

# S-TEC SYSTEM 55 NORMAL OPERATING PROCEDURES

In order to activate any mode, the autopilot master switch must be in the **ON** position and the **RDY** annunciator must be illuminated.

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## CONTROL WHEEL STEERING (CWS)

Your new System 55 has a very desirable mode of operation - **Control Wheel Steering (CWS)**. This feature is the quickest way to engage both the Roll and Pitch Axes of the System and synchronize the autopilot with the present aircraft attitude.



Depress and hold the **Control Wheel Steering** switch located on the aircraft's control wheel. The **CWS** and **VS** modes will annunciate and **RDY** will extinguish. Position the aircraft in the desired roll and pitch attitude. Note: Aircraft vertical speed x 100 will be displayed in the Programmer/Computer Annunciator window directly above the VS selector knob. Example: + 6 equals 600 FPM rate of climb.

Allow the aircraft to stabilize in the desired attitude for 2 to 3 seconds, release the Control Wheel Steering switch and the autopilot roll and pitch servos will engage synchronized with the Aircraft's turn rate and vertical speed.

NOTE: IF THE AIRCRAFT ROLL ANGLE IS GREATER THAN A STANDARD RATE TURN WHEN THE CWS SWITCH IS RELEASED, THE BANK ANGLE WILL BE REDUCED TO PRODUCE 90% OF A STANDARD RATE TURN AS A MAXIMUM.

From the **CWS** mode, the pilot may select other modes such as **HDG**, **NAV**, **ALT** or may modify the present vertical speed using the **VS** knob.

The pilot may re-enter the **CWS** mode at any time by simply depressing the **CWS** switch on the control wheel, positioning the aircraft in the desired roll and pitch attitude and releasing the **CWS** switch. NOTE: After initial autopilot engagement when the **CWS** switch is depressed, the roll and pitch servos will be disengaged during the maneuvering phase. An audible tone will be heard indicating servo disengagement.

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## HEADING MODE

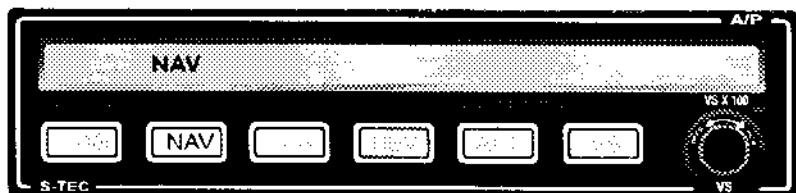
**Heading (HDG)** mode may be selected initially from **CWS** mode or **RDY** mode. Set the heading bug on the DG or optional HSI to the desired heading, and press the **HDG** switch. The **HDG** annunciator will illuminate. New headings can be selected simply by repositioning the heading bug.

A reminder: When operating in the **HDG** mode, the system is not coupled to any navigation aid. It merely flies a specific heading. It will be necessary to monitor navigation instruments for course deviation due to wind drift, and to establish wind correction angles.



## NAV Intercept and Tracking (with Standard DG)

To intercept and track a VOR, RNAV, Loran or GPS course, tune the Navigation Radio receiver to the proper frequency and select the desired course. Move the heading bug in the direction of desired travel to match the selected course.



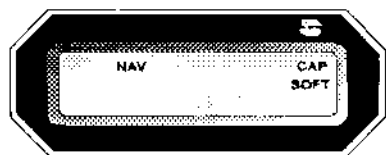
Engage the **NAV** mode. If the course needle is at full-scale deviation, the autopilot will establish a 45° intercept angle. As the aircraft approaches the selected course, the autopilot senses the closure rate, and gradually, smoothly shallows the intercept angle. The point at which this turn begins is variable, depending on the aircraft position and closure rate to the course. However, the turn will always begin between 100% (full-scale) needle deflection and 20% of full-scale.

During the intercept sequence, the system operates in maximum gain and sensitivity to needle position and motion; 90% of standard rate turn. When the selected course is intercepted, and the needle is centered, indicating course capture, initiation of the tracking gain program is automatic.



