PILOT'S GUIDE FOR THE KFC 150/KAP 150 & KAP 100 FLIGHT CONTROL SYSTEMS



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INTRODUCTION



The pressures of single-pilot instrument flying place critical demands on the skill and concentration of any pilot.

To help you meet the challenge, King Radio has developed three digital, panel-mounted Silver Crown flight control systems for single and twin engine aircraft.

These systems bring digital flight control technology from the flight deck of the new generation airliners to the cockpits of piston powered aircraft for the first time. The result is lightweight, compact flight control systems which incorporate the functions of computer, mode selector, and annunciator in a single, panel-mounted unit. These digital panel-mounted systems use fewer parts than previous generation flight control systems for singles and twins. And fewer parts mean potentially greater reliability.

It's also significant that these Silver Crown flight control systems have been designed from the beginning to interface with your Silver Crown package of COMM/NAV Pulse products. Consider the advantage of having your avionics working together as an integrated system rather than as a group of unrelated components built by several manufacturers.

To fully utilize the impressive capabilities of your new digital, panel-mounted flight control system, you must understand the performance capabilities and basic operational requirements of these advanced-design Silver Crown systems. This pilot's guide is divided into three sections. The first provides a general familiarization with each flight control system including the associated panel-mounted displays. The second section describes each system, including the KCS 55A slaved compass system and its operation, as well as optional altitude preselect/alerting and vertical speed hold. The final section covers emergency procedures and optional NAV 1/NAV 2 switching.

GENERAL DESCRIPTION: KFC 150, KAP 150 AND KAP 100



KFC 150 Flight Control System

The KFC 150 is the ultimate panel-mounted digital flight control system for singles and twins. It has the autopilot capability you need, plus a complete flight director system. The flight director provides attitude commands for the pilot to hand-fly, or displays to the pilot the commands being followed by the autopilot. The KFC 150 has capabilities similar to King's popular KFC 200 Flight Control System.

KAP 150 Autopilot System

The KAP 150 Autopilot System is a two-axis, panel-mounted digital system which delivers highly sophisticated IFR capability. It has modes and functions similar to the KFC 150 but has no flight director.

KAP 100 Autopilot System

The KAP 100 Autopilot System is a single-axis panel-mounted digital system which extends Silver Crown quality and reliability to an entirely new entry-level capability. The KAP 100 Autopilot is the most affordable option in the Silver Crown line of flight control systems and offers many substantial workload relief benefits.

The following chart highlights the major attributes of each of the three systems

SILVER CROWN PANEL-MOUNTED FLIGHT CONTROL SYSTEM CAPABILITIES

	KFC 150	KAP 150	KAP 100
Two Axis	Yes	Yes	—
Single Axis	—	—	Yes
Flight Director	Yes	—	—
KI 525A PNI	Standard	Optional	Optional
KG 107 DG	—	Standard	Standard
KG 258 Horizon Reference Indicator	—	Standard	Standard
KI 256 Flight Command Indicator	Standard	—	—
Automatic Electric Elevator Trim	Standard	Standard	—
Manual Electric Trim	Standard	Standard	Optional
Yaw Damper	Optional for some aircraft	Optional for some aircraft	—
KA 185 Remote Mode Annunciator	Optional for some aircraft	Optional for some aircraft	Optional for some aircraft
KAS 297B Altitude Preselect/ Alerting, Vertical Speed Hold	Optional for some aircraft	Optional for some aircraft	—
FUNCTIONS/MODES			
ALT Hold (ALT)	Yes	Yes	—
ALT Preselect	Optional	Optional	—
Heading Select (HDG)	Yes	Yes	Yes
NAV (VOR/RNAV)	Yes	Yes	Yes
Approach (APR)	Yes	Yes	Yes
Glideslope (GS)	Yes	Yes	—
Back Course (BC)	Yes	Yes	Yes
Control Wheel Steering (CWS)	Standard	Standard	Optional with King manual electric trim
Vertical Speed Hold	Optional	Optional	—
Vertical Trim	Yes	Yes	—
Auto Capture	Yes	Yes	Yes
Auto Track	Yes	Yes	Yes
All Angle Intercept	Yes	Optional (with KI 525A)	Optional (with KI 525A)
Auto 45-degree Intercept	—	Standard (with KG 107)	Standard (with KG 107)
TEST			
Manual and Auto Trim Monitor	Both	Both	Manual Trim Monitor (with King manual electric trim option)
Roll Rate Monitor	Yes	Yes	Yes
Pitch Rate Monitor	Yes	Yes	—

NOTE: The KFC 150, KAP 150 and KAP 100 are designed as independent systems to maximize their individual capabilities. Therefore they are not designed for conversion from one system to another.

IMPORTANT: This Pilot's guide provides a general description of various operational characteristics of the KFC 150, KAP 150 and KAP 100 Flight Control Systems. However, operation of a system should not be attempted without reviewing the specific information in the FAA approved Aircraft Flight Manual Supplement for your particular aircraft type.

SYSTEMS INTEGRATION

The individual systems diagrams on pages 7, 8, and 9, show the components and their relationships in typical KFC 150, KAP 150 and KAP 100 Flight Control Systems. The actual components used on individual aircraft may vary slightly in order to optimize certification and installation requirements.

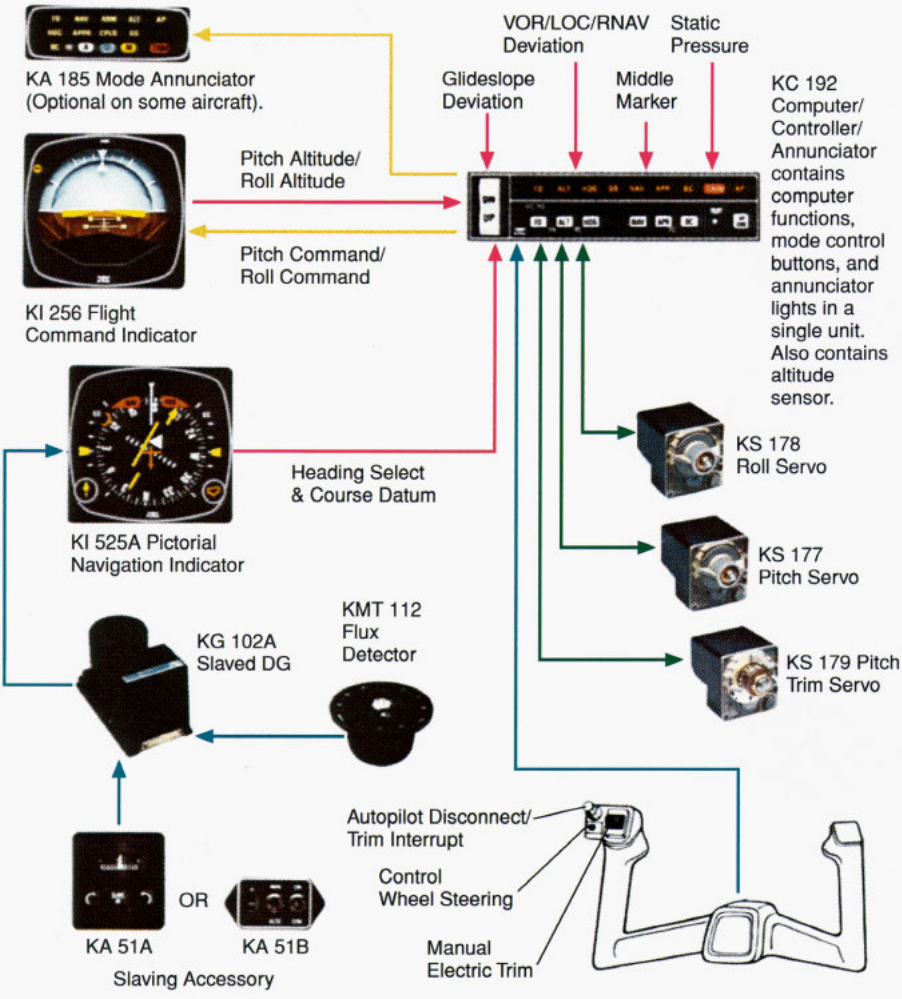
Each system has a number of inputs and outputs: sensor outputs are shown in red; computation inputs shown in blue; display outputs shown in orange; and aircraft control shown in green. The systems diagrams reflect that the KAP 150 and KFC 150 systems control both pitch and roll axes of the aircraft. The KAP 100, being a single-axis system, controls only the roll axis of the aircraft. All sensor information (pitch and roll reference, heading and course datum, RNAV/VOR/LOC/GS deviation and flags, marker receiver and static pressure [altitude] is fed into the system's flight computer).

The flight computer computes pitch and roll steering commands (or in the case of the KAP 100, roll commands only). In the KFC 150 system these commands are routed through the KI 256 Flight Command Indicator (FCI), where they are displayed on the V-Bar as visual guidance commands.

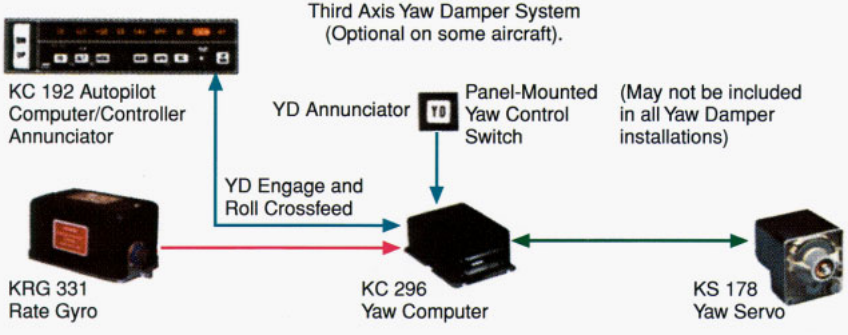
In all three systems these steering commands are fed to the autopilot computation circuits contained in the appropriate flight computer which generates the commands for the individual servos to manipulate the ailerons, elevator and elevator trim. An optional yaw channel is available for some aircraft, but is independent of pitch and roll commands.

Using the same pitch and roll commands in the KFC 150 system for flight director and autopilot provides totally consistent flight director steering command and autopilot control. There is no disagreement in computation. The autopilot simply converts the pitch and roll steering commands from the flight computer, displayed on the V-Bar in the FCI, into the required elevator and aileron position commands. Full integration of flight director and autopilot allows the pilot to delegate the manual effort of flying the aircraft to the autopilot while monitoring its activity with the flight director.

TYPICAL KFC 150 FLIGHT CONTROL SYSTEM



This is a 2-Axis (Pitch and Roll) System.



TYPICAL KAP 150 AUTOPILOT SYSTEM



KA 185 Mode Annunciator
(Optional on some aircraft).

VOR/LOC/RNAV Deviation

Static Pressure

Glideslope Deviation

Middle Marker

KC 191 Computer/ Controller/ Annunciator contains computer functions, mode control buttons, and annunciator lights in a single unit. Also contains altitude sensor.



Pitch Attitude/ Roll Attitude



KG 258 Attitude Reference Indicator

Heading Select & Course Datum



KG 107 Directional Gyro



KI 204 or other Course Deviation Indicator (not included).

OR



KI 525A Pictorial Navigation Indicator



KG 102A Slaved DG



KMT 112 Flux Detector



KCS 55A Slaved Compass System (Optional)

OR



KA 51A KA 51B
Slaving Accessory



KS 178 Roll Servo

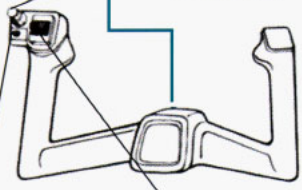


KS 177 Pitch Servo



KS 179 Pitch Trim Servo

Autopilot Disconnect/ Trim Interrupt



Control Wheel Steering

Manual Electric Trim

This is a 2-Axis (Pitch and Roll) System.



KC 191 Autopilot Computer/Controller Annunciator

Third Axis Yaw Damper System
(Optional on some aircraft).

YD Annunciator



Panel-Mounted Yaw Control Switch

(May not be included in all Yaw Damper installations)

YD Engage and Roll Crossfeed



KRG 331 Rate Gyro

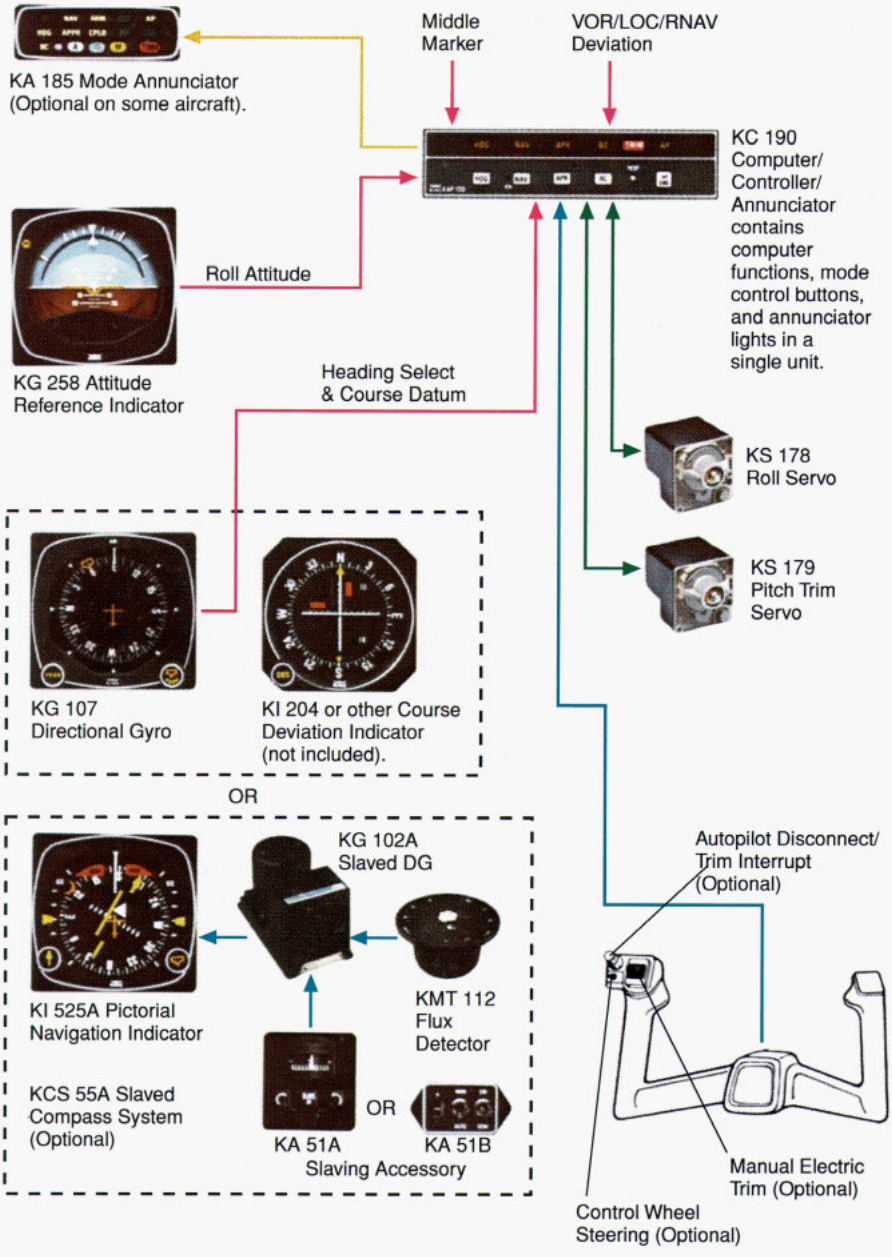


KC 296 Yaw Computer



KS 178 Yaw Servo

TYPICAL KAP 100 AUTOPILOT SYSTEM



This is a Single-Axis (Roll) System.

DESCRIPTION OF PANEL UNITS



KC 192 Mode Controller/Computer/Annunciator

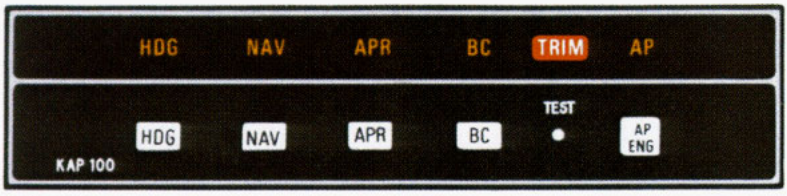
The KC 192 Mode Controller/ Computer/Annunciator for the KFC 150 system incorporates all computer functions, mode control buttons and annunciator lights in a single panel-mounted unit. The KC 192 annunciates all vertical and lateral flight director and autopilot system modes.

In addition, the KC 192 has seven push buttons for engaging flight director and/or autopilot modes, a push button to initiate a system self-test, and a vertical trim rocker switch to allow for changing the aircraft's pitch up or down without disconnecting the autopilot.



KC 191 Mode Controller/Computer/Annunciator

The KC 191 Mode Controller/ Computer/Annunciator for the KAP 150 incorporates the functions of a computer, mode controller and annunciator lights in a single, panel-mounted unit. The KC 191 annunciates all vertical and lateral autopilot system modes. In addition, the KC 191 has six push buttons for engaging autopilot modes, a push button to initiate system self-test, and a vertical trim rocker switch to allow for changing the aircraft pitch up or down without disconnecting the autopilot.



KC 190 Mode Controller/Computer/Annunciator

The KC 190 Mode Controller/ Computer/Annunciator for the KAP 100 incorporates the functions of a computer, mode controller and annunciator lights in a single, panel-mounted unit. The KC 190 annunciates all lateral autopilot system modes. In addition, the KC 190 has five buttons for engaging autopilot modes, and a push button to initiate system self-test.



KI 256 Flight Command Indicator (FCI)

The KI 256 displays the following information:

- Pitch and roll attitude.
- Flight Director pitch and roll commands.
- DH (decision height) annunciation when used with a radar altimeter.

The KI 256 contains an air-driven vertical gyro. Engine(s) must be running, pressure or vacuum system operating and gyro up to speed before the system will operate. Allow three minutes for the gyro to come up to speed.



KG 253 Electric Horizon Reference Indicator

The KG 253 displays the following information:

- Pitch and roll attitude.
- DH (decision height) annunciation when used with a radar altimeter.

The KG 253 is an electric attitude reference indicator. Electrical power (D.C.) must be applied in order for the unit to operate. Immediately following electrical power turn-on, the knob labeled "Pull to Erect" should be pulled out with a moderate, even pull and held in the out position for approximately three seconds. The knob should then be released quickly but smoothly. Erecting the unit should only by accomplished while the aircraft is relatively level on the ground or in level flight. The gyro must be up to speed before the system will operate. Allow three minutes for the gyro to come up to speed.



KG 258 Horizon Reference Indicator

The KG 258 displays the following information:

- Pitch and roll attitude.
- DH (decision height) annunciation when used with a radar altimeter.

The KG 258 contains an air-driven attitude reference indicator. Engine(s) must be running before the system will operate. Allow three minutes for the gyro to come up to speed.



KI 254 Electric Flight Command Indicator (FCI)

The KI 254 displays the following information:

- Pitch and roll attitude.
- Flight Director pitch and roll commands.
- DH (decision height) annunciation when used with a radar altimeter.

The KG 254 contains an electric vertical gyro. Electrical power (D.C.) must be applied in order for the unit to operate. Immediately following electrical power turn-on, the knob labeled "Pull to Erect" should be pulled out with a moderate, even pull and held in the out position for approximately three seconds. The knob should then be released quickly but smoothly. Erecting the unit should only be accomplished while the aircraft is relatively level on the ground or in level flight. The gyro must be up to speed before the system will operate. Allow three minutes for the gyro to come up to speed.



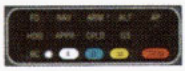
KI 204/206



KG 107



KI 525A



KA 185



KAS 297B

KI 204/206 Course Deviation Indicator

The KI 204/206 displays the following:

- VOR/LOC/GLIDESLOPE Deviations.
- Course Select (OBS).
- TO/FROM Flag Indication.

The KI 204/206 is used with the KN 53, KX 155 or KX 175B, and the KN 75 Glideslope Receiver. The KI 206 is used with the KN 74, KNS 80, KNS 81, KX 165 or KNC 610.

KG 107 Directional Gyro

The KG 107 Directional Gyro displays the following information:

- Unslaved gyro magnetic heading information.
- Selected heading (HDG "bug").

The KG 107 is an air-driven directional gyro indicator. Engine(s) must be running, pressure or vacuum system operating and gyro up to speed before the system will operate. Allow three minutes for the gyro to come up to speed.

KI 525A Horizontal Situation Indicator (HSI)

The KI 525A is the display portion of the KCS 55A Slaved Compass System and displays the following:

- Slaved gyro magnetic heading information.
- Selected heading (HDG "bug").
- VOR/LOC/RNAV course deviation.
- Glideslope deviation.

KA 185 Mode Annunciator (Optional)

The KA 185 provides a parallel annunciation display of all appropriate operating modes and may be positioned on the panel in the pilot's normal scan.

KAS 297B Altitude Selector (Optional)

The KAS 297B is used with a KEA 130A Altimeter to provide altitude preselect/alerting and vertical speed modes for the KFC 150 and KAP 150 systems.

System Monitor Description

Through the use of extensive monitor circuits in the 100 series flight control systems, safer control of the aircraft is provided, since failures are predominantly "soft" (aircraft control is automatically returned to the pilot when a fault is detected). Because of this safety factor, the 100 series flight control systems are able to provide smoother control of the aircraft due to increased servo authority.

The internal monitors continuously check for the presence of operating pitch and roll microprocessors, adapter modules (used to tailor the autopilot to individual aircraft models), pitch and roll reference signals, proper internal voltages, trim power, "runaway" auto trim, wrong direction of trim, abnormal pitch attitude rates, and abnormal roll attitude rates.

The trip levels for pitch and roll attitude rates and duration are independently set on the adapter modules for each aircraft.

Digital design allows the incorporation of these monitors without the weight and space penalties associated with previous technology systems. Now these important safety features are available to the operators of piston engine aircraft at a reasonable price.

THE KFC 150 FLIGHT CONTROL SYSTEM

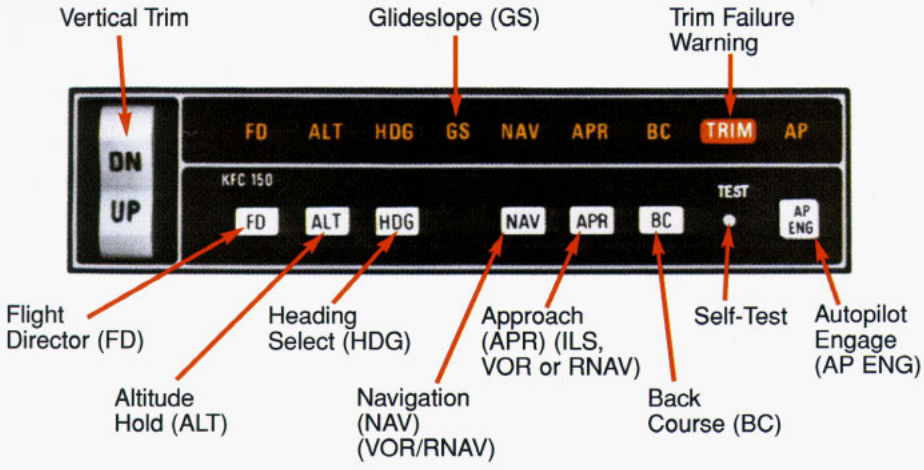


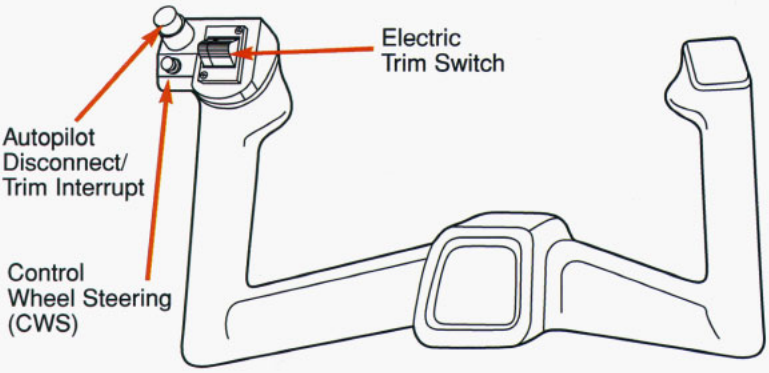
The KFC 150 is the ultimate in digital panel-mounted flight control systems for singles and twins.

The system incorporates a highly capable two-axis autopilot and a flight director system. An optional third-axis (yaw damper) system is available for some aircraft at a slightly higher cost.

The flight director system is a computer which calculates the appropriate pitch and roll attitudes required to intercept and maintain headings, courses, approach paths, pitch attitudes and altitudes. Once computed, the commands are displayed to the pilot on the single-cue steering command which is part of the KI 256 Flight Command Indicator (FCI).

The pilot can then manually fly the commands shown on the KI 256, or engage the autopilot portion of the system and have it fly the commands. Monitoring the single-cue steering command (V-bar) will tell the pilot if the commands are being satisfied. A good cross-check is to monitor the raw data (course or localizer and glideslope information) on the KI 525A PNI to see if the aircraft is intercepting or tracking course and glidepath as desired. (If you are unfamiliar with the operation of a Pictorial Navigation Indicator (PNI) you should stop here and review the section of the KCS 55A Compass System on page 95.)



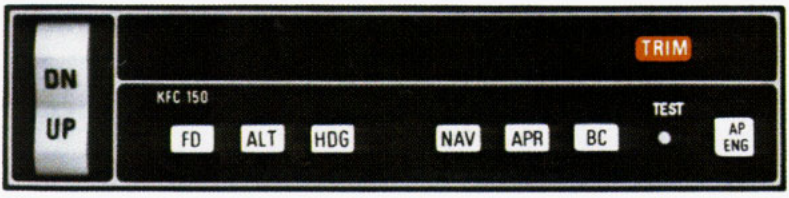


Mode	Flight Director/Autopilot Action
Attitude Reference	Power on and no modes selected. FCI displays aircraft attitude and PNI displays aircraft heading. Command V-bar is biased out of view. Aircraft engine(s) must be running for pressure or vacuum to be applied to FCI attitude gyro.
Flight Director (FD)	V-bar will appear and command wings level and pitch attitude of the aircraft at the time of mode selection.
Autopilot Engage (AP ENG)	Aircraft control surfaces (ailerons and elevators) smoothly respond to all selected Flight Director mode commands with automatic pitch trim. Engages Yaw Damper if present.

