

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.

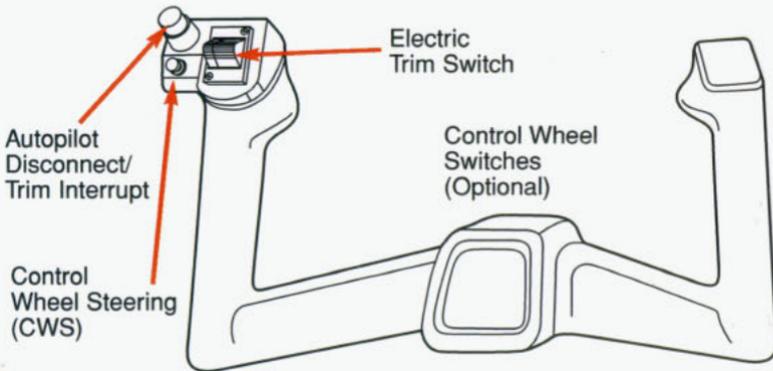
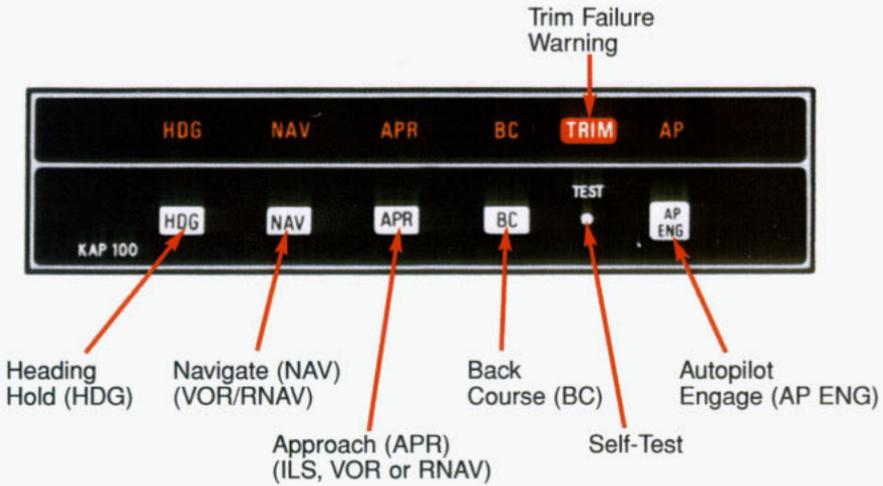
The KAP 100 is capable not only of flying the aircraft in a wings level attitude, but also of intercepting and tracking headings and courses. It can fly all of the lateral modes flown by the KAP 150 including heading hold (HDG), NAV (NAV), approach (APR) and back course (BC).

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.

OPERATING THE KAP 100 SYSTEM

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.)

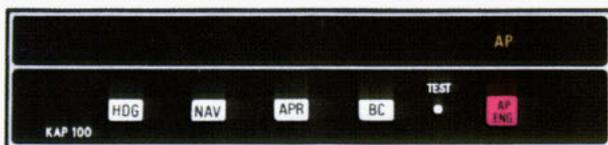
*On systems with King manual electric trim only.

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.

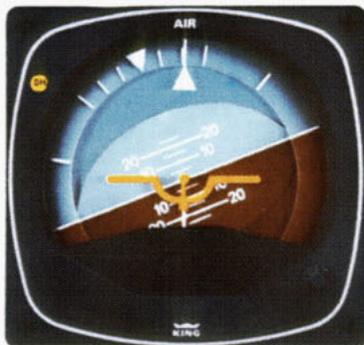
NOTE: For system limitations refer to the Flight Manual Supplement for your particular aircraft.



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.

