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2.16 OTHER LIMITATIONS

2.16.7 AUTOPILOT LIMITATIONS

1. The autopilot must not be used if the engine power (LH & RH) is set to more than 80% load indication.
2. The autopilot must not be used during single engine operation.
3. The autopilot must be disconnected (using the DISC button) during take-off and landing.
4. The system is approved for Category I operation only (Approach mode selected).
Maximum flap extension during approach operation: APP position.
5. Autopilot maximum airspeed limitation: 180 KIAS
Autopilot minimum airspeed limitation: 90 KIAS
6. Altitude Select captures below 800 feet AGL are prohibited.
7. The autopilot must be disengaged:
 - below 200 ft AGL during approach operations with speeds of 130 KIAS or less.
 - below 250 ft AGL during approach operations with speeds greater than 130 KIAS.
 - below 200 ft AGL during departure operations.
 - below 800 ft AGL for all other phases of flight.
8. Overriding the autopilot to change pitch or roll attitude is prohibited. (Disengage or press CWS while maneuvering.)
9. If the CDI source is changed when the autopilot is engaged in NAV mode, the autopilot lateral mode will revert to ROLL ATTITUDE mode and the NAV mode must be manually selected by the pilot.

3. EMERGENCY PROCEDURES

3.2 AIRPLANE-RELATED G1000 WARNINGS

3.2.12 AP TRIM FAIL

AP TRIM FAIL	This annunciation is active when the autopilot automatic trim is inoperative.
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NOTE

The red annunciation AP TRIM FAIL will illuminate normally during the pre-flight self test.

(a) AP TRIM FAIL annunciation remains illuminated after the pre-flight self-test

1. AUTOPILOT circuit breaker pull

NOTE

When the AUTOPILOT circuit breaker is pulled, the manual electric trim and autopilot autotrim systems will be disabled, and the AP TRIM FAIL annunciation will extinguish.

(b) Inflight illumination of if the AP TRIM FAIL annunciation

- Proceed according to Section 3.12 - OTHER EMERGENCIES in this Supplement (next page).

| 3.12 OTHER EMERGENCIES

| 3.12.9 AUTOPILOT OR ELECTRIC TRIM MALFUNCTION / FAILURE

The four step procedure listed below should be among the basic airplane emergency procedures that are committed to memory. It is important that the pilot be proficient in accomplishing all four steps without reference to this manual.

NOTE

Accomplish items 1 and 2 simultaneously!

1. Airplane control stick grasp firmly and regain airplane control
2. AP DISC switch press and hold throughout recovery
3. Trim retrim airplane manually as required
4. AUTOPILOT circuit breaker pull

WARNING

Do not attempt to re-engage the autopilot following an autopilot, autotrim, or manual electric trim malfunction until the cause for the malfunction has been corrected.

NOTE

When the AUTOPILOT circuit breaker is pulled, the manual electric trim and autopilot autotrim systems will be disabled, and the AP TRIM FAIL annunciation will extinguish.

NOTES

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of the recommended course of action for an emergency situation.

1. An autopilot trim malfunction may be recognized as an uncommanded deviation in the airplane flight path or when there is abnormal control stick or trim wheel motion. In some cases, especially for autopilot trim, there may be little or no airplane motion, yet the red AP TRIM FAIL annunciation may illuminate. The primary concern in reacting to an autopilot or autopilot trim malfunction, or to an automatic disconnect of the autopilot, is in maintaining control of the airplane. Immediately grasp the control stick and press and hold down the AP DISC switch throughout the recovery. Manipulate the controls as required to safely maintain operation of the airplane within all of its operating limitations.

Elevator trim should be used manually as needed to relieve control forces. Finally, locate and pull the AUTOPILOT circuit breaker, to completely disable these systems.

2. A manual electric trim malfunction may be recognized by the illumination of the red AP TRIM FAIL annunciation on the G1000, or by unusual trim wheel motions with the autopilot mode DISENGAGED without pilot actuation of the manual electric trim switch. As with an autopilot malfunction, the first concern following a manual electric trim malfunction is regaining control of the airplane. Grasp the control stick firmly and press and hold down the AP DISC switch. Locate and pull the AUTOPILOT circuit breaker.

