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System Description, Installation, and Maintenance Manual

Aspire 350-3A

Part Number	Model
90405928-001	Aspire 350-3A SDU
90405930-000	Aspire 350-3A SCM
90406851-000	Aspire 350 HGA
90406980-000	Aspire 350 LGA

Publication Number D202305003983, Revision 0

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THIS IS AN INITIAL RELEASE OF ASPIRE 350-3A SDIMM ATA NO. 23-15-74 ISSUED FOR USE IN SUPPORT OF THE FOLLOWING:

Table TI-1 shows the applicable components.

Table TI-1. Applicable Components

Component PN	Nomenclature
90405928-001	Aspire 350-3A Satellite Data Unit (SDU)
90405930-000	Aspire 350-3A SDU Configuration Module (SCM)
90406851-000	Aspire 350 High Gain Antenna (HGA)
90406980-000	Aspire 350 Dual Low Gain Antenna (LGA)

Revision History

Table TI-2 shows the revision history of this SDIMM .

Table TI-2. Revision History

Revision Number	Revision Date
0	14 Aug 2024

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RECORD OF REVISIONS

For each revision, write the revision number, revision date, date put in the manual, and your initials in the applicable column.

NOTE: Refer to the Revision History in the TRANSMITTAL INFORMATION section for revision data.

Revision Number	Revision Date	Date Put in Manual	By		Revision Number	Revision Date	Date Put in Manual	By

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RECORD OF TEMPORARY REVISIONS

Instructions on each page of a temporary revision tell you where to put the pages in your manual. Remove the temporary revision pages only when discard instructions are given. For each temporary revision, put the applicable data in the record columns on this page.

Definition of Status column: A TR may be active, incorporated, or deleted. “Active” is entered by the holder of the manual. “Incorporated” means a TR has been incorporated into the manual and includes the revision number of the manual when the TR was incorporated. “Deleted” means a TR has been replaced by another TR, a TR number will not be issued, or a TR has been deleted.

Temporary Revision Number	Status	Page Number	Issue Date	Date Put In Manual	By	Date Removed From Manual	By

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SERVICE BULLETIN LIST

Service Bulletin/ Revision Number	Title	Modification	Date Put In Manual

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SECTION 1 – INTRODUCTION

1. How to Use This Manual

A. General

(1) This manual provides information about the installation of the Aspire 350-3A System.

(2) Standard maintenance procedures that technicians must know are not given in this manual.

(3) This publication is written in agreement with the ATA Specification.

(4) Warnings, cautions, and notes in this manual give the data that follows:

- A WARNING gives a condition or tells personnel what part of an operation or maintenance procedure, which if not obeyed, can cause injury or death
- CAUTION gives a condition or tells personnel what part of an operation or maintenance procedure, which if not obeyed, can cause damage to the equipment
- A NOTE gives data, not commands. The NOTE helps personnel when they do the related instruction.

(5) Warnings and cautions go before the applicable paragraph or step. Notes follow the applicable paragraph or step.

B. Symbols

(1) The symbols and special characters are in agreement with (IEEE) Publication 260 and IEC Publication 27. Special characters in text are spelled out.

(2) The signal mnemonics, unit control designators, and test designators are shown in capital letters.

(3) The signal names followed by an "*" show an active low signal.

(4) The symbols in Figure 1-1 show non-ionizing radiation hazard, ESDS , and moisture sensitive devices.

ICN-38473-1000083826-001-01

Figure 1-1. Hazard Symbols

C. Figures

(1) Figures are labelled using a suffix number after the section they are contained in.

(2) Figures spanning multiple pages contain a reference to the number of sheets and current sheet, for example, (Sheet 1 of 9).

2. Scope

This manual provides detailed information for avionics technicians about the wiring, installation, and setup of the Aspire 350-3A Satellite Communications System. The installer is responsible for the approval and certification of system components on the aircraft, and for the installation of wiring in the aircraft.

NOTE : The use of the name Aspire 350-3A is interchangeable with simply Aspire 350 which is the certified name of the product.

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4. References

A. Honeywell/Vendor Publications

(1) Additional publications related to the operation and maintenance of the Aspire 350-3A system are described in Table 1-1.

Table 1-1. Honeywell and Vendor Publications

Description	ATA Number	Publication Number
Component Maintenance Manual with Illustrated Parts List, Aspire 350-3A SCM	23-15-65	D201910000022
Aspire ORT Tool User Guide	23-15-66	D201910000024
Aspire 350-3A User Guide	23-15-69	D202407004453
Component Maintenance Manual with Illustrated Parts List, Aspire 350-3A SDU	23-15-75	D202307004037

Table 1-2. Vendor Publications

Description	Vendor	ATA Number	Publication Number
Abbreviated Component Maintenance Manual, Aspire 350-3A LGA	AeroAntenna Technology	23-15-01	AT1621-23
Instructions for Continued Airworthiness and Abbreviated Component Maintenance Manual, Aspire 350-3A HGA	AeroAntenna Technology	23-15-03	AT7521-7()

B. **Reference Publications**

(1)
- The United StatesGPO Style Manual (available at http://www.gpo.gov/fdsys/pkg/GPOSTYLEMANUAL- 2008/content-detail.html)
- IEEE Std 260.1, Standard Letter Symbols for Units of Measurement (available from the American National Standards Institute at http://www.ansi.org)
- ASME Y14.38, Abbreviations for Use on Drawings and Related Documents (available from the American National Standards Institute at http://www.ansi.org)
- ASME Y14.5, Dimensioning and Tolerancing (available from the American National Standards Institute at http://www.ansi.org)
- ANSI/IEEEStd 91, Graphic Symbols for Logic Functions (available from the American National Standards Institute at http://www.ansi.org)
- CAGE codes and manufacturer's addresses are available at https://cage.dla.mil.
- IEEE 315/ANSI Y32.2, Graphic Symbols for Electrical and Electronics Diagrams (available from the American National Standards Institute at http://www.ansi.org)
- RTCA DO-262F, Change 1, Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS) September 15, 2022
- RTCA DO-160G Environmental Conditions and Test Procedures for Airborne Equipment Dec 8, 2010
- RTCA DO-326 Airworthiness Security Process Specification, December 8, 2010
- RTCA DO-356A Airworthiness Security Methods and Considerations, June 21, 2018
- RTCA DO-301 Minimum Operational Performance Standards (MOPS) for Global Navigation Satellite System (GNSS) Airborne Active Antenna Equipment for theL1 Frequency Band, December 13, 2006
- ARINC 600-20 Air Transport Avionics Equipment Interfaces, July 11, 2017
- ARINC 429 P1-19 Digital Information Transfer System (DITS), Part 1, Functional Description, Electrical Interfaces, Label Assignments and Word Formats, June 25, 2009
- ARINC 771-2 Low-Earth Orbiting Aviation Satellite Communication Systems, August 15, 2023

5. Acronyms and Abbreviations

A. General

(1) The abbreviations are used in agreement with ASME Y14.38.

(2) Acronyms and non-standard abbreviations used in this publication are as follows:

Table 1-3. List of Acronyms and Abbreviations

Term	Full Term
AAC	Aeronautical Administrative Communication
ACARS	Aircraft Communications Addressing and Reporting System
ACD	Aircraft Control Domain
AES	Aircraft Earth Station
AMO	Approved Maintenance Organization
AOC	Aircraft Operational Control
APC	Aeronautical Passenger Communications
ASME	American Society of Mechanical Engineers
ATA	Air Transport Association
ATS	Air Traffic Service
AWG	American Wire Gage
BCX	Broadband Core Transceiver
BITE	Built-In Test Equipment
BP	Bottom Plug
CAGE	Commercial and Government Entity
CBIT	Continuous Built-In Test
CFDS	Centralized Fault Display System
CFM	Cubic Feet per Minute
CFR	Code of Federal Regulation
CMC	Central Maintenance Computer
CMU	Communications Management Unit
CRC	Cyclic Redundancy Check
DAL	Design Assurance Level
DHCP	Dynamic Host Control Protocol
EMI	Electro-Magnetic Interference
ESDS	Electrostatic Discharge Sensitive
ETH	Ethernet
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation

Table 1-3. List of Acronyms and Abbreviations (Cont)

Term	Full Term
FTP	File Transfer Protocol
GB	Gigabyte
GPO	Government Publishing Office
GUI	Graphical User Interface
HCM	Honeywell Certus MODEM
HGA	High Gain Antenna
HW	Hardware
ICAO	International Civil Aviation Organization
IEC	International Electro-technical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identify
IPC	illustrated parts catalog
IRS	Inertial Reference System
JAA	Joint Aviation Authority
KPA	Kilopascal
LAN	Local Area Network
LBT	L-Band Transceiver
LED	Light Emitting Diode
LGA	Low Gain Antenna
LRU	line replaceable unit
LSP	Loadable Software Part
MAX	Maximum
MB	Megabyte
MEL	Minimum Equipment List
MIB	Management Information Base
MOPS	Minimum Operational Performance Standards
MP	Middle Plug
NEMA	National Electrical Manufacturers Association
NO	Normal Operation
NTP	Network Time Protocol
OID	Object Identifier
ORT	Owner Requirements Table

Table 1-3. List of Acronyms and Abbreviations (Cont)

Term	Full Term
POST	Power On Self-Test
PSI	Pounds per Square Inch
RAM	Random Access Memory
REV	Revision
RF	Radio Frequency
RFI	Radio Frequency Interference
RX	Receive
SAE	Society of Automotive Engineers
SATCOM	Satellite Communications
SCM	SDU Configuration Module
SDIMM	System Description, Installation, and Maintenance Manual
SDU	Satellite Data Unit
SEC	Secondary
SIP	Session Initiation Protocol
SITA	Société Internationale de Télécommunications Aéronautiques
SNMP	Simple Network Management Protocol
SSU	Safety Services Unit
STC	Supplemental Type Certificate
STD	Standard
SW	Software
TNC	Threaded Neill–Concelman
TP	Top Plug
TR	temporary revision
TX	Transmit
USIM	Universal Subscriber Identity Module
VDC	Voltage Direct Current
WSC	Williamsburg SATCOM Controller
WSCI	Williamsburg SATCOM Controller Interface
csv	Comma Separated Values
dB	decibels
hr	Hour
kg	Kilogram
lb	Pound

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SECTION 2 – SYSTEM DESCRIPTION

1. Aspire 350-3A SATCOM System Overview

The Aspire 350-3A satellite communications (SATCOM) system is designed to be installed on an aircraft to operate as an Aircraft Earth Station (AES). An AES is used to transmit and receive wireless signals from air-to-ground via a relay satellite as part of the Aeronautical Mobile-Satellite (Route) Service (AMS(R)S). The Aspire 350-3A system interfaces with the Iridium satellite network to supply voice and data services to the aircraft cockpit and cabin. Figure 2-1 shows the L-band system. The Iridium network employs a constellation of 66 space vehicles (SVs) in low Earth orbit (LEO) arranged in six polar orbits.

