



Pilot's Operating Handbook And FAA Approved Airplane Flight Manual **SKYHAWK** **SP**

CESSNA MODEL 172S NAV III AVIONICS OPTION - KAP 140 AUTOPILOT

Serials

172S9810 thru 172S10467 and 172S10469 thru 172S10506
and

172S10508 thru 172S10639 and 172S10641 thru 172S10655

SUPPLEMENT 3 BENDIX/KING KAP 140 2 AXIS AUTOPILOT

SERIAL NO. <u>172S10160</u>
REGISTRATION NO. <u>SE-MBN</u>

This supplement must be inserted into Section 9 of the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual when the Bendix/King KAP 140 2 Axis Autopilot System is installed.

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SECTION 9 - SUPPLEMENTS
SUPPLEMENT 3

CESSNA
MODEL 172S NAV III
KAP 140 AUTOPILOT

SUPPLEMENT 3

BENDIX/KING KAP 140 2 AXIS AUTOPILOT

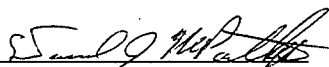
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CESSNA
MODEL 172S NAV III
KAP 140 AUTOPILOT

SECTION 9 - SUPPLEMENTS
SUPPLEMENT 3

SERVICE BULLETIN CONFIGURATION LIST

The following is a list of Service Bulletins that are applicable to the operation of the airplane, and have been incorporated into this supplement. This list contains only those Service Bulletins that are currently active.

<u>Number</u>	<u>Title</u>	<u>Airplane Serial</u> <u>Effectivity</u>	<u>Revision</u> <u>Incorporated</u>	<u>Incorporated</u> <u>in Airplane</u>
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BENDIX/KING KAP 140 2 AXIS AUTOPILOT

GENERAL

The Bendix/King KAP 140 2 Axis Autopilot provides the following modes of operation:

1. Roll (ROL) mode - keeps the wings level.
2. Vertical Speed (VS) mode - holds the climb or descent rate at the moment the autopilot is engaged or a manually-set climb or descent rate. Controlled using the up (UP) and down (DN) buttons.

NOTE

The autopilot can hold a set vertical speed only if engine power and airplane weight will let it. If the vertical speed set on the autopilot is more than the airplane can supply and airspeed decreases sufficiently, the airplane can be made to stall. Make sure that the vertical speed set on the autopilot results in airplane performance that stays in the operating limitations of both the autopilot and the airplane.

3. Altitude Hold (ALT) mode - holds a set altitude using combined engine power, pitch and pitch trim control.
4. Heading (HDG) mode - holds the magnetic heading set using the HDG bug on the G1000 Primary Flight Display (PFD) Horizontal Situation Indicator (HSI).
5. Navigation (NAV) mode - locks on a course set using the course (CRS) knob when a valid VHF navigation source (NAV 1 or NAV 2) is shown on the G1000 HSI, when GPS is set as the HSI navigation source and the GPS is operating in OBS mode, or when the course is set automatically using GPS direct-to or flight plan (FPL) navigation and GPS is shown on the G1000 HSI.

(Continued Next Page)

GENERAL (Continued)

6. Approach (APR) mode - locks on-course with greater sensitivity than NAV mode. APR mode is used to lock on the final approach course to the Final Approach Fix (FAF), and start the final approach segment of the procedure. While operating on an intercept heading or course, in either HDG or NAV mode, APR mode is set or armed (ARM) to lock on to the final approach course. APR mode will work for VOR, LOC and ILS approaches using either the NAV 1 or NAV 2 VHF navigation radios with the correct signal, the applicable radio set as the navigation source on the HSI and the correct course (CRS) set on the HSI. APR mode will automatically lock on the glideslope (GS) using vertical speed mode during ILS approaches. APR supplies vertical guidance only for ILS approaches, and then only when established on the localizer before glideslope intercept. This mode also works for GPS or RNAV/GPS approaches when GPS is set as the navigation source on the HSI.

The KAP 140 autopilot gives the pilot altitude preselect and altitude alert functions. The altitude preselect function lets the pilot set a limit or target altitude before starting a climb or descent. The autopilot will climb or descend, as applicable, at the preselected vertical speed and will return to level flight at the preselected altitude. The altitude alert function will supply an altitude alert, an electronic sound or aural tone, at 1000 feet before the preselected altitude or when altitude changes more than 200 feet from the altitude selection.

The KAP 140 autopilot elevator trim system supplies automatic adjustment of elevator trim during normal autopilot operation. The autopilot elevator trim system also supplies the pilot with a Manual Electric Trim (MET) system when the autopilot is not engaged. The MET system is controlled by using the DN-UP switches on the control wheel. The elevator trim system is designed to default to a fail-safe condition for any single trim system malfunction during flight. All trim system malfunctions will produce warning annunciations on the face of the KAP 140 autopilot display and on the upper right portion of the Garmin G1000 PFD.

(Continued Next Page)

GENERAL (Continued)

Internal computer logic prevents the autopilot or MET system from engaging until the KAP 140 autopilot computer has successfully completed the preflight self-test sequence and has determined the system is operating correctly. The preflight self-test will automatically start when the AVIONICS switch (BUS 2) is set to the ON position.

The KAP 140 autopilot will disengage if any of the following conditions occur:

1. Internal autopilot system malfunction.
2. Autopilot computer monitor detects either roll axis (R) or pitch axis (P) malfunction annunciation.
3. Pitch accelerations larger than +1.4g or -0.6g caused by a servo malfunction. The pilot cannot maneuver the airplane and cause this condition, although some turbulence can.
4. DC electric turn coordinator malfunction.
5. The A/P DISC/TRIM INT switch on the left control wheel is pushed.

The AVIONICS switch (BUS 2) supplies electrical power to the AUTO PILOT circuit breaker from AVIONICS BUS 2. The AVIONICS switch (BUS 2) can also de-energize the KAP 140 autopilot or MET system in an emergency.

The following circuit breakers energize and supply protection for the KAP 140 autopilot:

<u>LABEL</u>	<u>FUNCTIONS</u>
AUTO PILOT	A pullable circuit breaker on the AVIONICS BUS 2 energizes the KAP 140 autopilot computer and the roll, pitch and pitch trim servos.
WARN	A pullable circuit breaker on the CROSSFEED BUS supplies power for the PITCH TRIM annunciation on the Garmin G1000 PFD.

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GENERAL (Continued)

