S-TEC

Pilot's Operating Handbook

Forty | Fifty

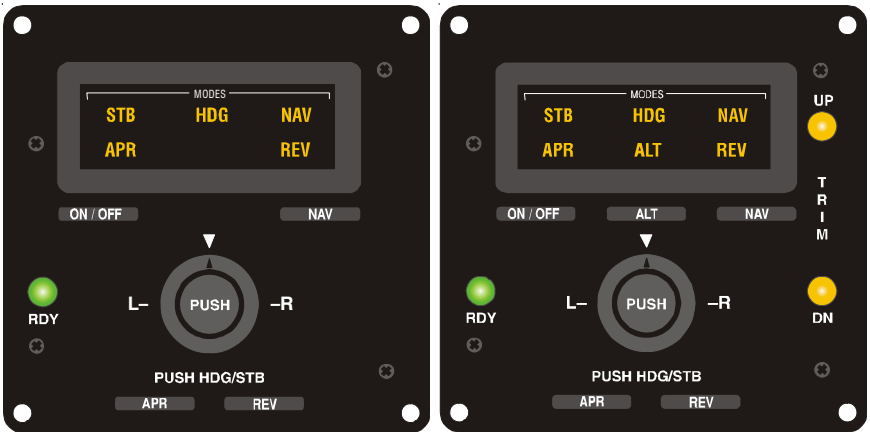

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Table of Contents

List of Figures

Fig. **Pg.**

List of Tables

Table **Pg.**

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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 Forty / Fifty Autopilot (AP).

Note:

This POH must be carried in the aircraft 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 aircraft specific information, such as unique ground tests, limitations, and emergency procedures.

Note:

The System Forty / Fifty 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 Forty / Fifty is a rate based autopilot. When in control of the roll axis, the autopilot senses turn rate, along with the non-rate quantities of heading error and course deviation indication. When in control of the pitch axis, the autopilot senses acceleration, along with the non-rate quantity of altitude. 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 roll servo is typically coupled to the ailerons, and the pitch servo is coupled to the elevator.

The System Forty controls only the roll axis.

The System Fifty controls both the roll axis and pitch axis. Activation of roll axis control must always precede activation of pitch axis control.

The optional Yaw Damper senses excessive adverse yaw about the yaw axis, and responds by driving the yaw servo in the proper direction to provide damping. The yaw servo is coupled to the rudder.

1.4 Modes of Operation

1.4.1 Roll Axis Control

Once the RDY lamp becomes illuminated after power-up, pressing the ON/OFF mode selector switch will engage the roll mode below.

Stabilizer (STB) Mode - Used to Hold Wings Level

Subsequently pressing the PUSH HDG/STB mode selector switch will engage the roll mode below, provided that a heading system is installed.

Heading (HDG) Mode - Used to Turn onto a Selected Heading and Hold it

Thereafter, successively pressing the PUSH HDG/STB mode selector switch will alternately engage the STB mode and HDG mode. However, if no heading system is installed, then the STB mode will just be repeatedly engaged.

Note:

A heading system (HSI or DG) is optional. If a heading system is installed in the aircraft, then the heading mode can be engaged. Otherwise, the heading mode cannot be engaged.

Pressing the NAV mode selector switch will engage the roll mode below.

Navigation (NAV) Mode - Used to Track a VOR Course

Pressing the APR mode selector switch will engage the roll mode below.

Approach (APR) Mode - Used to Track a LOC Course

Pressing the REV mode selector switch will engage the roll mode below.

Reverse (REV) Mode - Used to track a LOC Back Course

With the NAV, APR, or REV mode engaged and a heading system installed, subsequently pressing the PUSH HDG/STB mode selector switch will engage the HDG mode. Thereafter, successively pressing the PUSH HDG/STB mode selector switch will alternately engage the STB mode and HDG mode.

With the NAV, APR, or REV mode engaged and no heading system installed, subsequently pressing the PUSH HDG/STB mode selector switch will engage the STB mode.

1.4.2 Pitch Axis Control

Successively pressing the ALT mode selector switch, or optional ALT ENG/DSNG Switch, will alternately engage and disengage the single pitch mode below.

Altitude Hold (ALT HOLD) Mode - Used to Hold Altitude

1.5 Block Diagrams

The System Forty Block Diagram is shown in Fig. 1-1.

The System Fifty Block Diagram is shown in Fig. 1-2.

The Yaw Damper Block Diagram is shown in Fig. 1-3.

