

Peregrine
13000 East Control Tower Road
Suite 220 Box K-4
Englewood, Colorado 80112

E-TA-11-0009 Rev E

FAA
Airplane Flight Manual Supplement
to the

Aircraft Make: _____ Model: _____

Select approved Aircraft Make and Model from Supplemental Type Certificate SA00744DE
Approved Model List (AML)

Airplane Flight Manual

for the installation of

ADS-B Transmitter: Trig TT31 Transponder

Position Source: _____

Select approved Position Source from Supplemental Type Certificate SA00744DE AML

Aircraft Serial Number: _____ Aircraft Registration Number: _____

This supplement must be attached to the FAA approved Aircraft Flight Manual when the aircraft is modified for ADS-B Out by the installation of the Trig TT31 Mode S Transponder using an ADS-B Out GPS Position Source accordance with Supplemental Type Certificate SA00744DE.

The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the basic Aircraft Flight Manual.

FAA Approved _____


Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Directorate

DATE: 6/26/2015

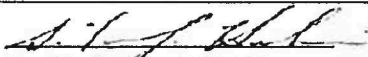
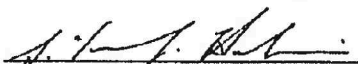
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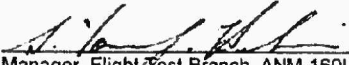
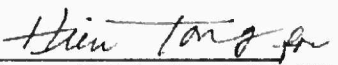
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-	04/02/2012	1-13	Complete Supplement	 Mgr. Flt Test Br. ANM-160L Federal Aviation Administration Los Angeles Aircraft Certification Office Transport Airplane Directorate Date: <u>April 2, 2012</u>
A	09/13/2012	1-21	- Added aircraft models to SA00744DE. - Updated references to ADS-B Out GPS Position Source. - Corrected TT31 software version and antenna model. - Reordered sections for standard format. - Updated Sect 4 for basic operations. - Updated Sect 6 for weight & balance. - Moved sys discussion to Sect 7. - Added Sect 8.	 Manager, Flight Test Branch, ANM-160L Federal Aviation Administration Los Angeles Aircraft Certification Office Transport Airplane Directorate Date: <u>Sept 13, 2012</u>

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B	11/08/2012	7,9	- Added position source, Accord Technologies NexNav Mini 21000 GPS in document title, limitations section (2.), and weight and balance section (6.).	 Manager, Flight Test Branch, ANM-160L Federal Aviation Administration Los Angeles Aircraft Certification Office Transport Airplane Directorate Date: <u>NOVEMBER 8, 2012</u>
		8	- Updated Section 4 to remove system descriptions from normal procedures.	
C	02/07/2012	1	- Removed reference to Mooney models. Added reference to AML.	 Manager, Flight Test Branch, ANM-160L Federal Aviation Administration Los Angeles Aircraft Certification Office Transport Airplane Directorate Date: <u>3/20/13</u>
		9	- Added entry on cover sheet for aircraft model. - Removed Mooney arm and moment values from W&B table.	

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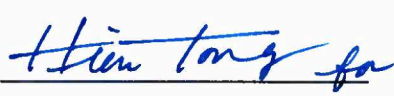
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Rev No	Page		Description	FAA Approved
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D	07/22/2014	All i, 2, 4 1 2 3 5 5- 14	<ul style="list-style-type: none"> - Spelled out first use of acronyms. - Added position source: GNS 400W/500W GPS to document title, limitations section (2.), and weight and balance section (6.). - Replaced Figure 1. - Specified limitations for Garmin Units. - Removed checklists from Normal Procedures. - Updated Software Version (3.12) in Section 7. - Clarified system description discussions. <p>Changes denoted by change bar in the left hand margin.</p>	<p><i>Hien Tong</i></p> <p>Manager, Flight Test Branch, ANM-160L, Federal Aviation Administration, Los Angeles Aircraft Certification Office, Transport Airplane Directorate</p> <p>Date: <u>7/23/2014</u></p>

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Rev No	Date	No.	Description	FAA Approved
E	06-26-2015	i	- Removed specific reference to position sources, added reference to AML.	 Manager, Flight Test Branch, ANM-160L, Federal Aviation Administration, Los Angeles Aircraft Certification Office, Transport Airplane Directorate Date: <u>6/26/2015</u>
		2	- Removed listing of position source makes and models from Limitations.	
		3	- Removed weight and balance information for permanently installed equipment.	
		12	- Corrected format for Section 7.11.	

