



Airspace Technology Demonstration 2 (ATD-2)

Prescheduling with EOBT's
September 4, 2019

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- Flights out of CLT that are scheduled with TBFM are subject to Approval Request (APREQ, also known as Call For Release)
 - About 1 in 10 flights that depart CLT are subject to APREQ
 - Other facilities, like SFO, have similar percentages
- TFDM has a plan to use the Earliest OFF Block Times provided by Operators plus new scheduling automation to secure a slot in TBFM at a set time prior to departure
 - ATD-2 has implemented this logic (plus a few additional features) and has been running this for all flights from CLT to ATL since Oct 2018 and to ORD since late June 2019
- Pre-scheduling with EOBT has gone well at CLT, and led to improved predictability (reduced variation)
 - At the same time, departure compliance to APREQ has risen. This helps the downstream facilities being scheduled into achieve a more stable schedule.

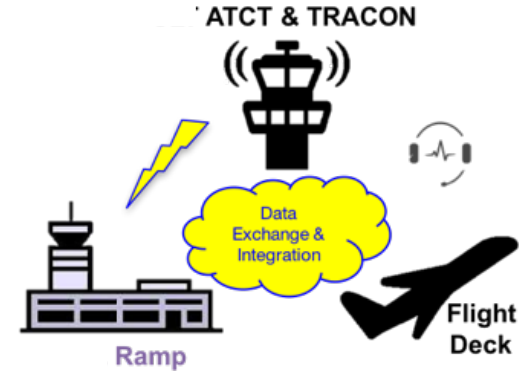
Pre-Scheduling with EOBTs (Started in Oct 2018)



1

At an adaptable time prior to departure (e.g. 20 min) the ATD-2 system uses the EOBT, taxi time estimate and a buffer to electronically submit a release time request to TBFM

• **Important Note:**
Providing an EOBT gives you an advantage!

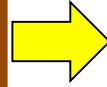


2

Center TMC approves or adjusts the time based on center constraints

3

ATCT and Ramp utilize the now visible APREQ time on their strips and pushback advisories

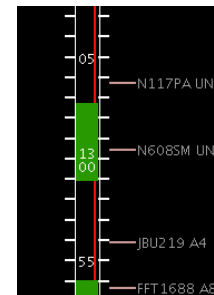


The data is made available on the TTP SWIM feed so that Operators can get it to their pilots



4

IDAC-style scheduling between TBFM and ATD-2 is used to re-schedule as necessary



Current Pre-Scheduling Logic in ATD-2 Leverages TFBM, SWIM and ATD-2



- 1) ATD-2 utilizes the Earliest Off Block Time (EOBT) data from Operators, an adapted buffer, and the predicted surface taxi time to generate an Earliest Feasible Takeoff Time (EFTT)
- 2) ATD-2 automatically send an APREQ release request to the appropriate Center TMC at an adapted time period prior to departure (currently 20 minutes prior to best estimate of pushback)
- 3) TFBM allows Center TMCs to respond to the release request just like it came from a native FAA IDAC system (i.e. no new training required)
- 4) SWIM provides the release time to the ATD-2 system, which in turn provides it to the ATC controller's flight strips, ramp controllers display, and SWIM TTP
- 5) Using ATD-2, CLT ATCT and ramp monitors progress toward the release time using agreed upon local procedures
- 6) <If necessary> ATD-2, TFBM and SWIM are used for re-planning the APREQ
- 7) ATD-2 captures data at each step for detailed measurement and analysis



- An important topic with pre-scheduling is the process used by the ATD-2 system to determine the earliest feasible takeoff time (EFTT) buffer size
- ATD-2 has two buffers that are relevant, EFTT and Controlled Time of Departure (CTD)
- EFTT Buffer
 - A statically adapted value that is added to the system's estimate of takeoff.
 - The EFTT does not include surface metering delay, but does account for some congestion that may prevent the flight from reaching the runway. The idea is not to 'double delay' the flight but also to provide a realistic OFF time into TBFM.
 - ATD-2 uses a **1 minute buffer for flights with EOBTs**, and a **4 minute buffer for flights that have no EOBT**
 - These buffers are necessary to ensure high compliance with earlier scheduling
- CTD Buffer
 - Used to help ensure flights to push back early/on-time to meet the APREQ
 - This value is the same for all Operators and independent of EOBT submission or not
 - Example: the system expects the pushback need to be at 12:10, but 12:04 is given as guidance to ramp personnel (and verbally to pilot, electronically in SWIM TTP)



- Lower and/or more predicable TBFM assigned delay
 - Allows continuation of pre-scheduling process while making progress toward the end state FAA and Industry plan
- Preparation for TFDM
 - Allows Operators time to calibrate EOBTs and operations ahead of TFDM deployment. Note: the resulting APREQ times are available to Operators on the TFDM Terminal Publication (TTP) SWIM feed
- Simplified Center operations
 - Reduces the need to manually enter times from surface into TBFM
 - Allows ZTL to delegate pre-scheduling monitoring functions to the site
- Greater Operator support in meeting release times
 - Allows ramp and pilots to help ATCT in the conformance to the controlled OFF time
- Metrics for Data-Driven Analysis and Improvement
 - Each steps of the scheduling process is captured in a highly instrumented system that can be used to analyze and improve the process.



