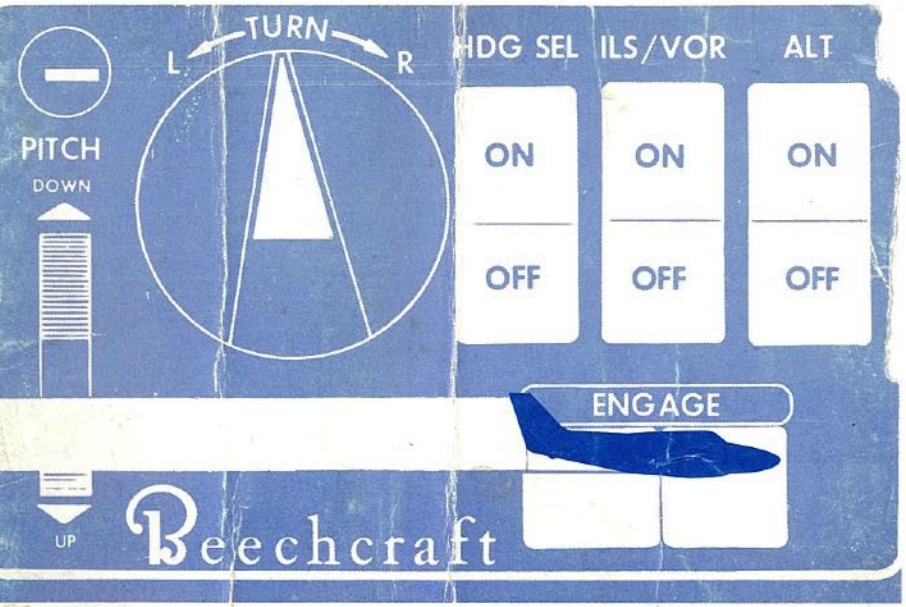

BEECH AIRCRAFT CORPORATION
WICHITA, KANSAS 67201
U.S.A.

Beechcraft® H-14

OPERATOR'S MANUAL

98-34350
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.ITHO USA

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INTRODUCTION

The H-14 Autopilot extends the utility of an aircraft by reducing pilot fatigue, by providing complete ILS, LOC and glideslope, VOR, and other IFR system capabilities, and by providing smooth, uniform control under all flight conditions.

When you fly with the H-14 you need only command and monitor a system that performs nearly every flight control task between takeoff and touchdown. You devote far less time to operating the airplane and more to other pilot functions, without relinquishing full control. With fewer overlapping tasks, your flight becomes noticeably easier and immeasurably safer.

H-14 FEATURES

ADAPTABILITY

Using advanced design principles, the H-14 Autopilot adapts itself to changing flight conditions. It automatically senses what the aircraft is doing, and adjusts its control authority to make every maneuver smooth and uniform.

SAFETY

In addition to comfort and convenience, the H-14 Autopilot provides a measure of safety above that offered by other autopilots. It has smooth manual override and safety interlock features which make manual take-over possible without disengaging the autopilot, and it adapts itself to maintain safe control authority under extreme flight conditions. During an engine failure, the autopilot maintains control of the aircraft while the pilot deals with the emergency. Manual retrimming can be done without disengaging the autopilot.

RELIABILITY

The reliability designed into the H-14 Autopilot increases the margin of safety even further. Demands on components are well below their specified operating limits. Design simplification has reduced the number of components and electrical circuits to a minimum.

H-14 COMPONENTS

SENSING ELEMENTS

DIRECTIONAL GYRO INDICATOR

The directional gyro indicator provides a gyroscopically stabilized visual-heading reference for the pilot and an electrical heading signal for the autopilot.

TURN AND BANK GYRO

The turn and bank gyro provides a visual indication of the direction of turn, rate of turn, and slip indication for the pilot. It also generates an electrical yaw rate signal for the autopilot.

ATTITUDE INDICATOR

The attitude indicator provides a visual bank and pitch reference for the pilot and electrical roll and pitch signals for the autopilot.

