

# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

## *Overview of AIRS Operational Flight Evaluation Project*

Review for the ACP India Roundtable on  
ADS-B (In) Applications

April 2026



Federal Aviation  
Administration

# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

## *Agenda*

- **Project Background**
  - Operational Evaluation Details
  - CDTI-Assisted Separation on Approach (CAS-A) Overview
  - Initial-Interval Management (I-IM) Overview
- **Controller Feedback**
  - CDTI-Assisted Separation on Approach (CAS-A)
  - Initial-Interval Management (I-IM)
- **Lessons Learned**
  - CDTI-Assisted Separation on Approach (CAS-A)
  - Initial-Interval Management (I-IM)

# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

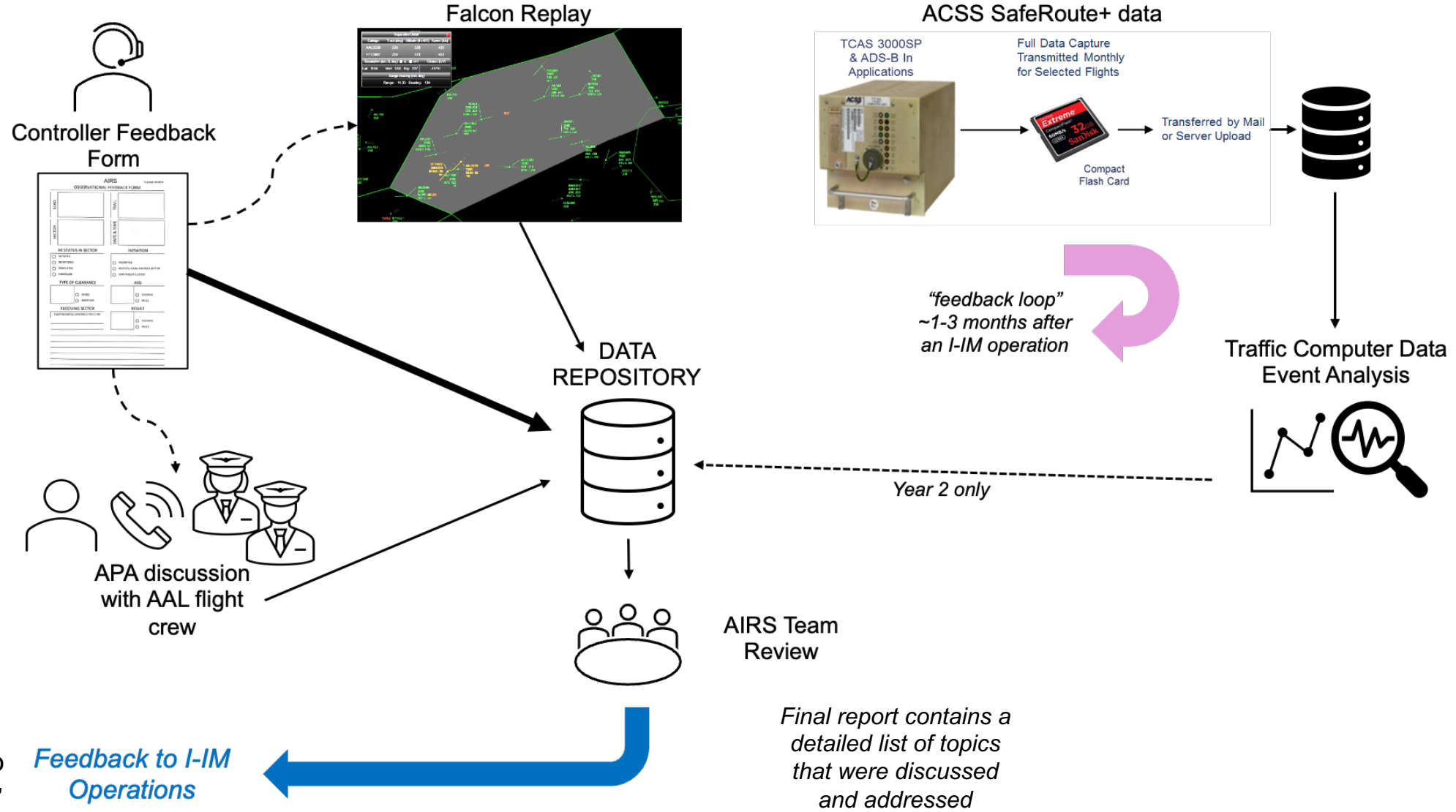
- AIRS Evaluation project demonstrated the **operational feasibility** and **value** of ADS-B In capabilities (CAVS, CAS-A, I-IM) using a **retrofit solution**
- **Why an Operational Evaluation?**
  - Support industry and Air Traffic Control (ATC) investment decisions
  - Gather real-world experience to validate future ATC automation requirements and costs
  - Evaluate flight crew and controller acceptance of the operations
  - Evaluate and confirm operational benefit assumptions
- **Characteristics of the AIRS Operational Evaluation**
  - Minimal ATC infrastructure modifications
  - Focused data collection and analyses involving ATC, flight crews and engineering
  - Key questions to answer:
    - **Operational Feasibility:** How well does it integrate and work in a real operational environment?
    - **Value:** Does it provide value to airlines, flight crews, ATC and the public?
    - **Retrofit Solution:** Can the benefits be achieved using a less costly aircraft retrofit solution (versus forward fit solution)





# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

*How Data Collection was Used in I-IM Operational Evaluation*



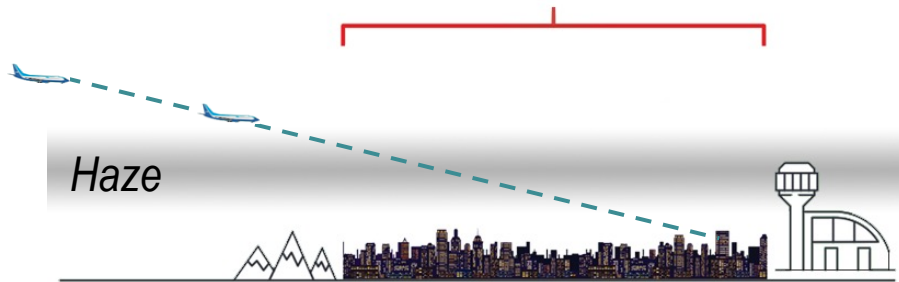
**Example Change:** Divided IM clearance issued by controller to reduce flight crew "startle factor"

*Feedback to I-IM Operations*

*Final report contains a detailed list of topics that were discussed and addressed*

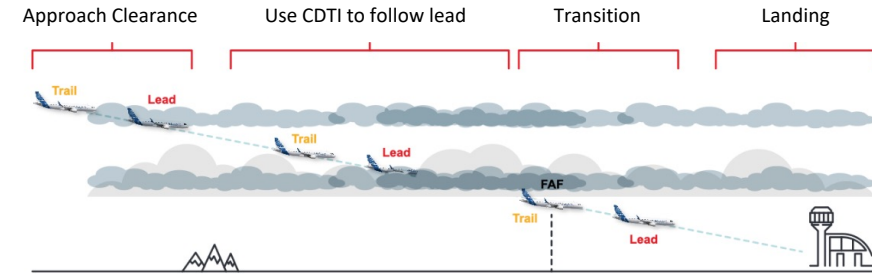
# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

