



CENTURY 2000

AUTOPILOT FLIGHT SYSTEM

PILOT'S OPERATING MANUAL

REVISED APRIL 9, 1999
68S1035

FACTORY SERVICE CENTERS

Century Flight Systems, Inc. has established Factory owned and operated Customer Service Center. The personnel operating this Center are dedicated to providing Customer Satisfaction with our products.

Besides providing technical consultation, Service Center personnel also provide competent repairs and spares support to our dealers as well as direct customer in or out of warranty repair service. The location of our Factory Service Center is:

Municipal Airport, Mineral Wells, Texas

**Product Support
Telephone: (940) 325-2517**

If any time you need service at the Center please call for and arrange for an appointment. This way, we can minimize shop repair time.

LOG OF REVISIONS

06-01-87	Altitude Preselect Addition Pages i, ii, Replaced Pages 75, 76, 77, 78 Added
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FORWARD

The Century Flight Systems, Inc. Century 2000 Autopilot is an advanced General Aviation Flight Control System utilizing “State of the Art” electronic techniques.

In this handbook we have detailed the features, functions and general operating instructions of the Century 2000 System.

May we suggest that you do two things:

1. Read this handbook and your Airplane Flight Manual Supplement. The handbook presents general operating procedures. Each aircraft installation has an Airplane Flight Manual Supplement or Autopilot Handbook that contains FAA approved flight procedures and operating limitations in that particular model aircraft. The appropriate AFM Supplement is a document which must be aboard U.S. Registered Aircraft with the autopilot installed.
2. Spend some VFR time with the equipment to become familiar with its operation so that you may have the full benefit of its capabilities.

NOTE

The Century 2000 Autopilot is a modular design. It may be installed and operated as a roll axis only autopilot, roll and pitch axis, or a roll, pitch, and yaw axis. The asterisk symbol (*) appearing before certain sections of this manual indicates instructions for those systems having the pitch expansion installed. Operators of the roll only Century 2000 should disregard the sections, paragraphs and sentences marked by asterisk.



THE CENTURY 2000 3-AXIS IFCS

FEATURES

The Century 2000 Autopilot

This autopilot only version uses a standard artificial horizon in combination with a directional gyro (DG) or an NSD-360A, NSD-1000 Horizontal Situation Indicator (HSI). A Century Flight Systems, Inc. Yaw Damper (Y/D) may be incorporated with the Century 2000 when a Y/D is certified for your plane.

An outstanding feature of the Century 2000 is that it has a rate based inner loop for short term dynamics. This means that rate information is derived from the horizon so that motion about the roll and pitch axis is programmed to occur at a rate appropriate to the activity. Examples of controlled rate motion are as follows:

ROLL AXIS:

Heading Command - Roll at 5° per second diminishing near bank limit.

Navigation Soft Mode - Roll at 2.5 degrees per second to reduced bank limit (8°).

Gust Disturbances - Resisted by certificated servo velocity.

*PITCH AXIS:

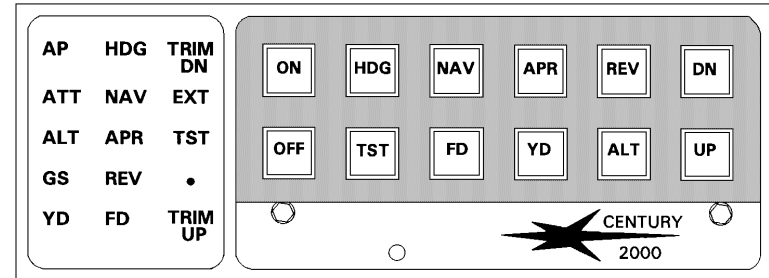
Command Attitude - 0.7° per second attitude change.

Gust Recovery - Maximum rate consistent with passenger comfort.

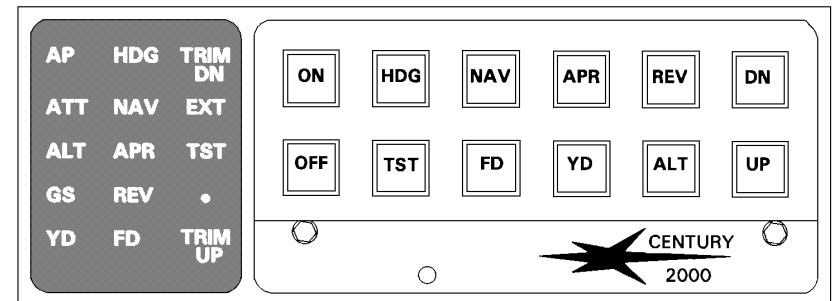
Maximum System Capability - 2.4° per second .

CENTURY OPERATING CONTROLS

The MODE PROGRAMMER push-button switches are backlit and dimming is provided by the control panel light dimmer switch.



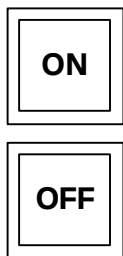
The MODE ANNUNCIATOR light intensity is controlled automatically by a self-contained ambient light level sensor; this feature provides optimum Mode Annunciator light level for all cockpit conditions. The Century 2000 Autopilot is activated with the Aircraft Master switch and operates in a low power state until the autopilot operation is desired. Mode selection is made by pushing the desired mode switch on the Mode Programmer. The selected mode will be illuminated on the Mode Annunciator.



*A separate Trim Master switch is located on the Control Panel. Autotrim function is activated by the Autopilot Engage switch.

AUTOPILOT ON-OFF -

Autopilot engage is accomplished by pressing the momentary ON switch on the left side of the Programmer. The Autopilot will engage in the HDG mode. If the system is pitch expanded, the ATT mode will also be present when engaged and the autopilot will synchronize to the existing aircraft pitch attitude.

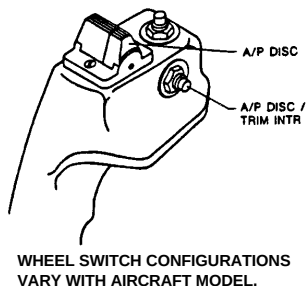


In HDG mode the aircraft will track the heading selected on the DG or HSI. In NAV, APR, or REV modes the aircraft will intercept and track any properly programmed radio-defined course. Instructions for proper radio setup in these modes are included in this manual.

* In ATT mode the autopilot will synchronize to the aircraft pitch attitude upon engagement.

* In ALT mode the aircraft will synchronize to the indicated altitude present at the time of engagement.

The autopilot may be disengaged by pressing the momentary OFF switch on the programmer, * by pressing the AP OFF switch on the control wheel trim switch; * by pressing the Master Disconnect/Trim Interrupt switch, if present on the control wheel; or by interrupting power at the Aircraft Master switch. Disengagement causes the AP annunciator to flash for 5 seconds.



***MANUAL ELECTRIC TRIM -** With the Aircraft and Trim Master switches on, a manually operated electric trim function is activated by the control wheel trim switch. This switch serves a dual function:

- *1. Disengage the Autopilot.
2. Activate manual electric trim.

*Moving the red portion of the trim switch forward or aft will cause autopilot disengagement. Moving both parts of the trim switch forward or aft simultaneously will disengage the autopilot and cause the trim to run up or down.

***MASTER DISCONNECT/TRIM INTERRUPT**

Many Century 2000 autopilots incorporate an additional switch on the control wheel (usually a red button). Pressing this button will disconnect the Century 2000, the Yaw Damper (if installed), and will interrupt the operation of the Trim System. Release of the button will restore power to the Trim System. However, the Autopilot will return to the HDG and ATT mode and will require re-engagement in order to resume automatic flight.

***AUTOTRIM -** The Century 2000 autopilot is equipped with automatic pitch trim. When the Trim Master switch is on, Autotrim is activated by engaging the autopilot.

*The Autotrim system is fail safe in design. The integrity of the trim system is verified by the preflight test.

**PREFLIGHT TEST SEQUENCE
CENTURY 2000 PREFLIGHT PROCEDURES
FOR NO MOD. CENTURY 2000
NOTE**

During system functional check the system must be provided adequate D.C. voltage (12.0 VDC or 24 VDC min.) and instrument air (4.2 in. Hg. Min.). It is recommended that the engine be operated to provide the necessary power and that the aircraft be positioned in a level attitude, during the functional check. Due to the weight of the elevator in certain models of aircraft, steps 4 and 5 may not move the control wheel. To verify correct direction of commands, support elevators to remove weight and continue steps.

AUTOPILOT/AUTOTRIM - To be performed before the first flight of each day.

- *1. Trim Master switch - ON.
2. Engage autopilot.
3. Move the heading bug left and right of the lubber line. Observe that the control wheel moves in the direction of the heading bug displacement.
- *4. Press the DN switch - verify that the control wheel moves in the down direction. Verify that after approximately a 3 second delay, the trim moves in the down direction.
- *5. Press the UP switch - verify that the control wheel moves in the up direction. Verify that after approximately a 3 second delay, the trim moves in the up direction.
6. Grasp control wheel and override roll and *pitch servo actuators to assure override capability.
7. Hold control yoke and disengage autopilot by activating the AP OFF switch on the control wheel or by the programmer off switch.
8. Check controls through full travel in roll and pitch to assure complete autopilot disengagement.
9. With autopilot OFF, press TST switch. All annunciators shall illuminate.
- *10. After "GS" and "ALT" annunciators extinguish release TST SWITCH; only "HDG", "ATT", and "TST" remain illuminated.
- *11. Press DN switch, HDG, and ATT annunciators remain illuminated, TST may momentarily flicker and then remains illuminated.
- *12. Press UP switch, HDG, and ATT annunciators remain illuminated, TST may momentarily flicker and then remains illuminated.
- *13. Momentarily press TST switch. HDG and ATT annunciators remain illuminated, TST annunciator flashes.
- *14. Press and hold DN switch. TST annunciator extinguishes

*15. Press and hold the UP switch. TST annunciator extinguishes.

*16. Momentarily press and release TST switch. HDG and ATT annunciators remain illuminated, TST annunciator extinguishes.

***COMMAND TRIM SYSTEM** - To be performed before the first flight of each day.

1. Using the control wheel trim switch, verify normal trim up and down operation.
 2. Move red portion of trim switch forward and aft. Observe that the trim system does not operate.
 3. Release the red bar on the control wheel trim switch. Move the black portion fore and aft. Observe that the trim system does not operate.
- This completes the test sequences.

CAUTION

Any failure of the above procedures indicates that a failure exists in the system and the system shall not be operated until the failure has been located and corrected.

CAUTION

Check the elevator trim setting before takeoff.

PREFLIGHT TEST SEQUENCE

CENTURY 2000 PREFLIGHT PROCEDURES FOR "A" MOD. CENTURY 2000

NOTE

During system functional check the system must be provided adequate D.C. voltage (12.0 VDC or 24 VDC min.) and instrument air (4.2 in. Hg. Min.). It is recommended that the engine be operated to provide the necessary power and that the aircraft be positioned in a level attitude, during the functional check. Due to the weight of the elevator in certain models of aircraft, steps 4 and 5 may not move the control wheel. To verify correct direction of commands, support elevators to remove weight and continue steps.

AUTOPILOT/AUTOTRIM - To be performed before the first flight of each day.

- *1. Trim Master Switch - ON.
- 2. Engage Autopilot.
- 3. Move the heading bug left and right of the lubber line. Observe that the control wheel moves in the direction of the heading bug displacement.
- *4. Press the DN Switch - verify that the control wheel moves in the down direction. Verify that after approximately a 3 second delay, the trim moves in the down direction.
- *5. Press the UP Switch - verify that the control wheel moves in the up direction. Verify that after approximately a 3 second delay, the trim moves in the up direction.
- 6. Grasp control wheel and override roll and pitch servo actuators to assure override capability.
- 7. Hold control yoke and disengage autopilot by activating the AP OFF Switch on the control wheel or by the programmer off switch.
- 8. Check controls through full travel in roll and pitch to assure complete autopilot disengagement.
- 9. With autopilot OFF, press and hold TST switch. All available mode annunciators shall illuminate for 3 seconds then extinguish and the AP shall flash as long as the TST switch is held.
- *10. Release the TST switch. Only HDG, ATT and TST shall be illuminated.
- *11. Press and hold the DN switch. The TST annunciator may momentarily flicker but should remain illuminated. HDG and ATT shall remain on. Release the DN switch.

