



# **Garmin GPS and XM<sup>®</sup> Antenna STC Installation Manual**

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A	11/19/10	Initial Release
B	3/11/11	Correct typo in part number of doubler.

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### **DOCUMENT PAGINATION**

<b>Section</b>	<b>Pagination</b>
Table of Contents	i - ii
Section 1	1-1 through 1-2
Section 2	2-1 through 2-12
Section 3	3-1 through 3-4
Section 4	4-1 through 4-2
Appendix A	A-1 through A-10
Appendix B	B-1 through B-6
Appendix C	C-1 through C-14

**TABLE OF CONTENTS**

1	GENERAL DESCRIPTION.....	1-1
1.1	Introduction .....	1-1
1.2	Scope .....	1-1
1.3	Technical Specifications.....	1-1
1.4	Environmental Specifications.....	1-2
1.5	Regulatory Compliance .....	1-2
2	INSTALLATION OVERVIEW .....	2-1
2.1	Introduction .....	2-1
2.2	Pre-Installation Information .....	2-1
2.3	Installation Materials.....	2-1
2.4	Antenna Installation Considerations.....	2-3
2.5	Antenna Installation.....	2-7
2.6	Antenna Grounding .....	2-8
2.7	Coax Cable Installation .....	2-8
2.8	Weight and Balance.....	2-9
3	INSTALLATION PROCEDURE.....	3-1
3.1	Non-Pressurized Aircraft.....	3-1
3.2	Pressurized Aircraft.....	3-3
3.3	Instructions for Continued Airworthiness (ICAW) .....	3-3
4	LIMITATIONS.....	4-1
4.1	Installation .....	4-1
4.2	Preservation of Previous Systems.....	4-1
APPENDIX A NON-PRESSURIZED AIRCRAFT ANTENNA INSTALLATION .....		A-1
A.1	Metallic Skin Aircraft.....	A-1
APPENDIX B PRESSURIZED AIRCRAFT ANTENNA INSTALLATION .....		B-1
B.1	Hawker Beechcraft 90 and 200 Series Aircraft .....	B-1
APPENDIX C LIGHTNING ZONING.....		C-1
C.1	Location of Antennas .....	C-1
C.2	Aircraft Zoning Diagrams .....	C-1
C.3	Single Propeller Aircraft.....	C-2
C.4	Aircraft with Two Propellers.....	C-4
C.5	Aircraft with Multiple Jet Engines .....	C-7
C.6	Aircraft with Multi-Propellers.....	C-8
C.7	Figure Identification for Each Aircraft Model .....	C-9

**LIST OF FIGURES**

Figure 2-1.	Through Mount Teardrop Footprint Antenna .....	2-2
Figure 2-2.	Garmin ARINC 743 Footprint Antenna.....	2-2
Figure 2-3.	Antenna Installation Location .....	2-5
Figure 2-4.	GA 35 Antenna Dimensions .....	2-10
Figure 2-5.	GA 36 Antenna Dimensions .....	2-11
Figure 2-6.	GA 37 Antenna Dimensions .....	2-12
Figure A-1.	Doubler Design, Teardrop Footprint Antenna.....	A-3
Figure A-2.	Doubler Design, ARINC 743 Footprint Antenna.....	A-4
Figure A-3.	Skin Cutout Detail, Teardrop Footprint Antenna.....	A-5
Figure A-4.	Skin Cutout Detail, ARINC 743 Footprint.....	A-6



Figure A-5. Sample Doubler Location.....	A-7
Figure A-6. Doubler Installation, Teardrop Footprint Antenna.....	A-8
Figure A-7. Doubler Installation, ARINC 743 Footprint Antenna .....	A-9
Figure A-8. Through Mount Teardrop Footprint Antenna Installation.....	A-10
Figure A-9. GA 37 ARINC 743 Footprint Antenna Installation .....	A-10
Figure B-1. Hawker Beechcraft 90 and 200 Series Antenna Location .....	B-1
Figure B-2. Doubler Design, ARINC 743 Footprint Antenna, Hawker Beechcraft 90 and 200 Series...	B-2
Figure B-3. Hawker Beechcraft 90 and 200 Series Fuselage Skin Cutout Detail.....	B-3
Figure B-4. Hawker Beechcraft 90 and 200 Series GA36 Antenna Installation.....	B-4
Figure B-5. Hawker Beechcraft 90 and 200 Series GA36 and GA 37 Antenna Installation .....	B-5
Figure C-1. Zoning Legend.....	C-1
Figure C-2. Single Prop (Zoning for a Low or High Wing Single Prop).....	C-2
Figure C-3. Single Rear-Mounted Prop with a Curved Fuselage (Zoning For a Low or High Wing Aircraft with a Curved Fuselage).....	C-3
Figure C-4. Single Rear-Mounted Prop Above Fuselage (Zoning for a Low or High Wing Aircraft with a Rear-Mounted Prop Above Fuselage).....	C-3
Figure C-5. Twin Front-Mounted Props (Zoning for a Low or High Wing Twin Prop Aircraft with Front-Mounted Propellers. The distance d1 and d2 are the same on both engines) .....	C-4
Figure C-6. Twin Rear-Mounted Props (Zoning for a Low or High Wing Twin Prop Aircraft with Rear-Mounted Propellers).....	C-5
Figure C-7. Front and Rear-mounted Props (Zoning for Low or High Wing with a Front and Rear Mounted Propellers).....	C-6
Figure C-8. Twin Jet Engines (Zoning for a Low or High Wing Twin Jet Engine Aircraft).....	C-7
Figure C-9. Triple Front-Mounted Props (Wings and Above Fuselage) .....	C-8

### **LIST OF TABLES**

Table 1-1. Antenna Models.....	1-1
Table 1-2. Environmental Qualification Form Reference.....	1-2
Table 2-1. Installation Materials .....	2-1
Table 2-2. Antenna Installation.....	2-7
Table 2-3. Ground Plane Requirements .....	2-8
Table 2-4. Antenna Information.....	2-10
Table 3-1. Recommended Fastener Torque .....	3-2
Table A-1. Antenna Doubler Design and Installation.....	A-1
Table C-1. Approved Model List and Reference Figures .....	C-9

## 1 GENERAL DESCRIPTION

### 1.1 Introduction

This manual presents mechanical and electrical installation requirements for installing the Garmin antennas listed in Table 1-1 and the information contained herein is STC approved.

### 1.2 Scope

This installation manual applies to the installation of antennas identified in the following table. This STC installation manual does not include antenna product information. Refer to the antenna specific installation manual in Table 1-1.

**Table 1-1. Antenna Models**

Model	Garmin Part Number	Aero Antenna Part Number	Color	Description	Footprint Mount Style	Ref Figure	Installation Manual Part Number
GA 35	013-00235-00	AT575-93GW-TNCF-000-RG-27-NM	White	GPS/WAAS	Tear Drop	Figure 2-1	190-00848-00
	013-00235-01	AT575-93GB-TNCF-000-RG-27-NM	Black				
	013-00235-02	AT575-93GO-TNCF-000-RG-27-NM	Olive Green				
GA 36	013-00244-00	AT575-126GW-TNCF-000-RG-27-NM	White	GPS/WAAS	ARINC 743	Figure 2-2	190-00848-00
	013-00244-01	AT575-126GB-TNCF-000-RG-27-NM	Black				
	013-00244-02	AT575-126GO-TNCF-000-RG-27-NM	Olive Green				
GA 37	013-00245-00	AT2300-126GW-TNCF-000-RG-27-NM	White	GPS/WAAS + XM Antenna	ARINC 743	Figure 2-2	190-00848-00
	013-00245-01	AT2300-126GB-TNCF-000-RG-27-NM	Black				
	013-00245-02	AT2300-126GO-TNCF-000-RG-27-NM	Olive Green				

In the event of a discrepancy between the information provided in this manual and the installation manuals listed in Table 1-1, the information contained within this document shall take precedence.

Instructions for antenna installation in aircraft with pressurized cabin are limited to Hawker Beechcraft 90 and 200 Series. Antenna installation in pressurized aircraft other than Beechcraft models listed may require additional manufacturer's data and FAA approval.

Structural aspects of antenna installation in composite or fabric aircraft are beyond the scope of the instructions in this installation manual. Additional manufacturer's data may be necessary and FAA approval may be required to cover the installation of the antenna in composite or fabric aircraft.

Refer to Section 4, Limitations, for additional limitation information.

It is possible for installers to seek evaluation and approval of an alternate installation by means of the field approval process. This manual and all the data contained within may be used by the installer in pursuit of a field approval.

### 1.3 Technical Specifications

Refer to the specific antenna installation manual listed in Table 1-1 for antenna technical specifications.

## 1.4 Environmental Specifications

It is the responsibility of the installing agency to obtain the latest revision of the antenna Environmental Qualification Form. This form is available directly from Garmin. Refer to Table 1-2 for the Environmental Qualification Form Part Number for the antenna models covered in this manual.

**Table 1-2. Environmental Qualification Form Reference**

Model	Environmental Qualification Form Part Number
GA 35	Aero Antenna: TSO575-126G
GA 36	Aero Antenna: TSO575-126G
GA 37	Aero Antenna: TSO2300-126

To obtain a copy of this form, see the dealer/OEM manuals portion of the Garmin web site ([www.garmin.com](http://www.garmin.com)).

## 1.5 Regulatory Compliance

The antennas covered by this installation manual are TSO approved. Refer to the antenna specific installation manual listed in Table 1-1 for more details.



## 2 INSTALLATION OVERVIEW

### 2.1 Introduction

This section provides equipment and hardware information for installing the desired antenna. Installation of any antenna should follow the aircraft TC or STC requirements. For technical information on a specific antenna, refer to the respective publication as listed in Table 1-1.

### 2.2 Pre-Installation Information

Always follow acceptable avionics installation practices per FAA Advisory Circulars (AC) 43.13-1B, 43.13-2A, or later FAA approved revisions of these documents.

Follow the installation procedure in this section as it is presented for a successful installation. Read the entire section before beginning the procedure. Prior to installation, consider the structural integrity of the antenna installation as defined in AC 43.13-2B, Chapter 1 and 3.

### 2.3 Installation Materials

The antenna is provided with a kit of parts and may vary depending on the model of antenna being installed. Refer to the antenna installation manual Table 1-1 for the specific materials that are supplied with the antenna. Table 2-1 lists the materials that are required for installation.

**Table 2-1. Installation Materials**

			Antenna Model		
			GA 35	GA 36	GA 37
Reference Antenna Figure			Figure 2-1	Figure 2-2	Figure 2-2
Through Mount Teardrop Footprint Antenna			X		X
ARINC 743 Footprint Antenna				X	X
Materials Required					
Garmin PN	Alternate	Description			
115-00846-00	[1]	Doubler Plate		1	1
115-00846-10	[1]	Doubler Plate	1		
115-00873-00	[2]	Doubler Plate		1	1
210-10004-09	AN365C832 MS21044C08	Nut, Self-locking .1640-32UNJC-3B	4		
N/A	MX20426AD4-( ) [3]			Rivet, Solid	X [4]
211-60212-20	MS51958-67	Screw, Machine .1900-32 UNF-2Ax1"			
N/A	MX24693-C276	Screw, Machine .1900-32 UNF-2Ax1"		4	4
N/A	MS28775-116	O-ring, Nitrile	1		
	Size 2-121	O-ring, Nitrile 26.64mm IDx2.62mm W			
N/A	MS28775-142	O-ring, Nitrile		1	1
253-00002-00	N/A	Gasket, Neoprene			
253-00138-00	N/A	Gasket, Neoprene			

Notes:

[1] Doubler plate may be fabricated per drawings in Appendix A

[2] Doubler plate may be fabricated per drawings in Appendix B

[3] Length determined at installation

[4] Quantity determined at installation



**Figure 2-1. Through Mount Teardrop Footprint Antenna**



**Figure 2-2. Garmin ARINC 743 Footprint Antenna**

## 2.4 Antenna Installation Considerations

### NOTE



Although the signal coax cable is not installed under this STC, when choosing a location for the antenna, you should consider the coax routing distance from the existing or planned location of the receiver to the proposed antenna location. The receiver installation manual should include information you can use to check whether the planned coax routing distance will support intended receiver signal gain and loss requirements.

The following sub-sections include requirements for this STC installation.

### 2.4.1 Placement of Antenna for Lightning Protection

Antennas must be installed in an aircraft lightning zone that matches their qualifications. The DO-160 Section 23 qualifications of the antennas support installation in Lightning Zones 1C, 2A or 3. See Section C.1 for the zone applicable to each antenna. This typically places the antenna at least 51.2 inches (1.3 meters) aft of the aircraft nose. The exact distances are provided by the lightning zones identified in Appendix C. Antennas shall not be installed in fuel bay areas where the fasteners or antenna stud penetrate the wet or dry fuel bay.

### 2.4.2 GA 35 and GA 36 GPS/WAAS Antennas

The GPS antenna is a key element in the overall system performance and integrity for a GPS/WAAS navigation system. The mounting location, geometry, and surroundings of the antenna can affect the system performance and/or availability. The following guidance provides information to aid the installer in ensuring that the most optimum location is selected for the installation of the GPS antenna. The installation guidelines presented here meet the intent of AC 20-138A section 16. The greater the variance from these guidelines, the greater the chance of decreased antenna performance. Approach procedures with vertical guidance are the most sensitive to these effects. LNAV only approaches, terminal operations, and enroute operations may also be affected. Because meeting all of these installations guidelines may not be possible on all aircraft, these guidelines are listed in order of importance to achieve optimum performance. Items 3a, 3b, and 3c below are of equal importance and their significance may depend on the aircraft installation. The installer should use their best judgment to balance the installation guidelines.

1. Mount the antenna as close to level as possible with respect to the normal cruise flight attitude of the aircraft. If the normal flight attitude is not known, substitute with the waterline, which is typically referenced as level while performing a weight and balance check.
2. The GPS antenna should be mounted in a location to minimize the effects of airframe shadowing during typical maneuvers. Typically mounting farther away from the tail section reduces signal blockage seen by the GPS antenna.
- 3a. The GPS antenna should be mounted no closer than two feet from any VHF COM antenna or any other antenna which may emit harmonic interference at the L1 frequency of 1575.42 MHz. An aircraft EMC check (reference VHF COM interference check in Post Installation Checkout procedures for the GPS receiver installation) can verify the degradation of GPS in the presence of interference signals. If an EMC check reveals unacceptable interference, insert a GPS notch filter in line with the offending VHF COM or the (re-radiating) ELT transmitter.

### NOTE



This check can only be performed if a GPS receiver exists on the aircraft or one is being installed, GPS receiver installation is not covered by this STC.

## NOTE



When mounting a combination antenna, the recommended distance of two feet or more is not applicable to the distance between the antenna elements in a combination antenna (ex. GPS and XM) provided the combination antenna is TSO authorized and has been tested to meet Garmin's minimum performance standards.

- 3b. The GPS antenna should be mounted no closer than two feet from any antennas emitting more than 25 watts of power. An aircraft EMC check can verify the degradation of GPS in the presence of interference signals.
- 3c. To achieve the best possible low-elevation antenna gain (by minimizing pattern degradation due to shadowing and near-field interaction), the GPS antenna shall be mounted with clearance from other antennas, including passive antennas such as another GPS antenna or XM antenna. When practical, installers shall use 12 inch center-to-center spacing between antennas. If 12 inch spacing is not practical, installers shall use the maximum center-to-center spacing from adjacent antennas, but never less than 9 inch center-to-center spacing. Spacing less than 9 inches center-to-center results in unacceptable GPS/WAAS antenna pattern degradation.
4. To limit degradation by windscreen effects, avoid mounting the antenna closer than 3 inches from the windscreen. Also see Section 2.6.1 for ground plane effect on antenna gain pattern.

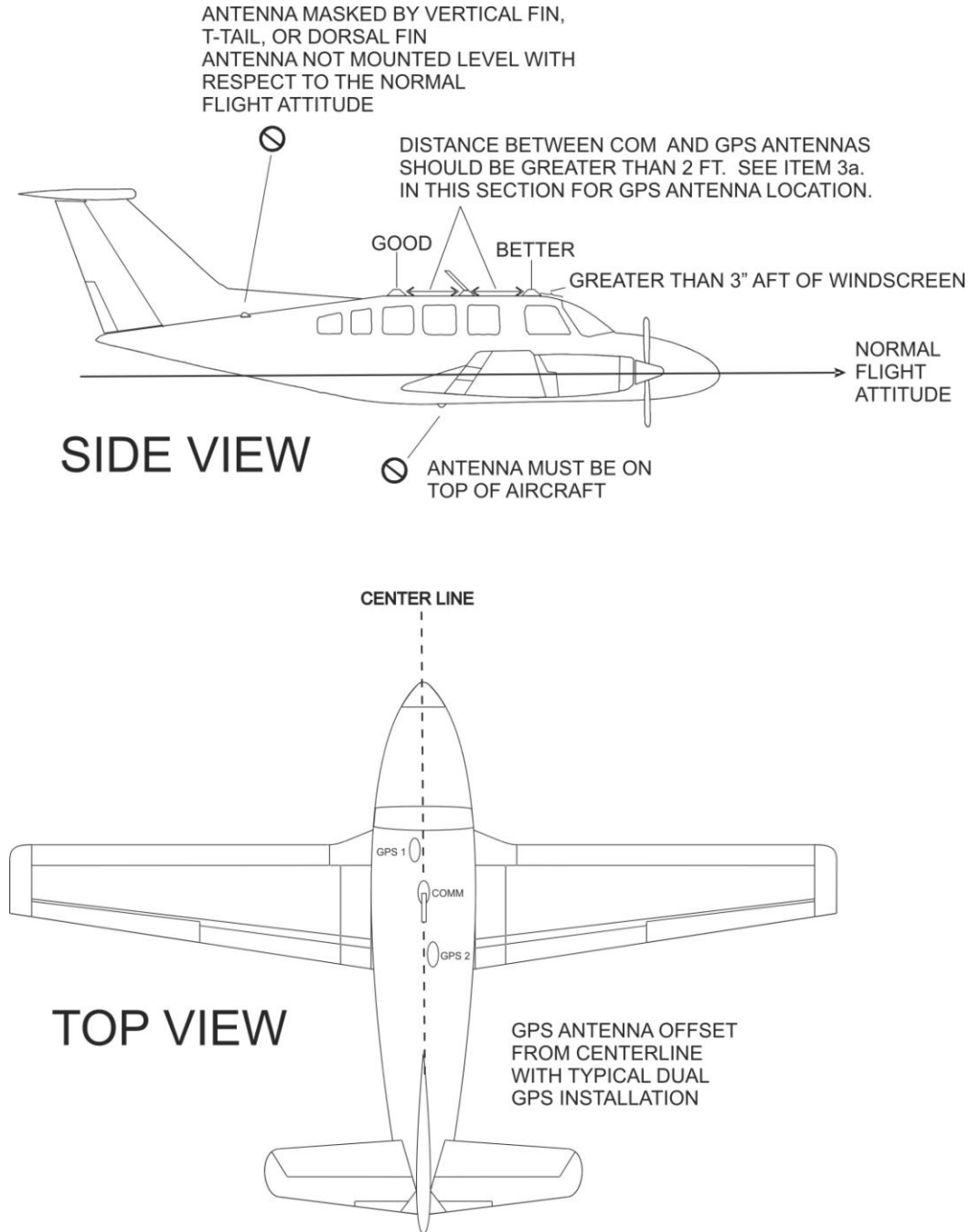
## NOTE



Antennas on certain airplanes with a maximum speed over 250 KIAS must install the antennas at least 24 inches aft of the windscreen, unless another location has been certified. See Section C.7 for affected models.

