



ATD-2 Integrated Arrival/ Departure/Surface (IADS) System Phase 1 Evaluations

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1 Overview

This document provides an overview of the ATD-2 stakeholder and partner evaluations, also known as Shadow Sessions, held at Charlotte-Douglas International Airport (CLT) in preparation for and during the Phase 1 evaluation period from 9/30/2017 – 9/30/2018. All of the user engagement sessions are listed below, but only a few of the major ones ([highlighted in blue](#)) are described in more detail in the rest of this document.

The original Shadow Session materials were posted by Shivanjli Sharma, ATD-2 Field Demo Lead, on the ATD-2 Confluence collaboration website. This document is comprised of information extracted from those ATD-2 Confluence pages and organized by others. Additional details for each Shadow Session are available on request.

1.1 ATD-2 CLT Shadow Sessions

- Shadow 1 – Jul 12-14, 2016
- Shadow 2, CLT Ramp & ATCT – Aug 23-25, 2016
- Shadow 3 – Sep 20-22, 2016
- Shadow 4 – Oct 18-20, 2016
- Shadow 5 – Nov 16-17, 2016
- Shadow 6 – Jan 24-26, 2017
- Shadow 7, Pilot Engagement – Feb 22-23, 2017
- Phase 1 Demonstration Freeze (FRZ1) – Mar 29, 2017
- Engineering Shadow 1.A, Shadow 8 – Apr 19-20, 2017
- Engineering Shadow 1.B, Shadow 9 – May 30-Jun 2, 2017
- Engineering Shadow 1.C, Shadow 10 – Jun 27-29, 2017
- [Operational Shadow Evaluation 1 \(OSE1\), Shadow 11 – Aug 22-23, 2017](#)
- Phase 1A, Shadow 12 – Oct 12, 2017
- Phase 1B, Shadow 13 – Oct 23-25, 2017
- Phase 1C, Shadow 14 – Nov 28, 2017
- Shadow 15 – Feb 13, 2018
- Shadow 16 (V3.1.2) – May 14, 2018
- Shadow 17 (V4.0.0) – Sep 11, 2018

Pilot Engagement Activities 2017

- [Pilot Webinars](#)
- [Pilot Engagement Communication Documents](#)

1.2 What is a shadow session?

- The purpose of shadow evaluations are to gain your input on the ATD-2 system's usability, acceptability and utility
- Shadow evaluations will vary in formality
- Both informal and more formal shadow sessions:

- Have a clear purpose/objective. The shadow sessions are part of a larger narrative of ATD-2 system progress.
- Are system focused (not PowerPoint focused)
- Go hand-in-hand with ATD-2 agile software development
- Are designed to inform on the latest system and elicit feedback
- Will have clear minutes/notes/outcomes (and pictures)
- Will have support from a multi-disciplinary team from NASA. These will typically include human factors, software and field demo support.
- Are time boxed. It is generally more important to be disciplined about our time usage than get through all proposed material.

2 Operational Shadow Evaluation 1 (OSE1)

2.1 Description

The goal of the OSE1 period is to have the system deployed across the CLT Lab, backroom areas in operational facilities, and operational areas such that the users can gain system familiarization and the ATD2 team can evaluate system readiness for the go live date.

2.2 System Configuration during OSE1 Period

- Systems in operational areas will be live and available for viewing and testing, but will not have any impact outside of our network
 - APREQ negotiation will not be available as our TBFM instances will be set to manual mode, this means no red/green bar spacing shown on STBO to prevent any confusion about the accuracy of slots, but we will be showing all TBFM SWIM times on those that we are automatically able to read into the system
- No expectation that users will consistently enter data into the system, unless we are in a focused test period. This means we will have to have everyone coming into contact with the system aware that the information they are seeing is in a test state so as to not take stale information entered and misinterpret or create misperceptions. Perhaps a simple placard or sign may be sufficient.
- Targeted time periods during which a shift or some time where the users attempt to use the system for their duties across the tower and ramp, and then have a coordinated de-brief. We can plan to have a number of these targeted time periods during OSE1 leading up to the point where all/most shifts get to this point near go live.
- NASA personnel available on site during the OSE1 period, this individual will have specific periods they can be available in the tower and the ramp to answer questions or concerns as well as facilitate the targeted time periods the ramp and tower will be using the system simultaneously
- Shared chat window between the systems that will allow individuals to quickly check and communicate between the ramp and tower to reduce confusion about information flowing across.

2.3 ATD-2 Training for Phase I - Schedule & Participants



Expectations in Training Week (August 7th- 11th & September 11th – 15th)



| Session | Monday | | Tuesday | | Wednesday | | Thursday | | Friday | |
|-------------------|----------|----------|----------|----------|-----------|----------|----------|----------|----------|----------|
| | ATC-T | Ramp | ATC-T | Ramp | ATC-T | Ramp | ATC-T | Ramp | ATC-T | Ramp |
| Morning Session | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Afternoon Session | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | |
| Total | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 2 |

- September will be make up sessions and refresher training knowing that 2 trainees per session may not always be possible in August
- ATC-T
 - Total ATC-T personnel expected to be trained = 18
 - Morning session (7:30am to 11:30am), Afternoon session (1:30pm to 5:30pm)
- Ramp
 - Total Ramp personnel expected to be trained = 18
 - Morning session (10:30am to 2:30pm), Afternoon session (2:30pm to 6:30pm)

]

2.4 OSE1 Shadow Session #11

Date: August 22-23, 2017

Agenda:

- OSE1 Overview
 - review OSE1 procedures thus far
 - discuss feedback that has been received
 - software development and release cycles
 - bug fixes/new features that need to be highlighted
- Requirements Discussion: rather than introduce features that may be in 3.1 and beyond I think it would be useful to frame this section as soliciting feedback needed to fine tune the system for go live - essentially software features that are in place that need tweaking for operational use
 - departure fix closures and scheduler interaction
 - EFTT and CDT in high level terms
 - gate conflicts
 - a few higher profile items like source columns for APREQs and RTC readability changes
- Go Live Discussion
 - Propose micro-phases
- Training Update:
 - status on training last week

- Manuals and how to share with users
- looking ahead to the next training events
- HF baseline data collection
- OSE1 Adjustments Prior to Go Live (ramp focused):
 - ramp controller interaction with RTC
 - higher resolution monitors in the ramp
 - large monitors in the ramp

Notes and Outcomes:

- Received updated dwg files from Airport Ops detailing:
 - South Cargo Ramp addition at the very south end, adjacent to RWY 36R
 - Most up to date copy of the Concourses we have on file. This also includes current striping at each parking position.
 - additional concrete that is currently being utilized as a Hardstand to the North of current A Concourse
- Need to verify all scratch pad entries propagate to STBO and when/if data loss occurs determine the source of the issue
 - This is significant in that NATCA Rep brought this up in terms of degrading user confidence in the system. The TMCs have noticed missing scratch pad information resulting in aircraft shown on incorrect rwy timelines in STBO
- AAL is making progress on getting their EOBT data available via SWIM (TFDM topic in TFMS)
 - SME approximated that it may be another month, but we will continue performing data quality checks on the alternate feed established
- The next few months will require some coordination between OSE1 support personnel and ramp managers to begin exposing a broader group of ramp controllers to RTC
 - Suggest the following SOP moving forward for OSE1
 - OSE1 support personnel target the 1:30pm bank and the later evening banks to inquire with the ramp manager if any RCs can switch over to using the RTC system
 - This will be a RM decision as their workload will be impacted by having to run 2 systems at a time
- What If system feedback
 - Need to set up a flights table in STBO that could show a departure list with a/c TOBT to use as an executive summary of sorts to help make business decisions
 - Need a manner in which to export that information to others (this requires some thought)
- DASH modifications
 - A higher priority request may include the ability to enable a tool tip for excess queue time that will show acid info
 - A few modifications to the gate conflict panel in the quick look to make it easier to read (label changes) and the ability to sort
- Local runway change addition to RTC is not needed
 - AAL will procure 32 in monitors with the upgraded resolution (apparently they are already on site)
 - We are waiting on the test system at the NASA observer station to be ready so we can close the loop on this item

