

AIRSPACE TECHNOLOGY

DEMONSTRATIONS

TECHNICAL INTERCHANGE MEETING

Presented by: Ian Levitt and Mike Prichard

September 22-23, 2021

TBO is a collection of systems, capabilities, processes, and people working together to achieve operational objectives



Time-Based Management (TBM)

Manages Trajectories by Scheduling and Metering Aircraft through Constraint Points



Performance Based Navigation (PBN)

Enables Aircraft to Accurately Navigate along their Trajectories



Enterprise Enablers

Expands and Automates Sharing of Common Information about Aircraft Trajectories

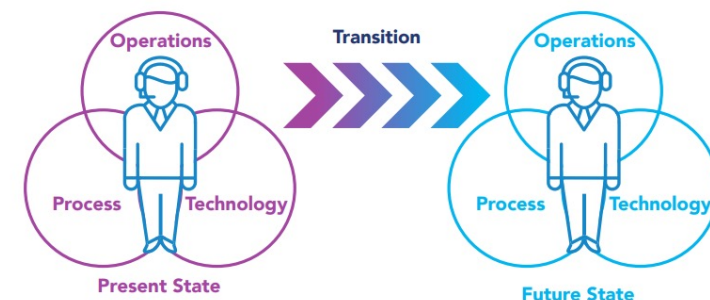
Operating Areas



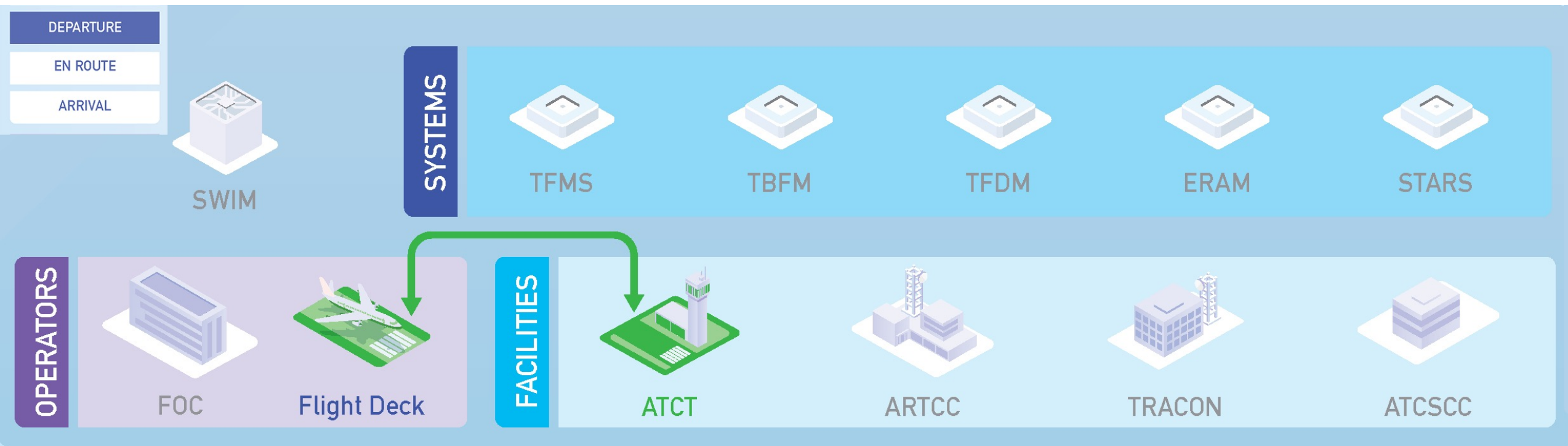
Deconfliction across all operating areas and FAA projects

