

COBHAM

LGA-5005 HLD and Enhanced Low Gain Antenna (HELGA)

Installation manual



LGA-5005 (HELGA)

Installation manual

Document number: 98-152675-A

Release date: 15 December 2020

Disclaimer

Information in this document is subject to change without notice.

The information, drawings and wiring diagrams contained in this manual are intended as a reference for engineering planning only. The drawings and wiring diagrams contained herein do not represent any specific Supplemental Type Certificate (STC). It is the installer's responsibility to produce installation drawings specific to the aircraft. This manual and the drawings and wiring diagrams contained herein may not be used as a substitute for an STC package.

The newest versions of Cobham SATCOM user and installation manuals as well as outline drawings can be downloaded from www.cobham.com/satcom, **Cobham SYNC Partner Portal**. Some material and features are for partners only and can only be accessed after login with a password.

Thrane & Thrane A/S is not responsible for the content or accuracy of any translations or reproductions, in whole or in part, of this manual from any other source. In the event of any discrepancies, the English version shall be the governing text.

Thrane & Thrane A/S is trading as Cobham SATCOM.

Controlled documentation

Notwithstanding the terms of the above disclaimer, Cobham SATCOM undertakes in the case of controlled documentation to supply the customer with all updates or amendments to this document and furthermore undertakes to notify the customer in advance of material changes to the information contained herein.

Manufacturer address

Thrane & Thrane A/S, Lundtoftegårdsvej 93D, DK-2800, Kgs. Lyngby, Denmark

Copyright

© 2020 Thrane & Thrane A/S. All rights reserved. Printed in Denmark.

Trademark Acknowledgements

- **Inmarsat** is a registered trademark of the International Maritime Satellite Organization (IMSO) and is licensed by IMSO to Inmarsat Limited and Inmarsat Ventures plc.
- Inmarsat's product names are either trademarks or registered trademarks of Inmarsat.
- Other product and company names mentioned in this manual may be trademarks or trade names of their respective owners.

Company web site:
www.cobham.com/satcom

Disposal

Old electrical and electronic equipment marked with this symbol can contain substances hazardous to human beings and the environment. Never dispose these items together with unsorted municipal waste (household waste). In order to protect the environment and ensure the correct recycling of old equipment as well as the re-utilization of individual components, use either public collection or private collection by the local distributor of old electrical and electronic equipment marked with this symbol.



Contact the local distributor for information about what type of return system to use.

Record of revisions

Rev.	Description	Release Date	Initials
A	Original version	15 December 2020	UFO

Safety summary

The following general safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings in this manual may violate the safety standards of design, manufacture and intended use of the equipment.

Radiation warning



WARNING! Keep a safety distance of minimum 60 cm (2 ft) to the antenna when the system is transmitting,

During transmission the LGA-5005 can radiate microwave power in any direction not screened by the aircraft fuselage. High levels of radio frequency radiation are considered harmful to health. Although all countries have not agreed upon a single value, the American National Standards Institute (ANSI/IEEE C95.1-1999) recommends that any person in a controlled environment should not be exposed to radiation stronger than 5 mW/cm² at the frequencies used in this system.

System cable installation

Take care when planning the routing of cables to and from the LGA-5005. The installation of these cables must not interfere with existing aircraft systems or make future interference possible. Secure and insulate all cables correctly. Adhere to the minimum bend radius specifications.

Hardware installation

The installation of the LGA-5005 must not compromise the safety or integrity of the aircraft structure. Take care to prevent any changes to vital aircraft components or structures when installing the antenna.

Table of Contents

Chapter 1	About This Manual	
	1.1 Purpose	1-1
	1.2 Manual overview	1-1
	1.3 Precautions	1-2
Chapter 2	Introduction	
	2.1 Scope	2-1
	2.2 System overview	2-2
	2.3 Interface of the LGA-5005	2-3
Chapter 3	Installation	
	3.1 General information and overview	3-1
	3.2 Storage and transportation	3-1
	3.3 Unpacking & initial inspection	3-2
	3.4 Prerequisites	3-3
	3.4.1 Antenna location and mounting considerations	3-3
	3.4.2 Structural modifications and sealing	3-3
	3.4.3 Grounding	3-5
	3.4.4 Alignment and installation limitations	3-5
	3.5 Installation of the antenna	3-8
	3.5.1 Installation verification	3-10
	3.6 Removal of the antenna	3-10
Chapter 4	Maintenance	
	4.1 General maintenance and repair	4-1
	4.1.1 Technical support	4-1
	4.1.2 Repair and Servicing	4-1
	4.1.3 Maintenance intervals	4-1
	4.2 Events generated by the LGA-5005	4-2
	4.3 Returning units for repair	4-3
	4.3.1 Return Material Authorization (RMA)	4-3
Chapter 5	Special tools, fixtures and equipment	
Chapter 6	Illustrated parts list	
Appendix A	Equipment specifications	
	A.1 LGA-5005 specifications	A-1

A.2 DO-160 specificationsA-2
A.2.1 Qualification FormsA-2
A.3 CertificationA-5
A.3.1 Certifying agencyA-5
A.3.2 List of (E)TSOs and deviationsA-5

Appendix B References
B.1 ReferencesB-1

GlossaryGlossary-1

IndexIndex-1

List of figures

Figure 2-1:	LGA-5005.....	2-1
Figure 2-2:	AVIATOR 200 S with LGA-5005.....	2-3
Figure 3-1:	Mounting hole sealing kit.....	3-2
Figure 3-2:	Areas where NO sealant is to be applied.....	3-4
Figure 3-3:	Breathing/drainage slots, both sides.....	3-4
Figure 3-4:	Fore/aft of the antenna.....	3-5
Figure 3-5:	Base of the antenna.....	3-8
Figure 3-6:	Sealant application to the bolt access holes of the antenna radome.....	3-9
Figure 6-1:	LGA-5005 – HELGA.....	6-1

List of tables

Table 2-1:	Equipment covered	2-1
Table 2-2:	Summary of system equipment.....	2-2
Table 2-3:	Coaxial cable characteristics.....	2-4
Table 4-1:	Inspection tasks for LGA-5005.....	4-2
Table 5-1:	Tools, fixtures and equipment required for the LGA-5005 installation.....	5-1
Table 5-2:	List of supplies.....	5-1
Table 6-1:	Legend for figure items	6-2
Table A-1:	Equipment specifications for LGA-5005.....	A-1
Table A-2:	Qualification Forms.....	A-2
Table A-3:	Common environmental conditions and tests (DO160G) for LGA-5005	A-2

About This Manual

1.1 Purpose

This installation manual provides the general instruction for the installation of the LGA-5005 on aircraft.

Important

The information, drawings and wiring diagrams contained in this manual are intended as a reference for engineering planning only. The drawings and wiring diagrams contained herein do not represent any specific certified installation design. It is the installer's responsibility to produce installation drawings specific to the aircraft. This manual and the drawings and wiring diagrams contained herein may not be used as a substitute for a certified design package.

It is important that you observe all safety requirements listed in the beginning of this manual, and install the system according to the guidelines in this manual.

1.2 Manual overview

The manual is structured in chapters and appendices:

- **Introduction**
This chapter contains a short presentation of the LGA-5005, interface and outline drawing.
- **Installation**
This chapter contains information about storage, transportation, unpacking and instructions how to install and remove the antenna.
- **Maintenance**
Maintenance interval and actions. Repair and servicing.
- ***Special tools, fixtures and equipment***
- **Appendices**
The appendices contain equipment specifications and a list of references.
- **Glossary**
Abbreviations and acronyms
- **Index**

1.3 Precautions

Warnings, Cautions and Notes

Text marked with “Warning”, “Caution”, “Note” or “Important” show the following type of data:

- **Warning:** A Warning is an operation or maintenance procedure that, if not obeyed, can cause injury or death, or jeopardize the flight safety on the aircraft.
- **Caution:** A Caution is an operation or maintenance procedure that, if not obeyed, can cause damage to the equipment.
- **Note:** A Note gives information to help the reader.
- **Important:** A text marked Important gives information that is important to the user, e.g. to make the system work properly. This text does **not** concern damage on equipment, flight safety nor personal safety.

