



SixtyPSS

Pilot's Operating Handbook



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SECTION 1 OVERVIEW

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1.1 Document Organization

Section 1 Overview

Section 2 Pre-Flight Procedures

Section 3 In-Flight Procedures

Section 4 Operating Parameters

Section 5 Glossary

1.2 Purpose

This Pilot's Operating Handbook (POH) provides Pre-Flight and In-Flight operating procedures for the S-TEC System Sixty Pitch Stabilization System (PSS) Autopilot (AP).

Note:

This POH must be carried in the A/C and made available to the pilot at all times. It can only 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 A/C specific information, such as unique ground tests, limitations, and emergency procedures.

Note:

The System Sixty PSS autopilot is a tool provided to aircraft owners, that serves to assist them with cockpit workload management. The ability of the autopilot to provide optimum assistance and performance is directly proportional to the pilot's knowledge of its operating procedures. Therefore, it is highly recommended that the pilot develop a thorough understanding of the autopilot, its modes, and operating procedures in Visual Meteorological Conditions (VMC), prior to using it under Instrument Flight Rules (IFR).

1.3 General Control Theory

The System Sixty PSS is a rate based autopilot, that controls only the pitch axis of the aircraft. The autopilot senses vertical speed, acceleration, and closure rate to the selected glideslope, along with the non-rate quantities of altitude and glideslope deviation indication. These sensed data provide feedback to the autopilot, which processes them in order to control the aircraft through the use of mechanisms coupled to the control system. The pitch servo is coupled to the elevator. The optional autotrim function senses when the aircraft needs to be trimmed about the pitch axis, and responds by driving the trim servo in the proper direction to provide trim. The trim servo is coupled to the elevator trim tabs.

S-TEC

1.4 Modes of Operation

Altitude Hold (ALT HOLD) Mode

Used to Hold Altitude

Vertical Speed (VS) Mode

Used to Hold Vertical Speed

Glideslope (GS) Mode

Used to Intercept and Track Glideslope

1.5 Block Diagram

The System Sixty PSS Block Diagram is shown in Fig. 1-1.