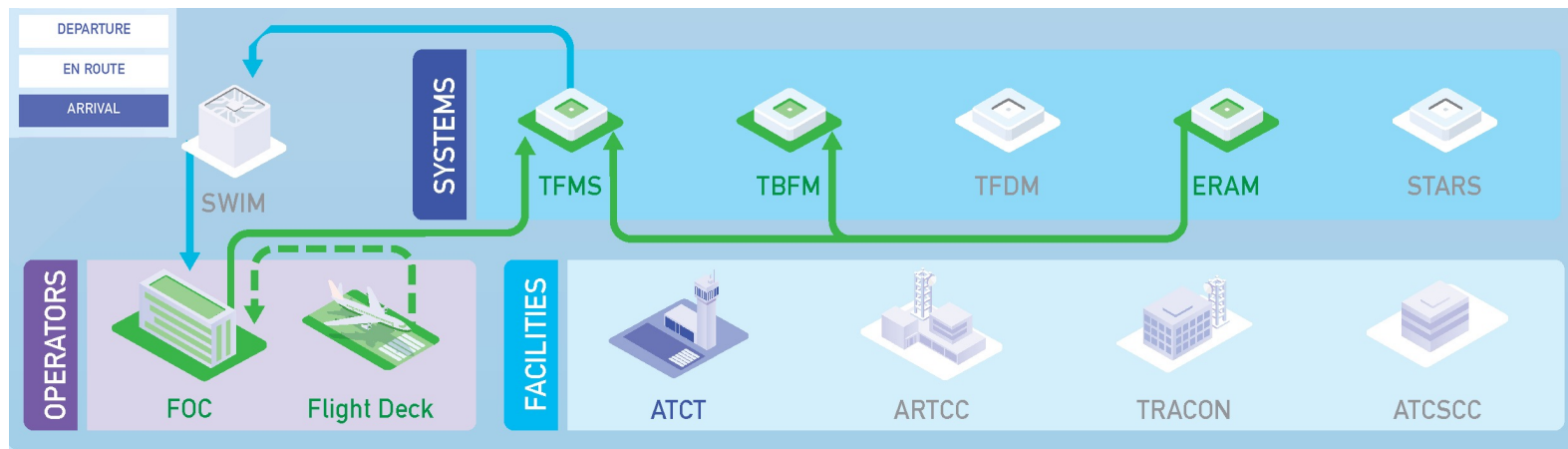
Change Strategy

Addressing the people component to achieve implementation success



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



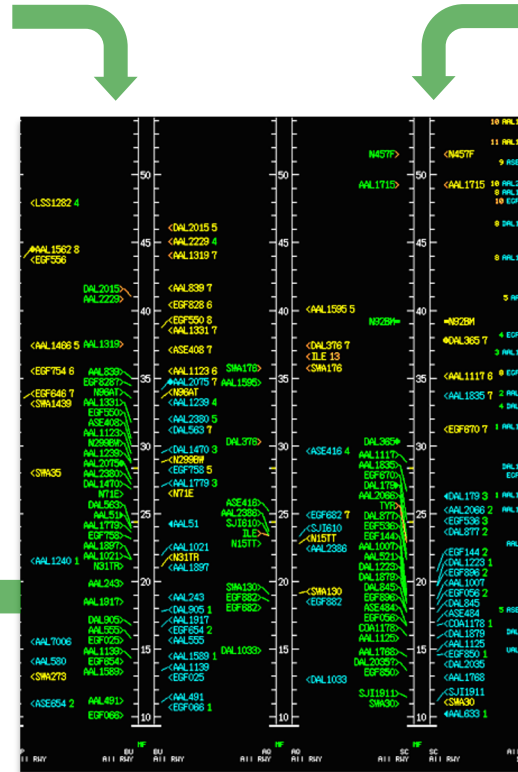
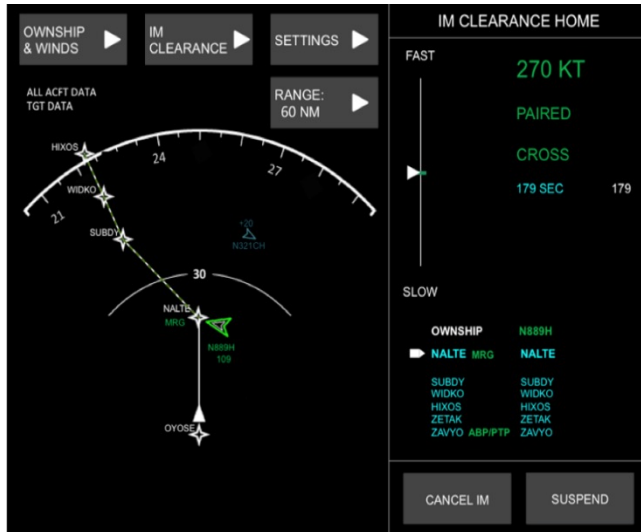