Mode	Flight Director/Autopilot Action
Heading (HDG)	Select desired heading on PNI, then select HDG mode. The V-bar will command the necessary bank to turn to and maintain the selected heading.
Navigate (NAV) (VOR/RNAV)	The V-bar will command the bank necessary to turn to and maintain a VOR or RNAV course selected by the pilot.
Approach (APR) (ILS, VOR or RNAV)	The V-bar will command the bank and pitch necessary to capture and track localizer and glideslope for ILS approaches, or to capture and track the appropriate course for VOR or RNAV.
Back Course (BC)	The V-bar will command the bank necessary to capture and track a reverse localizer course. Glideslope is locked out.
Altitude Hold (ALT)	The V-bar will command the pitch attitude necessary to maintain the engaged altitude.
Test Button	Depressing the test button initiates a test of the KFC 150 circuitry, including operation of various modes and of the trim. The test must be performed after power is applied and before the autopilot can be engaged, but the flight director can be used without the test being performed.
Vertical Trim	This rocker switch allows you to make small corrections in selected altitude while in altitude hold, or adjust pitch attitude at a rate of approximately .9 degrees per second when not in altitude hold.
Control Wheel Steering (CWS)	This button mounted on the control wheel allows you to maneuver the aircraft in pitch and roll without disengaging the autopilot. After the CWS button is released, the autopilot resumes control of the aircraft.

OPERATING THE KFC 150 SYSTEM

Initial Power On



When initially powered (no modes selected), the KFC 150 will display aircraft attitude on the FCI and aircraft heading on the PNI. The V-bar will be biased out of view. The trim light will be lit on the KC 192 as a reminder of the need to perform the system self-test.

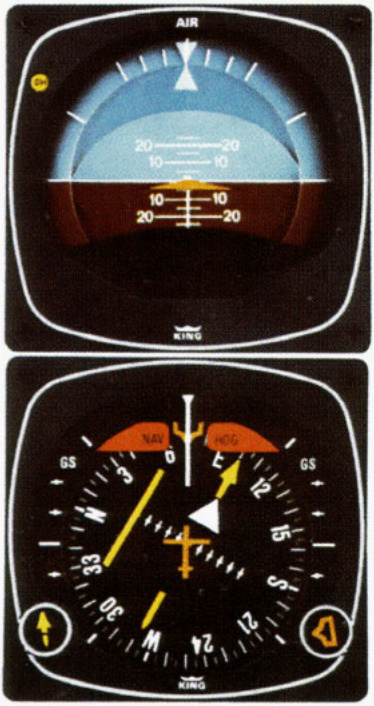
System Self-Test



The KFC 150 system incorporates a system self-test function which is activated by a test button on the KC 192 Mode Controller/Computer/Annunciator. The test must be performed before the autopilot portion of the system can be used, but need not be performed before using the flight director portion. This test determines, before takeoff, that the system is operating normally. To perform a test — momentarily push the test button. The following actions will occur:

1. All annunciator lights, the trim light and autopilot lights will illuminate.
2. The trim light will flash 4 times.
3. The annunciator legends will go blank, an aural tone will beep (approx. 6 times) and the "AP" light will flash (approx. 12-13 times) and go off. (If the AP light fails to flash you will be unable to engage the autopilot.)
4. The KC 192 display will go blank.

The test checks all digital computing capability, the disconnect capability of the autopilot, the auto trim drive and monitor systems, and the failure annunciator system. **CAUTION:** If the trim legend flashes or remains on at the end of the test it indicates there is a failure in the trim system and the autopilot will not engage. See a qualified King Service Agency for repair.

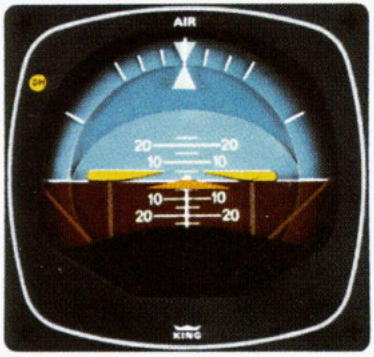


Attitude Reference Mode of Operation

The system will be in the basic attitude reference or "gyro" mode with engine(s) running and aircraft power on, but no modes selected (annunciator panel blank). Aircraft heading is shown on the PNI and roll and pitch attitude on the FCI.

Attitude Gyro Operation Note: When shutting down the aircraft for short periods of time, make sure the Attitude Gyro has completely spun down before starting operations again. Gyro spin down occurs when the air supply is cut off to the gyro and usually takes about 10 minutes.

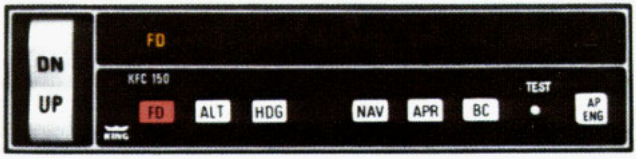
During Gyro spin down most gyros have a tendency to "tilt" (precess) to one side. If the air supply is reapplied to the gyro while in this state, slow gyro erection (leveling) will occur due to gyro inertia. If aircraft operations are initiated before the gyro is fully erected, there is a greater possibility that the gyro may tumble causing loss of primary attitude information from the Attitude Gyro.



FLIGHT DIRECTOR (FD) MODE

The flight director mode is activated by depressing the "FD" button on the mode controller or the CWS button on the control wheel. The V-bar will appear and provide commands to maintain wings level and the pitch attitude existing at the time of engagement. To satisfy the V-bar command the pilot can manually fly the orange delta wing "aircraft" into the V-bar to align the top of the delta wing flush with the bottom edge of the V-bar. Or the pilot can engage the autopilot and let it satisfy the commands by maneuvering the aircraft in a similar manner.





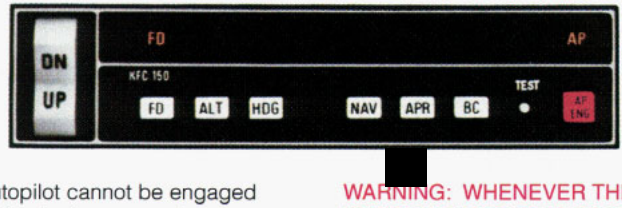
If a change in pitch attitude is desired, the control wheel steering (CWS) button on the pilot's control wheel can be used to synchronize the V-bar (in the FD mode with autopilot disengaged) without removing your hand from the control wheel.

The vertical trim switch may be used to adjust the selected pitch attitude up or down at .9 degrees per second.

The flight director can also be activated by direct selection of any specific mode, which will activate the command V-bar. Such selection will illuminate both FD and the appropriate annunciator mode.

Selection of a mode which supersedes one already selected will cause the flight director and/or autopilot to follow the mode most recently selected by the pilot.

AUTOPILOT ENGAGEMENT (AP ENG)



NOTE: The autopilot cannot be engaged until the flight director is engaged.

The autopilot is engaged by depressing the "AP ENG" button on the KC 192.

CAUTION: Prior to autopilot engagement, the pilot should make sure the V-bar commands are satisfied. This will prevent any rapid changes in the aircraft's attitude when the autopilot is engaged.

Once engaged, the autopilot will attempt to satisfy the V-bar commands generated by the selected flight director modes.

The autopilot provides two-axis (pitch and roll) stabilization and automatic elevator trim as well as automatic response to all selected flight director commands.

The addition of an optional third axis yaw damper system will significantly dampen yaw oscillations and improve turn coordination.

WARNING: WHENEVER THE AUTOPILOT IS DISENGAGED, THE AP LEGEND ON THE ANNUNCIATOR PANEL WILL FLASH AND AN AURAL TONE WILL SOUND TO ALERT THE PILOT.

CAUTION: Overpowering the Autopilot in the pitch axis in flight for periods of three seconds or more will result in the autotrim system operating in the direction to oppose the pilot and will, therefore, cause an increase in the pitch overpower forces, and if Autopilot is disengaged, will result in a pitch transient control force. Operation of the autopilot on the ground may cause the autotrim to run because of backforce generated by elevator downsprings or pilot induced forces.





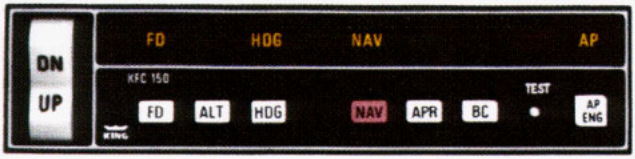
HEADING SELECT (HDG) MODE

To operate in heading select mode:

1. Move the heading "bug" to the desired heading on the PNI (using the HDG knob).
2. Depress the HDG button on the KC 192 to engage the heading select mode. The V-bar on the FCI will command a bank towards the selected heading, in the direction of the shortest turn. If the autopilot is engaged it will turn the aircraft to intercept and fly the heading.
3. The V-bar will continue to command the bank necessary to maintain the selected heading. If you move the heading "bug" again while heading select mode is engaged, the V-bar will immediately command a turn to the new heading. If the autopilot is engaged, it will immediately turn the aircraft in the direction of the new heading. The HDG mode is canceled when NAV or APR coupling occurs, or when the HDG or FD mode button is pushed again to "off".

NOTE: For system limitations refer to the Flight Manual Supplement for your particular aircraft.

(See page 24/25 for illustration)





NOTE: You should consider using HDG select mode just prior to VOR station passage. If the autopilot is engaged in NAV mode it may cause erratic maneuvers while following a rapidly changing course deviation needle as the aircraft flies in the cone of confusion.

NAVIGATION (NAV) MODE (VOR, RNAV)

The Navigation (NAV) mode provides guidance to the pilot (or autopilot) in intercepting and tracking VOR and RNAV courses. To operate in the navigation mode:

1. Tune the frequency for the selected VOR (or VORTAC) station. For RNAV, set in the waypoint distance and VORTAC radial.
2. Set the PNI course pointer to the desired course.
3. Establish the desired intercept angle by setting the heading "bug" on the intercept heading, and activate HDG mode. ("HDG" light will illuminate.)
4. Depress the "NAV" button on the KC 192. ("NAV" light will flash to signify that the NAV mode is armed.)

NOTE: If the NAV mode is selected with the aircraft level within ±4 degrees of bank and within 2-3 dots of course deviation, NAV/ARM will be bypassed and the NAV mode will engage directly.

5. The V-bar will command the required bank to maintain the selected heading until the capture point* is reached. Then the V-bar will command a turn to intercept the course. If the autopilot is engaged, it will turn to satisfy the commands. (The HDG light will go off as HDG mode is disengaged, and the "NAV" light will stop flashing and illuminate continuously as the NAV mode goes from arm to engage.)
6. The V-bar will continue to command the required bank to maintain course with automatic crosswind compensation and the autopilot (if engaged) will satisfy those commands.

*The capture point will vary depending on the angle of intercept and the rate of change of VOR/RNAV radials.

(See page 30/31 for illustration)



APPROACH (APR) MODE

The approach (APR) mode provides guidance to the pilot (or autopilot) in intercepting and tracking ILS (both localizer and glideslope), and VOR and RNAV courses. To operate in the APR mode:

1. Tune the frequency for the selected ILS, VOR or RNAV approach.
2. Set the PNI course pointer to the final approach course (ILS front course even when flying a back course approach).
3. Set the HDG SEL "bug" on the PNI to the desired intercept angle and activate the HDG mode.
4. Depress the "APR" button. This arms the automatic capture function. (The "APR" light will flash to signify the approach mode is armed.)
5. The V-bar will command the required bank to maintain the selected heading until the capture point is reached. Then the V-bar will command a turn to intercept the course. If the autopilot is engaged it will turn to satisfy the commands. As the V-bar commands the turn to intercept the selected course, the heading mode will be canceled and the APR mode will go from arm to engage. (HDG light will go out and APR light will go from flashing to steady.)
6. The V-bar will continue to command the required bank to maintain course and the autopilot (if engaged) will satisfy those commands. (Automatic crosswind compensation will provide precise tracking. VOR/LOC deviation is shown on the PNI, and actual crab angle is shown by offset of the course arrow from the lubber line.)
7. Once localizer course capture has occurred on an ILS, the glideslope mode is armed. Automatic capture occurs as the aircraft approaches the glideslope from either above or below.



When the intercept occurs, "GS" is illuminated on the annunciator panel. The V-bar commands the pitch necessary to maintain the glideslope. If the autopilot is engaged it will satisfy these commands. If the altitude hold (ALT) mode had been engaged prior to GS capture, it will disengage at capture and the "ALT" light will go out.

NOTE: For system limitations refer to your Flight Manual Supplement.

(See page 28/29 for illustration)

NOTE: GS is locked out in VOR or RNAV APR.



BACK COURSE (BC) MODE

The back course (BC) mode provides guidance to the pilot (or autopilot) in intercepting and tracking a reverse course LOC. To operate in the back course mode:

1. Tune the frequency for the selected ILS back course.
2. BE CERTAIN TO SET IN THE ILS FRONT COURSE EVEN THOUGH YOU WILL BE FLYING A RECIPROCAL HEADING ON AN ILS BACK COURSE APPROACH. FOR EXAMPLE, THE BACK COURSE APPROACH MIGHT HAVE A FRONT COURSE OF 090 DEGREES WHICH YOU WILL SET IN AS YOU FLY A BACK COURSE HEADING 270 DEGREES TO RUNWAY 27.
3. Set the heading select "bug" on the PNI to the desired intercept angle and activate the HDG mode.
4. Select the back course mode by either depressing the "APR" button and then the "BC" button or by merely depressing the BC button by itself. (BC will light and the "APR" light will flash to signify approach mode is armed.)
5. The V-Bar will command the required bank to maintain the selected heading until the capture point in reached, then it will command a turn to intercept the course. The "HDG" light will go off and the "APR" light will illuminate steadily as the BC mode goes from arm to engage. If the autopilot is engaged it will turn to satisfy the commands.
6. The V-bar will continue to command the required bank to maintain course and the autopilot (if engaged) will satisfy those commands. Automatic crosswind compensation will provide precise tracking. (The glideslope is locked out during a back course approach.)

(See page 26/27 for illustration)



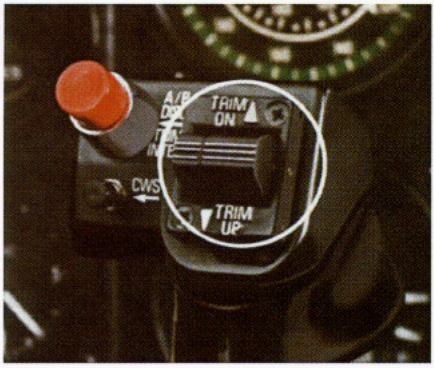
ALTITUDE HOLD (ALT) MODE

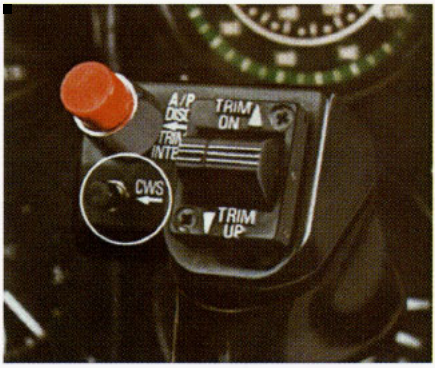
The altitude hold (ALT) mode provides guidance to the pilot (or autopilot) for maintaining the altitude at which this mode was engaged. To operate in the ALT mode:

1. Depress the "ALT" button when the aircraft has reached the altitude you wish to maintain. (For smoother operation, press the "ALT" button when the vertical velocity is no more than 500 fpm.)

2. The V-bar will command the required pitch to maintain the selected altitude. The pilot can maintain this altitude manually by following the V-bar or engage the autopilot and have it satisfy the flight director commands.

3. The vertical trim switch may be used to adjust altitude up or down at a maximum rate of 500 fpm without disengaging altitude hold. (The ALT mode is canceled by automatic glideslope capture or by depressing the "ALT" button.) When the vertical trim switch is released, the flight director V-bar will begin to command pitch changes to maintain the new altitude.





AUTO/MANUAL TRIM

The KFC 150 includes as standard equipment an automatic and manual electric trim. The automatic trim allows the KFC 150 system to trim off elevator control surface pressures while the autopilot is controlling the elevator through a pitch servo. If the autopilot is not engaged, and the pilot is hand flying the aircraft, he can use a manual electric trim switch mounted on the yoke to trim off elevator control forces.

NOTE: See the Flight Manual Supplement for detailed instructions on your particular aircraft.

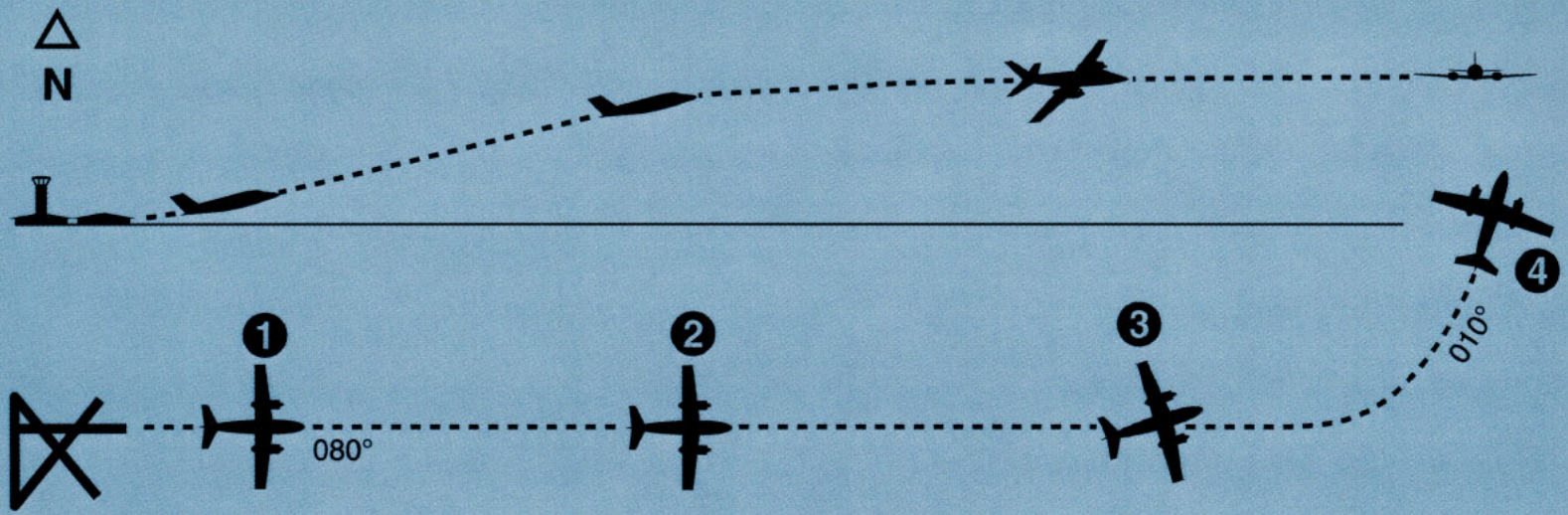
CONTROL WHEEL STEERING MODE (CWS)

With the autopilot engaged, control wheel steering (CWS) allows the pilot to maneuver the aircraft without disengaging the autopilot.

To use control wheel steering, depress the CWS button on the yoke. This releases the autopilot servos and allows you to assume manual control while autopilot control functions are placed in a synchronization state. This means that when you release the CWS button, the autopilot will smoothly resume control of the aircraft and fly it to the lateral command you were using prior to engaging CWS. The vertical command used by the autopilot will be the one existing when CWS is released.

OPERATIONS WITH THE KFC 150

Takeoff And Climb To Assigned Altitude





1. The aircraft is well off the ground and climbing.
   The heading "bug" on the PNI is turned to the desired heading of 80 degrees (runway heading), and the HDG mode is pushed on.
   The flight director responds with the command V-bar calling for wings level and existing aircraft pitch as the aircraft is already headed 080 degrees.



2. The heading "bug" on the PNI is turned to the new desired heading of 010 degrees and the aircraft begins to respond win an immediate left turn just as the autopilot mode is engaged by depressing the "AP" button.

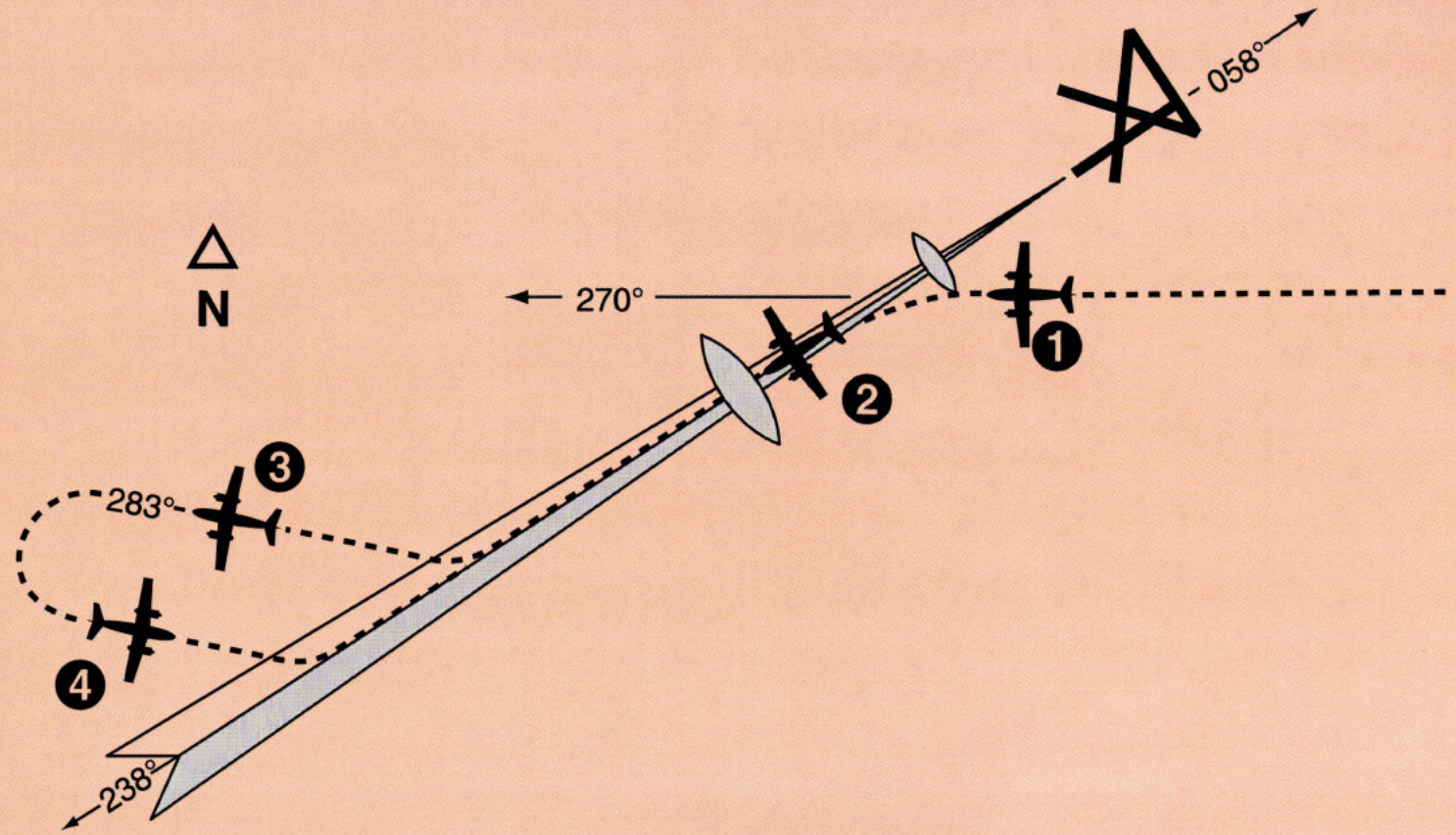


3. With the autopilot engaged, the aircraft is responding to flight director commands with a left bank. Takeoff climb attitude continues.



4. Desired altitude has been reached, altitude hold (ALT) has been engaged and the aircraft has returned to level flight. The 010 degree heading has been acquired.

Outbound On Front Course For Procedure Turn To ILS Approach





1. In heading select (HDG) and altitude hold (ALT) mode, the aircraft is heading 270 degrees toward the localizer. The front inbound localizer course of 058 degrees is selected. APR mode and BC mode are selected to go outbound on the front course. The capture point is now being computed, based on closure rate. (APR light is flashing to indicate the approach mode is armed.)



2. When the computed capture point is reached the approach mode is automatically activated and a left turn outbound on the localizer is commanded by the flight director, and is satisfied by the autopilot.

   Note that the left-right deviations of the bar give "fly-to" indications just as on the front course inbound.

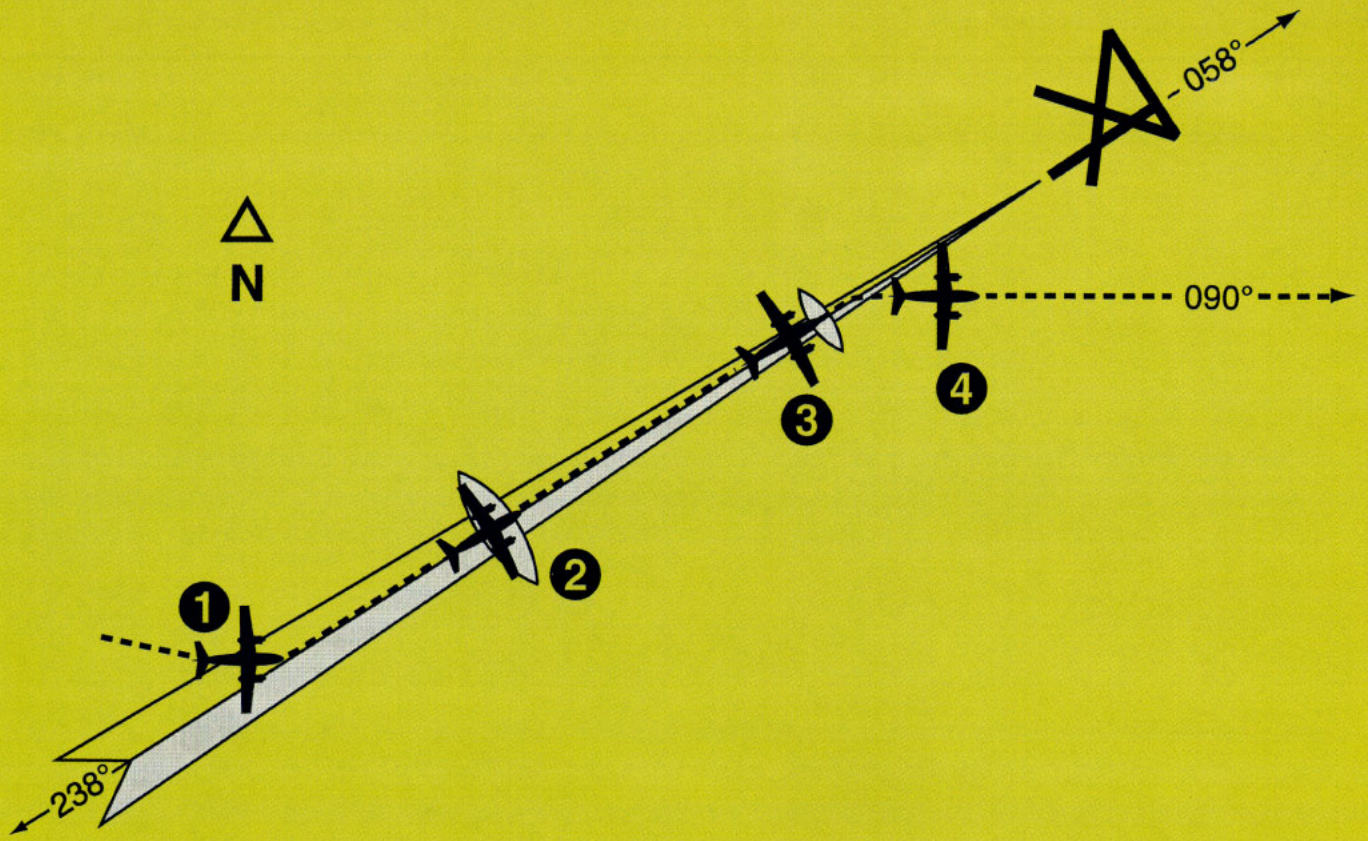


3. During the procedure turn outbound, the deviation bar shows pictorially that the aircraft is flying away from the localizer centerline at a 45 degree angle on a selected heading of 283 degrees.