- Large screen monitors (both in the front and rear of the ramp tower)
 - Would like these to convey information to ramp leadership team and have the same information shown on both monitors. Need to provide a wireless mouse and keyboard to use for the NUCs mounted to the back of these monitors.
- Go Live Discussion: presented possibilities of what go live would like and after discussion we seem to be closing in on the following:
 - Agile micro phased approach to go live will be used
 - Micro phase #1: DE&I during bank 2
 - Micro phase #2: DE&I during longer time periods as RC adopt the technology (this is the fuzziest of the phases as it will be hard to gauge when the transition will occur since it is dependent on a large group of individuals)
 - Micro phase #3: IDAC style electronic negotiation when it is ready
 - Micro phase #4: Surface metering during bank 2
- Arrange and schedule a meeting with NATCA Rep on remaining OIS parsing requirements (targeting 10:30am ET on either Mon, Tue, Thu)
- Arrange and schedule a meeting with field demo partners on Sep 12 at CLT to discuss the go live plan and date

3 Phase 1 Shadow Evaluations

3.1 Phase 1A Field Demo Log

3.1.1 Description

Phase 1A started on September 29, 2017 and focuses on using the data exchange and integration capabilities between CLT ATCT and AAL ramp. The initial description of this stage stated we would begin with bank two, but given the desire of the ramp managers (RMs) and ramp controllers (RCs) the IADS system has been in use operationally all day since Go Live. We will continue monitoring use of the clients and interactions between ATC and Ramp to ensure things continue to go smoothly. The ramp managers have indicated they will continue using the clients during all of operations until they encounter a problem that will force them to switch back to Aerobahn.

3.1.2 RTC Usage

| Date | AM (0600 - 1430) | PM (1430 - 2300) |
|-----------|------------------|--|
| 9/29/2017 | Y | Y |
| 9/30/2017 | Y | Y |
| 10/1/2017 | Y | Partial - switched to Aerobahn in the evening due to missing flights |
| 10/2/2017 | Y | Partial - switched to Aerobahn around 1630/1700 ET due to IMC issue and RM going off shift |
| 10/3/2017 | Y | N - switched to Aerobahn at 1430/1500 ET as tower did not have TMC updating STBO and missing flights in south sector |
| 10/4/2017 | Y | N |
| 10/5/2017 | Y | N |

| Date | AM (0600 - 1430) | PM (1430 - 2300) |
|------------|-----------------------|--|
| 10/6/2017 | Y | Y |
| 10/7/2017 | N - no RM on duty | N - too many missing flights and ship changes causing flight matching issues |
| 10/8/2017 | Y | N - switched to Aerobahn |
| 10/9/2017 | Y | Partial - started with the PM shift but switched out around 4pm ET |
| 10/10/2017 | Partial - only bank 2 | N |
| 10/11/2017 | Partial - only bank 2 | N |

3.1.3 High Priority Items

High priority items discussed include:

- Heavy indicator for 757s and verification that heavy indicators are appearing as expected
- Flight matching issues
 - Ability to create a target would be great but I know it is a tough one to expect within a month. I still think we need to investigate the cases reported and see if we can identify what is really going on
 - Flights in the hardstand are not showing in RTC (most likely related to repositioning issues that NASA Researcher and others have mentioned)
 - NASA Researcher reports that West ramp controller is contacted by tow crew in the evening when flights are moved to the hardstand and those tail numbers are reported and are used to create targets in Aerobahn
- To aid with the above, the ability to see the tail number in the flight menu is very important. It will then help them track the flight and determine if they need to change the gate or take another action. I know we can have them look it up on STBO in a flights table, I am going to set Kerry up with a list today but not all users will be comfortable using a flights table

3.1.4 Specific Issues and Field Problem Reports (ATDIFR) Mapping

| Item | Description | Version | ATDIRs | Notes/Priority |
|--|--|---------|-------------------------------------|--|
| Flight Matching Issues | | | ATDIFR-20 ATDIFR-19 ATDIFR-12 | |
| Gate Conflict Issues | | | ATDIFR-16 ATDIFR-14 | |
| Could not undo pushback | After a flight was erroneously pushed back, the controller was unable to undo pushback (occurred several times) | v3.0.6 | ATDIFR-18 | |
| Flights with both EDCT and APREQ do not ack when user clicks | Ramp The blinking flight strips when both EDCT and APREQ are present did not stop blinking when the user clicked on it. | | | NASA: Medium/Low the percentage of EDCT and |

| Item | Description | Version | ATDIRs | Notes/Priority |
|--|--|---------|--------|--|
| | This would be a bigger issue when there are many flights doing this, which is usually not the case. | | | APREQ flights is very small |
| Ability to search by tail# | Ramp | v3.0.7 | | NASA: Medium: this ties in with flight matching issues |
| Flights should be not allowed to hold in the AMA | We need to remove the ability to hold an aircraft beyond the spot by removing it from the right click open option | v3.0.7 | | NASA: Low |
| Ability to change ramp status added to RTC | Currently this exists in RMTC only, but often RM is not available, and RC may need to use this to enable to DE&I with the ATC-T SS: this is important if we want RTC usage when there is no ramp manager coverage | v3.0.7 | | |
| Arrival target larger or tags visible so that they can see the flights in the surrounding airspace | Currently, users are using Aerobahn to handle see targets in the surrounding airspace | v3.1 | | low |
| Improve radio dial for VMC/IMC on STBO TM panel | NASA: TMCs requested we make the radio dial for VMC/IMC clearly show the indication of when they are in IMC or VMC. Currently, it is hard to distinguish which option is selected. | v3.0.7 | | |
| Airstart in right click menu See mock up proposal for airstart to right. Strip when in airstart state>>>>> | | | | |
| Not able to add scratchpad remark to flights in near airspace 30 min to an hour away, cannot find these flights easily Medical Emergency is a use case for this feature | NASA: this can be useful until we get the medical emergency flights designed and developed in the system for 3.1. we need the ability to search arrivals, which exists but they don't show up and allow scratchpad entry made to mark it as medical emergency | | | |
| Make the engine symbol more salient, may be have a green border or brighter yellow | NASA: After observing the RTC in operational environment, the flights in pushback state are difficult to | | | |

| Item | Description | Version | ATDIRs | Notes/Priority |
|---|---|---------|--------|----------------|
| | <p>see. We have gone to a larger display than originally intended when this feature was designed. I think the solution is to put a bright green border around then spool up icon. This will make it more visually salient, and the green color has the connotation of pushback from the green arrow used in Aerobahn.</p> <p>NASA: we should try different options as mock ups and get feedback before implementing</p> | | | |
| When hardstand is assigned to hollow icon or persisted target using flight menu, a count up timer should be provided automatically if icon dragged to or repositioned to hardstand | NASA: This is similar to an arrival getting into hardstand but if we put a count up timer on all flights repositioned to hardstand, it will add clutter and may not be desired for flights sitting there overnight. Needs to be explored. | | | |
| Adding hold to countdown was tried with RC during training on training system. There was 9 min counting down, RC tried right click menu, and the adding time to hold options (2, 5, 10 min) were not available. | NASA: This may be a bug that should be addressed before metering is turned on | | | |
| If the countdown had expired, and a pulsing PUSH is displayed in red with the additional 5 minutes countdown timer, then adding time to hold resulted in the display cyan countdown timer when more than 5 minutes of hold had been added (so, it looks as if the original recommended hold time is counting down). | <p>NASA: This should be resolved before we turn metering on.</p> <p>We trained the users to leave any time after the push came on even if the extra hold added had not expired.</p> | | | |

3.1.5 Planning for v3.0.6

Guidance on 3.0.x release content [provided by ATD-2 SubProject Manager on 1 Oct 2017]:

On Sep 29, 2017, the ATD2 Field Demo went live with IADS v3.0.5. Early user acceptance of the ATD2 IADS system has been encouraging. At this point in the Field Demo our priorities for the 3.0.x branch must be maintaining and improving IADS system stability while judiciously addressing only the most urgent functionality shortfalls to maintain and improve end-user acceptance of the system. To that end, all 3.0.x changes should be in one of the following categories:

- fixes for critical bugs

- improvements to address critical end-user functionality shortfalls reported by end users
- improvements to address critical end-user functionality shortfalls anticipated due to upcoming usage changes (i.e. future micro phases)
- improvements to address critical system robustness issues that could impact end-user acceptance

3.2 Shadow 12: Phase 1A Status Meeting – Oct 12, 2017

Objectives:

