

# Avionics Solutions for ADS-B

**Honeywell**

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# What's Been Done?

**Honeywell Bendix King** KT-73 Mode S Panel Mount Transponder (DO-260) used in Airservices 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.

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.



## Traffic Computer

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



# FAA Surface Indicating & Alerting Program (SURF IA)

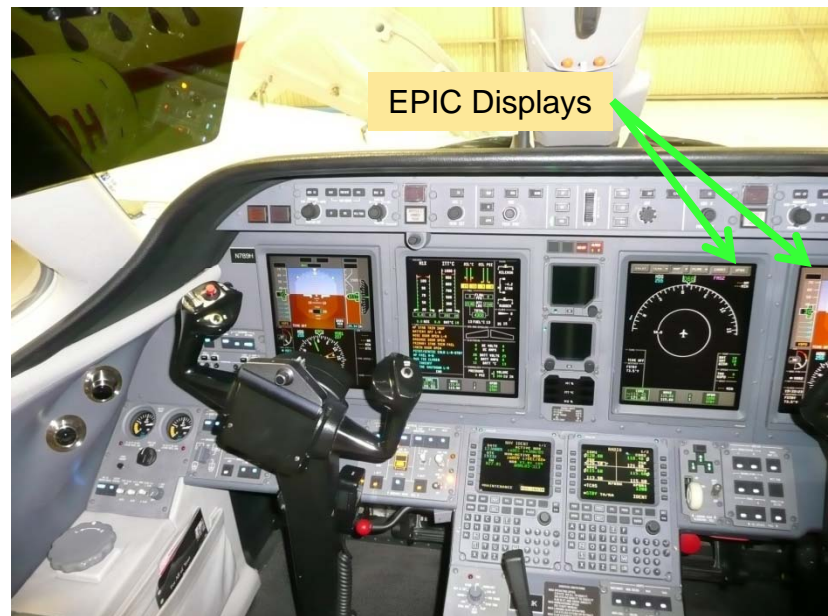
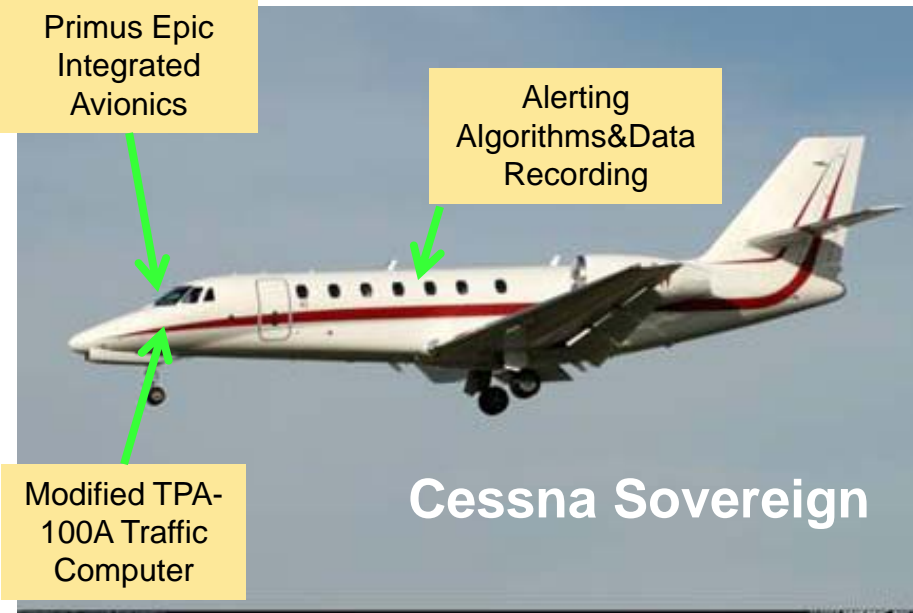
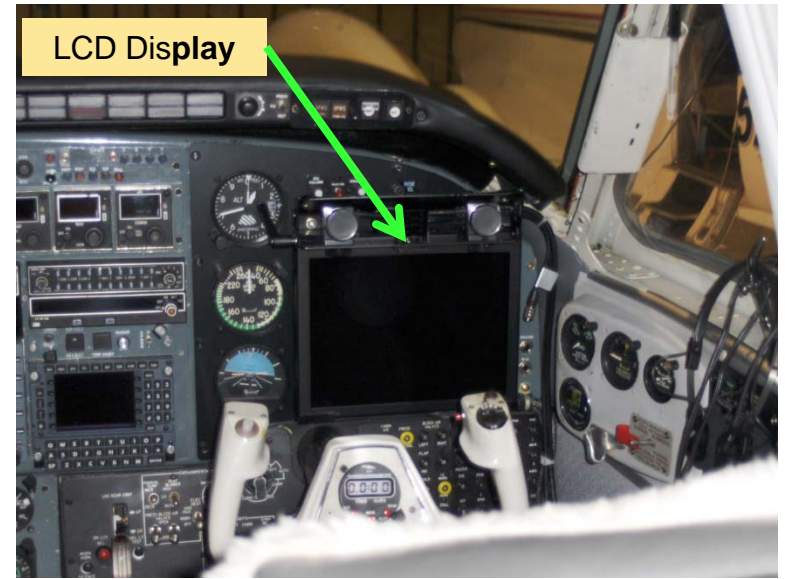
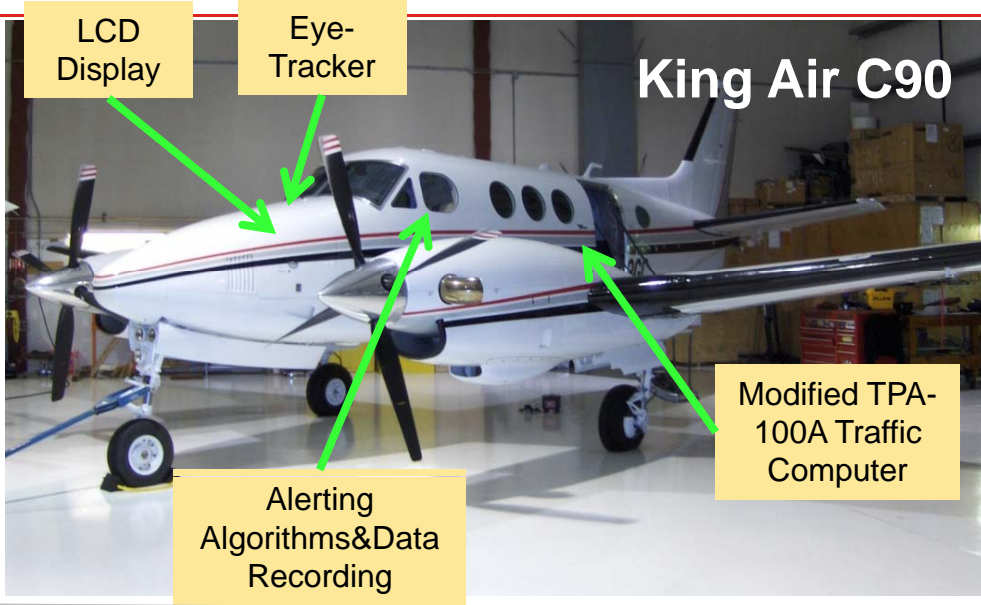
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- FAA Sponsored Program with Honeywell, Jet Blue & Alaska Airlines
- Sixteen Month Program (Nov 2008 - Mar 2010) to:
  - Accelerate RTCA SURF IA standards development by producing an Operational Performance Assessment and Operational Safety Assessment
  - Develop display concepts and indication and alerting algorithms
    - ◆ Honeywell human factors evaluation included JetBlue Airways and Alaska Airlines pilots
  - Prototype display, surveillance and alerting functionality
  - Demonstrate the system
    - ◆ Demonstrations at Seattle-Tacoma International airport (SEA) and Snohomish County Paine Field airport (PAE) Dec 2009 – Feb 2010
    - ◆ Preliminary evaluation of TIS-B compatibility and Effectiveness for SURF IA at SEA
    - ◆ Use Honeywell King Air and Sovereign test aircraft