*12. Press and hold the UP switch. The TST annunciator may momentarily flicker but should remain illuminated. HDG and ATT shall remain on. Release the UP switch.

*13. Momentarily press and hold the TST switch. The AP and TST annunciators shall flash and the HDG and ATT shall stay illuminated. Release the TST switch. The HDG and ATT shall remain on the TST annunciator shall remain flashing.

*14. Press and hold the DN switch. The TST annunciator shall extinguish. HDG and ATT shall remain on. Release the DN switch.

***COMMAND TRIM SYSTEM** - To be performed before the first flight of each day.

- 1. Using the control wheel trim switch, verify normal trim up and down operation.
- 2. Move red portion of trim switch forward and aft. Observe that the trim system does not operate.
- 3. Release the red bar on the control wheel trim switch. Move the black portion fore and aft. Observe that the trim system does not operate.

CAUTION

Any failure of the above procedures indicates that a failure exists in the system and the system shall not be operated until the failure has been located and corrected.

CAUTION

Check the elevator trim setting before takeoff.

PREFLIGHT TEST SEQUENCE

CENTURY 2000 PREFLIGHT PROCEDURES FOR "A" MOD. CENTURY 2000 TWO AXIS TRIM PROMPTER

NOTE

During system functional check the system must be provided adequate D.C. voltage (12.0 VDC or 24 VDC min.) and instrument air (4.2 in. Hg. Min.). It is recommended that the engine be operated to provide the necessary power and that the aircraft be positioned in a level attitude, during the functional check. Due to the weight of the elevator in certain models of aircraft, steps 4 and 5 may not move the control wheel. To verify correct direction of commands, support elevators to remove weight and continue steps.

1. Engage autopilot.
2. Move the heading bug left and right of the lubber line. Observe that the control wheel moves in the direction of the heading bug displacement.
3. Press the DN Switch - Verify the control wheel moves in the DOWN direction.
** Verify that after approximately a 3 second delay, the Trim DN Prompt flashes.
4. Press the UP Switch - Verify the control wheel moves in the UP direction.
** Verify that after approximately a 3 second delay the Trim UP Prompt flashes.
5. Grasp the control wheel and override roll and pitch servo's to assure override capability.
6. Hold control wheel and disengage autopilot. Check controls through full travel in all axis to assure complete autopilot disengagement.
7. With autopilot OFF, press and hold TST switch. All available mode annunciators shall illuminate for 3 seconds then extinguish and the AP shall flash as long as the TST switch is held.
8. Release the TST switch. Only HDG, ATT and TST shall be illuminated.
9. Press and hold the DN switch. The TST annunciator may momentarily flicker but should remain illuminated. HDG and ATT shall remain on. Release the DN switch.
10. Press and hold the UP switch. The TST annunciator may momentarily flicker but should remain illuminated. HDG and ATT shall remain on. Release the UP switch.

11. Momentarily press and hold the TST switch. The AP and TST annunciators shall flash and the HDG and ATT shall stay illuminated. Release the TST switch. The HDG and ATT shall remain on the TST annunciator shall remain flashing.
12. Press and hold the DN switch. The TST annunciator shall extinguish. HDG and ATT shall remain on. Release the DN switch.
13. Press and hold the UP switch. The TST annunciator shall extinguish. HDG and ATT shall remain on. Release the UP switch.
14. Momentarily press the TST switch. HDG and ATT shall remain illuminated, TST annunciator shall extinguish.

****The control wheel may have to be assisted to move up and/or down.**

CAUTION

Any failure of the above procedures indicates that a failure exists in the system and the system shall not be operated until the failure has been located and corrected.

CAUTION

Check the elevator trim setting before takeoff.

PREFLIGHT TEST SEQUENCE **CENTURY 2000 PREFLIGHT PROCEDURES FOR** **“A” MOD. CENTURY 2000 SINGLE AXIS**

NOTE

During system functional check the system must be provided adequate D.C. voltage (12.0 VDC or 24 VDC min.) and instrument air (4.2 in. Hg. Min.). It is recommended that the engine be operated to provide the necessary power and that the aircraft be positioned in a level attitude, during the functional check.

1. Engage autopilot.
2. Move the heading bug left and right of the lubberline. Observe that the control wheel moves in the direction of the heading bug displacement.
3. Grasp the control wheel and override roll servo to assure override capability.
4. Hold control wheel and disengage autopilot. Check control through full travel to assure complete autopilot disengagement.
5. With autopilot OFF, press and hold TST switch. All available mode annunciators shall illuminate.

CAUTION

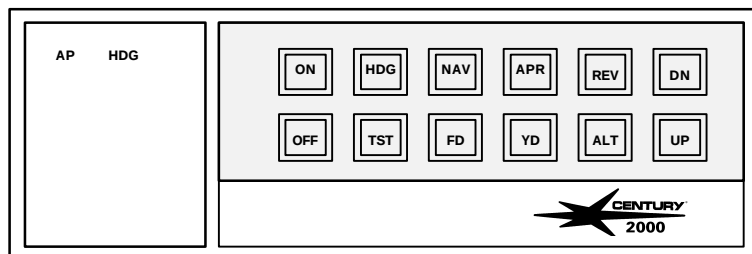
Any failure of the above procedures indicates that a failure exists in the system and the system shall not be operated until the failure has been located and corrected.

CAUTION

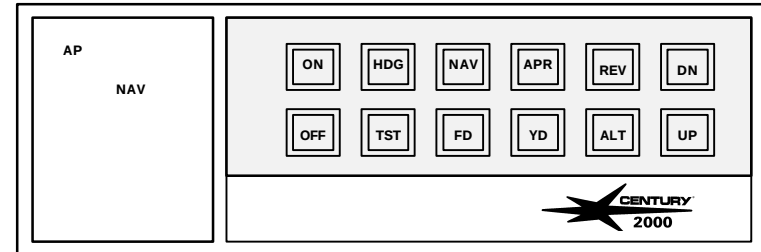
Check the elevator trim setting before takeoff.

LATERAL OPERATING MODES

HEADING - In HDG mode the autopilot will capture and hold the heading selected on the DG or HSI. HDG annunciator will illuminate.



NAVIGATION - In NAV mode the autopilot has an automatic 45 degree VOR-LOC intercept angle. Selected angle intercepts are available when the system is equipped with NSD-360A, NSD-1000 or other HSI.



When executing an intercept, the rate at which the aircraft is closing upon the selected radio-defined course is determined by the computer and at the proper time an on-course turn is initiated. thirty-five seconds after the on-course turn the computer will reduce its bank limits to 13 degrees. After 70 seconds the bank limits will be reduced to 8 degrees to produce a 'soft' navigation mode when tracking a VOR signal. The system will remain in 'soft' mode during station passage. However, if a new course which requires re-intercept is selected, the 'soft' mode will unlock and the intercept sequence will reoccur.

NOTES

The NAV mode should be used when executing a holding pattern on the localizer to prevent automatic glideslope coupling.

When radio receiver is tuned to a localizer frequency, the coupler will operate with localizer (APR) dynamics in the NAV mode.

HEADING SYSTEMS

In systems equipped with a DG the autopilot heading bug must be set to match the selected VOR/LOC course when in NAV, APR, or REV modes. For Ioran or GPS tracking, set the heading bug to the “desired bearing” information.

In systems equipped with and NSD-360A, NSD-1000 or other HSI instrument, the heading bug is disabled when in the NAV, APR, or REV modes. In these modes the azimuth information to the autopilot is provided by the radio course pointer.



NOTES

In systems equipped with an NSD-360A, NSD-1000 or other HSI always set the radio course pointer to the Front Course Inbound Heading when operating in the APR or REV modes.

In systems equipped with a DG, during an instrument approach, the heading bug must be set to match course for the segment of the approach being flown when using the NAV, APR, or REV modes.

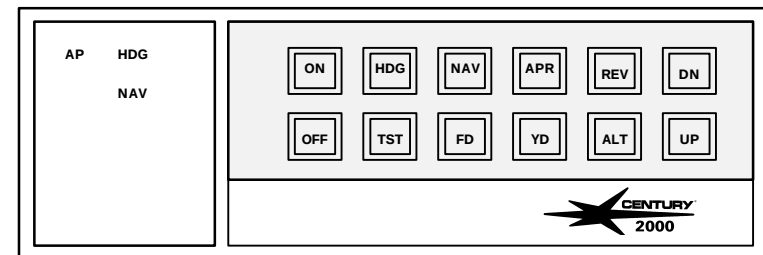
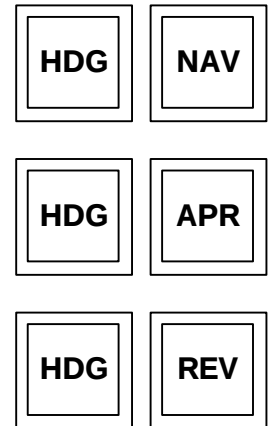
See section on operating techniques for additional operating instructions for the NSD-360A, NSD-1000 and the DG.

SELECTED INTERCEPT ANGLE

In systems equipped with a NSD-360A, NSD-1000 or other HSI, a selected intercept angle function is available while operating in the NAV, APR, and REV modes.

Selected angle intercepts are initiated by performing the following steps:

1. While operating in the HDG mode, set the course pointer to the desired radial .
2. Set the heading bug on the NSD to the desired intercept heading.
3. Press the HDG and NAV, HDG and APR or HDG and REV mode buttons simultaneously.



Both HDG and the selected lateral mode will now illuminate on the annunciator. As the aircraft begins its on-course turn, the HDG annunciator will extinguish indicating that the system has captured the selected radio course and is now receiving azimuth input from the radio course pointer.

NOTE

If valid radio signal is lost after initiating a selected angle intercept, the applicable navigation mode annunciator will flash and the autopilot will remain in the HDG mode.

APPROACH - The APR mode provides an automatic 45 degree VOR-LOC intercept angle and selected angle intercepts when the system is equipped with an NSD-360A, NSD-1000 or other HSI.



The intercept, crosswind, and tracking sequences are similar to those described in the NAV mode of operation except that 70 seconds after the on-course turn the bank angles are reduced to 12 degrees. *The APR mode has additional enabling logic for the automatic glideslope arm, capture, and track sequence and must be used on ILS approaches.

REVERSE (Back Course) - The REV mode is for use in tracking the localizer back course Inbound and front course Outbound or VOR course Outbound.



Automatic 45 degree intercepts, selected angle intercepts, crosswind correction and tracking are as described in the APR mode except that response to radio signals is reversed.

NOTES

When using an NSD-360A, NSD-1000 or other HSI always set the radio course pointer to the inbound front course localizer heading.

When using a DG, always set the heading bug to the final approach heading to the airport.

*PITCH OPERATING MODES

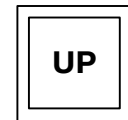
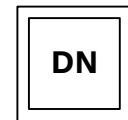
***ALTITUDE** - ALT mode will cause the aircraft to maintain the pressure altitude present at the time of ALT engagement.



*ALT may be engaged at maximum rate of climb or descent, but for passenger comfort, rate of climb or descent should be reduced to 1,000 feet per minute or less prior to ALT engagement. Depressing either the pitch UP or DN switch will shift the AP mode back to ATT mode.

***ATTITUDE** - ATT mode places pitch command with the pitch UP and DN switches. Pitch is always synchronized to the existing aircraft attitude after pitch modification. When engaging the autopilot or when transferring the system to ATT from ALT, the aircraft will maintain its existing attitude.

***PITCH MODIFIER SWITCHES** - The pitch modifier switches are momentary push-button type, located on the right side of the Mode Programmer, used to modify the airplane's attitude and to shift the AP from the ALT mode to the ATT mode.



***GLIDESLOPE COUPLING** - In the presence of selected APR mode only and other enabling logic, the glideslope function is fully automatic. Therefore, no GS engage switch is used.

*GS mode may be entered from either ATT or ALT mode, from either above or below the glideslope.