ATD-1 objectives to advance Arrival Terminal Metering



Flight deck Interval Management (FIM)

Terminal Sequencing and Spacing (TSAS)

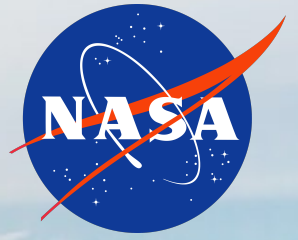


Controller
Managed Spacing
(CMS)

Traffic Management Advisor with Terminal Metering (TMA-TM)



Meet the Panelists



Capt. Paul Harrison, Technical Pilot, Alaska Airlines

Cam Morast, Product Manager, L3Harris / ACSS

John Robinson, Chief Engineer, Cavan Solutions

Capt. Rocky Stone, B777 Captain, United Airlines

Bill True, Staff Scientist, Honeywell

Dr. Lesley Weitz, Sr. Principal Aerospace Engineer, MITRE

Kevin Witzberger, ATD-1 OIA Lead, NASA

Jeffrey Woods, Air Traffic Controller, NATCA

Brandon Yarmark, Computer Scientist, FAA William J. Hughes Technical Center

Arrival TBO

a recent history

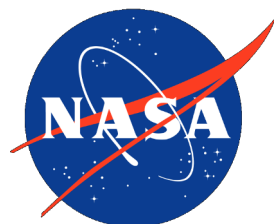




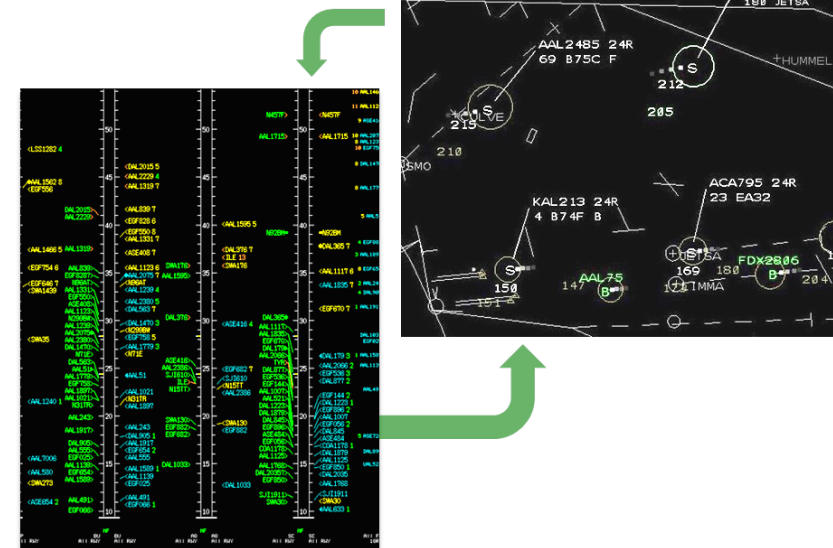
Operational Integration Assessment (OIA)