The Iridium network provides fully global voice and data communications. Messages form aircraft to ground are routed from satellite-to-satellite on intersatellite crosslinks and landed at teleports around the world located in several locations on the earth. A connected aircraft transitions (seamlessly) from satellite to satellite as a rising satellite comes into view of the aircraft and a setting satellite moves out of coverage of the aircraft location. The dynamic nature of the Iridium constellation provides added redundancy and high network availability. Once landed, traffic enters the PSTN/PSDN (for Block 1 services) or is routed to the Internet for broadband services via Iridium gateways. Traffic from the ground moves in the opposite direction.

Iridium-based communication solutions have been widely adopted by nearly all segments of the aviation industry. The Iridium Block 1 service is primarily employed to transmit safety voice calls and safety data messages to and from aircraft in remote continental and oceanic airspace beyond the range of line-of-sight terrestrial VHF links. The Iridium Certus service is used by the Aspire 350-3A system for non-safety communications.

Connection with the Iridium network is via the LGA (Low Gain Antenna) for cockpit safety voice and for ACARS data. These services make use of the legacy Block 1 services that have been in use by the aviation industry for more than 10 years. The new Iridium satellites host the Block 1 payloads to support the installed base of aviation users.

The High Gain Antenna (HGA) is used to connect to broadband Certus services. This allows for upload speeds of 350kbps (kilobits per second) and download speeds of 700kbps. This connectivity is intended for non-safety, non-priority services used by the cabin.

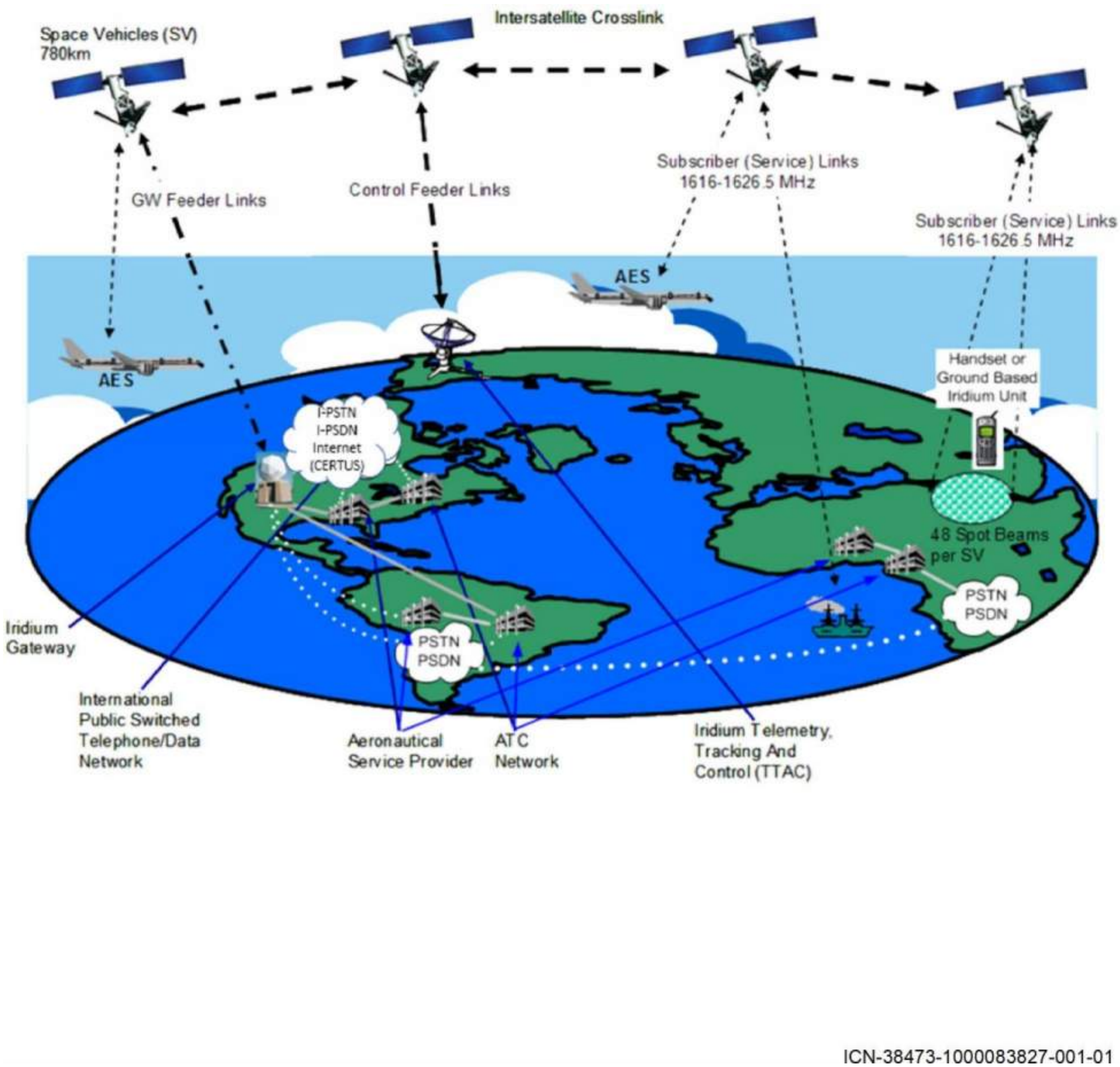


Figure 2-1. Iridium L-band Network Basic Configuration

A. General Description

(1) In this document, the product identifier (“Aspire 350-3A”) is interchangeable with the product name (“Aspire 350”) used for certification.

(a) The Aspire 350-3A system provides satellite voice and data connectivity using the Iridium satellite service in support of the following categories of communications:

1 Aircraft Control Domain (ACD) including cockpit safety voice and data communications.

a Air Traffic Service (ATS)

b Aircraft Operational Control (AOC)

c Aeronautical Administrative Communication (AAC)

d Aeronautical Passenger Communications (APC)

AND

2 A The Non-Safety Domain which provides non-safety, non-prioritized voice and data. It is suitable for cabin services.

(b) The Aspire 350-3A avionics equipment consists of a Satellite Data Unit (SDU), an SDU Configuration Module (SCM), a High Gain Antenna (HGA), and a dual Low Gain Antenna (LGA).

(c) The Aspire 350-3A provides three satellite communication channels:

1 Two channels for the following cockpit services (via the LGA):

a Aircraft Communications Addressing and Reporting System (ACARS) data, supporting AOC, ARINC 623 ATS, and FANS 1/A+ services (CPDLC, ADS-C, AFN)

b One channel of cockpit voice

c Position reporting functions

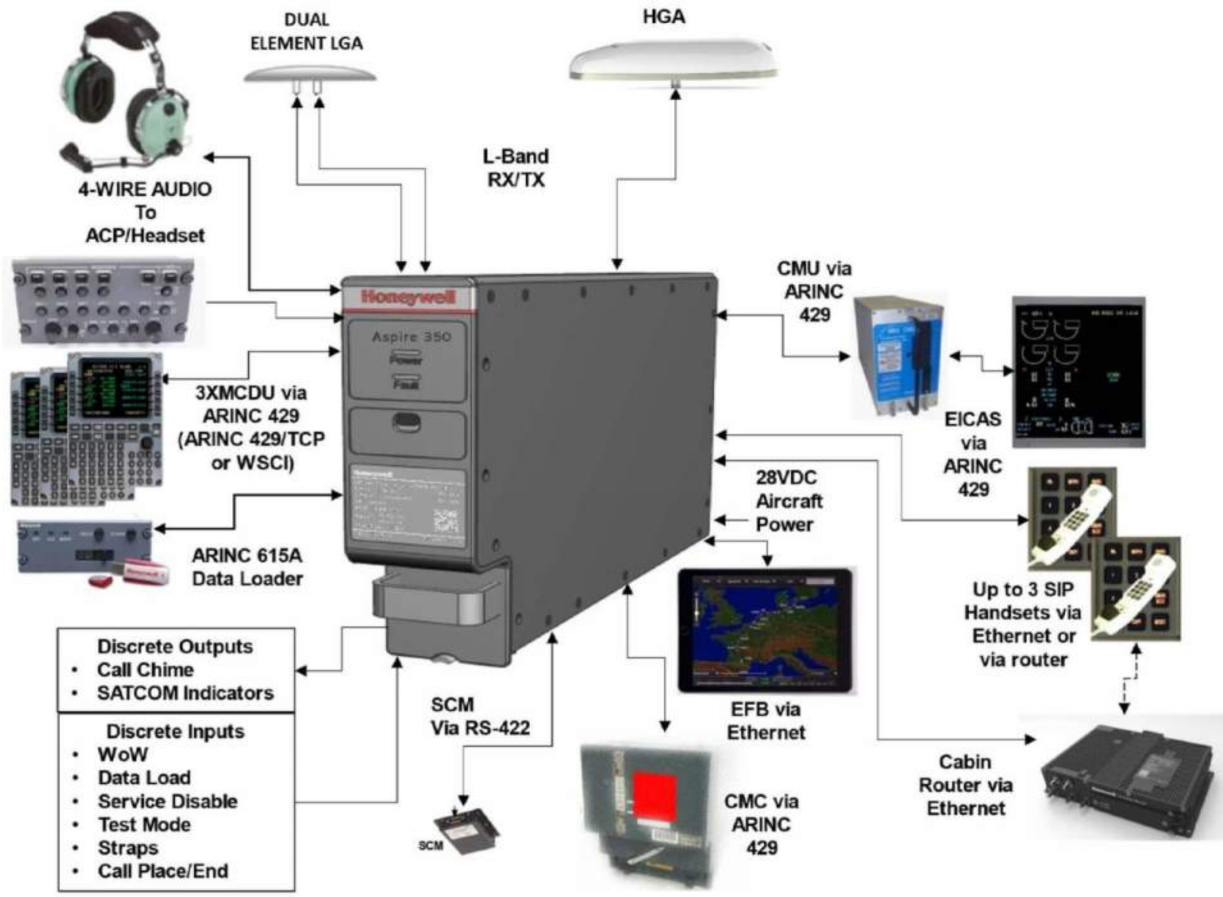
2 A third channel for cabin voice and data services (via the HGA) using the Honeywell Certus MODEM (HCM). The HCM is a ruggedized BCX (Broadband Core Transceiver).

