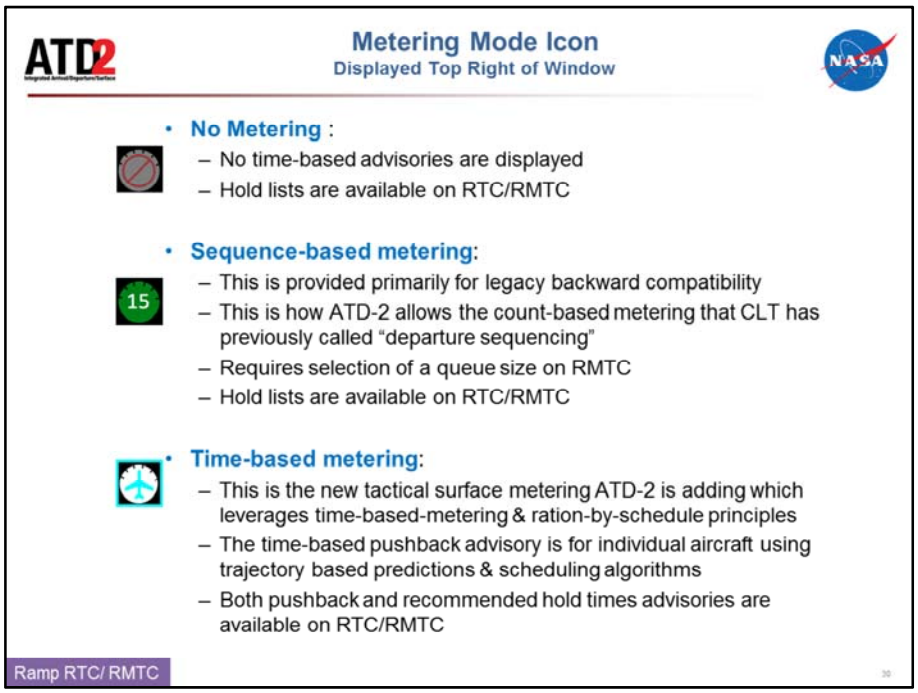
As a theme most TMIs are never shared directly with Ramp. They know about this after the TMI has been given to the pilot. NASA team discussed these topics for data exchange and integration between the Ramp and the Tower over 7 shadow evaluations that were held at CLT lab. This list shows all the topics that were discussed and planned to become part of the phase-1. Our main system is Surface Trajectory Based Operations (STBO), which is analogous to a big house that has several windows – one for the amp and one for the ATC-T (STBO Client). These data exchange items will be displayed in a similar way in the two windows- RTC and STBO Client.

Data Exchange Planned for Phase-1

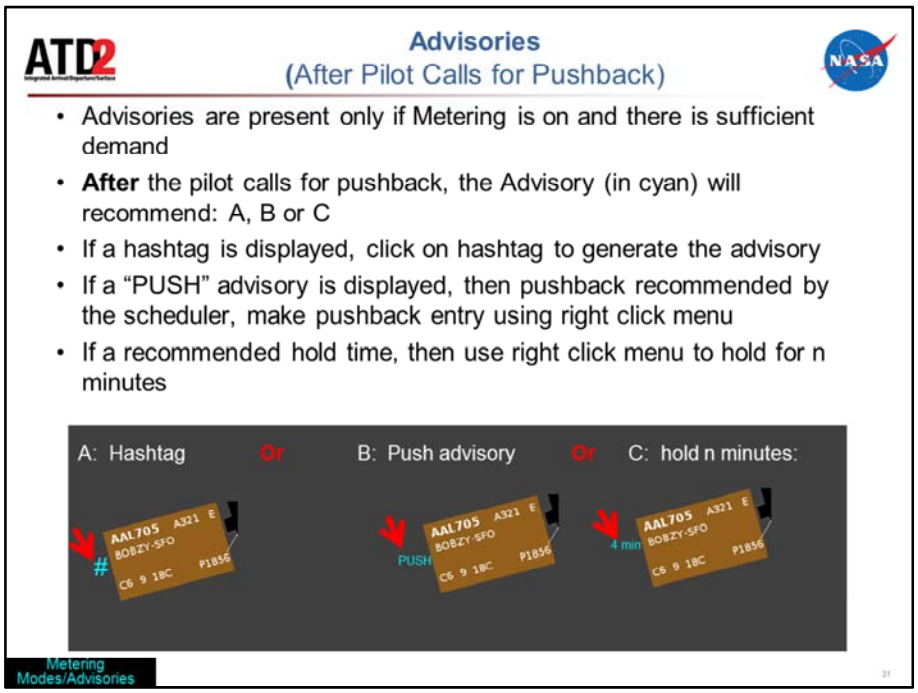
- Metering – Time based metering
- Pushback and Surveillance information
- APREQ Scheduling
- MIT handling
- EDCT flights
- Airport configurations and runway utilization
- Runway assignments – operational necessity only
- Gate Conflicts
- Ground Stop
- Cancellations
- Departure fix closure
- Long On Board
- Runway Closure
- Ramp Closure



The Ramp Manager will have the option to set the metering mode from the tools menu. The option to set it as “no metering” or “departure sequence metering” is meant to collect data, it does not change any algorithms. Ramp Manager is expected to make this input into the system and it will be sent to the users as a new notification. The notification icon shown in the top right hand side will be also get updated for both STBO Client and RTC. A close up of the notification icons can be seen in the next few slides



The metering modes are described above. These will be updated depending on Mode set by the Ramp Manager, STBO Client will also display the Metering Mode Icon on the right hand corner of the Toolbar.



When Time Based Metering is enabled, there may not be advisories generated right away. The metering may be enabled sooner than the tool turns on these advisories. The tool turns on the advisories when it sees a demand capacity imbalance that propagates delays to some flights. The advisories should be used when the pilot calls in.

Tactical Scheduler advisories provide a recommended hold time for the controller to advise a flight to either pushback or hold at the moment they call for pushback approval.

These advisories are updated every 10 seconds based on real time movements on the surface including queue length, number of pushbacks at the gate.

Gate conflicts are not resolved by scheduler, RC may decide to push a flight at a gate with a conflict, or to hold the arrival in HS.

When Tactical Scheduler Advisories are in use, we ask the ramp controllers to follow these recommendations while controlling traffic

Data Exchange Planned for Phase-1

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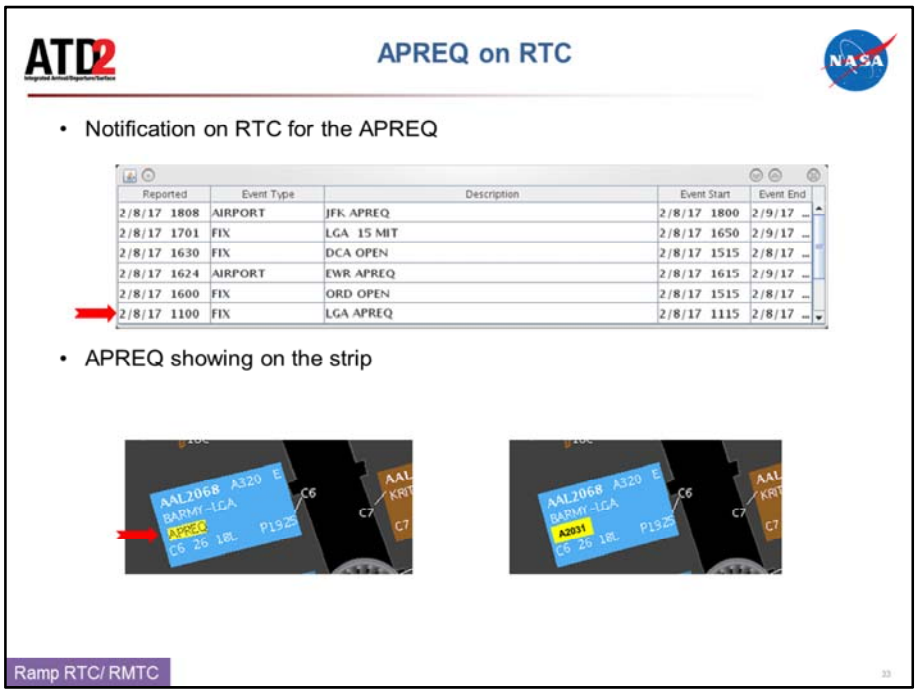
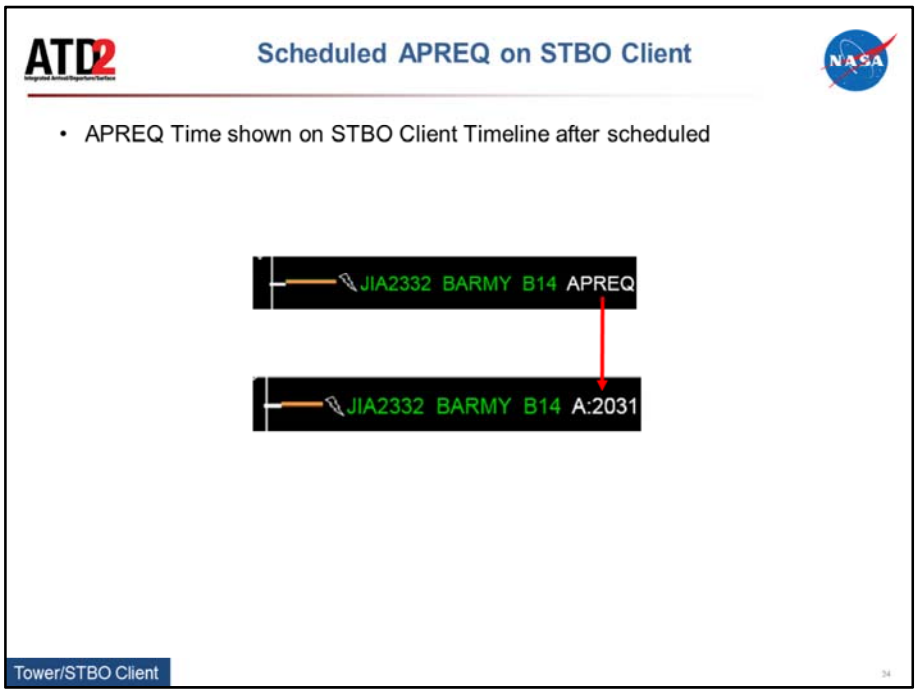
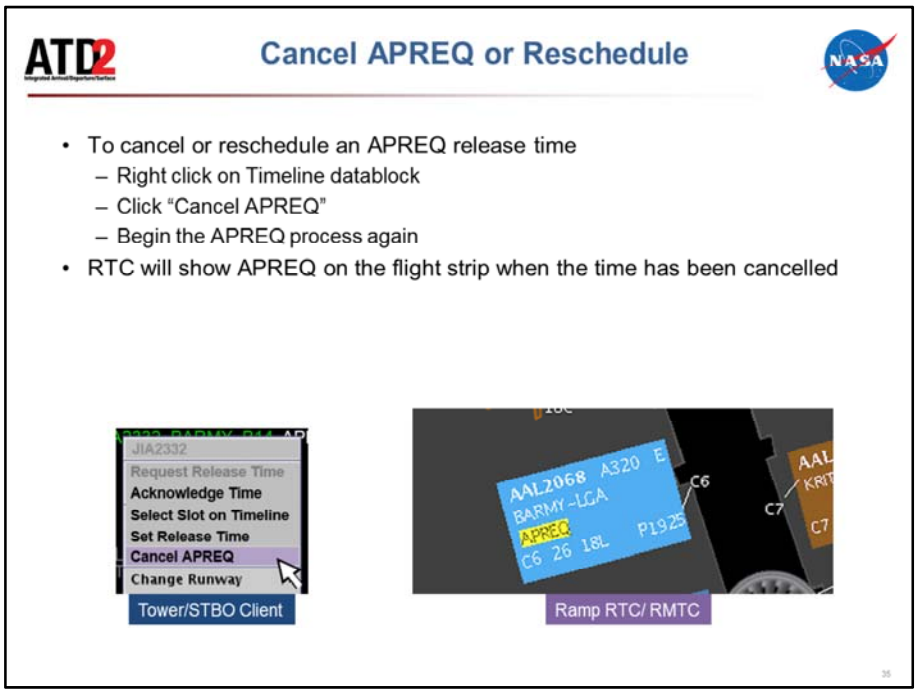
- Gate Conflicts
- Ground Stop
- Cancellations
- Departure fix closure
- Long On Board
- Runway Closure
- Ramp Closure



