TABLE OF CONTENTS

SECTION 9

SUPPLEMENTS

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.

THIS PAGE INTENTIONALLY LEFT BLANK

SUPPLEMENT 1

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:

"WARNING - AIR CONDITIONER MUST BE OFF TO INSURE NORMAL TAKEOFF CLIMB PERFORMANCE."

In full view of the pilot, to the right of the engine gauges (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 condenser door is in the up 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 right of the engine instrument cluster 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.

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 6 KTS at all power settings.
(b) The decrease in range may be as much as 45 nautical miles for the 94 gallon capacity.

The climb performance is not compromised measurably with the air conditioner operating since the compressor is declutched and the condenser door is retracted, both automatically, when a full throttle position is selected. When the full throttle position is not used or in the event of a malfunction which would cause the compressor to operate and the condenser door to be extended, a decrease in rate of climb of as much as 100 fpm can be expected. Should a malfunction occur which prevents condenser door retraction when the compressor is turned off, a decrease in rate of climb of as much as 50 fpm can be expected.

THIS PAGE INTENTIONALLY LEFT BLANK

SUPPLEMENT 2

AUTOFLITE II AUTOPILOT INSTALLATION

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional AutoFlite II Autopilot is installed in accordance with STC SA-3054 SW-D. 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 AutoFlite II Autopilot is installed.

SECTION 2 - LIMITATIONS

(a) Autopilot operation prohibited above 174 KIAS. (Autopilot Vmo)
(b) Autopilot must be "OFF" for takeoff and landing.

SECTION 3 - EMERGENCY PROCEDURES

(a) In case of malfunction, PRESS disconnect switch on pilot's control wheel.
(b) In case of malfunction, overpower autopilot at either control wheel.
(c) AutoFlite II master switch - OFF.
(d) In climb, cruise or descent configuration a malfunction with a 3 second delay in recovery initiation may result in 55° bank and a 220' altitude loss.
(e) In approach configuration, coupled or uncoupled, a malfunction with a 1 second delay in recovery initiation may result in a 20° bank and a 20' altitude loss.

SECTION 4 - NORMAL PROCEDURES

AUTOFLITE II PREFLIGHT INSPECTION

(a) AutoFlite master switch - ON.
(b) Rotate Turn Command Knob to left and right. Aircraft control wheels should rotate in corresponding directions.
(c) With AutoFlite II on, rotate aircraft control wheel to left and right. Only light forces should be required to override roll servo clutch.
(d) AutoFlite II master switch - OFF - rotate control wheel left and right to assure disengagement.

AUTOFLITE II IN-FLIGHT PROCEDURE

(a) Engagement
(1) Check Turn Command Knob in center detent position.
(2) AutoFlite II master switch - ON.

(b) Disengagement
(1) AutoFlite II master switch - OFF.

(c) Heading Changes
(1) Move Trim Knob on instrument for Drift Correction from a Constant Heading.
(2) Move Turn Command Knob for left or right banked turns. Rotation of knob to stop will yield an appropriate bank angle to obtain an appropriate standard rate turn. Intermediate settings may be used for lesser turn rates.

(d) OMNI Tracker
(1) Turn Command Knob - move to center detent position and push IN to engage tracker. Aircraft will track desired radial established on NAV 1 (or as selected, if equipped with a NAV Selector Switch).

NOTE

Tracker must be engaged within 10° of being "on course" i.e. VOR course needle centered and aircraft heading within a 10° of VOR course.

(2) Trim Knob - push IN for high sensitivity. Use high sensitivity position for Localizer tracking and as desired for OMNI tracking.

(e) Maintain directional trim during all autopilot operations.

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 is installed in accordance with STC SA-3053 SE-D. 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 Piper AutoControl IIIB Autopilot is installed.

SECTION 2 - LIMITATIONS

(a) Autopilot operation prohibited above 174 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 roll ON-OFF Rocker Switch "OFF."
(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 55° bank and 220' 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 a 20° bank and 20' altitude loss.
(e) Emergency Operation with Optional NSD 360A (HSI) Slaved and/or Non-Slaved:

NSD 360A

(1) Appearance of HDG Flag:
    a. Check air supply (vac. or pressure) for adequate air supply (4.2 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 VOR/LOC and Glide Slope displays are still functional, use card set to rotate card to aircraft heading for correct picture.

SECTION 4 - NORMAL PROCEDURES

PREFLIGHT INSPECTION

(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. Engage Autopilot "ON" and HDG switches. Set HDG bug to aircraft heading and rotate O.B.S. 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 vacuum to ascertain that the directional gyro and attitude gyro are receiving sufficient air.

(c) Roll Section:
  (1) To engage, center Roll knob, push AP "ON-OFF" switch to "ON" position. To turn, rotate console ROLL 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. 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 with the intercept angle diminishing as the needle off set diminishes.
    d. NAV mode - NAV mode provides reduced VOR sensitifity 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 on H.S.I.
   b. Select LOC-Normal on Radio Coupler to intercept and track inbound on the localizer. Select LOC-REV to intercept and track 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 on H.S.I.
   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 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 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.

THIS PAGE INTENTIONALLY LEFT BLANK

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 in accordance with STC SA-3253 SW-D. 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 AltiMatic IIIC Autopilot is installed.

