

S-TEC

Pilot's Operating Handbook Fifty Five SR

Cirrus SR20 SRV Aircraft



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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 Fifty Five SR Autopilot (AP), installed in the Cirrus SR20 SRV aircraft (A/C).

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 Fifty Five SR autopilot is a tool provided to SR20 SRV 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 Fifty Five SR is a rate based autopilot. When in control of the roll axis, the autopilot senses turn rate, as well as closure rate to the selected course, along with the non-rate quantities of heading error, course error, and course deviation indication. When in control of the pitch axis, the autopilot senses vertical speed and 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 trim cartridge and roll servo (selected aircraft only) are coupled to the ailerons. The pitch trim cartridge and pitch servo (selected aircraft only) are coupled to the elevator. Activation of roll axis control must always precede activation of pitch axis control.

1.4 Modes of Operation

1.4.1 Roll Axis Control

Heading (HDG) Mode

Used to Turn onto a Selected Heading and Hold it

Navigation (NAV) Mode

Used to Intercept and Track a VOR Course

Navigation Approach (NAV APR) Mode

Used to Intercept and Track a LOC/VOR Front Course Inbound

Reverse (REV) Mode

Used to Intercept and Track a VOR Back Course Inbound

Navigation Global Positioning System Steering (NAV GPSS) Mode

Used to Laterally Steer along a Course defined by GPS

1.4.2 Pitch Axis Control

Altitude Hold (ALT HOLD) Mode

Used to Hold Altitude

Vertical Speed (VS) Mode

Used to Hold Vertical Speed

1.5 Block Diagram

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

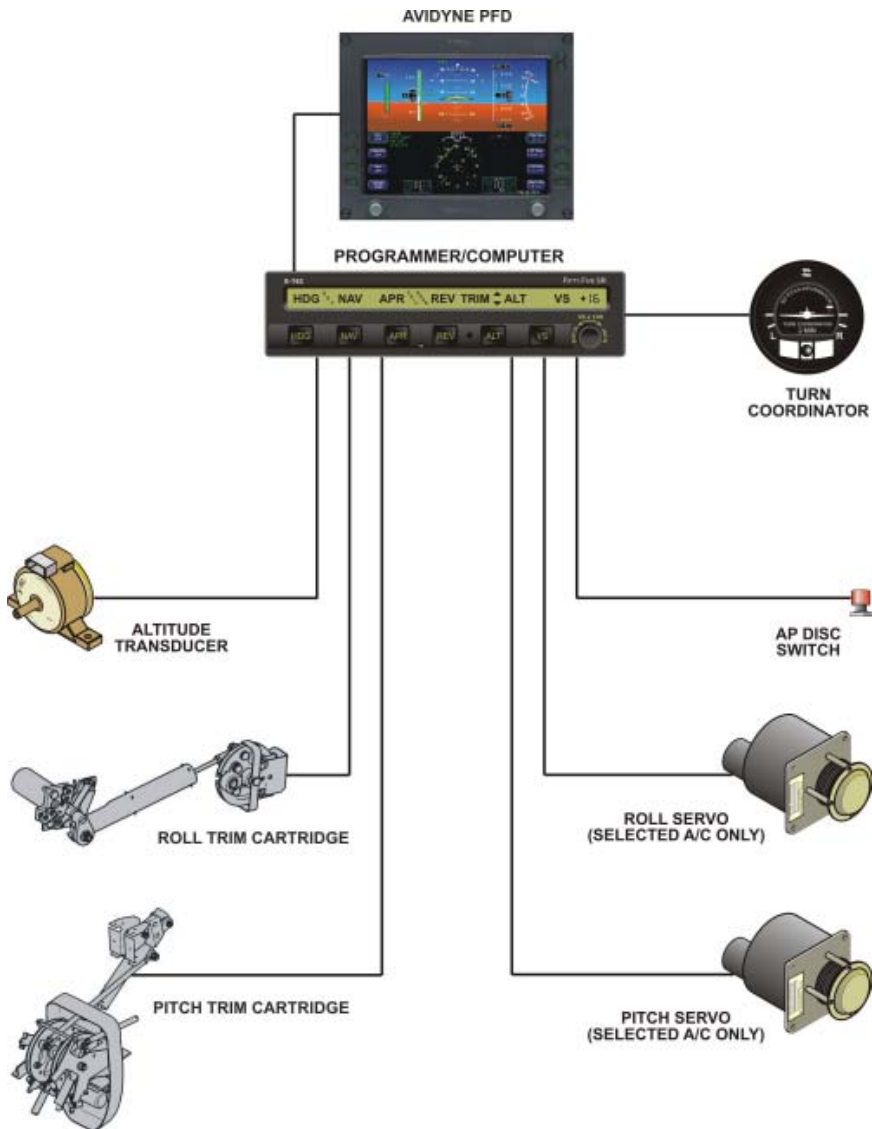


Fig. 1-1. System Fifty Five SR Block Diagram

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SECTION 2 PRE-FLIGHT PROCEDURES

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2.1 Power-Up Test

Perform the actions shown in Table 2-1. For each action, verify the corresponding response where applicable.

