

# Automatic Dependent Surveillance – Broadcast (ADS-B)

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**Honeywell**

## Honeywell and ADS-B

- Honeywell has been developing ADS-B enabled avionics for several years.
- A number of ADS-B In and Out products are currently in operation in virtually all segments of aviation
  - General Aviation
  - Corporate Aviation
  - Regional Transport
  - Air Transport
  - Military Transport
- Honeywell is proud to support new ADS-B capabilities that will offer clear benefits to our customers and help the world's airspace evolve into a more efficient and safer environment for aviation.

## What's Been Done?

Honeywell Bendix King KT-73 Mode S Panel Mount Transponder (DO-260) used in Air Services Australia ADS-B Trials



Honeywell TRA-67A Mode S Transponders have been capable of DO-260 1090ES for several years. Shipping on virtually all Air Transport Types.

### Traffic Computer



Honeywell certified Traffic Computer with SmartTraffic™ for use by Airbus for integration of Airborne Traffic Situational Awareness (ATSAW) applications like In Trail Procedure in non-oceanic airspace.

ADS-B Based Surveillance and Data Link for *Autopilot Coupled* station keeping provided by Honeywell MILACAS-FR.

Military is an excellent first adopter and proving ground for demanding applications which can transition to civil sector when appropriate infrastructure (ground and air) in place.



## What Are We Doing for ADS-B Out?

### ADS-B OUT Avionics Equipage transitions to DO-260B



Honeywell is modifying the following Mode S Transponders to transmit DO-260B, US NPRM compliant ADS-B Out

- TSO Received : Primus II & Primus EPIC
- In Development: Primus Apex TRA-67 MST 67A



# ADS-B Out Product Planning

Product	Application	DO-260	DO-260A	DO-260B
AESU (A380)	Air Transport	--	Available	Available
TRA-67A	Air Transport	Available	--	Replace with TRA-100B
TRA-100B	Air Transport	-	-	TSO 1Q15
Epic	Regional, Helicopter Business Aviation	--	Available	Available
Primus II	Regional Business Aviation	--	--	Available
MST-67	Regional Business Aviation	--	--	Replace with MST 100B
MST 100B	Regional Business Aviation	—	—	TSO 1Q15
APEX	Business Aviation General Aviation	--	--	TSO 4Q13

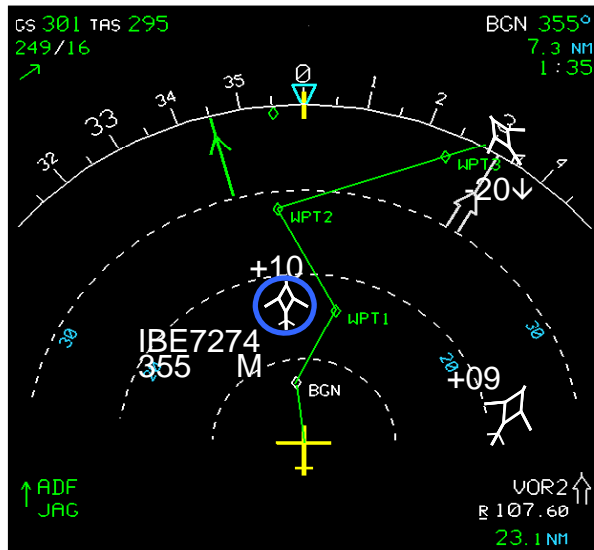
# Traffic/Aircraft Collision Avoidance System



**SmartTraffic™ - Foundation for Honeywell's ADS-B enabled Hybrid Surveillance and Airborne Traffic Situational Awareness (ATSAW)**

## SmartTraffic™ for TCAS Traffic Computer

### Airborne Traffic Situational Awareness (ATSA-AIRB)



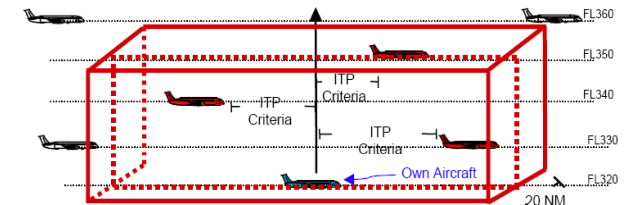
- Position, Orientation, Relative Altitude, Vertical Tendency
- Aircraft ID, Ground Speed, Wake Vortex (when traffic selected)