4. Now you have reset the heading "bug" to 103 degrees and made a 180 degree turn to this heading. This 103 degree heading will intercept the front course of 058 degrees. You must now reselect the approach mode by depressing the APR button on the mode controller. The APR light will begin to flash signifying the approach mode is armed. The PNI clearly pictures the course you are to intercept and the angle of interception. Automatic capture of the localizer will occur.

Front Course ILS Approach





1. Continuing the maneuver on the preceding page, APR coupling occurs (APR light comes on steady, HDG light goes off), and the glideslope mode is automatically armed. The V-bar will command a turn to the localizer course and the PNI shows aircraft position relative to the localizer.



2. The autopilot (or pilot) is following the command V-bar on the KI 256 which commands the necessary bank to maintain localizer centerline. At the outer marker, the glideslope pointers are at the midpoint. Altitude hold is automatically disengaged when the glideslope is captured. The ALT light goes out and GS comes on. The V-bar will command a descent on the glideslope and on localizer.

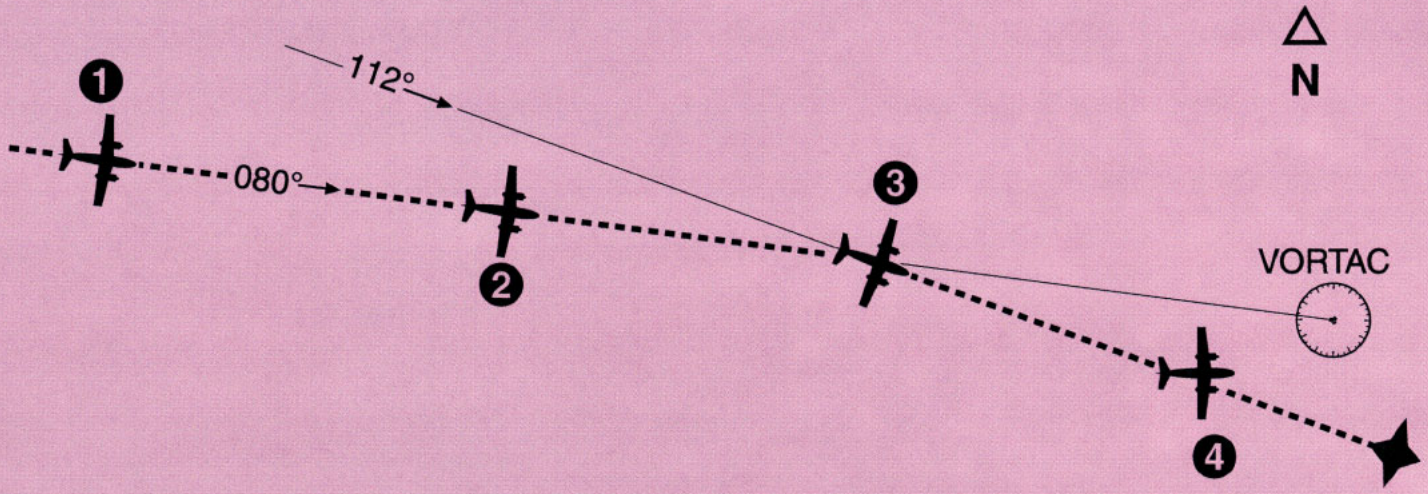


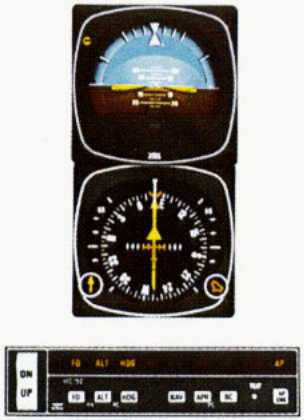
3. At the middle marker, the autopilot is disconnected with the button on the control wheel. This disengages the autopilot and cancels all operating flight director modes. The pilot initiates a missed approach.



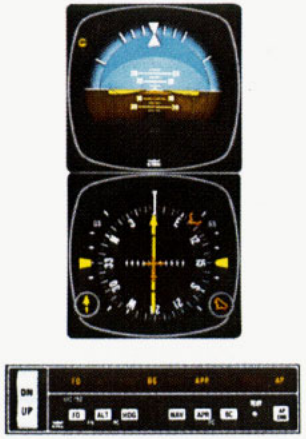
4. The heading "bug" has been previously set to the missed approach heading, 090 degrees. Activating the HDG mode causes the command V-bar on the KI 256 to command a turn to that heading. Engaging the autopilot will cause it to turn to and fly that heading. With the basic pitch attitude mode engaged, the autopilot will fly the aircraft at the pitch attitude existing at engagement. To increase or decrease that pitch during climbout, use control wheel steering or the vertical trim rocker switch.

VOR/RNAV Capture





1. The aircraft is flying an OMNI airway in HDG mode on a heading of 080 degrees.



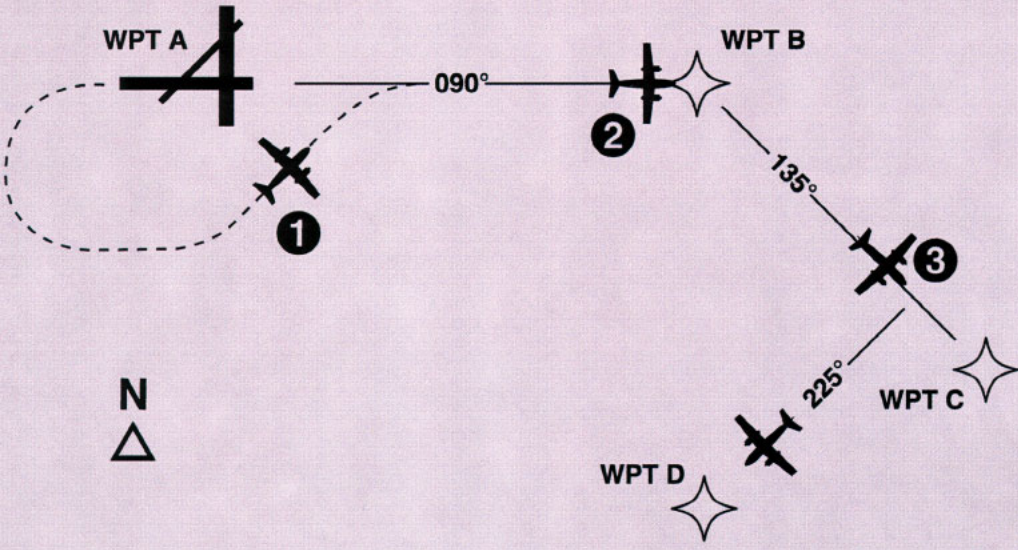
2. A waypoint has been established and the RNAV computer is in enroute mode. A 112 degree course to the waypoint has been selected and "NAV" mode button pushed "on". The "NAV" light is flashing to signify that the NAV mode is armed. The autopilot is still following the heading select mode on 080 degrees and will do so until the capture zone is entered and NAV mode is engaged. The capture point is now being computed based on closure rate.



3. The capture sequence starts when NAV mode is automatically engaged canceling the NAV/ARM and HDG modes. The V-bar is calling for a right bank which is being satisfied by the autopilot.



4. The aircraft has completed its turn to the 112 degree course. A wind correction produces an aircraft heading of 105 degrees, displaying a seven degree "crab" angle to maintain the 112 degree course.



Objective: Intercept the desired course and complete a "direct to" operation after passing waypoint "B" while coupled to a Long Range Nav.



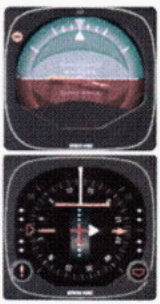


1. The aircraft is engaged in Heading (HDG) and Altitude Hold (ALT) mode. A flight plan from waypoint "A" to "B" to "C" is entered in the Long Range Nav. The course pointer is selected to 090∞ and NAV Arm is activated by pressing the NAV button. The aircraft is heading 045∞ to intercept the course. As the course deviation bar moves toward the center position, NAV mode is coupled and tracks the Long Range Nav.





2. As the aircraft crosses waypoint "B", the course pointer must be rotated to reflect the course or bearing to the new active waypoint (135∞ in this case).





3. The aircraft changes the active waypoint to "D" via a "direct to" operation with the Long Range Nav. The course pointer must be rotated to 225∞ to reflect the bearing to "D". The autopilot will then correctly track the course to waypoint "D".

NOTE: The course arrow on the KI 525A must be set at the Desired Track or OBS setting indicated by the Long Range Nav. Moving the course pointer does not affect movement or location of the Left/Right D-Bar. However, in order for the KFC 150 to track the course, the proper course must be set in the HSI.

THE KAP 150 AUTOPILOT SYSTEM



The KAP 150 is a high-performance digital, panel-mounted autopilot system for singles and twins.

While the KAP 150 doesn't include a flight director as found in the KFC 150, it is a highly capable two-axis autopilot system which is in most respects identical to the autopilot portion of the KFC 150.

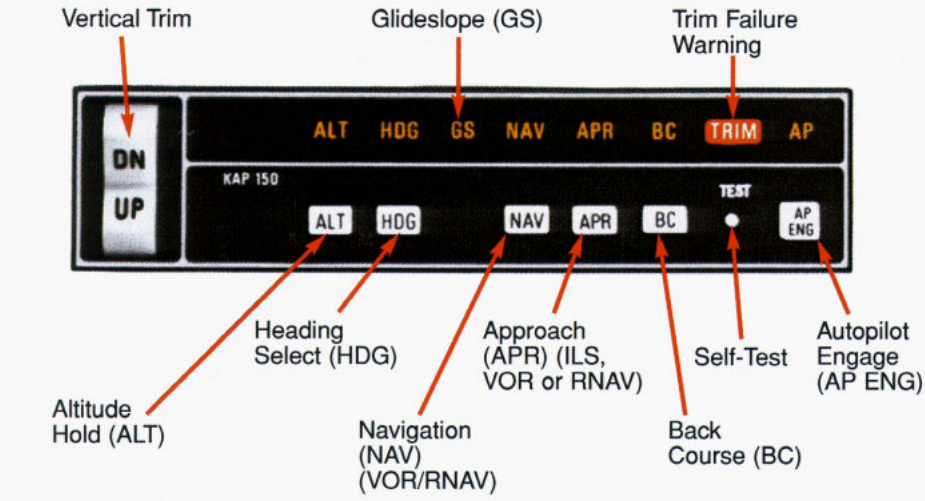
Because the KAP 150 doesn't include a flight director, it uses a standard attitude reference without V-bar commands. This is the KG 258 Horizon Reference Indicator.

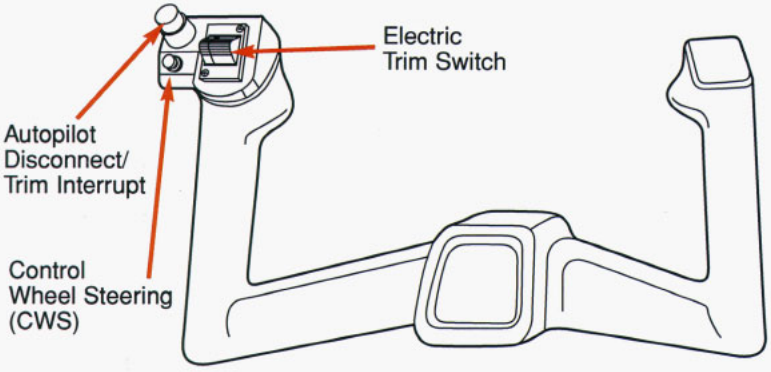
The standard magnetic heading system used with the KAP 150 is the King KG 107 Directional Gyro which can be installed with a CDI of your choice. The KG 107 is not a slaved system, which means the gyro must be adjusted periodically to correct for precession.

The KG 107 displays aircraft magnetic heading. Radio navigation course information must be read from the associated CDI to monitor the horizontal navigation results of autopilot control movements.

To monitor the vertical navigation results of autopilot control movements during an ILS approach, cross-check the glideslope on the CDI.

NOTE: It is possible to obtain a combined presentation of heading, radio navigation course and glideslope information with the optional KI 525A Pictorial Navigation Indicator (PNI). The KI 525A is part of the KCS 55A Slaved Compass System which is available as an option to replace the standard KG 107. (If you are unfamiliar with the operation of a Pictorial Navigation Indicator (PNI) you should stop here and review the section of the KCS 55A Compass System on Page 95.)





Mode	Autopilot Action
Attitude Reference	Power on and no modes selected. KG258 displays aircraft attitude and KG 107 displays unslaved heading. Align heading to magnetic compass by pushing and rotating the knob on the lower left of the KG 107 and update periodically to correct for precession. (With optional KCS 55A Compass System a PNI is installed in place of the KG 107. The KI 525A PNI will display slaved aircraft heading and requires no periodic update.)
Autopilot Engage (AP ENG)	Aircraft control surfaces (ailerons and elevators) smoothly respond to satisfy autopilot modes selected by the pilot with automatic pitch trim.

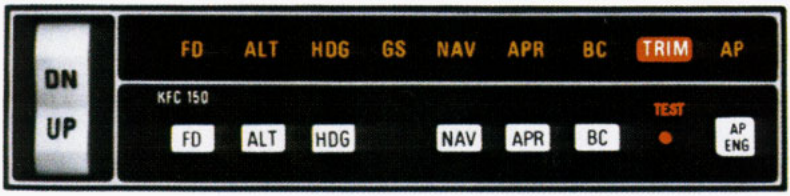
Heading (HDG)	Select desired heading on the "bug" on the KG 107 (or optional KI 525A), and the autopilot will turn to and maintain the heading.
Navigate (NAV) (VOR/RNAV)	With VOR (or RNAV) course selected on the CDI or PNI, the autopilot will intercept and track the appropriate course.
Approach (APR) (ILS, VOR or RNAV)	With an ILS or VOR (or RNAV) course selected on the CDI or PNI, the autopilot will intercept and track the appropriate localizer and glideslope for ILS, or the appropriate course for VOR or RNAV.
Back Course (BC)	With the ILS front course set into the CDI or PNI, the autopilot will capture and track a reverse LOC course. Glideslope is locked out.
Attitude Hold (ALT)	The autopilot will maintain the engaged altitude.
Test Button	Depressing the test button initiates a test of the KAP 150 circuitry including operation of various modes and of the trim. The test must be performed after turn on before the autopilot can be engaged.
Vertical Trim	This rocker switch allows you to adjust the pitch to achieve approximately a 500 fpm rate of change while in ALT hold, or a rate of approximately .9 degrees per second when not in ALT hold.
Control Wheel Steering	This switch mounted on the control wheel allows you to maneuver the aircraft in pitch and roll without disengaging the autopilot. After the CWS switch is released, the autopilot resumes control of the aircraft.

Initial Power On



When initially powered (no modes selected), the KAP 150 will display aircraft attitude on the KG 258 and unslaved heading on the KG 107. Align heading to the magnetic compass by pushing and rotating the knob on the lower left of the KG 107 and update periodically to correct for precession. The trim light will be lit on the KC 191 to remind of the need to perform the system self-test. (With optional KCS 55A Compass System, a KI 525A PNI is installed in place of the KG 107. The PNI will display slaved heading.)

System Self-Test



The KAP 150 system incorporates a system self-test function which is activated by a test button on the KC 191 Mode Control/Computer/Annunciator. The test must be performed before the autopilot can be engaged. The test determines, before takeoff, that the system is operating normally. To perform a test — momentarily push the test button:

1. All annunciator lights, the trim light and autopilot light will illuminate.
2. The trim light will flash 4 times.
3. The annunciator legends will be blank, an aural tone will beep (approx. 6 times) and the "AP" light will flash (approx. 12-13 times) and go off. (If the AP light fails to flash you will be unable to engage the autopilot.)
4. The KC 191 display will go blank.

The test checks all digital computing capability, the disconnect capability of the autopilot, the auto trim drive and monitor systems, and the failure annunciator system.

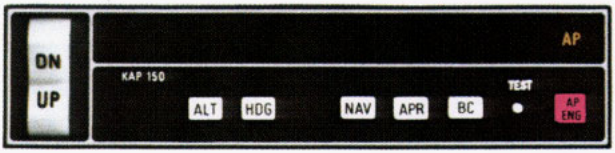
CAUTION: If the trim legend flashes or remains on at the end of the test it indicates there is a failure in the trim system and the autopilot will not engage. See a qualified King Service Agency for repair.

Attitude Reference Mode Of Operation

The system will be in the basic attitude reference or "gyro" mode with engine(s) running and aircraft power on, but no modes selected (annunciator panel blank). Aircraft heading is shown on the KG 107 and pitch and roll attitude on the KG 258 Horizon Reference Indicator. (When the optional KI 525A PNI is installed in place of a KG 107, aircraft heading will be shown on the KI 525A.)

Attitude Gyro Operation Note: When shutting down the aircraft for short periods of time, make sure the Attitude Gyro has completely spun down before starting operations again. Gyro spin down occurs when the air supply is cut off to the gyro and usually takes about 10 minutes.

During Gyro spin down most gyros have a tendency to "tilt" (precess) to one side. If the air supply is reapplied to the gyro while in this state, slow gyro erection (leveling) will occur due to gyro inertia. If aircraft operations are initiated before the gyro is fully erected, there is a greater possibility that the gyro may tumble causing loss of primary attitude information from the Attitude Gyro.



AUTOPILOT (AP) MODE

NOTE: The autopilot cannot be engaged and used after power has been applied to the system until the system self-test has been performed.

The autopilot provides two-axis (pitch and roll) stabilization and automatic elevator trim as well as automatic response to all selected autopilot modes.

On initial engagement, with no other autopilot modes selected on the KC 191, the KAP 150 will maintain the existing aircraft pitch attitude and fly the aircraft wings level.

The addition of an optional third axis yaw damper system will significantly damp out yaw oscillations and improve turn coordination.

WARNING: Whenever the autopilot is disengaged the AP legend will flash and an aural tone will sound to alert the pilot.

NOTE: For system limitations refer to the Flight Manual Supplement for your particular aircraft.

CAUTION: Overpowering the Autopilot in the pitch axis in flight for periods of three seconds or more will result in the autotrim system operating in the direction to oppose the pilot and will, therefore, cause an increase in the pitch overpower forces, and if Autopilot is disengaged, will result in a pitch transient control force. Operation of the Autopilot on the ground may cause the autotrim to run because of backforce generated by elevator downsprings or pilot induced forces.





(1)



(2)



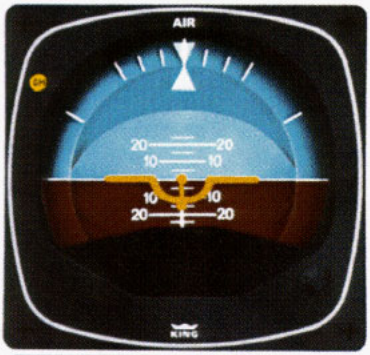
HEADING SELECT (HDG) MODE

In the heading mode, the autopilot will intercept and fly a selected heading. The following steps should be taken to operate in the heading mode:

1. Move the heading "bug" to the desired heading on the KG 107 using the HDG knob. (If the optional KI 525A is installed, set the heading "bug" on it instead.)
2. Depress the HDG button on the KC 191 to engage the heading select mode. With the autopilot engaged, the autopilot will turn the aircraft in the shortest direction to intercept and fly the heading.
3. If you move the heading "bug" again while the heading select mode is engaged, the autopilot will immediately turn the aircraft in the direction of the newly selected heading.

(See page 48/49 for illustration)









NOTE: For system limitations refer to the Flight Manual Supplement for your particular aircraft.

NAVIGATION (NAV) MODE USING THE KG 107/KI 206 INDICATORS (VOR/RNAV)

In the navigation (NAV) mode, the autopilot intercepts and tracks VOR and RNAV courses.

To operate in the NAV mode (with the KAP 150 currently in the HDG mode):

1. Tune the frequency for the selected VOR (or VORTAC) station. For RNAV, set in the waypoint distance and VORTAC radial.
2. Set the OBS to the desired course.
3. Depress the NAV button on the KC 191. (HDG will remain illuminated and NAV will flash to signify that the NAV mode is armed.)

NOTE: If the NAV mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, NAV arm mode will be bypassed and the NAV mode will engage directly.

4. Within five seconds, move the heading "bug" on the KG 107 to the same magnetic heading as the selected course on the CDI.
5. The autopilot will fly an automatic 45 degree intercept heading until within the capture zone,* then intercept and fly the desired course.
6. The autopilot will bank as necessary to maintain course.

NOTE: You should consider using HDG select mode just prior to VOR station passage. If the autopilot is engaged in NAV mode it may cause erratic maneuvers while following a rapidly changing course deviation needle as the aircraft flies in the cone of confusion.

*The capture point will vary depending on the angle of intercept and the rate of change of VOR/RNAV radials.

(See page 58/59 for illustration)



NAVIGATION (NAV) MODE USING THE OPTIONAL KI 525A PNI (VOR, RNAV)

In the navigation (NAV) mode, the autopilot intercepts and tracks VOR and RNAV courses.

To operate in the NAV mode:

1. Tune the frequency for the selected VOR (or VORTAC) station. For RNAV, set in the waypoint distance and VOR-TAC radial.
2. Set the desired course on the KI 525A PNI.
3. Establish the desired intercept angle by setting the heading "bug" on the intercept heading and activate HDG mode. ("HDG" light will illuminate.) The KAP 150 can perform all-angle intercepts when using the KI 525A PNI.
4. Depress the NAV button on the KC 191. (NAV light will flash to signify that NAV mode is armed.)

NOTE: If the NAV mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, NAV arm mode will be bypassed and the NAV mode will engage directly.

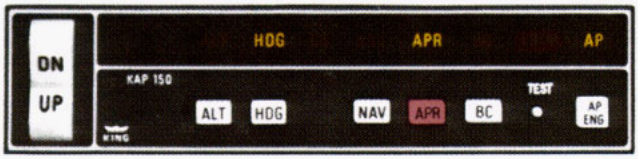
5. The autopilot will fly the selected heading until entering the capture zone,* then turn to intercept the selected course. The HDG light will go off and the NAV light will illuminate steadily as the NAV mode goes from arm to engage.
6. The autopilot will bank as necessary to maintain course.

*The capture point will vary depending on the angle of intercept and the rate of change of VOR/RNAV radials.

(See page 60/61 for illustration)



NOTE: You should consider using HDG select mode just prior to VOR station passage. If the autopilot is engaged in NAV mode it may cause erratic maneuvers while following a rapidly changing course deviation needle as the aircraft flies in the cone of confusion.









APPROACH (APR) MODE USING THE KG 107/KI 206 INDICATORS

The approach (APR) mode allows the autopilot to intercept and track ILS (both localizer and glideslope) and VOR and RNAV courses. To operate in the APR mode (with the KAP 150 currently in HDG mode):

1. Tune the frequency for the selected ILS, VOR or RNAV approach.
2. Set the OBS to the final approach course (front course for ILS even when flying a back course approach).
3. Check the heading displayed on the KC 107 against the magnetic compass and reset if necessary.
4. Depress the "APR" button on the KC 191. (HDG will remain illuminated and "APR" will flash to signify that APR mode is armed.)

NOTE: If the APR mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, APR arm mode will be bypassed and the APR mode will engage directly.

5. Within five seconds, move the heading "bug" on the KG 107 to the same magnetic heading as the selected course on the CDI.
6. The autopilot will fly an automatic 45 degree intercept heading until within the capture zone, then intercept and fly the desired course. (The "HDG" light will go off and the "APR" light will illuminate steadily as the APR mode goes from arm to engage.)
7. The autopilot will bank as necessary to maintain course.

(continued)

NOTE: For system limitations refer to your Flight Manual Supplement.

(See page 54/55 for illustration)

8. Once localizer course capture has occurred on an ILS approach, the glideslope mode is armed. Automatic capture occurs as the aircraft approaches the glideslope from either above or below. When the intercept occurs, "GS" is illuminated on the annunciator panel. The autopilot will maintain the glideslope with pitch corrections. If altitude hold (ALT) mode had been engaged prior to GS capture, it will disengage at capture and the ALT light will go out.

NOTE: GS is locked out on VOR or RNAV APR.







APPROACH (APR) MODE USING THE OPTIONAL KI 525A PNI

The approach (APR) mode allows the autopilot to intercept and track ILS (both localizer and glideslope), VOR and RNAV courses. To operate in the APR mode:

1. Tune the frequency for the selected ILS, VOR or RNAV approach.
2. Set the final approach course on the KI 525A PNI.
3. Establish the desired intercept angle by setting the heading "bug" on the intercept heading and activate the HDG mode. (HDG will illuminate.)
4. Depress the "APR" button on the KC 191 (APR light will flash to signify that APR mode is armed).

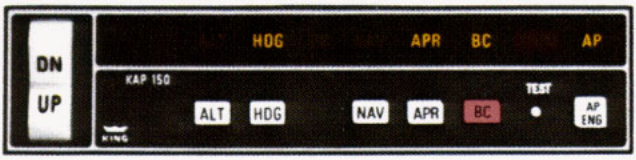
NOTE: If the APR mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, APR arm mode will be bypassed and the APR mode will engage directly.

5. The autopilot will fly the selected heading until entering the capture zone, then turn to intercept the course. The "HDG" light will go off and the "APR" light will illuminate steadily as the APR mode goes from arm to engage.
6. The autopilot will bank as necessary to maintain course.
7. Once localizer course capture has occurred on an ILS approach, the glideslope mode is armed. Automatic capture occurs as the aircraft approaches the glideslope from either above or below. When the intercept occurs, "GS" is illuminated on the annunciator panel. The autopilot will maintain the glideslope with pitch corrections. If altitude hold (ALT) mode had been engaged prior to GS capture, it will disengage at capture and the ALT light will go out.

NOTE: For system limitations refer to your Flight Manual Supplement.

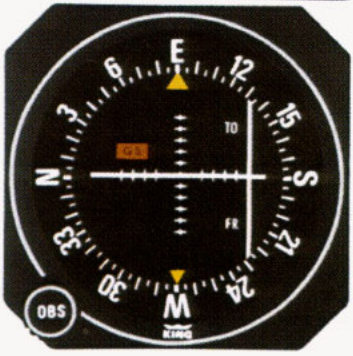
NOTE: GS is locked out on VOR and RNAV APR.

