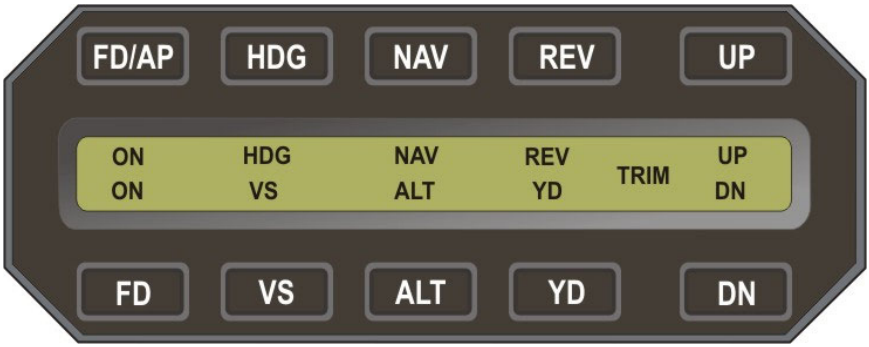
S-TEC

# Sixty Five

# Pilot's Operating Handbook



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# SECTION 1
# OVERVIEW

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### 1.1 Document Organization

Section 1 Overview

Section 2 Pre-Flight Procedures

Section 3 In-Flight Procedures

Section 4 Operating Parameters

Section 5 Glossary

### 1.2 Purpose

This Pilot's Operating Handbook (POH) provides Pre-Flight and In-Flight operating procedures for the S-TEC System Sixty Five Autopilot (AP).

***Note:***

***This POH must be carried in the A/C and made available to the pilot at all times. It can only be used in conjunction with the Federal Aviation Administration (FAA) approved Aircraft Flight Manual (AFM) or Aircraft Flight Manual Supplement (AFMS). Refer to the applicable AFM or AFMS for A/C specific information, such as unique ground tests, limitations, and emergency procedures.***

***Note:***

***The System Sixty Five autopilot is a tool provided to aircraft owners, that serves to assist them with cockpit workload management. The ability of the autopilot to provide optimum assistance and performance is directly proportional to the pilot's knowledge of its operating procedures. Therefore, it is highly recommended that the pilot develop a thorough understanding of the autopilot, its modes, and operating procedures in Visual Meteorological Conditions (VMC), prior to using it under Instrument Flight Rules (IFR).***

### 1.3 General Control Theory

The System Sixty Five is a rate based autopilot. When in control of the roll axis, the autopilot senses turn rate, as well as closure rate to the selected course, along with the non-rate quantities of heading error, course error, and course deviation indication. When in control of the pitch axis, the autopilot senses vertical speed, acceleration, and closure rate to the selected glideslope, along with the non-rate quantities of altitude and glideslope deviation indication. These sensed data provide feedback to the autopilot, which processes them in order to control the aircraft through the use of mechanisms coupled to the control system. In most aircraft, the roll servo is coupled to the ailerons. The pitch servo is coupled to the elevator. Activation of roll axis control must always precede activation of pitch axis control.

The autotrim function senses when the aircraft needs to be trimmed about the pitch axis, and responds by driving the trim servo in the proper direction to provide trim. The trim servo is coupled to the elevator trim tabs.

The optional yaw damper senses excessive adverse yaw about the yaw axis, and responds by driving the yaw servo in the proper direction to provide damping. The yaw servo is coupled to the rudder.

The optional flight director is a display of the flight profile.

## 1.4 Modes of Operation

### 1.4.1 Roll Axis Control

Heading (HDG) Mode

Used to Turn onto a Selected Heading and Hold it

Navigation (NAV) Mode

Used to Intercept and Track a VOR Course

Navigation Approach (NAV APR) Mode

Used to Intercept and Track a LOC Front Course Inbound

Reverse (REV) Mode

Used to Intercept and Track the Reciprocal of a Specified VOR Course

Reverse Approach (REV APR) Mode

Used to Intercept and Track a LOC Back Course Inbound

### 1.4.2 Pitch Axis Control

Altitude Hold (ALT HOLD) Mode

Used to Hold Altitude

Vertical Speed (VS) Mode

Used to Hold Vertical Speed

Glideslope (GS) Mode

Used to Intercept and Track Glideslope

### 1.4.3 Yaw Axis Control

Yaw Damper (YD) Mode

Used to Dampen Excessive Adverse Yaw

## 1.5 Block Diagram

The System Sixty Five Block Diagram is shown in Fig. 1-1.

The Yaw Damper Block Diagram is shown in Fig. 1-2.

The Flight Director Block Diagram is shown in Fig. 1-3.

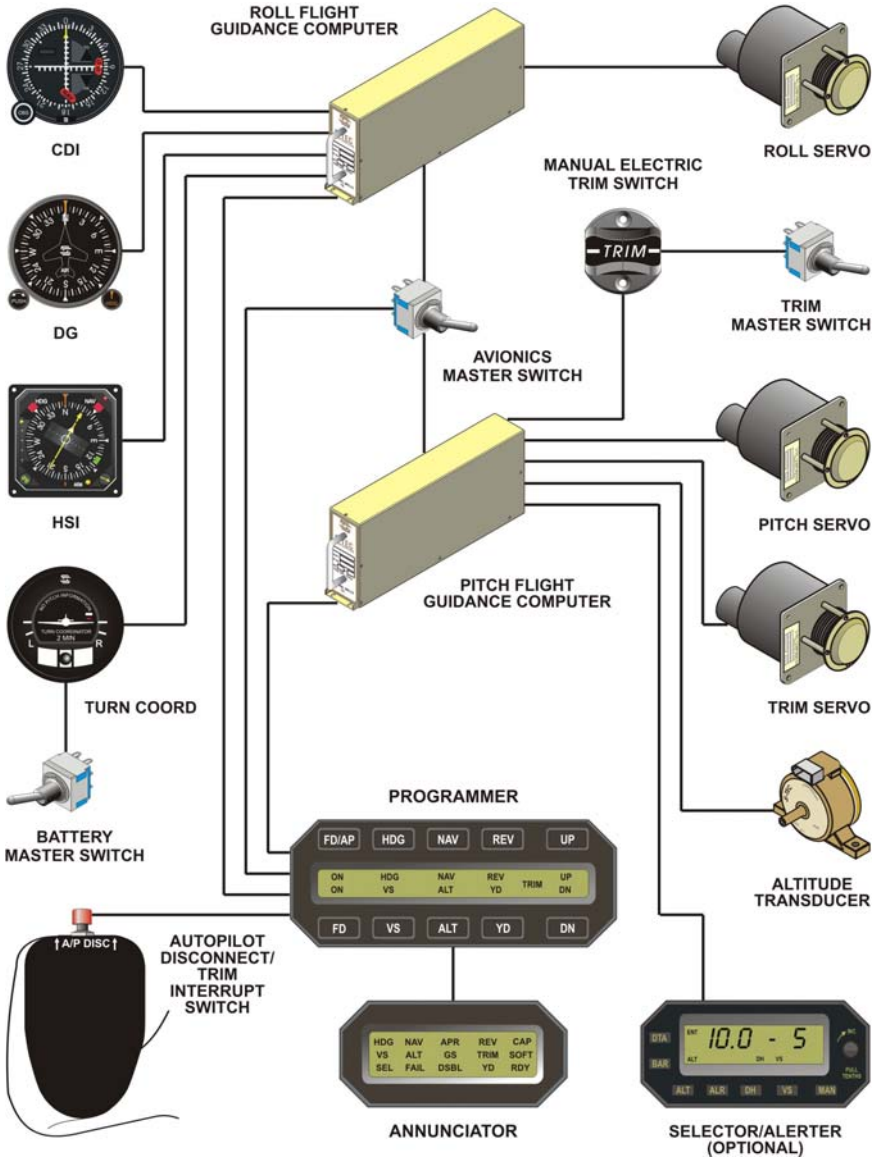


**Fig. 1-1. System Sixty Five Block Diagram**

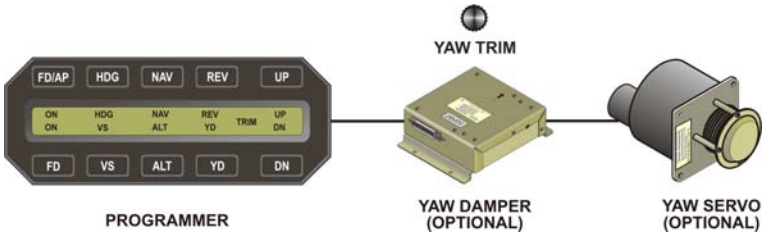


**Fig. 1-2. Yaw Damper Block Diagram**

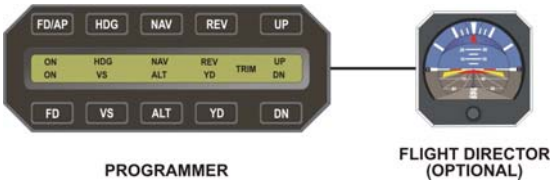


**Fig. 1-3. Flight Director Block Diagram**

### 1.6 Related S-TEC Documents

POH, ST-901 GPSS Converter, PN 8799

# SECTION 2
# PRE-FLIGHT PROCEDURES

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## 2.1 Pre-Flight Test

Prior to takeoff and with engine running, perform the actions shown in Table 2-1. For each action, verify the corresponding response where applicable.

**Table 2-1. Pre-Flight Test (continued on page 2-6)**

| ACTION | RESPONSE |
|---|---|
| 1. Set Trim Master Switch to OFF position (if installed). | ------ |
| 2. Set Battery Master Switch to ON position. | ------ |
| 3. Set Avionics Master Switch to ON position. | RDY annunciation only appears on AP display within 3 minutes, as shown in Fig. 2-1. |
| *Note:*<br>*Should a Turn Coordinator failure be detected, the RDY annunciation will not appear as shown in Fig. 2-2, and the autopilot will not operate.* | |
| 4. Move A/C Control Wheel forward and aft, to sense its freedom of movement about pitch axis. | ------ |
| 5. Press/Hold UP switch on Programmer, while maintaining a grasp on A/C Control Wheel.<br><br>*Note: This verifies g-force limit switch operation.* | Pitch Servo initially engages, as sensed by the reduced freedom of A/C Control Wheel movement about pitch axis, and Audible Alert sounds a steady tone.<br><br>After 2 seconds Pitch Servo disengages, as sensed by the increased freedom of A/C Control Wheel movement about pitch axis. |
| 6. Release UP switch. | Audible Alert is squelched. |

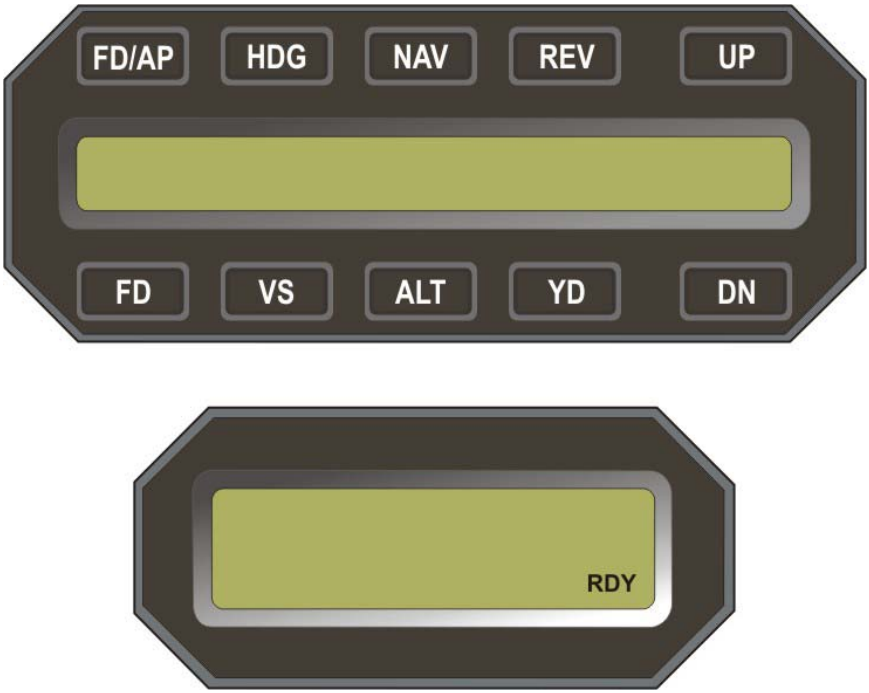


**Fig. 2-1. AP Display, RDY for Operation**


**Fig. 2-2. AP Display, Turn Coordinator Failure, RDY Does Not Appear**

**Table 2-1. Pre-Flight Test (continued from page 2-3)**

| ACTION | RESPONSE |
|---|---|
| 7. Press/Hold DN switch on Programmer, while maintaining a grasp on A/C Control Wheel.<br><br>*Note: This verifies g-force limit switch operation.* | Pitch Servo initially engages, as sensed by the reduced freedom of A/C Control Wheel movement about pitch axis, and Audible Alert sounds a steady tone.<br><br>After 2 seconds Pitch Servo disengages, as sensed by the increased freedom of A/C Control Wheel movement about pitch axis. |
| 8. Release DN switch. | Audible Alert is squelched. |
| 9. Press FD/AP switch. | ON annunciation appears on AP display, as shown in Fig. 2-3. |
| 10. Set Heading Bug under Lubber Line. | ------ |
| 11. Move A/C Control Wheel left and right, to sense its freedom of movement about roll axis. | ------ |
| 12. Press HDG mode selector switch to engage heading mode, and then press YD mode selector switch to disengage yaw damper mode (only if yaw damper is installed). | HDG annunciation appears on AP display, whereas RDY and YD are extinguished as shown in Fig. 2-4. |
| 13. Attempt movement of A/C Control Wheel left and right. | A/C Control Wheel's reduced freedom of movement indicates that Roll Servo is engaged.<br><br>Verify that Roll Servo can be overridden. If not, pull Autopilot Circuit Breaker and do not use. |

