



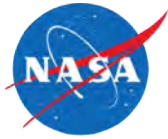
Evolution of Electronic Approval Request Procedures at Charlotte Douglas International Airport

DASC

26 September 2018

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Outline



- Background
- Operations
- Data Collection
- Results
- Summary



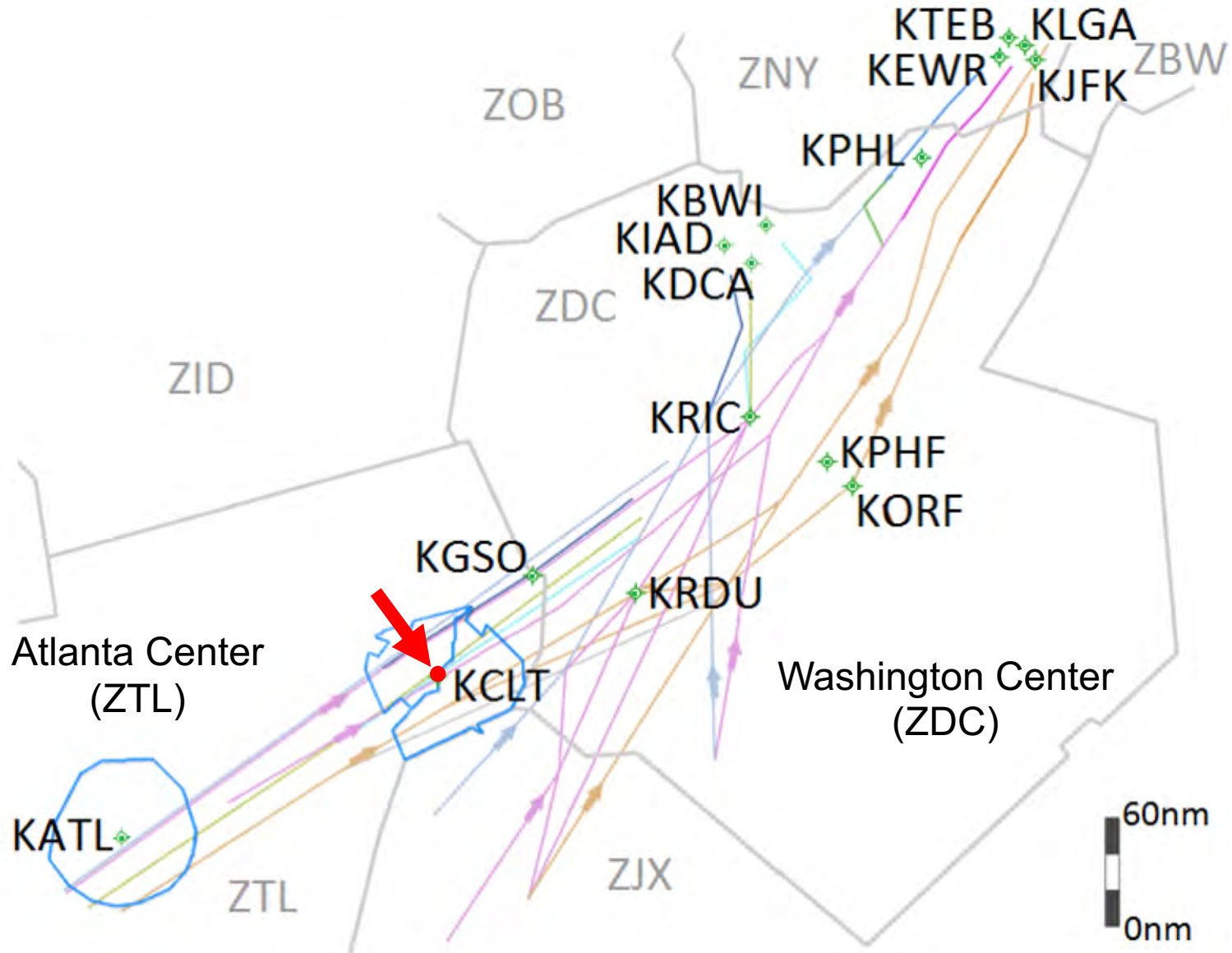
Background

Background



- Air traffic capacity and demand imbalances result in congestion and delays
- Traffic Management Initiatives (TMIs)
 - Used to address capacity/demand imbalances
 - Result in flow control times or controlled take-off times
 - E.g., Approval Request (APREQ) / Call for Release (CFR)

Charlotte Douglas International Airport (CLT) and Surrounding Airspace



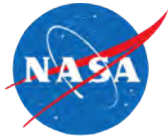
Goal of Project



Airspace Technology Demonstration 2 (ATD-2) project

- Providing performance on-par or better than current-day tools and procedures
- Augment operations through improved data integration and sharing