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1. GENERAL

1.1. Introduction

The purpose of this document is to describe the operating procedures for the Trig TT31 Mode S transponder and an Automatic Dependent Surveillance-Broadcast (ADS-B) Out Global Positioning System (GPS) position source. This supplement will address normal operations of the installed equipment including any considerations of the ADS-B Out functionality of the system.

The information to be included in this supplement contains limitations, procedures, and performance information specific to the ADS-B Out compliant installation that is not otherwise included in the basic Airplane Flight Manual.

TT31 front Panel showing Pilot control input is shown in Figure 1.



Figure 1: Trig Avionics TT31 Transponder

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1.2. **ADS-B Out System**

The installed ADS-B Out system has been shown to meet the equipment requirements of 14 Code of Federal Regulations (CFR) § 91.227, *Automatic Dependent Surveillance-Broadcast (ADS-B) Out Equipment Performance Requirements*.

2. **LIMITATIONS**

Data provided by a remotely-mounted ADS-B Out System GPS/Wide Area Augmentation System (WAAS) receiver is **prohibited** for navigational use without additional Federal Aviation Administration (FAA) approval.

This Supplemental Type Certificate (STC) does not provide approval for the installation of instrument panel GPS receivers for navigational use. Use of instrument panel GPS receivers for navigational purposes **must** be approved independently of this STC.

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3. EMERGENCY PROCEDURES

No change

4. NORMAL PROCEDURES

No change

5. PERFORMANCE

No change

6. WEIGHT AND BALANCE

No change

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7. SYSTEM DESCRIPTION

The TT31 transponder is a DO-181D Class 1 compliant Mode S level 2 datalink transponder, which is compatible with the European elementary surveillance requirements. The TT31 includes interfaces which can be connected to an appropriate GPS position source and can be used to generate ADS-B position and state extended squitter transmissions. TT31 software version 3.12 (or later approved revision) provides support for ADS-B in accordance with DO-260B. The TT31 software version is shown on the face of the transponder display upon system power up.

The GPS/WAAS Sensor is designed to provide position, velocity, time and integrity (PVT&I) data. The GPS position sensors approved under this STC meet all ADS-B Out performance requirements identified in FAA advisory circular AC 20-165A.

By connecting the GPS position source to the Trig TT31 transponder over a single RS232 interface, the system will generate ADS-B position and state extended squitter transmissions.

The airspeed switch input to the system allows the transponder to automatically switch between airborne and ground modes and affects both the Mode S reply behavior and the ADS-B reporting behavior. This input ensures that the system is transmitting the appropriate information for the given aircraft operating mode.

The operating manual for the transponder is Trig Avionics document 00454-00-AE, *TT31 Mode S Transponder Operating Manual*.

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7.1. Front Panel

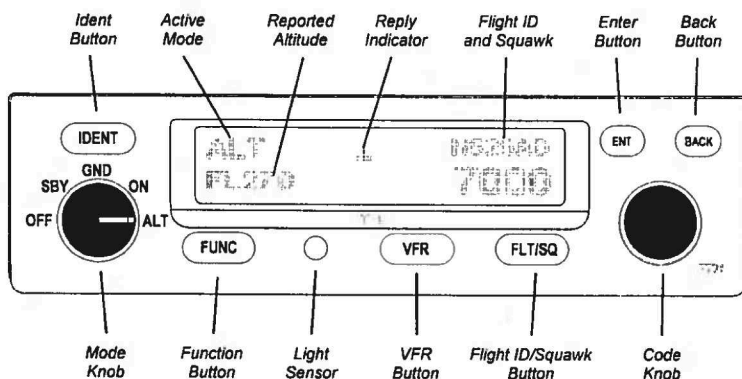


Figure 2: TT31 Transponder Front Panel

7.2. ADS-B Monitor

The transponder provides an ADS-B Monitor function that can be accessed with the FUNC push button. By selecting the ADS-B Monitor function, the display will provide the position information that is being transmitted in ADS-B position reports (see Figure 3: ADS-B Monitor). This can provide confirmation that the correct information is being transmitted, particularly where the GPS source is remote from the transponder.

