Global Positioning System Steering (GPSS) Converter Pilot's Operating Handbook

MEGGITT AVIONICS

S-TEC

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INTRODUCTION

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1.0 Introduction

The primary purpose of the GPS Steering (GPSS) Converter **Pilot Operating Handbook (POH)** is to provide pilots with step-by-step functional Preflight and In-Flight Operating Procedures for the installed system.

1.1 Notice

This manual may be used in conjunction with FAA approved autopilot Airplane Flight Manual Supplement (AFMS), Pilots Operating Handbook Supplement (POHS), or Supplemental Flight Manual (SFM). Refer to the specific AFMS, POHS or SFM for your aircraft specific information and emergency operating procedures.

If the autopilot is to be used during Instrument Flight Rules (IFR) operations, we recommend that you develop a thorough understanding of the autopilot system, its functions and characteristics in Visual Meteorological Conditions (VMC). Accomplish this before undertaking a IFR flight.

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SECTION 2
THEORY OF OPERATION

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2.0 Theory of Operation

2.1 General

The Global Positioning System Steering (GPSS) Converter is an autopilot accessory unit that enables a pilot to switch between heading and GPS navigational signals. The converter provides direct digital coupling between the GPS navigator and the autopilot and is compatible with select S-TEC autopilots.

During normal flight operations, the GPSS Converter can be switched between the heading and GPSS modes of operation. In the heading mode, the converter receives a heading error signal from the heading bug on the Horizontal Situation Indicator (HSI) or Directional Gyro (DG). The converter processes this information and sends this heading error directly to the autopilot.

In the GPSS mode, the converter receives ground speed and bank angle digital signals that are calculated and converted to a commanded turn rate. The turn rate is then scaled and converted to a DC heading error signal that is compatible with S-TEC autopilots. The end result is an autopilot that can be directly coupled to the roll steering commands produced by the GPS Navigator, eliminating the need for the pilot to make any further adjustments to the HSI course arrow or the DG's heading bug.

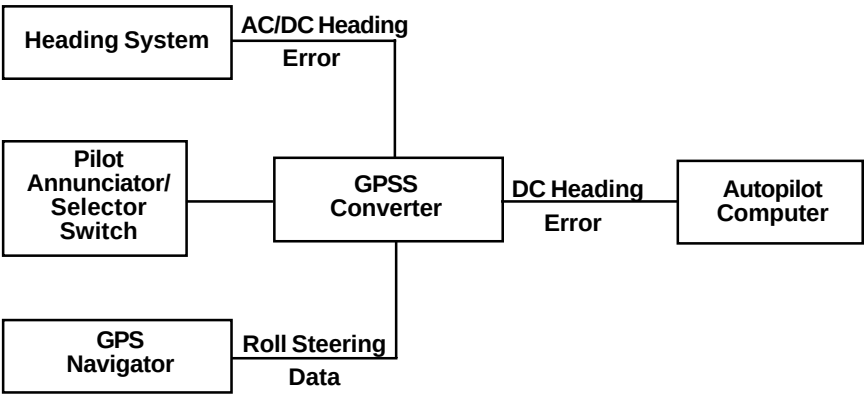

Fig. 2-1. GPSS Converter Operation

2.2 GPSS Converter

The GPSS Converter accepts either 14 or 28 VDC power input that enables it to switch between the Heading (HDG) and GPSS modes of operation. The switch, a momentary push button, is equipped with both a HDG and a GPSS indicator. The unit illuminates the proper indicator according to the current mode of operation. The pilot can switch between modes by simply pushing the button. If the unit is in the HDG mode, autopilot HDG operation will be normal. During flight, if the pilot selects the GPSS mode and valid Roll Steering Data is present, the autopilot will begin to track to the GPS waypoint. If the unit is in the GPSS mode of operation and valid Roll Steering Data is lost, or if GPSS is selected and no valid GPSS signal is available, the GPSS indicator will flash to indicate a problem. The aircraft will immediately go wings level until the pilot can program a valid GPS flight plan or switch the unit to the HDG mode.

