CUSTOMER SUCCESS STORY

A world-class avionics solution for an aircraft with a unique mission

Primus Epic® CDS/R upgrade helps a Boeing 747SP reach for the stars

Overview
NASA must deliver world-class scientific research and space exploration in times when significant economic and budgetary challenges mean that it must maximize the value of any expenditure.

By converting a Boeing 747SP, which first flew in 1977, to carry a 19 ton telescope, NASA’s Stratospheric Observatory For Infrared Astronomy (SOFIA), the world’s largest airborne astronomical observatory, was born.

NASA needed to equip the 30-year-old aircraft with an avionics platform that would support several thousand flights over the next 20 years. Honeywell’s Primus Epic Control Display System Retrofit (CDS/R) was selected as the avionics solution for the aircraft.

Background
NASA’s Stratospheric Observatory For Infrared Astronomy (SOFIA) is the world’s largest airborne astronomical observatory.

A partnership between NASA and the German Aerospace Center (DLR), SOFIA makes use of an extensively modified Boeing 747SP aircraft, carrying a reflecting telescope with an effective diameter of 2.5 meters. The German-built telescope weighs 19 tons and is mounted in the rear fuselage of the aircraft.

Based at Palmdale, California and flying at altitudes of up to 45,000 feet, above 99.8 percent of the water vapor in the atmosphere, SOFIA studies the universe at infrared wavelengths, enabling observations unobtainable from even the largest and highest ground-based telescopes.

NASA and DLR have a shared goal that SOFIA will help scientists to better understand how stars and planets are formed, how organic materials necessary for life evolve in space and how the black hole at the center of the Milky Way influences its surroundings.

Another goal of SOFIA is to inspire the development of new scientific instrumentation and foster the education of young scientists and engineers.

SOFIA’s Boeing 747SP has a distinguished history. It was originally delivered to Pan American Airlines in 1977. The aircraft’s SP designation indicates the special performance, short-body version of the 747, designed for longer flights than the original 100 series of the Boeing 747.

Although Pan Am traditionally named its aircraft after famous clipper ships, it gave this aircraft a special name – Clipper Lindbergh – in honor of the famous aviator Charles Lindbergh.

Lindbergh’s widow, Ann Morrow Lindbergh, personally christened the aircraft on the 50th anniversary of Lindbergh’s history-making first solo flight from New York to Paris in 1927.

Bought by NASA in 1997 for its new role as a flying astronomical observatory, Clipper Lindbergh was eventually rededicated for its new mission in May 2007, by Lindbergh’s grandson Erik.

Business Need
More than 40 years after man last walked on the Moon, NASA remains at the forefront of scientific research and space exploration. SOFIA is one of many astrophysics missions under NASA’s Science Mission Directorate.

QUICK FACTS
Honeywell solution
Primus Epic® CDS/R

Product features
- A commercial off-the-shelf avionics solution
- The CDS/R integrates perfectly with other aircraft systems, assisting customers to deliver a great, long-term and cost-effective solution
- The CDS/R flight deck upgrade provides immediate appearance, usability and mandate compliance benefits while simultaneously readying the flight deck and aircraft for additional upgrades in the future

Why Honeywell?
- The high Mean Time Between Failure (MTBF) and low acquisition costs help in reducing Life Cycle Costs (LCC) and improving functionality, safety, and useful life of the SOFIA airframe. Honeywell’s global reach and network ensures that SOFIA is supported by world-class service and support

Customer
- Name: NASA SOFIA
- Location: Palmdale, California
- Industry: Astronomy
- Website: www.nasa.gov
Like any other federal administration, NASA is publicly funded through Congress and in the current economic climate the requirement to make budgets stretch as far as possible, while maintaining world-class performance, is more acute than ever.

NASA's response was to modify the Boeing 747SP and to equip the aircraft with the very best technology, for both the telescope and scientific equipment in the modified cabin section and on the flight deck to support the precise routes required for an airborne observatory.

Honeywell has been a supplier to NASA since the administration's launch in 1958 and Honeywell technology has been on board almost all of NASA's vehicles and on every human space flight vehicle since Apollo.

Solution
Honeywell's Primus Epic Control Display System Retrofit (CDS/R) equipped the aircraft’s flightdeck with a new, flexible and highly integrated avionics suite that seamlessly connects with existing equipment for an economical, operationally advanced system.

It also provides a platform on which a wide variety of additional components can be added to meet future requirements. New display features include graphical uplink weather and world leading Jeppesen charts and maps.

Honeywell’s DU-1080 liquid crystal display unit offers crisp, clear, full-color electronic flight instrument displays with excellent contrast ratios that are easy to read. These displays have logged well over five million flight hours on forward fit and retrofit aircraft platforms.

An advanced file graphics server generates custom graphics and performs high speed processing and high capacity data storage to support the display of electronic charts and maps and uplinked weather information.

The server enables the display of approach charts, terminal maps, standard instrument departure (SIDs) charts, standard terminal arrival (STARs) charts and the map application. The map feature provides a moving map on which uplink weather data is displayed.

Honeywell’s new XM data link weather receiver brings high speed graphical weather to the CDS/R flight deck.

The XM receiver adds a new dimension to Honeywell’s line of datalink weather receivers by providing WINN, Honeywell’s Weather Information Network, at any altitude, including on the ground.

Benefits
Honeywell’s Primus Epic CDS/R has a flexible and scalable architecture which allows customers to immediately gain benefits, while also positioning the aircraft for future upgrade with a variety of optional features.

Hardware is carefully selected to operate seamlessly with a very wide variety of legacy analog and digital hardware and interfaces.

For SOFIA, this ensures compliance with airspace regulations worldwide, and provides the NASA pilots with advanced safety, capability and reliability features.

With a heavy telescope on board, managing the aircraft’s weight is an ongoing operational issue. Honeywell’s modern, light LCDs help reduce overall weight by up to 45 kilograms (99lbs). The system is also designed to save on power and promotes more efficient cooling through a significant reduction in wiring.

Large LCD viewable areas, more in keeping with modern personal computers, with patented all angle viewing technology make seeing and absorbing data easier too, improving situational awareness and response.

Supported by Honeywell’s worldwide customer support, maintenance and planned upgrades can be executed smoothly and swiftly in concert with the aircraft’s busy schedule and evolving mission requirements.

“Honeywell’s CDS/R provides pilots with crystal clear screens and displays, delivering a huge range of much more easily accessible data - and therefore situational awareness - with which to navigate and fly safely and securely,” said Bob Blaser, senior product manager for manned space systems, Honeywell.

“Honeywell understands the importance of the work being done on the SOFIA program and is proud to provide the organization with great technology and a huge support network that means people are always on hand when NASA needs them.

“Honeywell’s CDS/R is a cost-effective solution that enabled NASA to replace the aircraft’s 30-year-old avionics with an advanced system that would meet airspace compliance and successfully prepare the aircraft for another 20 years of operation.”

Bob Blaser, senior product manager for manned space systems, Honeywell