Federal Aviation Administration

Airspace Technology Demonstration 2 (ATD-2)
ANG-C52

FAA/NASA Coordinated Activities Compilation

Sep 2018 - Aug 2019

NextGEN

Executive Summary

NASA's Airspace Technology Demonstration 2 (ATD-2) is a five-year research activity running from 2015-2020. NASA's ATD-1 Demonstration focused on improving the efficiency of arrivals using Terminal Sequencing and Spacing (TSAS) to facilitate increased use of efficient RNAV approaches during periods of high traffic demand. RNAV arrival efficiency decreased when vectoring became required to maintain separation resulting in less efficient flight paths for the vectored aircraft. TSAS provided visual references to controllers allowing them to sequence aircraft through speed adjustments rather than vectoring, allowing more flights to remain on the more efficient RNAV flight path. ATD-2 will focus on the scheduling of departures within a metroplex terminal environment to create similar efficiencies for departing aircraft. A primary challenge for ATD-2 is to develop a departure metering solution that accommodates surface and airspace flow constraints while allowing aircraft to execute efficient flight profiles.

In October 2014, the NextGen Integration Working Group (NIWG) recommended a range of potential enhancements to Surface Operations that are designed to increase predictability and provide actionable and measurable surface efficiency improvements. The NIWG's specific recommendations in the Surface Focus Area included the deployment of an initial airport surface departure management capability in the 2017 timeframe that reflects the capability described in the FAA's Surface Collaborative Decision Making (S-CDM) Concept of Operations.

Subsequent to the NIWG's recommendations, the FAA completed a feasibility assessment focusing on technical, operational, cost and schedule constraints. The option of working in conjunction with NASA to define joint milestones for the ATD-2 project was identified as the only feasible option to meet the NIWG Departure Management recommendation in the required timeframe.

Project Communications

The project team has compiled a list of project stakeholders and will update the list as additional stakeholders are identified. Communications plans are in place to ensure the stakeholder groups are adequately informed of project activities. The following channels are being used to ensure key stakeholders receive timely updates on project status and activities.

- Monthly ATD-2 Status Reports submitted to ANG-1
- Weekly Significant Activities Reports submitted to ANG-C
- Weekly ATD-2 Stakeholder meetings
- Quarterly IADS RTT/ATD-2 meetings
- Monthly FAA/NASA Leadership Teleconferences

FAA Status

September 2018

The ATD-2 Project is currently progressing into Phase 2 while continuing Phase 1 capabilities introduced in November of 2017. As of 9/30/2018, the joint project team has completed the milestones to initiate Phase 2 with a target start date of 10/1/2018. NASA completed a Technology Transfer of Phase 1 artifacts on 9/28/2018.

During the week of 9/3/2018 to 9/7/2018 the project team worked on multiple fronts to complete the network cutover of AEFS to the FTI network. The team also worked to install networking and switches at Atlanta Center to display ATD-2 on a screen shared with the existing Aerobahn Display.

During the week of 9/9/2018 ANG-C3 (WJHTC) supported formal test efforts of TFDM / AEFS with NASA ATD-2 software. ANG-C32 also supported the planning and deployment of Operational interfaces between NASA ATD-2 and AEFS/ARMT to support Risk Mitigation testing in early September at Charlotte Tower. A new Proxy interface was placed in OPS to connect the ATD-2 system with existing operational assets in Charlotte (CLT) through the newly developed ARMT / AEFS interface.

FAA Stakeholders met at the Charlotte ATD-2 lab on 9/11/2018 for a briefing on the Phase 2 capabilities and to agree on a schedule to introduce them. The FAA Stakeholders agreed with the capabilities to be evaluated in Phase 2 and agreed to target 10/1/2018 for the TBFM/IDAC go live. The team determined a “micro-phase” strategy for Strategic Metering. The first micro-phase which allows ramp managers to manually freeze the TOBT was implemented 8/13/2018, to allow ramp managers to familiarize with the capability and develop procedures. The next step introducing Strategic metering is scheduled for the week of 10/15/2017. The final micro-phase which introduces automatic TOBT freeze is targeted for 1/2019.

On 9/19/2018 ANG-C52 representatives traveled to Atlanta Center to observe NASA ATD-2 training for the Center TMU’s and to facilitate the Independent Risk Assessment Team (IRAT). On 9/20/2018 The FAA Enterprise Data Services Independent Risk Assessment Team (IRAT) completed its verification that the ATD-2 network did not interface with the FAA network and complied with security requirements.

The Safety Risk Management Document was signed by Atlanta Center on 9/27/2018.