BENDIX/KING KAP 140 2 AXIS AUTOPILOT SYSTEM

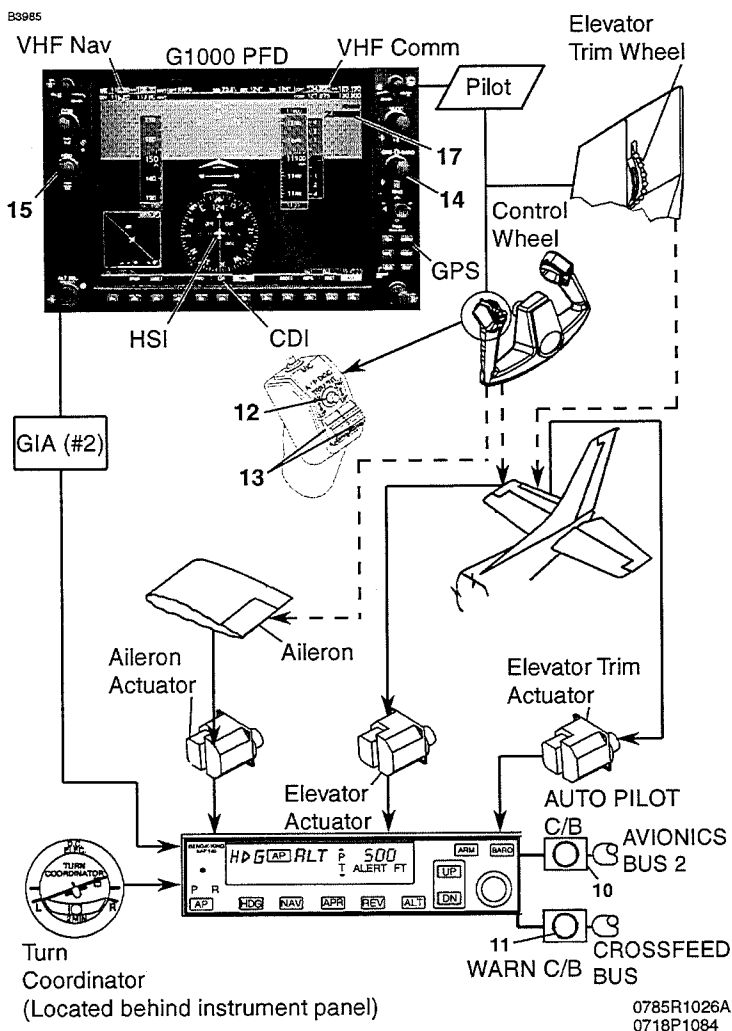
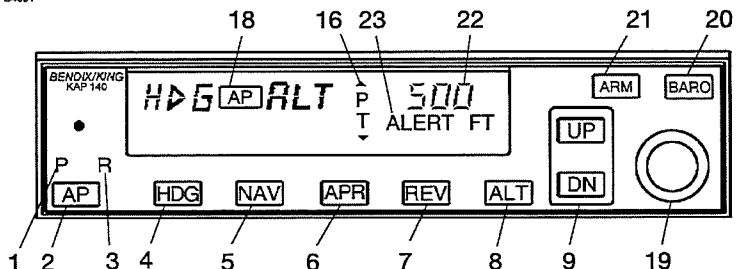


Figure S3-1*

GENERAL (Continued)

**BENDIX/KING KAP 140 2 AXIS AUTOPILOT WITH
ALTITUDE PRESELECT, OPERATING CONTROLS
AND INDICATORS**

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Figure S3-2

1. PITCH AXIS (P) ANNUNCIATOR - P annunciations on the lower left corner of the KAP 140 autopilot computer indicates failure of pitch axis and will either disengage the autopilot or not allow engagement of the pitch axis. In turbulent air, the P annunciator may illuminate during abnormal vertical accelerations.
2. AUTOPILOT ENGAGE/DISENGAGE (AP) BUTTON - When the AP button is pressed and held for approximately 0.25 seconds, the autopilot will engage only if all preflight self-test conditions are met. The autopilot will engage in the basic roll (ROL) mode which functions as a wing leveler and the pitch axis vertical speed (VS) mode. The commanded vertical speed will be displayed in the upper right corner of the KAP 140 autopilot computer display. The captured VS will be the vertical speed present at the moment the AP button is pressed. The AP button may also be used to disengage the autopilot.
3. ROLL AXIS (R) ANNUNCIATOR - R annunciations on the lower left corner of the KAP 140 autopilot computer indicates failure of the roll axis and will disengage the autopilot or not allow engagement of the roll axis.

(Continued Next Page)

GENERAL (Continued)

4. **HEADING (HDG) MODE SELECTOR BUTTON** - When pushed, will select the heading mode, which commands the airplane to turn and maintain the heading selected by the heading bug on the HSI. A new heading may be selected at any time by rotating the heading select knob on the Garmin G1000 PFD resulting in the airplane turning to the new heading bug location on the HSI. The button can also be used to change between HDG and ROL modes.
5. **NAVIGATION (NAV) MODE SELECTOR BUTTON** - When pushed, will select the navigation mode. This mode provides automatic beam capture and tracking of VOR, LOC, or GPS signals as set on the HSI. NAV mode is recommended for enroute navigation tracking.
6. **APPROACH (APR) MODE SELECTOR BUTTON** - When pushed, will select the approach mode. This mode provides automatic beam capture and tracking of VOR, GPS, LOC and Glideslope (GS) on an ILS, as set on the HSI. APR mode tracking sensitivity is recommended for instrument approaches.
7. **BACK COURSE APPROACH (REV) MODE BUTTON** - This button is active only when the coupled navigation receiver is tuned to a LOC/ILS frequency. When pushed, will select the back course approach mode. This mode functions identically to the approach mode except that the autopilot response to LOC signals is reversed. The glideslope feature is locked out with the autopilot in the REV mode.
8. **ALTITUDE HOLD (ALT) MODE SELECT BUTTON** - When pushed, will select the altitude hold mode. This mode provides capture and tracking of the selected altitude. The selected altitude is the airplane altitude at the moment the ALT button is pressed. If the ALT button is pressed with an established VS rate present, there will be about a 10%, of VS rate, overshoot, but will quickly return to the selected altitude.

(Continued Next Page)

GENERAL (Continued)

9. VERTICAL SPEED (UP/DN) MODE BUTTONS - The action of these buttons depends on the vertical mode selection when pressed.
 - a. If VS mode is active, AP plus any lateral mode, and the UP button is pressed, the autopilot will modify the displayed VS command Feet Per Minute (FPM) in the up direction. Single momentary cycles on either the UP or DN button will increment the VS command by 100 FPM per cycle. When either button is continuously held in, it will modify the VS command by 300 FPM per second.
 - b. If ALT mode is active, pressing the UP/DN buttons will modify the captured altitude by 20 feet per cycle. If held continuously will command the airplane up or down at the rate of 500 FPM, synchronizing the ALT reference to the actual airplane altitude upon button release.
10. AUTO PILOT CIRCUIT BREAKER, refer to Figure S3-1, A 5-amp pullable circuit breaker supplies 28 VDC to the KAP 140 autopilot system.
11. WARN CIRCUIT BREAKER, refer to Figure S3-1, A 5-amp pullable circuit breaker supplies power to the autopilot disconnect horn and PITCH TRIM annunciator on the Garmin G1000 PFD.
12. AUTOPILOT DISCONNECT (A/P DISC/TRIM INT) SWITCH, refer to Figure S3-1, When depressed, will disengage the autopilot and interrupt Manual Electric Trim (MET) power. An autopilot disconnect will be annunciated by a continuous 2 second tone accompanied by flashing **AP** annunciations on the KAP 140 autopilot computer display.
13. MANUAL ELECTRIC TRIM (MET) SWITCHES, refer to Figure S3-1, When both switches are pressed in the same direction, the trim system will provide pitch trim in the selected direction. Use of manual electric trim during autopilot operation will disengage the autopilot.
14. COURSE SELECT (CRS) KNOB, refer to Figure S3-1, Selects the desired magnetic course to be tracked by the autopilot.

NOTE

The HDG bug must also be positioned to the proper course to capture and track the selected radial or desired track.

(Continued Next Page)

GENERAL (Continued)

15. HEADING SELECT KNOB (HDG), refer to Figure S3-1, Positions the heading pointer bug on the HSI compass card.

NOTE

The position of the heading bug also provides heading datum to the autopilot when armed for course capture in NAV, APR, or REV (BC) modes.