*Capture of the glideslope depends upon satisfying conditions which will complete the arming sequence. After arming, capture will occur just before glideslope interception so as to rotate smoothly to interception. This “anticipative capture” point is determined by the rate of closure satisfying a computer equation. In order for the GS mode to arm, the following conditions must exist simultaneously:

1. No. 1 NAV radio channeled to localizer frequency.
2. Localizer deviation must be less than 90 percent either side of center.
3. A valid localizer signal (no flag).
4. A valid glideslope signal (no flag).
5. APR mode selected.

*When these conditions are met the GS annunciator will illuminate in conjunction with the active pitch mode annunciator indicating glideslope is armed.

*When “anticipative capturing” occurs, the active pitch mode annunciator will extinguish leaving only the illuminated GS annunciator to indicate that transition to the glideslope signal has occurred.

*The GS mode may be deactivated by selection of any other pitch mode (ALT, ATT) but automatic recapture of the glideslope may occur in ALT or ATT modes.

NOTES

The NAV mode should be used when executing a holding pattern on the localizer to prevent automatic glideslope coupling.

When radio receiver is tuned to a localizer frequency, the coupler will operate with localizer (APR) dynamics in the NAV mode.

*CWS MODE (Pitch Sync) - The system is equipped with a control wheel steering switch located on the horn of the pilot's control wheel. When depressed, this switch will disengage the roll and pitch servos to allow manual maneuvering.

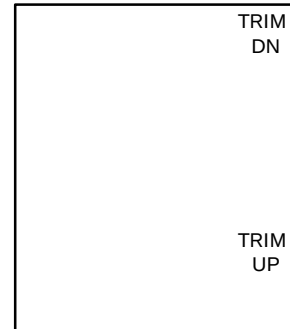
*When released the system will re-engage in the lateral (roll) mode previously in use.

*If the autopilot is in ALT mode the system will synchronize to the indicated altitude present upon release of the CWS switch.

*If the Autopilot is in the ATT mode the system will synchronize to the pitch attitude present at the time of release.



CENTURY 2000 WITH TRIM PROMPTING



The Century 2000 may be ordered as a Trim Prompting autopilot. This means automatic control (autotrim) of the elevator trim is not available on these system. When the autopilot displays a flashing TRIM UP or TRIM DOWN on the annunciator, the pilot should manually move the trim control of his aircraft in the direction indicated on the autopilot. When the autopilot determines that the trim condition is satisfied, the trim lamp on the annunciator will extinguish and the pilot should stop his trim

action. There are 2 degrees of trim prompting. For a small trim error the trim prompt will flash approximately once each second. A large trim error will cause the prompt to flash approximately 3 times per second. A large error not corrected for a period of approximately 2 minutes will sound an alert for 5 seconds. The alert will repeat every 2 minutes until the large error is corrected.

REVIEW OF INTERLOCKS AND FAILURE WARNINGS

The Century 2000 Systems include a number of automatic interlocks that will prevent system operation or individual mode operation if the input information is not valid or if other pre-requisite conditions do not exist. In addition to the interlocks, the system will annunciate various failure conditions as advisory information for the pilot. Following is a brief description of the interlocks and warnings provided.

INTERLOCKS

Autopilot engagement is inhibited unless valid gyro excitation is being provided by the system.

*Selection of ALT mode is inhibited if the system altitude information is unreliable or if the entire system has not been powered for a time sufficient to allow temperature stabilization, usually 2 to 6 minutes depending on ambient temperature.

If the navigation information becomes invalid during selected angle intercepts the appropriate NAV/APR/REV annunciator will flash and automatic mode switching from HDG to the armed navigation mode will be inhibited.

WARNINGS

LOW VOLTAGE - When the aircraft bus voltage provided the system falls below the minimum required for reliable system function, any mode annunciator not already illuminated will flash.

ATTITUDE GYRO EXCITATION - Absence of valid gyro excitation will cause the autopilot to disengage and the AP annunciator to flash. The autopilot cannot be re-engaged until this condition is corrected.

AP DISENGAGEMENT - Anytime the autopilot is disengaged the AP annunciator will flash and sound an alert for approximately 5 seconds, then remain off.

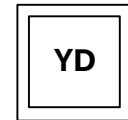
NAVIGATION INFORMATION INVALID - The appropriate navigation mode annunciator will flash when selected and invalid navigation signals are present (NAV flag in view).

***GLIDESLOPE INFORMATION INVALID** - The GS annunciator will flash when glideslope information is invalid or any other GS Arming condition is lost (GS flag in view) after glideslope capture. If valid glideslope information or any other GS Arming condition is not available during the arming sequence, the system will not arm and glideslope capture will not occur.

YAW DAMPER SYSTEM

(YAW DAMPER EXPANDED SYSTEMS ONLY)

The Century Flight Systems, Inc. Yaw Damper system is a frequently installed expansion to the Century 2000. The system has only one control - the YD Push Button. This expansion may be operated without the autopilot engaged.



For pilot assistance and passenger comfort, its function is to add additional stability to the yaw axis of the aircraft and minimize any tendency to hunt or Dutch roll in the aircraft. In addition, the Yaw Damper incorporates an “electronic slip/skid sensor” to assist in coordinating turns and trimming the aircraft under conditions of asymmetric power. The Yaw Damper does not ordinarily compensate for rudder trim variations with speed changes and therefore may “bump” the rudder controls slightly when engaged.

The Yaw Damper is automatically engaged when the Century 2000 autopilot is engaged. The Yaw Damper may also be engaged through the YD switch on the Century 2000 if autopilot engagement is not desired. A YD light on the annunciator of the Century 2000 confirms the Yaw Damper is engaged. The Yaw Damper may be disengaged by pressing the YD switch on the Century 2000 or by pressing the Master Disconnect or the Master Disconnect/Trim Interrupt switch (if system has autotrim) located on the control wheel. The YD annunciator light will extinguish to indicate disengagement.

On some models of aircraft, the Yaw Damper cannot be incorporated into the Century 2000 Autopilot. On those models the Yaw Damper is considered as stand alone. To engage the Yaw Damper the pilot will have to press the remote mounted panel switch. This switch is an electromechanical switch which will illuminate to confirm Yaw Damper engagement. To disengage, the switch must be pressed again.



The Heading Selector DG replaces the standard directional gyro and provides a fully visible heading indicator around the normal DG opening. The DG dial is marked in 5 degree intervals and numbered each 30 degrees around its azimuth. A center index is provided at the top to align selected headings. Additional indices are located each 45 degrees to facilitate rapid turn selection without mental arithmetic. Any heading may be selected, either before or after engagement, and turns up to 180 degrees may be programmed directly, either right or left. If the heading indicator is rotated beyond 180 degrees from the DG card heading, the heading selector will command a reversal in bank to reach the resultant selected heading in the shortest direction .

The DG card is normally set to the magnetic compass with the card set knob on the left in the usual fashion, while the heading selector indicator is rotated by the heading selector knob on the right. It will still be necessary for the pilot to verify the compass card heading with the magnetic compass periodically. Direction of rotation of both the knobs and indicator commands the same direction of turn.

NSD-360A, NSD-1000 AND OTHER HEADING SYSTEMS

The Century 2000 autopilot may be optionally equipped with the Century Flight Systems, Inc. NSD-360A or NSD-1000 HSI. The explanation which follows will be based on Century's HSI, however the principles will apply equally to the heading systems of other manufacturers provided the differences in design, features and concepts are ascertained and allowed for such as slaving, knob location, size, etc.

The NSD-360A and the NSD-1000 (Navigation Situation Display) are basically identical units except for the gyro capsule. The 360A is an air driven gyro where as the 1000 is an electric gyro. The HSIs have electrically servoed heading card driven by the information processed from the gyro capsule. Warning flags and indicators include NAV flag, glideslope flag, TO/FROM meter and heading flag. Lateral radio information is presented by the left/right meter and vertical radio information is presented by the glideslope meter. Autopilot heading information is represented by positioning the heading bug to the desired heading track.

Autopilot course information is derived from course needle position (direction) and left/right radio information (deviation from desired radio track) to provide precise intercept and track capability.

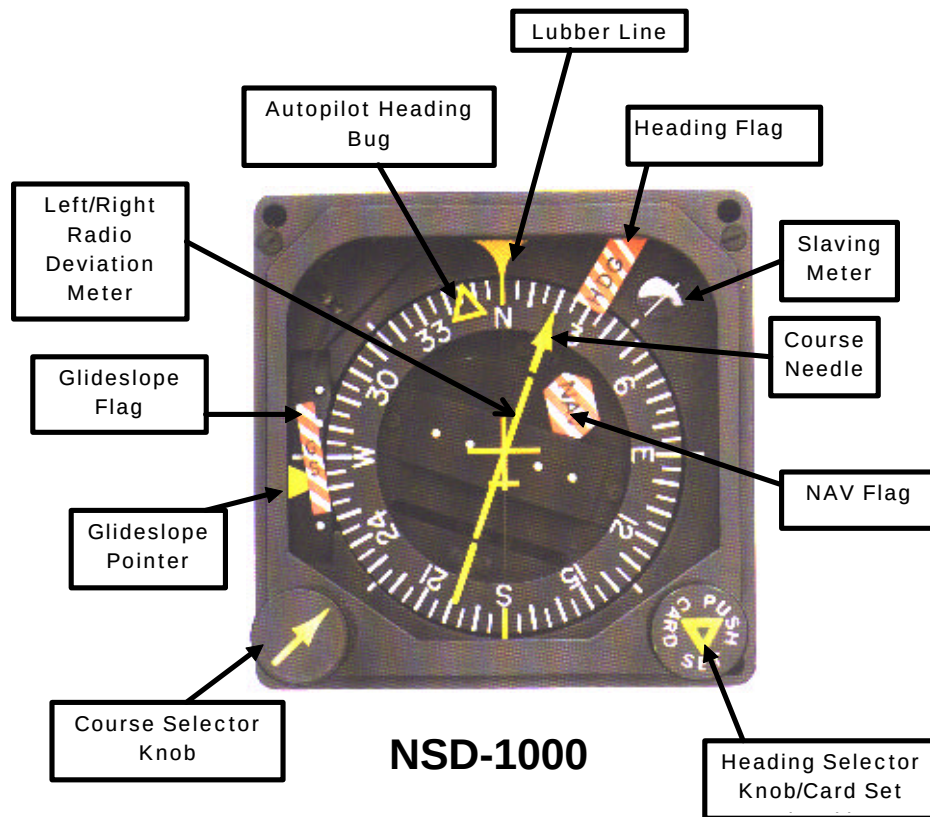
NOTE

The Century 2000 is capable of using radio information provided by a loran or GPS. There are several important factors to consider when using those units with the autopilot and HSI.

Because the HSI incorporates an integrated course/left-right display and an OBS resolver, a switching device will be required in order for the HSI to display the selected information.

Most manufacturers of loran and GPS have the capability to adjust the course width (CDI sensitivity) of their units. Course width is measured in nautical miles from full scale left to full scale right deflection of the CDI. If the course width is too wide, the autopilot will be insensitive to the movement of the CDI. If the course width is too narrow, the autopilot will be overly responsive to the CDI movement.

For proper autopilot operation with a loran or GPS, the autopilot needs both direction and deviation. Directional information is provided by the heading bug, if a DG is being used, or by the course needle, when an HSI is being used. When a waypoint is called up, the loran or GPS will display a “desired track”. The heading bug or course arrow must match this “desired track”. If you use multiple legs in a flight, you must match the heading bug or course arrow with the new “desired track”.





FLY LEFT



FLY RIGHT



FLY UP



FLY DOWN

CENTURY 2000 FLIGHT DIRECTOR
STEERING HORIZON SINGLE QUE

With the addition of the Flight Director expansion, the pilot may choose to program a particular flight sequence and monitor autopilot maneuvering by observing the steering bar or he may switch the autopilot off and place himself in the control system loop by following commands of the steering bar. Pressing the FD switch on the computer programmer will activate the flight director steering bars and the annunciator will illuminate FD. The great advantage of the Flight Director is that the computer observes many inputs, compares these inputs to the sequence programmed by the pilot and resolves differences into combinations of four commands: Fly Up, Fly Down, Fly Left and Fly Right. To accomplish the programmed maneuver, the pilot need only to “fly the delta into the ‘vee’ of the steering bar”.



The Flight Director may be switched off and the steering bars stowed out of view by momentarily pressing the FD switch on the programmer.