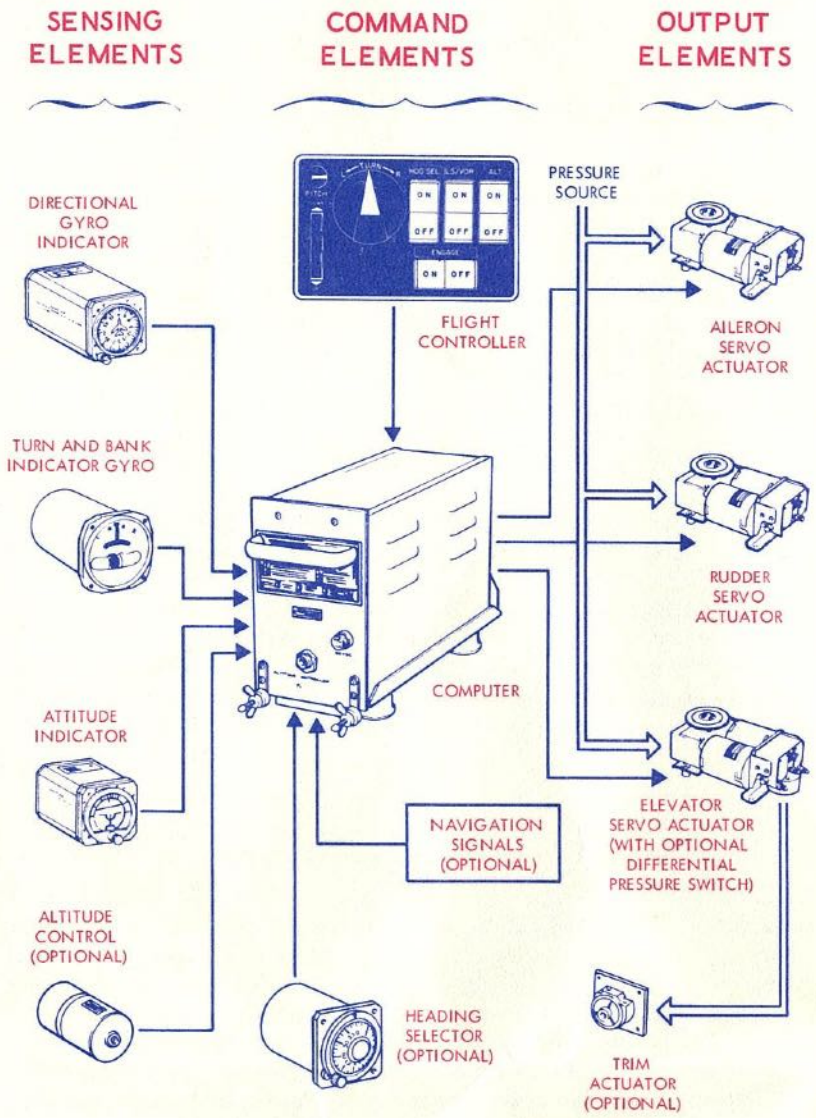
ALTITUDE CONTROL

The optional altitude control is mounted in the computer. It senses the barometric altitude of the aircraft and supplies an altitude hold signal to the computer. It is engaged by a switch on the flight controller.

COMMAND ELEMENTS

FLIGHT CONTROLLER

This integrally-lighted flight controller provides the controls which engage and operate the autopilot. These controls are: a turn command knob, switches to engage the various modes of operation, a pitch command wheel, and a pitch trim indicator which shows electrical mistrim before engagement and elevator mistrim after engagement.



The flight controller is available in both three- and four-switch versions. The four-switch controller is the same as the three-switch version except for the addition of a heading select switch. Also, the four switches are rearranged for pilot convenience.

HEADING SELECTOR

This optional unit supplies a selected heading command signal to the autopilot. It has a compass-marked dial and a knob which both adjusts the dial and switches the signal. For autopilots using the four-switch flight controller, the knob on the heading selector only adjusts the dial. The signal switching is performed on the flight controller.

COMPUTER

The computer utilizes information from the gyros, flight controller, heading selector, navigation receivers, or navigation systems to produce command signals which move the control surface servos. The computer is transistorized and most of its electrical components are mounted on easily removable plug-in cards.

OUTPUT ELEMENTS

SERVO ACTUATORS

The servo actuators are pneumatically powered by an aircraft pump or bleed air from a turbine engine. The servo actuators move the control surfaces in response to command signals from the computer. Overpowering of the servo causes air to compress. There is no mechanical clutch. Shear pins are also provided as an added safety feature.