16. PITCH TRIM (PT) Annunciator - **PT** annunciations on the KAP 140 autopilot computer display indicates system operation with arrowheads to indicate direction of pitch trim motion. The **PT** annunciation will flash if autotrim has not satisfied the request for trim for a period of 10 seconds. A solid **PT** without an arrowhead is an indication of a pitch trim fault. Refer to the RECOVERY PROCEDURE listed in the EMERGENCY PROCEDURES section of the supplement for proper response to a pitch trim fault.
17. PITCH TRIM Annunciation, refer to Figure S3-1, **PITCH TRIM** annunciations on the upper right corner of the Garmin G1000 PFD indicates the automated preflight self-test has detected a pitch trim fault or the continuous monitoring system has detected a pitch trim fault during flight. Refer to the RECOVERY PROCEDURE listed in the EMERGENCY PROCEDURES section of the supplement for proper response to a pitch trim fault.
18. AUTOPILOT ENGAGE AP Annunciation - **AP** annunciation on the KAP 140 autopilot computer display indicates the autopilot is engaged. Flashing **AP** annunciations on the KAP 140 autopilot computer display indicates pilot initiated or automatic disengagement of the KAP 140 autopilot system.
19. ROTARY KNOBS - Used to set the altitude alerter reference altitude; or may be used immediately after pressing the BARO button, to adjust the autopilot barometric setting to match that of the airplane's altimeter when manual adjustment is required.

(Continued Next Page)

GENERAL (Continued)

20. **BARO SET (BARO) BUTTON** - When pushed and released, will change the display from the altitude alerter selected altitude to the baro setting display (either IN HG or HPA) for 3 seconds. If pushed and held for 2 seconds, will change the baro setting display from IN HG to HPA or vice versa. Once the baro setting display is visible the rotary knobs may be used to manually adjust the baro setting.
21. **ALTITUDE ARM (ARM) BUTTON** - When pushed, will change the altitude arming function between on or off. When **ALT ARM** is annunciated, the autopilot will capture the altitude alerter displayed altitude (provided the airplane is climbing or descending in VS to the displayed altitude). ALT hold arming when the autopilot is engaged is automatic upon altitude alerter altitude selection via the rotary knobs. Note that the alerter functions are independent of the arming process thus providing full time alerting, even when the autopilot is disengaged.
22. **ALTITUDE ALERTER/VERTICAL SPEED/BARO SETTING DISPLAY** - Normally displays the altitude alerter selected altitude. If the UP or DN button is pushed while in VS hold, the display changes to the command reference for the VS mode in FPM for 3 seconds. If the BARO button is pushed, the display changes to the autopilot baro setting in either IN HG or HPA for 3 seconds.
23. **ALTITUDE ALERT ANNUNCIATION** - **ALERT** annunciation on the KAP 140 autopilot computer display illuminates continuously in the region of 200 to 1000 feet from the selected altitude if the airplane was previously outside of this region. Flashes for two seconds the first time the airplane crossed the selected altitude and continuously in the 200 to 1000 feet region if the airplane was previously inside of this region (i.e. at the selected altitude). Associated with the visual alerting is an aural alert (5 short tones) which occurs 1000 feet from the selected altitude upon approaching the altitude and 200 feet from the selected altitude on leaving the altitude.

OPERATING LIMITATIONS

The following autopilot limitations must be obeyed:

1. The entire Preflight procedure given in the Normal Procedures section of this supplement must be satisfactorily completed prior to each flight. Use of the autopilot or manual electric trim system is prohibited before the satisfactory completion of the Preflight procedure.
2. The autopilot must be OFF during takeoff and landing.
3. During autopilot operation, a pilot must be seated in the left front seat with their seat belt fastened.
4. The system is approved for Category I operation only (Approach mode selected).
5. Autopilot maximum airspeed limitation - 140 KIAS.
Autopilot minimum airspeed limitation - 70 KIAS.
Autopilot minimum approach airspeed - 80 KIAS.
6. Maximum flap extension - 10°.
7. Maximum lateral fuel imbalance with autopilot engaged - 90 Pounds.
8. The autopilot must be disengaged below 200 feet AGL during approach operations and below 800 feet AGL for all other phases of flight.
9. Manually overriding the autopilot to change pitch or roll attitude is prohibited. (Disengage the autopilot before moving the control wheel manually).
10. If the red **PITCH TRIM** warning annunciator, shown on the upper right corner of the Garmin G1000 PFD, comes on during flight, perform the Recovery Procedure shown in the Emergency Procedures section of this supplement. The electric trim and autopilot systems will not operate with the AUTO PILOT circuit breaker in the open position.
11. Operation of the KAP 140 autopilot is prohibited when the GMA 1347 audio panel is inoperative as no warning tone will be supplied when the autopilot disengages.

EMERGENCY PROCEDURES

The four-step recovery procedure listed below should be committed to memory. It is important that the pilot be proficient in accomplishing all four steps without reference to this supplement.

RECOVERY PROCEDURE

1. In case of autopilot, autopilot trim, or manual electric trim malfunction (accomplish steps 1a. and 1b. simultaneously):
 - a. Airplane Control Wheel - **GRASP FIRMLY** and regain control of airplane.
 - b. A/P DISC/TRIM INT Switch - **PUSH** and **HOLD** throughout recovery.
 - c. AIRPLANE - **TRIM** manually as needed.
 - d. AUTO PILOT Circuit Breaker - **OPEN** (pull out).

WARNING

FOLLOWING AN AUTOPILOT, AUTOTRIM OR MANUAL ELECTRIC TRIM SYSTEM MALFUNCTION, DO NOT ENGAGE THE AUTOPILOT UNTIL THE CAUSE OF THE MALFUNCTION HAS BEEN CORRECTED.

NOTE

The AVIONICS switch (BUS 2) may be used to de-energize the autopilot and electric trim systems. If necessary, complete steps 1a. thru 1c. listed above, set the AVIONICS switch (BUS 2) to the OFF position and then locate and open (pull) the AUTO PILOT circuit breaker. Then the AVIONICS switch (BUS 2) can be set to the ON position to restore power to the other avionics equipment on AVIONICS BUS 2. Primary attitude, airspeed, directional compass, and altitude instruments will continue to operate when the AVIONICS switch (BUS 2) is in the OFF position.

Maximum altitude losses due to autopilot malfunction:

CONFIGURATION	ALTITUDE LOSS
Cruise, Climb or Descent	350 Feet
Maneuvering	100 Feet
Approach	90 Feet

(Continued Next Page)

EMERGENCY PROCEDURES (Continued)

AMPLIFIED EMERGENCY PROCEDURES

The following paragraphs provide additional information for more complete understanding of the recommended course(s) of action in emergency situations.

1. An autopilot or autotrim malfunction occurs when there is an uncommanded deviation in the airplane flight path or when there is abnormal control wheel or trim wheel motion. In some cases, (especially for autopilot trim), there may be little to no airplane motion, but the **PITCH TRIM** warning annunciator, located on the upper right corner of the Garmin G1000 PFD, may come on.
2. The primary concern in reacting to an autopilot or autopilot trim system malfunction, or to an automatic disconnect of the autopilot, is to keep control of the airplane. Immediately grasp the control wheel and push and hold the A/P DISC/TRIM INT switch throughout the recovery. Manipulate the controls as required to safely keep the airplane within all of its operating limitations. Elevator trim should be used manually as needed to relieve control forces. Locate and open (pull) the AUTO PILOT circuit breaker on the lower right hand corner of the circuit breaker panel to completely disable the autopilot system.
3. A manual electric trim system malfunction (without pilot actuation of the manual electric trim switches) may be recognized by the **PITCH TRIM** annunciator coming on or by unusual trim wheel motions with the autopilot not engaged. As with an autopilot malfunction, the first concern following a manual electric trim system malfunction is to keep the airplane in control. Grasp the control wheel firmly and push and hold down the A/P DISC/TRIM INT switch. Locate and open (pull) the AUTO PILOT circuit breaker on the lower right hand corner of the AVIONICS BUS 2 circuit breaker panel.