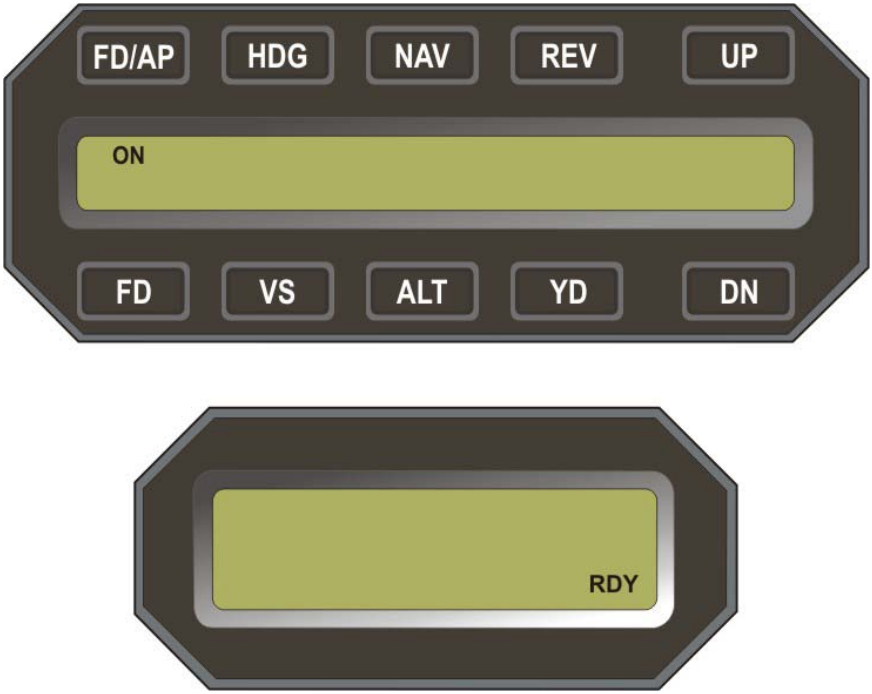


**Fig. 2-3. AP Display, Programmer ON**


**Fig. 2-4. AP Display, HDG Mode Engaged**

**Table 2-1. Pre-Flight Test (continued from page 2-6)**

| ACTION | RESPONSE |
|---|---|
| 14. Turn Heading Bug to the left side of Lubber Line. | A/C Control Wheel turns to the left. |
| 15. Turn Heading Bug to the right side of Lubber Line. | A/C Control Wheel turns to the right. |
| 16. Set Heading Bug under Lubber Line. | A/C Control Wheel stops. |
| 17. Move A/C Control Wheel forward and aft, to sense its freedom of movement about pitch axis. | ------ |
| 18. Press ALT mode selector switch to engage altitude hold mode. | ALT annunciation appears on AP display, as shown in Fig. 2-5. |
| 19. Attempt movement of A/C Control Wheel forward and aft. | A/C Control Wheel's reduced freedom of movement indicates that Pitch Servo is engaged.<br><br>Verify that Pitch Servo can be overridden. If not, pull Autopilot Circuit Breaker and do not use. |
| 20. Move A/C Control Wheel until elevator is in neutral position. | ------ |
| 21. Press/Hold UP switch. | A/C Control Wheel moves in aft direction, while Audible Alert sounds a steady tone. |
| 22. Release UP switch. | A/C Control Wheel continues moving in aft direction, but Audible Alert is squelched. |

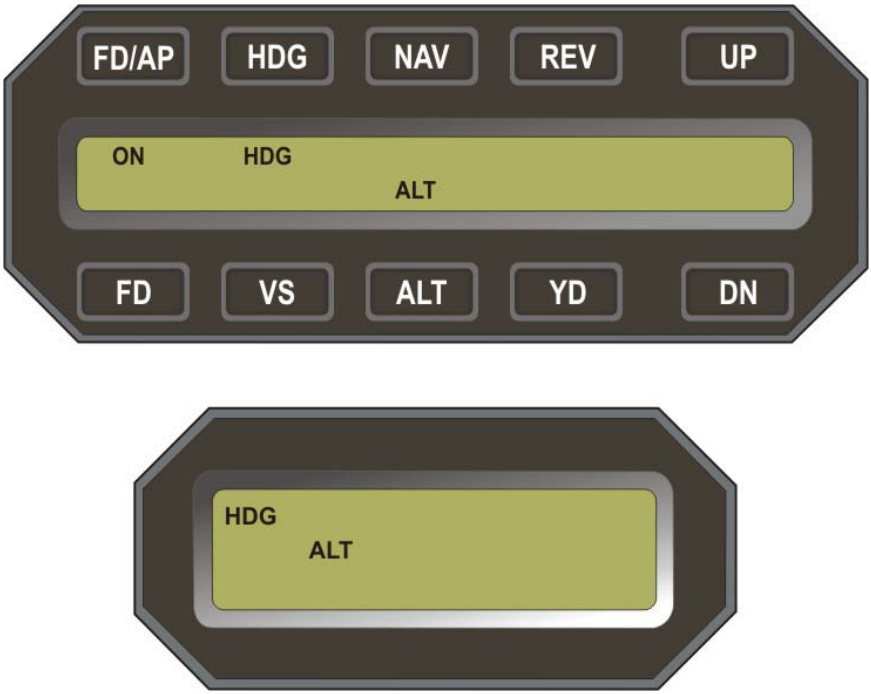


**Fig. 2-5. AP Display, HDG and ALT HOLD Modes Engaged**

**Table 2-1. Pre-Flight Test (continued from page 2-9)**

| ACTION | RESPONSE |
|---|---|
| 23. Press/Hold DN switch. | A/C Control Wheel slows to a stop in aft direction, and then moves in forward direction while Audible Alert sounds a steady tone. |
| 24. Release DN switch. | A/C Control Wheel continues moving in forward direction, but Audible Alert is squelched. |
| 25. Press VS mode selector switch to engage vertical speed mode. | A/C Control Wheel stops.<br><br>VS annunciation appears on AP display, whereas ALT is extinguished as shown in Fig. 2-6. |
| 26. Press/Hold UP switch. | A/C Control Wheel moves in aft direction, while Audible Alert sounds a steady tone. |
| 27. Release UP switch. | A/C Control Wheel continues moving in aft direction, but Audible Alert is squelched. |
| 28. Press/Hold DN switch. | A/C Control Wheel slows to a stop in aft direction, and then moves in forward direction while Audible Alert sounds a steady tone. |
| 29. Release DN switch. | A/C Control Wheel continues moving in forward direction, but Audible Alert is squelched. |
| 30. Press ALT mode selector switch to engage altitude hold mode. | A/C Control Wheel stops.<br><br>ALT annunciation appears on AP display, whereas VS is extinguished. |


**Fig. 2-6. AP Display, HDG and VS Modes Engaged**

**Table 2-1. Pre-Flight Test (continued from page 2-11)**

| ACTION | RESPONSE |
|---|---|
| *Note:*<br>*If it is not possible to select a local VOR frequency on Navigation Receiver, then proceed to step 44. Otherwise, proceed to step 31.* | |
| 31. Select local VOR frequency on Navigation Receiver. | ------ |
| *Note:*<br>*Proceed to either step 32 (HSI) or step 38 (DG).* | |
| 32. Turn Course Pointer until CDI needle is centered. | ------ |
| 33. Turn A/C until Course Pointer is under Lubber Line, to null course error input to autopilot. | ------ |
| 34. Press NAV mode selector switch to engage navigation mode. | NAV and SOFT annunciations appear on AP display, whereas HDG is extinguished as shown in Fig. 2-7. |
| 35. Turn Course Pointer left until CDI needle deflection is 2 dots right of center. | A/C Control Wheel turns to the right. |
| 36. Turn Course Pointer right until CDI needle deflection is 2 dots left of center. | A/C Control Wheel turns to the left. |
| 37. Turn Course Pointer left until CDI needle deflection is centered. | A/C Control Wheel stops. |
| *Note: Proceed to step 43.* | |

**Table 2-1. Pre-Flight Test (continued from page 2-13)**

| ACTION | RESPONSE |
|---|---|
| 38. Turn OBS until CDI needle is centered. | ------ |
| 39. Press NAV mode selector switch to engage navigation mode. | NAV and SOFT annunciations appear on AP display, whereas HDG is extinguished as shown in Fig. 2-7. |
| 40. Turn OBS until CDI needle deflection is 2 dots right of center. | A/C Control Wheel turns to the right. |
| 41. Turn OBS until CDI needle deflection is 2 dots left of center. | A/C Control Wheel turns to the left. |
| 42. Turn OBS until CDI needle is centered. | A/C Control Wheel stops. |
| 43. Press HDG mode selector switch to engage heading mode. | HDG annunciation appears on AP display, whereas NAV and SOFT are extinguished. |
| 44. Move A/C Control Wheel as far forward as possible. | After 3 seconds, TRIM and UP annunciations appear on AP display as shown in Fig. 2-8, and Audible Alert sounds a steady tone.<br><br>After 7 seconds, TRIM and UP annunciations flash, and Audible Alert becomes periodic. |
| 45. Move A/C Control Wheel aft until TRIM and UP annunciations are extinguished. | Audible Alert is squelched. |

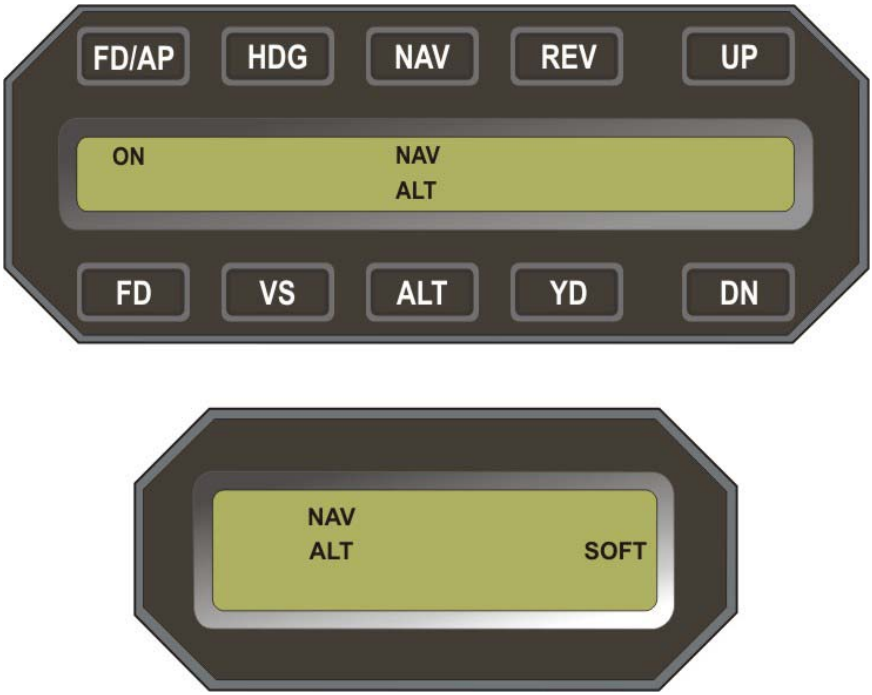


**Fig. 2-7. AP Display, NAV and ALT HOLD Modes Engaged, SOFT Condition**

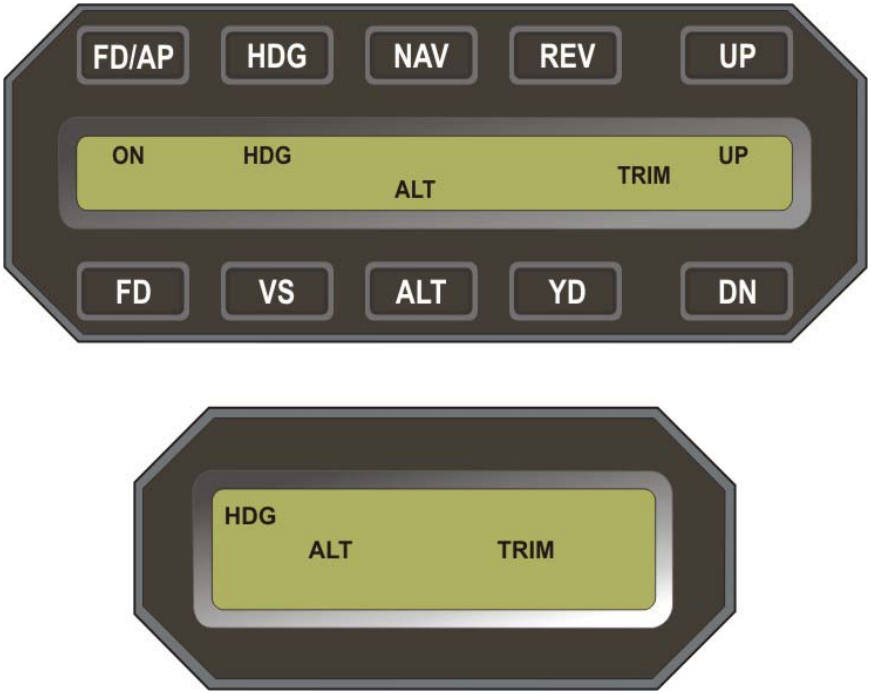


**Fig. 2-8. AP Display, HDG and ALT HOLD Modes Engaged, TRIM UP Required**

**Table 2-1. Pre-Flight Test (continued from page 2-14)**

| ACTION | RESPONSE |
|---|---|
| 46. Move A/C Control Wheel as far aft as possible. | After 3 seconds, TRIM and DN annunciations appear on AP display as shown in Fig. 2-9, and Audible Alert sounds a steady tone.<br><br>After 7 seconds, TRIM and DN annunciations flash, and Audible Alert becomes periodic. |
| 47. Move A/C Control Wheel forward until TRIM and DN annunciations are extinguished. | Audible Alert is squelched. |
| *Note:*<br>*Although autotrim is standard equipment, it cannot be installed on selected aircraft models. If autotrim is installed, then proceed to step 48. Otherwise, proceed to step 62.* | |
| 48. Set Trim Master Switch to ON position. | ------ |
| 49. Move A/C Control Wheel as far forward as possible. | After 2-3 seconds, Elevator Trim Wheel begins to run nose up with increasing speed. |
| 50. Move A/C Control Wheel aft until Elevator Trim Wheel stops. | ------ |
| 51. Move A/C Control Wheel as far aft as possible. | After 2-3 seconds, Elevator Trim Wheel begins to run nose down with increasing speed. |
| 52. Move A/C Control Wheel forward until Elevator Trim Wheel stops. | ------ |