October 2018

The ATD-2 Project successfully initiated the initial Phase 2 capabilities on 10/1/2018. The 5 new capabilities available are:

- 2-way data exchange between ATD-2 and AEFS, Electronic release negotiation between Atlanta Center (ZTL) and Charlotte ATCT,
- Availability of the Terminal Flow Management System (TFDM) Terminal Publication Prototype
- Extending the surface metering time horizon beyond tactical management towards strategic
- Transitioning metering decisions from the ramp tower to the CLT Traffic Management Coordinator.
  NOTE: As the stakeholders gain experience, strategic metering parameters will be adjusted to determine the optimal time horizon.
- Mobile application for 2-way data exchange with GA pilots.
  Note: This capability is active as of 10/29/2018, and coordination with the GA pilot user community is continuing.

On 10/13/2018 ATD-2 team members from FAA HQ and MITRE met with representatives from Clark County Regional Airport Authority and the Las Vegas FAA ATCT Traffic Manager to discuss the Departure Demand Mitigation tool developed locally for Las Vegas airports. The Las Vegas representatives are interested in integrating their tool with the MITRE 2-way mobile data application to provide pilots with departure demand information so they are aware when delays should be expected. MITRE, the Airport Authority and local FAA stakeholders agreed to continue coordination for a plan to meet their respective objectives.

ATD-2 Co-leads attended the Surface Collaborative Decision-Making (SC) Meeting in Charlotte on 10/30/2018. Attendees observed hands on demonstrations of ATD-2 capabilities at the ATD-2 Lab.

November 2018

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With Phase 2 capabilities now in the evaluation phase, the ATD-2 Project Team continued to coordinate on data exchange capabilities via Mobile technology and focused on planning for Phase 3 evaluations at Dallas/Fort Worth Airport, Dallas Love Field Airport and Ft Worth Center. The team is also formulating plans for the transition to the new ATCT at Charlotte Douglas International Airport. During November, the team continued coordinating to determine methods to incentivize General Aviation operators to provide updated departure times and understand the role of 3rd Party Application providers.

In early November, the AEFS PM advised the ATD-2 project team of issues with the AEFS touchscreen interface at the Charlotte Clearance Delivery position, becoming sluggish and non-responsive. AEFS engineers suggested the issue may be related to the connection with ATD-2 due to the high message rate being passed. The AEFS team proposed disconnecting ATD-2 to restore AEFS performance while longer term solutions are explored. After the connection was removed AEFS performance has been stable. AEFS is researching a fix that would allow the system to handle the current ATD-2 message rate and NASA is looking at how they might throttle the messages to a lower update rate.

On 11/15/2018, NASA briefed the SWIFT team on ATD2 accomplishments so far and the plan moving forward. They also presented metrics and research findings from the data they are collecting at CLT and how that could be beneficial to both FAA and industry.

December 2018 - February 2019

Due to the lapse in funding (12/22/2018 to 1/25/2019, 2019) the ATD-2 project and stakeholders schedules were affected. After short term funds were restored, all stakeholders' first priority was evaluating impacts to their individual programs before considering impacts to the ATD-2 project. These reevaluations had to account for the potential of another lapse in

funding, therefore the focus was on short term plans until the potential for a second work stoppage was resolved in mid-February. With stability restored, stakeholders began to focus on longer term planning; however, there is remaining uncertainty on aspects of ATD-2 Phase 3. The TFDM program is in the process of reassessing the results of schedule changes. The TBFM program is also in the process of reexamining schedule changes. As primary stakeholders in ATD-2, TBFM and TFDM preplanning will have impacts that will have to be accommodated within ATD-2. ANG and the PMO's are coordinating to develop scope and schedules to achieve ATD-2 objectives.

Activities that were scheduled to take place such as General Aviation pilot engagement in Dallas and the NASA ATD-2 Technology Transfer to Industry workshop at the AMES Research Center have been rescheduled with the Pilot Engagement scheduled for the week of 3/25/2019 and the NASA Industry Workshop being split into two events. The initial ATD-2 Phase 1 Transfer brief to industry will be presented at the SWIM Industry FAA Team (SWIFT) meeting 5/21/2019 to 5/22/2019. The Workshop is tentatively scheduled for the week of 9/16/2019.
The CDM Stakeholders Group assigned Task #92 to the Surface Collaborative Decision-making team and the Flow Evaluation team. This task is a continuation of previously closed task #69 with a change being the addition of the Flow Evaluation Team (FET) to bring the task up to date. The SCT/FET are being tasked to work with the Surface Office and ANG to validate the suitability of the surface metering capability for use within the NAS at TFDM equipped airports.