While the FD is on, the autopilot will stay in the mode of operation if the autopilot is disengaged or when it is re-engaged. When the FD is off and the autopilot is disengaged, the autopilot will revert to the default modes of operation which is the HDG and ATT modes.

NOTE

The pilot should always keep in mind that the Steering Horizon displays **COMPUTED DATA** and will give a command satisfied indication if the pitch attitude and heading are satisfactory for normal conditions. The system cannot compensate for inadequate power or airspeed to accomplish the desired maneuver, therefore, a raw data display is mandatory with the Flight Director display so that the pilot is constantly presented with concise data on his heading and actual position on the Localizer, Glideslope and VOR radial. For this reason, whenever the Flight Director expansion is added, it is recommended that an HSI be installed also .

CENTURY 2000

OPERATING TECHNIQUES

In the pages that follow, we have included techniques for:

VOR Navigation

VOR Approaches

Localizer Approaches

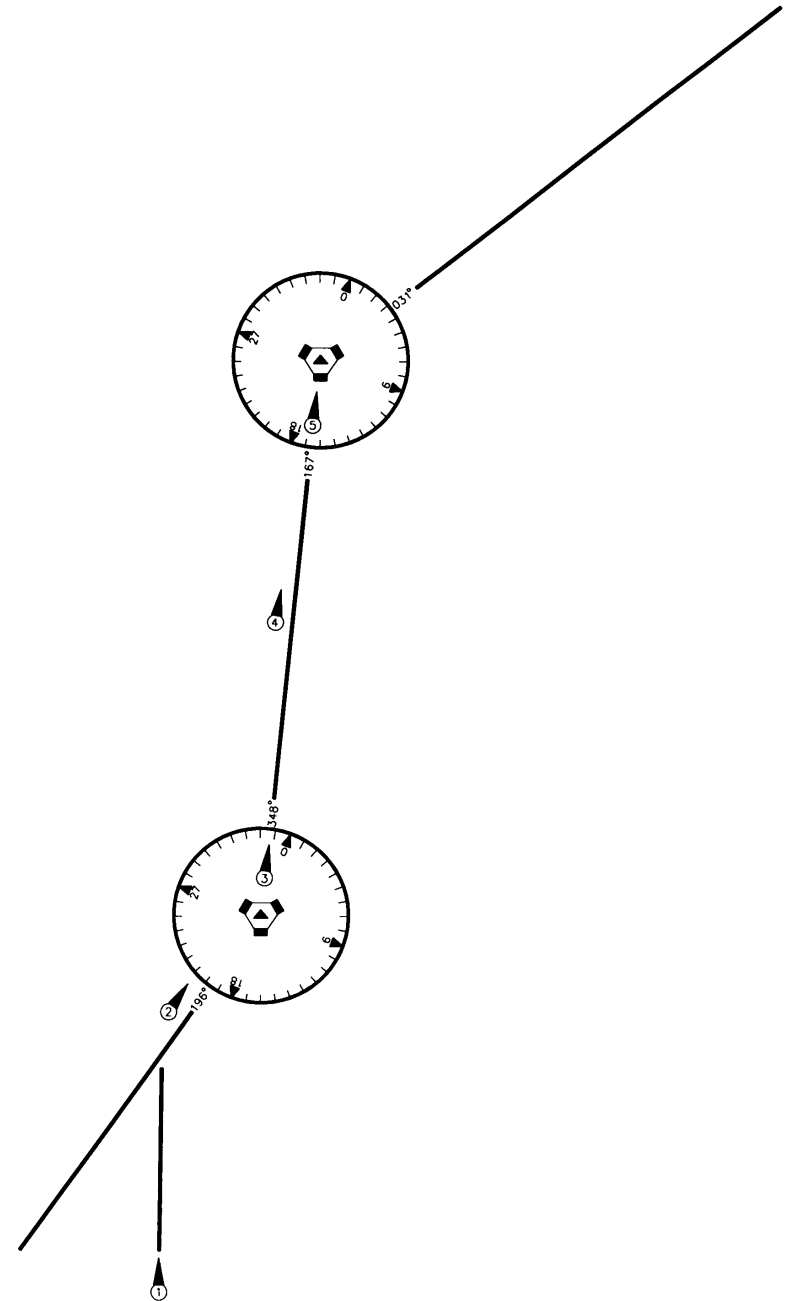
Glideslope Arming & Coupling

Localizer Back Course

Note: The Century 2000 autopilot is capable of tracking lateral information from a loran or GPS. Several factors in procedure and operation are important to remember. Adjust the course width (CDI sensitivity) of the loran or GPS to insure it is not too wide or too narrow (represented as nautical miles per dot). A course width too wide would cause the autopilot to S-turn back and forth along the desired track. Too narrow would cause the autopilot to be overly sensitive to CDI movement. When tracking a desired waypoint, the bearing information will be displayed on the loran or GPS. This bearing information must be inputted into the autopilot through either the heading bug (when using a DG) or the course arrow (when using an HSI) in order for the autopilot to track properly.

The photographs depict the Century Flight Systems Navigational Situation Display 1000 (NSD 1000) as the HSI and the standard Directional Gyro. The techniques are equally applicable to other compass systems.

VOR Navigation



STEP	HSI	MODE	REMARKS
1		HDG/NAV ALT	A selected angle intercept of up to 90° may be selected by setting the course arrow to the desired radial and the heading bug to the appropriate heading for the desired intercept. Press the HDG and NAV switches on the autopilot. The system will remain in this mode until the on course turn.
2		NAV ALT	After intercept, the system will correct for crosswind and adjust its internal radio authority and limit bank angles
3		NAV ALT	If a course change is required at the VOR, reposition the course arrow. If deviations because of station passage is not desired, press HDG and set the heading bug on the desired course.
4		NAV ALT	Station switching is accomplished by tuning the nav receiver to the desired station and setting the course with the course arrow. A course change of 45° or more will cause the system to kick out of "soft track" and set up a 45° intercept to the new course.

STEP	HSI	MODE	REMARKS
1		NAV ALT or ATT	The VOR approach usually begins from an enroute situation.
2		HDG ALT or ATT	As the VOR is neared, match the heading bug to the course flown and press the HDG switch. Set the course arrow for the inbound intermediate course segment.
3		REV ALT or ATT	As the VOR is crossed, press the REV switch to fly the selected course outbound. Should a lower altitude be required, press the MODIFIER switch to make the altitude change.
4		REV ALT or ATT	When the desired altitude is reached, press the ALT switch.

[illegible]

STEP	HSI	MODE	REMARKS
5		HDG ALT or ATT	Turn the heading bug to the outbound procedure turn heading and press the HDG switch.
6		HDG ALT or ATT	Proceed outbound until sufficient time has elapsed to assure proper re-interception.
7		HDG ALT or ATT	Lead aircraft through the procedure turn by moving the heading bug in the direction of the procedural turn.
8		HDG/NAV ALT or ATT	As the aircraft continues to turn, press the HDG and NAV switch simultaneously and turn the heading bug to intercept the inbound course.

The diagram illustrates a flight path starting from a nest (represented by a triangle) and ending at a roosting site (represented by a rectangle). The path is marked with numbered points 1 through 11. Key features include:

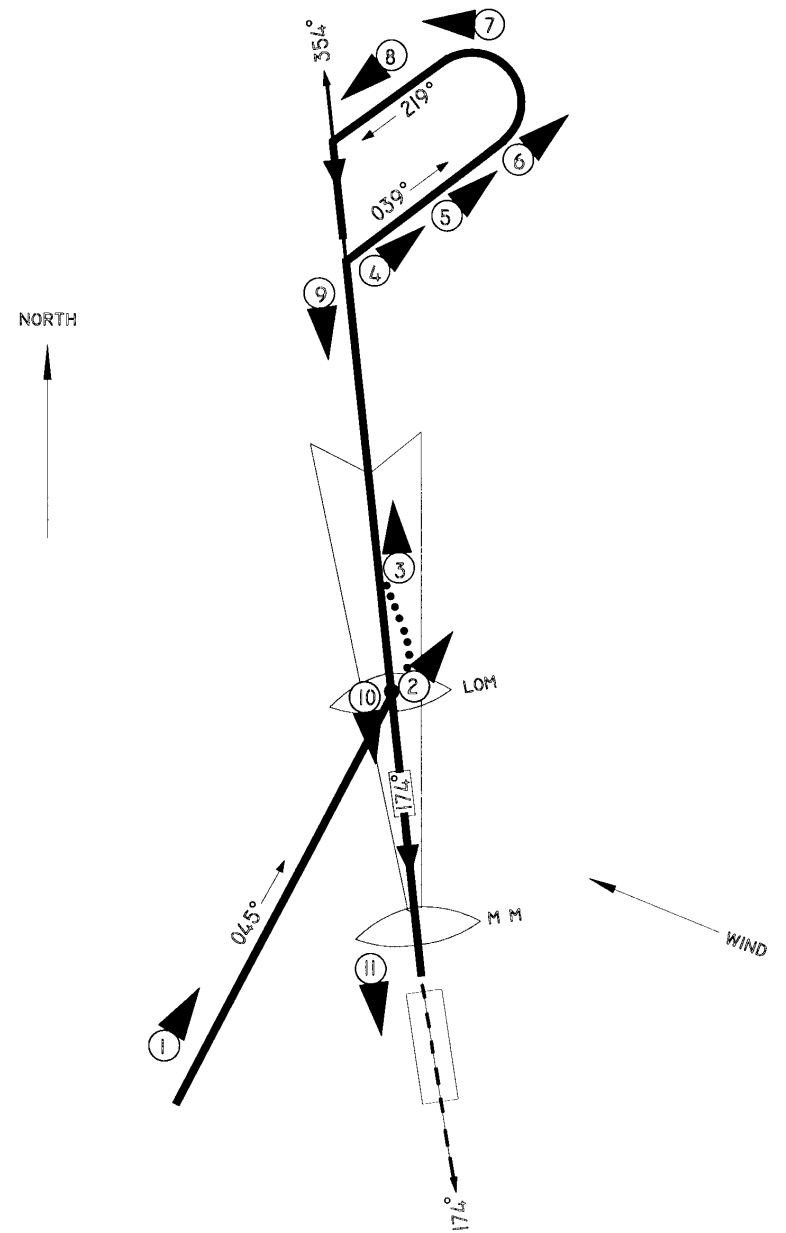
- Nest:** Located near point 2.
- Roosting Site:** Located at the top of the diagram, indicated by a dashed line and an arrow pointing towards it labeled 357°.
- Angles:**
 - 115° between the initial path segment and a reference line.
 - 357° at the final destination.
 - 222° at point 6.
 - 042° at point 8.
 - 177° at point 9.
- VOR and WIND:** Arrows indicate the direction of VOR (Visual Orientation Reference) and WIND.
- Path Segments:** The path consists of several straight segments connected by curved paths, with points 1 through 11 marking specific locations along the route.

VOR Approach

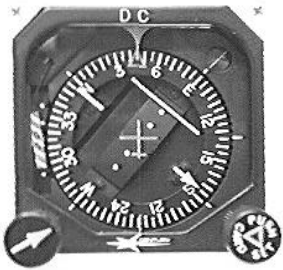
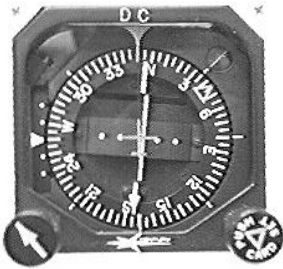
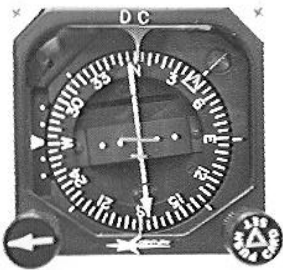
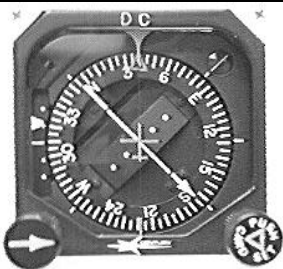
STEP	HSI	MODE	REMARKS
9		NAV ALT or ATT	As the aircraft approaches the inbound course, the system will switch out of the dual mode and turn to the inbound course.
10		NAV ATT	After the on course turn, the system will correct for crosswind and enter into a "soft track" mode. The aircraft's altitude and speed should be controlled as appropriate for the approach. Once the aircraft has reached minimums, disconnect the autopilot.
11		NAV ATT	If a missed approach is required, disconnect the autopilot and establish desired climb attitude and airspeed. When appropriate press HDG and ATT or ALT and engage autopilot.