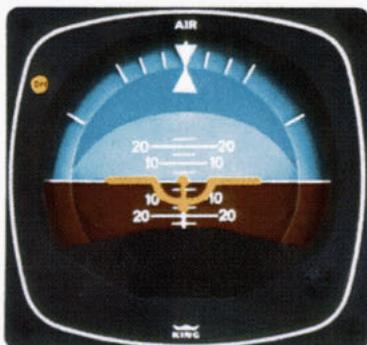
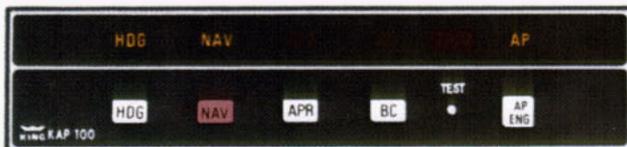


(1)



(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):

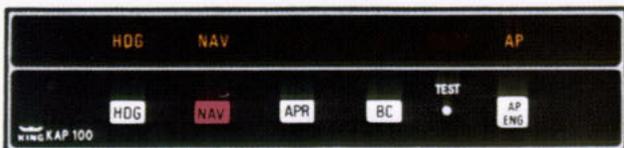
1. Tune the frequency for the selected VOR (or VORTAC) station. For RNAV, set in the waypoint distance and VOR-TAC radial.
2. Set the OBS to the desired course.
3. Depress the NAV button on the KC 190. (HDG will remain illuminated and NAV will flash to signify that the NAV mode is armed.)

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.

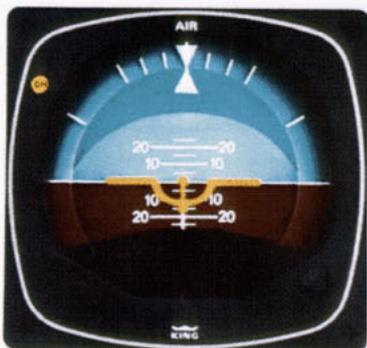
5. The autopilot will fly the selected heading until entering the capture zone,* then turn to intercept the selected course. The HDG light will go off and the NAV light will illuminate steadily as the NAV mode goes from arm to engage.
6. The autopilot will bank as necessary to maintain course.

*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):

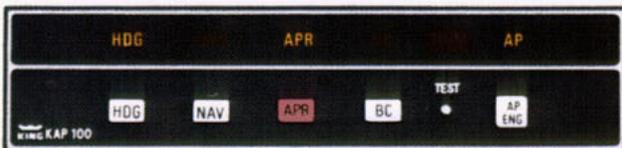
1. Tune the frequency for the selected ILS, VOR or RNAV approach.
2. Set the OBS to the final approach course (front course for ILS even when flying a reverse course approach).
3. Check the heading displayed on the KG 107 against the magnetic compass and reset if necessary.
4. Depress the "APR" button 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

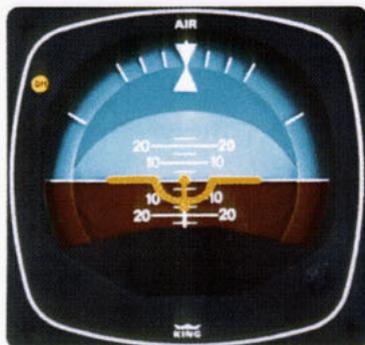
The approach (APR) mode allows the autopilot to intercept and track ILS (localizer only), VOR and RNAV courses. To operate in the APR mode:

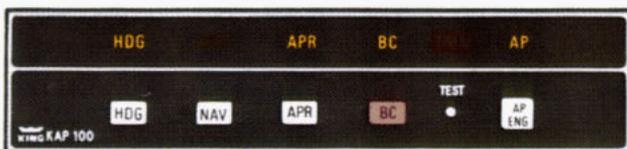
1. Tune the frequency for the selected ILS, VOR or RNAV approach.
2. Set the final approach course on the KI 525A PNI.
3. Establish the desired intercept angle by setting the heading "bug" on the intercept heading and activate the HDG mode.
4. Depress the "APR" button on the KC 190 (APR light will flash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