5. For multiple GPS installations, the antennas should not be mounted in a straight line from the front to the rear of the fuselage. Also varying the mounting location will help minimize any aircraft shading by the wings or tail section (in a particular azimuth, when one antenna is blocked the other antenna may have a clear view).

Figure 2-3 shows the recommended placement of antennas.



**Figure 2-3. Antenna Installation Location**



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### **2.4.3 XM® Antennas**

The XM antenna must be mounted on top of the aircraft for greatest satellite visibility. For best performance, select a location with an unobstructed view of the sky above the aircraft when in level flight (see Figure 2-3). Location of communication antennas too close to the XM antenna may not only degrade the transmission through reflection, but can also absorb and re-radiate the transmission causing a condition similar to having two COM antennas located in close proximity to each other.

The antenna should be mounted (edge to edge) no closer than 1.25 inches from any passive (receive only) antenna such as a GPS or another XM antenna, five inches from a VHF active antenna such as VHF Comm. transmitting antennas or ACARS, five inches from an active radar altimeter (4 GHz), and 12 inches from a UHF/Microwave transmitting antennas such as a transponder, DME, active TCAS, UAT, SATCOM, or Flitephone.

Maintain about three feet from heater, ignition, autopilot, and other control surface actuators and motors. Maintain about five feet from fluorescent lamps, related ballast, air conditioners, blowers, strobe lights and power supplies.

Follow installation spacing guidelines from other nearby antennas.

### **2.4.4 GA 37 Combination GPS/WAAS and XM® Antenna**

For the GA 37 combination GPS and XM antennas, follow mounting location considerations for both GPS/WAAS antennas and for XM Radio Antennas.

## 2.5 Antenna Installation

The specific mounting instructions depend on which antenna model is installed and what type of aircraft the antenna is being installed on. Use Table 2-2 in determining which data to use for installation.

**Table 2-2. Antenna Installation**

	Antenna Model		
	GA 35	GA 36	GA 37
Antenna Mount	Teardrop Footprint	ARINC 743 Footprint	ARINC 743 Footprint
Installation on Non-Pressurized Aircraft with Metallic Skin	Appendix A	Appendix A	Appendix A
Installation on Pressurized Aircraft with Metallic Skin	Appendix B	Appendix B	Appendix B

### 2.5.1 Non-Pressurized Aircraft Installation

This installation manual covers structural installations of the antennas listed in Table 1-1 on metal aircraft with 2024-T3 aluminum skin 0.020 to 0.080 inches thick. Structural installation defined by this STC requires the antenna to be installed using a doubler plate as shown in Appendix A.

Aircraft structure must not be weakened as a result of installation of the antenna and doubler. Mounting areas should be selected such that no structural members other than aircraft skin are altered. Refer to the aircraft manufacturer's specifications and AC 43.13-2B Chapters 1 and 3 for appropriate guidance on structural modifications and antenna installation. Make use of any available reinforcements where appropriate.

### 2.5.2 Pressurized Aircraft Installation

Refer to Appendix B for antenna installation on pressurized aircraft.

Antenna installations on metal aircraft models with pressurized cabin other than listed in Appendix B require FAA approved installation design and engineering substantiation data whenever such installation incorporate alteration (penetration) of the cabin pressure vessel by connector holes and/or mounting arrangements. This STC provides data for pressurized aircraft antenna installation only on certain aircraft that are listed in Appendix B.

## 2.6 Antenna Grounding

Antenna grounding is required to provide the appropriate antenna performance and safely dissipate any lightning currents from a lightning attachment to the antenna. The antenna performance is also dependent on the size of the ground plane and further guidance is provided below. This metallic ground plane must be electrically bonded, to the rest of the metallic aircraft structure or aircraft ground plane, to safely carry any lightning currents. This STC does not provide data to mount the antenna on composite fairing. The aircraft skin provides the required ground plane in metallic aircraft for antenna performance and lightning protection.

### 2.6.1 Ground Plane

For optimum antenna performance, a metallic ground plane or skin sized at least 7.5 inches beyond the perimeter of the antenna is required. Table 2-3 lists the ground plane perimeter required for each antenna. If ground plane is added to the aircraft, round its edges to be as circular as practical for best performance.

**Table 2-3. Ground Plane Requirements**

	Antenna Model		
	GA 35	GA 36	GA 37
Ground Plane Extend Beyond Antenna Perimeter (inches)	7.5	7.5	7.5

### 2.6.2 Bonding Requirements

Antennas, ground planes, and supporting brackets must be electrically bonded to the aircraft's main structure. The aircraft ground plane must be electrically bonded to the antenna baseplate. Refer to SAE ARP 1870 section 5 when surface preparation is required to achieve electrical bond. The electrical bond must achieve direct current (DC) resistance less than or equal to 2.5 milliohms to structure local to where the equipment is mounted. Compliance should be verified by inspection using a calibrated milliohm meter. An equivalent OEM procedure may also be substituted.

Typically it is not necessary to remove paint under the footprint of the antenna on the metal skin of the aircraft to meet the antenna bonding requirements. The painted surface prevents corrosion and should be left intact if possible. If paint needs to be removed for bonding, be careful to avoid excessive chipping or cracking beyond the antenna baseplate, which could become a source for corrosion. The resistance of 2.5 milliohms can usually be achieved through the antenna mounting screws which attach to the antenna doubler.

To verify that the bonding requirements have been met, perform the following steps:

1. Disconnect coaxial cable(s) from the antenna connector(s).
2. Measure the resistance between the antenna connector (TNC external ground) and a nearby exposed portion of conductive aircraft structure (example: Measure the resistance between the antenna connector body and nearby exposed rivet on fuselage stringer).
3. Verify the resistance is equal to or less than 2.5 milliohms.

## 2.7 Coax Cable Installation

Installation of the coax cable is beyond the scope of this STC. Refer to the interfaced receiving equipment for installation instructions, selection of coax cable, and signal loss requirements that may affect antenna placement. To support protection of the GPS antenna from the indirect effects of lightning, the cable routing must be within the fuselage and must not be routed behind an exterior composite structure.



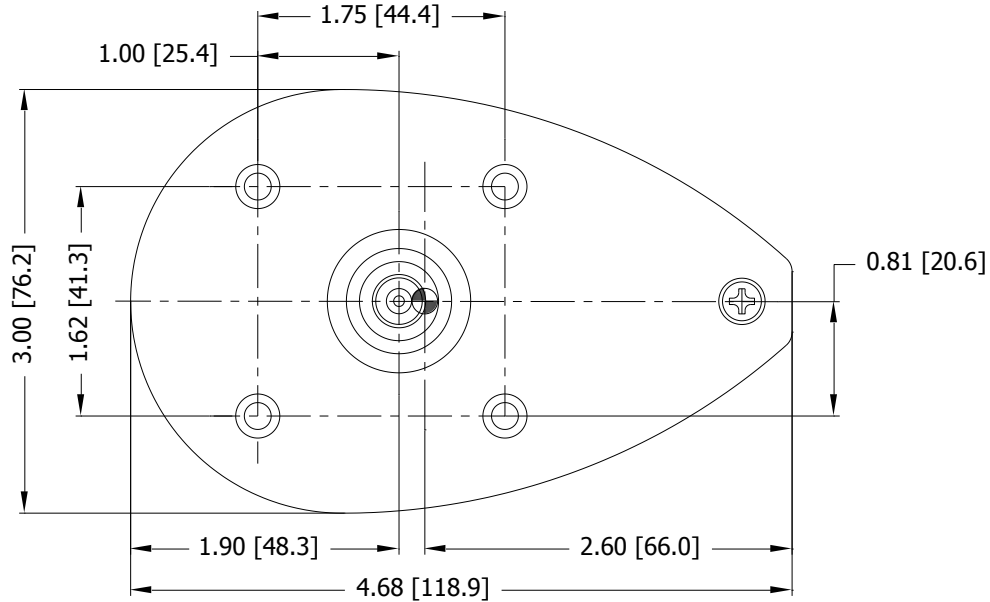
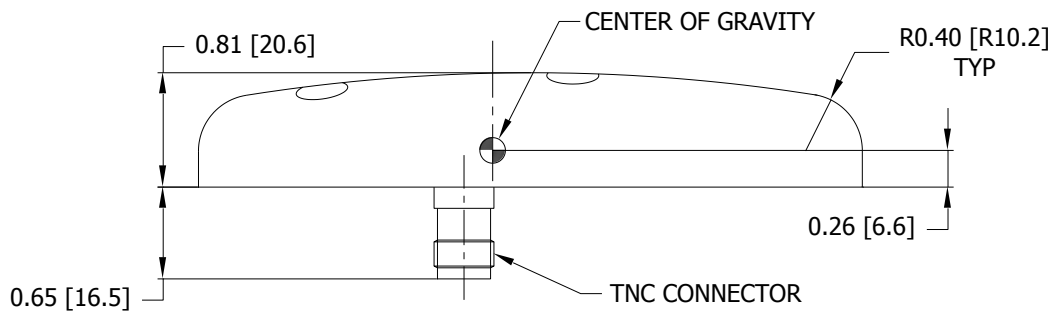
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## 2.8 Weight and Balance

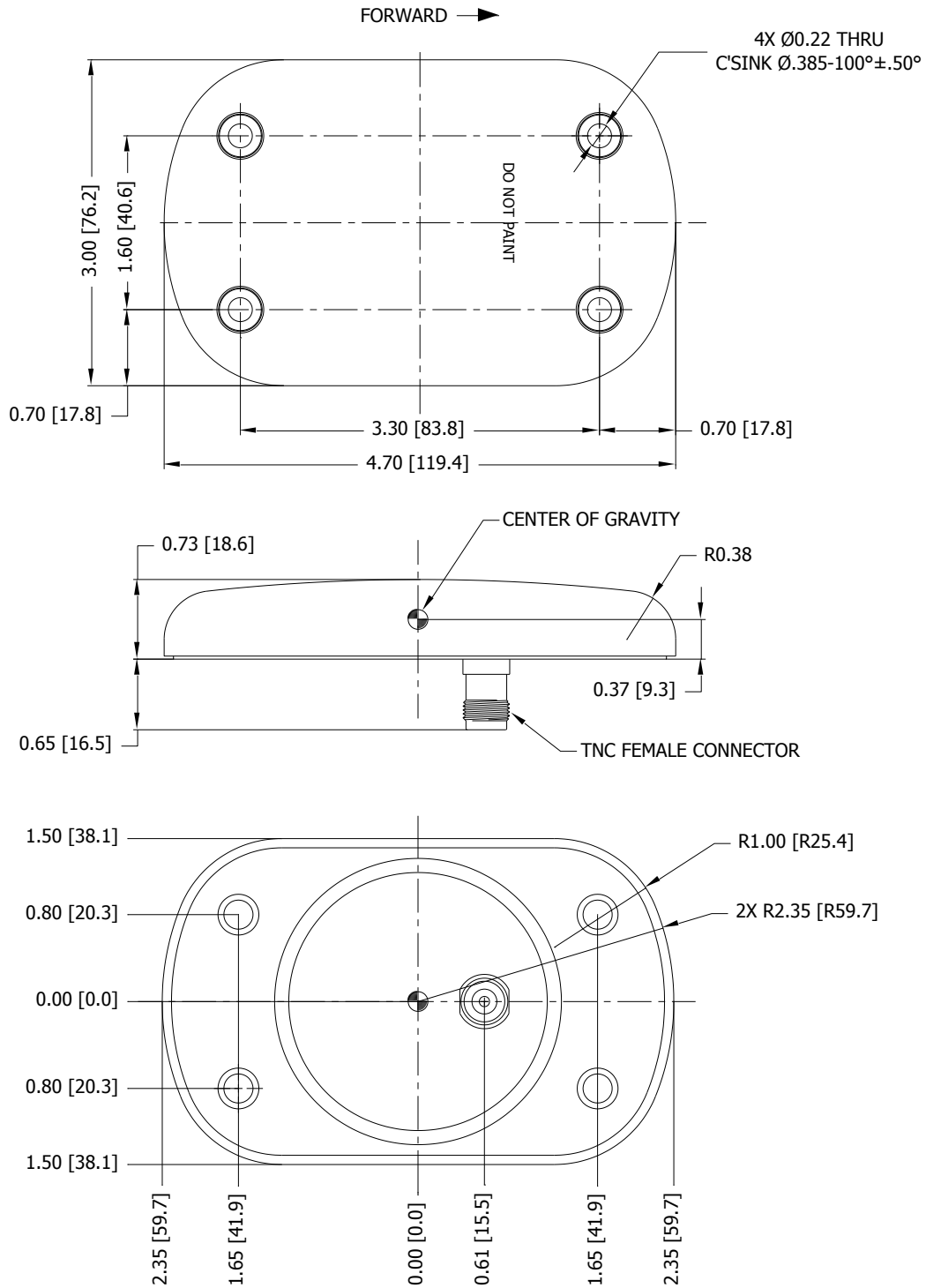
Weight and balance computation is required after the installation of the antenna. Follow the guidelines as established in AC 43.13-1B, Chapter 10 Section 2. Make appropriate entries in the equipment list indicating items added, removed, or relocated along with the date accomplished. Include your name and certificate number in the aircraft records. Table 2-4 lists the specific antenna, doubler, and installation kit weights, as well as cross reference to figures displaying antenna dimensions and CG information.

**Table 2-4. Antenna Information**

	Antenna Model		
	GA 35	GA 36	GA 37
Mount Style	Through	Through	Through
Antenna Weight	0.47 lbs (0.21 kg)	0.47 lbs (0.21 kg)	0.50 lbs (0.23 kg)
Doubler Weight	0.09 lbs (0.04 kg)	0.17 lbs (0.08 kg)	0.17 lbs (0.08 kg)
Dimensions and CG Information	Figure 2-4	Figure 2-5	Figure 2-6



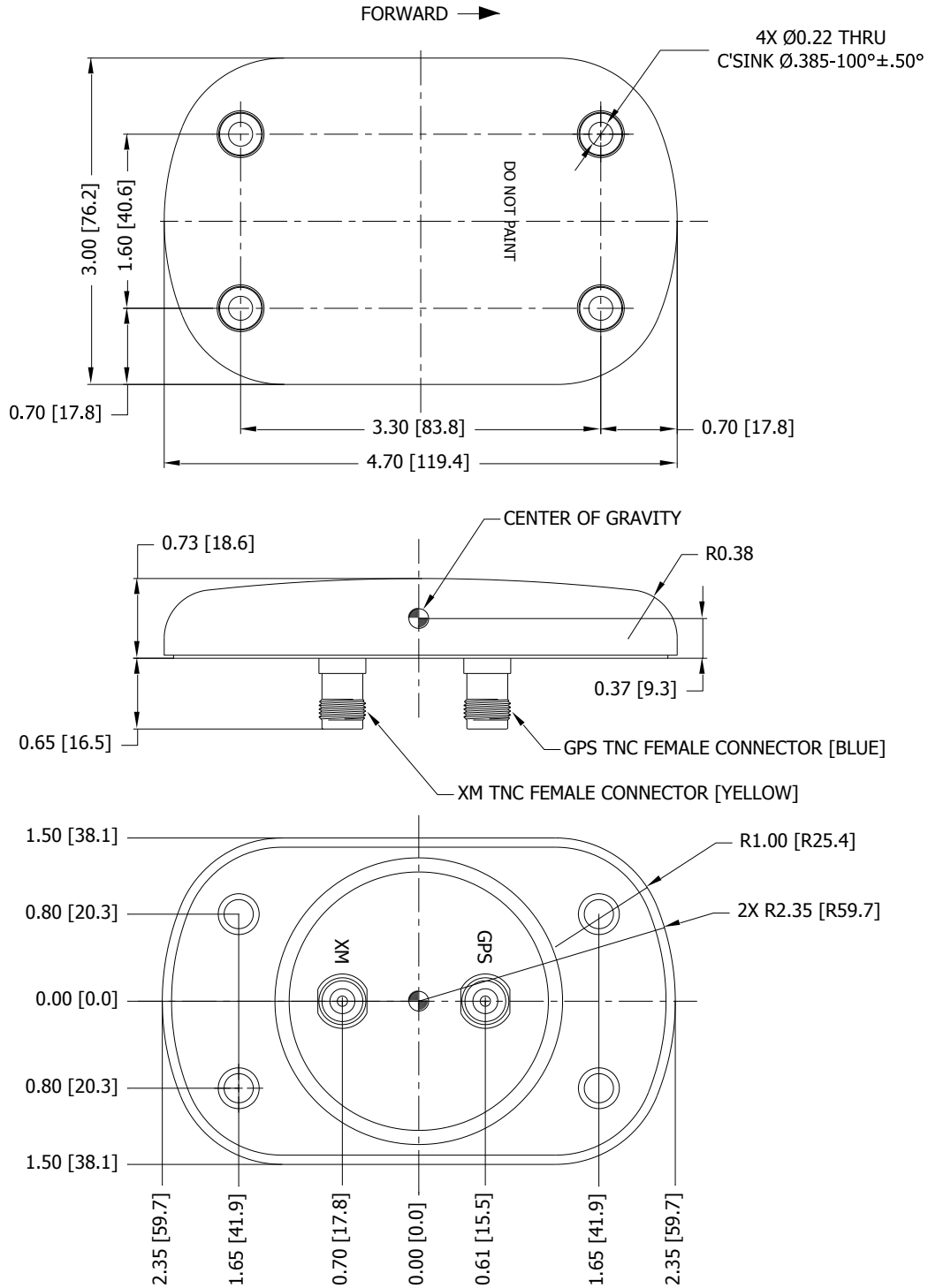
**Figure 2-4. GA 35 Antenna Dimensions**



**NOTES:**

1. DIMENSIONS IN INCHES [MM].

**Figure 2-5. GA 36 Antenna Dimensions**



**NOTES:**

1. DIMENSIONS IN INCHES [MM].

**Figure 2-6. GA 37 Antenna Dimensions**

### 3 INSTALLATION PROCEDURE

#### 3.1 Non-Pressurized Aircraft

Refer to Appendix A for antenna installation details.