(Continued Next Page)

EMERGENCY PROCEDURES (Continued)

AMPLIFIED EMERGENCY PROCEDURES (Continued)

Trim system voice messages will be provided for the following flight conditions:

1. TRIM IN MOTION - Elevator trim runs for more than 5 seconds, message repeats every 5 seconds.
2. CHECK PITCH TRIM - An out of trim condition has existed for approximately 20 seconds, take immediate corrective action:
 - a. Airplane Control Wheel - **GRASP FIRMLY** and regain control of airplane.
 - b. A/P DISC/TRIM INT Switch - **PUSH** and **HOLD** throughout recovery.
 - c. AIRPLANE - **TRIM** manually as needed.
 - d. AUTO PILOT Circuit Breaker - **OPEN** (pull out).

NOTE

Emergency procedures for any malfunction are essentially the same: immediately grasp the control wheel and regain control of airplane while pushing and holding the A/P DISC/TRIM INT switch, then trim the airplane as needed. After these steps have been accomplished, secure the autopilot electric trim system by pulling the AUTO PILOT circuit breaker. As with any airplane emergency procedure, it is important that these 4 steps of the recovery procedure be committed to memory.

3. The AVIONICS switch (BUS 2) may be used to remove all electric power from the autopilot and electric trim systems while the AUTO PILOT circuit breaker is located and opened. When the AVIONICS switch (BUS 2) is OFF, the autopilot and electric trim systems will not operate. After opening the AUTO PILOT circuit breaker, set the AVIONICS switch (BUS 2) to the ON position to return power to the other equipment on AVIONICS BUS 2.
4. It is important that all portions of the autopilot and electric trim system are tested prior to each flight in accordance with the Normal Procedures section of this supplement in order to assure their integrity and continued safe operation during flight.

(Continued Next Page)

EMERGENCY PROCEDURES (Continued)

AMPLIFIED EMERGENCY PROCEDURES (Continued)

WARNING

FOLLOWING AN AUTOPILOT, AUTOTRIM OR MANUAL ELECTRIC TRIM SYSTEM MALFUNCTION, DO NOT ENGAGE THE AUTOPILOT UNTIL THE CAUSE OF THE MALFUNCTION HAS BEEN CORRECTED.

■ A flashing **PT** annunciation on the face of the autopilot indicates a failure in the pitch trim system. The pitch trim (autotrim) system has not reduced the load on the pitch servo sufficiently quickly. This condition should be temporary.

1. **FLASHING PT ANNUNCIATION** - OBSERVE airplane pitch behavior. If pitch behavior is satisfactory, wait 5 to 10 seconds for the annunciation to go off.
2. If **PT** annunciation continues, **CONTROL WHEEL - GRASP FIRMLY, DISENGAGE** the autopilot and **CHECK** for out of trim condition in pitch. Manually trim to reduce control forces.
3. **AUTOPILOT OPERATION - CONTINUE**, if satisfied that the pitch trim malfunction indication was temporary. **DISCONTINUE** if failure of autotrim.

If a red **P** or **R** is shown on the face of the autopilot:

1. A red **P** indicates that the pitch axis system of the autopilot has been disabled and cannot be engaged.

WARNING

DO NOT ENGAGE THE AUTOPILOT IF ONLY THE ROLL AXIS IS OPERATING.

NOTE

■ If the red **P** lamp comes on because of abnormal acceleration of the airplane (due to turbulence), the red **P** lamp should go off within approximately one minute and normal operation of the autopilot will begin again.

2. A red **R** indicates that the autopilot roll axis system has been disabled and cannot be engaged. The autopilot cannot be engaged again.

(Continued Next Page)

EMERGENCY PROCEDURES (Continued)

AMPLIFIED EMERGENCY PROCEDURES (Continued)

If a flashing mode annunciation is shown on the face of the autopilot:

1. **HDG** flashing - Shows a failed heading input. **PUSH** the HDG button to change to ROL mode. **ROL** will be shown on the face of the autopilot.

NOTE

The **HDG** annunciation will flash for 5 seconds on selection of NAV, APR or REV mode to instruct the pilot to set the HDG bug, on the HSI, to the desired course.

2. **NAV, APR or REV** flashing - Shows that the autopilot navigation source is not working correctly (flag). The navigation signal may have been lost or the navigation source may have been switched at the PFD.

NOTE

NAV, APR or REV flashing can also be caused by a failed heading input (during course capture).

3. **GS** flashing - Shows a failed glideslope signal or input (GS will ARM again if a good glideslope signal comes back).

NOTE

- If the approach is continued using the localizer only, make sure to obey the Minimum Descent Altitude (MDA) for the non-precision approach procedure. Use ALT or VS mode as necessary to control altitude.
- When the mode annunciator starts to flash, the autopilot has changed to a default mode of operation: ROL for lateral control and/or VS for vertical control. The autopilot may be engaged in the previous mode again as soon as the correct navigation, glideslope or heading signal or source is available.

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EMERGENCY PROCEDURES (Continued)

AMPLIFIED EMERGENCY PROCEDURES (Continued)

Effects of equipment failure on autopilot operation:

1. Failure of Attitude Indicator - No effect on autopilot.
2. Failure of AHRS - The autopilot will function only in ROL mode.
3. Failure of DC Turn Coordinator - Autopilot will disengage or will not engage.
4. Failure of HSI - If HSI fails to function correctly, no heading signal will be available, so the autopilot HDG, NAV, APR and REV modes will not function correctly. Only ROL mode will function correctly.
5. Failure of the Transponder Pressure Altitude Encoder - The Altitude Alert and Altitude Preselect functions will not operate correctly (gray code signal not available).
6. Failure of the No. 2 GIA 63 Integrated Avionics Unit: If the No. 2 GIA 63 unit fails, the autopilot will function only in ROL mode.
7. Failure of the GMA 1347 Audio Panel - No aural annunciator (Electronic sound or aural tone) will be heard when the autopilot disengages.

NORMAL PROCEDURES

PREFLIGHT (PERFORM BEFORE EACH FLIGHT):

1. MASTER Switch (BAT) - ON
2. AVIONICS Switch BUS 2 - ON
3. POWER APPLICATION and SELF-TEST - The autopilot tests itself when power is first made available. The test is a sequence of internal checks before starting normal system operation. The test sequence is shown on the face of the autopilot as **PFT X**. "X" is the test sequence step number. Successful completion of the self-test is shown by all autopilot display elements coming on (Display Test), the PITCH TRIM annunciator on the PFD coming on and the operation of the autopilot disengagement tone.

WARNING

IF THE RED P STAYS ON, THE AUTOPILOT HAS FAILED THE PREFLIGHT TEST. OPEN (PULL) THE AUTO PILOT CIRCUIT BREAKER TO MAKE SURE THAT THE AUTOPILOT AND MANUAL ELECTRIC TRIM SYSTEM WILL NOT OPERATE.

NOTE

When power is first supplied to the autopilot, the red **P** (pitch axis) annunciator may come on the face of the autopilot to show that the pitch system cannot be engaged. This condition should last approximately 30 seconds. The red **P** (pitch axis) annunciator will go off and the autopilot pitch trim system will function correctly.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

PREFLIGHT (PERFORM BEFORE EACH FLIGHT): (Continued)

4. **MANUAL ELECTRIC TRIM (MET) SYSTEM - TEST** (Using the DN - UP switches on the outboard side of the left control wheel):
 - a. Left Switch - PUSH FORWARD to DN position and hold. MONITOR elevator trim wheel for movement. If elevator trim wheel moves, MET system has failed. Release switch to center OFF position.

NOTE

Any movement of the elevator trim wheel during the check of either the left or right switch means that the MET system has failed. The airplane may be flown if the AUTO PILOT circuit breaker is PULLED and secured in the OPEN position so that the autopilot is disconnected from electrical power and will not operate until it is repaired.

