

Statement of Work

Aircraft Interior and Lighting Upgrade

Boeing 747SP
Revision – Basic
April 2, 2012, 2012

Background

The National Aeronautics and Space Administration (NASA) operates a Boeing 747SP aircraft as an airborne astronomical observatory under the Stratospheric Observatory for Infrared Astronomy (SOFIA) Program. This aircraft is operated by NASA Dryden Flight Research Center (DFRC) and is based at Palmdale, CA. As owner and operator of this unique aircraft, NASA has a requirement to upgrade the Interior and Exterior lighting on the aircraft in preparation for the upcoming Science Flights.

Aircraft Information:

Type Aircraft	Boeing 747-SP-09
Engine Type	PW JT9D-7
Tail Number	N747NA
Line Number	306
Serial Number	21441
Effectivity	RG091
Location	Palmdale, CA

The SOFIA Program consists of an airborne observatory platform equipped with a 2.5 meter infrared telescope, and multiple subsystems to support the telescope and other scientific instruments capable of infrared and sub-millimeter observations. The aircraft will operate on a worldwide basis at a ceiling of 45,000 feet. The telescope will look out of an open cavity in the side of the aircraft and allow astronomers to obtain sharper infrared images than ever before for a planned operational life of 20 years.

The SOFIA Observatory aircraft will be required to support multiple missions which will consist of diverse crew members from around the world as well as students from Universities and High Schools. As a result, an upgrade to the current aircraft lighting and interior furnishings is required to support the mission crew, air crew and personnel onboard the aircraft. The average flight will be approximately 8 hours long.

Scope

This Statement of Work represents a plan for the completion of the design, development, installation support, test and verification of the SOFIA custom interior furnishings, placarding and lighting upgrade. This Statement of Work governs 2 key tasks: 1) the upgrade of the aircraft lighting from fluorescent to Light Emitting Diode (LED). 2) The design and manufacture of the interior ceiling and side paneling required for aircraft interior modifications and the repair of existing interior ceiling and sidewall panels.

Performance of this contract includes the use of commercial hardware and services to satisfy the stated requirements of NASA SOFIA flight and science operations.

The contractor shall support transition from development to operations by providing engineering support and consultation, as necessary, to NASA or its contractors on systems developed or integrated by the contractor.

Tasks

The contractor shall provide required products and services for NASA personnel to upgrade the interior and exterior lighting of the NASA B747SP aircraft. The upgrades shall include converting the current fluorescent lighting, with exception of the cockpit instruments, to LED. Examples of the lighting requirement are listed below, but they are not limited to:

1. Interior Lighting:
 - a. Running Lights
 - b. Cove Lights
 - c. Ceiling Lights
 - d. Wash Lights
 - e. Window Lights
 - f. Emergency Lighting
 - g. Exit
 - h. No Smoking/Fasten Seat Belt centrally located 3 places
 - i. Door Lights
 - j. Mission Consoles Work Station Lights
 - i. On Desk
 - ii. Overhead
 - k. Telescope Area Lighting
 - l. Cavity Lighting
 - m. Galley Lights

2. Exterior Lighting:
 - a. Landing and Runway Lights
 - b. Navigation Lights
 - i. Tail
 - ii. Wingtip
 - c. Anti-Collision Lights
 - i. Red Center Fuselage
 - ii. White Wing Tips
 - d. Tail Lights

The contractor shall provide the required products and services for NASA personnel to upgrade the interior paneling of the aircraft; this shall include the upgrade of all the interior sidewall and ceiling panels. The existing interior paneling shall be upgraded and repaired to include trim and matching color to accommodate the extensive aircraft modification. This will include all the interior aircraft side panels original equipment manufacturer (OEM) and local manufactured paneling located on the main cabin and upper deck. This task includes the following, but is not limited to:

1. Manufacture custom installation of overhead closed storage at center fuselage from FS 600 to FS 800

2. Manufacture floor to ceiling sidewall panels from Door 1 R aft, FS 500 to FS 1000
3. Manufacture covering for sidewalls adjacent to and including the MCCS rack to include:
 - a. light weight hinged and louvered doors for the MCCS rack installation that are capable of fastening securely for flight, and are recessed to accommodate cabling
 - b. Custom cover for the sidewalls and top of the MCCS rack to accommodate the highly modified area including cooling plumbing
4. Manufacture of light weight ceiling panels Zone 200, WL 320 RH, to WL 199 LH, FS 1390, to FS 1720, to accommodate the modified area over the telescope apparatus area.
5. Manufacture custom sidewall panels LH side of main cabin FS 1060 to FS 1080 and FS 1350 to FS 1720
6. Repair, refinish and color match all existing and local manufactured sidewall and ceiling panels in main cabin and upper deck.
7. Modify OEM panels that have components removed or that no longer exists, i.e. movie projector.
8. All panels and furnishings shall be trimmed for a smooth contoured appearance.