(See page 56/57 for illustration)









BACK COURSE (BC) MODE USING THE KG 107/KI 206 INDICATORS

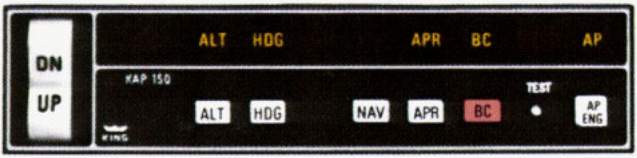
In the back course (BC) mode the autopilot intercepts and tracks a reverse course ILS. To operate in the BC mode (with the KAP 150 currently in the HDG mode):

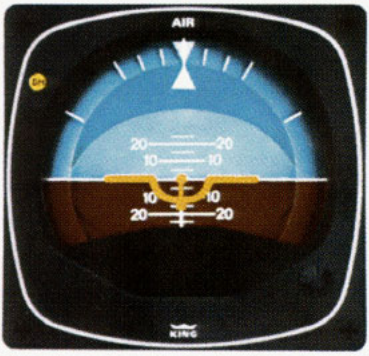
1. Tune the frequency for the selected ILS back course.
2. Select the back course mode by either depressing the "APR" button and then the BC button, or by merely depressing the BC button itself. (The "HDG" light will remain illuminated, BC will illuminate, and the "APR" light will flash to signify that the APR mode is armed.)
3. Within five seconds, move the heading "bug" on the KG 107 to the same magnetic heading as the selected front course (090 degrees in this example).

NOTE: If the BC APR mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, BC APR arm mode will be bypassed and the BC APR mode will engage directly.

4. The autopilot will fly an automatic 45 degree intercept heading until within the capture zone, then intercept and fly the desired course, which will be a reciprocal to the front course. (The "HDG" light will go off and the "APR" light will illuminate steadily as the BC mode goes from arm to engage.)
5. The autopilot will bank as required to maintain course. Automatic crosswind compensation will provide precise tracking. (The glideslope is locked out because this is a back course approach.)

(See page 50/51 for illustration)







(See page 52/53 for illustration)

BACK COURSE (BC) MODE USING THE OPTIONAL KI 525A PNI

In the back course (BC) mode the autopilot intercepts and tracks a reverse course ILS. To operate in the BC mode:

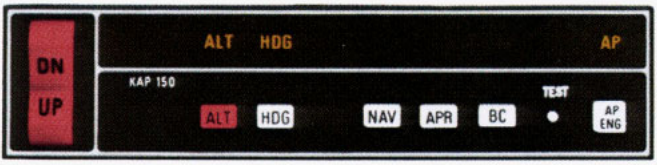
1. Tune the frequency for the selected ILS back course.
2. BE CERTAIN TO SET IN THE ILS FRONT COURSE EVEN THOUGH YOU WILL BE FLYING A RECIPROCAL HEADING ON AN ILS BACK COURSE APPROACH. FOR EXAMPLE, A BC APPROACH MIGHT HAVE A FRONT COURSE OF 090 DEGREES WHICH YOU WILL SET IN AS YOU FLY A BACK COURSE HEADING OF 270 DEGREES TO RUNWAY 27.
3. Establish the desired intercept angle by setting the heading "bug" on the intercept heading and activate the HDG mode. ("HDG" light will illuminate.)
4. Select the back course mode by either depressing the "APR" button and then the BC button, or by merely depressing the BC button itself. (HDG will remain illuminated, BC will illuminate, and APR will flash to signify that APR mode is armed.)

NOTE: If the BC APR mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, BC APR arm mode will be bypassed and the BC APR mode will engage directly.

(continued)

NOTE: For system limitations refer to your Flight Manual Supplement.

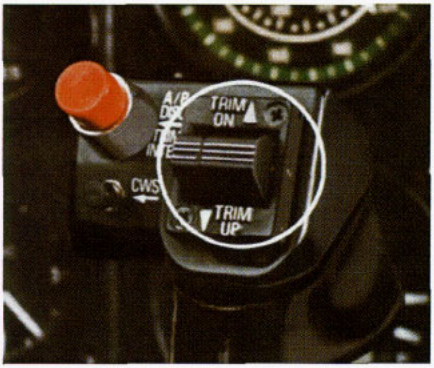
5. The autopilot will fly the selected heading until entering the capture zone, then turn to intercept the course. The "HDG" light will go off and the "APR" light will illuminate steadily as the BC mode goes from arm to engage.
6. The autopilot will bank as required to maintain course. Automatic crosswind compensation will provide precise tracking. (The glideslope is locked out because this is a back course approach.)



ALTITUDE HOLD MODE (ALT)

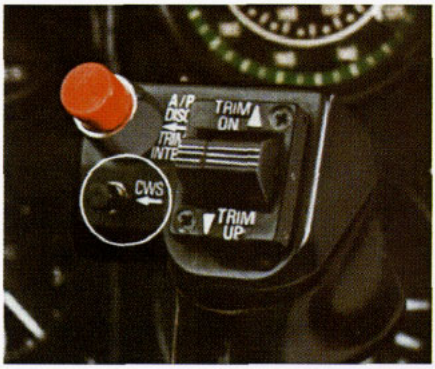
In the altitude hold (ALT) mode, the autopilot maintains the altitude at which the mode was engaged. To operate in the ALT mode:

1. Depress the "ALT" button when the aircraft has reached the altitude you wish to maintain. (For smoother operation, press the "ALT" button when the vertical velocity is no more than 500 fpm.)
2. The autopilot will then make the required pitch changes to keep the aircraft level at the selected altitude.
3. The vertical trim switch may be used to adjust altitude up or down at approximately 500 fpm without disengaging altitude hold. (The ALT mode is canceled by automatic glideslope capture or by depressing the "ALT" button.) When the vertical trim switch is released, the autopilot will maintain the new altitude.



AUTO/MANUAL TRIM

The KAP 150 includes as standard equipment an automatic and manual electric trim. This allows the KAP 150 system to trim off elevator control surface pressures while the autopilot is controlling the elevator through a pitch servo. If the autopilot isn't engaged and the pilot is hand flying the aircraft, the manual electric trim switch mounted on the yoke can be used to trim off elevator control forces.



CONTROL WHEEL STEERING MODE (CWS)

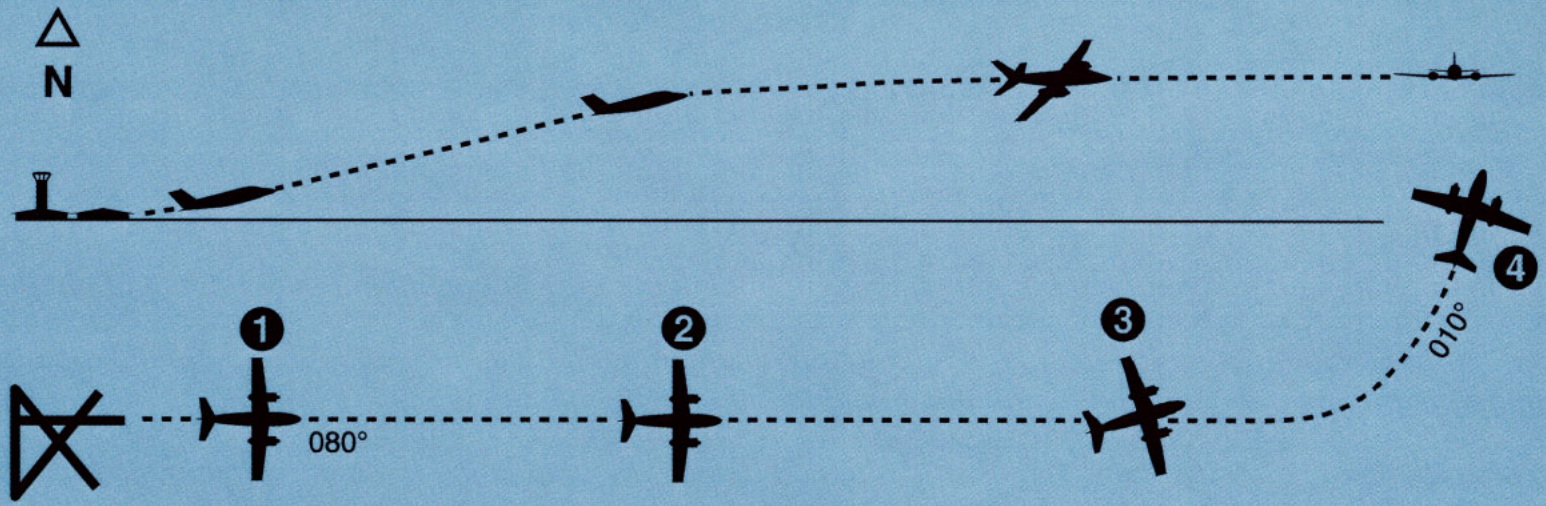
With the autopilot engaged, control wheel steering (CWS) allows the pilot to maneuver the aircraft without disengaging the autopilot.

To use control wheel steering, depress the CWS button on the yoke. This releases the autopilot servos and allows you to assume manual control while autopilot control functions are placed in a synchronization state. This means that when you release the CWS button, the autopilot will smoothly resume control of the aircraft and fly it to the lateral command you were using prior to engaging CWS. The vertical command used by the autopilot will be the one existing when CWS is released.

NOTE: For system limitations refer to your Flight Manual Supplement.

OPERATIONS WITH THE KAP 150

Takeoff And Climb To Assigned Altitude





1. The aircraft is well off the ground and climbing.

   The heading "bug" on the KG 107 or KI 525A is turned to the desired heading of 080 degrees (runway heading).

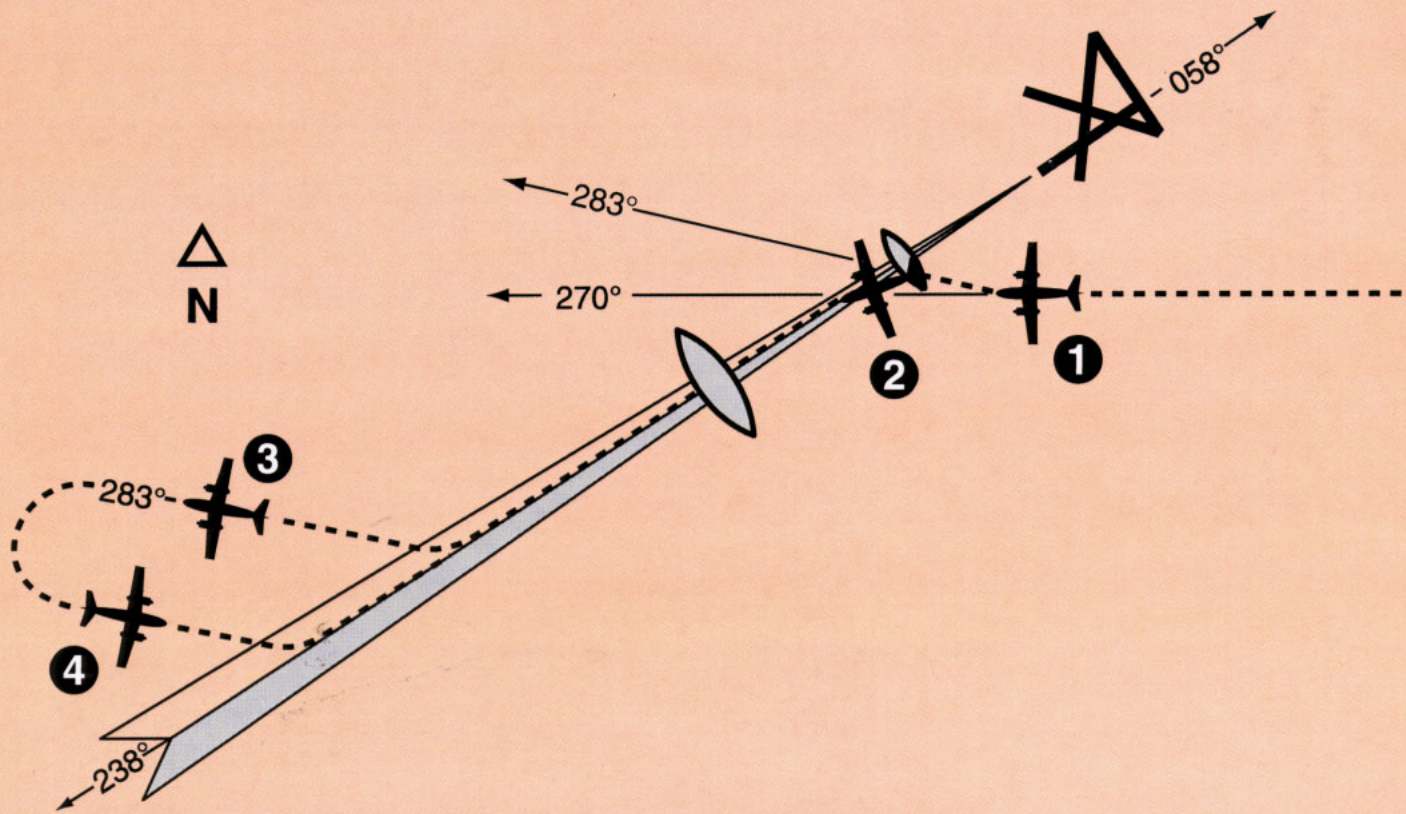
   By depressing the "AP ENG" and "HDG" buttons on the KC 191, the autopilot engages and begins to maintain the heading of 080 degrees. The autopilot is maintaining wings level as 080 degrees is the existing aircraft heading.

2. The heading "bug" on the KG 107 or KI 525A is turned to the new desired reading of 010 degrees and the aircraft begins to respond with an immediate left turn.

3. With the autopilot engaged, the autopilot is responding to the heading select mode with a left bank. Takeoff climb attitude continues.

4. Desired altitude has been reached, altitude hold (ALT) has been engaged and the aircraft has returned to level flight. The 010 degree heading has been acquired.

Outbound On Front Course For Procedure Turn To ILS Approach (KG 107 & KI 206)





1. The aircraft is heading 270 degrees with heading (HDG), altitude hold (ALT) and autopilot (AP) engaged. To intercept and fly the ILS front course outbound, set the front course outbound, set the front course on the OBS and depress the approach (APR) button and the reverse course (BC) button (or just the BC button alone). Move the heading "bug" within five seconds to the front course (058 degrees). The autopilot will turn 45 degrees to intercept the localizer signal. In this case, the aircraft will turn to 283 degrees.

2. When the computed capture point is reached, HDG mode is canceled and approach mode is automatically activated and a left turn outbound on the localizer is initiated by the autopilot.

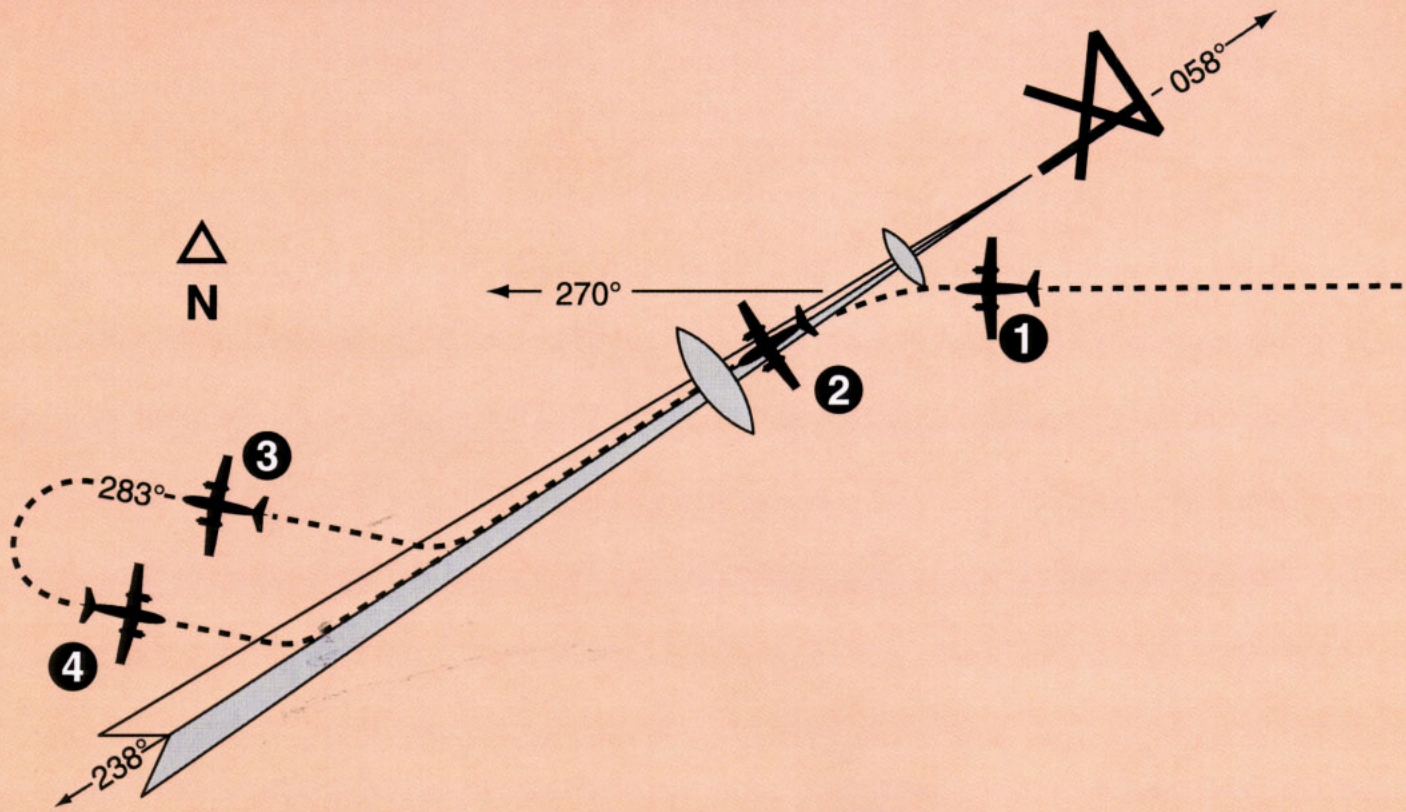
   Note that the left-right deviations of the CDI course deviation needle are reversed (you must turn right to center a deviation of the index to the left). This needle reversing takes place because you are flying outbound on a front course.

3. During the procedure turn outbound, the CDI course index goes off scale to the right. The aircraft is flying away from the localizer centerline at a 45 degree angle on a selected heading of 283 degrees.

*Check the heading displayed on the KG 107 against the magnetic compass and reset if necessary.

4. Now you have reset the heading "bug" to 103 degrees and made a 180 degree turn to this heading. This 103 degree heading will intercept the front course of 058 degrees. You must now reselect the approach mode by depressing the "APR" button on the mode controller.* The "APR" light will begin to flash signifying the approach mode is armed. Move the heading bug within five seconds to the front course (058 degrees). Since the 45 degree intercept is 103 degrees, the aircraft will not turn until the front course is captured.

Outbound On Front Course For Procedure Turn To ILS Approach (KI 525A)





1. The aircraft is heading 270 degrees with heading (HDG), altitude hold (ALT) and autopilot (AP) engaged. To intercept and fly the ILS front course outbound, set the front course on the PNI and depress the approach (APR) button and the reverse course (BC) button (or just the BC button alone). The back course (BC) mode is selected to go outbound on the front course. The capture point is now being computed based on closure rate.



2. When the computed capture point is reached, HDG mode is canceled and approach mode is automatically activated and a left turn outbound on the localizer is initiated by the autopilot.

   NOTE: The left-right deviations of the PNI course needle operate just as though you were flying a front course approach.

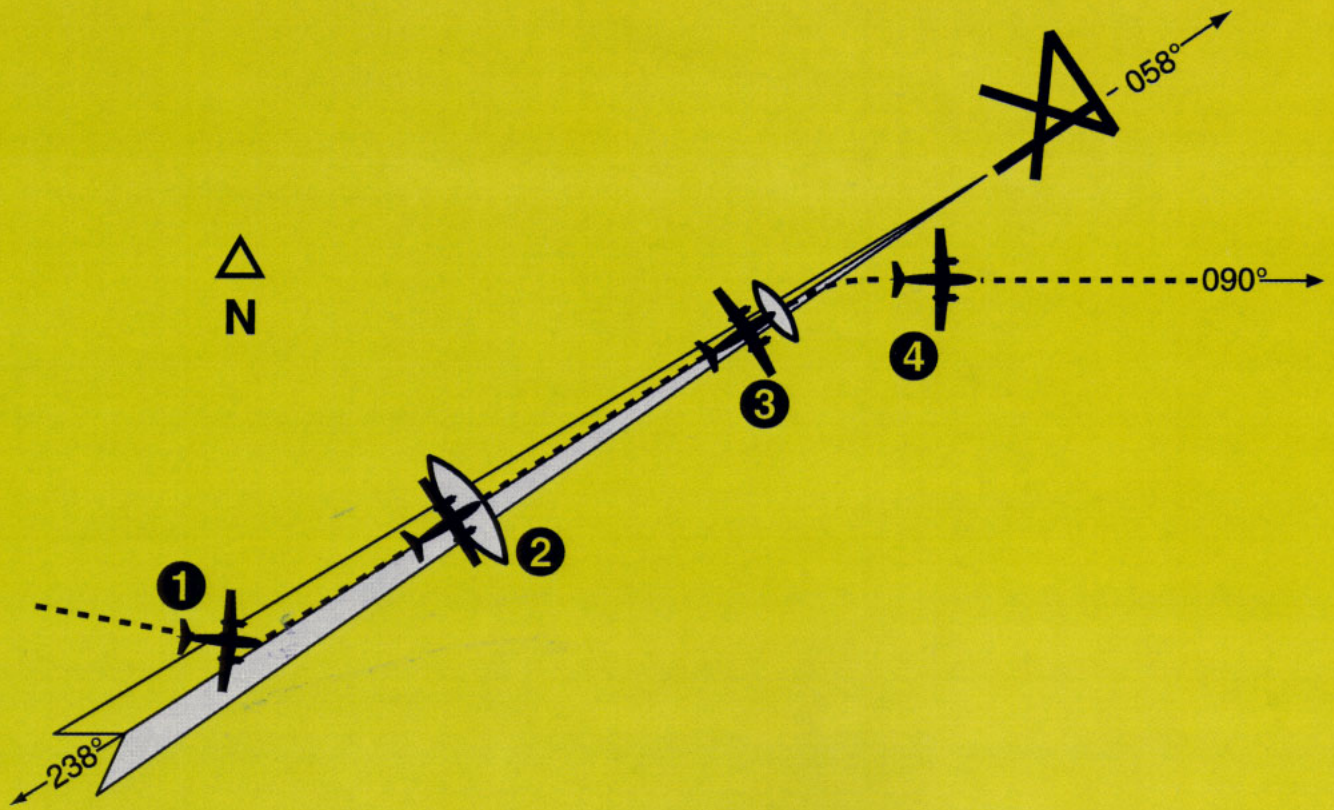


3. During the procedure turn outbound, the deviation bar shows pictorially that the aircraft is flying away from the localizer centerline at a 45 degree angle on a selected heading of 283 degrees.



4. Now you have reset the heading "bug" to 103 degrees and made a 180 degree turn to this heading. The 103 degree heading will intercept the front course of 058 degrees. You must now reselect the approach mode by depressing the "APR" button on the mode controller. The "APR" light will begin to flash signifying the approach mode is armed. Automatic capture of the localizer will occur.

Front Course ILS Approach (KG 107 & KI 206)





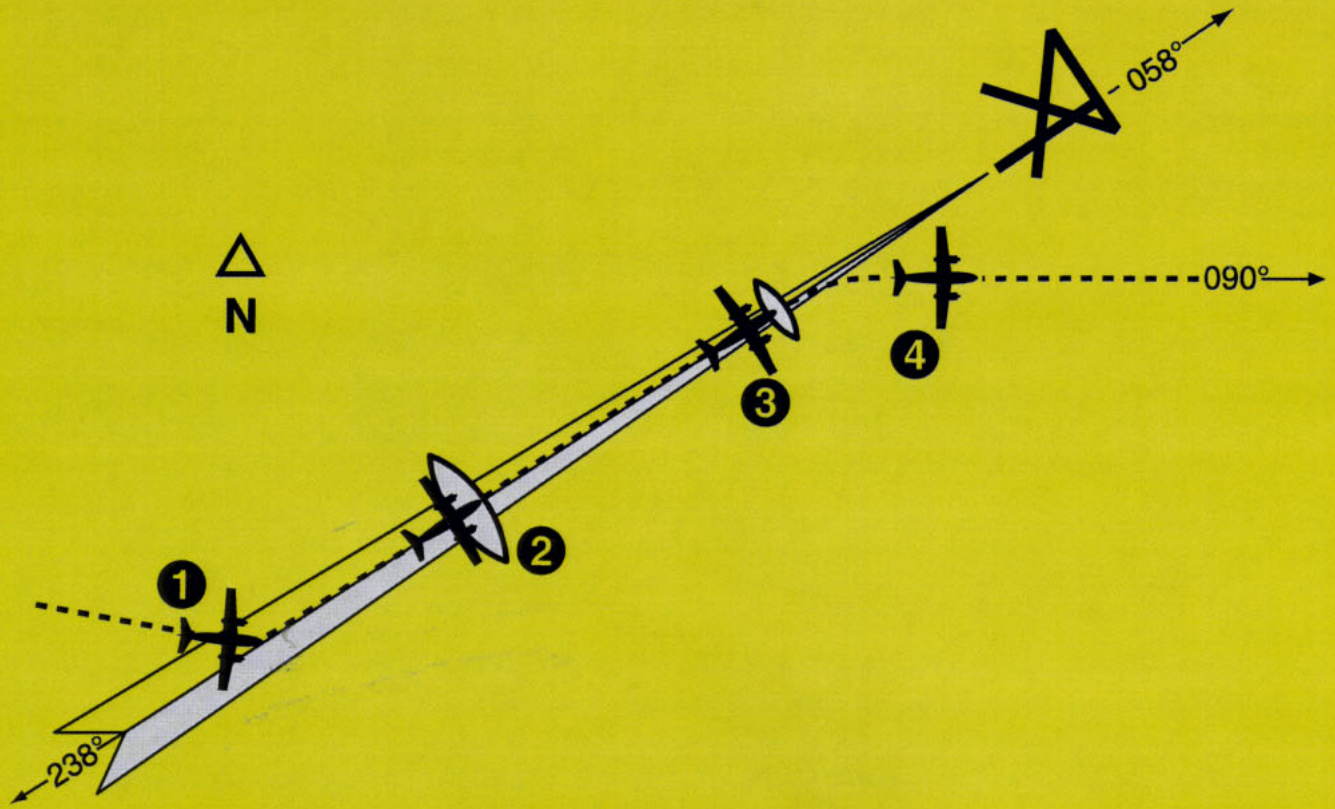
1. Continuing the maneuver on page 50, APR coupling occurs ("APR" light comes on steady, "HDG" light goes off), and the glideslope mode is automatically armed. The autopilot will roll the aircraft out on localizer and the course index will center.