3. Note that the emergency procedure for any malfunction is essentially the same: immediately grasp the control stick and regain airplane control while pressing and holding the AP DISC switch down, and manually retrim the airplane as needed. After these steps have been accomplished secure the autopilot or electric trim system using the proper circuit breaker. As with any other airplane emergency procedure, it is important that the 4 steps of the Autopilot/Electric Trim Emergency Procedures located on page 11 of this Supplement are committed to memory.
4. The AVIONICS MASTER switch may be used as required to remove all power from the Autopilot and Electric Trim systems while the circuit breaker is located and pulled. Return the AVIONICS MASTER switch to the ON position as soon as possible. With the AVIONICS MASTER switch off, all flight instruments will remain operational; however, not all communications, navigation, and identification equipment will be operable.
5. The KAP 140 autopilot incorporates a pitch monitor that detects abnormal airplane acceleration in the vertical axis; therefore, if the airplane, for any reason, is moved rapidly in pitch, the autopilot may disconnect automatically.
6. It is important that all portions of the autopilot and electric trim system are preflight tested prior to each flight in accordance with the procedures published herein in order to assure their integrity and continued safe operation during flight.

WARNING

Do not attempt to re-engage the autopilot or to use the manual electric trim system following an autopilot, autotrim or manual electric trim malfunction until the cause for the malfunction has been corrected.

4A. NORMAL OPERATING PROCEDURES

WARNING

The G1000 altitude references (digits and altimeter bug) are included to increase altitude awareness, and are not connected in any way to the KAP 140 autopilot. Altitude alerter and autopilot functions are accomplished with the altitude set function of the KAP 140 autopilot.

CAUTION

The entire preflight test procedure outlined under Section 4A.6.4 BEFORE TAXIING of this Supplement must be successfully completed prior to each flight. Use of the autopilot or manual electrical trim system is prohibited prior to completion of these tests.

4A.6.11 APPROACH & LANDING

1. Approach (APR) Coupling (to enable glideslope coupling on an ILS, and more precise course tracking on instrument approaches).
 - a. BARO setting - CHECK.
 - 1) Course Bearing Pointer - SET to desired course.
 - 2) Heading Selector Knob - SET BUG to provide desired intercept angle.
 - 3) APR Mode Selector Button - PRESS.
 - a) If the Course Deviation Bar is greater than 2 to 3 dots: the airplane will continue in HDG mode (or ROL if HDG not selected) with the APR ARM annunciated; when the computed capture point is reached HDG mode will disengage, the ARM annunciator will go out and the selected course will be automatically captured and tracked.
 - b) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting APR mode; the APR annunciator will illuminate and the capture/track sequence will automatically begin.
 - 4) Airspeed - Maintain 90 to 130 KIAS during coupled autopilot approaches (recommended).

2. BC Approach Coupling (i.e., reverse localizer) (REV)

a. BARO setting - CHECK.

- 1) Course Bearing Pointer - SET to the ILS front course inbound heading.
- 2) Heading Selector Knob - SET BUG to provide desired intercept angle and engage HDG mode.
- 3) REV Mode Selector Button - PRESS.
 - a) If the Course Deviation Bar is greater than 2 to 3 dots: the airplane will continue in HDG mode (or ROL if HDG not selected) with REV ARM annunciated; when the computed capture point is reached HDG mode will disengage, the ARM annunciator will go out and the selected course will be automatically captured and tracked.
 - b) If the D-Bar is less than 2 to 3 dots: the HDG mode will disengage upon selecting REV mode; the REV annunciator will illuminate and the capture/track sequence will automatically begin.

4. HEADING (HDG) MODE SELECTOR BUTTON - When pushed, it will select the Heading mode, which commands the airplane to turn to and maintain the heading selected by the heading bug on the HSI. A new heading may be selected at any time and will result in the airplane turning to the new heading. The button can also be used to toggle between HDG and ROL.
5. NAVIGATION (NAV) MODE SELECTOR BUTTON - When pushed, will select the navigation mode. The mode provides automatic beam capture and tracking of VOR, LOC or GPS as selected for presentation on the HSI or CDI. NAV mode is recommended for enroute navigation tracking.
6. APPROACH (APR) MODE SELECTOR BUTTON - When pushed, it will select the navigation mode. The mode provides automatic beam capture and tracking of VOR, GPS, LOC, and Glideslope (GS) on an ILS, as selected for presentation on the HSI or CDI. APR mode tracking sensitivity is recommended for instrument approaches.
7. BACK COURSE APPROACH (REV) MODE SELECTOR BUTTON - When pushed, it 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.
8. ALTITUDE HOLD (ALT) MODE SELECT BUTTON - When pushed, it will select the Altitude Hold mode. This mode provides capture and tracking of the selected altitude. The selected altitude is the altitude at the moment the ALT button is pressed. If the ALT button is pressed with an established VS rate present, there will be approximately a 10 % (of VS rate) overshoot, with the airplane returned positively to the selected altitude.