Operational STBO Arr/Dep = Departure; Destination has APREQ = Yes; Has AOFF = No; Ga

Flight ID	Dest	Dep Fix	Swap	AC Type	Gate	EOBT ▲	AOBT	Flight Status	APREQ Requi...	APREQ	EDCT
RPA3402	EWR	KILNS		E170	A21			Scheduled_Out		APRQ	
ENY9806	LGA	BARMY		E135	E6	31/20:00		Scheduled_Out		APRQ	
AAL2068	LGA	BARMY		A321	C13	31/20:17	31/20:34	Pushback		APRQ	
JIA5672	IAD	KILNS		CRJ9	E26	31/20:54		Scheduled_Out		APRQ	
DAL1095	ATL	BOBZY		B712	A4	31/21:00		Scheduled_Out		APRQ	
JIA5354	ATL	BOBZY		CRJ9	E38C	31/21:02		Scheduled_Out		APRQ	
AAL1722	LGA	BARMY		B738	B4	31/21:20		Scheduled_Out		APRQ	

Last updated: 20:36:54 GMT



Operational STBO Arr/Dep = Departure; Destination has APREQ = Yes; Has AOFF = No; Ga

Flight ID	Dest	Dep Fix	Swap	AC Type	Gate	EOBT ▲	AOBT	Flight Status	APREQ Requ...	APREQ	EDCT
RPA3402	EWR	KILNS		E170	A21			Scheduled_Out		APRQ	
ENY9806	LGA	BARMY		E135	E6	31/20:00		Scheduled_Out		APRQ	
AAL2068	LGA	BARMY		A321	C13	31/20:17	31/20:34	Taxiing_AMA		APRQ	
JIA5672	IAD	KILNS		CRJ9	E26	31/20:54		Scheduled_Out		APRQ	
DAL1095	ATL	BOBZY		B712	A4	31/21:00		Scheduled_Out	31/21:15	APRQ:...	
JIA5354	ATL	BOBZY		CRJ9	E38C	31/21:02		Scheduled_Out		APRQ	
AAL1722	LGA	BARMY		B738	B4	31/21:20		Scheduled_Out		APRQ	
AAL1891	EWR	KILNS		A321	C10	31/21:24		Scheduled_Out		APRQ	

Last updated: 20:40:11 GMT

JIA5273 LIT ESTRR E16
 AAL1756 AUS ESTRR B1
 AAL1988 SAT ESTRR B8
 AAL662 LAX ESTRR B5
 JIA5354 ATL BOBZY E38C APREQ
 DAL1095 ATL BOBZY A4 APREQ
 RPA4461 CMH WEAZL C3
 JIA5277 SDF JOJJO E16A

25 — AAL863
 — JIA5633
 20 — DAL2994
 — JIA5016
 — JIA5214
 — AAL2553
 15 — VTE3403
 — ENY3862
 — DAL2133
 10

Preschedule Time Returned



Operational STBO Arr/Dep = Departure; Destination has APREQ = Yes; Has AOFF = No; Ga

Search Clear

Flight ID	Dest	Dep Fix	Swap	AC Type	Gate	EOBT ▲	AOBT	Flight Status	APREQ Requ...	APREQ	EDCT
RPA3402	EWR	KILNS		E170	A21			Scheduled_Out		APRQ	
FFT1028	PHL	KILNS		A320	A28			Scheduled_Out		APRQ	
ENY9806	LGA	BARMY		E135	E6	31/20:00	31/20:40	Out		APRQ	
AAL2068	LGA	BARMY		A321	C13	31/20:17	31/20:34	In_Queue		APRQ	
JIA5672	IAD	KILNS		CRJ9	E26	31/20:54		Scheduled_Out		APRQ	
JIA5354	ATL	BOBZY		CRJ9	E38C	31/20:56		Scheduled_Out		2130	
DAL1095	ATL	BOBZY		B712	A4	31/21:00		Scheduled_Out		2116	
AAL1722	LGA	BARMY		B738	B4	31/21:20		Scheduled_Out		APRQ	
AAL1891	EWR	KILNS		A321	C10	31/21:24		Scheduled_Out		APRQ	
AAL1594	JFK	BARMY		B738	B14	31/21:26		Scheduled_Out		APRQ	

Last updated: 20:43:42 GMT

JIA5273 LIT ESTRR E16

RPA4461 CMH WEAZL C3

DAL1095 ATL BOBZY A4 A:2116

JIA5277 SDF JOJJO E16A

JIA5407 CVG JOJJO E14A

DAL2994

VTE3403

JIA5016 E

JIA5214 E

AAL2553

ENY3862

DAL2133

JIA5253 E

AAL884

Showing Early but red space



Operational STBO Arr/Dep = Departure; Destination has APREQ = Yes; Has AOFF = No; Ga

Search Clear

Flight ID	Dest	Dep Fix	Swap	AC Type	Gate	EOBT ▲	AOBT	Flight Status	APREQ Requ...	APREQ	ED
RPA3402	EWR	KILNS		E170	A21			Scheduled_Out		APRQ	
FFT1028	PHL	KILNS		A320	A28			Scheduled_Out		APRQ	
ENY9806	LGA	BARMY		E135	E6	31/20:00	31/20:40	Taxiing_AMA		APRQ	
AAL2068	LGA	BARMY		A321	C13	31/20:17	31/20:34	In_Queue		APRQ	
JJA5672	IAD	KILNS		CRJ9	E26	31/20:54		Scheduled_Out		APRQ	
JJA5354	ATL	BOBZY		CRJ9	E38C	31/20:56		Scheduled_Out		2130	
DAL1095	ATL	BOBZY		B712	A4	31/21:00		Scheduled_Out		2116	
AAL1722	LGA	BARMY		B738	B4	31/21:20		Scheduled_Out		APRQ	
AAL1891	EWR	KILNS		A321	C10	31/21:24		Scheduled_Out		APRQ	
AAL1594	JFK	BARMY		B738	B14	31/21:26		Scheduled_Out		APRQ	
AAL1876	PHI	KILNS		A332	D9	31/21:29		Scheduled_Out		APRQ	