SECTION 2 - LIMITATIONS

(a) Autopilot operation prohibited above 174 KIAS. (Autopilot Vmo)
(b) Autopilot operation prohibited with more than 2 notches of flap extension.
(c) Autopilot must be "OFF" during takeoff and landing.
(d) A placard stating "Conduct Trim Check prior to flight (see POH)" to be installed in clear view of pilot.

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 autopilot or trim emergency is encountered, do not attempt to determine which system is at fa 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 breakers 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.
(5) If the trim system operates only in one direction, pull the trim circuit breaker and do not operate the trim system until corrective action is taken. Monitor autopilot operation closely when operating without trim follow-up.

(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 55° of bank and 350 feet of altitude loss.
(2) An autopilot malfunction during an approach with a 1 second delay in recovery initiation could result in as much as 22° of bank and 80 feet altitude loss. Maximum altitude loss measured in approach configuration and operating either coupled or uncoupled.

EMERGENCY OPERATION WITH OPTIONAL HSI
(Slaved and/or Non-Slaved)

(a) Appearance of HDG Flag:
(1) Check air supply gauge (vac or pressure) for adequate air supply (4 in. Hg min.).
(2) Check NSD 360 circuit breaker
(3) Observe display for proper operation.

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

(b) To disable heading card - pull circuit breaker and use magnetic compass for directional data.
(c) With card disabled - VOR and Glide Slope displays are still functional; use card set to rotate card to aircraft heading for correct picture.
(d) Slaving Failure - (i.e. failure to self correct for gyro drift):
(1) Check gyro slaving switch is set to No. 1 position (if equipped with Slave No. 1 - No. 2 switch) or "Slaved" position when equipped with Slaved and Free Gyro Mode Switches.
(2) Check for HDG Flag.
(3) Check compass circuit breaker.
(4) Reset heading card while observing slaving meter.

NOTE

Dead slaving meter needle or a needle displaced fully one direction indicates a slaving system failure.

(5) Select slaving amplifier No. 2, if equipped. If not equipped, proceed to step 7.
(6) Reset heading card while checking slaving meter. If proper slaving indication is not obtained.
(7) Switch to free gyro mode and periodically set card as on unslaved gyro.

NOTE

In the localizer mode, the "TO-FROM" arrows may remain out of view, depending upon the design of the NAV converter and in the installation.

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 up and then down and check control yoke 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 yoke and disengage autopilot by pressing Master Autopilot Disconnect/Trim Interrupt Switch button. Check Roll and Pitch controls to assure autopilot has disconnected.

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 elevator 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 Emergency Procedures Section 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.

(c) Pre-Flight: 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 control and check override capability. Check nose down operation. Recheck override.
(4) Activate center bar only - Push rocker fore and aft - only. Trim should not operate with either separate action.

(d) 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 control 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 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 90 KIAS lower flaps one or two notches.

NOTE

Prior to disengaging Altitude Hold mode, rotate Pitch Command 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 on H.S.I.
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. Engage HDG mode on autopilot console to engage coupler.

(3) ILS - Back Course

a. Set inbound, front, localizer course on H.S.I.
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) above as appropriate. Slow to 90-95 KIAS while inbound to F.A.F. and lower one or two notches of flaps.

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 L.O.M. as described in Section 4 (f) or (g) above and in Altitude Hold mode.

b. Inbound to L.O.M. slow to 90-100 KIAS and lower flaps one or two notches.

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 lower landing gear and reduce power to maintain approximately 90-95 KIAS on final approach. 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.

SUPPLEMENT 5

PIPER ELECTRIC PITCH TRIM

SECTION 1 - GENERAL

This supplement supplies information necessary for the operation of the airplane when the optional Piper Electric Pitch Trim 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 Piper Electric Pitch Trim 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

(a) In case of malfunction, PRESS disconnect switch located above the ignition switch.
(b) In case of malfunction, overpower the electric trim at either control wheel.
(c) Maximum altitude change with a 4 second delay in recovery initiation is 800 feet and occurs in the descent configuration. Maximum altitude change in the approach configuration with a 4 second recovery delay is 100 feet.

SECTION 4 - NORMAL PROCEDURES

The electric trim system may be turned ON or OFF by a switch located above the ignition switch. The pitch trim may be changed when the electric trim system is turned on either by moving the manual pitch trim control wheel or by operating the trim control switch on the pilot's control yoke. To prevent excessive speed increase in the event of an electric trim run-away malfunction, the system incorporates an automatic disconnect feature which renders the system inoperative above approximately 169 KIAS. The disconnected condition does not affect the manual trim system.