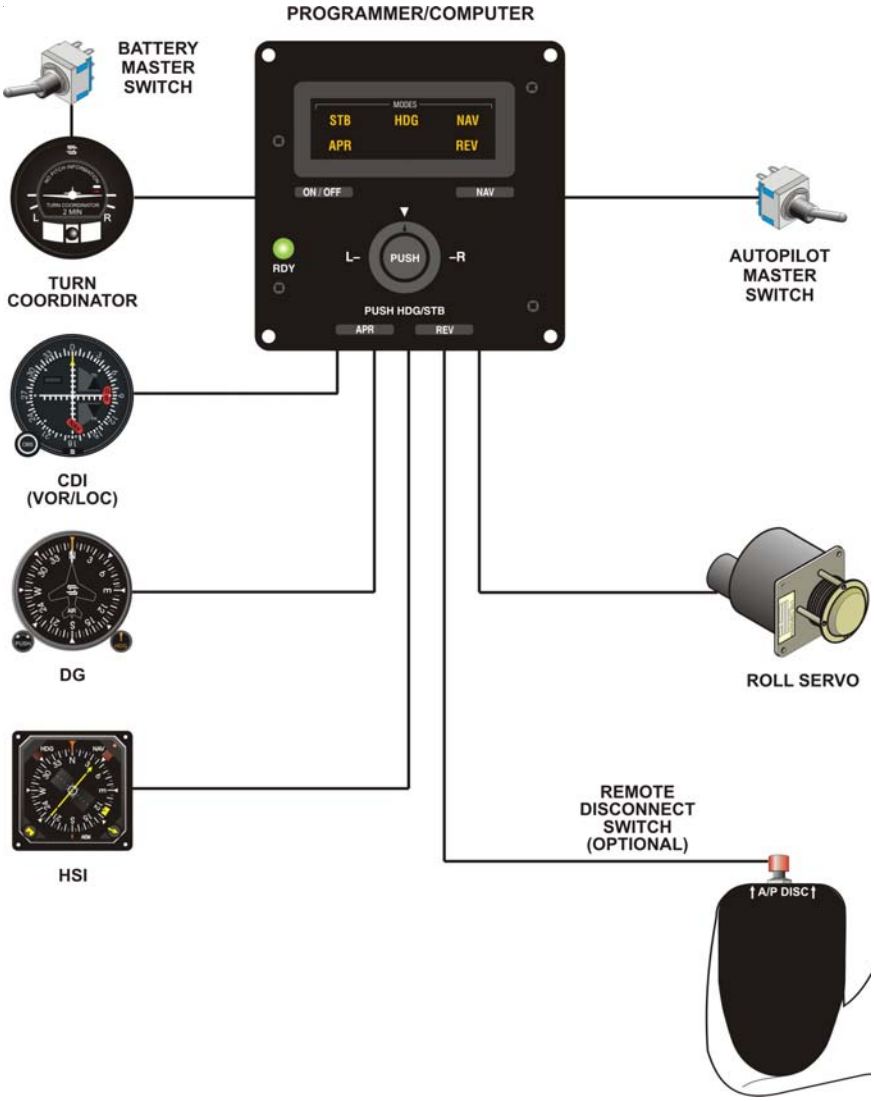

Fig. 1-1. System Forty Block Diagram

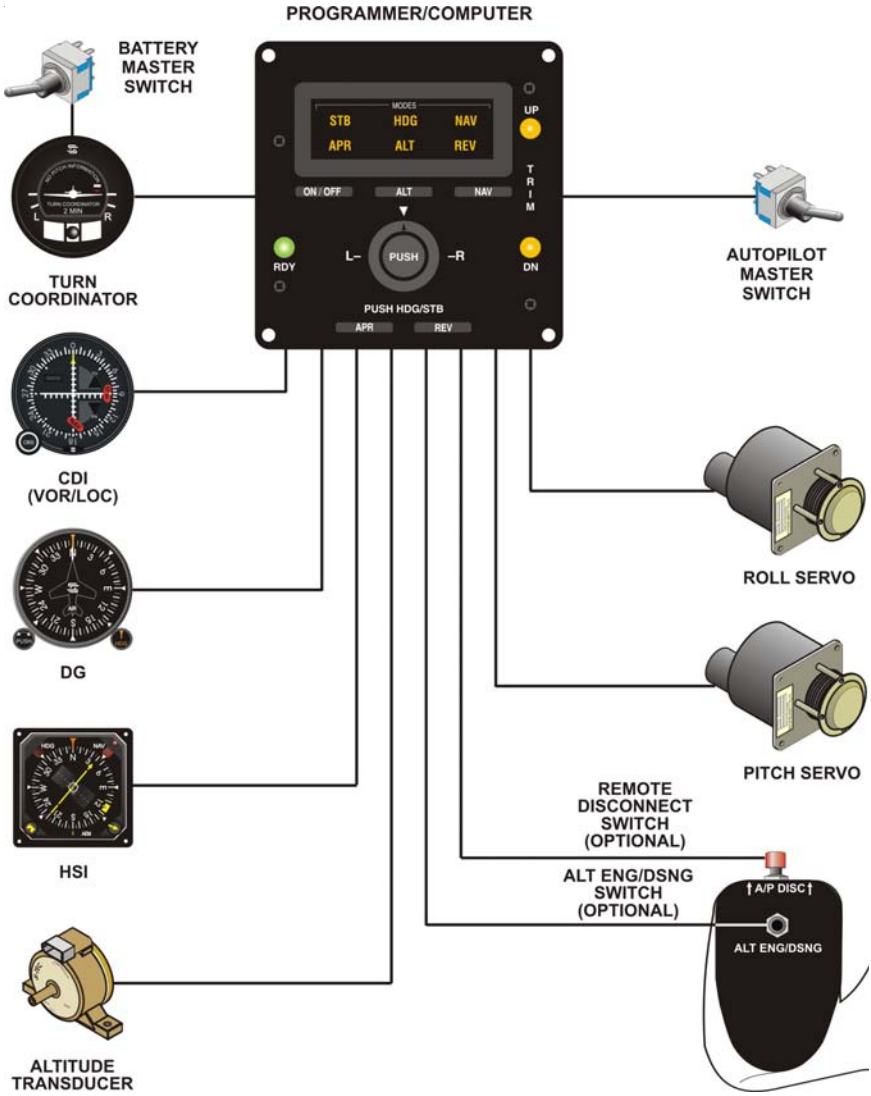

Fig. 1-2. System Fifty Block Diagram

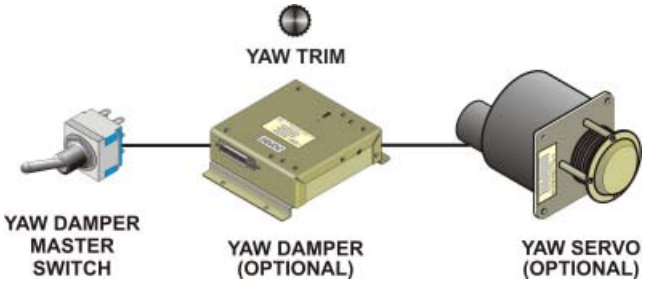

Fig. 1-3. Yaw Damper Block Diagram

SECTION 2
PRE-FLIGHT PROCEDURES

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2.1 Pre-Flight Test

2.1.1 System Forty

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, System Forty (continued on page 2-6)

ACTION	RESPONSE
1. Set Yaw Damper 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 Autopilot Master Switch to TEST position.	STB, HDG, NAV, APR, and REV annunciations all appear, and RDY lamp is illuminated on AP display, as shown in Fig. 2-1.
5. Set Autopilot Master Switch to ON position.	All annunciations and RDY lamp are extinguished, as shown in Fig. 2-2. RDY lamp re-illuminates within 3 minutes, as shown in Fig. 2-3.
Note: *Should a Turn Coordinator failure be detected, the RDY lamp will not re-illuminate as shown in Fig. 2-4, and the autopilot will not operate.*	

Fig. 2-1. AP Display, STB, HDG, NAV, APR, REV Annunciations Appear, RDY Lamp Illuminated (System Forty)

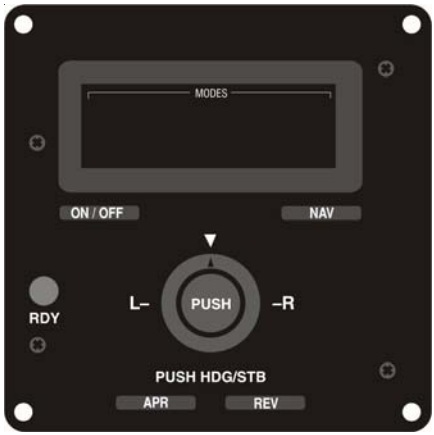

Fig. 2-2. AP Display, All Annunciations and RDY Lamp Extinguished (System Forty)

Fig. 2-3. AP Display, RDY for Operation (System Forty)

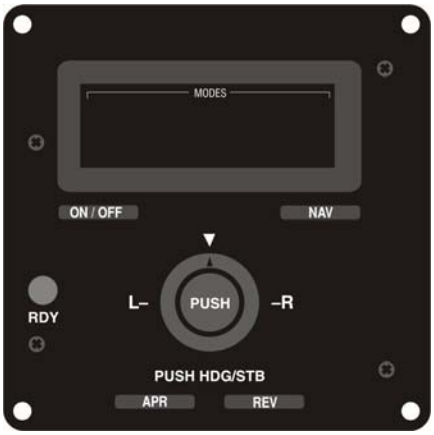

Fig. 2-4. AP Display, Turn Coordinator Failure, RDY Lamp Does Not Re-Illuminate (System Forty)

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

ACTION	RESPONSE
6. Move A/C Control Wheel left and right, to sense its freedom of movement about roll axis.	------
7. Set L-R Turn Knob under its index.	------
8. Press ON/OFF mode selector switch to engage stabilizer mode.	STB annunciation alone appears on AP display, as shown in Fig. 2-5.
9. Attempt movement of A/C Control Wheel left and right.	A/C Control Wheel's reduced freedom of movement indicates that Roll Servo is engaged. Roll Servo can be overridden. If not, disconnect autopilot and do not use.
10. Turn L-R Turn Knob to the left side of its index.	A/C Control Wheel turns to the left.
11. Turn L-R Turn Knob to the right side of its index.	A/C Control Wheel turns to the right.
12. Set L-R Turn Knob under its index.	A/C Control Wheel stops.
Note: *If A/C is equipped with a heading system (HSI or DG), then proceed to step 13. If A/C is not equipped with a heading system, then proceed to step 18 only if a VOR frequency can be selected. Otherwise, proceed to step 31.*	
13. Set Heading Bug under Lubber Line.	------
14. Press HDG mode selector switch to engage heading mode.	HDG annunciation alone appears on AP display, as shown in Fig. 2-6.

