



# S-TEC

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



S-TEC  
One S-TEC Way  
Municipal Airport  
Mineral Wells  
TX 76067-9236  
USA

Tel: +1(940) 325 9406  
Toll-free: +1(800) 872 7832  
Fax: +1 (940) 325 3904

[www.s-tec.com](http://www.s-tec.com)  
[www.meggitt.com](http://www.meggitt.com)

# MEGGITT



Page Intentionally Blank

## Table of Contents

<u>Section</u>	<u>Page</u>
1.0 Introduction.....	1-3
2.0 Theory of Operation.....	2-3
2.1 General.....	2-3
2.2 <b>GPSS</b> Converter.....	2-4
2.3 Interfacing With Existing Autopilots.....	2-4
2.4 Configuration.....	2-4
3.0 Procedures.....	3-3
3.1 Pre-Flight Procedures.....	3-3
3.2 In-Flight Procedures.....	3-3
3.2.1 Enroute Navigation Procedures.....	3-3
3.2.2 <b>GPS</b> Approach Procedures.....	3-5
3.3 Emergency Procedures.....	3-5
4.0 Appendix A: Specifications.....	4-3
5.0 Glossary.....	5-3

## List of Figures

<u>Figure</u>	<u>Page</u>
2-1 <b>GPSS</b> Converter Operation.....	2-3
2-2 <b>GPSS</b> Data Input.....	2-4
2-3 Three Configurations of the <b>GPSS</b> Converter.....	2-4
3-1 <b>GPS</b> Overlay of <b>VOR/DME-A</b> Approach.....	3-6
3-2 <b>GPS</b> "T" Approach.....	3-7
3-3 <b>GPS</b> Approach with Holding Pattern.....	3-8
3-4 <b>GPS</b> Overlay of <b>VOR</b> Approach with Procedure Turn.....	3-9

Page Intentionally Blank

# **SECTION 1 INTRODUCTION**

Page Intentionally Blank

## 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.

### Notice

This handbook must be used in conjunction with the Federal Aviation Administration (**FAA**) approved Aircraft Flight Manual (**AFM**) or Aircraft Flight Manual Supplement (**AFMS**). Refer to the applicable **AFM** or **AFMS** for aircraft specific information, aircraft emergency procedures, and return of aircraft to service.

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.



Page Intentionally Blank

# **SECTION 2**

# **THEORY OF OPERATION**

Page Intentionally Blank

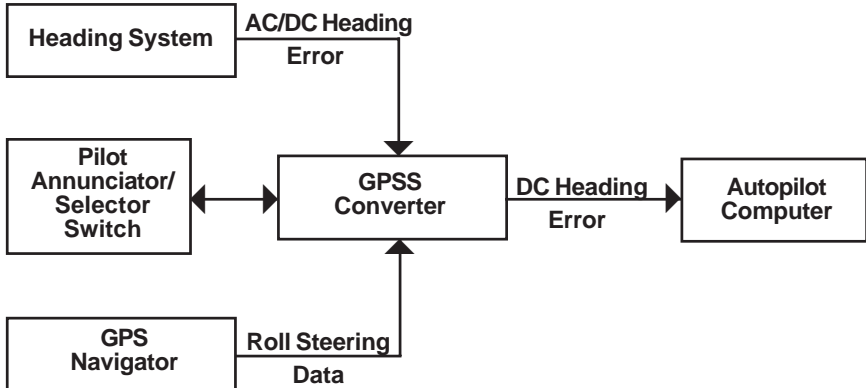
## 2.0 Theory of Operation

### 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 switch and remotely located converter unit. The switch should be mounted in clear view of the pilot so that minimum head and eye movement is required to monitor system operation.



**Fig. 2-3. GPSS Converter Configuration**

# **SECTION 3 PROCEDURES**

Page Intentionally Blank

### 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 position.

**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 required 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.

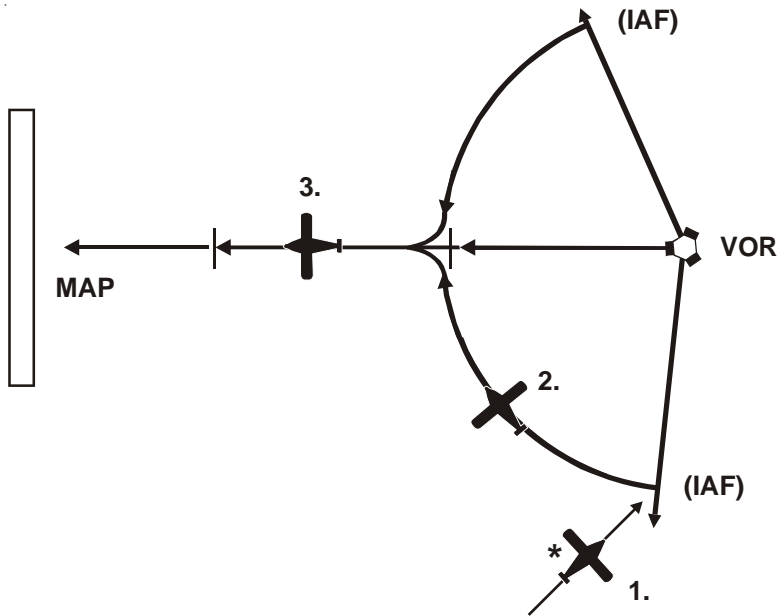
### 3.2.2 GPS Approach Procedures

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** Converter 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.