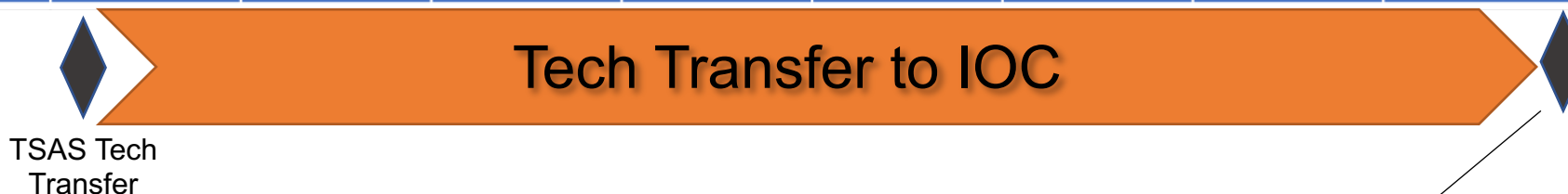
T&E requested by FAA to identify risks for TSAS integration with ERAM, STARS, and TBFM

TSAS Tech Transfer



MITRE





TSAS Tech Transfer



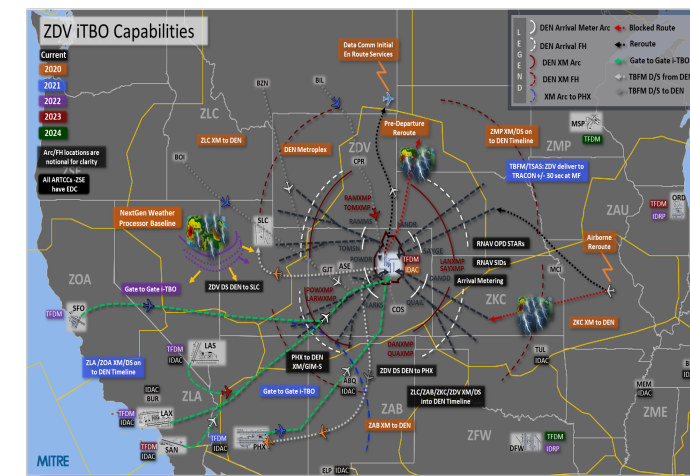
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First Site Initial Operating Capability (IOC)
Expected December 2022

Initial Operational Capability occurs when site personnel declare a new capability ready for conditional or limited operational use.

Initial operational capability requires satisfaction of operational requirements, as well as full logistics support and training for technicians and air traffic specialists.



Status of TBO in the Northwest Mountain Region
Courtesy FAA, TBO Industry Day Master Slide Deck, Aug 2001



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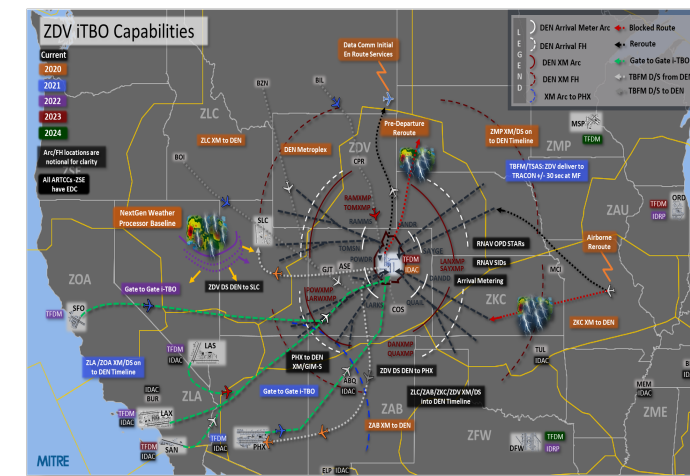


TSAS Functionality Initial Factory Testing and Acceptance

TSAS Final Investment Decision (FID)

Final Investment Decision: the event at which the FAA decides whether it will approve, fund, and baseline a proposed investment initiative

TSAS IOC



Status of TBO in the Northwest Mountain Region
Courtesy FAA, TBO Industry Day Master Slide Deck, Aug 2001



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TSAS Capability Test Lab completed