General precautions

All personnel who operate equipment or do maintenance as specified in this manual must know and follow the safety precautions.

The warnings and cautions that follow apply to all parts of this manual.



WARNING! Before using any material, refer to the manufacturers’ material safety data sheets for safety information. Some materials can be dangerous.



CAUTION! Do not use materials that are not equivalent to materials specified by Cobham SATCOM. Materials that are not equivalent can cause damage to the equipment.



CAUTION! The system contains items that are sensitive to electrostatic discharge. Use approved industry precautions to keep the risk of damage to a minimum when you touch, remove or insert parts or assemblies.

Introduction

2.1 Scope

This installation manual provides the general installation instructions and mounting considerations for the LGA-5005, part number: 405005.

The Design Assurance Level of the LGA-5005 for software and hardware is DAL D.

The installer must derive specific installation details for each different aircraft type, using this manual as a guideline, while adhering to standard aircraft practices, refer to [1], or its equivalent.



CAUTION! The material in this manual is subject to change. Before you start with the installation you must verify that the complete and up-to-date publication is used.

The following figure shows the LGA-5005.

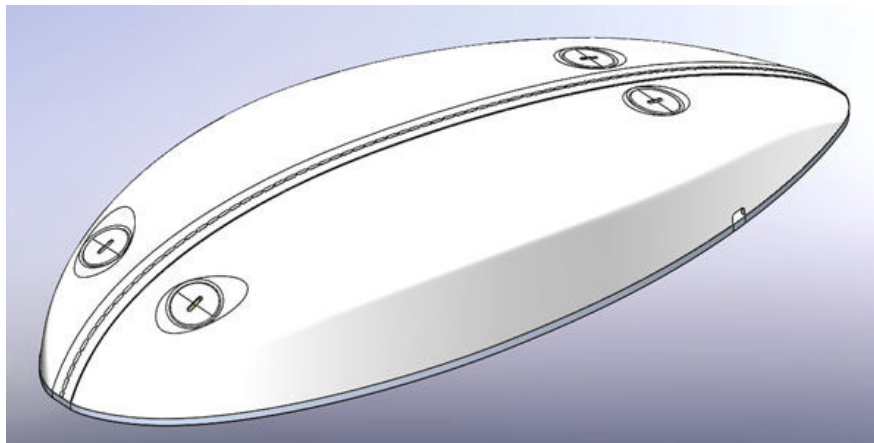


Figure 2-1: LGA-5005

Type Number	Equipment Name	Abbreviated Name	Certified Part Number ^a	OEM PNR [for Cobham internal use only]
LGA-5005	HLD/Enhanced Low Gain Antenna	HELGA	405005-vvccc	677-A0213

Table 2-1: Equipment covered

a. Final PNR suffix vvccc: vv = customer specific, ccc = minor variants

2.2 System overview

The purpose of the LGA-5005 is to provide an L-band radio link between the Inmarsat SwiftBroadband Class 4 SATCOM system AVIATOR 200S and an Inmarsat I4 satellite. For SwiftBroadband services, the LGA-5005 is part of a single channel aeronautical SATCOM system comprising the following subsystems (as defined in ARINC 781-6, Attachment 7, Configuration 3 [4]), interconnected as shown in Figure 2-2:

- LGA-5005 HLD/Enhanced Low Gain Antenna (HELGA)
- SDU-5045 Compact Satellite Data Unit (CSDU)
- SCM-5055 CSDU Configuration Module (SCM)

Type Number	Equipment Name	Abbreviated Name	Certified Part Number ^a	OEM PNR [for Cobham internal use only]
LGA-5005	HLD/Enhanced Low Gain Antenna	HELGA	405005-vvccc	677-A0213
SCM-5055	Compact SDU Configuration Module	SCM	405055-vvccc	677-A0217
SDU-5045	Compact Satellite Data Unit	CSDU	405045-vvccc	–

Table 2-2: Summary of system equipment

- a. Final PNR suffix vvccc: vv = customer specific, ccc = minor variants

The following block diagram shows the AVIATOR 200S system with LGA-5005:

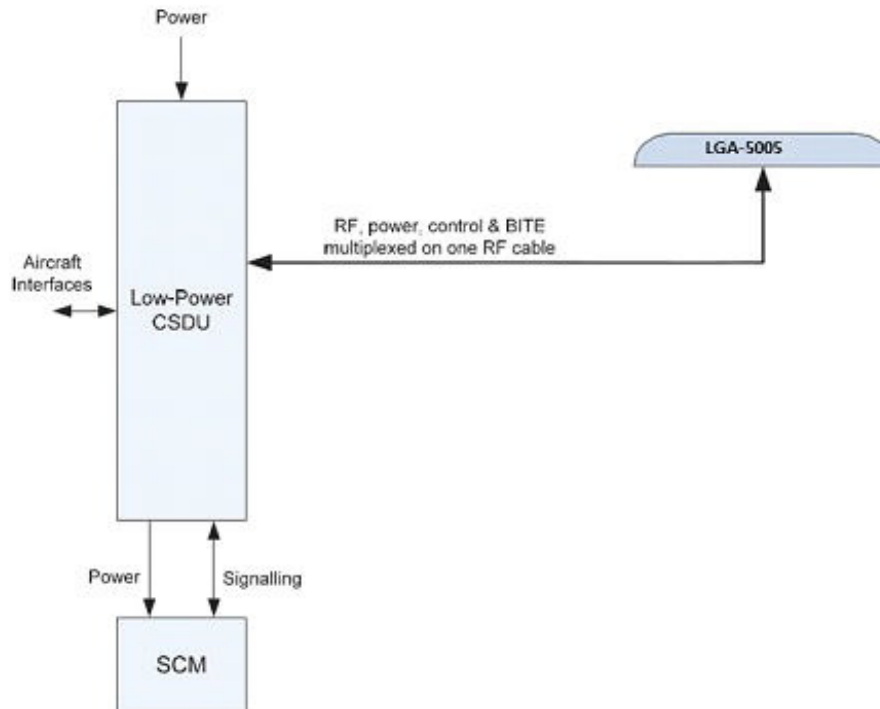


Figure 2-2: AVIATOR 200 S with LGA-5005

The LGA-5005 is intended to comply with DO-262B, Appendix E, as part of an AES4 system. LGA-5005 may only be installed with an AVIATOR-S CSDU [SDU-5045, part number 405045-vvccc] and SCM [SCM-5055, part number 405055-vvccc]. Together, these three items form a complete AES4 system, as defined in DO-262B, Appendix E.

The LGA-5005 is powered by the CSDU (SDU-5045) of the AVIATOR 200S system.

2.3 Interface of the LGA-5005

The LGA-5005 has a single TNC female bulkhead connector to interface to the CSDU. This interface carries the following signals, separated in the frequency domain:

- DC supply from the CSDU to power the LGA-5005
- RF Tx signal to be amplified and transmitted from the antenna.
- RF Rx signal received by the antenna and amplified by the LNA.
- Control link modem signal from the CSDU to the LGA-5005.
- Status link modem signal from LGA-5005 to the CSDU.