TRIM ACTUATOR AND PRESSURE SWITCH

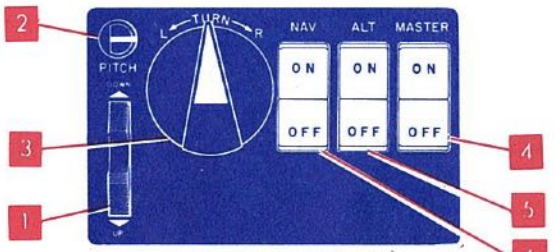
These optional units make up the automatic pitch trim system. The trim actuator is a pneumatically powered turbine which moves the elevator trim surface in response to pneumatic pressure supplied by the differential pressure switch. The differential pressure switch is mounted on the elevator servo actuator. It senses the need for trim changes and "switches" pneumatic pressure to the trim actuator.

OPERATION OF THE H-14

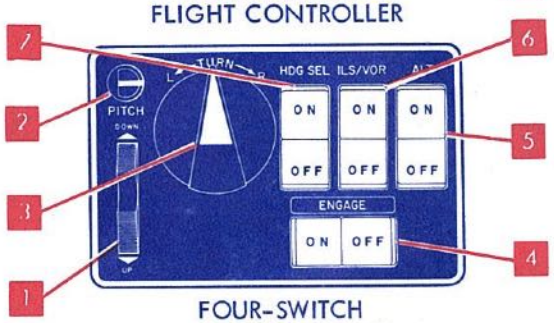
HEADING HOLD FUNCTION

OPERATING POWER

- The proper aircraft circuit breaker must be closed to provide power to the autopilot.
- As soon as the attitude indicator, directional gyro, and turn and bank indicator gyro have erected, the autopilot is ready for engagement on the flight controller.



THREE-SWITCH
FLIGHT CONTROLLER



FOUR-SWITCH
FLIGHT CONTROLLER

The numbers in the red boxes are used to identify the flight controller switches and controls when they are referred to in the following procedures.

ENGAGING

- Manually trim the aircraft.
- Adjust the PITCH command wheel 1 to center the PITCH trim indicator 2 .
- Place the TURN command knob 3 in its center detent.
- Push the MASTER (or ENGAGE) switch 4 to ON to engage the autopilot. (The autopilot can be engaged at any time after take-off.)
- When the autopilot is engaged, the autopilot will hold the heading being flown at the time of engagement if the TURN knob is centered.

Note

Heading hold is a basic function of the autopilot. All other heading functions will override it. These are: heading select, VOR coupling, localizer coupling, and turn command. After any of these is disengaged, the autopilot automatically reverts to heading hold.

DISENGAGING

Any of the following actions will disengage the autopilot:

- Pushing the control wheel autopilot-disengage button
- Pushing the MASTER (or ENGAGE) switch 4 to OFF
- Opening the aircraft circuit breaker controlling power to the autopilot

ALTITUDE HOLD FUNCTION

ENGAGING

- With the aircraft in level flight, push the ALT switch 5 to ON.
- The aircraft will maintain the altitude existing at moment of engagement.

Note

It is advisable to level the aircraft with the PITCH command wheel before engaging. Altitude hold can be engaged during a climb or descent, but the aircraft will level off slightly beyond the selected altitude, and at disengagement the aircraft will resume the climb or descent in effect at time of engagement.

DISENGAGING

Any of the following actions will disengage the altitude hold function:

- Commanding a pitch change using the PITCH command wheel 1
- Automatic engagement of the glide slope coupler
- Pushing the ALT switch 5 to OFF

MANEUVERING WITH THE AUTOPILOT

CLIMB OR DESCENT

Move the PITCH command wheel 1 UP or DOWN. The amount of PITCH wheel offset determines the rate of climb or descent.

TURNS

Turn the TURN command knob 3 left (L) or right (R). (The heading selector can also be used for turn control. See instructions for its use under NAVIGATING WITH THE AUTOPILOT.)

USE OF FLAPS AND LANDING GEAR

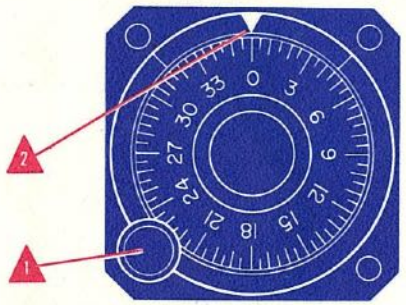
Gear and flaps may be used in the normal manner with the autopilot engaged. For smoothness of flight, operate the flaps in small increments.