##### 3.1.1 Metallic Aircraft

###### 3.1.1.1 Antenna Doubler

1. Use Garmin P/N 115-00846-10 for teardrop footprint antenna installation, or Garmin P/N 115-00846-00 for ARINC 743 footprint antenna installation. Refer to Appendix A for information on selecting the appropriate doubler design based on the aircraft skin thickness at the antenna location.
2. Make the doubler from 2024-T3 aluminum (AMS-QQ-A-250/5), 0.063 inch sheet thickness.
3. For doubler installation with MS20426AD4-X rivets, countersink the rivet holes if aircraft skin thickness is 0.020 to 0.050 inches. For doubler installation with NAS1097AD4-X flush head rivets, countersink the rivet holes if aircraft skin thickness is 0.020 to 0.031 inches.
4. Sixteen rivet holes exist in the part when using Garmin P/N 115-00846-10 doubler for teardrop footprint antenna installation, or Garmin P/N 115-00846-00 doubler for ARINC 743 footprint antenna installation.
5. For installation of Garmin P/Ns 115-00846-00 and 115-00846-10 in aircraft skins between 0.020 and 0.035 inches thick, only 12 rivets are required as identified in doubler design detail (Figure A-1 and Figure A-2) and in the skin cutout detail (Figure A-3 and Figure A-4).
6. For installation of Garmin P/Ns 115-00846-00 and 115-00846-10 in aircraft skins between 0.063 and 0.080 inches thick, 4 additional fastener holes have to be drilled since 20 rivets are required as identified in doubler design detail (Figure A-1 and Figure A-2) and in the skin cutout detail (Figure A-3 and Figure A-4).

###### 3.1.1.2 Antenna Installation

1. Refer to Appendix A for guidance on selecting the appropriate antenna mounting cutout.
2. Drill or punch the holes in aircraft skin to match the doubler.
3. Install a doubler plate to reinforce the aircraft skin, as required. Refer to Section 3.1.1.1 for doubler preparation. Refer to Appendix A for additional guidance on the doubler installation for teardrop and ARINC 743 footprint antennas.
4. Dimple the aircraft skin for doubler installation with MS20426AD4-X rivets when skin thickness is 0.020 to 0.050 inches. For doubler installation with NAS1097AD4-X flush head rivets, dimple the aircraft skin when skin thickness is 0.020 to 0.031 inches.
5. Countersink the aircraft skin for doubler installation with MS20426AD4-X rivets when skin thickness is 0.051 to 0.080 inches. For doubler installation with NAS1097AD4-X flush head rivets countersink the aircraft skin when skin thickness is 0.032 to 0.050 inches.
6. For the GA 35 through mount teardrop footprint antenna, secure O-ring in the O-ring groove on the underside of the antenna.
7. For the GA 36 and GA 37 ARINC 743 footprint antennas, secure the O-ring in the O-ring groove on the underside of the antenna.
8. MS21044C08 self-locking nuts (No. 8, supplied) and NAS1149FN832P washers are required to secure GA 35 teardrop footprint antenna.

9. MS24693-C276 stainless steel countersunk head machine screws (No. 10, supplied) are required to secure GA 36 and GA 37 ARINC 743 footprint antennas. MS21047L3 low height self-locking nutplates are installed on ARINC 743 footprint antenna doubler.
10. Torque antenna fasteners per Table 3-1. Torque should be applied evenly across all fasteners to avoid deformation of the mounting area.

**Table 3-1. Recommended Fastener Torque**

	Fastener Size	
	No. 8 0.1640-36UNF-2A	No. 10 1900-32UNF-2A
Recommended Torque	12 to 15 in-lbs	15 to 20 in-lbs

11. Ensure that the antenna base and aircraft skin are in continuous contact with the gasket or O-ring, as appropriate to the antenna model. Verify electrical bonding of the antenna by inspection using a calibrated milliohm meter. Any metallic part of the antenna or it's fasteners may be used to verify the electrical bond to the doubler. See Section 2.6.2 for final bonding check requirements.
12. Seal the antenna and gasket by running a bead of the MIL-A-46146 Non-Corrosive RTV Silicone Adhesive-Sealant along the edge of the antenna where it meets the exterior aircraft skin. Use caution to insure that the antenna connectors are not contaminated with sealant.

### CAUTION



Do not use construction grade RTV sealant or sealants containing acetic acid. These sealants may damage the electrical connections to the antenna. Use of these type sealants will void the antenna warranty.

## 3.2 Pressurized Aircraft

Refer to Appendix B for antenna installation details

### 3.2.1 King Air 90 and 200 Series model aircraft.

#### 3.2.1.1 Antenna Doubler

1. Use Garmin P/N 115-00873-00 doubler for GA 36 and GA 37 ARINC 743 footprint antenna installation.
2. Alternatively, fabricate the doubler from 2024-T3 aluminum (AMS-QQ-A-250/5), 0.050 inch sheet. Refer to Figure B-2 for information on doubler design. Countersink rivet holes and install NAS1473A3 capped, self-locking nutplates in the doubler with MS20426AD3-3 solid rivets. Prime antenna doubler with MIL-PRF-23377 High Solids Epoxy Primer (preferred), or TT-P-1757 Alkyd Base One Component Primer (optional).

#### 3.2.1.2 Antenna Installation

1. Determine antenna location on top of the fuselage. Refer to Figure B-1 and Figure B-3 for antenna location and fuselage skin cutout details.
2. If needed to meet bonding requirements, remove paint and primer from the fuselage skin underneath the antenna footprint and prepare skin surface for electrical bonding per SAE ARP1870 Aerospace Systems Electrical Bonding and Grounding for Electromagnetic Compatibility and Safety, Section 5. Antennas have to be electrically bonded meeting requirements defined in Section 2.6.2
3. Drill or punch the holes in aircraft skin to match the doubler. Countersink aircraft skin for doubler installation with NAS1097AD4-5 flush head rivets.
4. Install doubler and rivets wet with MIL-S-8802 High Adhesion Temperature Resistant Sealant.
5. Secure the O-ring in the O-ring groove on the underside of the GA 36 and GA 37 ARINC 743 footprint antennas.
6. MS24693-C276 stainless steel countersunk head machine screws (No. 10, supplied) are required to secure GA 36 and GA 37 ARINC 743 footprint antennas. NAS1473A3 capped, self-locking nutplates are installed on ARINC 743 footprint antenna doubler.
7. Torque antenna fasteners per Section 20-01-00 of King Air 90 series, or 200 series Maintenance Manual, or per Table 3-1. Torque should be applied evenly across all fasteners to avoid deformation of the mounting area.
8. Ensure that the antenna base and aircraft skin are in continuous contact with the O-ring. Verify electrical bonding of the antenna by inspection using a calibrated milliohm meter. Any metallic part of the antenna or its fasteners may be used to verify the electrical bond to the doubler. See Section 2.6.2 for final bonding check requirements.
9. Seal the antenna and gasket by running a bead of the MIL-A-46146 Non-Corrosive RTV Silicone Adhesive-Sealant along the edge of the antenna where it meets the exterior aircraft skin to the fuselage using. Use caution to insure that the antenna connectors are not contaminated with sealant.

## 3.3 Instructions for Continued Airworthiness (ICAW)

Ensure that the appropriate aircraft information is filled in on the ICAW is completed and inserted in the aircraft permanent records.

1. Fill in the Aircraft Make, Model, Registration Number, S/N, and antenna location(s) information on the cover of the ICAW (Garmin document 005-00638-09).
2. Insert the completed ICAW in the aircraft permanent records.

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## **4 LIMITATIONS**

Installation of the antenna identified in Section 2 of this document into an aircraft does not alter the operation approvals previously granted to the aircraft. Additional operation approvals may require FAA evaluation of all systems installed in a particular aircraft and is outside the scope of this document.

### **4.1 Installation**

The antennas must be installed on top of the fuselage, or within the area in line with the top of the fuselage (for high-wing airplanes or biplanes), unless there is another otherwise acceptable position that is NOT in line with any control surfaces.

Antennas shall not be installed in fuel bay areas where the fasteners or antenna stud penetrate the wet or dry fuel bay.

Antennas shall not be located and installed directly on airplane windshield, canopy, or window(s) made from transparent materials like Acrylic Plastic Sheet (Methacrylate) as these materials do not facilitate required antenna grounding and are not suitable for mechanical installation involving fastener penetration.

Except for pressurized aircraft models listed in Appendix B of this document, penetration of the pressure vessel of pressurized aircraft is not approved under the STC. Further evaluation and/or certification approval is required for penetration of the pressure vessel of pressurized aircraft.

Structural aspects of antenna installation in composite or fabric aircraft are beyond the scope of the instructions in this installation manual. Additional manufacturer's data may be necessary and FAA approval may be required to cover the installation of the antenna in composite or fabric aircraft.

### **4.2 Preservation of Previous Systems**

It is the installer's responsibility to preserve the essential characteristic of the aircraft being modified by this manual to be in accordance with the aircraft manufacturer's original design.

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## Appendix A NON-PRESSURIZED AIRCRAFT ANTENNA INSTALLATION

### A.1 Metallic Skin Aircraft

This appendix describes the structural aspects of antenna installation in metallic skin aircraft. One acceptable method is to use Garmin P/N 115-00846-10 doubler plate for the teardrop footprint antenna or Garmin P/N 115-00846-00 doubler plate for the ARINC 743 footprint antenna.

Another acceptable method is to fabricate a doubler. Teardrop footprint antenna doubler is shown in Figure A-1. and ARINC 743 footprint antenna doubler is shown in Figure A-2. Doubler design, including number of rivets and fastener hole preparation, varies depending on the thickness of the skin and choice of rivet. Table A-1 provides a summary of design and installation details for the antenna doubler.

**Table A-1. Antenna Doubler Design and Installation**

Aircraft Skin Thickness	Type of Rivet [1] - NAS1097AD4-X Rivet, Solid, Flush Shear Head 100°			
	Number of Rivets	Hole Size	Doubler Preparation	Skin Preparation
0.020 to 0.031 inch	12	Ø0.129 inch	Countersink Ø0.225x100°	Dimple
0.032 to 0.035 inch	12	Ø0.129 inch	None	Countersink Ø0.189x100°
0.036 to 0.050 inch	16	Ø0.129 inch	None	Countersink Ø0.189x100°
Aircraft Skin Thickness	Type of Rivet [1] – MS20426AD4-X Rivet, Solid, Countersunk 100°			
	Number of Rivets	Hole Size	Doubler Preparation	Skin Preparation
0.020 to 0.035 inch	12	Ø0.129 inch	Countersink Ø0.225x100°	Dimple
0.036 to 0.050 inch	16	Ø0.129 inch	Countersink Ø0.225x100°	Dimple
0.051 to 0.062 inch	16	Ø0.129 inch	None	Countersink Ø0.225x100°
0.063 to 0.080 inch	20	Ø0.129 inch	None	Countersink Ø0.225x100°
	Design References			
	Doubler	Holes and Cutouts in Aircraft Skin	Doubler Installation	Antenna Installation
Figure Number	Figure A-1 Figure A-2	Figure A-3 Figure A-4	Figure A-5 Figure A-6 Figure A-7 [2]	Figure A-8 Figure A-9 [3]

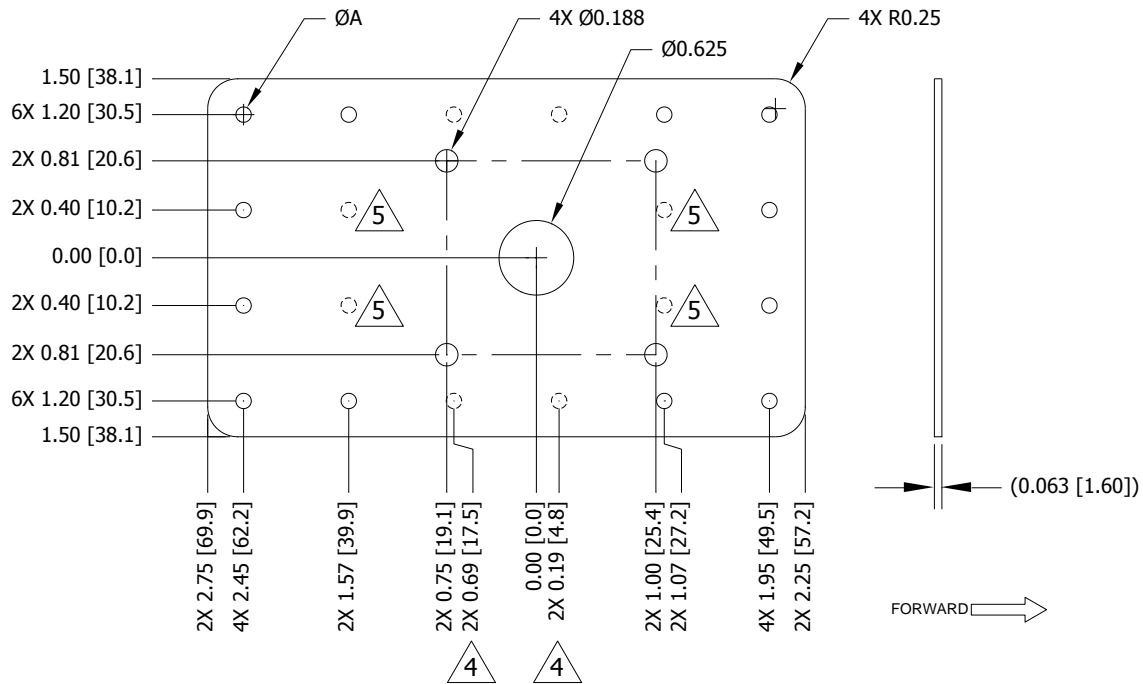
Notes:

- [1] Rivet length determined at installation, dependent on thickness of material (rivet length = grip length + 1.5\*rivet diameter)
- [2] Doubler installation figure show skin cutouts for GA 37 antenna as an example; use only the skin cutouts required for the antenna being installed.
- [3] For installations shown in Figure A-8 surface under the washer shall be prepared for electrical bond, see also section 2.6.2.

Figure A-3 shows the details of aircraft skin cutout required for teardrop footprint antenna installation and Figure A-4 shows the details of aircraft skin cutout required for ARINC 743 antenna installation. Note the number of doubler fastener holes varying with aircraft skin thickness.

Figure A-6 and Figure A-7 show installation of the doubler on aircraft skin. Figure A-5 shows an example of the doubler location between stringers on the top fuselage skin, just off centerline. The location should be flat, with no gaps between the skin and doubler, to keep from deforming the skin during installation.

Figure A-8 shows installation of the through mount teardrop footprint antenna (GA 35). Figure A-9 shows installation of the ARINC 743 footprint antenna with O-ring (GA 36 and GA 37).

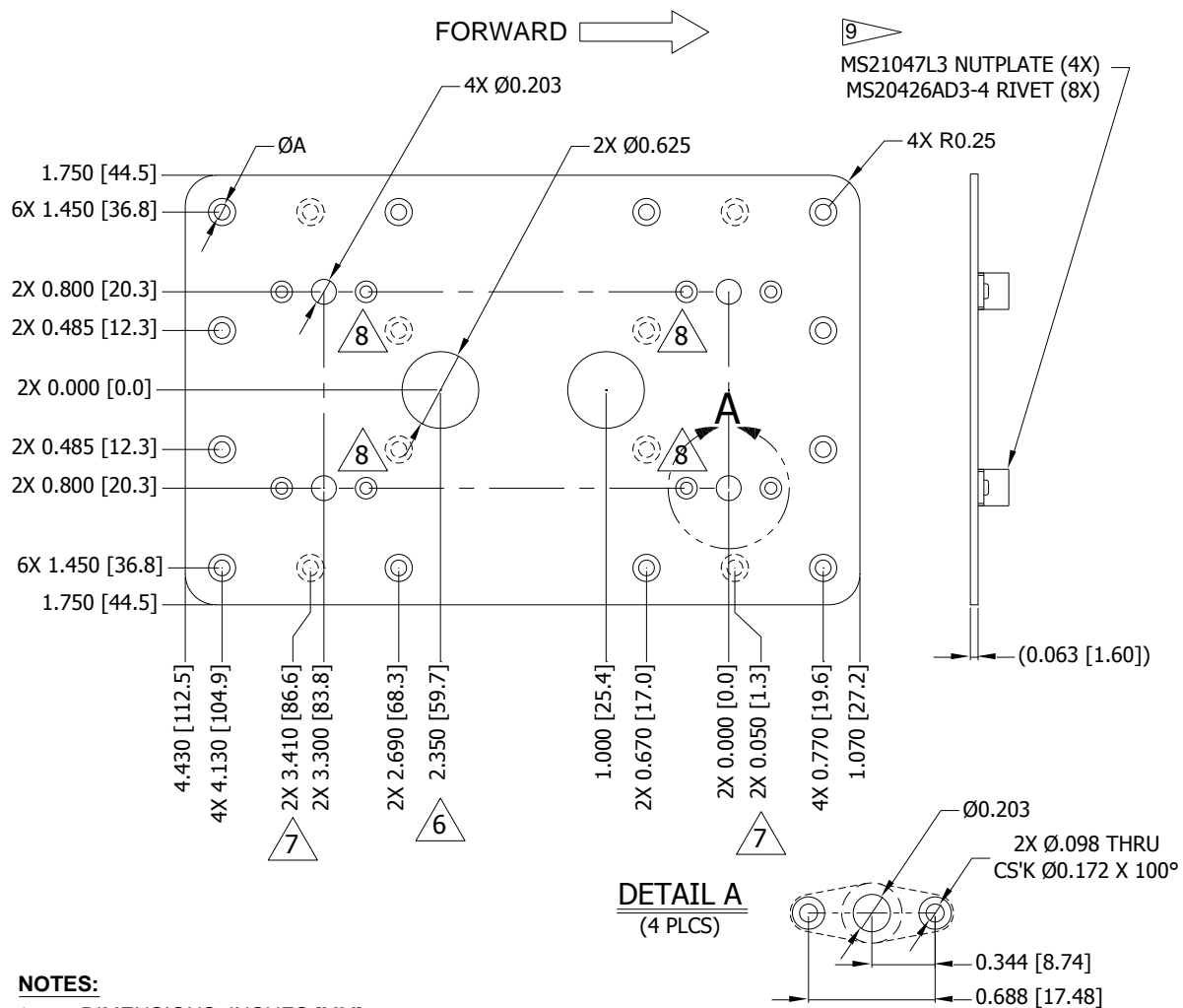


**NOTES:**

1. DIMENSIONS: INCHES.
2. MATERIAL: 0.063" THICKNESS 2024-T3 ALUMINUM (AMS-QQ-A-250/5).
3. TOLERANCE: .XX +/- 0.030", .XXX +/- 0.010".
4. THESE HOLES CAN BE OMITTED IF REQUIRED NUMBER OF FASTENERS IS LESS THAN 16.
5. THESE HOLES HAVE TO BE ADDED IF REQUIRED NUMBER OF FASTENERS IS GREATER THAN 16
6. REMOVE BURRS AND BREAK SHARP EDGES.