2.3 Interfacing With Existing Autopilots

For S-TEC autopilots that do not have a dedicated GPSS data input channel, the autopilots heading channel is used. The heading channel will limit the commanded turn to 90% of a standard rate turn. The GPSS Converter is configured as necessary to accommodate variations in the aircraft's heading system and the autopilot is configured to accept the standard DC Heading Error Signal.

Fig. 2-2. GPSS Data Input

2.4 Configuration

The GPSS Converter includes a panel mounted switchand remotely located converter unit. The switch should be mounted in clear view of the pilot so that minimum head and eye movementis required to monitor system operation.

Fig. 2-3. GPSS Converter Configuration

SECTION 3
PROCEDURES

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3.0 Procedures

3.1 Pre-Flight Procedures

***NOTE*: The GPSS Converter requires either 14 or 28 VDC as input power.**

1. Place aircraft master and avionics switches to on.

NOTE: **When aircraft power is applied, the HDG lamp on the GPSS panel switch will illuminate. This indicates that the autopilot, when turned on, will operate normally in heading mode, when selected.**

2. Place the autopilot master switch to **ON**.

3. Select the HDG mode on the autopilot after the ready (RDY) annunciator appears.

4. Move the DG or HSI heading bug left and right. The control wheel should smoothly follow the HDG bug movement.

5. Activate a valid GPS waypoint or flight plan on the GPS Navigator.

6. Press and release the GPSS switch, the HDG lamp goes out and the GPSS lamp flashes. The HDG bug will no longer move the control wheel.

NOTE: **The GPSS steering function cannot be ground tested even though a valid GPS Steering Signal is present on the GPS Navigator due to the missing ground speed component.**

7. Disconnect the autopilot.

3.2 In-Flight Procedures

NOTE: **The GPSS mode can be used for enroute navigation or GPS approaches. For enroute navigation use the following procedure:**

3.2.1 Enroute Navigation Procedures

1. Select the HDG mode on the autopilot.

2. Select the HDG mode on the panel mounted GPSS converter switch.

3. Program and activate the desired destination waypoint or flight plan into the GPS navigator.

4. Select the GPSS mode on the panel mounted GPSS converter switch. Observe that GPSS annunciates steady.

5. Verify that the autopilot immediately begins tracking to the desired waypoint.

CAUTION:

Anytime the GPS Navigator has a valid waypoint programmed into it and the pilot selects the GPSS mode with the autopilot in the HDG mode, the autopilot will immediately begin tracking to the waypoint, regardless of any external Nav selector switch postion.

CAUTION:

Some S-TEC autopilots are capable of pilot selectable intercept angles by using HDG and Nav modes simultaneously (dual mode) where the HDG mode extinguishes leaving the autopilot in the NAV mode as the course is approached. DO NOT attempt to conduct pilot selectable intercepts (dual mode) when using the GPSS converter since this capability does not exist. Conduct all GPSS operations with the autopilot in the HDG mode only. Selecting any lateral mode besides HDG (NAV, APR, REV, etc.) will decouple the autopilot from the GPSS function.

NOTE: **If the GPSS lamp flashes when engaged, it indicates either:**

1. The GPS Navigator is not on or does not have an active waypoint or flight plan.

2. The bank angle and ground speed signals are not being received or may not be valid.

NOTE: **When operating in the GPSS mode, the autopilot does not use inputs from the HDG bug or course arrow, therefore, the pilot is not required to set these. The pilot will be rquired to revert back to the HDG mode to maneuver the aircraft in a holding pattern or procedure turn since these elements are not usually contained in the navigator data base.**

NOTE: **If the GPSS lamp begins to flash, the aircraft will go wings level within 0.5 to 2 seconds. The pilot can then either enter a valid GPS waypoint or press and release the GPSS switch to return the autopilot to the HDG mode.**