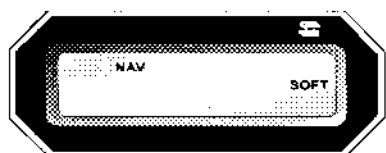
If the aircraft is equipped with the optional Annunciator, the **NAV** and **CAP** modes will be annunciated.

The high sensitivity level is maintained for about 15 seconds while wind correction angle is established. Turn rate maximum is then reduced to 45% standard rate.



The optional remote Annunciator will indicate *NAV*, *CAP* and *SOFT*.

Approximately 60 seconds later, the turn rate maximum is reduced to 15% of standard rate and the lowest level of sensitivity is achieved.



At this point the optional remote Annunciator will indicate *NAV* and *SOFT*. The *CAP* annunciation will extinguish.

If the Heading bug is within  $5^\circ$  of center and needle deflection is less than 10%, the computer will immediately establish this lowest sensitivity level when *NAV* is selected.

This condition provides low activity levels during station passage when VOR signals are erratic. In other words, it ignores short-term needle excursion.

The system includes a course deviation monitor. If the aircraft strays off course or LOC centerline by 50% needle deflection, the *NAV* annunciator flashes a warning. It flashes at station passage because of short-term needle excursion, and because the NAV signal is inadequate. It also flashes when the OBS NAV flag is displayed. When that occurs, the *FAIL* annunciation will illuminate.

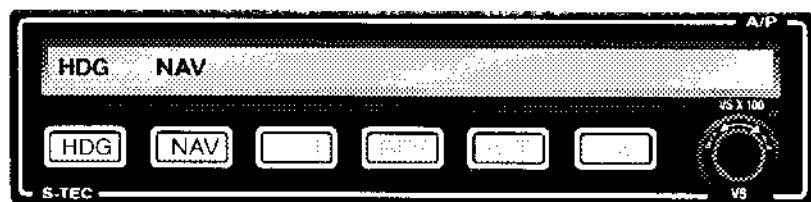
When operating in the *NAV/SOFT* mode, and needle deflection of 50% or more is experienced for 1.5 minutes, the gain program will switch to *NAV/CAP/SOFT*, increasing sensitivity and authority to re-establish the aircraft on course.

When a course change of 10° or more is required at an en route VOR, select the new course, and reset the NAV mode to reinstate the capture sequence. Set the DG heading bug to the new course.

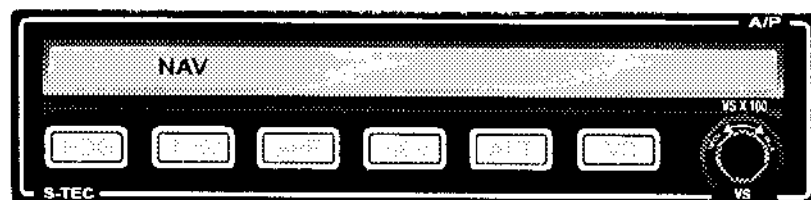
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### PILOT SELECTABLE INTERCEPT ANGLE (S)

The pilot may select an angle of intercept less than the standard 45°. Simply place the heading bug on the D.G. to the desired heading to be used for the course intercept and push both HDG and NAV switches simultaneously. Both HDG and NAV will be annunciated.



The selected heading will now be flown until the autopilot computes that an on course turn must be made to minimize overshoot at the point of intercept. At the time the on course turn begins, the HDG mode will extinguish and you must move the heading bug to match the selected radio course. This will allow the autopilot the full range of cross wind correction during NAV track mode.



NOTE: INTERCEPT ANGLES GREATER THAN 45° USUALLY RESULT IN SOME COURSE OVERSHOOT, DEPENDING ON THE DISTANCE FROM THE STATION AND AIRCRAFT SPEED. THEREFORE, ANGLES GREATER THAN 45° ARE NOT RECOMMENDED.

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### NAV INTERCEPT AND TRACK (OPTIONAL H.S.I.)

