

**Pilot's Operating Handbook and
FAA Approved Airplane Flight Manual
Supplement
for**

S-Tec System 55X Autopilot

When the S-Tec System Fifty Five X (55X) Autopilot is installed in the Cirrus Design SR20, this Supplement is applicable and must be inserted in the Supplements Section (Section 9) of the Cirrus Design SR20 Pilot's Operating Handbook. This document must be carried in the airplane at all times. Information in this supplement adds to, supersedes, or deletes information in the basic SR20 Pilot's Operating Handbook.

• Note •

This POH Supplement Revision dated Revision 4: 08-15-07, supersedes and replaces Revision 3 of this supplement dated 07-18-05..

FAA Approved Joseph C. Mieser Date Aug 15 2007
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Section 1 - General

This airplane is equipped with an S-TEC System 55X Autopilot. The System 55X autopilot is a two-axis autopilot system. The system consists of a flight guidance programmer/computer, altitude encoder, altitude selector / alerter, turn coordinator, and HSI. Mode selection and vertical speed selection is made on the programmer/computer panel. A button on each control yoke handle may be used to disengage the autopilot. The autopilot makes roll changes through the aileron trim motor and spring cartridge and makes pitch changes for altitude hold through the elevator trim motor. The SR20 installation of the S-Tec System 55X Autopilot features:

- Heading Hold and Command;
- NAV/LOC/GS tracking, high and low sensitivity, GPSS roll steering, and automatic 45° course intercept;
- Altitude Hold and Command; and
- Vertical Speed Hold and Command.

Refer to S-Tec System Fifty-Five X Autopilot Pilot's Operating Handbook (POH): Serials 1005 thru 1336; P/N 87109 dated 8 November 2000 or later OR Serials 1337 and subsequent; P/N 87247 original release or later for full operational procedures and description of implemented modes. The System 55X POH also contains detailed procedures for accomplishing GPS & VOR course tracking, front course and back course localizer approaches, and glideslope tracking.

• Note •

The SR20 implementation of the System 55X Autopilot does not utilize the optional remote annunciator, roll servo, and optional trim servo. Therefore, all references to these items in the S-Tec System 55X POH shall be disregarded. Additionally, this installation does not utilize a CWS (Control Wheel Steering) switch or an AUTOPILOT MASTER switch.

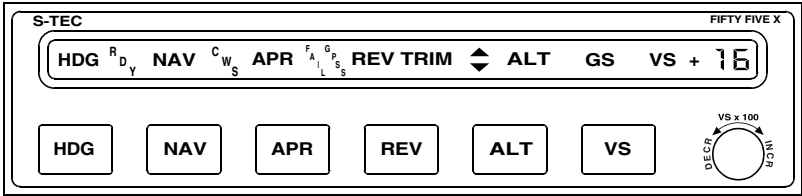
This installation utilizes the airplane's pitch and roll trim actuators to affect steering changes. Therefore, the automatic trim function of the System 55X is not implemented. Disregard all references in the S-Tec System 55X POH to this feature.

Roll and pitch information are displayed on attitude indicator.
Autopilot Flight Director is not implemented in this installation.

Section 2 - Limitations

1. Autopilot operation is prohibited above 185 KIAS.
2. The autopilot must not be engaged for takeoff or landing.
3. The autopilot must be disengaged for missed approach, go-around, and bailed landing.
4. Flaps must be set to 50% for autopilot operation in Altitude Hold at airspeeds below 95 KIAS.
5. Flap deflection is limited to 50% during autopilot operations.
6. The autopilot must be disconnected in moderate or severe turbulence.
7. Minimum engage height for the autopilot is 400 ft AGL.
8. Minimum speed with the autopilot engaged is $1.2V_S$ for the given configuration.
9. For VOR/GPS and ILS glideslope and localizer intercept, capture, and tracking, the following limitations apply:
 - a. The autopilot must be disengaged no later than 100 feet below the Minimum Descent Altitude.
 - b. The autopilot must be disconnect during approach if course deviation exceeds 50%. The approach should only be continued by "hand-flying" the airplane.
 - c. 12 knot maximum crosswind component between the missed approach point and outer marker.
 - d. The intercept of the localizer shall occur at least 5 miles outside of the outer marker.
 - e. If the crosswind component is greater than 12 knots and less than 17 knots, the intercept shall occur at least 10 miles outside of the outer marker.
 - f. The intercept angle shall be no greater than a 45-degree intercept.