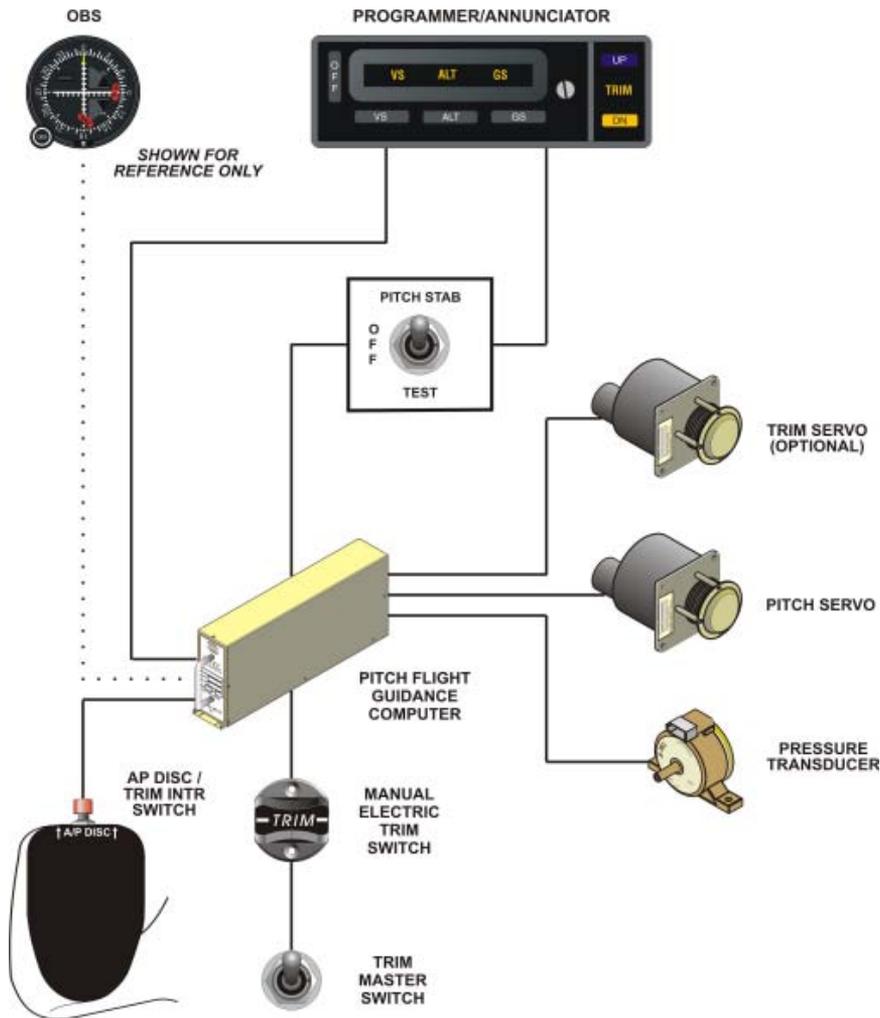


Fig. 1-1. System Sixty PSS Block Diagram

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SECTION 2 PRE-FLIGHT PROCEDURES

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2.1 Pre-Flight Test

Prior to takeoff and with engine running, perform the actions shown in Table 2-1. For each action, verify the corresponding response where applicable.

Table 2-1. Pre-Flight Test (continued on page 2-4)

ACTION	RESPONSE
1. Set Trim Master Switch to OFF position (if installed).	-----
2. Set Battery Master Switch to ON position.	-----
3. Set Avionics Master Switch to ON position.	-----
4. Set Pitch Stab Switch to TEST position.	<p>The following annunciations all appear on AP display, as shown in Fig. 2-1:</p> <p>VS ALT GS TRIM</p> <p>UP switch and DN switch lamps are both illuminated on AP display.</p>



Fig. 2-1. AP Display, All Annunciations Appear

Table 2-1. Pre-Flight Test (continued from page 2-3)

ACTION	RESPONSE
5. Move A/C Control Wheel forward and aft, to sense its freedom of movement about pitch axis.	-----
6. Press ALT mode selector switch to engage altitude hold mode.	-----
7. Attempt movement of A/C Control Wheel forward and aft.	<p>A/C Control Wheel's reduced freedom of movement indicates that Pitch Servo is engaged.</p> <p>Pitch Servo can be overridden. If not, set Pitch Stab Switch to OFF position and do not use.</p>
8. Press/Hold UP switch, while maintaining a grasp on A/C Control Wheel.	Pitch Servo disengages after ½ second, as sensed by the increased freedom of A/C Control Wheel movement about pitch axis.
9. Release UP switch, while maintaining a grasp on A/C Control Wheel.	Pitch Servo immediately re-engages, as sensed by the reduced freedom of A/C Control Wheel movement about pitch axis.
10. Press/Hold DN switch, while maintaining a grasp on A/C Control Wheel.	Pitch Servo disengages after ½ second, as sensed by the increased freedom of A/C Control Wheel movement about pitch axis.
11. Release DN switch, while maintaining a grasp on A/C Control Wheel.	Pitch Servo immediately re-engages, as sensed by the reduced freedom of A/C Control Wheel movement about pitch axis.

Table 2-1. Pre-Flight Test (continued from page 2-4)

ACTION	RESPONSE
12. Set Pitch Stab Switch to ON position.	All annunciations are extinguished, as shown in Fig. 2-2. UP switch and DN switch lamps are extinguished.
13. Press VS mode selector switch to engage vertical speed mode.	VS annunciation only appears on AP display, as shown in Fig. 2-3.
14. Move A/C Control Wheel until elevator is in neutral position.	-----