AIRCRAFT SKIN THICKNESSES	FASTENER HOLE SPECIFICATION		
	NUMBER	ØA	COUNTERSINK
			MS20426AD4-XX
			NAS1097AD4-X
0.020 TO 0.031 INCH	12	Ø0.129	Ø0.225×100°
0.032 TO 0.035 INCH			Ø0.225×100°
0.036 TO 0.050 INCH	NONE		
0.051 TO 0.062 INCH			NONE
0.063 TO 0.080 INCH	20	NONE	NONE

**Figure A-1. Doubler Design, Teardrop Footprint Antenna**

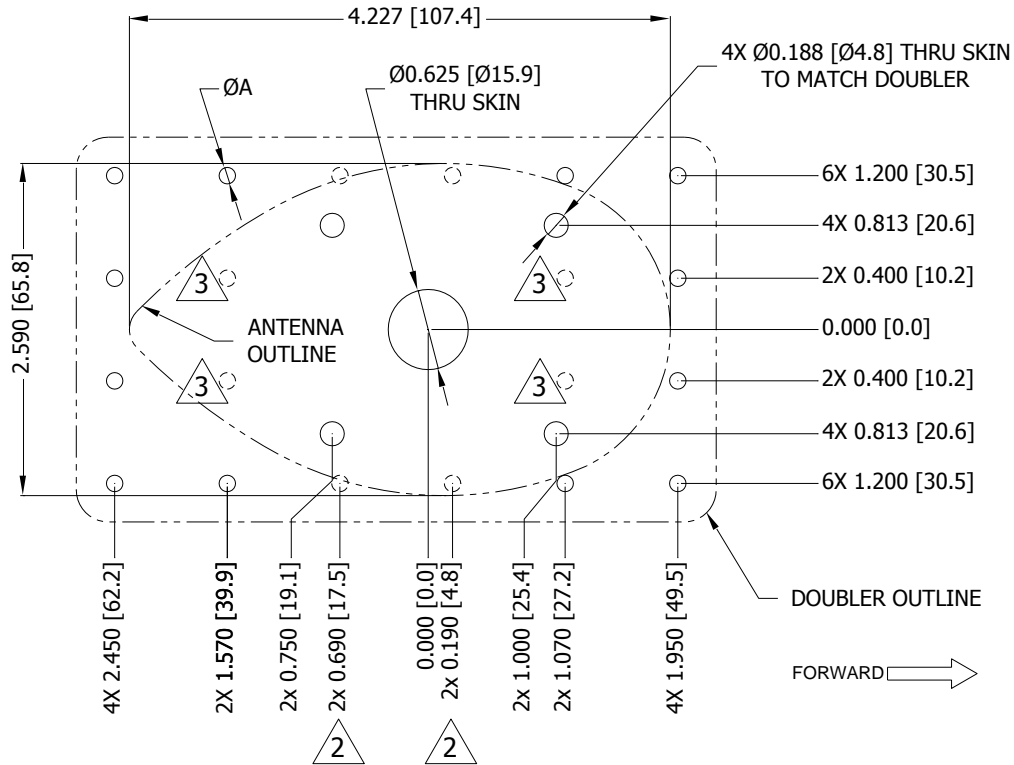


**NOTES:**

1. DIMENSIONS: INCHES [MM]
2. MATERIAL: 0.063" THICKNESS 2024-T3 ALUMINUM (AMS-QQ-A-250/5)
3. TOLERANCE: .XX ±0.030", .XXX ±0.010"
4. REMOVE BURRS AND BREAK SHARP EDGES
5. RESERVED.
6. HOLE OPTIONAL, GA 36 ANTENNA INSTALLATION.
7. THESE HOLES CAN BE OMITTED IF REQUIRED NUMBER OF FASTENERS IS LESS THAN 16.
8. THESE HOLES HAVE TO BE ADDED IF REQUIRED NUMBER OF FASTENERS IS GREATER THAN 16.
9. MS21059L3 MAY BE USED IN PLACE OF MS21047L3.

AIRCRAFT SKIN THICKNESSES	FASTENER HOLE SPECIFICATION		
	NUMBER	ØA	COUNTERSINK
0.020 TO 0.031 INCH	12	Ø0.129	MS20426AD4-XX
0.032 TO 0.035 INCH			NAS1097AD4-X
0.036 TO 0.050 INCH	Ø0.225×100°		NONE
0.051 TO 0.062 INCH	NONE		
0.063 TO 0.080 INCH	20		

**Figure A-2. Doubler Design, ARINC 743 Footprint Antenna**

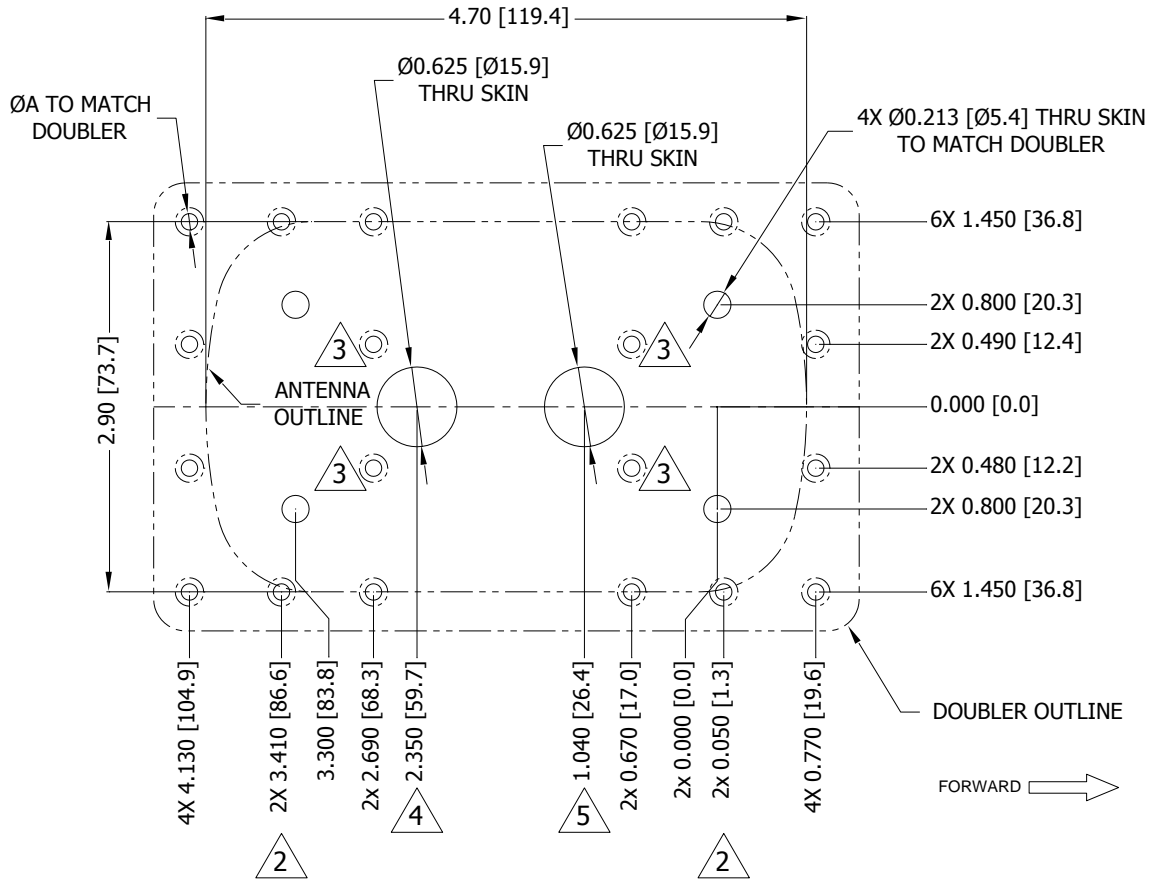


**NOTES:**

1. DIMENSIONS: INCHES [MM]
2. THESE HOLES CAN BE OMITTED IF REQUIRED NUMBER OF FASTENERS IS LESS THAN 16.
3. THESE HOLES HAVE TO BE ADDED IF REQUIRED NUMBER OF FASTENERS IS GREATER THAN 16.

AIRCRAFT SKIN THICKNESSES	FASTENER HOLE SPECIFICATION IN AIRCRAFT SKIN		
	NUMBER	ØA	RIVET TYPE
0.020 TO 0.031 INCH	12	Ø0.129	MS20426AD4-XX
0.032 TO 0.035 INCH			NAS1097AD4-X
0.036 TO 0.050 INCH	DIMPLE		
0.051 TO 0.062 INCH	COUNTERSINK Ø0.189×100°		
0.063 TO 0.080 INCH	20	COUNTERSINK Ø0.225×100°	

**Figure A-3. Skin Cutout Detail, Teardrop Footprint Antenna**



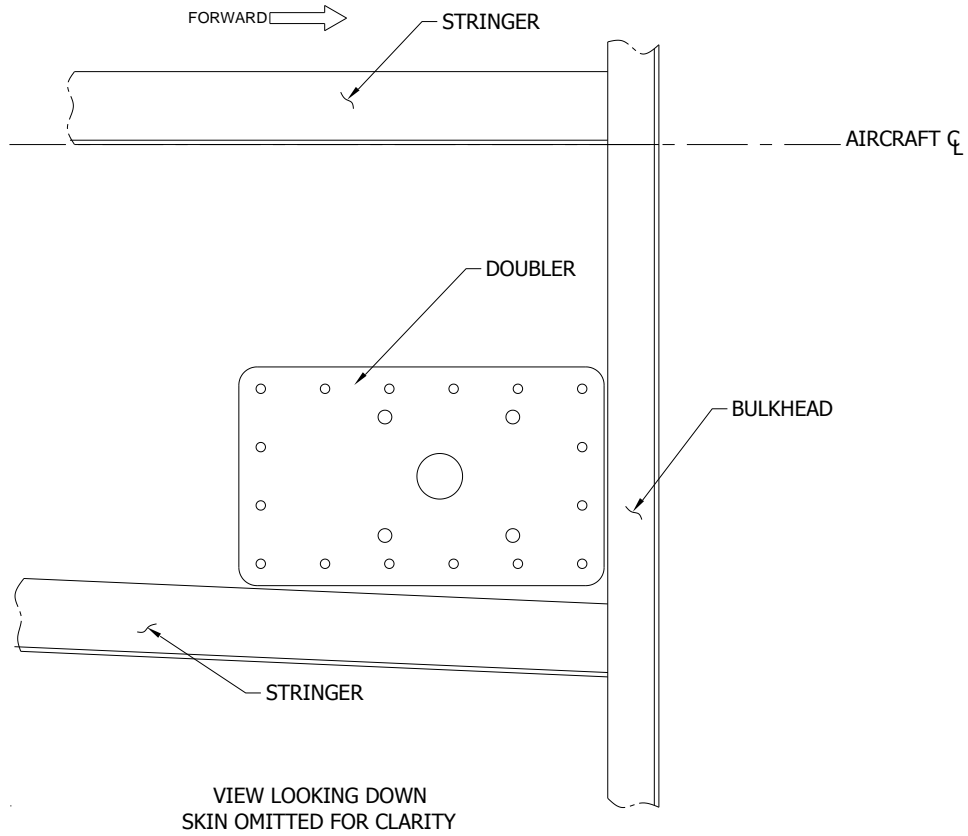
**NOTES:**

1. DIMENSIONS: INCHES [MM]
2. THESE HOLES CAN BE OMITTED IF REQUIRED NUMBER OF FASTENERS IS LESS THAN 16.
3. THESE HOLES HAVE TO BE ADDED IF REQUIRED NUMBER OF FASTENERS IS GREATER THAN 16
4. HOLE CENTER FOR GA 37 ARINC 743 STYLE ANTENNA.
5. HOLE CENTER FOR GA 36 AND GA 37 ARINC 743 STYLE ANTENNA.

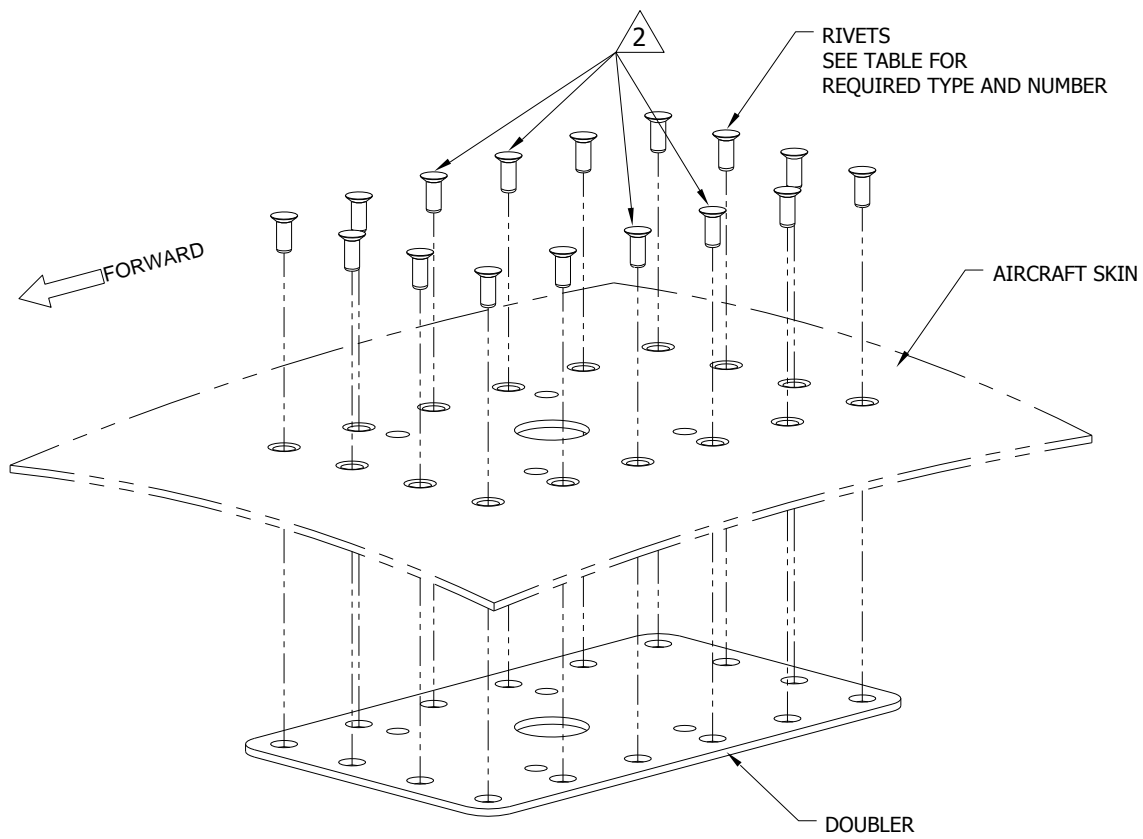
AIRCRAFT SKIN THICKNESSES	FASTENER HOLE SPECIFICATION IN AIRCRAFT SKIN		
	NUMBER	ØA	RIVET TYPE
0.020 TO 0.031 INCH	12	Ø0.129	MS20426AD4-XX
0.032 TO 0.035 INCH			NAS1097AD4-X
0.036 TO 0.050 INCH	DIMPLE		DIMPLE
0.051 TO 0.062 INCH	COUNTERSINK		COUNTERSINK Ø0.189×100°
0.063 TO 0.080 INCH	20		COUNTERSINK Ø0.225×100°

**Figure A-4. Skin Cutout Detail, ARINC 743 Footprint**





**Figure A-5. Sample Doubler Location**

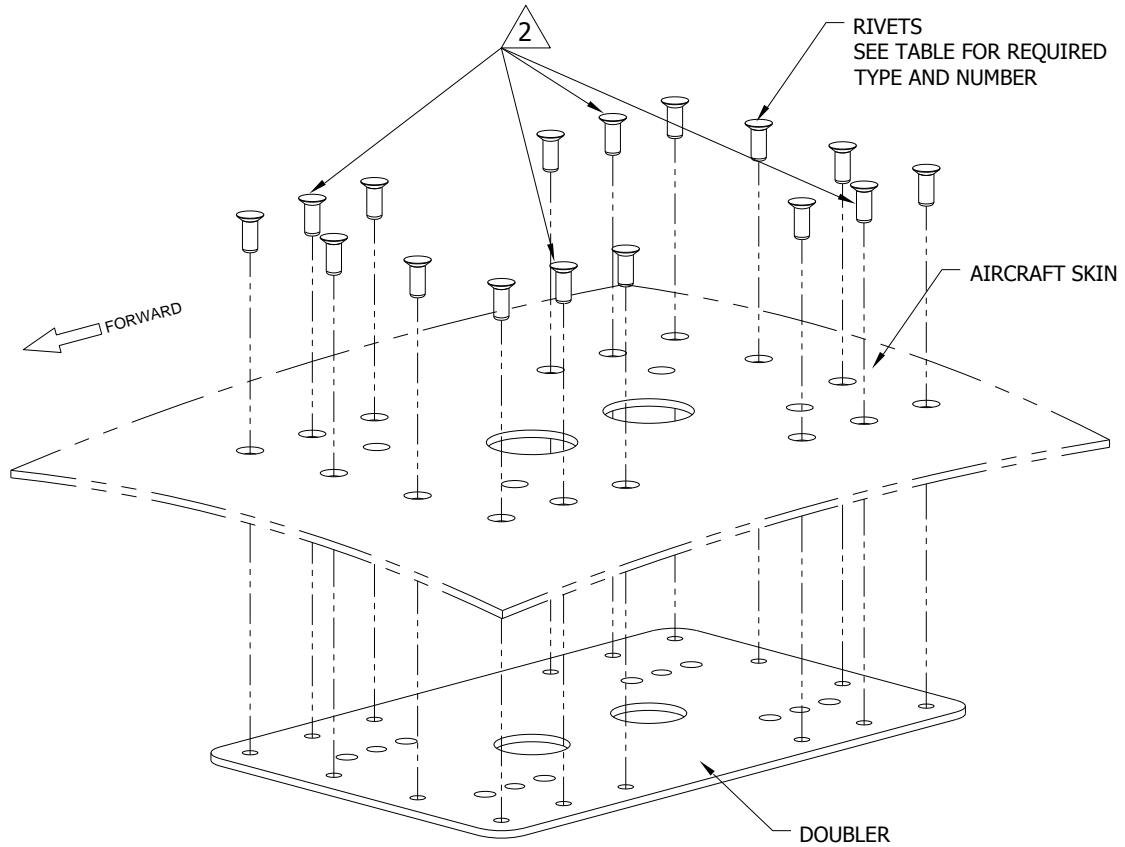


**NOTES:**

1. RIVET SELECTION (LENGTH) AND INSTALLATION DETERMINED USING THE GUIDANCE FOUND IN AC43.13-1B.
2. THESE RIVETS CAN BE OMITTED IF REQUIRED NUMBER OF FASTENERS IS LESS THAN 16.