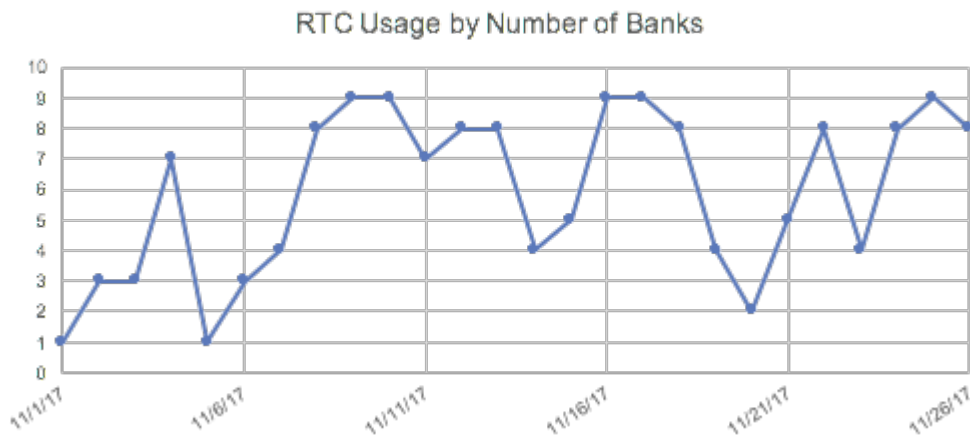
- Discuss system us and thoughts since Go Live
- Review issues and feedback that has been reported thus far
- Review features in the pipeline for next software release
- Look ahead to Phase 1B

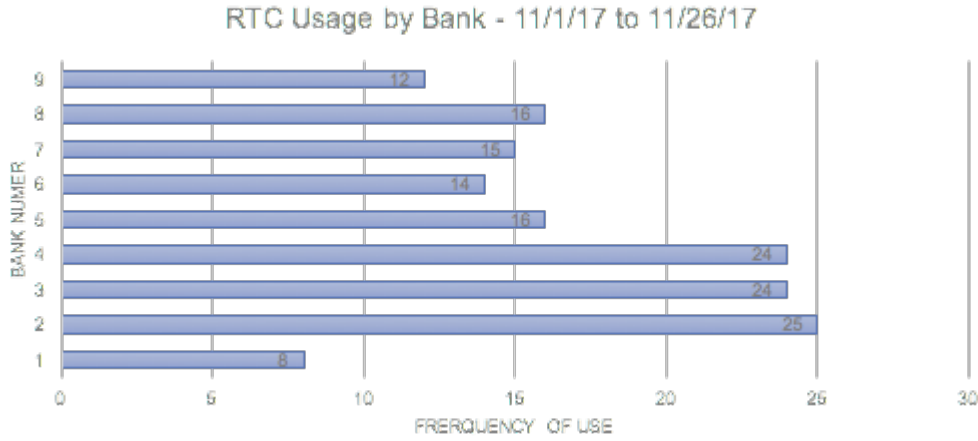
3.3 Shadow 13: Phase 1B Transition – Oct 23-25, 2017

Stakeholders and Partners Meeting Objectives from 10/25/17:

- Review Phase 1A and discuss feedback on data exchange and integration between CLT ATCT and AAL ramp tower
- Review new features in release 3.0.6
- Discuss procedures for Phase 1B
- Look ahead to Phase 1C

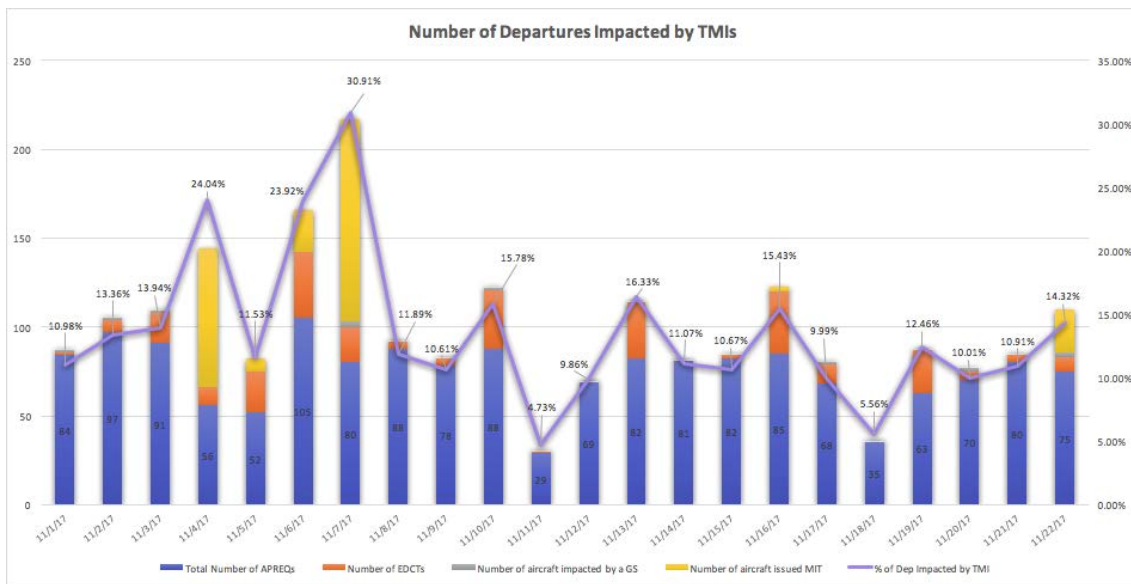
3.3.1 Phase 1B System Usage Data



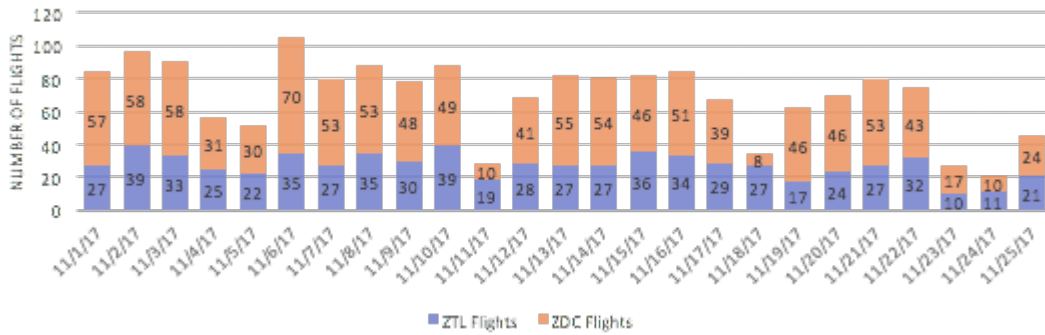


Notes:

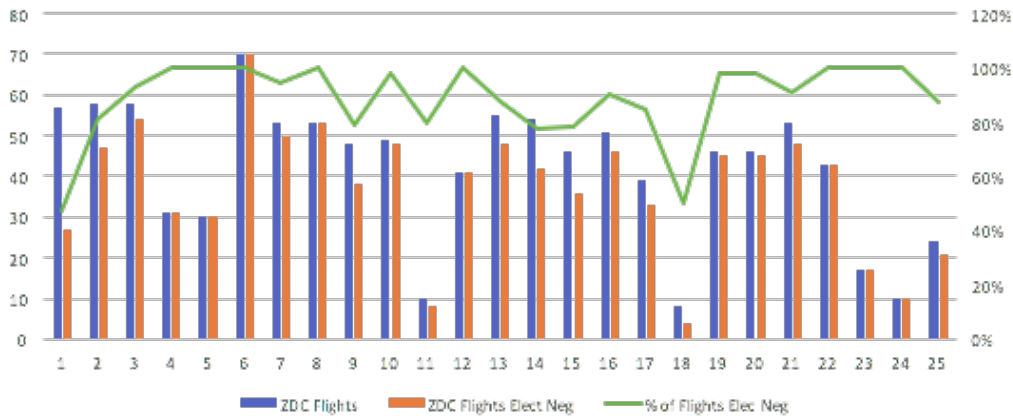
- 11/14/17 issue with data flowing on clark caused tracks to freeze and ramp switched back to Aerobahn
- 11/20/17 CLT was in a deice/defrost event that limited use of RTC in bank 2 this day (was used bank 3 and 4)