SECTION 5 - PERFORMANCE

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

THIS PAGE INTENTIONALLY LEFT BLANK

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-32RT-300, Lance II. The aircraft 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 SA1430CE, 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 pitch trim system which is also used 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 or A/P	Autopilot
APPR	Approach
ARM	System Arm for Capture
BC	Back Course
CDI	Course Deviation Indicator or Control
CPLD	Coupled
CWS	Control Wheel Steering
DISC	Disconnect
FCS	Flight Control System
FD	Flight Director System
FDI	Flight Director Indicator
GA	Go Around
GS	Glideslope
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 181 kts indicated airspeed (KIAS). Minimum speed for autopilot operation is 85 kts indicated airspeed (KIAS).
(c) During autopilot operation, the wing flaps must not be extended beyond 25° (2 notches).
(d) The autopilot must be disengaged during takeoff and landing.
(e) System approved for Category I operation only (APPR selected).
(f) Autopilot attitude command limits:

Pitch	±15°
Roll	±25°
Yaw	NA

(g) The maximum fuel inbalance must not exceed 12 gallons (approximately one half hour flight time) during autopilot operation. If the autopilot is disengaged with a large fuel inbalance, a roll transient control force will occur.
(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 DN/UP

- Throttle lever:

GA

SECTION 3 - EMERGENCY PROCEDURES

(a) AUTOPILOT DISENGAGEMENT
Disengage AP and/or prevent engagement by:
(1) Pilot's A/P DISC switch.
(2) AP engage lever on Mode Controller.
(3) Pulling the AUTOPILOT circuit breaker.
(4) Turning BAT-MASTER switch OFF.
(5) Turning FCS MASTER switch OFF.
(6) Depressing GA switch on engine throttle.

(b) AUTOMATIC AUTOPILOT DISENGAGEMENT
Any of the following conditions will cause AP to automatically disengage:
(1) External power failure.
(2) Actuating manual electric pitch 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) MANUAL ELECTRIC PITCH TRIM DISENGAGEMENT

Manual electric pitch trim can be disengaged by pressing AP DISC/TRIM INTERRUPT switch and holding it down until recovery can be made, then turn off FCS MASTER switch and manually retrim the airplane using the manual trim control wheel. After the airplane is trimmed out, pull the (PITCH TRIM) breaker and turn the FCS MASTER switch back on.

NOTE

IF (PITCH TRIM) CIRCUIT BREAKER IS PULLED, AP CAN BE ENGAGED/RE-ENGAGED BUT AIRPLANE ELECTRIC TRIM SYSTEM WILL BE DISABLED (TRIM LIGHT ANNUNCIATOR FLASHES) AND AIRPLANE MUST BE TRIMMED MANUALLY TO MAINTAIN PITCH CONTROL AUTHORITY.

(d) MAXIMUM ALTITUDE LOSSES DUE TO AUTOPILOT MALFUNCTIONS

Configuration	Altitude Loss
(1) Cruise, Climb, Descent	300 feet
(2) Maneuvering	100 feet
(3) APPR	100 feet

CAUTION

OVERPOWERING THE AUTOPILOT IN THE PITCH AXIS FOR PERIODS OF 3 SECONDS OR MORE WILL RESULT IN THE AUTOTRIM SYSTEM OPERATING IN THE DIRECTION TO OPPOSE THE PILOT AND WILL, THEREFORE, CAUSE AN INCREASE IN THE PITCH OVERPOWER FORCES AND IF AUTOPILOT DISENGAGES WOULD RESULT IN A PITCH TRANSIENT CONTROL FORCE.

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 FCS MASTER switch supplies power to the AUTOPILOT and PITCH TRIM system.
(c) The KFC 200 is controlled by the following circuit breakers:

AUTOPILOT - This supplies power to the FCS KC 295 Computer, KC 290 Mode Controller, KA 285 Annunciator panel, AP Pitch and Roll servos and KI 256.

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

PITCH TRIM - This supplies power to the FCS autotrim and manual electric pitch trim systems.

(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 FCS MASTER 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 mode and will transfer the GA mode to PAH. When the CWS is held depressed Manual Electric Trim may be operated without disengaging the AP.

TRIM UP/DN - Manual Electric pitch trim is activated by a dual action type switch that requires both halves be moved simultaneously for actuating up or down trim commands. Operation of the manual electric pitch trim switch 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 the switch will indicate a fixed angle of climb of 6° on the FDI. Selection of the GA Mode when in the APPR or NAV CPLD Mode will disengage the mode and revert to the FD Mode (wings level) for lateral steering. The AP, if engaged, will disengage. However, the AP may be engaged/re-engaged with the GA Mode selected and will follow the FDI pitch command to climb at the fixed angle.

(e) FCS WARNING FLAGS AND ANNUNCIATORS DESIGNATION AND OPERATION

FD - The KI 256 Flight Director Indicator command bars will be biased out of view whenever the system is invalid or a FD mode is not engaged.

HDG - 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.

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. The trim servo motor running without a command is monitored on autotrim and manual trim. The 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 - The Glideslope valid (GS pointer being in view on PNI) has to be present before GS may couple. If, after GS CPLD, the valid is lost, the system will flash the GS Annunciator and transfer from GS CPLD to PAH with the FDI pitch steering bar providing pitch attitude steering information. If the GS valid returns the system will revert back to GS CPLD.

NAV - The NAV or APPR Modes (ARM or CPLD) may be selected and will function with or without a NAV warning flag present. The FDI bank steering will continue to provide steering information with or without a valid NAV signal.