2. The autopilot is following the localizer. At the outer marker, the glideslope deviation needle is at midscale. Altitude hold is automatically disengaged when the glideslope is captured. The "ALT" light goes out and "GS" comes on. The autopilot will make pitch and bank changes as necessary to maintain localizer and glidepath.

3. At the middle marker, the autopilot is disconnected with the button on the control wheel. This cancels all operating autopilot modes. The pilot initiates a missed approach.

4. The heading "bug" has been set to the missed approach heading, 090 degrees. Engaging the autopilot and activating the "HDG" mode causes the autopilot to commence a right turn to a heading of 090 degrees. With the basic pitch mode engaged, the autopilot will fly the aircraft at the pitch existing at engagement. To increase or decrease that pitch during climbout, use control wheel steering or the vertical trim control.

Front Course ILS Approach (KI 525A)





1. Continuing the maneuver on page 52, APR coupling course ("APR" light comes on steady, "HDG" light goes off), and the glideslope mode is automatically armed. The autopilot will roll the aircraft out on localizer and the course index will center.



2. The autopilot is following the localizer. At the outer marker, the glideslope deviation needle is at midscale. Altitude hold is automatically disengaged when the glideslope is captured. The "ALT" light goes out and "GS" comes on. The autopilot will make pitch and bank changes as necessary to maintain localizer and glidepath.

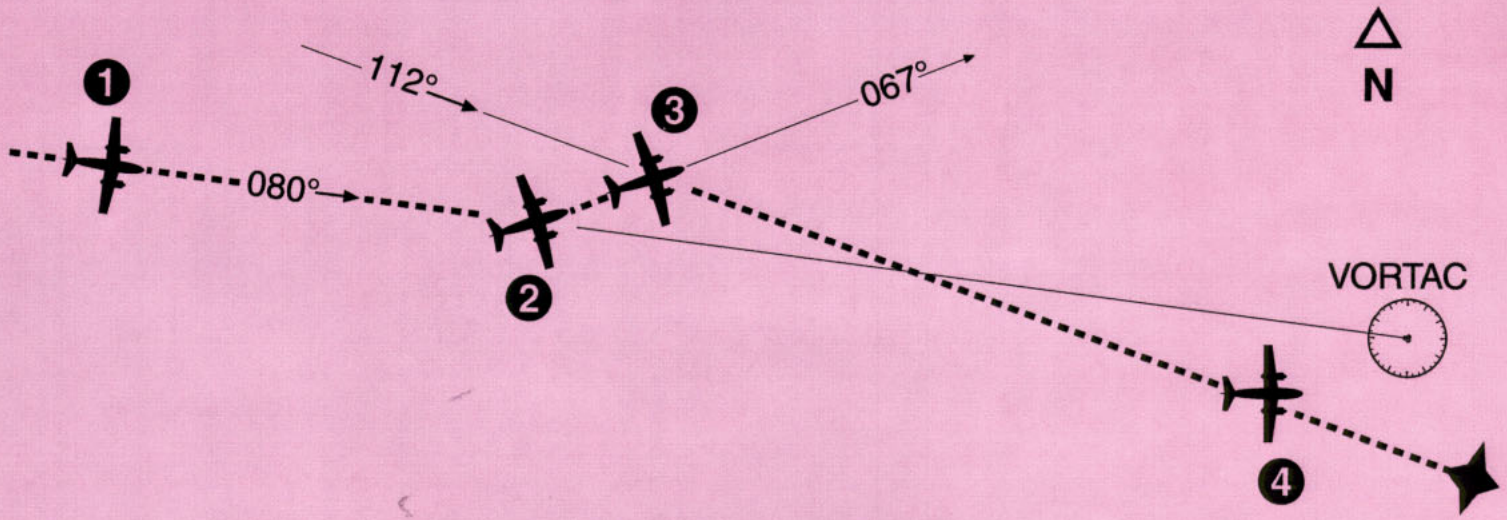


3. At the middle marker, the autopilot is disconnected with the button on the control wheel. This cancels all operating autopilot modes. The pilot initiates a missed approach.



4. The heading "bug" has been previously set to the missed approach heading, 090 degrees. Engaging the autopilot and activating the "HDG" mode causes the autopilot to commence a right turn to a heading of 090 degrees. With the basic pitch mode engaged, the autopilot will fly the aircraft at the pitch existing at engagement. To increase or decrease that pitch during climbout, use control wheel steering or the vertical trim control.

RNAV Capture (KG 107 and KI 206)





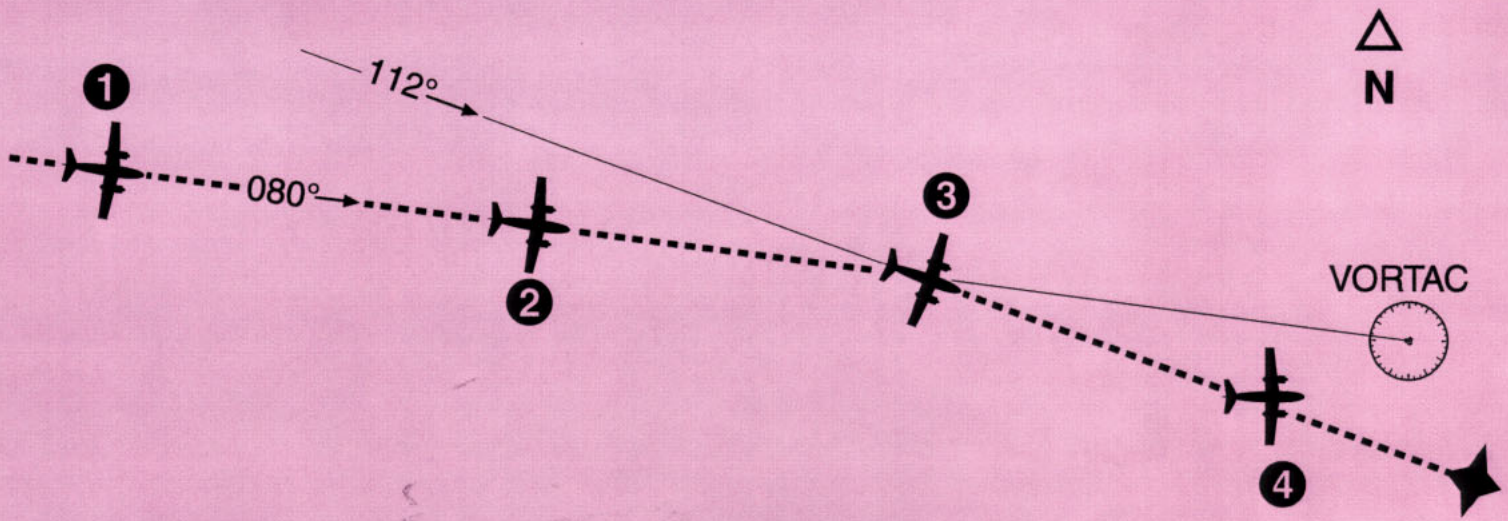
1. The aircraft is flying an OMNI airway in HDG mode on a heading of 080 degrees.

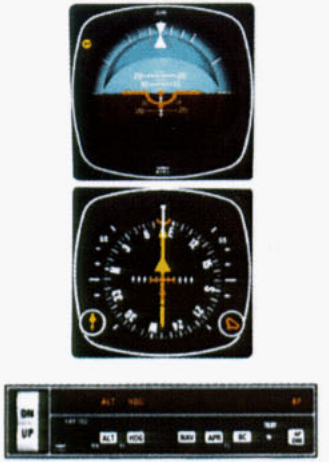
2. A waypoint has been established and the RNAV computer is in enroute mode. A 112 degree course to the waypoint has been selected and "NAV" button pushed "on". The "NAV" light is flashing to signify that the NAV mode is armed. Move the heading bug within 5 seconds to 112 degrees and the autopilot will set up a 45 degree intercept (067 degrees) until the capture zone is entered and NAV mode is engaged. The capture point is now being computed based on closure rate.

3. The capture sequence starts when NAV mode is automatically engaged canceling the NAV/ARM and HDG modes. The autopilot is turning the aircraft right.

4. The aircraft has completed its turn to the 112 degree course. A wind correction produces an aircraft heading of 105 degrees, displaying a seven degree "crab" angle to maintain the 112 degree RNAV course.

RNAV Capture (KI 525A)





1. The aircraft is flying an OMNI airway in HDG mode on a heading of 080 degrees.



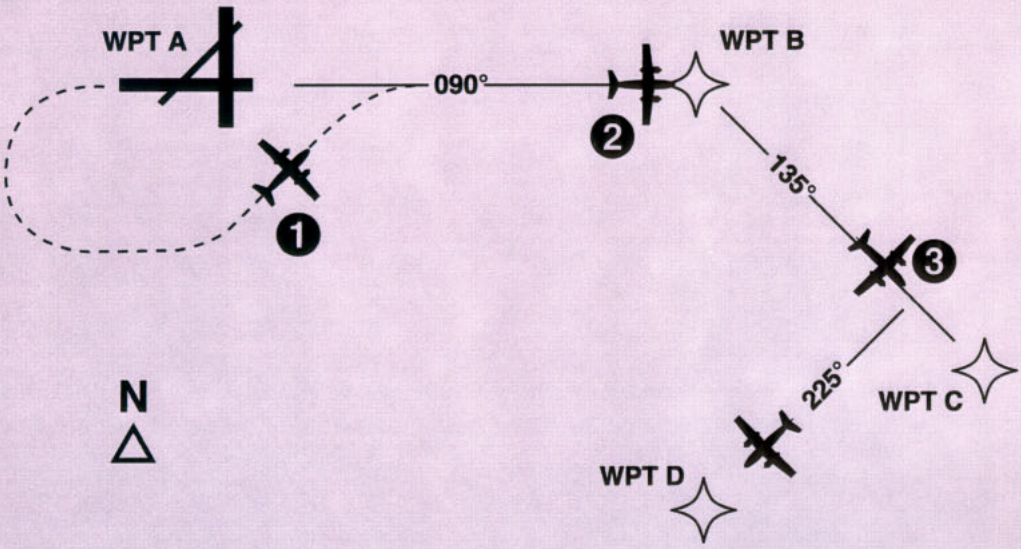
2. A waypoint has been established and the RNAV computer is in enroute mode. A 112 degree course to the waypoint has been selected and "NAV" button pushed "on". The "NAV" light is flashing to signify that the NAV mode is armed. The autopilot is still following the heading select mode on 080 degrees and will do so until the capture zone is entered and NAV mode is engaged. The capture point is now being computed based on closure rate.



3. The capture sequence starts when NAV mode is automatically engaged canceling the NAV/ARM and HDG modes. The autopilot is turning the aircraft right.



4. The aircraft has completed its turn to the 112 degree course. A wind correction produces an aircraft heading of 105 degrees, displaying a seven degree "crab" angle to maintain the 112 degree RNAV course.



Objective: Intercept the desired course and complete a "direct to" operation after passing waypoint "B" while coupled to a Long Range Nav.









1. The aircraft is engaged in Heading (HDG) and Altitude Hold (ALT) mode. A flight plan from waypoint "A" to ""B" to "C" is entered in the Long Range Nav. The course pointer is selected to 090° and NAV Arm is activated by pressing the NAV button. The aircraft is heading 045° to intercept the course. As the course deviation bar moves toward the center position, NAV mode is coupled and tracks the Long Range Nav.



2. As the aircraft crosses waypoint "B", the course pointer must be rotated to reflect the course or bearing to the new active waypoint (135° in this case).



3. The aircraft changes the active waypoint "D" via a "direct to" operation with the Long Range Nav. The course pointer must be rotated to 225° to reflect the bearing to "D". The autopilot will then correctly track the course to waypoint "D".

NOTE: The course arrow on the KI 525A must be set at the Desired Track or OBS setting indicated by the Long Range Nav. Moving the course pointer does not affect movement or location of the Left/Right D-Bar. However, in order for the KAP 150 to track the course, the proper course must be set in the HSI.

THE KAP 100 AUTOPILOT SYSTEM



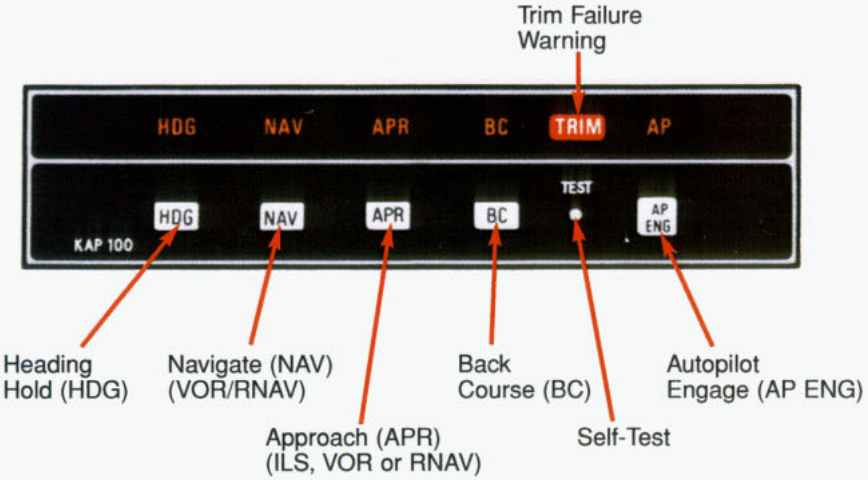
The KAP 100 is a single-axis, digital, panel-mounted autopilot designed to incorporate substantial pilot workload relief benefits into a highly affordable system for both light single and twin engine aircraft.

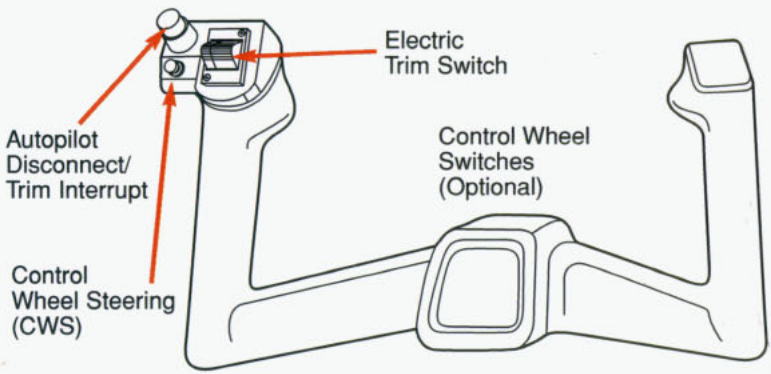
The KAP 100 is capable not only of flying the aircraft in a wings level attitude, but also of intercepting and tracking headings and courses. It can fly all of the lateral modes flown by the KAP 150 including heading hold (HDG), NAV (NAV), approach (APR) and back course (BC).

Like the KAP 150, the KAP 100 comes equipped with the King KG 107 directional gyro as standard equipment, but an optional KCS 55A Compass System with a KI 525A PNI may be chosen instead. (If you are unfamiliar with the operation of a Pictorial Navigation Indicator (PNI) you should stop here and review the section of the KCS 55A Compass System on page 95.)

The KG 107 is not a slaved system, which means the gyro must be adjusted periodically to correct for precession.

The KG 107 displays aircraft magnetic heading, and radio navigation course information must be read from the associated CDI to monitor the horizontal navigation results of autopilot control movements.





Mode	Autopilot Action
Attitude Reference	Power on and no modes selected. KG 258 displays aircraft attitude and KGS 107 displays unslaved heading. Align heading to magnetic compass by pushing and rotating the knob on the lower left of the KG 107 and update periodically to correct for precession. (With the optional KCS 55A Compass System, a KI 525A PNI is installed in place of the KG 107. The PNI will display slaved aircraft heading and requires no periodic update.)
Autopilot Engage (AP ENG)	Aircraft control surfaces (ailerons) smoothly respond to satisfy the autopilot modes selected by the pilot.

Heading (HDG)	Select desired heading on the "bug" on the KG 107 (or optional KI 525A), and the autopilot will turn to and maintain the heading.
Navigate (NAV) (VOR/RNAV)	With a VOR course (or RNAV on RNAV equipped aircraft) selected on the CDI or PNI, the autopilot will intercept and track the appropriate course.
Approach (APR) (ILS, VOR or RNAV)	With an ILS or VOR (or RNAV) course selected on the CDI or PNI, the autopilot will intercept and track the appropriate ILS localizer only, VOR or RNAV course.
Back Course (BC)	With the front course ILS set on the CDI or PNI, the autopilot will capture and track a reverse localizer course.
Test Button	Depressing the test button initiates a test of the KAP 100 circuitry including operation of the King manual electric trim (if installed). The test must be performed after turn on before the autopilot can be engaged.
Control Wheel Steering (CWS)	This optional feature for the KAP 100 includes a switch mounted on the control wheel which allows you to maneuver the aircraft in the roll axis without disengaging the autopilot. After the CWS switch is released, the autopilot resumes control of the aircraft.

When initially powered (no modes selected), the KAP 100 will display aircraft attitude on the KG 258 and unslaved heading on the KG 107. Align heading to the magnetic compass by pushing and rotating the knob on the lower left of the KG 107 and update it periodically to correct for precession.



System Self-Test

The KAP 100 system incorporates a system self-test function which is activated by a test button on the KC 190 Mode Control/Computer/Annunciator. The test must be performed before the autopilot can be engaged. The test determines, before takeoff, that the system is operating normally. To perform the test, momentarily push the test button:

1. All annunciator lights, the trim light and autopilot light will illuminate.
2. The trim light will flash 4 times.*
3. The annunciator legends will go blank, an aural tone will beep (approx. 6 times) and the "AP" light will flash (approx. 12-13 times) and go off. (If the AP light fails to flash you will be unable to engage the autopilot.)
4. The KC 190 display will go blank.

The test checks all digital computing capability, the disconnect capability of the autopilot, and the failure annunciator system. CAUTION: If the trim legend flashes at the end of the test it indicates there is a failure in the King Manual Electric Trim. (See a qualified King Service Agency for repair.)

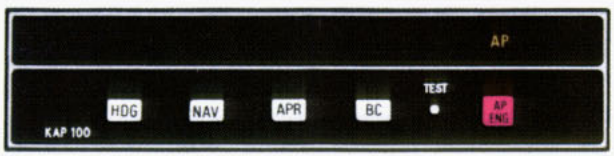
*On systems with King manual electric trim only.

Attitude Reference Mode Of Operation

The system will be in the basic attitude reference or "gyro" mode with engine(s) running and aircraft power on, but no modes selected (annunciator panel blank). Aircraft heading is shown on the KG 107 and pitch and roll attitude on the KG 258 Horizon Reference Indicator. (When the optional KI 525A PNI is installed in place of the KG 107, aircraft heading will be shown on the KI 525A.)

Attitude Gyro Operation Note: When shutting down the aircraft for short periods of time, make sure the Attitude Gyro has completely spun down before starting operations again. Gyro spin down occurs when the air supply is cut off to the gyro and usually takes about 10 minutes.

During Gyro spin down most gyros have a tendency to "tilt" (precess) to one side. If the air supply is reapplied to the gyro while in this state, slow gyro erection (leveling) will occur due to gyro inertia. If aircraft operations are initiated before the gyro is fully erected, there is a greater possibility that the gyro may tumble causing loss of primary attitude information from the Attitude Gyro.



AUTOPILOT (AP) MODE

NOTE: The autopilot cannot be engaged and used after power has been applied to the system until the system self-test has been performed.

The autopilot provides single axis (roll) stabilization as well as automatic response to all selected autopilot modes.

On initial engagement, with no other autopilot modes selected on the KC 190, the KAP 100 will fly the aircraft wings level.

Warning: Whenever the autopilot is disengaged, the AP legend on the annunciator panel will flash and an aural tone will sound to alert the pilot.

NOTE: For system limitations refer to the Flight Manual Supplement for your particular aircraft.



HEADING SELECT (HDG) MODE

In the heading mode, the autopilot will intercept and fly a selected heading. The following steps should be taken to operate in the heading mode:

1. Move the heading "bug" to the desired heading on the KG 107 using the heading select knob. (If the optional KI 525A is installed, set the heading "bug" on it instead.)
2. Depress the HDG button on the KC 190 to engage the heading select mode. With the autopilot engaged, the autopilot will turn the aircraft in the shortest direction to intercept and fly the heading.
3. If you move the heading "bug" again while the heading select mode is engaged, the autopilot will immediately turn the aircraft in the direction of the new heading.

(1)





(2)











*The capture point will vary depending on the angle of intercept and the rate of change of VOR/RNAV radials.

(See page 84/85 for illustration)

NAVIGATION (NAV) MODE USING THE KG 107/KI 206 INDICATORS (VOR, RNAV)

In the navigation (NAV) mode the autopilot intercepts and tracks VOR and RNAV courses. To operate in the NAV mode (with the KAP 100 currently in HDG mode):

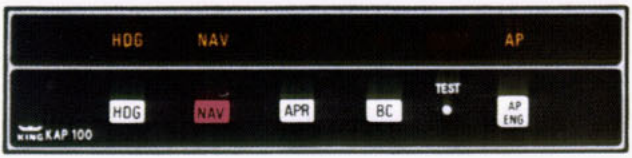
1. Tune the frequency for the selected VOR (or VORTAC) station. For RNAV, set in the waypoint distance and VOR-TAC radial.
2. Set the OBS to the desired course.
3. Depress the NAV button on the KC 190. (HDG will remain illuminated and NAV will flash to signify that the NAV mode is armed.)

NOTE: If the NAV mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, NAV arm mode will be bypassed and the NAV mode will engage directly.

4. Within five seconds, move the heading bug on the KG 107 to the same magnetic heading as the selected course on the CDI.
5. The autopilot will fly an automatic 45 degree intercept heading until within the capture zone,* then intercept and fly the desired course. The "HDG" light will go off and the "NAV" light will illuminate steadily as the "NAV" mode goes from arm to engage.
6. The autopilot will bank as necessary to maintain course.

NOTE: You should consider using HDG select mode just prior to VOR station passage. If the autopilot is engaged in NAV mode it may cause erratic maneuvers while following a rapidly changing course deviation needle as the aircraft flies in the cone of confusion.

NOTE: For system limitations refer to the Flight Manual Supplement for your particular aircraft.



NAVIGATION (NAV) MODE USING THE OPTIONAL KI 525A PNI (VOR, RNAV)

In the navigation (NAV) mode, the autopilot intercepts and tracks VOR and RNAV courses. To operate in the NAV mode:

1. Tune the frequency for the selected VOR (or VORTAC) station. For RNAV, set in the waypoint distance and VORTAC radial.
2. Set the desired course on the KI 525A PNI.
3. Establish the desired intercept angle by setting the heading "bug" on the intercept heading and activate HDG mode. The KAP 100 can perform all-angle intercepts when using the KI 525A PNI. (HDG light will illuminate.)
4. Depress the NAV button on the KC 190. (NAV light will flash to signify that NAV mode is armed.)

NOTE: If the NAV mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, NAV arm mode will be bypassed and the NAV mode will engage directly.

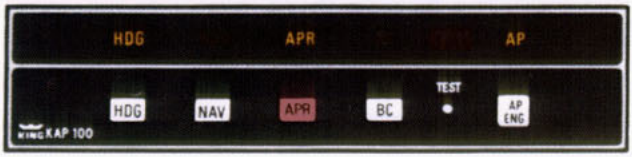
5. The autopilot will fly the selected heading until entering the capture zone,* then turn to intercept the selected course. The HDG light will go off and the NAV light will illuminate steadily as the NAV mode goes from arm to engage.
6. The autopilot will bank as necessary to maintain course.

*The capture point will vary depending on the angle of intercept and the rate of change of VOR/RNAV radials.

(See page 86/87 for illustration)



NOTE: You should consider using HDG select mode just prior to VOR station passage. If the autopilot is engaged in NAV mode it may cause erratic maneuvers while following a rapidly changing course deviation needle as the aircraft flies in the cone of confusion.









APPROACH (APR) MODE USING THE KG 107/KI 206 INDICATORS

The approach (APR) mode allows the autopilot to intercept and track ILS localizer, or VOR or RNAV courses. To operate in the APR mode (with the KAP 100 currently in HDG mode):

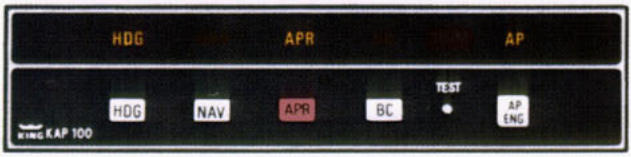
1. Tune the frequency for the selected ILS, VOR or RNAV approach.
2. Set the OBS to the final approach course (front course for ILS even when flying a reverse course approach).
3. Check the heading displayed on the KG 107 against the magnetic compass and reset if necessary.
4. Depress the "APR" button on the KC 190 (HDG will remain illuminated and APR will flash to signify that APR mode is armed).

NOTE: If the APR mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, APR arm mode will be bypassed and the APR mode will engage directly.

5. Within five seconds, move the heading "bug" on the KG 107 to the same magnetic heading as the selected course on the CDI.
6. The autopilot will fly an automatic 45 degree intercept heading until within the capture zone, then intercept and fly the desired course. The "HDG" light will go off and the "APR" light will illuminate steadily as the APR mode goes from arm to engage.
7. The autopilot will bank as necessary to maintain the localizer or approach course.

NOTE: For system limitations refer to your Flight Manual Supplement.

(See page 80/81 for illustration)



APPROACH (APR) MODE USING THE OPTIONAL KI 525A PNI



The approach (APR) mode allows the autopilot to intercept and track ILS (localizer only), VOR and RNAV courses. To operate in the APR mode:

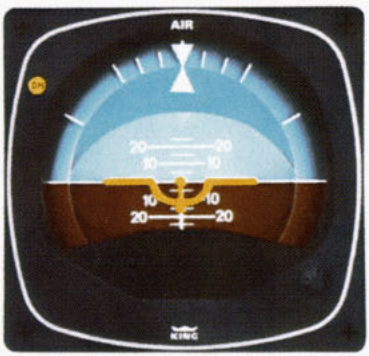
1. Tune the frequency for the selected ILS, VOR or RNAV approach.
2. Set the final approach course on the KI 525A PNI.
3. Establish the desired intercept angle by setting the heading "bug" on the intercept heading and activate the HDG mode.
4. Depress the "APR" button on the KC 190 (APR light will flash to signify that APR mode is armed).

NOTE: If the APR mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, APR arm mode will be bypassed and the APR mode will engage directly.

5. The autopilot will fly the selected heading until entering the capture zone, then turn to intercept the course. The "HDG" light will go off and the "APR" light will illuminate steadily as the APR mode goes from arm to engage.
6. The autopilot will bank as necessary to maintain course.