March 2019

On 03/25/19, ANG-C52 facilitated a meeting with Dallas Love Field General Aviation Operators and NBAA stakeholders at the Frontiers of Flight Museum on the Airport grounds. NASA and MITRE briefed participants on ATD-2 Phase 3 activities, the MITRE Mobile EOBT Application and discussed how GA Operators can participate in Phase 3. On 03/26/2019, NASA and MITRE briefed the Dallas Fort Worth International Airport VP of Operations on Phase 3 status and activities. During the afternoon of the 26th stakeholders met at the North Texas Research Station to coordinate key event schedules.

The FAA's ATD-2 team with support from VOLPE have begun to strategize and prepare to support NASA's Phase 3 activities with special attention dedicated to the successful creation of the Safety Risk Management Document (SRMD). The Safety Risk Management (SRM) process is a formalized approach to integrated system safety. It both informs decision-makers about the potential hazards, safety risks, and ways to reduce risk associated with a particular proposal and identifies ways to mitigate existing hazards in the NAS. The methodology is applied to all NAS equipment, operations, and procedures to identify safety hazards and address risk.

The SRMD has been identified as a critical action item that must be delivered in order for NASA to be able to begin collecting key data during upcoming Phase 3 operations. Increased communication (in addition to the IADS RTT Weekly Meeting) was initiated in order to discuss, expedite and share information with NASA on specifics related to the SRMD support needed in Phase 3.

April 2019

On 04/22/19, the ANG-C52 program management team observed a Human in the Loop (HITL) experiment at the NASA Ames Research Center. The HITL was conducted in the Future Flight Central (FFC) facility and focused on the use of ATD-2 tools and surface metering at Dallas Fort Worth Airport (DFW). ATD-2's surface metering has been designed to resemble the surface metering that will be implemented with TFDM and the S-CDM concept. The research focus of this HITL was to allow the operational-like evaluation of surface metering at DFW while also analyzing various research questions. The HITL ran scenarios with full-scale DFW arrival and departure traffic that is anticipated with this summer's traffic demand, however focus was on East side ramp operations for A, C, and E terminal as opposed to the entire airport. FAA Deputy Administrator, Carl Burleson and NexGen Chief Scientist, Steve Bradford toured NASA's Future Flight Central Facility on 04/24/19 and were briefed on the ongoing HITL. The ANG-C52 program management team was also updated on Phase 3 operations. The various ATD-2 teams engaged in productive discussions detailing strategy moving forward for phase 3.

The ATD-2 team and collaborating partners were awarded the Technology and Innovation Group Award for 2018 by NASA's Associate Administrator for Aeronautics, Dr. Jaiwon Shin. The award was presented to the ATD-2 team on 04/24/19 at the NASA Ames research center. Several FAA programs (TFDM, TBFM, and AEFS) and program offices (ANG-C, AJV) were recognized and individuals were presented certificates in acknowledgement of their specific contributions.

The ANG-C52 team and MITRE met with Clark County Airport Authority and the FAA Tower Traffic Coordinator at Las Vegas, McCarran International Airport from 04/09/19-04/12/19 to review the General Aviation Strategic Scheduling Capability, Pacer. The briefing included a demonstration of Pacer, highlighting the systems capabilities, limitations and planned features that are being developed. The Data Sharing Memorandum of Agreement between FAA and Clark County was also discussed.

May 2019

The SWIM Industry-FAA Team (SWIFT) Conference hosted by Southwest Airlines was held in Dallas/Fort Worth International Airport (DFW), , on May 21-22, 2019. On Day 2 (May 22, 2019) of the SWIFT conference, NASA presented the data analysis work accomplished with the Airspace Technology Demonstration 2 (ATD-2) to the Airline industry, FAA and other stakeholders. The SWIFT is an FAA forum, open to the public, offering a collaborative environment for outreach activities related to FAA information services shared via SWIM.

The ATD-2 Phase 3 Field Demonstration Freeze (FRZ3) event was held in Dallas/Fort Worth, TX on May 23, 2019. NASA held a one-day freeze event where all Field Demonstration Partners reviewed and evaluated detailed field demonstration plans for the upcoming ATD-2 Phase 3 demonstration. Oriol Oliva of ANGC-52 was the opening speaker for the event and acknowledged all key stakeholders and participants for the project. Craig Johnson, of MITRE, briefed the event participants on the mobile work being implemented in Dallas. Phase 3 is scheduled to begin with the first Micro phase on June 10, 2019.

