

SCT



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Surface CDM Team



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Dan	Torres	FEDEX	Industry SME
Lee	Brown	JBU	Industry SME
Paul	Amen	AAL	Industry SME
David	Uswajesdakul	UAL	Industry SME
Airport SMEs			
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John	Howard	LAS	Airport SME
Henry	Smith	LAS	Airport SME
Paul	Sichko	DFW	Airport SME
Rob	Kelley	FLL	Airport SME
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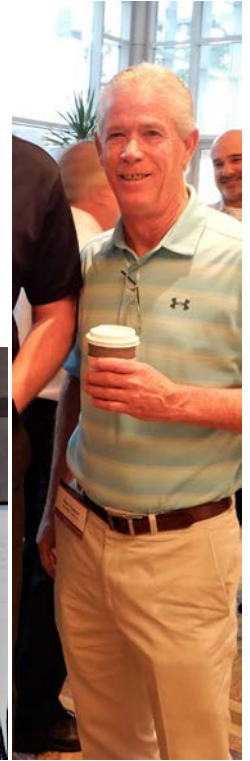
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Sad to see them go!

- Bernie Davis AAL
- Clay Whitesell UAL
- Ron Ooten SWA



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SCT Open Tasks

- Task #75: TFDM - Industry Engagement Throughout TFDM Development and Deployment (slides 6-10)
- Task #82: Collaborative Site Implementation Teams (CSIT) - Assist with TFDM Training to Airport Operators and Developing LOAs (slides 11-15)



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SCT Open Tasks

- Task #92: w/ FET Surface Collaborative Decision Making Departure Metering and NAS Scheduling. This task is a continuation of closed task #69 (slides 17-32)
- Task #100: w/ FET Real-time Coordination, Collaboration and Information Exchange (slide 16)



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Task 75 TFD/Industry Engagement throughout TFD Development and Deployment

This task is primarily fulfilling the NextGen Integration Working Group (NIWG) recommendation establishing on-going Industry engagement with the FAA throughout the development and deployment of the Terminal Flight Data Management (TFD) system. The SCT is expected to provide, as needed, interpretation of the SCDM ConOps as well as the surface management related requirements as defined in the System Specification Document approved in the June 2016 TFD Final Investment Decision during the development and deployment of the TFD system.



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SCT attended the NASA Airspace Technology Demonstration 2 (ATD-2) Industry Workshop, September 4-5 2019 at the Omni Dallas Hotel at Park West, Dallas, TX

Workshop Objectives:

- Transfer to NAS users the lessons learned from the implementation of NASA's ATD-2 project
- Identify emerging needs for tools, services and platforms for the aviation market
- Provide a deeper understanding of the transformational potential of the future surface system
- Enable industry operators to meet upcoming TFDM requirements for their organization while achieving benefits



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Terminal Flight Data Manager (TFDM) is being developed by Leidos under an FAA contract. The system will help tower controllers better manage the flow of aircraft to and from the gate to the runway, eliminating the long conga lines of aircraft waiting to takeoff, and improving the overall efficiency of air traffic during the takeoff and landing phases of flight. TFDM has four core objectives:

- Improved electronic flight data distribution and electronic flight strips in the tower
- Collaborative decision-making on the airport surface
- Traffic flow management integration between TFMS, TBFM, and TFDM
- Systems consolidation



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TFDM is one of the seven NextGen Transformational Programs and one of three Traffic Management Programs in the ATIS's Decision Support Systems.

Link to a video, "Terminal Flight Data Manager, It's About Time"

https://www.faa.gov/air_traffic/technology/tfdm/



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Task #82 Collaborative Site Implementation Teams (CSIT)- Assist With TFDM Training to Airport Operators and Developing LOAs

- Collaborate with CSIT to develop training that effectively educates and communicates a thorough understanding of the TFDM capabilities to be implemented at a local facility. This training would include materials that address anticipated local TFDM surface metering, and templates for local SCDM Letters of Agreement (LOAs).
- Coordinate with CSIT to arrange formal engagement with stakeholders at individual airports in accordance with the CSIT site visit waterfall. Specific stakeholders may include:
 - Flight Operations Center
 - Flight Operators
 - Ramp Control
 - Airport Operator
 - Fixed Base Operators



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Surface CDM Team Members will:

Provide team members to participate in CSIT site visits.