- b. Left Switch - PULL AFT to UP position and hold. Make sure that the elevator trim wheel does not move. Release switch to center OFF position.
- c. Right Switch - PUSH FORWARD to DN position and hold. Make sure that the elevator trim wheel does not move. Make sure the red PT light on the face of autopilot comes on. Release switch to center OFF position.

NOTE

If red PT light is not shown on the face of the autopilot after the right switch is held in the DN position for 5 seconds, the trim monitor system has failed. The airplane may be flown if the AUTO PILOT circuit breaker is PULLED and secured in the open position so the autopilot is disconnected from electrical power and will not operate until it is repaired.

- d. Right Switch - PULL AFT to UP position and hold. Make sure that the elevator trim wheel does not move. Make sure the red PT light on the face of the autopilot comes on. Release switch to center OFF position.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

PREFLIGHT (PERFORM BEFORE EACH FLIGHT): (Continued)

- e. Left and Right Switches - PUSH BOTH FORWARD (DN position) at same time and hold. Make sure that the elevator trim wheel moves in the nose-down direction. While holding both switches forward, PUSH and HOLD the A/P DISC/TRIM INT switch, make sure that the elevator trim wheel does not move while the A/P DISC/TRIM INT switch is held. Continue to hold both switches forward and RELEASE the A/P DISC/TRIM INT switch. Make sure that the elevator trim wheel moves in nose-down direction. Release both switches to the center OFF position.

NOTE

Make sure that the elevator trim tab moves up with nose down elevator trim (both switches held in the DN position) movement. If the elevator trim wheel moves while the A/P DISC/TRIM INT switch is pushed and held, the manual electric trim system has failed. The airplane may be flown if the AUTO PILOT circuit breaker is PULLED and secured in the open position so that the autopilot is disconnected from electrical power and will not operate until it is repaired.

- f. Left and Right Switches - PULL BOTH AFT (UP position) at same time and hold. Make sure that the elevator trim wheel moves in the nose-up direction. While holding both switches in the aft position, PUSH and HOLD the A/P DISC/TRIM INT switch, make sure that the elevator trim wheel does not move while the A/P DISC/TRIM INT switch is held. Continue to hold both switches aft and RELEASE the A/P DISC/TRIM INT switch. Make sure that the elevator trim wheel moves in nose-up direction. Release both switches to the center OFF position.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

PREFLIGHT (PERFORM BEFORE EACH FLIGHT): (Continued)

NOTE

- Make sure that the elevator trim tab moves down with nose up elevator trim (both switches held in the UP position) movement. If the elevator trim wheel moves while the A/P DISC/TRIM INT switch is pushed and held, the MET system has failed. The airplane may be flown if the AUTO PILOT circuit breaker is PULLED and secured in the open position so that the autopilot is disconnected from electrical power and will not operate until it is repaired.
- 5. BARO setting flashing - SET current local barometer (atmospheric pressure) using knobs or push BARO button to accept the present setting.
- 6. AUTOPILOT - ENGAGE (push and hold AP button for 1 second).
- 7. FLIGHT CONTROLS - MOVE. Make sure that the autopilot can be overpowered in both pitch axis and roll axis.
- 8. A/P DISC/TRIM INT Switch - PUSH. Make sure that the autopilot disengages. Make sure that the disengagement warning sound is heard.
- 9. ELEVATOR TRIM WHEEL - SET pointer to TAKEOFF position.

WARNING

- **WHEN THE AUTOPILOT IS ENGAGED, THE PILOT-IN-COMMAND MUST CONTINUOUSLY MONITOR AND BE READY TO DISENGAGE THE AUTOPILOT AS NOTED ABOVE. DO THE EMERGENCY RECOVERY PROCEDURE IF AUTOPILOT OPERATION IS ERRATIC OR DOES NOT CORRECTLY CONTROL THE AIRPLANE.**
- **DURING AUTOPILOT OPERATIONS, THE PILOT-IN-COMMAND MUST SET THE AUTOPILOT VERTICAL SPEED (VS) RATE AND ENGINE POWER TO MAKE SURE THAT AIRSPEED STAYS BETWEEN 80 KIAS AND 160 KIAS AND DOES NOT EXCEED ANY OTHER AIRPLANE OPERATING LIMITATION.**

(Continued Next Page)

NORMAL PROCEDURES (Continued)

PREFLIGHT (PERFORM BEFORE EACH FLIGHT): (Continued)

NOTE

Autopilot tracking performance will not be as good as usual in turbulence.

10. AVIONICS Switch (BUS 2) - OFF
11. MASTER Switch (BAT) - OFF

BEFORE TAKEOFF

1. A/P DISC/TRIM INT Switch - PUSH
2. BARO - SET

CAUTION

CONTINUE TO SET BARO THROUGHOUT THE FLIGHT WHEN THE ALTIMETER SETTING CHANGES. NO FLASHING BARO SETTING WILL BE SHOWN TO REMIND THE PILOT.

3. ALTITUDE SELECT - SET target altitude using knobs.

CAUTION

THERE IS NO CONNECTION BETWEEN THE G1000 ALT SEL FEATURE AND THE KAP 140 ALTITUDE ALERT FUNCTION.

NOTE

At 1000 feet before the altitude selection, an electronic sound or tone will be supplied for the pilot. Altitude changes of more than 200 feet from the altitude selection will cause a series of short tones to alert the pilot.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

AFTER TAKEOFF

1. Elevator Trim - SET to trim airplane before engaging the autopilot.

NOTE

If the autopilot is engaged when the airplane is out of trim, the result can be an unwanted altitude change, TRIM FAIL annunciation and autopilot disengagement.

2. Airspeed and Rate of Climb - STABLE

NOTE

Only engage the autopilot during wings-level stable flight. The autopilot will come on in ROL (wings leveler) and VS (Vertical Speed) modes. The VS mode initial rate-of-climb will be the vertical speed at the time the autopilot is engaged. Do not engage the autopilot when the airplane cannot hold the climb rate because of excessive pitch attitude, low airspeed, low engine power or high airplane weight. Do not engage the autopilot when the performance or operation of the autopilot or airplane will not obey the limitations.

3. AP Button - PUSH and HOLD. Make sure that **ROL** and **VS** are shown on the face of the autopilot. If no selection of other operating modes is made, the autopilot will operate in ROL and VS modes.

NOTE

When operating in ROL mode, turbulence may result in changes to airplane heading. ROL mode only works to keep the wings level.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

AFTER TAKEOFF (Continued)

4. Make HDG or NAV mode selection as applicable (optional).

WARNING

- **WHEN OPERATING THE AUTOPILOT IN VS MODE WITH POWER SET FOR CLIMB AND AIRSPEED AT OR NEAR BEST RATE-OF-CLIMB, CONTINUED OPERATION IN VS MODE CAN RESULT IN A STALL. IF NECESSARY, DISENGAGE THE AUTOPILOT AND RETURN THE AIRPLANE TO STABLE CLIMB BEFORE ENGAGING THE AUTOPILOT AGAIN.**
- **WHEN OPERATING AT OR NEAR AUTOPILOT MAXIMUM AIRSPEED, REDUCE POWER TO CONTROL THE DESIRED RATE-OF-DESCENT AND KEEP THE AIRSPEED LESS THAN THE AUTOPILOT MAXIMUM LIMIT.**
- **DO NOT MOVE THE CONTROL WHEEL WHEN THE AUTOPILOT IS ENGAGED. IF THE PILOT TRIES TO FLY THE AIRPLANE MANUALLY WHEN THE AUTOPILOT IS ENGAGED OR TRIES TO MANUALLY "HELP" THE AUTOPILOT, THE AUTOPILOT WILL ADJUST PITCH TRIM TO OPPOSE CONTROL WHEEL MOVEMENT AND CAUSE THE AIRPLANE TO GO OUT OF TRIM. THE OUT-OF-TRIM CONDITION WILL CAUSE LARGE ELEVATOR CONTROL FORCES WHEN THE AUTOPILOT IS DISENGAGED.**

(Continued Next Page)

NORMAL PROCEDURES (Continued)

CLIMB OR DESCENT

1. BARO - SET current altimeter.
2. VS (Vertical Speed) Mode:
UP or DN Buttons - PUSH button to set airplane vertical speed in 100 FPM increments. PUSH and HOLD the button for the KAP 140 to increase the vertical speed at approximately 300 ft/min/sec to the desired value, then RELEASE. The rate will be set at the time of button release.

