S-TEC CORPORATION
MINERAL WELLS, TEXAS 76067

FAA/DAS APPROVED
PILOT'S OPERATING HANDBOOK AND/OR
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
PIPER MODELS PA-28-140, PA-28-150, PA-28-160; AND PA-28-180, S/N 28-1 THROUGH S/N 28-7205318; AND PA-28-235, S/N 28-10001 THROUGH S/N 28-11378 AND S/N 28-7110001 THROUGH S/N 28-7210023

WITH
S-TEC SYSTEM 20 SINGLE AXIS
AUTOMATIC FLIGHT GUIDANCE SYSTEM
(14 VOLT SYSTEM)

REG. NO. N7776N

SER. NO. 28-5224

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 20 Autopilot Model ST-711-20 installed in accordance with STC SA09254AC-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 20 Single 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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SECTION II

OPERATING LIMITATIONS

1. Autopilot operation prohibited above the following airspeeds:
   (a) For Models PA-28-140, PA-28-150, PA-28-160, and PA-28-180, 155 MPH, CAS (Autopilot Vmo).
   (b) For Model PA-28-235, 180 MPH CAS (Autopilot Vmo).
2. Autopilot operation prohibited 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:

Configuration	Bank Angle/Altitude Loss
Climb	45°/-20′
Cruise	50°/-40′
Descent	50°/-120′

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

Configuration	Bank Angle/Altitude Loss
Maneuvering	18°/NONE
Approach (coupled or uncoupled)	15°/-20'

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 20 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.

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.

NOTE: Some of the features shown in the illustration (page 5) are not available on the System 20 Single Axis Autopilot but are only available on the S-TEC System 30 Autopilot which includes the altitude hold feature. These items are depicted only because both autopilots use the same turn coordinator instruments.

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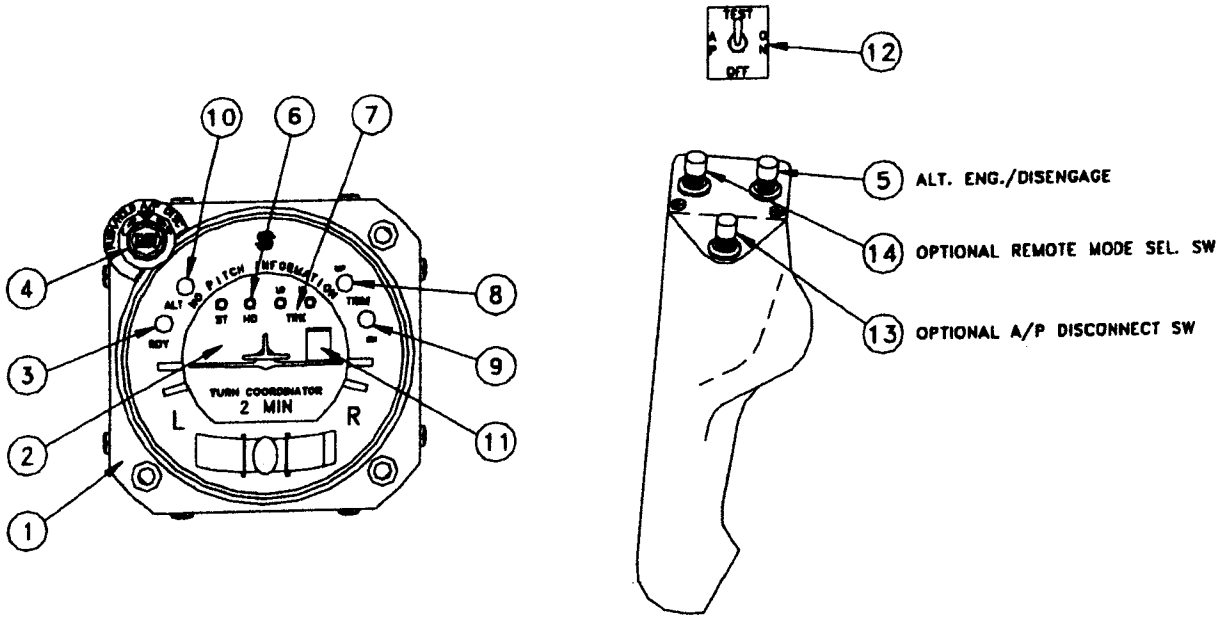

1. Turn Coordinator, Mode Programmer and Annunciator Unit - Provides basic flight information, autopilot mode switching and annunciation.

2. Mode Annunciation Window - Displays mode in use.

3. Green Ready (RDY) Light - Illuminates when autopilot is ready for engagement

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. This switch not available on the system 20 autopilot.

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.

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. This function not available on the system 20 autopilot.

9. This function not available on the system 20 autopilot.

10. This function not available on the system 20 autopilot.

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. Depressing this switch for more than two seconds will also disconnect the autopilot.

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).

FUNCTIONAL PRE-FLIGHT TEST

1. AP Master Switch - Move to A/P position - Observe all lights and annunciators illuminate. After a few seconds all lights except the "READY" light will extinguish indicating that the autopilot is ready to be engaged.

2. Momentarily Press Mode Knob - STB Annunciator illuminates. Rotate turn knob left and right, observe control wheel moves in corresponding direction. Center turn knob.

3. Set D.G. (if installed) and place bug under lubber line. Push turn knob to engage HDG mode. Observe HDG annunciator. Move HDG bug left and right observe proper control wheel motion.

4. 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.

5. 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.

6. Hold control wheel and push mode knob for 2 seconds - 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.

3. Center turn-knob - push mode knob once to enter stabilizer mode.

4. Set turn knob to level or turning flight, as desired.

5. Set HDG bug to desired heading (if installed) and press mode knob again 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 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.