(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 (Perform prior to each flight)

(1) With no modes engaged and power applied to all systems, depress the Test Button on the Mode Controller. All annunciators will be illuminated on the annunciator panel, including the three marker lights, if the airplane uses the KA 285 as a remote marker annunciator. Also, the red TRIM failure light will flash. At least four or more flashes must be observed to indicate proper operation of the autotrim/manual electric pitch trim feature and audible warning should sound.

(2) With the AP disengaged, run the following manual electric pitch trim checks.

a. Verify that the PITCH TRIM circuit breaker is in.

b. Actuate the left-side switch to the fore and aft positions. The trim solenoid should engage, but the trim should not run.
Actuate the right-side switch to the fore and aft positions. The trim solenoid should not engage and the trim should not run.

c. Grasping the manual trim wheel, run the trim both up and down and check the overpower capability. (Check that the trim indicator moves with the wheel.)

d. Press the AP DISC/TRIM INTERRUPT switch down and hold. The manual electric pitch trim will not operate either up or down.

(3) Engage the FD. Then engage the AP, depress the CWS switch, center the flight controls and then release the CWS switch. Apply force to the controls to determine if the AP can be overpowered.

(4) Check the operation of the pilot's control wheel switch functions.

(5) Engage the FD and AP and put in a pitch (UP) command using the vertical trim switch on the Mode Controller. Hold the control column to keep it from moving and observe the autotrim run in the nose-up direction after approximately three seconds delay. Use the vertical trim switch and put in a pitch (DN) command. Hold the control column and observe that the autotrim runs in the nose-down direction after approximately three seconds.

(6) Engage the HDG mode and the 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 TAKEOFF.

NOTE

IF THE AUTOPILOT CIRCUIT BREAKER IS TRIPPED, THE RED "TRIM" FAILURE LIGHT ON THE ANNUNCIATOR PANEL WILL BE DISABLED AND THE AUDIBLE WARNING WILL CONTINUOUSLY SOUND INDICATING THAT THE FAILURE LIGHT IS DISABLED. IN THIS EVENT THE "PITCH TRIM" CIRCUIT BREAKER SHOULD BE PULLED AND INFLIGHT TRIM ACCOMPLISHED BY USING THE MANUAL PITCH TRIM WHEEL.

(h) IN-FLIGHT OPERATION

(1) Engage Procedure:
After takeoff, 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 and holding 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 the AP. While monitoring the flight controls, disengage the system by one of the following methods: depressing the pilot's AP DISC; by operation of the manual electric pitch trim switch; or by the operation of the engage lever on the Mode Controller. The AP light on the annunciator panel will flash at least four times and remain off to indicate that the AP is disengaged. To deactivate the flight director system, depress the FD switch on the Mode Controller or press the AP DISC/TRIM INTERRUPT switch on the pilot's control wheel.

(3) Flight Director Mode (FD):
The FD mode must be engaged before the AP can be engaged. The FD alone indicates PAH and wings level. The pilot may choose to fly the FDI commands manually, without the AP engaged, by depressing the FD mode switch on the Mode Controller and selecting any of the other modes he wishes to follow. When the AP is engaged, the airplane will automatically follow the FDI commands. The FD may be disengaged by depressing the FD mode switch on the Mode Controller at any time the AP is <u>not</u> engaged or by pressing the AP DISC/TRIM INTERRUPT switch on the pilot's control wheel with or without the AP engaged. FD mode engagement is displayed on the annunciator.

NOTE

THE "VERTICAL TRIM" SWITCH, LOCATED ON THE MODE CONTROLLER, MAY BE USED TO TRIM THE COMMAND PITCH ATTITUDE AT A RATE OF ONE DEGREE PER SECOND (THE PITCH ATTITUDE DEGREES LEGEND ON THE AIRPLANE ATTITUDE INDICATOR WILL NOT SERVE TO INDICATE ACCURATE FDI PITCH STEERING BAR PITCH ATTITUDES IN DEGREES).

(4) Altitude Hold Mode (ALT):
When the ALT switch on the Mode Controller is pressed, the FDI will provide commands for maintaining 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 or descent. The ALT will automatically disengage when glideslope couples or the GA 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 MODE CONTROLLER, MAY BE USED TO CHANGE OR TRIM THE COMMAND ALTITUDE UP OR DOWN AT 500 TO 700 FPM WITHOUT DISENGAGING THE MODE. THE NEW PRESSURE ALTITUDE THAT EXISTS WHEN THE SWITCH IS RELEASED WILL THEN BE HELD.

(5) Heading Mode (HDG):
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 FDI and/or AP will command a 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 FDI and/or AP will automatically command a turn in the direction of the new setting. To disengage the HDG Mode, depress the HDG switch on the Mode Controller and observe the HDG light go out on the annunciator. The HDG mode will automatically disengage when APPR or NAV CPLD is achieved.

(6) Navigation Mode (NAV):
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. The annunciator will indicate NAV ARM until intercepting the selected course, unless the NAV switch is engaged with wings level and a centered needle on the CDI. Then the mode will go directly to NAV CPLD as displayed on the annunciator panel. The system can intercept at any angle up to 90° and will always turn toward the course pointer. 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 the NAV switch or by engaging HDG when in NAV CPLD or by engaging APPR when in NAV CPLD/ARM.