AIRCRAFT SKIN THICKNESSES	DOUBLER FASTENER REQUIREMENTS	
	NUMBER	RIVET TYPE
0.020 TO 0.031 INCH	12	MS20426AD4-XX
0.032 TO 0.035 INCH		
0.036 TO 0.050 INCH	16	NAS1097AD4-X
0.051 TO 0.062 INCH		
0.063 TO 0.080 INCH	20	

**Figure A-6. Doubler Installation, Teardrop Footprint Antenna**



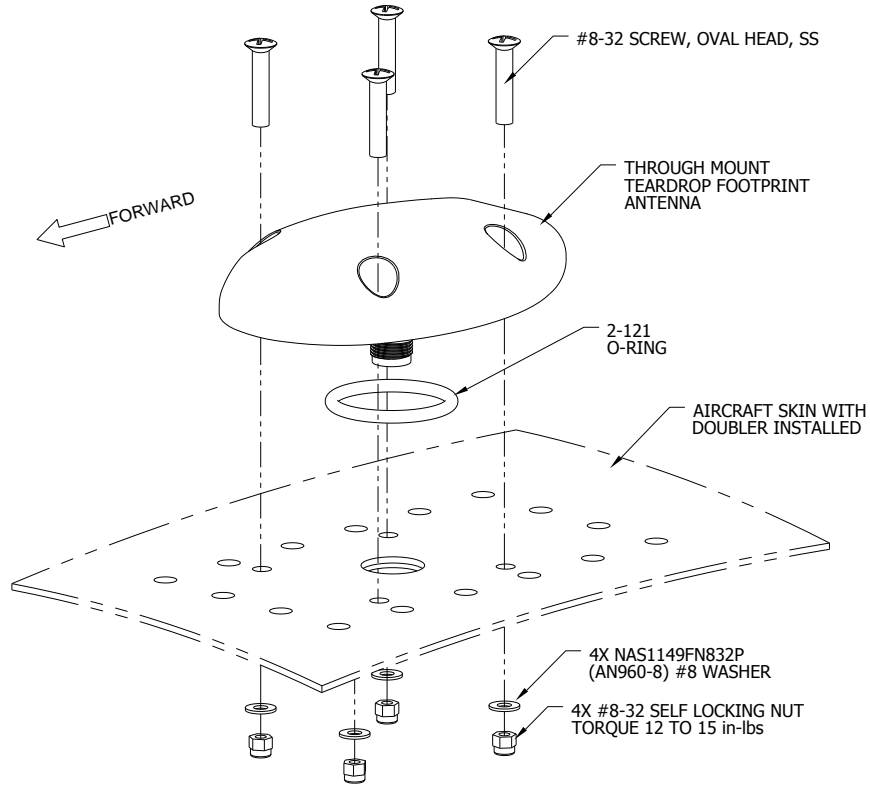
**NOTES:**

1. RIVET SELECTION (LENGTH) AND INSTALLATION DETERMINED USING THE GUIDANCE FOUND IN AC43.13-1B.

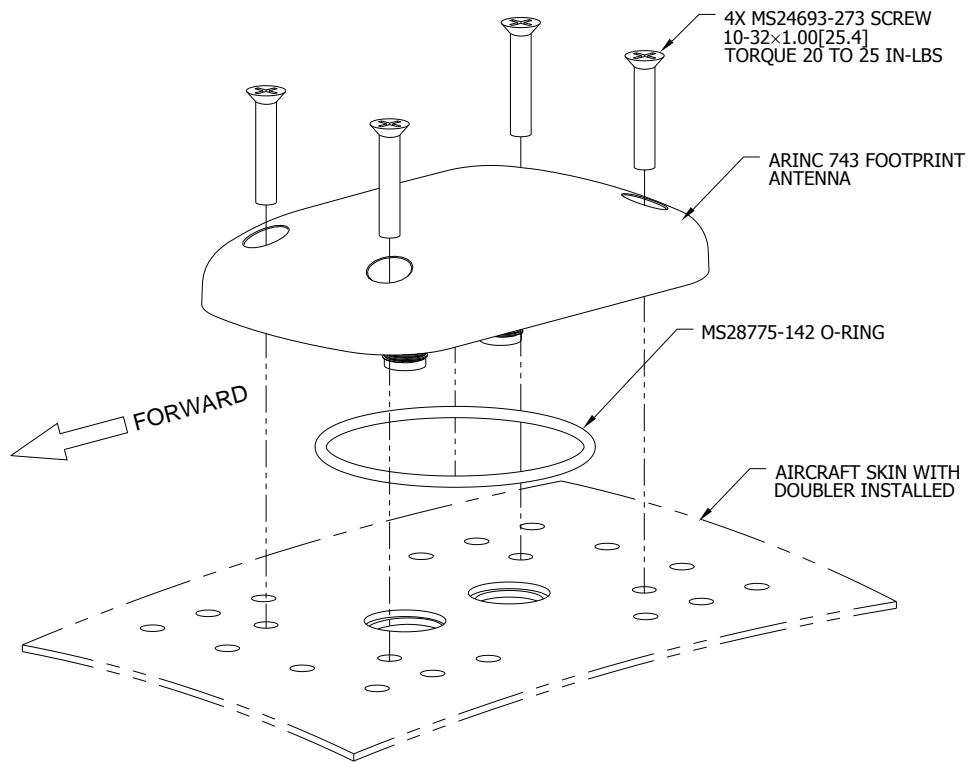
2. THESE RIVETS CAN BE OMITTED IF REQUIRED NUMBER OF FASTENERS IS LESS THAN 16.

AIRCRAFT SKIN THICKNESSES	DOUBLER FASTENER REQUIREMENTS	
	NUMBER	RIVET TYPE
0.020 TO 0.031 INCH	12	MS20426AD4-XX
0.032 TO 0.035 INCH		
0.036 TO 0.050 INCH	16	NAS1097AD4-X
0.051 TO 0.062 INCH		
0.063 TO 0.080 INCH	20	

**Figure A-7. Doubler Installation, ARINC 743 Footprint Antenna**



**Figure A-8. Through Mount Teardrop Footprint Antenna Installation**



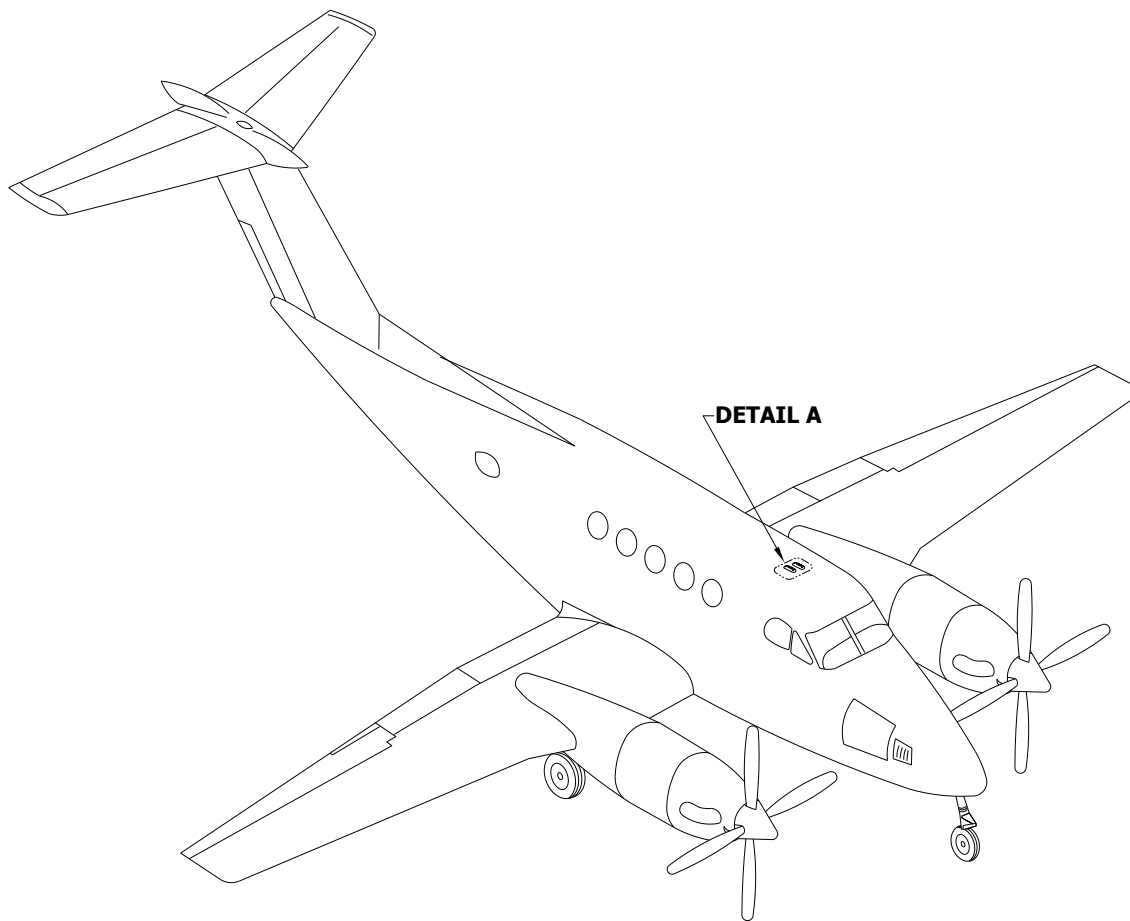
**Figure A-9. GA 37 ARINC 743 Footprint Antenna Installation**

**Appendix B PRESSURIZED AIRCRAFT ANTENNA INSTALLATION****B.1 Hawker Beechcraft 90 and 200 Series Aircraft**

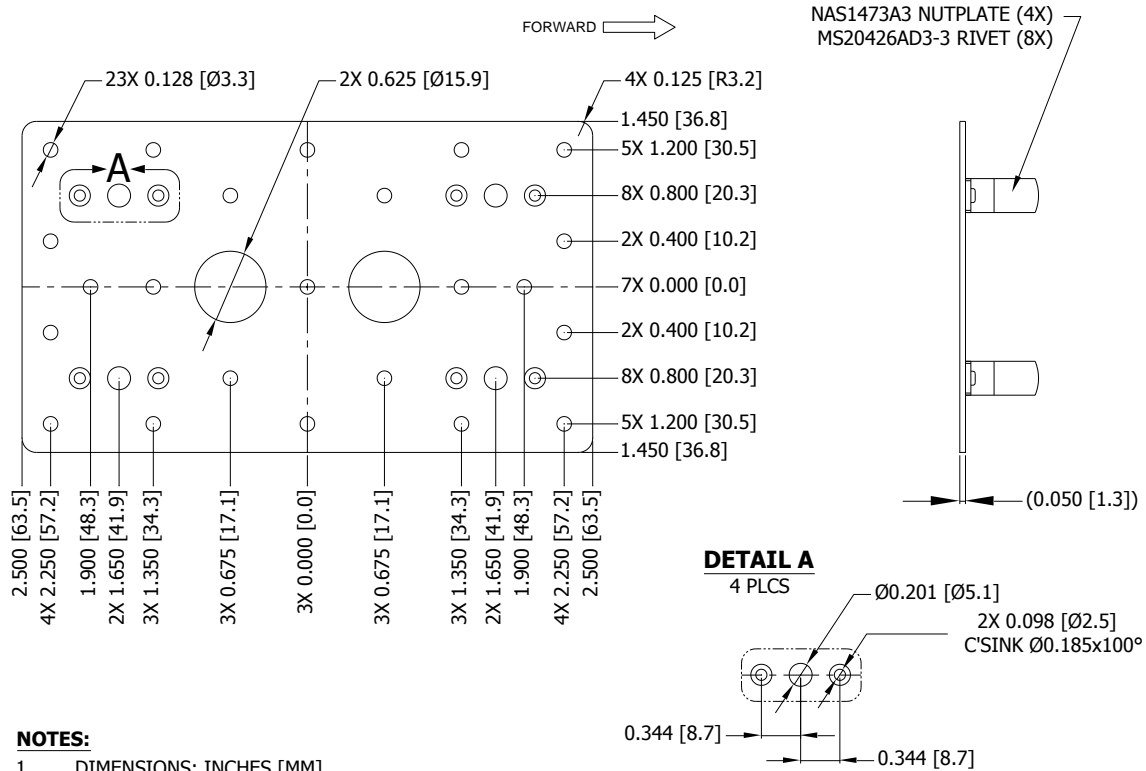
This appendix provides details of GA 36 and GA 37 ARINC 743 footprint antenna installation on Hawker Beechcraft B90, C90, C90A, C90GT, 200, 200C, B200, and B200C model airplanes (summarized as “90 and 200 Series” elsewhere in this document). Antenna location is shown in Figure B-1 and Figure B-3.

One method is to use Garmin P/N 115-00873-00 doubler. Alternatively, antenna doubler can be fabricated from 2024-T3 aluminum. Refer to Figure B-2 for doubler design details and to Figure B-4 for doubler installation.

Antenna installation requires connector and fastener holes in fuselage pressure vessel. Refer to Figure B-3 for details of fuselage skin cutout and fastener hole preparation. Antenna installation is shown in Figure B-4 and Figure B-5.



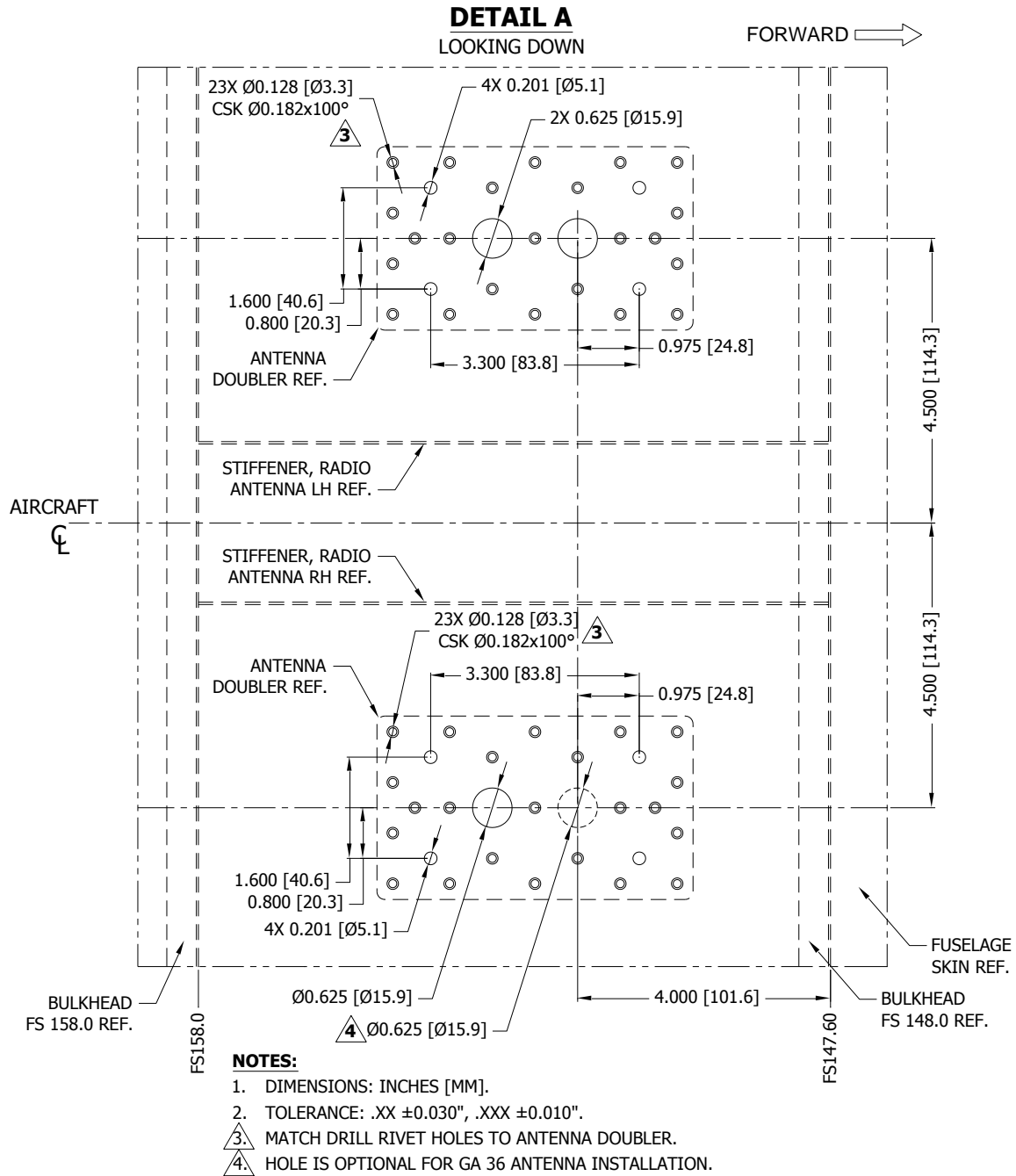
**Figure B-1. Hawker Beechcraft 90 and 200 Series Antenna Location**