Adding an APREQ restriction will generate a notification on RTC and add the word “APREQ” to the Flight Strips of the affected flights.



Initially the word “APREQ” is shown on Timeline data block when it’s known that the flight needs to request Wheels-up time. After the negotiated time is received from the Center, the word “APREQ” changes to the scheduled time shown as ”A:hhmm” on the Timeline datablock.



If the APREQ release time needs to be rescheduled then it has to be cancelled using the right click menu. After it has been cancelled, the APREQ process has to start all over again with the Center.

Data Exchange Planned for Phase-1

- Metering – Time based metering
- Pushback and Surveillance information
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- MIT handling
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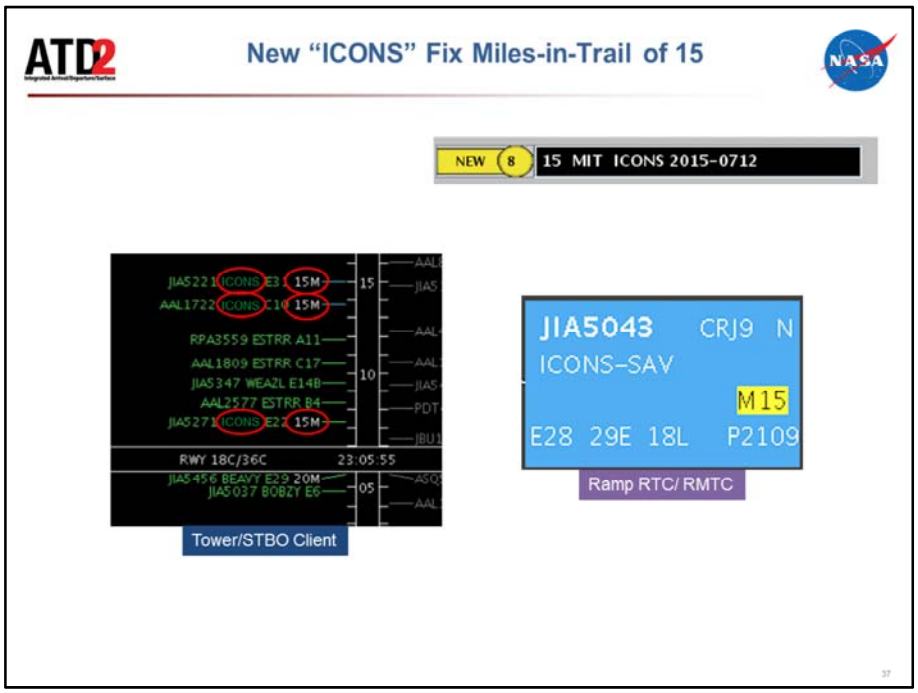
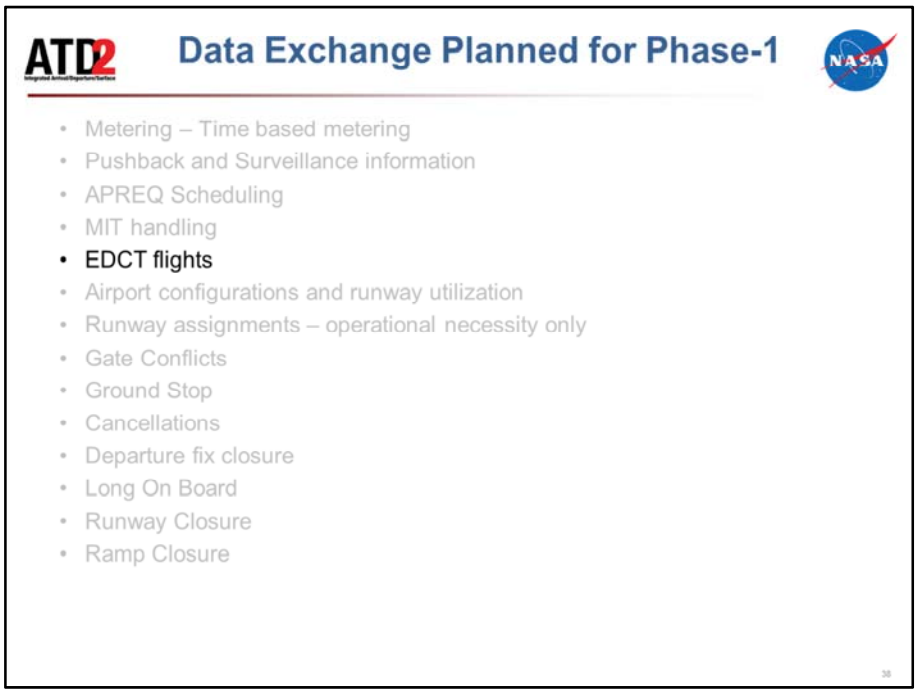
- Runway assignments – operational necessity only
- Gate Conflicts
- Ground Stop
- Cancellations
- Departure fix closure
- Long On Board
- Runway Closure
- Ramp Closure



Added restrictions show up as "M15" on Timeline.


ATD2
Data Exchange Planned for Phase-1
NASA
• Metering – Time based metering
• Pushback and Surveillance information
• APREQ Scheduling
• MIT handling
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• Airport configurations and runway utilization
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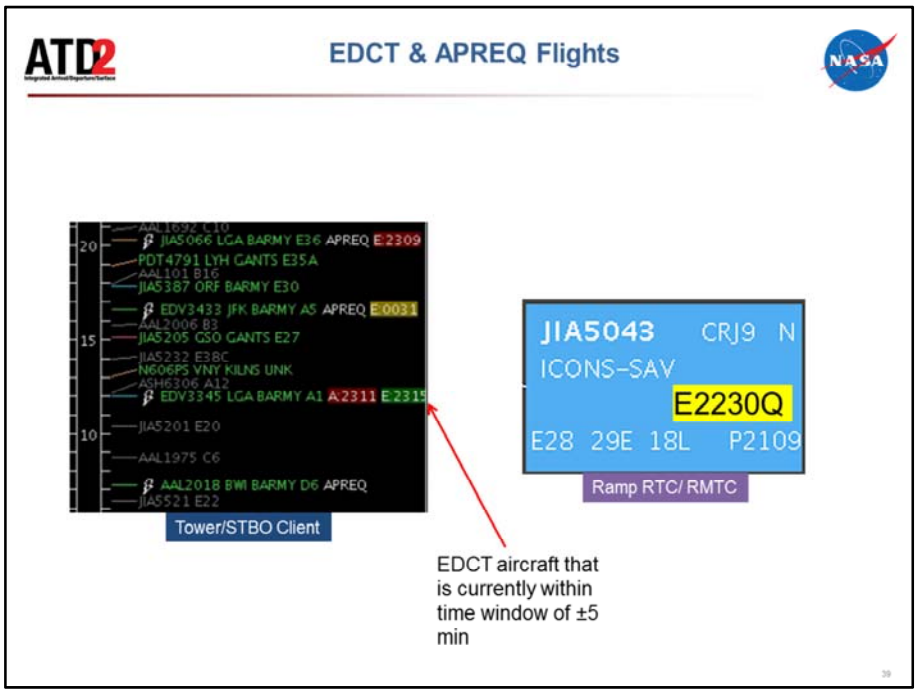
• Ramp Closure



Expected Departure Clearance Times (EDCT) are “Wheels Up” times that are assigned to aircraft due to Traffic Management Initiatives (TMIs) that require holding aircraft on the ground at the departure airport. They have a - 5 minute / + 5 minute conformance window.

EDCTs are read through our system and show up on the STBO Client timeline as “E:hhmm.” If the flight is subject to EDCT agreen compliance indicator show if the flight is inside the +/- 5 window, it’s red when it is outside the window and late, and it’s yellow when it’s outside the window and early.

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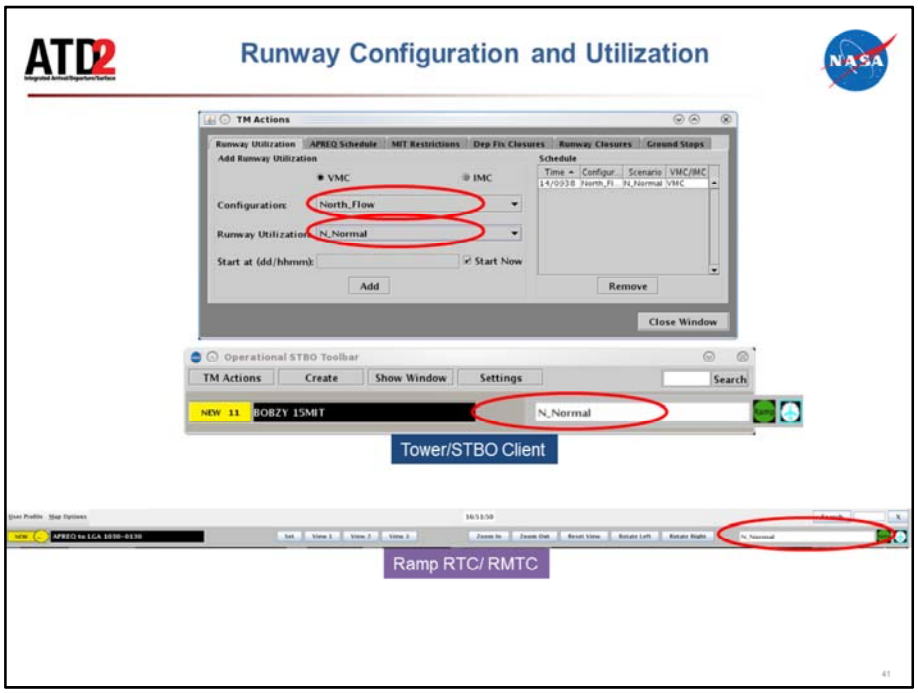
- Ramp Closure



This feature will certainly eliminate the need for phone calls between the Ramp and ATC-T. The ATC-T has agreed to input the airport configuration and any changes to runway utilization. This will be displayed to the Ramp as well as the ATC-T as a notification.