TRIMMING (WHILE ENGAGED)

If the autopilot does not have the automatic pitch trim option, use the manual elevator trim to center the PITCH trim indicator 2 as necessary. The rudder may be trimmed for "ball-center" at any time.

NAVIGATING WITH THE AUTOPILOT

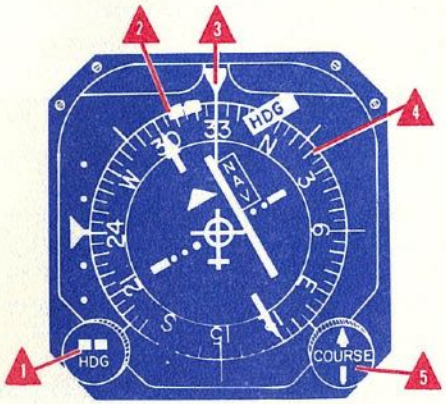
USING THE H-14 TYPE HEADING SELECTOR (CG136)



- Turn the heading selector knob 1 to position the desired heading at the index 2.
- Push the heading selector knob 1. (On systems with four-switch flight controllers, engage HDG SEL switch 7.) The aircraft will turn toward the heading and will roll out on the selected heading. The turn will not start until the heading selector knob is pushed so that the heading may be preselected in advance of engagement.
- Make heading changes by turning the heading selector to the desired heading. The aircraft will turn in the direction that the heading selector knob was turned.
- Any of the following actions will disengage the heading select function:
  - Move the TURN command knob 3 out of the center detent.
  - Push the NAV switch 6 to ON.
  - Pull the heading selector knob 1 out, or disengage HDG SEL switch 7 on four-switch flight controller.

USING A FLIGHT DIRECTOR TYPE HEADING SELECTOR (PN101, FD107, ETC.)

TYPICAL FLIGHT DIRECTOR



- Turn the HDG select knob 1 to position the heading select marker 2 over the desired heading on the compass card 4.
- Push the heading select switch on instrument panel or HDG SEL switch on four-switch flight controller. The aircraft will turn toward the selected heading. As the aircraft turns, the heading select marker 2 and compass card 4 will rotate. The autopilot will roll the aircraft to level flight when the heading select marker 2 and the compass card 4 heading selected are directly under the lubber line 3. The turn will not start until the heading select switch is energized so that the heading may be preselected in advance of engagement.
- Make heading changes by turning the HDG select knob 1 to the desired heading. The aircraft will turn in the direction the HDG select knob 1 and the heading select marker 2 are turned.
- Disengagement of the flight director type heading selector is the same as for the H-14 type heading selector (CG136).

USING VOR COUPLING

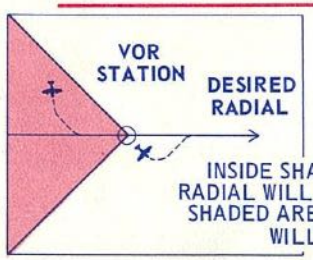
Before using, determine how your autopilot is coupled to the various types of systems. There are four variations of VOR couplings as follows:

1. VOR coupling with H-14 type heading selector (CG136)
2. VOR coupling without heading select capability
3. VOR coupling with flight director with heading select and course select
4. VOR coupling with flight director with course select only (course datum)

When using, do not attempt to make an intercept to an omni radial when within 20 miles of the station if more than a full scale VOR needle deflection exists and you are within 10 degrees of the selected radial.

During the intercept course of a VOR approach, the aircraft will follow an autopilot computed course which may be different than the course computed for the navigation system display. After bracketing, the autopilot will hold the aircraft on the course indicated by the navigation system display.

If actual aircraft heading is away from VOR and lateral offset from selected radial is maximum (5 dots), bank angle during initial bracketing turn may exceed 24 degrees but will not exceed 45 ± 5 degrees.



INSIDE SHADED AREA, THE INBOUND RADIAL WILL BE INTERCEPTED. OUTSIDE SHADED AREA, THE OUTBOUND RADIAL WILL BE INTERCEPTED.

1. Using VOR Coupling with H-14 Type Heading Selector (CG136)

A. Tune the navigation receiver to the desired VOR station.

B. Set the OMNI BEARING SELECTOR (OBS) and the heading selector (disengaged) to the desired radial heading.

C. Push NAV switch 6 to ON to engage VOR coupler. The autopilot will turn towards the heading set on the heading selector and OBS (this may turn aircraft away from the desired radial initially). The autopilot will then turn the aircraft to make an intercept on the desired radial (intercept angle may be as much as 45 ± 5 degrees). The aircraft will roll out on the selected radial and track inbound toward the VOR station. (The bank angle after the initial bank will be 5- to 10-degrees while the intercept angle is being established.)