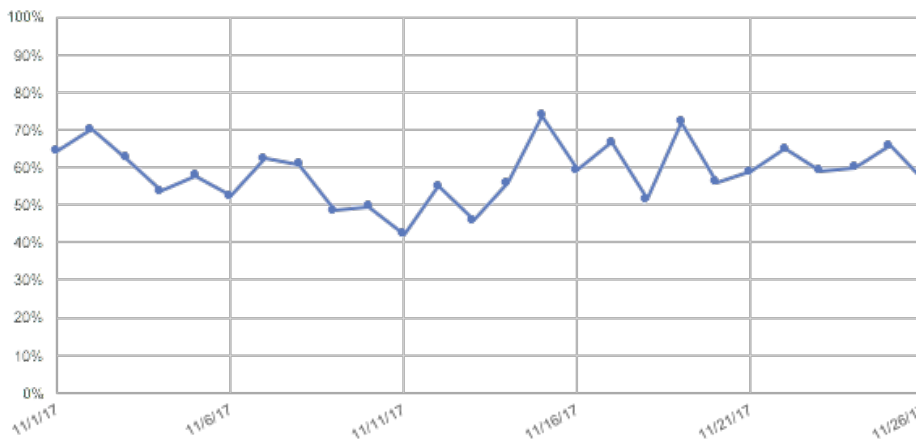
PHASE 1B APREQS



APREQ Flights Through ZDC Electronically Negotiated



Percent of Flights that had an APREQ Time Prior to Push



| Date | 11/1/17 | 11/2/17 | 11/3/17 | 11/4/17 | 11/5/17 | 11/6/17 | 11/7/17 | 11/8/17 | 11/9/17 | 11/10/17 | 11/11/17 | 11/12/17 |
|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|
| Total Number of APREQs | 84 | 97 | 91 | 56 | 52 | 105 | 98 | 107 | 99 | 105 | 57 | 69 |

| Date | 11/1/17 | 11/2/17 | 11/3/17 | 11/4/17 | 11/5/17 | 11/6/17 | 11/7/17 | 11/8/17 | 11/9/17 | 11/10/17 | 11/11/17 | 11/12/17 |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|
| Number of APREQs to ZDC & ZNY | 57 | 58 | 58 | 31 | 30 | 70 | 59 | 66 | 52 | 55 | 24 | 35 |
| Number of APREQs Electronically Negotiated | 27 | 47 | 54 | 31 | 30 | 70 | 59 | 66 | 52 | 55 | 24 | 35 |
| Number of EDCTs | 2 | 7 | 17 | 10 | 23 | 37 | 22 | 14 | 7 | 28 | 15 | 0 |
| Number of aircraft impacted by a GS | 1 | 1 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 0 |
| Number of aircraft issued MIT | 0 | 0 | 0 | 78 | 7 | 24 | 99 | 24 | 0 | 0 | 0 | 0 |
| Total Number of Aircraft Impacted by TMIs | 87 | 105 | 109 | 144 | 82 | 166 | 222 | 145 | 106 | 133 | 73 | 69 |

3.3.2 Phase 1B Training Notes & Observations

WebEx: 10/23/17

Slides used in WebEx and distributed: New Features RTC3.0.6_171020.pptx

Field: 10/23-10/25/17

3.3.2.1 Tasks



- Hands-on training of new features in v3.0.6
 - Toggle to show frequencies on map
 - Toggle to show ADW on map
 - Callsigns visible one zoom level higher
 - 757 type indication
 - Updated flight menu information
 - Create target (existing data)
 - Reposition target
- Record times that RTC is in use
- Verify departure fix and departure runway mapping of new procedures
- Collect data of flight matching issues
 - Real-time
 - Aerobahn view

- Status of construction

3.3.2.2 Hours of RTC Operation

| Date | Time Start | Time End | Manager | Controllers (N/E/S/W) | Notes |
|-------|------------------------------------|----------------------------|--------------|-----------------------|--|
| 10/24 | started before 8:45 AM EDT / 1245Z | 2:15 PM EDT / 1815Z | Ramp Manager | Ramp Controllers | All except for South started before 8:45. South switched to RTC prior to 2nd bank at 9:30. |
| 10/24 | 2:15 PM EDT / 1815Z | 3:40 PM EDT / 1940Z | Ramp Manager | Ramp Controllers | Ramp Mgr shift change at 3PM/ 1900Z. East Ramp Controller switched back to Aerobahn at 3:25. Others used RTC until approx 3:40. |
| 10/25 | started before 8:45 AM EDT / 1245Z | At least until 2:10 PM EDT | Ramp Manager | Ramp Controllers | West Ramp Controller could not use RTC until 10:00 due to display issues. One Ramp Controller took over for another after 10:30 for one bank. |

3.3.2.3 Flight Matching/Gate Conflict Issues (not reported in ATDIFR)

| Date | Time | Notes | RTC | Aerobahn |
|-------|-------|---|-----|---|
| 10/24 | 1305Z | E30, JIA5509 tag showed up only around the time when it was scheduled to push. No disk to show gate occupied. There was a gate conflict with inbound, JIA5247. | |  |
| 10/24 | 1455Z | East needed to create missing departure target on RTC for AAL2046. Was able to create it with no problems. | |  |
| 10/24 | 1926Z | JIA5073 hollow arrival icon did not move to gate, turn into disk, was blocking gate. North Ramp moved icon away to hangar (though it was not really there) to get it out of the way. | | Flight doesn't exist in real life. Nothing to take a picture of. |
| 10/25 | 1300Z | During ASDE-X outage, RM noticed wrong callsigns at the gates on RTC. After ASDE-X came back the callsigns were correct again. But what does ASDE-X have to do with callsigns at the gates? | | |

3.3.2.4 General

| Date | Time | Notes |
|-------|-------|--|
| 10/24 | 1340Z | Ramp using scratch pad to denote hardstand instead of yellow box. They verbally coordinated. RM explained he would still ask why a/c is going to HS for planning. |

| Date | Time | Notes |
|-------|-------|---|
| 10/25 | 1245Z | Scheduled ASDE-X outage. Didn't seem to go out until a few minutes later, for about 15 min. |
| 10/25 | 1400Z | Create target: Ramp Controller suggested being able to type flight number directly into drop down list to search for flight |
| 10/25 | - | E14/16 gate labels overlapping. E35A, E35B labels overlapping |

3.4 Shadow 14: Phase 1C Transition – Nov 28-30, 2017

3.4.1 Shadow Session 14

Stakeholders and Partners Meeting Objectives from 11/28/17:

- Review Phase 1B and discuss feedback on continued data exchange and integration between CLT ATCT and AAL ramp tower as well as electronic negotiation with ZDC
- Discuss procedures for Phase 1C
- Review new features in release 3.0.7
- Tactical Scheduler Overview

Strategic-Tactical Fusion Discussion Goals, 11/30/17:

- Incorporate lessons learned from tactical scheduler during Phase 1
- Provide planning tools on the strategic timeframe
 - Provide advance notice of metering
 - Provide TOBTs and TMATs with longer lead time
 - Provide predictions at longer look-ahead times
- Continue to make use of tactical data, such as readiness information

3.4.2 Phase 1 System Usage Data - Surface Metering

Phase 1C Debrief of Week One of Surface Metering Discussion Topics, 12/6/17

- User feedback regarding perception of surface metering
- Discussion of surface metering procedures
- Review of preliminary results
- Preliminary benefits metrics
- Data sharing moving forward

3.4.2.1 Surface Metering Impacted by Weather, Scheduling, or Other Events

The following table lists the dates that surface metering was not initiated.

| Date | Surface Metering was NOT Initiated |
|-----------|---|
| 7/4/2018 | No bank 2 |
| 7/3/2018 | No bank 2 |
| 6/17/2018 | No metering in bank 2 or 3 due to IROPs and PSA IT Issue |
| 6/16/2018 | No metering in bank 2 or 3 due to IROPs (multiple cancellations and several late flights) |

| Date | Surface Metering was NOT Initiated |
|------------|--|
| 6/15/2018 | No metering in bank 2 or 3 due IROPs (recovery ops due to weather event the previous evening) |
| 5/26/2018 | No metering in bank 2 due to earlier ground stop |
| 4/15/2018 | No metering during bank 3 due to weather |
| 4/5/2018 | No metering because no RM on duty (FR2 event) |
| 3/21/2018 | No metering in bank 3 due to deicing |
| 3/9/2018 | No metering in bank 2 or bank 3 due to scheduling issues that prevented a RM being on duty |
| 3/2/2018 | POTUS (TFR) for Billy Graham's funeral |
| 2/26/2018 | No metering in Bank 3 due to complications during south converging operations during bank 2 |
| 2/20/2018 | (connection issues due to router) |
| 2/17/2018 | (large number of EDCTs) |
| 2/4/2018 | |
| 1/18/2018 | |
| 1/17/2018 | (snow): NATCA Rep – Today was a full blown de-icing day. Major snow event disrupted normal ops. I would again consider today's data as a one-off or outlier type of day. |
| 1/11/2018 | |
| 12/27/2017 | |
| 12/26/2017 | |
| 12/9/2017 | |

3.4.2.2 Surface Metering

When the flight was put on hold AND metering was on for the runway, the flight is counted as being held for surface metering. All times are shown in minutes.