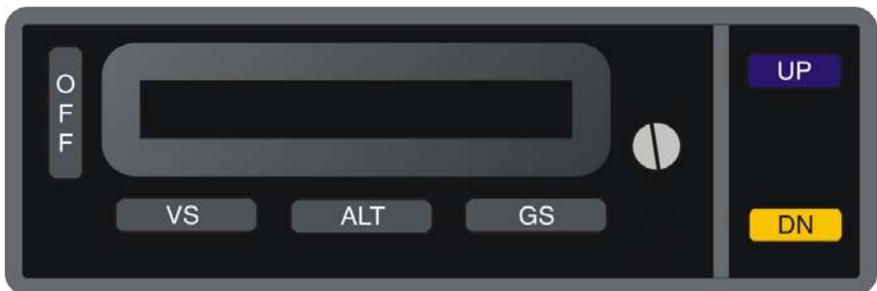
**Fig. 2-2. AP Display, All Annunciations Extinguished****Fig. 2-3. AP Display, VS Mode Engaged**

Table 2-1. Pre-Flight Test (continued from page 2-5)

ACTION	RESPONSE
15. Press/Hold UP switch.	A/C Control Wheel moves in aft direction.
16. Release UP switch.	A/C Control Wheel continues moving in aft direction.
17. Press/Hold DN switch.	A/C Control Wheel slows to a stop in aft direction, and then moves in forward direction.
18. Release DN switch.	A/C Control Wheel continues moving in forward direction.
19. Press ALT mode selector switch to engage altitude hold mode.	A/C Control Wheel stops. ALT annunciation only appears on AP display, as shown in Fig. 2-4.
20. Press/Hold UP switch.	A/C Control Wheel moves in aft direction.
21. Release UP switch.	A/C Control Wheel continues moving in aft direction.



Fig. 2-4. AP Display, ALT HOLD Mode Engaged

Table 2-1. Pre-Flight Test (continued from page 2-6)

ACTION	RESPONSE
22. Press/Hold DN switch.	A/C Control Wheel slows to a stop in aft direction, and then moves in forward direction.
23. Release DN switch.	A/C Control Wheel continues moving in forward direction.
24. Press VS mode selector switch to engage vertical speed mode.	A/C Control Wheel stops. VS annunciation only appears on AP display.
25. Move A/C Control Wheel as far aft as possible.	After 3 seconds, TRIM annunciation appears on AP display as shown in Fig. 2-5, DN switch lamp becomes illuminated, and audible alert sounds a steady tone. After 7 seconds, TRIM annunciation flashes, DN switch lamp flashes, and audible alert becomes periodic.
26. Move A/C Control Wheel forward until TRIM annunciation is extinguished.	DN switch lamp is extinguished, and audible alert is squelched.

**Fig. 2-5. AP Display, VS Mode Engaged, TRIM Required**

Table 2-1. Pre-Flight Test (continued from page 2-7)

ACTION	RESPONSE
27. Move A/C Control Wheel as far forward as possible.	<p>After 3 seconds, TRIM annunciation appears on AP display as shown in Fig. 2-5, UP switch lamp becomes illuminated, and audible alert sounds a steady tone.</p> <p>After 7 seconds, TRIM annunciation flashes, UP switch lamp flashes, and audible alert becomes periodic.</p>
28. Move A/C Control Wheel aft until TRIM annunciation is extinguished.	UP switch lamp is extinguished, and audible alert is squelched.
<p><i>Note:</i></p> <p><i>If autopilot is equipped with autotrim, then proceed to step 29. Otherwise, proceed to step 44.</i></p>	
29. Set Trim Master Switch to ON position.	-----
30. Move A/C Control Wheel as far aft as possible.	After 3 seconds, Elevator Trim Wheel begins to run nose down with increasing speed.
31. Move A/C Control Wheel forward until Elevator Trim Wheel stops.	-----
32. Move A/C Control Wheel as far forward as possible.	After 3 seconds, Elevator Trim Wheel begins to run nose up with increasing speed.
33. Move A/C Control Wheel aft until Elevator Trim Wheel stops.	-----

Table 2-1. Pre-Flight Test (continued from page 2-8)