Table 2-1. Power-Up Test

ACTION	RESPONSE
1. Set Battery Switch 1 and Battery Switch 2 to ON position, respectively.	<p>All annunciations appear on AP display as shown in Fig. 2-1, and then extinguish.</p> <p>Software revision number briefly appears on AP display as shown in Fig. 2-2, and then extinguishes.</p> <p>INITIAL AHRS ALIGNMENT message appears on PFD display.</p> <p>RDY annunciation alone re-appears on AP display within 3 minutes, as shown in Fig. 2-3 (<i>Notes 1, 2</i>), and on PFD display.</p>

Notes:

1. *Should a Programmer/Computer failure be detected, the FAIL annunciation alone will re-appear on the AP display as shown in Fig. 2-4, and the autopilot will not operate.*

2. *Should a Turn Coordinator failure be detected, the AP display will remain blank indefinitely and the autopilot will not operate.*



Fig. 2-1. AP Display, Power-Up Annunciations



Fig. 2-2. AP Display, Software Revision Number

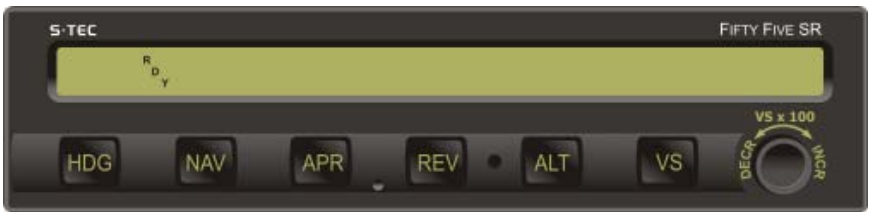


Fig. 2-3. AP Display, Ready for Operation



Fig. 2-4. AP Display, Programmer/Computer Failure

2.2 Pre-Flight Test

Prior to takeoff and with engine running, perform the actions shown in Table 2-2. For each action, verify the corresponding response where applicable. All actions pertaining to mode selector switches apply to the autopilot bezel.

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

ACTION	RESPONSE
1. Move A/C Control Sidestick left and right, to sense its freedom of movement about roll axis.	-----
2. Set Heading Bug under Lubber Line.	-----
3. Press HDG mode selector switch to engage heading mode.	HDG annunciation alone appears on AP display, as shown in Fig. 2-5, and on PFD display.
4. Attempt movement of A/C Control Sidestick left and right (A/C with Roll Servo Only).	A/C Control Sidestick's reduced freedom of movement indicates that Roll Servo is engaged. Roll Servo can be overridden. If not, disconnect autopilot and do not use.
5. Turn Heading Bug to the left side of Lubber Line.	A/C Control Sidestick moves to the left.
6. Turn Heading Bug to the right side of Lubber Line.	A/C Control Sidestick moves to the right.
7. Set Heading Bug under Lubber Line.	A/C Control Sidestick stops.
8. Move A/C Control Sidestick forward and aft, to sense its freedom of movement about pitch axis (A/C with Pitch Servo Only).	-----

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

ACTION	RESPONSE
9. Press ALT mode selector switch to engage altitude hold mode.	<p>ALT annunciation appears with HDG on AP display, as shown in Fig. 2-6.</p> <p>ALT annunciation appears with HDG on PFD display, along with AP in upper right-hand corner.</p>
10. Attempt movement of A/C Control Sidestick forward and aft (A/C with Pitch Servo Only).	<p>A/C Control Sidestick's reduced freedom of movement indicates that Pitch Servo is engaged.</p> <p>Pitch Servo can be overridden. If not, disconnect autopilot and do not use.</p>
11. Press VS mode selector switch to engage vertical speed mode.	<p>HDG, VS, and +0 (or ± 1) annunciations only appear on AP display, as shown in Fig. 2-7.</p> <p>HDG annunciation only appears on PFD display.</p>
12. Rotate AP Modifier Knob CW until +5 (500 FPM climbing) is commanded, as shown in Fig. 2-8.	A/C Control Sidestick moves in aft direction.
13. Rotate AP Modifier Knob CCW until -5 (500 FPM descending) is commanded, as shown in Fig. 2-9.	A/C Control Sidestick moves in forward direction.
14. Rotate AP Modifier Knob CW until +0 (0 FPM) is commanded.	A/C Control Sidestick stops.
15. Move A/C Control Sidestick as far aft as possible (A/C with Pitch Servo Only).	<p>After 3 seconds, TRIM ∇ annunciation appears on AP display.</p> <p>After 7 seconds, TRIM ∇ annunciation flashes.</p> <p>Aft trim motor can be heard driving to reposition elevator.</p>

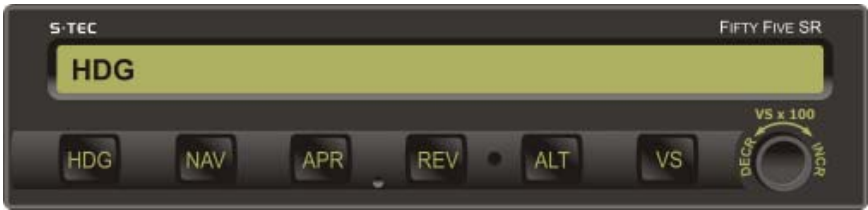


Fig. 2-5. AP Display, HDG Mode Engaged (Pre-Flight)