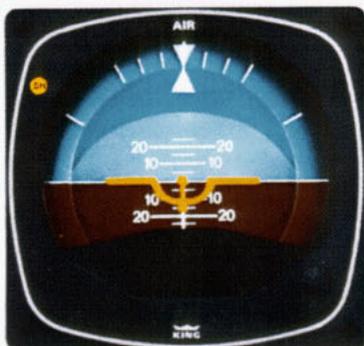
BACK COURSE (BC) MODE USING THE OPTIONAL KI 525A PNI

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

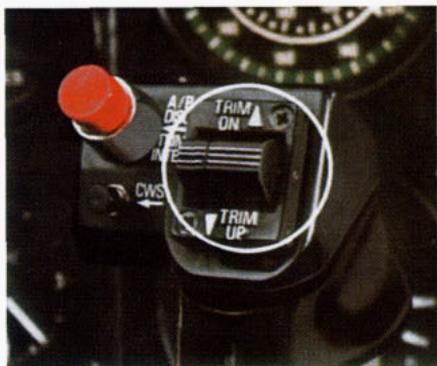
1. Tune the frequency for the selected ILS back course.
2. BE CERTAIN TO SET IN THE ILS FRONT COURSE EVEN THOUGH YOU WILL BE FLYING A RECIPROCAL HEADING ON AN ILS BACK COURSE APPROACH. FOR EXAMPLE, A BC APPROACH MIGHT HAVE A FRONT COURSE OF 090 DEGREES WHICH YOU WILL SET IN AS YOU FLY A BACK COURSE HEADING 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)

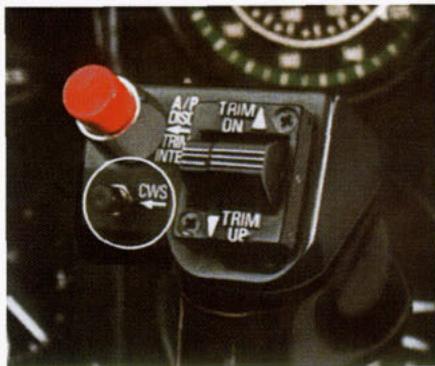


5. The autopilot will fly the selected heading until entering the capture zone, then turn to intercept the course. The "HDG" light will go off and the "APR" light will illuminate steadily as the BC mode goes from arm to engage.
6. The autopilot will bank as required to maintain course. Automatic crosswind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

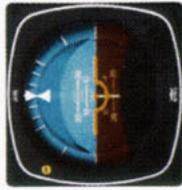
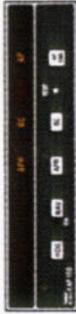
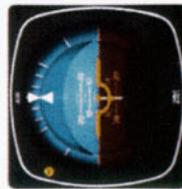


CONTROL WHEEL STEERING (CWS) MODE (OPTIONAL)

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.



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.

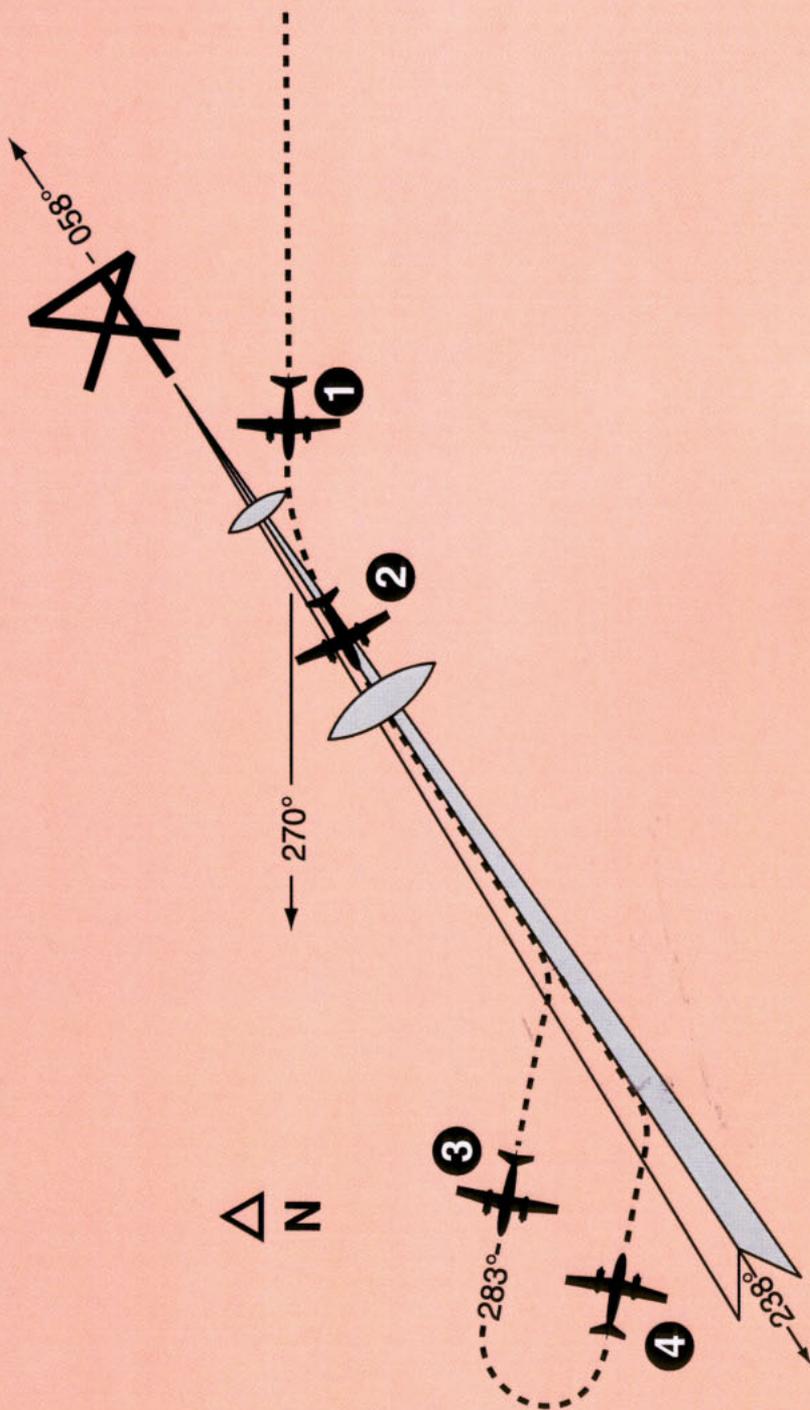
2. When the computed capture point is reached, HDG mode is cancelled and approach mode is automatically activated and a left turn outbound on the localizer is initiated by the autopilot. Note that the left-right deviations of the CDI course deviation needle are reversed (you must turn right to center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