APREQ/CFR Users



TOWER



TERMINAL



PILOTS



RAMP



CENTER

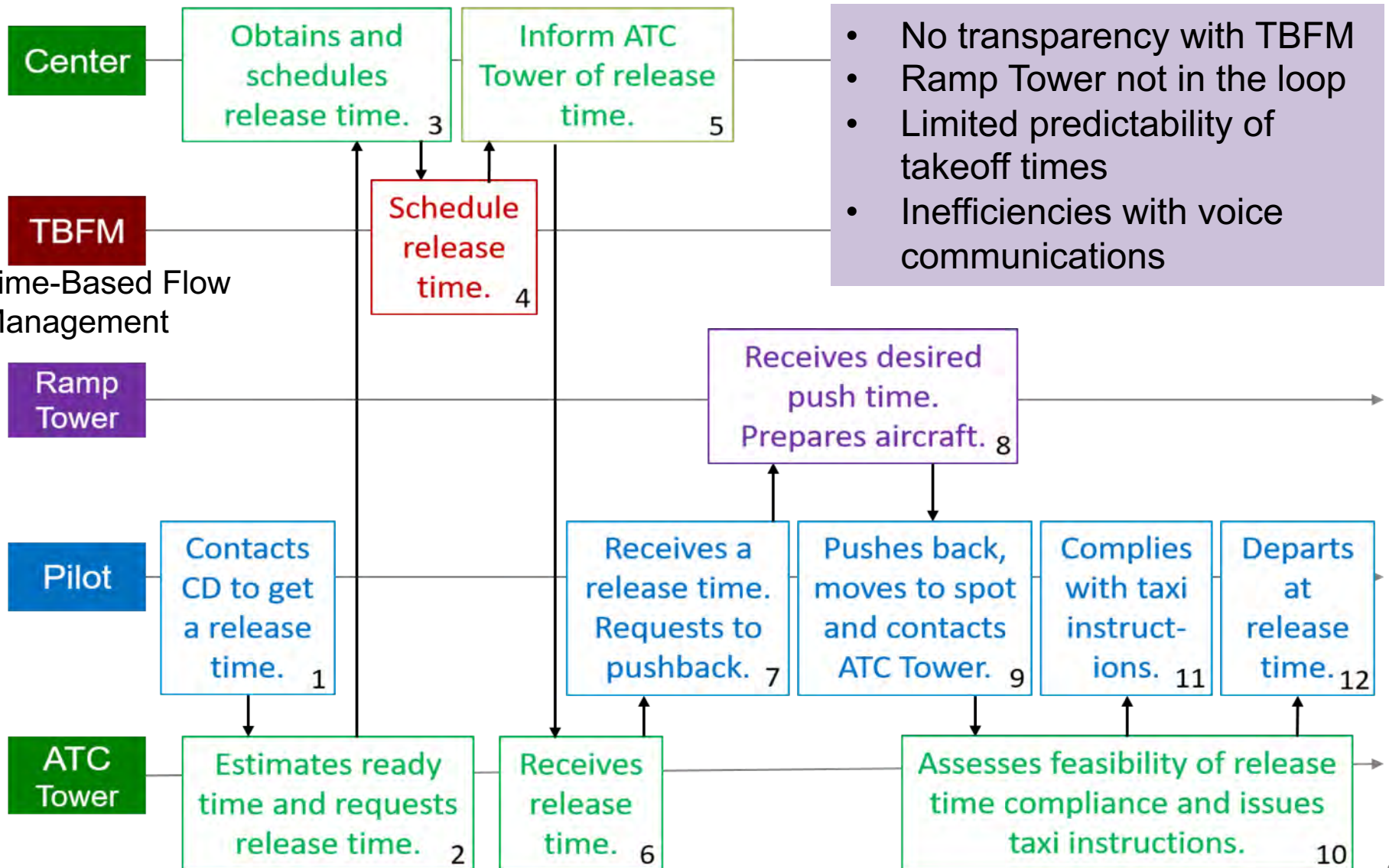


Operations

“Current-Day” APREQ/CFR Procedures

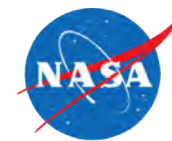


Call for Release Scheduling Procedures

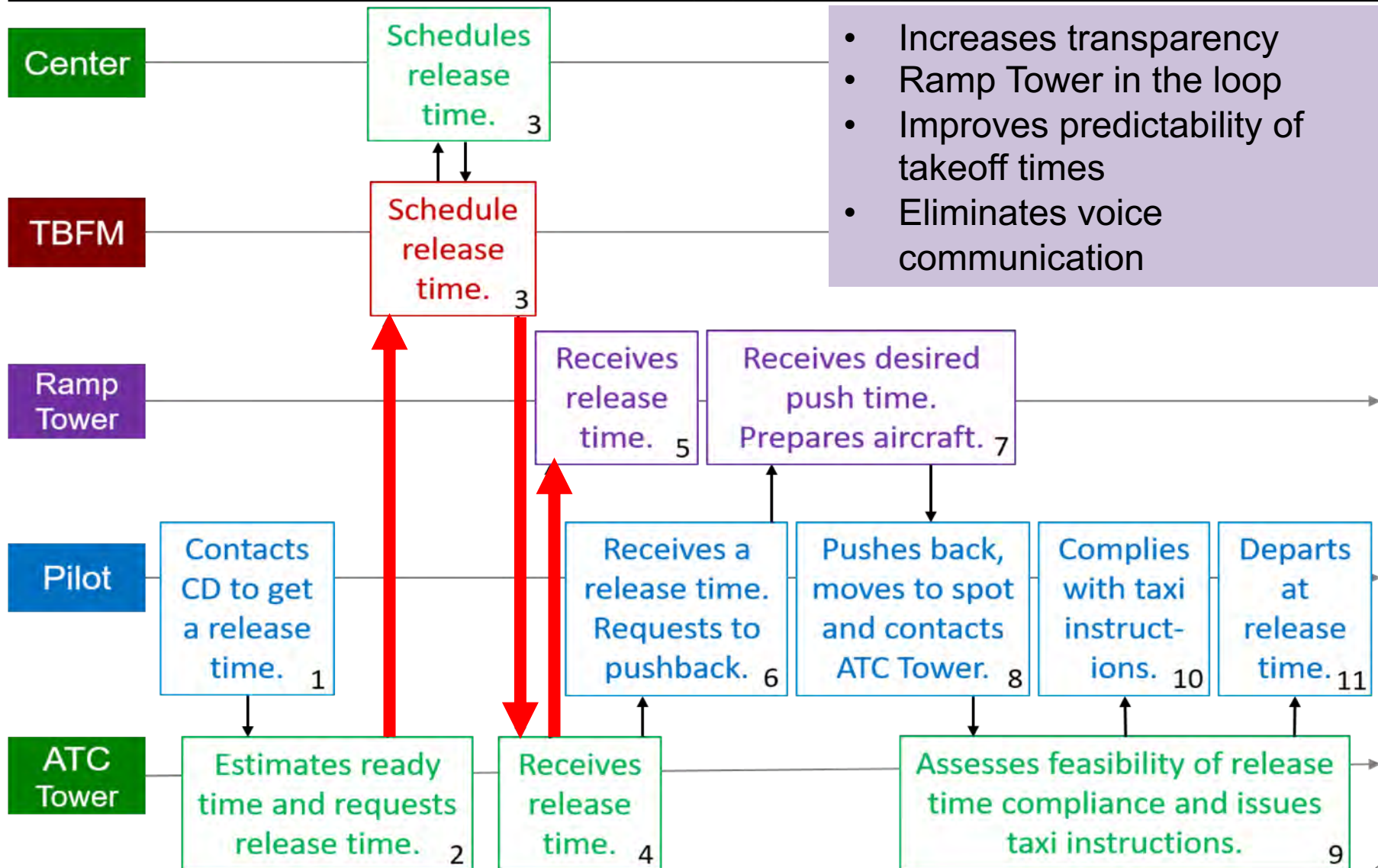


- No transparency with TBFM
- Ramp Tower not in the loop
- Limited predictability of takeoff times
- Inefficiencies with voice communications

APREQ Semi-Automatic Electronic Coordination



Semi-Automatic Electronic APREQ Scheduling Procedures



- Increases transparency
- Ramp Tower in the loop
- Improves predictability of takeoff times
- Eliminates voice communication

Surface Trajectory Based Operations (STBO) Client – ATC Tower



The screenshot displays the STBO Client interface with several key components highlighted in yellow boxes:

- Toolbar:** Located at the top left, it includes buttons for 'TM Actions', 'Create', and 'NEW', along with a search bar and a dropdown menu showing 'RAMAY 15 MIT'.
- Map:** The central area shows a 3D map of the airport terminal and runways. A yellow box labeled 'Map' is overlaid on the terminal building.
- Timeline (Left):** A vertical timeline for Runway 18L/36R, showing flight arrivals and departures with their respective aircraft IDs and times. A yellow box labeled 'Timeline' is overlaid on this section.