- g. The ILS is flown at normal approach speeds, and within any STC or TC speed constraints and as defined in this flight manual.
 - h. The flaps should be extended in the approach configuration prior to the Outer Marker. No further changes in the flap configuration should be made throughout the autopilot-coupled approach.
 - i. The glideslope is approached in such a manner to allow automatic arming of the glideslope, or if the glideslope is manually armed no more than 15% above the glideslope.
10. The S-TEC System Fifty Five X Pilot's Operating Handbook: *Serials 1005 thru 1336*; P/N 87109 dated 8 November 2000 or later OR *Serials 1337 and subsequent*; P/N 87247 original release or later, must be carried in the airplane at all times and must be available to the pilot while in flight.



SR20_FM09_1509

Figure - 1
System 55X Autopilot Programmer/Computer
P/N 11934-S13
Revision 4: 08-15-07

Section 3 - Emergency Procedures

Autopilot Malfunction

Refer to *Electric Trim/Autopilot Failure* procedure in the SR20 POH. Do not reengage the autopilot until the malfunction has been identified and corrected. The autopilot may be disconnected by:

1. Pressing the A/P DISC/Trim switch on the control yoke handle.
2. Pulling the AUTOPILOT circuit breaker on Essential Bus.

Altitude lost during a roll axis autopilot malfunction and recovery:

Flight Phase	Bank Angle	Altitude Loss
Climb	30°	None
Cruise	55°	100 ft
Descent	55°	120 ft
Maneuvering	10°	None
Approach	0°	20 ft

Altitude lost during a pitch axis autopilot malfunction and recovery:

Flight Phase	Altitude Loss
Cruise	200 ft
ILS	25 ft

System Failure and Caution Annunciations

If any of the following failure annunciations occur at low altitude or during an actual instrument approach, disengage the autopilot, execute a go-around or missed approach as appropriate. Inform ATC of problem. Do not try to troubleshoot until a safe altitude and maneuvering area are reached or a safe landing is completed.

Annunciation	Condition	Action
Flashing RDY for 5 seconds with audible tone.	Autopilot disconnect. All annunciations except RDY are cleared.	None.
Flashing RDY with audible tone then goes out.	Turn coordinator gyro speed low. Autopilot disengages and cannot be re-engaged.	Check power to turn coordinator.
Flashing NAV, REV, or APR.	Off navigation course by 50% needle deviation or more.	Use HDG mode until problem is identified. Crosscheck raw NAV data, compass heading, and radio operation.
Flashing NAV, REV, or APR with steady FAIL	Invalid radio navigation signal.	Check Nav radio for proper reception. Use HDG mode until problem is corrected.
Flashing VS	Excessive vertical speed error over selected vertical speed. Usually occurs in climb.	Reduce VS command and/or adjust power as appropriate.
Flashing GS	Off glideslope centerline by 50% needle deviation or more.	Check attitude and power. Adjust power as appropriate.
Flashing GS with steady FAIL	Invalid glideslope radio navigation signal.	Disconnect autopilot and initiate go-around or missed approach procedure. Inform ATC.
Flashing GS plus ALT.	Manual glideslope disabled.	Re-enable by pressing NAV mode button.

Section 4 - Normal Procedures

Refer to Section 7 – Systems Description for a description of the autopilot and altitude selector and their respective modes.

• WARNING •

The pilot must properly monitor and control the engine power to avoid stalling the airplane in autopilot altitude hold or vertical speed modes.