CAUTION

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

(7) Approach Mode (APPR):
The Approach mode may be selected by tuning the NAV receiver to the desired VOR or LOC frequency, setting the CDI to the desired radial or inbound course and depressing the APPR switch on the Mode Controller. The annunciator will indicate APPR ARM until the course is intercepted unless the APPR switch is engaged with the wings level and there is a centered needle on the CDI. In that situation, the mode will go directly to APPR CPLD as displayed on the annunciator panel.

The system can intercept at any angle up to 90° and will always turn toward the course pointer. See approach procedure for more detail. APPR mode can be disengaged by depressing the APPR switch on the Mode Controller, by depressing the GA switch on the 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 COMMAND AND/OR CONTROL WITHOUT A VALID VOR/LOC SIGNAL (NAV FLAG IN VIEW).

(8) Back Course Mode (BC):
For 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) Vertical Mode Switch (TRIM DN/UP):
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 engine throttle. GA will illuminate on the annunciator panel indicating mode status. The GA mode provides a fixed pitch up angle indication on the FDI that will command the best rate of climbout. 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 a desired heading with the HDG bug to intercept the radial and engage HDG and AP (maximum recommended intercept angle - 90°).
(3) Select the desired radial and engage NAV. The FCS will remain on HDG as indicated on the annunciator panel and in 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 to front course.
(3) Set Heading Bug and engage HDG to intercept selected CDI course at any angle (maximum recommended intercept angle - 90°).
(4) Engage APPR and note APPR ARM on the annunciator panel.
(5) When airplane approaches the selected CDI course, APPR will couple, HDG will decouple, the FDI and/or AP will give commands to track LOC or VOR, and CPLD will illuminate on the annunciator panel.
(6) When the glideslope beam is intercepted, the glideslope will couple automatically and indicate GS on the annunciator panel. If ALT was engaged prior to intercepting the glideslope, it will automatically disengage when GS couples. FDI and/or AP will now provide commands to track LOC and GS. Adjust throttle to control speed on descent. Set HDG bug for missed approach but do not engage HDG.

(7) Landing or missed approach.
   a. Disengage AP and land.
   b. Go Around by depressing GA switch on engine throttle. The AP if engaged, will disengage. The FDI will indicate a climb. Manually fly the airplane and retrim as required to establish the GA attitude on the FDI. The AP may then be re-engaged. APPR may be engaged 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 switch DN on the Mode Controller or by establishing the desired PAH using the CWS interrupt switch.

SECTION 5 - PERFORMANCE

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

THIS PAGE INTENTIONALLY LEFT BLANK

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 PA-32RT-300, Lance II. The aircraft 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 SA1430CE, and must remain in this handbook at all times when the optional King KFC 200 Automatic Flight Control System is installed.

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

The airplane is equipped with an electric pitch trim system which is also used 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 or A/P	Autopilot
APPR	Approach
ARM	System Arm for Capture
BC	Back Course
CDI	Course Deviation Indicator or Control
CPLD	Coupled
CWS	Control Wheel Steering
DISC	Disconnect
FCS	Flight Control System
FD	Flight Director System
GS	Glideslope
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 181 kts indicated airspeed (KIAS). Minimum speed for autopilot operation is 85 kts indicated airspeed (KIAS).

(c) During autopilot operation, the wing flaps must not be extended beyond 25 ° (2 notches).

(d) The autopilot must be disengaged during takeoff and landing.

(e) System approved for Category I operation only (APPR selected).

(f) Autopilot attitude command limits:

Pitch	± 15 °
Roll	± 25 °
Yaw	NA

(g) The maximum fuel inbalance must not exceed 12 gallons (approximately one half hour flight time) during autopilot operation. If the autopilot is disengaged with a large fuel inbalance, a roll transient control force will occur.

(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

SECTION 3 - EMERGENCY PROCEDURES

(a) AUTOPILOT DISENGAGEMENT

Disengage AP and/or prevent engagement by:

(1) Pilot's A/P DISC switch.
(2) AP engage lever on Mode Controller.
(3) Pulling the AUTOPILOT circuit breaker.
(4) Turning BAT MASTER switch OFF.
(5) Turning FCS MASTER switch OFF.

(b) AUTOMATIC AUTOPILOT DISENGAGEMENT

Any of the following conditions will cause AP to automatically disengage:

(1) External power failure.
(2) Actuating manual electric pitch 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 vertical modes can be selected.

(c) MANUAL ELECTRIC PITCH TRIM DISENGAGEMENT

Manual electric pitch trim can be disengaged by pressing AP DISC/TRIM INTERRUPT switch and holding it down until recovery can be made, then turn off FCS MASTER switch and manually retrim the airplane using the manual trim control wheel. After the airplane is trimmed out, pull the (PITCH TRIM) breaker and turn the FCS MASTER switch back on.

NOTE

IF (PITCH TRIM) CIRCUIT BREAKER IS PULLED, AP CAN BE ENGAGED/RE-ENGAGED BUT AIRPLANE ELECTRIC TRIM SYSTEM WILL BE DISABLED (TRIM LIGHT ANNUNCIATOR FLASHES) AND AIRPLANE MUST BE TRIMMED MANUALLY TO MAINTAIN PITCH CONTROL AUTHORITY.