D. When over the VOR station, the aircraft will bank smoothly in each direction and will continue to track outbound on the selected radial. The VOR coupler does not disengage automatically.

E. To track a different radial outbound, proceed as follows:

- If within a 30-degree heading change, set the heading selector and the OBS to the new radial heading. The aircraft will turn to assume the new track.
- If greater than a 30-degree heading change, use the TURN command knob 3 to turn the aircraft to the desired heading. Set the OBS and the heading selector to the desired radial heading. Push the NAV switch 6 to ON to engage.

F. Any of the following actions will disengage the VOR coupling: Moving the TURN command knob 3 out of the center detent, engaging the heading selector, or pushing the NAV switch 6 to OFF.

2. Using VOR Coupling without Heading Select Capability

A. Tune the navigation receiver to the desired VOR station.

B. Set the OBS to the desired radial heading.

C. Turn the aircraft to the same radial heading using the TURN command knob 3. The aircraft must be on a heading within 10 degrees of the radial heading before engaging the VOR coupler.

D. Push the NAV switch 6 to ON to engage the VOR coupler. The aircraft will turn toward the selected radial and will roll out on the radial and track inbound toward the VOR station.

E. When over the VOR station, the aircraft will bank smoothly in each direction and will continue to track outbound on the selected radial. The VOR coupler does not disengage itself.

F. To track a different radial outbound, use the TURN command knob 3 to turn the aircraft to the desired radial heading. Set the OBS to the desired radial heading. Push the NAV switch 6 ON to engage the coupler.

G. Either of the following actions will disengage the VOR coupling: moving the TURN command knob 3 out of the center detent, or pushing the NAV switch 6 to OFF.

3. Using VOR Coupling with Flight Director with Heading Select and Course Select

This procedure is the same as variation 1, page 13, except the flight director HDG select knob (1, page 11) is used in place of the heading selector. Also, the COURSE selector 5 is used in place of the OBS to select the VOR radial.

4. Using VOR Coupling with Flight Director with Course Select Only (Course Datum)

A. Tune navigation receiver to the desired VOR station. Set COURSE selector (5, page 11) to the desired radial heading.

B. Push NAV switch 6 to ON to engage VOR coupler. The aircraft will turn towards the heading set on the COURSE selector (this may turn aircratt away from desired radial initially). The autopilot will then turn the aircraft to make an intercept on the desired radial (intercept angle may be as much as 45±5 degrees). The aircraft will roll out on the radial and track inbound toward the VOR station. (The bank angle after the initial bank will be 5- to 10-degrees while the intercept angle is being established.)

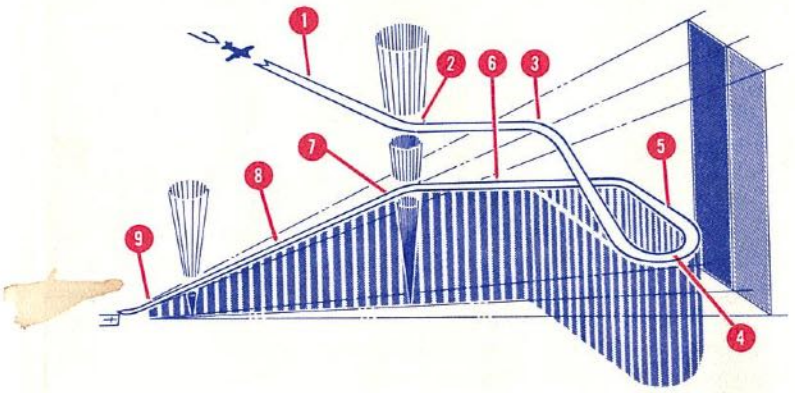
C. When over the VOR station, the aircraft will bank smoothly in each direction and will continue to track outbound on the selected radial. The VOR coupler does not disengage.

D. To track a different radial outbound, proceed as follows:

- If within a 30-degree heading change, set the COURSE selector to the desired radial heading.
- If greater than a 30-degree heading change, set desired new radial heading on the heading selector prior to reaching the station. When over the omni station, engage heading select (NAV will disengage). While aircraft is turning, select desired radial on COURSE selector. Engage NAV (heading select will disengage) and autopilot will intercept and track on new radial.