Autopilot Pre-Flight Tests

1. Battery Master Switch ON
2. Avionics Power Switch ON
Note that all autopilot annunciators, except CWS, and TRIM illuminate. After about 5 seconds, all lights will go out. When the turn coordinator gyro has reached operational RPM, the RDY annunciator will come on.
3. Heading Mode TEST
 - a. Center the HDG bug under the lubber line on the HSI.
 - b. Momentarily press HDG button on autopilot Mode Selector. Note that HDG light illuminates.
 - c. Then rotate HDG knob on the HSI to the left then right. Note that control yokes follow movement of knob. Then return HDG bug to lubber line.
4. Vertical Speed TEST
 - a. Press VS button on autopilot programmer/computer. Note that VS light illuminates VS+0.
 - b. Rotate the VS control knob to 500 FPM up (+5). After a short delay, the control yoke will move aft.
 - c. Rotate the VS control knob to 500 FPM down (-5). After a short delay, the control yoke will move forward.
5. Altitude Hold TEST
 - a. Depress ALT button on autopilot programmer/computer. Note that ALT annunciator comes on, VS annunciator goes out, and yoke does not move.

6. Overpower Test:
 - a. Grasp control yoke and input left aileron, right aileron, nose up, and nose down to overpower autopilot. Overpower action should be smooth in each direction with no noise or jerky feel.
7. Radio Check:
 - a. Turn on NAV1 radio, with a valid NAV signal, and select VLOC for display on the HSI.
 - b. Use autopilot programmer/computer to engage NAV mode and move OBS so that VOR deviation needle moves left or right. Note that control yokes follow direction of needle movement.
8. Autopilot Disconnect Tests:
 - a. Press Pilot A/P DISC/Trim Switch (control yoke). Note that the autopilot disengages. Move control yoke to confirm that pitch and roll control is free with no control restriction or binding.
 - b. Repeat step using Copilot A/P DISC/Trim Switch.

In-Flight Procedures

1. Autopilot RDY Light..... CHECK ON
2. Trim airplane for existing flight conditions.
3. Engage desired mode by pressing mode selector button on autopilot programmer/computer.

Heading Mode

1. Begin by selecting a heading on HSI within 10° of the current airplane heading.
2. Press HDG button on autopilot programmer/computer. The HDG annunciator will illuminate and the airplane will turn to the selected heading.
3. Use HSI HDG bug to make heading changes as desired.

Altitude Hold Mode

1. Manually fly the airplane to the desired altitude and level off.

• Note •

For smoothest transition to altitude hold, the airplane rate of climb or descent should be less than 100 FPM when Altitude Hold is selected.

2. Press HDG or NAV to engage a roll mode. The associated annunciator will illuminate.

• Note •

A roll mode must be engaged prior to engaging a pitch mode.

3. Press the ALT button on the autopilot programmer/computer. The ALT annunciator will illuminate indicating that the mode is engaged and the autopilot will hold the present altitude.

• Note •

Manually flying the airplane off the selected altitude will not disengage altitude hold and the autopilot will command a pitch change to recapture the altitude when the control input is released.

4. Altitude can be synchronized to another altitude by rotating the VS knob on the programmer/computer. Clockwise rotation will increase and counterclockwise rotation will decrease altitude 20 feet for each 'click.' The maximum adjustment is ± 360 feet. Adjustments greater than 360 feet can be made by selecting VS mode and flying the airplane to the new altitude and then re-engaging ALT mode.

Vertical Speed Mode

1. Begin by manually establishing the desired vertical speed.
2. Press HDG or NAV to engage a roll mode. The associated annunciator will illuminate.

• Note •

A roll mode must be engaged prior to engaging a pitch mode.

3. Press the VS button on the autopilot programmer/computer to engage the vertical speed mode. When the mode is engaged, the

autopilot will synchronize to and hold the vertical speed at the time the mode was engaged.

• Note •

The vertical speed is displayed in 100-foot increments on the programmer/computer window or on the vertical speed indicator on the PFD. A plus (+) value indicates climb and a negative or minus (-) value indicates descent.

4. Vertical speed can be adjusted by rotating the VS knob on the programmer/computer or the right knob on the PFD when the VSI bug has been selected.

• Note •

A flashing VS mode annunciator indicates excessive error between actual vertical speed and the selected vertical speed (usually in climb). The pilot should adjust power or reduce the commanded vertical speed as appropriate to remove the error.