### Enhanced Visual Separation on Approach (ATSA-VSA)



- Better situational awareness relative to preceding aircraft.
- Runway capacity improvement

### In-Trail Procedures in Oceanic Airspace (ATSA-ITP)



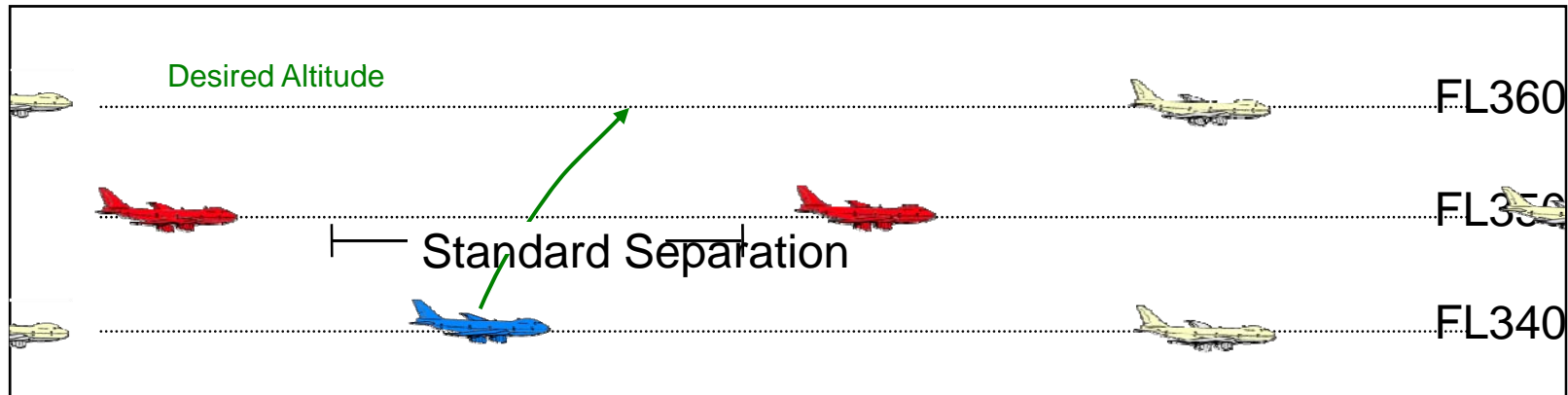
ITP TRAFFIC LIST 1/3	
SEP	80NM / -2000FT CLIMB
CRITERIA	15NM / -20KT
AFR6512	ITP NOT ALLOWED
<13NM REL ALT+10	D.GS+22
AZA557	ITP NOT ALLOWED
<18NM REL ALT+20	D.GS-07
DLH461	ITP ALLOWED
<55NM REL ALT+11	D.GS-05

- ICAO & FAA\* recognized procedure
- Airspace capacity improvement
- Fuel burn reduction through transoceanic flight routing

**Honeywell is first to certify ATSAW; Software only upgrade solution**

**<http://www.honeywell.com/SmartTraffic>**

# Motivation for ADS-B In-Trail Procedures (ITP)



**NEED → CHALLENGE = OPPORTUNITIES**

→ Altitude Changes required for better fuel economy, winds, and ride quality

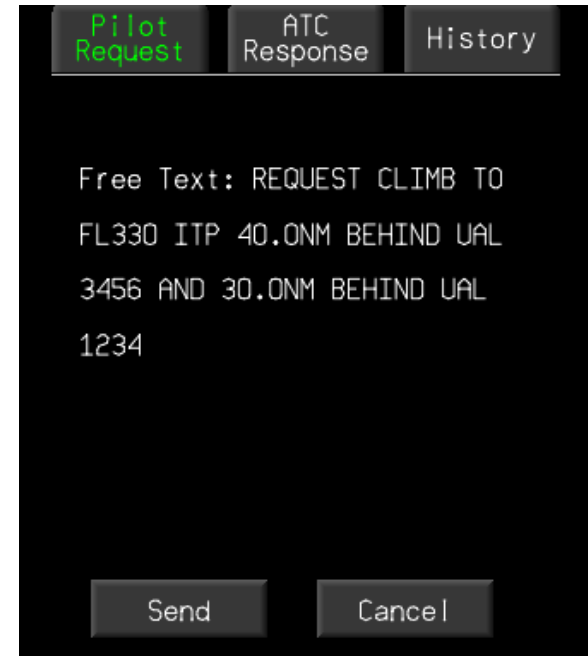
→ The combination of locally dense traffic and large separation minima limits altitude changes

→ Use airborne ADS-B applications to enable altitude changes otherwise blocked by conventional operations

Source: FAA



# Cockpit Display of Traffic Information (CDTI)\* – In Trail Procedures (ITP)



ITP request formulation based on traffic selection and criteria checks.