If your aircraft is equipped with an optional Horizontal Situation Indicator, your S-TEC autopilot will receive both left/right deviation and course information when the course selector is set to the desired course. With an H.S.I., the heading bug is not used during tracking.

To intercept and track a VOR, RNAV, LORAN or GPS Course, select the desired course with the H.S.I. Course Selector and engage the NAV mode.



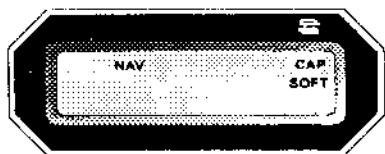
If the course needle is at full-scale deviation, the autopilot will establish a 45° intercept angle. As the aircraft approaches the selected course, the autopilot senses the closure rate, and gradually, smoothly shallows the intercept angle. The point at which this turn begins is variable, depending on the aircraft position and closure rate to the course. However, the turn will always begin between 100% (full-scale) needle deflection and 20% of full-scale.

During the intercept sequence, the system operates in maximum gain and sensitivity to needle position and motion: 90% of standard rate. When the selected course is intercepted, and the needle is centered, indicating course capture, initiation of the tracking gain program is automatic.



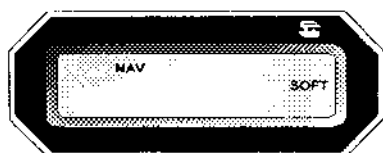
If the aircraft is equipped with the optional annunciator, the *NAV* and *CAP* modes will be annunciated.

The high sensitivity level is maintained for about 15 seconds while wind correction angle is established. Turn rate maximum is then reduced to 45% standard rate.



The optional remote annunciator will indicate *NAV*, *CAP* and *SOFT*.

Approximately 60 seconds later, the turn rate maximum is reduced to 15% standard rate and the lowest level of sensitivity is achieved.



At this point the optional remote annunciator will indicate *NAV* and *SOFT*. The *CAP* annunciation will extinguish.

If the course selector is within 5° of center and needle deflection is less than 10%, the computer will immediately establish this lowest sensitivity level when *NAV* is selected.

This condition provides low activity levels during station passage when VOR signals are erratic. In other words, it ignores short-term needle excursion.

The system includes a course deviation monitor. If the aircraft strays off course or LOC centerline by 50% needle deflection, the *NAV* annunciator flashes a warning. It flashes at station passage because of short-term needle excursion, and because *NAV* signal is inadequate. It also flashes when the H.S.I. NAV flag is displayed. When that occurs, the *FAIL* annunciation will illuminate.

When operating in the *NAV/SOFT* mode, and needle deflection of 50% or more is experienced for 1.5 minutes, the gain program will switch to *NAV/CAP/SOFT*, increasing sensitivity and authority to re-establish the aircraft on course.

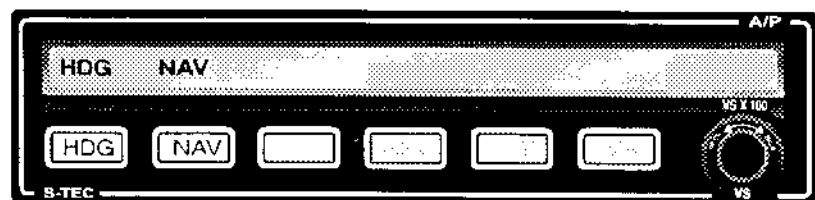
When a course change of 10° or more is required at an en route VOR, select the new course, and reset the **NAV** mode to reinstate the capture sequence.

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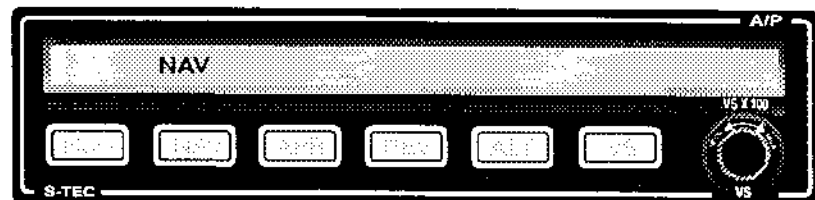
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## PILOT SELECTABLE INTERCEPT ANGLE (S)

The pilot may select an angle of intercept less than the standard 45°. Simply place the heading bug on the H.S.I. on the desired heading to be used for the course intercept and push both **HDG** and **NAV** switches simultaneously. Both *HDG* and *NAV* will be annunciated.