Fig. 2-5. AP Display, STB Mode Engaged (System Forty)

Fig. 2-6. AP Display, HDG Mode Engaged (System Forty)

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

ACTION	RESPONSE
15. Turn Heading Bug to the left side of Lubber Line.	A/C Control Wheel turns to the left.
16. Turn Heading Bug to the right side of Lubber Line.	A/C Control Wheel turns to the right.
17. Set Heading Bug under Lubber Line.	A/C Control Wheel stops.
Note: If it is not possible to select a local VOR frequency on Navigation Receiver, then proceed to step 31. Otherwise, proceed to step 18.	
18. Select local VOR frequency on Navigation Receiver.	------
Note: Proceed to either step 19 (HSI) or step 25 (DG).	
19. Turn Course Pointer until CDI needle is centered.	------
20. Press NAV mode selector switch to engage navigation mode.	NAV annunciation alone appears on AP display, as shown in Fig. 2-7.
21. Press APR mode selector switch to engage approach mode.	APR annunciation alone appears on AP display, as shown in Fig. 2-8.
22. Turn Course Pointer left until CDI needle deflection is 2 dots right of center.	A/C Control Wheel turns to the right.
23. Turn Course Pointer right until CDI needle deflection is 2 dots left of center.	A/C Control Wheel turns to the left.

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

ACTION	RESPONSE
24. Turn Course Pointer left until CDI needle is centered.	A/C Control Wheel stops.
Note: Proceed to step 33.	
25. Turn OBS until CDI needle is centered.	------
26. Press NAV mode selector switch to engage navigation mode.	NAV annunciation alone appears on AP display, as shown in Fig. 2-7.
27. Press APR mode selector switch to engage approach mode.	APR annunciation alone appears on AP display, as shown in Fig. 2-8.
28. Turn OBS until CDI needle deflection is 2 dots right of center.	A/C Control Wheel turns to the right.
29. Turn OBS until CDI needle deflection is 2 dots left of center.	A/C Control Wheel turns to the left.
30. Turn OBS until CDI needle is centered.	A/C Control Wheel stops.
Note: Proceed to step 33.	
31. Press NAV mode selector switch to engage navigation mode.	NAV annunciation alone appears on AP display, as shown in Fig. 2-7.
32. Press APR mode selector switch to engage approach mode.	APR annunciation alone appears on AP display, as shown in Fig. 2-8.
33. Press REV mode selector switch to engage reverse mode.	REV annunciation alone appears on AP display, as shown in Fig. 2-9.

Fig. 2-7. AP Display, NAV Mode Engaged (System Forty)

Fig. 2-8. AP Display, APR Mode Engaged (System Forty)

Fig. 2-9. AP Display, REV Mode Engaged (System Forty)

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

ACTION	RESPONSE
34. Disconnect autopilot by any one of the following means: a. Press optional AP DISC Switch typically located on Control Wheel. b. Press ON/OFF mode selector switch.	All annunciations are extinguished. RDY lamp is illuminated.
35. Move A/C Control Wheel left and right.	A/C Control Wheel's increased freedom of movement indicates that Roll Servo is disengaged.
Note: If a Yaw Damper is installed, then proceed to step 36. Otherwise, proceed to step 45.	
36. Actuate A/C Rudder Pedals alternately in succession, to sense their freedom of movement about yaw axis.	------
37. Set Yaw Damper Master Switch to ON position.	------
38. Turn Yaw Trim Knob until A/C Rudder Pedals stop.	------
39. Attempt actuation of A/C Rudder Pedals alternately in succession.	A/C Rudder Pedals' reduced freedom of movement indicates that Yaw Servo is engaged. Yaw Servo can be overridden. If not, set Yaw Damper Master Switch to OFF position, and do not use.

Table 2-1. Pre-Flight Test, System Forty (continued from page 2-12)

ACTION	RESPONSE
40. Turn Yaw Trim Knob fully CCW.	Left A/C Rudder Pedal slowly moves forward.
41. Turn Yaw Trim Knob fully CW.	Right A/C Rudder Pedal slowly moves forward.
42. Turn Yaw Trim Knob CCW until A/C Rudder Pedals stop.	------
43. Set Yaw Damper Master Switch to OFF position.	------
44. Actuate A/C Rudder Pedals alternately in succession.	A/C Rudder Pedals' increased freedom of movement indicates that Yaw Servo is disengaged.
45. Trim A/C for takeoff.	------

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2.1.2 System Fifty

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

Table 2-2. Pre-Flight Test, System Fifty (continued on page 2-20)

ACTION	RESPONSE
1. Set Yaw Damper 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 Autopilot Master Switch to TEST position.	STB, HDG, NAV, APR, ALT, and REV annunciations all appear, while TRIM UP, TRIM DN, and RDY lamps are illuminated on AP display, as shown in Fig. 2-10. TRIM UP lamp extinguishes after 2 seconds, as shown in Fig. 2-11. TRIM UP lamp re-illuminates after 4 seconds, as shown in Fig. 2-12. TRIM DN lamp extinguishes after 7 seconds, as shown in Fig. 2-13.
5. Set Autopilot Master Switch to ON position.	All annunciations and lamps are extinguished, as shown in Fig. 2-14. RDY lamp re-illuminates within 3 minutes, as shown in Fig. 2-15.
Note: *Should a Turn Coordinator failure be detected, the RDY lamp will not re-illuminate as shown in Fig. 2-16, and the autopilot will not operate.*	

Fig. 2-10. AP Display, STB, HDG, NAV, APR, ALT, REV Annunciations Appear, TRIM UP, TRIM DN, RDY Lamps Illuminated (System Fifty)

Fig. 2-11. AP Display, TRIM UP Lamp Extinguished (System Fifty)

Fig. 2-12. AP Display, TRIM UP Lamp Re-illuminated (System Fifty)

Fig. 2-13. AP Display, TRIM DN Lamp Extinguished (System Fifty)

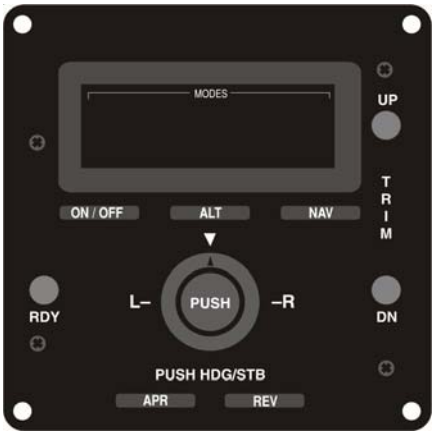

Fig. 2-14. AP Display, All Annunciations and Lamps Extinguished (System Fifty)

