

SECTION 9 - SUPPLEMENTS

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SECTION 9

SUPPLEMENTS

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**SECTION 9
SUPPLEMENTS**

9.1 GENERAL

This section provides information in the form of Supplements which are necessary for efficient operation of the airplane when equipped with one or more of the various optional systems and equipment not provided with the standard airplane.

All of the Supplements provided by this section are "FAA Approved" and consecutively numbered as a permanent part of this Handbook. The information contained in each Supplement applies only when the related equipment is installed in the airplane.

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SUPPLEMENT 1

WINDSHIELD HEATING INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the efficient operation of the airplane when the optional windshield heating system is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional windshield heating system is installed.

SECTION 2 - LIMITATIONS

Under no circumstances should the unit be turned on for a period exceeding 30 seconds unless:

- (a) The aircraft is in flight or
- (b) Ice exists on the heated panel.

SECTION 3 - EMERGENCY PROCEDURES

No changes to the basic Emergency Procedures provided by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 - NORMAL PROCEDURES

An operational check is accomplished by turning the heated panel switch on for a period not exceeding 30 SECONDS. Proper operation is indicated by the glass section being warm to the touch.

SECTION 5 - PERFORMANCE

An additional compass deviation card is required with this installation. This card should indicate corrected readings with windshield heat and radios on.

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SUPPLEMENT 2

OXYGEN INSTALLATION - SCOTT AVIATION PRODUCTS
EXECUTIVE MARK III PART NUMBER 802180-00 OR 802180-01

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional oxygen system is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional oxygen system is installed.

SECTION 2 - LIMITATIONS

- (a) No smoking allowed.
- (b) The aircraft is restricted to six occupants with two (2) oxygen units installed.
- (c) The aircraft is restricted to four occupants with one (1) oxygen unit installed.
- (d) Oxygen duration:

DURATION IN HOURS AT ALTITUDE

Persons Using Each Unit	5,000	10,000	15,000	20,000	25,000
1	10.6	6.3	4.7	3.8	3.3
2	5.3	3.2	2.4	1.9	1.7
3	3.5	2.1	1.6	1.3	1.1
4	2.7	1.6	1.2	.95	.8

NOTE

For six occupants maximum duration will be obtained with three (3) persons utilizing each unit. See above chart for number of persons vs duration (per unit).

SECTION 3 - EMERGENCY PROCEDURES

- (a) Time of useful consciousness at 25,000 feet is approximately 3 minutes.
- (b) If oxygen flow is interrupted as evidenced by the flow indicators or hypoxic indications;
 - (1) Install another mask unit.
 - (2) Install mask connection in an unused outlet if available.
 - (3) If flow is not restored, immediately descend to below 12,500 feet.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT

- (a) Check oxygen quantity.
- (b) Installation (Forward facing seating arrangement only)
 - (1) Remove middle center seat and secure oxygen units to seat by use of belts provided.
 - (2) Reinstall seat and secure seat by adjusting the middle seat belt tightly around seat aft of the oxygen units.
- (c) Installation (Club seating arrangement only)
 - (1) Install mounting base between center seats utilizing slotted receptacles for front attachment points and bolts for aft attachment points.
 - (2) Slide oxygen bottles into position on top of mounting base ensuring that all mounting lugs engage in the slotted receptacle and that the locking pin is in the raised position.
- (d) Turn on oxygen system and check flow indicators on all masks. Masks for the two aft seats are stowed in the seat pockets of the middle seats. All other masks are stowed in the oxygen system containers.

IN-FLIGHT

- (a) Adjust oxygen mask.
- (b) Turn on system.
- (c) Monitor flow indicators and quantity.

CAUTION

Use of oxygen unit is prohibited when gauge approaches red area.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

SUPPLEMENT 2A

FIXED OXYGEN SYSTEM INSTALLATION - SCOTT AVIATION PRODUCTS
AMBASSADOR MARK III PART NUMBER 802889-03

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional fixed oxygen system is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional fixed oxygen system is installed.

SECTION 2 - LIMITATIONS

- (a) No smoking allowed when oxygen system is in use.
- (b) Oxygen duration: (Bottle pressure 1850 PSI)

DURATION IN HOURS AT ALTITUDE
(Based on 90% Consumption)

Persons Using Each Unit	5,000	10,000	15,000	20,000	25,000
1	7.4	7.7	8.1	8.3	8.5
2	3.7	3.9	4.1	4.2	4.3
3	2.5	2.6	2.7	2.8	2.8
4	1.9	1.9	2.0	2.1	2.1
5	1.5	1.5	1.6	1.7	1.7
6	1.2	1.3	1.4	1.4	1.4

SECTION 3 - EMERGENCY PROCEDURES

- (a) Time of useful consciousness at 25,000 feet is approximately 3 minutes.
- (b) If oxygen flow is interrupted as evidenced by the flow indicators or hypoxic indications;
 - (1) Install another mask unit.
 - (2) Install mask connection in an unused outlet if available.
 - (3) If flow is not restored, immediately descend to below 12,500 feet.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT

- (a) Check oxygen quantity.
- (b) Turn on oxygen system and check flow indicators on all masks. All masks are stored in the seat pockets of the front and middle seats.

IN-FLIGHT

- (a) Adjust oxygen mask.
- (b) Turn on system.
- (c) Monitor flow indicators and quantity.

CAUTION

Do not use oxygen system below 200 PSI to prevent contamination and/or moisture from entering depleted cylinder-regulator assembly. If cylinder has been depleted it must be removed and refurbished in accordance with the manufacturer's recommended procedures.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

SUPPLEMENT 3

AUTOCONTROL IIIB AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Piper AutoControl IIIB Autopilot is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook based on EDO-AIRE Mitchell STC SA3024SW-D and must remain in this handbook at all times when the optional Piper AutoControl IIIB Autopilot is installed.

SECTION 2 - LIMITATIONS

- (a) Autopilot operation prohibited above 172 KIAS. (Autopilot Vmo)
- (b) Autopilot must be "OFF" for takeoff and landing.

SECTION 3 - EMERGENCY PROCEDURES

- (a) In an emergency the AutoControl IIIB can be disconnected by:
 - (1) Pushing the AP ON-OFF switch "OFF."
 - (2) Pulling the AP circuit breaker.
- (b) The autopilot can be overpowered at either control wheel.
- (c) An autopilot runaway, with a 3 second delay in the initiation of recovery while operating in climb, cruise or descending flight, could result in a 60° bank and 150 foot altitude loss.
- (d) An autopilot runaway, with a 1 second delay in the initiation of recovery, during an approach operation, coupled or uncoupled, could result in 18° and 20 foot altitude loss.
- (e) Emergency operation with optional NSD 360 and NSD 360A (HSI) - Slaved and/or Non-Slaved:

NSD 360

- (1) Appearance of HDG Flag:
 - a. Check air supply gauge (vac or pressure) for adequate air supply (4 in. Hg. min.).
 - b. Check compass circuit breaker.
 - c. Observe display for proper operation.
- (2) To disable heading card - pull circuit breaker and use magnetic compass for directional data.

NOTE

If heading card is not operational, autopilot should not be used.

- (3) With card disabled:
 - a. VOR and Glide Slope displays are still functional; use card set to rotate card to aircraft heading for correct picture.
 - b. Localizer - left-right information still usable. Flag information is disabled - compare needle with No. 2 indicator for valid left-right needle operation.
- (4) Slaving Failure - (i.e. failure to self-correct for gyro drift):
 - a. Check gyro slaving switch is set to No. 1 position.
 - b. Check for HDG Flag.
 - c. Check compass circuit breaker.
 - d. Reset heading card while observing slaving meter.
 - e. Select slaving amplifier No. 2 (gyro slaving switch is set to No. 2 position).
 - f. Reset heading card while checking slaving meter.
 - g. Switch to free gyro and periodically set card as unslaved gyro.

NSD 360A (Instrument with red-white striped NAV-HDG Flags)

- (1) The emergency procedures for the NSD 360A remain identical to those listed for the NSD 360 (above), except that the presence of the NAV Flag on a localizer frequency invalidates the NAV left-right information. Usable navigation data will be indicated in both VOR and Localizer modes by the absence of the NAV Flag, whether the card is disabled or not.
- (2) In the localizer mode the "TO-FROM" arrows may remain out of view, depending upon the design of the NAV converter used in the installation.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT

- (a) **AUTOPILOT**
 - (1) Place radio coupler in HDG mode (if installed) and place the AP "ON-OFF" switch to the "ON" position to engage roll section. Rotate roll command knob left and right and observe that control wheel describes a corresponding left and right turn, then center knob.
 - (2) Set proper D.G. heading on D.G. and turn HDG bug to aircraft heading. Engage HDG mode rocker switch and rotate HDG bug right and left. Aircraft control wheel should turn same direction as bug. Grasp control wheel and manually override servo, both directions.
- (b) **RADIO COUPLER - (OPTIONAL)**
 - (1) Tune and identify VOR or VOT station. Position radio coupler to OMNI mode. Place autopilot and HDG switches to the ON position. Set HDG bug to aircraft heading and rotate OBS to cause OMNI indicator needle to swing left and right slowly. Observe that control wheel rotates in direction of needle movement.
 - (2) Disengage AP "ON-OFF" switch. Reset radio coupler control to HDG.

IN-FLIGHT

- (a) Trim airplane (ball centered).
- (b) Check air pressure or vacuum to ascertain that the directional gyro and attitude gyro are receiving sufficient air.

- (c) Roll Section:
- (1) To engage, center ROLL COMMAND knob, push AP "ON-OFF" switch to "ON" position. To turn, rotate ROLL COMMAND knob in desired direction. (Maximum angle of bank should not exceed 30°.)
 - (2) For heading mode, set directional gyro with magnetic compass. Push directional gyro HDG knob in, rotate bug to aircraft heading. Push console heading rocker (HDG) switch to "ON" position. To select a new aircraft heading, push D.G. heading knob "IN" and rotate, in desired direction of turn, to the desired heading.
- (d) Radio Coupling VOR-ILS with H.S.I. (Horizontal Situation Indicator) Type Instrument Display. (Optional)
- (1) VOR Navigation
 - a. Tune and identify VOR station. Select desired course by rotating CRS knob of H.S.I. (H.S.I. course knob).
 - b. Select OMNI mode on radio coupler.
 - c. Select HDG mode on autopilot console to engage coupler. Aircraft will turn to a 45° intercept angle to intercept the selected VOR course. Intercept angle magnitude depends on radio needle off course magnitude, 100% needle deflection will result in 45° intercept with the intercept angle diminishing as the needle offset diminishes.
 - d. NAV mode - NAV mode provides reduced VOR sensitivity for tracking weak, or noisy VOR signals. NAV mode should be selected after the aircraft is established on course.
 - (2) ILS-LOC Front Course
 - a. Set inbound, front, localizer course with H.S.I. course knob.
 - b. Select LOC-Normal on radio coupler to intercept and track inbound on the localizer. Select LOC-REV to intercept and track the localizer course outbound to the procedure turn area.
 - c. Select HDG mode on autopilot console to engage coupler.
 - (3) ILS - Back Course
 - a. Set inbound, front localizer course with H.S.I. course knob.
 - b. Select LOC-REV on radio coupler to intercept and track inbound on the back localizer course. Select LOC-NORM to intercept and track outbound on the back course to the procedure turn area.
 - c. Select HDG mode on autopilot console to engage coupler.
- (e) Radio Coupling - VOR/ILS with standard directional gyro. (Optional)
- Radio coupler operation in conjunction with a standard directional gyro and VOR/LOC display differs from operation with an integrated display (H.S.I.) only in one respect. The HDG bug is used as the radio course datum and therefore must be set to match the desired VOR course as selected on the OBS.
- (1) For VOR intercepts and tracking:

Select the desired VOR course and set the HDG bug to the same heading. Select OMNI mode on the coupler and HDG mode on the autopilot console.
 - (2) For ILS Front Course intercepts and tracking:

Tune the localizer frequency and place the HDG bug on the inbound, front course heading. Select LOC-NORM mode on the coupler and HDG mode on the autopilot console.

- (3) For LOC Back Course intercepts and tracking:

Tune the localizer frequency and place the HDG bug on the inbound course heading to the airport. Select LOC-REV mode with coupler and HDG mode on the autopilot console.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

SUPPLEMENT 4

ALTIMATIC IIIC AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional AltiMatic IIIC Autopilot is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook based on EDO-AIRE Mitchell STC SA3023SW-D and must remain in this handbook at all times when the optional AltiMatic IIIC Autopilot is installed.

SECTION 2 - LIMITATIONS

- (a) Autopilot operation prohibited above 172 KIAS. (Autopilot Vmo)
- (b) Autopilot must be "OFF" during takeoff and landing.
- (c) Autopilot operation not authorized with greater than 25° of flap extension.
- (d) Required placard P/N 13A660-1 "Conduct Trim Check prior to flight (see P/O/H)" to be installed in clear view of pilot.
- (e) During autopilot operation, the pilot must be in his seat with the safety belt fastened.

SECTION 3 - EMERGENCY PROCEDURES

This aircraft is equipped with a Master Disconnect/Interrupt Switch on the pilot's control wheel. When the switch button is depressed it will disconnect the autopilot. When depressed and held it will interrupt all Electric Elevator Trim Operations. Trim operations will be restored when the switch is released. If an autopilot or trim emergency is encountered, do not attempt to determine which system is at fault. Immediately depress and hold the Master Disconnect/Interrupt button. Turn off autopilot and trim master switch and retrim aircraft, then release the interrupt switch.

NOTE

During examination of this supplement, the pilot is advised to locate and identify the autopilot controls, the trim master switch and circuit breaker for both systems.

- (a) In the event of an autopilot malfunction the autopilot can be:
- (1) Overpowered at either control wheel.