(d) MAXIMUM ALTITUDE LOSSES DUE TO AUTOPILOT MALFUNCTIONS

Configuration	Altitude Loss
(1) Cruise, Climb, Descent	300 feet
(2) Maneuvering	100 feet
(3) APPR	100 feet

CAUTION

OVERPOWERING THE AUTOPILOT IN THE PITCH AXIS FOR PERIODS OF 3 SECONDS OR MORE WILL RESULT IN THE AUTOTRIM SYSTEM OPERATING IN THE DIRECTION TO OPPOSE THE PILOT AND WILL, THEREFORE, CAUSE AN INCREASE IN THE PITCH OVERPOWER FORCES AND IF AUTOPILOT DISENGAGES WOULD RESULT IN A PITCH TRANSIENT CONTROL FORCE.

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 FCS MASTER switch supplies power to the AUTOPILOT and PITCH TRIM system.
(c) The KFC 200 is controlled by the following circuit breakers:

AUTOPILOT - This supplies power to the FCS KC 295 Computer, KC 292 Mode Controller, KA 285 Annunciator panel and AP Pitch and Roll Servos.

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

PITCH TRIM - This supplies power to the FCS autotrim and manual electric pitch trim systems.

(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 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 FCS MASTER 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 PAH, or ALT hold mode. When the CWS is held depressed Manual Electric Trim may be operated without disengaging the AP.

TRIM UP/DN - Manual electric pitch trim is activated by a dual action type switch that requires both halves be moved simultaneously for actuating up or down commands. Operation of the manual electric pitch trim switch will disengage the AP lever switch on the Mode Controller (except when CWS switch is held depressed as previously noted).

(e) FCS WARNING FLAGS AND ANNUNCIATORS DESIGNATION AND OPERATION

HDG - 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.

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. The trim servo motor running without a command is monitored on autotrim and manual trim. The 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 - The Glideslope valid (GS pointer being in view on PNI) has to be present before GS may couple. If, after GS CPLD, the valid is lost, the system will flash the GS Annunciator and transfer from GS CPLD to PAH. If the GS valid returns, the system will revert back to GS CPLD.

NAV - The NAV or APPR Modes (ARM or CPLD) may be selected and will function with or without a NAV warning flag present. The AP will continue to provide steering with or without a valid NAV signal.

(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 (PREFORM PRIOR TO EACH FLIGHT)

(1) With no modes engaged and power applied to all systems, depress the Test Button on the Mode Controller. All annunciators will be illuminated on the annunciator panel except FD and GA. The three marker lights will also illuminate if the airplane uses the KA 285 as a remote marker indicator. Also, the red TRIM failure light will flash. At least four or more flashes must be observed to indicate proper operation of the autotrim/manual electric pitch trim feature and the audible warning should sound.

(2) With the AP disengaged, run the following manual electric pitch trim checks.

a. Verify that the PITCH TRIM circuit breaker is in.

b. Actuate the left-side switch to the fore and aft positions. The trim solenoid should engage, but the trim should not run.
Actuate the right-side switch to the fore and aft positions. The trim solenoid should not engage and the trim should not run.

c. Grasping the manual trim wheel, run the trim both up and down and check the overpower capability. (Check that the trim indicator moves with the wheel.)

d. Press the AP DISC/TRIM INTERRUPT switch down and hold. The manual electric pitch trim will not operate either up or down.

(3) Engage the AP, depress the CWS switch, center the flight controls and then release the CWS switch. Apply force to the controls to determine if the AP can be overpowered.

(4) Check the operation of the pilot's control wheel switch functions.

(5) Engage the AP and put in a pitch (UP) command using the vertical trim switch on the Mode Controller. Hold the control column to keep it from moving and observe the autotrim run in the nose-up direction after approximately three seconds delay. Use the vertical trim switch and put in a pitch (DN) command. Hold the control column and observe that the autotrim runs in the nose-down direction after approximately three seconds.

(6) Engage the AP and HDG. 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 clockwise.

CAUTION

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

NOTE

IF THE AUTOPILOT CIRCUIT BREAKER IS TRIPPED, THE RED "TRIM" FAILURE LIGHT ON THE ANNUNCIATOR PANEL WILL BE DISABLED AND THE AUDIBLE WARNING WILL CONTINUOUSLY SOUND INDICATING THAT THE FAILURE LIGHT IS DISABLED. IN THIS EVENT THE "PITCH TRIM" CIRCUIT BREAKER SHOULD BE PULLED AND INFLIGHT TRIM ACCOMPLISHED BY USING THE MANUAL PITCH TRIM WHEEL.

(h) IN-FLIGHT OPERATION

(1) Engage Procedure:
After takeoff, clean up airplane and establish climb. Engage the AP. The pitch attitude will lock on any attitude up to 15 °.

Engaging and holding the CWS switch allows the pilot to momentarily revert to manual control while retaining his previous modes and to 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 A/P DISC/TRIM INTERRUPT switch; by operation of the manual electric pitch trim switch; or by the operation of the engage lever on the Mode Controller. The AP light on the annunciator panel will flash at least four times and remain off to indicate that the AP is disengaged.