Last updated: 20:44:11 GMT

Less green space available

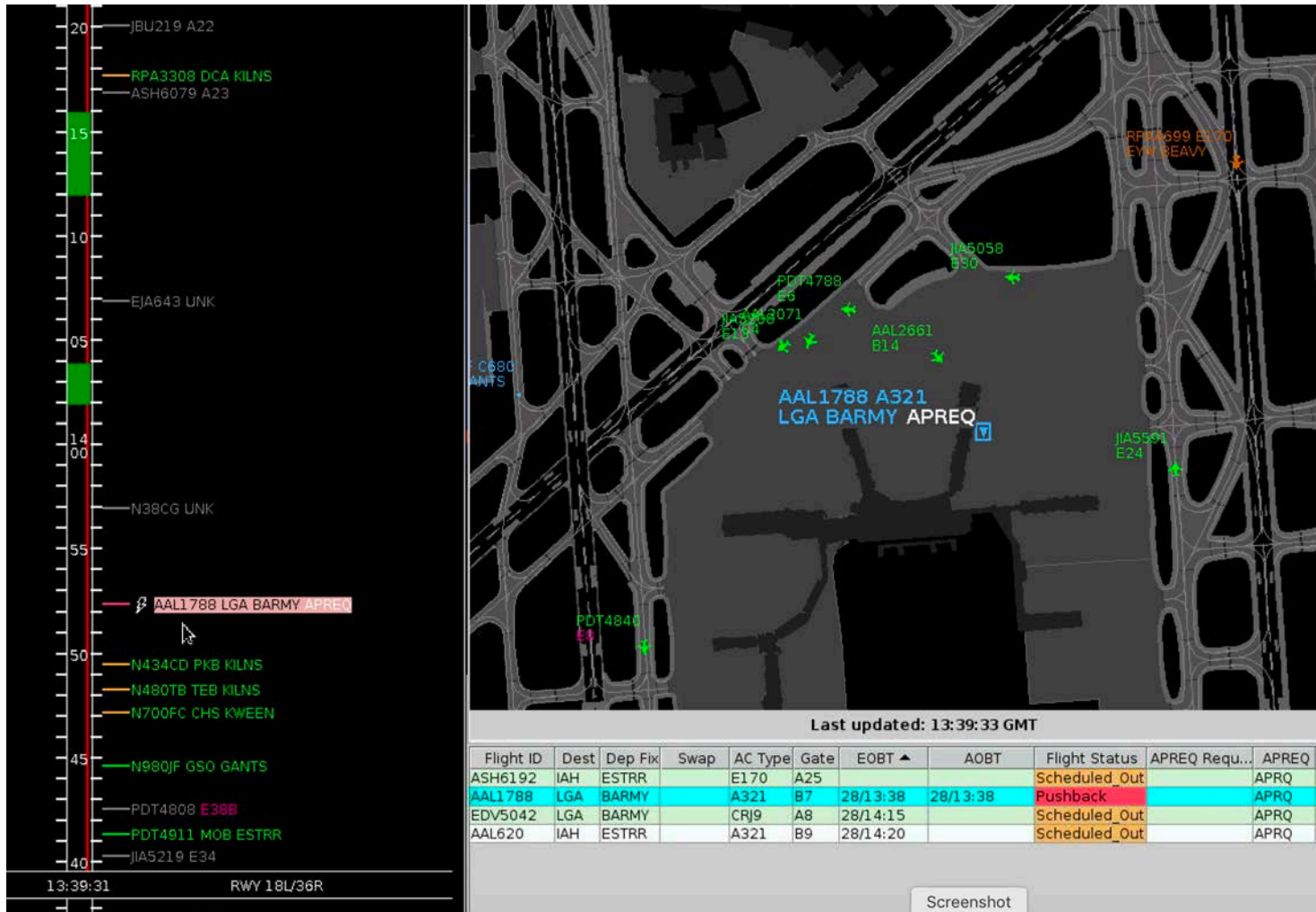


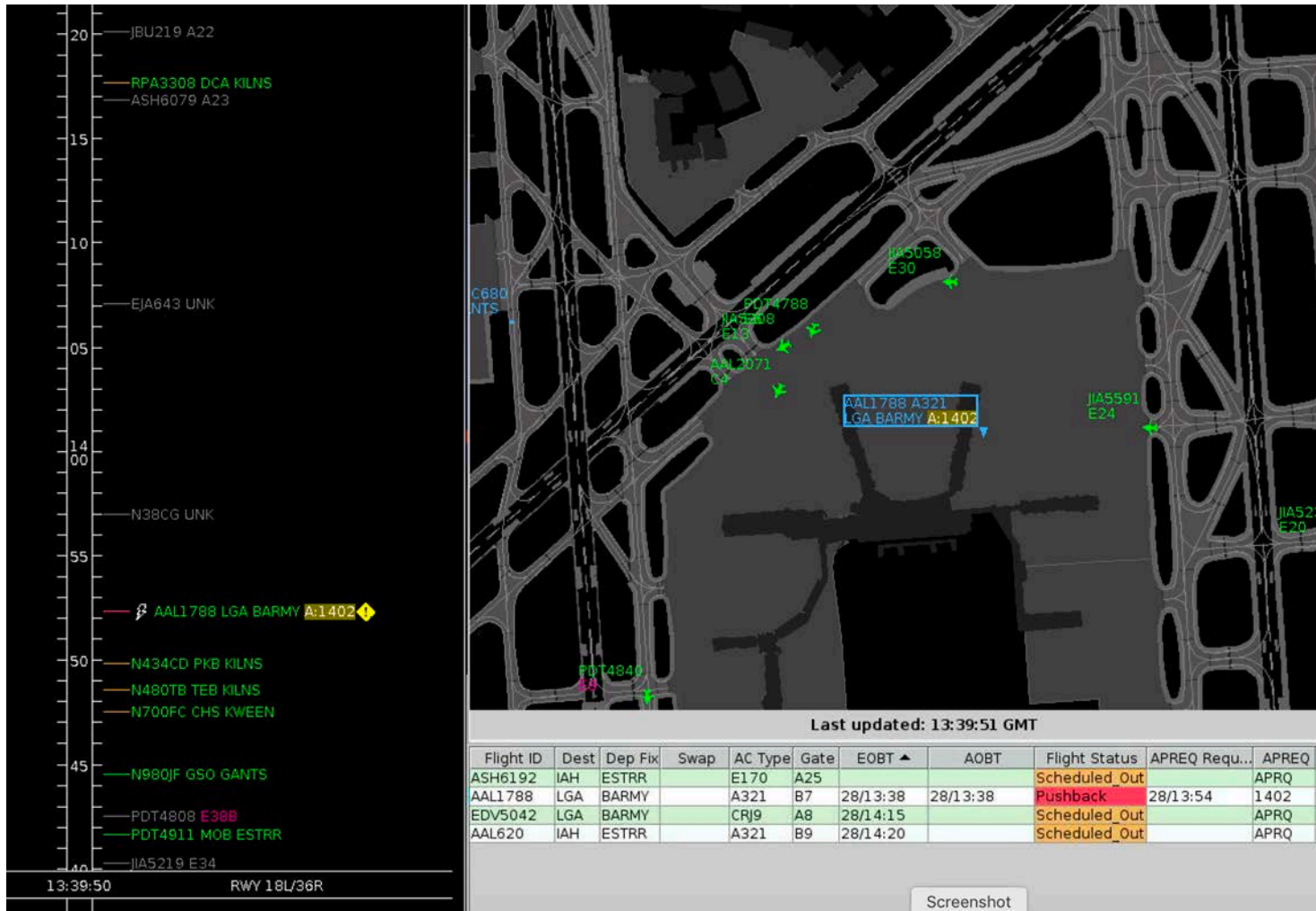


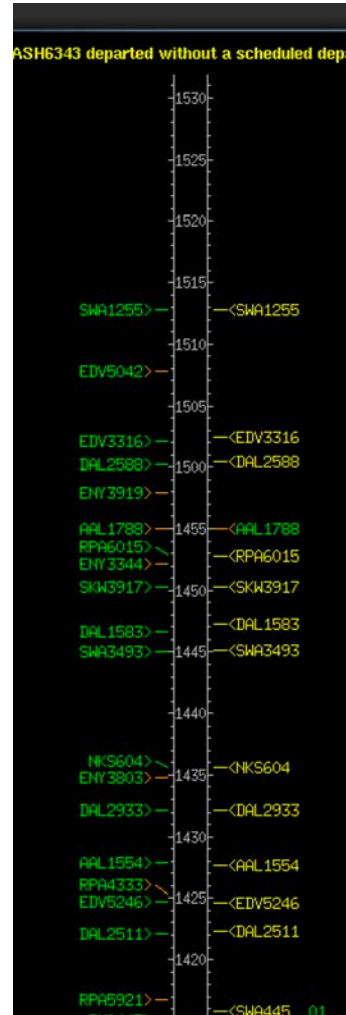


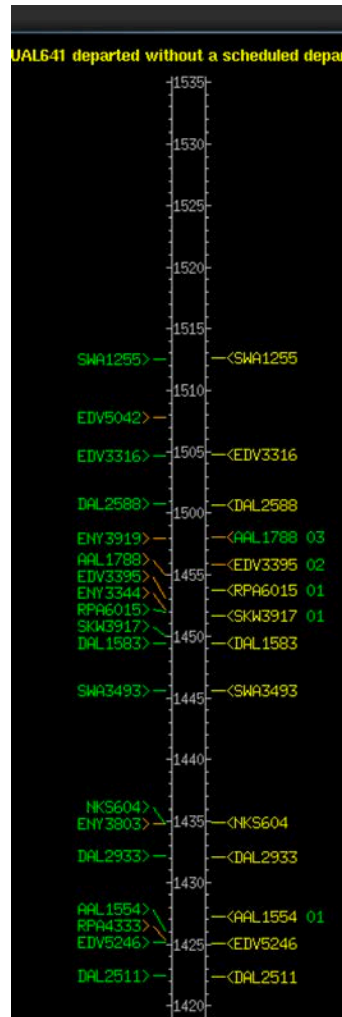
- If everyone is prescheduled does it become ineffective?
- “End of the line” prescheduling
 - CLT is the furthest airport away scheduling to the northeast
 - Goldilocks Principle
- Inaccurate EOBT’s can “waste” slots in the overhead stream
 - This can be a problem for a normal APREQ but will be magnified in prescheduling
 - Encourage ALL to file accurate EOBT’s