The 2019 Collaborative Decision Making (CDM) General Session and Spring Training was hosted in Mclean, Virginia at the MITRE Corporation on May 14-15, 2019. The session was attended by ANGC-52 management and other aviation community stakeholders. CDM is a joint government/industry initiative aimed at improving air traffic flow management through increased information exchange. CDM is comprised of representatives from government, general aviation, airlines, private industry and academia who work together to create technological and procedural solutions to the Air Traffic Flow Management (ATFM) challenges faced by the National Airspace System (NAS).

June 2019

The ATD-2 Phase 3 Safety Risk Management (SRM) Panel Meeting was held in Fort Worth, TX, on June 11, 2019. The FAA conducted an SRM Panel Meeting for NASA's ATD-2 Phase 3 project. As in the case of ATD-2 Phases 1 and 2, the ATD-2 Phase 3 demonstration will be "live" in the NAS. As such, prior SRM analysis is required in accordance with procedures outlined in the FAA's Safety Management Systems (SMS) manual. The ATO Central Service Area (AJV-C) facilitated the panel at NASA's North Texas Research Facility. The SRM Panel concluded that the use of the ATD-2 in the North Texas Region introduces no new risk into the National Airspace System allowing Phase 3 capabilities to be utilized as planned.

NASA briefed the FAA TBFM Operations Team on Phase 1 and Phase 2 ATD-2 capabilities on June 26, 2019 in Washington DC at JMA Solutions Headquarters. Al Capps (NASA), Bob

Staudenmeier and Isaac Robeson (Contract Support to NASA) briefed the work accomplished with the ATD-2, Phase 1 and Phase 2 at Charlotte. The briefing included an overview of the electronic release negotiation capability of ATD-2 including the pre-scheduling capability being used for flights departing CLT to Atlanta and Chicago. The briefing provided the TBFM Ops team with improved understanding of future TFDM capabilities and impacts to TBFM.

July 2019

Micro phase 3B began on July 22, 2019. The primary goal of this phase is to begin the initial use case for load balancing with a set of preference weighted routing alternatives (known as Trajectory Options Sets (TOS)) submitted by flight operators. These TOS summary and updated flight summary reports were shared with the NASA North Texas (NTX) facility to allow them to analyze these TOSs and collect sufficient objective and subjective data to verify the system is working as expected. Airline stakeholders (Southwest and American Airlines), DFW Tower, DFW TRACON, Dallas Love Tower and Ft. Worth Center coordinate via teleconference during scheduled evaluation periods to monitor system inputs and outputs. Stakeholders provided real time feedback on the systems capabilities while NASA is capturing all significant data and responding to all requested changes needed.

August 2019

The FAA ATD-2 management has begun the process of reconvening the full NASA/FAA Joint Risk Management Board (JRMB). An initial FAA-only internal meeting has been scheduled for September 30 to discuss risks and issues regarding the ATD-2 project. The purpose of the JRMB is to identify, track and mitigate issues determined and agreed to be joint risks for both NASA and FAA. The Risk Board meets as needed to review proposed risks for addition to the Joint Risk Register and to update currently identified risks.

ANG-C52 has provided updates to the AEFS and TBFM Test Plans. These updates were submitted through WebCM in support of the NAS Change Proposal (NCP) process. With safety as a fundamental mission of the FAA, any changes to NAS systems, equipment, and facilities must not introduce unacceptable risk into the NAS. These NAS system changes are authorized and documented through the NCP and Safety Risk Management (SRM) process.

Key Stakeholders

Leadership Team

Name	Organization	Title
Pam Whitley	ANG-1	Assistant Administrator for NextGen ANG-1
Steve Bradford	ANG-3	Chief Scientist – NextGen
Paul Fontaine	ANG-C	Director Portfolio Management and Technology Development Office
Wes Wright	ANG-C5	Division Manager Technology Development and Prototyping
Jaiwon Shin	NASA	Associate Administrator for Aeronautics Research Mission Directorate
Akbar Sultan	NASA	Director Airspace Systems Program Office
Bob Pearce	NASA	Deputy Director Airspace Systems Program Office