Fig. 2-6. AP Display, HDG and ALT HOLD Modes Engaged (Pre-Flight)



Fig. 2-7. AP Display, HDG and VS Modes Engaged (Pre-Flight)



Fig. 2-8. AP Display, HDG and VS Modes Engaged, 500 FPM Climbing (Pre-Flight)



Fig. 2-9. AP Display, HDG and VS Modes Engaged, 500 FPM Descending (Pre-Flight)

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

ACTION	RESPONSE
<p>16. Move A/C Control Sidestick as far forward as possible (A/C with Pitch Servo Only).</p>	<p>After 3 seconds, TRIM ^ annunciation appears on AP display.</p> <p>After 7 seconds, TRIM ^ annunciation flashes.</p> <p>Aft trim motor can be heard driving to reposition elevator.</p>
<p>17. Move A/C Control Sidestick aft until TRIM ^ annunciation is extinguished (A/C with Pitch Servo Only).</p>	<p>-----</p>
<p>18. Press AP DISC Switch.</p>	<p>Autopilot disconnects as follows:</p> <p>RDY annunciation flashes and Audible Alert sounds a periodic tone, while all other annunciations are extinguished.</p> <p>After 5 seconds, RDY annunciation stops flashing but remains, and Audible Alert is squelched.</p>
<p>19. Press/Hold forward on Manual Electric Trim Switch (A/C with Pitch Servo Only).</p>	<p>A/C trims nose down.</p>
<p>20. Release Manual Electric Trim Switch (A/C with Pitch Servo Only).</p>	<p>A/C stops trimming.</p>
<p>21. Press/Hold aft on Manual Electric Trim Switch (A/C with Pitch Servo Only).</p>	<p>A/C trims nose up.</p>
<p>22. Release Manual Electric Trim Switch (A/C with Pitch Servo Only).</p>	<p>A/C stops trimming.</p>

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

ACTION	RESPONSE
23. Trim A/C for takeoff.	-----

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SECTION 3 IN-FLIGHT PROCEDURES

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3.1 Normal Operating Procedures

3.1.1 Heading (HDG) Mode

Set the Heading Bug to the desired heading on the compass card, and then press the HDG mode selector switch to engage the heading mode. The HDG annunciation will appear as shown in Fig. 3-1, 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.



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

3.1.2 Navigation (NAV) Mode

Select the VOR frequency on the Navigation Receiver. Set the Course Pointer to desired course on compass card, and then press the NAV mode selector switch to engage the navigation mode. The NAV annunciation will appear as shown in Fig. 3-2, to acknowledge that this mode is engaged.



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

If the Left/Right Needle is at full scale (100%) deflection from center, then the autopilot will establish the aircraft on a 45° intercept angle relative to the selected course. Even if Left/Right Needle deflection is less than 100% from center, the autopilot may still establish an intercept angle of 45°, provided that the aircraft's closure rate to the selected course is sufficiently slow. Otherwise, the intercept angle will be less than 45°.

As the aircraft approaches the selected course, the autopilot senses the corresponding rate at which the Left/Right Needle approaches center (closure rate), in order to initiate the aircraft's turn onto the course at the proper point, and thereby prevent overshoot. The point at which this turn begins is variable, being further from the course at faster closure rates, and closer to the course at slower closure rates. Although closure rate is principally a function of groundspeed, the distance of the aircraft from the VOR station also has an effect. Nevertheless, the turn will always begin between 100% and 20% of Left/Right Needle deflection from center.

During this stage of the intercept sequence, the autopilot operates at maximum gain and sensitivity to closure rate. In addition, it limits the aircraft's turn rate to 90% of a standard rate turn.

When the aircraft arrives at 15% Left/Right Needle deflection from center, the course is captured. At that instant, a step reduction in autopilot gain occurs, so that the Course Pointer has sufficient authority to complete the intercept. In addition, the sensitivity to closure rate is reduced. The overall authority of the autopilot during this stage of the intercept sequence is called the HIGH GAIN condition.

Fifteen seconds after course capture, a second step reduction in autopilot gain occurs, to limit the aircraft's turn rate to 45% of a standard rate turn. In addition, the sensitivity to closure rate is reduced again. The overall authority of the autopilot during this stage of the intercept sequence is called the INTERMEDIATE GAIN condition.

Thirty seconds after course capture, the autopilot establishes the required crosswind correction angle.

Seventy five seconds after course capture, a third step reduction in autopilot gain occurs, to limit the aircraft's turn rate to 15% of a standard rate turn. In addition, the sensitivity to closure rate is reduced once more. This marks the end of the intercept sequence, and the beginning of tracking. The overall authority of the autopilot during tracking is called the LOW GAIN condition.

The pilot should make speed, distance, and time considerations during the 75 second period from course capture to the beginning of tracking, to account for the aircraft's position. For example at 115 kts, a distance of 2.4 nautical miles will be traveled in 75 seconds.

If it should happen that the Course Pointer is already within 5° of the selected course, and Left/Right Needle deflection is less than 10% from center, then the autopilot will immediately establish the LOW GAIN condition upon engagement of the navigation mode.

While tracking in the LOW GAIN condition, the autopilot ignores short term Left/Right Needle deflections (excursions), to thereby inhibit aircraft scalloping during VOR station passage. Should Left/Right Needle deflection exceed 50% from center for a period of 60 seconds, the autopilot will revert to the INTERMEDIATE GAIN condition, as a means to re-establish the aircraft on course.