Data Exchange Planned for Phase-1

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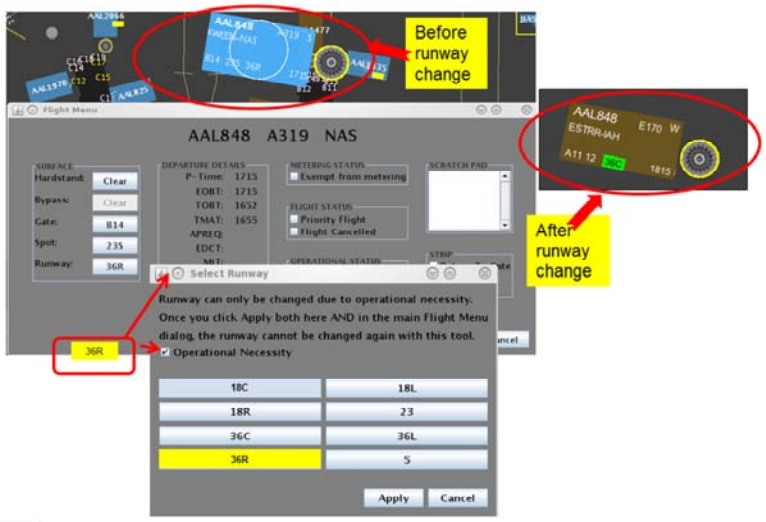
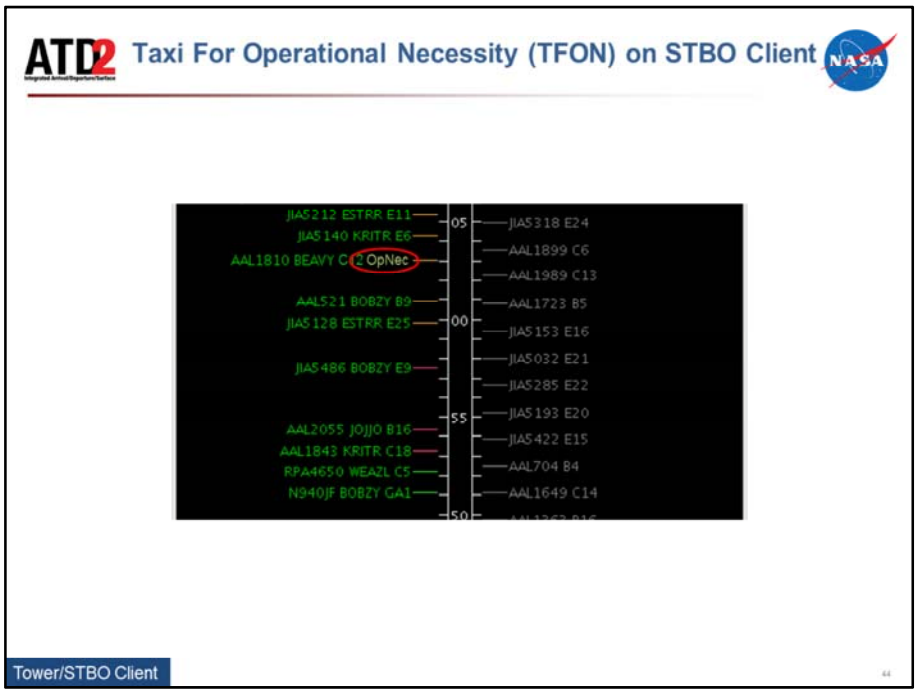
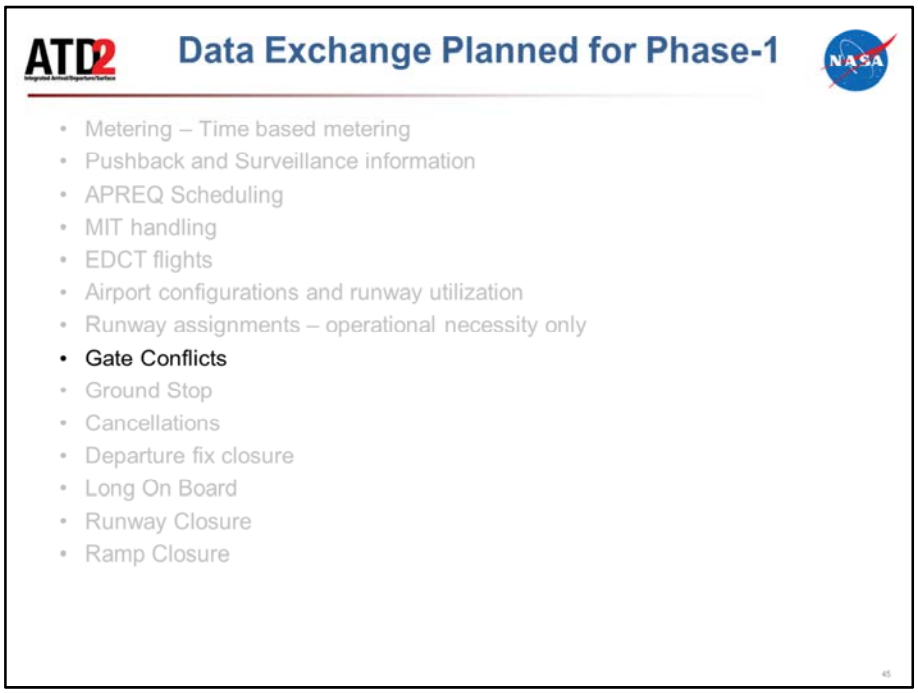
Taxi For Operational Necessity (TFON) on RTC



Ramp RTC/ RMTC



ATC-T knows that a flight has changed runway due to Operational Necessity. The word “OpNec” will show on the STBO Timeline datablock.


ATD2
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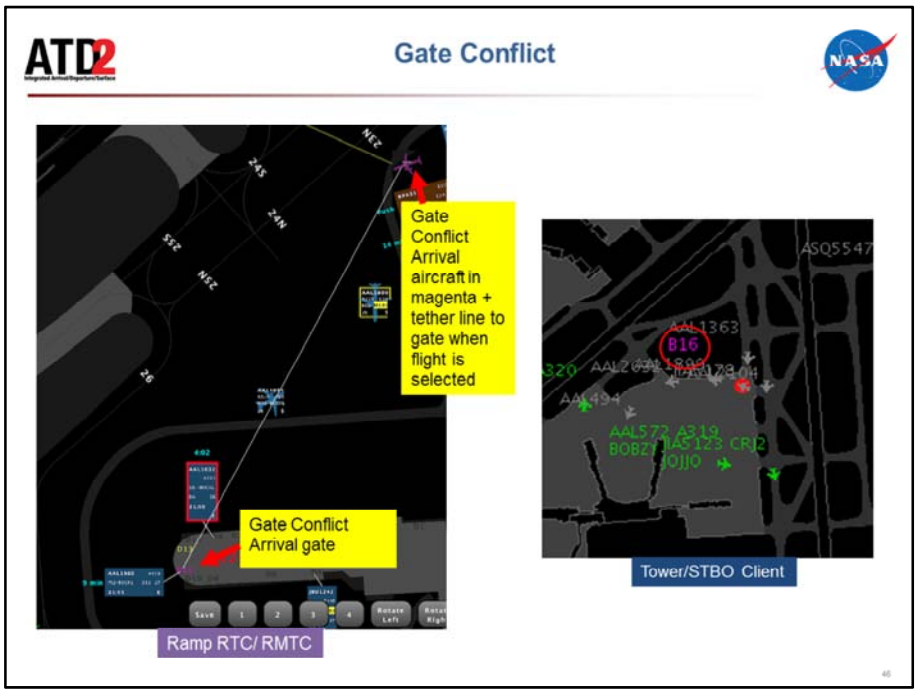

In RTC, the gate conflicts are shown as magenta for the arrival icon and the affected gate also shows as magenta. In future the users will be able to configure gate conflicts and see gate conflicts/ gate occupied in the next “n” minutes and “n” min could be specified by the users as per their needs. Also gates blocked due to heavies parked next to the gate will be marked as magenta.

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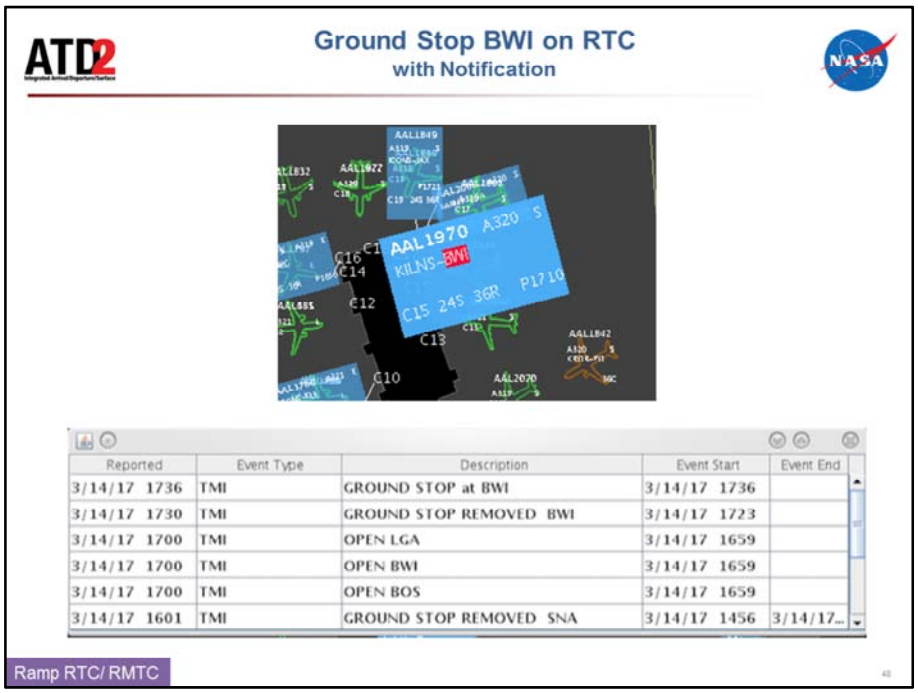

On RTC, Notification window shows the “Ground Stop at BWI,” and the flight strip highlights the individual flights with destination to BWI in blinking red for that sector until it is acknowledged.

