LGA-3000 Antenna
Product Specification

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NOTICE

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DOCUMENT CHANGE HISTORY

ISSUE	DATE	ECP	DESCRIPTION OF CHANGE
A.0	27/05/11	10/308	Initial document draft for validation by engineering
1.0	30/05/11	11/034	Initial Release
1.1	22/05/12	11/219	Figure 1: updated Section 4.2: reference to Extended L-Band added Table 1: length width & height corrected as per OD. Section 16: updated to reference ACMM. Section 17: DO-160 string in section 17: Commas removed, brackets corrected.

DOCUMENT APPROVAL AND VALIDATION

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1. SCOPE

This document outlines the technical details of the LGA-3000 Low Gain Antenna. The aim of this document is to describe the product, its architecture, functional design and other specifications.

Figure 1: LGA-3000 Antenna

2. ABBREVIATIONS

LGA	Low Gain Antenna
GPS	Global Positioning System
HLD	High Power Amplifier/Low Noise Amplifier/Diplexer
LNA	Low Noise Amplifier
LRU	Line-Replaceable Unit
RF	Radio frequency
Rx	Receive signal
SB200	SwiftBroadband Class 15 Service and equipment
SDU	Satellite Data Unit
Tx	Transmit signal

3. APPLICABLE DOCUMENTS

[1]	677-A0205_OD	LGA-3000 Outline Drawing
[2]	677-A0205_ACMM	LGA-3000 Abbreviated Component Maintenance Manual

4. PRODUCT DESCRIPTION

4.1 General Description

The LGA-3000 is a Low Gain Blade Antenna with integral Global Positioning System (GPS) Antenna functionality, forming one component of an Inmarsat SB200 Class 15 SwiftBroadband solution. The antenna complies with the relevant Inmarsat standards.

4.2 Equipment Description

The LGA-3000 Low Gain Antenna (PN: 677-A0205) is a non-steered antenna taking the form of a typical aeronautical blade. It includes a GPS Patch for the position reporting required by Inmarsat's network (for operational reasons), making it the only antenna capable of supporting a self-contained 3 LRU SB200 solution.

The main features of the antenna are:

1. Inmarsat approved for SB200;
2. Designed specifically for Inmarsat's SB200 Service and its relevant system architecture;
3. Extended L-Band compliant;
4. Built-in GPS Antenna and LNA;
5. Weight of less than 630 grams or 1.38 lbs.

4.3 System Architecture and Block Diagram

A typical system block diagram is given below:

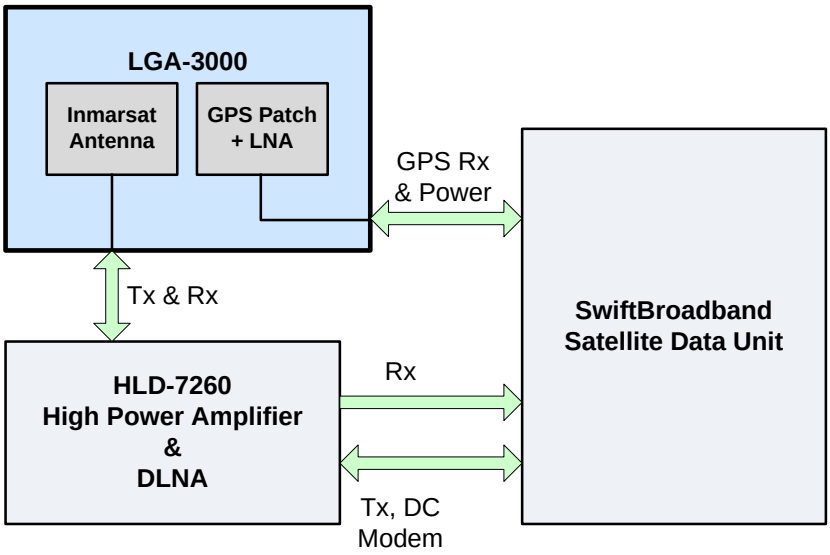

Figure 2: SB200 Satcom System block diagram with LGA-3000 Antenna.

4.4 Antenna Delivery Package

The antenna is supplied with no ancillary parts.