GPS tracking and GPS Approach

1. Begin with a reliable GPS signal selected on the NAV receiver.
2. Select desired course on HSI and establish a desired intercept heading.
3. Press the NAV button on the autopilot programmer/computer twice. The NAV and GPSS mode annunciators will illuminate.

• Note •

If the course needle is at full-scale deviation, the autopilot will establish the airplane on a heading for a 45° intercept with the selected course. As the airplane approaches the course, the autopilot will smoothly shallow the intercept angle. The pilot may select an intercept angle less than the standard 45° by setting the desired intercept heading with the HSI HDG bug, pressing and holding HDG, and then pressing NAV once to intercept course in NAV mode or twice to intercept course in GPSS mode on the autopilot programmer/computer. When the on-course intercept turn begins the HDG mode will disengage and the annunciator will go out.

Turns while in GPSS mode can exceed the standard rate by 20% to 30%.

In NAV mode while tracking a GPS or VOR/LOC signal, during the intercept sequence the autopilot operates at maximum gain and sensitivity (90% of standard rate turn). When the selected course is intercepted, course deviation needle centered, the course-tracking program is activated. The system will remain at maximum sensitivity for approximately 15 seconds while the wind correction angle is established. The maximum turn rate is then reduced to 45% standard rate. Approximately 60 seconds later, the maximum turn rate is reduced to 15% standard rate.

4. For increased sensitivity during GPS approach or if desired for enroute tracking, press the APR button on the autopilot programmer/computer. The NAV, GPSS, and APR annunciators will be illuminated. Use HDG to accomplish a procedure turn. Engage GPSS again to complete the approach.

VOR Tracking and VOR-LOC Approach

1. Begin with a reliable VOR or VOR-LOC signal selected on the NAV receiver.
2. Select desired course on HSI and establish a desired intercept heading.
3. Press the NAV button on the autopilot programmer/computer. The NAV mode will illuminate. Course interception and tracking will be as described under GPS Tracking and GPS Approach above.
4. For station passage, set HDG bug to within 5° of selected course.

• Note •

If the HDG bug is within 5° of center and the course deviation is less than 10%, the autopilot will immediately establish the lowest level of sensitivity and limit the turn rate to a maximum of 15% of a standard rate turn.

5. For increased sensitivity during approach or if desired for enroute tracking, press the APR button on the autopilot programmer/computer. Both NAV and APR annunciators will be illuminated.

Glideslope Intercept and Tracking

1. Begin with a reliable ILS signal selected on the NAV receiver.
2. Select autopilot NAV and APR. Airplane must be within 50% needle deviation of localizer centerline.
3. Select ALT mode. Airplane must be 60% or more below the glideslope centerline during the approach to the intercept point. If the above conditions have existed for 10 seconds, GS mode will arm, the GS annunciator will come on and the ALT annunciator will remain illuminated. When glideslope intercept occurs, the ALT annunciator will go out and the system will track the glideslope.

• Note •

If approach vectoring locates the airplane too near the glideslope at the intercept point (usually the outer marker), the GS mode can be manually armed by pressing the ALT button once. Once capture is achieved, GS annunciator will come on and ALT annunciator will go out.

Section 5 - Performance

There is no change to the airplane performance when the S-Tec System 55X autopilot is installed.

Section 6 - Weight & Balance

There is no change to the airplane weight & balance when the S-Tec System 55X autopilot is installed.

Section 7 - Systems Description

Autopilot

The airplane is equipped with an S-Tec System 55X two-axis Automatic Flight Control System (Autopilot). The autopilot programmer/computer is installed in the center console radio stack.

The autopilot roll axis uses an inclined gyro in the turn coordinator case as the primary turn and roll rate sensor. In addition to the turn coordinator instrument, the roll axis computer receives signals from the HSI and the #1 NAV/GPS radio. The roll computer computes roll steering commands for turns, radio intercepts, and tracking. Roll axis

steering is accomplished by autopilot steering commands to the aileron trim motor and spring cartridge.