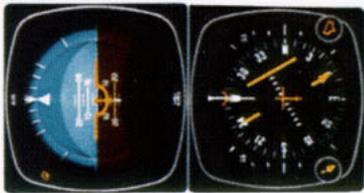
3. During the procedure turn outbound, the CDI course index goes off scale to the right. The aircraft is flying away from the localizer centerline at a 45 degree angle on a selected heading of 283 degrees.

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.

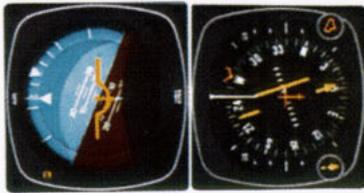
*Check the heading displayed on the KG 107 against the magnetic compass and reset if necessary.

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

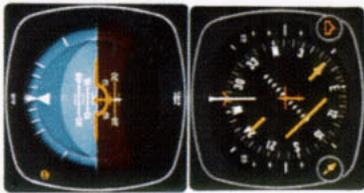




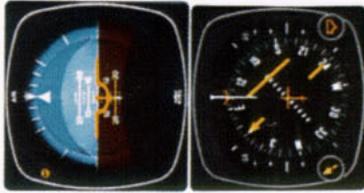
1. The aircraft is heading 270 degrees with heading (HDG) mode and autopilot (AP) engaged. To intercept and fly the ILS front course outbound, set the front course on the PNI and depress the approach (APR) button and the reverse course (BC) button (or just the BC button alone). The back course (BC) mode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