B. Hardware Part Numbers

(1) The Aspire 350-3A System is made up of the LRUs in Table 2-1.

Table 2-1. Aspire 350-3A LRU Hardware Part Numbers

SATCOM Product	Hardware Part Number
SDU	90405928-001
SCM	90405930-000
HGA	90406851-000
LGA	90406980-000



ICN-38473-1000083828-001-01

Figure 2-2. Aspire 350-3A System Block Diagram

A. Satellite Data Unit (SDU)

(1) The Aspire 350-3A SDU is the central communications processing and control unit, largely determining the functionality of the complete Aircraft Earth Station and provide the following cockpit and cabin services:

(a) Trusted domain for cockpit service:

1 One safety data channel to transmit and receive ACARS datalink messages.

2 One safety voice channel to support a single SATVOICE call.

(b) Untrusted domain for cabin service.

1 3 simultaneous channels of Session Initiation Protocol (SIP) voice used by any of up to 30 SIP handsets.

2 Standard Internet Protocol (IP) applications .

B. SDU Configuration Module (SCM)

(1) The SCM provides memory for storage of ORT files and licenses and hosts up to two Universal Subscriber Identity Modules (USIMs) needed for Iridium network access. If the Aspire 350-3A SDU is replaced, the previous ORT configuration saved on the SCM is automatically transferred to the replacement SDU without requiring an ARINC 615A upload of the ORT configuration. It assists in the replacement of faulty SDUs as it minimizes SATCOM re-configuration steps.

C. Antenna

(1) The Aspire 350-3A system utilizes a dual-puck LGA to provide cockpit services and an HGA to provide cabin services.

3. AES Iridium Functions and Services

A. The SDU, SCM and HGA are designed to support the Iridium service offerings described below in Table 2-7

Table 2-7. Service Offering

Service Offering	Description
Cockpit safety (LBT modems) and Certus modem Cabin services (Refer to Figure 2-3)	- Cockpit safety via Iridium legacy block 1 modems with passive dual LGA also referred to as the dual puck antenna - Cabin service via Iridium Certus modem with HGA as shown in Figure 2-3.

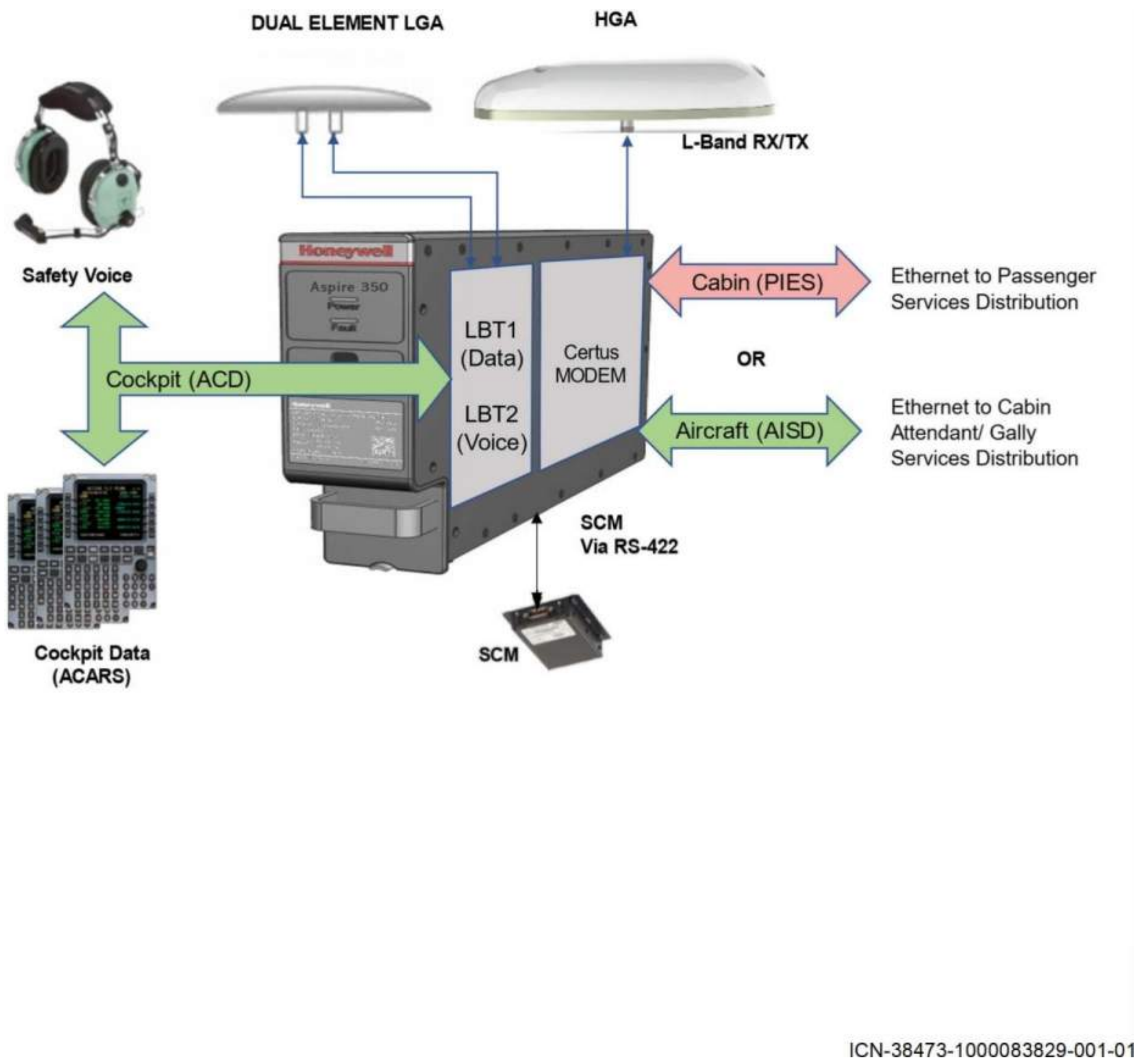


Figure 2-3. AES System Configuration Showing Aspire 350-3A

4. Segregation of ACD and Non-Safety Domains

A. The Aspire 350 SDU maintains strict segregation between the safety/high priority cockpit communications services and the administrative/cabin services. This follows RTCA DO-326A and DO-356A for cyber-security guidance and consideration. The Aspire 350 SDU architecture ensures that the lower security domain used by the cabin and administrative applications can never access the cockpit data pathways. This includes the physical layers for the cockpit as well as the higher layers associated with control and network protocols.

B. This segregation is achieved through both physical and electrical means and has been subjected to rigorous testing and analysis within Honeywell. The implementation of these measures starts at the requirements definition stage and is flowed to the design both in hardware and software.

SECTION 3 – SYSTEM OPERATION

1. SATCOM Modes of Operations

A. Overview

(1) The mode of operation of the Aspire 350-3A system is controlled by the SDU. After power is applied to the system (“Power-On Mode”) the SDU performs a self-test prior to providing full operational services. The SCM provides the configuration information for the SDU. The SDU waits for HGA communications before completing the SATCOM Configuration test. After the POST (Power-On Self-Test) sequence is completed the HGA is disabled.

(2) Figure 3-1 shows the potential transitions between operational modes.

B. **Power On Mode**

(1) Power-On Mode is entered when power is applied to the SDU.

(2) Power-on functions include:

(a) Booting Aircraft Control Domain (ACD) application code. No other processors are active during this mode.

(b) Providing a limited set of Built-In Test Equipment (BITE) tests that can only be performed by boot code.

C. **SDU Configuration & Test Mode**

(1) The SDU Configuration & Test Mode is entered when ACD application code begins executing.

(2) The SDU Configuration & Test Mode functions include:

(a) ORT and Licence validation.

(b) Performing startup operations.

(c) Configuring the SDU based on configuration strap wiring, Secure ORT and User ORT values, and the presence or absence of licence key files.

(d) Executing invasive tests.

(e) Transitioning to Data Loading Mode if a software upload operation is requested.

(f) No user services are available.

D. **SATCOM System Configuration & Test Mode**

(1) The SDU enters SATCOM System Configuration & Test Mode on successful completion of SDU Configuration mode.

(2) The SATCOM System Configuration & Test Mode functions include:

(a) Waiting until communications are established with the HGA (if installed).

(b) Retrieving HGA configuration data.

(c) Validating that HGA functions align with the settings indicated in the ORT.

(d) Performing cable calibration (calculating cable attenuation between SDU and HGA).

(e) Optionally executing system invasive tests.

(3) When the above tests are performed on the ground (WOW detected) the HGA is disabled. Note that there are no RF transmissions during POST.

E. **Application Mode**

(1) The SDU enters Application Mode upon the successful completion of operations performed during SATCOM System Configuration & Test Mode.

(2) In Application Mode, the SDU is capable of providing Iridium Block 1 satellite services for SATVOICE and ACARS applications, and Iridium Certus satellite services to either devices connected to the Ethernet 1 Port or devices connected to the Ethernet 2 Port.

(3) If the Dual Safety Disable discrete input is asserted to signal ground, the SDU remains in Application Mode but disables RF transmissions.