## CDTI Assisted Visual Separation (CAVS)

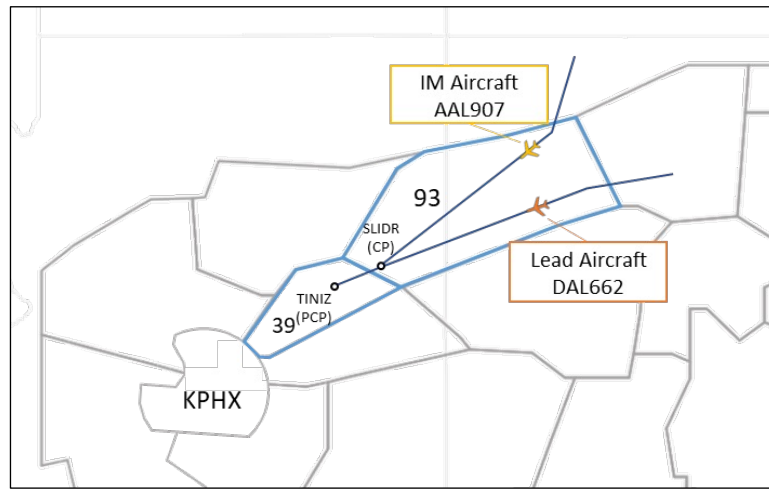


- Flight crews can use CDTI to maintain contact with Traffic-to-Follow (TTF) during challenging visibility situations (Haze, Surface Lights, etc.)
- Flight crews must acquire TTF “out the window” (OTW) first, then can rely on CDTI display
- No controller required for operation

## CDTI Assisted Separation on Approach (CAS-A)



- Controller clears aircraft for an approach and instructs CAS-A aircraft to follow the Traffic-to-Follow (TTF)
- Flight crew acquires TTF on CDTI with no OTW required
- Airport must be VMC, but aircraft may transit IMC to the airport (if on instrument approach)



EAGUL Arrivals into PHX

## Initial-Interval Management (I-IM)

- Pilots use tools in the flight deck to achieve and then maintain an Assigned Spacing Goal (ASG)
- Limited to two clearances – “cross” and “maintain”
- Operations can be performed with time based ASG (seconds) or distance based ASG (NM)
- I-IM is a subset of Flight-deck Interval Management (FIM)

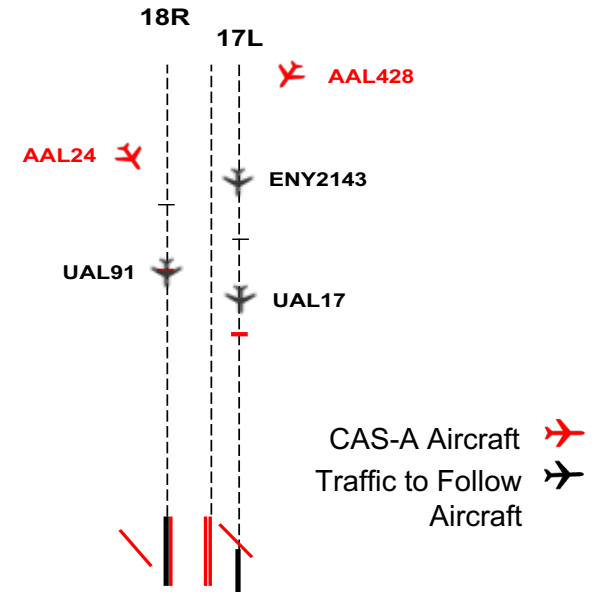
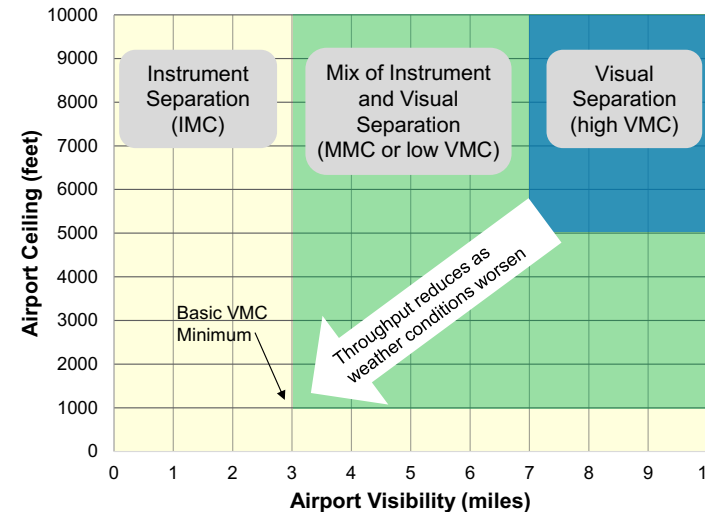
# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