Fig. 2-15. AP Display, RDY for Operation (System Fifty)

Fig. 2-16. AP Display, Turn Coordinator Failure, RDY Lamp Does Not Re-Illuminate (System Fifty)

Table 2-2. Pre-Flight Test, System Fifty (continued from page 2-15)

ACTION	RESPONSE
6. Move A/C Control Wheel left and right, to sense its freedom of movement about roll axis.	------
7. Set L-R Turn Knob under its index.	------
8. Press ON/OFF mode selector switch to engage stabilizer mode.	STB annunciation alone appears on AP display, as shown in Fig. 2-17.
9. Attempt movement of A/C Control Wheel left and right.	A/C Control Wheel's reduced freedom of movement indicates that Roll Servo is engaged. Roll Servo can be overridden. If not, disconnect autopilot and do not use.
10. Turn L-R Turn Knob to the left side of its index.	A/C Control Wheel turns to the left.
11. Turn L-R Turn Knob to the right side of its index.	A/C Control Wheel turns to the right.
12. Set L-R Turn Knob under its index.	A/C Control Wheel stops.
Note: *If A/C is equipped with a heading system (HSI or DG), then proceed to step 13. If A/C is not equipped with a heading system, then proceed to step 18 only if a VOR frequency can be selected. Otherwise, proceed to step 31.*	
13. Set Heading Bug under Lubber Line.	------
14. Press HDG mode selector switch to engage heading mode.	HDG annunciation alone appears on AP display, as shown in Fig. 2-18.

Fig. 2-17. AP Display, STB Mode Engaged (System Fifty)

Fig. 2-18. AP Display, HDG Mode Engaged (System Fifty)

Table 2-2. Pre-Flight Test, System Fifty (continued from page 2-20)

ACTION	RESPONSE
15. Turn Heading Bug to the left side of Lubber Line.	A/C Control Wheel turns to the left.
16. Turn Heading Bug to the right side of Lubber Line.	A/C Control Wheel turns to the right.
17. Set Heading Bug under Lubber Line.	A/C Control Wheel stops.
Note: If it is not possible to select a local VOR frequency on Navigation Receiver, then proceed to step 31. Otherwise, proceed to step 18.	
18. Select local VOR frequency on Navigation Receiver.	------
Note: Proceed to either step 19 (HSI) or step 25 (DG).	
19. Turn Course Pointer until CDI needle is centered.	------
20. Press NAV mode selector switch to engage navigation mode.	NAV annunciation alone appears on AP display, as shown in Fig. 2-19.
21. Press APR mode selector switch to engage approach mode.	APR annunciation alone appears on AP display, as shown in Fig. 2-20.
22. Turn Course Pointer left until CDI needle deflection is 2 dots right of center.	A/C Control Wheel turns to the right.
23. Turn Course Pointer right until CDI needle deflection is 2 dots left of center.	A/C Control Wheel turns to the left.

Table 2-2. Pre-Flight Test, System Fifty (continued from page 2-22)

ACTION	RESPONSE
24. Turn Course Pointer left until CDI needle is centered.	A/C Control Wheel stops.
Note: Proceed to step 33.	
25. Turn OBS until CDI needle is centered.	------
26. Press NAV mode selector switch to engage navigation mode.	NAV annunciation alone appears on AP display, as shown in Fig. 2-19.
27. Press APR mode selector switch to engage approach mode.	APR annunciation alone appears on AP display, as shown in Fig. 2-20.
28. Turn OBS until CDI needle deflection is 2 dots right of center.	A/C Control Wheel turns to the right.
29. Turn OBS until CDI needle deflection is 2 dots left of center.	A/C Control Wheel turns to the left.
30. Turn OBS until CDI needle is centered.	A/C Control Wheel stops.
Note: Proceed to step 33.	
31. Press NAV mode selector switch to engage navigation mode.	NAV annunciation alone appears on AP display, as shown in Fig. 2-19.
32. Press APR mode selector switch to engage approach mode.	APR annunciation alone appears on AP display, as shown in Fig. 2-20.
33. Press REV mode selector switch to engage reverse mode.	REV annunciation alone appears on AP display, as shown in Fig. 2-21.

Fig. 2-19. AP Display, NAV Mode Engaged (System Fifty)

Fig. 2-20. AP Display, APR Mode Engaged (System Fifty)

Fig. 2-21. AP Display, REV Mode Engaged (System Fifty)

Table 2-2. Pre-Flight Test, System Fifty (continued from page 2-23)

ACTION	RESPONSE
34. Move A/C Control Wheel forward and aft, to sense its freedom of movement about pitch axis.	------
35. Press ALT mode selector switch, or optional ALT ENG/DSNG Switch, to engage altitude hold mode.	ALT annunciation appears on AP display, as shown in Fig. 2-22.
36. Attempt movement of A/C Control Wheel forward and aft.	A/C Control Wheel's reduced freedom of movement indicates that Pitch Servo is engaged. Pitch Servo can be overridden. If not, disconnect autopilot and do not use.
37. Move A/C Control Wheel as far forward as possible.	After 3 seconds, TRIM UP lamp becomes illuminated on AP display, as shown in Fig. 2-23. After 7 seconds, TRIM UP lamp flashes.
38. Move A/C Control Wheel aft until TRIM UP lamp is extinguished.	------
39. Move A/C Control Wheel as far aft as possible.	After 3 seconds, TRIM DN lamp becomes illuminated on AP display, as shown in Fig. 2-24. After 7 seconds, TRIM DN lamp flashes.
40. Move A/C Control Wheel forward until TRIM DN lamp is extinguished.	------

Fig. 2-22. AP Display, REV and ALT HOLD Modes Engaged (System Fifty)

Fig. 2-23. AP Display, REV and ALT HOLD Modes Engaged, TRIM UP Required (System Fifty)

Fig. 2-24. AP Display, REV and ALT HOLD Modes Engaged, TRIM DN Required (System Fifty)

Table 2-2. Pre-Flight Test, System Fifty (continued from page 2-26)

ACTION	RESPONSE
41. Disconnect autopilot by any one of the following means: a. Press optional AP DISC Switch typically located on Control Wheel. b. Press ON/OFF mode selector switch.	All annunciations are extinguished. TRIM UP and TRIM DN lamps are extinguished. RDY lamp is illuminated.
42. Move A/C Control Wheel left and right.	A/C Control Wheel's increased freedom of movement indicates that Roll Servo is disengaged.
43. Move A/C Control Wheel forward and aft.	A/C Control Wheel's increased freedom of movement indicates that Pitch Servo is disengaged.
Note: If a Yaw Damper is installed, then proceed to step 44. Otherwise, proceed to step 53.	
44. Actuate A/C Rudder Pedals alternately in succession, to sense their freedom of movement about yaw axis.	------
45. Set Yaw Damper Master Switch to ON position.	------
46. Turn Yaw Trim Knob until A/C Rudder Pedals stop.	------
47. Attempt actuation of A/C Rudder Pedals alternately in succession.	A/C Rudder Pedals' reduced freedom of movement indicates that Yaw Servo is engaged. Yaw Servo can be overridden. If not, set Yaw Damper Master Switch to OFF position, and do not use.