Apply subject matter expertise in the understanding of:

- Local stakeholders and operations at airports
- The role airport operations play in local operations



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CSIT Site Visit Schedule

2020		2021		2022		2023		2024	
Mar	CLT	Jan	IAH	Feb	SEA	Jan	DFW	Apr	DCA
Sep	PHX	Feb	ATL	Mar	MCO	Feb	BOS		
Oct	LAX	Apr	PHL	Apr	EWR	Mar	MSP		
Nov	SFO	Oct	LAS	May	JFK	Apr	IAD		
		Nov	ORD	May	LGA	May	SLC		
		Dec	SAN	Sep	DEN	Sept	FLL		
				Oct	MDW	Oct	DTW		
				Nov	MIA	Nov	BWI		



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CSIT Outreach in 2020

- Pre-COVID in-person briefing for IAD
- Virtual briefings ongoing for both flight operators and TFDM Configuration A sites
CLT, PHX, LAX, SFO, IAH, ATL (Dec 7)
- Virtual briefings for flight operators:
Spirit, Frontier, FedEx
- TFDM User Guide and Data Operational User Guide available by the end of 2020 (will be posted to the CDM website)



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CSIT Plans for 2021

- Continued virtual briefings for flight operators and Configuration A sites
- Site visits to begin as able. Schedule will follow the updated TFDM waterfall
- Tech Talks
 - Bi-monthly forums for non-FAA stakeholders with TFDM to discuss technical challenges with implementation
 - First session will be in January 2021 and focus on substitution (exact schedule TBD). Email CSIT@faa.gov to be added to the invitation



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Task # 100 Real-time Coordination, Collaboration and Information Exchange (as Briefed by FET)

- Identify opportunities for improved coordination, collaboration and information exchange between the flight operators and the FAA traffic flow management system
- Determine the benefit from initial field evaluations using prototyping software such as MITRE's NOD
- The intent of this effort is to inform the development of recommendations regarding the implementation of the studied capabilities and procedures for routine use in FAA and flight operator operations.



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Task # 92 Surface Collaborative Decision Making Departure Metering and NAS Scheduling w/FET

- From CLT, where NASA demonstrated surface capabilities, ATD-2 transitioned its research to the Dallas Metroplex
- “Surface meets TOS and SWAP” or, Integration of scheduling capabilities among TFDM, Traffic Flow Management System (TFMS) and Time Based Flow Management (TBFM) is a key element in improving schedule predictability. Constrained resources within metroplex environments must be accounted for in order to develop improved departure scheduling and planning capabilities and are therefore a focus of ATD-2



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February 2020- FET and SCT Teams convened at the NASA NTX Research Facility for the ATD2 Phase 3 operational joint tasking.

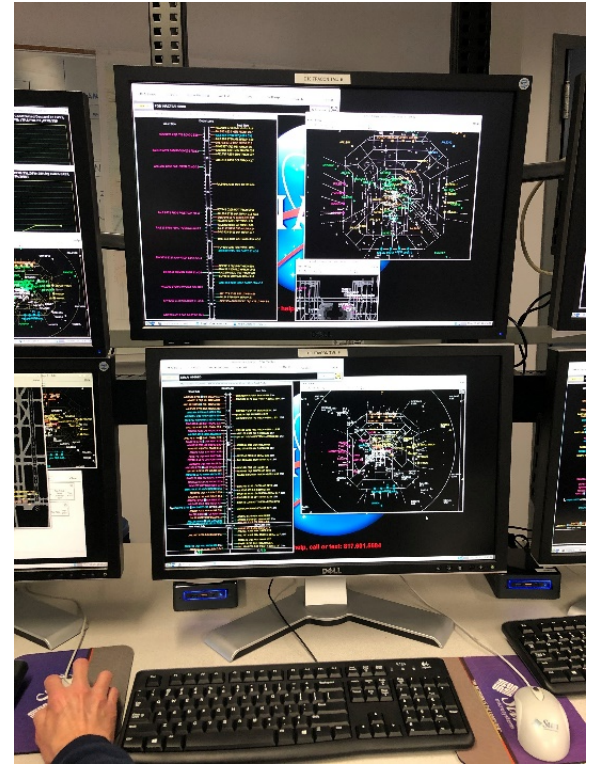
- Presentation focused on delay metrics by metroplex, airport and fleet mix.
- Analyzation of total and average delays in addition to constraint calculations up to 60 minutes ahead of time was utilized. (cont.)