## CDTI Assisted Separation on Approach (CAS-A)

### • CAS-A Operations

- Dallas Fort Worth International Airport (KDFW) had to be reporting VMC (1000 ft AGL ceiling; 3 SM horizontal visibility)
- CAS-A could be used in conjunction with a visual or instrument approach
- CAS-A aircraft were told to designate TTF and needed to confirm that with controller
- TTF designation could be issued by feeder controller or final controller
- CAS-A aircraft was given an approach clearance and subsequently instructed to “follow traffic” (could be one transmission or two separate transmissions)
  - Controller would enter VC (Visual approach CAS) or IC (Instrument approach CAS) into STARS scratchpad
  - VC/IC appeared as alternating element (with landing runway) in STARS datablock

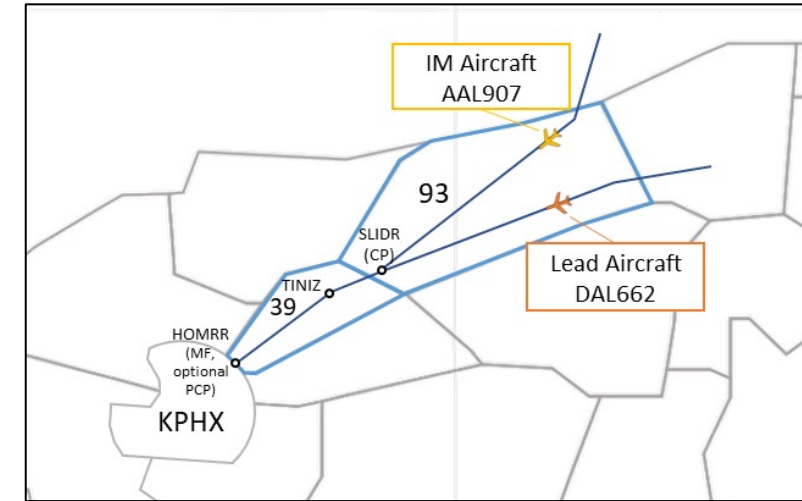
### • STARS did not prompt controllers about CAS-capable aircraft



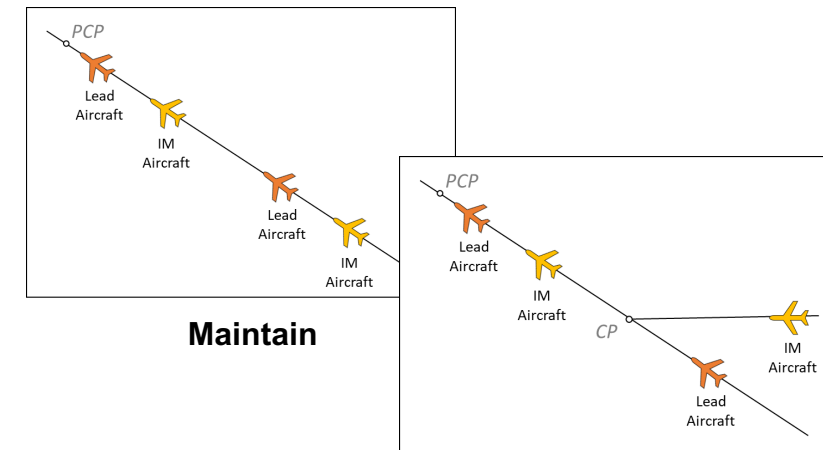
# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