38

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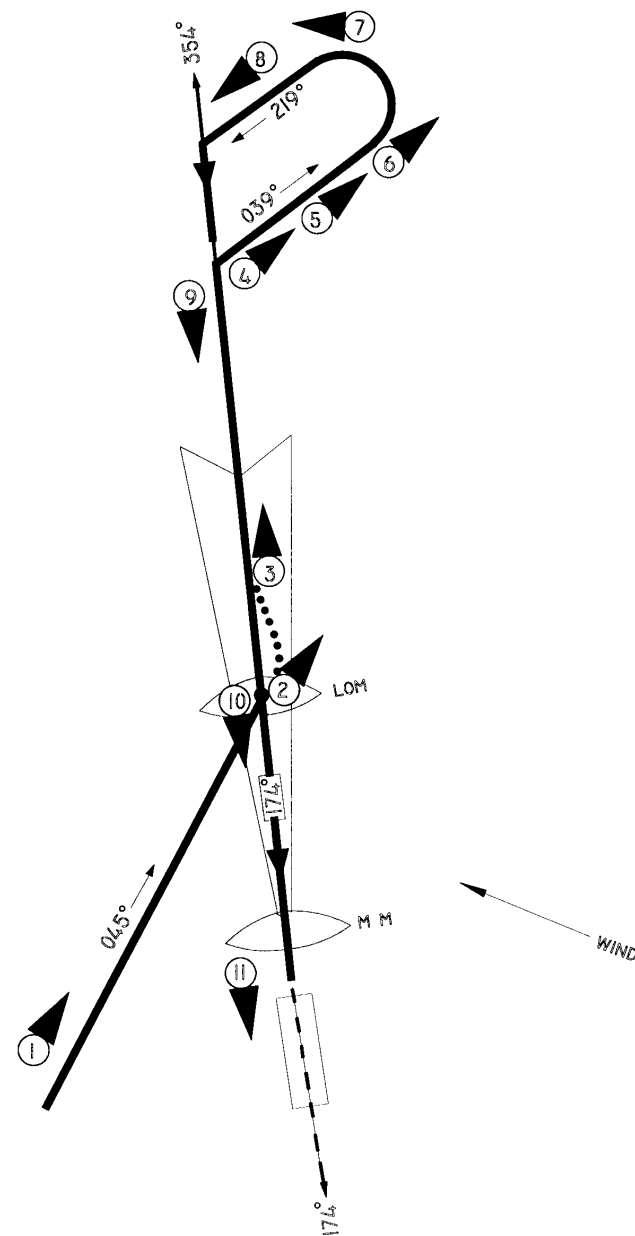


LOCALIZER Approach

STEP	HSI	AP MODE	REMARKS
1		HDG ALT or ATT	The localizer or ILS approach begins with a transition from the enroute structure to the outer compass locator (LOM). The heading bug is used to select the desired heading. The aircraft's altitude may be controlled by the modifier switch or through the use of the altitude mode. The Inbound Front Course direction is selected with the course arrow.
2		REV ALT or ATT	Upon reaching the LOM, press the REV switch. The autopilot will intercept and track outbound.
3		REV ALT or ATT	Upon tracking the localizer, the system will compensate for crosswind and enter the "soft track" mode. The procedure turn outbound heading may be selected with the heading bug.
4		HDG ALT or ATT	At the appropriate time, press the HDG switch to begin the procedure turn. Altitude appropriate to this phase of the approach should be controlled using ALT or ATT as necessary

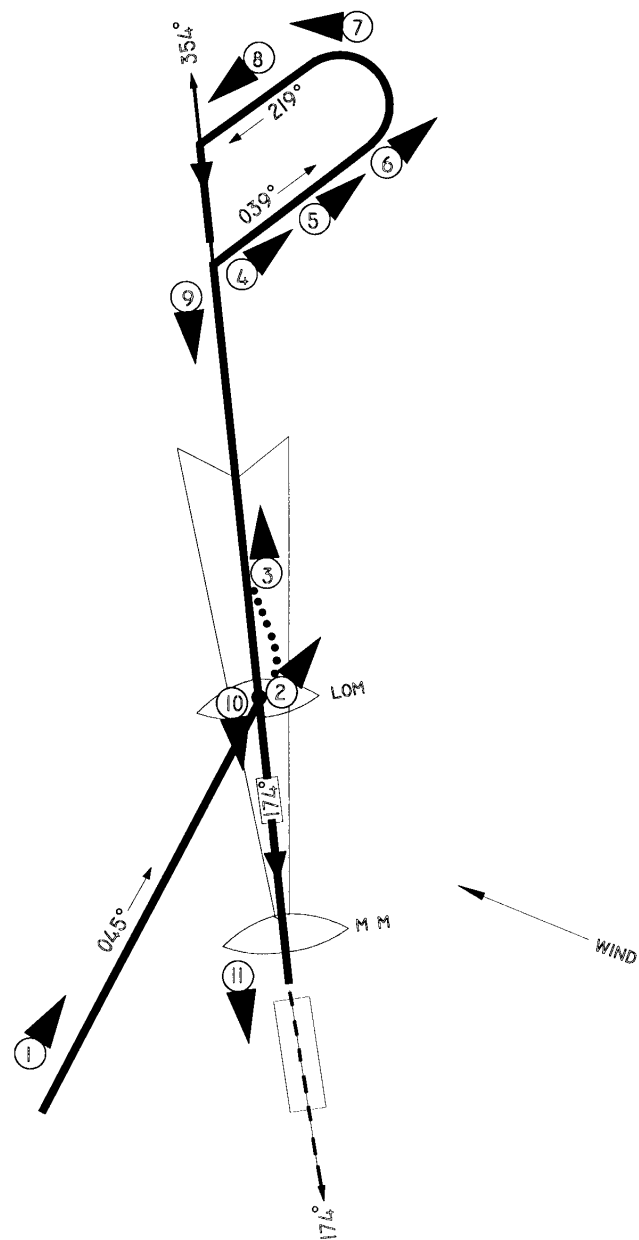
LOCALIZER APPROACH

NORTH



STEP	HSI	MODE	REMARKS
5		HDG ALT or ATT	Proceed outbound in the procedure turn until sufficient time has elapsed to assure proper re-interception.
6		HDG ALT or ATT	Lead the aircraft through the procedure turn by moving the heading bug in the direction of the turn.
7		HDG ALT or ATT	Continue to lead the aircraft through the turn.
8		HDG/APR ALT or ATT	Press both the HDG and APR switch simultaneously. The HDG and APR lamps should illuminate to indicate a dual mode. The aircraft will follow the heading bug until the system determines when an on course turn is required.

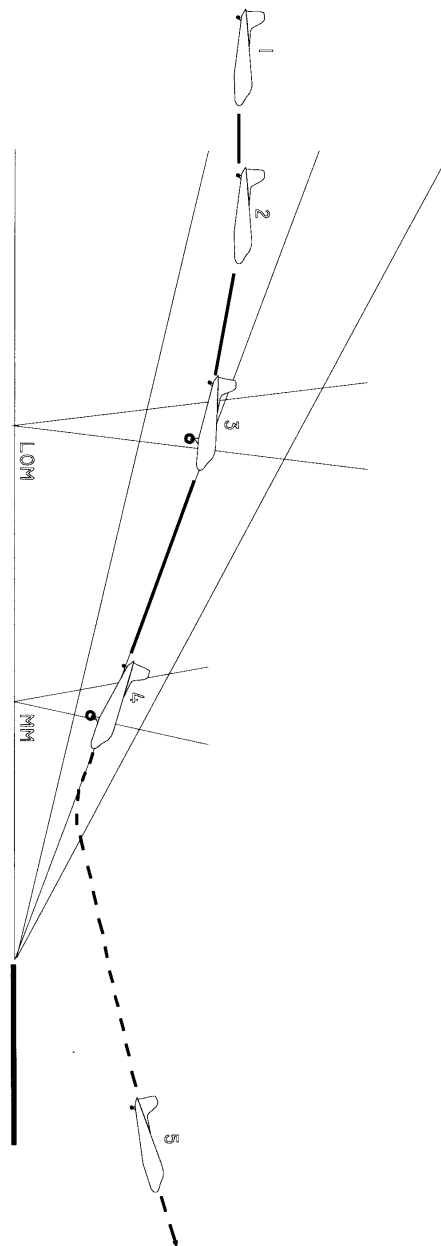
NORTH



LOCALIZER Approach

STEP	HSI	MODE	REMARKS
9		APR ALT/GS	When the on course turn is initiated the HDG lamp will extinguish and the system will track the localizer. After intercept, the system will correct for crosswind and enter into the "soft track" mode. Internal radio gains and bank angles will be limited. The system will also automatically arm for glide slope.
10		APR GS	As the glide slope beam is captured, the ALT lamp will extinguish. The system will track the localizer and glide slope. Power changes should be performed in small increments as necessary to maintain correct airspeed. Once the aircraft has reached minimums, disconnect the autopilot.
11		HDG ATT	If a missed approach is required, disconnect the autopilot and establish desired climb attitude and airspeed. When appropriate press HDG and ATT and engage autopilot.

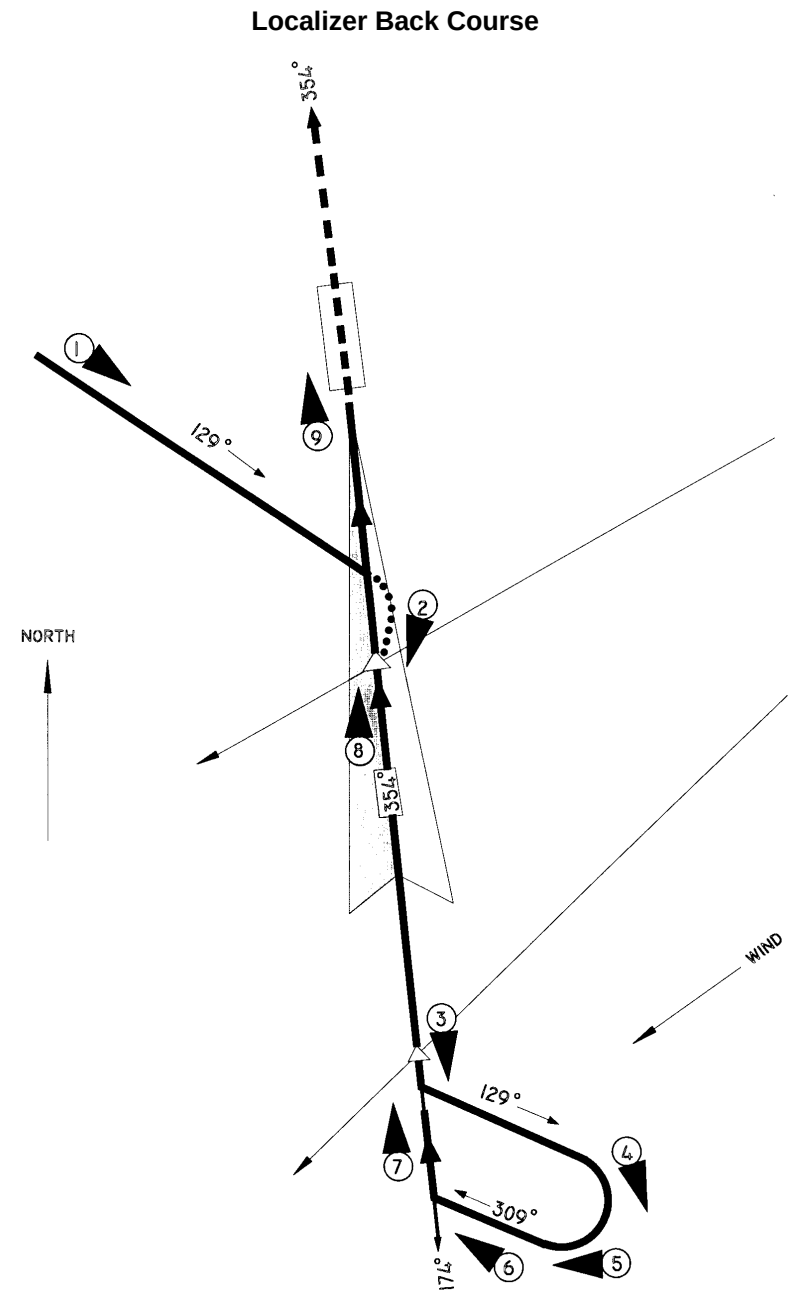
GS Arming & Capture



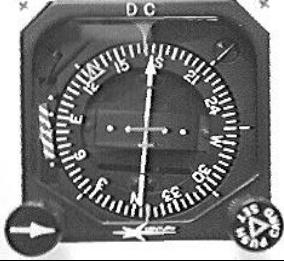
GS Arming & Capture

STEP	HSI	MODE	REMARKS
1		APR ALT or ATT GS	The typical glide slope portion of an ILS begins with the aircraft in the ALT mode or in the ATT mode with the aircraft on a closure attitude to the glide slope beam.
2		APR ALT or ATT GS	The Century 2000 autopilot system incorporates circuitry which anticipates when capture should occur. It is important the aircraft be configured for landing before the system captures glide slope.
3		APR GS	When capture occurs, the ALT or ATT lamp will extinguish.
4		APR GS	Upon reaching the decision height, disconnect the autopilot and complete the approach or conduct normal missed approach procedures as required.