Note: \* denotes under development

## SmartTraffic™ – CDTI\*

- Initial functions
  - (Enhanced) Traffic Situation Awareness (TSA) – (ATSA AIRB)
  - (Enhanced) Visual Separation on Approach (VSA)
  - Oceanic In-Trail Procedures (ITP) for Air Transport aircraft
  - Airport Surface Situation Awareness (ASSA) – (ATSA SURF)\*
- Platform for future CDTI
  - Advanced Approach Applications such as:
    - CDTI Assisted Visual Separation (CAVS)\*
    - CDTI-Assisted Pilot Procedures (CAPP)\*
  - Various Interval Management (IM) applications
    - Flight Deck Interval Management – Spacing (FIM-S)\*
    - Flight Deck Interval Management – Defined Interval (FIM-DI)\*
    - Interval Management - Defined Interval, Oceanic (IMDIO)\*
  - VFR-like Separation in All Weather Conditions or Electronic Flight Rule (EFR)\*



Note: \* denotes under development

# Runway Occupied Alert Examples\*



Caution Alert

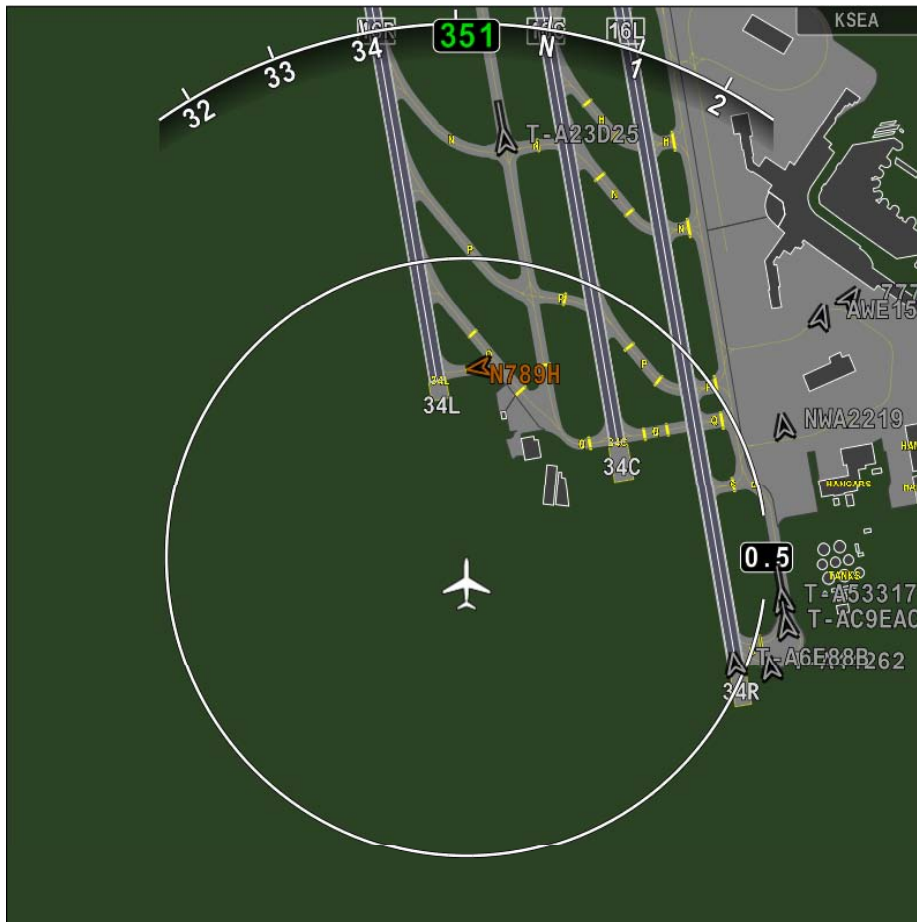


Warning Alert

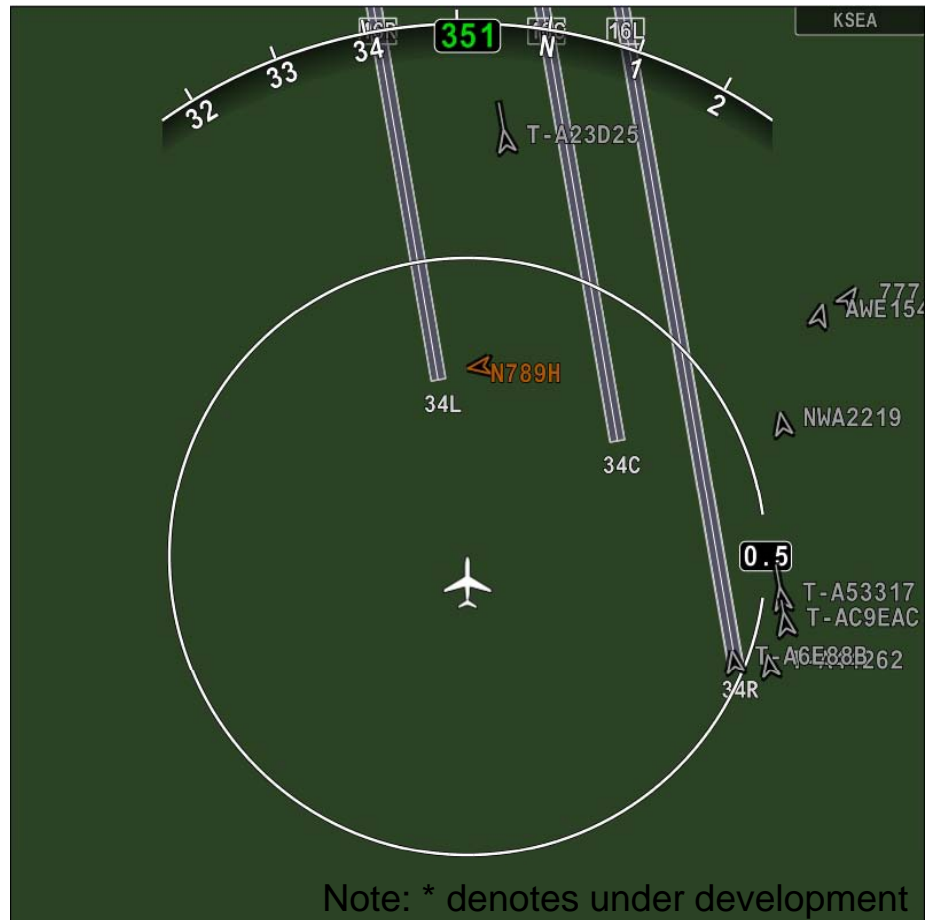
Note: \* denotes under development

# ASSA versus FAROA\*

ASSA (Airport Surface Situational Awareness)



FAROA (Final Approach and Runway Occupancy Awareness)



Note: \* denotes under development

## Honeywell ADS-B Capability Planning

2008

2010

2012

2014

2016

2018

### Horizon 1

#### ADS-B Out

- Adding ADS-B Out to production transponders
- Hybrid Surveillance

### Horizon 2

#### Initial ADS-B In SmartTraffic™ Applications

- Enhanced Visual Separation on Approach
- AIRB
- In Trail Procedure
- SURF

### Advanced Technology R&D

### Horizon 3

#### Advanced ADS-B In Applications

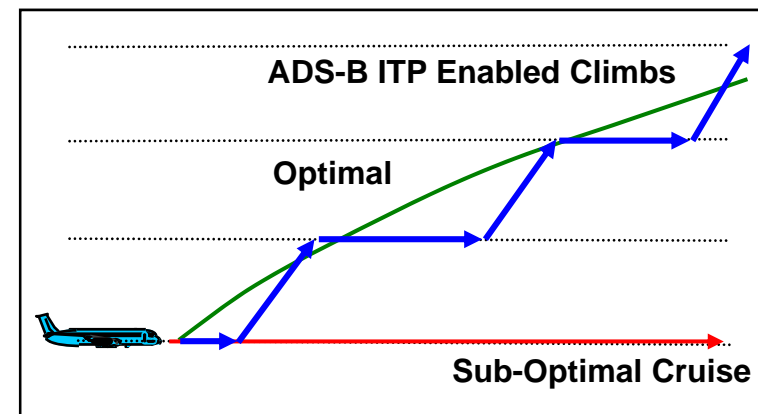
- Flight Deck Interval Management
- SURF IA