CAUTION

Do not overpower autopilot pitch axis for periods longer than 3 seconds because the autotrim system will operate in a direction to oppose the pilot and will, thereby, cause an increase in the pitch overpower forces.

- (2) Disconnected by depressing the Master Disconnect/Interrupt Switch.
 - (3) Disconnected by depressing the Trim Switch "AP OFF" bar.
 - (4) Disconnected by pushing the roll rocker switch "OFF."
- (b) In the event of a trim malfunction:
- (1) Depress and hold the Master Trim Interrupt Switch.
 - (2) Trim Master Switch - "OFF." Retrim aircraft as necessary using manual trim system.
 - (3) Release Master Interrupt Switch - be alert for possible trim action.
 - (4) Trim Circuit Breaker - Pull. Do not operate trim until problem is corrected.
- (c) If a trim runaway occurs with the autopilot operating, the above procedure will disconnect the autopilot which will immediately result in higher control wheel forces. Be prepared to manually retrim, as necessary to eliminate undesirable forces.
- (d) Altitude Loss During Malfunction:
- (1) An autopilot malfunction during climb, cruise or descent with a 3 second delay in recovery initiation could result in as much as 60° of bank and 200' of altitude loss.
 - (2) Altitude loss - high altitude descent - 3 second delay in recovery could result in a 60° bank and a 420' altitude loss.
 - (3) An autopilot malfunction during an approach with a 1 second delay in recovery initiation could result in as much as 20° of bank and 75' altitude loss. Maximum altitude loss measured in approach configuration gear down and operating either coupled or uncoupled, single or multi-engine.
- (e) Emergency Operation With Optional NSD 360 and NSD 360A (HSI) - Slaved and/or Non-Slaved:
- NSD 360
- (1) Appearance of HDG Flag:
 - a. Check air supply guage (vac or pressure) for adequate air supply (4 in. Hg. min.).
 - b. Check compass circuit breaker.
 - c. Observe display for proper operation.
 - (2) To disable heading card - pull circuit breaker and use magnetic compass for directional data.

NOTE

If heading card is not operational, autopilot should not be used.

- (3) With card disabled:
 - a. VOR and Glide Slope displays are still functional; use card set to rotate card to aircraft heading for correct picture.
 - b. Localizer - left-right information still usable. Flag information is disabled - compare needle with No. 2 indicator for valid left-right needle operation.
- (4) Slaving Failure - (i.e. failure to self-correct for gyro drift):
 - a. Check gyro slaving switch is set to No. 1 position.
 - b. Check for HDG Flag.
 - c. Check compass circuit breaker.
 - d. Reset heading card while observing slaving meter.
 - e. Select slaving amplifier No. 2 (gyro slaving switch is set to No. 2 position).
 - f. Reset heading card while checking slaving meter.
 - g. Switch to free gyro and periodically set card as unslaved gyro.

NSD 360A (Instrument with red-white striped NAV-HDG Flags)

- (1) The emergency procedures for the NSD 360A remain identical to those listed for the NSD 360 (above), except that the presence of the NAV Flag on a localizer frequency invalidates the NAV left-right information. Usable navigation data will be indicated in both VOR and Localizer modes by the absence of the NAV Flag, whether the card is disabled or not.
 - (2) In the localizer mode the "TO-FROM" arrows may remain out of view, depending upon the design of the NAV converter used in the installation.
- (f) Single Engine Operations:
- (1) Engine failure during an autopilot approach operation: Disengage autopilot conduct remainder of approach manually.
 - (2) Engine failure during go around: Disengage autopilot, retrim aircraft, perform normal aircraft engine out procedures then re-engage autopilot.
 - (3) Engine failure during normal climb, cruise, descent: Retrim aircraft, perform normal aircraft engine out procedures.
 - (4) Maintain aircraft yaw trim throughout all single engine operations.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT INSPECTION - AUTOPILOT

- (a) Roll Section
 - (1) Place Radio Coupler in "Heading" mode and place roll rocker switch "ON" to engage roll section. Rotate roll command knob left and right and observe that control wheel describes a corresponding left and right turn, then center knob.
 - (2) Set proper D.G. Heading on D.G. and turn Heading Bug to aircraft heading. Engage "Heading" mode rocker switch and rotate heading bug right and left. Aircraft control wheel should turn same direction as bug. Grasp control wheel and manually override servo, both directions.
 - (3) Disengage autopilot by depressing trim switch. Check aileron operation is free and autopilot is disconnected from controls.

(b) Pitch Section

- (1) Engage "Roll" rocker switch.
- (2) Center pitch command disc and engage "Pitch" rocker switch.
- (3) Rotate pitch command disc full DOWN and full UP and check that control wheel moves same direction. Check to see that servo can be overridden by hand at control wheel.

NOTE

Autopilot might not be able to raise elevators, on ground, without assistance from pilot.

- (4) Hold control wheel and disengage autopilot by pressing Master Autopilot Disconnect/Trim Interrupt Switch button. Check Roll and Pitch controls to assure autopilot has disconnected.

TRIM SYSTEM

General

This aircraft is equipped with a Command Trim System designed to withstand any type of single malfunction, either mechanical or electrical, without uncontrolled operation resulting. The preflight check procedure is designed to uncover hidden failures that might otherwise go undetected. Proper operation of the electric trim system is predicated on conducting the following preflight check before each flight. If the trim system fails any portion of the procedure, pull the trim circuit breaker out until trim system is repaired. Substitution of any trim system component for another model is not authorized. For emergency interrupt information, refer to Section 3 of this Supplement.

Command Electric Trim Switch

The Command Electric Trim Switch on the left hand portion of the pilot's control wheel has two functions:

- (1) When the top bar (AP OFF) is pressed, it disconnects the Autopilot.
- (2) When the top bar is pressed AND the rocker is moved forward, nose down trim will occur, when moved aft, nose up trim will occur.

(a) Preflight: Command Trim - Before Each Flight

- (1) Check trim circuit breaker - IN.
- (2) Trim Master Switch - ON.
- (3) AP OFF - Check normal trim operation - UP. Grasp trim wheel and check override capability. Check nose down operation. Recheck override.
- (4) Activate center bar only. Trim should not operate.
- (5) Without pressing center bar, move rocker fore and aft - trim should not operate with either separate action.

(b) Autotrim - Before Each Flight

- (1) AP ON - (Roll and Pitch Sections) Check automatic operation by activating autopilot pitch command UP then DN. Observe trim operation follows pitch command direction.

NOTE

In autopilot mode, there will be approximately a 3 second delay between operation of pitch command and operation of trim.

- (2) Press center bar (AP OFF) - release - check autopilot disengagement.
- (3) Rotate trim wheel to check manual trim operation. Reset to takeoff position prior to takeoff.

AUTOPILOT IN-FLIGHT PROCEDURE

- (a) Trim airplane (ball centered).
- (b) Check air pressure or vacuum to ascertain that the directional gyro and attitude gyro are receiving sufficient air.
- (c) Roll Section
 - (1) To engage - Center ROLL COMMAND knob, push ROLL rocker to "ON" position. To turn, rotate console ROLL knob in desired direction.
 - (2) For heading mode, set directional gyro with magnetic compass. Push directional gyro HDG knob in, rotate to select desired heading. Push console heading rocker (HDG) to "ON" position. (Maximum angle to bank will be 20° with heading lock engaged.)
- (d) Pitch Section (Roll section must be engaged prior to pitch section engagement).
 - (1) Center pitch trim indicator with the pitch command disc.
 - (2) Engage pitch rocker switch. To change attitude, rotate pitch command disc in the desired direction.
- (e) Altitude Hold

Upon reaching desired or cruising altitude, engage altitude hold mode rocker switch. As long as Altitude Hold mode rocker is engaged, aircraft will maintain selected altitude. For maximum passenger comfort, rate of climb or descent should be reduced to approximately 500 FPM prior to altitude hold engagement. For accurate Altitude Holding below 100 KIAS lower flaps one or two notches.

NOTE

Prior to disengaging Altitude Hold mode, rotate Pitch Command Disc to center.

- (f) Radio Coupling VOR-ILS with H.S.I. type instrument display. (Optional)
 - (1) VOR Navigation
 - a. Tune and identify VOR Station. Select desired course by rotating CRS knob of H.S.I.
 - b. Select OMNI mode on Radio Coupler.
 - c. Select HDG mode on autopilot console to engage coupler. Aircraft will turn to a 45° intercept angle to intercept the selected VOR course. Intercept angle magnitude depends on radio needle off - course magnitude, 100% needle deflection will result in 45° intercept angle, diminishing as the needle off-set diminishes.
 - d. NAV mode - NAV mode provides reduced VOR sensitivity for tracking weak, or noisy, VOR signals. NAV mode should be selected after the aircraft is established on course.

- (2) ILS-LOC Front Course
 - a. Set inbound, front, localizer course with H.S.I. course knob.
 - b. Select LOC Normal on Radio Coupler to intercept and track inbound on the localizer. Select LOC-REV to intercept and track the localizer course outbound to procedure turn area.
 - c. Select HDG mode on autopilot console to engage coupler.
- (3) ILS - Back Course
 - a. Set inbound, front, localizer course with H.S.I. course knob.
 - b. Select LOC-REV, on radio coupler to intercept and track inbound on the back localizer course. Select LOC-NORM to intercept and track outbound on the back course to the procedure turn area.
 - c. Engage HDG mode on autopilot console to engage coupler.
- (g) Radio Coupling - VOR/ILS with standard directional gyro. (Optional)

Radio Coupler operation in conjunction with a standard directional gyro and VOR/LOC display differs from operation with an integrated display (H.S.I.) only in one respect. The HDG bug is used as the radio course datum and therefore must be set to match the desired VOR/ILS course as selected on the O.B.S.

 - (1) For VOR Intercepts and Tracking:

Select the desired VOR Course and set the HDG bug to the same heading. Select OMNI mode on the coupler and engage HDG mode on the autopilot console.
 - (2) For ILS Front Course Intercepts and Tracking:

Tune the localizer frequency and place the HDG bug on the inbound, front course heading. Select LOC-NORM mode on the coupler and engage HDG mode on the autopilot console.
 - (3) For LOC Back Course Intercepts and Tracking:

Tune the localizer frequency and place the HDG bug on the inbound course heading to the airport. Select LOC-REV mode on the coupler and engage HDG mode on the autopilot console.
- (h) Coupled Approach Operations
 - (1) VOR or LOC
 - a. After arrival at the VOR Station, track outbound to the procedure turn area as described in Section 4 (f) or (g) as appropriate. Slow to 100 -105 KIAS while inbound to FAF and lower one or two notches of flaps (10° or 25°).
 - b. Use HDG mode and Pitch or Altitude Hold modes as appropriate during procedure turn.
 - c. At the F.A.F. inbound, return to pitch mode for control of descent and lower landing gear.
 - d. At the M.D.A. select altitude hold mode and add power for level flight. Monitor altimeter to assure accurate altitude control is being provided by the autopilot.
 - e. Go Around - For missed approach select desired pitch attitude with pitch command disc and disengage altitude hold mode. This will initiate the pitch up attitude change. Immediately add takeoff power and monitor Altimeter and rate of climb for positive climb indication. After climb is established, retract flaps and gear. Adjust attitude as necessary for desired airspeed and select HDG mode for turn from the VOR final approach course.

- (2) ILS - Front Course Approach With Glide Slope Capture. (Optional)
- a. Track inbound to LOM as described in Section 4 (f) or (g) above and in Altitude Hold mode.
 - b. Inbound to LOM slow to 100 to 105 KIAS and lower flaps one or two notches (10° or 25°)
 - c. Automatic Glide Slope capture will occur at Glide Slope intercept if the following conditions are met:
 1. Coupler in LOC-Normal mode.
 2. Altitude Hold mode engaged (Altitude Rocker on Console).
 3. Under Glide Slope for more than 20 seconds.
 4. Localizer radio frequency selected on NAV Receiver.
 - d. At Glide Slope Intercept immediately reduce power to maintain 100 KIAS on final approach and lower landing gear. Glide Slope capture is indicated by lighting of the green Glide Slope engage Annunciator Lamp and by a slight pitch down of the aircraft.
 - e. Monitor localizer and Glide Slope raw data throughout approach. Adjust power as necessary to maintain correct final approach airspeed. All power changes should be of small magnitude and smoothly applied for best tracking performance. Do not change aircraft configuration during approach while autopilot is engaged;
 - f. Conduct missed approach maneuver as described in (h) (1) e. above.

NOTE

Glide Slope Coupler will not automatically decouple from Glide Slope. Decoupling may be accomplished by any of the following means:

1. Disengage Altitude Mode.
2. Switch Radio Coupler to HDG Mode.
3. Disengage Autopilot.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

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SUPPLEMENT 5

AIR CONDITIONING INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the efficient operation of the airplane when the optional air conditioning system is installed. The information contained within this supplement is to be used "as described" in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional air conditioning system is installed.

SECTION 2- LIMITATIONS

- (a) To insure maximum climb performance the air conditioner must be turned "OFF" manually prior to takeoff to disengage the compressor and retract the condenser door. Also the air conditioner must be turned "OFF" manually before the landing approach in preparation for a possible go-around.

- (b) Placards
In full view of the pilot, in the area of the air conditioner controls when the air conditioner is installed:

**"AIR CONDITIONER MUST BE OFF PRIOR TO TAKE-OFF
AND LANDING AND SINGLE ENGINE OPERATION"**

In full view of the pilot, beside the condenser door light:

"AIR COND DOOR OPEN"

SECTION 3 - EMERGENCY PROCEDURES

No changes to the basic Emergency Procedures provided by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 - NORMAL PROCEDURES

Prior to takeoff, the air conditioner should be checked for proper operation as follows:

- (a) Check aircraft master switch "ON".
- (b) Turn the air conditioner control switch to "ON" and the fan switch to one of the operating positions - the "AIR COND DOOR OPEN" warning light will turn on, thereby indicating proper air conditioner condenser door actuation.