(4) If the system detects "On-Ground" operation, the system will transition to Data Loading Mode if a software upload operation is requested.

(5) Certain faults reported by the continuous built-in test (CBIT) function on the SDU will result in a transition to RF Safe Mode.

F. Data Loading Mode

(1) In Data Loading Mode, the SDU can perform a software upload of loadable software parts (LSPs) or a file download of historical logs.

(2) Data Loading Mode is activated by initiating an ARINC 615A operation or selecting "Activate" on the "Dataload" page on the Web GUI.

(3) After a download operation, Data Loading Mode exits to Application Mode.

(4) After an upload operation (e.g., installation of Secure ORT or User ORT), the SDU automatically performs a reset and returns to Power On Mode.

(a) If the upload operation is successful, the SDU eventually transitions to Application Mode.

(b) If the upload operation is unsuccessful, the SDU eventually transitions to RF Safe Mode.

(5) Refer to SECTION 6 – SOFTWARE CONFIGURATION-for further details on Data Loading.

G. Aircraft Test Mode

(1) If the SDU detects "On-Ground" operation, it will transition to Aircraft Test Mode if any of the following tests are commanded by the operator:

(a) Commanded Self-Test (using CFDS or Web GUI).

(b) Audio Loopback Test.

(c) Audio Test Tone.

(d) Carrier Test Tone.

(2) During Aircraft Test Mode the SDU is reconfigured as appropriate for the selected test. Certain interfaces and functions may not be available.

(3) The SDU returns to Application Mode after completing Commanded Self-Test.

(4) The SDU remains in Aircraft Test Mode after other tests are completed until it is reset.

H. Radio Frequency (RF) Safe Mode

(1) The SDU transitions to RF Safe Mode if any of the following system configuration conditions are detected by POST or CBIT:

(a) SDU configuration missing including missing licence keys.

(b) SDU configuration incomplete.

(c) SDU configuration discrepancy or corruption.

(2) In RF Safe Mode, the RF output of the system is disabled as a significant system configuration problem has been detected. RF Safe Mode does permit other interactions to allow the condition (e.g., loading a missing ORT) to be identified and potentially remedied. Once the problem has been remedied, normal operation can only be achieved by an SDU power cycle.

(3) Characteristics of this mode include:

(a) RF transmissions are muted and satellite services are disabled.

(b) If the error permits, the Web GUI remains operational, permitting the configuration error to be identified via:

1 Multi-function Control and Display Unit (MCDU)

2 CMU interface communications

3 CFDS communications

4 Web GUI maintenance interface

(c) The capability to enter Data Loading Mode

SECTION 4 – SYSTEM PRE-CONFIGURATION

1. Aspire 350-3A Configuration

The Aspire 350 SATCOM can be configured to provide an ACD domain for secure cockpit communications and an optional Non-Safety domain suitable for cabin services as shown in Figure 4-1.

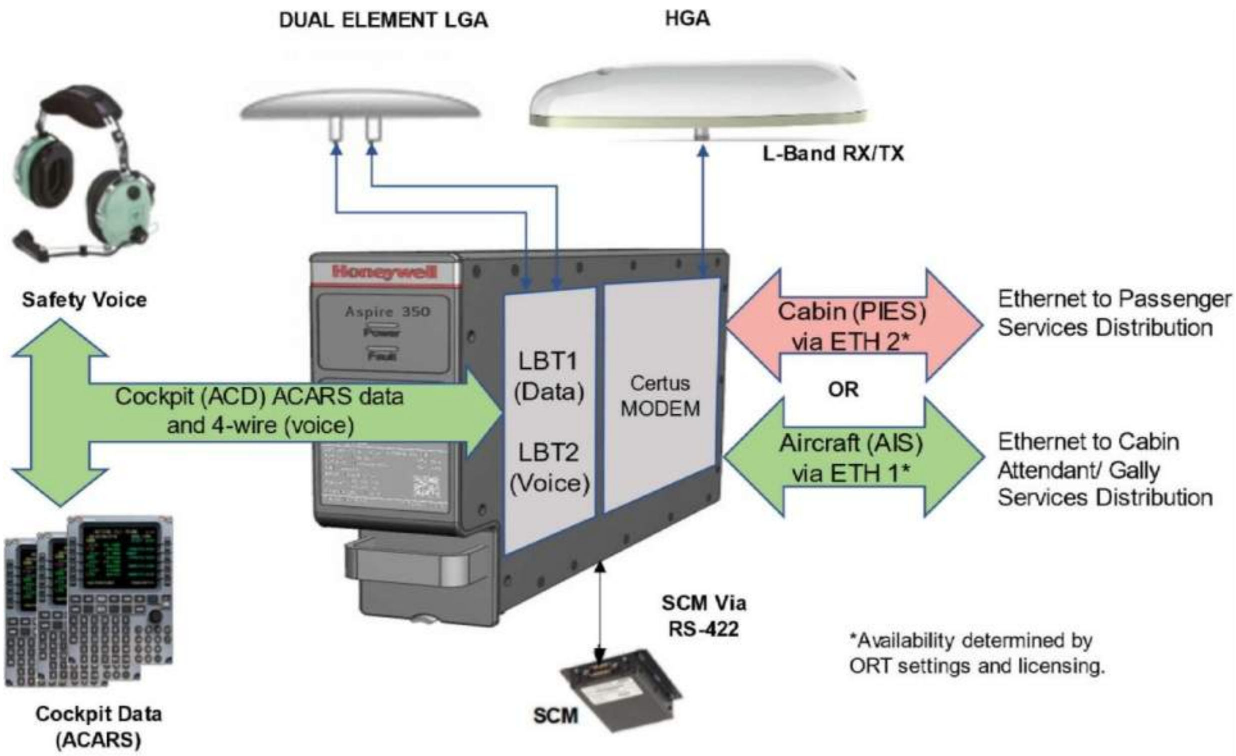


Figure 4-1. Aspire 350-3A Domains and Channel Use

The service offering identified in Table 2-7 is repeated below with a mapping to the SDU domains:

Table 4-1. Aspire 350-3A Service Offering Mapping to SDU Domains

Service Offering	SDU Domains In Use
Cockpit safety (LBT modems) and Certus modem Cabin services	- ACD and - Non-Safety Domain (if configured for passing secure data through the Honeywell Certus MODEM)

NOTE :

1 The Aspire-350 SDU contains a firewall that prevents ground-initiated connections, such as FTP port 20 that could be initiated from a ground FTP server in "Active" mode, from being passed to the user's cabin equipment.

2 To enable CERTUS on ground testing, discrete input MP06C (Cabin Disable / CERTUS on-ground) must be asserted (pulled low). This does not include POST of the Aspire 350 SDU that will test the HGA and the HCM (Honeywell Certus Modem) prior to disabling them while on-ground. While CERTUS on-ground testing is enabled, there is no expectation that Data Load operation will be successful.

2. Standalone and Dual SATCOM Configuration Options

A. Overview

(1) The Aspire 350-3A system is designed to operate as a standalone safety services SATCOM. It is possible for a system integrator to install and operate a second L-band SATCOM system in a dual safety SATCOM configuration.

(2) Honeywell does not recommend simultaneous RF transmissions of Iridium and Inmarsat L-band SATCOMs on the same aircraft. It is the responsibility of the system integrator to ensure compatibility of dual SATCOMs which operate in L-band.

B. Dual SATCOM Interfaces

(1) The Dual System Disable and Dual System Select discrete inputs/outputs can be used to operate two L-band SATCOMs in a warm-standby configuration, where only one SATCOM in a dual configuration is transmitting at any given time.

(2) If the Dual System Disable discrete input is asserted, the Aspire 350-3A SDU disconnects from the Iridium network, mutes RF transmissions, and de-asserts its Dual System Select discrete output.

(3) In a standard standalone configuration, the Dual System Disable and Dual System Select discrete inputs/outputs may remain unwired, as depicted in Figure 4-2.

(4) The configuration pins, specifically CONFIG PIN 3 (MP03D) and CONFIG PIN 5 (MP03F), on the back connector of the Aspire 350-3A SDU are used to specify the SDU position with reference to a second safety services SDU installed on the aircraft. The default position is “SDU 1”.

(5) Secure ORT parameters containing “Sdu1” will take effect only if the SDU is configured in the left position as SDU 1.

(6) Secure ORT parameters containing “Sdu2” will take effect only if the SDU is configured in the right position as SDU 2.

D. General Requirements

(1) There are no special tools, fixtures, and equipment required for the SDU, SCM, HGA, and LGA installation.

- For SCM Outline and Installation, refer to Figure 5-6
- For SDU Outline and Installation, refer to For SCM Outline and Installation, refer to Figure 5-7
- For HGA Outline and Installation, refer to Figure 5-9
- For LGA Outline and Installation, refer to Figure 5-10

6. Antenna Installation

A. Overview

(1) Antenna installation must comply with all applicable FAA airworthiness regulations or national equivalent. At a minimum, the antenna(s) shall meet or be certified to TSO-C159().

(2) The maximum length of a coaxial cable connecting the SDU to the HGA depends on the cable specifications, cable length, and the presence of coaxial connectors and adapters (if installed).

- For LGA refer to the Bottom Plug Connector (Insert C) of Figure 5-8 (Sheet 7 of 8)
- For HGA refer to the Top Plug Connector of Figure 5-8 (Sheet 7 of 8)

NOTE: Consult the antenna manufacturer's Abbreviated Component Maintenance Manuals for the proper antenna installation procedures. These are referenced in Honeywell/Vendor Publications on Page 1-3.

B. Antenna Installation and Separation Considerations

(1) The Iridium LGA and HGA must be mounted on top of the fuselage with a maximum rotational offset from the aircraft centerline of ± 1°.

(a) The LGA is an omni-directional antenna that has visibility of any Iridium satellite within the envelope.

(b) The HGA is a directional antenna which attaches to an Iridium satellite within the envelope and then uses data received from it to steer towards that satellite as it orbits above.

(2) Both antennas should be mounted in a location that facilitates a full satellite visibility envelope, 8 degrees above the horizon for an azimuth of 360 degrees as shown in Figure 5-1.

(a) In general, short interruptions in service should be anticipated when either antenna is unable to maintain a line-of-sight connection with an Iridium satellite.