E. Any of the following actions will disengage the VOR coupling: moving the TURN command knob 3 out of the center detent, engaging the heading selector, or pushing the NAV switch 6 to OFF.

MAKING AN AUTOPILOT ILS APPROACH



1. With the NAV switch 6 in the OFF position, tune the navigation receiver to the desired ILS frequency.

Note

Use ILS IN-FLIGHT PROCEDURE CHECK LIST.

2. Fly outbound, making any necessary heading changes with the TURN command knob 3 or the heading selector.

3. Start the procedure turn using the TURN command knob 3 or the heading selector and descend to the authorized procedure turn altitude using the PITCH command wheel 1.

4. After reaching the procedure turn altitude, level off using the PITCH command wheel 1. Push the ALT switch 5 to ON and complete the procedure turn using the TURN command knob 3 or the heading selector for best performance. (Intercept angle should not be more than 15 degrees for every mile outside the outer marker up to 75 degrees and 15 miles.)

5. After the localizer needle is off the peg about 3 dots, push the NAV switch 6 to ON to engage the ILS coupler. (If the engagement is made too soon, the aircraft may turn initially in the wrong direction.) The aircraft will roll out on the localizer beam and track inbound. The heading selector will automatically disengage.

6. Lower landing gear. Set flaps in increments as desired.

7. When the aircraft intercepts the glide path, the ALT switch 5 will revert to OFF, and the glide slope coupler will automatically engage. The aircraft will start to descend along the glide path.

Note

If glide slope is not available or is inoperative, fly the letdown with the PITCH command wheel.

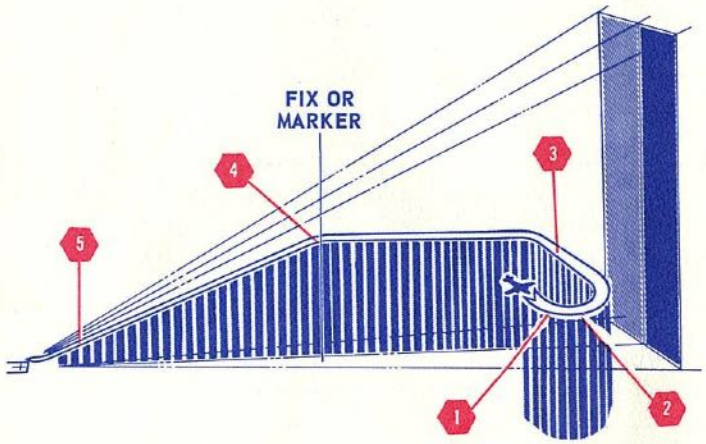
8. Adjust the throttles to control airspeed during descent. Set the heading selector to a missed approach heading. (Do not engage.)

9. At 200 feet, disengage the autopilot.

Note

During the intercept course of an ILS approach, the aircraft will follow an autopilot computed course which may be different than the navigation system indicated course. After bracketing, the autopilot will hold the aircraft on the course indicated by the navigation system indicator.