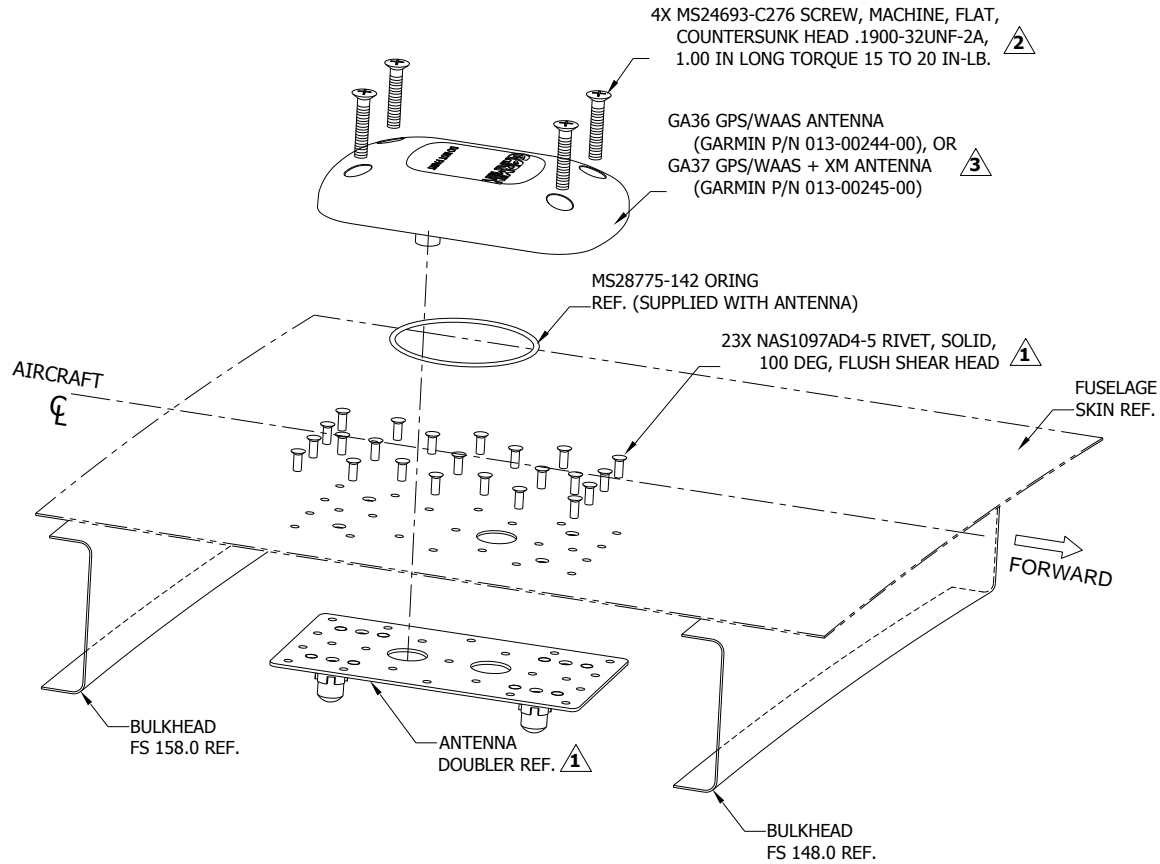
**NOTES:**

1. DIMENSIONS: INCHES [MM].
2. TOLERANCE: .XX ±0.030", .XXX ±0.010".
3. MATERIAL: 0.050" THICKNESS 2024-T3 ALUMINUM (AMS-QQ-A-250/5).
4. REMOVE BURRS AND BREAK SHARP EDGES R 0.010 MAX.
5. INSTALL NAS1473A3 NUTPLATES AS SHOWN USING MS20426AD3-3 RIVETS
6. FINISH: PRIMER AFTER NUTPLATE INSTALLATION.  
PREFERRED PRIMER SPECIFICATION: MIL-PRF-23377 TYPE 1 CLASS C2.  
OPTIONAL PRIMER SPECIFICATION: TT-P-1757 TYPE 1, CLASS C, YELLOW

**Figure B-2. Doubler Design, ARINC 743 Footprint Antenna, Hawker Beechcraft 90 and 200 Series**



**Figure B-3. Hawker Beechcraft 90 and 200 Series Fuselage Skin Cutout Detail**

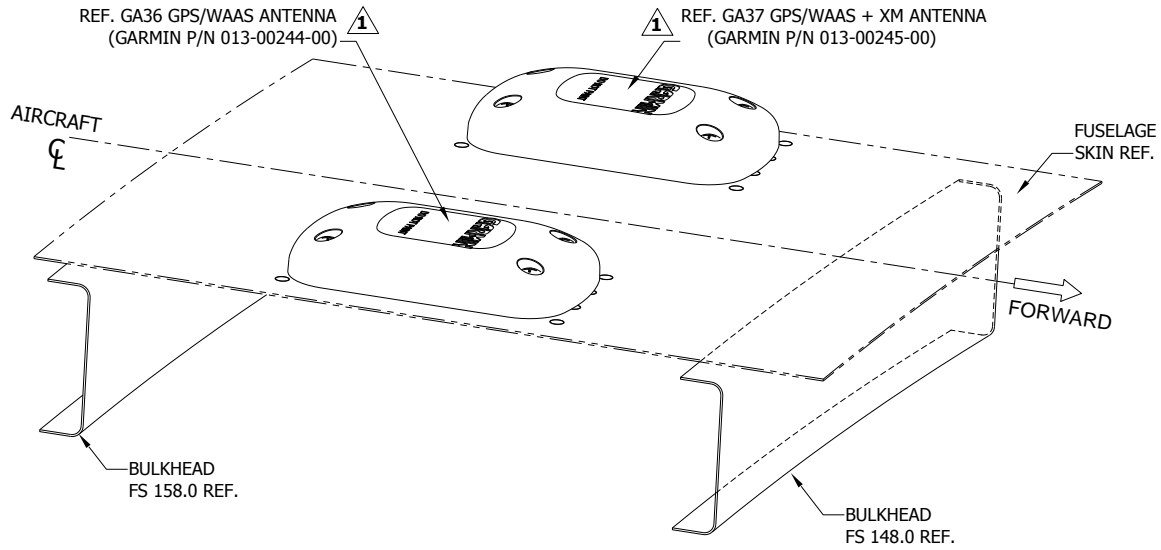


**NOTES:**

- <sup>1</sup> INSTALL WET WITH SEALANT, MIL-S-8802B OR EQUIVALENT.
- <sup>2</sup> UNLESS OTHERWISE NOTED, TORQUE ALL FASTENERS PER THE KING AIR 90/200/B200 SERIES MAINTENANCE MANUAL, SECTION 20-01-00.
- <sup>3</sup> ANTENNAS SHALL BE ELECTRICALLY BONDED. REMOVE PAINT AND PRIMER UNDER ANTENNA FOOTPRINT. THE SURFACE PREPARATION SHALL BE PER SAE ARP 1870, SECTION 5.
4. THE ELECTRICAL BOND SHALL ACHIEVE A DIRECT CURRENT (DC) RESISTANCE OF 2.5 MILLIOHMS OR LESS BETWEEN THE ANTENNA CONNECTOR AND AIRCRAFT STRUCTURE (WITH THE COAX DISCONNECTED). COMPLIANCE SHALL BE VERIFIED USING A CALIBRATED MILLIOHMMETER.

**Figure B-4. Hawker Beechcraft 90 and 200 Series GA36 Antenna Installation**





**NOTES:**

- ⚠ AFTER INSTALLATION, FILLET SEAL AROUND ANTENNA WITH -
- MIL-S-8802 SEALING COMPOUND, TEMPERATURE-RESISTANT, INTEGRAL FUEL TANKS AND FUEL CELL CAVITIES, HIGH ADHESION, OR
  - MIL-A-46146 NON-CORROSIVE RTV SILICONE ADHESIVE-SEALANT.

**Figure B-5. Hawker Beechcraft 90 and 200 Series GA36 and GA 37 Antenna Installation**

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## Appendix C LIGHTNING ZONING

### C.1 Location of Antennas

The table below lists the qualified lightning zones for the antennas installed under this STC:

Antenna	Zone
GA 35	1C, 2A, or 3
GA 36	1C, 2A, or 3
GA 37	1C, 2A, or 3

Each antenna must be installed completely within the limits of zones for which it is qualified. For example, an antenna qualified for Zone 1C with the antenna center in Zone 1C but with the antenna body extending into Zone 1B or 1A is not allowed.

### C.2 Aircraft Zoning Diagrams

The following figures show the zoning for several different types of fuselages. Only the fuselage and sometimes the wings are pictured in these diagrams. The antennas in this STC must be mounted only on the upper surface of the fuselage. Which figure to use for each aircraft model included in this STC is identified in Section C.7.

Note that after every Zone A, a 5.9 inches (0.15 m) Zone B follows. Although these Zone B areas are marked on the diagrams, sometimes their widths are not defined. Note that although all diagrams show low wing aircraft, the same zoning can be applied to high wing planes.







Instead of Zone 2A extending outboard for 19.7 inches (0.50 m), in most places it has been increased to 23.6 inches (0.60 m) to allow for a safety margin. The 23.6 inches should be measured from the outboard-most edge of the fuselage or the tip of the propeller, whichever is longer.

The values  $d_1$  and  $d_2$  are defined as follows:

$$d_1 = 51.2 \text{ inches (1.3 m)}$$

$$d_2 = 102.4 \text{ inches (2.6 m)}$$

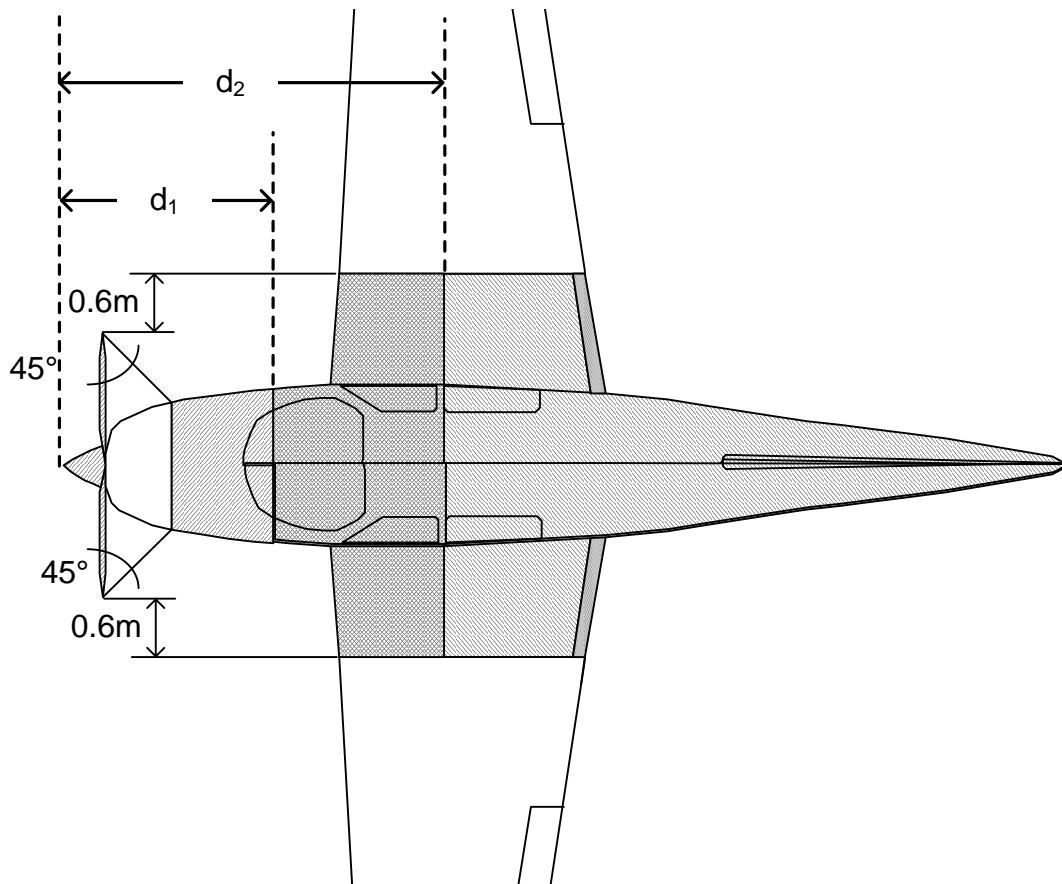
All diagrams use the legend shown in Figure C-1.

	Zone 1A		Zone 2A
	Zone 1B		Zone 2B
	Zone 1C		Zone 3

**Figure C-1. Zoning Legend**

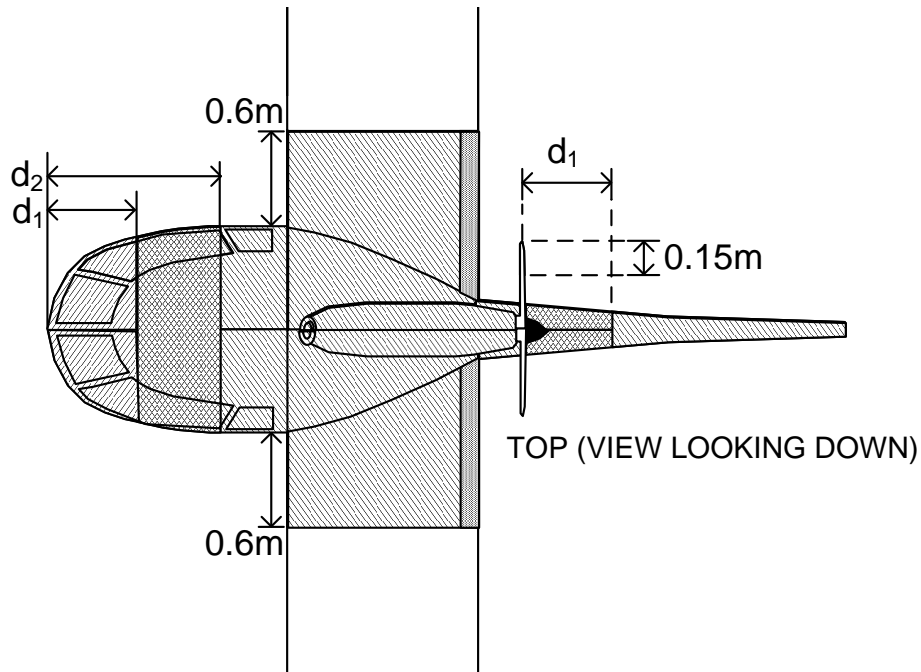
## C.3 Single Propeller Aircraft

Zoning of low or high wing planes with single propellers is shown in Figure C-2. The tip of the nose forward of the propeller, and the propeller itself, are Zone 1A. The area of the nose immediately aft of the propeller is Zone 3. The 23.6 inches (0.60 m) should be measured from the outboard-most edge of the fuselage or the tip of the propeller, whichever is longer. Figure C-2 shows the case where the propeller is longer than the fuselage. Figure C-3 shows the case of an aircraft with a curved fuselage.

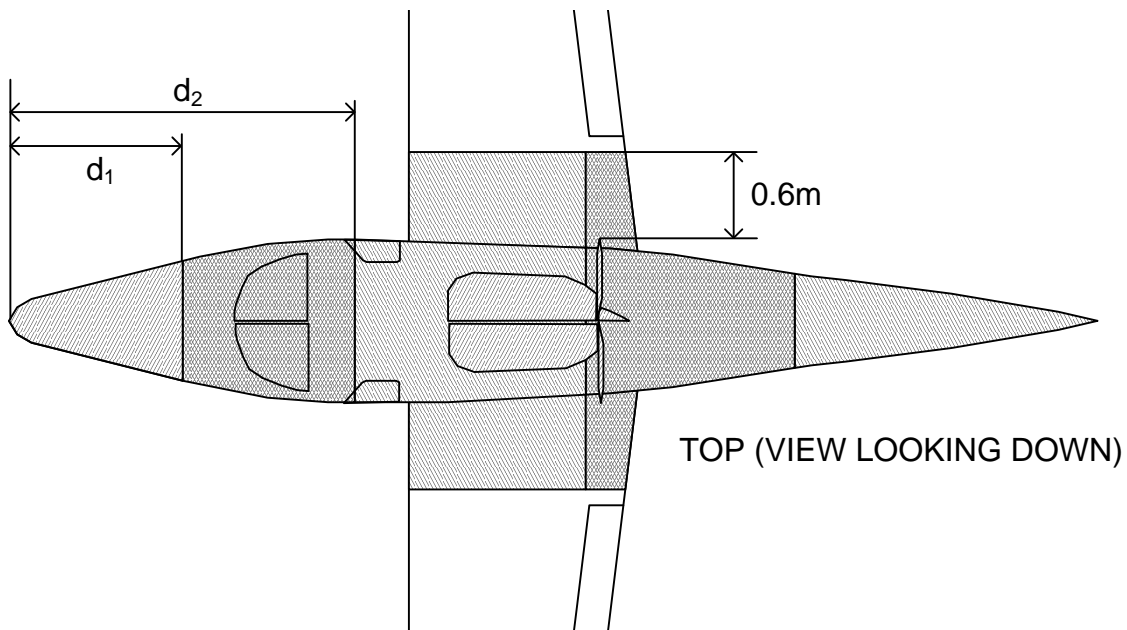


NOTE: Shown for propeller wider than fuselage.