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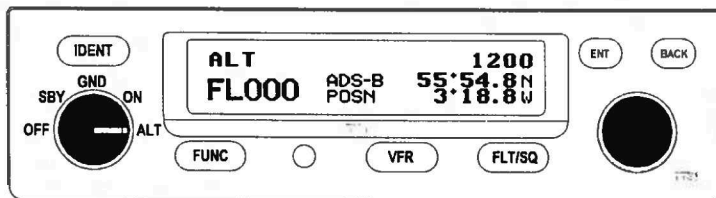


Figure 3: ADS-B Monitor

Following initial position fix, loss of ADS-B position information from the GPS source will also result in a **WARNING** message being displayed (see Figure 4: Loss of ADS-B Position Information). This message will also be displayed within 5 minutes after system power-up if no position information is being received. This message may be cleared by pressing the ENT button.



Figure 4: Loss of ADS-B Position Information

The transponder will resume transmitting ADS-B parameters upon reacquisition of the position information from the GPS source. Transmission will resume regardless of whether or not the fault message has been cleared.

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In the event that valid position information is NOT available from the GPS, and the message has been cleared, the latitude and longitude display will be replaced by dashes on the ADS-B Monitor. If no valid latitude and longitude is shown when the ADS-B Monitor is selected, then ADS-B position information is NOT being transmitted

7.3. Warning Messages

If the transponder detects a problem, the screen will indicate WARNING and a brief statement of the problem. Depending on the nature of the problem, your transponder may not be replying to interrogations. Note the message on the screen and pass that information to your avionics maintenance personnel. Press ENT to clear the message; if the fault is still present the message will reappear. The error message will remain visible as long as the condition persists until the pilot clears the message by pressing ENT.

7.4. Fault Annunciation

If the transponder detects an internal failure, the screen will indicate FAULT and a brief statement of the problem. No replies will be made to interrogations when a fault is detected.

Some FAULT indications can be recovered by switching the transponder off and back on again, although in all cases a FAULT code implies that there is a fault with the transponder or the installation. Note the FAULT message at the bottom of the screen and pass that information to your avionics maintenance personnel.

In the event of a FAULT message, the pilot should consider the transponder inoperative and should take appropriate actions to remain in compliance with the requirements of 14 CFR 91.215, *ATC transponder and altitude reporting equipment and use* and 91.225 *Automatic Dependent Surveillance-Broadcast (ADS-B) Out equipment and use*.

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7.5. Display

The display shows the operating mode of the transponder, the reported pressure altitude, and the current squawk code and Flight ID. The reply indicator is active when the transponder replies to interrogations.

The pressure altitude is displayed as a Flight Level, which is the pressure altitude in hundreds of feet. When non-standard atmospheric conditions apply, this may not match the altimeter's indicated altitude, but will be correctly displayed by the ATC radar.

7.6. Mode Selector Knob

The left hand knob controls the power to the transponder and the operating mode. Listed below are descriptions of the selectable functions of the Mode Selector Knob on the transponder.

Table 1: Mode Selector Control

OFF	Power is removed from the transponder.
SBY	The transponder is on, but will not reply to any interrogations.
GND	The transponder will respond to Mode S ground interrogations from surface movement radar.
ON	The transponder will respond to all interrogations, but altitude reporting is suppressed.
ALT	The transponder will respond to all interrogations with altitude encoded.

When operating the aircraft for flight purposes (e.g. pre-flight, taxi, takeoff, enroute, landing) the transponder should always be set to ALT unless directed otherwise by air traffic control. The transponder will ensure that the air/ground status is automatically selected.

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7.7. Push Buttons

Reference Figure 2: TT31 Transponder Front Panel. The following describe the functions of the push buttons on the transponder.