- (c) Turn the air conditioner control switch to "OFF" - the "AIR COND DOOR OPEN" warning light will go out, thereby indicating the air conditioner door is in the retracted position.
- (d) If the "AIR COND DOOR OPEN" light does not respond as specified above, an air conditioner system or indicator bulb malfunction is indicated and further investigation should be conducted prior to flight.

The above operational check may be performed during flight if an in flight failure is suspected.

The condenser door light is located to the left of the warning gear unsafe light in front of the pilot. The door light illuminates when the door is open and is off when the door is closed.

SECTION 5 - PERFORMANCE

Operation of the air conditioner will cause slight decreases in cruise speed and range. Power from the engine is required to run the compressor, and the condenser door, when extended, causes a slight increase in drag. When the air conditioner is turned off there is normally no measurable difference in climb, cruise or range performance of the airplane.

NOTE

To insure maximum climb performance the air conditioner must be turned off manually before takeoff to disengage the compressor and retract the condenser door. Also the air conditioner must be turned off manually before the landing approach in preparation for a possible go-around. The air conditioner must be off during all one engine inoperative operations.

Although the cruise speed and range are only slightly affected by the air conditioner operation, these changes should be considered in preflight planning. To be conservative, the following figures assume that the compressor is operating continuously while the airplane is airborne. This will be the case only in extremely hot weather.

- (a) The decrease in true airspeed is approximately 4 KTS at all power settings.
- (b) The decrease in range may be as much as 25 nautical miles for the 93 gallon capacity.
- (c) The decrease in range may be as as much as 35 nautical miles for the 123 gallon capacity.

The climb performance is slightly affected by the air conditioner operation. A decrease in the rate of climb of as much as 80 fpm can be expected at all altitudes with the air conditioner operating.

SUPPLEMENT 6

**KFC 200 AUTOMATIC FLIGHT CONTROL SYSTEM
(WITH FLIGHT DIRECTOR INSTALLATION)**

SECTION 1 - GENERAL

This manual is to acquaint the pilot with the operation of the KFC 200 Automatic Flight Control System with optional Flight Director as installed in the PA-34-200T Seneca II. The airplane must be operated within the limitations herein specified.

This supplement has been "FAA Approved" as a permanent part of this handbook based on King STC SA1147CE and must remain in this handbook at all times when the optional King KFC 200 Automatic Flight Control System is installed.

The KFC 200 is certified in this airplane with two axis control, pitch and roll. The system may be operated as a flight director alone with the pilot steering the airplane to the flight director command presentation or the autopilot can be engaged to steer the airplane to the flight director command presentation.

The airplane is equipped with an electric trim system which is controlled by pilot operation of the trim switch.

The autopilot uses the electric trim to accomplish automatic trimming to unload the autopilot elevator servo so that autopilot disengagement does not result in transient airplane motion. An autotrim/electric pitch trim monitor is provided in the autopilot. Autotrim and/or electric pitch trim faults are visually annunciated on the Mode Annunciator and accompanied by an audible warning.

ABBREVIATIONS

ALT	Altitude or Altitude Hold
AP	Autopilot
APPR	Approach
ARM	System Arm for Capture
BC	Back Course
CDI	Course Deviation Indicator or Control
CPLD	Coupled
DISC	Disconnect
FDI	Flight Director Indicator
FCS	Flight Control System
FD	Flight Director
GA	Go Around
HDG	Heading Select
NAV	Navigation
PAH	Pitch Attitude Hold
PNI	Pictorial Navigation Indicator

SECTION 2 - LIMITATIONS

- (a) During autopilot operation, pilot must be seated at the controls with seat belt fastened. Operation is restricted to left side pilot position.
- (b) Maximum speed for autopilot operation is 173 KIAS.
- (c) The maximum altitude for operation of the autopilot has not been determined. The maximum altitude flight tested was 24,000 feet.
- (d) Do not extend flaps beyond 25° during autopilot operation.
- (e) The autopilot must be disengaged during takeoff and landing.
- (f) System approved for Category I operation only (APPR or BC selected).
- (g) Autopilot attitude command limits:
 - Pitch ± 15
 - Roll ± 25
- (h) Placards:

Location - Pilot's control wheel, left horn:

AP TRIM
DISC INTERRUPT

- Pilot's control wheel, left horn:

CWS

- Pilot's control wheel, left horn:

TRIM UP/DN

- Left throttle lever:

GO AROUND

SECTION 3 - EMERGENCY PROCEDURES

- (a) AUTOPILOT DISENGAGEMENT
 - Disengage the autopilot and/or prevent engagement by:
 - (1) Pilot's DISC switch.
 - (2) AP engage lever on MODE CONTROLLER.
 - (3) Pulling the autopilot circuit breaker.
 - (4) Turning BAT-MASTER switch OFF.
 - (5) Turning RADIO POWER switch OFF.

(b) AUTOMATIC AUTOPILOT DISENGAGEMENT

Any of the following will cause the autopilot to automatically disengage:

- (1) External power failure.
- (2) Actuating manual electric trim.
- (3) Internal Flight Control System failure.
- (4) With KCS 55A system a loss of compass valid, (displaying HDG flag) disengages the AP and FD when a mode using heading information is engaged. With compass flag present only FD and vertical modes can be selected.

(c) ELECTRIC PITCH TRIM

Electric pitch trim can be disengaged by pressing AP and TRIM DISC switch and holding it down until recovery can be made then turn off RADIO POWER and manually retrim the airplane using the manual trim control wheel. After the airplane is trimmed out pull the trim breaker and turn the RADIO POWER switch back on.

(d) MAXIMUM ALTITUDE LOSSES DUE TO AUTOPILOT MALFUNCTION

- | | |
|----------------------------|----------|
| (1) Cruise, Climb, Descent | 400 feet |
| (2) Maneuvering | 100 feet |
| (3) APPR | 50 feet |
| (4) SE APPR | 50 feet |

CAUTION

WHEN THE AUTOPILOT IS ENGAGED, MANUAL APPLICATION OF A FORCE TO THE PITCH AXIS OF THE CONTROL WHEEL FOR A PERIOD OF THREE SECONDS OR MORE WILL RESULT IN THE AUTOTRIM SYSTEM OPERATING IN THE DIRECTION TO CREATE A FORCE OPPOSING THE PILOT. THIS OPPOSING MISTRIM FORCE WILL CONTINUE TO INCREASE, AS LONG AS THE PILOT APPLIES A FORCE TO THE CONTROL WHEEL, AND WILL ULTIMATELY OVERPOWER THE AUTOPILOT. IF THE AUTOPILOT IS DISENGAGED UNDER THESE CONDITIONS, THE PILOT MAY BE REQUIRED TO EXERT CONTROL FORCES IN EXCESS OF 50 POUNDS TO MAINTAIN THE DESIRED AIRCRAFT ATTITUDE. THE PILOT WILL HAVE TO MAINTAIN THIS CONTROL FORCE WHILE HE MANUALLY RETRIMS THE AIRCRAFT.

(e) ENGINE FAILURE (Coupled)

- (1) Disengage AP
- (2) Follow basic Airplane Flight Manual single engine procedures.
- (3) Airplane rudder axis must be manually trimmed prior to engaging autopilot for single-engine operations.

CAUTION

IF RUDDER TRIM CANNOT BE MAINTAINED WHEN POWER IS CHANGED DURING A SINGLE ENGINE COUPLED APPROACH, DISENGAGE AUTOPILOT AND CONTINUE APPROACH MANUALLY.

CAUTION

AT AIRSPEEDS BELOW 96 KIAS, RAPID POWER APPLICATION MAY CAUSE A PRONOUNCED PITCH UP ATTITUDE OF 20° OR MORE.

SECTION 4 - NORMAL PROCEDURES

- (a) The BAT-MASTER switch function is unchanged and can be used in an emergency to shut off all electrical power while the problem is isolated.
- (b) The RADIO POWER switch supplies power to the avionics bus bar of the radio circuit breakers, AP and TRIM circuit breakers.
- (c) The KFC 200 is controlled by the following circuit breakers:

AUTOPILOT - This supplies power to the KC 295 Flight Computer, KA 285 Ann., KI 256 FDI if used, and both AP servos.

FCS MASTER - This in conjunction with the radio power switch supplies power to the avionics bus.

COMPASS SYSTEM - This supplies power to the KCS 55A/55 Compass System.

PITCH TRIM - This supplies power to the FCS Trim System and manual electric trim.

(d) PILOT'S CONTROL WHEEL SWITCH FUNCTIONS

AP DISC/TRIM INTERRUPT - This emergency disconnect switch will disengage the AP, interrupt the power to the electric trim system, and disconnect all FD Modes. To resume AP control, a FD Mode and the AP lever on the Mode Controller must be re-engaged. In the event of electric trim or autotrim failure, the switch can be held depressed, which removes all power from the trim system to allow the pilot time to turn off the RADIO POWER switch and pull the (PITCH TRIM) circuit breaker.

CWS - This switch when depressed and held will allow the pilot to manually fly the airplane without disengaging the AP. When the switch is released the AP will resume control, (within the pitch and roll attitude limits). The CWS switch will resync the FD in PAH, or ALT hold and will transfer the GA mode to PAH. When the CWS is held depressed Manual Electric Trim may be operated without disengaging the AP.

MANUAL PITCH TRIM - The operation of the manual electric trim switch on the pilot's control wheel will disengage the AP lever switch on the Mode Controller. (Except when CWS switch is held depressed as previously noted.)

GA - The GA switch is located on the throttle and the operation of switch will indicate a fixed angle of climb of 6° on the FD. Selection of the GA Mode when in the APPR or NAV CPLD Mode will disengage the mode and revert to the FD, (wings level) mode for lateral steering, on models with serial numbers 34-8070021 and below. The AP if engaged will remain engaged and follow the pitch command to climb at the fixed angle.

On models with serial numbers 34-8070022 and up, the AP if engaged will disengage, the AP may be engaged/reengaged with the GA Mode selected and will follow the pitch command to climb at the fixed angle.

(e) **FCS WARNING FLAGS AND ANNUNCIATORS DESIGNATION AND OPERATION**

FD - This warning flag mounted in the KI 255 Flight Director Indicator will be in view whenever any of the following conditions are missing: KC 295 internal power valid, VG excitation valid, adapter board valid, or a FD mode not selected. (The KI 256 Flight Director Indicator does not have a warning flag. However, the command bars will be biased out of view whenever the system is invalid or a FD mode is not engaged.)

HDG/PWR* - This warning flag mounted in the Pictorial Navigation Indicator will be in view whenever the directional gyro information is invalid. If a HDG invalid occurs with either NAV, APPR, or HDG modes selected the AP and/or FD is disengaged. Basic FD mode may then be re-engaged along with any vertical mode and the AP re-engaged. This flag is labeled HDG in the KCS 55A Compass System.

TRIM - The TRIM warning light, located in the lower right corner of the annunciator panel, will flash and be accompanied by an audible warning whenever autotrim and/or manual electric pitch trim failures occur. Trim servo motor running without a command is monitored on both trim modes. Trim servo motor not running when commanded to run, and the trim servo motor running in the wrong direction are monitored on Autotrim only. The TRIM warning light flashes four times and the audible warning sounds when the test switch on the Mode Controller is depressed.

GS INVALID - The GS valid (GS pointer being in view on KI 525) has to be present before GS may couple. If, after GS CPLD, the valid is lost, the system will flash the GS Annunciator and revert from GS CPLD to PAH. If the GS valid returns the system will revert back to GS CPLD.

NAV FLAG - The Nav or APPR Modes (ARM or CPLD) may be selected and will function with or without a Nav warning flag present.

AP Disconnect Alert - The Autopilot Disconnect Alerter will sound an audible warning for approximately 2 seconds whenever the auto-pilot engage lever on the KC 290 Mode Controller is disengaged, on models with serial numbers 34-8070022 and up only.

*This warning flag is labeled PWR in the KCS 55 Compass System. All modes may be selected and will function with or without a PWR warning flag present.

(f) BEFORE ENGAGING FLIGHT CONTROL SYSTEM

- (1) Check that all circuit breakers for the system are in.
- (2) Allow sufficient time for gyros to come up to speed and system warm-up. (3-4 minutes)

(g) PREFLIGHT CHECK (Run prior to each flight.)

- (1) With no modes engaged and all valid flags retracted, depress the test button on the Mode Controller. All mode annunciators will be illuminated on the annunciator panel and the red autotrim failure light will flash. At least four or more flashes must be observed to indicate proper operation of the autotrim/manual electric trim feature and an audible warning should sound. The three marker lights will also illuminate during test if the airplane uses the KA 285 as a remote marker indicator.
- (2) Engage the FD then engage AP, depress the CWS switch, center the flight controls and release CWS. Apply force to the controls to determine if the AP can be overpowered.
- (3) Check operation of the pilot's control wheel switch functions.
- (4) Disengage the AP and run the following manual electric trim checks.
 - a. Trim breaker IN.
 - b. Run the trim up and down to check normal trim operation in both directions.
 - c. Run the trim from stop to stop. The time required shall be 39 ± 5 seconds.
 - d. Grasping the manual trim wheel, run the trim both up and down and check overpower capability.
 - e. Press the AP DISC/TRIM INTERRUPT switch down and hold. The manual electric trim will not operate either up or down.
- (5) Engage the FD and AP and put in a pitch up command using the vertical trim switch on the KC 290 Mode Controller. Hold the control column from moving and observe the autotrim run in the nose-up direction after approximately a three second delay. Use the vertical trim switch and put in a nose-down command. Hold the control column and observe the autotrim run in the nose-down direction after approximately three seconds.
- (6) Engage the HDG mode and AP. Set the HDG bug to command a right turn. The control wheel will rotate clockwise. Set the HDG bug to command a left turn. The control wheel will rotate counterclockwise.