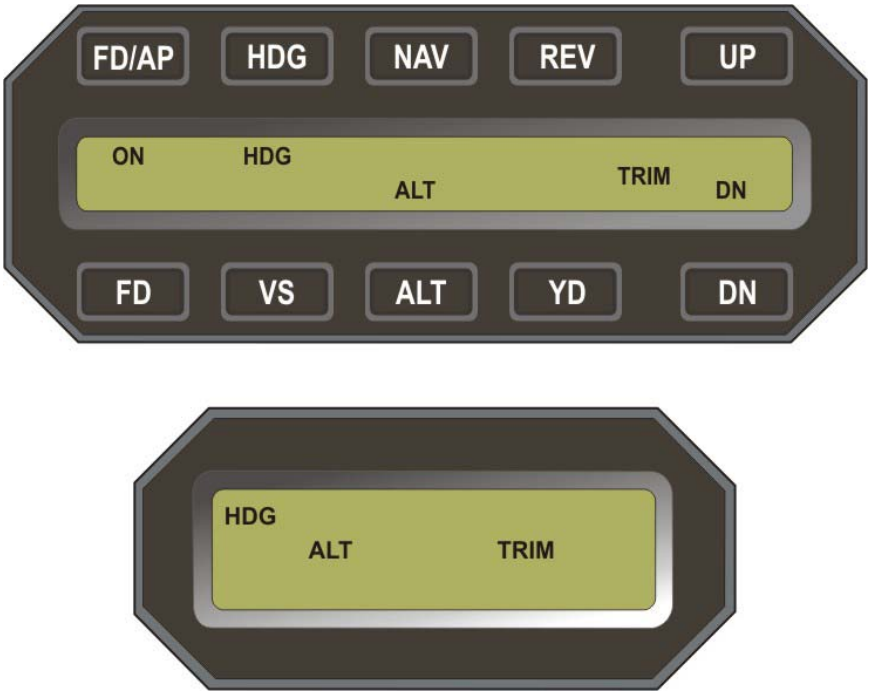


**Fig. 2-9. AP Display, HDG and ALT HOLD Modes Engaged, TRIM DN Required**

**Table 2-1. Pre-Flight Test (continued from page 2-17)**

| ACTION | RESPONSE |
|---|---|
| 53. Press momentarily either forward or aft on both segments of Manual Electric Trim Switch. | Autopilot disconnects as follows:<br><br>RDY annunciation appears flashing and ON remains, whereas all other annunciations are extinguished.<br><br>After 5 seconds, RDY annunciation stops flashing but remains. |
| 54. Press/Hold forward on both segments of Manual Electric Trim Switch. | Elevator Trim Wheel runs nose down at full speed, and TRIM annunciation appears flashing on AP display. |
| 55. Press/Hold AP DISC / TRIM INTR Switch. | Elevator Trim Wheel stops. |
| 56. Release AP DISC / TRIM INTR Switch. | Elevator Trim Wheel resumes running nose down at full speed. |
| 57. Release Manual Electric Trim Switch. | Elevator Trim Wheel stops.<br><br>TRIM annunciation is extinguished. |
| 58. Press/Hold aft on both segments of Manual Electric Trim Switch. | Elevator Trim Wheel runs nose up at full speed, and TRIM annunciation appears flashing on AP display. |
| 59. Press/Hold AP DISC / TRIM INTR Switch. | Elevator Trim Wheel stops. |
| 60. Release AP DISC / TRIM INTR Switch. | Elevator Trim Wheel resumes running nose up at full speed. |
| 61. Release Manual Electric Trim Switch. | Elevator Trim Wheel stops.<br><br>TRIM annunciation is extinguished. |

**Table 2-1. Pre-Flight Test (continued from page 2-19)**

| ACTION | RESPONSE |
|---|---|
| *Note:*<br>*If autopilot is equipped with a Yaw Damper, then proceed to step 63. Otherwise, proceed to step 72.* | |
| 62. Press AP DISC / TRIM INTR Switch. | Autopilot disconnects as follows:<br><br>RDY annunciation appears flashing and ON remains, whereas all other annunciations are extinguished.<br><br>After 5 seconds, RDY annunciation stops flashing but remains. |
| *Note:*<br>*If autopilot is equipped with a Yaw Damper, then proceed to step 63. Otherwise, proceed to step 72.* | |
| 63. Actuate A/C Rudder Pedals alternately in succession, to sense their freedom of movement about yaw axis. | ------ |
| 64. Press YD mode selector switch to engage yaw damper mode. | YD annunciation appears on AP display, as shown in Fig. 2-10. |
| 65. Turn Yaw Trim Knob until A/C Rudder Pedals stop. | ------ |
| 66. Attempt actuation of A/C Rudder Pedals alternately in succession. | A/C Rudder Pedals' reduced freedom of movement indicates that Yaw Servo is engaged.<br><br>Yaw Servo can be overridden. If not, pull Autopilot Circuit Breaker and do not use. |


**Fig. 2-10. AP Display, YD Mode Engaged**

**Table 2-1. Pre-Flight Test (continued from page 2-20)**

| ACTION | RESPONSE |
|---|---|
| 67. Turn Yaw Trim Knob fully CCW. | Left A/C Rudder Pedal slowly moves forward. |
| 68. Turn Yaw Trim Knob fully CW. | Right A/C Rudder Pedal slowly moves forward. |
| 69. Turn Yaw Trim Knob CCW until A/C Rudder Pedals stop. | ------ |
| 70. Press YD mode selector switch to disengage yaw damper mode. | YD annunciation is extinguished. |
| 71. Actuate A/C Rudder Pedals alternately in succession. | A/C Rudder Pedals' increased freedom of movement indicates that Yaw Servo is disengaged. |
| 72. Trim A/C for takeoff. | ------ |

# SECTION 3
# IN-FLIGHT PROCEDURES

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### 3.1 Normal Operating Procedures

#### 3.1.1 Heading (HDG) Mode

Set the Heading Bug to the desired heading on the compass card (HSI or DG), and then press the HDG mode selector switch to engage the heading mode. The HDG annunciation will appear as shown in Fig. 3-1, to acknowledge that this mode is engaged. The autopilot will turn the aircraft onto the selected heading and hold it. A new heading can be subsequently selected by setting the Heading Bug to it.


**Fig. 3-1. AP Display, HDG Mode Engaged**

### 3.1.2 Navigation (NAV) Mode

Select the VOR frequency on the Navigation Receiver.

Heading System HSI

Set Course Pointer to desired course on compass card.

Heading System DG

Set Heading Bug and OBS to desired course on each respective compass card.

Press the NAV mode selector switch to engage the navigation mode. The NAV annunciation will appear as shown in Fig. 3-2, to acknowledge that this mode is engaged.

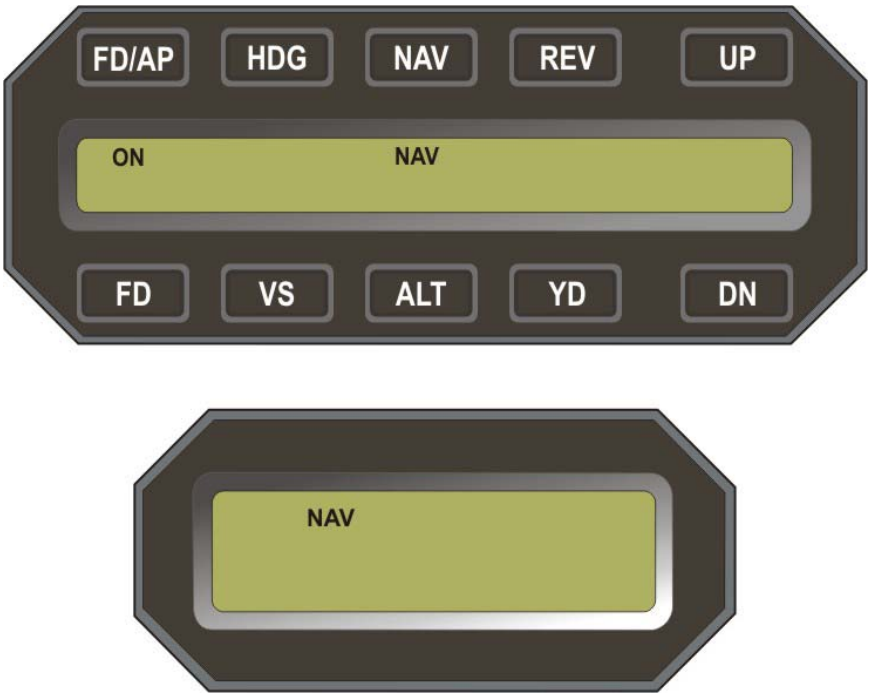



**Fig. 3-2. AP Display, NAV Mode Engaged**

If the Course Deviation Indication (CDI) is at full scale (100%) needle deflection from center, then the autopilot will establish the aircraft on a 45° intercept angle relative to the selected course. Even if CDI needle deflection is less than 100%, the autopilot may still establish an intercept angle of 45°, provided that the aircraft's closure rate to the selected course is sufficiently slow. Otherwise, the intercept angle will be less than 45°.

As the aircraft approaches the selected course, the autopilot senses the corresponding rate at which the CDI needle approaches center (closure rate), in order to initiate the aircraft's turn onto the course at the proper point, and thereby prevent overshoot. The point at which this turn begins is variable, being further from the course at faster closure rates, and closer to the course at slower closure rates. Although closure rate is principally a function of groundspeed, the distance of the aircraft from the VOR station also has an effect. Nevertheless, the turn will always begin between 100% and 20% CDI needle deflection.

During this stage of the intercept sequence, the autopilot operates at maximum gain and sensitivity to closure rate. In addition, it limits the aircraft's turn rate to 90% of a standard rate turn, although for some higher performance (turboprop) aircraft this is 75%.

When the aircraft arrives at 15% CDI needle deflection, the course is captured. At that instant, a step reduction in autopilot gain occurs, so that the Course Pointer (HSI) or Heading Bug (DG) has sufficient authority to complete the intercept. In addition, the sensitivity to closure rate is reduced. The overall authority of the autopilot during this stage of the intercept sequence is called the CAP condition, which is acknowledged by the appearance of the CAP annunciation as shown in Fig. 3-3.

Fifteen seconds after course capture, a second step reduction in autopilot gain occurs, to limit the aircraft's turn rate to 45% of a standard rate turn, although for some higher performance (turboprop) aircraft this is 37.5%. In addition, the sensitivity to closure rate is reduced again. The overall authority of the autopilot during this stage of the intercept sequence is called the CAP SOFT condition, which is acknowledged by the appearance of the SOFT annunciation as shown in Fig. 3-4.

Thirty seconds after course capture, the autopilot establishes the required crosswind correction angle.

Seventy five seconds after course capture, a third step reduction in autopilot gain occurs, to limit the aircraft's turn rate to 15% of a standard rate turn, although for some higher performance (turboprop) aircraft this is 12.5%. In addition, the sensitivity to closure rate is reduced once more. This is acknowledged by the extinguishment of the CAP annunciation, as shown in Fig. 3-5. It marks the end of the intercept sequence, and the beginning of tracking. The overall authority of the autopilot during tracking is called the SOFT condition.


**Fig. 3-3. AP Display, NAV Mode Engaged, CAP Condition**


**Fig. 3-4. AP Display, NAV Mode Engaged, CAP SOFT Condition**


**Fig. 3-5. AP Display, NAV Mode Engaged, SOFT Condition**

The pilot should make speed, distance, and time considerations during the 75 second period from course capture to the beginning of tracking, to account for the aircraft's position. For example at 115 kts, a distance of 2.4 nautical miles will be traveled in 75 seconds.