The NAV annunciation will flash whenever Left/Right Needle deflection exceeds 50% from center, or the NAV Flag is in view. In the latter event, the FAIL annunciation will also appear.

While tracking in the LOW GAIN condition and within 50% Left/Right Needle deflection from center, should it be desired to track in the higher authority INTERMEDIATE GAIN condition instead, press the APR mode selector switch to engage the navigation approach (NAV APR) mode. This is acknowledged as shown in Fig. 3-3.

While tracking in either the LOW GAIN or INTERMEDIATE GAIN condition, if a new course is selected that is different from the original course by 10° or more, then the autopilot will revert to the HIGH GAIN condition.

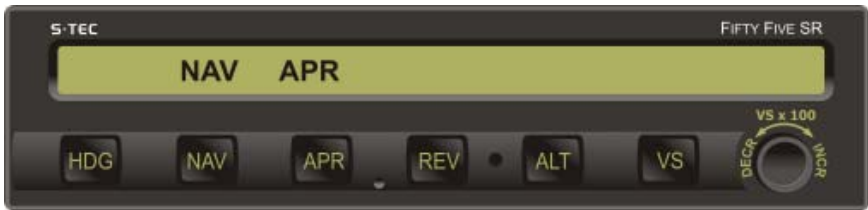


Fig. 3-3. AP Display, NAV APR Mode Engaged

3.1.2.1 Pilot Selectable Intercept Angle

To select an intercept angle other than 45°, set the Heading Bug to the desired intercept heading on the compass card, such that the difference between this heading and the desired course is the intercept angle. Then set the Course Pointer to the desired course. Press/Hold the HDG mode selector switch, and then press the NAV mode selector switch to engage the heading mode and arm the navigation mode. The HDG and NAV annunciations will appear as shown in Fig. 3-4, to acknowledge this.

The autopilot will establish the aircraft on the selected intercept angle (heading), until it must turn the aircraft onto the selected course to prevent overshoot. At that point in the intercept sequence, the HDG annunciation will extinguish to indicate engagement of the navigation mode.

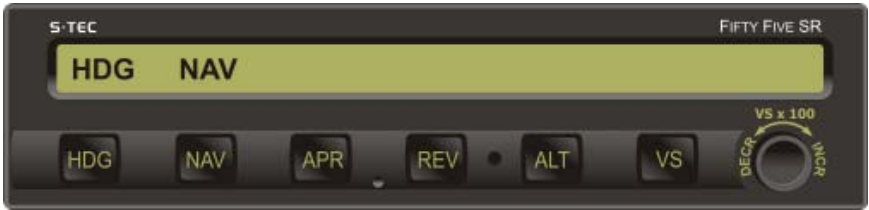


Fig. 3-4. AP Display, HDG Mode Engaged, NAV Mode Armed

3.1.3 Navigation Global Positioning System Steering (NAV GPSS) Mode

Program a predefined course into the GPS Navigation Receiver, comprised of course segments connected by waypoints. Press the NAV mode selector switch twice to engage the navigation global positioning system steering mode, unless the navigation mode is already engaged. In the latter event, only press the NAV mode selector switch once. The NAV and GPSS annunciations will appear as shown in Fig. 3-5, to acknowledge that this mode is engaged. The autopilot will laterally steer the aircraft along the predefined course, and limit its turn rate to either:

- 130% of a standard rate turn (Prog/Comp Hardware Mod Code AM and below)
- 90% of a standard rate turn (Prog/Comp Hardware Mod Code AN and AP)
- 110% of a standard rate turn (Prog/Comp Hardware Mod Code AR and above)

During this mode of operation, the autopilot will not accept any course error input from the Course Pointer.

If it should happen that a predefined course has not been programmed into the Navigation Receiver upon attempted engagement of the navigation global positioning system steering mode, then the FAIL annunciation will appear, the NAV and GPSS annunciations will flash, and the autopilot will hold the aircraft's wings level.



Fig. 3-5. AP Display, NAV GPSS Mode Engaged

3.1.3.1 Pilot Selectable Intercept Angle

To select an intercept angle, set the Heading Bug to the desired intercept heading on the compass card, such that the difference between this heading and the next course segment is the intercept angle. Press/Hold the HDG mode selector switch, and then press the NAV mode selector switch twice to engage the heading mode and arm the navigation global positioning system steering mode. The HDG, NAV, and GPSS annunciators will appear as shown in Fig. 3-6, to acknowledge this.

The autopilot will establish the aircraft on the selected intercept angle (heading), until it must turn the aircraft onto the next course segment to prevent overshoot. At that point in the intercept sequence, the HDG annunciation will extinguish to indicate engagement of the navigation global positioning system steering mode.



Fig. 3-6. AP Display, HDG Mode Engaged, NAV GPSS Mode Armed

3.1.4 Altitude Hold (ALT HOLD) Mode

The altitude hold mode can only be engaged if a roll mode (HDG, NAV, NAV APR, REV, NAV GPSS) is already engaged. With a roll mode engaged and 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. 3-7, to acknowledge that this mode is engaged. The autopilot will hold the aircraft at its current (captured) altitude. This altitude may be modified for barometric pressure changes, by rotating the Modifier Knob either clockwise (CW) for an increase in altitude, or counter-clockwise (CCW) for a decrease in altitude. Each detent equals 20 feet, and the range is ± 360 feet from the original captured altitude.