CAUTION

DISENGAGE THE AP AND CHECK THAT THE AIRPLANE
MANUAL PITCH TRIM IS IN THE TAKEOFF POSITION
PRIOR TO TAKE-OFF.

(h) IN-FLIGHT OPERATION

(1) Engage Procedure:

After take-off, clean up airplane and establish climb. Engage the FD mode first, monitor flight controls and engage AP. The pitch attitude will lock on any attitude up to 15° pitch attitude. Engaging the CWS switch allows the pilot to momentarily revert to manual control, while retaining his previous modes, except GA, and conveniently resuming that profile at his discretion.

(2) Disengage Procedure:

Check the airplane trim by monitoring the command bars before disengaging AP. While monitoring the flight controls disengage the system by one of the following methods: Depressing the pilot's disc. switch, operating the manual trim switch or operating the AP engage lever on the Mode Controller. The AP light on the annunciator panel will flash at least four times and remain off to indicate the AP is disengaged. To deactivate the Flight Director System, depress the FD switch on the Mode Controller or press the AP and Trim Disconnect switch.

(3) Flight Director Mode:

The FD must be engaged before the AP can be engaged. The FD mode alone indicates PAH and wings level. The pilot may choose to fly the FD manually without the AP engaged by depressing the FD switch on the Mode Controller and selecting any of the other modes he wishes to follow. The FD may be disengaged by depressing the FD switch on the MODE CONTROLLER at any time the AP is not engaged or by pressing the AP and Trim Disconnect switch with or without the AP engaged. FD engagement is displayed on the annunciator panel.

NOTE

THE VERTICAL TRIM SWITCH (LOCATED ON THE KC 290 MODE CONTROLLER PANEL) MAY BE USED TO TRIM THE PITCH ATTITUDE AT A RATE OF ONE DEGREE PER SECOND.

(4) Altitude Hold Mode:

When the ALT switch on the Mode Controller is pressed the airplane will maintain the pressure altitude existing at the time the switch is depressed. For smooth operation, engage the ALT at no greater than 500 feet per minute climb/descent. The ALT will automatically disengage when Glideslope couples or the go-around switch is depressed. ALT hold may be turned off at any time by depressing the ALT switch. ALT engagement is displayed on the annunciator panel.

NOTE

THE VERTICAL TRIM SWITCH (LOCATED ON THE KC 290 MODE CONTROLLER PANEL) MAY BE USED TO CHANGE OR TRIM THE ALTITUDE UP OR DOWN AT 500 FPM WITHOUT DISENGAGING THE MODE.

(5) Heading Mode:

Set the heading bug to the desired heading on the PNI, depress the HDG switch on the Mode Controller and HDG will be displayed on the annunciator panel. The airplane will turn to the heading selected and hold. The pilot may then choose any new heading by merely setting the bug on a new heading. The airplane will automatically turn in the direction the heading bug is turned. To disengage the HDG Mode, depress the HDG switch on the MODE CONTROLLER and observe the HDG light go out on the annunciator panel. The HDG Mode will automatically disengage when APPR or NAV CPLD is achieved.

- (6) The navigation mode may be selected by tuning the NAV receiver to the desired frequency, setting the CDI to the desired radial and depressing the NAV switch on the MODE CONTROLLER. If the NAV switch is engaged with a centered needle on the CDI, the mode will go directly to NAV CPLD as displayed on the annunciator panel. If a condition requiring a capture exists at mode engagement, the pilot is required to set up an intercept angle using either HDG or FD mode. NAV may be disengaged by depressing NAV switch or by engaging HDG or APPR when in NAV CPLD.

CAUTION

**THE NAV MODE OF OPERATION WILL CONTINUE TO
PROVIDE AIRPLANE CONTROL WITHOUT A VALID
VOR/LOC SIGNAL (NAV FLAG IN VIEW).**

- (7) Approach Mode:

To select the approach mode, tune the appropriate VOR or LOC frequency and depress the APPR switch on the MODE CONTROLLER. The annunciator will indicate APPR ARM until intercepting the course when it will automatically couple and track. The system can intercept at any angle and will always turn toward the course pointer. See approach procedure for more detail. Approach mode can be disengaged by depressing the APPR switch on the MODE CONTROLLER, by depressing GA switch on the left engine throttle control, or by engaging HDG or NAV when in APPR CPLD. The annunciator panel indicates the status of the approach mode.

CAUTION

**THE APPR MODE OF OPERATION WILL CONTINUE TO
PROVIDE AIRPLANE CONTROL WITHOUT A VALID
VOR/LOC SIGNAL (NAV FLAG IN VIEW).**

- (8) Back Course Mode:

For back course (BC) operation, proceed as for normal approach mode, but engage BC after selecting APPR. The BC switch reverses the signals in the computer and cannot be engaged without a LOC frequency selected. BC status is indicated on the annunciator panel. BC mode can be disengaged by depressing either the BC, APPR, or GA switches, or by selecting other than a LOC frequency on the NAV receiver.

- (9) Trim Up/Dn:

Operation of the vertical trim switch on the Mode Controller provides a convenient means of adjusting the ALT hold or PAH angle function without disengaging the mode.

- (10) Go Around Mode (GA):

The GA mode may be engaged at any time by depressing the GA switch on the left engine throttle. GA will illuminate on the annunciator panel indicating mode status. The GA mode provides a fixed pitch up angle that will command the best rate of climbout for single engine performance, on models with serial numbers 34-8070021 and below, the AP if engaged will remain engaged. GA will cancel all other vertical modes as well as APPR or NAV CPLD.

On models with serial numbers 34-8070022 and up, the AP if engaged will disengage. GA will cancel all other vertical modes as well as APPR or NAV CPLD.

(i) VOR PROCEDURES

- (1) Tune NAV receiver to appropriate frequency.
- (2) Set desired Heading with the HDG BUG to intercept radial and engage HDG and AP.
- (3) Select desired radial and engage NAV. The airplane will remain on HDG as indicated on the annunciator panel and ARM on the NAV mode. When the airplane intercepts the beam the system will automatically couple and track in NAV mode and indicate CPLD on the annunciator panel.
- (4) A new course may be selected over the VOR station when operating in the NAV mode, by selecting a new radial when the To-From indication changes.
- (5) For VOR approach, see approach procedure.

(j) APPROACH PROCEDURES

- (1) Tune ILS or VOR.
- (2) Set CDI for inbound course.
- (3) Set Heading Bug and engage HDG to intercept course beam at any angle.
- (4) Engage APPR and note APPR ARM on the annunciator panels.
- (5) When airplane approaches beam APPR will couple, HDG will decouple, airplane will track LOC or VOR, and CPLD will illuminate on the annunciator panel.
- (6) When the glideslope beam is intercepted, the glideslope (GS) will couple automatically and indicates GS on the annunciator panel. If the ALT MODE was engaged prior to intercepting the glideslope, it will automatically disengage when GS couples. Airplane will now track LOC and GS. Adjust throttles to control speed on descent. Set HDG bug for missed approach but do not engage HDG.

NOTE

Operation of marker test function after APPR CPLD will reduce the flight control system gains. If this should occur, the APPR switch should be recycled.

- (7) Landing or missed approach
 - a. Disengage AP and land.
 - b. Go-Around by depressing GA switch on left engine throttle. The AP will remain engaged and the FD will indicate a climb. APPR Mode may be used for a straight away missed approach or HDG may be engaged to turn to the missed approach heading.

On models with serial numbers 34-8070021 and below, the AP will remain engaged and the FD will indicate a climb. APPR Mode may be used for a straight away missed approach or HDG may be engaged to turn to the missed approach heading.

On models with serial numbers 34-8070022 and up, the AP, if engaged, will disengage and the FD will indicate a climb. The AP may be engaged/re-engaged after the airplane is established in the Go Around attitude and the airplane in trim. The APPR Mode may be used for a straight away missed approach or HDG may be engaged to turn to the missed approach heading.

(k) BACK COURSE PROCEDURE

Same as front course except that BC is engaged after APPR is engaged and the airplane must be set for descent manually by holding the vertical trim control DN on the Mode Controller or by establishing the desired PAH using the CWS.

SECTION 5 - PERFORMANCE

Installation of the King KFC 200 Flight Control System does not effect the basic performance information presented by Section 5 of this handbook.

SUPPLEMENT 7

KFC 200 AUTOMATIC FLIGHT CONTROL SYSTEM
(WITHOUT FLIGHT DIRECTOR INSTALLATION)

SECTION 1 - GENERAL

This manual is to acquaint the pilot with the operation of the KFC 200 Automatic Flight Control System as installed in the Seneca II. The airplane must be operated within the limitations herein specified.

This supplement has been "FAA Approved" as a permanent part of this handbook based on King STC SA1147CE and must remain in this handbook at all times when the optional King KFC 200 Automatic Flight Control System is installed.

The KFC 200 is certified in this airplane with two axis control, pitch and roll.

The airplane is equipped with an electric trim system which is controlled by pilot operation of the trim switch. The autopilot uses the electric trim to accomplish automatic trimming to unload the autopilot elevator servo so that autopilot disengagement does not result in transient airplane motion. An autotrim/electric pitch trim monitor is provided in the autopilot. Autotrim and/or electric pitch trim faults are visually annunciated on the Mode Annunciator and accompanied by an audible warning.

ABBREVIATIONS

ALT	Altitude or Altitude Hold
AP	Autopilot
APPR	Approach
ARM	System Arm for Capture
BC	Back Course
CDI	Course Deviation Indicator or Control
CPLD	Coupled
DISC	Disconnect
FCS	Flight Control System
GA	Go Around
HDG	Heading Select
NAV	Navigation
PAH	Pitch Attitude Hold
PNI	Pictorial Navigation Indicator

SECTION 2 - LIMITATIONS

- (a) During autopilot operation, pilot must be seated at the controls with seat belt fastened. Operation is restricted to left side pilot position.
- (b) Maximum speed for autopilot operation is 173 KIAS.
- (c) The maximum altitude for operation of the autopilot has not been determined. The maximum altitude flight tested was 24,000 feet.
- (d) Do not extend flaps beyond 25° during autopilot operation.
- (e) The autopilot must be disengaged during takeoff and landing.
- (f) System approved for Category I operation only (APPR or BC selected).
- (g) Autopilot attitude command limits:
 - Pitch $\pm 15^\circ$
 - Roll $\pm 25^\circ$
- (h) Placards:

Location - Pilot's control wheel, left horn:

AP
DISC

TRIM
INTERRUPT

- Pilot's control wheel, left horn:

CWS

- Pilot's control wheel, left horn:

TRIM UP/DN

- Left throttle lever:

GO AROUND

SECTION 3 - EMERGENCY PROCEDURES

- (a) AUTOPILOT DISENGAGEMENT
 - Disengage the autopilot and/or prevent engagement by:
 - (1) Pilot's DISC switch.
 - (2) AP engage lever on MODE CONTROLLER.
 - (3) Pulling the AUTOPILOT circuit breaker.
 - (4) Turning BAT-MASTER switch OFF.
 - (5) Turning RADIO POWER switch OFF.

(b) AUTOMATIC AUTOPILOT DISENGAGEMENT

Any of the following will cause the autopilot to automatically disengage:

- (1) External power failure.
- (2) Actuating manual electric trim.
- (3) Internal Flight Control System failure.
- (4) With KCS 55A system a loss of compass valid (displaying HDG flag) disengages the AP when a mode using heading information is engaged. With compass flag present only AP and vertical modes can be selected.

(c) ELECTRIC PITCH TRIM

Electric pitch trim can be disengaged by pressing AP DISC/TRIM INTERRUPT switch and holding fully down until recovery can be made then turn off RADIO POWER and manually retrim the airplane using the manual trim control wheel. After the airplane is trimmed out pull the trim breaker and turn the RADIO POWER switch back on.

(d) MAXIMUM ALTITUDE LOSSES DUE TO AUTOPILOT MALFUNCTION

- | | |
|----------------------------|----------|
| (1) Cruise, Climb, Descent | 400 feet |
| (2) Maneuvering | 100 feet |
| (3) APPR | 50 feet |
| (4) SE APPR | 50 feet |

CAUTION

WHEN THE AUTOPILOT IS ENGAGED, MANUAL APPLICATION OF A FORCE TO THE PITCH AXIS OF THE CONTROL WHEEL FOR A PERIOD OF THREE SECONDS OR MORE WILL RESULT IN THE AUTOTRIM SYSTEM OPERATING IN THE DIRECTION TO CREATE A FORCE OPPOSING THE PILOT. THIS OPPOSING MISTRIM FORCE WILL CONTINUE TO INCREASE, AS LONG AS THE PILOT APPLIES A FORCE TO THE CONTROL WHEEL, AND WILL ULTIMATELY OVERPOWER THE AUTOPILOT. IF THE AUTOPILOT IS DISENGAGED UNDER THESE CONDITIONS, THE PILOT MAY BE REQUIRED TO EXERT CONTROL FORCES IN EXCESS OF 50 POUNDS TO MAINTAIN THE DESIRED AIRCRAFT ATTITUDE. THE PILOT WILL HAVE TO MAINTAIN THIS CONTROL FORCE WHILE HE MANUALLY RETRIMS THE AIRCRAFT.

- (e) **ENGINE FAILURE (Coupled)**
 - (1) Disengage AP.
 - (2) Follow basic Airplane Flight Manual single engine procedures.
 - (3) Airplane rudder axis must be manually trimmed prior to engaging autopilot for single engine operations.