CAUTION

THE VERTICAL SPEED MODE HAS SYSTEM LIMITS OF +1500/-2000 FEET PER MINUTE. OPERATING THE MODEL 172S NEAR THESE LIMITS IS NOT RECOMMENDED.

3. POWER - SET as applicable for vertical speed selection.

NOTE

The autopilot can hold a set vertical speed only if engine power and airplane weight are correct for the conditions. If the vertical speed set for the autopilot is more than the airplane can supply and airspeed decreases sufficiently, the airplane can be made to stall. Make sure that the vertical speed set for the autopilot results in airplane performance that stays in the operating limitations of both the autopilot and the airplane.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

ALTITUDE PRESELECT MODE (ALTITUDE LOCK ON)

1. ALTITUDE SELECT - SET (target altitude using knob on KAP 140)
2. ALTITUDE ARM - PUSH the ARM button to set the altitude lock on feature to the ON position (if needed). **ALT ARM** will show on the face of the autopilot when altitude lock on is set to the ON condition.

NOTE

- Minor differences between the autopilot altitude selection and the airplane altitude indication may be seen after altitude lock on. This small difference is generally due to autopilot system tolerances.
- Use of altitude preselect (Lock On) mode is not recommended for lock on at Minimum Descent Altitude (MDA) during non-precision instrument approach procedures due to the possibility of altitude overshoot. Glideslope (GS) lock on during an ILS approach will prevent lock on to a preselect altitude selection.
- Use Vertical Speed (VS) mode as described previously in CLIMB or DESCENT for altitude change.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

ALTITUDE HOLD

1. ALT Button - PUSH (verify **ALT** annunciator is shown on the front of the autopilot computer display). The autopilot will stay at the set altitude.

NOTE

- If the ALT button is pushed while the airplane is climbing or descending, the airplane may go through the altitude selection by approximately 10% of the vertical rate (example: 500 FPM = approximately 50 feet), but will quickly lock on and correct to the target altitude.
- In Advisory Circular AC00-24B "Thunderstorms", the FAA recommends the use of Pitch Attitude Hold for autopilot operation in severe turbulence. The KAP 140 does not use pitch reference, so it is recommended that the autopilot be disengaged and the airplane flown manually in severe turbulence.

CHANGING ALTITUDE

If the autopilot is engaged in ALT mode (Altitude Hold):

1. For small altitude changes (less than 100 feet), push the UP or DN button momentarily to program an increase or decrease to the altitude selection, as applicable, of 20 feet each time the button is pushed. This lets the autopilot make small corrections to the altitude selection.
2. For larger altitude changes, push and HOLD the UP or DN button, as applicable, to start a 500 FPM altitude change. Release the button at the altitude the autopilot is to hold.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

CHANGING ALTITUDE (Continued)

If the autopilot is engaged in Vertical Speed (VS) mode:

1. UP or DN Button - PUSH momentarily for 100 FPM vertical speed increments or PUSH and HOLD for 300 ft/min/sec vertical rate change and RELEASE at the rate desired. The autopilot will climb or descend at rate selection.

NOTE

- The autopilot can hold a vertical speed selection only if engine power and airplane weight are correct for the conditions. If the vertical speed set for the autopilot is more than the airplane can supply and airspeed decreases sufficiently, the airplane can be made to stall. Make sure that the vertical speed set for the autopilot results in airplane performance that stays in the operating limitations of both the autopilot and the airplane.
- When operating at or near the best rate-of-climb airspeed, with the engine set to climb power or when in vertical speed mode, it can be easy to slow to airspeeds where any additional reduction in airspeed will result reduced rate-of-climb. Hold sufficient airspeed during vertical speed mode operation to avoid a stall.

HEADING (HDG) MODE OPERATION

1. HDG Knob - SET the heading pointer ("bug") on the G1000 HSI to the correct magnetic heading using the HDG knob on the PFD.
2. HDG Button - PUSH to engage HDG mode. Make sure that the HDG annunciator is shown on the face of the autopilot. The autopilot will turn the airplane at approximately standard rate (3°/sec) to lock on to the heading selection.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

NAVIGATION (NAV) MODE OPERATION

The KAP 140 autopilot will operate in NAV mode using GPS or VHF (VOR or LOC) navigation signal inputs. The G1000 HSI shows the GPS, NAV 1 or NAV 2 navigation signal being supplied to the autopilot. The navigation source selection shown on the HSI is made using the CDI softkey.

If using NAV 1 or NAV 2, make sure that the radio is adjusted to the correct frequency and is the active frequency. Make sure that NAV 1 or NAV 2, as applicable, is shown on the HSI.

WARNING

WHEN THE KAP 140 AUTOPILOT IS ENGAGED IN NAV, APR OR REV OPERATING MODE, IF THE HSI NAVIGATION SOURCE IS CHANGED FROM GPS TO NAV1, AUTOMATICALLY OR MANUALLY (USING THE CDI SOFTKEY), OR MANUALLY FROM NAV2 TO GPS, THE CHANGE WILL INTERRUPT THE NAVIGATION SIGNAL TO THE AUTOPILOT AND WILL CAUSE THE AUTOPILOT TO REVERT TO ROL MODE OPERATION. NO WARNING CHIME OR PFD ANNUNCIATION IS PROVIDED. THE PREVIOUSLY SELECTED MODE SYMBOL SHOWN ON THE AUTOPILOT DISPLAY WILL BE FLASHING TO SHOW THE REVERSION TO ROL MODE OPERATION. IN ROL MODE, THE AUTOPILOT WILL ONLY KEEP THE WINGS LEVEL AND WILL NOT CORRECT THE AIRPLANE HEADING OR COURSE. SET THE HDG BUG TO THE CORRECT HEADING AND SELECT THE CORRECT NAVIGATION SOURCE ON THE HSI USING THE CDI SOFTKEY BEFORE ENGAGING THE AUTOPILOT IN ANY OTHER OPERATING MODE.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

NAVIGATION (NAV) MODE OPERATION (Continued)

CAUTION

THE G1000 HSI SHOWS A COURSE DEVIATION INDICATOR FOR THE SELECTED GPS, NAV 1 OR NAV 2 NAVIGATION SOURCE. THE G1000 HSI DOES NOT PROVIDE A WARNING FLAG WHEN A VALID NAVIGATION SIGNAL IS NOT BEING SUPPLIED TO THE INDICATOR. WHEN A VALID NAVIGATION SIGNAL IS NOT BEING SUPPLIED, THE COURSE DEVIATION BAR (D-BAR) PART OF THE INDICATOR IS NOT SHOWN ON THE HSI COMPASS CARD. THE MISSING D-BAR IS CONSIDERED TO BE THE WARNING FLAG.

NOTE

When navigating using GPS, make sure that the GPS 2 unit is available on the G1000 MFD AUX - GPS STATUS page. No annunciation is provided for GPS 2 malfunction.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

NAV COURSE CAPTURE (LOCK ON)

1. CRS Pointer - SET the HSI course pointer to the desired magnetic course using the CRS knob on the PFD.

NOTE

If operating GPS-Direct (Direct-to) or on an active GPS Flight Plan, the course pointer will be automatically set by the G1000.