Table 2-2. Pre-Flight Test, System Fifty (continued from page 2-29)

ACTION	RESPONSE
48. Turn Yaw Trim Knob fully CCW.	Left A/C Rudder Pedal slowly moves forward.
49. Turn Yaw Trim Knob fully CW.	Right A/C Rudder Pedal slowly moves forward.
50. Turn Yaw Trim Knob CCW until A/C Rudder Pedals stop.	------
51. Set Yaw Damper Master Switch to OFF position.	------
52. Actuate A/C Rudder Pedals alternately in succession.	A/C Rudder Pedals' increased freedom of movement indicates that Yaw Servo is disengaged.
53. Trim A/C for takeoff.	------

SECTION 3
IN-FLIGHT PROCEDURES

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3.1 Normal Operating Procedures

3.1.1 Stabilizer (STB) Mode, System Forty / Fifty

Set the L-R Turn Knob under its index, and then engage the stabilizer mode. The STB annunciation alone will appear as shown in Fig. 3-1, to acknowledge that this mode is engaged. The autopilot will hold the aircraft at wings level.

Turning the L-R Turn Knob to the left or right of its index will cause the aircraft to turn either left or right, respectively. The L-R Turn Knob is active only when the stabilizer mode is engaged.

a. System Forty **b. System Fifty**

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

3.1.2 Heading (HDG) Mode, System Forty / Fifty

Set the Heading Bug to the desired heading on the compass card (HSI or DG), and then engage the heading mode. The HDG annunciation alone will appear as shown in Fig. 3-2, to acknowledge that this mode is engaged. The autopilot will turn the aircraft onto the selected heading and hold it. A new heading can be subsequently selected by setting the Heading Bug to it.

a. System Forty **b. System Fifty**

Fig. 3-2. AP Display, HDG Mode Engaged

3.1.3 Navigation (NAV) Mode, System Forty / Fifty

Select the VOR frequency on the Navigation Receiver. Maneuver the aircraft to within ±1 CDI needle width and ±10° heading of the selected course. Engage the navigation mode. The NAV annunciation alone will appear as shown in Fig. 3-3, to acknowledge that this mode is engaged. The autopilot will track the selected course with minimum authority, thereby ignoring short term CDI needle deflections (excursions) to inhibit aircraft scalloping during VOR station passage.

a. System Forty **b. System Fifty**

Fig. 3-3. AP Display, NAV Mode Engaged

3.1.4 Approach (APR) Mode, System Forty / Fifty

3.1.4.1 LOC Course Tracking

Select the LOC frequency on the Navigation Receiver. Maneuver the aircraft to within ±1 CDI needle width and ±10° heading of the selected course. Engage the approach mode. The APR annunciation alone will appear as shown in Fig. 3-4, to acknowledge that this mode is engaged. The autopilot will track the selected course with maximum authority.

3.1.4.2 GPS Course Tracking

Program a predefined course into the GPS Navigation Receiver, comprised of course segments connected by waypoints. Maneuver the aircraft to within ±1 CDI needle width and ±10° heading of each successive course segment. Engage the approach mode. The APR annunciation alone will appear as shown in Fig. 3-4, to acknowledge that this mode is engaged. The autopilot will track the selected course segment with maximum authority.

3.1.4.3 VOR Course Tracking

Select the VOR frequency on the Navigation Receiver. Maneuver the aircraft to within ±1 CDI needle width and ±10° heading of the selected course. Engage the approach mode. The APR annunciation alone will appear as shown in Fig. 3-4, to acknowledge that this mode is engaged. The autopilot will track the selected course with maximum authority. As a result, however, the aircraft may exhibit scalloping during VOR station passage.

a. System Forty **b. System Fifty**

Fig. 3-4. AP Display, APR Mode Engaged

3.1.5 Reverse (REV) Mode, System Forty / Fifty

Select the LOC frequency on the Navigation Receiver. Maneuver the aircraft to within ±1 CDI needle width and ±10° heading of the selected back course. Engage the reverse mode. The REV annunciation alone will appear as shown in Fig. 3-5, to acknowledge that this mode is engaged. The autopilot will track the selected back course with maximum authority.

a. System Forty **b. System Fifty**

Fig. 3-5. AP Display, REV Mode Engaged

3.1.6 Altitude Hold (ALT HOLD) Mode, System Fifty

The altitude hold mode can only be engaged if a roll mode (STB, HDG, NAV, APR, REV) is already engaged. Maneuver the aircraft to the desired altitude. Engage the altitude hold mode. The ALT annunciation will appear as shown in Fig. 3-6, to acknowledge that this mode is engaged. The autopilot will hold the aircraft at its current (captured) absolute pressure altitude.

Fig. 3-6. AP Display, STB and ALT HOLD Modes Engaged (System Fifty)

3.1.7 Manual Elevator Trim Prompts, System Fifty

If the altitude hold mode is engaged, then the autopilot will provide a prompt 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, either the TRIM UP lamp or TRIM DN lamp will become illuminated, as a prompt to trim the aircraft in the indicated direction. This is shown in Fig. 3-7. If no action is taken after four more seconds, then the lamp will flash. Once the aircraft has been sufficiently trimmed, such that the pitch servo loading is below the preset threshold, the lamp will extinguish.

a. TRIM UP Required

b. TRIM DN Required

Fig. 3-7. AP Display, Manual Trim Prompts (System Fifty)

3.2 Approach Procedures

3.2.1 Straight-In LOC Approach

3.2.1.1 Heading System DG

Select the LOC frequency on the Navigation Receiver. Set the Heading Bug to the FRONT INBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND LOC course. Engage the approach mode. The autopilot will track the FRONT INBOUND LOC course.

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

3.2.1.2 Heading System HSI

Select the LOC frequency on the Navigation Receiver. For reference only, set the Course Pointer to the FRONT INBOUND LOC course. Set the Heading Bug to the FRONT INBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND LOC course. Engage the approach mode. The autopilot will track the FRONT INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-9.

3.2.2 Straight-In VOR Approach

3.2.2.1 Heading System DG

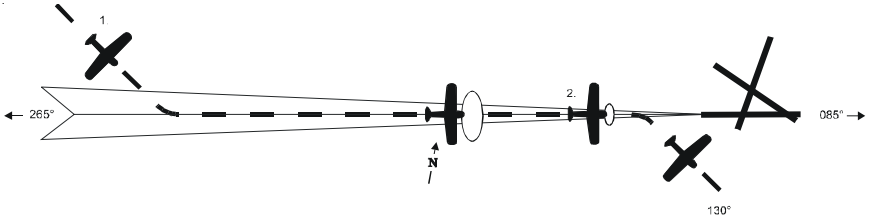
Select the VOR frequency on the Navigation Receiver. Set the OBS to the FRONT INBOUND VOR course. Set the Heading Bug to the FRONT INBOUND VOR heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND VOR course. Engage the approach mode. The autopilot will track the FRONT INBOUND VOR course.

A summary pictorial of this procedure is shown in Fig. 3-10.