(b) Aircraft pitch and roll maneuvers and low-altitude operations in mountainous regions may temporarily restrict the visibility envelope and may potentially result in short service interruptions.

(c) The LGA should be mounted forward on the fuselage while maintaining required minimum separation from GNSS antennas, as shown in Figure 5-2

(d) The HGA should be mounted aft of the LGA on the fuselage, as far forward as possible while maintaining required minimum separation from the LGA and GNSS antennas, as shown in Figure 5-3.

(3) The geometry of the aircraft’s vertical and horizontal stabilizers relative to the HGA in particular may result in line-of-sight signal blockages which could degrade the non-safety Iridium Certus connection.

(a) The installation locations described in this section are intended to minimize signal blockages due to the aircraft’s vertical stabilizer, as shown in Figure 5-2, particularly for the LGA providing safety services.

(4) If installed together, the LGA and HGA should be installed with a separation distance of at least 196.9” (5.0 m) edge-to-edge.

(a) This separation is intended to limit interference to the LGA from the HGA.

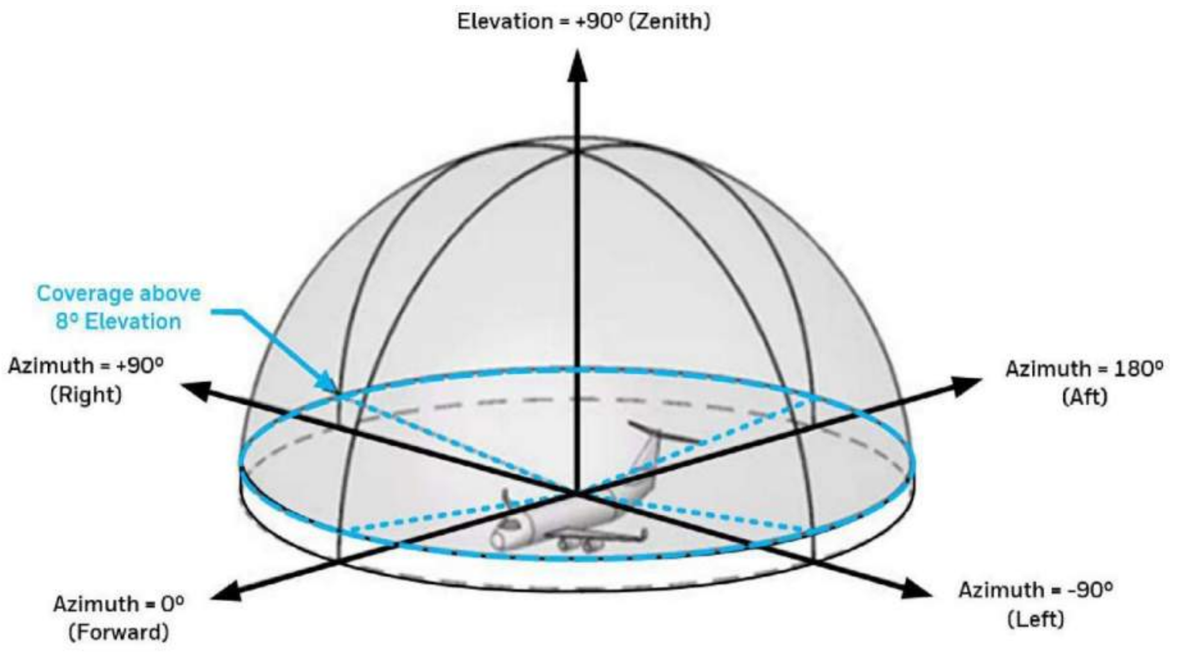


Figure 5-1. LGA and HGA Satellite Visibility Envelope

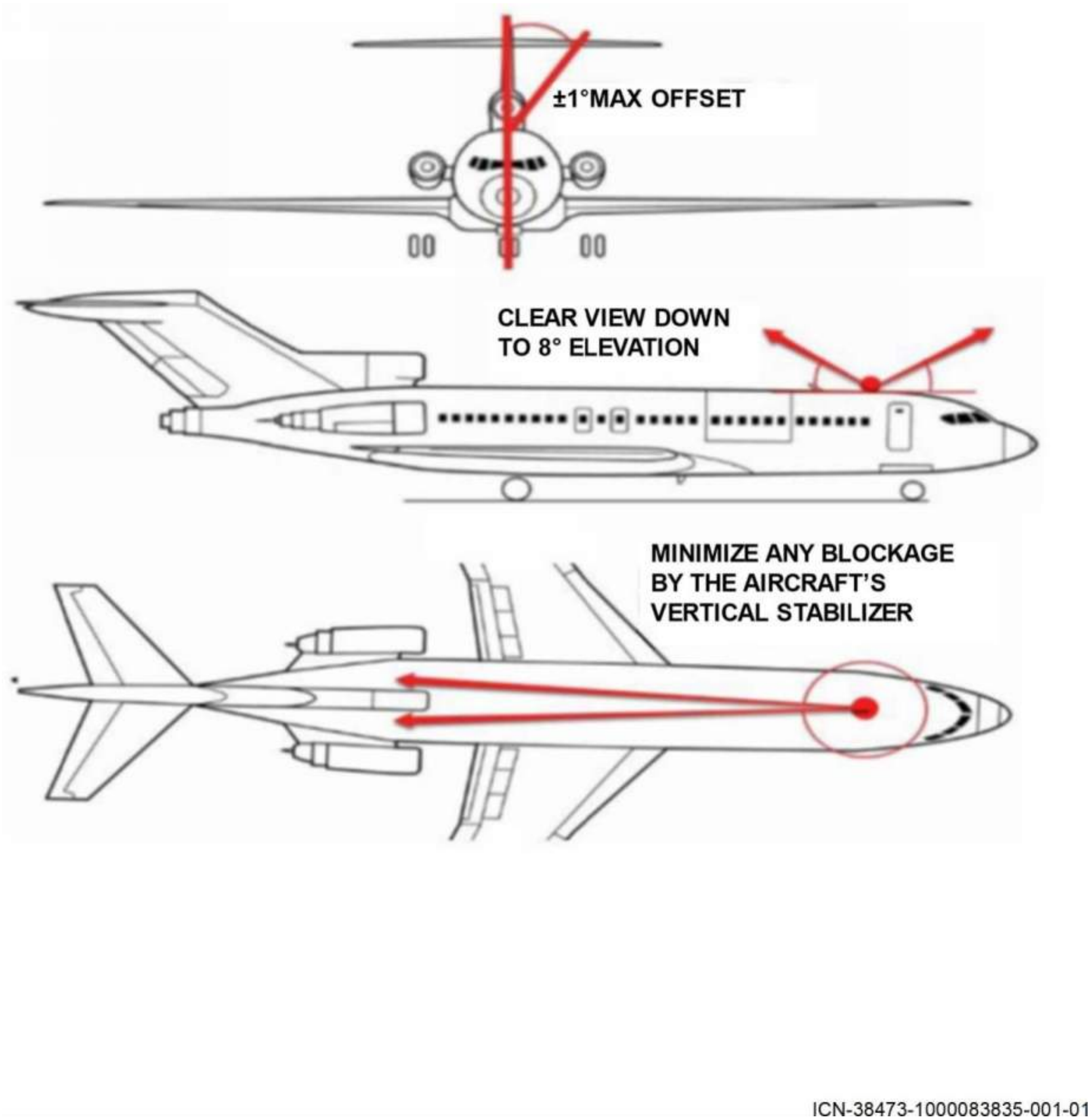


Figure 5-2. LGA Mounting Position

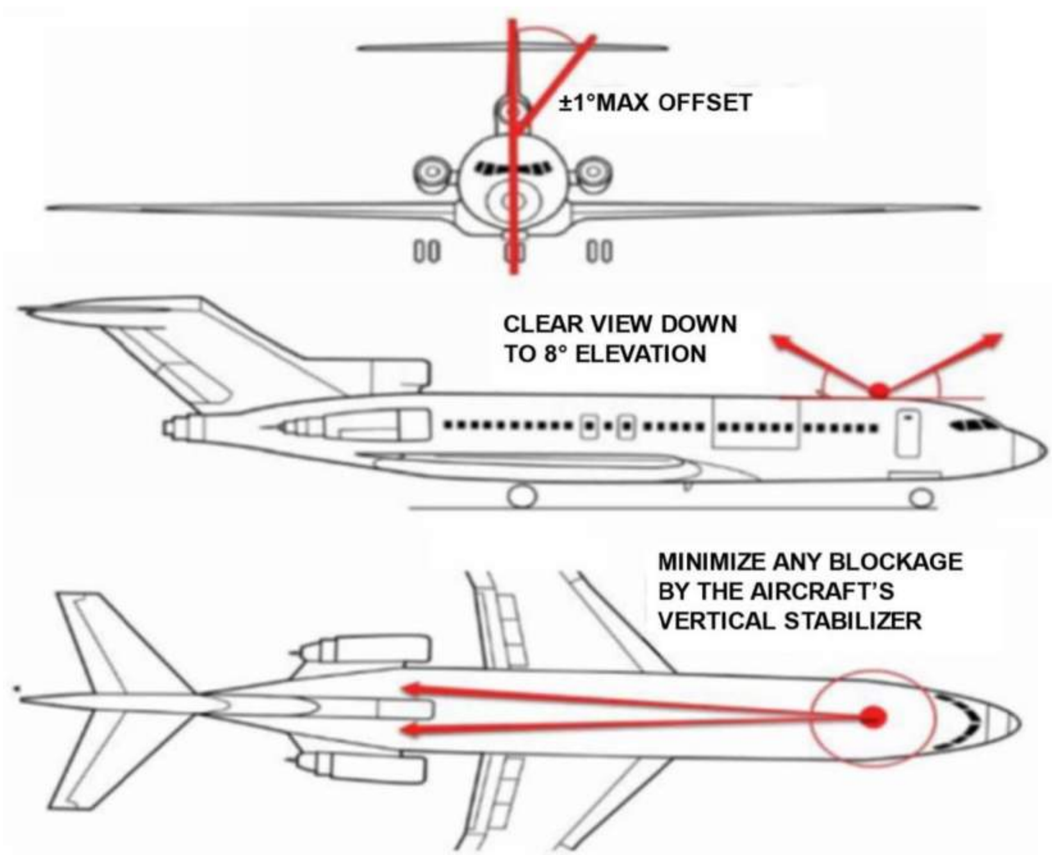


Figure 5-3. HGA Mounting Position

C. Navigation System Separation Considerations

(1) Additional antenna separation considerations exist if a GNSS antenna is installed on the aircraft which receives signals from one of the following satellite constellations:

(a) GPS

(b) GALILEO

(c) GLONASS

(2) The Iridium Certus service operates at a higher power than the Iridium SBD service and poses an additional interference threat to navigation systems compared with SBD.

