

MOONEY AIRCRAFT CORPORATION
LOUIS SCHREINER FIELD
KERRVILLE, TEXAS 78028

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR
M20M, M20R, M20S

WITH

BENDIX/KING KFC 225
AUTOMATIC FLIGHT CONTROL SYSTEM

Model _____

Reg. No. _____

Serial No. _____

This supplement must be attached to the FAA Approved Airplane Flight Manual when the Bendix/King KFC 225 Automatic Flight Control System is installed in accordance with Mooney Aircraft Corporation Drawing No. 830139. 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.

FAA APPROVED: _____

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Page 1 of 20

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LOG OF REVISIONS

Rev. No.	Revised Pages	Description of Revision	FAA Approved	Date
A	2	Log of Revision page entry		8/15/00
	11	Added information on Altitude Capture Alert annunciation.		

The revised portions of affected pages are indicated by vertical black lines in the margin.

TABLE OF CONTENTS

SECTION	PAGE
I GENERAL.....	4
II LIMITATIONS.....	6
IIIA EMERGENCY PROCEDURES.....	6
IIIB ABNORMAL PROCEDURES.....	8
IV NORMAL PROCEDURES.....	10
V PERFORMANCE	20
VI WEIGHT & BALANCE.....	20
VII AIRPLANE & SYSTEM & DESCRIPTION.....	20
VIII HANDLING, SERVICING & MAINTENANCE.....	20
IX SUPPLEMENTAL DATA	20
X SAFETY TIPS	20

SECTION I — GENERAL

This manual is provided to acquaint the pilot with the limitations as well as normal and emergency operating procedures of the Bendix/King KFC 225 Automatic Flight Control System. The limitations presented are pertinent to the operation of the KFC 225 system as installed in the Mooney M20M, M20R, and M20S airplane; the Autopilot must be operated within the limitations herein specified.

The KFC 225 Automatic Flight Control System is certified in this airplane with 3-axis Autopilot control: pitch, roll and yaw.

The KFC 225 system provides the pilot with the following features:

pitch attitude hold (PIT), vertical speed hold (VS), altitude hold preselect (ALT ARM), altitude capture (ALT CAP), altitude hold (ALT), altitude alerting, and go around (GA) in pitch; roll attitude hold (ROL), heading hold (HDG), navigation course capture (NAV ARM), navigation course tracking (NAV), approach course capture (APR ARM), and back course approach tracking (REV) in the roll axis. Control wheel steering (CWS) allows synching of the pitch axis modes (except glideslope) and maneuvering the aircraft by hand if desired.

The KFC 225 system has an electric pitch trim system that provides auto-trim during autopilot operation and manual electric trim (MET) for the pilot when the autopilot is not engaged. Trim faults are monitored and annunciated both visually and aurally.

An automatic preflight self-test begins with initial power application to the autopilot. A lockout device prevents autopilot engagement and MET operation until the system has successfully passed preflight self-tests.

The following circuit breakers are used to protect the following elements of the KFC 225 Automatic Flight Control System:

The following conditions will cause the Autopilot to automatically disengage:

- A. Electrical Power failure.
- B. Internal Automatic Flight Control System failure.
- C. Roll rates in excess of 14° per second except when the CWS button is depressed.
- D. Pitch rates in excess of 6° per second except when the CWS button is depressed.
- E. Pitch accelerations in excess of +1.6 g or less than +0.4g will cause only the autopilot servo clutch to disengage, (Sustained accelerations will cause auto pilot disengagement except when the CWS button is depressed.)

The Radio Master switch supplies power to the avionics bus bar for the radio and autopilot circuit breakers.

The airplane MASTER switch function is unchanged and can be used in conjunction with the alternator switches in an emergency to shut off electrical power to all automatic flight control systems while the problem is being isolated.

<u>LABEL</u>	<u>FUNCTION</u>
COMPUTER	Supplies power to the KFC 225 Computer.
SERVO	Supplies power to the autopilot pitch, roll and pitch trim servos.
ALERT	Supplies sonalert power for autopilot disconnect tone and separate TRIM/FAIL annunciator when installed.
HSI	Supplies power to the KCS 55A Compass System.
ENCDR	Supplies power to the Altitude Encoder.
ANN	Supplies power to the TRIM FAIL annunciation when the original equipment annunciator panel is installed.
AUDIO	Supplies power to the autopilot speaker alerting and autopilot headphone alerting.