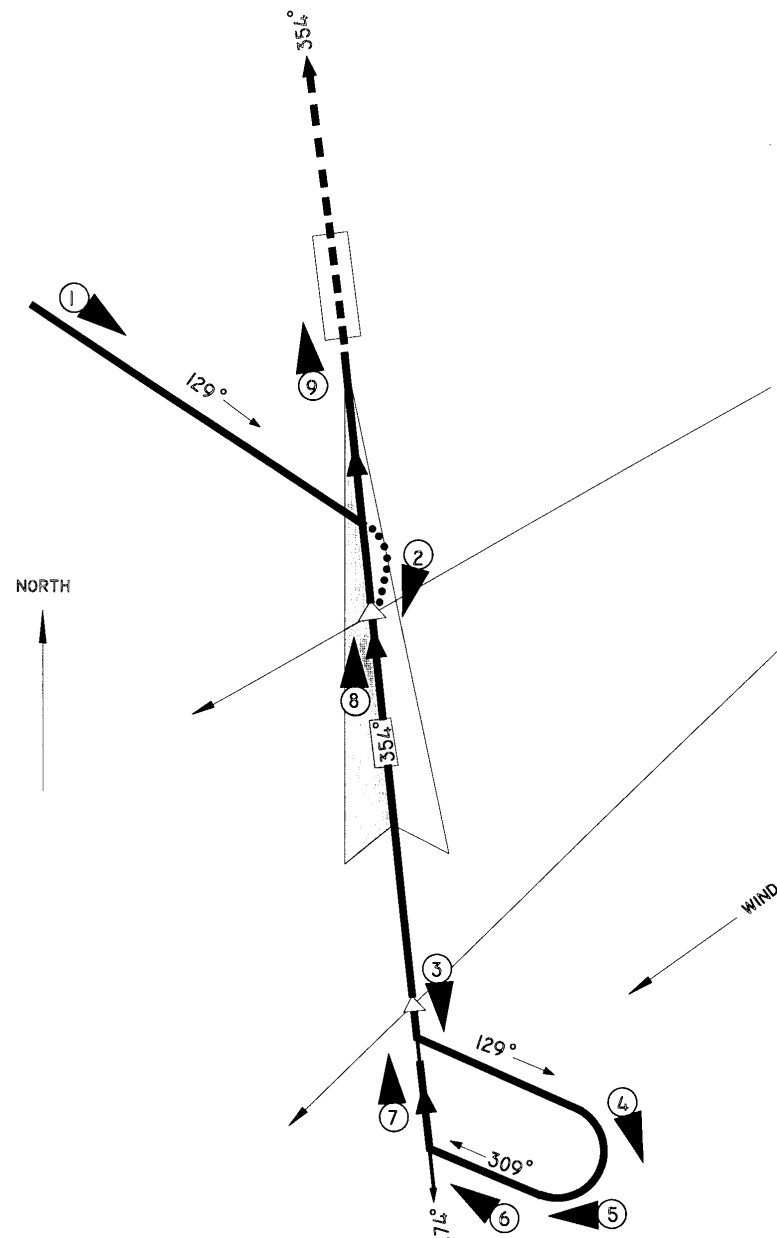
NOTES



Localizer Back Course

STEP	HSI	MODE	REMARKS
1		HDG/NAV ALT or ATT	The localizer back course approach begins with a transition from the enroute structure to an intercept with the back course outbound. The inbound front course is set on the course arrow. Press the HDG and NAV switches simultaneously. The system will follow the heading bug until an on course turn is made.
2		NAV ALT or ATT	As the outbound course is tracked, select the outbound procedure turn heading with the heading bug. Altitude should be controlled as appropriate for the procedure.
3		HDG ALT or ATT	When the outbound procedure turn is desired, press the HDG switch and fly outbound for sufficient time to permit re-interception.
4		HDG ALT or ATT	Lead the aircraft through the procedure turn by moving the heading bug in the direction of the turn.

Localizer Back Course

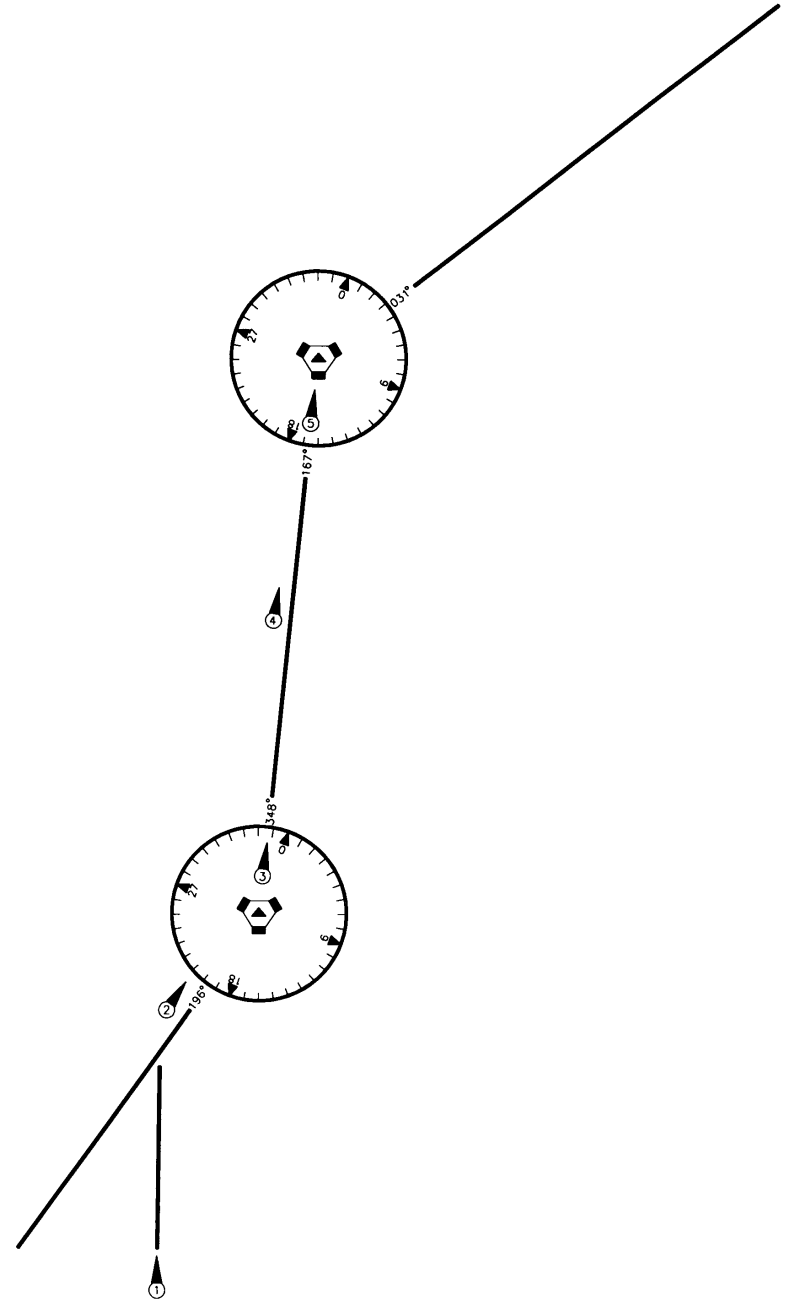


Localizer Back Course

STEP	HSI	MODE	REMARKS
5		HDG ALT or ATT	As the aircraft continues to turn, set the heading bug to the inbound procedure turn heading.
6		HDG/REV ALT or ATT	Press the HDG and REV switches simultaneously. The HDG and REV lamps should illuminate to indicate the system is in a dual mode. The system will follow the heading bug until the on course turn is initiated then the HDG lamp will extinguish.
7		REV ALT or ATT	After the on course turn is completed, the system will enter the "soft track" mode to limit radio authority and bank angles and to correct for crosswind.
8		REV ATT	Control altitude and airspeed as appropriate for the approach.

Localizer Back Course

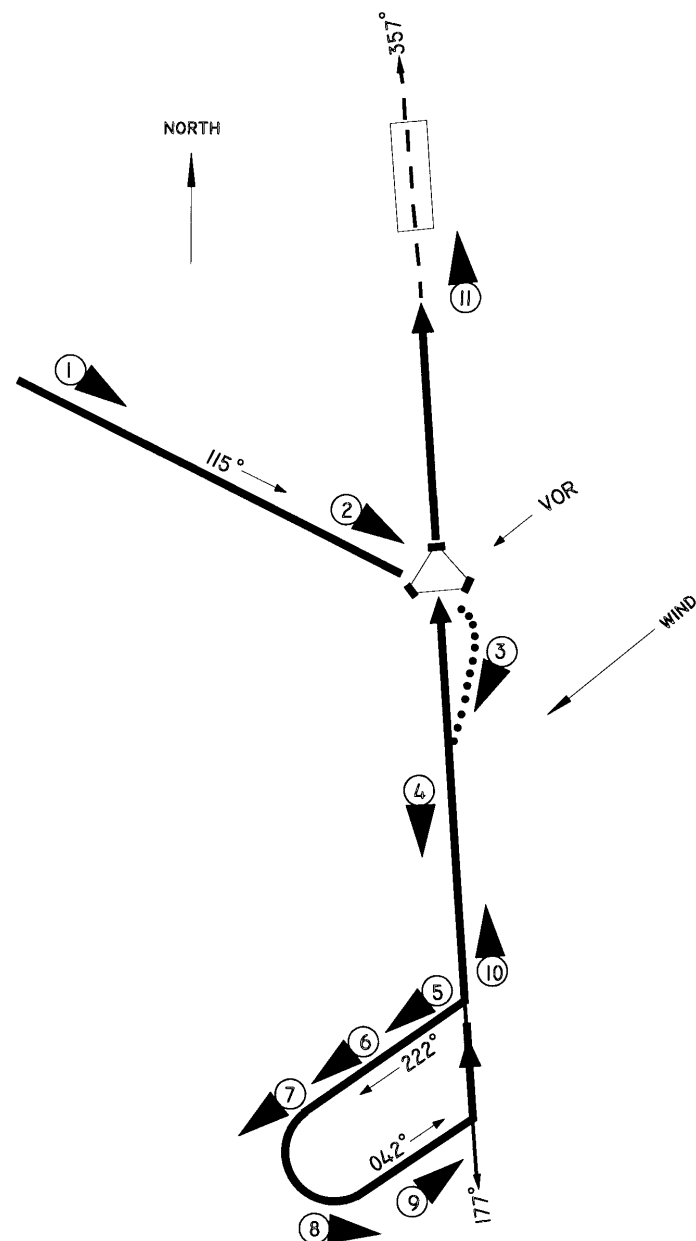
STEP	HSI	MODE	REMARKS
9		REV ATT	Once the aircraft has reached minimums, disconnect the autopilot. If a missed approach is required, disconnect the autopilot and establish desired climb attitude and airspeed. When appropriate press HDG and ATT or ALT and engage autopilot.