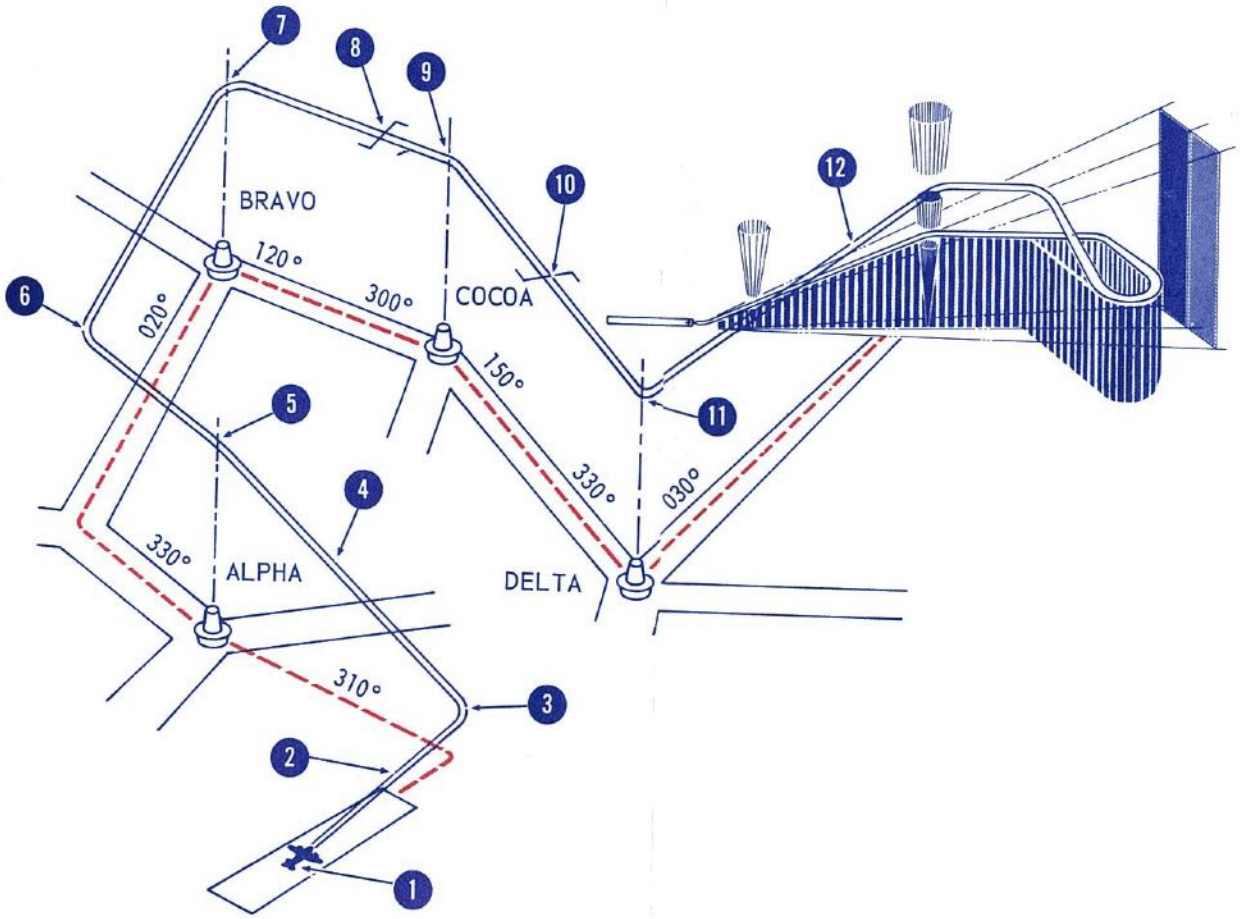
MAKING AN AUTOPILOT BACK COURSE LOCALIZER APPROACH



1. When flying inbound on a radar vectored approach or according to the FAA published procedure, tune the navigation receiver and push the back course switch.
2. Push the ALT switch 5 to ON when at the altitude specified in the published procedure.
3. After the localizer needle is off the peg and moving toward center, push the NAV switch 6 to ON to engage the ILS coupler. The aircraft will roll out on the back course localizer beam and track inbound.
4. When the fix or marker is reached, lower the landing gear. Set the flaps as desired. Fly the descent using the PITCH command wheel 1 (usually about 500 ft/min).
5. Disengage the autopilot when the published back course minimum altitude is reached.

EXAMPLE OF AN IFR FLIGHT USING VOR COUPLING WITH H-14 TYPE HEADING SELECTOR

1. Prior to take-off, set the heading selector to the climb out heading directed by ARTC.
2. Push the MASTER switch 4 to engage the autopilot after the gear is up and climb is established.
3. Engage the heading selector. Tune the navigation receiver to VOR station Alpha.
4. Set the OBS and the heading selector to 310°, and push the NAV switch 6 to engage VOR coupling. At altitude, level off and push the ALT switch 5 to engage altitude hold.
5. Over VOR station Alpha, set the OBS and heading selector to 330°.
6. Engage heading selector. Tune the navigation receiver to VOR station Bravo. Set the OBS and heading selector to 020°.
7. Over VOR station Bravo, use the TURN command knob 3 to turn to a 120° heading. Set the OBS and heading selector to 120°. Push the NAV switch 6 to engage VOR coupling. The TURN command knob should be used for turns greater than 30°.
8. Tune the navigation receiver to VOR station Cocoa.
9. Over station Cocoa, set the OBS and heading selector to 150°.
10. Tune the navigation receiver to VOR station Delta.