The selected heading will now be flown until the autopilot computes that an on course turn must be made to minimize overshoot at the point of intercept. At the time the on course turn begins, the *HDG* mode will extinguish.



NOTE: INTERCEPT ANGLES GREATER THAN 45° USUALLY RESULT IN SOME COURSE OVERTHOOT, DEPENDING ON THE DISTANCE FROM THE STATION AND AIRCRAFT SPEED. THEREFORE, ANGLES GREATER THAN 45° ARE NOT RECOMMENDED.

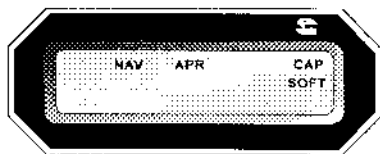
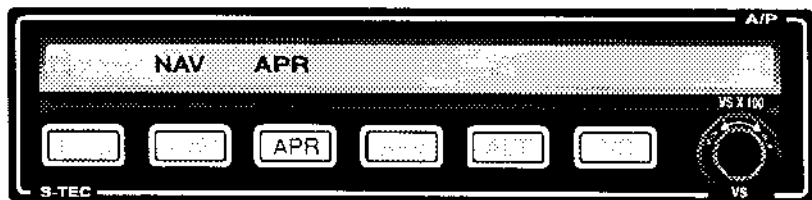
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## APPROACH (APR) MODE SWITCH

The **APR** mode provides increased sensitivity for VOR, LORAN, GPS or AREA NAV approaches. The pilot may also select this mode if increased sensitivity is desired for en route NAV tracking.

*NAV* and *APR* will be annunciated on the Programmer/Computer.



If the optional remote annunciator is installed, *NAV*, *APR*, *CAP* and *SOFT* will be annunciated.

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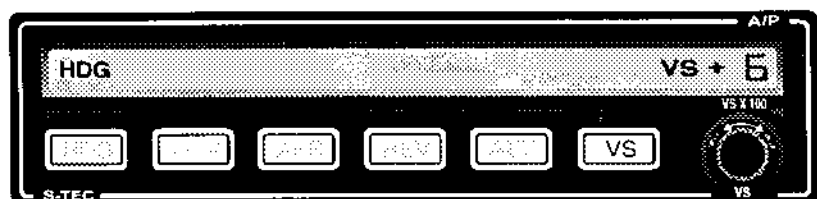
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## VERTICAL SPEED (VS)

In order to engage vertical speed, the autopilot roll axis must be engaged. Selecting **CWS** mode or any roll mode will satisfy this requirement.

In **CWS** mode, the pilot may select the desired vertical speed in 100 ft increments by rotating the **VS** knob clockwise or counter clockwise.

With any roll mode engaged, the pilot may select the **VS** mode by pressing the **VS** mode select switch. The autopilot will synchronize with the aircraft's vertical speed at the time the mode is selected and the corresponding vertical speed will be indicated in the Programmer/Computer display. Vertical speed may now be modified in 100 ft increments by rotating the **VS** knob clockwise or counter clockwise.



The + (positive) symbol annunciation indicates a *climb* vertical speed selection. Clockwise rotation of the **VS** knob increases the rate of climb and counter clockwise rotation decreases the rate of climb to 0. The - (negative) symbol annunciation indicates a *descent* vertical speed selection. Counter clockwise rotation of the **VS** knob increases the rate of descent and clockwise rotation decreases the rate of descent to 0. Maximum selectable VS limits are  $\pm 1600$  FPM.