The following voice messages will be annunciated as conditions warrant:

1. "TRIM IN MOTION, TRIM IN MOTION..." - Elevator trim running for more than 5 seconds.
2. "CHECK PITCH TRIM" - An out of trim condition has existed for 16 seconds.
 - a. Airplane control Wheel - GRASP FIRMLY, press CWS and check for an out of pitch trim condition. Manually retrim as required.
 - b. CWS button - RELEASE.
 - c. AUTOPILOT OPERATION - CONTINUE if satisfied that the out of trim condition was temporary. DISCONTINUE if evidence indicates a failure of the auto trim function.

The following optional voice messages will be annunciated if the system is configured for voice messaging:

- 1 "ALTITUDE" - 1000 feet before approaching selected altitude.
- 2 "LEAVING ALTITUDE" - 200 feet away, departing selected altitude.
- 3 "AUTOPILOT" - Autopilot has disengaged, either through pilot action or automatically.

SECTION II — LIMITATIONS

- A. The entire preflight test procedure outlined under Section 4, paragraph A of this supplement, including steps 1 through 7, must be successfully completed prior to each flight. Use of the autopilot or manual electric trim system is prohibited prior to completion of these tests.\
- B. During autopilot operation, a pilot with seat belt fastened must be seated at the left pilot position.
- C. The autopilot must be OFF during Takeoff and Landing.\
- E. Autopilot maximum airspeed limitations:—— 180 KIAS.
Autopilot minimum airspeed limitation:—— 80 KIAS.
- F. Altitude Select captures below 800 feet AGL are prohibited.
- G. The autopilot must be disengaged below 200 feet AGL during approach operations and below 800 feet AGL for all other phases of flight.
- H. Overriding the autopilot to change pitch or roll attitude is prohibited. (Disengage the autopilot or press CWS while maneuvering).
- I. The SERVOS circuit breaker must be pulled following any in-flight illumination of the red TRIM/FAIL warning light, but only after first completing the Emergency Procedures (Section IIIA) paragraph A. The manual electric trim and autopilot autotrim systems will be disabled with the circuit breaker pulled. (The red TRIM/FAIL warning will illuminate normally during preflight self-test if the TRIM FAIL light remains illuminate after preflight self-test, the SERVOS circuit breaker must be PULLED. Do not operate autopilot with flaps extended beyond the Take-Off position.)
- J. Required Placards:
 - 1. Above Radio Stack

AUTOPILOT AND ELECTRIC TRIM PREFLIGHT TESTS MUST BE CONDUCTED PRIOR TO EACH FLIGHT.

SECTION III A — EMERGENCY PROCEDURES

The four-step procedure listed under paragraph A 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.

- A. In case of Autopilot, Autopilot Trim, or Manual Electric Trim malfunction (accomplish Item 1 & 2 simultaneously):
 - 1. Airplane Control Wheel.....**GRASP FIRMLY**, regain aircraft control.
 - 2. **A/P DISC/TRIM INTER** Switch..... **PRESS** and **HOLD** throughout recovery until Step 4 has been accomplished.
 - 3. AIRCRAFT**RETRIM** manually as needed.
 - 4. **SERVOS** circuit breaker..... **PULL**

NOTE:

The RADIO MASTER switch may be used as an alternate means of removing all power from the autopilot and electric trim systems.

If necessary, perform Steps 1 through 3 above, then turn the AVIONICS MASTER switch OFF before locating the SERVOS circuit breaker. Turn the RADIO MASTER switch back ON as soon as possible to restore power to all other avionics equipment.

Primary attitude, airspeed and altitude instrument will remain operational at all times.

If the malfunction has been identified as a TRIM FAIL event, the CMPTR circuit breakers may be reset allowing use of the flight director only.

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.

Maximum Altitude losses due to autopilot malfunction:

<u>Configuration</u>	<u>Altitude Loss</u>
Cruise, Climb, Descent-----	340 ft.
Maneuvering-----	100 ft.
APPR -----	90 ft.

B. Airplane Stall (Autopilot coupled)

1. **AUTOPILOT** **DISENGAGE**, perform stall recovery.

C. Amplified Emergency Procedures

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 or autopilot trim malfunction may be recognized as an uncommanded deviation in the airplane flight path or when there is abnormal control wheel or trim wheel motion. In some cases, and especially for autopilot trim, there may be little to no airplane motion, yet the red TRIM FAIL annunciator may illuminate and an alert tone will sound.

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 wheel firmly and press and hold down the A/P DISC/TRIM INTER 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, pull the SERVOS circuit breaker to completely disable these systems.

2. A manual electric trim malfunction may be recognized by the illumination of a red TRIM FAIL annunciator accompanied by an alert tone or by unusual trim wheel motions with the autopilot 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

following a manual electric trim malfunction is regaining control of the airplane
Grasp the control wheel firmly and press and hold down the A/P DISC/TRIM INTER switch. Pull the SERVOS circuit breaker.