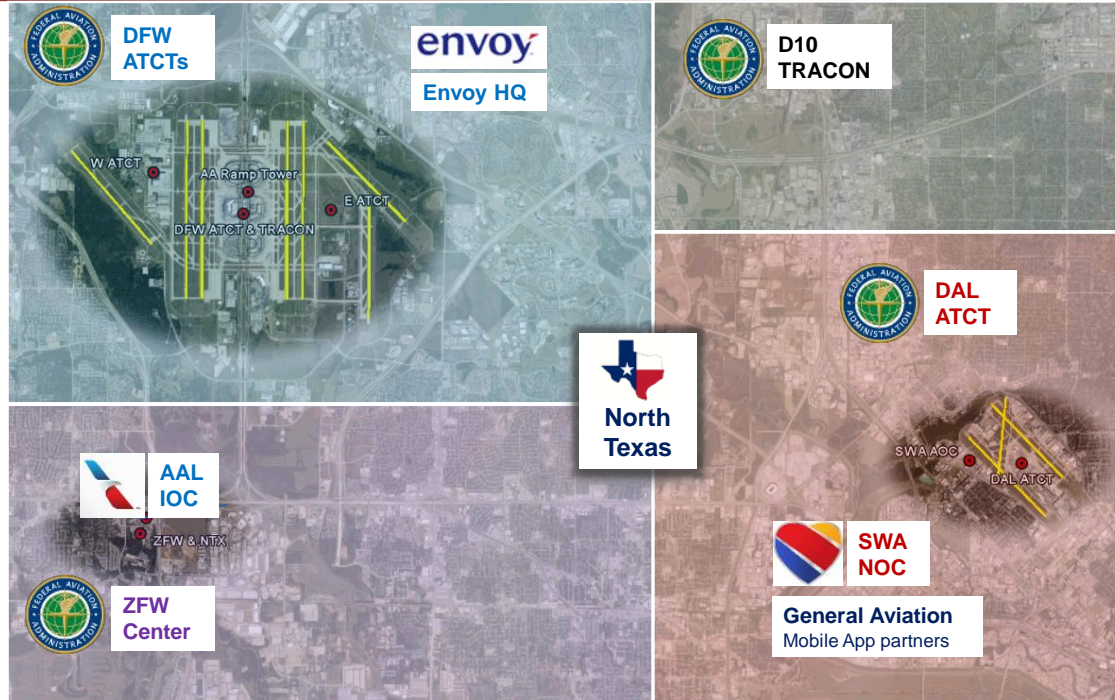


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- NASA demonstrated the combined delay savings with one re-route via an alternate departure fix during DFW/DAL testing period.
- Overall demonstration of ATD-2 capabilities allowed both teams to view the aggregate and cumulative delay savings utilizing a new data/metric vehicle for 2020.
- Excellent presentation overall with multiple NAS benefits should this system be supported by the FAA moving forward.





3/19/2020

1





ATD² NTX FY21 Extension Mission

- Objective:

- Transfer results, knowledge and technology (i.e. digital services) that enables broader adoption of a Trajectory Option Set (TOS) based digital rerouting concept

- Approach:

- Maximize probability of TOS usage in 'Stormy 21' amid potential reduced demand (post COVID). Requires dev changes.
- Extrapolate NTX-based TOS findings, capabilities and associated workflow NAS-wide
- Work with operators to incorporate ATD-2 TOS findings in requirements for operator flight planning systems
- Transfer existing (and emerging) software services of high interest
- Provide analytical underpinnings for TOS in other metroplexes



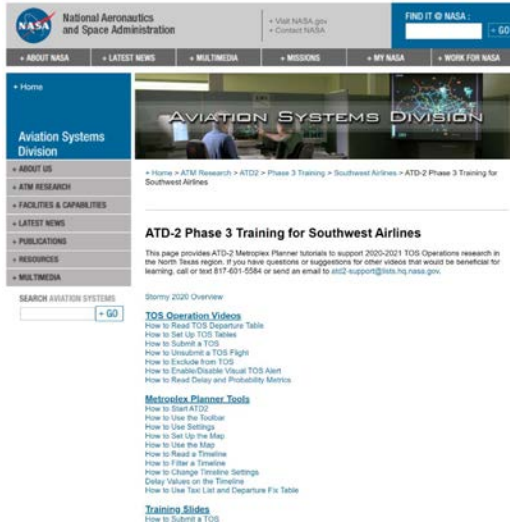
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NTX Latest 2020 Update