2. HDG Bug - SET the HSI heading bug to the desired course intercept heading.
3. HDG Button - PUSH to engage KAP 140 in heading mode. Make sure that the **HDG** annunciation is shown on the face of the autopilot.
4. NAV Button - PUSH to arm the autopilot NAV lock on function. Make sure that the autopilot is correctly engaged from the annunciation on the autopilot:
 - a. If the HSI D-Bar is less than 2 to 3 dots from center, the autopilot will go to NAV mode. The **NAV** annunciator will be shown on the face of the autopilot.
 - b. If the HSI D-Bar is more than 2 to 3 dots from center, the **NAVARM** annunciator will be shown on the face of the autopilot. When the computed intercept point is reached, the **ARM** annunciator will go off and lock on (capture and track) will begin automatically. The **NAV** annunciator will stay on the face of the autopilot.

NOTE

The **HDG** annunciation will flash for 5 seconds on selection of NAV mode to instruct the pilot to set the HDG bug, on the HSI, to the desired course.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

GPS NAV AND ROLL STEERING

The KAP 140 autopilot has DC (analog) roll steering capability. Roll steering enables the flight guidance system (in this case, the G1000 GPS navigation computer) to control the autopilot through automatic course changes at flight plan waypoints and to lock on to the course to the next waypoint.

The GPS navigation computer uses ground speed, track and turn rate data to calculate the bank angle required for waypoint course changes. The GPS roll steering signal will make the autopilot turn the airplane and lock on course to the next waypoint without flying directly over the current waypoint, except for designated fly-over waypoints. The flight path is approximately tangent to the inbound and outbound flight plan legs.

The distance from the waypoint to start the turn will vary with groundspeed, degrees of heading change, etc., but will usually be approximately 0.5 nautical mile from the waypoint. Flight plan sequencing to the next waypoint will occur at approximately the midpoint of the turn.

Roll steering works only if all the following conditions are true:

1. GPS must be the navigation source shown on the G1000 HSI.
2. The GPS navigation computer must be executing an active flight plan.
3. The KAP 140 must be engaged in NAV or APR mode.
4. The GPS must not be operating in OBS mode (PFD).

NOTE

When on an active GPS flight plan with the KAP 140 autopilot coupled in NAV or APR mode, waypoint course changes greater than approximately 140° could result in a turn rate that reaches the autopilot bank angle limit. The pilot may need to change the KAP 140 to HDG mode (also arm NAV or APR mode) and manually set the intercept heading to help the autopilot lock on the new course.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

HOLDING PATTERNS AND PROCEDURE TURNS

When operating IFR on an active GPS flight plan, enroute or transitioning to the terminal environment, a holding pattern or course reversal maneuver may be necessary. The G1000 GPS does not provide course guidance through these maneuvers. The pilot must set both the G1000 and the KAP 140 to the correct operating mode and provide course guidance.

The holding pattern is usually shown on the MFD Navigation Map (for a published holding fix), but it is not included as a leg of the flight plan. GPS flight plan execution must be paused by entering OBS mode and using autopilot HDG or NAV modes, as applicable, to perform the maneuver.

The procedure turn is included as a leg in the flight plan along with the instrument approach procedure selection. Course guidance is supplied through the turn to outbound course lock on, but is discontinued after approximately 1 minute. G1000 OBS mode is not required but the KAP 140 must be set to HDG mode and the HDG bug used to provide guidance through the course reversal. When established inbound, change from HDG to APR mode for lock on to the final approach course.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

HOLDING PATTERNS AND PROCEDURE TURNS (Continued)

For a KAP 140 that has been operating in NAV mode on an active GPS flight plan:

On arrival at the holding fix, set the KAP 140 in HDG mode and provide course guidance by manually adjusting the G1000 HDG bug to command turns and heading, as applicable. Pause G1000 flight plan execution during the holding pattern by using the OBS mode selection on the PFD. Set the correct inbound holding course on the HSI course pointer and NAV mode may be used for the KAP 140 on the inbound leg of the holding pattern for course guidance, but HDG mode must be used for the remainder of the holding pattern maneuver. At the end of the holding procedure, exit OBS mode to start the flight plan executing again and set NAV mode on the KAP 140 to lock on to the course. Refer to the Garmin G1000 Cockpit Reference Guide (CRG) for further information.

Arriving at the Initial Approach Fix (IAF), usual starting point for the procedure turn maneuver, the G1000 will command the autopilot to turn to the outbound course and will provide course guidance for approximately 1 minute. Unlike the holding pattern, the G1000 includes the procedure turn as a leg in the flight plan, so no OBS mode change is needed. Set the HDG bug to the procedure turn outbound leg heading and push the HDG button on the KAP 140 to start the turn. After the correct time flying outbound, adjust the HDG bug to make the turn to the procedure turn inbound heading. When established on the procedure turn inbound, push the APR button on the KAP 140 to lock on to the final approach course. Refer to the Garmin G1000 CRG for further information.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

APPROACH (APR) MODE OPERATION

Approach (APR) mode gives more precise tracking during instrument approach procedures. It engages automatic lock on to the final approach course on most approaches and automatic capture of the glideslope on ILS approaches.

The G1000 system will automatically change from GPS to ILS at final approach course lock on (only when the procedure has been activated in the flight plan and the ILS CDI capture feature is enabled). Automatic change to VHF navigation is only provided for ILS approaches.

WARNING

WHEN THE KAP 140 AUTOPILOT IS ENGAGED IN NAV, APR OR REV OPERATING MODES, IF THE HSI NAVIGATION SOURCE IS CHANGED FROM GPS TO NAV1, AUTOMATICALLY OR MANUALLY (USING THE CDI SOFTKEY), OR MANUALLY FROM NAV2 TO GPS, THE CHANGE WILL INTERRUPT THE NAVIGATION SIGNAL TO THE AUTOPILOT AND WILL CAUSE THE AUTOPILOT TO REVERT TO ROL MODE OPERATION. NO WARNING CHIME OR PFD ANNUNCIATION IS PROVIDED. THE PREVIOUSLY SELECTED MODE SYMBOL SHOWN ON THE AUTOPILOT DISPLAY WILL BE FLASHING TO SHOW THE REVERSION TO ROL MODE OPERATION. IN ROL MODE, THE AUTOPILOT WILL ONLY KEEP THE WINGS LEVEL AND WILL NOT CORRECT THE AIRPLANE HEADING OR COURSE. SET THE HDG BUG TO THE CORRECT HEADING AND SELECT THE CORRECT NAVIGATION SOURCE ON THE HSI USING THE CDI SOFTKEY BEFORE ENGAGING THE AUTOPILOT IN ANY OTHER OPERATING MODE.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

APPROACH (APR) MODE OPERATION (Continued)

NOTE

Changing from GPS to ILS includes tuning the NAV 1 active frequency to the correct LOC frequency, slewing the course pointer to the applicable final approach course magnetic heading and changing the CDI to NAV 1 while keeping the autopilot in APR mode. The G1000 will do this automatically if ILS CDI capture is set to AUTO.

Roll steering will only operate on instrument approach procedures selected from a current GPS aeronautical database when:

1. The autopilot is engaged in NAV or APR mode.
2. GPS is shown as the navigation source on the HSI.

NOTE

- Make sure that the applicable GPS mode is set during each portion of the approach procedure selection symbol (**NAV**, **APR** or **REV**) flashing on the face of the autopilot.
- If either the GPS or VHF navigation signal, as applicable, fails when the autopilot is engaged in NAV, APR or REV mode, the autopilot will change back to ROL mode operation. ROL mode operation is shown by the previous mode.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

APPROACH (APR) CAPTURE (LOCK ON)

1. BARO - SET current local barometric pressure (altimeter).
2. CRS Pointer - SET the HSI course pointer to the desired magnetic course using the CRS knob on the PFD.