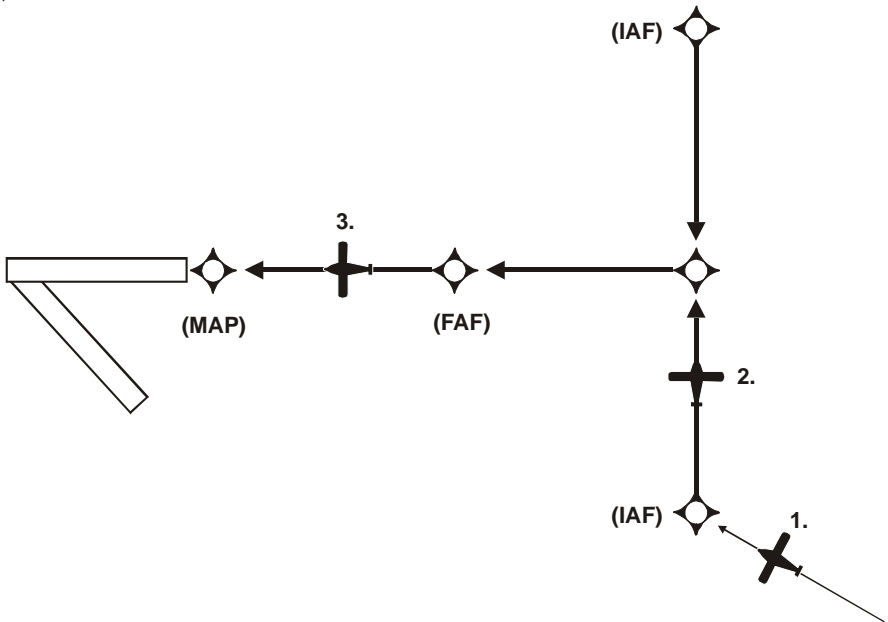
**NOTE:** A **GPSS** unit malfunction will most likely affect the autopilots heading mode, rendering it unusable. However, it may be possible to use other autopilot lateral modes such as navigation (NAV) or approach and the pitch modes, if so equipped. Exercise caution when examining the use of these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



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

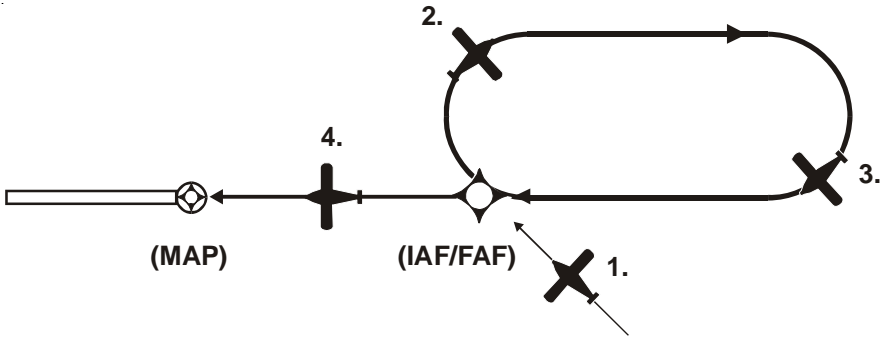
1. **A.** Program approach and desired **IAF** into **GPS** navigator.  
**B.** Engage autopilot **HDG** mode.  
**C.** Engage **GPSS** mode on panel mounted **GPSS** switch.  
**D.** Autopilot begins tracking to selected Initial Approach Fix (**IAF**).
2. **A.** While in **GPSS** mode, autopilot will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



**Fig. 3-2. GPS "T" 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.

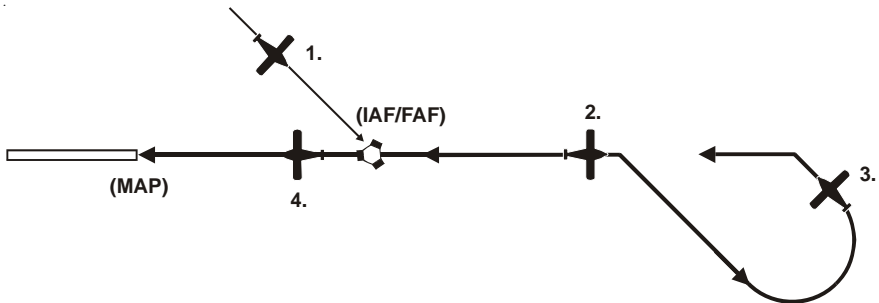


**Fig. 3-3. GPS Approach with Holding Pattern**

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 90° 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. 3-4. GPS Overlay of VOR Approach with Procedure Turn**

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  $90^\circ$  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.

Page Intentionally Blank

# **SECTION 4 APPENDICES**



Page Intentionally Blank

## Appendix A: Specifications

### GPSS Converter System Requirements

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

Page Intentionally Blank

# **SECTION 5 GLOSSARY**

Page Intentionally Blank

# GLOSSARY

<b><u>Term</u></b>	<b><u>Meaning</u></b>
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

Page Intentionally Blank

# S-TEC

One S-TEC Way · Municipal Airport  
Mineral Wells, Texas 76067-9236 USA  
Telephone: 940/325-9406; FAX: 940/325-3904  
1-800-USA-STECH  
[www.s-tec.com](http://www.s-tec.com)

Information in this document is subject to change without notice.  
©2000 S-TEC. All rights reserved. Printed in the United States  
of America. S-TEC and the S-TEC logo are registered  
trademarks of S-TEC.

**Notice: You must contact S-TEC Customer Support at 800-872-7832  
for a Return Material Authorization (RMA) number prior to the  
return of any component for any reason.**

P/N: 8799  
Date: 05 September 2003  
Printed in USA