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- Ground Stop
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- Long On Board
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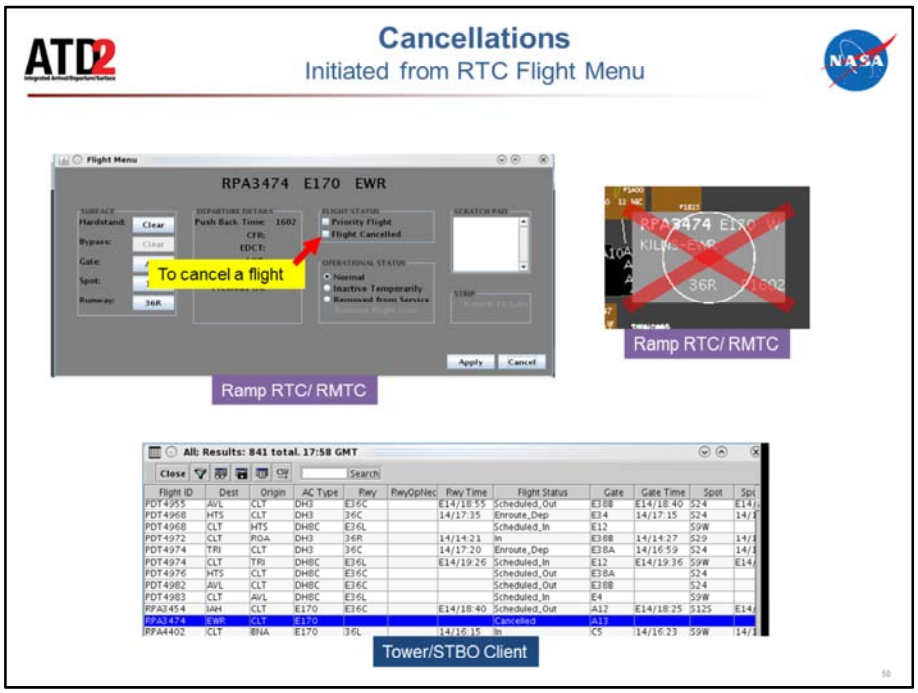
- Ramp Closure



Cancellations come into the system quite late, sometimes the ramp is aware of these and will be able to enter them into RTC. But cancellation provided by the AA data will also be read into the system.

To cancel a flight from RTC, open the flight menu for the flight, select “Flight Cancelled.”

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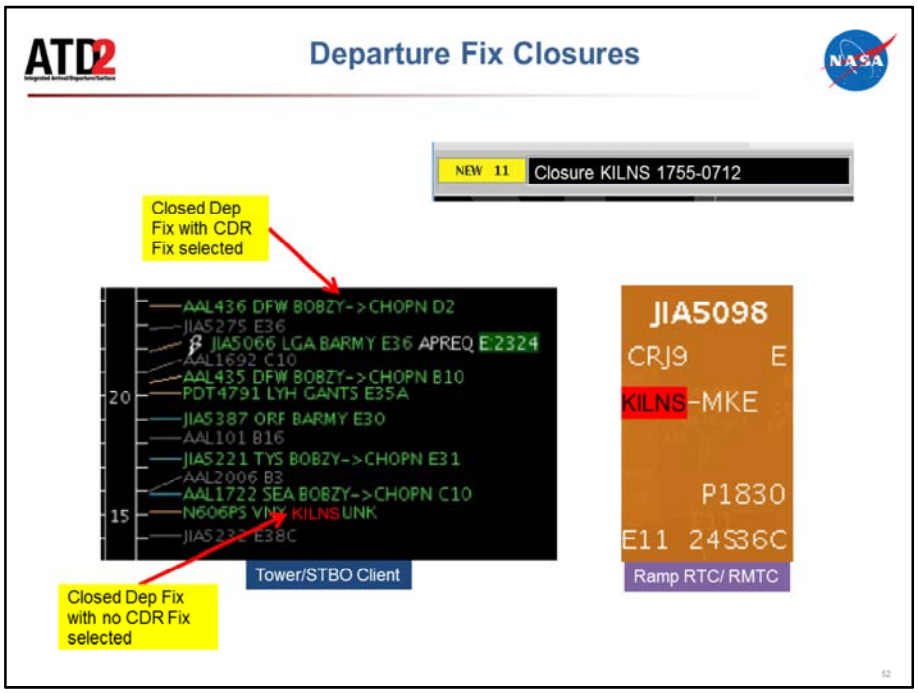

If no “CDR Flights To” fix was selected in STBO Client, the fix will turn red and the datablock will move to the end of the closure after a few seconds (or 2 hours into the future if “No End Time” was selected). If a CDR fix was selected, the red will update to show the CDR as “[original fix]→[CDR fix]”. On the RTC/RMTC, regardless of whether a CDR fix was selected or not, the original fix will be displayed in red.

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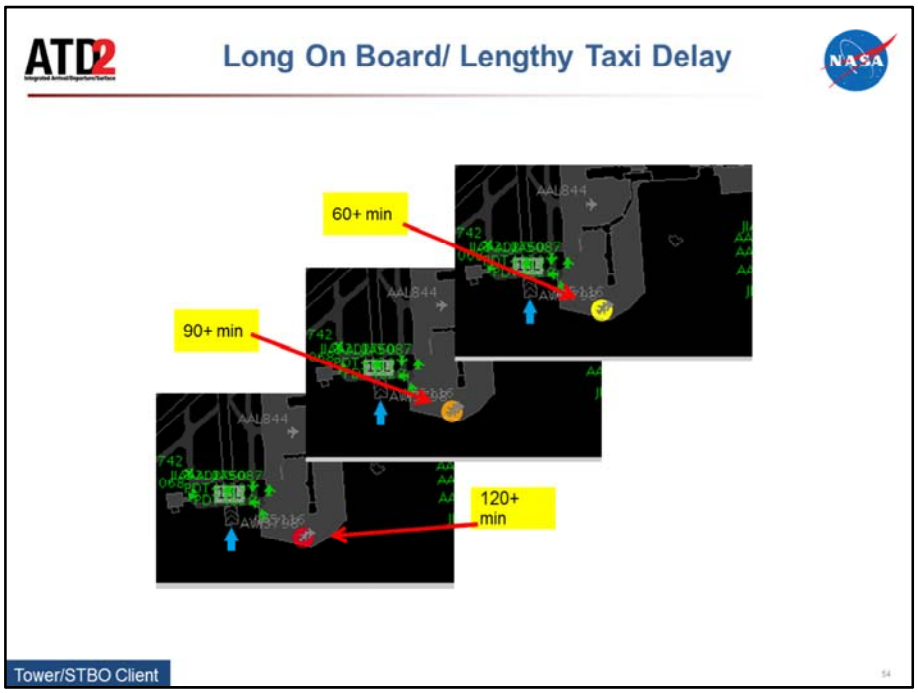
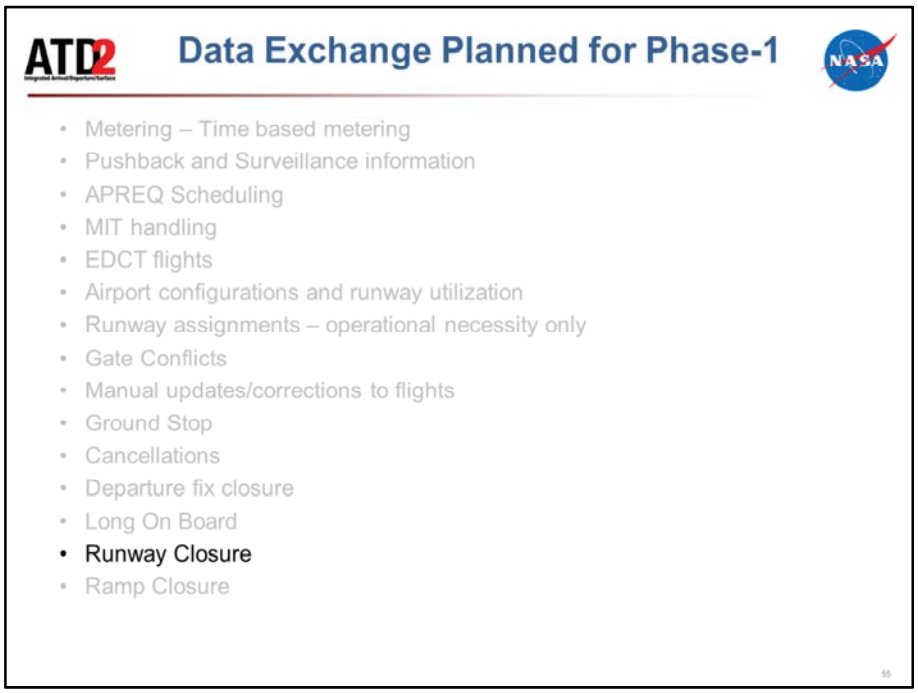


Long On Board is especially important to the Airlines to avoid heavy penalties. ATC-T also expressed a desire to see the LOB information so that they could assist the Ramp with getting the flights to their gates as soon as possible. The timer for LOB starts as soon as the arrival touches ground and gets its ON, and for departures it starts when it gets its OUT or pushes back. The LOB indicator is a colored disc drawn on the flight icon. On STBO Client Map and RTC/RMTC it is a yellow disc when the flight has been on the tarmac for 60 min, it's orange when it has been there for 90 min and its red when the flight has been on tarmac for over 120 minutes or 2 hours.