(See page 82/83 for illustration)









BACK COURSE (BC) MODE USING THE KG 107/KI 206 INDICATORS

In the back course (BC) mode the autopilot intercepts and tracks a reverse course ILS. To operate in the BC mode (with the KAP 100 currently in the HDG mode):

1. Tune the frequency for the selected ILS back course.
2. Select the back course mode by either depressing the APR button and then the BC button, or by merely depressing the BC button itself.
3. Within five seconds, move the heading "bug" on the KG 107 to the same magnetic heading as the selected front course (090 degrees in this example). The "HDG" light will remain illuminated, and the "APR" light will flash to signify that the APR mode is armed.

NOTE: If the BC APR mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, BC APR arm mode will be bypassed and the BC APR mode will engage directly.

4. The autopilot will fly an automatic 45 degree intercept heading until within the capture zone, then intercept and fly the desired course, which will be a reciprocal to the front course. The "HDG" light will go off and the "APR" light will illuminate steadily as the BC mode goes from arm to engage.
5. The autopilot will bank as required to maintain course. Automatic crosswind compensation will provide precise tracking.

NOTE: For system limitations refer to your Flight Manual Supplement.

(See page 76/77 for illustration)



BACK COURSE (BC) MODE USING THE OPTIONAL KI 525A PNI

In the back course (BC) mode the autopilot intercepts and tracks a reverse course ILS. To operate in the BC mode:

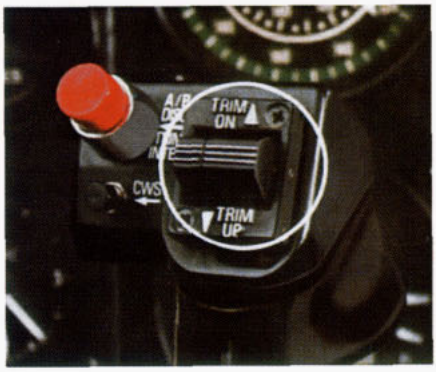
1. Tune the frequency for the selected ILS back course.
2. BE CERTAIN TO SET IN THE ILS FRONT COURSE EVEN THOUGH YOU WILL BE FLYING A RECIPROCAL HEADING ON AN ILS BACK COURSE APPROACH. FOR EXAMPLE, A BC APPROACH MIGHT HAVE A FRONT COURSE OF 090 DEGREES WHICH YOU WILL SET IN AS YOU FLY A BACK COURSE HEADING OF 270 DEGREES TO RUNWAY 27.
3. Establish the desired intercept angle by setting the heading "bug" on the intercept heading and activate the HDG mode. ("HDG" light will illuminate.)
4. Select the back course mode by either depressing the "APR" button and then the BC button, or by merely depressing the BC button itself. (HDG will remain illuminated, BC will illuminate, and APR will flash to signify that APR mode is armed.)

NOTE: If the BC APR mode is selected with the aircraft level within ±4 degrees and within 2-3 dots of course deviation, BC APR arm mode will be bypassed and the BC APR mode will engage directly.

(See page 78/79 for illustration)

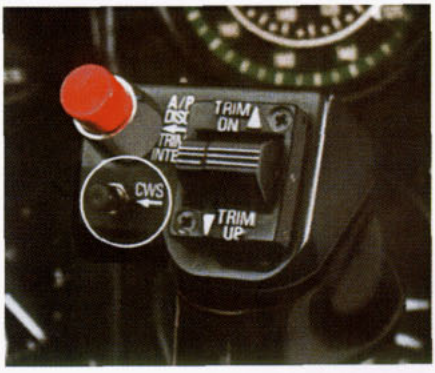


5. The autopilot will fly the selected heading until entering the capture zone, then turn to intercept the course. The "HDG" light will go off and the "APR" light will illuminate steadily as the BC mode goes from arm to engage.
6. The autopilot will bank as required to maintain course. Automatic crosswind compensation will provide precise tracking.



MANUAL ELECTRIC TRIM (OPTIONAL)

Manual electric trim can be obtained as an option with the KAP 100. This will make it easier for the pilot to trim off elevator control surface pressures.



CONTROL WHEEL STEERING (CWS) MODE (OPTIONAL)

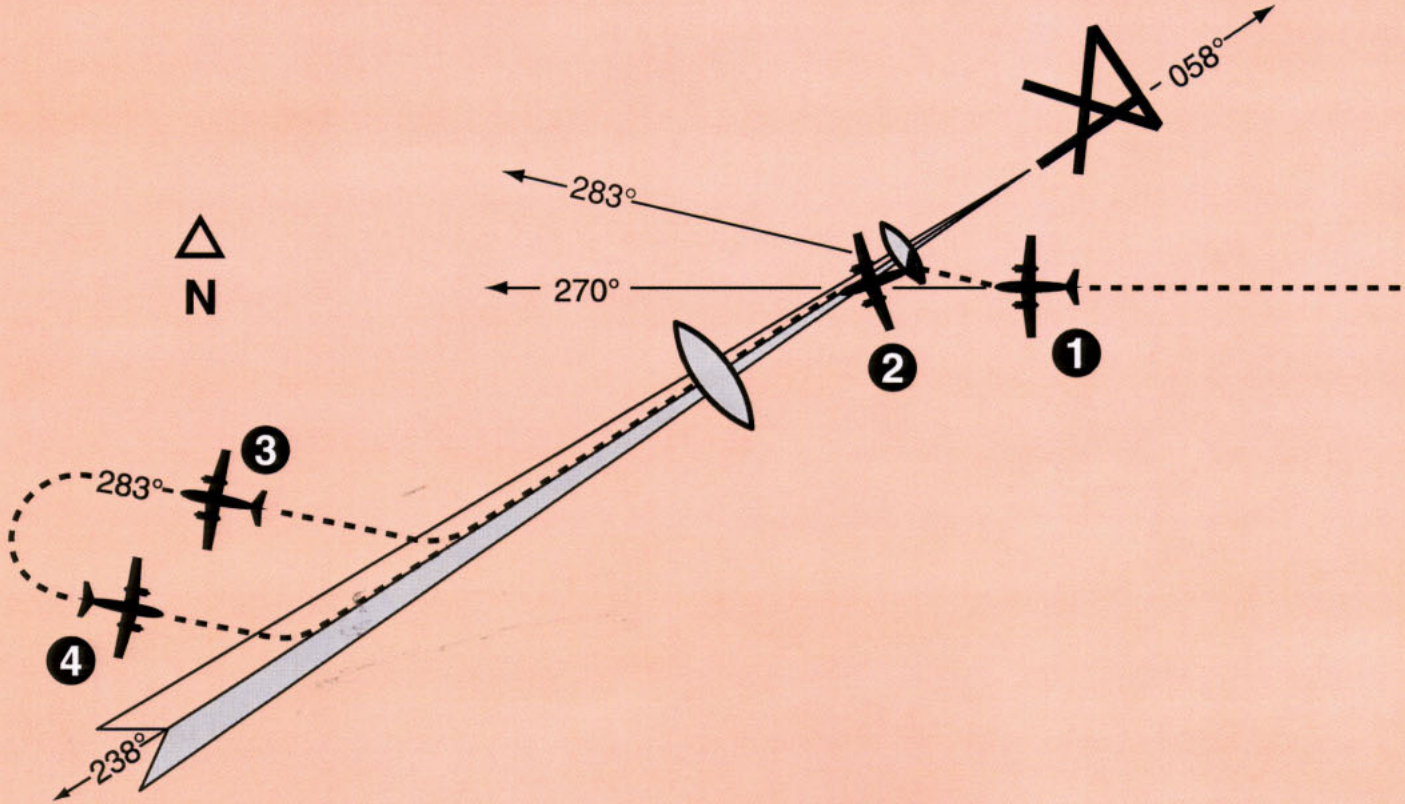
Control wheel steering is included as part of the King Manual Electric Trim option with the KAP 100. It allows the pilot to maneuver the aircraft in the roll axis without disengaging the autopilot.

To use control wheel steering (CWS), depress the CWS button on the yoke. This releases the autopilot roll servo and allows you to assume manual control while the autopilot functions are placed in a synchronization state. This means that when you release the CWS button, the autopilot will smoothly resume control of the aircraft and fly it to the lateral command you were using prior to engaging CWS.

NOTE: For system limitations refer to your Flight Manual Supplement.

OPERATIONS WITH THE KAP 100

Outbound On Front Course For Procedure Turn To ILS Approach (KG 107 & KI 206)





1. The aircraft is heading 270 degrees with heading (HDG) mode and autopilot (AP) engaged. To intercept and fly the ILS front course outbound, set the front course on the OBS and depress the approach (APR) button and the reverse course (BC) button (or just the BC button alone). Move the heading "bug" within five seconds to the front course (058 degrees). The autopilot will turn 45 degrees to intercept the localizer signal. In this case, the aircraft will turn to 283 degrees.

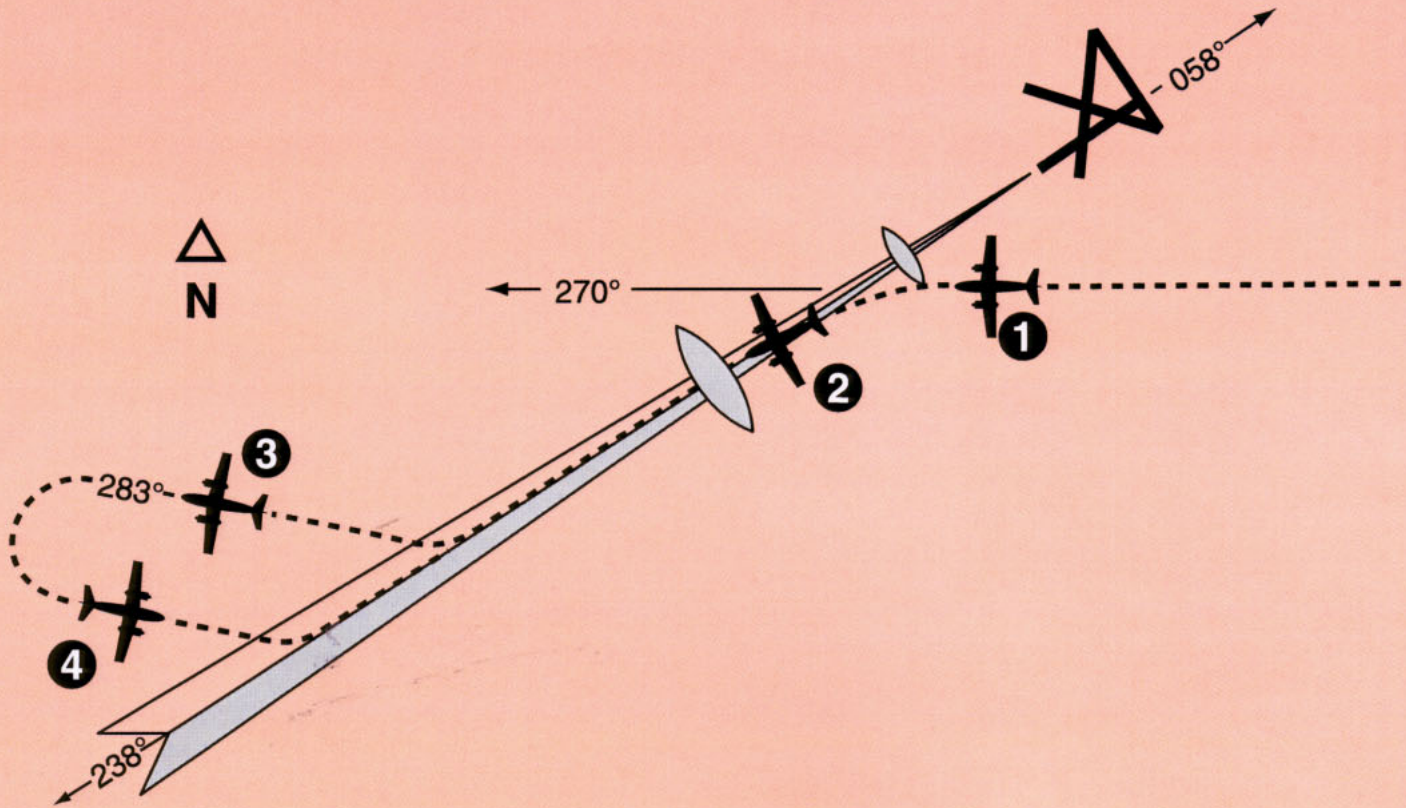
2. When the computed capture point is reached, HDG mode is canceled and approach mode is automatically activated and a left turn outbound on the localizer is initiated by the autopilot.
Note that the left-right deviations of the CDI course deviation needle are reversed (you must turn right to center a deviation of the index to the left). This needle reversing takes place because you are flying outbound on a front course.

3. During the procedure turn outbound, the CDI course index goes off scale to the right. The aircraft is flying away from the localizer centerline at a 45 degree angle on a selected heading of 283 degrees.

*Check the heading displayed on the KG 107 against the magnetic compass and reset if necessary.

4. Now you have reset the heading "bug" to 103 degrees and made a 180 degree turn to this heading. This 103 degree heading will intercept the front course of 058 degrees. You must now reselect the approach mode by depressing the "APR" button on the mode controller.* The "APR" light will begin to flash signifying the approach mode is armed. Move the heading bug within five seconds to the front course (058 degrees). Since the 45 degree intercept is 103 degrees, the aircraft will not turn until the front course is captured.

Outbound On Front Course For Procedure Turn (KI 525A)





1. The aircraft is heading 270 degrees with heading (HDG) mode and autopilot (AP) engaged. To intercept and fly the ILS front course outbound, set the front course on the PNI and depress the approach (APR) button and the reverse course (BC) button (or just the BC button alone). The back course (BC) mode is selected to go outbound on the front course. The capture point is now being computed, based on closure rate.



2. When the computed capture point is reached, HDG mode is canceled and approach mode is automatically activated and a left turn outbound on the localizer is initiated by the autopilot.
Note that the left-right deviations of the PNI course needle operate just as though you were flying a front course approach.

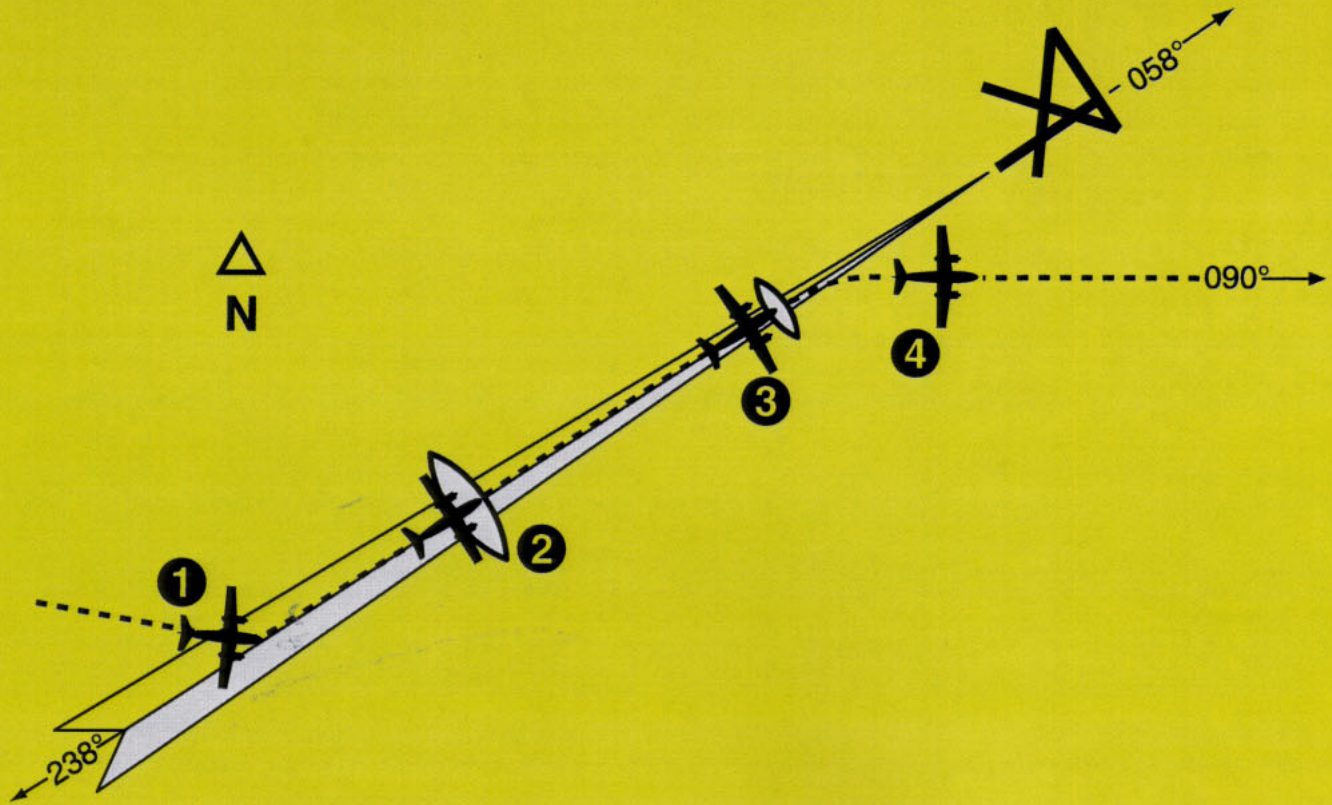


3. During the procedure turn outbound, the deviation bar shows pictorially that the aircraft is flying away from the localizer centerline at a 45 degree angle on a selected heading of 283 degrees.



4. Now you have reset the heading "bug" to 103 degrees and made a 180 degree turn to this heading. This 103 degree heading will intercept the front course of 058 degrees. You must now reselect the approach mode by depressing the "APR" button on the mode controller. The "APR" light will begin to flash signifying the approach mode is armed. Automatic capture of the localizer will occur.

Front Course ILS Approach (KG 107 & KI 206)





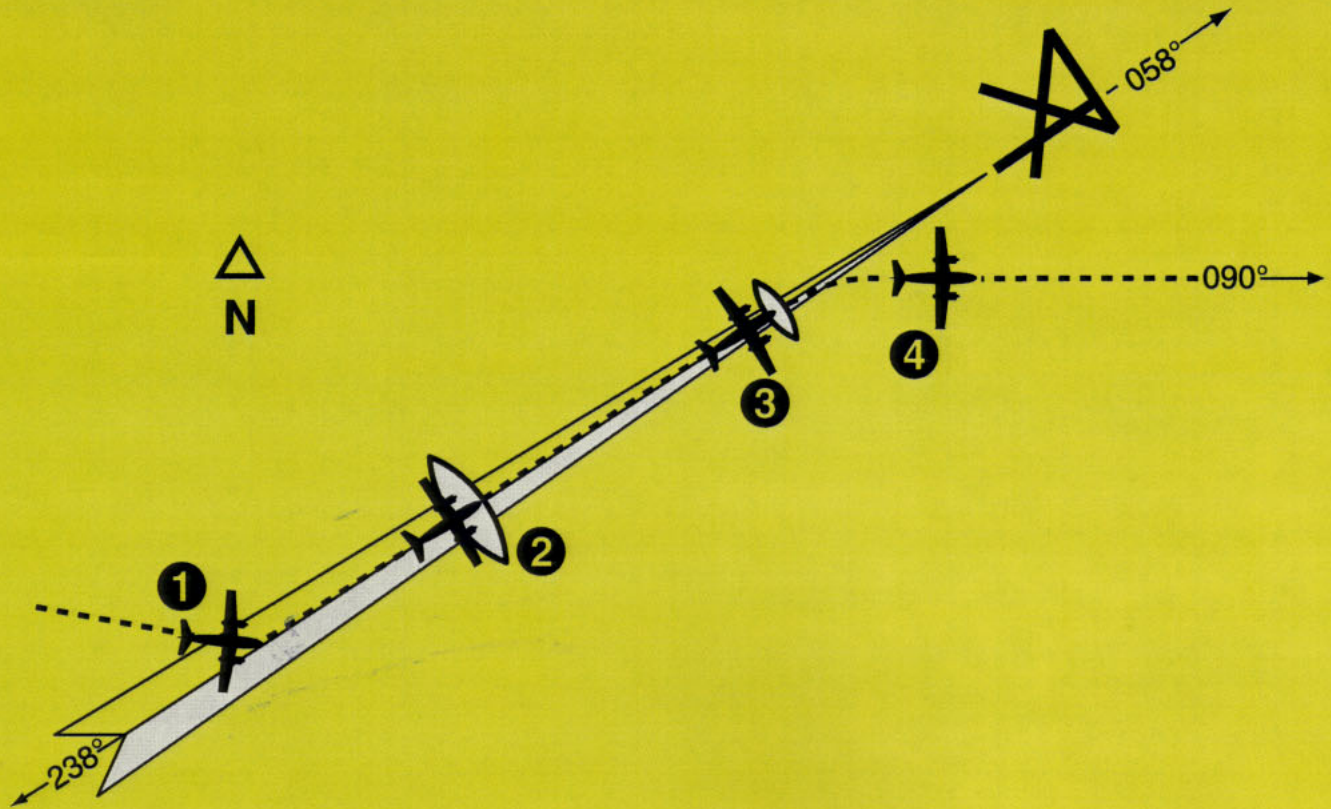
1. Continuing the maneuver on page 77, APR coupling occurs ("APR" light comes on steady, "HDG" light goes off). The autopilot will roll the aircraft out on localizer and the course index will center.

2. The autopilot is following the localizer. At the outer marker, the glideslope deviation needle is at midscale. The autopilot will make bank changes as necessary to maintain localizer (glidepath is manually maintained by the pilot).

3. At the middle marker, the autopilot is disconnected with the button on the KC 190 (or on the control wheel if equipped with the optional King manual electric trim). This cancels all operating autopilot modes. The pilot initiates a missed approach.

4. The heading "bug" has been set to the missed approach heading, 090 degrees. Engaging the autopilot and activating the "HDG" mode causes the autopilot to commence a right turn to a heading of 090 degrees. Pitch attitude during climbout is manually controlled by the pilot.

Front Course ILS Approach (KI 525A)





1. Continuing the maneuver on page 79, APR coupling occurs ("APR" light comes on steady, "HDG" light goes off). The autopilot will roll the aircraft out on localizer and the course index will center.



2. The autopilot is following the localizer. At the outer marker, the glideslope deviation needle is at midscale. The autopilot will make bank changes as necessary to maintain localizer. Glidepath is manually maintained by the pilot.

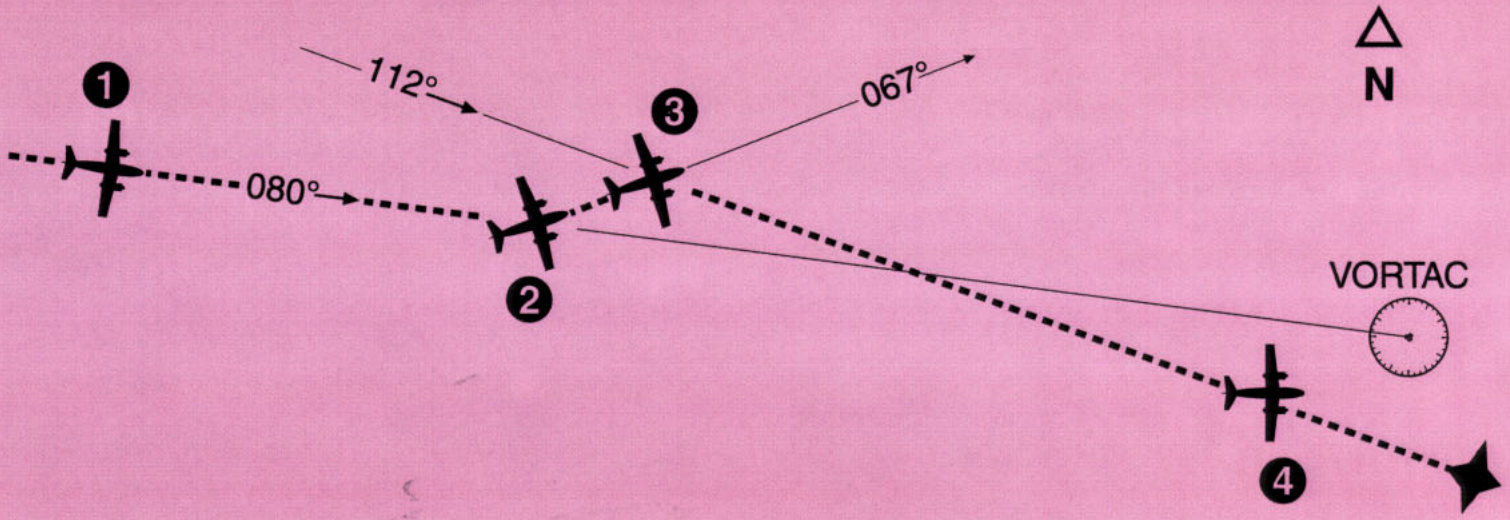


3. At the middle marker, the autopilot is disconnected with the button on the KC 190 (or on the control wheel if equipped with the optional King manual electric trim). This cancels all operating autopilot modes. The pilot initiates a missed approach.



4. The heading "bug" has been previously set to the missed approach heading, 090 degrees. Engaging the autopilot and activating the "HDG" mode causes the autopilot to commence a right turn to a heading of 090 degrees. Pitch attitude during climbout is manually controlled by the pilot.

RNAV Capture (KG 107 And KI 206)





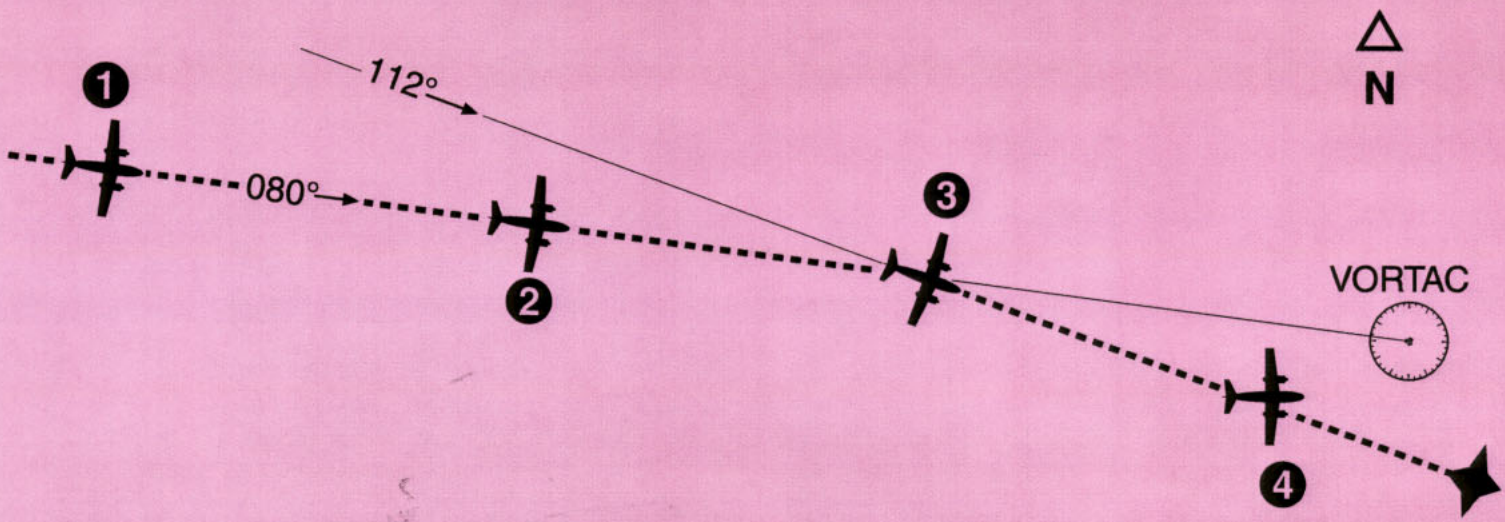
1. The aircraft is flying an OMNI airway in HDG mode on a heading of 080 degrees.