If it should happen that the Course Pointer (HSI) or Heading Bug (DG) is already within 5° of the selected course, and CDI needle deflection is less than 10%, then the autopilot will immediately establish the SOFT condition upon engagement of the navigation mode.

While tracking in the SOFT condition, the autopilot ignores short term CDI needle deflections (excursions), to thereby inhibit aircraft scalloping during VOR station passage. Should CDI needle deflection exceed 50% for a period of 60 seconds, the autopilot will revert to the CAP SOFT condition as a means to re-establish the aircraft on course.

The NAV annunciation will flash whenever CDI needle deflection exceeds 50%, or the NAV Flag is in view. In the latter event, the FAIL annunciation will also appear.

#### 3.1.2.1 Pilot Selectable Intercept Angle

To select an intercept angle other than 45°, set the Heading Bug to the desired intercept heading on the compass card, such that the difference between this heading and the desired course is the intercept angle. Then set the Course Pointer (HSI) or OBS (DG) to the desired course. Press and hold the HDG mode selector switch, and then press the NAV mode selector switch to engage the heading mode and arm the navigation mode. The HDG and NAV annunciations will appear as shown in Fig. 3-6, to acknowledge this.

The autopilot will establish the aircraft on the selected intercept angle (heading), until it must turn the aircraft onto the selected course to prevent overshoot. At that point in the intercept sequence, the HDG annunciation will extinguish to indicate engagement of the navigation mode.

If the selected intercept angle is greater than 35°, then the HDG annunciation will extinguish at 90% CDI needle deflection. However, if the selected intercept angle is less than 35°, then the HDG annunciation will extinguish at 20% CDI needle deflection. In addition, the course is captured at one of the following points:

15% CDI needle deflection (Roll Computers with Mod Code K and below)

20% CDI needle deflection (Roll Computers with Mod Code L and above)

If the heading system is a DG, at the moment the HDG annunciation extinguishes, immediately set the Heading Bug to the course in order to input a course error to the autopilot. Otherwise, the autopilot will lack sufficient authority to turn the aircraft onto the course.

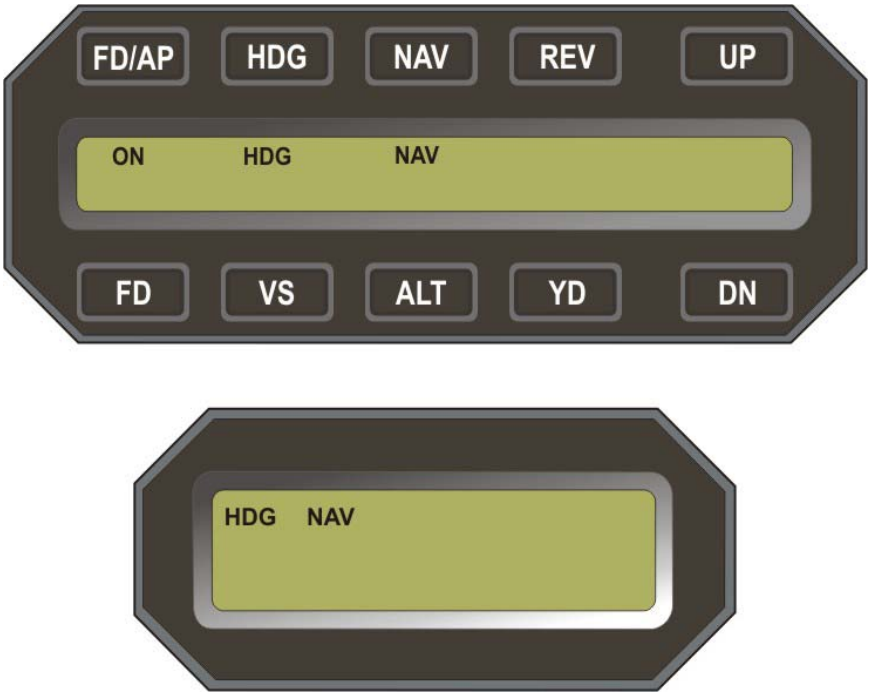



**Fig. 3-6. AP Display, HDG Mode Engaged, NAV Mode Armed**

### 3.1.3 Altitude Hold (ALT HOLD) Mode

The altitude hold mode can only be engaged if a roll mode (HDG, NAV, NAV APR, REV, REV APR) is already engaged. With a roll mode engaged and the aircraft at the desired altitude, press the ALT mode selector switch to engage the altitude hold mode. The ALT annunciation will appear as shown in Fig. 3-7, to acknowledge that this mode is engaged. The autopilot will hold the aircraft at its current (captured) altitude.

This altitude may be modified for barometric pressure changes, by pressing and holding either the UP switch for an increase in altitude, or the DN switch for a decrease in altitude. The altitude changes 20 feet for each second the respective switch is pressed and held. The range is ±200 feet from the original captured altitude.

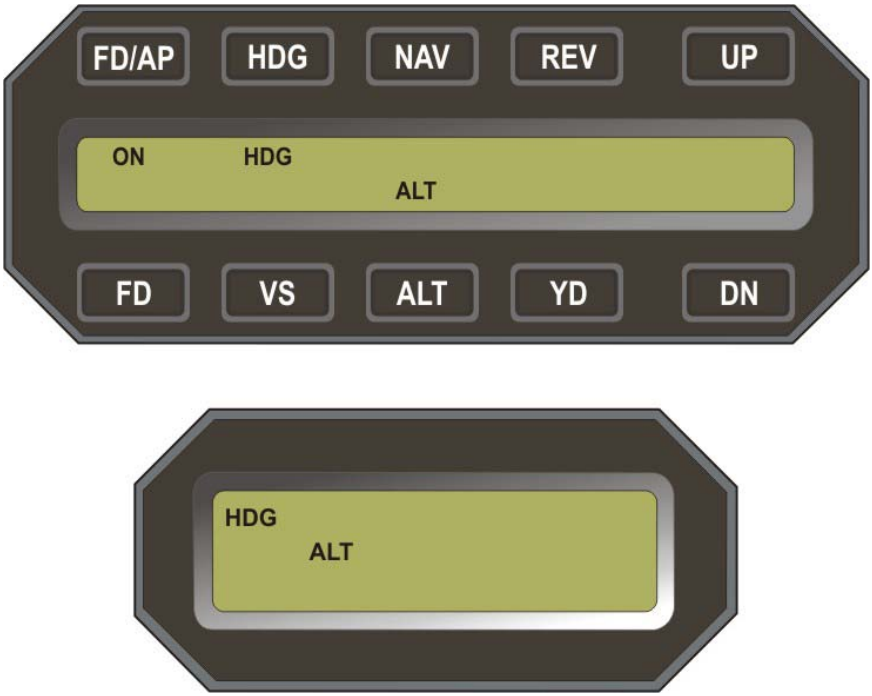



**Fig. 3-7. AP Display, HDG and ALT HOLD Modes Engaged**

### 3.1.4 Vertical Speed (VS) Mode

***Caution:***

***The vertical speed mode is used to establish and hold a PILOT selected vertical speed. Since the autopilot receives no airspeed information, it is the responsibility of the pilot to ensure that the vertical speed selection is within the operating limits of the aircraft's capabilities. Selection of a vertical speed beyond the capability of the aircraft can create a condition of reduced airspeed, and possibly lead to a stall condition.***

The vertical speed mode can only be engaged if a roll mode (HDG, NAV, NAV APR, REV, REV APR) is already engaged. With a roll mode engaged and the aircraft at the desired vertical speed, press the VS mode selector switch to engage the vertical speed mode. The VS annunciation will appear as shown in Fig. 3-8, to acknowledge that this mode is engaged. The autopilot will hold the aircraft at its current (captured) vertical speed.

This vertical speed may be modified by pressing and holding either the UP switch or the DN switch. In a climb, pressing and holding the UP switch increases the climb rate, whereas pressing and holding the DN switch decreases the climb rate. In a descent, pressing and holding the DN switch increases the descent rate, whereas pressing and holding the UP switch decreases the descent rate.

The vertical speed changes 160 FPM for each second the respective switch is pressed and held. The range is ±1600 FPM from the original captured vertical speed.

During a climb, should the aircraft become unable to hold the captured vertical speed for a period of fifteen seconds, the VS annunciation will flash as an alert to the potential for an impending stall condition. In that event, immediately increase the aircraft's thrust if possible, reduce the commanded vertical speed using the DN switch, or both, until the VS annunciation stops flashing.

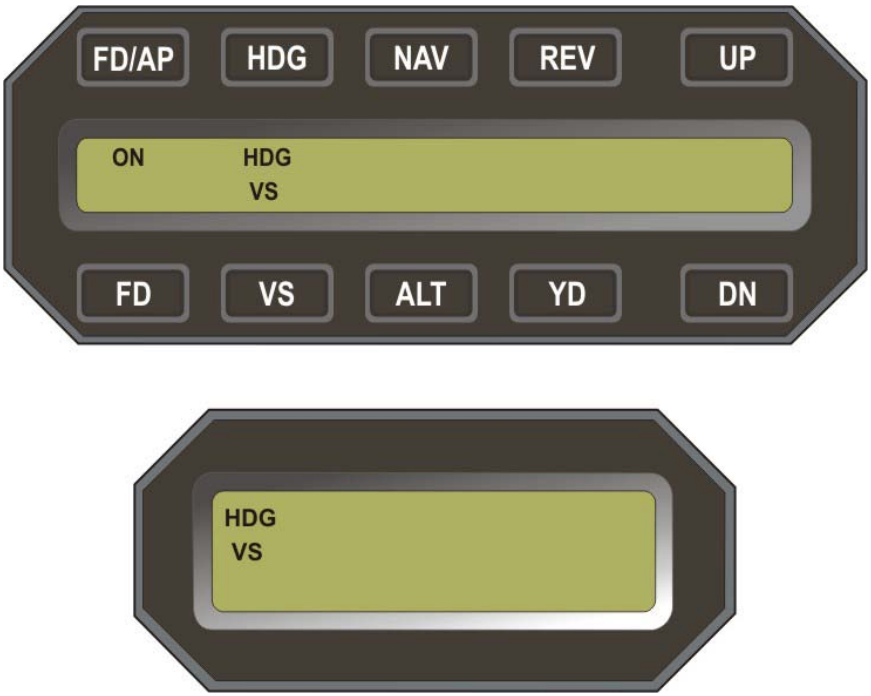



**Fig. 3-8. AP Display, HDG and VS Modes Engaged**

### 3.1.5 Elevator Trim

#### 3.1.5.1 Manual Elevator Trim

If the autopilot is not equipped with autotrim, or is so equipped but the Trim Master Switch is in the OFF position, and a pitch mode (ALT HOLD, VS, GS) is engaged, then the autopilot will provide an annunciation whenever it is necessary to manually trim the aircraft about the pitch axis using the Elevator Trim Wheel.

Should the pitch servo loading exceed a preset threshold for a period of three seconds, the TRIM UP annunciation or TRIM DN annunciation will appear as shown in Fig. 3-9 or Fig. 3-10 respectively, as a prompt to trim the aircraft in the indicated direction using the Elevator Trim Wheel. In addition, an audible alert will sound a steady tone. If no action is taken after four more seconds, then the annunciation will flash and the audible alert will become periodic. Once the aircraft has been sufficiently trimmed, such that the pitch servo loading is below the preset threshold, the annunciation will extinguish and the audible alert will be squelched.

#### 3.1.5.2 Automatic Elevator Trim

If the autopilot is equipped with autotrim, the Trim Master Switch is in the ON position, and a pitch mode (ALT HOLD, VS, GS) is engaged, then the autopilot will automatically trim the aircraft about the pitch axis.

Should the pitch servo loading exceed a preset threshold for a period of 2-3 seconds, the trim servo will become active, and so the Elevator Trim Wheel will run either nose up or nose down with increasing speed. Once the aircraft has been sufficiently trimmed, such that the pitch servo loading is below the preset threshold, the trim servo will become inactive and so the Elevator Trim Wheel will stop.

#### 3.1.5.3 Manual Electric Elevator Trim

If the autopilot is equipped with autotrim, then there will also be the Manual Electric Trim Switch located on the Control Wheel. This switch can be used to trim the aircraft about the pitch axis from the RDY, or when only a roll mode (HDG, NAV, NAV APR, REV, REV APR) is engaged, provided that the Trim Master Switch is in the ON position.

To trim the aircraft nose up, press aft and hold both segments of the Manual Electric Trim Switch. The TRIM annunciation will appear flashing as shown in Fig. 3-11, and the Elevator Trim Wheel will run nose up at full speed. Upon release of this switch, the TRIM annunciation will extinguish and the Elevator Trim Wheel will stop.

To trim the aircraft nose down, press forward and hold both segments of the Manual Electric Trim Switch. The TRIM annunciation will appear flashing as shown in Fig. 3-11, and the Elevator Trim Wheel will run nose down at full speed. Upon release of this switch, the TRIM annunciation will extinguish and the Elevator Trim Wheel will stop.

Should the Manual Electric Trim Switch ever be actuated when a pitch mode (ALT HOLD, VS, GS) is engaged, the autopilot will disconnect.