ATD2
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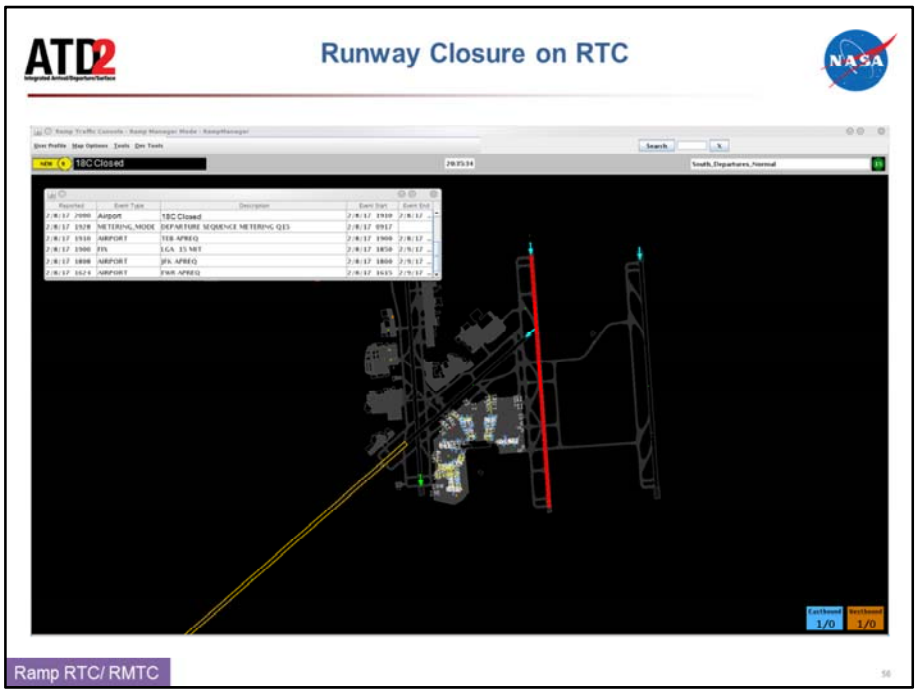
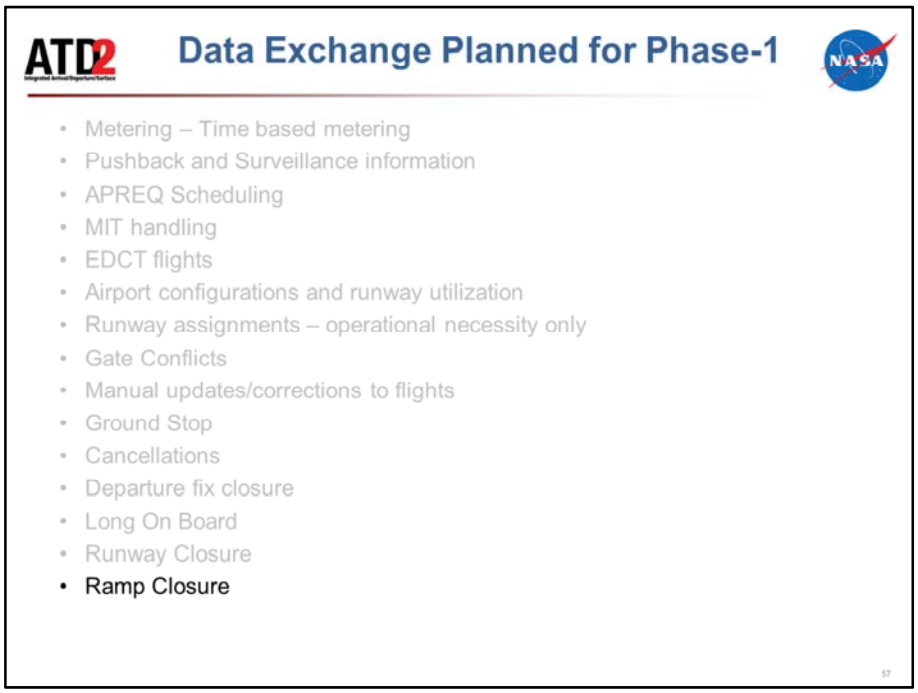


The closed runway is marked red with white “X”s at either end on STBO Client and RTC/RMTC.


ATD2
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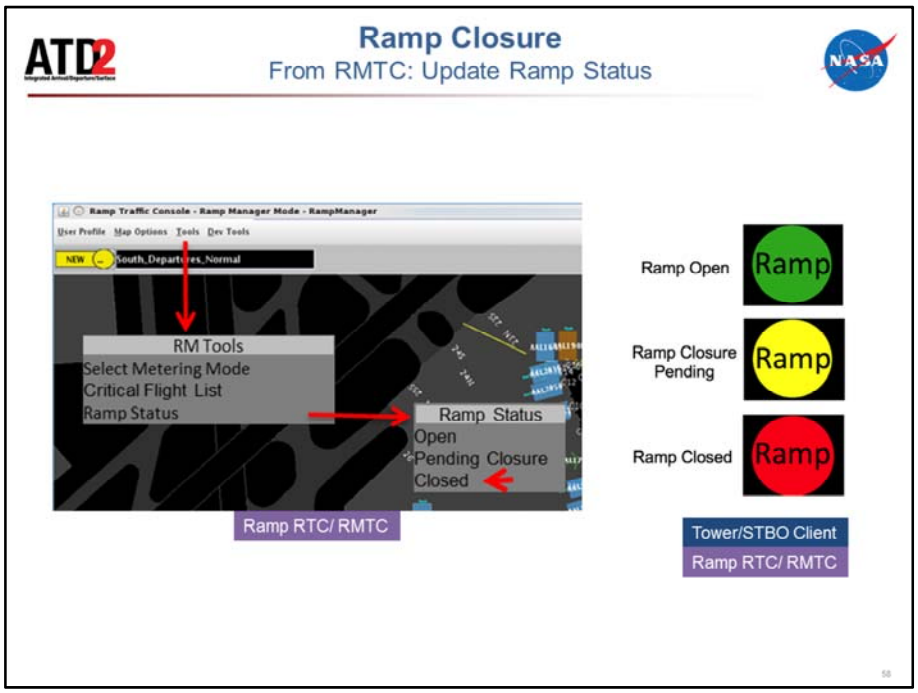
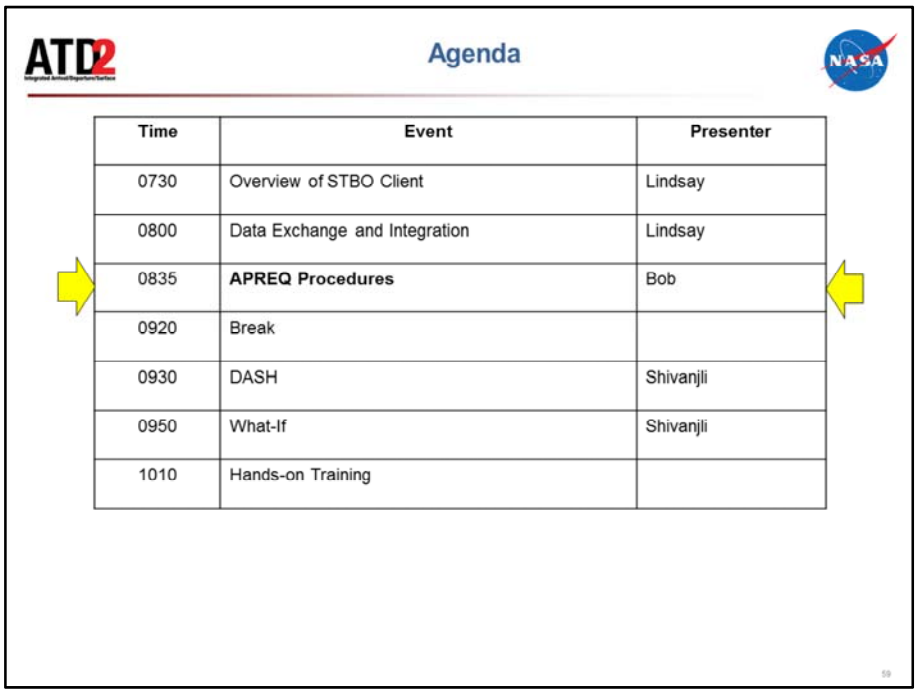
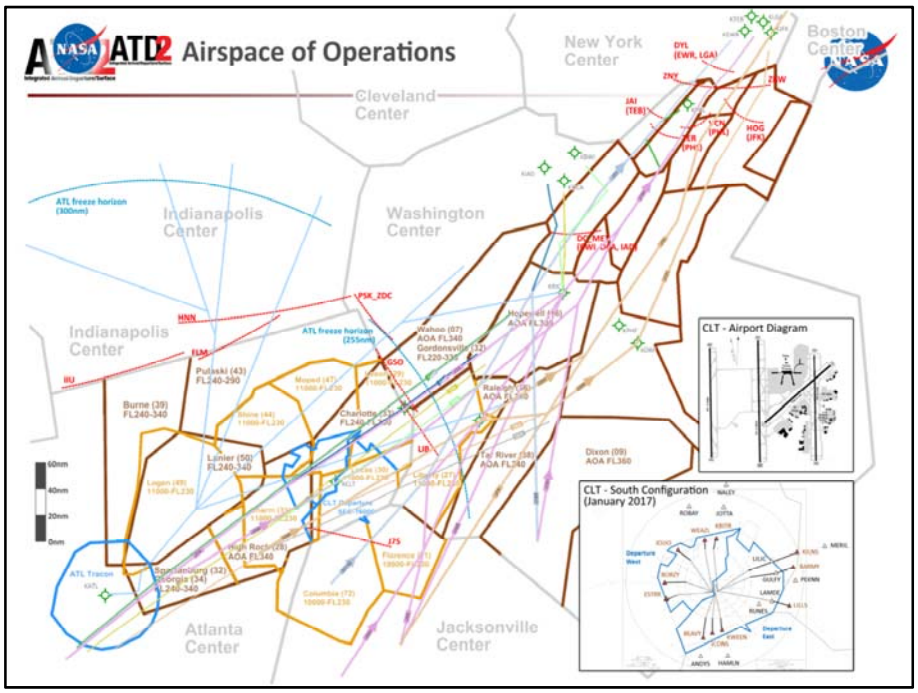
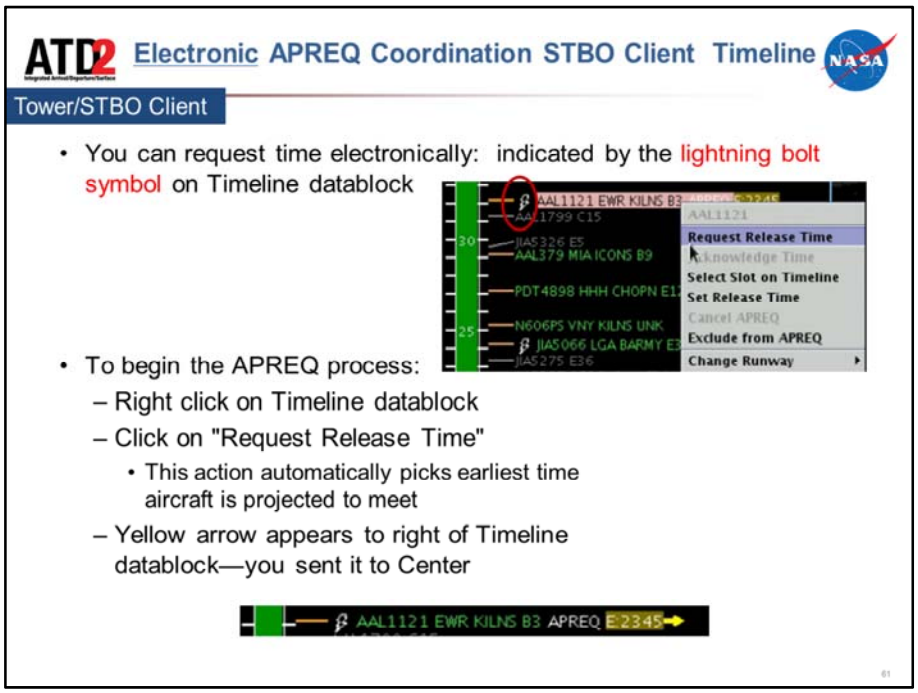


Ramp Closures often occur due to inclement weather especially lightning. This information will be entered by the Ramp and shared with the ATC-T.