VOR Navigation

Directional Gyro	OBS	Remarks
		Step 1. NAVI/ATT or ALT. A 45° intercept to a selected radial is accomplished by setting the OBS to the desired radial and turning the heading bug to that same degree and then pressing the NAV mode on the autopilot.
		Step 2. NAVI/ATT or ALT. After intercept, the autopilot will correct for crosswind and adjust its internal radio authority and limit bank angles.
		Step 3. NAVI/ATT or ALT. After station passage, the OBS indicates a FROM flag. If a course change is required at the VOR, turn the OBS and heading bug to new course. If a course change of more than 45° is required, the autopilot will re-cycle for a standard intercept.
		Step 4. NAVI/ATT or ALT. Station switching is accomplished by tuning the receiver to the new station.
		Step 5. HDG/ATT or ALT. For smooth station passage, it might be desirable to cycle the autopilot to the HDG mode before passage. Then after passage occurs turn the OBS and heading bug to the new radial and press NAV on the autopilot.

VOR APPROACH



		Step 1. NAV/ATT or ALT. The VOR approach usually begins from an enroute situation. The heading bug and the OBS are set to the same degree radial. The autopilot is providing crosswind correction to track the desired radial.
		Step 2. HDG/ATT or ALT. As the VOR is neared, match the heading bug to either the course or the lubber line and press HDG on the autopilot. Set the OBS to the inbound course. Control altitude as necessary for the procedure.
		Step 3. REV/ATT or ALT. As the VOR is crossed, turn the heading bug to the outbound course and press the REV button.
		Step 4. REV/ATT or ALT. The autopilot will track outbound and correct for wind. Control attitude with the modifier switches. When the desired altitude is reached press ALT.
		Step 5. HDG/ATT or ALT. To start the procedure turn, press HDG and turn the heading bug to the outbound procedure turn heading.

VOR Approach

		Step 6. HDG/ATT or ALT. Proceed outbound until sufficient time has elapsed before starting the turn inbound.
		Step 7. HDG/ATT or ALT. Lead the aircraft through the procedure turn by moving the heading bug.
		Step 8. HDG/ATT or ALT. As the aircraft turns, move the heading bug to the desired heading to intercept the inbound course.
		Step 9. NAV/ATT or ALT. Press the NAV button and turn the heading bug to the inbound course (same as the OBS). The autopilot will set up a 45° intercept angle.
		Step 10. NAV/ATT or ALT. The autopilot will anticipate the on course turn. After intercept it will correct for crosswind, limit bank angles and adjust it's radio gain. Control pitch as necessary for the approach.

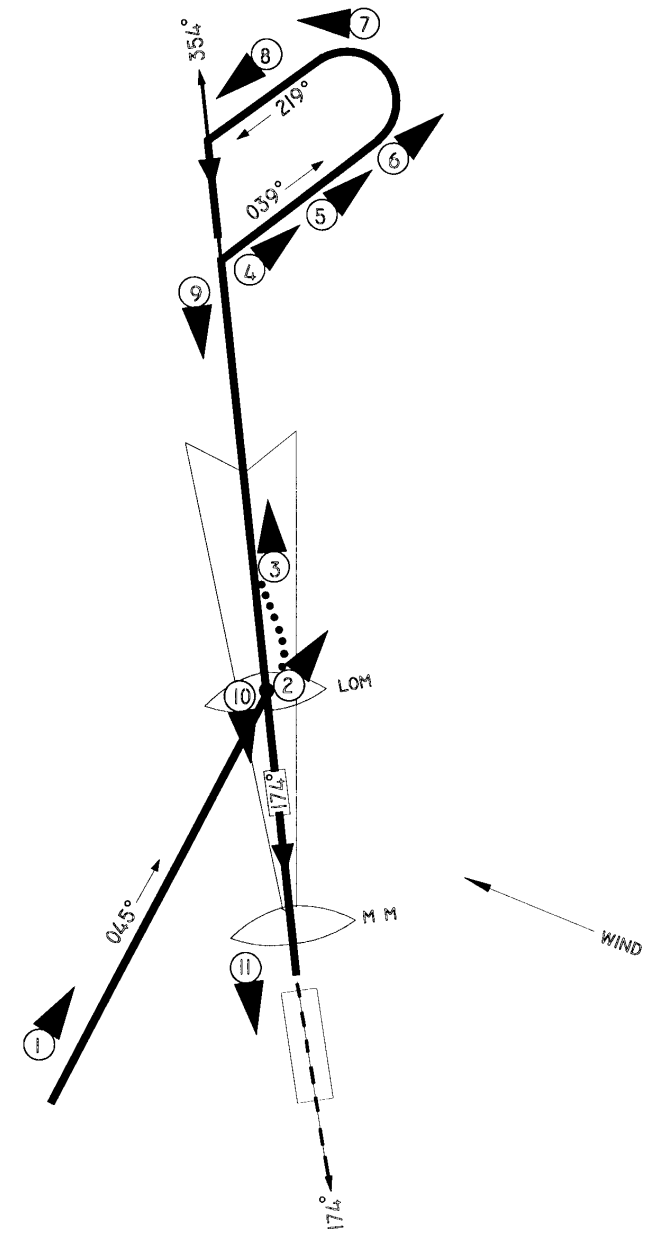
VOR Approach

		Step 11. HDG/ATT. Once the aircraft has reached the decision height, disconnect the autopilot and continue the approach or conduct the missed approach. For the missed approach, establish the aircraft's attitude and airspeed then turn the heading bug to the missed approach heading. Re-engage the autopilot and monitor aircraft's environment.
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NOTES

Localizer Approach

NORTH

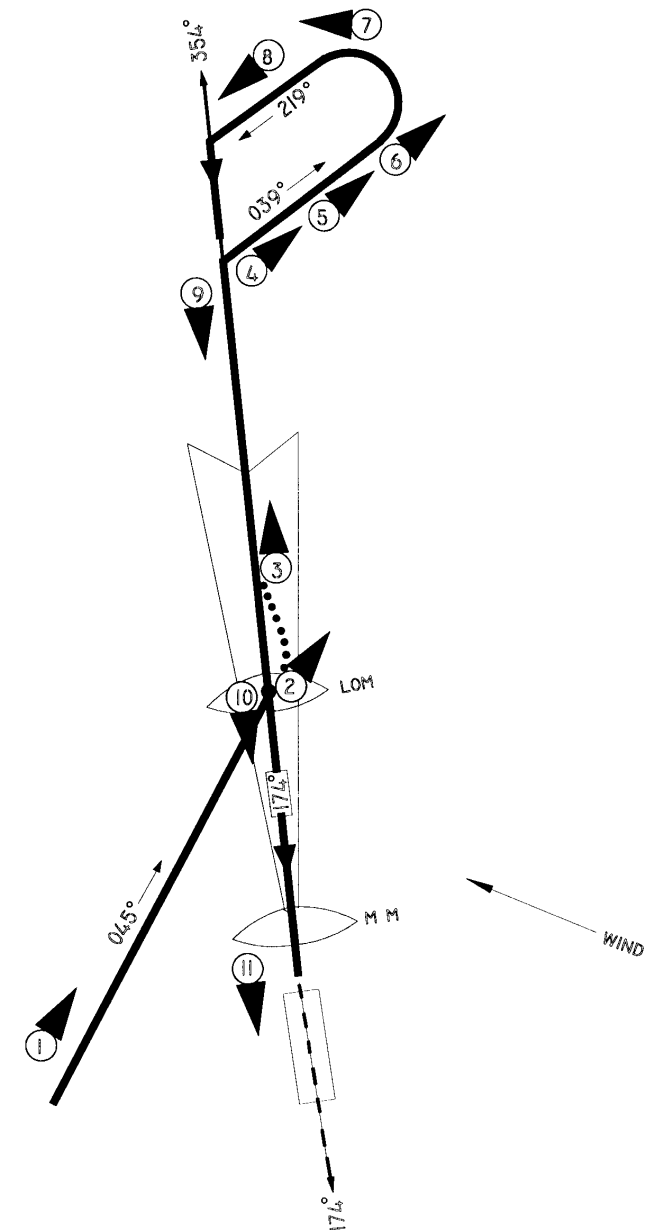


Localizer Approach

		Step 1. HDG/ATT or ALT. The localizer or ILS approach begins with a transition from the enroute structure to the outer compass locator (LOM). The heading bug is used to select the desired heading. The aircraft's attitude may be controlled by the modifier switch or through the use of the altitude mode.
		Step 2. REV/ATT or ALT. Upon reaching the LOM, turn the heading bug to the outbound course of the ILS and press the REV switch. The autopilot will intercept and track outbound .
		Step 3. REV/ATT or ALT. Upon tracking the localizer, the system will compensate for crosswind and enter the "soft track" mode.
		Step 4. HDG/ATT or ALT. At the appropriate time, press the HDG switch to begin the procedure turn. Altitude appropriate to this phase of the approach should be controlled using ALT or ATT as necessary.
		Step 5. HDG/ATT or ALT. Proceed outbound in the procedure turn until sufficient time has elapsed to assure proper re-interception.

Localizer Approach

NORTH



Localizer Approach



Step 6. HDG/ATT or ALT.
Lead the aircraft through the procedure turn by moving the heading bug in the direction of the turn.



Step 7. **HDG/ATT or ALT.**
Continue to lead the aircraft through the turn.



Step 8. APR/ALT.
Turn the heading bug to the inbound front course of the ILS and press the APR switch. The autopilot will establish a 45° intercept to the localizer. When the localizer is less than 98% of full scale, the GS lamp will illuminate to indicate the autopilot is armed for glideslope.

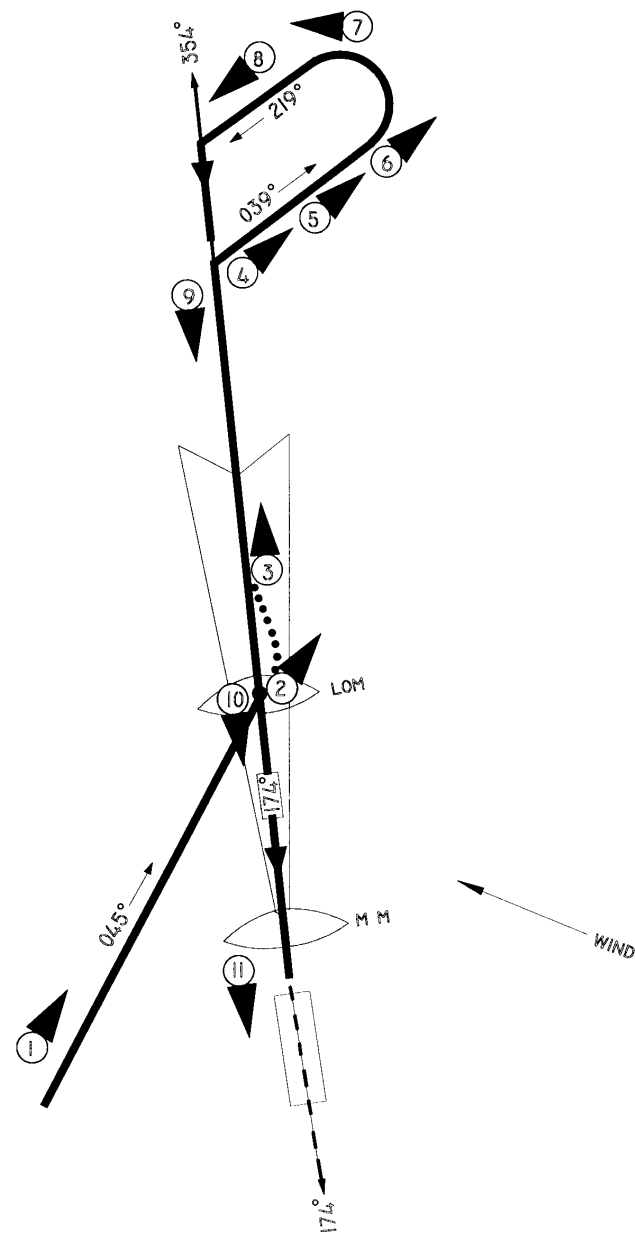


Step 9. APR/ALT/GS.
After intercept, the system will correct for crosswind and enter into the “soft track” mode. Internal radio gains and bank angles will be limited.