July-November



Training Methods Available

- **Virtual Training**
- Individual Training Web Sites
- In facility training (if permitted)



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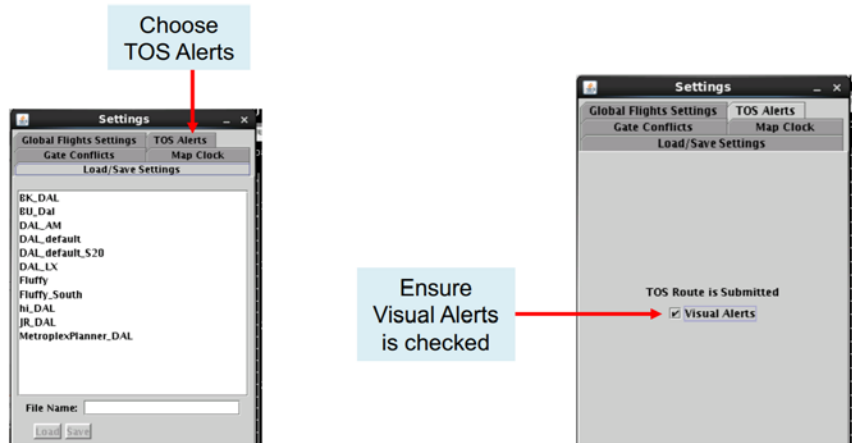
NTX Training is Ongoing to Ready for Stormy 2021



Settings to Enable TOS Alert Pop Up Box



Several ATD-2 Planner Tutorials have been provided to stakeholders in the North Texas Region.



The image shows two screenshots of the ATD-2 Settings application. The left screenshot shows the 'Settings' window with the 'TOS Alerts' tab selected. A callout box with the text 'Choose TOS Alerts' has a red arrow pointing to the 'TOS Alerts' tab. The right screenshot shows the 'TOS Alerts' sub-window with the 'Visual Alerts' checkbox checked. A callout box with the text 'Ensure Visual Alerts is checked' has a red arrow pointing to the checked checkbox. The 'TOS Alerts' sub-window also displays 'TOS Route is Submitted' and 'Map Clock' options.



AAL2474 DFW-RSW joins the AMA from terminal D. Flight plan is filed out the east departure gate. Tower taxi plan is set for the east and north gate departures to use the east side and the south and west gate departures to use the west side. Projected delay savings for the candidate route out the south gate is 26 minutes for AAL2474, projected savings for the AAL fleet is 67 minutes.



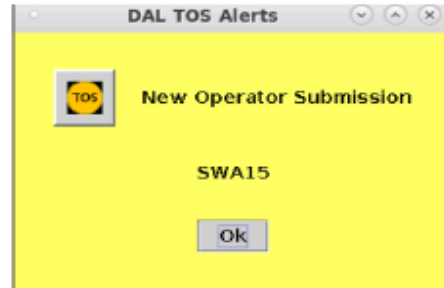
AAL2474 turns east on the bridge to taxi to RWY 17R for departure



AAL2474 joins the queue on the east side.
 Note the small queue on the west side.



- Continue to make TOS available and coordinate on reroutes, resource permitting and collect data when TOS is used



- Finalize time parameters for formal Stormy 2021 TOS Testing



- Moved to all virtual training in March, 2020 due to COVID-19
- Training is conducted by NASA personnel through remote connection to ATD-2 and use of virtual platform to display and explain functions of ATD-2
- Initial and follow up training has been provided to airline and ATC personnel as well as new NATCA ATD-2 national representative
- Developed training materials for each field facility including:
 - Unique training web site for each field facility
 - Access to training material both on the ATD-2 machines and via internet connection on any airline or ATC computer
 - 18 YouTube tutorial videos on using various facets of ATD-2
 - 9 slide show presentations on using ATD-2
 - Updated user training manual



- Designed to simulate flight operator TOS submissions and ATC approval process
- Various traffic volume and weather scenarios are simulated
- Flight operator verbalizes their decision making process and outlines internal coordination required to make a TOS submission
- TOS submission process is discussed and reviewed by all participants
- Tabletop exercises with American and Southwest airlines have been conducted; coordinating with Envoy airlines to schedule exercise in the near future
- Tabletop exercises with ATC facilities will be scheduled when ATC resources are available to participate