Fig. 3-7. AP Display, HDG and ALT HOLD Modes Engaged

3.1.5 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.

The vertical speed mode can only be engaged if a roll mode (HDG, NAV, NAV APR, REV, NAV GPSS) is already engaged. With a roll mode engaged and 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. 3-8, to acknowledge that this mode is engaged, along with the current vertical speed. The latter appears as a number in units of FPM x 100, prefixed by either a "+" to indicate a climb, or a "-" to indicate a descent (i.e., for example, +5 indicates 500 FPM climbing, if within the aircraft's capabilities). The autopilot will hold the aircraft at its current (captured) vertical speed. This vertical speed may be modified by rotating the Modifier Knob. In a climb, rotating the Modifier Knob clockwise (CW) increases the climb rate, whereas rotating it counter-clockwise (CCW) decreases the climb rate. In a descent, rotating the Modifier Knob CCW increases the descent rate, whereas rotating it CW decreases the descent rate. Each detent equals 100 FPM, and 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 Modifier Knob, or both, until the VS annunciation stops flashing.

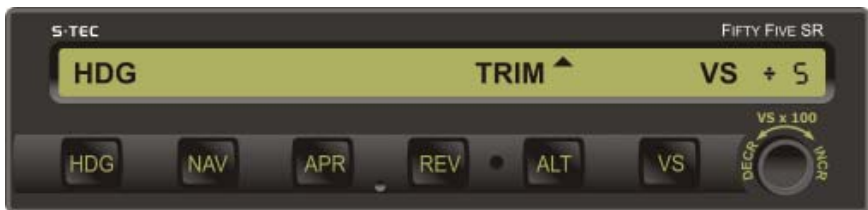


Fig. 3-8. AP Display, HDG and VS Modes Engaged

3.1.6 Automatic Elevator Trim (A/C with Pitch Servo Only)

When both a roll mode (HDG, NAV, NAV APR, REV, NAV GPSS) and a pitch mode (ALT HOLD, VS) are engaged, the autopilot will provide an annunciation whenever it is automatically trimming the aircraft about the pitch axis.

Should the pitch servo loading exceed a preset threshold for a period of three seconds, the autopilot will annunciate either TRIM \wedge or TRIM ∇ as an advisement that it is automatically trimming the aircraft in the indicated direction. This is shown in Fig. 3-9. If the autopilot is still in the process of automatically trimming the aircraft after four more seconds, then the annunciation will flash. Once the aircraft has been sufficiently trimmed, such that the pitch servo loading is below the preset threshold, the annunciation will extinguish.



a. TRIM UP in Progress



b. TRIM DN in Progress

Fig. 3-9. AP Display, Automatic Trim Advisements

3.1.7 Manual Electric Elevator Trim

A Manual Electric Trim Switch is located on each Control Sidestick. Either one can only be used to trim the aircraft from the RDY.

To trim the aircraft nose up, press/hold aft on the Manual Electric Trim Switch. The TRIM annunciation will appear flashing as shown in Fig. 3-10.

To trim the aircraft nose down, press/hold forward on the Manual Electric Trim Switch. The TRIM annunciation will appear flashing as shown in Fig. 3-10.



Fig. 3-10. AP Display, Manual Electric Trim in Progress

3.2 Non-Precision Approach Procedures

3.2.1 Straight-In Back Course Approach

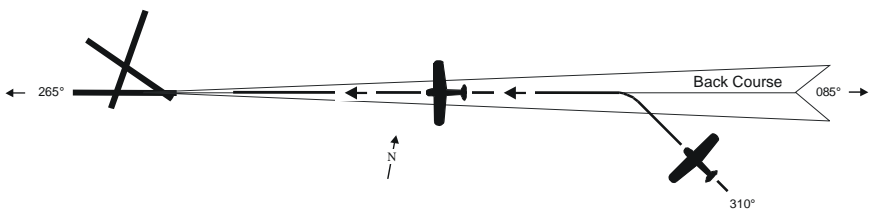
Select the LOC frequency on the Navigation Receiver. Set the Course Pointer to the FRONT INBOUND LOC course on the compass card. Press the REV mode selector switch to engage the reverse mode. The REV annunciation will appear as shown in Fig. 3-11, to acknowledge that this mode is engaged. The autopilot will intercept and track the BACK INBOUND LOC course.

The REV annunciation will flash whenever Left/Right Needle deflection exceeds 50% from center, or the NAV Flag is in view. In the latter event, the FAIL annunciation will also appear.

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



Fig. 3-11. AP Display, REV Mode Engaged, Track LOC Back Course Inbound



- Select LOC frequency.
- Set Course Pointer to FRONT INBOUND LOC course.
- Press REV mode selector switch to engage reverse mode.
- Intercept and track BACK INBOUND LOC course.

Fig. 3-12. Straight-In Back Course Approach

3.2.1.1 Pilot Selectable Intercept Angle

To select an intercept angle, set the Heading Bug to the desired intercept heading on the compass card, such that the difference between this heading and the BACK INBOUND LOC course is the intercept angle. Set the Course Pointer to the FRONT INBOUND LOC course on the compass card.