Step 10. APR/GS.
As the glide slope beam is captured, the ALT lamp will extinguish. The system will track the localizer and glide slope. Power changes should be made in small increments as necessary to maintain correct airspeed.

Localizer Approach



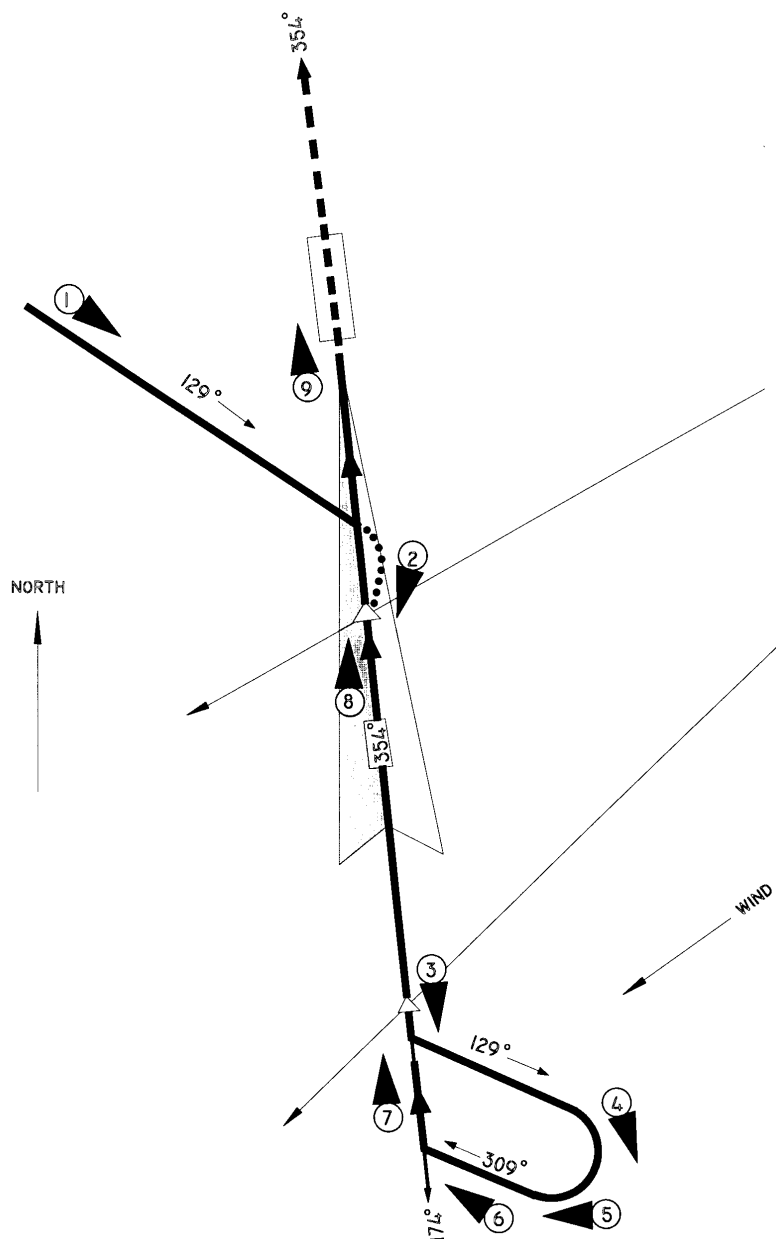
Localizer Approach



Step 11. HDG/ATT

Once the aircraft has reached minimums, disconnect the autopilot. If a missed approach is required, disconnect the autopilot and establish desired climb attitude and airspeed. When appropriate press HDG and ATT and engage autopilot.

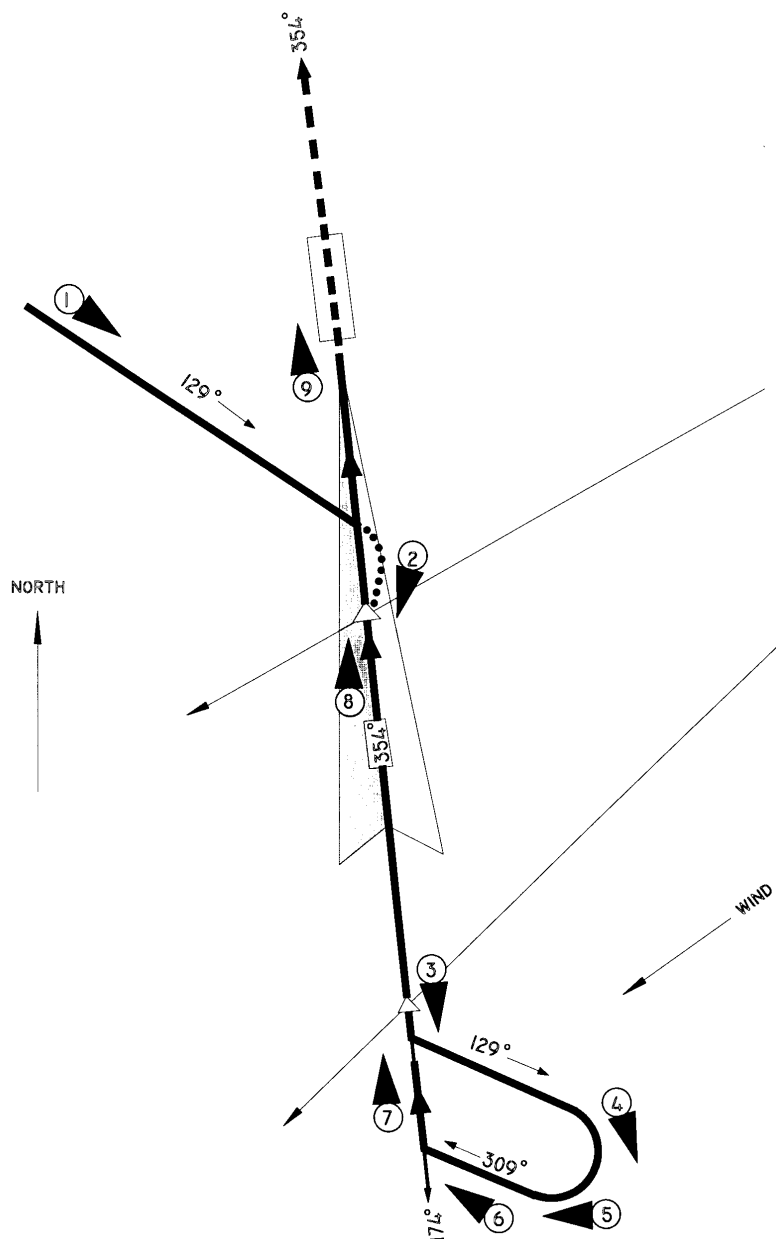
Localizer Back Course



Localizer Back Course

		Step 1. HDG/ATT or ALT. The localizer back course approach begins with a transition from an enroute structure to intercept the back course outbound. An alternate method would be to set the inbound front course with the heading bug and press the APR switch to set up a 45° intercept to the back course.
		Step 2. APR/ATT or ALT. After the intercept, the autopilot will track the outbound course and compensate for any crosswind and begin "soft track".
		Step 3. HDG/ATT or ALT. At the appropriate time, press the HDG switch to begin the procedure turn. Altitude appropriate to this phase of the approach should be controlled using ALT or ATT as necessary.
		Step 4. HDG/ATT or ALT. Proceed outbound in the procedure turn until sufficient time has elapsed to assure proper re-interception.
		Step 5. HDG/ATT or ALT. Lead the aircraft through the procedure turn by moving the heading bug in the direction of the turn.

Localizer Back Course



Localizer Back Course

		Step 6. REV/ATT or ALT. As the aircraft continues to turn, set the heading bug to the inbound procedure turn heading. Press the REV switch. The autopilot will set up a 45° intercept.
		Step 7. REV/ATT. After the on course turn is completed, the system will enter the "soft track" mode to limit radio authority and bank angles and to correct for crosswind. Control altitude and airspeed as appropriate for the approach.
		Step 8. REV/ATT. Once the aircraft has reached minimums, disconnect the autopilot. If a missed approach is required, disconnect the autopilot and establish desired climb attitude and airspeed. When appropriate press HDG and ATT or ALT and engage autopilot.

MAINTENANCE

The Century 2000 has been designed and manufactured to render reliable service; however, some of the system components will require a regular inspection and service. It is important that agencies selected for service are properly qualified and equipped to render service on the Century 2000.

We have listed several items below to assist you in monitoring you system maintenance.

1. Gyro Filters - The gyros used with the Century 2000 are precision devices whose performance and service life are in part dependent upon the quality of the air supply. Poor air quality can significantly reduce gyro life (to hours) and performance by contaminating bearings. Regular filter maintenance is good investment.
2. Aircraft Static Systems - Air leaks and water entrapment can significantly affect altitude hold performance. Static System maintenance and checks help not only the AFCS, but assure proper function of static instruments. Altitude Hold units used by Century Flight Systems, Inc., should NOT be disconnected during static system checks as they are designed to withstand such test without damage.
3. Periodic inspection and maintenance is recommended for those items of the autopilot which attach to the aircraft control systems. During normal inspection is a good time to make these simple checks on the autopilot.
 - A. Inspect the bridle cable on the Pitch, Roll, and Yaw Servos for
 1. Condition
 2. Tension
 3. Freedom - move controls through full range of travel.
 - B. Inspect bridle Cable clamps for:
 1. Obstruction.
 2. Bolt Torque - 55 ± 5 inch pounds of torque. Note: This higher than normal is FAA approved and required.
 3. Gap between clamp halves - .005" minimum, assures that cables are under clamping pressure.

- C. Inspect Trim Capstans for:
 1. Evidence of wear
 2. The clutch should slip instead of cable on capstan if overpowered.
- D. Inspect Trim Cables for:
 1. Fraying
 2. Proper tension (high end of spec is usually best).
 3. Freedom of travel.

EMERGENCY OPERATION

Check the Flight Manual Supplement located in the Installation Manual for the C2000.

Effective: July 4, 1975

LIMITED WARRANTY CENTURY FLIGHT SYSTEMS, INC. AUTOPILOT

Each new Century Flight Systems, Inc. Autopilot is warranted by the manufacturer to be free from defects in material and workmanship under normal use, subject to the following conditions:

1. Century Flight Systems, Inc. will through its designated service facilities at its option either repair or replace new components which, shall within (12) months after date of installation, be found to Century Flight Systems, Inc. satisfaction, to have been defective in material or workmanship under normal use.
2. The warranty registration must be signed and returned to Century Flight System, Inc. within ten days of equipment installation date. In the event that the registration card is not returned within this time, the date of shipment from the factory will be deemed to be the installation date .
3. This warranty will not apply to any product which has been installed, repaired in any way whatsoever in Century Flight Systems, Inc. opinion to adversely affect its performance or reliability, or which has been subject to misuse, contamination, negligence, or accident.
4. Cost of transportation, removal or reinstallation are at the option of Century Flight Systems, Inc.
5. This Century Flight System, Inc. sole express warranty with respect to the goods supplied herein. CENTURY FLIGHT SYSTEMS, INC. MAKES NO OTHER EXPRESS WARRANTY OF ANY KIND WHATSOEVER. CENTURY FLIGHT SYSTEMS, INC. EMPLOYEES MAY HAVE MADE ORAL STATEMENTS ABOUT THE PRODUCTS DESCRIBED IN THIS CONTRACT. SUCH STATEMENTS DO NOT CONSTITUTE WARRANTIES, SHALL NOT BE RELIED UPON BY THE CUSTOMER, AND ARE NOT PART OF THE SALE CONTRACT.
6. THE DURATION OF ANY IMPLIED WARRANTY, AND OF ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL BE LIMITED TO (12) MONTHS COMMENCING AT DATE OF INSTALLATION THE FULL EXTENT PERMITTED BY APPLICABLE LAW, CONSEQUENTIAL DAMAGE OR BREECH OF ANY WARRANTY ARE HEREBY DISCLAIMED AND EXCLUDED BY CENTURY FLIGHT SYSTEMS, INC.

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