11 Use the TURN command knob 3 to turn to 030° heacing. Set the OBS and heading selector to 030°. Push the NAV switch 6 to engage VOR coupling. Use the PITCH command wheel 1 to descend to the minimum enroute altitude.

12 Engage heading select to disengage VOR coupling. Start the procedure for MAKING AN AUTOPILOT ILS APPROACH.

AUTOPILOT CHECK LIST

GROUND CHECKS

SWITCHING CHECKS (aircraft dc power on, TURN command centered)

1. Push MASTER, ALT, NAV switches ON - switches must hold in.
2. Push control wheel disengage - switches must drop OFF.
3. Push MASTER, ALT, NAV switches ON.
4. Rotate PITCH knob - ALT switch must drop OFF.
5. Rotate TURN knob - NAV switch must drop OFF, recenter TURN.
6. Push NAV switch ON, push heading selector knob in - NAV switch must drop OFF.
7. Push NAV switch ON - heading selector knob must release.
8. Push heading selector knob in, rotate TURN knob - heading selector knob must release.

FUNCTIONAL CHECKS (engines running at fast idle)

1. Center TURN and PITCH command; if pitch trim meter is not centered, move PITCH command to center pitch trim meter; push MASTER switch ON.
2. Rotate TURN knob left - control wheel must turn left.
3. Rotate TURN knob right - control wheel must turn right.
4. Rotate PITCH wheel DOWN - control wheel must move forward (if control wheel was held in neutral).
5. Rotate PITCH wheel UP - control wheel must move aft (a slight back pressure on control wheel may be needed).

NOTE: Automatic pitch trim moves elevator trim wheel in the same direction as the control wheel. Check automatic pitch trim as follows:

(a) Center pitch trim meter - elevator trim wheel must be free to rotate.

(b) Rotate PITCH wheel DOWN to obtain 3/4 of a trim needle width deflection - after 5 to 8 seconds elevator turn wheel must rotate to nose down trim.

(c) Slowly rotate PITCH wheel UP until pitch trim meter is centered - elevator trim wheel must stop rotating.

(d) Rotate PITCH wheel UP to obtain about 3/4 of a trim needle width deflection - elevator trim wheel must start turning in same direction (up) after 8 to 12 seconds.

6. Set the heading selector to the directional gyro (D.G.) heading, push the heading selector knob in and rotate it right - control wheel must turn right (repeat to left).
7. Taxi aircraft, set D.G. and uncage, center TURN knob.
8. Turn aircraft left - control wheel must turn right.
9. Turn aircraft right - control wheel must turn left.
10. Disengage and adjust elevator trim.

ILS COUPLING CHECKS (engines running at fast idle)

1. Tune navigation receiver to local ILS station.
2. Push MASTER and NAV switches ON - control wheel must turn toward needle.
3. If equipped with a heading selector, rotate heading select knob with heading selector disengaged - control wheel must not follow knob rotation.

VOR COUPLING CHECKS (engines running at fast idle)

1. Tune navigation receiver to nearby VOR station or local test station.
2. Adjust OBS to center OBS needle, set heading selector to D.G. heading, push MASTER and NAV switches ON.
3. Rotate OBS knob to move needle left - control wheel must turn left.
4. Rotate OBS knob to move needle right - control wheel must turn right. If equipped with a heading selector that must be used (see page 13), rotate heading select knob with heading selector disengaged - control wheel must follow knob rotation.

*IN-FLIGHT CHECKS**

ILS COUPLING CHECKS

1. Tune navigation receiver.
2. Push MASTER switch ON.
3. If outbound - use TURN knob or heading selector.
4. On procedure turn - use TURN knob or heading selector, use PITCH wheel to descend.
5. At 3 dots - push NAV switch ON.
6. On beam - drop gear, lower flaps in increments.
7. On glide path - control speed.
8. At minimum altitude - disengage.

VOR COUPLING CHECKS

1. Tune navigation receiver to desired VOR station.
2. Set OBS and heading selector to desired VOR heading.
3. Push MASTER and NAV switches ON.
4. At station passage, fly outbound as follows:
   - Within 30 degrees of inbound heading - reset OBS and heading selector.
   - More than 30 degrees change from inbound heading - use TURN knob to complete turn, reset OBS and heading selector, push NAV switch ON.

* Operate the aircraft in accordance with the detailed operating instructions in the airplane flight manual. This check list does not supersede those instructions but serves only as a reminder for the procedures published therein.