**Figure C-2. Single Prop**  
**(Zoning for a Low or High Wing Single Prop)**



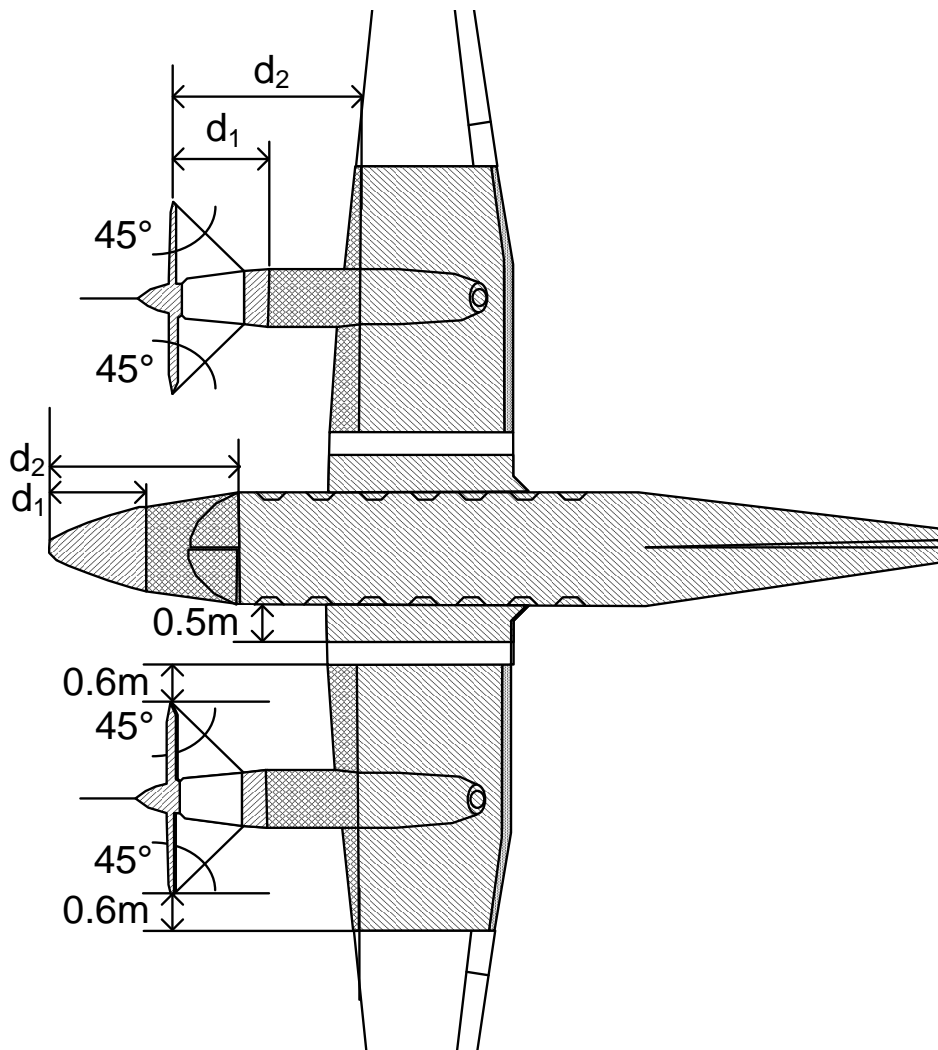
**Figure C-3. Single Rear-Mounted Prop with a Curved Fuselage  
(Zoning For a Low or High Wing Aircraft with a Curved Fuselage)**



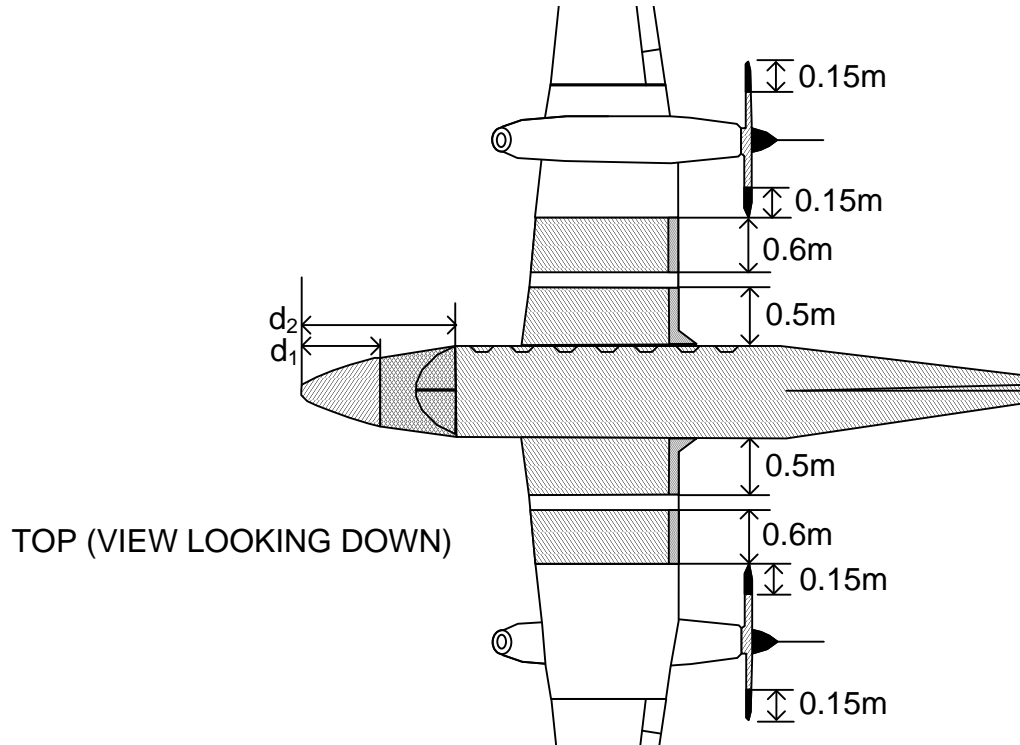
**Figure C-4. Single Rear-Mounted Prop Above Fuselage  
(Zoning for a Low or High Wing Aircraft with a Rear-Mounted Prop Above Fuselage)**

## C.4 Aircraft with Two Propellers

Zoning of low or high wing planes with twin propellers is shown in Figure C-5. The text below assumes the aircraft fuselage and wing are constructed of metal. If both propellers are in the reverse direction, the fuselage should be zoned as shown in Figure C-6. Note that Zone 2A can overlap onto the nacelles if they are within 23.6 inches (0.60 m) outboard of the fuselage. All but the last 5.9 inches (0.15 m) of the propellers should be Zone 1A. From 5.9 inches (0.15m) inward to the tips of the propellers should be Zone 1B. Figure C-7 shows an aircraft that has both front and rear propellers.

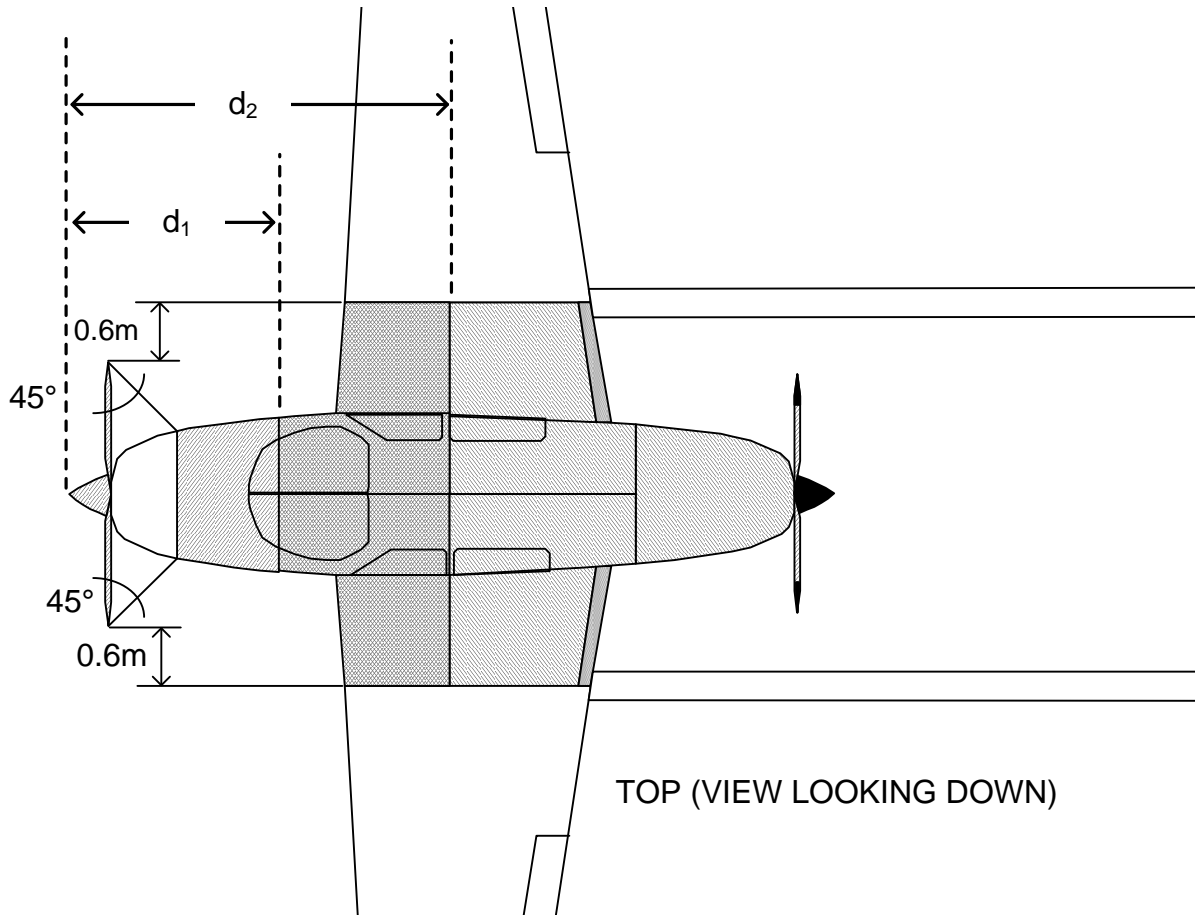


**Figure C-5. Twin Front-Mounted Props**  
**(Zoning for a Low or High Wing Twin Prop Aircraft with Front-Mounted Propellers. The distance d1 and d2 are the same on both engines)**



NOTE: Although the engine nacelles are shown as Zone 3. They may be Zone 2A if the engine falls within the Zone 2 area of the wing (within 23.6 inches (0.60 m) outboard from the edge of the fuselage).

**Figure C-6. Twin Rear-Mounted Props  
(Zoning for a Low or High Wing Twin Prop Aircraft with Rear-Mounted Propellers)**



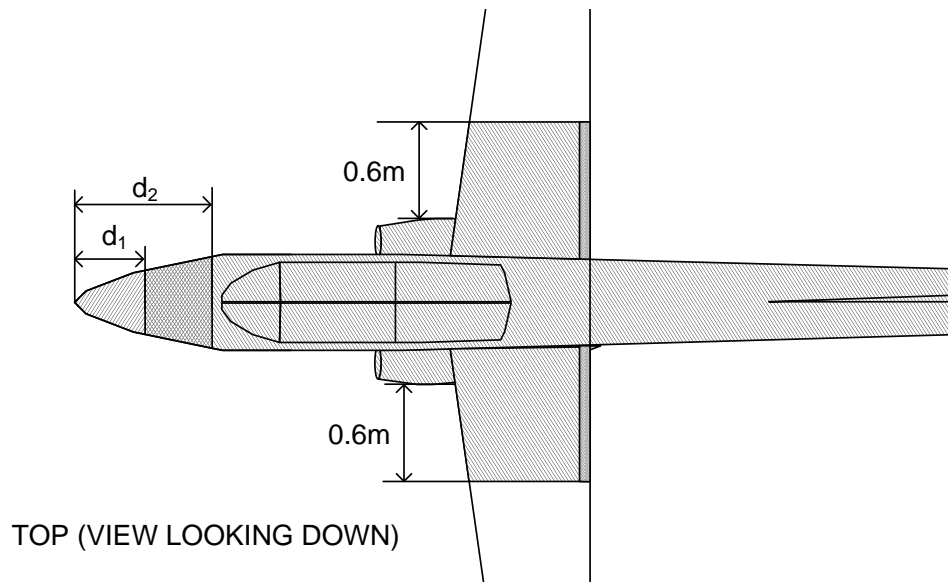
NOTE: Nothing can be mounted in the tail booms of the aircraft.

**Figure C-7. Front and Rear-mounted Props  
(Zoning for Low or High Wing with a Front and Rear Mounted Propellers)**



## C.5 Aircraft with Multiple Jet Engines

Zoning of low or high wing twin jet engine aircraft is shown in Figure C-8.



**Figure C-8. Twin Jet Engines  
(Zoning for a Low or High Wing Twin Jet Engine Aircraft)**

## C.6 Aircraft with Multi-Propellers

Zoning of an aircraft with three front-mounted propellers is shown in Figure C-9.

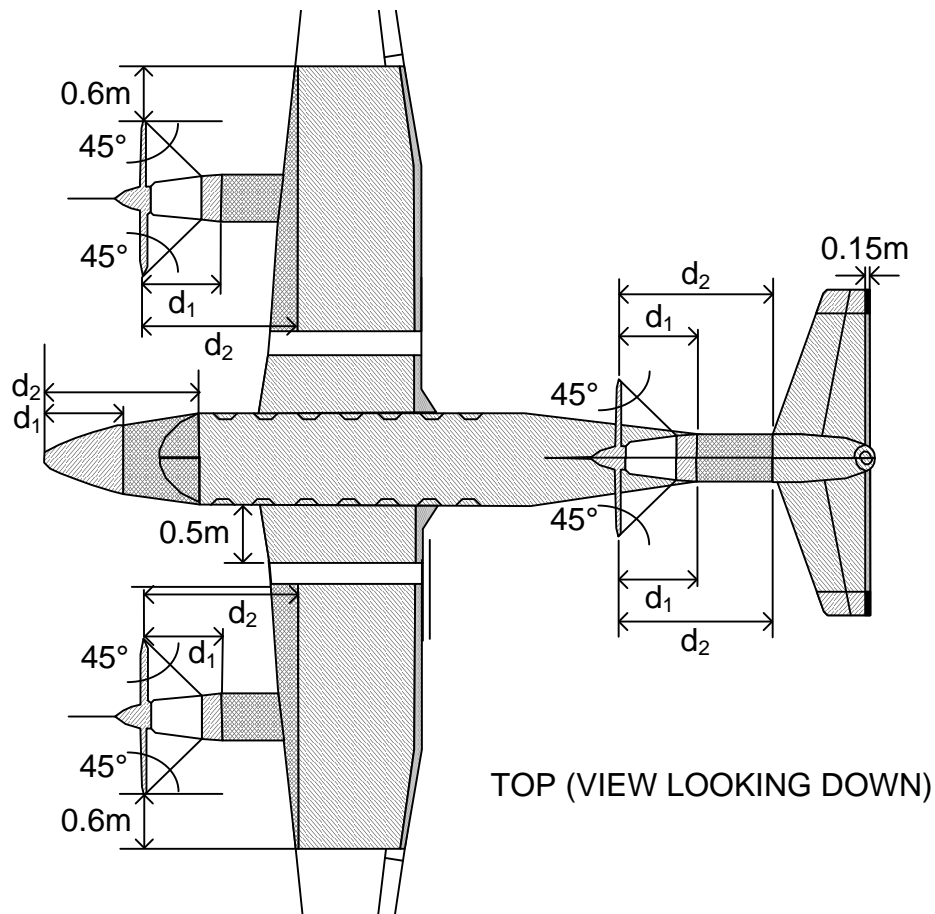


Figure C-9. Triple Front-Mounted Props (Wings and Above Fuselage)

## C.7 Figure Identification for Each Aircraft Model

The aircraft models included in this STC are listed below in Aircraft Make order. For each model, the applicable lightning zoning diagram is identified. Table C-1 provides model specific installation information and is not the FAA Approved Model List (AML). For the AML, refer to the FAA AML attached to the STC.

**Table C-1. Approved Model List and Reference Figures**

Aircraft Make (TCDS Holder) [common name or previous make]	Aircraft Model (alias)	Type Certificate Number (TCDS)	TC Certification Basis	Lightning Zoning Figure	Notes
<b>Aermacchi S.p.A</b> (Aermacchi S.p.A) [Siai Marchetti]	S.205-18/F, S.205-18/R, S.205-20/F, S.205-20/R, S.205-22/R, S.208, S.208A	A9EU	FAR 23	Figure C-2	
<b>Aermacchi S.p.A (Aermacchi S.p.A) [Siai Marchetti]</b>	F.260, F.260B, F.260C, F.260D, F.260E, F.260F	A10EU	CAR 3	Figure C-2	
<b>Aero Commander</b> (Dynac Aerospace Corp) [Aero Commander] [Voltaire]	(Voltaire) 10, (Voltaire) 10A (Aero Commander) 100 (Aero Commander) 100A (Aero Commander) 100-180	1A21	CAR 3	Figure C-2	
<b>Aerostar</b> (Aerostar Aircraft Corporation) [Piper Aerostar]	PA-60-600 (Aerostar 600), PA-60-601 (Aerostar 601)	A17WE	FAR 23	Figure C-5	
<b>Atlantic Coast Seaplanes, LLC (Atlantic Coast Seaplanes LLC) [A.G. McKinnon; Viking Air Limited; Aero Planes]</b>	G-21C, G-21D, G-21E, G-21G	4A24	CAR 3	Figure C-5	Some WAAS based operations may have limited availability due to poor visibility
<b>B-N Group LTD.</b> (B-N Group Ltd.) [Britten-Norman]	BN-2, BN-2A, BN-2A-2, BN-2A-3, BN-2A-6, BN-2A-8, BN-2A-9, BN-2A-20, BN-2A-21, BN-2A-26, BN-2A-27, BN-2B-20, BN-2B-21, BN-2B-26, BN-2B-27, BN-2T, BN-2T-4R	A17EU	FAR 23	Figure C-5	
<b>B-N Group LTD. (B-N Group Limited) [Britten-Norman]</b>	BN2A MK. III, BN2A MK. III-2, BN2A MK. III-3	A29EU	FAR 23	Figure C-9	
<b>Cessna</b> (Cessna Aircraft Company)	120, 140	A-768	CAR 3	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	140A	5A2	CAR 3 CAR4a	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	150, 150A, 150B, 150C 150D, 150E, 150F, 150G, 150H, 150J, 150K, 150L, 150M, A150K, A150L, A150M, 152, A152	3A19	CAR 3 FAR 23	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	170, 170A, 170B	A-799	CAR 3	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	172, 172A, 172B, 172C, 172D, 172E, 172F, 172G, 172H, 172I, 172K, 172L, 172M, 172N, 172P, 172Q, 172R, 172S	3A12	CAR 3 FAR 23	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	172RG, P172D, R172E, R172F, R172G, R172H, R172J, R172K, 175, 175A, 175B, 175C	3A17	CAR 3	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	177, 177A, 177B	A13CE	FAR 23	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	177RG	A20CE	FAR 23	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	180, 180A, 180B, 180C, 180D, 180E, 180F, 180G, 180H, 180J, 180K	5A6	CAR 3	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	182, 182A, 182B, 182C, 182D, 182E, 182F, 182G, 182H, 182J, 182K, 182L, 182M, 182N, 182P, 182Q, 182R, 182S, 182T, R182, T182, TR182, T182T	3A13	CAR 3 FAR 23	Figure C-2	