- Timeline (Right):** A vertical timeline for Runway 18C/36C and 18R/36L, showing flight arrivals and departures. A yellow box labeled 'Timeline' is overlaid on this section.
- Flights Table:** A table at the bottom center displaying flight details. A yellow box labeled 'Flights Table' is overlaid on the table.

Flight ID	Dest	AC Type	Mtrd On Tl	Elms Eta	RwyOpNec	Rwy Time	Status	Ramp A	Gate	Spot
JAS265	CLT	CRJ9	21/18:28	21/18:31		21/18:28	In	E SOUTH	E15	S9W
JAS372	RIC	CLT							S20	S24
JAS376	CLT								17	S27E
JAS379	CLE								25	S24
JAS386	BWI								26	S24
JAS386	CLT								5A	S27E
JAS387	BWI								B	S27E
JAS388	CLT								17	S27E
JAS388	BDL	CRJ9	21/18:04	21/18:04		21/18:04	Out	E NORTH	E22	S24
JAS400	CLT	CRJ7					Scheduled_In	E SOUTH	E3	S27E
JAS401	CLT	CRJ7		21/21:51			Scheduled_In	E SOUTH	E17	S27E
JAS403	CLT	CRJ9		21/23:55			Scheduled_In	E SOUTH	E17	S9W
JAS403	CHA	CRJ9		21/22:22		E2 1/21:34	Scheduled_Out	E SOUTH	E15	S24
JAS408	IND	CRJ9		21/21:03		E2 1/19:48	Scheduled_Out	E EAST	E18	S24

Elements of User Interface Timeline



Verbal
Coordination
Required

Has APREQ/CFR
restriction – needs
release time

Unavailable
slot in
overhead
stream



Available
slot in
overhead
stream

Electronic
Coordination
Available

Selected
flight
datablock

Menu Options:

- *Request Release Time*
 - automation chooses a release time to request
- *Select Slot on Timeline*
 - user chooses a release time to request