ACTION	RESPONSE
34. Press Momentarily either forward or aft on both segments of Manual Electric Trim Switch, in order to Disconnect AP.	All annunciations are extinguished. UP switch and DN switch lamps are extinguished.
35. Press/Hold either forward or aft on only one segment of Manual Electric Trim Switch, but not both.	Elevator Trim Wheel does not begin to run.
36. Press/Hold forward on both segments of Manual Electric Trim Switch.	Elevator Trim Wheel runs nose down at full speed, and TRIM annunciation appears flashing on AP display.
37. Press/Hold AP DISC / TRIM INTR Switch.	Elevator Trim Wheel stops.
38. Release AP DISC / TRIM INTR Switch.	Elevator Trim Wheel resumes running nose down at full speed.
39. Release Manual Electric Trim Switch.	Elevator Trim Wheel stops. TRIM annunciation is extinguished.
40. Press/Hold aft on both segments of Manual Electric Trim Switch.	Elevator Trim Wheel runs nose up at full speed, and TRIM annunciation appears flashing on AP display.
41. Press/Hold AP DISC / TRIM INTR Switch.	Elevator Trim Wheel stops.
42. Release AP DISC / TRIM INTR Switch.	Elevator Trim Wheel resumes running nose up at full speed.
43. Release Manual Electric Trim Switch.	Elevator Trim Wheel stops. TRIM annunciation is extinguished.

Table 2-1. Pre-Flight Test (continued from page 2-9)

ACTION	RESPONSE
<i>Note: Proceed to step 45.</i>	
44. Press AP DISC / TRIM INTR Switch, in order to Disconnect AP.	All annunciations are extinguished. UP switch and DN switch lamps are extinguished.
45. Trim A/C for takeoff.	-----

SECTION 3 IN-FLIGHT PROCEDURES

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3.1 Normal Operating Procedures

3.1.1 Vertical Speed (VS) Mode

Caution:

The vertical speed mode is used to establish and hold a PILOT selected vertical speed. Since the autopilot receives no airspeed information, it is the responsibility of the pilot to ensure that the vertical speed selection is within the operating limits of the aircraft's capabilities. Selection of a vertical speed beyond the capability of the aircraft can create a condition of reduced airspeed, and possibly lead to a stall condition.

With the aircraft at the desired vertical speed, press the VS mode selector switch to engage the vertical speed mode. The VS annunciation will appear as shown in Fig. 3-1, to acknowledge that this mode is engaged. The autopilot will hold the aircraft at its current (captured) vertical speed.

This vertical speed may be modified by pressing and holding either the UP switch or the DN switch. In a climb, pressing and holding the UP switch increases the climb rate, whereas pressing and holding the DN switch decreases the climb rate. In a descent, pressing and holding the DN switch increases the descent rate, whereas pressing and holding the UP switch decreases the descent rate.

The vertical speed changes 160 FPM for each second the respective switch is pressed and held. The range is ± 1600 FPM from the original captured vertical speed.

During a climb, should the aircraft become unable to hold the captured vertical speed for a period of fifteen seconds, the VS annunciation will flash as an alert to the potential for an impending stall condition. In that event, immediately increase the aircraft's thrust if possible, reduce the commanded vertical speed using the DN switch, or both, until the VS annunciation stops flashing.



Fig. 3-1. AP Display, VS Mode Engaged

3.1.2 Altitude Hold (ALT HOLD) Mode

With the aircraft at the desired altitude, press the ALT mode selector switch to engage the altitude hold mode. The ALT annunciation will appear as shown in Fig. 3-2, to acknowledge that this mode is engaged. The autopilot will hold the aircraft at its current (captured) absolute pressure altitude.

This altitude may be modified for barometric pressure changes, by pressing and holding either the UP switch for an increase in altitude, or the DN switch for a decrease in altitude. The altitude changes 20 feet for each second the respective switch is pressed and held. The range is ± 200 feet from the original captured altitude.