(3) The Iridium and GLONASS G1 bands are adjacent. The Aspire 350-3A HGA cannot be operated on aircraft using GLONASS for navigation.

(4) Although the Iridium and GPS L1/Galileo E1 bands do not directly append each other, in rare cases, a GPS receiver's operations can be impacted from interference from the Aspire 350-3A system, primarily the Iridium Certus service when the HGA transmits using the Iridium band.

(5) The specifications of the GNSS antenna and receiver used should be verified for rejection of Iridium band frequencies.

(6) The out-of-band rejection requirements defined in RTCA DO-301 and RTCA DO-373 may not be sufficient to ensure compatibility of an active GNSS antenna with the Aspire 350-3A HGA at a practical separation distance.

(7) Refer to the GNSS antenna and receiver manufacturer(s) for additional guidance.

(8) GNSS antennas with built-in filtering of at least 50 dB at 1618 MHz should be installed with a minimum separation distance of 10 ft (3.05 m) from the LGA or HGA.

(9) A greater separation distance may be needed for GPS antennas not equipped with Iridium band filtering, or for antennas with support for the GLONASS G1 band.

D. Inmarsat SATCOM Separation Considerations

(1) For installation of an Aspire 350-3A system on the same aircraft as an Inmarsat L-band (SwiftBroadband or Classic Aero) system, the Aspire 350-3A requires that a switching functionality be used to only allow one system to be active at a time. As such, interoperability need not be considered.

E. General LGA Installation Instructions

(1) Refer to Aero Antenna Technology document ABBREVIATED COMPONENT MAINTENANCE MANUAL Model Number AT1621-23 dated July 10, 2015 for the LGA. This document also covers maintenance such as touchup or removal.

F. General HGA Installation Instructions

(1) Refer to Aero Antenna Technology document INSTRUCTION FOR CONTINUED AIRWORTHINESS AND ABBREVIATED COMPONENT MAINTENANCE MANUAL Part Number AT7521-7( ), dated August 2, 2023 or later for the HGA. This document also covers maintenance such as touchup or removal.

G. Federal Aviation Administration (FAA) Regulatory Approval

(1) Installation of the LGA or HGA on the aircraft fuselage requires an aircraft skin penetration which must be officially inspected and approved.

(2) Refer to the aircraft manufacturer's structural repair manual (or equivalent) to identify proper procedures for aircraft skin penetrations.

(3) This inspection must be approved by an FAA-authorized representative and documented per FAA Form 8100-9 or Form 8110-3. The completed FAA Form 8100-9 or Form 8110-3 should be included with the installation certification data.

H. Connecting the Antennas

WARNING: WHEN CONNECTING OR DISCONNECTING THE HGA TO/FROM THE SDU TRAY FIRST ENSURE THAT THE SDU IS POWERED DOWN.

(1) The LGA has two coaxial connectors. One must be connected to BP06 and the other must be connected to BP07 using coaxial cables with 50 Ohm impedance and maximum 2dB cable loss (L_{MAX}). The support of an L_{MAX} operation limit of 2dB instead of an L_{MAX} limit of 3dB is an approved deviation from TSO-C159e Change 1 and RTCA DO-262F.

(2) The HGA has one coaxial connector which must be connected to TP71 on the SDU tray using a coaxial cable of 50 Ohm impedance and maximum 6 dB cable loss (L_{MAX}), 1 VDC voltage drop and 7.5 amps rating.

NOTE: RF connectors and adapters will introduce additional cable loss and voltage drops which reduce the maximum cable length from the values specified in .

I. Checking Antenna Installation

(1) Once the antennas are installed and connected to the SDU ensure the Weight-on-Wheels discrete input (MP07C) is set to the "On-Ground" position and use the SDU's Web GUI to check that no antenna faults are being reported by the SDU. With the aircraft outside and with a clear view of the sky also use the Web GUI to check the signal levels on the LBTs and HCM. If the signals are strong (≥3 bars) then antenna installation has been successful.

NOTE: When the SDU detects "On-Ground" operation, Iridium Certus transmissions are disabled to minimize interference to other aircraft employing GLONASS for navigation. To enable on-ground testing of cabin services, Iridium Certus transmissions can be temporarily enabled by asserting the Certus-on-Ground discrete input (MP06C) to signal ground.

(2) It is the responsibility of the operator to ensure that there is no possibility of interference with local aircraft and that the system is disabled (de-assert or UNGROUND MP06C) once ground operations are completed.

7. Electrical Installation

This section provides electrical installation details for Aspire 350-3A terminals.

A. Cabling and Connector Requirements

This section provides general electrical installation information on power, ground, shielding requirements, and cabling.

(1) Power Requirements

(a) The Aspire 350-3A SDU is powered by the aircraft electrical system at 28 VDC (nominal).

(2) Ground Requirements

(a) Improper grounding can potentially lead to ground loops and induced Electromagnetic Interference (EMI) or Radio Frequency Interference (RFI). When installing an Aspire 350-3A terminal, follow standard grounding practices for both chassis and cabling shields.

(3) Cable Shielding and Termination

(a) The preferred method of cable shield termination is in accordance with National Electrical Manufacturers Association (NEMA) WC 27500:2000 and ARINC 741. ARINC Report 413A - Guidance for National Aircraft Electrical Power Utilization and Transient Protection provides more detailed information in Attachment 3-2, Wire Shielding and Grounding Requirements.

(4) Unless otherwise stated, all cable shields must be connected to the closest aircraft ground at both ends of the cable and on both sides on any production break in the cable. Where applicable, terminate shields with connectors via the backshell or via a pigtail with a suitable termination to the closest aircraft ground.

Table 5-2. Cable Requirements

Cable function	Conductor Type (Typical)	Single point	Multiple point	Minimum conductor coverage by shield
Power lines	Single conductor, stranded	N/A	N/A	N/A
Serial Data	Twisted pair, stranded	Yes	Yes	85%
Ethernet Data	Twisted pair, stranded	Yes	Yes	85%
Discrete Line	Single conductor, stranded	N/A	N/A	N/A
RF TX and RX	Coaxial	Yes	Yes	95%

Definitions

Single Point: Cable shield terminated at one end only via a connector or suitable crimp terminal.

Multiple Point: Cable shield terminated at both ends via a connector or suitable crimp terminal, usually at both ends of the cable and at both sides of any production break.

N/A: Not applicable.

(5) Cabling Notes

(a) Before proceeding with the installation of the Aspire 350-3A terminal, read all cabling notes provided on the Aspire 350-3A terminal System Interconnection Diagram Figure 5-8.

(b) When installing the Aspire 350-3A terminal, follow the cabling requirements listed below:

1 ARINC 429 cabling should be shielded-twisted pair with an impedance in the range of 60-80 Ω.

2 Local Area Network (LAN) cables must meet flammability, Telecommunications Industry Association (TIA)/Electronics Industry Association (EIA) 568-A CAT 5 requirements and conform to ARINC 628 specifications.

3 Wire size recommendations should be per information provided on Figure 5-8 (Sheet 2 of 8).

4 Unless otherwise specified, for signaling use 22 American Wire Gauge (AWG).

(6) Coaxial Cable Considerations.

(a) The attenuation of coaxial cables and adapters between the SDU and the antennas should be:

1 Less than or equal to 6 dB loss for the HGA cable

2 Less than or equal to 2 dB loss for the LGA cable

(b) For the HGA coaxial cable:

1 The Direct Current (DC) voltage drop across the cable shall be less than 1 volt.

2 The cable must be able to carry 10 amps of HGA power.

B. Physical Connectors

(1) SDU Rear Panel Receptacle.

(a) The Aspire 350-3A SDU incorporates a low insertion force, size 2 shell ARINC 600 receptacle with a cavity arrangement per ARINC 771, Att. 1.

(b) The mating connector in the tray must be a Radiall NSXN2B577S0071 or equivalent.