The interconnection cable design will be specific to the requirements of the aircraft type. The interconnection cable between the antenna and the CSDU may be supplied as part of

the antenna or separately. The cable must meet the requirements set out in the following table.

Characteristic	Value
Interface impedance	50 Ohm.
Maximum allowed RF cable loss between CSDU and LGA-5005	18 dB at 1.6 GHz.
Maximum allowed cable DC resistance	0.6 Ohm.

Table 2-3: Coaxial cable characteristics

The definition of the electrical signals carried on the cable interface between LGA-5005 and the CSDU is specific to the Cobham AVIATOR-S system. LGA-5005 shall never be interfaced to any avionics other than an AVIATOR-S CSDU [part number 405045-vvccc].

Installation

3.1 General information and overview

This chapter contains considerations and recommendations for installation of the LGA-5005. Wiring and physical mounting must satisfy all applicable regulations.

This chapter has the following sections:

- *Storage and transportation*
- *Unpacking & initial inspection*
- *Prerequisites*
- *Installation of the antenna*
- *Removal of the antenna*

Important

The information, drawings and wiring diagrams contained in this manual are intended as a reference for engineering planning only. The drawings and wiring diagrams contained herein do not represent any specific certified installation design. It is the installer's responsibility to produce installation drawings specific to the aircraft. This manual and the drawings and wiring diagrams contained herein may not be used as a substitute for a certified design package.

Note

To ensure optimal performance of the LGA-5005, strict adherence to the installation considerations found in this section must be maintained.

Field-loadable Software (FLS) part number: Refer to [6], *98-145168; AVIATOR 200S Installation Manual (Cockpit)*

The Design Assurance Level of the LGA-5005 for software and hardware is DAL D.

3.2 Storage and transportation

Store the box in a dry area (< 50% RH) where the temperature is within the range of -55 °C to + 85 °C (- 67 °F and + 185 °F).

3.3 Unpacking & initial inspection

Inspect the shipping container immediately upon receipt for evidence of damage during transport. If the shipping container is severely damaged or water stained, request that the carrier's agent be present when opening the carton.

Unpack and check that the following items are present:

- LGA-5005
- Mounting hole sealing kit

Note | The sealing kit contains 6 sealing caps and air displacers (two are spares)

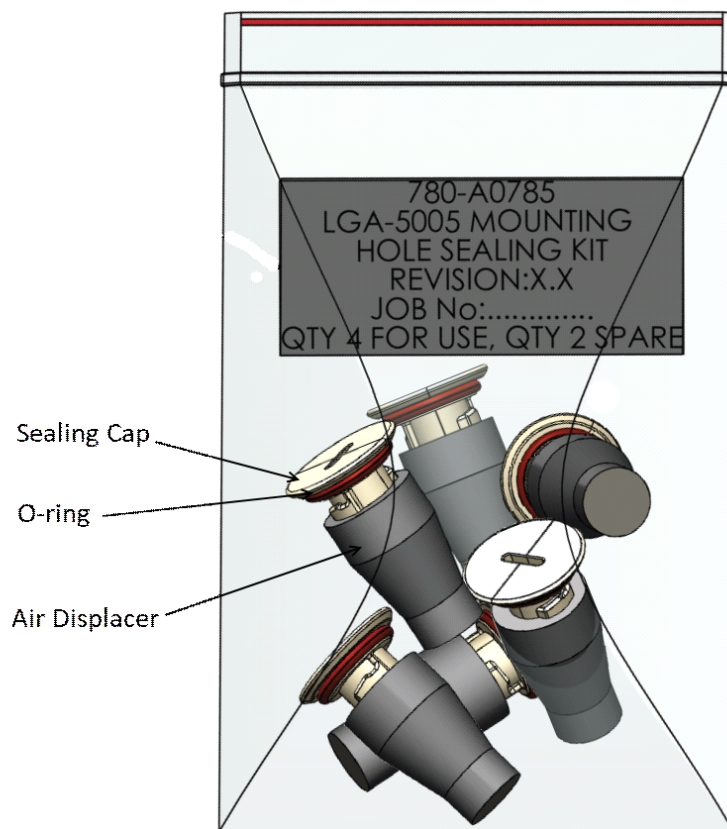


Figure 3-1: Mounting hole sealing kit

After unpacking the LGA-5005, inspect it thoroughly for hidden damage and loose components or fittings. If the contents are incomplete or there is mechanical damage or defect, notify your supplier.

Verify the following during unpacking of the unit:

- The connector has a protective cap fitted.

Retain the protective connector cap, packing material and containers for future storage and/or shipping use.

3.4 Prerequisites

Before you start to install the antenna, read the following sections carefully:

- *Antenna location and mounting considerations*
- *Structural modifications and sealing*
- *Grounding*
- *Alignment and installation limitations*

Refer to [2] for an outline drawing of the LGA-5005.

3.4.1 Antenna location and mounting considerations

This section provides information on the mounting of the LGA-5005 hardware and the installation of the antenna.

Make sure that the installation is in accordance with the following mounting considerations:

- Mount the LGA-5005 antenna on top of the fuselage.
- In some instances a mounting plate may be used to install the LGA-5005 onto the aircraft fuselage. This document can also be followed when the LGA-5005 is installed onto a mounting plate. Contact the antenna manufacturer for the relevant mounting plate installation instructions in order to install a mounting plate onto the aircraft fuselage.
- The antenna base is profiled with a radius of 3.25 m [127.95"].
If the fuselage radius is less than 1.8 m, contact the antenna manufacturer for a suitable solution (adaptor plate).
- Mount the LGA-5005 antenna in a position with a clear view of the sky.
- Make sure that the mounting location is interference free, refer to *Co-location with other antennas* on page 3-6.

For a detailed step-by-step installation procedure see *Installation of the antenna* on page 3-8.

3.4.2 Structural modifications and sealing

Structural loads

The effect of the installed antenna on the fuselage is airframe specific. A structural analysis must be performed to determine what structural modifications to the airframe are required before installing the antenna. This is the responsibility of the installation designer.

Sealing of the antenna

Sealing of the gap between antenna and fuselage skin is an aspect that is determined by customer preference. Cobham does not require the underside of the antenna to be sealed since there is no unprotected metal prone to corrosion.

Many years' experience on a similar installation concept has proven this. If, however, the customer has a requirement for fuselage skin protection, he should consider the use of an in-situ injectable sealant or a gasket to afford the necessary protection against corrosion.

Use of a gasket is not straightforward and will require the installer to determine if adequate compression can be supplied by the 4 mounting bolts to still attain sealing around the

connector/skin penetration area. The gasket may have to be reduced in size to achieve this and it will be different for different radii of aircraft fuselages.

If an injectable sealant is considered:

1. Apply sealant to the whole undersurface, EXCEPT the yellow areas, the O-ring and the area inside the O-ring as indicated in Figure 3-2

Important The sealing compound should have a low enough viscosity to be squeezed out readily during fastening of the attachment bolts to ensure that the antenna is seated as close to the fuselage skin as possible, i.e. the bonding areas (feet) should be in contact with the fuselage skin.

Note Note the requirements for provisions for grounding and bonding in section 3.4.3 (GB).

2. Take care that NO SEALING is applied in the breathing/drainage slot areas indicated in Figure 3-3. The breathing and drainage slots are also the air paths to allow breathing and drainage of liquids penetrating the slots due to cleaning or de-icing of the aircraft.