## ADS-B In Trail Procedure Operational Evaluation

- The objective of the program is to demonstrate potential fuel savings opportunities enabled by the ADS-B In – In Trail Procedure (ITP).
- Under an FAA funded program, Honeywell is developing, system integrating, and certifying a complete ITP avionics capability to be STC'd on United Airlines 747-400s.
- The system consists of Honeywell's TPA 100B Traffic Computer with ADS-B In and ITP capability, TRA 67A Transponders with ADS-B Out, and a Class 3 EFB running Honeywell ITP display software.
- United Airlines will operate approximately 12 Honeywell ITP avionics equipped 747-400 aircraft in the South Pacific (SOPAC) route for a 1 year Operational Evaluation.



First Officer EFB



## System Concept



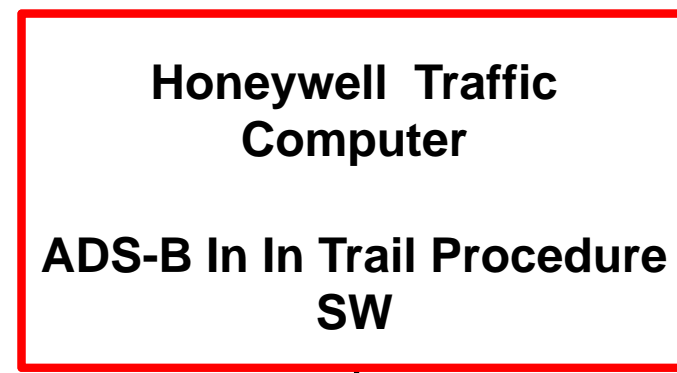
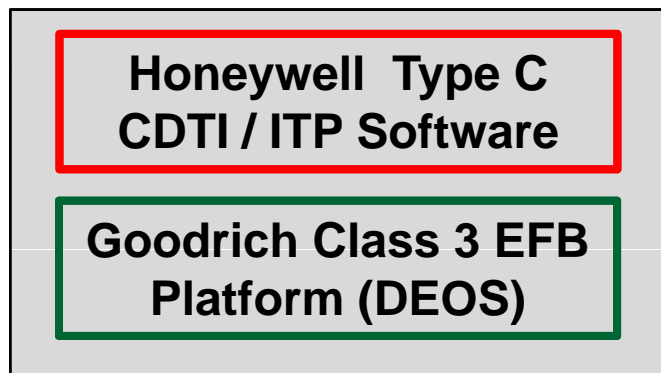
**Goodrich SmartDisplay® EFB with  
Honeywell SmartTraffic™ ITP Application**



**Honeywell TPA 100B  
Traffic Computer**



**Honeywell TRA 67A Mode  
S ADS-B Out Transponder**



A429 Display Data

## ITP Operational Benefits

- The objective of the In Trail Procedure (ITP) Operational Evaluation program is to demonstrate potential positive economic benefit opportunities enabled by ADS-B In.
- The Economic Benefit is projected to be realized as follows:
  - ITP certified aircraft will be able to climb to more efficient altitudes more often than current separation standards allow thereby saving fuel burn
  - An ITP certified fleet can save weight and fuel burn by loading and carrying less contingency fuel based on the expectation that desirable climbs will be possible more often
  - The weight savings generated by reductions in contingency fuel can be converted to revenue generating cargo or passengers.



## Conclusion

- Honeywell is committed to supporting ADS-B globally
  - Hundreds of ADS-B transponders delivered
  - More research & development underway
  - Helping to develop the global standards for ADS-B
  - Aircraft equipage decisions required for older aircraft
- Performance-Based Requirements
  - Install DO260 equipage for early applications
  - Align position performance and operational requirements
- ADS-B is a relatively simple technology
  - Varying business cases for operators and ANSPs
  - Plans must deliver value to all stakeholders throughout the transition
  - This will accelerate aircraft user adoption and airspace benefits
  - ADS-B In system complexity still in work with Merging and CDTI implementations

*ADS-B is a Key Building Block for ATM Modernization*