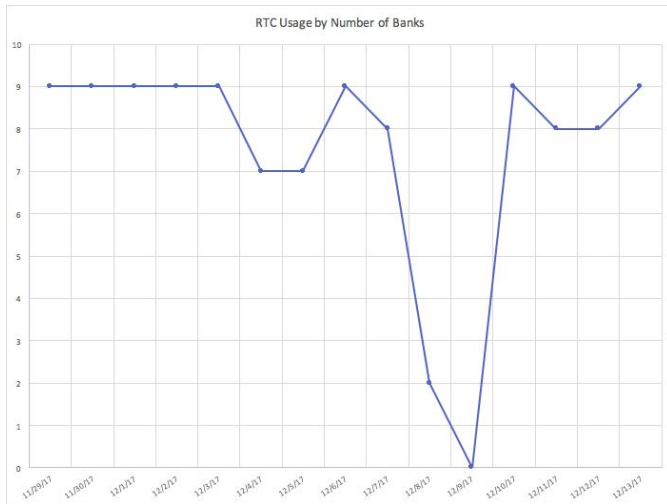
| Date | Bank | Rwy Utilization | DMP Parameters | Number of Flights Subject to Surface Metering | Total Gate Hold (Push Time - Ready Time) | Average Realized Hold (Push Time - Ready Time) | Mean Advisory (TOBT - Ready Time) | Peak Advisory (TOBT - Ready Time) | Mean Pass Back Delay When Put on Hold (TOBT - UOBT) |
|----------|------|---------------------------|---|---|--|--|-----------------------------------|-----------------------------------|---|
| 11/29/17 | 2 | North B/A/T=36C VMC | Upper = 16 Target = 14 Lower = 12 | 26 | 171.13 min | 6.58 min | 8.17 min | 25.13 min | 4.89 min |

| Date | Bank | Rwy Utilization | DMP Parameters | Number of Flights Subject to Surface Metering | Total Gate Hold (Push Time - Ready Time) | Average Realized Hold (Push Time - Ready Time) | Mean Advisory (TOBT - Ready Time) | Peak Advisory (TOBT - Ready Time) | Mean Pass Back Delay When Put on Hold (TOBT - UOBT) |
|----------|------|--|--|---|--|--|-----------------------------------|-----------------------------------|---|
| 11/30/17 | 2 | South Conv KR/J/N=18L VMC | Upper = 14 Target = 12 Lower = 10 | 32 | 161.48 min | 5.05 min | 6.24 min | 17.84 min | 2.47 min |
| 12/1/17 | 2 | North B/A/T=36C VMC | Upper = 16 Target = 12 Lower = 11 | 20 | 69.49 min | 3.48 min | 5.22 min | 9.93 min | 0.50 min |
| 012/2/17 | 2 | North B/A/T=36C IMC | Upper = 16 Target = 12 Lower = 11 | 26 | 91.71 min | 3.53 min | 5.47 min | 19.53 min | 2.85 min |
| 12/3/17 | 2 | North B/A/T=36C VMC | Upper = 16 Target = 12 Lower = 11 | 24 | 128.35 min | 5.35 min | 5.93 min | 15.17 min | 2.20 min |
| 12/4/17 | 2 | North B/A/T=36C VMC | Upper = 14 Target = 12 Lower = 10 | 32 | 160.36 min | 5.01 min | 6.28 min | 24.07 min | 3.14 min |
| 12/5/17 | 2 | South Sim BE/A/T=18C | Upper = 18 Target = 14 Lower = 13 | 34 | 179.03 min | 5.27 min | 7.71 min | 22.98 min | 4.15 min |
| 12/6/17 | 2 | Started N_Normal and at 1418Z went to North B/A/T = 36C | Upper = 18 Target = 14 Lower = 13 | | | | | | |
| 12/7/17 | 2 | N_Normal VMC | Upper = 17 Target = 13 Lower = 12 Justification: Testing for differences from established values | | | | | | |

| Date | Bank | Rwy Utilization | DMP Parameters | Number of Flights Subject to Surface Metering | Total Gate Hold (Push Time - Ready Time) | Average Realized Hold (Push Time - Ready Time) | Mean Advisory (TOBT - Ready Time) | Peak Advisory (TOBT - Ready Time) | Mean Pass Back Delay When Put on Hold (TOBT - UOBT) |
|----------|---|---------------------------|---|---|--|--|-----------------------------------|-----------------------------------|---|
| 12/8/17 | 2 | North B/A/T=36C VMC | Upper = 14 Target = 12 Lower = 10 | | | | | | |
| 12/9/17 | No surface metering due to deicing in CLT | | | | | | | | |
| 12/10/17 | Part of bank 2 due to deicing - SM turned at 1442Z | North N_Normal | Upper = 17 Target = 14 Lower = 13 | | | | | | |
| 12/11/17 | 2 (1427Z) RM has started turning on surface metering later once a queue has built up to account for the issues at the beginning of the bank | North B/A/T=36C VMC | Upper = 16 Target = 14 Lower = 12 | | | | | | |
| 12/12/17 | 2 | North N_Normal | Upper = 18 Target = 14 Lower = 13 | | | | | | |
| 12/13/17 | 2 | South_Conv | Upper = 20 Target = 14 Lower = 13 | | | | | | |

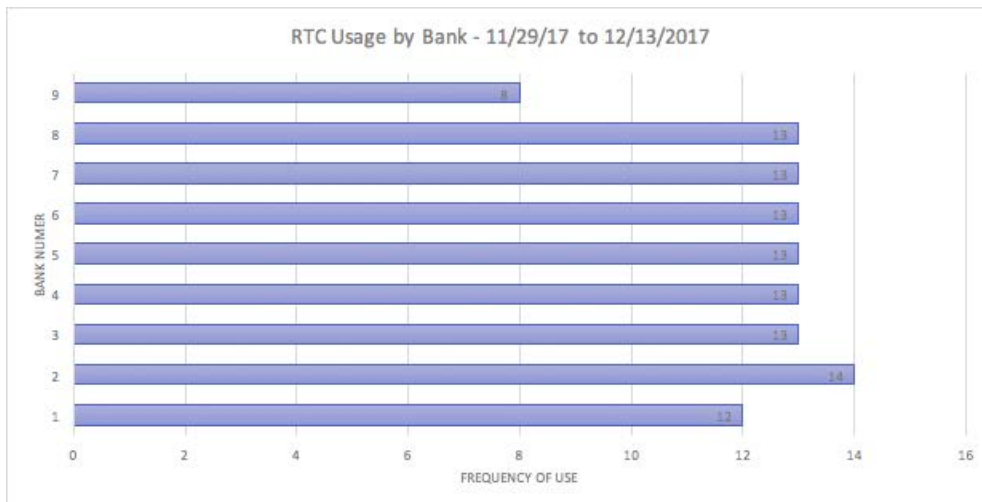
| Date | Bank | Rwy Utilization | DMP Parameters | Number of Flights Subject to Surface Metering | Total Gate Hold (Push Time - Ready Time) | Average Realized Hold (Push Time - Ready Time) | Mean Advisory (TOBT - Ready Time) | Peak Advisory (TOBT - Ready Time) | Mean Pass Back Delay When Put on Hold (TOBT - UOBT) |
|----------|--|--------------------------|---|---|--|--|-----------------------------------|-----------------------------------|---|
| 12/14/17 | 2 | South_Conv KR/J/N=18L | Upper = 20 Target = 14 Lower = 13 | | | | | | |
| 12/15/17 | 2 | North B/A/T=36C | Upper = 20 Target = 14 Lower = 13 | | | | | | |
| 12/16/17 | 2 (1422Z) | North B/A/T=36C | Upper = 18 Target = 14 Lower = 13 | | | | | | |
| 12/17/17 | 2 (1438Z) | North B/A/T=36C | Upper = 16 Target = 14 Lower = 12 | | | | | | |
| 12/18/17 | 2 (1409Z) Note, RM modified the upper threshold several times | | @1409Z Upper = 18 Target = 14 Lower = 13 @1423Z Changed Upper = 17 @1438Z changed upper = 16 | | | | | | |