## Initial-Interval Management (I-IM) – concept overview

- **Established partnership with Albuquerque Center (ZAB) to conduct operational flight evaluation of I-IM**
- **I-IM supports controllers in meeting a spacing goal**
- **IM avionics provide IM speeds to a flight crew that enables them to achieve an ATC Assigned Spacing Goal (ASG) relative to a Lead aircraft**
  - ASG can be in time (seconds) or distance (NM)
  - Limited to two clearances – “cross” and “maintain”
  - Used in level flight and descents to Center/TRACON boundary
- **Due to the lack of I-IM specific ground automation modifications, ZAB controller Subject Matter Experts provided required support (e.g., identifying IM pairs, ASG determination, sector coordination, etc.)**
- **Increases throughput and reduces delay through improved inter-aircraft relative spacing precision**
- **Improves spacing consistency versus with a ground system alone**



EAGUL arrivals



Maintain

Cross

➤ **Spacing precision achieved was close to MOPS assumptions ( $\pm 10$  seconds of the ASG 95% of the time)**

# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

## *Agenda*

- **Project Background**
  - Operational Evaluation Details
  - CDTI-Assisted Separation on Approach (CAS-A) Overview
  - Initial-Interval Management (I-IM) Overview
- **Controller Feedback**
  - CDTI-Assisted Separation on Approach (CAS-A)
  - Initial-Interval Management (I-IM)
- **Lessons Learned**
  - CDTI-Assisted Separation on Approach (CAS-A)
  - Initial-Interval Management (I-IM)

# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

*CDTI Assisted Separation on Approach (CAS-A) – Controller Feedback from Directed Discussions*

## **“Directed Discussions” were held with controllers in Nov 2024 during standard “team briefing” sessions**

- Most controllers indicated when they were busy, they did not think about CAS-A operations, but that could change with more equipped aircraft
- Attempting a CAS-A operation during a busy period required controllers to think about a different clearance with different phraseology which could break up their rhythm working the arrival/approach traffic feed
- Most controllers mentioned that visual separation was rarely used at the Dallas TRACON (D10)
- Many controllers stated that they could do the approach spacing better themselves\* and did not need any assistance from the flight crew
- Some controllers stated CAS-A operations were good during hazy conditions

\* While stated by many controllers, the quantitative data appears to challenge this assertion



# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

## *Initial-Interval Management (I-IM) Controller Feedback, 1 of 2*

- **Overall impressions**

- When flight crew was proficient with IM system, the operation worked well
- Most controllers had a positive experience with IM operations
- Given lack of automation support, support of ZAB controller SMEs was required

- **ZAB controllers could be grouped in three categories**

- Enthusiastic: could see how IM operations were beneficial conducted IM operations whenever possible
- Neutral: happy to do IM operations when supported by ZAB controller SMEs [most controllers]
- Negative: did not see benefits for their operation (tended to work in sectors with few IM opportunities)