Table 2: Push Button Controls

IDENT	Press the IDENT button only when ATC instructs you to "Ident" or "Squawk Ident". This activates the special position identification (SPI) pulse in the transponder replies for 18 seconds. IDENT will appear in the display.
FUNC	Pressing the FUNC button provides access to the flight timer, stopwatch, ADS-B monitor (depending on installation), and altitude monitor function.
VFR	Pressing the VFR button sets the transponder to the pre-programmed conspicuity code. Pressing the button again restores the previous squawk code.
FLT/SQ	Pressing FLT/SQ alternates the primary display between squawk code and Flight ID.
ENT	The ENT button enters a digit in the code selector.
BACK	The BACK button goes back to the previous digit in the code selector.

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7.8. Code Selector Knob

The right hand knob is used to set squawk codes and the Flight ID. The FLT/SQ button selects which will be updated. Turning the knob will highlight the first digit on the display, and the digit can be changed as required. Press the ENT button to advance to the next digit. When ENT is pressed on the last digit, the new squawk code or Flight ID will replace the previous value. If the code entry is not completed within 7 seconds, the changes are ignored and the previous code restored. Table 3: Standard SQUAWK Codes describes the common codes of the Code Selector knob on the transponder.

Table 3: Standard SQUAWK Codes

1200	VFR code in the USA
7000	VFR code commonly used in Europe
7500	Hijack code
7600	Loss of communications
7700	Emergency code

The Flight ID should correspond to the aircraft call sign entered on your flight plan. If no flight plan is active, the aircraft registration should be used as your Flight ID. Use only letters and digits. If the Flight ID is less than 8 characters long, entering a blank character will end it.

Contact your maintenance personnel to update the preset call sign/Flight ID if the aircraft registration number changes.

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7.9. Disabling the ADS-B System

Turning off the transponder/GPS or pulling the transponder/GPS circuit breaker will disable/terminate the ADS-B Out functionality. When the transponder is ON and in the ALT position, the automatic air/ground switch will determine the aircraft status (GND or ALT) and control the transmission of surface/airborne ADS-B messages as appropriate. The transponder and GPS MUST be enabled during all phases of flight including airport surface operations.

7.10. Additional TT31 Features

The TT31 provides the pilot with additional features. These features are accessible by pressing the "FUNC" push button and cycling through the features until the desired function is active.

Stopwatch

The stopwatch can be used as a convenient timer. Press the FUNC button to display the stopwatch. Pressing ENT will reset and start the timer. Pressing ENT again will stop the timer.

Flight Timer

The Flight Timer records the time for which the transponder has been powered on and operating in flight mode – either ON or ALT. The flight timer runs while the transponder is reporting airborne status, and stops when the transponder is reporting on ground status. The flight timer is reset when power is removed from the transponder. Press the FUNC button to display the Flight Timer.

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Altitude Monitor

The Altitude Monitor activates an aural alert or annunciator light (depending on installation) when the aircraft pressure altitude differs from the selected altitude by more than 200 feet. When Altitude Monitoring is in use, a small deviation pointer appears adjacent to the display on the transponder screen.

This installation is not integrated with an aural alert or annunciator light. When Altitude Monitoring is in use, the only indication will be the deviation pointer adjacent to the display on the transponder.

Press the FUNC button to display the altitude monitor enable screen. Pressing ENT toggles the altitude monitor at the present altitude.

7.11. Low Temperature Operation

The TT31 is certified to operate correctly down to -20°C, but at low temperatures the display may be impaired. On a cold day you may need to wait for the cockpit to warm up (or preheat) to ensure normal operation.

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8. HANDLING, SERVICE, AND MAINTENANCE

8.1. Handling

The TT31 transponder shall be handled as any other standard piece of avionics equipment. No special considerations are required while the unit is installed in the aircraft, and normal electro-static discharge (ESD) protection shall be followed if the unit is removed from the aircraft.

8.2. Service

No user serviceable components are included in the TT31 transponder. Any required servicing shall be completed by an appropriately rated FAA approved service center or person.

8.3. Maintenance

Other than for periodic functional checks as required by the FAA regulations, the TT31 unit has been designed and manufactured "on condition maintenance". There are no periodic service requirements necessary to maintain continued airworthiness.