3.4.2.3 RTC Usage

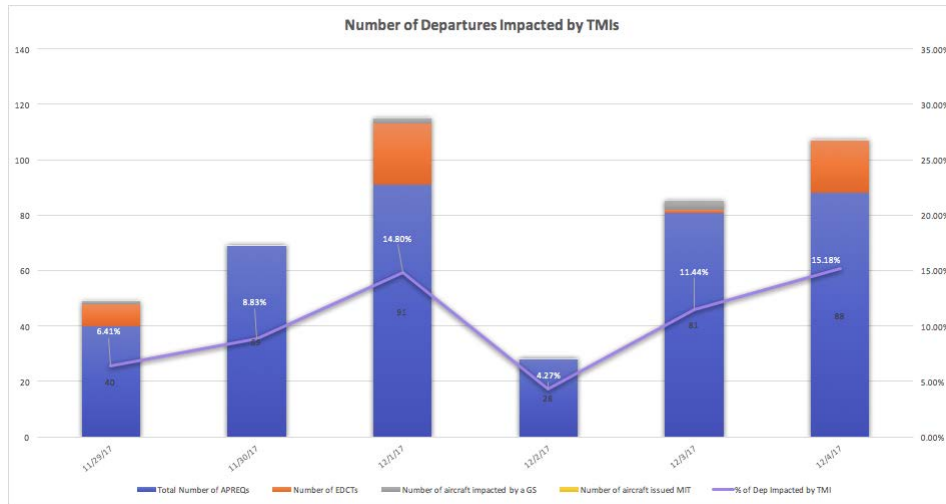


Notes:

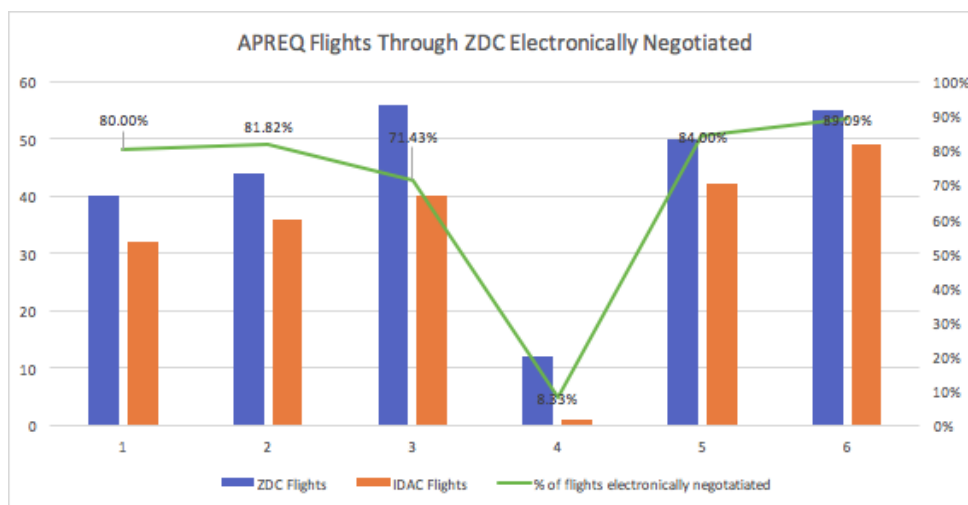
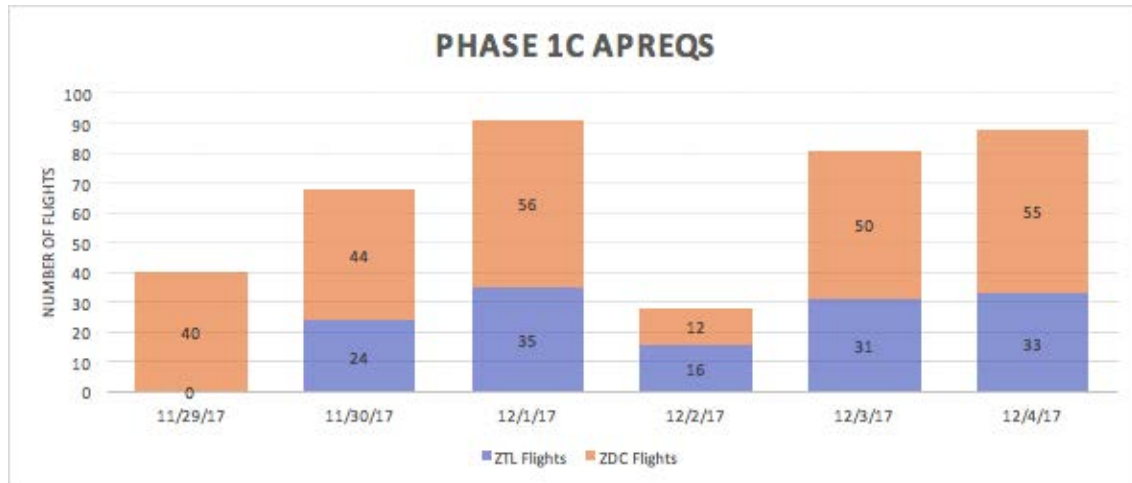
- 12/4/17 - RTC looks to have been used partially in bank 1 and there was no last bank this day
- 12/8/17 and 12/9/17 were impacted by a snow storm across the Southeast and the associated need for deicing procedures



3.4.2.4 TMIs Data



3.4.2.5 APREQ Electronic Coordination Data



3.5 Shadow 15 – February 13, 2018

Stakeholders and Partners Meeting Objectives from 2/13/18:

- Discuss system use and performance since the start of Phase 1C
- Review new features in current release as well as preview upcoming releases
- Initial data analysis on surface metering effectiveness, calibration of surface metering, as well as a look at early benefits metrics

Outcomes:

- Memo to clarify APREQ times on STBO and compliance to 2 min early and 1 min late was sent out to CLT ATC workforce on February 7, 2018
- Images of Ramp A Expansion

3.6 Shadow 16: V3.1.2 Session – May 14, 2018

Stakeholders and Partners Meeting Objectives from 5/14/18:

- Overview and demo of new features (STBO Client, RTC, Surface Metering Display)
- Leveraging surface metering
- Gate conflicts
- On-Time Performance A0-A14

Also presented at this Shadow Session were single-page summaries highlighting the new features in STBO Client and RTC in V3.1.2.

3.7 Shadow 17: V4.0.0 Session – Sep 11, 2018

Stakeholders and Partners Meeting Agenda from 9/11/18:

- Training Plans and Goals
- Strategic Scheduler
- Phase 1 and 2 Metrics
- ZTL Pre-Scheduling
- TTP
- Aircraft Management
- Phase 2 Go-Live Discussion

4 Pilot Engagement Activities 2017

This section summarizes the pilot webinars and pilot engagement communication documents associated with the ATD-2 Pilot Engagement Task in 2017.

Pilot Webinars

- The "Pilot Webinars" section describes content and notes from a series of ATD2/IADS introductory webinars that were provided to airline/ramp and other stakeholders.

Pilot Engagement Communication Documents

- The "Pilot Engagement Communication Documents" section describes ATD2/IADS content and documents (draft and final versions) that have been developed for communication with airline pilot representatives.

4.1 Pilot Webinars

4.1.1 Session 1 Summary: April 13, 2017 (WebEx)

4.1.1.1 Suggested Procedures Ramp – Pilot Interactions

1. Runway Assignment with Gate Hold. If Ramp issues a gate hold to the pilot, they should provide the expected runway at the time of the initial Gate Hold communication, not at the time that the Pushback clearance is issued.

Phraseology Recommendation: "Hold for 5 minutes for surface metering, expect runway 18L."

From NASA Researcher: The Ramp controllers have not been providing expected runway at gate hold time, this is something we can certainly train them on and I can see the benefit of letting pilots know early and able to program their FMS.

2. Departure Fix Closed. If Ramp tells the pilot to contact CD for new routing at pushback, pilots should remain at the gate until they receive their new departure clearance and it is programmed and verified in their FMS. Ramp should not place pilots in a position where they feel rushed and/or pressured to compromise safety. For example, Ramp should not clear an aircraft for pushback and tell pilots to contact clearance delivery for new routing at the same time. This applies unnecessary / implicit pressure for the pilot to pushback while communicating with clearance delivery. Instead, Ramp should notify pilots to contact Clearance Delivery for new Route and call back when ready for pushback.