3.2.2 GPS Approach Procedures

1. Select the HDG mode on the autopilot.

2. Select the HDG mode on the panel mounted GPSS converter switch.

3. Select and activate the desired approach on the GPS navigator.

4. Select the GPSS mode on the panel mounted GPSS converter switch. Observe that GPSS annunciates steady.

5. Verify that the autopilot immediately begins tracking to the desired initial approach fix.

6. If the selected approach contains a procedure turn or a holding pattern, the pilot must conduct the following procedure:

A. When approaching the procedure turn, deselect the GPSS mode by pressing the panel mounted switch, thus leaving the autopilot in HDG mode.

B. Lead the aircraft around the procedure turn or holding pattern using the HDG bug on the DG or HSI.

C. When approaching the desired inbound course, once again select the GPSS mode.

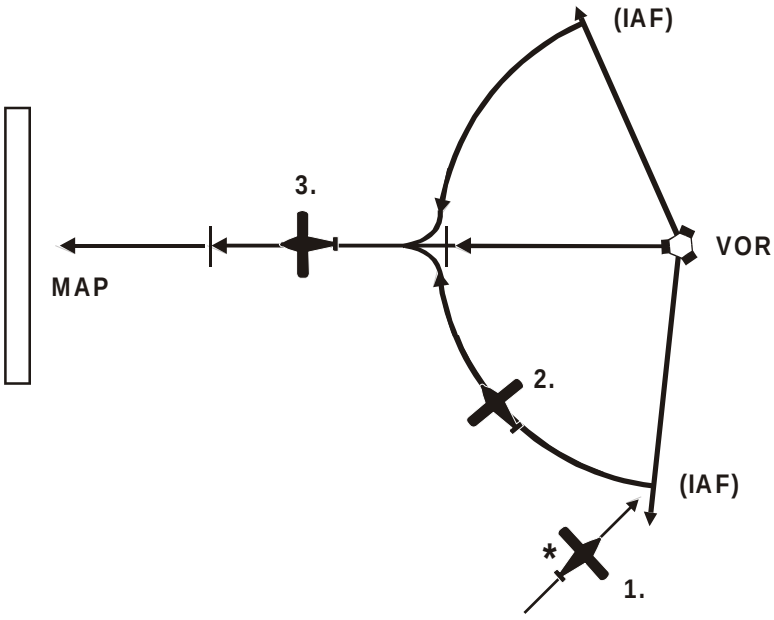
D. Conduct the remainder of the approach in the GPSS mode.

7. Monitor course tracking quality during GPSS operations.

3.3 Emergency Procedures

In the event of a malfunction of the GPSS Converte,r or any time it is not performing as expected, do not attempt to identify the system problem. Immediately regain control of the aircraft by disabling and disconnecting the autopilot as necessary. Do not attempt to use the GPSS function until the problem has been identified and corrected.

NOTE: **A GPSS unit malfunction will most likely affect the autopilots heading mode, rendering it unusable. However, it may be possible to use other autopilot lateral modes such as navigation (NAV) or approach and the pitch modes, if so equipped. Exercise caution when examining the use of these functions after a GPSS malfunction.**