**NOTE:** IF THE **VS** MODE ANNUNCIATOR FLASHES, WHILE IN THE **VS** MODE, THIS IS AN INDICATION OF EXCESSIVE ERROR BETWEEN ACTUAL VERTICAL SPEED COMPARED TO SELECTED VERTICAL SPEED (USUALLY IN A CLIMB) AND THE PILOT SHOULD ADJUST AIRCRAFT POWER OR REDUCE THE VERTICAL SPEED COMMAND AS APPROPRIATE.

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## ALTITUDE (ALT)

The altitude hold mode, **ALT**, may be engaged with any roll mode, **CWS** mode or **VS** mode engaged, by pressing the **ALT** mode switch. The aircraft will maintain the pressure altitude present at the time of **ALT** mode selection.

Altitude Correction for en route barometric pressure changes may be made while in **ALT** mode by rotation of the **VS** knob. Each "Click" will change the altitude by 20 ft. The maximum altitude correction is  $\pm 360$  ft. Corrections in excess of  $\pm 360$  ft will require selecting the **VS** mode and climbing or descending to the new altitude and re-engaging **ALT** mode.

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## Pitch Trim Indicator

Without automatic trim or when trim is turned off, a sensor in the System 55 autopilot pitch servo detects out-of-trim elevator loads. When such forces exceed a preset level and time delay, **TRIM** will annunciate on the Flight Guidance Programmer/Computer with either the ▲ (up) or ▼ (dn) symbol annunciated to indicate the direction elevator trim is required. In addition, effective with unit serial number 321 and on, an audible warning tone will sound for 5 seconds. **NOTE: This is the same audible beeping tone emitted when the autopilot is disconnected but at a slower rate.** The annunciation will be steady for about 5 seconds, then flash until proper trim conditions have been met.

**NOTE: IF TRIM IS ANNUNCIATED AND THE PILOT DISENGAGES THE AUTOPILOT, THERE WILL BE A RESIDUAL OUT OF TRIM FORCE AT THE CONTROL WHEEL. BE ALERT FOR THIS CONDITION IF THE AUTOPILOT IS DISENGAGED WHILE TRIM IS ANNUNCIATED.**

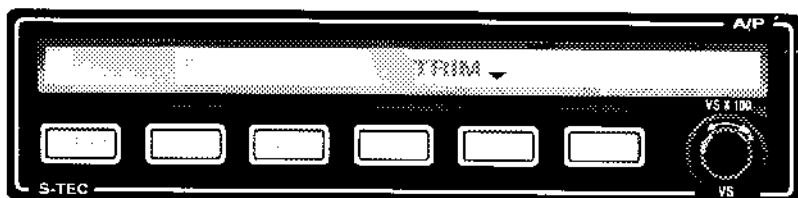
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## OPTIONAL AUTOTRIM

If the autopilot is equipped with optional autotrim, the aircraft elevator trim will be maintained automatically when the trim master switch is on and a pitch mode is activated.

When the elevator trim is in motion, *TRIM* and the ▲ (up) or ▼ (dn) symbol will annunciate indicating trim in motion and direction of travel. Should the trim continue to run in excess of 7 seconds, these annunciations will flash.



If the trim master switch is OFF or a failure has occurred in the autotrim, the system will automatically revert to "Pitch Trim Indicator" mode of operation.

**NOTE: USING THE TRIM SWITCH ON THE CONTROL WHEEL WHILE THE PITCH AXIS OF THE AUTOPILOT IS ENGAGED WILL DISCONNECT THE AUTOPILOT.**

The autotrim option also provides the pilot with **Manual Electric Trim** when the autopilot is disengaged or if only a roll axis mode has been engaged.

To use manual electric trim, simply push the trim toggle switch, located on the aircraft's control wheel, in the desired direction of trim. **FORWARD** for nose down or **AFT** for nose up. **TRIM** will be annunciated and will flash while the trim is in motion.



The S-TEC trim system is designed to accept any type of single failure - mechanical or electrical - without uncontrolled operation resulting. To ensure that no hidden failures have occurred, conduct a trim preflight check prior to every flight.

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