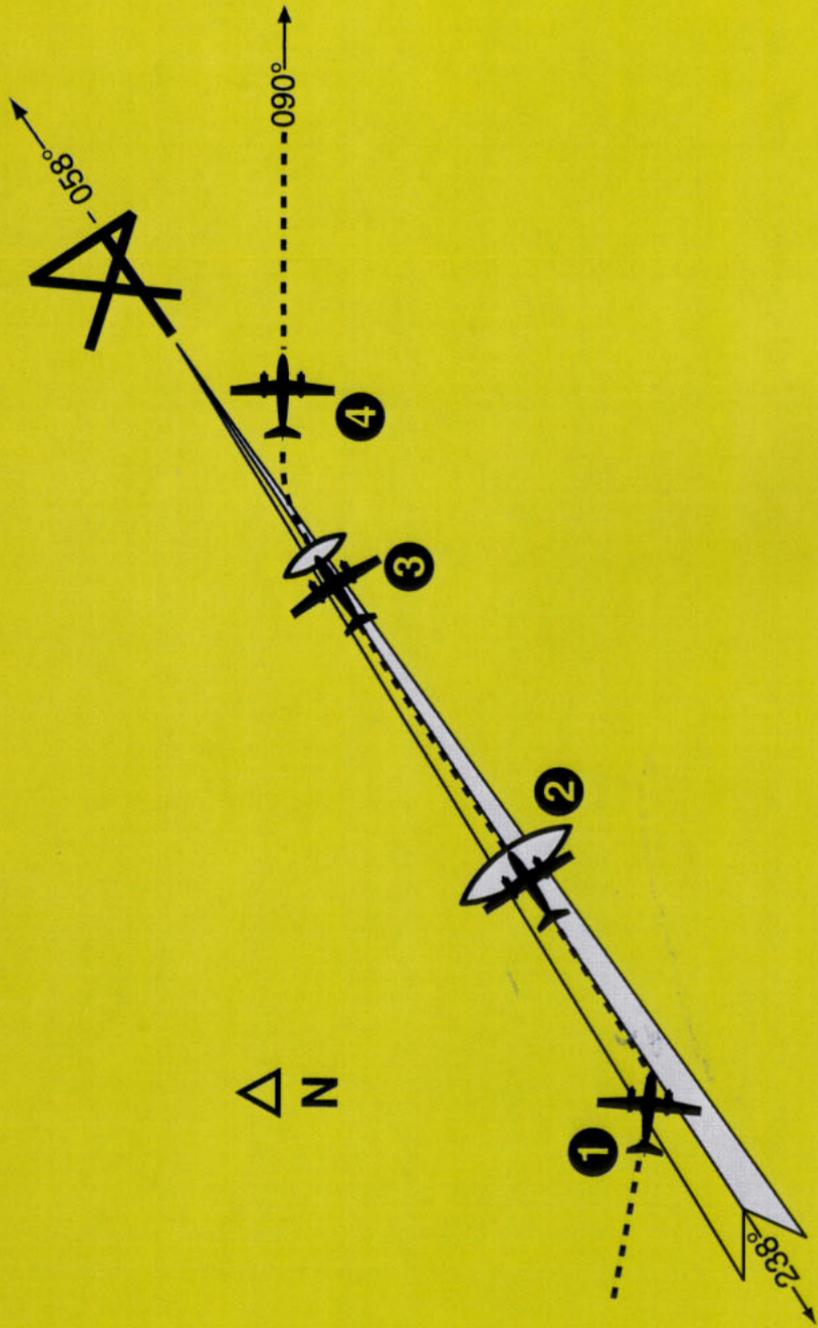
2. When the computed capture point is reached, HDG mode is canceled and approach mode is automatically activated and a left turn outbound on the localizer is initiated by the autopilot. Note that the left-right deviations of the PNI course needle operate just as though you were flying a front course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

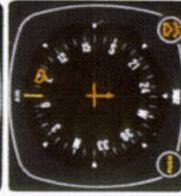
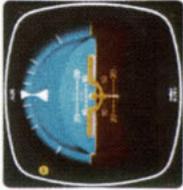
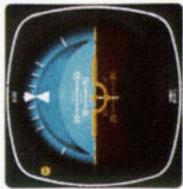
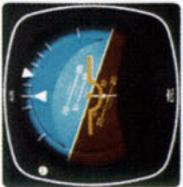


3. During the procedure turn outbound, the deviation bar shows pictorially that the aircraft is flying away from the localizer centerline at a 45 degree angle on a selected heading of 283 degrees.



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.