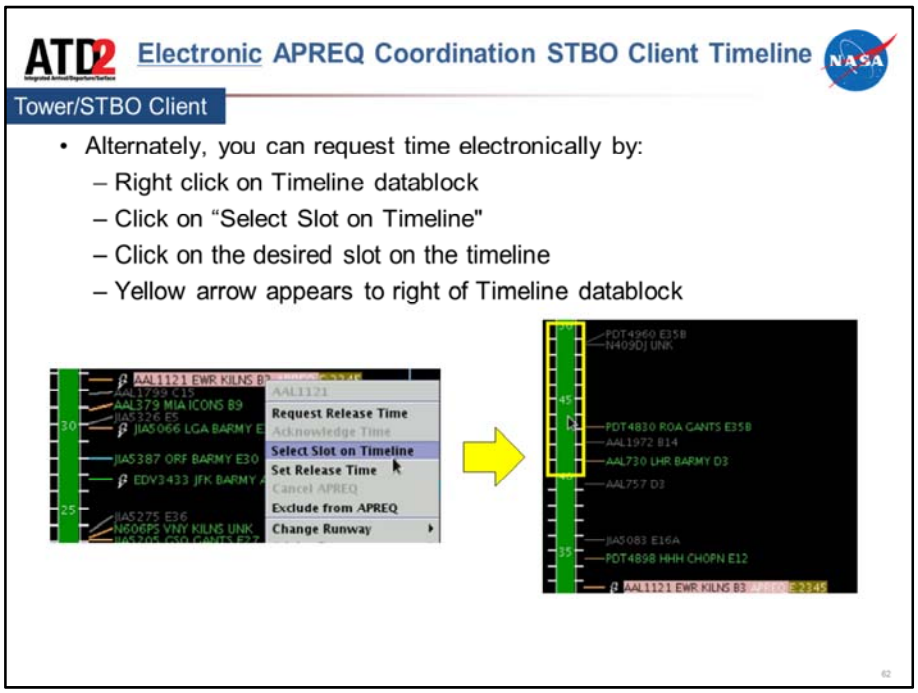

ATD2
Agenda
NASA
Time
Event
Presenter
0730
Overview of STBO Client
Lindsay
0800
Data Exchange and Integration
Lindsay
0835
APREQ Procedures
Bob
0920
Break
0930
DASH
Shivanjli
0950
What-If
Shivanjli
1010
Hands-on Training


Airspace of Operations
New York Center
Boston Center
Cleveland Center
Indianapolis Center
Washington Center
Indianapolis Center
Atlanta Center
Jacksonville Center
ATL freeze horizon (300nm)
ATL freeze horizon (255nm)
PSK_ZDC
HNN
FLM
IIU
LGO
UB
J75
DYL (EWR, LGA)
ZNY
ZBW
JAI (TEB)
HOG (JFK)
Wahoo (07) AOA FL340
Gordonsville (32) FL220-330
Pulaski (43) FL240-290
Burne (39) FL240-340
Lanier (50) FL240-340
Charlotte (33) FL240-FL330
Raleigh (36) AOA FL340
Tar River (38) AOA FL340
Dixon (09) AOA FL360
High Rock (28) AOA FL340
Spartanburg (32) Georgia (34) FL240-340
ATL Tracon
60nm
40nm
20nm
0nm
CLT - Airport Diagram
CLT - South Configuration (January 2017)

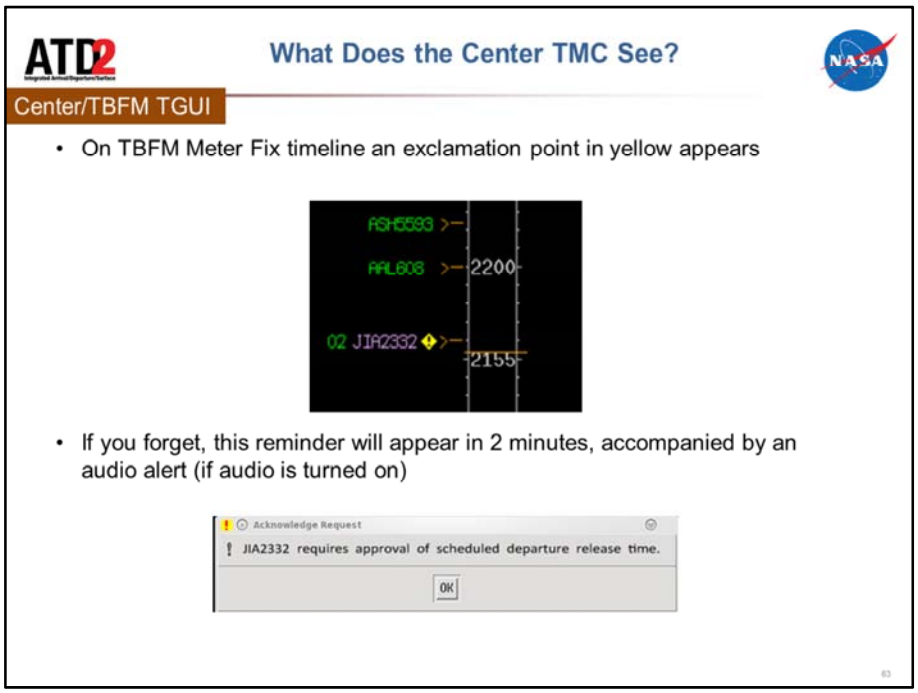


If a lightning bold symbol is present on the flight's timeline datablock, the APREQ release time can be negotiated electronically.

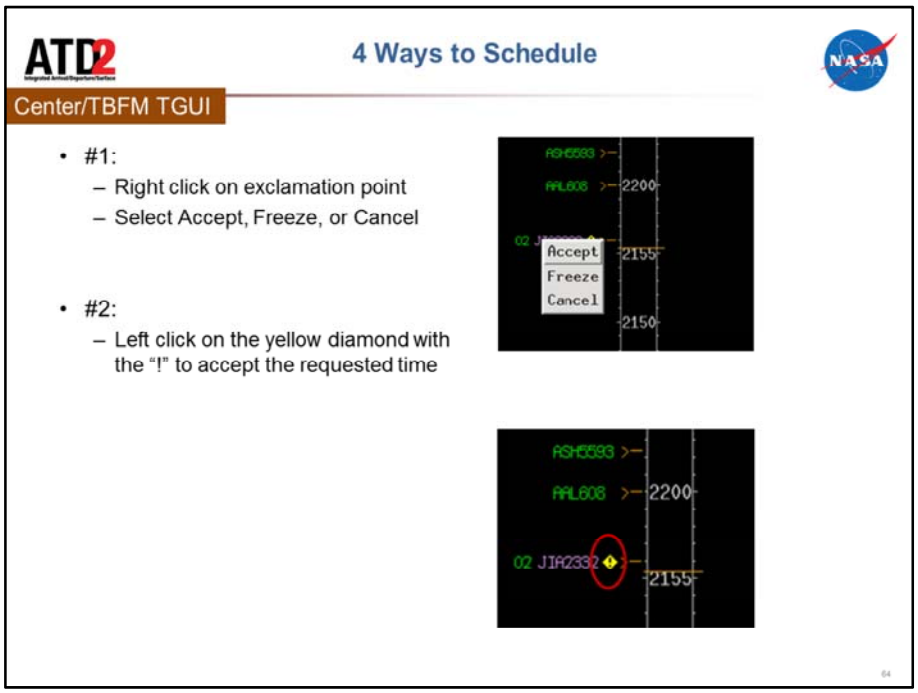
To begin the APREQ process, right click on the flight's timeline datablock and select "Request Release Time." This option automatically picks the earliest feasible takeoff time as the time to request to Center. When the time is sent, a yellow arrow will appear next to the Timeline datablock.



Alternately, the Tower user can send an electronic request for a specific time by choosing the "Select Slot on Timeline" option from the flight's right click menu. This will populate red and green bars in the middle of the Timeline to show available slots that the flight can be scheduled to in the overhead stream. Green slots are available, red slots are unavailable. Available slots are drawn from 15 minutes before the current predicted OFF time to 30 minutes after the current predicted OFF time. Click on a time on the Timeline and the STBO Client will send a request for that time to Center. Again, a yellow arrow will appear next to the Timeline datablock to show that the time was sent.



Note that the images are for demonstrative purposes and do not match the flight callsigns between ATCT and Center.

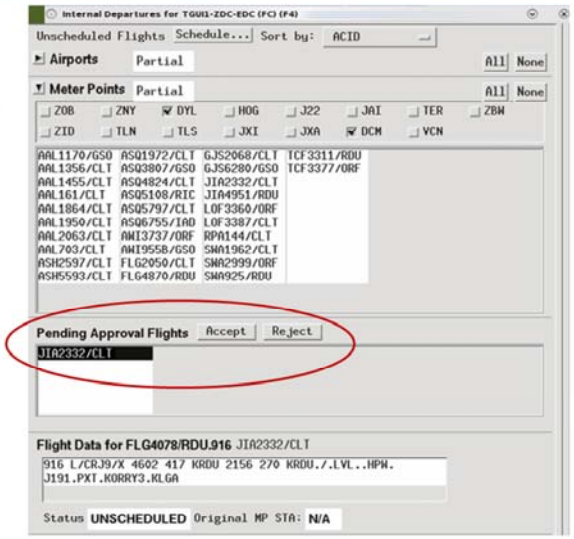


See slide for full description

4 Ways to Schedule

Center/TBFM TGUI

- #3:
  - Go to F4 window in TBFM
  - Accept or Reject



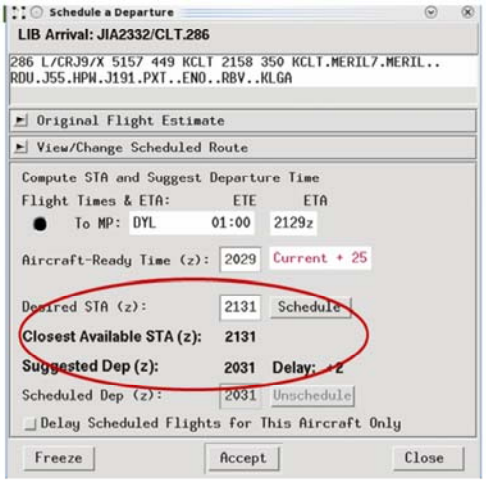
ATD-2

4 Ways to Schedule

NASA

Center/TBFM TGUI

- #4:
  - Go to "Schedule a Departure Window" in TBFM
  - Press "Schedule"

