Avionics Solutions for ADS-B
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.

**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.

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.
FAA Surface Indicating & Alerting Program (SURF IA)

- 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

King Air C90

LCD Display
Eye-Tracker
Alerting Algorithms & Data Recording
Modified TPA-100A Traffic Computer

Cessna Sovereign

Primus Epic Integrated Avionics
Alerting Algorithms & Data Recording
Modified TPA-100A Traffic Computer

EPIC Displays
Runway Occupied Alert Examples

Caution Alert

Warning Alert
ASSA versus FAROA

ASSA
Airport Surface Situational Awareness

FAROA
Final Approach and Runway Occupancy Awareness

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Principal Findings

- **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
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.
What Are We Doing?

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?

| + Additional “uplink” capacity | - ATC Transponder still required |
|                              | - Support for TCAS, SSRs |
| + Supported in U.S.            | - Common control inputs |
| + ADS-B Out and In             | - Mode A codes, Ident |
| + Lower total cost?            | - Global standard is 1090ES |
|                               | - Not globally interoperable |
|                               | - Need for rebroadcast |
|                               | - Requires “timemark” from GPS |

| + lower transmit power         | + lower transmit power |
| + integral receiver            | + integral receiver |
| + design analysis on-going     | + design analysis on-going |

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

**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

**Horizon 3**
Advanced ADS-B In Applications
- Flight Deck Interval Management
- SURF IA

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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*