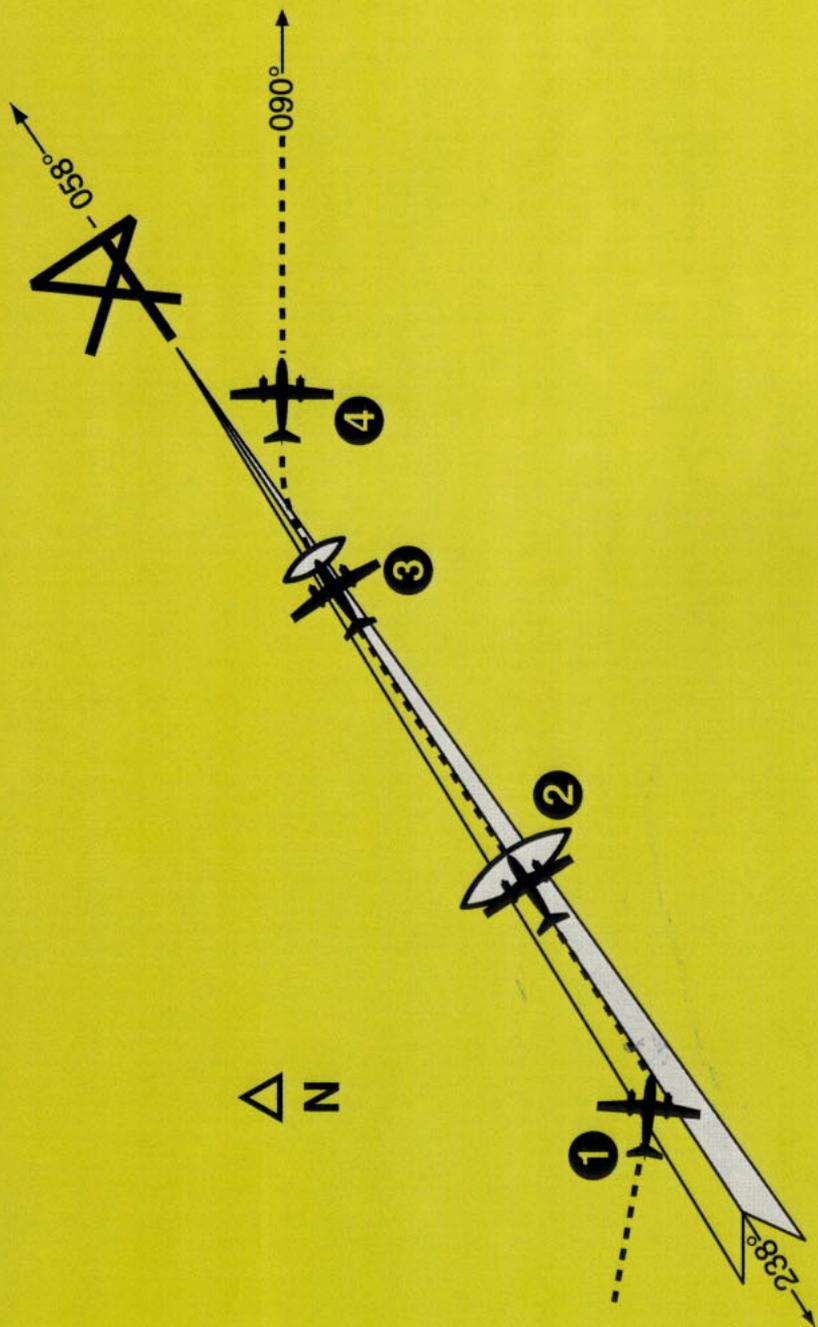
1. Continuing the maneuver on page 77, APPR coupling occurs ("APR" light comes on steady, "HDG" light goes off). The autopilot will roll the aircraft out on localizer and the course index will center.

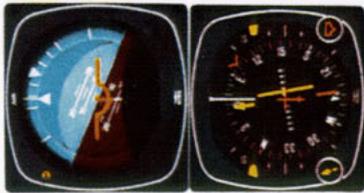
2. The autopilot is following the localizer. At the outer marker, the glide slope deviation needle is at midscale. The autopilot will make bank changes as necessary to maintain localizer (glidepath is manually maintained by the pilot).

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.

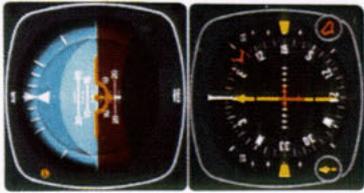
4. The heading "bug" has been set to the missed approach heading, 090 degrees. Engaging the autopilot and activating the "HDG" mode causes the autopilot to commence a right turn to a heading of 090 degrees. Pitch attitude during climbout is manually controlled by the pilot.