Phraseology Recommendation: "Departure fix closed, contact CI Del for new route, Call back when ready to push"

From NASA Researcher: your procedure sounds right, but we will not always be possible, especially if the gate is required by an arrival and the flight needs to take the wait elsewhere including hardstand. Again, we need to train the ramp folks on ensuring that the pilot has received their re route info before releasing them, but this is subject to gate and hard stand availability. We may have to work this out with the ramp folks.

From NASA Researcher: It is fine to push and move to hardstand, and then wait for routing information while in the hardstand. Pilots just don't want to push and taxi straight out while retrieving the new route information.

3. APREQ. When APREQ is issued – Ramp should always ask pilots if they have received their wheels up time from Clearance Delivery

From NASA Researcher: yes and we tried this procedure in the HITL. We asked ramp to ensure that APREQ time was negotiated. In fact, recently an alert has been added that shows a flight having word red in APREQ if it has pushed back without an APREQ time.

4. Hardstand Release. When placed in the hardstand, Pilots don't want to know TMAT time, they want to know the "READY time" (the time they need to be ready to taxi, with engines on, flight attendants/cabin ready and passengers seated). We should not introduce the term "TMAT" to pilots.

Pilot Suggestion. Determine the longest possible hardstand-to-spot taxi time and have ramp control subtract that constant value off of the TMAT time displayed on their console. When ramp delivers the aircraft to the hardstand, Ramp tells pilots to "**Be ready at [TMAT – x] minutes**". This may differ for every airport depending on the ramp configuration and distance from hardstand to spot, so we don't want pilots to have to remember or know the procedure for each airport.

From NASA Researcher. Hardstand release also provided the ramp folks with minutes before they will be released. So the users don't need to do this computation that you are suggesting, it's already in the works. And we need to train the users to ensure that they inform the pilots 5 min before their release time from Hardstand so that they have enough time to start the engines.

4.1.1.2 Pilot Concerns

1. Do not delay flights that call in after "EOBT+ X minutes", as long as they are ready to push by Scheduled Pushback time.

The ConUse specifies that if pilots don't call for pushback by "EOBT + 5 min", they will be moved from the Planning Group to the Uncertain Group, and wait for pilot to call in before being scheduled. These flights will experience a schedule delay, though it is uncertain at this time the length of those delays.

However, Pilots do NOT have access to the EOBT that their airline is providing. NOR SHOULD THEY. The pilots are managing their workflow to meet the scheduled pushback time. They should not be pressured to pushback early. Nor should they experience a flight delay for calling in after EOBT, as long as they are ready to push by the scheduled pushback time.

The EOBT is based on passenger loading and baggage loading, but does not consider flight / pilot readiness. The pilots might be working through a mechanical issue or reviewing their departure paperwork. They are managing their workflow to meet pushback time, but not to meet the airline-generated EOBT.

We don't want flights to experience a schedule delay if they call in by scheduled pushback time, but this is later than EOBT. Nor do we want to require airlines to change their guidance for when to call for pushback at KCLT only. If we launch a communication initiative that pilots need to call EARLY or else they may experience delays, then we are going to create a situation where pilots are going to start gaming the situation, and call before ready or rush flight deck configurations, which will be worse for overall predictability and possibly safety.

Suggestions:

- A. Through careful analysis, ensure that the '+ x' value is large enough to ensure that flights that call on-time (per the published schedule) are not moved to 'uncertain' regardless of how early their EOBT is. In other words, compare the EOBT to the published pushback time, and set the "+ x" value to ensure that 99% (?) of flights won't be bumped to the uncertain category if they call on-time per the scheduled pushback time. This analysis would have to look at all flights / aircraft type / gates etc
- B. Work with AA SME to ensure that his EOBTs also consider pilot procedures. For example, If AA policy is to close the door at 5 minutes before scheduled pushback time, it would be in the best interest of all (pilot, airline, and overall system predictability) to provide an EOBT that is no earlier than 5 minutes before scheduled pushback time, since that is the earliest that the pilot is going to call for pushback (regardless when the bags and passengers are loaded).

Both of these would reduce the number of times the scheduler needs to reschedule due to a missed EOBT window, and presumably would be better for overall system predictability.

NOTE: In email communication with ATD-2 Chief Engineer and Operations Analysis Lead, we agreed this EOBT + x value will require further analyses as EOBT data begin to come in.

Communication from ATD-2 Chief Engineer (5/4/2017 telecon): Software will now allow ramp to add time before an aircraft is moved from 'planning' to 'uncertain' group. At the ramp discretion, if the EOBT +x has been passed, but is not later than scheduled pushback time, ramp controller can keep the aircraft in the planning group.

2. Pilot Pay

AA has a mechanism to pay pilots for gate hold time (Original Mainline AA pilots can enter a 2 digit code in the ACARS, Original US Air pilots can file paper timecard adjustments). However, PSA does not have a contract mechanism to support this. PSA pilots will not get paid for gate holds. PSA pilots described their strategy of pushing back and rolling 10 ft to start the clock for pay. (Note: ATD-2 schedule should be robust to "Push and Rolls Strategy" using the 'Hover' feature.)

Suggestions:

- A. RM had requested that gate holds not exceed 10 minutes, is this the case? If so, we will communicate this to pilots, but if we tell pilots this, we need to make sure this is not exceeded.
NOTE: Per AI, 10 minutes is a guideline but not a requirement. 10 minutes should NOT be communicated to pilots.

- B. Is there a way to explicitly recognize pilots and airlines for fuel saved by taking gate holds with real-time (daily? monthly? feedback). E.g. a **dashboard concept*** for pilots that shows the fuel / \$\$ savings based on gate hold time @ estimated fuel burn when idling per aircraft type.

3. AA Culture re: D0 Times.

AA philosophy heavily emphasizes the importance of D0 times, and this extends to AA regionals. For example, if a PSA flight is 2 minutes late in pushing back, the pilot will get a call from the Chief Pilot asking why (even if the flight makes the A14 time). Unless a change is made in corporate culture and all regionals, pilots will not want to take delays at the gate. We need to make sure pilots will not be called-out for late D0 times if asked to hold at the gate.

Currently, airlines / pilots are not called-out for late pushback if it is due to ATC delay. These flights are marked as ATC-delay by Ramp Controllers. Pilot suggested that the Tower Reg Op Control Duty Manager and Tower Unit Manager Regional Ops would be the ones to agree to mark the flight as an ATC delay if taking a gate hold due to ATC.

Suggestion.

- A. Can Ramp input ATD-2 gate holds as an ATC delay?
- B. This will take an extensive communication campaign that goes higher up the management chain.
- C. Can we find ways to recognize pilots and airlines for fuel saved by taking gate holds e.g. a dashboard* for pilots that shows the fuel / \$\$ savings based on gate hold time @ estimated fuel burn when idling per aircraft type.

*NOTE: SME followed-up with ATD-2 Field Demo Lead. It should be possible to email metrics reports to airlines that will show fuel savings etc as a result of gate holds. We will work with pilot groups to determine usefulness of this, metrics of interest, POC to receive reports etc.

4. Training Needs

| Training Topic | Notes |
|---|---|
| Runway Assignment for Operational Necessity must be communicated to Ramp as soon as known | Under current ops, pilots wouldn't communicate this to ramp, b/c ramp would say, 'tell GC'. Pilot reported "Fundamental shift in letting Ramp know before we push back, as soon as we know that that RWY is no longer a viable RWY for us". (Paraphrase :) "Sometimes may not know this until off the gate because Load Control adjusts numbers. Not used to calling about this BEFORE the push." |
| When to Expect Gate Holds | Pilots advise NOT to tell pilots that surface metering will only apply during Bank 2. They don't know when the banks are, and don't need to know. Especially if there is a plan to expand beyond bank 2. |
| Once cleared, Pilots should expect to pushback without delay | Emphasize the importance of fostering an on-time culture |
| Surface metering benefit | A selling point of ATD-2 is that if surface metering is on, flights won't be delayed elsewhere (i.e. at spot or runway). Emphasize fuel / emission savings - ideally we'll be able to provide data/ graphics to demonstrate the fuel savings of a single flight, and multiplied over total number of operations. |
| Calling for pushback. | Clarify that there is no change to how / when pilots call for pushback. They should be ready to push when they call. They should not call early. |

| Training Topic | Notes |
|--|-------------------|
| EDCT/APREQ flights will not be subject to surface metering | No double penalty |

4.1.2 Session 2 Summary: April 28, 2017 (WebEx)

The purpose of this webinar was to introduce ATD-2 to airlines that have not previously attended an ATD-2 briefing. As such, there was little discussion. However, pilots were invited to provide input via email / phone following the call on certain topics.