Compliance Indicators



- Inside of compliance window (on time)



- Outside of compliance window and early



- Outside of compliance window and late





Data Collection

Data Collection

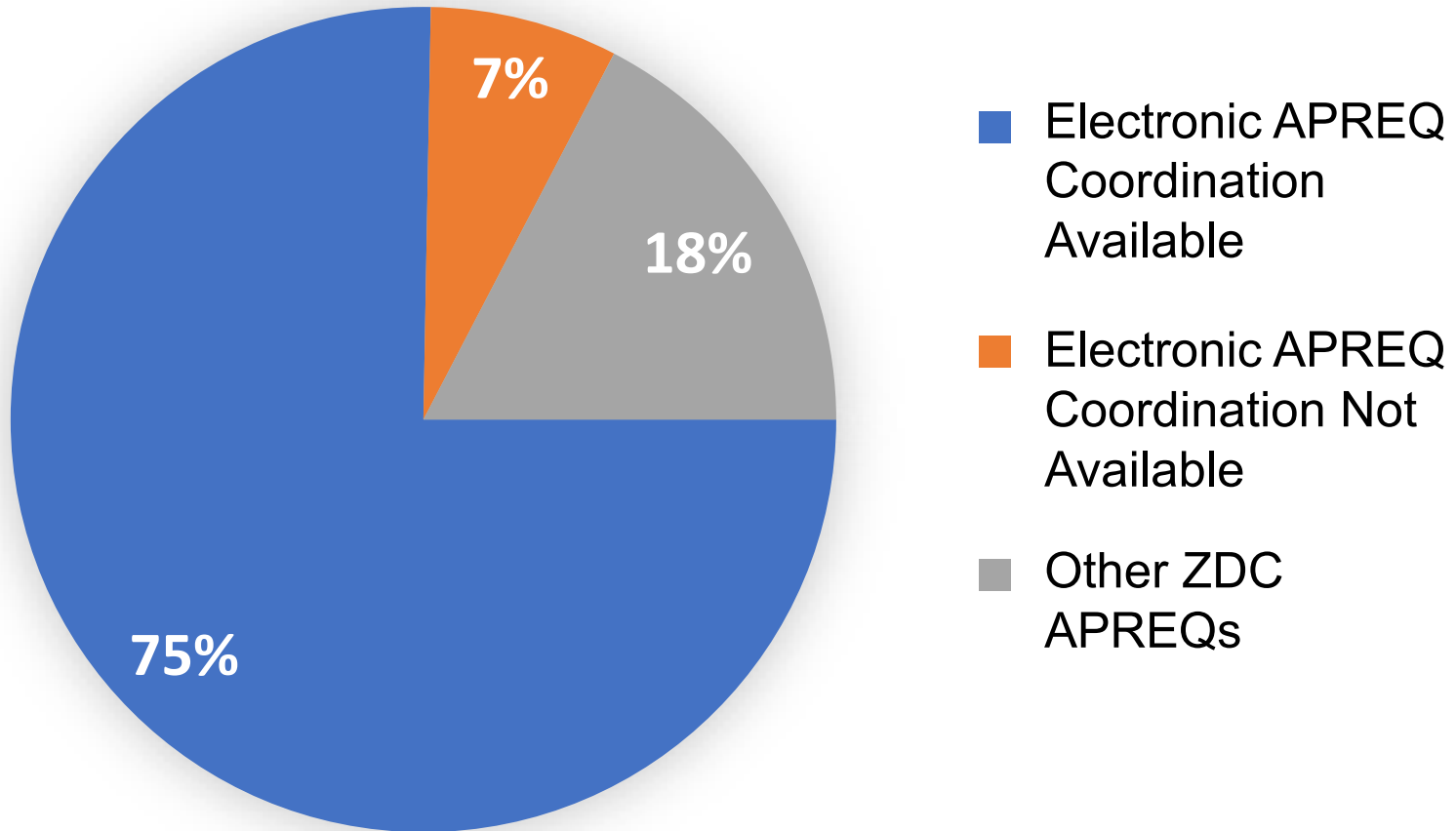


- September 2017: ATD-2 system deployed to CLT
- 2 November 2017: Semi-automatic electronic APREQ coordination began
- 23 November 2017 – 2 January 2018: 41-day data collection period
- 27,479 CLT departures with:
 - 2,561 (9.3%) subject to APREQ restrictions

Eligibility for Electronic APREQ Coordination with Washington Center (ZDC)