3.2.2.2 Heading System HSI

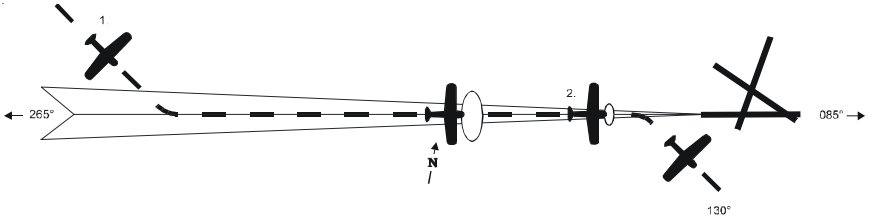
Select the VOR frequency on the Navigation Receiver. Set the Course Pointer to the FRONT INBOUND VOR course. Set the Heading Bug to the FRONT INBOUND VOR heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND VOR course. Engage the approach mode. The autopilot will track the FRONT INBOUND VOR course.

A summary pictorial of this procedure is shown in Fig. 3-11.



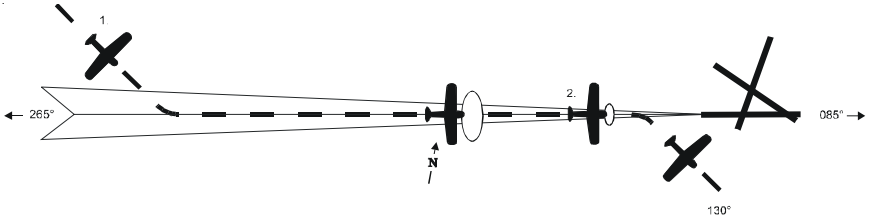
1. a. Select LOC frequency.
   b. Set Heading Bug to FRONT INBOUND LOC heading.
   c. Engage heading mode.
   d. Turn Heading Bug to establish aircraft on FRONT INBOUND LOC course.
   e. Engage approach mode.
   f. Track FRONT INBOUND LOC course.
2. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-8. Straight-In LOC Approach (DG)



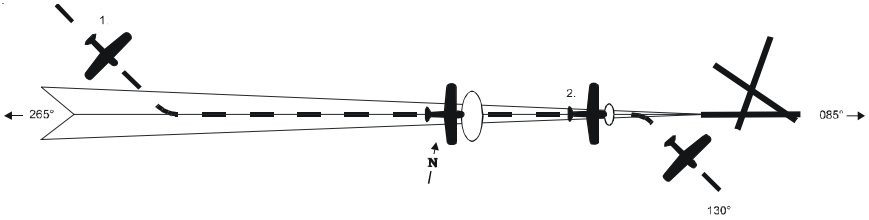
1. a. Select LOC frequency.
   b. Set Course Pointer to FRONT INBOUND LOC course (reference only).
   c. Set Heading Bug to FRONT INBOUND LOC heading.
   d. Engage heading mode.
   e. Turn Heading Bug to establish aircraft on FRONT INBOUND LOC course.
   f. Engage approach mode.
   g. Track FRONT INBOUND LOC course.
2. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-9. Straight-In LOC Approach (HSI)



1. a. Select VOR frequency.
   b. Set OBS to FRONT INBOUND VOR course.
   c. Set Heading Bug to FRONT INBOUND VOR heading.
   d. Engage heading mode.
   e. Turn Heading Bug to establish aircraft on FRONT INBOUND VOR course.
   f. Engage approach mode.
   g. Track FRONT INBOUND VOR course.
2. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-10. Straight-In VOR Approach (DG)



1. a. Select VOR frequency.
   b. Set Course Pointer to FRONT INBOUND VOR course.
   c. Set Heading Bug to FRONT INBOUND VOR heading.
   d. Engage heading mode.
   e. Turn Heading Bug to establish aircraft on FRONT INBOUND VOR course.
   f. Engage approach mode.
   g. Track FRONT INBOUND VOR course.
2. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-11. Straight-In VOR Approach (HSI)

3.2.3 LOC Approach with Procedure Turn

3.2.3.1 Heading System DG

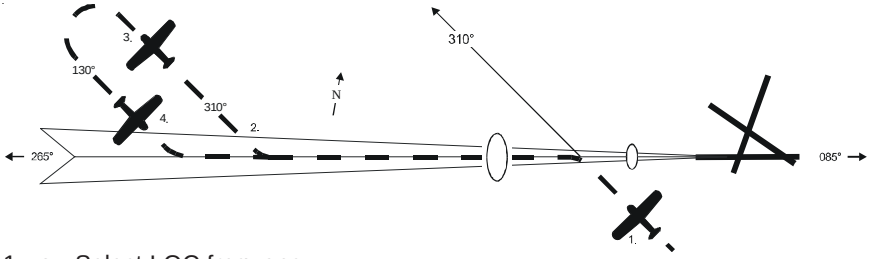
Select the LOC frequency on the Navigation Receiver. Set the Heading Bug to the FRONT OUTBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT OUTBOUND LOC course. At the appropriate point thereafter, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the FRONT INBOUND PROCEDURE TURN heading. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND LOC course. Engage the approach mode. The autopilot will track the FRONT INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-12.

3.2.3.2 Heading System HSI

Select the LOC frequency on the Navigation Receiver. For reference only, set the Course Pointer to the FRONT INBOUND LOC course. Set the Heading Bug to the FRONT OUTBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT OUTBOUND LOC course. At the appropriate point thereafter, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the FRONT INBOUND PROCEDURE TURN heading. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND LOC course. Engage the approach mode. The autopilot will track the FRONT INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-13.



1. a. Select LOC frequency.

   b. Set Heading Bug to FRONT OUTBOUND LOC heading.

   c. Engage heading mode.

   d. Turn Heading Bug to establish aircraft on FRONT OUTBOUND LOC course.

2. a. Set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.

3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.

4. a. Turn Heading Bug to establish aircraft on FRONT INBOUND LOC course.

   b. Engage approach mode.

   c. Track FRONT INBOUND LOC course.

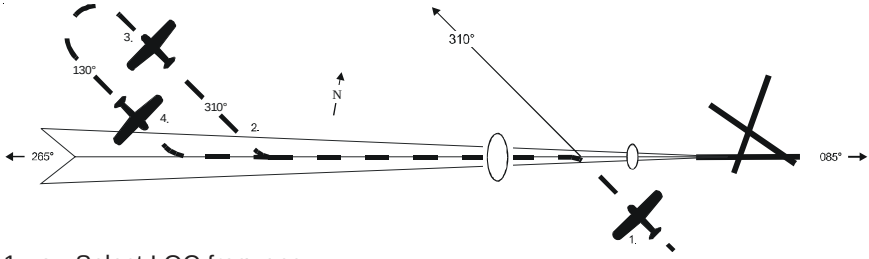
5. a. At middle marker, if missed approach is declared, disconnect autopilot.

   b. Stabilize aircraft.

   c. Set Heading Bug to missed approach heading.

   d. Engage heading mode.

Fig. 3-12. LOC Approach with Procedure Turn (DG)



1. a. Select LOC frequency.

   b. Set Course Pointer to FRONT INBOUND LOC course (reference only).

   c. Set Heading Bug to FRONT OUTBOUND LOC heading.

   d. Engage heading mode.

   e. Turn Heading Bug to establish aircraft on FRONT OUTBOUND LOC course.

2. a. Set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.

3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.

4. a. Turn Heading Bug to establish aircraft on FRONT INBOUND LOC course.

   b. Engage approach mode.

   c. Track FRONT INBOUND LOC course.