(3) AP Mode
The AP must be engaged before any other mode can be engaged. The AP 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 MODE CONTROLLER, MAY BE USED TO TRIM THE COMMAND PITCH ATTITUDE AT A RATE OF ONE DEGREE PER SECOND.

(4) Altitude Hold Mode (ALT):
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 ALT at no greater than 500 feet per minute climb or descent. The ALT will automatically disengage when glideslope couples. 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 MODE CONTROLLER, MAY BE USED TO CHANGE OR TRIM THE COMMAND ALTITUDE UP OR DOWN AT 500 TO 700 FPM WITHOUT DISENGAGING THE MODE. THE NEW PRESSURE ALTITUDE THAT EXISTS WHEN THE SWITCH IS RELEASED WILL THEN BE HELD.

(5) Heading Mode (HDG):
Set the heading bug to the desired heading on the PNI, engage the AP, depress the HDG switch on the Mode Controller and HDG will be displayed on the annunciator panel. The AP will command a 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 AP will automatically command a turn in the direction of the new setting. To disengage the HDG Mode, depress the HDG switch on the Mode Controller and observe the HDG light go out on the annunciator. The HDG mode will automatically disengage when APPR or NAV CPLD is acheived.

(6) Navigation Mode (NAV)
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. The annunciator will indicate NAV ARM until intercepting the selected course, unless the NAV switch is engaged with wings level and a centered needle on the CDI. Then the mode will go directly to NAV CPLD as displayed on the annunciator panel. The system can intercept at any angle up to 90° and will always turn toward the course pointer. 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 depressing the NAV switch or by engaging HDG when in NAV CPLD or by engaging APPR when in NAV CPLD/ARM.

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 (APPR)
The Approach mode may be selected by tuning the NAV receiver to the desired VOR or LOC frequency, setting the CDI to the desired radial or inbound course and depressing the APPR switch on the Mode Controller. The annunciator will indicate APPR ARM until the course is intercepted unless the APPR switch is engaged with the wings level and there is a centered needle on the CDI. In that situation, the mode will go directly to APPR CPLD as displayed on the annunciator panel.

The system can intercept at any angle up to 90° and will always turn toward the course pointer. See approach procedure for more detail. APPR mode can be disengaged by depressing the APPR switch on the Mode Controller, 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 (BC):
For 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 or APPR switches, or by selecting other than a LOC frequency on the NAV receiver.

(9) Vertical Mode Switch (TRIM DN/UP):
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.

(i) VOR PROCEDURES

(1) Tune NAV receiver to appropriate frequency.
(2) Set a desired heading with the HDG bug to intercept the radial and engage AP and HDG (maximum recommended intercept angle 90°).
(3) Select the desired radial and engage NAV. The FCS will remain on HDG as indicated on the annunciator panel and in 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 to front course.
(3) Set Heading Bug and engage HDG to intercept selected CDI course at any angle (maximum recommended intercept angle 90°).
(4) Engage APPR and note APPR ARM on the annunciator panel.
(5) When airplane approaches the selected CDI course, APPR will couple, HDG will decouple, the AP will give commands to track LOC or VOR, and CPLD will illuminate on the annunciator panel.
(6) When glideslope beam is intercepted, the glideslope will couple automatically and indicate GS on the annunciator panel. If ALT was engaged prior to intercepting the glideslope, it will automatically disengage when GS couples. The AP will now provide commands to track LOC and GS. Adjust throttle to control speed on descent. Set HDG bug for missed approach but do not engage HDG.
(7) For landing or missed approach, disengage AP.

(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 switch DN on the Mode Controller or by establishing the desired PAH using the CWS interrupt switch.

SECTION 5 - PERFORMANCE

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

THIS PAGE INTENTIONALLY LEFT BLANK

Nord Flyg Service AB
Eskilstuna flygplats
SE-635 06 ESKILSTUNA

GARMIN GNS 430
Navigation system

LFV APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

AC MFG MODEL: PA-32-RT-300

SERIAL NO: 3253129

REG NO: SE- GVV

This supplement must be attached to the LFV approved Airplane Flight Manual when the GARMIN GNS 430 is installed in accordance with unit installation manual, GARMIN GNS 430 installation manual P/N 190-00140-02, Rev H. The information contained herein supplements or supersedes the basic manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

GPS APPROACH IS NOT APPROVED

Norrköping 2001-09-04

LUFTFARTSVERKET
Aviation Safety Department

Sven Jakobsson

Sven Jakobsson

ESKILSTUNA. 2001-08-01

TABLE OF CONTENTS

SECTION I
GENERAL

1. The GNS 430 System is a fully integrated, panel mounted instrument which contains a VHF Communications Transceiver, a VOR/ILS receiver and a Global Positioning System (GPS) Navigation computer. The system consists of a GPS antenna, GPS receiver, VHF/VOR/LOC/GS antenna, VOR/ILS receiver, VHF COM antenna and a VHF Communications Transceiver. The primary function of the VHF Communication portion of the equipment is to facilitate communication with Air Traffic Control. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS system satellites, recover orbital data, make range and Doppler measurements, and process this information in real time to obtain the user's position, velocity and time.