AA1788 red/green space

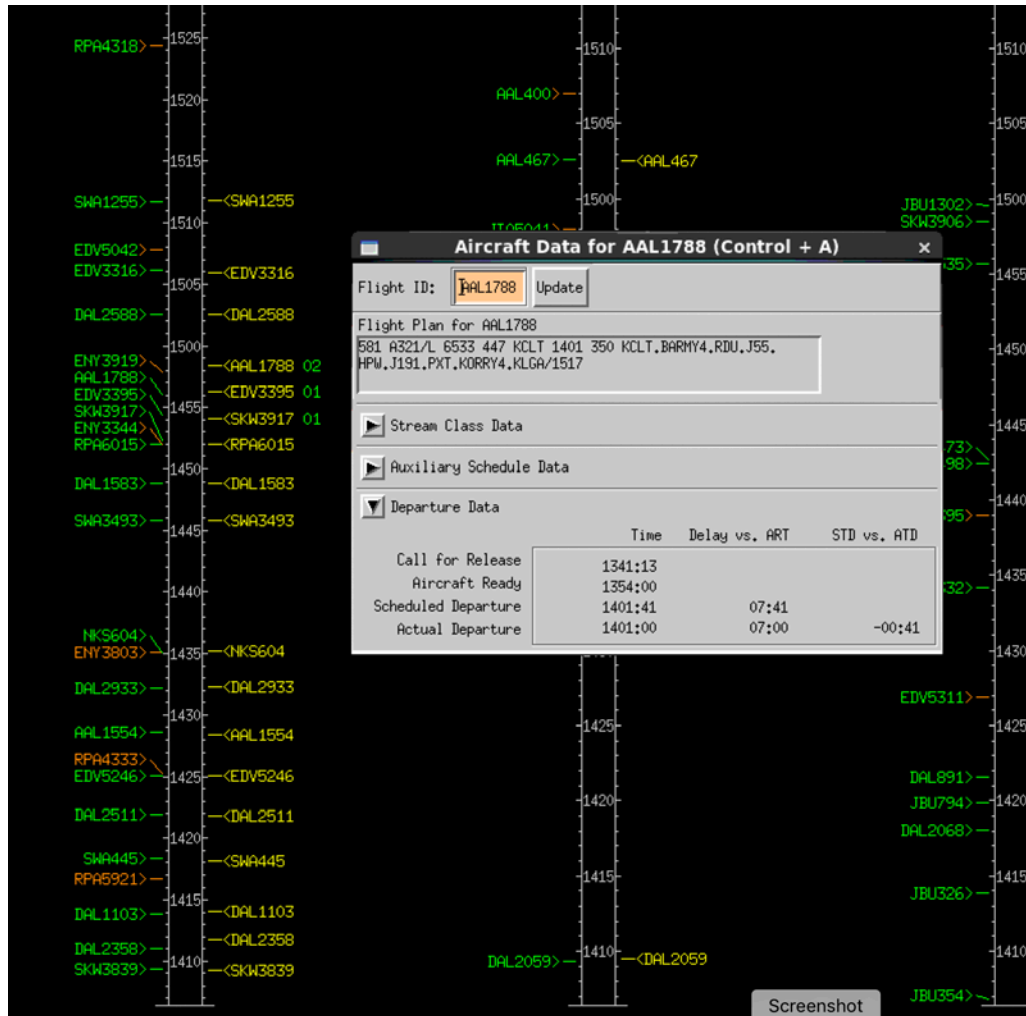




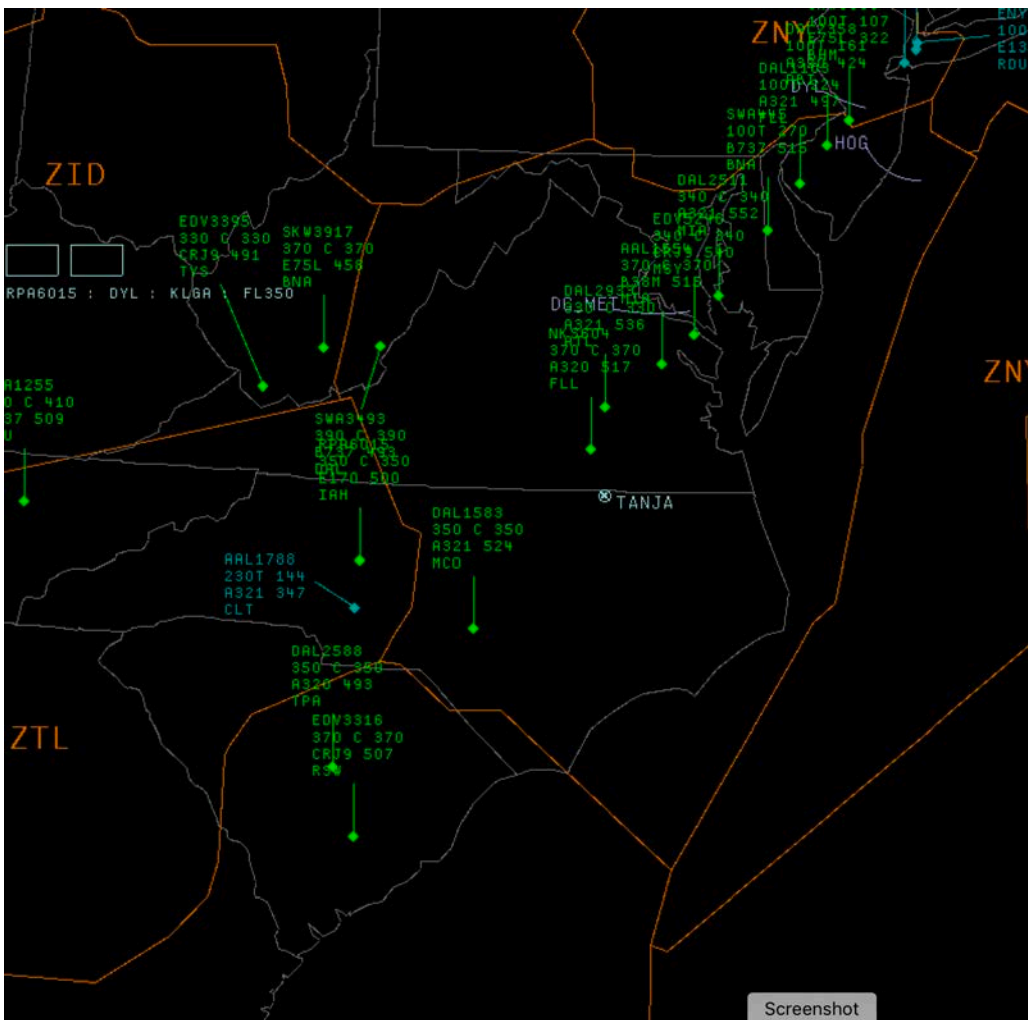
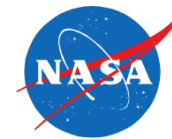