5. a. At middle marker, if missed approach is declared, disconnect autopilot.

   b. Stabilize aircraft.

   c. Set Heading Bug to missed approach heading.

   d. Engage heading mode.

Fig. 3-13. LOC Approach with Procedure Turn (HSI)

3.2.4 VOR Approach with Procedure Turn

3.2.4.1 Heading System DG

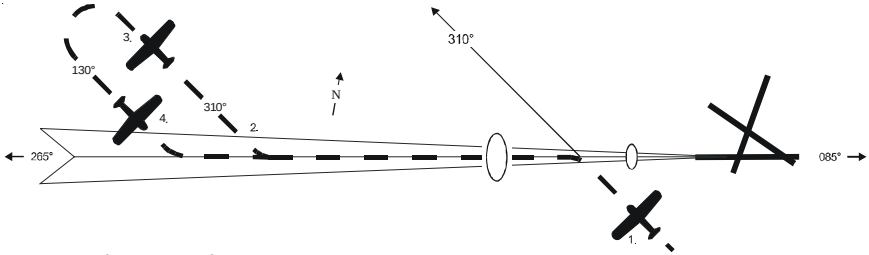
Select the VOR frequency on the Navigation Receiver. Set the OBS to the FRONT INBOUND VOR course. Set the Heading Bug to the FRONT OUTBOUND VOR heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT OUTBOUND VOR course. At the appropriate point thereafter, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the FRONT INBOUND PROCEDURE TURN heading. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND VOR course. Engage the approach mode. The autopilot will track the FRONT INBOUND VOR course.

A summary pictorial of this procedure is shown in Fig. 3-14.

3.2.4.2 Heading System HSI

Select the VOR frequency on the Navigation Receiver. Set the Course Pointer to the FRONT INBOUND VOR course. Set the Heading Bug to the FRONT OUTBOUND VOR heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT OUTBOUND VOR course. At the appropriate point thereafter, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the FRONT INBOUND PROCEDURE TURN heading. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND VOR course. Engage the approach mode. The autopilot will track the FRONT INBOUND VOR course.

A summary pictorial of this procedure is shown in Fig. 3-15.



1. a. Select VOR frequency.

   b. Set OBS to FRONT INBOUND VOR course.

   c. Set Heading Bug to FRONT OUTBOUND VOR heading.

   d. Engage heading mode.

   e. Turn Heading Bug to establish aircraft on FRONT OUTBOUND VOR course.

2. a. Set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.

3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.

4. a. Turn Heading Bug to establish aircraft on FRONT INBOUND VOR course.

   b. Engage approach track mode.

   c. Track FRONT INBOUND VOR course.

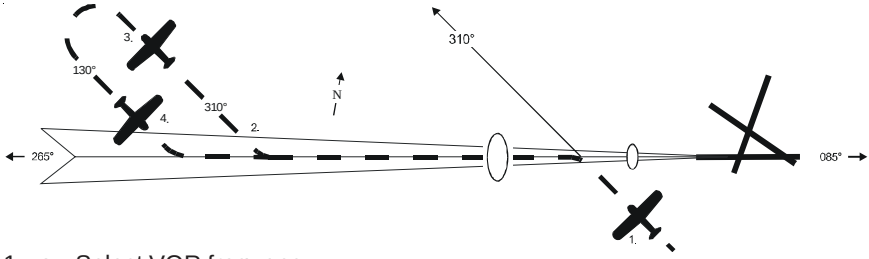
5. a. At middle marker, if missed approach is declared, disconnect autopilot.

   b. Stabilize aircraft.

   c. Set Heading Bug to missed approach heading.

   d. Engage heading mode.

Fig. 3-14. VOR Approach with Procedure Turn (DG)



1. a. Select VOR frequency.

   b. Set Course Pointer to FRONT INBOUND VOR course.

   c. Set Heading Bug to FRONT OUTBOUND VOR heading.

   d. Engage heading mode.

   e. Turn Heading Bug to establish aircraft on FRONT OUTBOUND VOR course.

2. a. Set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.

3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.

4. a. Turn Heading Bug to establish aircraft on FRONT INBOUND VOR course.

   b. Engage approach mode.

   c. Track FRONT INBOUND VOR course.

5. a. At middle marker, if missed approach is declared, disconnect autopilot.

   b. Stabilize aircraft.

   c. Set Heading Bug to missed approach heading.

   d. Engage heading mode.

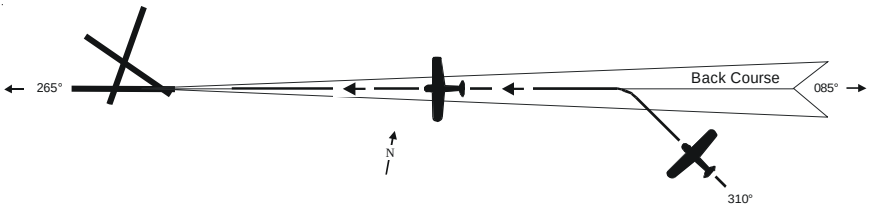
Fig. 3-15. VOR Approach with Procedure Turn (HSI)

3.2.5 Straight-In LOC Back Course Approach

3.2.5.1 Heading System DG

Select the LOC frequency on the Navigation Receiver. Set the Heading Bug to the BACK INBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the BACK INBOUND LOC course. Engage the reverse mode. The autopilot will track the BACK INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-16.



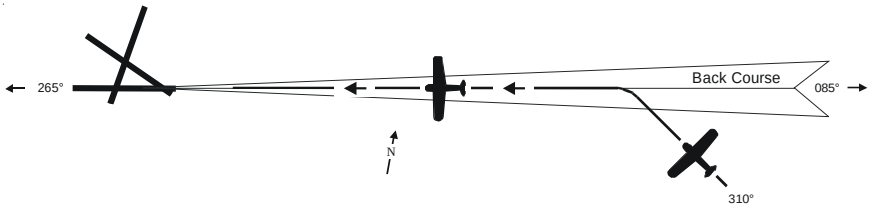
1. a. Select LOC frequency.
   b. Set Heading Bug to BACK INBOUND LOC heading.
   c. Engage heading mode.
   d. Turn Heading Bug to establish aircraft on BACK INBOUND LOC course.
   e. Engage reverse mode.
   f. Track BACK INBOUND LOC course.
2. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-16. Straight-In LOC Back Course Approach (DG)

3.2.5.2 Heading System HSI

Select the LOC frequency on the Navigation Receiver. For reference only, set the Course Pointer to the FRONT INBOUND LOC course. Set the Heading Bug to the BACK INBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the BACK INBOUND LOC course. Engage the reverse mode. The autopilot will track the BACK INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-17.