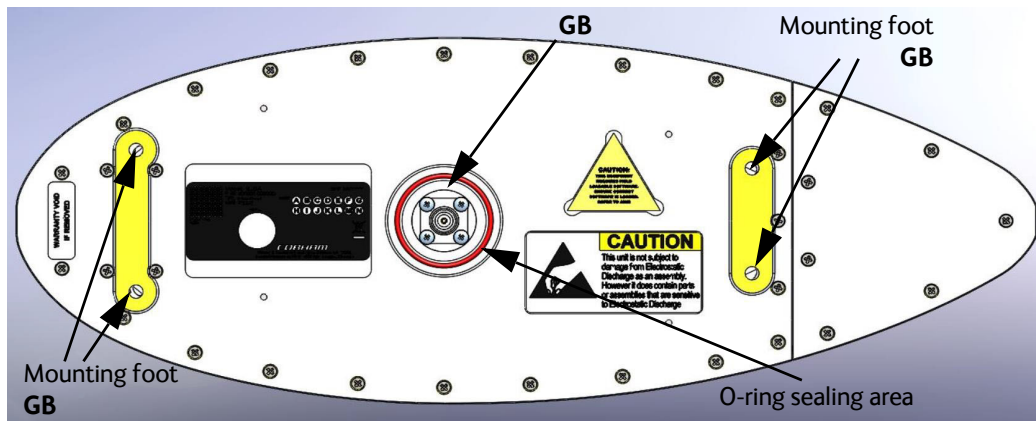


Figure 3-2: Areas where NO sealant is to be applied

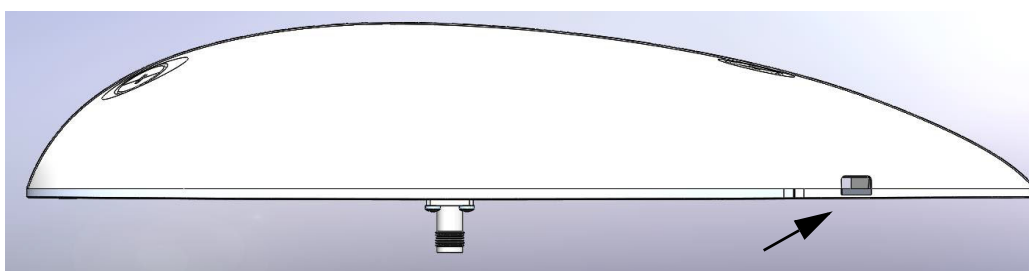


Figure 3-3: Breathing/drainage slots, both sides

3.4.3 Grounding

It is the responsibility of the installer to ensure that the grounding between the LGA-5005 and the fuselage is in accordance with the airframe manufacturer's requirements. The primary method of grounding the LGA-5005 is through the mounting bolts. Grounding may also be achieved through the mounting feet which are not painted, but chemically converted to allow for grounding to unpainted surfaces (see Figure 3-2).

In the case where the LGA-5005 is installed with a mounting plate, the four LGA-5005 to mounting plate bolts provide the primary grounding between the LGA-5005 and the plate. As mentioned above, the mounting feet provide additional grounding to the matching unpainted areas on the mounting plate.



CAUTION! The Installer must take corrosion effects into account especially when dissimilar materials are involved.

3.4.4 Alignment and installation limitations

Consider the following factors that influence the final position of the antenna:

- *Alignment and installation offset angles*
- *Lightning strike*
- *RF blockage*
- *Co-location with other antennas*
- *Fuselage Structure*
- *Engines and APU inlets*

Alignment and installation offset angles

Install the LGA-5005 with its long axis facing fore/aft, with the ventilation/breathing holes located in the aft position.

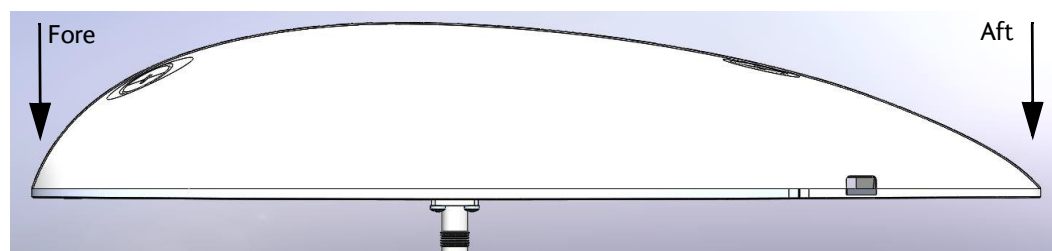


Figure 3-4: Fore/aft of the antenna

You may install the LGA-5005 slightly off the aircraft centre-line (roll offset), and/or with its nose slightly up or down (pitch offset). In this manual these are called installation offset angles.

The installation offset angles of the LGA-5005 are compensated for by the CSDU, in which case you must measure the yaw-, roll- and pitch-offsets. It is recommended that the

antenna offset angles be measured to an accuracy of 0.5° and programmed into the CSDU, refer to [6].

You can determine the roll and pitch offset of the antenna by subtracting the aircraft attitude angles from the antenna attitude angles (relative to the same local level). The aircraft attitude angles may be read from the aircraft avionics or measured with an electronic level on an appropriate reference surface. The antenna pitch attitude may be measured with an electronic level placed on the crown of the aircraft, on the longitudinal symmetry axis of the mounting holes on the fuselage. The roll attitude may be measured by placing suitable equal thickness spacers on 2 laterally adjacent fuselage mounting holes to support the electronic level during roll angle measurement.

These angles define the installation misalignment of the antenna and must be stored in the CSDU to be used as part of its beam steering calculations. The CSDU installation software will guide the installer through the process of entering the information (refer to [6]).

Lightning strike

The LGA-5005 is rated for RTCA DO-160 Section 23, category 2A and 2A. To protect the antenna in the event of a lightning strike ensure that the grounding considerations in paragraph 3.4.3 are adhered to.

RF blockage

The vertical and horizontal stabilizers (particularly a T-tail) may cause blockage of the RF beam. Placing the antenna further forward decreases the effect.

Co-location with other antennas

The LGA-5005 has passed the recommended RTCA/DO-160G Radiated Emission tests. However, transmission from the antenna may still affect the operation of other RF systems in particular cases. It is the responsibility of the Installer to evaluate this before deciding on the mounting position of the LGA-5005. This principle generally applies to the installation of any radio system on the aircraft.

Iridium and GPS/GLONASS systems are most likely to be affected by direct high power transmission. The separation requirement depends on the equipment installed. Interference between two Inmarsat SATCOM systems on the same aircraft normally does not present a problem. In this case a separation distance of at least 0.5 m is adequate to avoid affecting the radiation patterns of the antennas. Closer spacing may be possible; in this case it is advisable to contact Cobham for guidance.

Interference-free operation between an Inmarsat-based SATCOM system and other L-band (e.g. Iridium) SATCOM antennas cannot be guaranteed due to lack of guard bands between frequency allocations. If dissimilar SATCOM systems are installed, the separation distance should be as far as possible.

Simultaneous operation of dissimilar SATCOM systems may be possible most of the time, but successful communications will depend on frequency allocations made by both satellite networks as well the antenna's beam direction. A simple once-off test is therefore not sufficient to guarantee satisfactory operation under all circumstances. A thorough theoretical analysis is recommended. In particular, Iridium receivers cannot be guaranteed to operate reliably while an Inmarsat system is transmitting. This is true even with large separation between the antennas, as the aircraft may not be large enough to achieve a sufficient isolation between the antennas to guarantee operation.

In particular, an Iridium system should not be used for safety services (e.g. ACARS, FANS) while an Inmarsat transmitter is able to transmit. If a dual dissimilar SATCOM installation (Inmarsat + Iridium) is required for redundancy of safety services, the two systems should operate on a mutually exclusive basis. This may be achieved by a manual switch-over arrangement between the systems, or by an automatic cooperative arrangement, such as described in ARINC 781-7, Section 3.1.4.3.