Press/Hold the HDG mode selector switch, and then press the REV mode selector switch to engage the heading mode and arm the reverse mode. The HDG and REV annunciations will appear as shown in Fig. 3-13, to acknowledge this.

The autopilot will establish the aircraft on the selected intercept angle (heading), until it must turn the aircraft onto the BACK INBOUND LOC course to prevent overshoot. At that point in the intercept sequence, the HDG annunciation will extinguish to indicate engagement of the reverse mode.



Fig. 3-13. AP Display, HDG Mode Engaged, REV Mode Armed

3.2.2 Back Course Approach with Procedure Turn

Select the LOC frequency on the Navigation Receiver. Set the Course Pointer to the FRONT INBOUND LOC course on the compass card. Press the APR mode selector switch to engage the navigation approach mode. The NAV and APR annunciations will appear as shown in Fig. 3-14, to acknowledge that this mode is engaged. The autopilot will intercept and track the BACK OUTBOUND LOC course.



Fig. 3-14. AP Display, NAV APR Mode Engaged, Track LOC Back Course Outbound

At the appropriate time, set the Heading Bug to the BACK OUTBOUND PROCEDURE TURN heading, and then press the HDG mode selector switch to engage the heading mode. 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.

Press the REV mode selector switch to engage the reverse mode. The REV annunciation will appear as shown in Fig. 3-15, to acknowledge that this mode is engaged. The autopilot will intercept and track the BACK INBOUND LOC course.

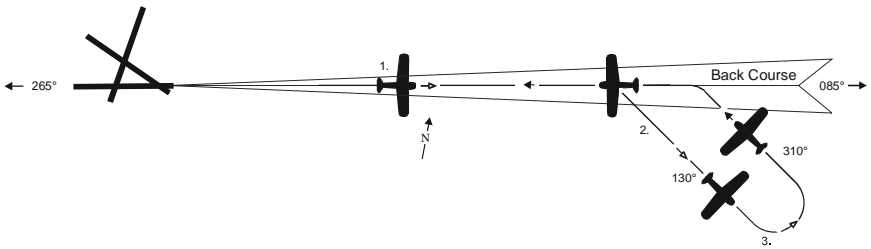


Fig. 3-15. AP Display, REV Mode Engaged, Track LOC Back Course Inbound

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

For those aircraft equipped with the Garmin 400W/500W Series GPS Navigation Receiver or equivalent unit, with the NAV GPSS mode engaged, the autopilot is capable of executing virtually this entire lateral approach sequence if it has been programmed into the Navigation Receiver.

Once on the BACK INBOUND LOC course, and with the Navigation Receiver set to VLOC, press the REV mode selector switch to engage the REV mode and complete the back course approach.



1. a. Select LOC frequency.
 - b. Set Course Pointer to FRONT INBOUND LOC course.
 - c. Press APR mode selector switch to engage navigation approach mode.
 - d. Intercept and track BACK OUTBOUND LOC course.
2. a. At appropriate time, set Heading Bug to BACK OUTBOUND PROCEDURE TURN heading.
 - b. Press HDG mode selector switch to engage heading mode.
3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on BACK INBOUND PROCEDURE TURN heading.
 - b. Press REV mode selector switch to engage reverse mode.
 - c. Intercept and track BACK INBOUND LOC course.

Fig. 3-16. Back Course Approach with Procedure Turn

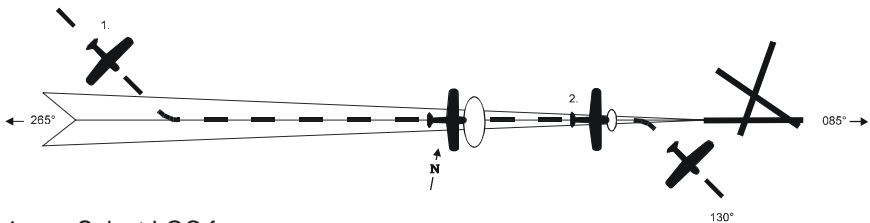
3.2.3 Straight-In LOC Approach

Select the LOC frequency on the Navigation Receiver. Set the Course Pointer to the FRONT INBOUND LOC course on the compass card. Press the APR mode selector switch to engage the navigation approach mode. The NAV and APR annunciators will appear as shown in Fig. 3-17, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT INBOUND LOC course.



Fig. 3-17. AP Display, NAV APR Mode Engaged, Track LOC Front Course Inbound

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



1. a. Select LOC frequency.
 - b. Set Course Pointer to FRONT INBOUND LOC course.
 - c. Press APR mode selector switch to engage navigation approach mode.
 - d. Intercept and 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. Press HDG mode selector switch to engage heading mode.