3. Note that the emergency procedure for any malfunction is essentially the same: — immediately grasp the control wheel firmly to regain airplane control while pressing and holding the A/P DISC/TRIM INTER switch down, and manually retrim the airplane as needed. After these steps have been accomplished, disable the autopilot or electric trim system by pulling the SERVOS 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 6 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 Pitch Trim systems in lieu of pulling the SERVOS circuit breaker. 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, communications, navigation and identification equipment will be inoperable.
5. The KFC 225 autopilot incorporates pitch, roll and yaw monitors that detect abnormal airplane movement; therefore, if the airplane, for any reason, is moved rapidly in pitch, roll or yaw, the monitors may disconnect the autopilot 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.

SECTION III B — ABNORMAL PROCEDURES

A. A flashing **PT** auto trim annunciation with an UP or DOWN arrowhead in the display of the autopilot computer suggests a failure of the auto trim function to relieve pitch servo loading in a timely manner.

1. FLASHING **PT** ANNUNCIATION **OBSERVE** aircraft pitch behavior.
If pitch behavior is satisfactory, wait
5-10 seconds for the annunciation to stop.
2. If annunciation continues,
Airplane Control Wheel **GRASP FIRMLY**
press **CWS** and check for an out of pitch
trim condition. Manually retrim as required.
3. **CWS** Button **RELEASE**
4. **AUTOPILOT OPERATION** **CONTINUE**
if satisfied that the out of trim indication was temporary.
..... **DISCONTINUE**
if evidence indicates a failure of the auto trim function.

- B. A red **P** or **R** annunciation on the face of the autopilot computer.
1. A red **P** annunciation is an indication that the pitch axis of the autopilot has been disabled and the autopilot cannot be engaged.

NOTE:

If the red **P** lamp was the result of some abnormal accelerations on the airplane, the annunciation should extinguish within approximately one minute and normal use of the autopilot will be re-established. This annunciation may be present during power up.

2. A red **R** annunciation is an indication that the roll axis of the autopilot has been disabled and the autopilot cannot be engaged.
- C. A flashing mode annunciation on the display of the autopilot computer or on the remote mode annunciator is normally indication of mode loss.
1. Flashing **HDG** - Indication of a failed heading input..... **PRESS HDG** button to terminate flashing.
 2. Flashing **NAV, APR, or REV** - Usually an indication of a flagged navigation source.....**PRESS NAV, APR or REV** button to terminate flashing.
Select a valid navigation source.

NOTE:

A flashing NAV, APR, or REV annunciation can also be caused by a failed heading or course datum input.

3. Flashing **GS** - Indication of a flagged glideslope (or a fault in the KFC 225 pressure sensor). GS will re-arm automatically if a valid GS signal is received.

NOTE:

To continue tracking localizer, observe the appropriate minimums for a non-precision approach. (Press VS to terminate the flashing GS and allow the vertical speed control of the pitch axis.)

At the onset of mode annunciator flashing, the autopilot has already reverted to a default mode of operation, i.e., ROL and/or PIT mode. An immediate attempt to re-engage the lost mode may be made if the navigation, glideslope or compass flag has cleared.

- D. Erratic altitude encoder operation:
1. Inaccurate or erratic altitude encoder output noted on the transponder or GPS altitude display.
- or
2. Erroneous altitude alert operation.
If items 1 and/or 2 are noted — altitude arm and capture should not be used and the altitude alerts should be ignored.
- F. Effects of other instrument losses upon autopilot operation:
1. Loss of the artificial horizon — will severely impact autopilot operation.
DO NOT ENGAGE autopilot into this situation.
 2. Loss of turn coordinator — no effect on the autopilot.

3. Loss of the HSI — Heading, navigation and approach modes inoperative.
4. Loss of altitude encoding — preselect altitude captures and altitude alerting inoperative. Note a dashed altitude display will appear on the autopilot computer.

SECTION IV — NORMAL PROCEDURES

A. PREFLIGHT (Perform prior to each flight)

1. **RADIO MASTER** switch **ON.**
2. **POWER APPLICATION AND SELF TEST** **OBSERVE.**

An approximate one minute self test is performed upon power application to the computer. This test is a sequence of internal checks that validate proper system operation prior to allowing normal operation. The sequence is indicated by "PFT" with an increasing number for the sequence steps. Successful completion of self-test is identified by all display segments being illuminated (Display Test), a momentary appearance of the flight director command bars and the disconnect tone sounding.

NOTE

Following the preflight self test, the red **P** annunciation warning on the face of the autopilot may illuminate indicating that the pitch axis cannot be engaged. this condition should be temporary,lasting less than 30 seconds. The **P** will extinguish and normal operation will be available.