- New metrics associated with the **OFF delay savings**
 - Metric: Probability OFF delay savings exceeds the Relative Trajectory Cost (RTC) informs about the chance of the flight having net savings beyond RTC
 - Metric: System level OFF delay savings informs about the benefits to additional flights beyond the TOS flight
- New use case associated with the **IN delay savings**
 - Extends the concept to capture delay predictions and metrics at the downstream arrival airport
 - Metric: Predicted IN delay on the filed route incorporating Airline Operator TFMS enroute prediction which include the adjusted wind miles
 - Metric: Predicted IN delay savings on the TOS route which is a combination of the OFF delays savings plus the TOS route additional flight time

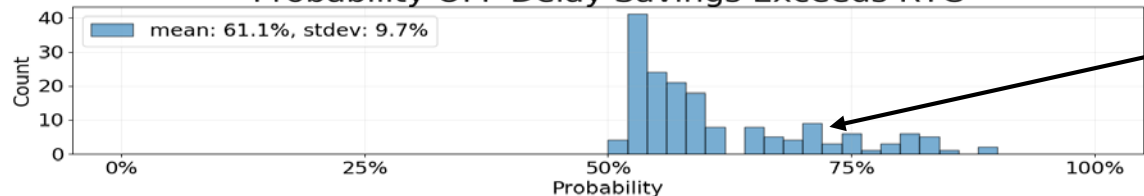


Example Shadow Benefits Sampled at OUT



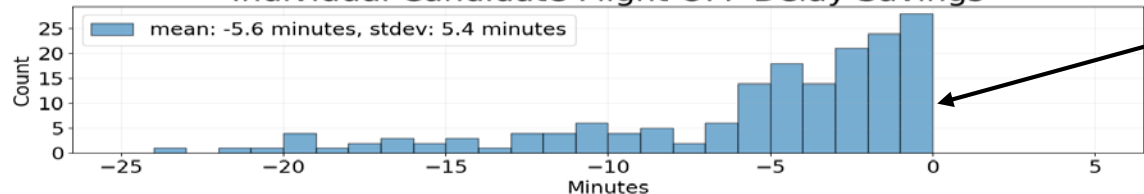
August 1st, 2020 – October 31st, 2020 (169 Candidate flights at OUT)

Probability OFF Delay Savings Exceeds RTC



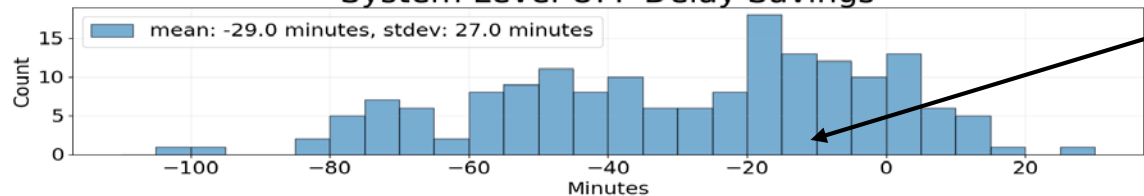
- The higher the probability the more likely the Candidate flight would have OFF delay savings which exceed the Relative Trajectory Cost (RTC)

Individual Candidate Flight OFF Delay Savings



- OFF delay savings beyond the RTC for the individual Candidate flight (negative value represents additional benefit beyond the RTC)

System Level OFF Delay Savings



- Aggregated OFF delay savings for all flights in the D10 TRACON including the Candidate flight. A negative value represents benefit at the system level. The set of system level flights is constrained to have Unimpeded Take Off Time (UTOT) within 60 minutes of current time.



- The ATD-2 Surface TBO airport surface model relies on detailed adaptation files which define the physical structure and constraints and encode SME knowledge in decision trees
- The adaptation files require significant time and resources to build and maintain and have been identified as a bottleneck to scaling the TOS capability across the NAS
- ATD-2 has identified the core data elements generated by the Surface TBO airport surface model and is building a scalable suite of machine learning services to replicate the capability
- The machine learning services will form the building blocks of a NAS-wide TOS digital reroute capability and the predictions from each service (example service: departure runway prediction) will be exposed through an Application Programming Interface (API)
- ATD-2 is working to transfer the machine learning services to the aviation community (e.g. Industry and FAA) to enable future applications





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