CAUTION

IF RUDDER TRIM CANNOT BE MAINTAINED WHEN POWER IS CHANGED DURING A SINGLE ENGINE COUPLED APPROACH, DISENGAGE AUTOPILOT AND CONTINUE APPROACH MANUALLY.

CAUTION

AT AIRSPEEDS BELOW 96 KIAS, RAPID POWER APPLICATION MAY CAUSE A PRONOUNCED PITCH UP ATTITUDE OF 20 OR MORE.

SECTION 4 - NORMAL PROCEDURES

- (a) The BAT MASTER switch function is unchanged and can be used in an emergency to shut off all electrical power while the problem is isolated.
- (b) The RADIO POWER switch supplies power to the avionics bus bar of the radio circuit breakers, AP and TRIM circuit breakers.
- (c) The KFC 200 is controlled by the following circuit breakers:

AUTOPILOT - This supplies power to the KC 295 Flight Computer, KA 285 Annunciator, KC 292 Mode Controller, and both AP servos.

FCS MASTER - This in conjunction with the RADIO POWER switch, supplies power to the avionics bus.

COMPASS SYSTEM - This supplies power to the KCS 55A/55 Compass System.

PITCH TRIM - This supplies power to the FCS Trim System and manual electric trim.

- (d) **PILOT'S CONTROL WHEEL SWITCH FUNCTIONS**

AP DISC/TRIM INTERRUPT - This emergency disconnect switch will disengage the AP and interrupt the power to the electric trim system. To resume AP control, the AP lever on the Mode Controller must be reengaged. In the event of electric trim or autotrim failure, the switch can be held depressed which removes all power from the trim system to allow the pilot time to turn off the RADIO POWER switch and pull the (PITCH TRIM) circuit breaker.

CWS - This switch when depressed and held will allow the pilot to manually fly the airplane without disengaging the AP. When the switch is released the AP will resume control (within the pitch and roll attitude limits). The CWS switch will resync the AP in PAH or ALT hold and will transfer the GA mode to PAH. When the CWS is held depressed Manual Electric Trim may be operated without disengaging the AP.

MANUAL PITCH TRIM - Operation of the manual electric trim switch on the pilot's control wheel will disengage the AP lever switch on the Mode Controller. (Except when CWS switch is held depressed as previously noted.)

GA - The GA switch is located on the throttle. On models with serial numbers 34-8070021 and below, the operation of the switch will cause the AP to command a fixed angle of climb of 6°. Selection of the GA Mode when in the APPR or NAV CPLD Mode will disengage the mode and revert to the AP (wings level) mode for lateral steering. On models with serial numbers 34-8070022 and up, the AP if engaged will disengage.

(e) FCS WARNING FLAGS AND ANNUNCIATORS DESIGNATION AND OPERATION

HDG/PWR* - This warning flag mounted in the pictorial Navigation Indicator will be in view whenever the directional gyro information is invalid. If a HDG invalid occurs with either NAV, APPR or HDG modes selected, the AP is disengaged. Basic AP mode may then be re-engaged along with any vertical mode. This flag is labeled HDG in the KCS 55A Compass System.

TRIM - The TRIM Warning light, located in the lower right corner of the annunciator panel, will flash and be accompanied by an audible warning whenever autotrim and/or manual electric pitch trim failures occur. Trim servo motor running without a command is monitored on both trim modes. Trim servo motor not running when commanded to run, and the trim servo motor running in the wrong direction are monitored on Autotrim only. The TRIM warning light flashes four times and the audible warning sounds when the test switch on the Mode Controller is depressed.

GS INVALID - The GS valid (GS pointer being in view on KI 525) has to be present before GS may couple. If, after GS CPLD, the valid is lost, the system will flash the GS Annunciator and revert from GS CPLD to PAH. If the GS valid returns, the system will revert back to GS CPLD.

NAV FLAG - The NAV or APPR Modes (ARM or CPLD) may be selected and will function with or without a NAV warning flag present.

AP Disconnect Alert - The Autopilot Disconnect Alerter will sound an audible warning for approximately 2 seconds whenever the autopilot engage lever on the KC 290 Mode Controller is disengaged, on models with serial numbers 34-8070022 and up only.

(f) BEFORE ENGAGING FLIGHT CONTROL SYSTEM

- (1) Check that all circuit breakers for the system are in.
- (2) Allow sufficient time for gyros to come up to speed and system warm-up. (3-4 minutes)

*This warning flag is labeled PWR in the KCS 55 Compass System. All modes may be selected and will function with or without a PWR warning flag present.

- (g) PREFLIGHT CHECK (Run prior to each flight)
- (1) With no modes engaged and all valid flags retracted, depress the test button on the Mode Controller. All mode annunciators except FD will be illuminated on the annunciator panel and the red autotrim failure light will flash and aural alert sound. At least four or more flashes and beeps must be observed to indicate proper operation of the autotrim/manual electric trim feature. The three marker lights will also illuminate during test if the airplane uses the KA 285 as a remote marker indicator.
 - (2) Engage the AP, depress the CWS switch, center the flight controls and release CWS. Apply force to the controls to determine if the AP can be overpowered.
 - (3) Check operation of the pilot's control wheel switch functions.
 - (4) Disengage the AP and run the following manual electric trim checks:
 - a. Trim breaker IN.
 - b. Run the trim up and down to check normal trim operation in both directions.
 - c. Run the trim from stop-to-stop. The time required shall be 39 ± 5 seconds.
 - d. Grasping the manual trim wheel, run the trim both up and down and check overpower capability.
 - e. Press the AP DISC/TRIM INTERRUPT switch down and hold. The manual electric trim will not operate either up or down.
 - (5) Engage the AP and put in a pitch up command using the vertical trim switch on the KC 292 Mode Controller. Hold the control column from moving and observe the autotrim run in the nose up direction after approximately a three second delay. Use the vertical trim switch and put in a nose down command. Hold the control column and observe the autotrim run in the nose down direction after approximately three seconds.
 - (6) Engage the AP and HDG modes. Set the HDG bug to command a right turn. The control wheel will rotate clockwise. Set the HDG bug to command a left turn. The control wheel will rotate counterclockwise.

CAUTION

DISENGAGE THE AP AND CHECK THAT THE AIRPLANE
MANUAL PITCH TRIM IS IN THE TAKEOFF POSITION
PRIOR TO TAKEOFF.

(h) IN-FLIGHT PROCEDURE

- (1) Engage Procedure:

After takeoff, clean up airplane and establish climb. Monitor flight controls and engage AP. The pitch attitude will lock on any attitude up to 15° pitch attitude. Engaging the CWS switch allows the pilot to momentarily revert to manual control, while retaining his previous modes, except GA, and conveniently resume that profile at his discretion.
- (2) Disengage Procedure:

While monitoring the flight controls, disengage the system by one of the following methods: depressing the pilot's disconnect switch; operating the manual trim switch or operating the AP engage lever on the Mode Controller. The AP light on the annunciator panel will flash at least four times and remain off to indicate the AP is disengaged.

- (3) AP Mode:
The AP must be engaged before any other mode can be engaged. The AP mode alone indicates PAH and wings level. The AP will automatically follow any other modes engaged. Disengaging the AP disengages all other modes.

NOTE

THE VERTICAL TRIM SWITCH (LOCATED ON THE KC 292 MODE CONTROLLER PANEL) MAY BE USED TO TRIM THE PITCH ATTITUDE AT A RATE OF ONE DEGREE PER SECOND.

- (4) Altitude Hold Mode:
When the ALT switch on the Mode Controller is pressed the airplane will maintain the pressure altitude existing at the time the switch is depressed. For smooth operation, engage the ALT at no greater than 500 feet per minute climb/descent. The ALT will automatically disengage when Glideslope couples or the GO AROUND switch is depressed. ALT hold may be turned off at any time by depressing the ALT switch. ALT engagement is displayed on the annunciator panel.

NOTE

THE VERTICAL TRIM SWITCH (LOCATED ON THE KC 292 MODE CONTROLLER PANEL) MAY BE USED TO CHANGE OR TRIM THE ALTITUDE UP OR DOWN AT 500 FPM WITHOUT DISENGAGING THE MODE.

- (5) Heading Mode:
Set the heading bug to the desired heading on the PNI, engage the AP, and depress the HDG switch on the Mode Controller. HDG and AP will be displayed on the annunciator panel. The airplane will turn to the heading selected and hold. The pilot may then choose any new heading by merely setting the bug on a new heading. The airplane will automatically turn in the direction the heading bug is turned. To disengage the HDG Mode, depress the HDG switch on the Mode Controller and observe the HDG light go out on the annunciator panel. The HDG Mode will automatically disengage when APPR or NAV CPLD is achieved.
- (6) NAV Mode:
The navigation mode may be selected by tuning the NAV receiver to the desired frequency, setting the CDI to the desired radial and with the AP engaged, depressing the NAV switch on the Mode Controller. If the NAV switch is engaged with a centered needle on the CDI, the mode will go directly to NAV CPLD as displayed on the annunciator panel. If a condition requiring a capture exists at mode engagement, the pilot is required to set up an intercept angle using either HDG or AP mode. NAV may be disengaged by pressing Nav switch or by engaging HDG or APPR when in NAV CPLD.

CAUTION

THE NAV MODE OF OPERATION WILL CONTINUE TO PROVIDE AIRPLANE CONTROL WITHOUT A VALID VOR/LOC SIGNAL (NAV FLAG IN VIEW).

(7) Approach Mode:

To select the approach mode, tune the appropriate VOR or LOC frequency and with the AP engaged, depress the APPR switch on the Mode Controller. The annunciator will indicate APPR ARM until intercepting the course when it will automatically couple and track. The system can intercept at any angle and will always turn toward the course pointer. See approach procedure for more detail. Approach mode can be disengaged by depressing the APPR switch on the Mode Controller, by depressing the GA switch on the left engine throttle control, or by engaging HDG or NAV when in APPR CPLD. The annunciator panel indicates the status of the approach mode.

CAUTION

**THE APPR MODE OF OPERATION WILL CONTINUE TO
PROVIDE AIRPLANE CONTROL WITHOUT A VALID
VOR/LOC SIGNAL (NAV FLAG IN VIEW).**

(8) Back Course Mode:

For back Course (BC) operation, proceed as for normal approach mode, but engage BC after selecting APPR. The BC switch reverses the signals in the computer and cannot be engaged without a LOC frequency selected. BC status is indicated on the annunciator panel. BC mode can be disengaged by depressing either the BC, APPR, or GA switches, or by selecting other than a LOC frequency on the Nav receiver.

(9) Trim Up/Dn:

Operation of the vertical trim switch on the Mode Controller provides a convenient means of adjusting the ALT hold or PAH angle function without disengaging the mode.

(10) Go Around Mode (GA):

The GA mode may be engaged any time the AP is engaged by depressing the GA switch on the left engine throttle. GA will illuminate on the annunciator panel indicating mode status, on models with serial numbers 34-8070021 and below the GA mode provides a fixed pitch up angle that will command the best rate of climbout for single engine performance. GA will cancel all other vertical modes as well as APPR or NAV CPLD.

On models with serial numbers 34-8070022 and up, the AP if engaged will disengage. GA will cancel all other vertical modes as well as APPR or NAV CPLD.

(i) VOR PROCEDURES

- (1) Tune NAV receiver to appropriate frequency.
- (2) Set desired Heading with the HDG BUG to intercept radial and engage AP and HDG.
- (3) Select desired radial and engage NAV. The airplane will remain on HDG as indicated on the annunciator panel and ARM on the NAV mode. When the airplane intercepts the beam, the system will automatically couple and track in NAV mode and indicate CPLD on the annunciator panel.
- (4) A new course may be selected over the VOR station when operating in the NAV mode, by selecting a new radial when the To-From indication changes.
- (5) For VOR approach, see approach procedure.

(j) APPROACH PROCEDURES

- (1) Tune ILS or VOR.
- (2) Set CDI for inbound course.

- (3) Set Heading Bug and engage HDG to intercept course beam at any angle.
- (4) Engage APPR and note APPR ARM on the annunciator panel.
- (5) When airplane approaches beam APPR will couple, HDG will decouple, airplane will track LOC or VOR, and CPLD will illuminate on the annunciator panel.
- (6) When the glideslope beam is intercepted, the glideslope (GS) will couple automatically and indicate GS on the annunciator panel. If the ALT MODE was engaged prior to intercepting the glideslope, it will automatically disengage when GS couples. Airplane will now track LOC and GS. Adjust throttles to control speed on descent. Set HDG bug for missed approach but do not engage HDG.

NOTE

Operation of marker test function after APPR CPLD will reduce the flight control system gains. If this should occur, the APPR switch should be recycled.

- (7) Landing or missed approach
 - a. Disengage AP and land.
 - b. Go-Around by depressing the GA switch on left engine throttle, on models with serial numbers 34-8070021 and below. The AP will remain engaged and will command a climb. APPR Mode may be used for a straight away missed approach or HDG may be engaged to turn to the missed approach heading.

On models with serial numbers 34-8070022 and up, the AP if engaged will disengage GA will cancel all other vertical modes as well as APPR or NAV CPLD.

(k) **BACK COURSE PROCEDURE**

Same as front course except that BC is engaged after APPR is engaged and the airplane must be set for descent manually by holding the vertical trim control DN on the Mode Controller or by establishing the desired PAH angle using the CWS.

SECTION 5 - PERFORMANCE

Installation of the King KFC 200 Flight Control System does not effect the basic performance information presented by Section 5 of this handbook.

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SUPPLEMENT 8

KNS 80 NAVIGATION SYSTEM

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional KNS 80 Navigation System is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional KNS 80 Navigation System is installed.