Fig. 3-2. AP Display, ALT HOLD Mode Engaged

3.1.3 Elevator Trim

3.1.3.1 Manual Elevator Trim

If the autopilot is not equipped with autotrim, or is so equipped but the Trim Master Switch is in the OFF position, and a pitch mode (VS, ALT HOLD, GS) is engaged, then the autopilot will provide an annunciation whenever it is necessary to manually trim the aircraft about the pitch axis using the Elevator Trim Wheel.

Should the pitch servo loading exceed a preset threshold for a period of three seconds, the TRIM annunciation will appear as shown in Fig. 3-3, and either the UP or DN switch lamp will illuminate, as a prompt to trim the aircraft in the indicated direction. In addition, an audible alert will sound a steady tone. If no action is taken after four more seconds, then both the TRIM annunciation and illuminated switch lamp will flash, and the audible alert will become periodic. Once the aircraft has been sufficiently trimmed, such that the pitch servo loading is below the preset threshold, the TRIM annunciation and switch lamp will extinguish, and the audible alert will be squelched.

3.1.3.2 Automatic Elevator Trim

If the autopilot is equipped with autotrim, the Trim Master Switch is in the ON position, and a pitch mode (VS, ALT HOLD, GS) is engaged, then the autopilot will automatically trim the aircraft about the pitch axis.

Should the pitch servo loading exceed a preset threshold for a period of three seconds, the trim servo will become active, and so the Elevator Trim Wheel will run either nose up or nose down with increasing speed. Once the aircraft has been sufficiently trimmed, such that the pitch servo loading is below the preset threshold, the trim servo will become inactive and so the Elevator Trim Wheel will stop.



Fig. 3-3. AP Display, Manual Trim Prompt

3.1.3.3 Manual Electric Elevator Trim

If the autopilot is equipped with autotrim, then there will also be the Manual Electric Trim Switch located on the Control Wheel. This switch can be used to trim the aircraft about the pitch axis whenever a pitch mode (VS, ALT HOLD, GS) **is not** engaged, provided that the Trim Master Switch is in the ON position.

To trim the aircraft nose up, press aft and hold both segments of the Manual Electric Trim Switch. The TRIM annunciation will appear flashing as shown in Fig. 3-4, and the Elevator Trim Wheel will run nose up at full speed. Upon release of this switch, the TRIM annunciation will extinguish and the Elevator Trim Wheel will stop.

To trim the aircraft nose down, press forward and hold both segments of the Manual Electric Trim Switch. The TRIM annunciation will appear flashing as shown in Fig. 3-4, and the Elevator Trim Wheel will run nose down at full speed. Upon release of this switch, the TRIM annunciation will extinguish and the Elevator Trim Wheel will stop.

Should the Manual Electric Trim Switch ever be actuated when a pitch mode (VS, ALT HOLD, GS) is engaged, the autopilot will disconnect.



Fig. 3-4. AP Display, Manual Electric Trim in Progress

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3.2 Precision Approach Procedures

3.2.1 Straight-In ILS Approach

Execute a straight-in intercept and track of the FRONT INBOUND LOC course, while holding the approach altitude. Ensure that the following conditions exist:

1. LOC frequency selected
2. GS Flag out of view
3. A/C more than 5% Glideslope Deviation Indication (GDI) needle deflection below GS centerline

Press the ALT mode selector switch to engage the altitude hold mode. The ALT annunciation will appear as shown in Fig. 3-5, to acknowledge that this mode is engaged.

Press the GS mode selector switch to arm the glideslope mode. The GS annunciation will appear as shown in Fig. 3-6, to acknowledge that this mode is armed.

With the glideslope mode armed, once the aircraft arrives at 5% GDI needle deflection below the GS centerline, the ALT annunciation will extinguish to indicate engagement of the glideslope mode, as shown in Fig. 3-7.

Note:

If the approach positions the aircraft at less than 5% below or slightly above the GS centerline, then manual engagement of the glideslope mode can be instantly achieved by pressing the GS mode selector switch.