5. PRODUCT SPECIFICATION: MAIN PARAMETERS

Table 1: The main parameters of the LGA-3000 Antenna

Specification	LGA-3000 Antenna
Length (Max)	346.0 mm [13.62]
Width (Max)	86.0mm [3.39]
Height (Max)	112.0 mm [4.41]
Weight (Max)	0.63 kg [1.38 lbs]
Temperature Range (operating)	-55 °C to +85 °C [-67 °F to 185 °F]
Altitude	Up to 16,754 m [55,000 ft]
Frequency	1518 MHz to 1675 MHz
Power Supply (GPS)	5 Vdc ± 0.5 Vdc, <0.6 W (supplied by Satcom SDU)
Coverage	0° to 360° Azimuth, 20° to 90° Elevation Meets Inmarsat specifications over 80% of Az/El defined above
Polarization	Right hand circular
Gain	Nominal antenna gain: 2.5 dBic
Qualification (Software)	N/A
Qualification (Environmental)	RTCA/DO-160F : Reference Section 17 for specific categories

6. INTERFACES

The LGA-3000 electrical interfaces (RF TX/Rx and GPS) are found under the body of the antenna within an O-ring sealed area of the antenna. They are colour coded to aid connection of the correct cables during the installation process.

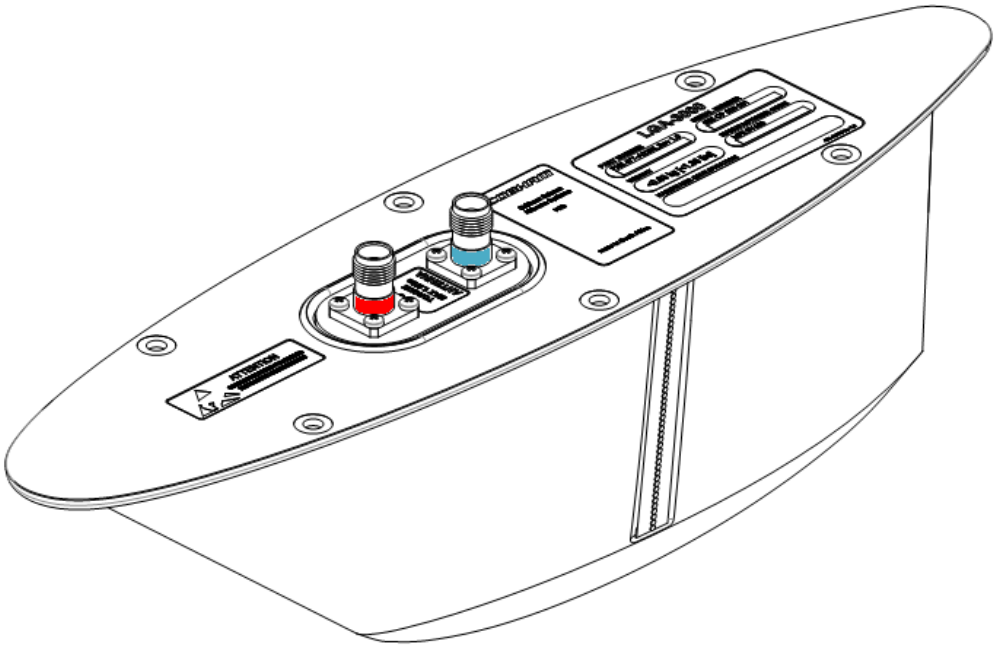

Figure 3: LGA-3000 Connectors and underside

6.1 Antenna Connectors

The RF connectors are panel mount TNC (female) connectors with the following colour codes:

- DC Power / GPS: Red
- RF (Tx/Rx): Blue

6.2 Mechanical Interface

Six antenna mounting points are provided for antenna installation. Refer to [1] for dimensional details.

Spacers or shims are recommended between the antenna and a curved airframe in the 6 mounting bolt locations. Sealant may be applied to close any gap.

7. RF PERFORMANCE OF THE LGA-3000

7.1 Coverage

- Azimuth 0 to 360 degrees
- Elevation 20 to 90 degrees
- Meet G/T, EIRP and Axial ratio simultaneously over at least 80% of the Az/El volume above and with aircraft in horizontal flight.

7.2 System Performance

- G/T $\geq$ -20 dB/K
- EIRP = 11.4 dBW

7.3 Discrimination

90° < θ ≤ 110° (or -20° ≤ elevation < 0): G0dBr - G(θ) ≥ 4 dB
110° < θ ≤ 180° (or -90° ≤ elevation < -20°): G0dBr - G(θ) ≥ 12 dB

Where G(θ) is the Tx gain averaged at θ° from zenith. The corresponding elevation angle is: 90° - θ° and the gain is averaged over φ ranging from 0 to 360°.

The 0 dBr gain level is defined as: G0dBr = G(θ = 70°), which is at 20° elevation.

7.4 Polarisation

- RHCP
- Axial ratio < 6dB over declared coverage volume

7.5 Power Handling

The antenna supports the transmission of a continuous single carrier of up to 10 Watts at the input connector.

7.6 VSWR

The antenna VSWR measured at the antenna input/output port is less than 1.5:1 (with respect to 50 ohm characteristic impedance).

