



S-TEC CORPORATION
RT. 4, BLDG. 946
WOLTERS INDUSTRIAL COMPLEX
MINERAL WELLS, TEXAS 76067

FAA APPROVED
SUPPLEMENTAL FLIGHT MANUAL
FOR

GULFSTREAM AEROSPACE MODELS AA-5, AA-5A AND AA-5B

WITH
S-TEC SYSTEM 40 SINGLE AXIS
AUTOMATIC FLIGHT GUIDANCE SYSTEM
(14 VOLT SYSTEM)

REG. NO. 1045290
SER. NO. 1195

The information in this manual is FAA Approved material which along with other approved documents is applicable to the operation of the airplane when modified by the installation of the S-TEC System 40 Autopilot Model ST-280-40 installed in accordance with STC SA5386SW-D.

SECTION I

GENERAL

This manual is to acquaint the pilot with the features and functions of the System 40 Single Axis Autopilot and to provide operating instructions for the system when installed in the above aircraft model(s). The aircraft must be operated within the limitations herein provided when the autopilot is in use.

SECTION II

OPERATING LIMITATIONS

1. Autopilot operation prohibited above the following speeds:
 - a. for Model AA-5: 145 KCAS (144 KIAS)
 - b. for Models AA-5A and AA-5B: 150 KCAS (150 KIAS)
2. Autopilot must be "OFF" during take-off and landing.

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SECTION III

EMERGENCY OPERATING PROCEDURES

In the event of an autopilot malfunction, or any time the autopilot is not performing as expected or commanded, do not attempt to identify the system problem. Immediately regain control of the aircraft by overpowering the autopilot as necessary and then disconnect the autopilot. Do not reengage the autopilot until the problem has been identified and corrected.

1. Autopilot may be disconnected by:
 - a. Depressing the "AP Disconnect" Switch on the left horn of the pilot's control wheel (if installed).
 - b. Depressing the "ON-OFF" Switch on the autopilot programmer unit.
 - c. Moving autopilot master switch to "OFF" position.
 - d. Pulling the autopilot circuit breaker.
2. Altitude loss during a malfunction and recovery.

- a. The following altitude losses and bank angles were recorded after a malfunction with a 3 second recovery delay:

<u>Configuration</u>	<u>Bank Angle/Altitude Loss</u>
Climb	58°/NONE
Cruise	60°/-110'
Descent	45°/-220'

- b. The following altitude losses and bank angles were recorded after a malfunction with a 1 second recovery delay:

<u>Configuration</u>	<u>Bank Angle/Altitude Loss</u>
Maneuvering	20°/ -40'
Approach (coupled or uncoupled)	13°/ -30'

The above values are the worst case for all the models covered by this document.

SECTION IV

NORMAL OPERATING PROCEDURES

4-1 SYSTEM DESCRIPTION

The System 40 is a pure rate autopilot which uses an inclined rate gyro in the Turn Coordinator instrument as the primary roll and turn rate sensor. The turn coordinator includes an autopilot pick-off, a gyro RPM detector and an instrument power monitor. Low electrical power will cause the instrument "flag" to appear while low RPM will cause the autopilot to disconnect. The autopilot includes a pre-flight test feature that allows a visual check of all the annunciator lamps.