The pitch computer receives altitude data from the altitude encoder pressure transducer plumbed into the static system, an accelerometer, and glideslope information from the HSI and #1 NAV radio. Pitch axis command for altitude hold, vertical speed hold, and glideslope tracking is accomplished by pitch computer commands to the elevator trim motor and trim cartridge.

28 VDC for autopilot and altitude selector/alerter is supplied through the 5-amp AUTOPILOT circuit breaker on the MAIN BUS #1.

All Autopilot mode selection is performed by using the mode select buttons and VS knob on the autopilot programmer/computer in the center console. Annunciators in the programmer/computer display window announce modes. *Refer to Figure 1* for an illustration of the programmer/computer.

RDY (Ready)— Illuminates when autopilot is ready for engagement. When the airplane's Battery Master switch is turned on and the rate gyro RPM is correct, the RDY annunciator will come on indicating the autopilot is ready for the functional check and operation. The autopilot cannot be engaged unless the RDY light is illuminated.

HDG (Heading) Mode – When HDG is selected, the autopilot will engage the HDG mode, fly the airplane to, and hold the heading set on the HSI. Subsequent heading changes are made using the HDG knob on the HSI. For smoothest transition to HDG mode, it is recommended that the airplane be aligned to within 10° of the selected heading before engaging HDG. The HDG mode is also used in combination with the NAV mode to set up a pilot selected intercept angle to a course.

NAV (Navigation) Mode - When NAV is selected, the autopilot will provide intercept and tracking of GPS, VOR, and Localizer courses. For course intercept with full-scale deviation, the autopilot automatically sets up a 45° intercept angle at maximum gain and sensitivity (turn is limited to 90% of standard rate). The point at which the turn to capture the course begins is dependent upon closure rate and airplane position. When the course is intercepted and the HSI course deviation needle centered (indicating course capture), the

autopilot automatically initiates a tracking gain program to reduce turn rate to 45% standard rate, and then 15% standard rate.

REV (Reverse Course) – When REV is selected, the autopilot will automatically execute high sensitivity gain for an approach where tracking the front course outbound or tracking the back course inbound is required. The APR and REV annunciators will illuminate when REV is selected.

APR (Approach) – When APR is selected, the autopilot provides increased sensitivity for VOR or GPS approaches. APR may also be used to provide increased sensitivity for enroute course tracking.

GS (Glideslope) - The autopilot GS function will capture and track an ILS glideslope. To arm the GS function, the following conditions must be met: (1) the NAV receiver must be tuned to the appropriate ILS frequency; (2) The glideslope signal must be valid - no flag; (3) the autopilot must be in NAV/APR/ALT modes; and (4) the airplane must be 60% or more below the glideslope centerline during the approach to the intercept point, and within 50% needle deviation of the localizer centerline at the point of intercept - usually the outer marker. When the above conditions have existed for 10 seconds, the GS annunciator will illuminate indicating GS arming has occurred (ALT annunciator will remain on). When the glideslope is intercepted and captured, the ALT annunciator will go out.

ALT (Altitude Hold), Mode - When ALT is selected, the autopilot will hold the altitude at the time the mode was selected. Altitude hold will not engage if an autopilot roll mode is not engaged. Altitude correction for enroute barometric pressure changes may be made by rotation of the VS knob on the autopilot programmer/computer. Clockwise rotation will increase and counterclockwise rotation will decrease altitude 20 feet for each 'click.' The maximum adjustment is ± 360 feet. Adjustments greater than 360 feet can be made by selecting VS mode and flying the airplane to the new altitude and then re-engaging ALT mode.

VS (Vertical Speed) Mode - When VS is selected, the autopilot will synchronize to and hold the vertical speed at the time the mode was selected. Altitude hold will not engage if an autopilot roll mode is not engaged. The vertical speed is displayed in 100-foot increments at the far right of the programmer/computer window next to the VS annunciation. A plus (+) value indicates climb and a negative or minus

(-) value indicates descent. Vertical speed can be adjusted by rotating the VS knob on the programmer/computer. Clockwise rotation increases and counterclockwise rotation decreases rate of climb (or descent) 100 FPM for each 'click.' The maximum adjustment is ± 1600 FPM.