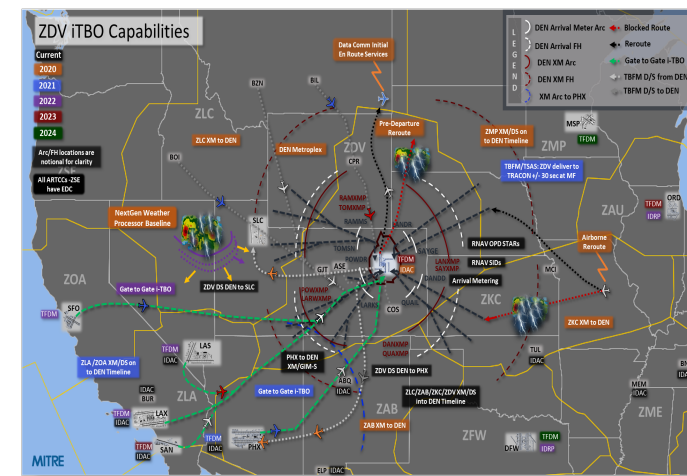


TSAS Capability Run for Record

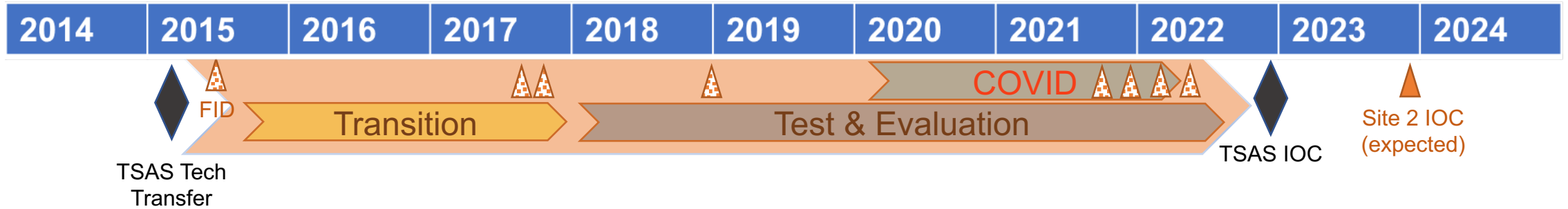
TSAS Capability Run for Record for updated Key Site

Key Site: the location at which a new service is first tested and evaluated for operational use.

TSAS IOC



Status of TBO in the Northwest Mountain Region
Courtesy FAA, TBO Industry Day Master Slide Deck, Aug 2001



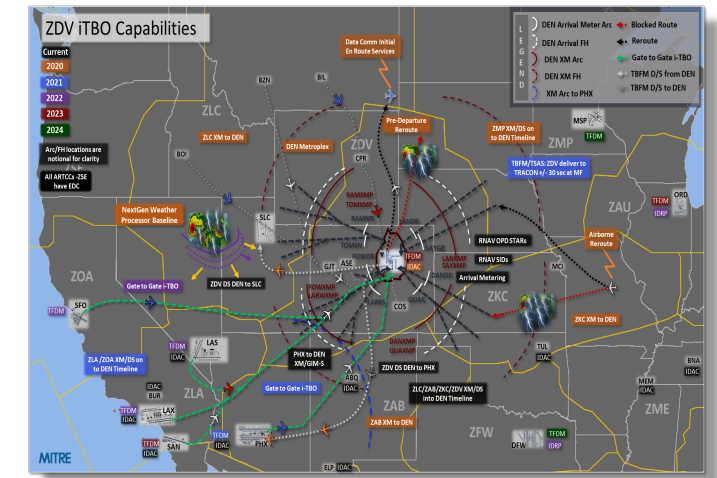
Covid restrictions slowed testing and site activities in 2020 and 2021

Remote Testing established but with limited success

Integration with 3 systems has been challenging

Currently running 2 sites (DEN and LAX) in parallel to minimize implementation issues that may impact IOC

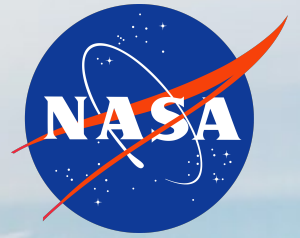
System Shadowing activities began earlier this year at both sites



