

S-TEC CORPORATION
MINERAL WELLS, TEXAS 76067

FAA/DAS APPROVED
PILOT'S OPERATING HANDBOOK AND/OR
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR

PIPER MODELS PA-28-151, S/N 28-7615001 AND UP; PA-28-161, PA-28-181,
AND PA-28-236; AND PA-28-151, S/N 28-7615001 AND UP
WHEN MODIFIED PER STC SA2969SW (160 H.P. ENGINE CONVERSION)

WITH
S-TEC SYSTEM 30 TWO AXIS
AUTOMATIC FLIGHT GUIDANCE SYSTEM
(14 VOLT SYSTEM)

REG. NO. D-EXEG
SER. NO. 28-7990445

This Supplement must be attached to the applicable FAA Approved Airplane Flight Manual, Pilot's Operating Handbook, or Pilot's Operating Handbook and FAA Approved Airplane Flight Manual modified by the installation of S-TEC System 30 Autopilot Model ST-703-30 installed in accordance with STC SA09251AC-D. The information contained herein supplements or supersedes the basic manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and/or Airplane Flight Manual.

SECTION I

GENERAL

This manual is to acquaint the pilot with the features and functions of the System 30 Two Axis Autopilot and to provide operating instructions for the system when installed in the listed aircraft model(s). The aircraft must be operated within the limitations herein provided when the autopilot is in use.

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Walter F. Davis

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DATE: 6-26-97

SECTION V.

APPENDIX

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LOG OF REVISIONS				
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SECTION II

OPERATING LIMITATIONS

1. Autopilot operation prohibited above the following airspeeds:
 - (a) For Models PA-28-151, PA-28-161, PA-28-181, 140 KIAS.
 - (b) For Model PA-28-236, 160 KIAS.
2. Autopilot operation prohibited with flap extensions greater than (1) notch (10°) while operating in altitude hold mode.
3. Autopilot must be off during take off and landing.

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. Press and hold the mode selector knob for approximately 2 seconds.
 - c. Moving the 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	50°/-20'
Cruise	55°/-160'
Descent	55°/-320'
 - 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	18°/-60'
Approach (coupled or uncoupled)	20°/-20'

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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 30 is a pure rate autopilot which uses an inclined rate gyro in the Turn Coordinator instrument as the primary roll and turn rate sensor and an accelerometer and an absolute pressure transducer as pitch rate sensors. 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 an automatic pre-flight test feature that allows a visual check of all the annunciator lamps and checks critical elements of the accelerometer system. The test feature will not enable autopilot function unless the automatic test sequence is satisfactorily completed.

When the pre-flight test is satisfactorily completed and when 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.

Pitch axis control is provided for the altitude hold function by use of the accelerometer and the pressure transducer. When the altitude hold mode is engaged an elevator trim sensor in the pitch servo will detect the elevator trim condition. When elevator trim is necessary to re-establish a trimmed condition, trim indicator lights on the programmer unit will illuminate to indicate the direction to trim to restore a trimmed condition. If the pilot ignores a trim light for more than five seconds the light will begin to flash to get the pilot's attention.

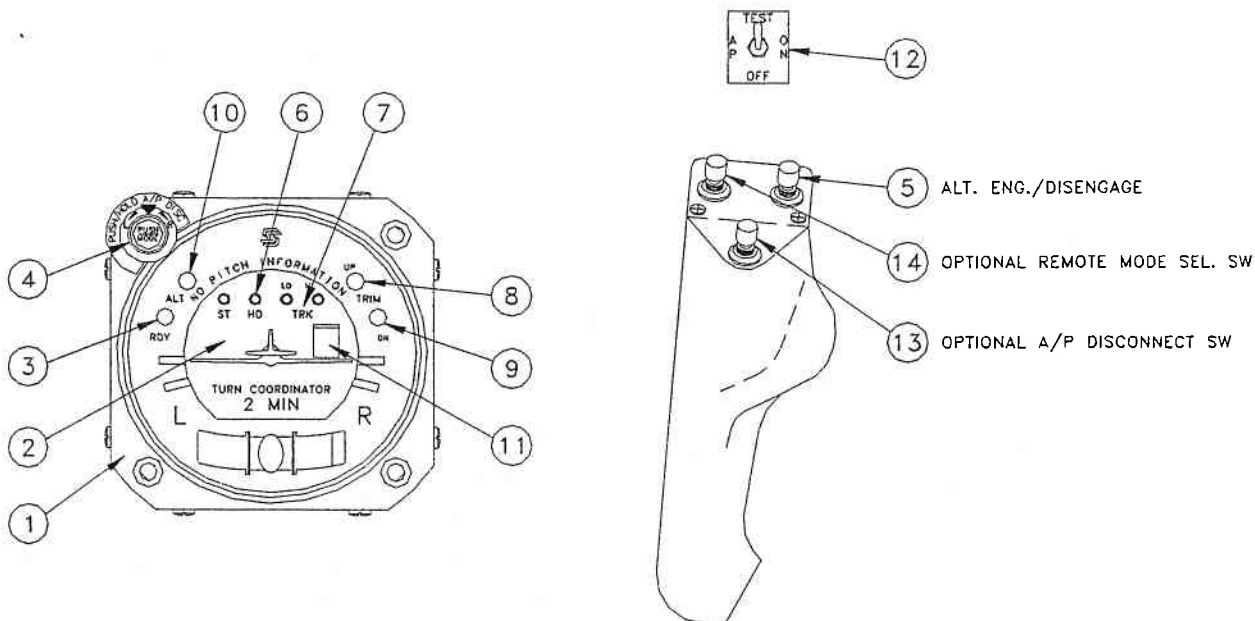
The indicator and annunciator lamp brilliance is controlled through the aircraft instrument light rheostat, except for the "trim" indicators which always illuminate at full intensity.