13. FOR WIRING SIZE AND TYPE RECOMMENDATIONS SEE TABLES BELOW.

INTERFACE	SATCOM INTERCONNECTION CABLES
28 VDC HOT	M22759/9-16-9, 16 AWG, WHITE
28 VDC RTN	M22759/9-16-0, 16 AWG, BLACK
CHASSIS GROUND	M22759/9-16-5, 16 AWG, GREEN
ARINC 429 SERIAL I/O (RECEIVED SIGNALS)	PIC D620224, OR EQUIVALENT (ONE FOR EACH SIGNAL) 1. DATA FROM MCDU 1; 2. DATA FROM MCDU 2; 3. DATA FROM PRIMARY IRS/GNSS (IF USED); 4. DATA FROM SECONDARY IRS/GNSS (IF USED); 5. DATA FROM CMU 1; 6. DATA FROM CMU 2; 7. SPARE INPUT 1; 8. DATA FROM GNSS TO SDU; 9. SPARE INPUT 2; 10. DATA FROM CFDS; 11. AES ID INPUT; 12. SPARE INPUT 3; 13. SPARE INPUT 4; 14. CROSSTALK FROM OTHER SDU; 15. FROM AIRBORNE DATA LOADER; AND 16. DATA FROM MCDU. 24 AWG, 1 SHIELDED TWISTED PAIR, 70 OHM, 30.0 PF/FT, DC RESISTANCE OR 25.2 OHMS/1000 FT., 95% SHIELDED, ETFE OUTER INSULATION
ARINC 429 SERIAL I/O (TRANSMITTED SIGNALS)	PIC D620224, OR EQUIVALENT (ONE FOR EACH SIGNAL) 1. SPARE OUTPUT 1; 2. DATA TO CMU 1 & 2; 3. SPARE OUTPUT 2; 4. SPARE OUTPUT 3; 5. DATA TO CFDS; 6. TO AIRBORNE DATA LOADER; 7. CROSSTALK TO OTHER SDU; AND 8. DATA TO MCDU 1, 2, 3. 24 AWG, 1 SHIELDED TWISTED PAIR, 70 OHM, 30.0 PF/FT, DC RESISTANCE OR 25.2 OHMS/1000 FT., 95% SHIELDED, ETFE OUTER INSULATION
4-WIRE AUDIO (COCKPIT AUDIO INPUT 1)	M27500-24SD2T23,24 AWG, SHIELDED PAIR CABLE
4-WIRE AUDIO (COCKPIT AUDIO OUTPUT 1)	M27500-24SD2T23,24 AWG, SHIELDED PAIR CABLE
4-WIRE AUDIO (COCKPIT AUDIO INPUT 2)	M27500-24SD2T23,24 AWG, SHIELDED PAIR CABLE
4-WIRE AUDIO (COCKPIT AUDIO OUTPUT 2)	M27500-24SD2T23,24 AWG, SHIELDED PAIR CABLE
ETHERNET 1, 2	ECS 922604, PIC E10424 OR EQUIVALENT: 10 BASE-T ETHERNET, 24 AWG, 4 CONDUCTORS, 2 TWISTED PAIRS, FOAM SHIELD, SILVER-PLATED COPPER BRAID OVER-SHIELD, FEP OUTER INSULATING JACKET, 100 OHMS
ETHERNET 3	ECS 422404, PIC E51424 OR EQUIVALENT: STAR QUAD ETHERNET, 24 AWG, 4 CONDUCTORS, TIN-COATED FLAT COPPER SHIELD, TIN-COATED COPPER BRAID OVER-SHIELD, EXTRUDED FEP OUTER INSULATING JACKET, 100 OHMS
SCM POWER	M27500-22SD2T23,22 AWG, SHIELDED PAIR CABLE; MAXIMUM LENGTH OF 10 METERS M27500-24SD2T23,24 AWG, SHIELDED PAIR CABLE; MAXIMUM LENGTH OF 6.2 METERS
SCM DATA TO SDU	M27500-24SD2T23,24 AWG, SHIELDED PAIR CABLE; MAXIMUM LENGTH OF 10 METERS
SCM DATA FROM SDU	M27500-24SD2T23,24 AWG, SHIELDED PAIR CABLE; MAXIMUM LENGTH OF 10 METERS
SCM CHASSIS GROUND	M22759/9-14-5, 14 AWG, GREEN, <12 INCHES TO GROUND PLANE
CONFIGURATION STRAPPING	STRAPPED AT ARINC CONNECTOR, WIRES CONSTRAINED IN THE BACKSHELL
OPEN/GROUND DISCRETES	M22759/9-24-X (ONE FOR EACH SIGNAL); WHERE X IS THE COLOR OF THE INSULATION: 0- BLACK 1- BROWN 2- RED 3- ORANGE 4- YELLOW 5- GREEN 6- BLUE 7- VIOLET 8- GRAY 9- WHITE 24 AWG, SINGLE CONDUCTOR, STRANDED, SILVER-PLATED COPPER, PTFE OUTER INSULATING JACKET

INTERFACE	SATCOM INTERCONNECTION CABLES
SWITCHED CONTACT OUTPUT	M22759/9-24-X (ONE FOR EACH SIGNAL); WHERE X IS THE COLOR OF THE INSULATION: 0- BLACK 1- BROWN 2- RED 3- ORANGE 4- YELLOW 5- GREEN 6- BLUE 7- VIOLET 8- GRAY 9- WHITE 24 AWG, SINGLE CONDUCTOR, STRANDED, SILVER-PLATED COPPER, PTFE OUTER INSULATING JACKET

SDU (BP06 AND BP07) TO LGA MAX COAXIAL CABLE LENGTH	MFG (OR EQUIVALENT)	P/N	DIA IN(MM)	LOSS @ 1626.5MHz (dB/100FT)	MAX LENGTH FT (M)	LOSS @ 1626.5MHz
	ECS/CARLISLE	310701	0.485(12.32)	3.92	51.0(15.5)	2.0
	ECS/CARLISLE	310801	0.452(11.48)	4.66	42.9(13.1)	2.0
	ECS/CARLISLE	311201	0.317(8.05)	6.77	29.5(9.0)	2.0
	ECS/CARLISLE	421201	0.313(7.95)	7.84	25.5(7.8)	2.0
	ECS/CARLISLE	311501	0.229(5.82)	9.15	21.9(6.7)	2.0
	ECS/CARLISLE	311601	0.229(5.82)	10.98	18.2(5.6)	2.0

SDU (TP71) TO HGA MAX COAXIAL CABLE LENGTH CABLES INDICATED WITH • ARE LIMITED BY DC RESISTANCE	MFG (OR EQUIVALENT)	P/N	DIA IN(MM)	LOSS @ 1626.5MHz (dB/100FT)	MAX LENGTH FT (M)	DCR AT MAX LENGTH	VOLTAGE DROP @7.5A
	ECS/CARLISLE	310701	0.485(12.32)	3.92	152.9(46.6)	0.13	0.98
	ECS/CARLISLE	310801	0.452(11.48)	4.66	128.7(39.2)	0.09	0.65
	ECS/CARLISLE	311201	0.317(8.05)	6.77	78.0(23.8)•	0.13	0.99
	ECS/CARLISLE	421201	0.313(7.95)	7.84	77.06(23.5)	0.13	0.98
	ECS/CARLISLE	311501	0.229(5.82)	9.15	44.0(13.4)•	0.13	0.98
	ECS/CARLISLE	311601	0.229(5.82)	10.98	32.0(9.8)•	0.13	0.98

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D	38473	90411443	A

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ICN-38473-1000083843-001-01

Figure 5-8. (Sheet 2 of 8) Aspire 350-3A - Electrical Drawings

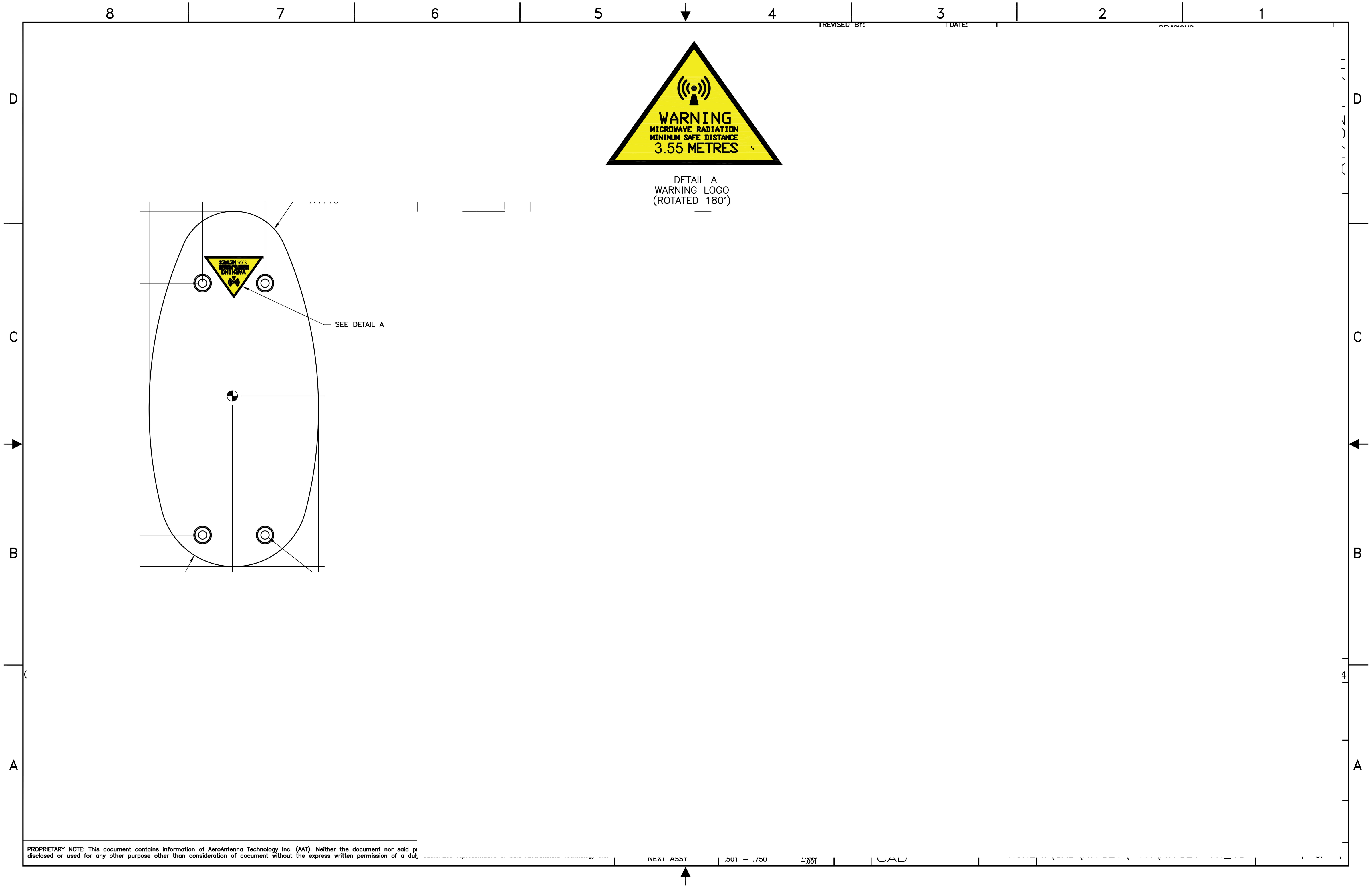

Figure 5-9. HGA Outline and Installation

D. RF Tone Test

(1) The RF Tone Test can be used to transmit a carrier wave on one or both channels are a specific frequency and power level. The intent of this is to allow the analysis of the effects of the Aspire 350 on other systems.