Questions from pilots:

How will pilots get info (EOBTs)? SME clarified existing communication mechanism will be used (PDC, or voice comm with Ramp/Clearance Delivery; SME later clarified that pilots will not be given an EOBT or a required push time)

Where is the EOBT coming from? SME stated that AA is taking care of EOBT transmission for AA and subsidiaries. NASA Researcher emphasized that all airlines are encouraged to provide EOBT through the SWIM mechanism.

What happens if we have a gate advisory but another aircraft needs our gate? SME discussed ramp controller gate conflict tools and hardstand procedures.

What happens if I have an APREQ and I have to pull out of sequence because of a mechanical problem? Will the system be able to handle that? Or will I get pushed to the back of the queue

Is there a way make sure aircraft that pull out of sequence for a short maintenance or FMS programming issue are not overly penalized (some delay would be expected)? But we should be vigilant about fostering a culture where pilots are resistant to do the safe thing (stop and set the parking brake) for fear of excessive delays.

Input from Air Wisconsin:

On the Issue of Pilot Pay and Gate Holds:

Per SME feedback: "Clock starts when the door is closed and the parking brake is released."

Per SME feedback: "I do feel gate holds will worry pilots as their pay is not started until the doors are closed. However, if they are permitted to board up knowing a push time, the gate hold shouldn't be a big deal as they won't be sitting there for long (having a planned push time affords them time to plan boarding)."

NOTE: SME reported clock started when parking brake is released and then later when the doors are closed. Other SME responded and clarified that pilots will not have an assigned push time in advance - rather that pilots call when ready, as per current ops, and will be told to push or hold.

Training Needs:

"We will have to educate our pilots on a various number of issues. Where to get your push time, when to board, what happens if you need to get out of the line (Maintenance / passenger issues), planned taxi time for fuel planning etc. From the company standpoint, how will we communicate EOBT times?"

EOBTs:

"Currently we are contracted through American Airlines. We end our contract with American in February of 2018 and we start a new contract with United. That being said, the EOBT times will need to change from AA to UA. I'm not sure how much UA is involved with CLT ops / ATD-2. Once we switch to UA, we will be flying through CLT a lot less frequently. That being said, we still want to stay ahead of the ATD-2 process so that when we do change over, we can still provide the FAA and CLT ops with great service from the pilots standpoint."

SME Note: Air Wisconsin is interested in supporting ATD-2, and may be a good partner for the FAA/MITRE work on the mobile app. Per SME feedback: "I think the app is a great idea. I'm sure we could get IT on board to help us communicate to you effectively. We do use iPads so this would help".

Here is a list of airlines and organizations that have attended an ATD-2 Pilot Briefing

AA Mainline

Piedmont

PSA

Air Wisconsin

Southwest Airlines

ALPA (ALPA rep also Alaska Airlines)

APA

UPS

NBAA

UAL (have seen briefing material via pilot SME)

Delta (CDM rep)

Envoy

4.1.3 Session 3: July 10, 2017

Action Items:

1. Provide source file for ATD-2 video. Pilots cannot access YouTube on AA devices. SME to look into whether video can be run in crew room.
2. Investigate resource availability for Training Poster Production: Graphic Design and Printing
3. EDCT procedures Clarification Required. (See notes regarding discussion below)

Pilot Training Plan

1. Posters with procedures graphics for crew room: Plan to have these ready for mid-September
2. Email on mobile device to be sent to all AA pilots first or second week of September. ** Need to determine if material needs to be formatted for phone/ tablet?
3. Print outs in each pilot's mailbox.
4. AA training dept. will provide staff in the crew room to talk to pilots and answer questions
5. Distance learning module, probably not until Jan.
6. *** NEED to determine training material requirements and deadlines for Non-AA pilots

Pilot Training Material Feedback

FEEDBACK:

There was general approval of the proposed draft communication to pilots. Recommendation to re-order page 2 chart with most important information first.

SME has reviewed the draft pilot communication with the Chief Pilots at CLT. The feedback was positive. No issues or concerns were raised with the content. Chief Pilots requested large-format posters with the procedures chart (page 2) that can be posted in the crew rooms.

PROCEDURES TO BE ADDED:

APU InOp: when APU is inoperable, crews need to start engines while at the gate, and this takes longer before they are ready to pushback. Pilots will need to communicate to Ramp that they will need time to start up. Pilots will not be able to start up engines and then call ramp for pushback (because if there is a delay, they will be at the ramp with engines running (safety issue), plus uncomfortable for passengers (no conditioned air, temperature). If given a gate hold, pilots need to know that their engine airstart procedures need to be completed by the pushback time specified. Crew should advise ramp they are starting their engine so ramp knows they need to push the a/c once started.

EDCT: Pilots should be encouraged to contact ramp BEFORE pushback to get a pushback time (they don't need to guess when to pushback, because Ramp has better tools and information). They can call before doors closed (i.e. they do not need to be ready to pushback) – this will allow them to take the delay at the gate, but with door open, unless ramp needs to move them to the hardstand.

PROPOSED PROCEDURE: *“When flight has an EDCT, Call Ramp Control prior to pushback to get advised pushback time”.*

PROCEDURES THAT REQUIRE CLARIFICATION

Modified EDCTs: Is it possible that EDCTs will be changed, and pilots will be notified, but RAMP will not? If pilots are notified of a change in EDCT, should it be a procedure that they contact RAMP and tell them? Or, should it be a procedure, that pilots always confirm their EDCT time with Ramp control? Since a central theme is improved information sharing —pilots will expect Ramp to have the most current information — if this is not the case, we'll have to call this exception out very clearly.

EDCT+APREQ: When a flight has BOTH APREQ and EDCT, APREQ takes priority. Is it safe to assume that the times will be coordinated such that wheels-up times will be compatible with the EDCT? Who is responsible for coordinating the EDCT and APREQ times? And will this be coordinated before the pilots receive a wheels up time?

OTHER**DASHBOARD: DATA METRICS for PILOTS**

Pilots expressed an interest in receiving data summaries for two general purposes:

1. To show the benefit of ATD-2 compared to current day (reduced delay, fuel burn, emissions) as motivation and incentive to participate
2. To optimize operations (e.g. refining block times; opportunities to minimize delays by adjusting schedule)

Data desired:

- Date, Flight ID, duration of delay imposed
- Data by city pairs to show how average delay is reduced with ATD
- Idle fuel burn reduction (provide fuel and emission savings, but not \$)

Frequency of data reports:

- To evaluate operational efficiencies, within 24 to 48 hours;
- To evaluate trends and compare to historical data, summaries over 1 month or 6 months.
- Would like to see data for individual days, but send it weekly

4.2 Pilot Engagement Communication Documents

The following posters and communication pieces geared for pilots were created by the ATD-2 team:

- Jun 6, 2017 Pilot Communication Procedures meeting/telecon. Graphical walkthrough of procedures attached below were discussed.
- Jun 19, 2017 Draft Pilot Communication routed for comments. Draft Graphical version of draft Pilot Communication (Note: Considered, but not used).

- Jun 27, 2017 Revised draft version of the Pilot Communication materials (cover letter and 5-column "what's new? / what to do?" procedure chart) routed for comments
- Jul 5, 2017 NASA-Ramp Manager discussion about ramp procedures - Q&A in slides
- Jul-Aug 2017 Pilot Crew Room Posters
 - Designed and coordinated creation of 3 Pilot Crew Room Posters re: ATD2/IADS. Multiple iterations with pilot rep and NASA support.
 - Overview ATD2/IADS poster
 - Poster with 5-column "what's new? / what to do?" procedure chart
 - Poster with Pilot procedures flowcharts
- Aug 31, 2017 Pilot Procedures Communication Cover Letter and 5-column Chart Finalized
- Sep 18, 2017 Final ATD2/IADS Pilot-centric Posters (for Flight Deck Crew areas at KCLT)
- Apr 2018 ATD2/IADS Pilot-centric Poster (for Flight Deck Crew areas at KCLT): Benefits and Pilot Procedures Reminder