Engineering Support

1. Installation of each upgrade will be accomplished by NASA personnel with support from the awarded contractor. NASA shall provide documentation to support the integration of the new lighting system, interior installation and any other required A/C drawings to support the design and implementation efforts. Aircraft drawings and manuals shall be provided by the contractor with the assistance of NASA engineering to ensure the A/C wiring diagram and operation manuals reflect the configuration of the newly designed and installed equipment.
2. The contractor shall provide all Engineering Documents associated with the upgrades. This shall include the following:
 - a. Engineering Drawings
 - b. Installation Drawings
 - c. Installation Specifications
 - d. Installation Procedures
 - e. User Documents
3. The contractor shall provide on-site support, if required by NASA, to aid in the development, installation, troubleshooting, or any on-site visits to support the upgrade.

Technical Requirements

1. Contractor shall provide a power budget for upgrade of fluorescent lighting to LED. Power consumption shall not exceed 15% of current power allowed for aircraft lighting
2. EMI effects of new LED lighting shall be minimal. Science instruments which are planned to be used for the SOFIA missions are sensitive to EMI, thus **NASA will perform** an EMI test after all installations are complete.
3. All lighting installed on the interior shall be capable of dimming with the exception of the Emergency Lighting
 - a. Individual dimming control shall only be required for the workstation lights and individual seating areas
 - b. Each Zone, A, B and C shall have individual dimming controls for all lighting located in the Zone
4. All lighting installed at the workstation consoles, rack areas, Telescope Assembly Area, forward EPO area and all seats in the upper deck shall be capable of adjustable task lighting
5. Lighting shall be installed in the Cavity that is controllable from the aircraft compartment for ground use and main deck in-flight. Cavity lighting must be capable of being turned off during flight from the main deck. Cavity lighting must also be able to be indicated on/off at the Mission Directors console
6. A Master Control Panel Switch (MCPS) for all lighting shall be installed which shall control all aircraft lighting. This shall be located either in the Upper Deck and/or in Zone A of the main cabin
7. All installed upgrades shall use the current aircraft wiring, if possible, to maintain integrity of aircraft
8. All lighting must meet FAA and PMA certifications
9. All interior paneling including sidewalls and ceiling shall conform to FAR 25.853, FAR 25.601, FAR 25.603 and MIL-STD-1472E
10. The contractor shall submit to NASA a ground and airborne test plan for the lighting modification. NASA will certify the upgrade after successful completion of ground and airborne testing of the complete SOFIA lighting and interior installation.

Safety and Quality Assurance

1. All supplied materials and hardware used for installation must comply with the requirements set forth in the attached NASA QA Procurement Quality Requirements
 - a. Q-1: Aircraft Assemblies, Parts and Materials, Counterfeit Prevention of Electronic Parts, Certification of Conformance, Process Qualification and Control, and Delivery Requirements

- b. Q-2: Certified Material Test Report and Aircraft Fastener Testing
- c. Q-4: Procurement of Electrical Wire
- d. Q-5: Electrical/ Electronic Articles and Materials
- e. Q-6: Age Control of Synthetic Elastomers
- f. Q-9: Identification and Data Retrieval
- g. Q-10: Process Qualification and Control

All information regarding these documents can be found in the attachment

Deliverables

1. All hardware and parts associated with the installation of the lighting components to include but not limited to, the LED fixtures, dimming modules, mounting hardware, etc.
2. Hardware and parts associated with the installation of all interior furnishings and panels.
3. Operation and Installation manuals including illustrated parts catalogue IPC.
4. Spare components as recommended by vendor or engineering.
5. Raw material manufacturer's test report
6. Engineering Drawings
7. Installation Drawings
8. Installation Specifications
9. Installation Procedures
10. User Documents
11. Operation, Installation, and Maintenance Manuals
12. All Applicable Drawings

Place of Performance

Manufacture of products: Contractor Facility

Installation Support: Dryden Aircraft Operations Facility, 2825 East Avenue P,
Palmdale, CA 93550

Period of Performance

Installations and system integrity shall be completed prior to January 2013.