2. A waypoint has been established and the RNAV computer is in enroute mode. A 112 degree course to the waypoint has been selected and "NAV" button pushed "on". The "NAV" light is flashing to signify that the NAV mode is armed. Move the heading bug within five seconds to 112 degrees and the autopilot will set up a 45 degree intercept (067 degrees) until the capture zone is entered and NAV mode is engaged. The capture point is now being computed based on closure rate.

3. The capture sequence starts when NAV mode is automatically engaged canceling the NAV/ARM and HDG modes. The autopilot is turning the aircraft right.

4. The aircraft has completed its turn to the 112 degree course. A wind correction produces an aircraft heading of 105 degrees, displaying a seven degree "crab" angle to maintain the 112 degree RNAV course.

RNAV Capture (KI 525A)





1. The aircraft is flying an OMNI airway in HDG mode on a heading of 080 degrees.



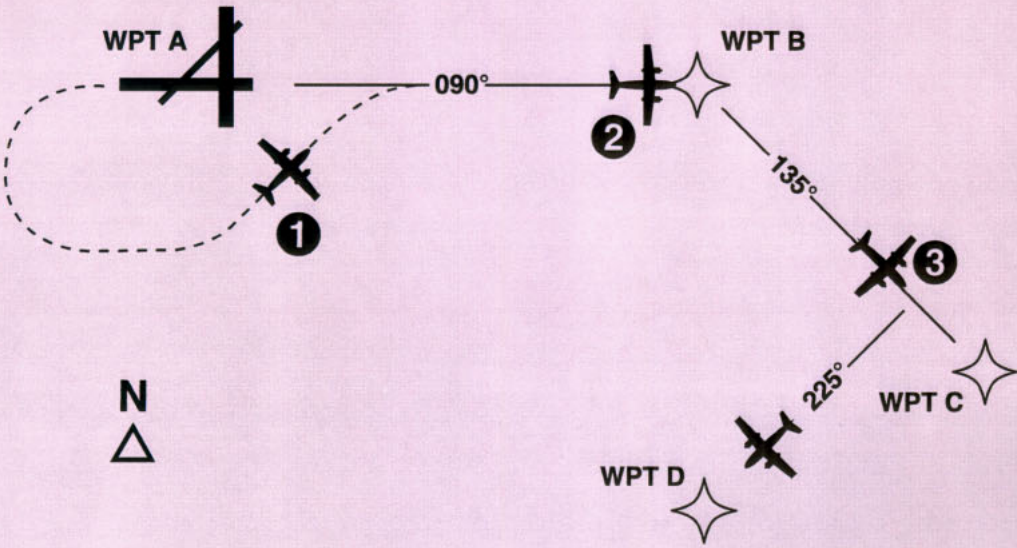
2. A waypoint has been established and the RNAV computer is in enroute mode. A 112 degree course to the waypoint has been selected and "NAV" button pushed "on". The "NAV" light is flashing to signify that the NAV mode is armed. The autopilot is still following the heading select mode on 080 degrees and will do so until the capture zone is entered and NAV mode is engaged. The capture point is now being computed based on closure rate.



3. The capture sequence starts when NAV mode is automatically engaged canceling the NAV/ARM and HDG modes. The autopilot is turning the aircraft right.



4. The aircraft has completed its turn to the 112 degree course. A wind correction produces an aircraft heading of 105 degrees, displaying a seven degree "crab" angle to maintain the 112 degree RNAV course.



Objective: Intercept the desired course and complete a "direct to" operation after passing waypoint "B" while coupled to a Long Range Nav.





1. The aircraft is engaged in Heading (HDG) and Altitude Hold (ALT) mode. A flight plan from waypoint "A" to "B" to "C" is entered in the Long Range Nav. NAV Arm is activated by pressing the NAV button. The Heading Bug, which acts as the course pointer, is then selected within five seconds to 090°. The autopilot commands a 045° intercept until coupled. Upon coupling, the autopilot tracks the Long Range Nav.
2. As the aircraft crosses waypoint "B", the Heading Bug, which acts as the course pointer in NAV mode, must be rotated to reflect the course or bearing to the new active waypoint (135° in this case).
3. The aircraft changes the active waypoint "D" via a "direct to" operation with the Long Range Nav. The Heading Bug must be rotated to 225° to reflect the bearing to "D". The autopilot will then correctly track the course to waypoint "D".

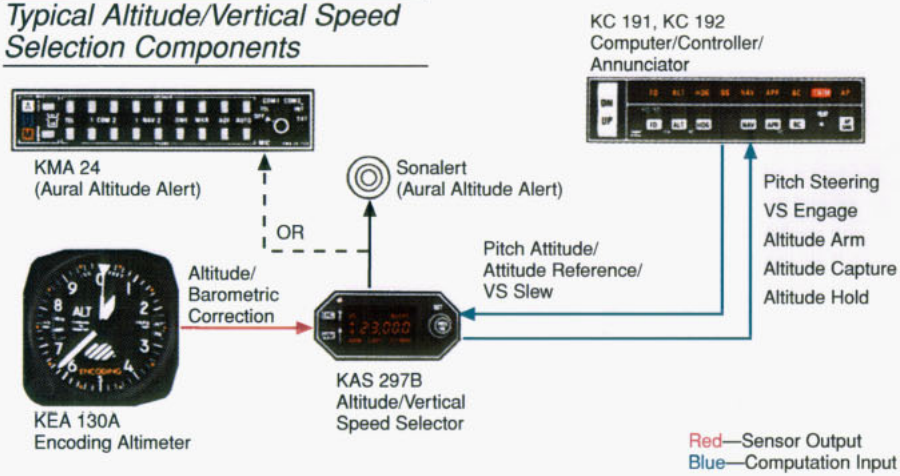
NOTE: In order for the KAP 100 to track the course in NAV mode, the heading bug on the KG 107 must be set at the Desired Track or OBS setting indicated by the Long Range Nav. Moving the OBS on the CDI does not affect movement or location of the Left/Right D-Bar, but only provides a course reference.

OPTIONAL KAS 297B ALTITUDE AND VERTICAL SPEED SELECTOR

The KAS 297B adds the versatility and benefits of Altitude Preselect and Vertical Speed Select to the KAP 150 and KFC 150 Flight Control systems. Altitude Alerting as defined by F.A.R. 91.51 is also provided.

The diagram below shows the normal system components including the KEA 130A which provides altitude and barometric correction information to the KAS 297B.

Typical Altitude/Vertical Speed Selection Components







Altitude Preselect Operation

To select a new altitude, the KAS 297B must be displaying feet (FT). If it is displaying feet per minute (FT/MIN), push the inner concentric knob to the "in" position.

Rotating the outer concentric knob will select altitude in 1000 ft. increments up to a maximum of 35,000 feet. The inner concentric knob controls altitude in 100 ft. increments.

Once the correct altitude has been entered, push the ARM button to arm the altitude capture mode. Use pitch attitude hold or select a vertical speed to guide the aircraft to the new altitude.

As the aircraft nears the selected altitude, a pitch round out is computed by the KAS 297B based on the aircraft's vertical speed. When the KAS 297B determines the round out should begin, the display will change from arm (ARM) to capture (CAPT) and Vertical Speed mode will be disengaged if it was in use. At the selected altitude, Altitude Hold is engaged and CAPT mode is disengaged.



Altitude Alerting

Regardless of whether the flight control system is engaged, the KAS 297B provides altitude alerting to alert arrival at and deviation from the selected altitude.

When the aircraft reaches 1,000 feet from the selected altitude, the KAS 297B will annunciate ALERT and a 2 second aural tone will sound. The ALERT will stay on until 300 feet* from selected altitude. When the aircraft reaches the selected altitude, a 2 second ALERT annunciation and aural tone alerts the pilot to the aircraft's altitude.

Until a new altitude is selected, the system will provide alerting any time the aircraft's altitude varies more than 300 feet* from the selected altitude.

*The inner alerting altitude can be set at time of installation to be either selected altitude ±500 or ±300 feet. Particular STC's may require the use of one of these settings. Consult your aircraft Flight Manual Supplement for details.



Vertical Speed Select Operation

Vertical speed may be engaged in either of two ways: by preselecting a vertical speed on the KAS 297B or by engaging vertical speed at its present value and then modifying a rate of climb or descent using the vertical trim rocker switch on the KC 191/192, the CWS button or rotating the select knob on the KAS 297B with the inner knob pulled to the out position.

NOTE: The pointer of a mechanical Vertical Speed Indicator has a typical accuracy of ±5 to ±15% depending on rate and altitude. Therefore, the aircraft may actually be holding the selected vertical speed even if the mechanical VSI disagrees. Timing altitude changes (e.g. 500 ft/min for 3 minutes should yield a 1,500 ft change in altitude) is the most accurate method of determining which is correct.

Also VSI's have a substantial lag in indication inherent in their design (Instantaneous, or IVSI indicators, reduce this lag considerably). Comparisons made prior to the stabilization of vertical speed will not be valid.

Vertical Speed Preselect

To preselect a vertical speed, pull the inner concentric knob out. The last used vertical speed, an up or down arrow, and FT/MIN will be annunciated. Rotating the inner knob adjusts vertical speed in 100 feet per minute increments while the outer knob controls the 1,000 feet per minute digit up to a maximum of ±3,000 feet/min. When the selected vertical speed passes through zero the up/down arrow will change directions. To engage this selected rate, push the engage (ENG) button (while vertical speed is displayed). Altitude Hold, if engaged, will be canceled and the system will capture the commanded vertical speed.

If a change in vertical speed is desired, the vertical trim rocker switch may be used to slew the rate up or down at 100 feet per minute for every second the rocker switch is held down. Vertical speed can also be modified by holding down the CWS button and changing pitch attitude until the desired vertical speed command is displayed on the KAS 297B. If the KAS 297B is displaying altitude at the time, vertical speed will be displayed until after the CWS switch is released.

The inner knob on the KAS 297B can be pulled out at any time to display the vertical speed command. Rotating the knob while it is "out" will vary the vertical speed command.

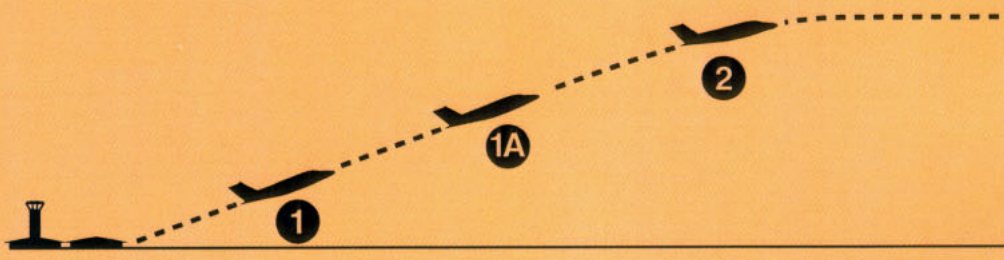
Vertical Speed Synch

Vertical Speed synch may be used to maintain the aircraft's current vertical speed by pushing the engage (ENG) button while the KAS 297B is displaying altitude. Immediately upon engaging VS synch, the KAS 297B will display for 2 seconds the vertical speed which the KAP/KFC 150 system will hold. Vertical Speed can be varied up or down just as described in Vertical Speed Preselect.

Test Mode

When the preflight test button on the KC 191/192 is pushed, all legends and digits are displayed on the KAS 297B to confirm the display's integrity.

Altitude Profile







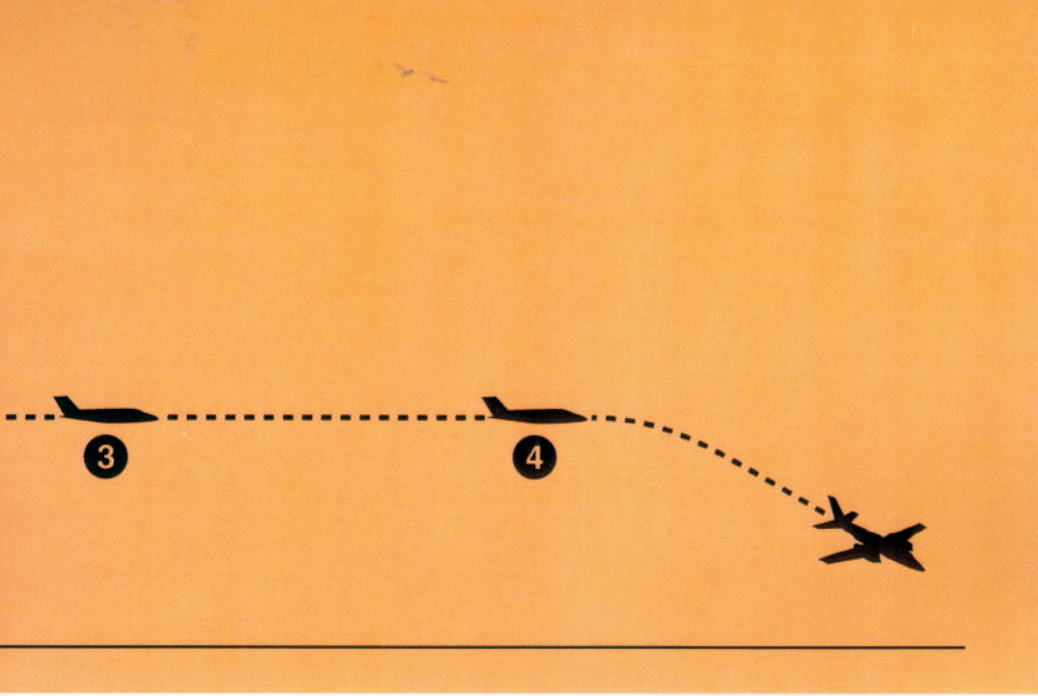
1. You have lifted off having previously set the assigned altitude of 11,000 feet. When a safe altitude is reached, the autopilot is engaged, altitude is ARMed, and the aircraft is climbing to the assigned altitude in pitch attitude hold. Once a stable rate of climb is established, the engage (ENG) button is pushed while the selected altitude is showing; engaging VS at its present value. The KAS 297B will automatically display this vertical speed for 2 seconds after pushing VS ENGage.

1A. The vertical trim rocker switch on the KC 191/192 is being used to slew the VS command, and the selected altitude display is replaced by vertical speed until 2 seconds after the rocker switch is released.

CWS or the VS select knob may also be used to vary the VS command.



2. As the aircraft reaches assigned altitude, alerting is provided and a pitch round out is computed. At the appropriate altitude, the autopilot has disengaged VS mode and annunciated the change to altitude capture (CAPT) mode.





3. You have now reached the assigned altitude of 11,000 feet and the autopilot has automatically engaged altitude hold.





4. In preparation for the descent, the new altitude is preset in the KAS 297B. When the descent is to be started, the new altitude is ARMed, the inner concentric knob is pulled out, the desired vertical speed is entered and the ENG button is pushed with vertical speed displayed.

   Operation of the autopilot in descent is identical to operation in climb with a pitch round out allowing a smooth capture of the assigned altitude.

NOTES

KING KCS 55A COMPASS SYSTEM



KA 51A



ki 525A



KA 51B



KMT 112



KG 102A

The KCS 55A Compass System, which includes the KA 51A or KA 51B Slaving Control and Compensator Unit, the KMT 112 Magnetic Slaving Transmitter and the KG 102A Directional Gyro as well as the KI 525A Pictorial Navigation Indicator is an integral part of the KFC 150 Flight Control System. It is also available as an option on the KAP 150 and KAP 100 Autopilot Systems.

The panel-mounted KI 525A PNI combines the display functions of both the standard Directional Gyro and the Course Deviation Indicator's VOR/LOC/Glideslope information to provide the pilot with a single visual presentation of the complete horizontal navigation situation. This greatly simplifies course orientation, interception and tracking, while eliminating the need for scan coordination between two separate indicators.

KI 525A INDICATOR



The KI 525A Pictorial Navigation Indicator is the panel display for the KCS 55A Compass System. It replaces the standard Directional Gyro and Course Deviation Indicator (CDI) in the aircraft's panel, combining slaved heading and VOR/LOC/Glideslope deviation information into one compact display. By providing a simple, comprehensive visual presentation of the aircraft's heading and position in relation to a desired course, the pilot's navigation workload is considerably reduced.

DESCRIPTION OF INDICATOR AND DISPLAY FUNCTIONS

Compass Card - Responding to the input from the slaved directional gyro, this card rotates within the display so that the aircraft heading is always at the top, under the lubber line.

Lubber Line - A fixed white marker at the top of the display that indicates aircraft magnetic heading on the compass card.

Symbolic Aircraft - A fixed representation of the actual aircraft. This miniature aircraft always points toward the top of the display and the lubber line.

Selected Course Pointer - On this two-part arrow, the "head" indicates the desired VOR or Localizer course and the "tail" indicates the reciprocal. This pointer is set by rotating the course select knob.

Course Select Knob - Used to rotate the course pointer to the desired course on the compass card. This knob corresponds to the Omni Bearing Selector (OBS) on standard NAV indicators.

VOR/RNAV and LOC Deviation Bar - This bar corresponds to the "left/right" needle on standard course deviation indicators. When the aircraft is precisely on the VOR radial or Localizer course, it forms the center section of the selected course pointer and will be positioned under the symbolic aircraft. When off course or approaching a new course, it will move to one side or the other. Since the entire VOR and Localizer display rotates with the compass card, the angular relationship between the deviation bar and the symbolic aircraft provides a pictorial symbolic display of the aircraft's position with respect to the selected course.

Deviation Scale - When tuned to a VOR frequency, each white dot represents 2 degrees of deviation left or right of course. When tuned to a Localizer, the deviation is 1/2 degree per dot. In RNAV "APR" the scale is 1/4 nautical mile per dot. In RNAV "ENROUTE" mode the scale is 1 nautical mile per dot.*

Heading Select Bug - A movable orange marker on the outer perimeter of the display, used primarily to select the desired heading you wish to fly. This desired heading is coupled to the KFC 150 Flight Director, KAP 150 Autopilot or KAP 100 Autopilot to provide the "Heading Select" function.

Heading Select Knob - Used to rotate the heading select bug to a desired point on the compass card.

To-From Indicator - A white triangle near the center of the display that indicates, with reference to the OBS setting, whether the course selected is "to" or "from" the selected VOR station and/or RNAV waypoint.

Dual Glideslope Pointers - Chartreuse triangular pointers on either side of the display drop into view when a usable glideslope signal is received and retract out of view when the glideslope signal becomes marginal. During an ILS approach, these pointers represent the vertical orientation of the aircraft with respect to the center of the glideslope beam. When on glideslope, the pointers will align with the center markers on the glideslope scale.

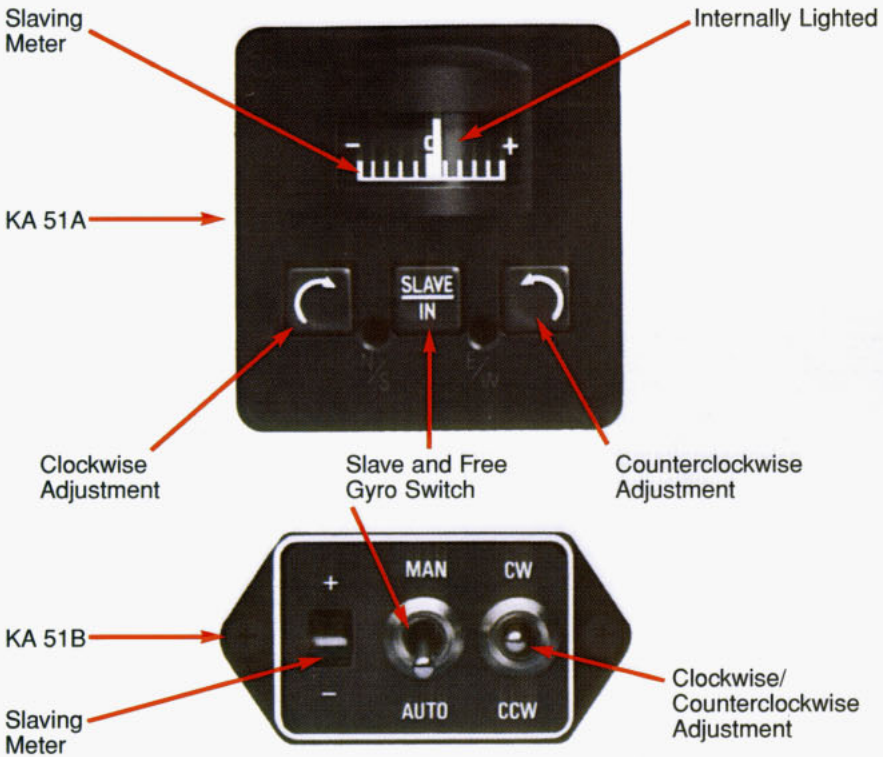
*This is true of all King and most other RNAV systems.

Glideslope Deviation Scale - White dots on each side of the display which, in conjunction with the glideslope pointers, indicate either "above", "below", or "on glideslope" during an ILS approach.

Compass Warning Flag - A red flag labeled "HDG" becomes visible in the upper right quadrant of the display whenever the electrical power is inadequate or the directional gyro is not up to speed. Compass failures can occur which will not be annunciated by the "HDG" flag. Therefore, periodic comparison with the standby compass is advised.

NAV Warning Flag - A red flag labeled "NAV" becomes visible in the upper left quadrant of the display whenever a usable VOR or Localizer signal is not being received. If RNAV is installed and the system is in RNAV mode, both VOR and DME must be usable before the NAV flag will disappear.

THE SLAVING METER



Slaving Meter - This meter indicates any difference between the displayed heading and the magnetic heading. Right or up deflection indicates a clockwise error of the compass card. Left or down deflection indicates a counterclockwise error of the compass card. Whenever the aircraft is in a turn and the card rotates, it is normal for this meter to show a full deflection to one side or the other.

NOTE: During level flight it is normal for the meter needle to continuously move from side to side and to be fully deflected during a turn. If the needle stays fully deflected, left or right, during level flight, the free gyro mode can be used to center it, as described below.

Slave and Free Gyro Switch (KA 51A) - When depressed, the system is in the slaved gyro mode. When the button is in the outer position (not engaged) the system is in the free gyro mode. (KA 51B) - Operation is identical except switch is pulled and moved to the appropriate position.

Clockwise Adjustment (KA 51A) - When the system is in the free gyro mode, depressing the clockwise manual heading drive button will rotate the compass card to the right to eliminate left compass card error. (KA 51B) - Operation is identical except switch is held to clockwise position.

Counterclockwise Adjustment (KA 51A) - When the system is in the free gyro mode, depressing the counterclockwise manual heading drive button will rotate the compass card to the left to eliminate right compass card error. (KA 51B) - Operation is identical except switch is held to counterclockwise position.

The **KA 51B Slaving Control and Compensator Unit** is a smaller slaving accessory which can be used in installations where panel space is limited. The KA 51B can be mounted either vertically or horizontally, and provides all the slaving modes and capabilities of the larger KA 51A.



The **KMT 112 Magnetic Slaving Transmitter** senses the direction of the earth's magnetic field and continuously transmits this information through the slaving circuitry to the directional gyro which is automatically corrected for precession or "drift". This sensor is mounted remotely — usually in a wing tip — to eliminate the possibility of magnetic interference.



The **KG 102A Directional Gyro** provides gyro stabilization for the system and contains the slaving circuitry necessary for operation of the system. Power may be from either 14 or 28 volts DC. Remote mounted.

OPERATING INSTRUCTIONS

1. Until power is applied to the KCS 55A System, and the directional gyro is up to speed, a red flag labeled "HDG" will be visible in the upper right quadrant of the KI 525A Indicator. In operation, this warning flag will be visible whenever the power being supplied is inadequate or the gyro is not up to speed.

2. With the application of power to the KCS 55A System, and gyro up to operating speed, the red "HDG" flag should disappear from view.

3. If the KCS 55A System is in the slaved gyro mode, the compass card will automatically fast slave at the rate of 180 degrees per minute toward the aircraft's magnetic heading. (Immediately after applying power, this compass card movement should be quite visible.) It will continue to fast slave until the proper magnetic heading is indicated, after which it will slave at a constant rate of 3 degrees per minute to keep the system aligned with the earth's magnetic field.

   Under some conditions it is possible for the system to stop slaving exactly 180 degrees from the correct heading. If this should occur, move the "Slave" switch on the KA 51A or KA 51B to the unslaved (free) position. Rotate the compass card ±10 degrees from the incorrect heading by using the manual rotation switch and then return the system to slaved operation. The system will then slave to the correct heading.

4. For free gyro operation, check the magnetic compass to determine the correct magnetic heading. Then use the manual slave switch to align the system with the earth's magnetic field. Periodic checks with the standby compass are recommended to check and correct for gyro precession.

5. Until a usable navigation signal is being received by the NAV system, a red flag labeled "NAV" will be visible in the upper left quadrant of the KI 525A Indicator. In operation, this warning flag should be visible whenever an inadequate navigation signal is being received.

6. For normal navigation to or from a VOR or VORTAC, set the NAV receiver to the desired VOR or VORTAC frequency and the red navigation flag (NAV) should disappear from view if a usable signal is being received.

7. Rotate the course select knob to position the course pointer to the desired VOR course.

8. The VOR deviation bar represents the selected course, and the relationship of this bar to the symbolic aircraft in the center of the instrument visually presents the actual relationship of the selected course to your aircraft heading. (In other words, if the symbolic aircraft on the display indicates approaching the deviation bar at 45 degrees, that is the angle at which your aircraft is actually approaching the selected course.)

9. To prepare for an ILS approach, tune the NAV receiver to the desired Localizer frequency. If a usable Localizer signal is being received, the NAV warning flag will disappear.

10. For a front or back course approach, rotate the course select knob to set the course pointer on the inbound Localizer course. As with normal navigation (#6 above), the LOC deviation bar represents the desired course. The relationship between this bar and the symbolic aircraft gives a true picture of your aircraft's position with respect to the Localizer course. Always setting the course pointer to the inbound Localizer course provides the correct deviation bar sensing whether flying a front or back course approach.

11. The glideslope deviation pointers should become visible on both sides of the display when a usable glideslope signal is received. If they do not come into view, a usable glideslope signal is not being received.

12. The glideslope pointers indicate the relative position of the glideslope path with respect to the aircraft. (In other words, if the pointers are above the center marker, the aircraft is below the glideslope.)