RTT Working Group			
Name	**Organization**	**Title**	**Tier**
Jane Thipphavong	NASA	IADS RTT Co-lead	Tier 0
Shawn Engelland	NASA	Manager, ATD Project (A)	Tier 0
Kevin Witzberger	NASA	Manager, ATD Deputy Project (A)	Tier 0
Al Capps	NASA	Manager, ATD-2 Sub Project (A)	Tier 0
Yoon Jung	NASA	ATD-2 Chief Scientist	Tier 0
Andras Kovacs	ANG-C52	Manager Communications Branch/IADS RTT Co-Lead	Tier 0
Todd Lewis	ANG-C52	STBO Project Co-Lead	Tier 0
Oriol Oliva	ANG-C52	STBO Project Co-Lead	Tier 0
Ben Marple	ANG-C52	Mobile Application Project Lead	Tier 0
John Short	ATO	NATCA ATD-2 Article 114 Rep	Tier 0
Mike Hoprich	ATO	CLT ATD-2 NATCA POC	Tier 1
Kurt Donnelly	AJW	PASS NextGen Rep	
Mark Novak	PMO	Decision Support Programs Manager (A)	Tier 1
Mike Huffman	PMO	TFDM Program Manager	Tier 1
Bob Tyo	PMO	TBFM Program Manager	Tier 1
Aaron Wilkins	PMO	TBFM POC	Tier 1
Omar Baradi	PMO	TFMS Program Manager	Tier 1
Paul Losee	PMO	TFMS POC	Tier 1
Paula Seeley (A)	AJR-E	Airport Surface Efficiency	Tier 1
Jeff Woods	ATO	NATCA PMO	Tier 1
Kevin McLaughlin	ATO	NATCA NextGen	Tier 1
Howard Sapp	AJV-73	Terminal Validation and Requirements	Tier 1
Jeffery T. Cox	AJV-85	Terminal Standards and Procedures	Tier 1
Eric Saldana	AJI-1	Safety and Technical Training	Tier 1
Mark Minik	AJT	Traffic Services	Tier 1

RTT Working Group			
Name	**Organization**	**Title**	**Tier**
Dave Spencer	AJW	Technical Operations	Tier 1
Kent Duffy	ARP	Airports	Tier 1

Acronyms and Abbreviations

A80	Atlanta TRACON
AAL	American Airlines
AEFS	Advanced Electronic Flight Strip System
AJV-7	Air Traffic Organization, Concepts, Validation & Requirements Directorate
AOL	Airspace Operations Laboratory
AMS	Acquisition Management System
ANG-C5	Office of Advanced Concepts & Technology Development
APREQ	Approved Request
ARB	Archetecture Review Board
ARMT	Airport Resource Management Tool
ART	Assessment of Ramp Times
ARTCC	Air Route Traffic Control Center
ATCT	Air Traffic Control Tower
ATD-2	Airspace Technology Demonstration 2
ATO	Air Traffic Organization
CCB	Change Control Board
CDM	Collaborative Decision Making
CLT	Charlotte Douglas International Airport
CSIT	Collaborative Site Implementation Team
eLMS	Electronic Learning Management System
EOBT	Earliest Off Block Time
FAA	Federal Aviation Administration
FET	Flow Evaluation Team
FFC	Future Flight Central (NASA)
FOS	Flight Operator Systems
FSOMS	Flight Substitutions and Operational Metrics
HITL	Human in the Loop Simulation
IADS RTT	Integrated Arrival/Departure/Surface Research Transition Team
IDAC	Integrated Departure Arrival Capability
IOC	Integrated Operations Center
IRAT	Independent Risk Assessment Team
NAC	NextGen Advisory Committee
NASA	National Aeronautics and Space Administration
NATCA	National Air Traffic Controllers Association
NCP	National Airspace System (NAS) Change Proposal
NESG	NAS Enterprise Security Gateway
NICS	NASA Integrated Communication Services
NIWG	NextGen Implementation Working Group
NOD	NAS Operational Dashboard
NTX	NASA North Texas Research Facility at Dallas/Ft. Worth Airport
OSE	Operational Shadow Evaluation

P3	Processes, Procedures, Policies
PLA	Project Level Agreement
PMO	Program Management Office
RMTC	Ramp Manager Tower Console
RNAV	Area Navigation
RTC	Ramp Tower Console
S-CDM	Surface Collaborative Decision Making
SMS	Safety Management System
SRM	Safety Risk Management
STDDS	SWIM Terminal Data Distribution System
STF	Surface Tactical Flow
SWIM	System Wide Information Management
SWIFT	SWIM Industry FAA Team
TBFM	Time Based Flow Management
TIM/TEM	Technical Interchange Meeting/Technical Exchange Meeting
TFDM	Terminal Flight Data Manager
TFMS	Traffic Flow Management System
TMAT	Target Movement Area Time
TOBT	Target Off-Block Time
TSAS	Terminal Sequencing and Spacing
TSD	Traffic Situation Display
TTP	TFDM Terminal Publication
ZDC	Washington Center
ZFW	Dallas/ Ft Worth Center
ZTL	Atlanta Center
3T	The 3 FAA Traffic Management Coordination Tools: TFMS, TBFM and TFDM