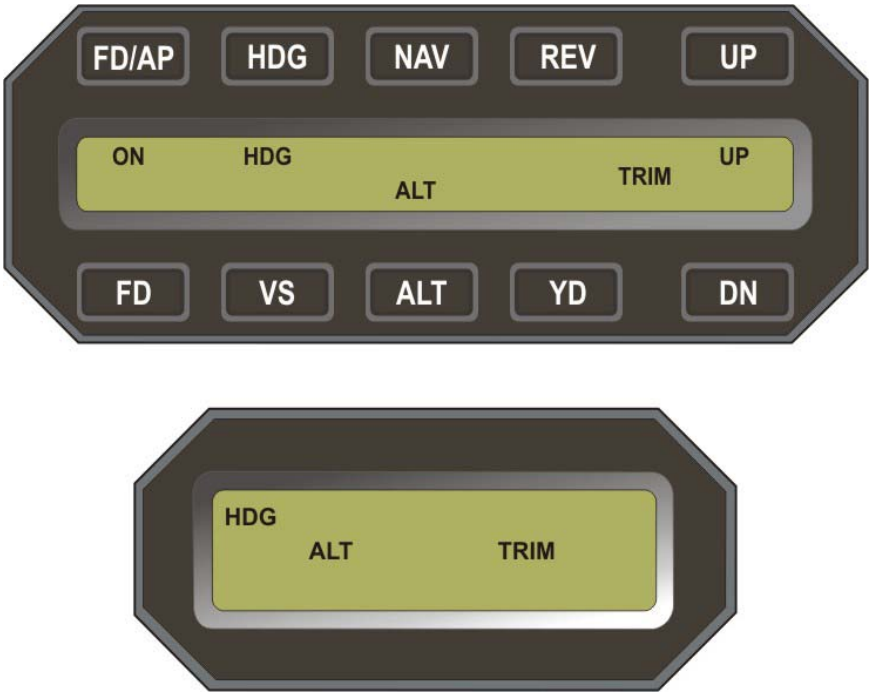



**Fig. 3-9. AP Display, TRIM UP Required**

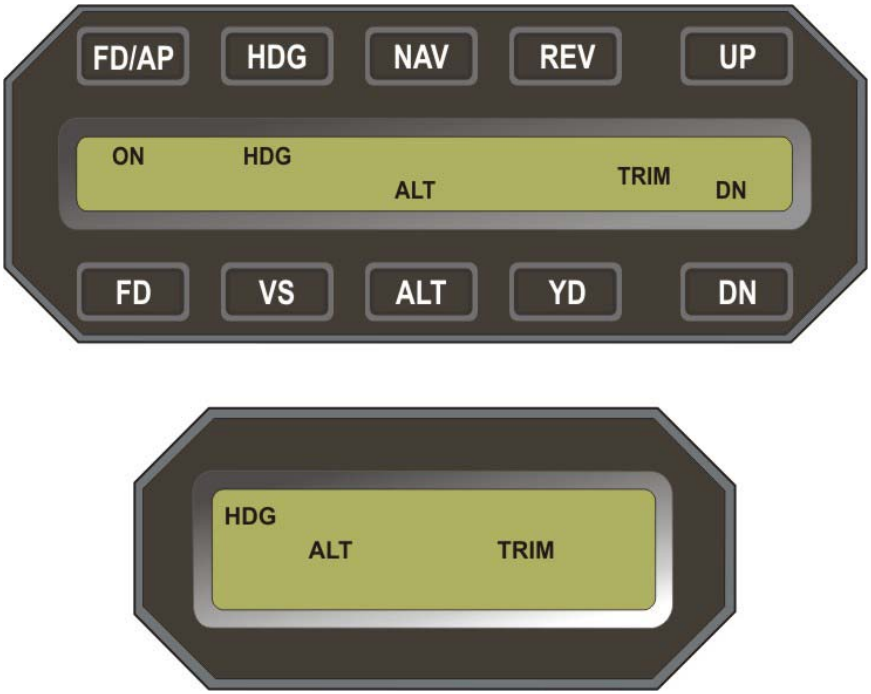



**Fig. 3-10. AP Display, TRIM DN Required**


**Fig. 3-11. AP Display, Manual Electric Trim in Progress**

## 3.2 Precision Approach Procedures

### 3.2.1 Straight-In ILS Approach

Execute a straight-in intercept and track of the FRONT INBOUND LOC course (reference section 3.3.3), while holding the approach altitude. The NAV, APR, ALT, CAP, and SOFT annunciations will appear as shown in Fig. 3-12.

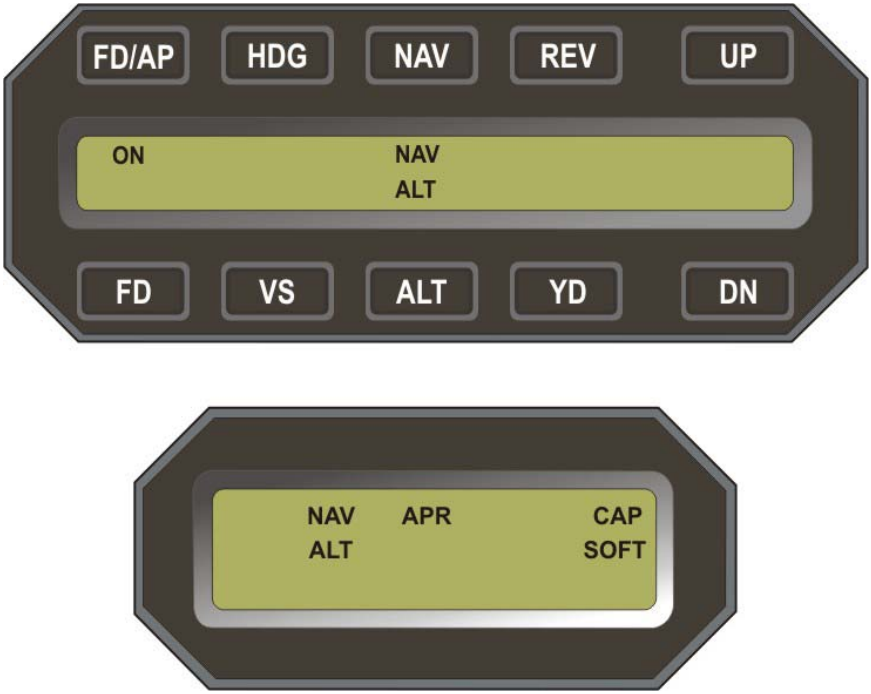



**Fig. 3-12. AP Display, NAV APR and ALT HOLD Modes Engaged**

Once the following conditions have existed simultaneously for a period of ten seconds, the GS annunciation will appear to acknowledge that the glideslope mode has automatically armed, as shown in Fig. 3-13:

1. NAV APR mode engaged
2. ALT mode engaged
3. NAV Flag out of view
4. GS Flag out of view
5. LOC frequency selected
6. A/C within 50% CDI needle deflection of LOC centerline
7. A/C more than 60% Glideslope Deviation Indication (GDI) needle deflection below GS centerline

If the last condition cannot be met because the aircraft is too near the GS centerline, then manual arming of the glideslope mode can be instantly achieved by pressing the ALT mode selector switch.

The armed glideslope mode can be subsequently disabled by pressing the NAV mode selector switch. The GS annunciation will flash, and the DSBL annunciation will appear to acknowledge this, as shown in Fig. 3-14. To then re-arm the glideslope mode, press the NAV mode selector switch again. The GS and DSBL annunciations will immediately extinguish, but the GS annunciation will re-appear after ten seconds.

With the glideslope mode armed, once the aircraft arrives at 5% GDI needle deflection below the GS centerline, the ALT annunciation will extinguish to indicate engagement of the glideslope mode, as shown in Fig. 3-15.

***Note:***

***If the approach positions the aircraft slightly above the GS centerline, then manual engagement of the glideslope mode can be instantly achieved by pressing the ALT mode selector switch.***

***Caution:***

***Manual engagement of the glideslope mode above the GS centerline will result in the aircraft moving aggressively toward the GS centerline. Do not manually engage the glideslope mode if GDI needle deflection is greater than 10% above the GS centerline.***

The GS annunciation will flash whenever GDI needle deflection exceeds 50%, or the GS Flag is in view. In the latter event, the FAIL annunciation will also appear.

At the Decision Height (DH), disconnect the autopilot to execute either a landing or go-around (GA).

A pictorial of this procedure is shown in Fig. 3-16.