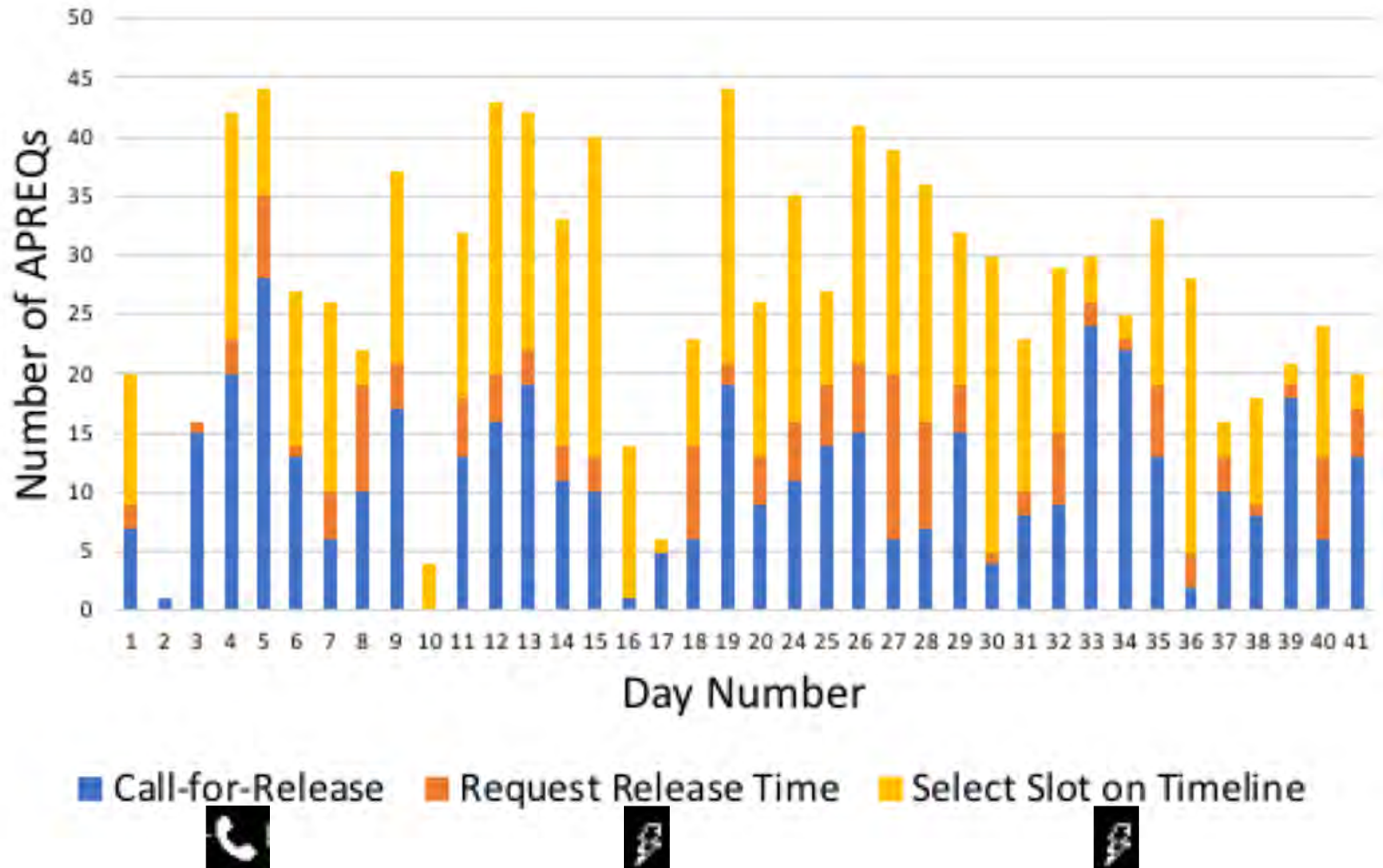
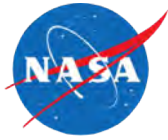
1,400 total APREQ flights coordinated with ZDC