If a GPS antenna is installed near the LGA-5005, it should preferably have an approval under TSO-C190, as this implies better immunity to SATCOM transmissions than the older TSO-C144. The separation distance between the antennas should be at least 1.8 m.

The isolation between the LGA-5005 and a GLONASS antenna should be at least 46 dB. This typically corresponds to a separation between the antennas of 10 m.

The separation distances above are guidelines only, as Cobham has no control over properties of the antennas of other systems. As with all radio systems, ensuring non-interference remains the responsibility of the installation designer.

Fuselage Structure

In addition to the 4 mounting holes, an RF connector hole must also be provided. The hole dimensions should be diameter 30/28 max/min to ensure proper sealing by the antenna O-ring. If a larger hole is required, the O-ring will not function and the installer should provide an alternative pressurisation sealing arrangement.

Engines and APU inlets

The Installer must verify that the LGA-5005 is positioned out of the zone of influence of the engines and APU inlets.

3.5 Installation of the antenna

The following is supplied with the antenna:

- LGA-5005 Mounting Hole Sealing Kit (refer to [4]).

The LGA-5005 can be mounted directly to the aircraft fuselage or to a mounting plate [10] which has been attached to the fuselage as described in document [11].



CAUTION! Do not step or walk on the mounting plate.

The procedure below covers both cases.

1. If applicable, refer to section 3.4.2, either apply sealing compound to the complete underside of the antenna, excluding the areas of the mounting feet and TNC connector O-ring, as indicated in Figure 3-5, or apply gasket(s) as per the installer design solution.

Important

The sealing compound should have a low enough viscosity to be squeezed out readily during fastening of the attach bolts to ensure that the antenna is seated as close to the fuselage skin as possible, i.e. the bonding areas (feet) should be in contact with the fuselage skin.

2. Connect the CSDU-LGA RF cable to the antenna's TNC connector.

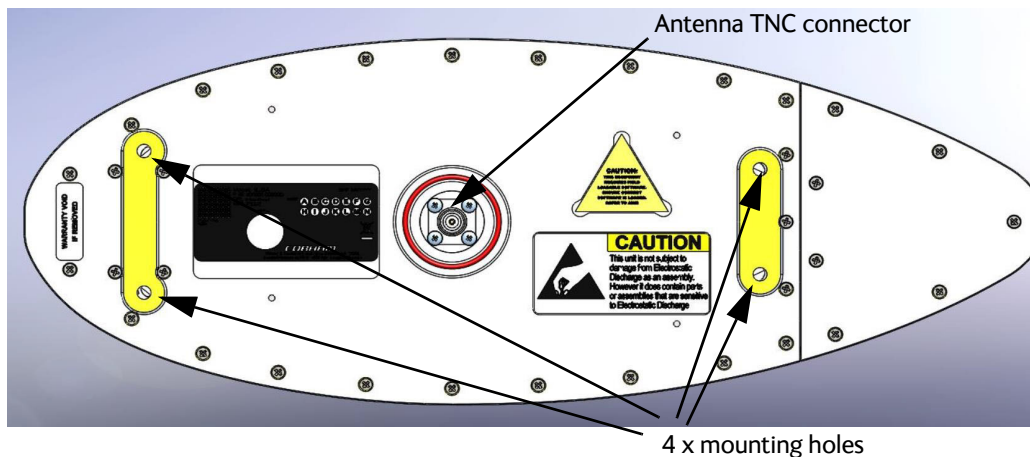


Figure 3-5: Base of the antenna

3. Use a 15 mm (0.591") torque spanner to tighten the TNC connectors to 0.46 to 0.69 Nm (0.34 to 0.51 ft-lb).
4. Position the antenna over the mounting holes in either the fuselage or the mounting plate, ensuring that the RF cable is aligned and does not get pinched when the antenna is lowered to its final mounting position.
5. Insert four 10-32 mounting bolts which should not be longer than NAS623-3-18 and the torque bolts to 3.95 to 6 Nm (2.9 to 4.4 ft-lb).
6. If sealing compound was applied in step 1, remove any excess sealing compound around the antenna periphery and ensure that the breathing/drainage slots are completely clear.
7. Check the maximum torque against the bolt specification and the fuselage or mounting plate structural limitations.



CAUTION! It is the responsibility of the Installer to ensure that the correct length and type of bolt is used.

8. If verification of the bonding resistance between the antenna and the fuselage is required, perform the measurement from the inside of the fuselage, between the body of the TNC connector and a suitable point on the inside of the fuselage.
9. Prior to fitting the sealing caps, apply a bead of non-curing Mastic-type sealant to the rim of the bolt access holes in the antenna radome as shown in blue in Figure 3-6.

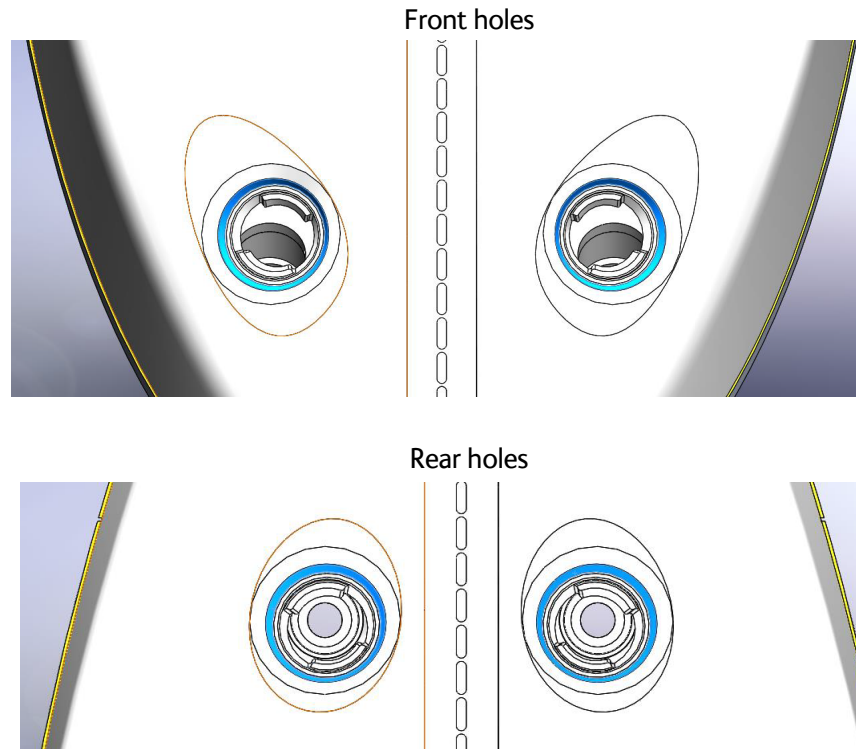


Figure 3-6: Sealant application to the bolt access holes of the antenna radome

10. Insert an air displacer into each mounting hole.
11. Check that the O-ring on the sealing cap is securely fitted into the o-ring groove.
12. Insert the sealing caps from the Mounting Hole Sealing Kit into each mounting hole and fasten (1/4-turn) with a 4-6mm flat screwdriver.
13. Wipe off any excess sealant.



The sealant forms an additional seal against water ingress and also minimises acoustic noise.

14. Fill slots in the sealing caps with the same non-curing Mastic-type sealant to minimise acoustic noise.

3.5.1 Installation verification

Make sure that the antenna is fixed to the fuselage or mounting plate by means of 4 bolts, which are externally accessed.

Refer to the Installation Manual of the satellite terminal for system verification tests [6].