Status of TBO in the Northwest Mountain Region
Courtesy FAA, TBO Industry Day Master Slide Deck, Aug 2001



Panel Discussion



Capt. Paul Harrison, Technical Pilot, Alaska Airlines

Cam Morast, Product Manager, L3Harris / ACSS

John Robinson, Chief Engineer, Cavan Solutions

Capt. Rocky Stone, B777 Captain, United Airlines

Bill True, Staff Scientist, Honeywell

Dr. Lesley Weitz, Sr. Principal Aerospace Engineer, MITRE

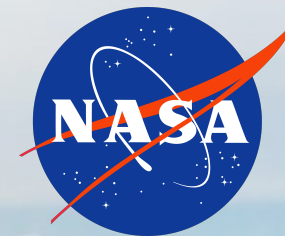
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FIM Tech Transfer



TSAS Tech
Transfer

TSAS
IOC

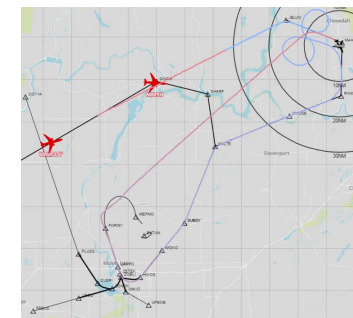
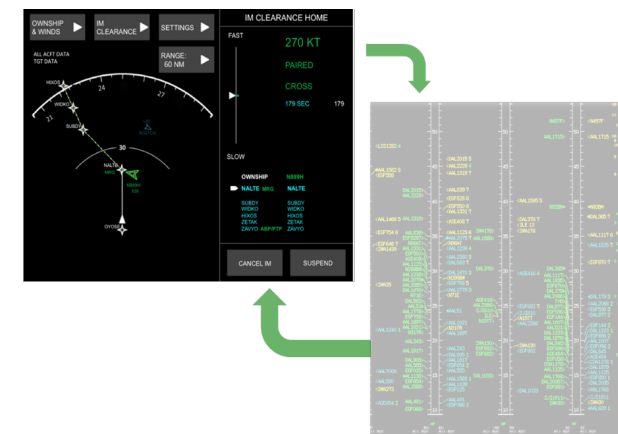
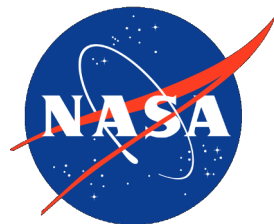
2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
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FIM Tech
Transfer

FIM Avionics Flight Test

Over 170 data points, validating FIM
performance under realistic conditions



TSAS Tech
Transfer

TSAS
IOC



FIM Tech
Transfer



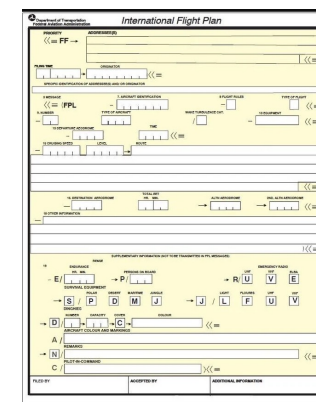
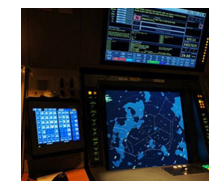
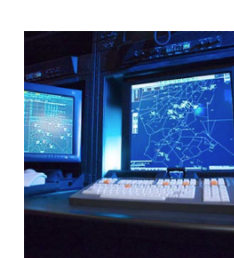
MITRE

ADS-B Enhancements Final Investment Decision (FID)
expected 2022

ICAO Flight Plan includes data fields for ADS-B In capabilities
of the aircraft and flight crew

ERAM flows information to STARS, TBFM, TFMS, TFDM

Display requirements in ERAM and STARS to indicate ADS-B In
capabilities to ATC

Initial-Interval Management (I-IM)