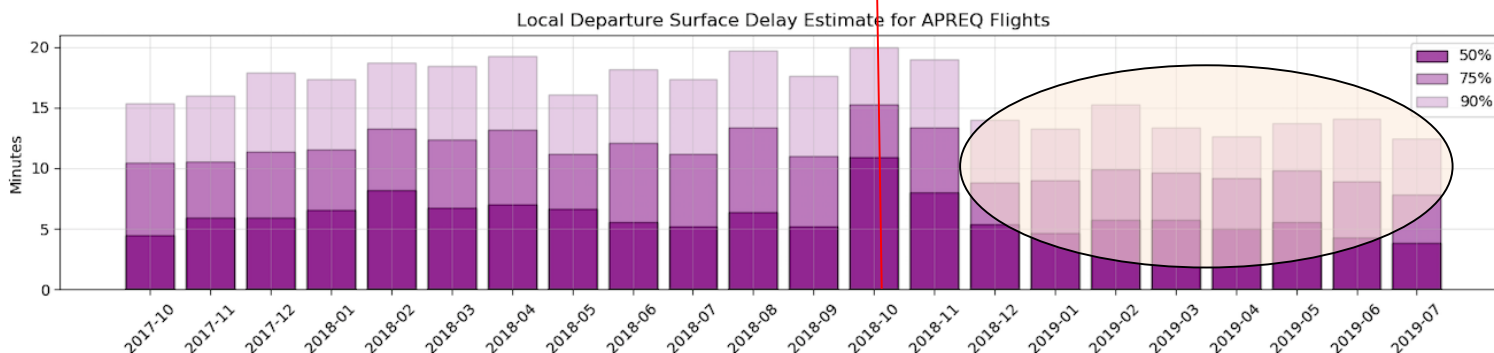
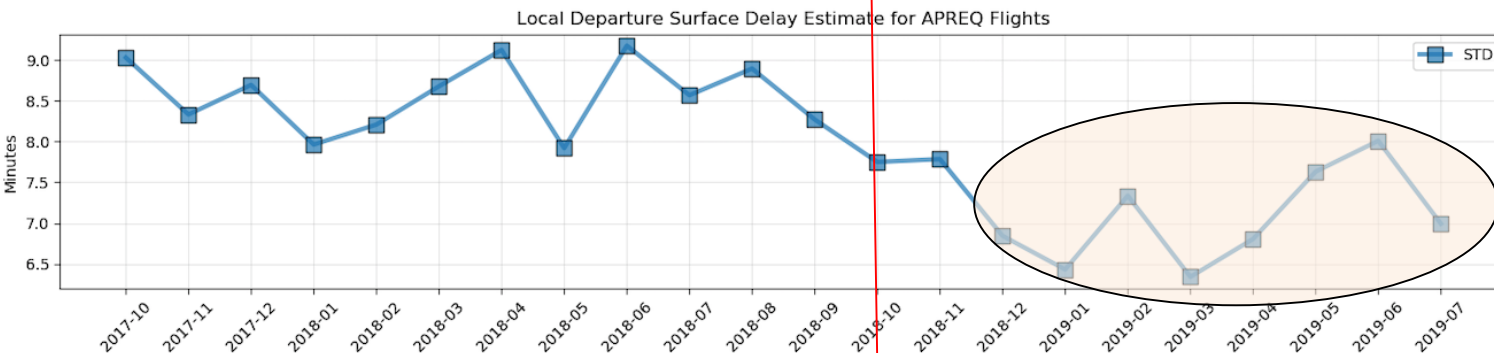
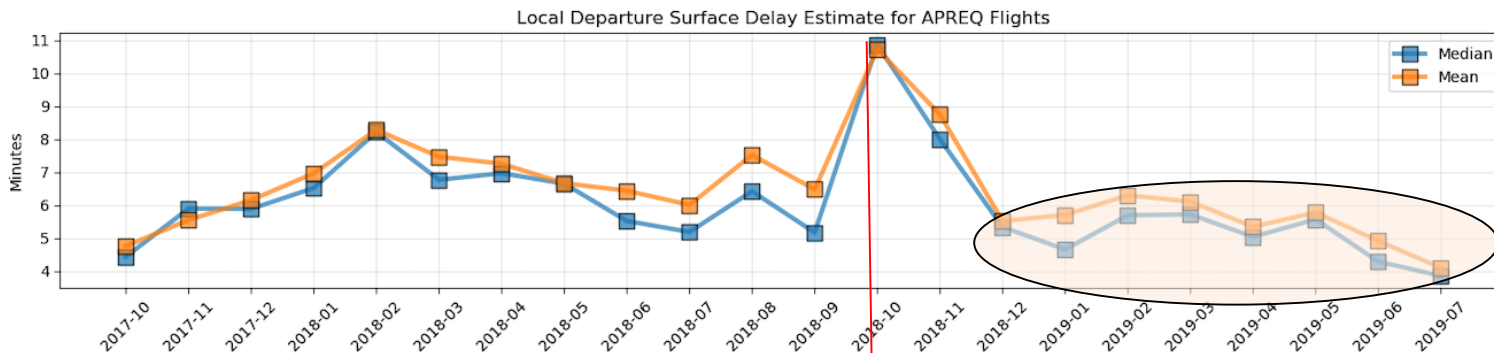
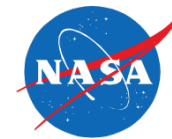
AA1788 Departs on Time