Front Course ILS Approach (KI 525A)

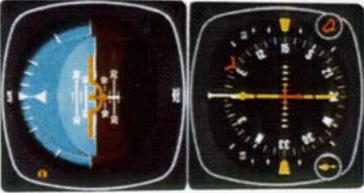




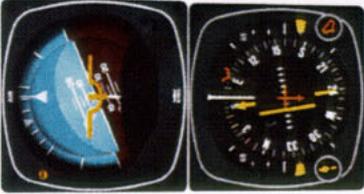
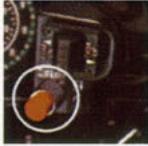
1. Continuing the maneuver on page 79, APR coupling occurs ("APR" light comes on steady, "HDG" light goes off). The autopilot will roll the aircraft out on localizer and the course index will center.



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

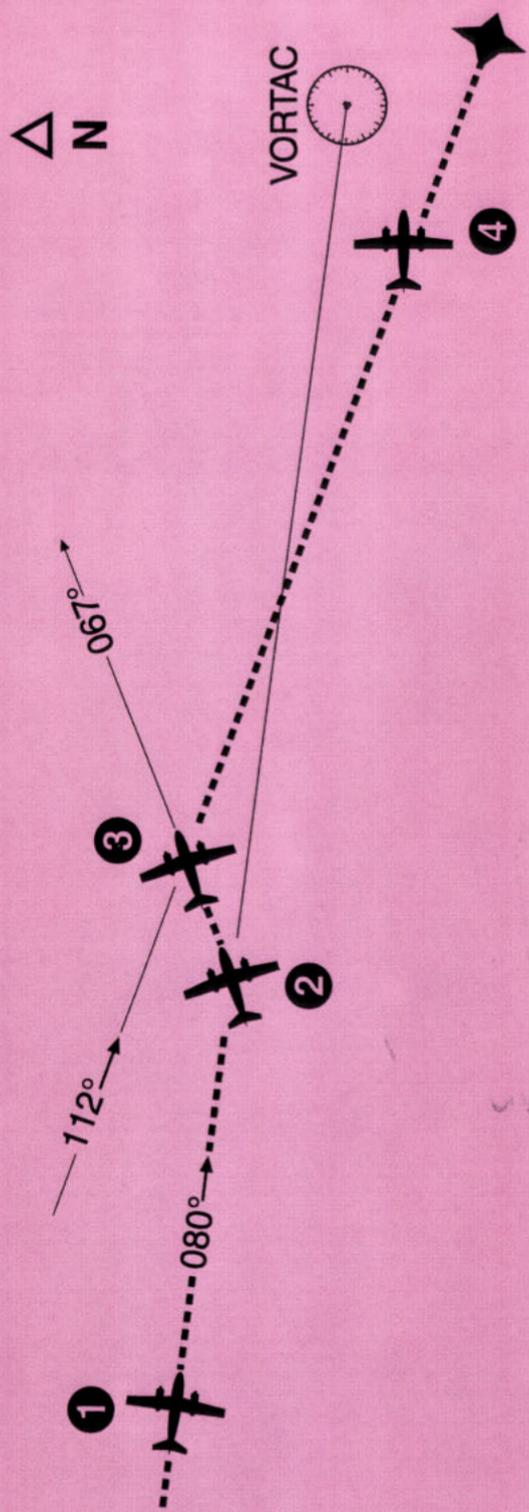


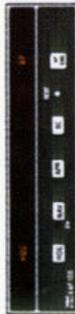
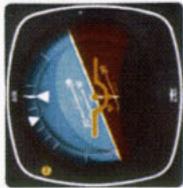
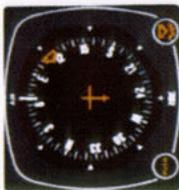
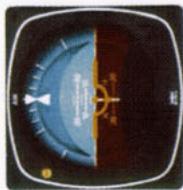
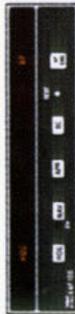
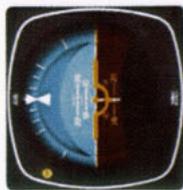
3. At the middle marker, the autopilot is disconnected with the button on the KC 190 (or on the control wheel if equipped with the optional King manual electric trim). This cancels all operating autopilot modes. The pilot initiates a missed approach.



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.