NOTE

If operating GPS-Direct (Direct-to) or on an active GPS flight plan, the course pointer will be automatically set by the G1000.

3. HDG bug - SET the HSI heading bug to the desired course intercept heading.
4. HDG Button - PUSH to engage autopilot HDG mode. Make sure that **HDG** is shown on the face of the autopilot.
5. APR Button - PUSH to arm the autopilot APR lock on function. Make sure that the autopilot is correctly engaged from the annunciation on the autopilot:
 - a. If the HSI D-Bar is less than 2 to 3 dots from center, the autopilot will go to APR mode. The **APR** annunciator will be shown on the face of the autopilot.
 - b. If the HSI D-Bar is more than 2 to 3 dots from center, the **APRARM** annunciator will be shown on the face of the autopilot. When the computed intercept point is reached, the **ARM** annunciator will go off and lock on (capture and track) will begin automatically. The **APR** annunciator will stay on the face of the autopilot.

NOTE

The **HDG** annunciation will flash for 5 seconds on selection of APR mode to instruct the pilot to set the HDG bug, on the HSI, to the desired course.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

APPROACH (APR) CAPTURE (LOCK ON) (Continued)

WARNING

WHEN THE KAP 140 AUTOPILOT IS ENGAGED IN NAV, APR OR REV OPERATING MODE, IF THE HSI NAVIGATION SOURCE IS CHANGED FROM GPS TO NAV1, AUTOMATICALLY OR MANUALLY (USING THE CDI SOFTKEY), OR MANUALLY FROM NAV2 TO GPS, THE CHANGE WILL INTERRUPT THE NAVIGATION SIGNAL TO THE AUTOPILOT AND WILL CAUSE THE AUTOPILOT TO REVERT TO ROL MODE OPERATION. NO WARNING CHIME OR PFD ANNUNCIATION IS PROVIDED. THE PREVIOUSLY SELECTED MODE SYMBOL SHOWN ON THE AUTOPILOT DISPLAY WILL BE FLASHING TO SHOW THE REVERSION TO ROL MODE OPERATION. IN ROL MODE, THE AUTOPILOT WILL ONLY KEEP THE WINGS LEVEL AND WILL NOT CORRECT THE AIRPLANE HEADING OR COURSE. SET THE HDG BUG TO THE CORRECT HEADING AND SELECT THE CORRECT NAVIGATION SOURCE ON THE HSI USING THE CDI SOFTKEY BEFORE ENGAGING THE AUTOPILOT IN ANY OTHER OPERATING MODE.

6. Airspeed - HOLD 100 KIAS minimum (recommended) during approaches when the autopilot is engaged.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

GLIDESLOPE ENGAGEMENT AND LOCK-ON

1. APR Mode - ENGAGED. Make sure that **GSARM** is shown on the face of the autopilot.

NOTE

The glideslope cannot lock-on when the autopilot is engaged in NAV or REV modes. Engaged in APR mode, with NAV 1 or NAV 2 set to the correct ILS frequency, and shown as the related HSI navigation source, the glideslope becomes armed at localizer lock-on.

2. Glideslope Indicator - CENTERED. Make sure that the **ARM** annunciator goes out and the **GS** annunciator stays on.

NOTE

The KAP 140 autopilot can lock on the glideslope from above or below. Capturing the glideslope from above is not recommended.

3. Airspeed - HOLD 100 KIAS minimum (recommended) during approaches when the autopilot is engaged.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

BACK COURSE (REV) MODE OPERATION

This mode provides reverse sensing for the autopilot navigation course on back course-type localizer approaches.

1. BARO - SET current local barometric pressure (altimeter).
2. CRS Pointer - SET the HSI course pointer to the ILS front course inbound heading using the CRS knob on the PFD.
3. HDG Bug - SET the HSI heading bug to the desired course intercept heading.
4. HDG Button - PUSH to engage HDG mode. Make sure that **HDG** is shown on the face of the autopilot.
5. REV Button - PUSH to arm the autopilot REV lock-on function. Make sure that the autopilot is correctly engaged from the annunciation on the autopilot:
 - a. If the HSI D-Bar is less than 2 to 3 dots from center, the autopilot will go to REV mode. The **REV** annunciator will be shown on the face of the autopilot.
 - b. If the HSI D-Bar is more than 2 to 3 dots from center, the **REVARM** annunciator will be shown on the face of the autopilot. When the computed intercept point is reached, the **ARM** annunciator will go off and lock on (capture and track) will begin automatically. The **REV** annunciator will stay on.

NOTE

The **HDG** annunciation will flash for 5 seconds on selection of REV mode to instruct the pilot to set the HDG bug, on the HSI, to the desired course.

6. Airspeed - HOLD 100 KIAS minimum (recommended) during approaches when the autopilot is engaged.

(Continued Next Page)

NORMAL PROCEDURES (Continued)

MISSED APPROACH

1. A/P DISC/TRIM INT Switch - PUSH to disengage the autopilot
2. Missed Approach Procedure - EXECUTE
3. If autopilot is to be engaged:
 - a. Elevator Trim - SET
 - b. Airspeed and Rate of Climb - STABILIZED

WARNING

THE G1000 WILL ENTER SUSP MODE (STOP THE FLIGHT PLAN) AT THE MISSED APPROACH POINT (MAP) AND WILL NOT SUPPLY A NAVIGATION SIGNAL TO THE KAP 140. IF THE G1000 IS TO BE USED FOR COURSE GUIDANCE TO THE MISSED APPROACH HOLDING POINT (MAHP), PUSH THE SUSP SOFTKEY TO START THE FLIGHT PLAN AND NAVIGATION SIGNAL AGAIN BEFORE ENGAGING THE KAP 140.

NOTE

- Only engage the autopilot during wings-level stable flight. The autopilot will come on in ROL (wings leveler) and VS (Vertical Speed) modes. The VS mode initial rate-of-climb will be the vertical speed at the time the autopilot is engaged. Do not engage the autopilot when the airplane cannot hold the climb rate because of excessive pitch attitude, low airspeed, low engine power or high airplane weight. Do not engage the autopilot when the performance or operation of the autopilot or airplane would not obey the limitations.
- The autopilot can hold a vertical speed selection only if engine power and airplane weight are correct for the conditions. If the vertical speed set for the autopilot is more than the airplane can supply and airspeed decreases sufficiently, the airplane can be made to stall. Make sure that the vertical speed set for the autopilot results in airplane performance that stays in the operating limitations of both the autopilot and the airplane.

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NORMAL PROCEDURES (Continued)

MISSED APPROACH (Continued)

NOTE

- When operating at or near the best rate-of-climb airspeed, with the engine set to climb power or when in vertical speed mode, it can be easy to slow to airspeeds where any additional reduction in airspeed will result reduced rate-of-climb. Hold sufficient airspeed during vertical speed mode operation to avoid a stall.
- c. AP Button - PUSH and HOLD to engage the autopilot. Make sure that **ROL** and **VS** are shown on the face of the autopilot. If no selection of other operating modes is made, the autopilot will operate in ROL and VS modes.

NOTE

When operating in ROL mode, turbulence may result in changes to airplane heading. ROL mode only works to keep the wings level. When tracking the ILS course outbound on the missed approach procedure, use NAV mode to prevent unwanted GS coupling.

BEFORE LANDING

1. A/P DISC/TRIM INT Switch - PUSH to disengage the autopilot.

PERFORMANCE

There is no change in airplane performance when the Bendix/King KAP 140 2 Axis Autopilot is installed. Refer to the Operating Limitations section of this supplement for limitations that can have an effect on airplane performance.