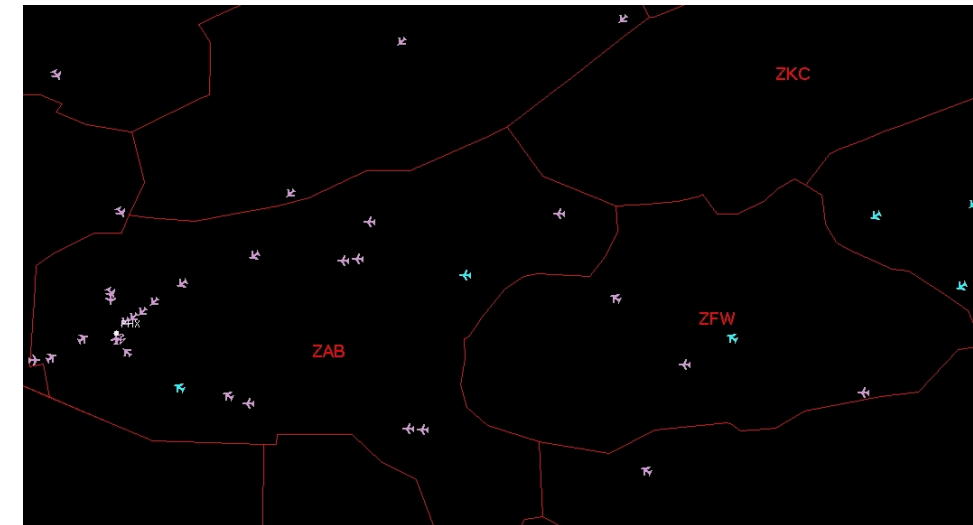
- **Some difficulties encountered**

- Early in evaluation, some flight crews were hesitant to accept IM clearances
- Controllers frustrated by long learning curve for flight crews – generally issuing IM clearances took longer
- Convective weather tended to disrupt or prevent IM operations
- Lack of opportunities given number of capable aircraft (3% of total air carrier airframes operating in US)

# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

## Initial-Interval Management (I-IM) Controller Feedback, 2 of 2

- **More information is needed in ERAM to support IM operations**
  - Indication of which aircraft can conduct IM (see below)
  - Identification and display of Lead aircraft and IM aircraft
  - Time-based ASGs derived from planned times of arrival of Lead and IM aircraft at common fix and displayed at controller position
  - Information to enable coordination across sectors and facility boundaries
- **ERAM “capability indicator” provided late in 2<sup>nd</sup> year of evaluation**
  - Green “M” near target symbol (see graphic at right) based on flight plan data (‘SUR/I0’ in Field 18)
  - Not enough time to conduct a formal evaluation, but several controllers felt it would be more effective to have “M” as part of data block versus adjacent to aircraft symbol
- **Coloring AAL A321 aircraft on Traffic Situation Display for PHX arrivals on Enhanced Status Information System (ESIS) board was more effective for ZAB controllers**



# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

## *Agenda*

- **Project Background**

- Operational Evaluation Details
- CDTI-Assisted Separation on Approach (CAS-A) Overview
- Initial-Interval Management (I-IM) Overview

- **Controller Feedback**

- CDTI-Assisted Separation on Approach (CAS-A)
- Initial-Interval Management (I-IM)

- **Lessons Learned**

- CDTI-Assisted Separation on Approach (CAS-A)
- Initial-Interval Management (I-IM)

# Lessons Learned – CAS-A oriented

- **Lack of ATC Automation support**

- Controllers struggled to easily identify CAS-capable aircraft and were less likely to remember to initiate a CAS operation
- Flight time/distance reductions identified were encouraging but would be limited without “CAS-awareness” in ATC arrival flow management automation

- **ATC Considerations for CAS-A Operations**

- Though most TTF designations were issued by Final controller, being able to designate TTF in outer terminal airspace (Feeder controller) would be more desirable for flight crews

- **Pilot Training for CAS-A Operations**

- Emphasize importance of proper use of ownship and TTF call signs, other tips to avoid call sign confusion, and minimizing requests for controller to repeat TTF’s call sign

- **Considerations for Flight Crew Interface**

- While not specified in standards, a traffic search/filter feature should be considered by all CDTI system designers to help flight crews quickly find TTF call sign
- Pilots indicated desire to have a CDTI in a location that works well for both pilot positions and integrated with the installed ND

# Lessons Learned – I-IM oriented

- **Operational Evaluation Approach and Focus**

- Operations over multiple years allowed data to drive modifications and more learning
- Focus new operations in areas where they can be used most often – anything new has a learning curve

- **Phraseology**

- Delicate balance to keep short as possible but provide enough information
- Phraseology that is clear to controllers may not be clear to pilots (for operations in a single location)
- Breaking up phraseology into a “designation” phase, followed by IM clearance, was most successful

- **Lack of IM-specific ATC Automation Tools**

- Controllers struggled to easily identify IM-capable aircraft and less likely to remember to issue an IM clearance without a prompt from a ZAB controller SME
- Coordinating IM operations between sectors/areas was done using ERAM data block 4<sup>th</sup> line, but this approach had limitations and could be confusing when used
- Time-based IM operations were very difficult or impossible to initiate without a ZAB controller SME supplying an ASG

# ADS-B In Retrofit Spacing (AIRS) Evaluation Project

*Additional Questions?*