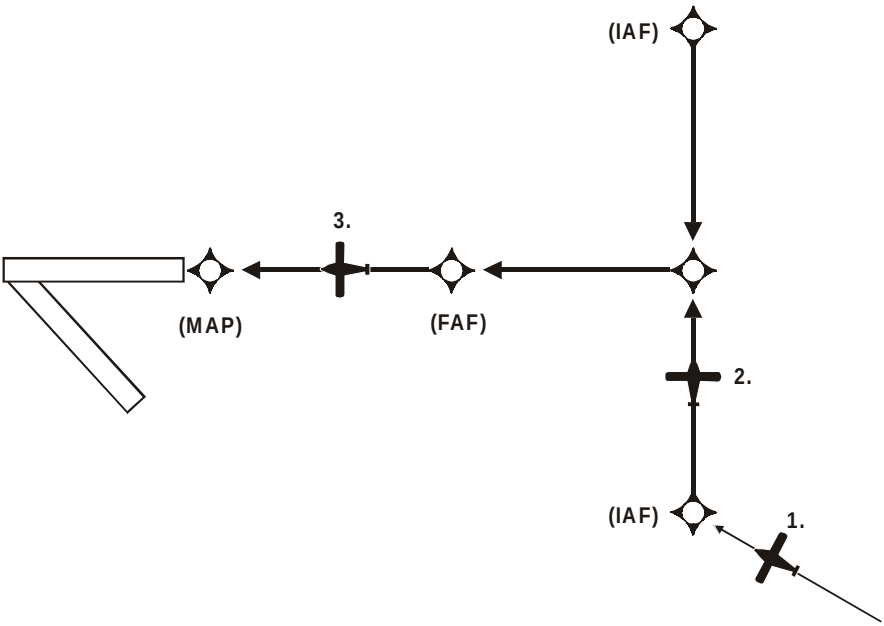
1. **A.** Program approach and desired IAF into GPS navigator.
B. Engage autopilot HDG mode.
C. Engage GPSS mode on panel mounted GPSS switch.
D. Autopilot begins tracking to selected Initial Approach Fix (IAF).

2. **A.** While in GPSS mode, autopilot will automatically intercept the IAF and track around the arc to the final approach course.

3. **A.** Monitor autopilot tracking performance.
B. Set HDG bug to missed approach heading as desired.
C. At the Missed Approach Point (MAP), disconnect the autopilot for landing or go-around as desired.

NOTE: **Not all GPS navigator units have the capability to provide steering data around an arc. See your operator's manual to deter mine this information.**

Fig. 3-1. GPS Overlay of VOR/DME-A Approach

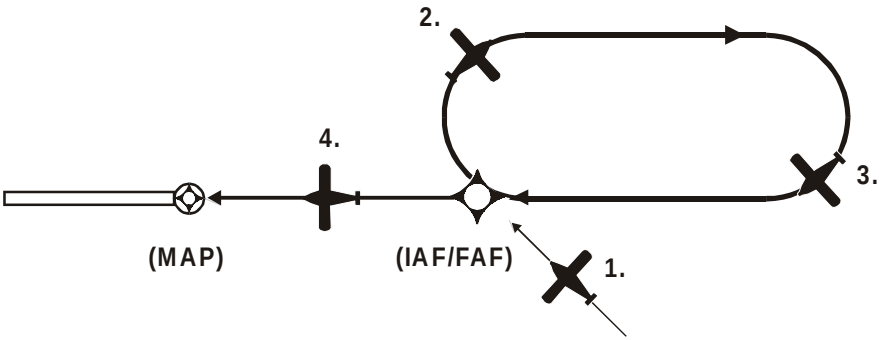


1. **A.** Program approach and desired IAF into GPS navigator.
B. Engage autopilot HDG mode.
C. Engage GPSS mode on panel mounted GPSS switch.

2. **A.** Autopilot automatically tracks each approach segment without further inputs from the pilot.

3. **A.** Monitor autopilot tracking performance.
B. Set HDG bug to missed approach heading if desired.
C. At the Missed Approach Point (MAP), disconnect the autopilot for landing or go-around as desired.

Fig. 3-2. GPS "T" Approach



1. **A.** Program desired approach into GPS navigator.
B. Engage autopilot HDG mode.
C. Engage GPSS mode on panel mounted GPSS switch.
D. Autopilot begins tracking to the Initial Approach Fix (IAF).