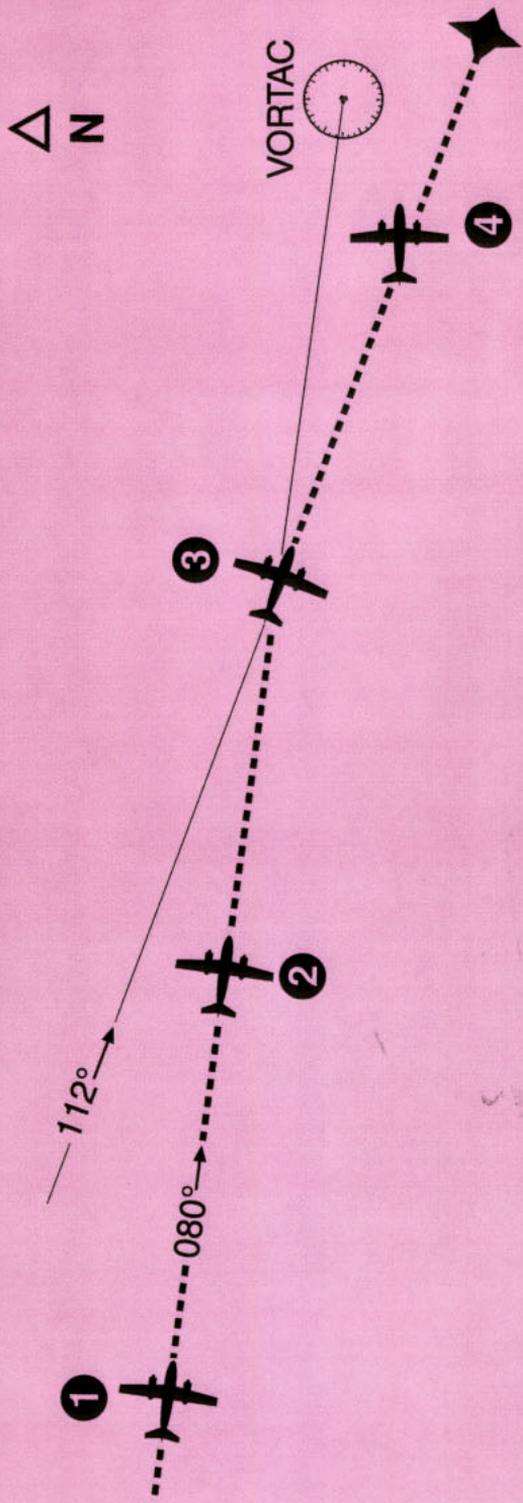


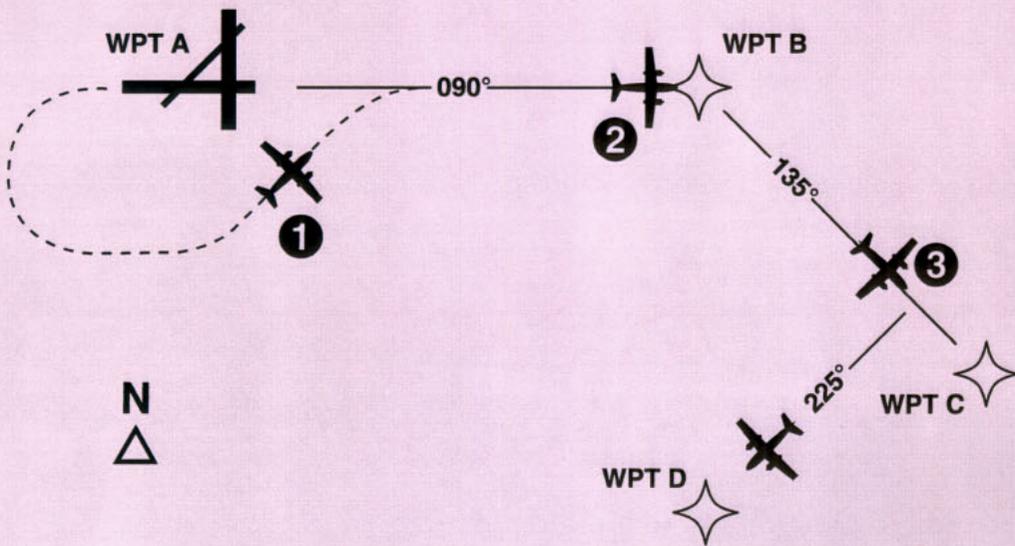
1. The aircraft is flying an OMNI airway in HDG mode on a heading of 080 degrees.

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.





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.