9. VERTICAL TRIM (UP/DN) BUTTONS - The action of these buttons is dependent upon the vertical mode present when pressed. If VS mode is active, the initial button stroke will bring up the commanded vertical speed in the display. Subsequent immediate button strokes will increment the vertical commanded either up or down at the rate of 100 ft/min per button press, or at the rate of approximately 300 ft/min per second if continuously. If ALT mode is active, incremental button strokes will move the altitude hold reference altitude either up or down by 20 feet per press, or if held continuously will command the airplane up or down at the rate of 500 ft/min, synchronizing the altitude hold reference to the actual airplane altitude upon button release. (Note that the altitude hold reference is not displayed. The display will continue to show the altitude alerter reference.)
10. ROTARY KNOBS - Used to set the altitude alerter reference altitude; or may be used immediately after pressing the BARO button, to adjust the autopilot baro setting to match that of the airplane's altimeter when manual adjustment is required.
11. BARO SET (BARO) BUTTON - When pushed and released, it 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, it 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 if the system configuration does not employ automatic correction.
12. ALTITUDE ARM (ARM) BUTTON - When pushed it will toggle altitude arming 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.

13. PITCH TRIM (PT) ANNUNCIATION - Indicates the direction of required pitch trim. With electric trim installed, the annunciation simply provides status to the autopilot request for auto trim. A solid indication represents the lowest demand level for trim, whereas a flashing annunciation implies a greater demand. A solid PT without an arrow head is an indication of a pitch trim fault. Refer to the EMERGENCY PROCEDURES for proper response to a pitch trim fault. During MET operation, this annunciation can be caused by a stuck MET switch. If the stuck switch fault clears, trim operation will resume.

14. 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.

NOTE

This display may be dashed for up to 3 minutes on start up if a blind encoder is installed which requires a warm up period.

15. ALTITUDE ALERT (ALERT) ANNUNCIATION - Illuminates continuously in the region of from 200 to 1000 feet from the selected altitude if the airplane was previously outside of this region.

Flashes

(1) for two seconds the first time the airplane crossed the selected altitude, and

(2) 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.

16. PITCH AND ROLL MODE DISPLAYS - Displays the active pitch modes (VS, ALT, ARM, ALT, GS ARM, GS) and roll modes (ROL, HDG, NAV ARM, NAV, APR ARM, APR, REV ARM, REV). Also displayed will be flashing AP annunciation (5 seconds) at each autopilot disconnect accompanied by an aural tone (for 2 seconds).

17. AUTOPILOT DISCONNECT (AP DISC) SWITCH (not shown) - When pressed, it will disengage the autopilot, and interrupt electric trim power. (Located on pilot's and copilot's stick.)

18. MANUAL ELECTRIC TRIM SWITCHES (not shown) - When both switches are pressed in the same direction, they will activate pitch trim in the selected direction. If only one switch is moved, the trim system will not operate. If one switch fail or is moved and held for 3 seconds, the trim monitoring system will detect a switch failure resulting in a PT annunciation on the autopilot display and the disabling of the electric trim system. Autopilot power will have to be cycled to clear the fault. Use of manual electric trim during autopilot operation will disengage the autopilot. (Located on the pilot's stick.)

19. CONTROL WHEEL STEERING (CWS) MODE BUTTON (not shown) - When pressed and held, it disengages the pitch, roll, and pitch trim clutches allowing the pilot to maneuver the airplane by hand. Pressing the CWS button will also sync the autopilot ALT or VS commands to the actual altitude or vertical speed present at the time the button is released. (Located at the pilot's stick.)

20. OMNI BEARING SELECT KNOB - Selects the desired course to be tracked by the autopilot.