3.6 Removal of the antenna

To remove the LGA-5005 where it has been installed either directly to the aircraft fuselage or to a mounting plate follow the procedure below:

1. Remove the mastic sealant from the sealing cap grooves using a toothpick or the side of a flat 4-6mm (0.16 – 0.24”) screwdriver.
2. Remove the sealing caps using a 4-6mm (0.16 – 0.24”) flat screwdriver (1/4 turn).
3. Remove the foam insert using a tweezer.

Note The air displacer inserts may be damaged during removal. Replace the inserts when refitting the antenna.

4. Remove the 4 mounting bolts using a Phillips screw driver with a #2 bit, and save for re-installation.
5. If the antenna was installed with sealing compound, loosen the antenna from the fuselage with a twisting motion and lift the antenna to expose the TNC connector.
6. Loosen the TNC connector using a 15mm (0.591”) flat spanner.

Maintenance

This chapter has the following sections:

- *General maintenance and repair*
- *Events generated by the LGA-5005*
- *Returning units for repair*

4.1 General maintenance and repair

The LGA-5005 does not require maintenance or adjustment apart from routine checking of its installation. However, periodic removal for corrosion inspection should be performed in accordance with the FAA approved (or governing regulatory agency) Instructions for Continued Airworthiness for the installation.

4.1.1 Technical support

Cobham provides a global network of highly qualified technical support engineers available 24/7/365 access in a Follow-the-sun support pattern.

When contacting the Cobham technical support engineers you have the following options:

1. Send an e-mail to **AVIATOR.support@cobham.com**
2. Use the Follow-the-sun technical hotline:
 - EMEA: +45 3955 8989
 - Americas: +1 925 798 2399
 - APAC: +65 6643 4700
 - Greater China: +86 213 393 3006
3. Use the online partner portal www.cobham.com/satcom, **Cobham SYNC Partner Portal**. Submit an email to: AVIATOR.support@cobham.com to request login credentials. The **Cobham SYNC Partner Portal** can be used to verify stock levels, register warranty items and for general spare parts management.

4.1.2 Repair and Servicing

Return the unit to the FAR Part 145 repair station for assessment. The antenna is only repairable by the original equipment manufacturer (refer to the ACMM [3]). For information on how to return a unit for repair, see *Returning units for repair* on page 4-3.

4.1.3 Maintenance intervals

Inspection intervals are equal to the Mandatory Periodic Inspection interval for the aircraft type on which it is fitted. It is also advisable to inspect the antenna if the aircraft is

subjected to hail or lightning strikes (refer to the ACMM [3]). Refer to Table 4-1, below, for information on inspection actions applicable to the LGA-5005.

Inspection tasks

Inspection	Action
Check that the antenna is securely fastened to the fuselage.	Re-tighten the screws.
Check the radome for cracks, paying particular attention to the area around the fixing points and to the front.	Return the unit to Cobham SATCOM. ^a
Check for excessive erosion or wind ablation of the radome.	Return the unit to Cobham SATCOM. ^a

Table 4-1: Inspection tasks for LGA-5005

- a. The radome can only be replaced by the manufacturer. Failure to comply with this will void all warranties.

4.2 Events generated by the LGA-5005

If the LGA-5005 fails, it will implement a BITE function that will report the failure to the CSDU, which in turn will report it to the OHMF (Onboard Health Management Function).

The CSDU will log a BITE event and report the status over the CSDU Centralized Fault Display System (CFDS) interface. This interface connects to the aircraft maintenance system.

All BITE logs are part of the CSDU's System log, which can be downloaded from the CSDU USB Front Maintenance port when on the ground. Refer to:

- Airline Operational User Guidance - 99-173107 [8]
- Operational User Guidance - 99-157303 [9]

Antenna failures are part of the System logs/Diagnostic report.

For more detail on the above refer to the A200S Installation manual [6].

4.3 Returning units for repair

4.3.1 Return Material Authorization (RMA)

Should your Cobham SATCOM product fail, use the online partner portal www.cobham.com/satcom, **Cobham SYNC Partner Portal**. There you will get guidance for the RMA process.

1. To request login credentials submit an email to: AVIATOR.support@cobham.com.
2. Fill in the RMA details at the **Cobham SYNC Partner Portal**.

Repackaging requirements

Should you need to send the LGA-5005 for repair, please read the below information before packing the product.

The shipping carton has been carefully designed to protect the LGA-5005 and its accessories during shipment. This carton and its associated packing material should be used when repackaging for shipment. Attach a tag indicating the type of service required, return address, part number and full serial number. Mark the carton FRAGILE to ensure careful handling.

Note | Correct shipment is the customer's own responsibility.

Important | If the original shipping carton is not available, the following general instructions should be used for repackaging with commercially available material. The packaging must at least meet ATA-300 Category III.

1. Protect the connectors from physical damage and electrostatic discharge.
2. Wrap the defective unit in heavy paper or plastic. Attach a tag indicating the type of service required, return address, part number and full serial number.
3. Use a strong shipping container, e.g. a double walled carton.
4. Protect the LGA-5005 by inserting a layer of shock-absorbing material between all surfaces of the equipment and the sides of the container.
5. Seal the shipping container securely.
6. Mark the shipping container FRAGILE to ensure careful handling.

Failure to do so may invalidate the warranty.

RMA procedure

Before returning units for repair, please follow this procedure:

1. Have the following information ready before calling the Customer Service Center:
 - Model number (example: LGA-5005).
 - Serial number (example: 00443322).
 - A thorough description of the fault.
 - Aircraft serial number and/or tail number.
2. Contact a Cobham Service Center, see *Technical support* on page 4-1.
3. Describe the fault as thoroughly as possible and ask for assistance. In some cases, the error may be resolved over the phone.
4. If the unit has to be returned for repair, request an RMA number.
5. Request replacement/loan unit if required.
6. Pack the equipment or parts to be returned in approved shipping containers.
7. Write the RMA number on the outside of all shipping containers and ship to the address communicated by your technical service contact.

Special tools, fixtures and equipment

For tools, fixtures and equipment necessary to perform the LGA-5005 installation procedures described in this manual refer to Table 5-1, below. There are no Cobham part numbers.

Note Equivalent substitutes may be used.

	Name	Specification or part number	Source /CAGE code	Section
1	Torque spanner	TNC, 15 mm (0.591"), 0.46 to 0.69 Nm (0.34 to 0.51 ft-lb)	Commercially available	<i>Installation of the antenna on page 3-8 & Removal of the antenna on page 3-10</i>
2	Torque driver 3	3.95 to 6 Nm (2.9 – 4.4 ft-lb)	Commercially available	<i>Installation of the antenna on page 3-8</i>
3	Phillips bit	Size is #2.	Commercially available	<i>Installation of the antenna on page 3-8 & Removal of the antenna on page 3-10</i>
4	Flat screw driver	4-6 mm (0.16 - 0.24")	Commercially available	<i>Installation of the antenna on page 3-8</i>
5	Tweezer	Serrated tip, 120mm (4.72")	Commercially available	<i>Removal of the antenna on page 3-10</i>

Table 5-1: Tools, fixtures and equipment required for the LGA-5005 installation

Item	Name	Specification or part number	Source /CAGE code	Section
1	Non-curing Mastic Sealant	Commercially available	-	<i>Installation of the antenna on page 3-8</i>
2	Isopropyl Alcohol	Commercially available	-	-