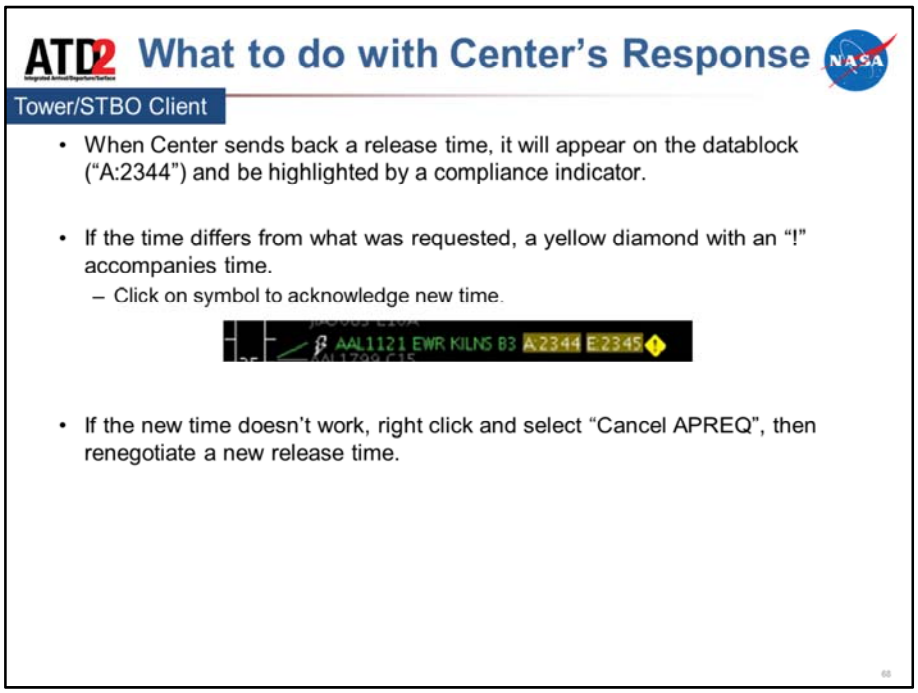


ATD2

After Center Schedules Release Time

Center/TBFM TGUI

- STA will looks turn green and will display the delay in minutes after ACID (02)



If Center returns a time that differs from the requested release time, a yellow diamond with an exclamation mark appears next to the flight's timeline datablock. If you accept this time, right click on the timeline datablock and choose "Acknowledge Time." In future versions of STBO Client, you will be able to click on the diamond to accept the time without having to right click on the timeline datablock first.

If you don't want to accept this time, right click on the timeline datablock, cancel the APREQ, and begin the APREQ process again.

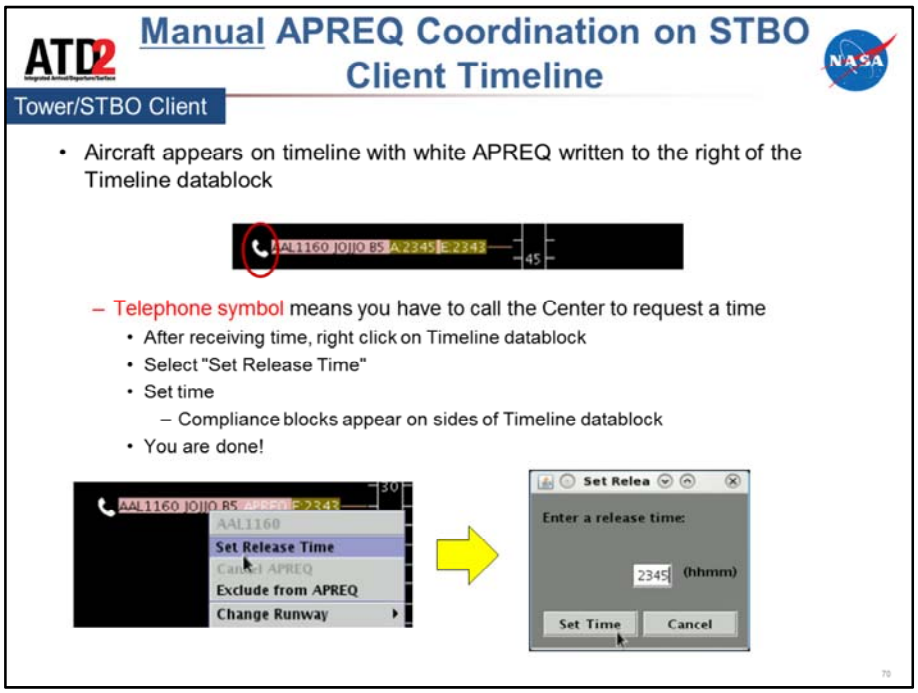
Status of APREQ Compliance

Tower/STBO Client

Once flight has a release time, compliance indicators highlight the APREQ release time.

- If indicator is green = on time
- If indicator is red = aircraft late
  - Right click on Timeline datablock
  - Cancel the APREQ first.
  - Restart process for requesting a release time.
- If indicator is yellow = aircraft early
  - Option 1: Delay the aircraft until it can meet it's release time.
  - Option 2: Right click on Timeline datablock
  - Cancel the APREQ first.
  - Restart process for requesting a release time.

Ramp is automatically notified of the new time.



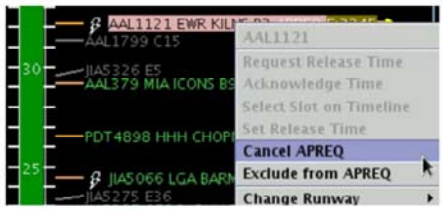
Flights that require manual coordination of APREQ release times will have a telephone symbol next to the flight's datablock. For these flights, you will need to verbally call the Center. Once Tower and Center agree on a time, right click on the flight's timeline datablock on the STBO Client Timeline and click "Set Release Time," then type in the time and click "Set."

Ramp is automatically notified of the release time.

Cancel APREQ or Reschedule

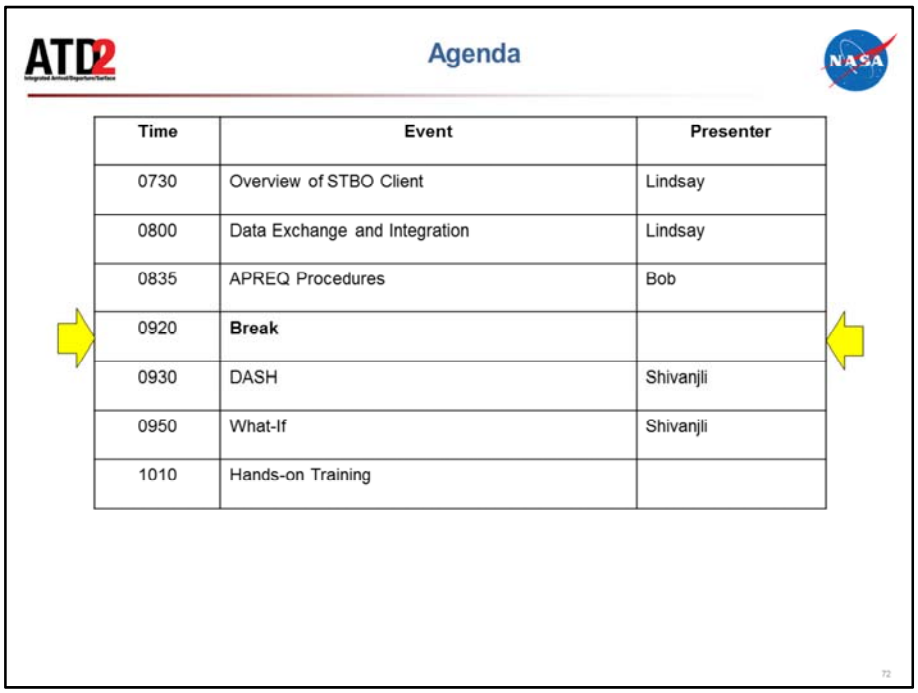
Tower/STBO Client

- To cancel or reschedule an APREQ release time
  - Right click on Timeline datablock
  - Click "Cancel APREQ"
  - Begin the APREQ process again



- When the APREQ is cancelled, datablock will return to the original configuration with no time or compliance indicator.

Ramp is automatically notified of the cancellation.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Hands-on Training
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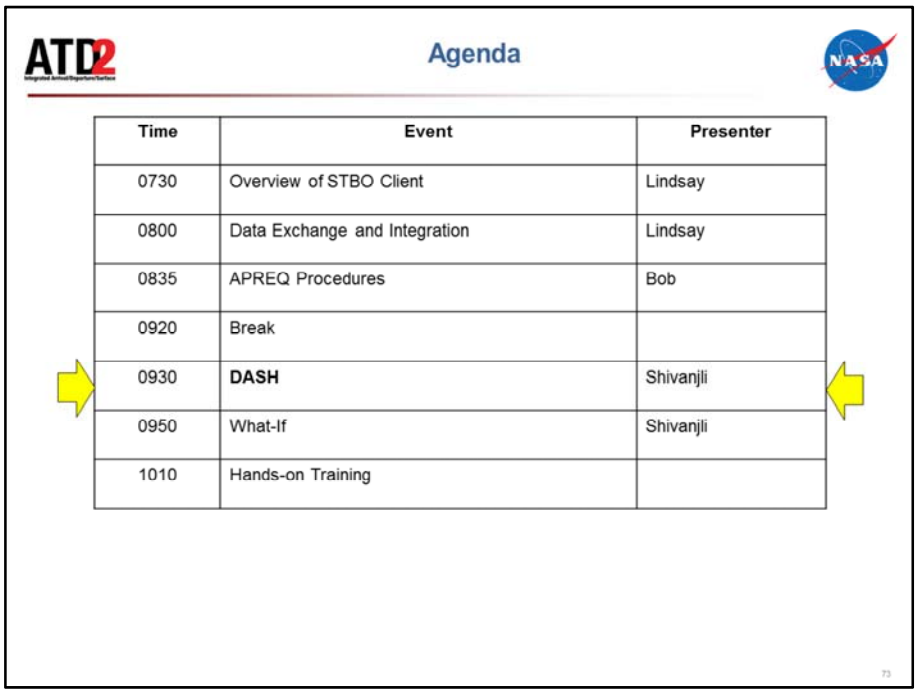
ATD2
Agenda
NASA
Time
Event
Presenter
0730
Overview of STBO Client
Lindsay
0800
Data Exchange and Integration
Lindsay
0835
APREQ Procedures
Bob
0920
Break
0930
DASH
Shivanjli
0950
What-If
Shivanjli
1010
Hands-on Training
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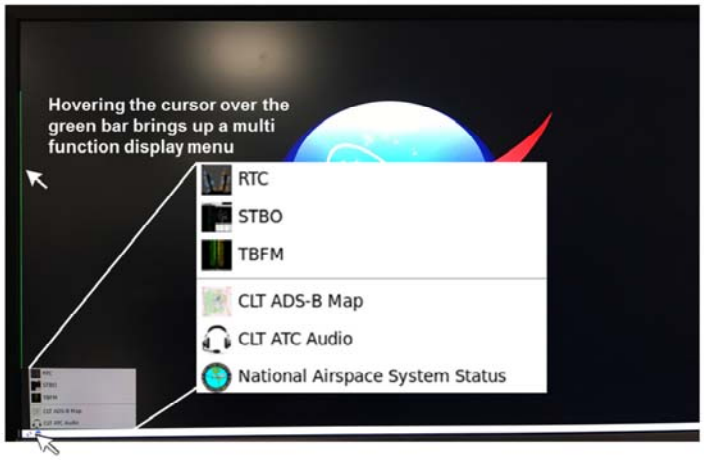
CLT Multi Functional Display (MFD)

