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

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 aloud 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

**With ATD-2**
- Multi-Airport Scheduling with TOS
- Controller flight strip automation integration
- Pre-Scheduling with EOBT
- Strategic Surface Metering
- Surface SWIM Publication

**Phase 3**

**Phase 2**
- SWIM
- NAS Data Fusion and Analytics
- New Data Exchange and Integration
- Overhead Stream Scheduling
- Tactical Surface Metering

**Phase 1**
- TFDM (Precursor)
- TFMS
- ERAM
- STARS

**Future Technical Uncertainty**

**w/o ATD-2**
Surface Trajectory Based Operations (STBO) Client
Traffic Management (TM) Actions Panel

- **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
• 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
TM Action Panel – Runway Utilization

• 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
• 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
• 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
TM Action Panel – Departure Fix Closures

- 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 to 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.
TM Action Panel – Runway Closures

- 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
TM Action Panel – Runway Closures

- **Impact to STBO Client**
  - Flights will be automatically reassigned to another runway
  - Runway shows blocked out in red on STBO map

- **Impact to RTC Client**
  - Runway shows blocked out in red on RTC map
• 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
STBO TM Notification Panel

• 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
### Notification Table - Detailed

<table>
<thead>
<tr>
<th>Reported</th>
<th>Event Type</th>
<th>Description</th>
<th>Event Start</th>
<th>Event End</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>5/16/18 1523</td>
<td>Fix</td>
<td>GIPPR 7MIT</td>
<td>5/16/18 1515</td>
<td>5/16/18 1630</td>
<td>OIS: EXCL PROP TURBO</td>
</tr>
<tr>
<td>5/16/18 1523</td>
<td>Fix</td>
<td>GAANTS 7MIT</td>
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<tr>
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<td>Fix</td>
<td>MERIL 7MIT</td>
<td>5/16/18 1515</td>
<td>5/16/18 1630</td>
<td>OIS: EXCL PROP TURBO</td>
</tr>
<tr>
<td>5/16/18 1508</td>
<td>TMI</td>
<td>APREQ to JFK</td>
<td>5/16/18 1500</td>
<td>5/17/18 0200</td>
<td>OIS: INCL JET BARMY KILNS</td>
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<tr>
<td>5/16/18 1441</td>
<td>TMI</td>
<td>APREQ to PHL</td>
<td>5/16/18 1130</td>
<td>5/16/18 1441</td>
<td>Cancelled</td>
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<tr>
<td>5/16/18 1410</td>
<td>Fix</td>
<td>BUCKL OPENED</td>
<td>5/16/18 1410</td>
<td>Cancelled</td>
<td></td>
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<tr>
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<td>Fix</td>
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<td>5/16/18 1319</td>
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- **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” Display
Flight strips color coded by runway assignment
Ramp Traffic Console – Gate Conflict

- Automatic detection of gate conflicts
- Conflicts show as a purple flight strip and gate label
Flight data tags color coded by departure fix
RTC – Ramp Closures

- Schedules and notification of ramp closures
- Does not directly impact flight scheduling
- Used to notify of impending weather or other emergency events
KILNS/BARMY in SWAP
RMTC Monitoring Fix Closures
• 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

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

• As controllers make updates, you get them on TTP SWIM!
AEFS Gate Conflict
• 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
RMTC can view delays
Surface Metering On and Active for 36R
Metering and Early Freeze
• Questions?
Honor Restrictions with Greater Fuel Efficiency

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

Airline and Airport Operators will gain access to these data elements through TTP SWIM
• “TargetedOffBlockTime”
• “TargetMovementAreaEntryTime”

• How long can I hold at the gate and still make my APREQ or EDCT time?
Data Exchange and Integration - Operator View

ATC to Operator

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

Call for release (APREQ)

- **UAL1087 A319 E**
  - KILNS-EWR
  - A10 27 18L '1916

Miles in trail (MIT)

- **DAL8928 B752 E**
  - BARMY-EWR
  - M20

Dep Fix closure

- **JBU1118 E190 E**
  - KILNS-JFK

Dep Fix change (CDR)

- **AAL1864 A319 E**
  - KILNS-DCA

Ground delay (EDCT)

- **FDX1935 B752 E**
  - KILNS-EWR
  - E2230
  - FDX 18L 916

APREQ + EDCT

- **JIA5026 A319 E**
  - KILNS-DCA
  - E2340Q
  - E5 27 18L P1916

ATC runway change

- **SWA210 A319 E**
  - KILNS-DCA
  - A6 18L P1916

Airport ground stop

- **UPS1283 B752 E**
  - KILNS-PHL
  - UPS 18L 1916

Ramp Tool Colors and Symbology

- 757 aircraft has blue and white border
- Arrival tail is green
- After pushback, engine symbol indicates spool up state
- 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
- Sector ownership

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