WARNING

When power is first applied to the autopilot computer, the servo clutches will engage momentarily during self-test requiring additional effort to control the airplane through the engaged clutches if taxiing or flying.

WARNING

If the TRIM/FAIL warning light stays ON, the autotrim did not pass preflight test. The SERVOS circuit breaker must be pulled. The autopilot and manual electric trim can not be used.

3. **MANUAL ELECTRIC TRIM** **TEST** as follows:
Command NOSE UP trim using the manual electric trim switches and verify the ability to interrupt trim motion by pressing the **A/P DISC/TRIM INTER** switch. Repeat NOSE DOWN.

4. **AUTOPILOT** **ENGAGE** by pressing AP button
5. **FLIGHT CONTROLS** **MOVE** fore, aft, left & right
to verify that the autopilot clutches
can be overpowered.

Verify that the yaw damper (if installed) can be overpowered through movement of the rudder pedals.

6. **A/P DISC/TRIM INTER** switch **PRESS**
Verify that the pitch, roll and yaw clutches disengage and that the autopilot disconnects. Note the aural disconnect tone.

7. **TRIM** **SET** to Take-Off position manually.

B. FLIGHT DIRECTOR OPERATION

The flight director modes of operation are the same as those used for autopilot operations except that the autopilot is not engaged and the pilot must maneuver the aircraft to satisfy the flight director commands. Note that the flight director will always be in view when the autopilot is engaged.

C. AUTOPILOT OPERATION

WARNING

The pilot in command must continuously monitor the autopilot when it is engaged, and be prepared to disconnect the autopilot and take immediate corrective action - including manual control of the airplane and/or performance of emergency procedures - if autopilot operation is not as expected or if airplane control is not maintained.

During all autopilot coupled operations, the pilot in command must use proper autopilot commands and use the appropriate combination of engine power, wing flaps, and landing gear to ensure that the airplane is maintained between 80 and 180 KIAS, and does not exceed other basic airplane operating limitations.

1. Before Take-Off:

- a. **A/P DISC/TRIM INTER** Switch..... **PRESS**
- b. Flight Director **ENGAGE**
as desired.
(HDG & GA modes are common choices.)
- c. Altitude Alert/Altitude preselect..... **SET**
ARM as desired

NOTE

An aural and visual alert is annunciated 1000 ft. prior to arrival at the selected altitude.

When the preselected altitude is reached, 5 beeps will annunciate, indicating altitude has been captured.

After the selected altitude is captured, another alert is annunciated if the aircraft deviates from the selected altitude by ± 200 ft. The aural alert is a series of 5 short tones followed by the voice message - "ALTITUDE" or "LEAVING ALTITUDE".

2. Inflight Autopilot Engagement

- a. Elevator Trim **VERIFY** or **SET**
to place the airplane in a trimmed condition prior to autopilot engagement.

- b. **AP** button..... **PRESS**

If no other modes have been selected on the flight director, the autopilot will operate in the **ROL** and **PIT** modes. If other flight director modes have been selected, the autopilot will engage into the existing flight director modes.

NOTE

Satisfy existing flight director commands manually prior to autopilot engagement to avoid undesirable pitch and roll transients.

WARNING

Do not help the autopilot or hand-fly the airplane with the autopilot

engaged as the autopilot will run the pitch trim to oppose control wheel movement. A mistrim of the airplane, with accompanying large elevator control forces, will result if the pilot manipulates the control wheel manually while the autopilot is engaged.

3. Climb or Descent

- a. Choose pitch attitude hold (**PIT**) or vertical speed hold (**VS**) mode.

WARNING

When operating at or near the best rate of climb airspeed and using vertical speed hold, it is easy to decelerate to an airspeed on the back side of the power curve where a decrease in airspeed results in a reduced rate of climb. Continued operation on the back side of the power curve in vertical speed mode will result in a stall. When operating at or near the maximum autopilot speed, it may be necessary to reduce power in order to maintain the desired rate of descent and not exceed the maximum autopilot speed.

- b. Using **CWS**

- 1) **CWS** Button **PRESS** and **MOVE**
aircraft nose to the desired pitch
attitude or vertical speed.

- 2) **CWS** Button **RELEASE**

Autopilot will command the present attitude within the limits of $\pm 15^\circ$ or the present vertical speed within the limits of ± 2000 ft/min.

- c. Using Vertical Trim

- 1) **VERTICAL TRIM** Control **PRESS** either the **UP** or **DN**
button to modify aircraft
attitude within the the limits of $\pm 15^\circ$, or
modify vertical speed within the limits of ± 2000 ft/min.

- 2) **VERTICAL TRIM** Control **RELEASE**
when the desired attitude is achieved or
the desired vertical speed command is displayed.