2. Provided the GARMIN GNS 430's GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

    a. VFR/IFR enroute, terminal and non-precition instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) operation in accordance with AC 20-138.

    b. One of the approved sensors, for a single or dual GNS 430 installation, for North Atlantic Minimun Navigation Performance Specification (MNPS) Airspace in accordance with AC 91-49 and AC 120-33.

    c. The system meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138, and JAA AMJ 20X2 Leaflet 2 Revision 1, provided it is receiving usable navigation information from the GPS receiver.

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. Navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

SECTION II
LIMITATIONS

1. The GARMIN GNS 430 Pilots Guide P/N 190-00140-00, Rev A, dated October 1998 or later appropriate revision must be immediately available to the flight crew whenever navigation is predicated on the use of the system.

2. The GNS 430 must utilize the following or later FAA approved software versions

Subsystem	Software Version
Main	2.00
GPS	2.00
COM	1.22
VOR/LOC	1.25
G/S	2.00

The main software version is displayed on the GNS 430 self test page immediately after turn-on for 5 seconds. The remaining system software versions van be verified on the AUX group sub page 2, "SOFTWARE DATABASE VER".

3. IFR enroute and terminal navigation predicated upon the GPS 430's GPS Receiver is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.

4. Instrument approach navigation predicated upon the GPS 430's GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment data base. The GPS equipment database must incorporate the current update cycle.

    a. Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.

    b. Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the GNS 430's GPS receiver is not authorized.

    c. Use of the GNS 430 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be present on the external indicator.

    d. When an alternate airport is required by the applicable operation rules it must be served by an approach based on other than GPS or Loran-C navigation, the aircraft must have the operational equipment capable of using that navigation aid and the required navigation aid must be operational.

    e. VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee Step-Down Fix altitude protection or arrival at approach minimums in normal position to land.

5. If not previously defined, the following default settings must be made in the "SETUP 1" menu of the GNS 430 prior to operation (refer to Pilot's Guide for procedure in necessary):

(a) **dis, spd** .. nm kt (sets navigation units to "nautical miles" and "knots")
(b) **alt, vs** ..... ft fpm (sets altitude units to "feet" and "feet per minute")
(c) **map datum** WGS 84 (sets map datum to WGS-84, see note below)
(d) **posn** ..... deg-min (sets navigation grid units to decimal minutes)

NOTE: In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the GNS 430 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the GNS 430 prior to its use for navigation.

SECTION III
EMERGENCY PROCEDURES

ABNORMAL PROCEDURES

1. If GARMIN GNS 430 navigation information is not available or invalid, utilize remaining operational navigation equipment as required.

2. If "RAIM POSITIONING WARNING" message is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the GNS 430 VOR/ILS receiver or an alternate means of navigation other than the GNS 430's GPS Receiver.

3. If "RAIM IS NOT AVAILABLE" message is displayed in the enroute, terminal, or intitial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the GNS 430's GPS Receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the GNS's VOR/ILS receiver or another IFR-approved navigation system.

4. If "RAIM IS NOT AVAILABLE" message is displayed while on the final approach segment, GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity (0.3 nautical mile). After 5 minutes the system will flag and no longer provide course guidance with approach sensitivity. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity by executing the missed approach.

5. In an in-flight emergency, depressing and holding the COM transfer button for 2 seconds will select the emergency frequency of 121.500 MHz into the "Active" frequency window.

SECTION IV
NORMAL PROCEDURES

1. DETAILED OPERATION PROCEDURES

Normal operation procedures are described in the GARMIN GNS 430 Pilot's Guide, P/N 190-00140-00, Rev. A, dated October 1998, or later appropriate revision.

2. PILOT'S DISPLAY

The GNS 430 System data will appear on the Pilot's HSI indicator. The source of data is either GPS or VLOC as annunciated on the display above the CDI key.

3. AUTOMATIC LOCALIZER COURSE CAPTURE

By default , the GNS 430 automatic localizer capture feature is enabled. This feature provides a method for system navigation data present on the external indicators to be switched automatically from GPS guidance to localizer/glide slope guidance at the point of course intercept on a localizer at which GPS derived course deviation equals localizer derived course deviation. If an offset from the final approach course is being flown, it is possible that the automatic switch from GPS course guidance to localizer/glide slope course will not occur. It is the pilot's responsibility to ensure correct system navigation data is present on the external indicatior before continuing a localizer based approach beyond the final approach fix.

4. AUTOPILOT / FLIGHT DIRECTOR OPERATION

Coupling of the GNS 430 System steering information to the autopilot/flight director can be accomplished by engaging the autopilot/flight director in the NAV or APR mode.

When the autopilot/flight director system is using course information supplied by the GNS 430 System and the course pointer is not automatically driven to the desired track, the course pointer on the HSI must be manually set to the desired track (DTK) indicated by the GNS 430. For detailed autopilot/flight director operational instructions, refer to the FAA Approved Flight Manual Supplement for the autopilot/flight director.

SECTION V
PERFORMANCE

No change

SECTION VI
WEIGHT AND BALANCE

See current weight and balance data.

SECTION VII
AIRPLANE AND SYSTEM DESCRIPTIONS

See GNS 430 Pilot's Guide for a complete description of the GNS 430 system.