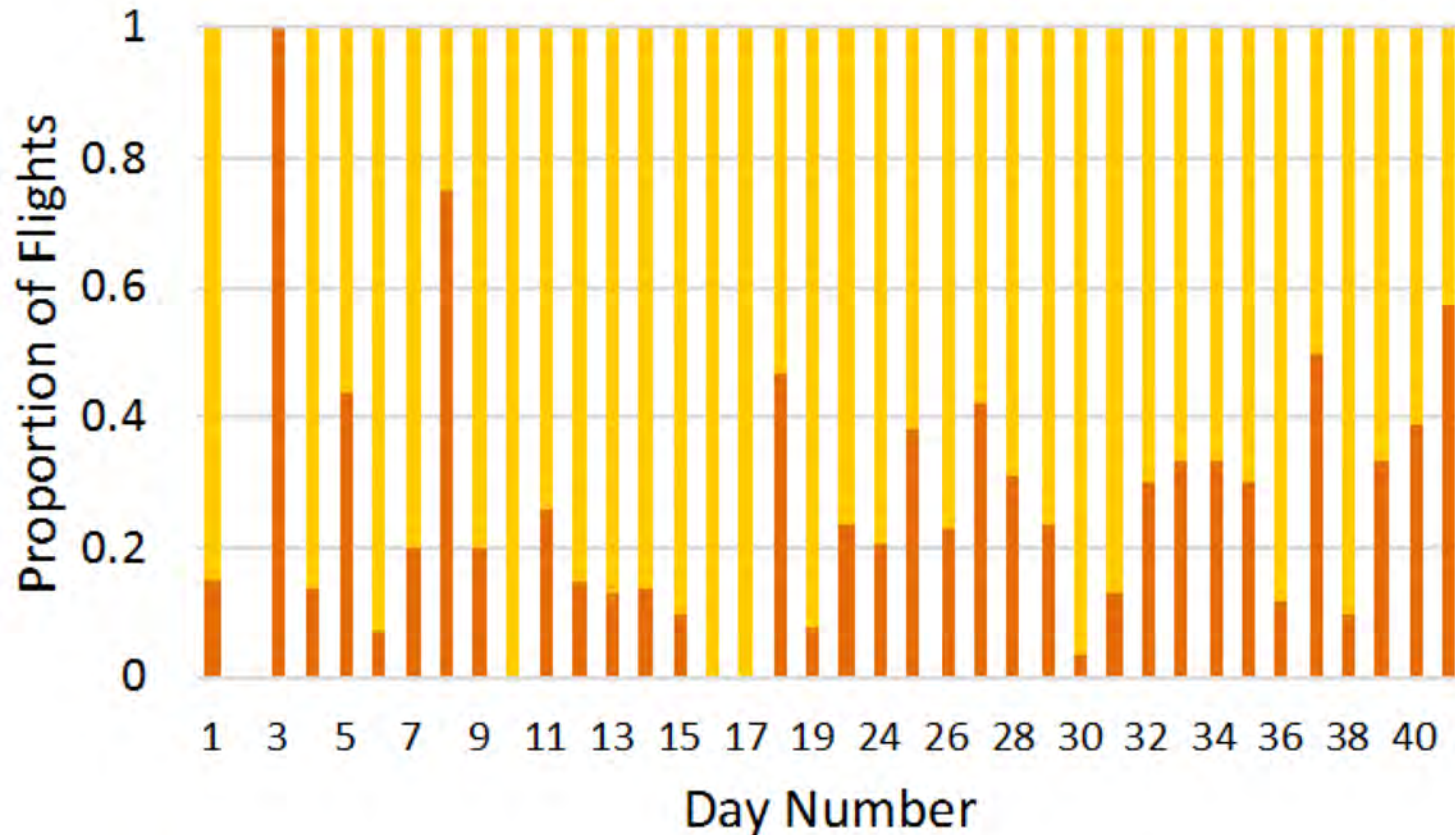
Results

CLT Usage of Electronic APREQ Coordination for Electronic Eligible Flights



Overall, 618 (58.9%) of APREQs were coordinated electronically out of 1,049 eligible flights.

Proportion of Use for Different Electronic APREQ Coordination Methods



Request Release Time Select Slot on Timeline

No effect of time passage on proportion of “Request Release Time” usage. Continued to engage with automation.

Rescheduling APREQ Release Times Electronically for Electronically Eligible Flights



Initial Scheduling Method	Rescheduling Method		Total
	Electronic Coordination	Call-for-Release	
Electronic Coordination	37	85	122
Call-for-Release	8	307	315
Total	45	392	437

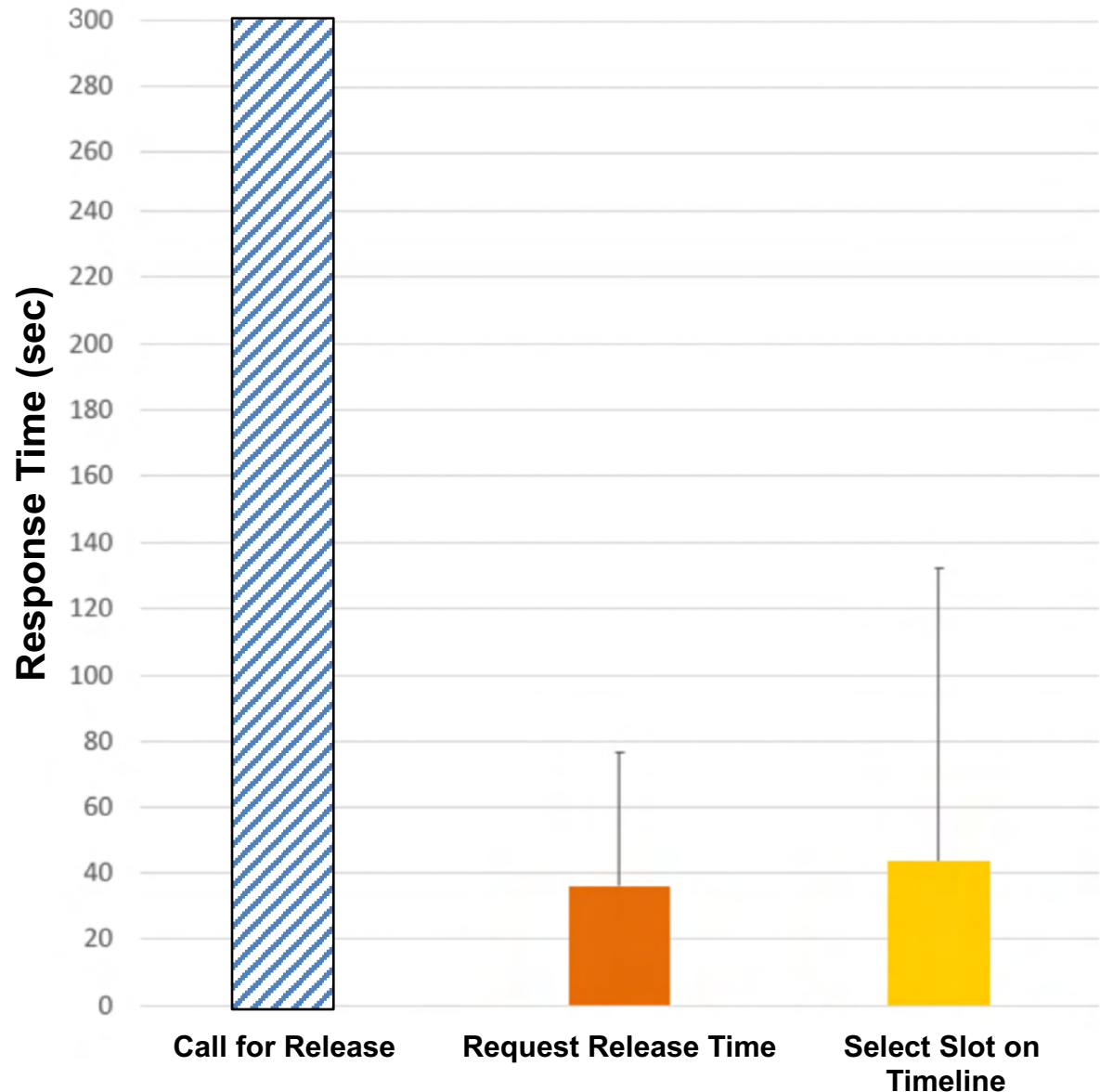
- Users explored the capabilities of the technology and found novel uses that exceeded training.
 - Users were *not* trained that electronic APREQ rescheduling was available.
- Electronic coordination reduces the need for rescheduling release times.