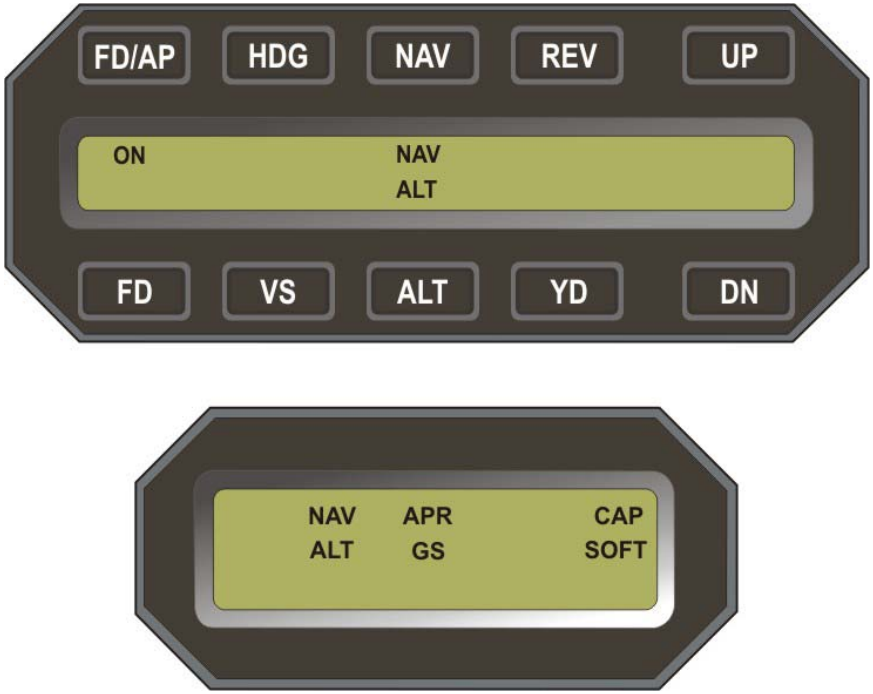



**Fig. 3-13. AP Display, NAV APR and ALT HOLD Modes Engaged, GS Mode Armed**

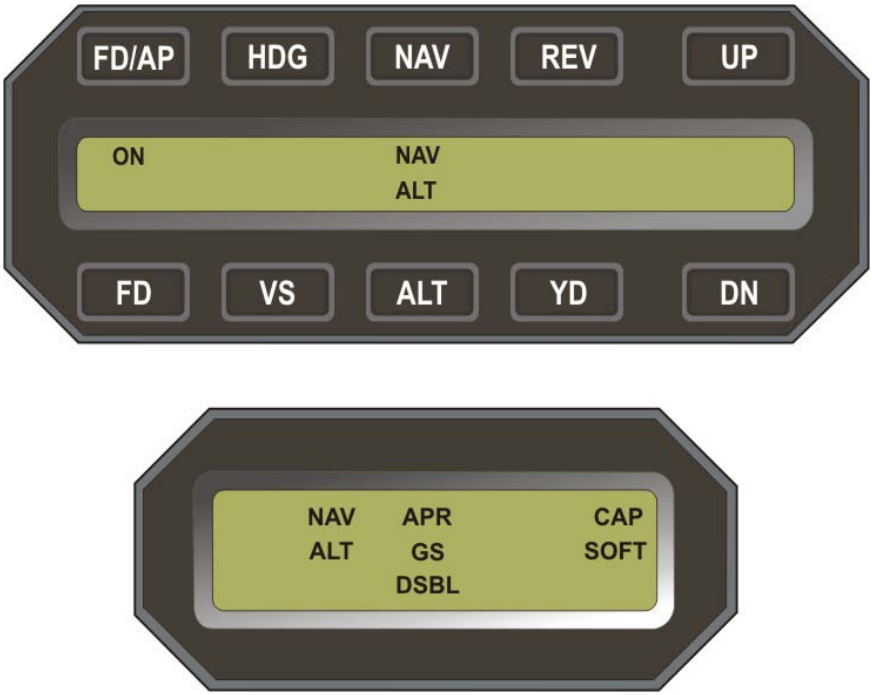



**Fig. 3-14. AP Display, NAV APR and ALT HOLD Modes Engaged, GS Mode Disabled**

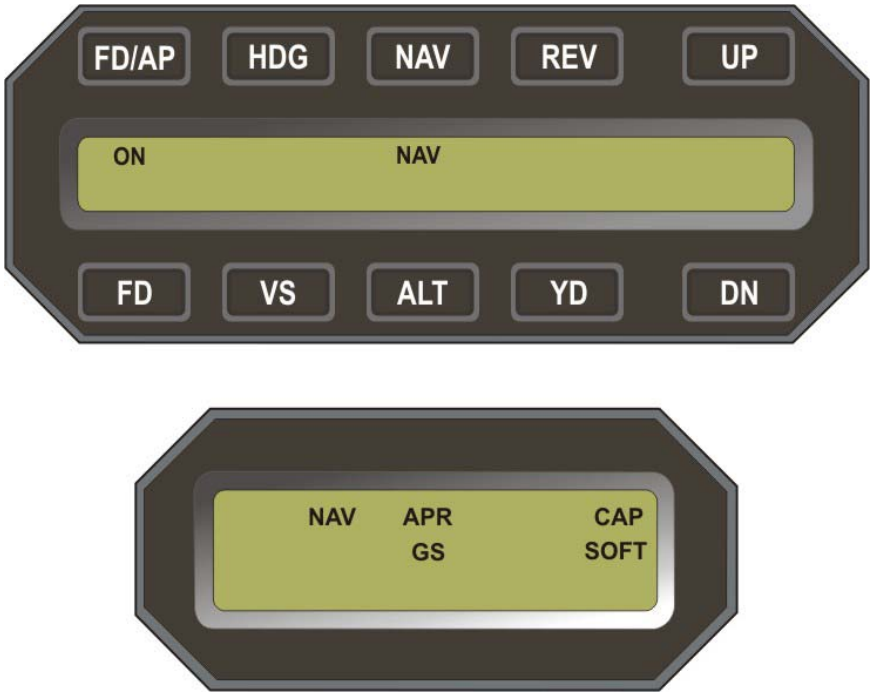



**Fig. 3-15. AP Display, NAV APR and GS Modes Engaged**

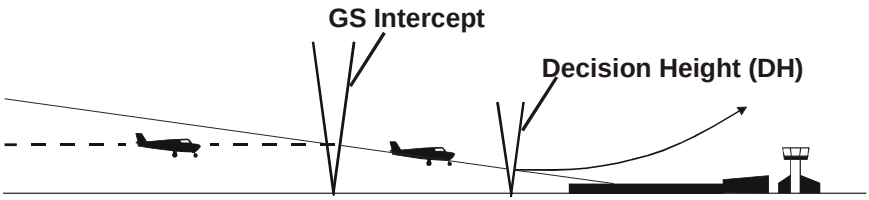



**Fig. 3-16. Straight-In ILS Approach**

### 3.2.2 ILS Approach with Procedure Turn

Execute a procedure turn intercept and track of the FRONT INBOUND LOC course (reference section 3.3.5) above the approach altitude, just until the aircraft is established on the FRONT INBOUND PROCEDURE TURN heading, with the heading mode still engaged. Establish the desired vertical descent speed, and then press the VS mode selector switch to engage the vertical speed mode. Upon reaching the approach altitude, press the ALT mode selector switch to engage the altitude hold mode. Press the NAV mode selector switch to engage the navigation approach mode, such that the autopilot will execute a straight-in intercept and track of the FRONT INBOUND LOC course (reference section 3.3.3). Execute a straight-in intercept and track of the glideslope (reference section 3.2.1).

For those aircraft equipped with both the Garmin 400W/500W Series GPS Navigation Receiver or equivalent unit, and the S-TEC ST-901 GPSS Converter, with its heading mode engaged the autopilot is capable of executing virtually this entire lateral approach sequence, if it has been programmed into the GPS Navigation Receiver and the GPSS Converter's GPSS mode is engaged.

Once on the FRONT INBOUND LOC course, with the GPS Navigation Receiver set to VLOC and conditions 2 thru 7 of section 3.2.1 satisfied, press the NAV mode selector switch to engage the NAV APR mode and complete the ILS approach.

### 3.3 Non-Precision Approach Procedures

#### 3.3.1 Straight-In Back Course Approach

Select the LOC frequency on the Navigation Receiver.

Heading System HSI

Set Course Pointer to FRONT INBOUND LOC course on compass card.

Heading System DG

Set Heading Bug to BACK INBOUND LOC course on compass card.

Press the REV mode selector switch to engage the reverse approach mode. The REV and APR annunciations will appear as shown in Fig. 3-17, to acknowledge that this mode is engaged. The autopilot will intercept and track the BACK INBOUND LOC course. To ensure that it has sufficient overall authority, the autopilot will track this course in the CAP SOFT condition, which is acknowledged by the appearance of those respective annunciations as shown in Fig. 3-18. If the heading system is a DG, then the autopilot will fly the aircraft in the direction opposite to that of CDI needle deflection.

The REV annunciation will flash whenever CDI needle deflection exceeds 50%, or the NAV Flag is in view. In the latter event, the FAIL annunciation will also appear.

A summary pictorial of this procedure is shown in Fig. 3-19.

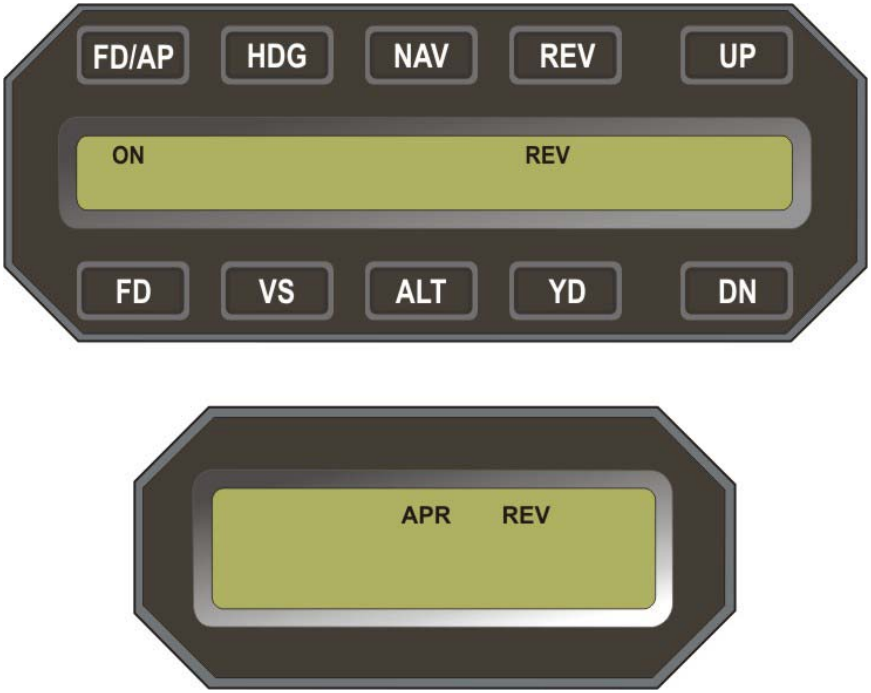



**Fig. 3-17. AP Display, REV APR Mode Engaged, Before LOC Back Course Intercept**

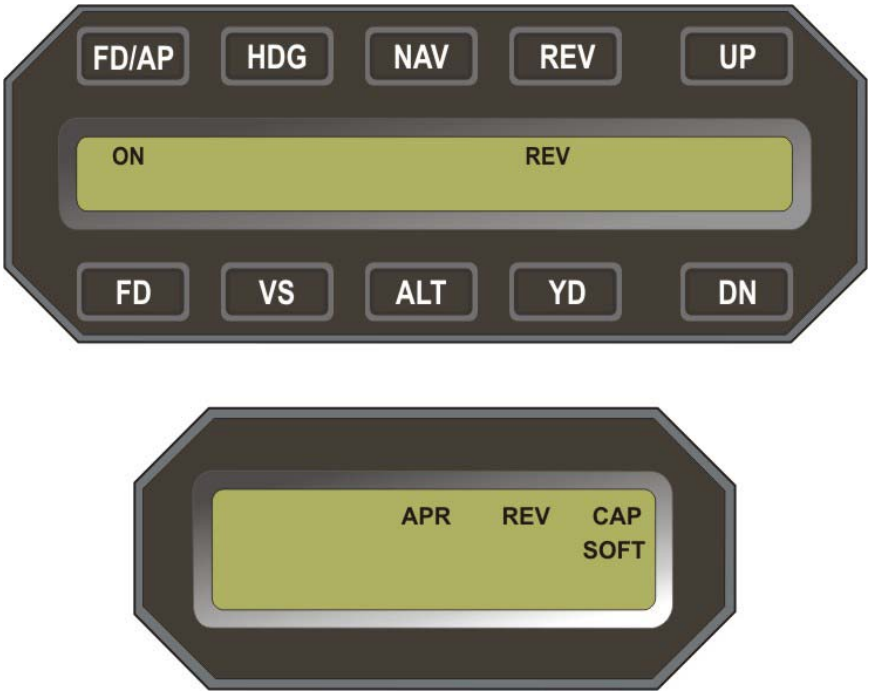
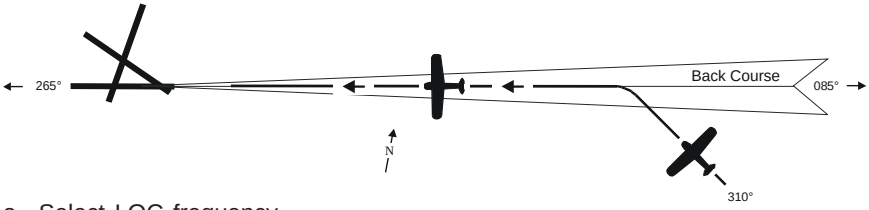



**Fig. 3-18. AP Display, REV APR Mode Engaged, Track LOC Back Course Inbound**




a. Select LOC frequency.

b. Heading System HSI

Set Course Pointer to FRONT INBOUND LOC course.

Heading System DG

Set Heading Bug to BACK INBOUND LOC course.

c. Press REV mode selector switch to engage reverse approach mode.

d. Intercept and track BACK INBOUND LOC course.

**Fig. 3-19. Straight-In Back Course Approach**

#### 3.3.1.1 Pilot Selectable Intercept Angle

To select an intercept angle, set the Heading Bug to the desired intercept heading on the compass card, such that the difference between this heading and the BACK INBOUND LOC course is the intercept angle. If the heading system is an HSI, set the Course Pointer to the FRONT INBOUND LOC course on the compass card.

Press and hold the HDG mode selector switch, and then press the REV mode selector switch to engage the heading mode and arm the reverse approach mode. The HDG, REV, and APR annunciations will appear as shown in Fig. 3-20, to acknowledge this.

The autopilot will establish the aircraft on the selected intercept angle (heading), until it must turn the aircraft onto the BACK INBOUND LOC course to prevent overshoot. At that point in the intercept sequence, the HDG annunciation will extinguish to indicate engagement of the reverse approach mode. At the moment this occurs, if the heading system is a DG, immediately set the Heading Bug to the BACK INBOUND LOC course, in order to input a course error to the autopilot. Otherwise, the autopilot will lack sufficient authority to turn the aircraft onto the course.

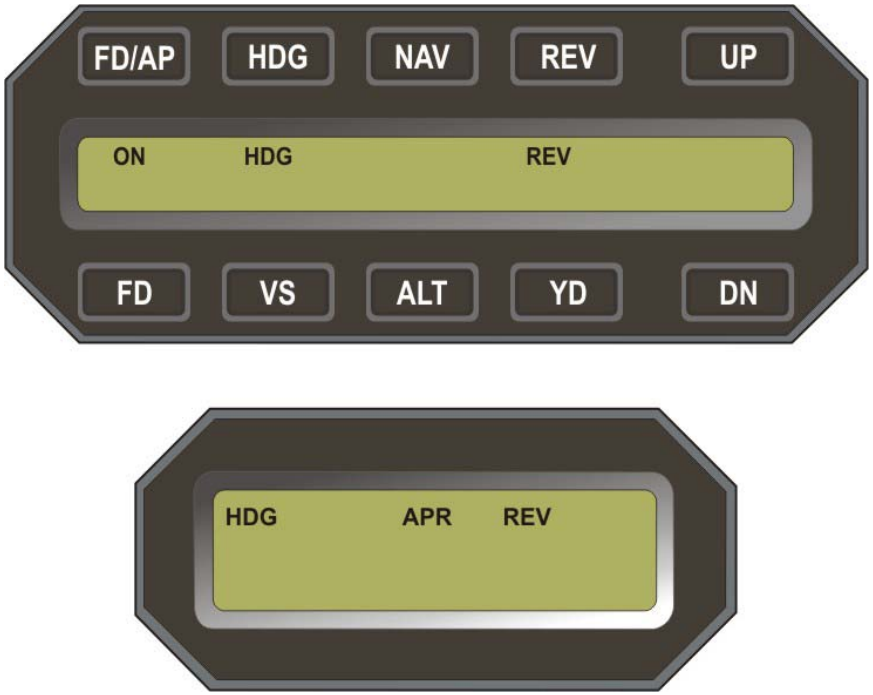



**Fig. 3-20. AP Display, HDG Mode Engaged, REV APR Mode Armed**

### 3.3.2 Back Course Approach with Procedure Turn

Select the LOC frequency on the Navigation Receiver.

Heading System HSI

Set Course Pointer to FRONT INBOUND LOC course on compass card.

Heading System DG

Set Heading Bug to FRONT INBOUND LOC course on compass card.

Press the NAV mode selector switch to engage the navigation approach mode. The NAV and APR annunciations will appear as shown in Fig. 3-21, to acknowledge that this mode is engaged. The autopilot will intercept and track the BACK OUTBOUND LOC course. To ensure that it has sufficient overall authority, the autopilot will track this course in the CAP SOFT condition, which is acknowledged by the appearance of those respective annunciations as shown in Fig. 3-22.

At the appropriate time, set the Heading Bug to the BACK OUTBOUND PROCEDURE TURN heading, and then press the HDG mode selector switch to engage the heading mode. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the BACK INBOUND PROCEDURE TURN heading.

Heading System HSI

Course Pointer remains unchanged on compass card.

Heading System DG

Set Heading Bug to BACK INBOUND LOC course on compass card.

Press the REV mode selector switch to engage the reverse approach mode. The REV and APR annunciations will appear as shown in Fig. 3-23, to acknowledge that this mode is engaged. The autopilot will intercept and track the BACK INBOUND LOC course. To ensure that it has sufficient overall authority, the autopilot will track this course in the CAP SOFT condition, which is acknowledged by the appearance of those respective annunciations as shown in Fig. 3-24. If the heading system is a DG, then the autopilot will fly the aircraft in the direction opposite to that of CDI needle deflection.