4. Altitude (**ALT**) Hold

- a. **ALT** Mode Selector Button **PRESS**

Note **ALT** mode annunciator **ON**. Autopilot will maintain the barometric pressure corrected altitude present at the time of engagement.

NOTE

In accordance with FAA recommendation (AC00-24B), use of basic "pitch attitude hold" mode is recommended during operation in severe turbulence.

- b. Pre-selected altitude captures with flight director engaged.

- 1) **ALTITUDE SELECT** knob **ROTATE**
until the desired altitude is displayed.

Note **ARM** annunciation occurs automatically upon altitude selection when the flight director is engaged.

- 2) Airplane..... **ESTABLISH** climb or descent necessary to intercept the selected altitude.

Note **ALT CAP** annunciated during level off at the pre-selected altitude.

- 3) ALTITUDE SELECT MODE (**ARM**) button**PUSH** to automatically disarm or arm altitude capture.

NOTE

Pre-selected altitude captures are not recommended on non-precision approaches to capture the **MDA**. A pre-selected altitude capture cannot be armed during glideslope operation.

c. Altitude changes

- 1) Using **CWS** (recommended for altitude changes greater than 100 ft.
 - a) **CWS** button **PRESS** and maneuver aircraft to desired altitude.
 - b) **CWS** button **RELEASE** when desired altitude is reached.

The autopilot will maintain the altitude present at the time of button release.

- 2) Using Vertical Trim (Recommended for altitude changes less than 100 ft).
 - a) **VERTICAL TRIM** control **PRESS** and **HOLD** either UP or DN button

Vertical Trim will command an altitude rate of change of about 500 fpm

- b) **VERTICAL TRIM** control **RELEASE** when the desired altitude is reached.

The autopilot will maintain the altitude present at the time of button release.

NOTE

As an alternative, press either the UP or DN button with a succession of quick momentary presses programming either an increase or decrease in the altitude reference at the rate of 20 feet per button press.

5. Heading Changes

a. Manual heading changes in **ROL** mode.

- 1) **CWS** button **PRESS** and **MANEUVER** aircraft to the desired heading.
- 2) **CWS** button **RELEASE** w/bank angle less than 6°.

Autopilot will attempt to maintain the aircraft at wings level in the ROL mode.

- 3) **CWS** button **RELEASE** w/bank angle greater than 6°.

Autopilot will maintain the bank angle present at the time of button release (up to the maximum bank angle commanded by the autopilot).

NOTE

Aircraft heading may change in **ROL** mode due to turbulence or attitude gyro precession.

b. Heading Hold

1) Heading Selector Knob..... **SET BUG**
to desired heading

2) **HDG** Mode Selector Button **PRESS**

Note HDG mode annunciator **ON**. Autopilot will automatically turn the aircraft to the selected heading.

c. Command Turns (Heading Hold mode **ON**)

1) Heading Selector Knob..... **MOVE BUG**
to the desired heading.

Autopilot will automatically turn the aircraft to the new selected heading.

6. **NAV** Coupling

a. Course Bearing Pointer **SET**
to desired course.

b. Heading Selector Knob..... **SET BUG**
to provide desired intercept angle and engage HDG mode.

c. **NAV** Mode Selector Button..... **PRESS**

1) If the Course Deviation Bar is greater than 2 to 3 dots from center:

The aircraft will continue in HDG mode (or ROL if HDG is not selected) with **NAV ARM** annunciated; when the computed capture point is reached, HDG will disengage, the **ARM** annunciator will go out and the selected course will be automatically captured and tracked.

2) If the D-Bar is less than 2 to 3 dots from center:

The HDG mode will disengage upon selecting NAV mode; the **NAV** annunciator will illuminate and the capture/track sequence will automatically begin.

NOTE

When operating in the NAV or APR mode with VOR as the selected navigation sensor, changes in the selected course which result in a D-Bar deviation of greater than 50% may result in the autopilot not tracking the signal. It is recommended that the new course be manually captured using the heading bug and the NAV ARM or APR ARM modes.

7. Approach (**APR**) Coupling (to enable glideslope coupling on an ILS, and more precise course tracking on instrument approaches).

a. Course Bearing Pointer **SET** to desired course

b. Heading Selector Knob..... **SET BUG**
to provide the desired intercept angle

c. **APR** Mode Selector Button..... **PRESS**

1) If the Course Deviation Bar is greater than 2 to 3 dots from center:

The aircraft will continue in HDG mode (or ROL if HDG is 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.

NOTE

When operating in the NAV or APR mode with VOR as the selected navigation sensor, changes in the selected course which result in a D-Bar deviation of greater than 50% may result in the autopilot not tracking the signal. It is recommended that the new course be manually captured using the heading bug and the NAV ARM or APR ARM modes.