Center Response Times



- No data available for “Call for Release”
- Subject matter expert feedback: CFR could take up to 3-5 min

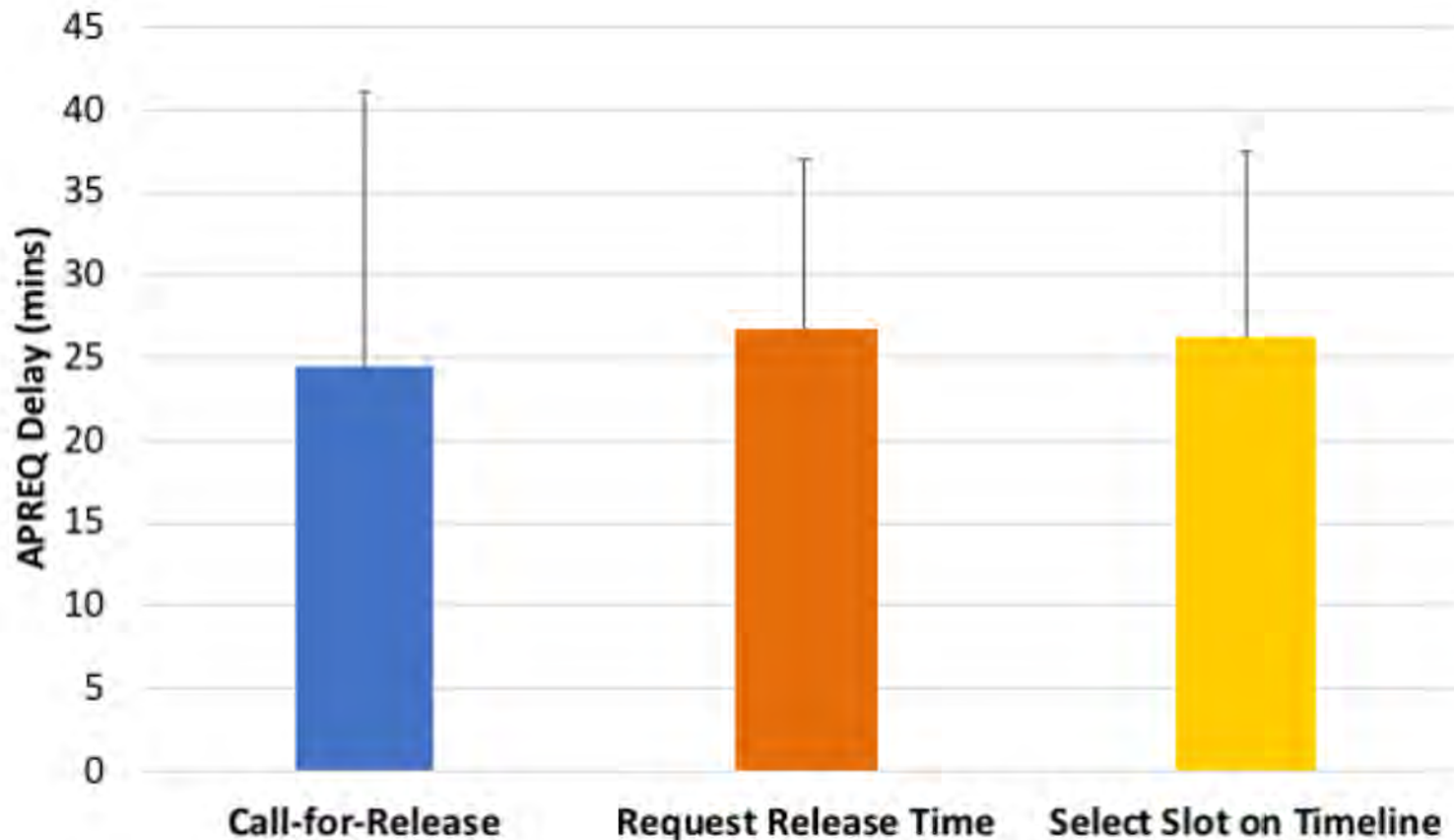
Response times from ZDC using electronic coordination rarely exceeded 1 minute.