Fig. 3-18. Straight-In LOC Approach

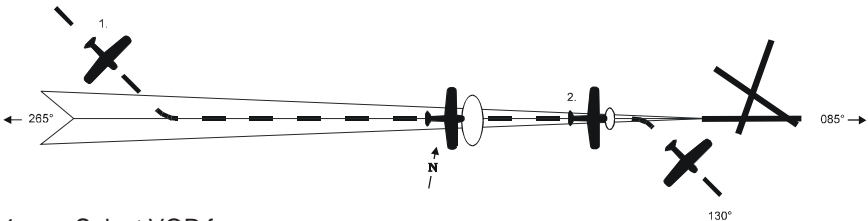
3.2.4 Straight-In VOR Approach

Select the VOR frequency on the Navigation Receiver. Set the Course Pointer to the FRONT INBOUND VOR course on the compass card. Press the APR mode selector switch to engage the navigation approach mode. The NAV and APR annunciators will appear as shown in Fig. 3-19, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT INBOUND VOR course.



Fig. 3-19. AP Display, NAV APR Mode Engaged, Track VOR Front Course Inbound

A summary pictorial of this procedure is shown in Fig. 3-20.



1. a. Select VOR frequency.
 - b. Set Course Pointer to FRONT INBOUND VOR course.
 - c. Press APR mode selector switch to engage navigation approach mode.
 - d. Intercept and 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. Press HDG mode selector switch to engage heading mode.

Fig. 3-20. Straight-In VOR Approach

3.2.5 LOC Approach with Procedure Turn

Select the LOC frequency on the Navigation Receiver. Set the Course Pointer to the FRONT INBOUND LOC course on the compass card. Press the REV mode selector switch to engage the reverse mode. The REV annunciation will appear as shown in Fig. 3-21, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT OUTBOUND LOC course.

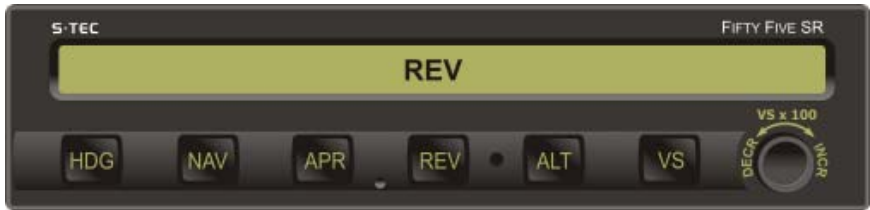


Fig. 3-21. AP Display, REV Mode Engaged, Track LOC Front Course Outbound

At the appropriate time, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading, and then press the HDG mode selector switch to engage the heading mode. 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.

Press the APR mode selector switch to engage the navigation approach mode. The NAV and APR annunciations will appear as shown in Fig. 3-22, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT INBOUND LOC course.



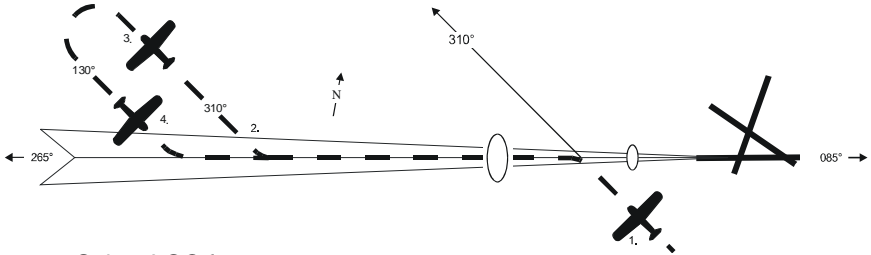
Fig. 3-22. AP Display, NAV APR Mode Engaged, Track LOC Front Course Inbound

A summary pictorial of this procedure is shown in Fig. 3-23.

For those aircraft equipped with the Garmin 400W/500W Series GPS Navigation Receiver or equivalent unit, with the NAV GPSS mode engaged, the autopilot is capable of executing virtually this entire lateral approach sequence if it has been programmed into the Navigation Receiver.

Once on the FRONT INBOUND LOC course, with the Navigation Receiver set to VLOC, press the APR mode selector switch to engage the NAV APR mode and complete the front course approach.

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1. a. Select LOC frequency.
b. Set Course Pointer to FRONT INBOUND LOC course.
c. Press REV mode selector switch to engage reverse mode.
d. Intercept and track FRONT OUTBOUND LOC course.
2. a. At appropriate time, set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.
b. Press HDG mode selector switch to engage heading mode.
3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.
4. a. Press APR mode selector switch to engage navigation approach mode.
b. Intercept and track FRONT INBOUND LOC course.
c. At middle marker, if missed approach is declared, disconnect autopilot.
d. Stabilize aircraft.
e. Set Heading Bug to missed approach heading.
f. Press HDG mode selector switch to engage heading mode.

Fig. 3-23. LOC Approach with Procedure Turn

3.2.6 VOR Approach with Procedure Turn

Select the VOR frequency on the Navigation Receiver. Set the Course Pointer to the FRONT INBOUND VOR course on the compass card. Press the REV mode selector switch to engage the reverse mode. The REV annunciation will appear as shown in Fig. 3-24, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT OUTBOUND VOR course.



Fig. 3-24. AP Display, REV Mode Engaged, Track VOR Front Course Outbound

At the appropriate time, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading, and then press the HDG mode selector switch to engage the heading mode. 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.

Press the APR mode selector switch to engage the navigation approach mode. The NAV and APR annunciations will appear as shown in Fig. 3-25, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT INBOUND VOR course.