A summary pictorial of this procedure is shown in Fig. 3-25.

For those aircraft equipped with both the Garmin 400W/500W Series GPS Navigation Receiver or equivalent unit, and the S-TEC ST-901 GPSS Converter, with its heading mode engaged the autopilot is capable of executing virtually this entire lateral approach sequence, if it has been programmed into the GPS Navigation Receiver and the GPSS Converter's GPSS mode is engaged.

Once on the BACK INBOUND LOC course, with the GPS Navigation Receiver set to VLOC, press the REV mode selector switch to engage the REV APR mode and complete the back course approach.

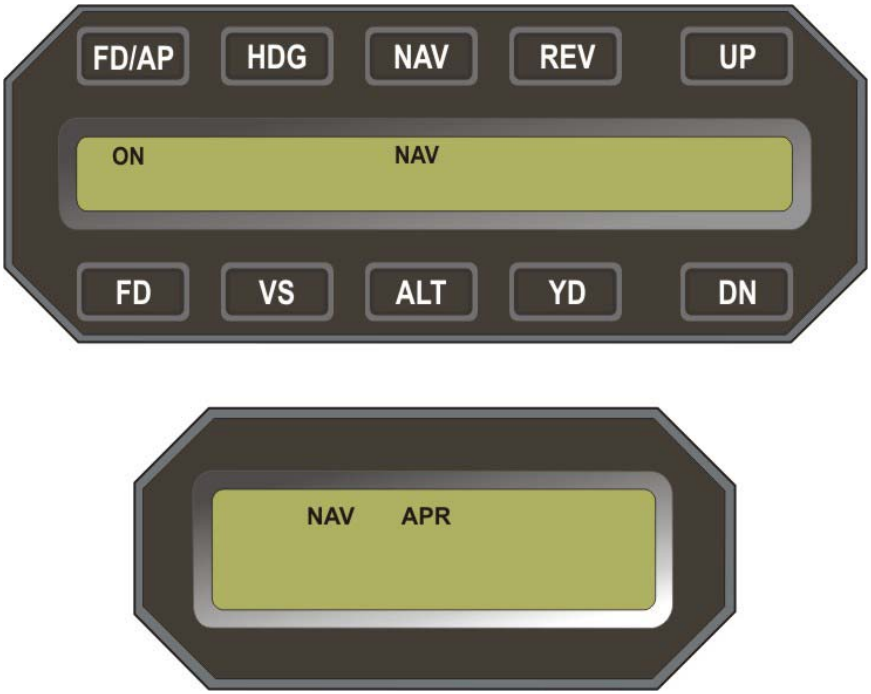



**Fig. 3-21. AP Display, NAV APR Mode Engaged, Before LOC Back Course Intercept**

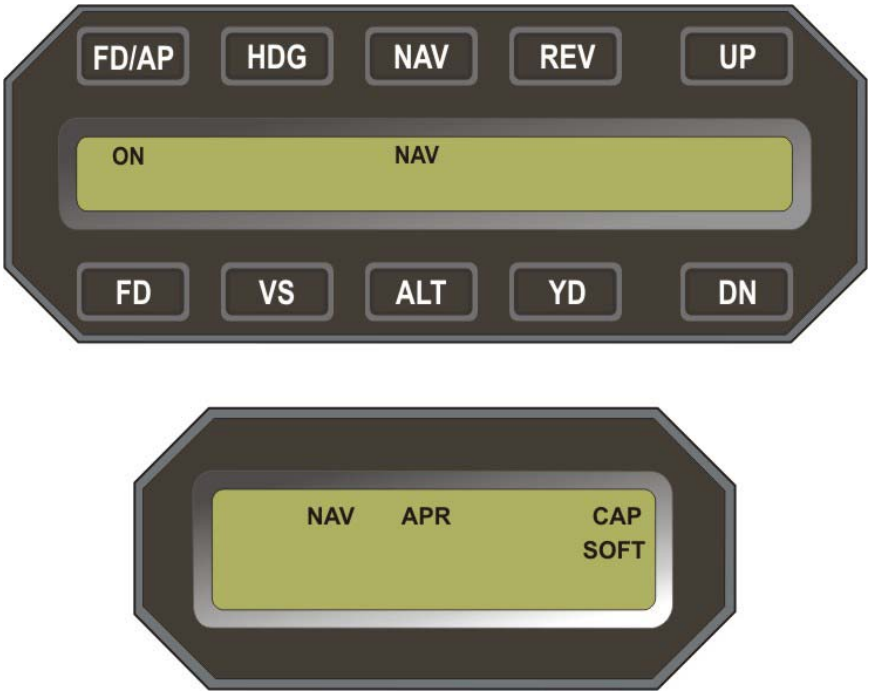



**Fig. 3-22. AP Display, NAV APR Mode Engaged, Track LOC Back Course Outbound**

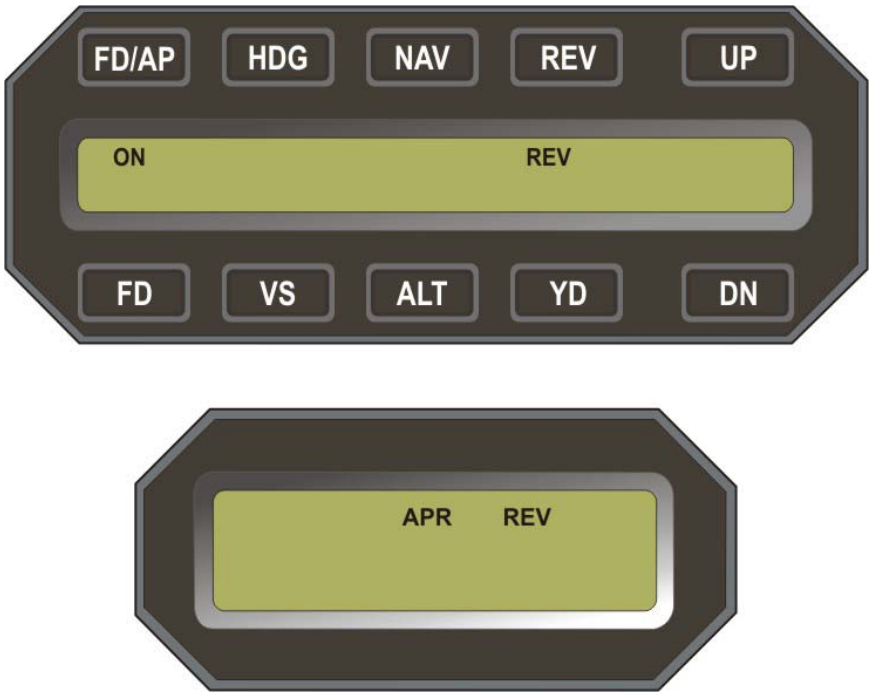



**Fig. 3-23. AP Display, REV APR Mode Engaged, Before LOC Back Course Intercept**

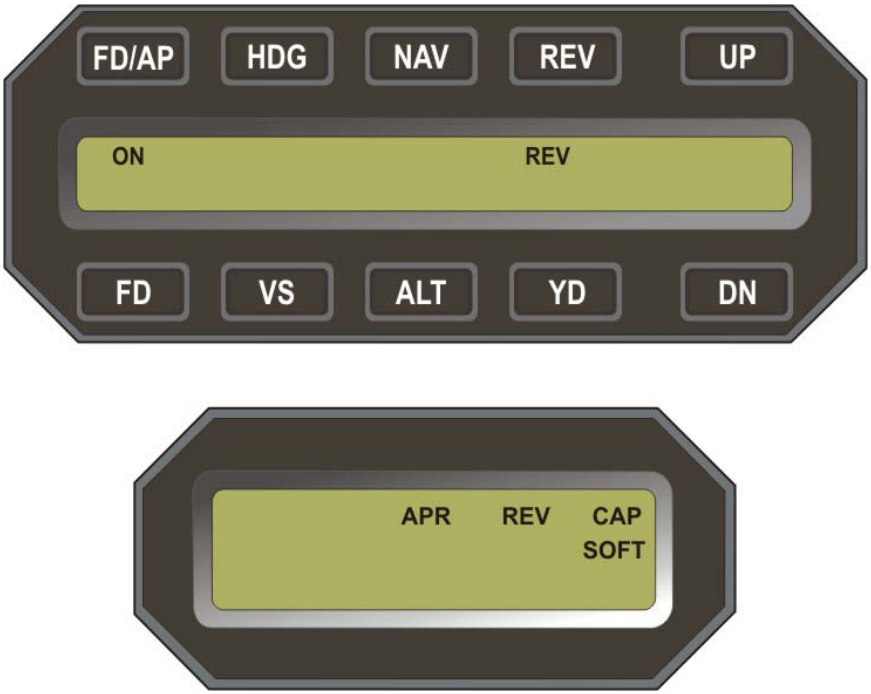
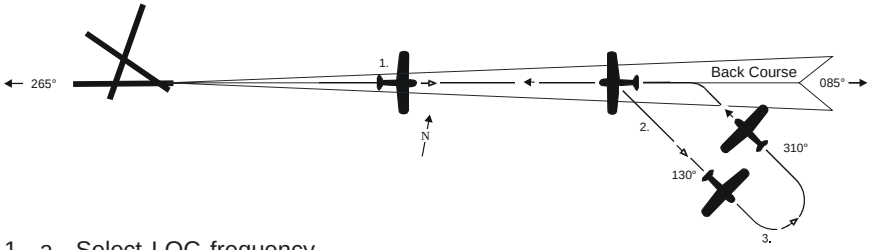



**Fig. 3-24. AP Display, REV APR Mode Engaged, Track LOC Back Course Inbound**




1. a. Select LOC frequency.

   b. Heading System HSI

      Set Course Pointer to FRONT INBOUND LOC course.

      Heading System DG

      Set Heading Bug to FRONT INBOUND LOC course.

   c. Press NAV mode selector switch to engage navigation approach mode.

   d. Intercept and track BACK OUTBOUND LOC course.

2. a. At appropriate time, set Heading Bug to BACK OUTBOUND PROCEDURE TURN heading.

   b. Press HDG mode selector switch to engage heading mode.

3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on BACK INBOUND PROCEDURE TURN heading.

   b. Heading System HSI

      Course Pointer remains unchanged.

      Heading System DG

      Set Heading Bug to BACK INBOUND LOC course.

   c. Press REV mode selector switch to engage reverse approach mode.

   d. Intercept and track BACK INBOUND LOC course.

**Fig. 3-25. Back Course Approach with Procedure Turn**

### 3.3.3 Straight-In LOC Approach

Select the LOC frequency on the Navigation Receiver.

Heading System HSI

Set Course Pointer to FRONT INBOUND LOC course on compass card.

Heading System DG

Set Heading Bug to FRONT INBOUND LOC course on compass card.

Press the NAV mode selector switch to engage the navigation approach mode. The NAV and APR annunciations will appear as shown in Fig. 3-26, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT INBOUND LOC course. To ensure that it has sufficient overall authority, the autopilot will track this course in the CAP SOFT condition, which is acknowledged by the appearance of those respective annunciations as shown in Fig. 3-27.

A summary pictorial of this procedure is shown in Fig. 3-28.