Table 5-2: List of supplies

Illustrated parts list

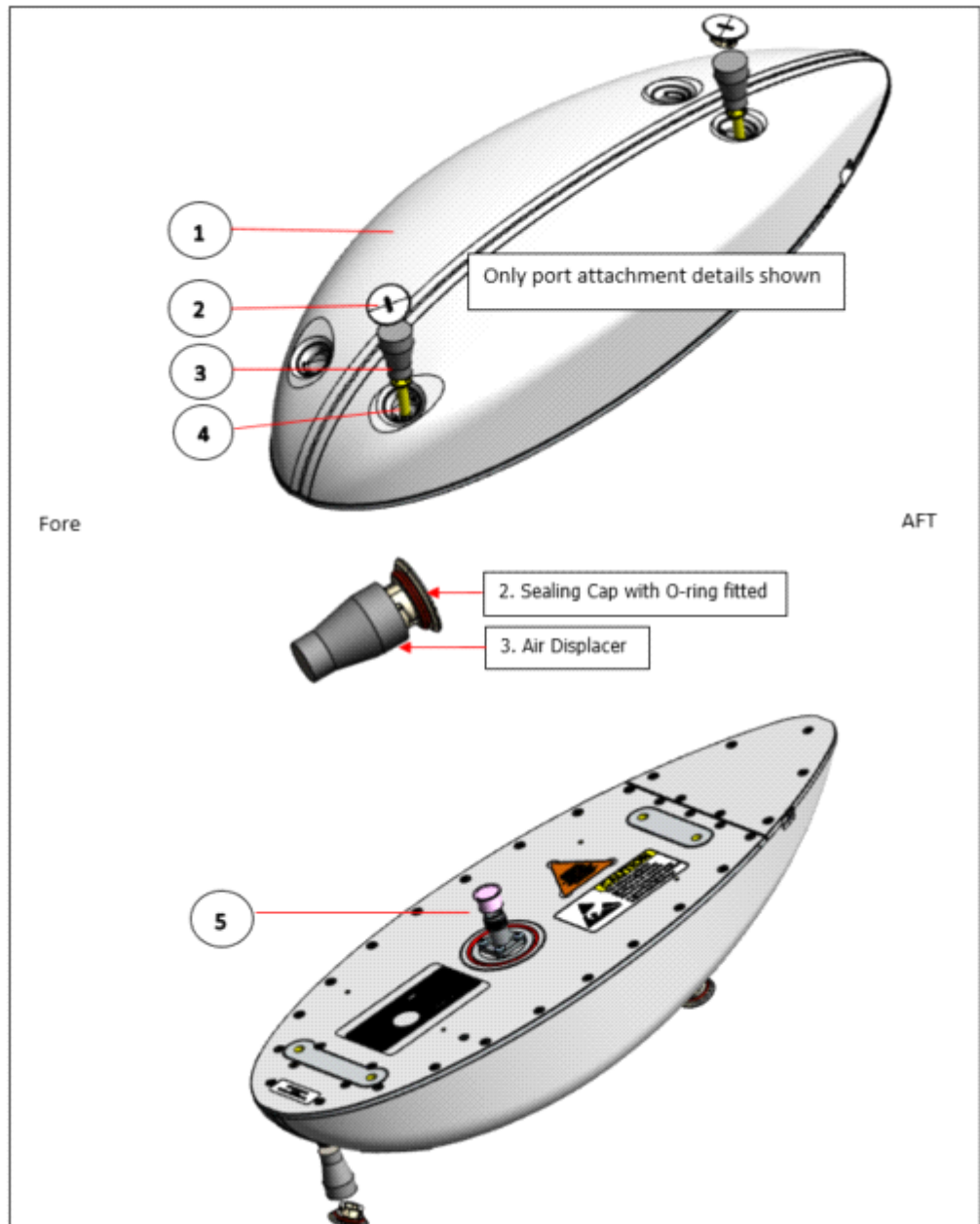


Figure 6-1: LGA-5005 – HELGA

Figure Item	Part Number	Nomenclature	Quantity per Assy	Notes
1	405005-vvccc ^a	HLD and Enhanced low Gain Antenna (HELGA)	1	
2	780-A0785	Sealing cap with O-ring and air displacer	4	2 spares included
4	NAS623-3-xx or NAS1101-3-xx	Mounting bolts	4	To be supplied by the installer. Length to be determined by installer
5	Commercially available	Anti-static cap	1	

Table 6-1: Legend for figure items

a. vv = customer identifier, ccc = minor variant

Equipment specifications

Important

The information, drawings, and wiring information contained in this manual are intended as a reference for engineering planning only. It is the installer's responsibility to compose installation drawings specific to the aircraft.

This appendix has the following sections:

- *LGA-5005 specifications*
- *DO-160 specifications*
- *Certification*

A.1 LGA-5005 specifications

Specification	Details
Power Requirements	28 V DC, < 50 W, supplied by the CSDU
Dimensions (nominal)	L = 379 mm [14.92"] W = 141 mm [5.55"] H = 62 mm [2.44"] (at widest point)
Weight (max)	1.82 kg [4.0 lbs]
Operating temperature	- 55 °C to + 70 °C [-67°F to +158°F]
Ground survival temperature	- 55 °C to + 85 °C [-67°F to +185°F]
Storage	Up to 30 years in the original packing (< 50% RH)
Altitude	Up to 16764 m [55 000 ft]
Frequency, Receive Band	1518.0 MHz - 1559.0 MHz
Frequency, Transmit Band	1626.5 MHz - 1660.5 MHz and 1668.0 MHz - 1675.0 MHz
Software	RTCA / DO-178C Level D
Hardware	RTCA / DO-254 Level D

Table A-1: Equipment specifications for LGA-5005

A.2 DO-160 specifications

A.2.1 Qualification Forms

The Environmental Qualification Forms list the environmental categories under which the LGA-5005 has been approved.

Qualification	Details
Environmental	Refer to RTCA DO-160G for further details on the following Environmental Qualification Forms.

Table A-2: Qualification Forms

Part Number: LGA-5005

Conditions	DO-160G	Cat.	Comments
Temperature and Altitude			For installation in: <ul style="list-style-type: none"> • Non-controlled-temperature locations • Non-pressurized locations. • Pressurized locations.
Low temperature	4.5.1 & 4.5.2	F2	For installation in non-controlled-temperature locations. Ground Survival Low Temperature: -55°C Short-Time Operating Low Temperature: -55°C Operating Low Temperature: -55°C
High temperature	4.5.3 & 4.5.4	F2	For installation in non-controlled-temperature locations. Ground Survival High Temperature: +85°C Short-Time Operating High Temperature: +70°C Operating High Temperature: +70°C The antenna will disable its transmitter when needed to prevent damage due to overheating.
In-flight loss of cooling	4.5.5	X	Not applicable.
Altitude	4.6.1	F2	For installation in non-pressurized locations: Max. 55000 ft
Overpressure	4.6.3	A2	For installation in pressurized locations: -15000 ft
Temperature variation	5.0	A	Externally mounted: 10°C/minute
Humidity	6.0	C	External equipment.

Table A-3: Common environmental conditions and tests (DO160G) for LGA-5005

Conditions	DO-160G	Cat.	Comments
Operational shocks and crash safety	7.0, 7.3.3	E	Low-frequency operational shock and low frequency crash: Shock Low-frequency operational 6g/20ms and Crash safety 20g/20ms.
Vibration	8.0	S(LMC) & R(C,C1)	Standard random vibration, Category S Curve C: <ul style="list-style-type: none"> Aircraft type 2 (Fixed wing, turbojet or turbofan engines) Aircraft zone 1 (fuselage) Robust random vibration, Category R (Curve C and Curve C1): <ul style="list-style-type: none"> Aircraft type 2 (Fixed wing, turbojet or turbofan engines) Aircraft zone 1 (fuselage) Standard sinusoidal vibration, Category S (Curve L and Curve M): <ul style="list-style-type: none"> Aircraft type 3, 4, 5 (Fixed wing, reciprocating & turboprop engines. Multi engines over 5,700KG. multi & single engines less than 5,700KG). Aircraft zone 1 (fuselage)
Vibration, high-level	8.6	H(R)	Vibration high-level, vibration test of short duration, during abnormal fixed-wing aircraft during blown tires or conditions of loss of engine fan blade.
Explosion proofness	9.0	X	Not applicable.
Waterproofness	10.0	SY	Heavy stream, de-icing, cleaning.
Fluids susceptibility	11.0	F	Spray test. Resistant to: Fuels, hydraulic fluids, lubricating oils, solvents and cleaning fluids, de-icing fluid, insecticides and fire extinguishants.
Sand and Dust	12.0	S	Subject to blowing sand and dust in the course of normal aircraft operation.
Fungus Resistance	13.0	F	Non-nutrient materials used.
Salt Spray	14.0	T	Severe salt fog.
Magnetic Effect	15.0	Z	Magnetic deflection distance: < 0.3 m
Power Input	16.0	X	No power from aircraft.
Voltage Spike	17.0	X	No power from aircraft.