SECTION 2 - LIMITATIONS

No changes to the basic limitations provided by Section 2 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 3 - EMERGENCY PROCEDURES

No changes to basic Emergency Procedures provided by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 - NORMAL PROCEDURES

(a) KNS 80 OPERATION

The KNS 80 can be operated in any one of 3 basic modes: (a) VOR, (b) RNAV, or (c) ILS. To change for one mode to another, the appropriate pushbutton switch is pressed, except that the ILS mode is entered automatically whenever an ILS frequency is channeled in the USE waypoint. The display will annunciate the mode by lighting a message above the pushbutton. In addition to the standard VOR and RNAV enroute (RNV ENR) modes, the KNS 80 has a constant course width or parallel VOR mode (VOR PAR) and a RNAV approach mode (RNV APR). To place the unit in either of these secondary modes the VOR pushbutton or the RNAV pushbutton, as the case may be, is pushed a second time. Repetitive pushing of the VOR button will cause the system to alternate between the VOR and VOR PAR modes, while repetitive pushing of the RNAV button causes the system to alternate between RNV ENR and RNV APR modes.

(b) CONTROLS

(1) VOR BUTTON

Momentary pushbutton.

When pushed while system is in either RNV mode causes system to go to VOR mode. Otherwise the button causes system to toggle between VOR and VOR PAR modes.

(2) RNAV BUTTON

Momentary pushbutton.

When pushed while system is in either VOR mode causes system to go to RNV ENR mode. Otherwise the button causes system to toggle between RNV ENR and RNV APR modes.

(3) HOLD BUTTON

Two position pushbutton.

When in depressed position, inhibits DME from channeling to a new station when the VOR frequency is changed. Pushing the button again releases the button and channels the DME to the station paired with the VOR station.

(4) USE BUTTON

Momentary pushbutton.

Causes active waypoint to take on same value as displayed waypoint and data display to go to FRQ mode.

(5) DSP BUTTON

Momentary pushbutton.

Causes displayed waypoint to increment by 1 and data display to go to frequency mode.

(6) DATA BUTTON

Momentary pushbutton.

Causes waypoint data display to change from FRQ to RAD to DST and back to FRQ.

(7) OFF/PULL ID CONTROL

- a. Rotate counterclockwise to switch off power to the KNS 80.
- b. Rotate clockwise to increase audio level.
- c. Pull switch out to hear VOR Ident.

(8) DATA INPUT CONTROL

Dual concentric knobs. Center knob has "in" and "out" positions.

a. Frequency Data

Outer knob varies 1 MHz digit.

A carryover occurs from the units to tens position.

Rollover occurs from 117 to 108 or vice versa.

Center knob varies frequency in .05 MHz steps regardless of whether the switch is in its "in" or "out" position.

b. Radial Data

Outer knob varies 10 degree digit.

A carryover occurs from tens to hundreds position.

A rollover to zero occurs at 360 degrees.

Center knob "in" position varies 1 degree digit.

Center knob "out" position varies 0.1 degree digit.

- c. Distance Data
 - Outer knob varies 10 NM digit.
 - A carryover occurs from the tens to hundreds place.
 - A rollover to zero occurs at 200 NM.
 - Center knob "in" position varies 1 NM digit.
 - Center knob "out" position varies 0.1 NM digit.
- (9) COURSE SELECT KNOB
 - Located in CDI unit.
 - Selects desired course through the VOR ground station or waypoint.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

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ANS 351 AREA NAVIGATION COMPUTER

REPORT: VB-850
9-45

(a) CONTROLS

CONTROL OR INDICATOR	FUNCTION
Mode Control	Selects ENR (enroute) or APPR (approach) modes of operation. In the enroute mode, CDI deviation is 1 mile/dot, 5 miles full scale. In approach, CDI deflection is 1/4 mile/dot, 1-1/4 miles full scale.
Waypoint Selector	Sequences display waypoints from 1 through 8. Winking waypoint number indicates inactive waypoints; steadily-on-waypoint number indicates active waypoint.
Return Button	Depressing RTN (return) button returns the display to the active waypoint when an inactive waypoint is currently being displayed.
Use Button	Depressing the USE button converts the waypoint being displayed into the active waypoint.
Radial Selector	Two concentric knobs set radial information into the display. Knobs control information as follows: Large knob: Changes display in 10-degree increments. Small knob pushed in: Changes display 1-degree increments. Small knob pulled out: Changes display in 0.1-degree increments.
Distance Selector	Two concentric knobs set distance information in nautical miles into the display. Knobs control information as follows: Large knob: Changes display in 10-mile increments. Small knob pushed in: Changes display 1-mile increments. Small knob pulled out: Changes display in 0.1-mile divisions from 00.0 through 100 miles. Beyond 100 nmi, changes display in 1-mile increments.
Check Button	Depressing CHK (check) button causes DME and bearing indicators to display raw distance and bearing information. RNAV computation, CDI deviation, to/from display, and autopilot tracking of RNAV path remain unaffected. The check button is spring-loaded to prevent permanent actuation.
Ambient Light Sensor	Automatically adjusts display lighting intensity as a function of cockpit ambient light.

(b) AREA NAVIGATION WAYPOINT PROGRAMMING

(1) Presetting of Waypoint On Ground

Waypoints are entered after engine start, since the waypoint information will probably be lost during the low-voltage condition occurring during engine cranking. Waypoint data should always be written in flight planning form to facilitate checking later in flight. When power is first applied to the ANS 351 and the system is in the RNAV mode, waypoint number 1 will be active, (waypoint number not blinking) and waypoint bearing and distance preset to zero will appear.

- a. Waypoint number 1 coordinates are set into the ANS 351 using concentric knobs under bearing and distance display fields.
- b. The waypoint selection knob is then rotated to select waypoint number 2. Note that the waypoint number is blinking, indicating that the waypoint is at this point inactive. Waypoint number 2 bearing and distance definitions are then set into the ANS 351.
- c. Set up the rest of the desired waypoints as described above.
- d. Press the RTN (return) pushbutton to display the active waypoint.

(2) Changing Waypoints In Flight

To change a waypoint in flight, rotate the waypoint selector until the desired waypoint number and coordinates are displayed on the ANS 351.

- a. Verify that the waypoint definition is correct by comparing the display with the flight plan.
- b. Uncouple the autopilot if tracking RNAV deviation.
- c. Select the desired reference facility frequency on the associated NAV receiver.
- d. Depress the USE pushbutton and note that the waypoint identification number stops winking.
- e. Select the desired course on OBS.
- f. Recouple the autopilot after deviation and distance-to-waypoint indications have stabilized.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

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SUPPLEMENT 10

NP-2041A AREA NAVIGATION COMPUTER PROGRAMMER

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional NP-2041A Area Navigation Computer Programmer is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional NP-2041A Area Navigation Computer Programmer is installed.

SECTION 2 - LIMITATIONS

No changes to the basic limitations provided by Section 2 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 3 - EMERGENCY PROCEDURES

No changes to basic Emergency Procedures by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 - NORMAL PROCEDURES

NOTE

The #1 VOR and DME receivers supply information to the NAV computer programmer, which in turn drives the pilot's navigation displays.

- (a) Turn the VHF COM/NAV on and set the DME frequency pairing selector to N1.
- (b) Turn the DME on.
- (c) **FREQUENCY SELECTION**
 - (1) **MANUAL** - Set KBD/NAV I/COM 1 selector on COM/NAV to NAV 1. Set in frequency of the reference VOR/DME station.
 - (2) **KEYBOARD** - Set KBD/NAV I/COM 1 selector on COM/NAV to KBD. Set in the frequency of VOR/DME station from the keyboard on the NP-2041A.

- (d) Set the mode selector on the NP-2041A to VOR/LOC.
- (e) Set the display selector on the NP-2041A to SBY.
- (f) Address Standby Waypoint 1 by pressing the SBY WPT key and the #1 key.
- (g) Program Waypoint 1 parameters (any sequence).

NOTE

Pressing the **FREQ**, **BRG**, **DST**, **EL**, or **CRS** keys causes flashing dot to appear in the associated display window. A flashing dot indicates the parameter that is being addressed. As number keys corresponding to data are pressed, the numbers appear in the addressed window. If valid data is entered into the window, the flashing dot will extinguish when the **ENTER** key is pressed. If invalid data is entered in the window, the data will be rejected when the **ENTER** key is pressed and the window will revert to a flashing dot, which indicates data should be re-entered.

- (1) **STATION FREQUENCY** - Press **FREQ** key; press number keys corresponding to the frequency of the VOR station; and press the **ENTER** key.
- (2) **WAYPOINT BEARING** - Press **BRG** key; press number keys corresponding to the waypoint bearing; and press the **ENTER** key.
- (3) **WAYPOINT DISTANCE** - Press **DIST** key; press number keys corresponding to the waypoint distance; and press the **ENTER** key.
- (4) **STATION ELEVATION** - Press **EL** key; press number keys corresponding to the station elevation in hundreds of feet; and press the **ENTER** key.
- (5) **INBOUND AND OUTBOUND COURSE** - Press **CRS** key; press number keys corresponding to the desired inbound or outbound course (depending upon whether **IN** or **OUT** annunciator lamp is illuminated); and press the **ENTER** key.

Press **CRS XFR** key; **IN/OUT** annunciator lamps will switch. Press **CRS** key, press number keys corresponding to the desired inbound or outbound course (as annunciated); and press the **ENTER** key.

- (h) Repeat Step (f) and (g) for any (or all) of the remaining waypoints.
- (i) Press **SBY WPT** key; press number key corresponding to the waypoint desired to be recalled from memory; and verify data.
- (j) Set the display selector to **BRG/DST**.

- (k) Press the WPT XFR key to transfer the standby waypoint to active.

NOTE

Provided the KBD/NAV 1/COM 1 selector on the COM/NAV unit is set to KBD, the NAV receiver and DME will be automatically tuned to the frequency stored for the active waypoint. The stored inbound course will be displayed in the CRS window for 30 seconds to allow the CRS control (OBS) on the IN-831 HSI to be set to that course. After the waypoint has been passed, the CRS XFR key can be pressed to recall the outbound course which will appear for 30 seconds to allow the CRS to be reset.

The course pointer on the IN-881 HSI will automatically reset to the display course, provided its function switch is in the HSI position.

- (l) With the mode selector bet to VOR/LOC, the following data is displayed.
- (1) DISPLAY SELECTOR SET TO BRG/DST - Bearing and distance to the selected VOR/DME station are displayed.
 - (2) DISPLAY SELECTOR SET TO KTS/TTS - Ground speed in knots and time-to-station are displayed in minutes.
 - (3) HSI - The HSI presents unprocessed information with conventional angular sensitivity, i.e., full scale deviation equals 10° off course.
 - (4) DISPLAY SELECTOR SET TO SBY - Data stored for standby waypoint (number appearing in SBY window) is displayed, and can be altered as desired.
 - (5) DISPLAY SELECTOR SET TO ACT - Data stored for active waypoint (number in ACT display window) is displayed, but cannot be altered.
- (m) With the mode selector set to RNAV, the following data is displayed.
- (1) DISPLAY SELECTOR SET TO BRG/DST - Bearing and distance to the selected waypoint is displayed.
 - (2) DISPLAY SELECTOR SET TO KTS/TTS - Ground speed in knots and time-to-waypoint is displayed in minutes.
 - (3) HSI - The HSI presents RNAV information with constant deviation, i. e., full scale deviation represents 5 nautical miles off course out to a distance of 100 nautical miles. From thereon full scale deviation represents 3° off course.
 - (4) DISPLAY SELECTOR SET TO SBY - Data stored for standby waypoint (number appearing in SBY window) is displayed and can be altered as desired.
 - (5) DISPLAY SELECTOR SET TO ACT - Data stored for active waypoint (number appearing in ACT window) is displayed, but cannot be altered.

- (n) With the mode selector set to APR, the displays are the same as RNAV, except full scale deviation represents 1.25 nautical miles off course out to 25 nautical miles. From thereon, full scale deviation represents 3° off course.
- (o) Program COM and NAV frequencies by performing the following steps.

NOTE

To program the COM/NAV Unit from the NP-2041A keyboard, the KBD/NAV/COM selector switches must be set to KBD.

- (1) **MODE SELECTOR** - The mode selector on the NP-2041A can be on in any position other than OFF or TEST to program COM 1 or COM 2 frequencies.
- (2) **COM 1 FREQUENCY** - Press COM 1 key; press number keys corresponding to the desired frequency; and press the ENTER key.
- (3) **COM 2 FREQUENCY** - Press COM 2 key; press number keys corresponding to the desired frequency; and press the ENTER key.
- (4) **NAV 1 FREQUENCY** - Set the mode selector to VOR/LOC. (To tune NAV 1 from keyboard, mode selector must be set to VOR/LOC.) Press NAV 1 key; press number keys corresponding to the desired frequency; and press the ENTER key.
- (5) **NAV 2 FREQUENCY** - Press NAV 2 key; press number keys corresponding to the desired frequency; and press the ENTER key.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

SUPPLEMENT 11

RDR-160 WEATHER RADAR SYSTEM

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional RDR-160 Weather Radar System is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional RDR-160 Weather Radar System is installed.

SECTION 2 - LIMITATION

No changes to the basic limitations provided by Section 2 of this Pilot's Operating Handbook are necessary for this supplement.