Kiosk Type Display with "My Desktop" view

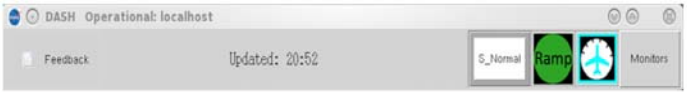


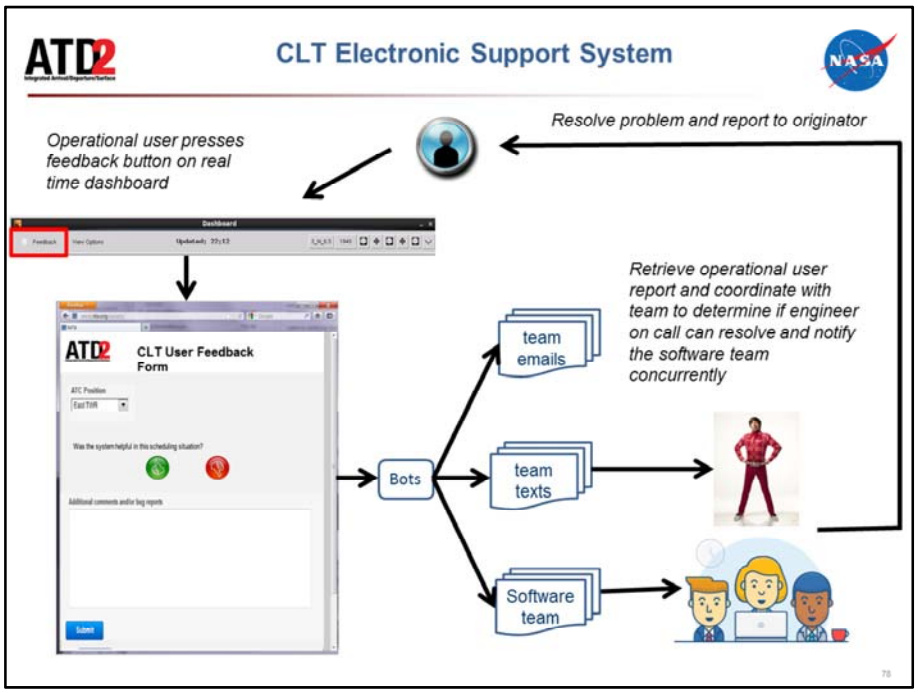
CLT Multi Functional Display (MFD)

Kiosk Type Display with "My Desktop" view

CLT Multi Functional Display (MFD)

DASH


DASH Operational: localhost
Feedback
Updated: 20:52
S_Normal
Ramp
Monitors


ATD2
CLT Electronic Support System
NASA
Operational user presses feedback button on real time dashboard
Resolve problem and report to originator
Dashboard
Feedback
View Options
CLT User Feedback Form
ATC Position
East TRR
Was the system helpful in this scheduling situation?
Additional comments and/or bug reports
Submit
Bots
team emails
team texts
Software team
Retrieve operational user report and coordinate with team to determine if engineer on call can resolve and notify the software team concurrently
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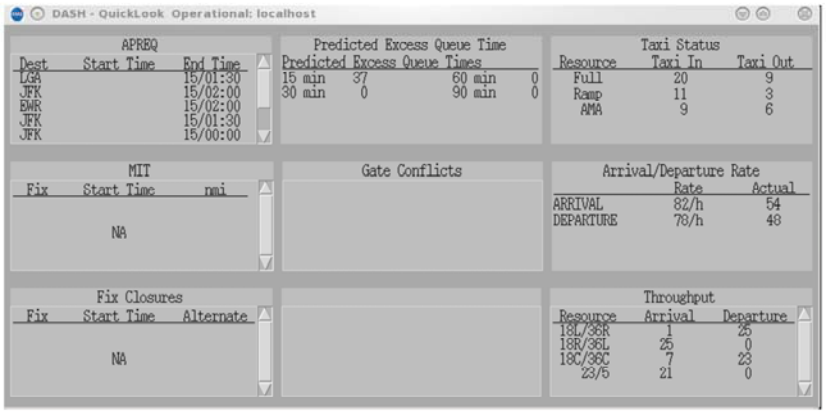
DASH Monitors

DASH Quick Look

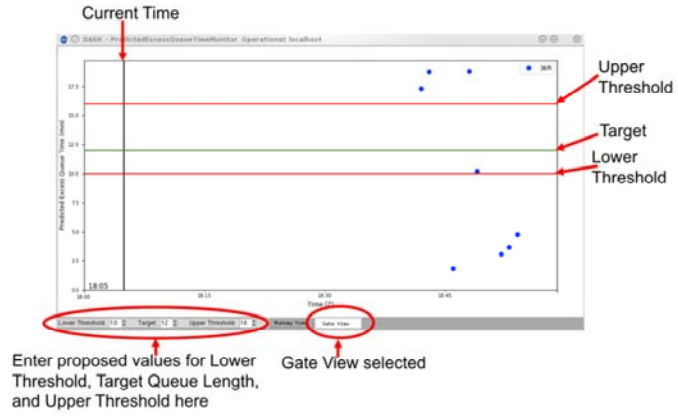


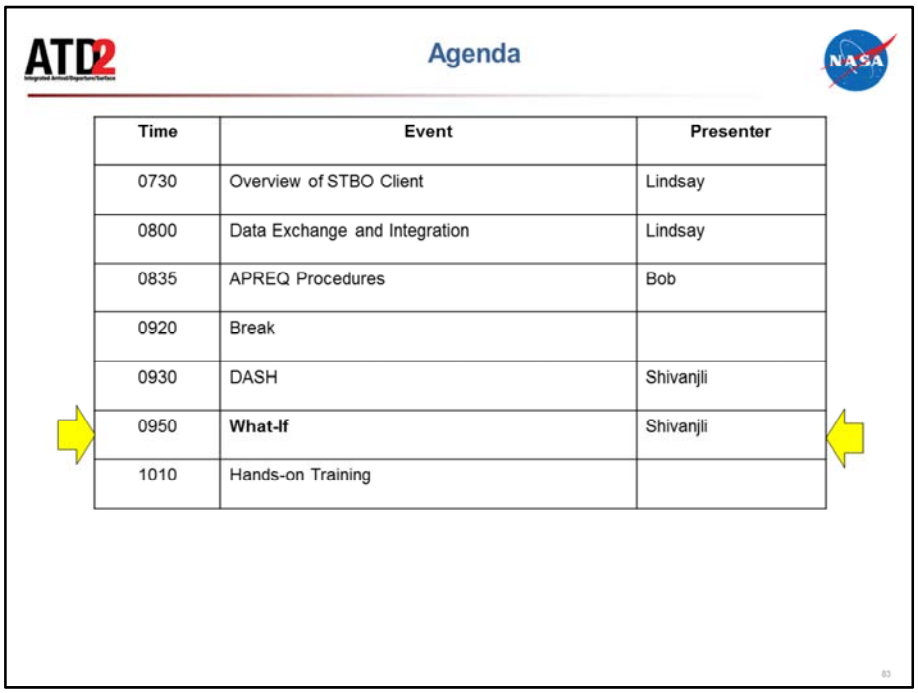
DASH – Predicted Excess Queue Time Monitor

Predicted Excess Queue Time Graph
Runway View

DASH – Predicted Excess Queue Time Monitor

Predicted Excess Queue Time Graph
Gate View

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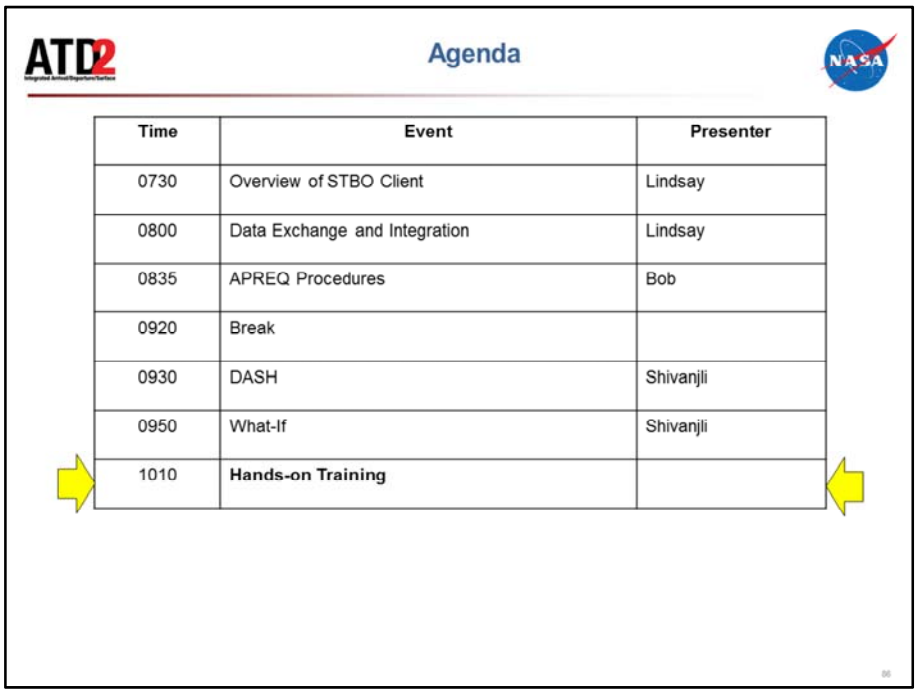
What If System

- Select What If system from MFD (green bar)

What If Desktop Appearance

Title bars of all windows labeled *What-If*

Desktop Background marked yellow *What-If*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