1. a. Select LOC frequency.
   b. Set Course Pointer to FRONT INBOUND LOC course (reference only).
   c. Set Heading Bug to BACK INBOUND LOC heading.
   d. Engage heading mode.
   e. Turn Heading Bug to establish aircraft on BACK INBOUND LOC course.
   f. Engage reverse mode.
   g. Track BACK INBOUND LOC course.
2. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-17. Straight-In LOC Back Course Approach (HSI)

3.2.6 LOC Back Course Approach with Procedure Turn

3.2.6.1 Heading System DG

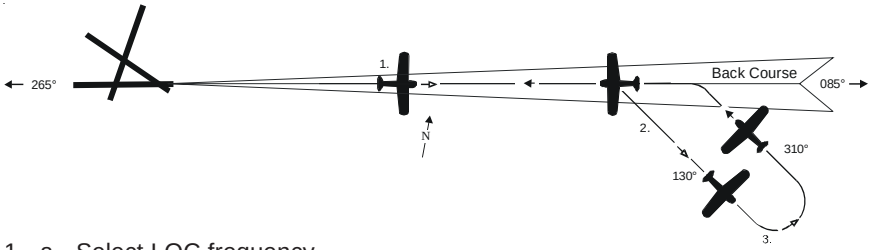
Select the LOC frequency on the Navigation Receiver. Set the Heading Bug to the BACK OUTBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the BACK OUTBOUND LOC course. At the appropriate point thereafter, set the Heading Bug to the BACK OUTBOUND PROCEDURE TURN heading. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the BACK INBOUND PROCEDURE TURN heading. At the appropriate point, turn the Heading Bug to establish the aircraft on the BACK INBOUND LOC course. Engage the reverse mode. The autopilot will track the BACK INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-18.

3.2.6.2 Heading System HSI

Select the LOC frequency on the Navigation Receiver. For reference only, set the Course Pointer to the FRONT INBOUND LOC course. Set the Heading Bug to the BACK OUTBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the BACK OUTBOUND LOC course. At the appropriate point thereafter, set the Heading Bug to the BACK OUTBOUND PROCEDURE TURN heading. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the BACK INBOUND PROCEDURE TURN heading. At the appropriate point, turn the Heading Bug to establish the aircraft on the BACK INBOUND LOC course. Engage the reverse mode. The autopilot will track the BACK INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-19.



1. a. Select LOC frequency.

   b. Set Heading Bug to BACK OUTBOUND LOC heading.

   c. Engage heading mode.

   d. Turn Heading Bug to establish aircraft on BACK OUTBOUND LOC course.

2. a. Set Heading Bug to BACK OUTBOUND PROCEDURE TURN heading.

3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on BACK INBOUND PROCEDURE TURN heading.

4. a. Turn Heading Bug to establish aircraft on BACK INBOUND LOC course.

   b. Engage reverse mode.

   c. Track BACK INBOUND LOC course.

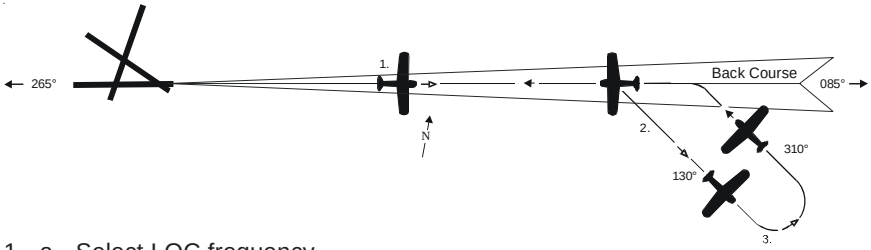
5. a. At middle marker, if missed approach is declared, disconnect autopilot.

   b. Stabilize aircraft.

   c. Set Heading Bug to missed approach heading.

   d. Engage heading mode.

Fig. 3-18. LOC Back Course Approach with Procedure Turn (DG)



1. a. Select LOC frequency.

   b. Set Course Pointer to FRONT INBOUND LOC course (reference only).

   c. Set Heading Bug to BACK OUTBOUND LOC heading.

   d. Engage heading mode.

   e. Turn Heading Bug to establish aircraft on BACK OUTBOUND LOC course.

2. a. Set Heading Bug to BACK OUTBOUND PROCEDURE TURN heading.

3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on BACK INBOUND PROCEDURE TURN heading.

4. a. Turn Heading Bug to establish aircraft on BACK INBOUND LOC course.

   b. Engage reverse mode.

   c. Track BACK INBOUND LOC course.

5. a. At middle marker, if missed approach is declared, disconnect autopilot.

   b. Stabilize aircraft.

   c. Set Heading Bug to missed approach heading.

   d. Engage heading mode.

Fig. 3-19. LOC Back Course Approach with Procedure Turn (HSI)

3.3 Yaw Damper Operation

The optional Yaw Damper serves to dampen excessive adverse yaw. It operates in either the AUTO mode or ON mode, depending upon the position of the Yaw Damper Master Switch shown in Fig. 3-20.

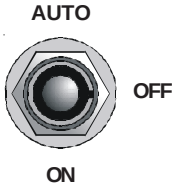


Fig. 3-20. Yaw Damper Master Switch

The Yaw Trim Knob, shown in Fig. 3-21, is used to center the slip/skid ball when the yaw servo is engaged.

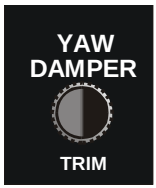


Fig. 3-21. Yaw Trim Knob

3.3.1 AUTO Mode

With the Yaw Damper Master Switch in the AUTO position, the yaw servo will become automatically engaged whenever a roll mode (STB, HDG, NAV, APR, REV) is engaged.

3.3.2 ON Mode

With the Yaw Damper Master Switch in the ON position, the yaw servo will be engaged at all times, entirely independent of autopilot operation.

3.3.3 Yaw Damper Trim

With the yaw servo engaged, rotate the Yaw Trim Knob to center the slip/skid ball.

3.4 Autopilot Disconnect

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

1. Press optional AP DISC Switch typically located on Control Wheel.
2. Press ON/OFF mode selector switch.
3. Set Autopilot Master Switch to OFF position.
4. Pull Autopilot Circuit Breaker.

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SECTION 4
OPERATING PARAMETERS

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4.1 Roll Axis Limits

Turn Rate

Piston A/C:

90% Standard Rate Turn

Turboprop A/C:

75% Standard Rate Turn

4.2 Pitch Axis Limits

Altitude

32,000 FT

Vertical Force Due to Acceleration

0.60 g

Modes

For the System Fifty, the pitch mode (ALT HOLD) can only be engaged after a roll mode (STB, HDG, NAV, APR, REV) has been engaged.

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SECTION 5
GLOSSARY

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Term	Meaning
A/C	Aircraft
ALT	Altitude
AP	Autopilot
APR	Approach
CDI	Course Deviation Indication
CW	Clockwise
CCW	Counter–Clockwise
DG	Directional Gyro
DISC	Disconnect
DN	Down
DSNG	Disengage
ENG	Engage
FAA	Federal Aviation Administration
FT	Feet
GPS	Global Positioning System
HDG	Heading
HSI	Horizontal Situation Indicator
IFR	Instrument Flight Rules
LOC	Localizer
MAP	Missed Approach Point
NAV	Navigation
OBS	Omnibearing Selector
PN	Part Number
POH	Pilot's Operating Handbook
REV	Reverse
RDY	Ready
STB	Stabilizer
UP	Up
VMC	Visual Meteorological Conditions
VOR	Very High Frequency Omnidirectional Radio Range

Notice:

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.

One S–TEC Way
Municipal Airport
Mineral Wells, TX 76067–9236
Tel: 800–872–7832
Fax: 940–325–3904
www.s-tec.com
www.cobham.com
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