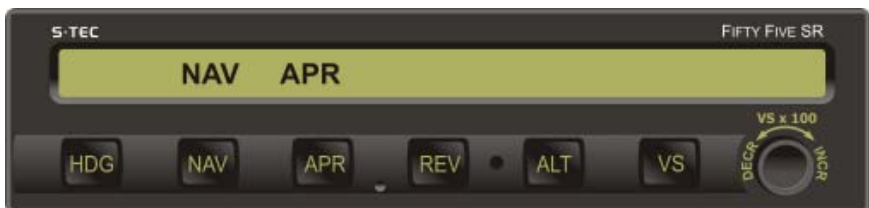
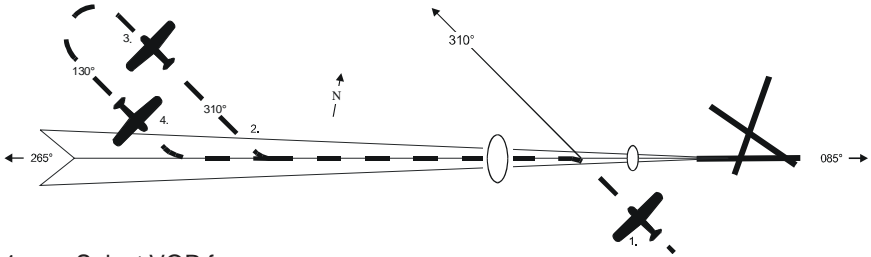


Fig. 3-25. AP Display, NAV APR Mode Engaged, Track VOR Front Course Inbound

A summary pictorial of this procedure is shown in Fig. 3-26.

For those aircraft equipped with the Garmin 400W/500W Series GPS Navigation Receiver or equivalent unit, with the NAV GPSS mode engaged, the autopilot is capable of executing virtually this entire lateral approach sequence if it has been programmed into the Navigation Receiver.

Once on the FRONT INBOUND VOR course, with the Navigation Receiver set to VLOC, press the APR mode selector switch to engage the NAV APR mode and complete the front course approach.



1. a. Select VOR frequency.
 - b. Set Course Pointer to FRONT INBOUND VOR course.
 - c. Press REV mode selector switch to engage reverse mode.
 - d. Intercept and track FRONT OUTBOUND VOR course.
2. a. At appropriate time, set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.
 - b. Press HDG mode selector switch to engage heading mode.
3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.
4. a. Press APR mode selector switch to engage navigation approach mode.
 - b. Intercept and track FRONT INBOUND VOR course.
 - c. At middle marker, if missed approach is declared, disconnect autopilot.
 - d. Stabilize aircraft.
 - e. Set Heading Bug to missed approach heading.
 - f. Press HDG mode selector switch to engage heading mode.

Fig. 3-26. VOR Approach with Procedure Turn

3.2.7 NAV GPSS Approach (Lateral Guidance Only)

Program a predefined approach into the GPS Navigation Receiver. Press the NAV mode selector switch twice to engage the navigation global positioning system steering mode (reference section 3.1.3). The autopilot will laterally steer the aircraft along the predefined approach. To control the assigned altitudes and rates of descent, use the altitude hold mode (reference section 3.1.4) and vertical speed mode (reference section 3.1.5), respectively. For those aircraft *not* equipped with the Garmin 400W/500W Series GPS Navigation Receiver or equivalent unit, to make any procedure turns, engage the heading mode and use the Heading Bug (reference section 3.1.1). Upon completion, re-engage the navigation global positioning system steering mode.

3.3 Autopilot Disconnect

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

1. Press AP DISC Switch.
2. Pull AP Circuit Breaker.
3. Stall Warning is activated.

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SECTION 4 OPERATING PARAMETERS

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4.1 Roll Axis Limits

Turn Rate

90% Standard Rate Turn (HDG, NAV, NAV APR, REV Modes)

130% Standard Rate Turn (NAV GPSS Mode) for Programmer/Computers with Hardware Mod Code AM and below.

90% Standard Rate Turn (NAV GPSS Mode) for Programmer/Computers with Hardware Mod Code AN and AP.

110% Standard Rate Turn (NAV GPSS Mode) for Programmer/Computers with Hardware Mod Code AR and above.

4.2 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

Modes

A pitch mode (ALT HOLD, VS) can only be engaged after a roll mode (HDG, NAV, NAV APR, REV, NAV GPSS) has been engaged.

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SECTION 5 GLOSSARY

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Term	Meaning
A/C	Aircraft
AFMS	Aircraft Flight Manual Supplement
AHRS	Attitude and Heading Reference System
ALT	Altitude
AP	Autopilot
APR	Approach
CW	Clockwise
CCW	Counter-Clockwise
DISC	Disconnect
FAA	Federal Aviation Administration
FPM	Feet-per-Minute
GPS	Global Positioning System
GPSS	Global Positioning System Steering
HDG	Heading
IFR	Instrument Flight Rules
INTR	Interrupt
KTS	Knots
LOC	Localizer
NAV	Navigation
PFD	Primary Flight Display
PN	Part Number
POH	Pilot's Operating Handbook
RDY	Ready
REV	Reverse
VLOC	VOR or LOC Frequency
VMC	Visual Meteorological Conditions
VOR	Very High Frequency Omnidirectional Radio Range
VS	Vertical Speed

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