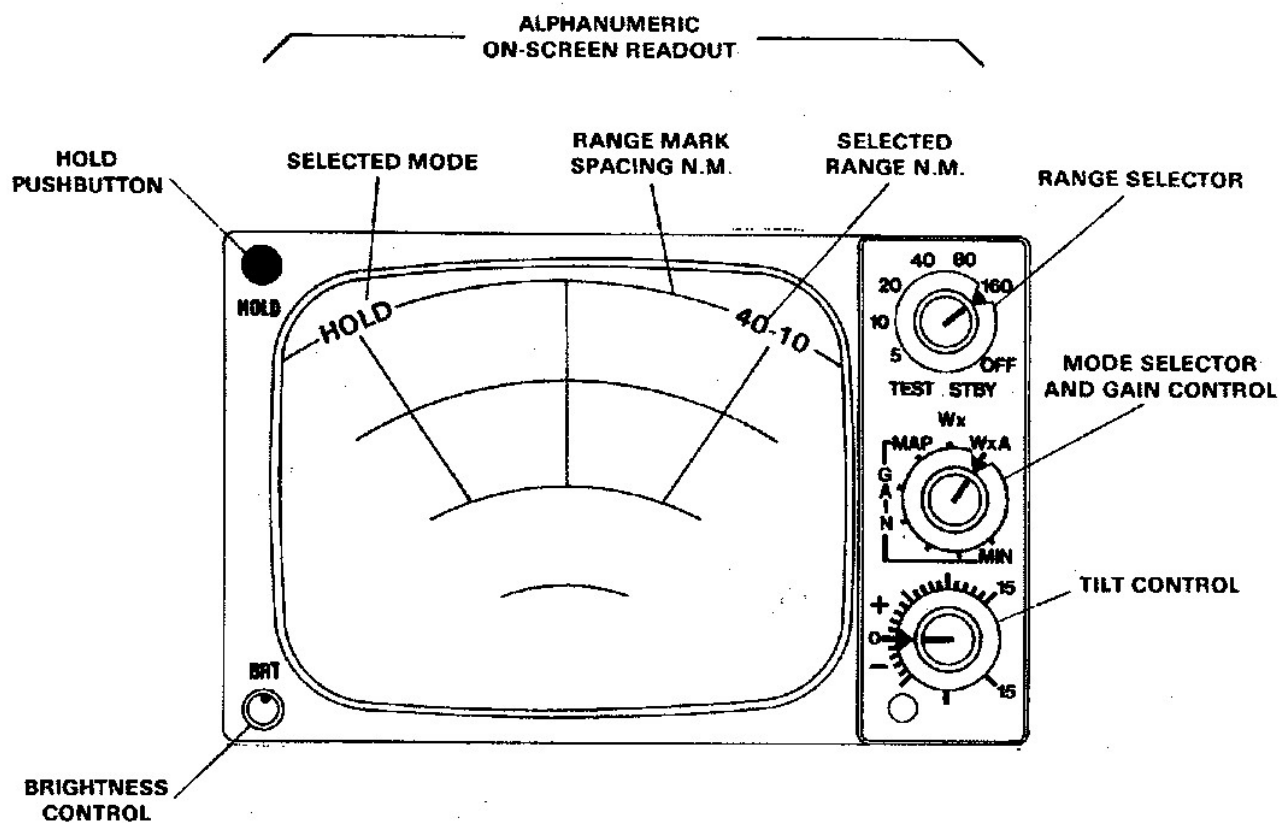
SECTION 3 - EMERGENCY PROCEDURES

No changes to basic Emergency Procedures by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 - NORMAL PROCEDURES

(a) System Controls

Table 4-3 lists and describes the system controls, all of which are mounted on the panel of the radar indicator. Figure 4-1 illustrates the location of these controls. Table 4-5 lists the alphanumeric readouts of range - range marks and mode selection as a function of switch position.



LOCATION OF CONTROLS

Figure 4-1

CONTROL	FUNCTION	OPERATIONAL USE
OFF/STBY/TEST	Range selector	1) Controls primary power to radar system. 2) Places system in "standby" condition during warmup period and when system is not in use. 3) Places system in "test" mode to determine operability of system. No transmission in "test" mode. 4) Selects operating range. Enables transmitter.
Wx/GAIN/Wx A	Gain control and Mode Selector	1) In Wx position, weather image gain is at pre-adjusted level. Contour operation is automatic and constant. 2) In GAIN position, 6 levels from MAP (maximum gain) to MIN may be selected for ground mapping operations. Contour operation is disabled. 3) In Wx A position, the radar indicator display alternately cycles between the Wx position and the GAIN MAP position. This will verify if a contour storm cell area is a storm cell and not a lake or some other terrain feature.
HOLD Pushbutton	Video Hold/ Scan	When the HOLD pushbutton initially depressed, weather or ground mapping image last presented is retained (frozen) on indicator display in order to evaluate the significance of storm cell movement. Depressing for a second time reveals direction and distance of target movement during hold period. During HOLD mode, the antenna continues to scan and the display will continue to be presented as long as power is supplied to the system. The word HOLD will be flashing.
TILT	Antenna tilt control	Electrically adjusts the antenna to move the radar beam to 15 degrees up or down from horizontal ("0" position).
BRT	Brightness Control	Control CRT picture insensity.

Table 4-3

RADAR-160 WEATHER RADAR SYSTEM

Range Switch Position	Range-Range Mark Readout
**TEST	40-10
5	5-1
10	10-2
20	20-4
40	40-10
80	80-20
160	160-40
Wx-MAP-Wx A Switch Position	Mode Readout*
Wx	Wx
MAP	MAP
WxA	WxA

*When the HOLD pushbutton is initially depressed, the MODE READOUT displays flashing HOLD.

**The MODE READOUT displays TEST.

Alphanumeric Readout
Table 4-5

(b) General Operating Precautions

WARNING

DO NOT OPERATE THE RADAR DURING REFUELING OPERATIONS OR IN THE VICINITY OF TRUCKS OF CONTAINERS ACCOMMODATING FLAMMABLES OR EXPLOSIVES; DO NOT ALLOW PERSONNEL WITHIN 15 FEET OF AREA BEING SCANNED BY ANTENNA WHEN SYSTEM IS TRANSMITTING.

- (1) Flash bulbs can be exploded by radar energy.
- (2) Since storm patterns are never stationary, the display is constantly changing, and continued observation is always advisable where areas of turbulence prevail.

NOTE

See RDR-160 pilot manual for detailed operating information and analysis of targets.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

SUPPLEMENT 12

RDR-160/IN2026A WEATHER RADAR SYSTEM

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional RDR-160/IN2026A Weather Radar System is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

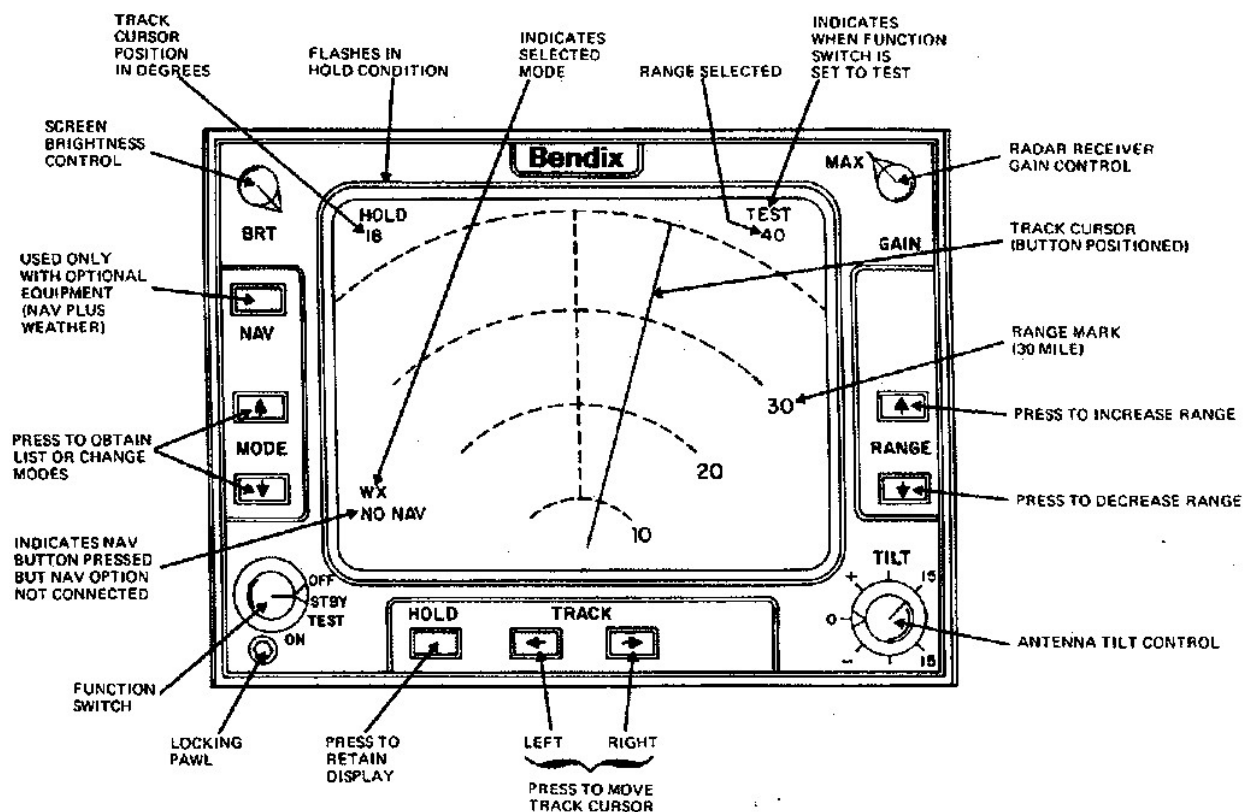
This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional RDR-160/IN2026A Weather Radar System is installed.

SECTION 2 - LIMITATIONS

No changes to the basic limitations provided by Section 2 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION - 3 EMERGENCY PROCEDURES

No changes to the basic Emergency Procedures by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.



IN-2026A CONTROLS AND DISPLAYS

Figure 4-1

(a) Equipment Operation and Controls

(1) RDR-160/IN-2026A Controls and Displays

Controls and displays for the RDR-160/IN-2026A Weather Radar System are listed in table 4-3, with a functional description. Location of the controls and displays is shown in figure 4-1. All operating controls and displays are located on the indicator.

CONTROL/DISPLAY	FUNCTION
Function selector	1. OFF position removes primary power from the system. 2. STBY position places system in the standby condition during warm-up period and when the system is not in use: No display. 3. TEST position selects test function to determine operability of the system. A test pattern is displayed. NO transmission exists in the TEST condition. 4. ON position selects the condition for normal operation. Radar transmission exists in the ON position.
[↓] RANGE button	Clears the display and places the indicator in the next lower range each time the button is pressed (eg: 40 to 20), until minimum range is reached.
TILT control	Electrically adjusts the antenna to move the radar beam up to +15 degrees above the horizontal, or to a maximum of -15 degrees below the horizontal position. The horizontal position is indicated as zero degrees on the control.
TRACK [→] button	When pressed, a yellow track cursor line appears and moves to the right (in one degree steps) while the button is held depressed. The track cursor stops when the button is released, and remains for about 10 to 15 seconds, then disappears unless the button is pressed again. The differential heading will be indicated in yellow numerals in the upper left corner of the display, and disappears simultaneously with the track cursor.
TRACK [←] button	When pressed, the yellow track cursor appears and moves to the left while held depressed. Operation is as explained above.
GAIN control	Varies the radar receiver gain when in the MAP mode. Gain and the STC are preset in TEST function and in the WX and WXA modes.
BRT control	Adjusts brightness of the display for varying cockpit light conditions.
[▲] MODE button	Pressing momentarily produces an "information list" on the display. Pressing again, while information display is still present, advances the indicator display to the next higher mode shown on the list. The list disappears after a few seconds and the mode does not change if the button is not pressed again. The following standard modes are available in the order shown. NAV FLT LOG - Functions available with optional IU-2023A. MAP - Ground mapping WXA - Weather mapping with alert. The red area flashes. WX - Weather mapping NOTE: When the top mode is reached, the button will not change the mode.

Table 4-3

CONTROL/DISPLAY	FUNCTION
[V] MODE button	Moves the indicator display to the next lower mode each time the button is pressed while the list is present. The sequence is as listed above. NOTE: When the bottom mode (WX) is reached, this button will not change the mode.
NAV button (push-on/push-off)	Operational only when optional IU-2023A Remote Computer Unit is connected. When actuated, provides NAV information superimposed over the MODE selected (WX, WXA, or MAP). If interface is not connected, the words NO NAV will be displayed in the lower left corner.
[A] RANGE button	Clears the display and advances the indicator to the next higher range each time the button is pressed (eg: 20 to 40, 40 to 80, etc.), until 160 mile range is reached. The range selected is displayed in the upper right corner (on the last range mark), and the distance to each of the other range marks circles is displayed along the right edge of the circles (arcs).
HOLD pushbutton (push-on/push-off)	Retains the display (NAV and weather) when button is actuated (push-on). The word HOLD flashes in the upper left corner of the display. The weather or ground mapping image last presented is retained (frozen) on indicator display in order to evaluate the significance of storm cell movement. Switching back to normal operation (pressing HOLD pushbutton a second time) reveals direction and distance of target movement during HOLD period. In HOLD, the antenna continues to scan and a non-updated display will continue to be presented as long as power is supplied to the system. A change in range selection, with indicator in HOLD results in a blank screen.

Table 4-3 (Cont.)

(b) Operating Precautions

WARNING

DO NOT OPERATE THE RADAR DURING REFUELING OPERATIONS OR IN THE VICINITY OF TRUCKS OR CONTAINERS ACCOMMODATING FLAMMABLES OR EXPLOSIVES. DO NOT ALLOW PERSONNEL WITHIN 15 FEET OF AREA BEING SCANNED BY ANTENNA WHEN SYSTEM IS TRANSMITTING.

- (1) Flash bulbs can be exploded by radar energy.
- (2) Since storm patterns are never stationary, the display is constantly changing. Continued observation is always advisable in stormy areas.

SECTION 5 - PERFORMANCE

No changes to the basic performance provided by Section 5 of the Pilot's Operating Handbook are necessary for this supplement.