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TSAS
IOC



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Paired Approach
Demonstration

ADS-B
Enhancements
Final Investment
Decision (FID)

Real world validation of advanced
ADS-B In FIM Application for the
Paired Approach Operation



MITRE

Alaska
AIRLINES

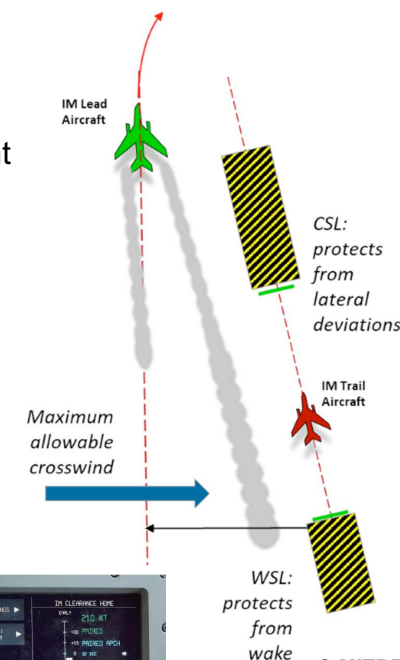
Honeywell



MOSAIC
ATM



Photo courtesy of the FAA



TSAS Tech
Transfer

TSAS
IOC

2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
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FIM Tech
Transfer



DO-361A / ED-236A
Minimum Operational
Performance Standards
(MOPS) for Flight-Deck
Interval Management (FIM)

Published March 2020



ADS-B In
Enhancements
Final Investment
Decision (FID)

DO-317C / ED-194B
Minimum Operational
Performance Standards
(MOPS) for Aircraft
Surveillance Applications
(ASA) Systems

Published June 2020



TSAS Tech
Transfer

TSAS
IOC



FIM Tech
Transfer

PA Demo

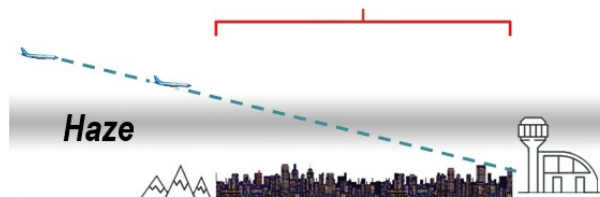
Standards

AAL Operational Approval for CDTI –
Assisted Visual Separation (CAVS)

Benefits data gathering has begun

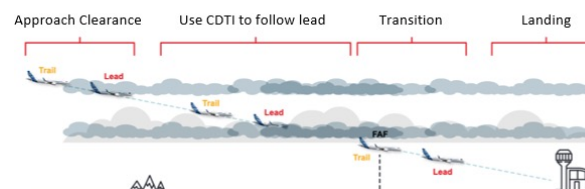
ADS-B
Enhancements
Final Investment
Decision (FID)

CDTI Assisted Visual Separation (CAVS)

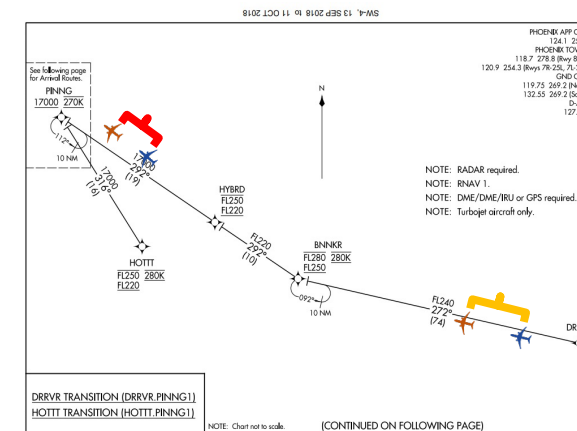


CAS and IM operational trials
and data collection (expected)

CDTI Assisted Separation (CAS)