APREQ Delay

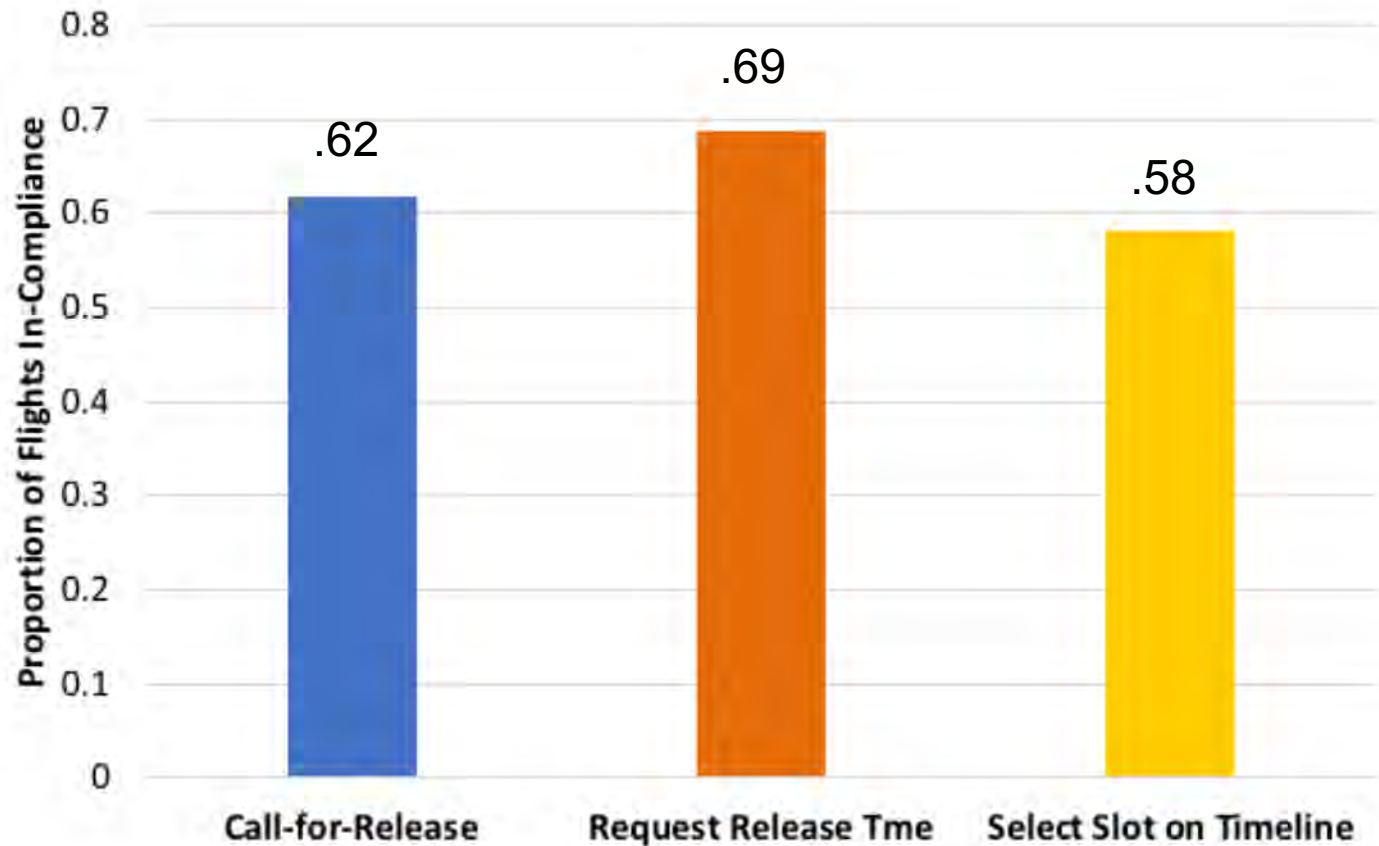


APREQ delay = Final APREQ Time – Expected Departure Time



No difference in delay across APREQ release time scheduling methods.

APREQ Compliance

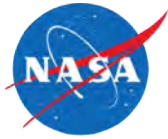


Largest proportion of flights in compliance with APREQ release time were scheduled using automation.



Summary

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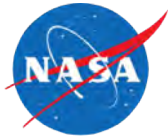
- Performance with ATD-2 electronic APREQ coordination met or exceeded Call-for-Release (“current-day”) procedures
- Users continued to engage with the automation and find innovative ways to interact with the ATD-2 technology
- Experienced ZDC and CLT TMCs stated that response times were greatly reduced
- Electronic coordination reduced the need for rescheduling APREQ release times

Future Direction



New features to support electronic negotiation are continually being released at CLT

- Training for electronic rescheduling
- Swapping APREQ release times for flights with same destinations
- Electronic coordination with Atlanta Center (ZTL)
- Data exchange with ATC Tower electronic flight strips/data
- Fully automatic APREQ release time coordination



Thanks for your attention!

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