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

- a. Course Bearing Pointer **SET**
to the ILS front course inbound heading
- b. Heading Selector Knob..... **SET BUG**
to provide desired intercept angle and engage HDG mode.
- c. **REV** Mode Selector Button..... **PRESS**

1) If the Course ;Deviation ;Bar is greater than 2 to 3 dots from center:

The aircraft will continue in HDG mode (or ROL if HDG is not selected) with the **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.

2a) If the D-Bar is less than 2 to 3 dots from center:

The HDG mode will disengage upon selecting NAV mode; the **NAV** annunciator will illuminate and the capture/track sequence will automatically begin.

2b) If the D-Bar is less than 2 to 3 dots from center:

The HDG mode will disengage upon selecting REV mode; the **REV** annunciator will illuminate and the capture/track sequence will automatically begin.

9. Glideslope Coupling

NOTE

Glideslope coupling is inhibited when operating in NAV or REV modes. Glideslope arm and coupling occurs automatically in the APR mode when tracking localizer.

- a. **APR** Mode..... **ENGAGED**
Note **GS ARM** annunciated

NOTE

Autopilot can capture glideslope from above or below the beam.

Establish a glideslope intercept in **ALT, PIT** or **VS**.

- b. At Glideslope centering Note **ARM** annunciator **OFF**
and GS becomes the active pitch mode.

10. Missed Approach

- a. **GA** Button..... **PRESS**
to disengage the autopilot and obtain a flyup
and wings level flight director command
- b. **MISSED APPROACH**..... **EXECUTE**
Utilize flight director modes as desired.

NOTE

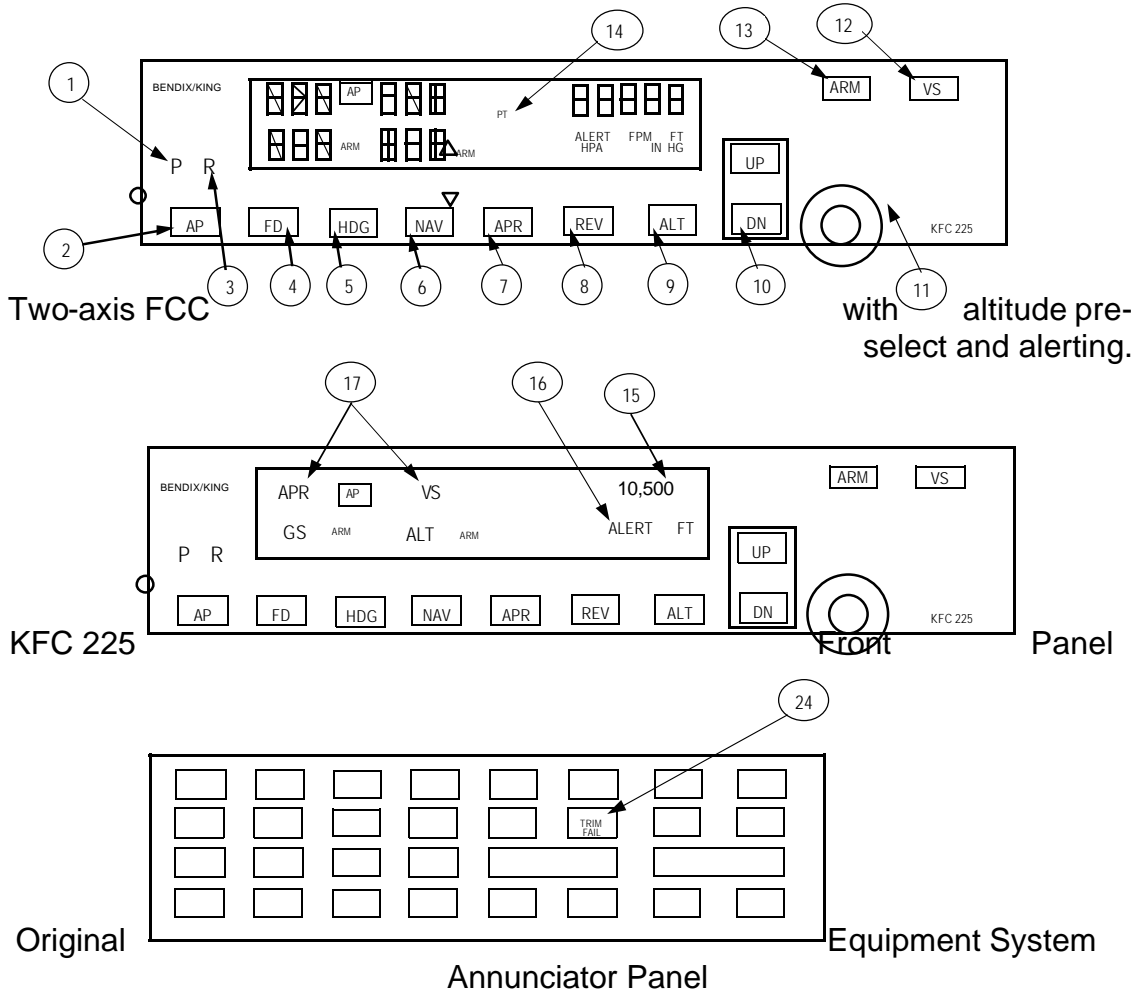
If tracking the ILS course outbound as part of the missed approach procedure is desired, use the **NAV** mode to prevent inadvertent GS coupling.