NOTE: It is highly recommended that this test be performed in an aircraft hangar of sufficient size to ensure that the nearest metal surface is at least 10 m (30.5 ft) away from the aircraft. This is needed to prevent the incidence of false positive results caused by intermodulation products being generated by walls/overlapping metal joints or fasteners.

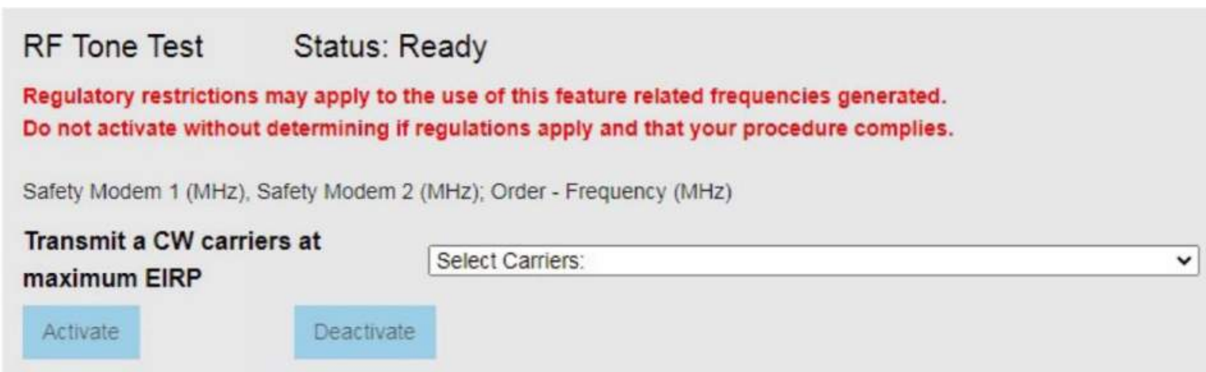

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Figure 7-2. RF Tone Test

WARNING: THIS TEST MUST NOT BE PERFORMED OUTSIDE AS IT WILL CAUSE INTERFERENCE WITH IRIDIUM SATELLITE SYSTEMS DUE TO THE OMNIDIRECTIONAL NATURE OF THE IRIDIUM LOW GAIN ANTENNA USED FOR THE BLOCK 1 SERVICES.

(a) Launch the Web GUI and login at the Advanced level following the directions in Section 8-5 Instructions for Access

(b) Navigate to the “Commanded Self-Test” page using the left sidebar.

(c) If the carrier tone test can be run the “Activate” button will be available, if not it will be greyed out and a message will be displayed indicating why the tone test can’t be run.

(d) Before running the tone test you will first need to correct the condition that is preventing it from running, if logged onto the network you will first need to log off.

(e) Once these have been corrected select the carrier option to be used from the pull-down list that appears and is repeated below (the first frequency is for LBT1 while the second is for LBT2, while the subsequent values are the IM frequencies of the order specified)

<Select Carriers:> pop-up list options:

- Option 1 "1618.020833, 1625.979165; 9th - 1586.187505, 11th - 1578.229173, 13th - 1570.270841"
- Option 2 "1618.520832, 1625.520832; 11th - 1583.520839, 13th - 1576.52084"
- Option 3 "1618.979166, 1625.020832; 13th - 1582.729172"
- Option 4 "1625.979165, 1618.020833; 9th - 1586.187505, 11th - 1578.229173, 13th - 1570.270841"
- Option 5 "1625.520832, 1618.520832; 11th - 1583.520839, 13th - 1576.52084"
- Option 6 "1625.020832, 1618.979165; 13th - 1582.729172"

(f) Upon selecting the desired option, press the “Activate” button and the test will start. The status will display “Running”. Carrier waves for frequencies of the selected option will be generated.

(g) When the duration of the test is complete press the “Deactivate” button to stop the test.

(h) During this test it will be necessary to measure the power received by the GPS antenna installed at the location normally used for GPS on the aircraft for which the Aspire 350-3A is being installed.

(i) This will require the use of the following:

1 A spectrum analyzer

2 A bias tee suitable for the 1.5-1.7 GHz band and capable of passing the current consumed by the GPS antenna LNA.

3 A power supply that can be set to the GPS antenna power requirements (typically 3.3-18 V at 100 mA).

(j) The GPS spectrum analyzer, GPS antenna and bias tee should be connected as shown in.

(k) The spectrum analyzer should be configured as follows:

1 Center frequency per test option frequency, i.e., to see the level of the 9th order product in Option 1 of Step 1 above, a center frequency of 1586.188 MHz should be used.

2 Frequency span of 100 kHz.

3 Resolution and video bandwidth 10 kHz.

4 Input attenuation should be 0 dB.

5 Reference level should be -40 dBm.

(l) The test limit level below are derived from DO-262F, Appendix D, Section D.2.2.3.1.1.6.1 for radiated antenna intermodulation products in the GNSS band.

1 Initially -128.5 dBm (this value assumes 55 dB of isolation (8.5 m) between the LGA and the GNSS antenna.

2 Reduced by 12.7 dB to allow for closer antenna spacing (2 m vs. 8.5 m above).

3 GPS antenna passive gains is from Section 2.2.3.2 of DO-301 (-5.5 dBiC padded by 2 dB).

4 Minimum active LNA gain from Section 2.2.6.2 of DO-301 of 26.5 dB (padded by an additional 3 dB).

5 The padding provides a net test margin of 5 dB.

(m) This yields a maximum level of -115.2 dBm for any of the measurement options above.

(n) If any exceedances of this level are detected the operator should check the connector tightness of the TNC connectors on the LGA, the seating of the SDU in its trace, the seating of the LGA on the aircraft surface (trapped debris) and finally the tightness of the LGA mounting screws. As a final note, if the aircraft is being tested near a hanger wall or other metallic structure (especially one that has been weathered or exhibits corrosion), some clearance (5-10 m) from that structure is recommended.

(o) Option 1 in the list above (6) is considered the best test of the system as it puts the most intermodulation products present in the L1 GPS band (9th, 11th, and 13th orders). The 9th-order product will likely have the highest power as it is the lowest order and thus will be easiest to find if present and will represent the most stringent test of the system.

NOTE: Error messages may occur if the RF tone test is operated in a hangar.

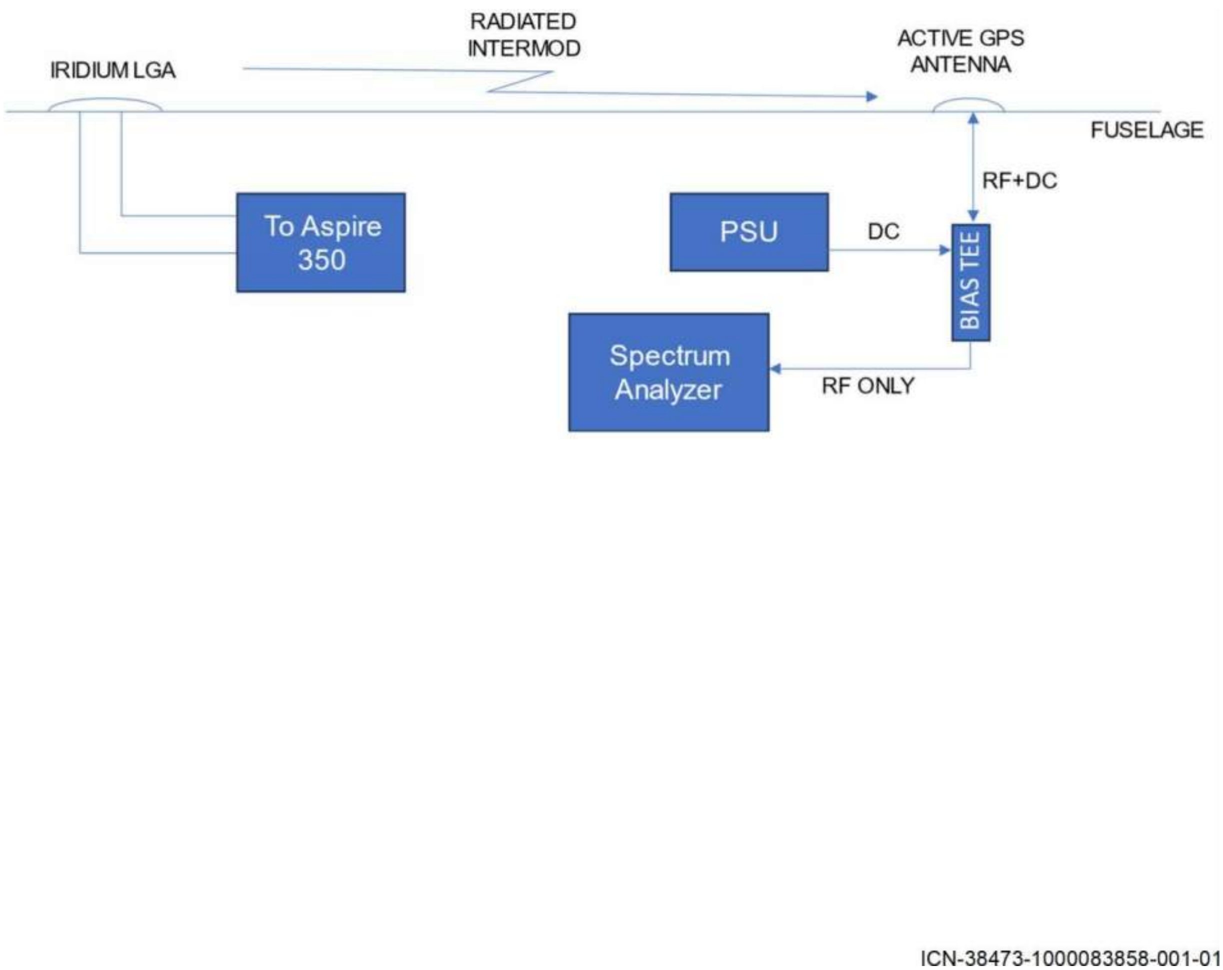

Figure 7-3. Schematic of Radiated IM for RF Tone Test