REPORT: VB-850
9-60

ISSUED: JULY 25, 1980

SUPPLEMENT 13

PIPER CONTROL WHEEL CLOCK INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Piper control wheel clock is installed. The information contained within this supplement is to be used in conjunction with the complete handbook.

This supplement has been "FAA Approved" as a permanent part of this handbook and must remain in this handbook at all times when the optional Piper control wheel clock is installed.

SECTION 2 - LIMITATIONS

No changes of the basic limitations provided by Section 2 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 3 - EMERGENCY PROCEDURES

No changes of the basic Emergency Procedures provided by Section 3 of this Pilot's Operating Handbook are necessary for this supplement.

SECTION 4 - NORMAL PROCEDURES

(a) SETTING

While in the CLOCK mode, the time and the date can be set by the operation of the RST button.

(b) DATE SETTING

Pressing the RST button once will cause the date to appear with the month flashing. Pressing the ST-SP button will advance the month at one per second, or at one per push, until the right month appears.

Pressing the RST button once again will cause the date to flash, and it can be set in a similar manner.

(c) TIME SETTING

The RST button must now be pressed two times to cause the hours digits to flash. The correct hour can be set in as described above

Pressing the RST button once again will now cause the minutes digits to flash. The minutes should be set to the next minute to come up at the zero seconds time mark. The RST button is pressed once more to hold the time displayed. At the time mark, the ST-SP button is pressed momentarily to begin the counting at the exact second.

If the minutes are not advanced when they are flashing in the set mode, pressing the RST button will return the clock to the normal timekeeping mode without altering the minutes timing. This feature is useful when changing time zones, when only the hours are to be changed.

(d) AUTOMATIC DATE ADVANCE

The calendar function will automatically advance the date correctly according to the four year perpetual calendar. One day must be added manually on Feb. 29 on leap year. The date advances correctly at midnight each day.

(e) DISPLAY TEST

Pressing both the RST and ST-SP buttons at the same time will result in a display test function.

SECTION 5- PERFORMANCE

No changes to the basic performance provided by Section 5 of this Pilot's Operating Handbook are necessary for this supplement.

SUPPLEMENT 14

FOR

RCA WEATHER SCOUT II MONOCHROME WEATHER RADAR

SECTION 1 - GENERAL

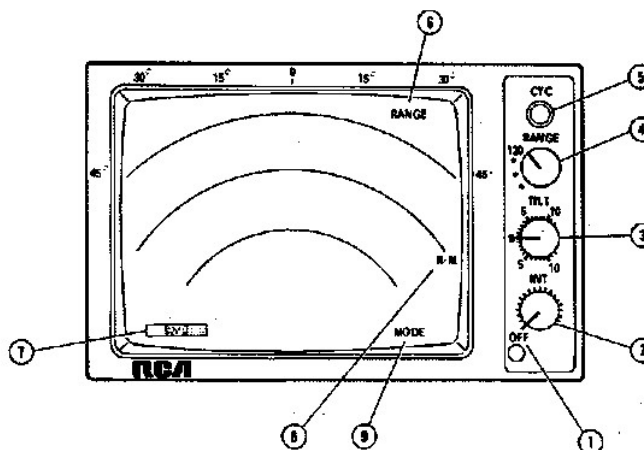
This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the RCA Weather Scout II Monochrome Weather Radar is installed. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

DESCRIPTION

The Weather Scout System is an alphanumeric digital weather radar system which detects storms along the flightpath and gives the pilot a 4 level visual display of their intensity. Areas of heaviest rainfall (level 3) will be brightest; areas of less severe and moderate rainfall (levels 2 and 1) will be progressively less bright; and no rainfall (level 0) will be black. The radar system performs only the function of weather detection and should not be used, nor relied upon, for proximity warning or anti-collision protection.

The system consists of two units; a Receiver-Transmitter Antenna (RTA) and a Digital Indicator (DI). The DI is mounted in the cockpit and contains all the controls used to operate the radar. For 28-VDC operation, the DI contains a DC-DC converter so that the actual power used in the system is always 14 volts. Range and mode alphanumeric and a test-bar pattern are always displayed on the 5 inch rectangular cathode-ray tube to facilitate evaluation of the weather display.

OPERATING CONTROLS AND DISPLAY FEATURES



All controls used to operate the radar system are located on the Digital Indicator front panel.

- | | | |
|----|--|---|
| 1 | OFF | On/Off function: full CCW rotation of INTensity control places system in OFF condition. |
| 2 | INT | Rotary control used to regulate brightness (INTensity) of display. |
| 3 | TILT | Rotary control used to adjust antenna elevation position. Control indexes increments of tilt from 0 to 12 degrees up or down. |
| 4. | RANGE
12/30/60/90
or
12/30/60/120 | Rotary switch used to select one of four ranges. |
| 5 | CYC | Pushbutton switch used to select cyclical contour mode. Level-3 data flashes on and off at 0.5 second intervals to highlight the most intense area of rainfall. Pressing switch second time restores normal or WX mode. |
| 6 | Range Field | Maximum selected range is displayed. Maximum range is always displayed when Indicator is in ON condition. |
| 7 | Test Field | Test block displays three illuminated levels. |
| 8 | Range Mark Identifier | Individual label displayed for each range mark. |
| 9 | Mode | Operating mode is displayed as CYC. When system is first turned on, WAIT is displayed until system times out (30-40 seconds). |

SECTION 2 - LIMITATIONS

- (a) Do not operate radar within 15 feet of ground personnel or when refueling operations are within 100 feet of the aircraft.

SECTION 3 - EMERGENCY PROCEDURES

There are no changes to the emergency procedures with this equipment installed.

SECTION 4 - NORMAL PROCEDURES

- (a) Preliminary Control Settings
- (1) Place the Indicator Control in the following positions before applying power from the aircraft electrical system:
- | | | |
|----|-------------------------|-------------------------------|
| a. | INTensity control | Full counterclockwise, in OFF |
| b. | TILT controls | Fully upward |
| c. | RANGE switch | 12 nautical miles |

NOTE

Control settings in this position will produce minimum hazards to ground personnel should the radar be activated.

- (b) Operational Control Settings
 - (1) Rotate INTensity control clockwise to bring system into ON condition.
 - (2) Note that WAIT is displayed during warm-up period of 30-40 seconds.
 - (3) When WX is displayed, rotate INTensity control clockwise until display brightness is at desired level.
 - (4) Set RANGE switch to desired range.
 - (5) Adjust TILT control for desired forward scan area.

CAUTION

If the radar is to be operated while the aircraft is on the ground.

- a. Direct nose of aircraft such that antenna scan sector is free of large metallic objects (hangars, other aircraft) for a distance of 100 feet (30 meters), and tilt antenna fully upward.
- b. Avoid operation during refueling of aircraft or during refueling operations within 100 feet (30 meters).
- c. Prevent personnel from standing within 15 feet from the radiating antenna.

SECTION 5 - PERFORMANCE

Installation of the RCA Weather Scout II Monochrome Weather Radar does not affect the basic performance information presented in Section 5 of this handbook.

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**SUPPLEMENT 15
FOR
RCA WEATHER SCOUT II COLOR WEATHER RADAR**

SECTION 1 - GENERAL

This supplement must be attached to the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the RCA Weather Scout II Color Weather Radar is installed. The information contained herein supplements or supersedes the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.

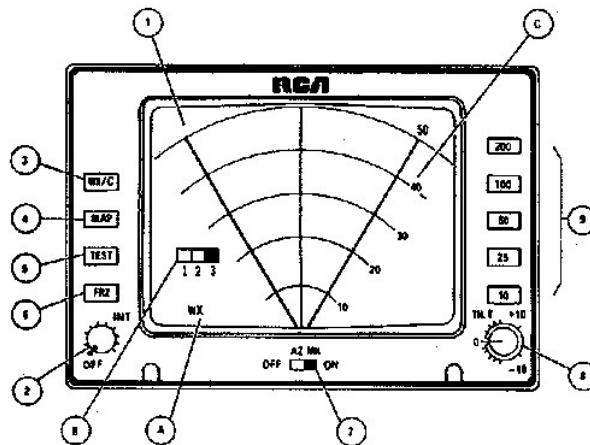
DESCRIPTION

The Weather Scout System is an alphanumeric digital display radar used for weather location and analysis. The system detects storms along the flight path and gives the pilot a visual indication of storm intensity. Target returns are displayed at one of four video levels: 0, 1, 2, or 3. Level 0 is shown as a dark screen because of weak or no returns; levels 1, 2, and 3 are shown as green, yellow, and red displays which represents increasing rainfall, from least to heaviest.

The system consists of three units; a Receiver-Transmitter-Antenna, a Digital Indicator, and a Weather Scout Interface Unit.

- (a) Receiver - Transmitter-Antenna (RTA)
The major assemblies contained in the RTA are the Modulator, IF/AFC Programmer, Antenna Drive, Magnetron, Mixer, Local Oscillator, and Parabolic Antenna.
- (b) Digital Indicator.
The Digital Indicator is installed in the aircraft instrument panel. All of the pilot's operating controls are mounted on the front panel of the Digital Indicator. A rectangular 5 inch TV-type cathode ray tube is used for clear viewing. Range/mode alphanumeric are displayed on the screen to facilitate evaluation of displays.
- (c) Interface Unit
The unit provides signal interface functions between the RTA and Digital Indicator and power interface between the aircraft primary supply and the Weather Scout Weather Radar System.

(d) Operating Controls and Display Features



INDICATOR CONTROLS AND DISPLAY FEATURES.

(1) Display Area

See item A, B, and C for explanation of alphanumeric display.

(A) Mode Field

Selected mode is displayed as WX, CYC, MAP, or TEST. STBY is displayed if R-T is warming up and no mode is selected after turn on. WAIT is displayed if a mode is selected prior to end of warm-up or when Indicator and Antenna are synchronizing.

(B) Auxiliary Field

FRZ is displayed as a blinking word if radar is in freeze mode (to remind pilot that radar display is not being updated for incoming target returns).

1, 2, 3, and color bar legend is displayed in WX/C, TEST and MAP modes. In weather mode color bar is green, yellow, and red. In map mode, color bar is cyan, yellow, and magenta.

(C) Range Mark Identifier

Five labelled range marks are displayed on each range. Label of furthest mark is same as range selected. Range and azimuth marks are displayed in cyan for WX/C and TEST, green for MAP.

(2) INT/OFF

Rotary control used to regulate brightness (intensity) of display.

On/Off function: Full CCW rotation of intensity control places system in OFF condition. CW rotation from OFF setting turns system ON. STBY is displayed until WX/C, MAP, or TEST is selected.

If WX/C or MAP is selected initially or prior to the end of the warm-up period, WAIT will be displayed until RT warms up (approximately 30 seconds).

If TEST is selected immediately. WAIT will be displayed until Antenna is synchronized (less than 4 seconds) and then test pattern will appear.

- | | |
|-------------------------------|---|
| (3) WX/C | Alternate-action switch used to select weather mode or cyclic contour mode.

If selected at turn-on, system will come up in weather-mode; second depression of switch will select cyclic contour mode.

If selected when system is already operating in another mode, system will return to weather mode; second switch depression will select cyclic contour mode.

In cyclic contour mode, 3-level (red) display will flash on and off at a 0.5 second intervals. |
| (4) MAP | Pushbutton switch used to select ground mapping mode. |
| (5) TEST | Pushbutton switch used to select test mode. Special test pattern is displayed. In test, transmitter does not transmit and range is automatically 100 n.m. |
| (6) FRZ | Pushbutton switch used to select freeze mode. Radar display is not updated with incoming target return data. As a warning to the pilot, FRZ level will flash on and off at 0.5 second intervals. |
| (7) AZ MK | Slide switch used to display three-azimuth markers at 30-degree intervals. |
| (8) TILT | Rotary control that enables pilot to select angles of antenna beam tilt with relation to airframe. Rotating control CW tilts beam upward; CCW rotation tilts beam downward. |
| (9) 10/25/50/100
(DI-1005) | Pushbutton switches used to select desired range. Five range marks are displayed for each range. |

SECTION 2 - LIMITATIONS

Do not operate radar within 15 feet of ground personnel or when refueling operations are within 100 feet of aircraft.

SECTION 3 - EMERGENCY PROCEDURES

There are no changes to the emergency procedures with this equipment installed.

SECTION 4 - NORMAL PROCEDURES

- (a) Preliminary Control Settings
 - (1) Place the Indicator Control in the following positions before applying power from the aircraft electrical system:
 - a. INTensity controlFully counterclockwise, in OFF
 - b. TILT controlFully upward
 - c. RANGE switch10 nautical miles

NOTE

Control settings in this position will produce minimum hazards to ground personnel should the radar be activated.

(b) Operational Control Settings

- (1) Rotate INTensity control clockwise to bring system into ON condition.
- (2) Note that STBY is displayed until a mode is selected.
- (3) Depress WX and note that WAIT is displayed during remaining portion of warm-up period.
- (4) When WX is displayed, rotate INTensity control clockwise until display brightness is at desired level.
- (5) Set RANGE switch to desired range.
- (6) Adjust TILT control for desired forward scan area.

NOTE

To place radar in STBY mode after it has been operating, rotate INT control momentarily to OFF, then back to desired viewing position. Radar will then remain in STBY with no radiated power until an operating mode is selected.

CAUTION

If the radar is to be operated while the aircraft is on the ground.

- a. Direct nose of aircraft such that antenna scan sector is free of large metallic objects (hangars, other aircraft) for a distance of 100 feet (30 meters), and tilt antenna fully upward.
- b. Avoid operation during refueling of aircraft or during refueling operations within 100 feet (30 meters).
- c. Prevent personnel from standing within 15 feet from the radiating antenna.

SECTION 5 - PERFORMANCE

Installation of the RCA Weather Scout II Color Weather Radar does not affect the basic performance information presented in Section 5 of this handbook.