Aircraft Make (TCDS Holder) [common name or previous make]	Aircraft Model (alias)	Type Certificate Number (TCDS)	TC Certification Basis	Lightning Zoning Figure	Notes
<b>Cessna</b> (Cessna Aircraft Company)	185, 185A, 185B, 185C, 185D, 185E, A185E, A185F	3A24	CAR 3	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	190, 195, 195A, 195B	A-790	CAR 3	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	206, P206, P206A, P206B, P206C, P206D, P206E, TP206A, TP206B, TP206C, TP206D, TP206E, U206, U206A, U206B, U206C, U206D, U206E, U206F, U206G, TU206A, TU206B, TU206C, TU206D, TU206E, TU206F, TU206G, 206H, T206H	A4CE	CAR 3 FAR 23	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	207, 207A, T207, T207A	A16CE	FAR 23	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	208, 208B	A37CE	FAR 23	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	210, 210A, 210B, 210C, 210D, 210E, 210F, T210F, 210G, T210G, 210H, T210H, 210J, T210J, 210K, T210K, 210L, T210L, 210M, T210M, 210N, T210N, 210R, T210R, 210-5, 210-5A	3A21	CAR 3 FAR 23	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	310, 310A (USAF U-3A), 310B, 310C, 310D, 310E (USAF U-3B), 310F, 310G, 310H, E310H, 310I, 310J, 310J-1, E310J, 310K, 310L, 310N, 310P, T310P, 310Q, T310Q, 310R, T310R	3A10	CAR 3 FAR 23	Figure C-5	
<b>Cessna</b> (Cessna Aircraft Company)	320, 320A, 320B, 320C, 320D, 320E, 320F, 320-1, 335	3A25	CAR 3 FAR 23	Figure C-5	
<b>Cessna</b> (Cessna Aircraft Company)	336	A2CE	CAR 3	Figure C-7	
<b>Cessna</b> (Cessna Aircraft Company)	337, 337A (USAF 02B), 337B, T337B, 337C, 337E, T337E, T337C, 337D, T337D, 337F, T337F, 337G, T337G, 337H, T337H, T337H-SP	A6CE	CAR 3 FAR 23	Figure C-7	
<b>Cessna</b> (Cessna Aircraft Company)	401, 401A, 401B, 402, 402A, 402B, 402C, 411, 411A	A7CE	CAR 3 FAR 23	Figure C-5	
<b>Cessna</b> (Cessna Aircraft Company)	404, 406	A25CE	FAR 23	Figure C-5	
<b>Cessna</b> (Cessna Aircraft Company)	Cessna FR172E, Cessna FR172F, Cessna FR172G, Cessna FR172H, Cessna FR172J, Cessna FR172K	A18EU	CAR 3	Figure C-2	
<b>Cessna</b> (Cessna Aircraft Company)	T303 (Crusader)	A34CE	FAR 23	Figure C-5	
<b>CPAC, Inc.</b> (CPAC, Inc.) [Commander Aircraft Co.]	112, 112TC, 112B, 112TCA, 114, 114A, 114B, 114TC	A12SO	CAR 3	Figure C-2	
<b>deHavilland</b> (Viking Air Limited) [deHavilland, Inc.]	DHC-2 Mk. I, DHC-2 Mk. II, DHC-2 Mk. III	A-806	CAR 3	Figure C-2	
<b>Dornier</b> (Dornier-Werke G.m.b.H.)	Do 27 Q-6	A8IN	CAR 3/10	Figure C-2	
<b>Dornier Luftfahrt GmbH</b> (Dornier Luftfahrt GmbH)	Do 28 D, Do 28 D-1, Dornier 228-100, Dornier 228-101, Dornier 228-200, Dornier 228-201, Dornier 228-202, Dornier 228-212	A16EU	FAR 23	Figure C-5	
<b>EADS-PZL</b> "Warszawa-Okecie" (EADS-PZL "Warszawa-Okecie" S.A.) [Panstwowe Zaklady Lotnicze]	PZL-KOLIBER 150A, PZL-KOLIBER 160A	A69EU	FAR 23	Figure C-2	
<b>EADS-PZL</b> "Warszawa-Okecie" (EADS-PZL "Warszawa-Okecie" S.A.) [Panstwowe Zaklady Lotnicze]	PZL-104 WILGA 80, PZL-104M WILGA 2000, PZL-104MA WILGA 2000	A55EU	FAR 23	Figure C-2	

Aircraft Make (TCDS Holder) [common name or previous make]	Aircraft Model (alias)	Type Certificate Number (TCDS)	TC Certification Basis	Lightning Zoning Figure	Notes
<b>Embraer (Empresa Brasileira de Aeronautica S. A.)</b>	EMB-110P1, EMB-110P2	A21SO	FAR 23 FAR 25	Figure C-5	
<b>Found Aircraft Canada, Inc.</b> (Found Aircraft Canada, Inc.)	FBA-2C, FBA-2C1, FBA-2C2, FBA-2C3	A7EA	CAR 3 FAR 23	Figure C-2	
<b>Found Brothers</b> (Found Brothers Aviation Limited)	FBA Centennial "100"	A13EA	FAR 23	Figure C-2	
<b>GA8 Airvan (Pty) Ltd</b> (GA8 Airvan (Pty) Ltd) [Gippsland Aeronautics Pty. Ltd.]	GA8	A00011LA	FAR 23	Figure C-2	
<b>Gulfstream American (Gulfstream American Corp) [Grumman]</b>	G-44, G-44A, SCAN Type 30	A-734	CAR 4a	Figure C-5	Some WAAS based operations may have limited availability due to poor visibility
<b>Grumman</b> (Grumman American Aviation Corporation)	Grumman G-21, Grumman G-21A	TC 654	Aero 7A	Figure C-5	Some WAAS based operations may have limited availability due to poor visibility
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	18A, S18A	TC 630	Aero 7A	Figure C-5	
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	18D, A18A, A18D, S18D, SA18A, SA18D	A-684	Aero 7A	Figure C-5	
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	19A, B19, M19A, 23, A23, A23A, A23-19, A23-24, B23, C23, A24, A24R, B24R, C24R	A1CE	CAR 3	Figure C-2	
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	35, A35, B35, C35, D35, E35, 35R, F35, G35	A-777	CAR 3	Figure C-2	
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	35-33, 35-A33, 35-B33, 35-C33, 35-C33A, E33, E33A, E33C, F33, F33A, F33C, G33, H35, J35, K35, M35, N35, P35, S35, V35, V35A, V35B, 36, A36, A36TC, B36TC	3A15	CAR 3 FAR 23	Figure C-2	
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	3N, 3NM, 3TM, JRB-6, D18C, D18S, E18S, RC-45J (SNB-5P), E18S-9700, G18S, H18, C-45G, C-45H, TC-45G, TC-45H, TC-45J, UC-45J (SNB-5)	A-765	CAR 3	Figure C-5	
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	45 (YT-34), A45 (T-34A) or (B-45), D45 (T-34B)	5A3	CAR 3	Figure C-2	
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	50(L-23A), B50(L-23B), C50, D50(L-23E), D50A, D50B, D50C, D50E, D50E-5990, E50(L-23D, RL-23D), F50, G50, H50, J50	5A4	CAR 3 FAR 23	Figure C-5	
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	58TC, 58TCA	A23CE	FAR 23	Figure C-5	
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	76	A29CE	FAR 23	Figure C-5	
<b>Hawker Beechcraft</b> (Hawker Beechcraft Corporation) [Raytheon] [Beech]	77	A30CE	FAR 23	Figure C-2	

Aircraft Make (TCDS Holder) [common name or previous make]	Aircraft Model (alias)	Type Certificate Number (TCDS)	TC Certification Basis	Lightning Zoning Figure	Notes
<b>Hawker Beechcraft (Hawker Beechcraft Corporation) [Raytheon] [Beech]</b>	99, 99A, 99A(FACH), A99, A99A, B99, C99	A14CE	FAR 23	Figure C-5	
<b>Hawker Beechcraft (Hawker Beechcraft Corporation) [Raytheon] [Beech]</b>	200, 200C, B200, B200C	A24CE	FAR 23 FAR 25	Figure C-5	This model has specific location data, see Section 3.2.1.
<b>Hawker Beechcraft (Hawker Beechcraft Corporation) [Raytheon] [Beech]</b>	B90, C90, C90A, C90GT	3A20	CAR 3 FAR 23 FAR 25	Figure C-5	This model has specific location data, see Section 3.2.1.
<b>Hawker Beechcraft (Hawker Beechcraft Corporation) [Raytheon] [Beech]</b>	D55, D55A, E55, E55A, 56TC, A56TC, 58, 58A, 95, B95, B95A, D95A, E95, 95-55, 95-A55, 95-B55, 95-B55A, 95-B55B (T-42), 95-C55, 95-C55A	3A16	CAR 3 FAR 23	Figure C-5	
<b>Hawker Beechcraft (Hawker Beechcraft Corporation) [Raytheon] [Beech]</b>	T-34C (T-34C-1) (34C)	A26CE	FAR 23	Figure C-2	
<b>HELIO (Helio Aircraft, LLC) [Alliance Aircraft Group, LLC]</b>	500	A2EA	CAR 3	Figure C-5	
<b>HELIO (Helio Aircraft, LLC) [Alliance Aircraft Group, LLC]</b>	H-250, H-295 (USAF U-10D), HT-295, H-391 (USAF YL-24), H-391B, H-395 (USAF L-28A or U-10B), H-395A, H-700, H-800	1A8	CAR 3	Figure C-2	
<b>HELIO (Helio Aircraft, LLC) [Alliance Aircraft Group, LLC]</b>	HST-550, HST-550A (USAF AU-24A)	A4EA	CAR 3	Figure C-2	
<b>Interceptor (Prop-Jets, Inc.) [Meyers]</b>	200, 200A, 200B, 200C, 200D	3A18	CAR 3	Figure C-2	
<b>King's Engineering Fellowship (The King's Engineering Fellowship)</b>	4500-300, 4500-300 Series II	A17CE	FAR 23	Figure C-5	
<b>Lockheed (Lockheed Aircraft Corporation)</b>	12-A (Army UC-40, UC-40A; Navy JO-1, JO-2)	TC 616	Aero 7A	Figure C-5	
<b>Lockheed (Lockheed Aircraft Corporation)</b>	18	A-723	CAR 4a	Figure C-5	
<b>Micco Aircraft Co., Inc. (MICCO Aircraft Company, Inc.) [Meyers] [LanShe]</b>	MAC-125C, MAC-145, MAC-145A, MAC-145B	3A1	CAR 4a FAR 23	Figure C-2	
<b>Mooney (Mooney Airplane Company, Inc.)</b>	M20, M20A, M20B, M20C, M20D, M20E, M20F, M20G, M20J, M20K, M20L, M20M, M20R, M20S, M20TN	2A3	CAR 3	Figure C-2	
<b>Morane-Saulnier (SOCATA - Groupe Aerospatiale)</b>	M.S.760, M.S.760A, M.S.760B	7A3	CAR 3	Figure C-8	Antennas must be located 24 inches aft of windshield to avoid vibration/buffet issues.
<b>MORANE SAULNIER (Rallye) Series (SOCATA - Groupe Aerospatiale)</b>	Rallye 100S, Rallye 150ST, Rallye 150T, Rallye 235E, Rallye 235C MS880B, MS885, MS894A, MS893A, MS892A-150, MS892E-150 (Rallye 150GT), MS893E (Rallye 180GT), MS894E	7A14	CAR 3	Figure C-2	
<b>Moravan a.s. (Moravan a.s.)</b>	Z-242L, Z-143L	A76EU	FAR 23	Figure C-2	
<b>Navion (Sierra Hotel Aero, Inc)</b>	Navion (L-17A), Navion A (L-17B, L-17C), Navion B, Navion D, Navion E, Navion F, Navion G, Navion H	A-782	CAR 3	Figure C-2	
<b>Pacific Aerospace Limited (Pacific Aerospace Limited)</b>	750XL	A50CE	FAR 23	Figure C-2	
<b>PIAGGIO (Industrie Aeronautiche E. Meccaniche) [Piaggio &amp; C.; Industrie Aeronautiche E Meccaniche]</b>	P.166, P.166B, P.166C, P.166 DL3	7A4	CAR 3 FAR 21 FAR 23	Figure C-6	

Aircraft Make (TCDS Holder) [common name or previous make]	Aircraft Model (alias)	Type Certificate Number (TCDS)	TC Certification Basis	Lightning Zoning Figure	Notes
<b>Pilatus</b> (Pilatus Aircraft Ltd.)	PC-6, PC-6-H1, PC-6-H2, PC-6/350, PC-6/350-H1, PC-6/350-H2, PC-6/A, PC-6/A-H1, PC-6/A-H2, PC-6/B-H2, PC-6/B1-H2, PC-6/B2-H2, PC-6/B2-H4, PC-6/C-H2, PC-6/C1-H2	7A15	CAR 3	Figure C-2	
<b>Pilatus (Pilatus Aircraft Ltd.)</b>	PC-7	A50EU	FAR 23 FAR 25	Figure C-2	
<b>Piper Aircraft, Inc.</b> (Piper Aircraft, Inc.) [New Piper]	PA-23, PA-23-160, PA-23-235, PA-23-250, PA-E23-250	1A10	CAR 3	Figure C-5	
<b>Piper Aircraft, Inc.</b> (Piper Aircraft, Inc.) [New Piper]	PA-24, PA-24-250, PA-24-260, PA-24-400	1A15	CAR 3	Figure C-5	
<b>Piper Aircraft, Inc.</b> (Piper Aircraft, Inc.) [New Piper]	PA-28-140, PA-28-150, PA-28-151, PA-28-160, PA-28-161, PA-28-180, PA-28-235, PA-28S-160, PA-28R-180, PA-28S-180, PA-28-181, PA-28R-200, PA-28R-201, PA-28R-201T, PA-28RT-201, PA-28RT-201T, PA-28-201T, PA-28-236	2A13	CAR 3 FAR 23	Figure C-2	
<b>Piper Aircraft, Inc.</b> (Piper Aircraft, Inc.) [New Piper]	PA-30, PA-39, PA-40	A1EA	CAR 3	Figure C-5	
<b>Piper Aircraft, Inc.</b> (Piper Aircraft, Inc.) [New Piper]	PA-31(PA-31-310), PA-31-300, PA-31-325, PA-31-350	A20SO	CAR 3 FAR23	Figure C-5	
<b>Piper Aircraft, Inc.</b> (Piper Aircraft, Inc.) [New Piper]	PA-32-260, PA-32-300, PA-32S-300, PA-32R-300, PA-32RT-300, PA-32RT-300T, PA-32R-301(SP), PA-32R-301(HP), PA-32R-301T, PA-32-301, PA-32-301T, PA-32-301FT, PA-32-301XTC	A3SO	CAR 3	Figure C-2	
<b>Piper Aircraft, Inc.</b> (Piper Aircraft, Inc.) [New Piper]	PA-34-200, PA-34-200T, PA-34-220T	A7SO	CAR 3 FAR 23	Figure C-5	
<b>Piper Aircraft, Inc. (Piper Aircraft, Inc.) [New Piper]</b>	PA-38-112	A18SO	FAR 23	Figure C-2	
<b>Piper Aircraft, Inc.</b> (Piper Aircraft, Inc.) [New Piper]	PA-44-180, PA-44-180T	A19SO	FAR 23	Figure C-5	
<b>Piper Aircraft, Inc.</b> (Piper Aircraft, Inc.) [New Piper]	PA-46R-350T	A25SO	FAR 23	Figure C-2	
<b>Polskie Zakłady Lotnicze Spolka zo.o (Polskie Zakłady Lotnicze Spolka zo.o.) [PZL Mielec]</b>	PZL M26 01	A44CE	FAR 23	Figure C-2	
<b>Quartz Mountain Aerospace Inc.</b> (Quartz Mountain Aerospace Inc.) [Luscombe]	11A, 11E	A-804	CAR 3	Figure C-2	
<b>Revo, Inc. (Revo, Incorporated) [Lake] [Global Amphibians LLC]</b>	Colonial C-1, Colonial C-2, Lake LA-4, Lake LA-4A, Lake LA-4P, Lake LA-4-200, Lake Model 250	1A13	CAR 3	Figure C-4	GPS antennas located just aft of the windshield may be best for this model. Some WAAS based operations may have limited availability due to poor visibility
<b>Rockwell International (Rockwell international Corporation) [North American]</b>	BC-1A, AT-6, AT-6A, AT-6B, AT-6C, AT-6D, AT-6F, SNJ-7, T-6G	A-2-575	CAR 4a	Figure C-2	

Aircraft Make (TCDS Holder) [common name or previous make]	Aircraft Model (alias)	Type Certificate Number (TCDS)	TC Certification Basis	Lightning Zoning Figure	Notes
<b>Short Brothers &amp; Harland LTD</b> (Short Brothers & Harland Ltd.)	SC-7 Series 2, SC-7 Series 3	A15EU	FAR 23	Figure C-5	
<b>SOCATA</b> (SOCATA - Groupe Aerospatiale)	TB 9, TB 10, TB 20, TB 21, TB 200	A51EU	FAR 23	Figure C-2	
<b>SOCATA, S.A.</b> (SOCATA, S.A.) [Grumman]	GA-7 (Cougar)	A17SO	FAR 23	Figure C-5	
<b>STOL (Sky Enterprises, Inc.) [ Republic; Stol Amphibian; Seabee; Trident; TwinBee]</b>	RC-3	A-769	CAR 3	Figure C-3	
<b>STOL (STOL Aircraft Corporation) [United Consultants; Twin-Bee]</b>	UC-1	A6EA	CAR 3	Figure C-5	Some WAAS based operations may have limited availability due to poor visibility
<b>TKEF (The King's Engineering Fellowship (TKEF))</b>	Model 44 (Angel)	A2WI	FAR 23	Figure C-6	
<b>True Flight Holdings LLC</b> (True Flight Holdings LLC) [American General] [Tiger Aircraft LLC]	AA-1, AA-1A, AA-1B, AA-1C	A11EA	FAR 23	Figure C-2	
<b>True Flight Holdings LLC</b> (True Flight Holdings LLC) [American General] [Tiger Aircraft LLC]	AA-5, AA-5A, AA-5B, AG-5B	A16EA	FAR 23	Figure C-2	
<b>Twin Commander</b> (Twin Commander Aircraft Corporation)	500, 500-A, 500-B, 500-U, 500-S, 520, 560, 560-A, 560-E	6A1	CAR 3	Figure C-5	
<b>Twin Commander (Twin Commander Aircraft Corporation)</b>	560-F, 680, 680E, 680F, 680FL	2A4	CAR 3	Figure C-5	
<b>Viking Air Limited</b> (Viking Air Limited) [deHavilland] [Otter]	DHC-3	A-815	CAR 3	Figure C-2	
<b>Viking Air Limited</b> (Viking Air Limited) [de Havilland, Inc.] [Bombardier, Inc.] [Twin Otter]	DHC-6-1, DHC-6-100, DHC-6-200, DHC-6-300	A9EA	CAR 3	Figure C-5	
<b>WSK "PZL-MIELEC" OBR (WSK PZL MIELEC and OBR SK MIELEC)</b>	PZL M20 03	A68EU	FAR 23	Figure C-5	
<b>Zenair</b> (Zenair Ltd.)	CH2000	TA5CH	FAR 23	Figure C-2	





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