AAL1788 on Center PGUI



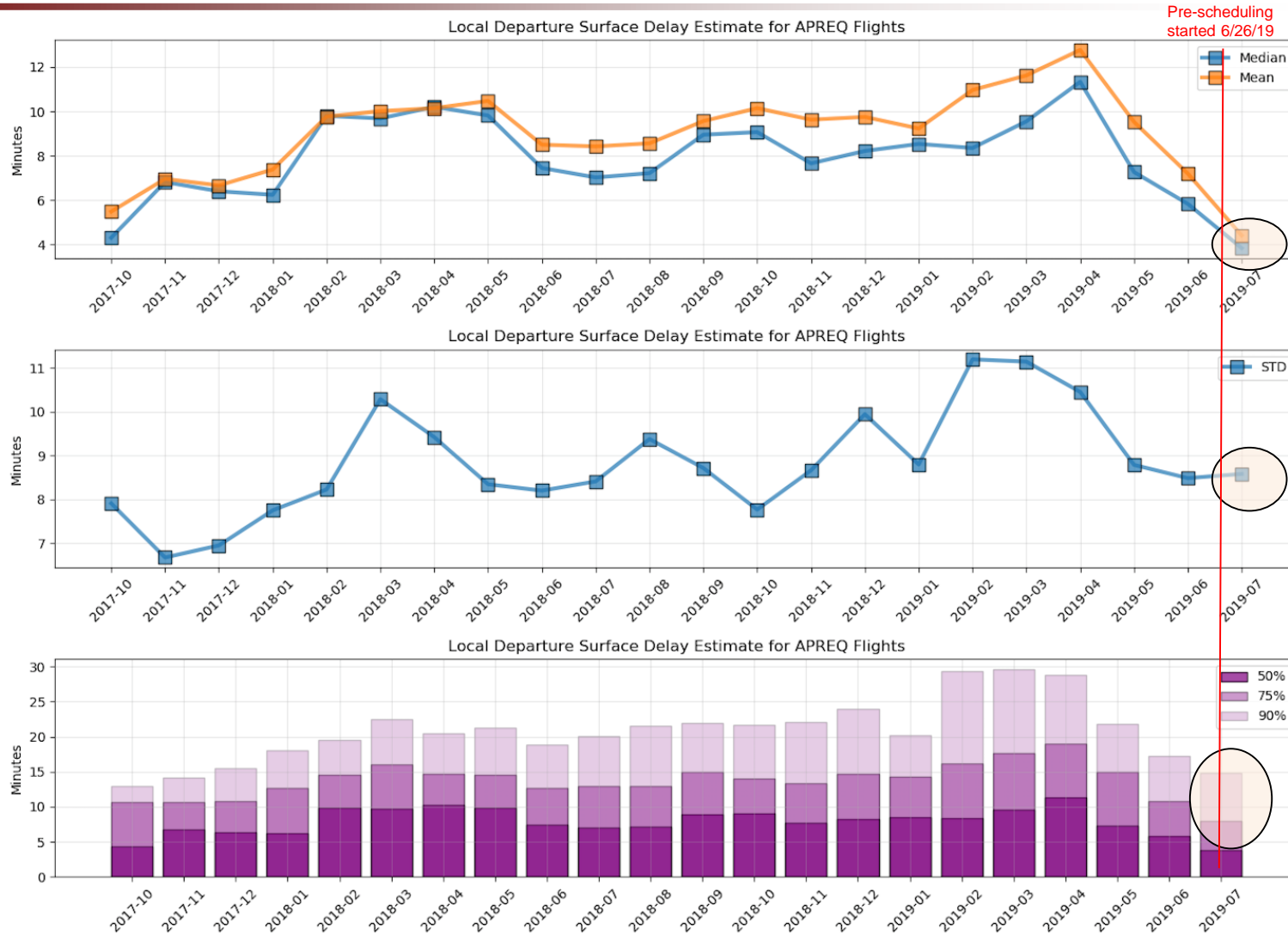
APREQ Delay For Flights into KATL



Pre-scheduling started Oct 2018

Continuing the trend in improvements for predictability of delay over last 7.5 months. (July 2019 only includes data up to the 15th).

APREQ Delay For Flights into KORD



Pre-scheduling started 6/26/19

Improvement over the last 2.5 months in delay estimate.