# Honeywell Aircraft for SURF IA Demonstrations

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# Runway Occupied Alert Examples



Caution Alert

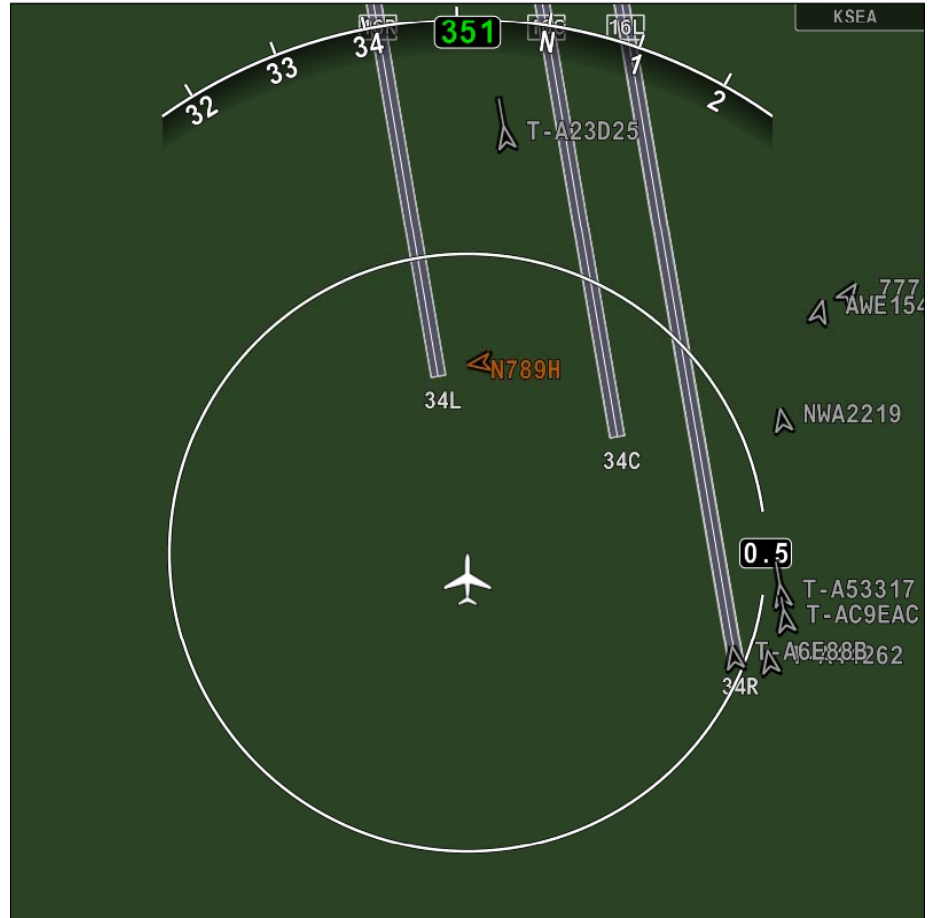
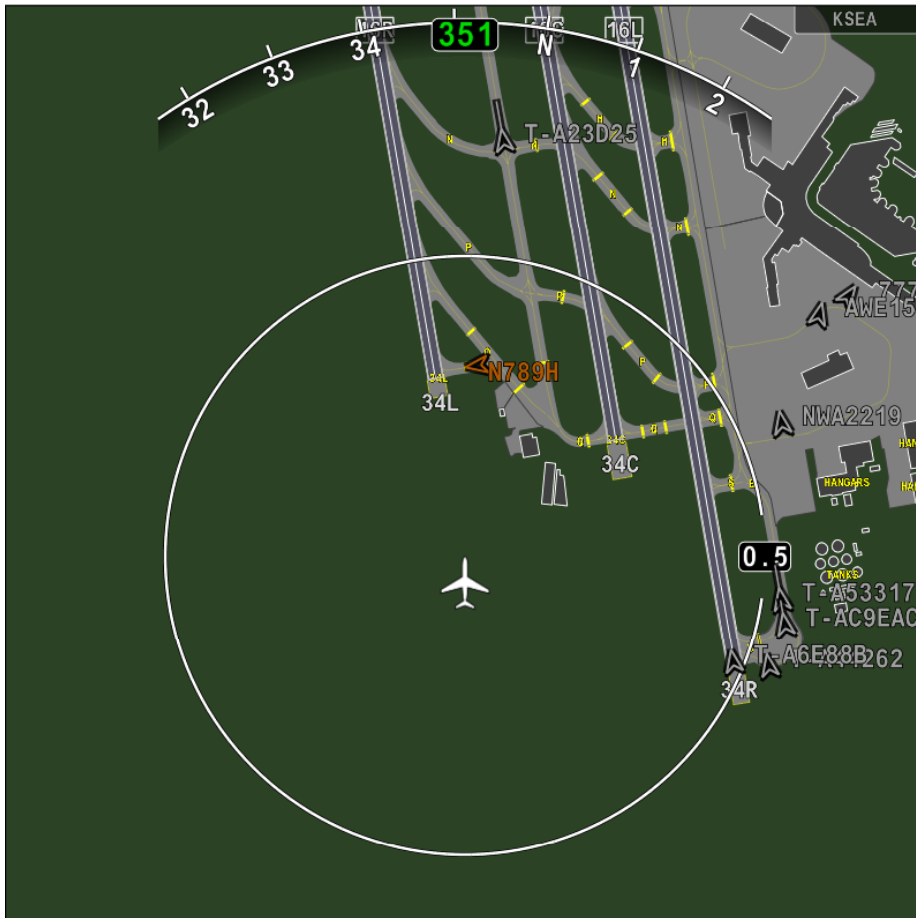