- c. **AUTOPILOT**-after aircraft is in trim**ENGAGE** as desired
- 11. Before Landing
 - a. **A/P DIS/TRIM INTER** Switch**PRESS** to disengage autopilot.

NOTE

Selective flight controls disengagement may be practiced by initially disconnecting the autopilot only at approach minimums via a momentary press of the manual electric trim switch.

D. SYSTEM CONTROLS AND DISPLAYS



NOTE

Default PIT and ROL modes are not displayed on the remote KA 285A annunciator

1. PITCH AXIS, (**P**) ANNUNCIATOR — When illuminated, indicates failure of the pitch axis and will lead to disengagement of the autopilot. (Will also illuminate during short term vertical accelerations in excess of +1.6g or less than +0.4g which may not cause autopilot disengagement.)

2. AUTOPILOT ENGAGE/DISENGAGE (**AP**) BUTTON — When pressed, engages the flight director, autopilot and optional yaw damper if all logic conditions are met. If the flight director is not already engaged, the system will engage into the basic wings level (ROL) and pitch (PIT) altitude hold modes. The pitch attitude maintained will be the pitch attitude present at the moment of AP button press. When pressed again, will disengage the autopilot.

3. ROLL AXIS (**R**) ANNUNCIATOR — When illuminated, indicates failure of the roll axis and will disengage the autopilot.

4. FLIGHT DIRECTOR (**FD**) MODE SELECTOR BUTTON — When pressed will engage the flight director into the basic roll (ROL) mode which functions as a wing leveler, and into the pitch attitude (PIT) hold mode. The pitch attitude maintained will be the pitch present at the moment of FD button press. When pressed again (and the autopilot is not engaged) will disengage the flight director.

5. HEADING (**HDG**) MODE SELECTOR BUTTON — When pressed, will engage 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 modes. This button will engage the flight director.

7. APPROACH (**APR**) MODE SELECTOR BUTTON — When pressed, will arm the Approach mode. This mode provides automatic beam capture and tracking of VOR, GPS, LOC, and Glideslope (GS) on an ILS, as selected for presentation on the HSI. APR ARM will annunciate. If pressed when APR mode is either armed or coupled, will disengage the mode. This button will engage the flight director.

8. BACK COURSE APPROACH (**REV**) MODE SELECTOR BUTTON — When pressed, will select the back course approach mode. This mode functions similarly to the approach mode except that the autopilot response to LOC signals is reversed and glideslope is inhibited. This button will engage the flight director.

9. ALTITUDE HOLD (**ALT**) MODE SELECTOR BUTTON — When pressed, will engage the Altitude Hold mode. The altitude maintained 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. If pressed when ALT hold mode is engaged, will disengage the mode, defaulting to PIT mode. This button will engage the flight director.

10. VERTICAL TRIM (**UP/DN**) BUTTONS — The response of these buttons is dependent upon the vertical mode present when pressed. If PIT mode is active, successive button presses will move the pitch attitude hold reference either up or down by 0.5° per press, or at the rate of 0.8° per second if held

continuously. If **VS** mode is active, the initial button press will bring up the commanded vertical speed in the display. Subsequent immediate button presses will increment the vertical speed command 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 held continuously. If **ALT** mode is active, successive button presses 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 neither the pitch attitude nor the altitude hold reference is displayed. The display will continue to show the altitude alerter reference.)

11. **ROTARY KNOBS** — Used to set the altitude alerter/altitude pre-select reference altitude. When the flight director is engaged, will automatically arm a pre-select altitude hold capture.

12. **VERTICAL SPEED (VS) MODE SELECTOR BUTTON** — When pressed, will engage the vertical speed hold mode. The vertical speed maintained is the vertical speed present at the moment the VS button is pressed. The vertical speed command reference will initially be displayed in place of the altitude alerter annunciation, defaulting back in 3 seconds to the altitude alerter value. Pressing either the up or DN button will again cause the vertical speed command reference to be displayed while causing it to increase or decrease. Vertical speed can be commanded to a maximum of a 2000-ft/min climb down to a maximum of a 2000-ft/min descent. When the VS button is pressed again, it will disengage the vertical speed mode. This button will engage the flight director.