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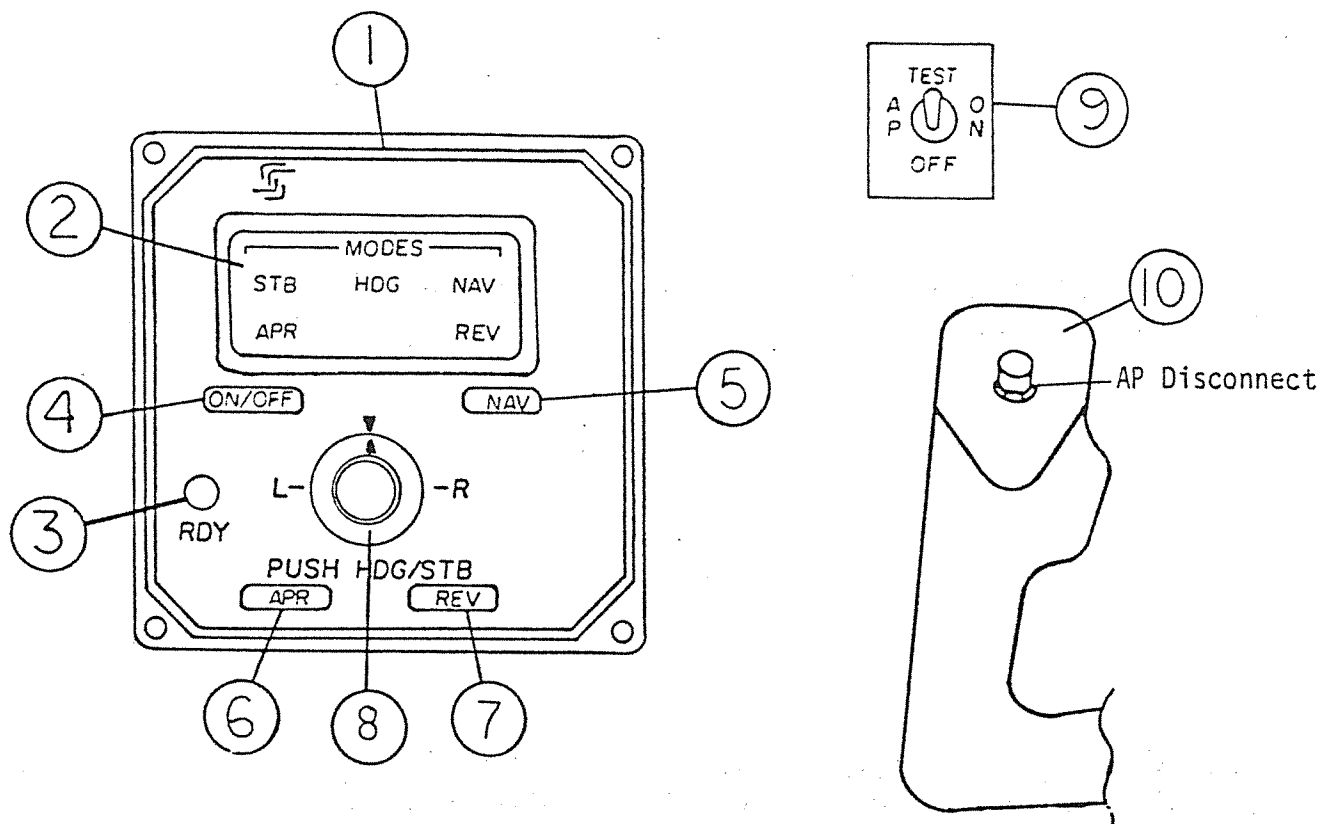
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The pre-flight test feature is operated by use of the remote master power ON-OFF test switch located on the instrument panel. When the System master power switch is on and the rate gyro RPM is correct, the green "RDY" light will illuminate indicating the autopilot is ready for the functional check and operation. The autopilot cannot be engaged unless the "RDY" light is illuminated. When the system is equipped with the optional 3" Air Driven Directional Gyro (D.G.) or a compass system, directional information is provided to the autopilot by a heading bug in the instrument.

The indicator and annunciator lamp brilliance is controlled through the aircraft instrument light rheostat.



1. Mode Programmer and Annunciator Unit - Provides mode switches and annunciation for the system.
2. Mode Annunciation Window - Displays mode in use.