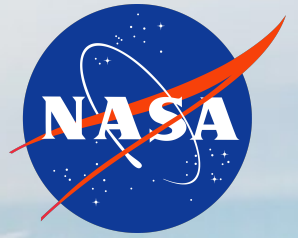


Initial-Interval Management (I-IM)





Panel Discussion



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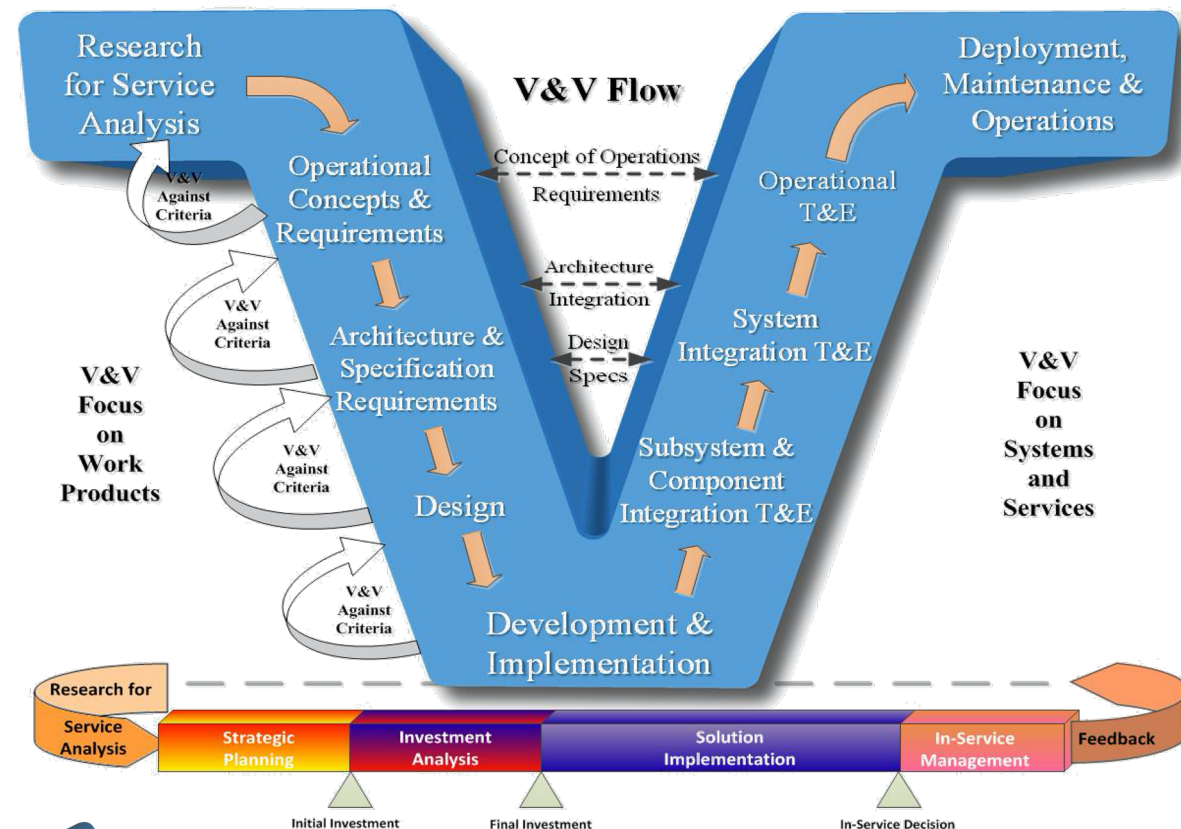
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- Shifting Left refers to V&V activities across the pre- and post-FID phases
- Increases efficiency in operationalizing the research



Shift Left V&V with evolving and maturing needs, work products, and capabilities

- Photo “water droplets on black surface” by [Jennifer Uppendahl](#) on [Unsplash](#), <https://unsplash.com/photos/EhkIkOkx0co>, Free to use under the Unsplash license, <https://unsplash.com/license> (slide 7)
- Diagram provided by MITRE and used with permission. (slide 17)