13. **ALTITUDE ARM (ARM) BUTTON** — When pressed, will toggle altitude arming ON or OFF. When ALT ARM is annunciated, the automatic flight control system will capture the altitude displayed in the Altitude Alerter/Vertical Speed Display (provided the aircraft is climbing or descending to the displayed altitude). ALT ARM mode is engaged automatically whenever the selected altitude is changed via the rotary knobs. Note that the alerter functions are independent of the arming process thus providing full time alerting, even when the flight director is disengaged. This button will engage the flight director.

14. **PITCH TRIM (PT) ANNUNCIATION** — A flashing **PT** with an accompanying arrow head is an indication that the request for auto trim has lasted longer than 10 seconds. A solid **PT** without an arrowhead is an indication of pitch trim fault. A trim runaway will generate the solid **PT** annunciation, a remote **TRIM/FAIL** (see item 24) annunciation and a continuous alert tone. Refer to the EMERGENCY PROCEDURES for proper response to a pitch trim fault.

15. **ALTITUDE ALERTER/VERTICAL SPEED DISPLAY** — Normally displays the altitude alerter selected altitude. The display indicates the reference vertical speed in FPM for 3 seconds after the CWS button or the UP or DN button is pressed and the VS mode is engaged.

16. ALTITUDE ALERT (**ALERT**) ANNUNCIATION — Illuminates as a solid alert in the region of from 1000 to 200 feet from the selected altitude if the airplane was previously outside of this region. Flashes (1) for two seconds the first time the airplane crosses the selected altitude and (2) flashes 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.

17. PITCH AND ROLL MODE, AND AUTOPILOT ANNUNCIATIONS — Displays the active flight director pitch modes (PIT, VS, ALT ARM, ALT CAP, ALT, GS ARM, GS, GA, and roll modes (ROL, HDG, NAV ARM, NAV, APR ARM, APR, REV ARM, REV). Displays when the autopilot (AP) is engaged. Also displayed will be a flashing AP annunciation (5 seconds) at each autopilot disconnect accompanied by an aural tone (for 2 seconds).

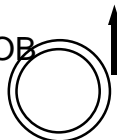
18. AUTOPILOT DISCONNECT (**AP DISC/TRIM INTER**) SWITCH (not shown) — When pressed, will disengage the autopilot and yaw damper (if installed), and interrupt electric trim power. (Located on the left horn of the pilot's control wheel. The switch is RED in color). (May also disengage the flight director depending on how the system is configured.)

19. MANUAL ELECTRIC TRIM SWITCHES (not shown) — When both switches are pressed in the same direction, will activate pitch trim in the selected direction. If only one switch is moved, the trim system will not operate. If one switch fails 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. Use of manual electric trim during autopilot operation will disengage the autopilot. (Located on the pilot's control wheel).

20. CONTROL WHEEL STEERING (**CWS**) MODE BUTTON (not shown) — When pressed and held, 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 automatic flight control system PIT, ROL, ALT or VS commands to the actual attitude, altitude or vertical speed present at the time the button is released. ROL will maintain wings level if CWS is released at less than 6° bank angle. (Located on the left horn of the pilot's control wheel.)

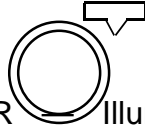
21. GO AROUND (**GA**) MODE BUTTON (not shown) — When pressed, will engage the flight director in a pitch up attitude of 6° and wings level (ROL mode). GA will disengage the autopilot, and cancel all armed modes including an armed altitude preselect. Lateral modes such as HDG or NAV ARM may subsequently be added. The autopilot may subsequently be engaged. Modification to the commanded pitch attitude such as through the UP/DN button or CWS, etc. will cancel GA and revert to pitch altitude hold. (Located on the instrument panel above throttle).

22. OMNI BEARING SELECT KNOB tracked by the autopilot.



Selects the desired course to be tracked by the autopilot. (Located on the HSI.)

23. HEADING SELECT KNOB
compass card.



Positions the heading bug on the
(Located on the HSI).

24. **TRIM/FAIL** ANNUNCIATOR Illuminates whenever the automated pre-flight self-test detects a pitch trim fault or a continuous monitoring system detects a pitch trim fault in flight. (Located in either the system annunciator panel or the pilot's instrument panel. The annunciator is RED in color). Refer to the EMERGENCY PROCEDURES for proper response to a pitch trim fault.

SECTION V THROUGH X

NO CHANGES TO THESE SECTIONS