8. BUILT IN GPS FRONT-END

The antenna houses a GPS antenna and LNA with the following specifications:

- Frequency: 1575.42 MHz ± 2.0 MHz
- Impedance: 50 Ohm nominal
- Voltage: 5 V ± 0.5 V (powered by SDU)
- DC Power: < 600 mW
- LNA Gain: 28 dB ± 3 dB
- Noise Figure: < 4.0 dB @ 25 deg C.

9. AERODYNAMIC LOADING

Antenna drag number is less than 0.5 lb at 11,000m for Mach 0.85.

10. PAINT

The antenna is to be painted with a white aircraft grade polyurethane outer coating or equivalent (CA40000) and an antistatic sub layer (DeSoto® Antistatic Coating 528x306).

11. ANTENNA ANTI-STATIC PROTECTION

The radome of the antenna is painted with an anti-static primer. As described above, there are 6 conductive bonding points at the mounting holes to provide grounding to the airframe. Refer to the antenna installation manual for grounding requirements.

12. GROUNDING

Antenna grounding is achieved through the 6 mounting bolts and their surrounding contact areas as shown in Figure 4. The underneath surface of the bolt head makes contact with the antenna's metallic surface.

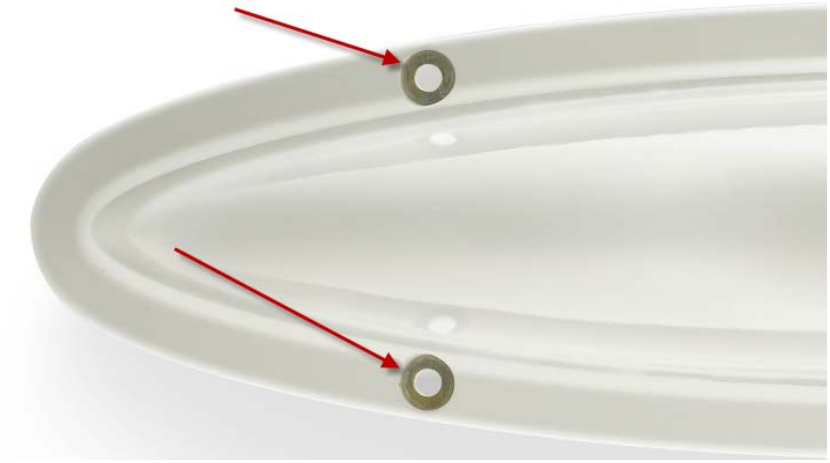

Figure 4: The conductive contact area around the mounting hole

13. LIGHTNING PROTECTION

In addition to the protection provided by the 3mm thick composite radome, the antenna is further protected by two segmented lightning diverter strips. The antenna is qualified to RTCA-DO-160F Cat 1A lightning strike and is designed to be fully operational after such a lightning strike. Refer to the antenna installation manual for grounding requirements.

14. AERODYNAMIC NOISE

Excluding the TNC connectors the antenna has a height of less than 112 mm and due to its shape and resulting low drag, will cause negligible aerodynamic noise.

15. CONNECTOR SEALING

No special precautions are required for connector sealing. The TNC connectors are environmentally sealed to the fuselage with an O-ring.

16. MAINTAINABILITY

The antenna does not contain any user adjustable or maintainable parts. Maintenance consists of routine inspection for radome damage and general corrosion preventative measures. Both these activities can be scheduled during routine aircraft maintenance periods. Refer to the abbreviated component maintenance manual [2] for more details.

17. ENVIRONMENTAL QUALIFICATION

The antenna is qualified to RTCA/DO-160F as specified below.

DO-160F Section	Description	Category
4	Temperature and Altitude	F3
4.5.4	Loss of Cooling	X
5	Temperature Variation	A
6	Humidity	C
7	Shock	A
8	Vibration	S(L,M,Y) R(C,C1,E,E1) U2(F,F1) H(R)
9	Explosion	E
10	Waterproofness	S
11	Fluids Susceptibility	F
12	Sand and Dust	S
13	Fungus Resistance	F
14	Salt Spray	T
15	Magnetic Effect	Z
16	Power Input	X
17	Voltage Spike	X
18	Audio Frequency Conducted Susceptibility	X
19	Induced Signal Susceptibility	ZW
20	Radiated Frequency Susceptibility (HIRF)	TT
21	Emission of Radio Frequency Energy	P
22	Lightning Induced Transient	XXE3X
23	Lightning Direct Effects	1A1A
24	Icing	C
25	Electrostatic Discharge	A
26	Fire, Flammability	X

This relates to the following DO-160F categorization string:

[(F3)X]ACA[S(LMY)R(CC1EE1)U2(FF1)H(R)]ESFSFTZXXX[ZW][TT]P[XXE3X][1A1A]CAX