- Backup



3.2.2.2.4 Release Times

3.2.2.2.4.1 The TFDM System **must** [SSD918] enable one of the following modes per Call for Release (CFR) program of requesting release times for flights subject to a call for release based on user input:

- a. Automatic Mode
- b. Manual Mode

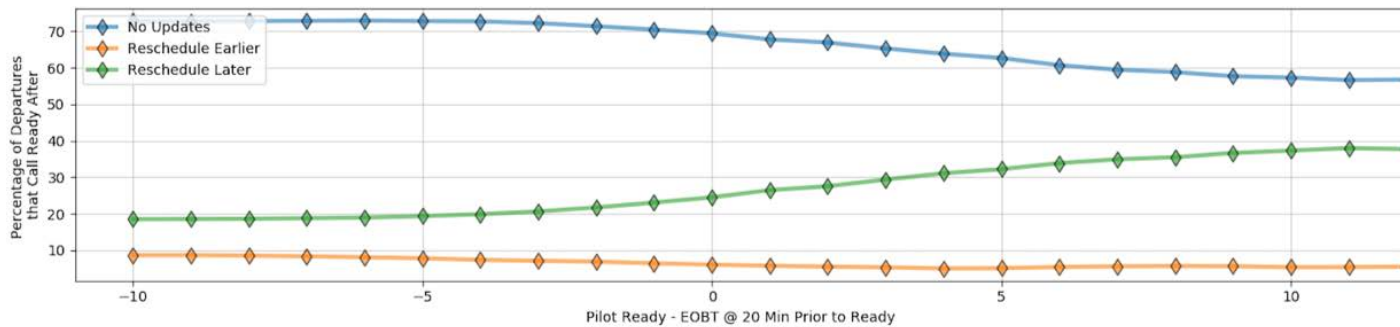
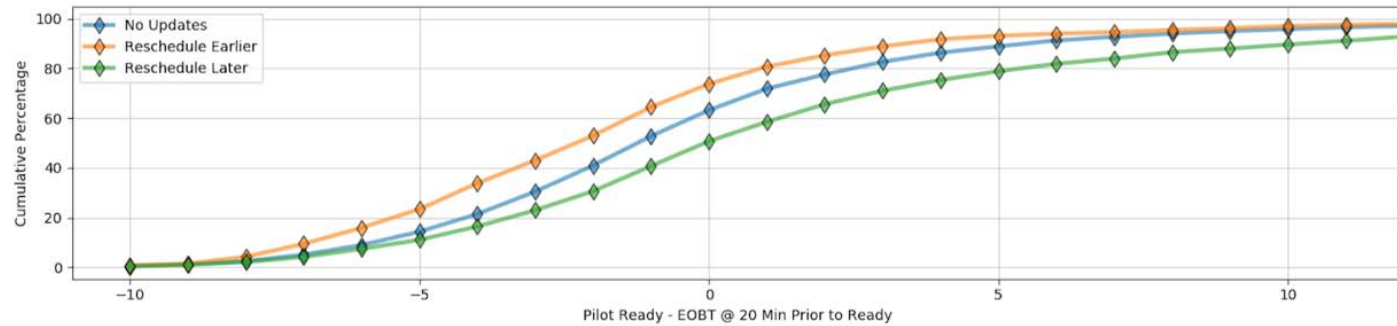
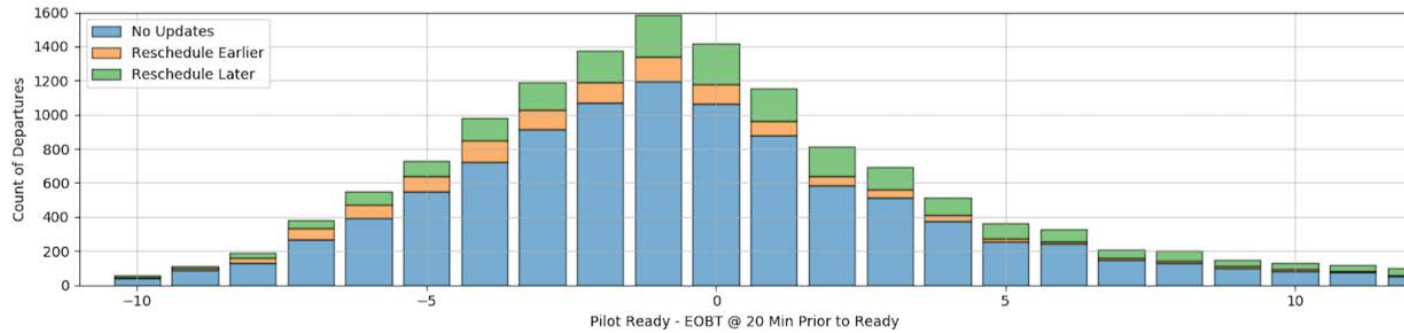
3.2.2.2.4.2 When in Automatic mode, the TFDM System **must** [SSD921] send a release time request:

- a. For a flight that is within an a **user-entered lead time** of a user-entered departure parameter as defined in adaptation or,
- b. Based on EFS Movement as defined in adaptation or,
- c. For an adapted change in flight state

3.2.2.2.4.3 For a Configuration A ATCT TFDM site, when in Automatic mode, the TFDM System **must** [SSD10497] calculate the release time request to be the:

- a. **Earliest Feasible Take Off Time (EFTT) plus the CTD buffer**, if the flight is not subject to a TMI
- b. **The latter of the Expect Departure Clearance Time (EDCT) and EFTT**, if the flight is subject to a TMI and has an EDCT

Above are a some of the pre-scheduling requirements from the TFDM SSD. ATD-2 seeks to evaluate and mature these requirements at CLT.



Prescheduling Impact to APREQ reschedule