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3. Ready Light (RDY) - Green RDY lamp illuminates when autopilot is ready for engagement.
4. ON-OFF Stabilizer Mode Switch - Momentary actuation engages roll system in stabilizer (STB) Mode and allows use of the turn knob (Item 8) to command turn rate desired. When the system is operating a momentary actuation will disengage the system and cancel all annunciations.
5. Navigation Mode Switch (NAV) - Momentary activation will engage the VOR Tracking Mode. This mode provides low system gain for comfortable cross country tracking.
6. Approach Mode Switch (APR) - Momentary actuation will engage the VOR or Localizer Tracking Mode. This mode provides a higher level of system gain for more active tracking of VOR or Localizer front course signals.
7. Reverse Approach Mode Switch (REV) - Momentary activation will engage the reverse tracking mode for use when tracking a localizer backcourse. This mode provides the same system gain as the APR Mode with reverse needle sensing.
8. Turn Knob and Heading Switch - The turn knob allows the selection of turn rates up to standard rate ($3^{\circ}/\text{sec.}$) either right or left. Turning the knob to the right or left will cause a turn that is proportional to the displacement of the knob from center. For level flight the electronics provide a small dead zone of approximately 10° at the center indice. To actuate heading mode, momentarily depress the turn knob. To return to STB Mode from HDG, depress the turn knob. When the system is operating in any radio mode and the system is equipped with a D.G., depressing the turn knob will return the system to HDG Mode directly.
9. Autopilot Master ON-OFF Test Switch - Refer to Pre-Flight Procedures for operating details.
10. Optional remote AP disconnect switch.

4-2 PRE-FLIGHT PROCEDURES

NOTE: During system functional checks the system must be provided adequate DC voltage (12 or 24 VDC minimum as appropriate).



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FUNCTIONAL PRE-FLIGHT TEST

1. AP Master Switch - Move to TEST position - Observe all lights and annunciators illuminate.
2. AP Master Switch - Move to ON position, observe ready (RDY) light illuminates.
3. Depress ON-OFF Switch - STB Annunciator illuminates. Rotate turn knob left and right, observe control wheel moves in corresponding direction. Center turn knob.
4. Set D.G. and place bug under lubber line (if installed) push turn knob to engage HDG mode. Observe HDG annunciator. Move HDG bug left and right observe proper control wheel motion.
5. Overpower Test - Grasp control wheel and overpower roll servo left and right, overpower action should be smooth with no noise or jerky feel. If unusual sounds or excessive play is detected, have the servo installation inspected prior to flight.
6. Radio Check -
 - A. Turn on NAV Radio, with valid NAV signal, engage NAV Mode and move VOR OBS so that VOR needle moves left and right - control wheel should follow the direction of needle movement.
 - B. Select REV Mode- the control wheel should rotate in opposite direction of the NAV needle.
 - C. Select APR Mode - the control wheel should again follow radio needle movement and with more authority than produced by NAV Mode.
7. Hold control wheel and depress ON-OFF Switch - note that roll servo releases. Move control wheel to confirm roll motions are free, with no control restriction or binding. If the optional disconnect switch is installed it may be used to effect the disconnect for this check.

4-3 IN-FLIGHT PROCEDURES

1. Check - RDY light on.
2. Trim aircraft for existing flight condition. Maintain Yaw Trim during all Autopilot operations.



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3. Center turn-knob - depress ON-OFF Switch.
4. Set turn knob to level or turning flight, as desired.
5. Set HDG bug to desired heading (if installed) and depress turn knob to engage heading mode, select headings as desired.

VOR TRACKING AND VOR-LOC APPROACH

1. Tune NAV receiver and select radial.
2. Maneuver aircraft to selected radial (or localizer) within ± 1 needle width and within 10^0 of the course heading.
3. Engage NAV Mode for VOR tracking.
4. Engage APR Mode for VOR or LOC approach.

To track the localizer front course outbound to the procedure turn area, maneuver to the localizer center and, when on the outbound heading, select REV Mode. To track the localizer back course inbound, maneuver to the localizer back course center and, when on the inbound heading, select REV Mode.

Approach Mode may be used to track VOR radials cross country if desired. Use of APR Mode for cross country tracking may result in some course scalloping if the VOR signal is weak or otherwise "noisy". In areas of poor signal quality NAV Mode may provide more accurate tracking even with reduced gain.

SECTION V

OPERATIONAL DATA

Text of this Section not affected by installation of this equipment.



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SECTION VI

REQUIRED OPERATING EQUIPMENT

Text of this Section not affected by installation of this equipment.

SECTION VII

WEIGHT AND BALANCE

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