Abnormal Circumstances

If the Warning Flag (HDG) appears during operation, the compass card indications will be in error. Power may be removed from the KG 102A Directional Gyro by pulling the appropriate circuit breaker. The Selected Course, VOR/LOC Deviation Bar, the NAV flag, and the To/From Indicator will remain in operation.

If the Navigation Warning Flag (NAV) appears during operation, there are several possibilities: (1) the NAV receiver is not turned on, (2) the NAV receiver is improperly tuned, (3) the ground VOR or LOC station is malfunctioning, (4) the aircraft is out of range of the selected ground station, (5) the aircraft NAV receiver has malfunctioned, (6) if in RNAV mode the DME has malfunctioned. (The compass card will continue to display the aircraft heading even if a usable NAV signal is not being received.)

If the glideslope pointers remain out of view during a front course ILS approach, either the aircraft glideslope receiver or the ground station glideslope transmitter is malfunctioning. Glideslope is usually not available during a back course approach. (The VOR and LOC course display will continue to function normally even if a usable glideslope signal is not being received.)

A continuous large deflection of the slaving meter or large discrepancies between the magnetic compass and the KI 525A compass card may indicate a failure in the slaving system. If a slaving failure should occur, the Slave/Free Switch should be moved to select the free gyro mode. Then, by using manual clockwise or counterclockwise corrections, the compass card can be rotated to the correct heading as indicated on the standby compass. The KCS 55A system should continue to function normally except the heading information will be solely derived from the KG 102A Directional Gyro. There will be no automatic heading correction and periodic adjustments must be made manually to correct for precession by reference to the standby magnetic compass, as with any directional gyro.

NOTE: It is desirable to disconnect the autopilot under the following conditions:

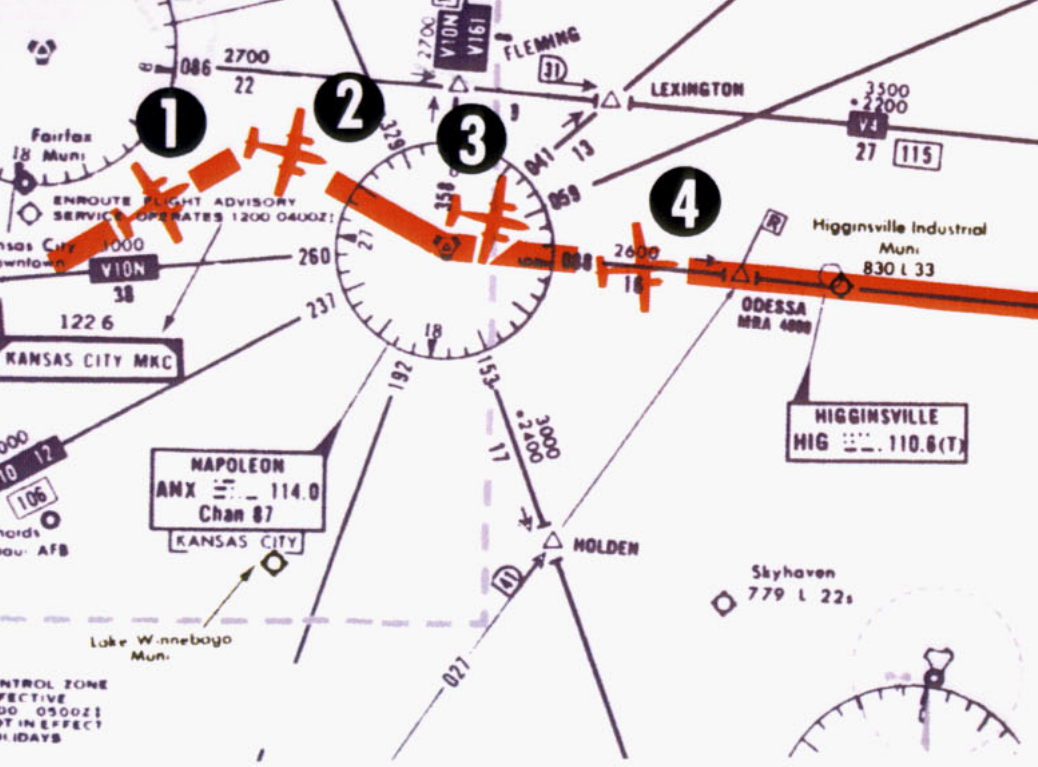
1. HDG flag comes into view.
2. System is in fast slave.
3. During manual slaving.

The system has the capability to supply the autopilot with an automatic disconnect signal under these conditions.

NOTE: For system limitations in your particular aircraft type, refer to your Flight Manual Supplement.

FLIGHT PROCEDURES WITH THE KCS 55A

The next few pages depict a normal flight departure from MKC enroute to STL via Victor Airway V-12. (The charts shown here are for illustration purposes only, not to be used for navigation.) Careful study of these photographs of the KI 525A PNI should give you a better idea of how simple and comprehensive the display is.







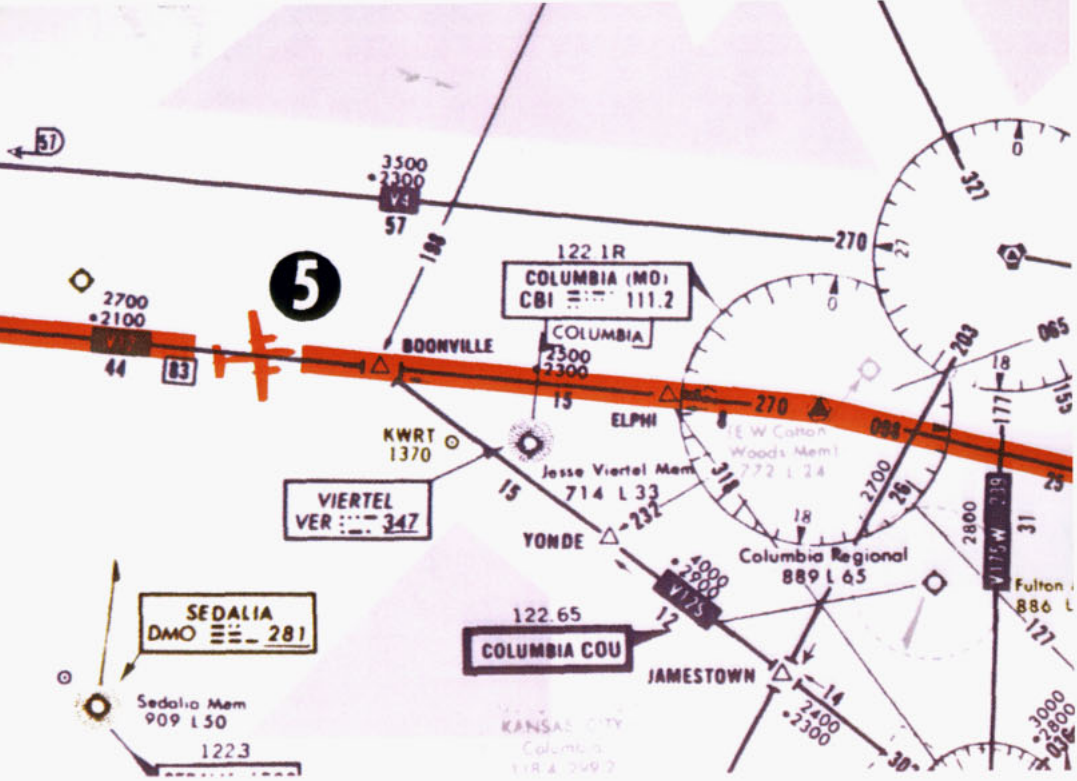
1.

Vectors to Intercept a Radial

After takeoff from Kansas City, we select a heading of 060 degrees with the heading bug to intercept the 110 degree course to Napoleon (ANX) VOR. Selected course pointer is set on 110 degrees with the course knob. The KI 525A Pictorial Navigation Indicator conveniently and accurately displays the intercept angle.

2.

The VOR deviation bar begins to center as we approach the 110 degree course to Napoleon. The KI 525A PNI makes it possible to intercept the new course smoothly, without overshooting or bracketing. One method of doing this is to adjust your heading so that the top of the deviation bar always touches the lubber line. As your aircraft heading approaches the new course, the deviation bar will swing towards the center and the angle of intercept will decrease.









3.

Turn to Intercept a Victor Airway

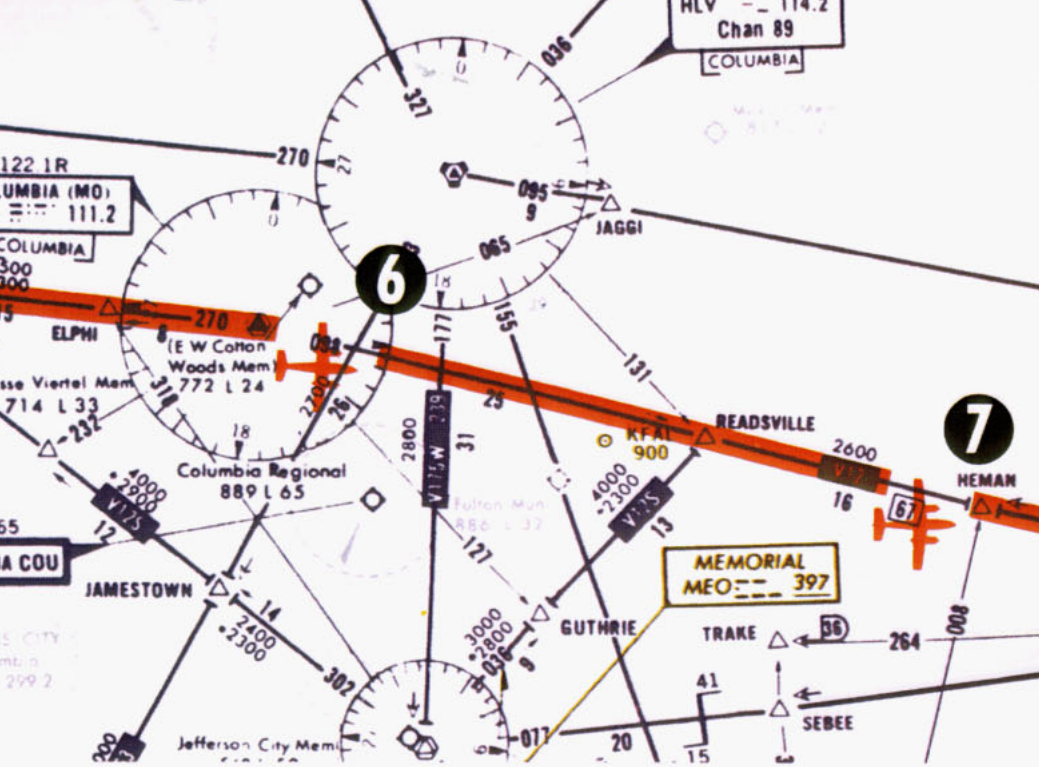
The "TO" indicator starts to swing to "FROM" as you fly over the Napoleon VORTAC station. At this time, set the selected course pointer on the V-12 course of 088 degrees. As you begin your left turn to track V-12, notice that the KI 525A PNI continuously displays an accurate picture of the relationship between your aircraft and the ANX 088 degree radial. Once again, you can make a precise, coordinated course interception by adjusting your heading to keep the top of the deviation bar touching the lubber line.

4.

When the deviation bar is centered and aligned with the course arrow, you are on course. Notice that correction for wind drift - in this case, a 080 degree heading on a 088 degree course - is completely automatic as long as you keep the deviation bar centered.

5.

About midway between Napoleon and Columbia (CBI), you switch to the CBI VOR and the TO/FROM indicator immediately swings to "TO". Also note the course arrow should be moved from 088 degrees to 090 degrees which is the V-12 inbound course to CBI.





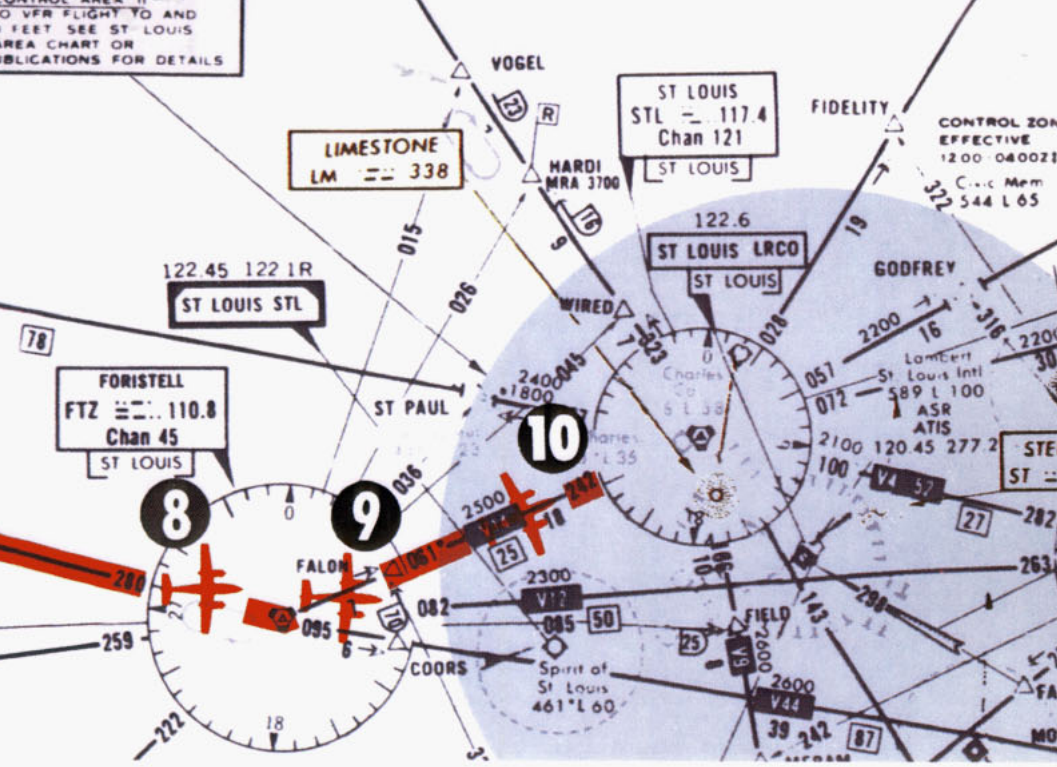


6.

As you fly over the Columbia station, the TO/FROM indicator changes to "FROM". Since the outbound course for V-12 from Columbia to Foristell (FTZ) is 098 degrees, you now set the selected course pointer on 098 degrees and fly to keep the deviation bar centered.

7.

Near the Heman intersection you switch to Foristell VORTAC and move the course arrow to 100 degrees, which is the V-12 inbound course to FTZ. The TO/FROM indicator changes to "TO".









8.

Airway Interception

Your clearance is V-12 to Foristell, then V-14 to the St. Louis (STL) VORTAC, direct Lambert Field. Approaching the FTZ station, the heading bug is on 100 degrees as a reference for the V-12 course or as heading command for the autopilot, is used. Select the St. Louis VORTAC on the NAV receiver and set the course pointer on the STL 062 degree course.

9.

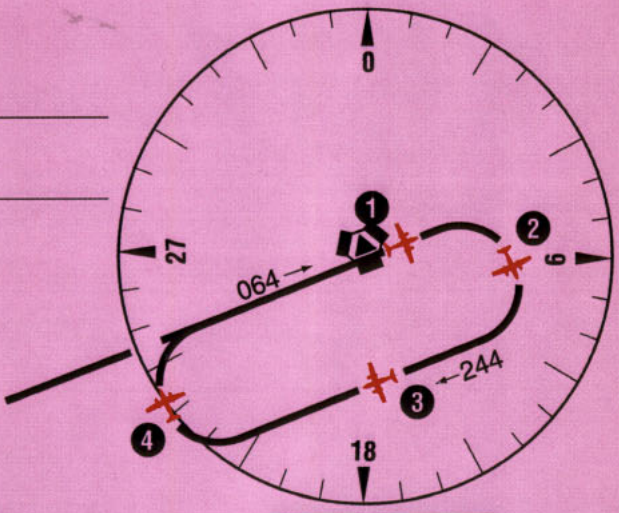
As you cross the Foristell VORTAC, the deviation bar will align with the course arrow. Now set the heading bug to 062 degrees and turn left to follow V-14 to the STL VORTAC.

10.

You are now established on V-14, flying to the STL VORTAC. Once again, if you fly to keep the deviation bar centered, correction for wind drift will automatically be accomplished.

NOTE: For system limitations refer to your Flight Manual Supplement.

HOLDING PATTERN







1. Approaching the STL VORTAC, the controller asks you to hold southwest of the VORTAC on the 244 degree radial, right turns. You are now over the station with a 064 degree course selected (the TO/FROM indicator has swung to "FROM"). Set your heading bug to the reciprocal or outbound heading of 244 degrees for easy reference and begin your right turn holding pattern.

2. Halfway through the outbound turn, the KI 525A display shows the deviation bar behind the symbolic aircraft. You know, therefore, that you must eventually fly back to the radial in order to be on course during the inbound leg of the holding pattern.



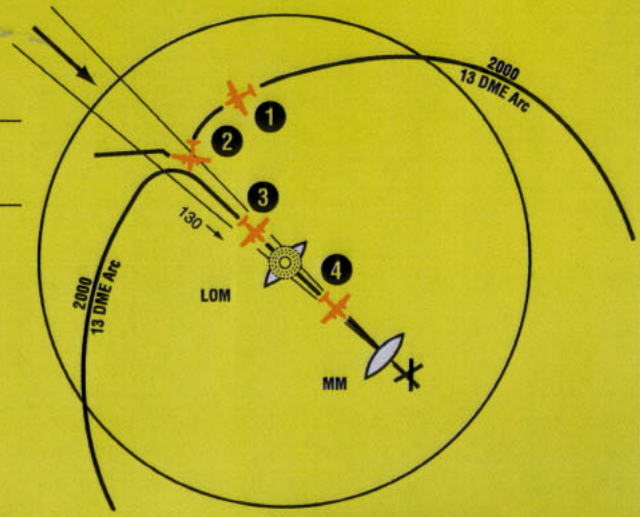


3. Outbound, you are using the heading bug as a reference for 244 degrees. The 244 degree radial is off the right wing and parallel to your outbound course.

4. Halfway through your turn to the inbound 064 degree course, the KI 525A shows the symbolic aircraft approaching the deviation bar at a right angle. By keeping the top of the deviation bar on the lubber line, you can complete your turn and roll out precisely on course.

   NOTE: For system limitations refer to your Flight Manual Supplement.

ILS APPROACH - FRONT COURSE







1. You are vectored from the holding pattern to the 13 DME arc. The aircraft is turning, with the heading bug set on 170 degrees to intercept the localizer. You have already set the selected course pointer on the inbound ILS course 130 degrees and the KI 525A shows the localizer course is directly ahead. The glideslope pointers came into view when the ILS frequency was tuned, since a usable glideslope signal is being received.

2. Capturing the ILS course can be accomplished without overshooting or bracketing with the same technique you used in intercepting an enroute course. Simply keep the top of the deviation bar on the lubber line and coordinate your turn until the bar is centered with the course arrow. Each dot on the LOC deviation scale represents 1/2 a degree of deviation when tuned to an ILS frequency.





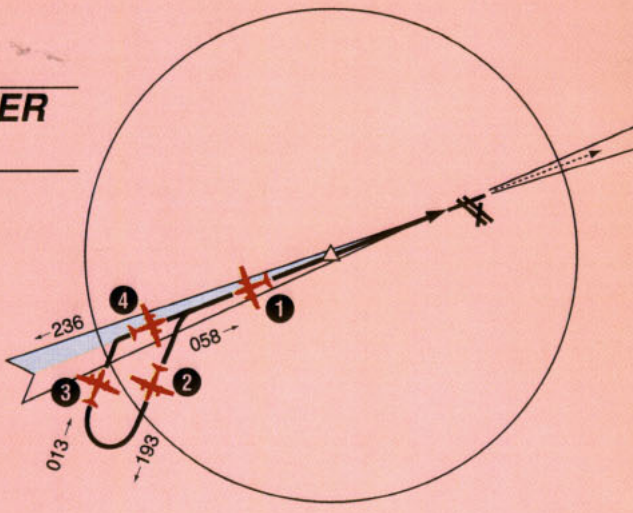
3. The KI 525A shows you that you have intercepted the localizer course. The glideslope pointers have started to center, although the display indicates your aircraft is still below the glidepath at this point.

4. You are now centered on the localizer and the glideslope. Once again, the KI 525A shows your aircraft is crabbed about 5 degrees to the right to maintain the localizer course.

NOTE: For system limitations refer to your Flight Manual Supplement.

REVERSE LOCALIZER APPROACH - (BC)

If a back course approach is required, it can be accomplished as easily as a front course approach. The course arrow should always be set on the front course inbound localizer course. This will result in conventional pictorial deviation sensing even on back course. The KI 525A display gives you an accurate picture of where you are at all times during the approach and procedure turn.





1. You are outbound on the back localizer course, having already set the course pointer to the inbound front course at 238 degrees. The heading bug is preset at 193 degrees for the procedure turn. (Since there is usually no glideslope signal on a back course, the glideslope pointers are out of sight.)



2. During the procedure turn outbound, the deviation bar shows pictorially that the aircraft (as represented by the symbolic aircraft in the center of the KI 525A) is flying away from the localizer centerline at a 45 degree angle when the heading bug is under the lubber line. Note that left-right deviations of the course bar give "fly-to" indicators, just as on the front course.



3. Now you've reset the heading bug to 013 degrees and made a 180 degree turn to this heading. This 013 degree heading will intercept the back course. The KI 525A clearly pictures the course you are to intercept and the angle of interception.



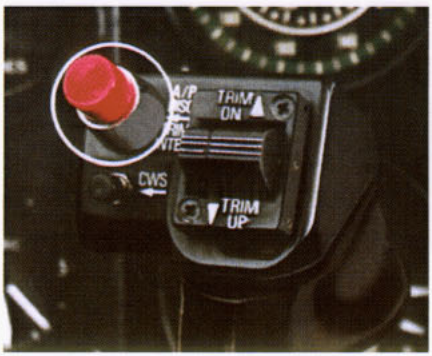
4. You have smoothly intercepted the back course. Since the course arrow is set on the front course (238 degrees), the KI 525A shows a true picture of the situation - flying inbound on the back course. You may reset the heading bug to 058 degrees for easy reference.

NOTE: For system limitations refer to your Flight Manual Supplement.

GENERAL EMERGENCY PROCEDURES

1. Disengage AP/Yaw Damp
   a. Simultaneously regain control of aircraft and hold down Autopilot Disconnect/Trim Interrupt button.
   b. Pull A/P circuit breaker.
   c. Release A/P Disconnect/Trim Interrupt button.
2. The following conditions will cause AP to automatically disengage:
   a. External power failure.
   b. Actuating manual electric trim.*
   c. Internal Flight Control System failure.
   d. With KCS 55A system, a loss of compass valid (displaying HDG flag) disengages the AP and FD when a mode using heading information is engaged. With compass flag present, only FD and vertical modes can be selected.
3. Engine Failure in Multi-engine Aircraft (Coupled)
   a. Simultaneously control aircraft and hold down Autopilot Disconnect/Trim Interrupt button.
   b. Release button.
   c. Follow basic Airplane Flight Manual single engine procedures.
   d. Airplane rudder and aileron axes should be manually trimmed prior to engaging autopilot for single engine operations.

CAUTION: Exact Emergency Procedures vary from aircraft to aircraft because of differences in electrical systems, instrument arrangements and flight characteristics. Consult the Flight Manual Supplement for your particular aircraft for detailed instructions on emergency procedures.



*If Trim Circuit Breaker has been pulled, M.E.T. switch will not disengage A/P.

NOTES

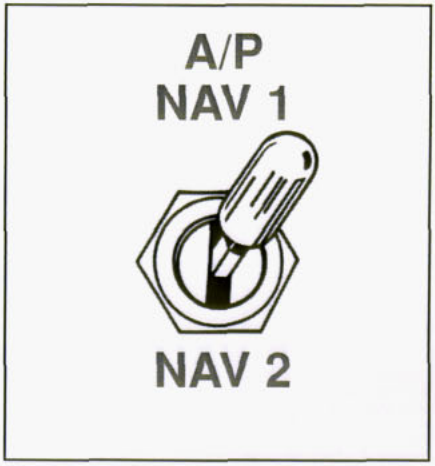
OPTIONAL NAV 1/NAV 2 SWITCHING

It is possible to obtain an optional NAV 1/NAV 2 switching system for the KFC 150, KAP 150 or KAP 100 to allow the autopilot to fly sensor information from either the Number 1 VOR/ILS/RNAV navigation radio or the Number 2 VOR/ILS/RNAV navigation radio.

With the switch installed on the cockpit panel, the pilot merely flips the switch if he wants to have the autopilot fly information from the Number 2 radio. This may be particularly helpful if either the Number 1 or Number 2 radio should fail.

When installed with a 100 series flight control using the KCS 55A compass system, a special status KI 525A PNI and a special status CDI are required. When using the number 2 system always set the OBS to the desired course. This includes setting the front course heading for either ILS Front or Back Course approaches.

When installed with a 100 series flight control using the KG 107, no special status CDI's are necessary.



NOTES

SYSTEM WEIGHT AND POWER REQUIREMENTS

	Weight		Volt/Amps
	(lbs)	(kgs)	
KAP 100 (with KG 107)	10.93	4.96	14/3.1 28/1.6
KAP 100 (with KCS 55A)	17.73	8.04	14/6.1 28/3.2
Additional for Manual Electric Trim	3.40	1.54	14/1.0 28/0.5
KAP 150 (with KG 107)	18.05	8.19	14/5.1 28/2.5
KAP 150 (with KCS 55A)	24.85	11.27	14/8.1 28/4.1
KFC 150	25.25	11.45	14/8.7 28/4.4
Additional for 3rd axis* (yaw damper)	4.49	2.04	14/2.2 28/1.1
Additional for Altitude/ Vertical Speed Preselect	3.00	1.32	14/0.5 28/0.4

*To add 3rd axis to a system without KCS 55A, additional AC power (inverter) is required.

In keeping with Honeywell's policy of continual product improvement, design and specifications described herein may be altered without notice.

BENDIX/KING WARRANTY SERVICE

Warranty service for your Bendix/King KFC 150, KAP 150 or KAP 100 is available at hundreds of Bendix/King Authorized Sales and Service Centers throughout the world. These Authorized Service Centers are carefully selected for their technical competence and total support capabilities. Each is specially equipped and trained to insure that the highest standards in customer service are maintained.

Only these qualified Bendix/King Sales and Service Centers are authorized to perform a warranted installation of your Bendix/King system—or to provide service under the Bendix/King Warranty.

Upon completion of your aircraft's flight control installation, you will be provided with a warranty information packet which lists the model, serial number and warranty expiration date for each unit of Bendix/King equipment installed.

This Bendix/King warranty is honored by Bendix/King Service Centers throughout the world. Keep your Bendix/King Warranty packet in your airplane at all times to verify your warranty status at any Bendix/King Service Center. It's your key to outstanding warranty service protection.

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