Table A-3: Common environmental conditions and tests (DO160G) for LGA-5005 (Continued)

Conditions	DO-160G	Cat.	Comments
Audio Frequency Conducted Susceptibility - power inputs	18.0	X	No power from aircraft.
Induced Signal Susceptibility	19.0	CW	Interference free operation is required, wide frequency range AC primary power.
Radio frequency susceptibility	20.0	WR	Bench Testing. RF Port.- Anechoic Chamber Method. For Conducted Susceptibility Cat W For Radiated Susceptibility Cat RY
Emission of radio frequency energy	21.0	H	Equipment installed with direct view of radio receivers antenna. Conducted emissions frequency extended to 200 MHz and sample broadband at 10 times the bandwidth used for narrowband, using the test methods as specified in RTCA DO-160 Section 21.3
Lightning induced transient susceptibility	22.0	A3J3L3	RF Port.
Lightning Direct Effects	23.0	1A1A	Zone 1A: First return stroke is likely during lightning channel attachment with a low expectation of flash hang on.
Icing	24.0	AC	Externally mounted, exposed to accumulating free water.
Electrostatic Discharge ESD	25.0	A	15 kV, 330 Ohm, 150 pF.
Fire, Flammability	26.0	X	No test required. Equipment located outside the pressure vessel, where it will not pose a safety hazard to the aircraft, personnel or equipment in the event of fire.

Table A-3: Common environmental conditions and tests (DO160G) for LGA-5005 (Continued)

A.3 Certification

A.3.1 Certifying agency

Acceptance for the installation and use of the LGA-5005 and its associated components must be obtained through the appropriate offices of the FAA or other certifying agency. It is recommended that all proposed installations be coordinated with the local jurisdiction of the FAA or other certifying agency prior to performing the installation.

A.3.2 List of (E)TSOs and deviations

This will be added at the time when ETSO and deviations are granted.

References

B.1 References

- [1] AC 43.131B/2B; Acceptable Methods, Techniques, and Practices - Aircraft Inspection, Repair and Alterations, U.S. Dept of Transportation, FAA
- [2] 94-157367; LGA-5005L Outline Drawing
- [3] 98-158756, LGA-5005 Abbreviated Maintenance Manual
- [4] 780-A0785 Mounting Hole Sealing Kit
- [5] RTCA DO-160G: Environmental Conditions and Test Procedures for Airborne Equipment, December 8, 2010
- [6] 98-145168; AVIATOR 200S Installation Manual (Cockpit)
- [7] 98-158752; AVIATOR 200S User Manual (Cockpit)
- [8] 99-173107, Airline Operational User Guidance
- [9] 99-157303, Operational User Guidance
- [10] 94-161849, LGA-5005 A350 Floating Mounting Plate, Outline Drawing
- [11] 98-164146, LGA-5005 A350 Floating Mounting Plate, Installation Notes

Manuals and wiring diagrams can be downloaded from www.cobham.com/satcom, **Cobham SYNC Partner Portal**. Some material and features are for partners only and can only be accessed after login with a password.

A

AES	Aircraft Earth Station
APU	Auxiliary Power Unit.
ARINC	Aeronautical Radio Incorporated.
ATA	Air Transport Association

C

CSDU	Compact Satellite Data Unit.
------	------------------------------

D

DC	Direct Current.
----	-----------------

F

FAA	Federal Aviation Administration.
FLS	Field-loadable Software

G

GB	Grounding and Bonding
GHz	Giga Hertz.
GLONASS	GLObal'naya NAVigatsionnaya Sputnikovaya Sistema. Global Navigation Satellite System
GPS	Global Positioning System.

H

HELGA	HLD and Enhanced Low Gain Antenna
HLD	High Power Amplifier, Low Noise Amplifier and Diplexer

L

LGA	Low Gain Antenna
LNA	Low Noise Amplifier.

O

OD	Outline Drawings
OEM	Original Equipment Manufacturer

P

PNR Part Number

R

RF Radio Frequency.

RH Relative Humidity.

RMA Return Material Authorization.

RTCA Radio Technical Commission for Aeronautics

Rx Received signal.

S

SCM SDU Configuration Module

SDU Satellite Data Unit

STC Supplemental Type Certificate. FAA certification document issued to companies that perform significant modifications on an aircraft.

T

TNC Threaded Neill-Concelman. A type of RF connector used for terminating coaxial cables.

Tx Transmitted signal.

A

address
 manufacturer, -ii
 aerodynamics load, bolts, 3-10
 alignment, 3-5
 antenna base
 radius, 3-3
 APU inlet, 3-7

B

block diagram, system, 2-3
 blockage, 3-6
 bolts, 3-10
 aerodynamic loads, 3-10
 breathing holes
 location, 3-5

C

cable DC resistance, 2-4
 cable loss, 2-4
 checking the antenna, 4-2
 connector
 protective cap, 3-2
 contact
 address, -ii

D

Design Assurance Level, 3-1
 hardware, A-1
 software, A-1
 DO-160 forms, A-2

E

Environmental Qualification Forms, A-2

F

fixtures, 5-1, 6-1
 fuselage
 orientation, antenna, 3-5

G

GPS/GLONASS, 3-6

I

impedance, 2-4
 inspection tasks, 4-2
 installation, 3-1
 installation offset angles, 3-5

interference
 with other antennas, 3-6

L

lightning strike, 3-6
 location of antenna, 3-3

M

maintenance, 4-1, 5-1, 6-1
 manufacturer
 address, -ii
 mounting, 3-3
 mounting bolts, 3-8
 mounting holes
 sealant, 3-9

O

offset roll and pitch, 3-5
 orientation on fuselage, 3-5

P

packaging for return, 4-3
 part number, 2-2
 LGA-5005, 2-1
 software, 3-1
 pitch offset, 3-6
 protective cap, 3-2

R

radiation warning, -iv
 References, B-1
 repackaging requirements, 4-3
 repair, 4-1, 5-1, 6-1
 returning units, 4-3
 returning units, 4-3
 shipping address, 4-4
 RF blockage, 3-6
 RMA procedure, 4-4
 roll offset, 3-6
 RTCA DO-160 forms, A-2

S

sealant
 application, 3-9
 mounting holes, 3-9
 sealing caps, 3-9
 Sealing Kit, 3-9
 service, 4-1, 5-1, 6-1
 shelf life, 3-1

- shipping address, 4-4
- software part number, 3-1
- specifications, A-1
- Standards, applicable, B-1
- STC, 3-1
- storage, 3-1
- structural loads, 3-3
- support
 - contact details, 4-1
 - contact information, 4-1

T

- technical support, 4-1
- tools, 5-1, 6-1
- torque
 - mounting bolts, 3-8
 - TNC connector, 3-8
- transportation, 3-1