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1. Turn Coordinator, Mode Programmer and Annunciator Unit - Provides basic flight information, autopilot mode switching and annunciation.
2. Mode Annunciation Window - Displays mode in use.
3. Green Ready (RDY) Light - Illuminates when autopilot is ready for engagement. When autopilot is disconnected "RDY" will flash for five seconds accompanied by beeping audio tone.
4. Mode Select/Disconnect Switch - Each momentary push of this knob will select an autopilot mode, left to right, beginning with ST (Stabilizer) mode and ending with (Hi) TRK mode. Holding the knob in for more than 2 seconds will disconnect the autopilot. Turning the knob left or right in the stabilizer mode will provide left/right commands to the autopilot proportional to knob displacement up to a standard rate turn.
5. Altitude Hold Engage/Disengage Switch - This control wheel mounted switch will engage or disengage the Altitude Hold Mode as desired. The blue (ALT) light on the annunciator panel will illuminate when ALT. mode is engaged.
6. Heading Mode - If the system is equipped with a D.G. this mode will permit preselected left/right turns using the D.G. heading bug.

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7. TRK (Track) - using the (Lo) mode of the tracking feature will provide low system gain for comfortable cross country tracking of VOR or GPS signals. Using the (Hi) mode of the tracking feature will provide a higher level of system gain for more active tracking of VOR, GPS or Localizer front course signals.
8. Trim UP Light - Illuminates to indicate the need for nose UP trim.
9. Trim DOWN Light - Illuminates to indicate the need for nose DOWN trim. When both lights are out, the aircraft is in trim longitudinally.
10. Blue (ALT) light illuminates when altitude mode is engaged.
11. Flag Window - Red flag visible indicates lack of power (12/24 Volt) to primary turn coordinator unit.
12. Autopilot Master ON-OFF Switch - Refer to pre-flight procedures for operating details.
13. Optional remote AP disconnect switch.
14. Optional Remote Mode Selector Switch - Allows mode selection from the control wheel. Also disconnects autopilot when depressed for approximately two seconds.

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).

MANDATORY PRE-FLIGHT TEST

1. AP Master Switch - Move to A/P (on) position.
 - A. Observe all lights and annunciators illuminate.
 - B. Observe the following light sequence of the trim indicators: (Sequence requires 9 seconds.)
 1. Initially both trim UP & DN lights are illuminated.
 2. UP light extinguishes and remains off.
 3. DN light then extinguishes and remains off.
 4. All lights extinguish except for "RDY" light.

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2. The autopilot can be engaged and disengaged repeatedly using the remote A/P disconnect switch or the mode selector knob but once the A/P master is switched off the test must be reconducted to get a ready indication. If the ready light does not illuminate after the test a failure to pass the test is indicated and the system will require service. NOTE: ALTITUDE MODE CANNOT BE ENGAGED UNLESS POWER IS ON FOR MORE THAN 15 SECONDS.

SYSTEM FUNCTIONAL TEST

3. Push Mode 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 Lo TRK Mode and move VOR OBS so that VOR needle moves left and right - control wheel should follow the direction of needle movement.
B. Select Hi TRK Mode - the control wheel should again follow radio needle movement and with more authority than produced by Lo TRK Mode.
7. Move control wheel to level flight position - Engage ALT Mode. Move control wheel fore and aft to overpower pitch servo clutch. 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.

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8. Trim Check - Manually apply back pressure to control wheel for 2-3 seconds - observe the DN trim light illuminates. Apply forward pressure to the control wheel for 2-3 seconds, observe the UP trim light illuminates. Move the control wheel to center - observe both UP/DN lights extinguish.
9. Hold control wheel and push mode knob for 2 seconds - note that roll and pitch servos release. Move control wheel to confirm roll and pitch 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

NOTE: The required pre-flight test can be conducted in flight if necessary. It should be noted, however, that when the UP/DN lights are flashing the pitch servo will momentarily engage and disengage. This alternate engage-disengage sequence is part of the test function. Because of the engage-disengage sequence the test should not be conducted while maneuvering.

1. Check - RDY light on.
2. Trim aircraft for existing flight condition. Maintain Yaw Trim during all Autopilot operations.
3. Center turn-knob - Press turn knob to select stabilizer mode.
4. Set turn knob to level or turning flight, as desired.
5. Set HDG bug to desired heading (if installed) and press knob to engage heading mode, select headings as desired.
6. At desired altitude, press ALT Mode Switch on control wheel. Trim aircraft as necessary to establish cruise condition - disengage ALT Mode to climb or descend.

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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 degrees of the course heading.
3. Engage Lo TRK Mode for VOR tracking.
4. Engage Hi TRK Mode for VOR or LOC approach.

Hi TRK Mode may be used to track VOR radials cross country if desired. Use of Hi TRK 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 Lo TRK Mode may provide more accurate tracking even with reduced gain.

GPS TRACKING AND GPS APPROACH

1. Begin track with a reliable GPS signal and CDI needle centered, with aircraft on the suggested heading to the waypoint.
2. Select the Hi track mode for GPS tracking or GPS approach.

SECTION V

OPERATIONAL DATA

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

SECTION VI

REQUIRED OPERATING EQUIPMENT

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

SECTION VII

WEIGHT AND BALANCE

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

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