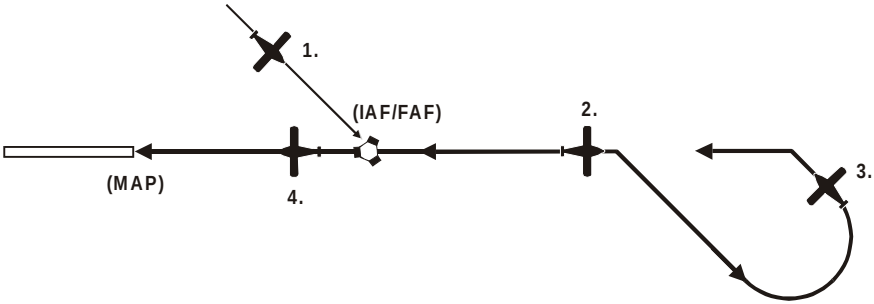
NOTE: **Step 2 and 3 only required for GPS receivers which do not perform holding patterns.**

2. **A.** Press GPSS switch to annunciate HDG mode.
B. Lead aircraft around the holding pattern outbound leg in 90º increments with the HDG bug.

3. **A.** Press the GPSS switch again to annunciate the GPSS mode.
B. Autopilot will track to the Final Approach Fix (FAF).
C. Continue the approach unless further holding is required.

4. **A.** Set the HDG bug to the missed approach heading if desired.
B. Monitor tracking to the Missed Approach Point (MAP).
C. Disconnect autopilot at the MAP for landing or go-around as desired.

Fig. 3-3. GPS Approach with Holding Pattern



1. **A.** Program desired approach and IAF into GPS navigator.
B. Engage autopilot HDG mode.
C. Engage GPSS mode on panel mounted GPSS switch.
D. Autopilot begins tracking to the Initial Approach Fix (IAF).

NOTE: **Step 2 and 3 only required for GPS receivers which do not perform holding patterns.**

2. **A.** Press GPSS switch to annunciate HDG mode.
B. Lead aircraft around the procedure turn in 90º increments with the HDG bug.

3. **A.** When approaching the inbound course, press the GPSS switch to enter the GPSS mode.
B. Autopilot will intercept and track the Final Approach course.

4. **A.** Monitor tracking to the Missed Approach Point (MAP).
B. Set the HDG bug to the missed approach heading if desired.
C. Disconnect autopilot at the MAP for landing or go-around as desired.

Fig. 3-4. GPS Overlay of VOR Approach with Procedure Turn

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SECTION 4
APPENDICES

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Appendix A:
Specifications

GPSS Converter
System Requirements

	Horizontal/Vertical	Remote
Power Required	14/28 VDC	14/28 VDC
Weight	.25 lbs.	**Remote Switch** .05 lbs. **Remote Unit** .25 lbs.
Current Requirements	200 mA	200 mA
Dimensions	**Horizontal Converter** 3.6D X 2.28W X 1H **Vertical Converter** 3.6D X 1W X 2.28H	**Remote Switch** 1D X .8W X 1.3H **Remote Converter** 4D X 3.4W X 1H
Technical Specification Order	C9c	C9c

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SECTION 5
GLOSSARY

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GLOSSARY

Term	Meaning
AFMS	Airplane Flight Manual Supplement
D	Depth
DC	Direct Current
DG	Directional Gyro
FAA	Federal Aviation Administration
FAF	Final Approach Fix
GPS	Global Positioning System
GPSS	Global Positioning System Steering
H	Height
HDG	Heading
HSI	Horizontal Situation Indicator
IAF	Initial Approach Fix
IFR	Instrument Flight Rules
lbs.	pounds
mA	milli amps
MAP	Missed Approach Point
NAV	Navigation
POH	Pilot’s Operating Handbook
POHS	Pilot's Operating Handbook Supplement
P/N	Part Number
RDY	Ready
SFM	Supplemental Flight Manual
VDC	Volts Direct Current
VMC	Visual Meteorological Conditions
W	Width

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