Warning Alert

# ASSA versus FAROA

## ASSA Airport Surface Situational Awareness

## FAROA Final Approach and Runway Occupancy Awareness



- **Pilot Acceptance:**

- Generally good Pilot Acceptance
- Pilots found airport map and traffic display very useful for gaining and maintaining situational awareness
- Display of “Engaged Traffic” and “Target Velocity Vector” was very useful
- Pilots prefer ASSA display, but found FAROA acceptable
- No data to support a requirement for inhibiting indications and alerts during Land and Hold Short Operations (LAHSO)

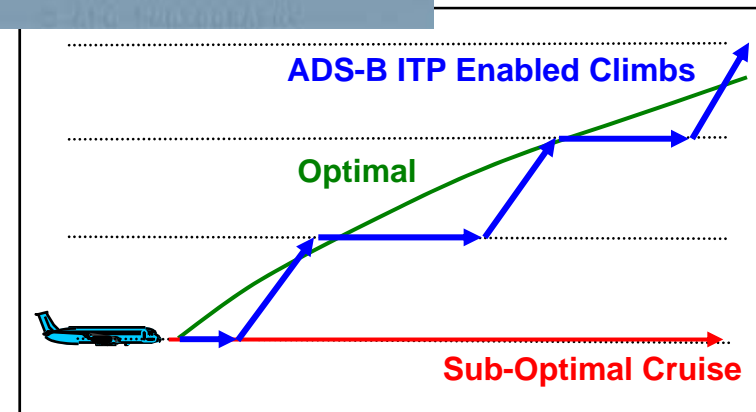
- **System Performance Observations:**

- Overall system performed well with some observations/limitations:
- **Some concerns/limitations observed with ADS-B data:**
  - ♦ Navigation Integrity Code (NIC) and Navigation Accuracy Code for Position (NACp) values *reported* by aircraft were often outside the limits set for SURF IA
- Many ADS-B equipped aircraft do not have Heading correctly reported (generally use Track angle, which is reported as zero when aircraft is stationary)
- ADS-B transmissions were sometimes masked when line-of-sight was blocked
- Occasionally observed loss of ADS-B signal reception, possibly due to multi-path reflections from hangars and/or large aircraft

# ADS-B In Trail Procedure Operational Evaluation Honeywell

- **Honeywell** has developed, integrated, and certified a complete ITP avionics capability STC'd on United Airlines 747-400s.
- The system consists of our TPA-100B Traffic Computer with ADS-B In and ITP capability, TRA 67A Transponders with ADS-B Out, and a Goodrich Class 3 SmartDisplay® EFB running Honeywell SmartTraffic™ ITP display software.

First Officer EFB





# What Are We Doing?

## 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

- MST 67A                      TRA-67A
- Primus II                      Primus EPIC
- Primus Apex



## Traffic Computer

**Honeywell** is modifying the TPA 100B to add SURF capability.

# What About UAT?

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- + Additional “uplink” capacity
- + Supported in U.S.
- + ADS-B Out and In
- + Lower total cost?
  - + lower transmit power
  - + integral receiver
  - + design analysis on-going

- ATC Transponder still required
  - Support for TCAS, SSRs
- Common control inputs
  - Mode A codes, Ident
- Global standard is 1090ES
  - Not globally interoperable
  - Need for rebroadcast
- Requires “timemark” from GPS

## Other Considerations

- Other commercial alternatives for broadcast weather
- Avionics solutions for ADS-B In
- Bandwidth for future aircraft densities
- Interoperability issues when operating away from ground station

*Choice Driven By Airspace & User Needs*

# Honeywell ADS-B Capability Planning

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2008

2010

2012

2014

2016

2018

## Horizon 1 ADS-B Out

- Adding ADS-B Out to production transponders
- Hybrid Surveillance
- Military Station Keeping

## Horizon 2 Initial ADS-B In Applications

- Smart Traffic
- 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

# 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**
  - Exploit 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*