Caution:

Manual engagement of the glideslope mode above the GS centerline will result in the aircraft moving aggressively toward the GS centerline. Do not manually engage the glideslope mode if GDI needle deflection is greater than 10% above the GS centerline.

The GS annunciation will flash whenever GDI needle deflection exceeds 50%, or the GS Flag is in view.

At the Decision Height (DH), disconnect the autopilot to execute either a landing or go-around (GA).

A pictorial of this procedure is shown in Fig. 3-8.



Fig. 3-5. AP Display, ALT HOLD Mode Engaged

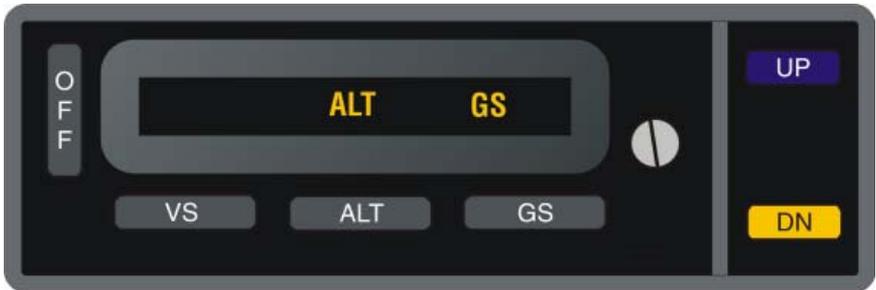


Fig. 3-6. AP Display, ALT HOLD Mode Engaged, GS Mode Armed



Fig. 3-7. AP Display, GS Mode Engaged

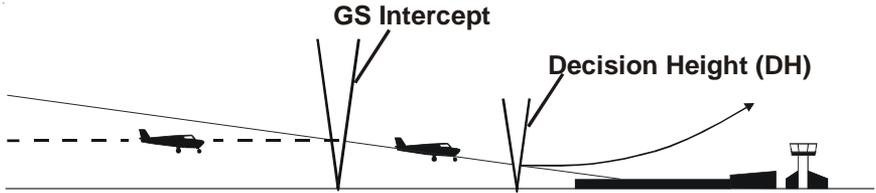


Fig. 3-8. Straight-In ILS Approach

3.3 Autopilot Disconnect

The autopilot can be disconnected by any of the following means:

1. Press AP DISC / TRIM INTR Switch typically located on Control Wheel.
2. Press either forward or aft on both segments of Manual Electric Trim Switch located on Control Wheel, whenever a pitch mode (VS, ALT HOLD, GS) is engaged.
3. Set Pitch Stab Switch to OFF position.
4. Pull AP Circuit Breaker.

3.4 Automatic Trim Disable

In the event of a trim runaway, the automatic trim function can be disabled by executing the following sequence:

1. Press/Hold AP DISC / TRIM INTR Switch typically located on Control Wheel.
2. Set Trim Master Switch to OFF position.
3. Pull Trim Circuit Breaker.

SECTION 4 OPERATING PARAMETERS

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4.1 Pitch Axis Limits

Altitude

32,000 FT

Vertical Force Due to Acceleration

± 0.6 g disregarding 1 g due to gravity

Vertical Speed

1600 FPM Climbing or Descending

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SECTION 5 GLOSSARY

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Term	Meaning
AC	Aircraft
AFM	Aircraft Flight Manual
AFMS	Aircraft Flight Manual Supplement
ALT	Altitude
AP	Autopilot
DH	Decision Height
DISC	Disconnect
DN	Down
FAA	Federal Aviation Administration
FPM	Feet-per-Minute
FT	Feet
GA	Go Around
GDI	Glideslope Deviation Indication
GS	Glideslope
IFR	Instrument Flight Rules
ILS	Instrument Landing System
INTR	Interrupt
LOC	Localizer
OBS	Omnibearing Selector
PFGC	Pitch Flight Guidance Computer
PN	Part Number
POH	Pilot's Operating Handbook
PSS	Pitch Stabilization System
STAB	Stabilization
VMC	Visual Meteorological Conditions
VS	Vertical Speed

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