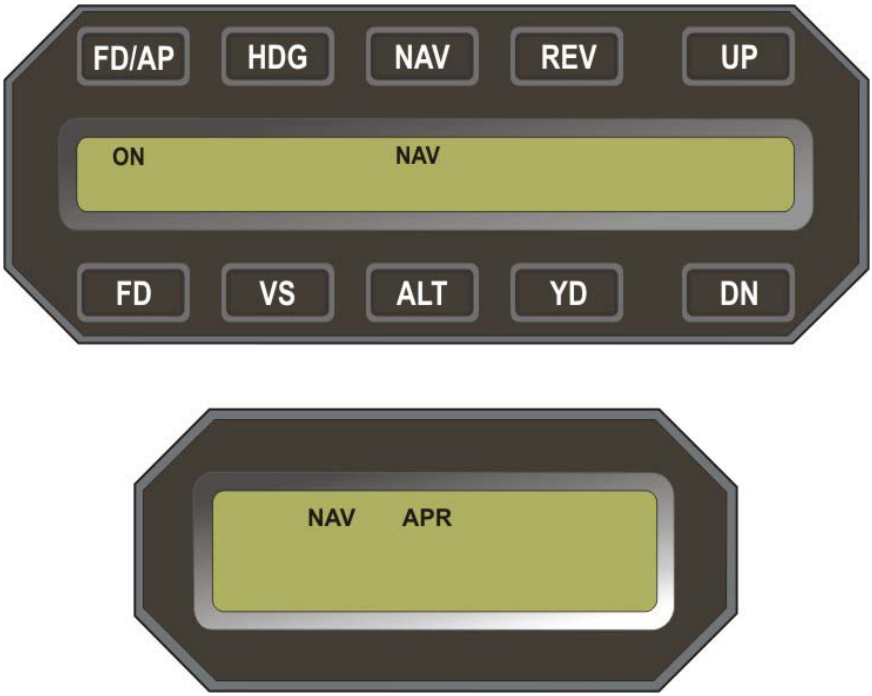



**Fig. 3-26. AP Display, NAV APR Mode Engaged, Before LOC Front Course Intercept**

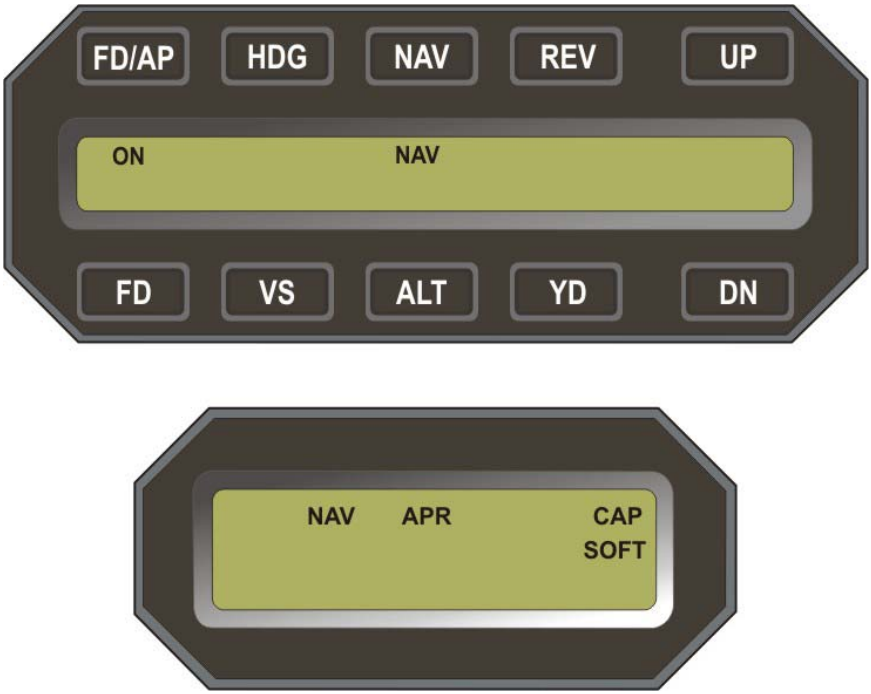
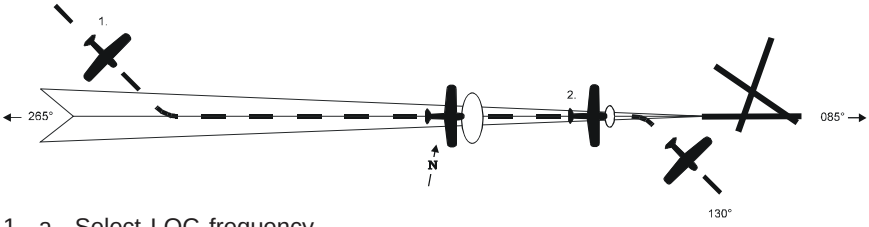



**Fig. 3-27. AP Display, NAV APR Mode Engaged, Track LOC Front Course Inbound**




1. a. Select LOC frequency.

   b. Heading System HSI

      Set Course Pointer to FRONT INBOUND LOC course.

      Heading System DG

      Set Heading Bug to FRONT INBOUND LOC course.

   c. Press NAV mode selector switch to engage navigation approach mode.

   d. Intercept and track FRONT INBOUND LOC course.

2. a. At middle marker, if missed approach is declared, disconnect autopilot.

   b. Stabilize aircraft.

   c. Set Heading Bug to missed approach heading.

   d. Press HDG mode selector switch to engage heading mode.

**Fig. 3-28. Straight-In LOC Approach**

### 3.3.4 Straight-In VOR Approach

Select the VOR frequency on the Navigation Receiver.

Heading System HSI

Set Course Pointer to FRONT INBOUND VOR course on compass card.

Heading System DG

Set Heading Bug and OBS to FRONT INBOUND VOR course on each respective compass card.

Press the NAV mode selector switch to engage the navigation mode. The NAV annunciation will appear as shown in Fig. 3-29, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT INBOUND VOR course. It will track this course in the SOFT condition, which is acknowledged by the appearance of that annunciation and the extinguishment of the CAP annunciation, as shown in Fig. 3-30.

A summary pictorial of this procedure is shown in Fig. 3-31.

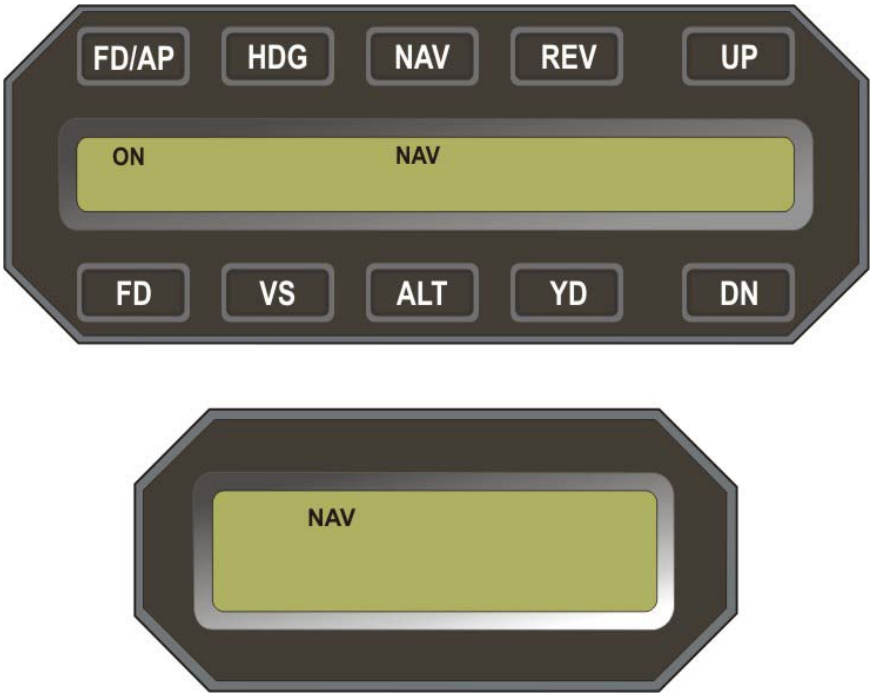



**Fig. 3-29. AP Display, NAV Mode Engaged, Before VOR Front Course Intercept**

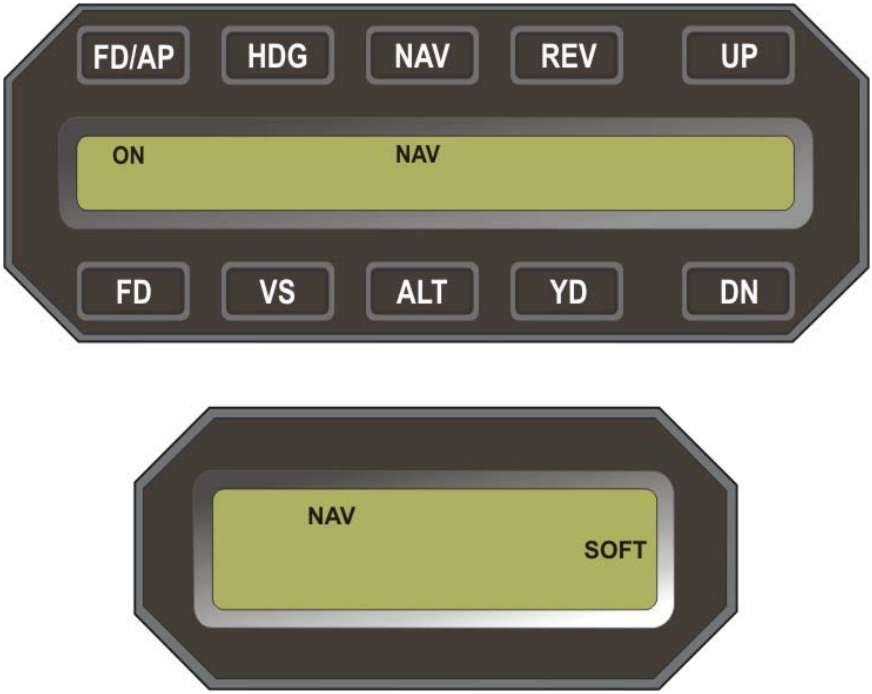
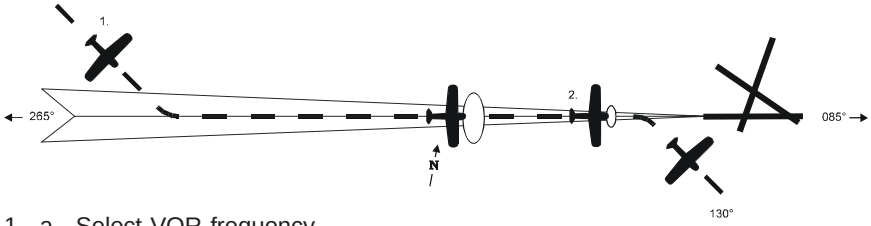



**Fig. 3-30. AP Display, NAV Mode Engaged, Track VOR Front Course Inbound**




1. a. Select VOR frequency.

   b. Heading System HSI

      Set Course Pointer to FRONT INBOUND VOR course.

      Heading System DG

      Set Heading Bug and OBS to FRONT INBOUND VOR course.

   c. Press NAV mode selector switch to engage navigation mode.

   d. Intercept and track FRONT INBOUND VOR course.

2. a. At middle marker, if missed approach is declared, disconnect autopilot.

   b. Stabilize aircraft.

   c. Set Heading Bug to missed approach heading.

   d. Press HDG mode selector switch to engage heading mode.

**Fig. 3-31. Straight-In VOR Approach**

### 3.3.5 LOC Approach with Procedure Turn

Select the LOC frequency on the Navigation Receiver.

Heading System HSI

Set Course Pointer to FRONT INBOUND LOC course on compass card.

Heading System DG

Set Heading Bug to BACK INBOUND LOC course on compass card.

Press the REV mode selector switch to engage the reverse approach mode. The REV and APR annunciations will appear as shown in Fig. 3-32, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT OUTBOUND LOC course. To ensure that it has sufficient overall authority, the autopilot will track this course in the CAP SOFT condition, which is acknowledged by the appearance of those respective annunciations as shown in Fig. 3-33. If the heading system is a DG, then the autopilot will fly the aircraft in the direction opposite to that of CDI needle deflection.

At the appropriate time, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading, and then press the HDG mode selector switch to engage the heading mode. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the FRONT INBOUND PROCEDURE TURN heading.

Heading System HSI

Course Pointer remains unchanged on compass card.

Heading System DG

Set Heading Bug to FRONT INBOUND LOC course on compass card.

Press the NAV mode selector switch to engage the navigation approach mode. The NAV and APR annunciations will appear as shown in Fig. 3-34, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT INBOUND LOC course. To ensure that it has sufficient overall authority, the autopilot will track this course in the CAP SOFT condition, which is acknowledged by the appearance of those respective annunciations as shown in Fig. 3-35.

A summary pictorial of this procedure is shown in Fig. 3-36.

For those aircraft equipped with both the Garmin 400W/500W Series GPS Navigation Receiver or equivalent unit, and the S-TEC ST-901 GPSS Converter, with its heading mode engaged the autopilot is capable of executing virtually this entire lateral approach sequence, if it has been programmed into the GPS Navigation Receiver and the GPSS Converter's GPSS mode is engaged.

Once on the FRONT INBOUND LOC course, with the GPS Navigation Receiver set to VLOC, press the NAV mode selector switch to engage the NAV APR mode and complete the front course approach.

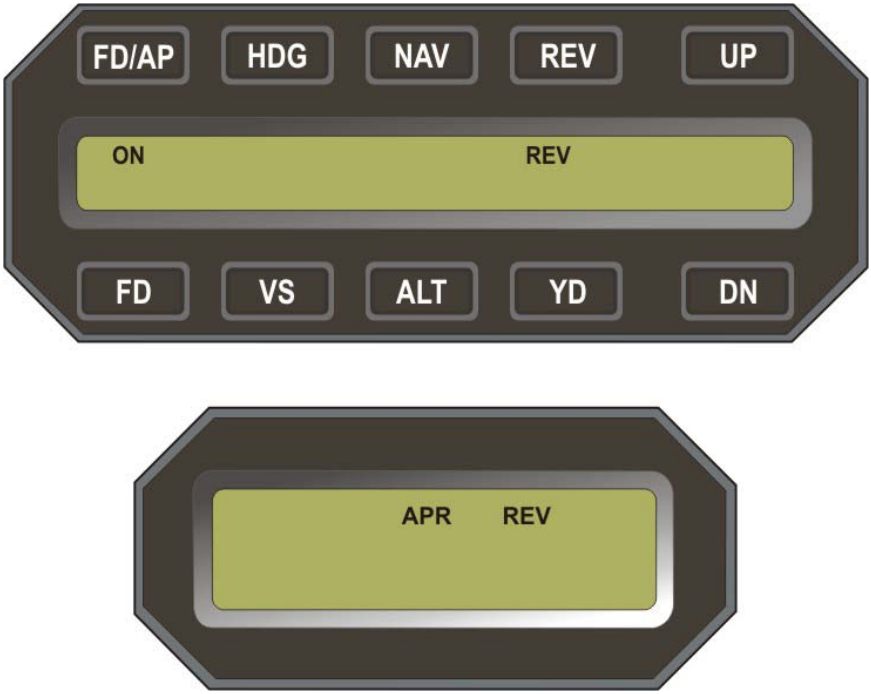



**Fig. 3-32. AP Display, REV APR Mode Engaged, Before LOC Front Course Intercept**

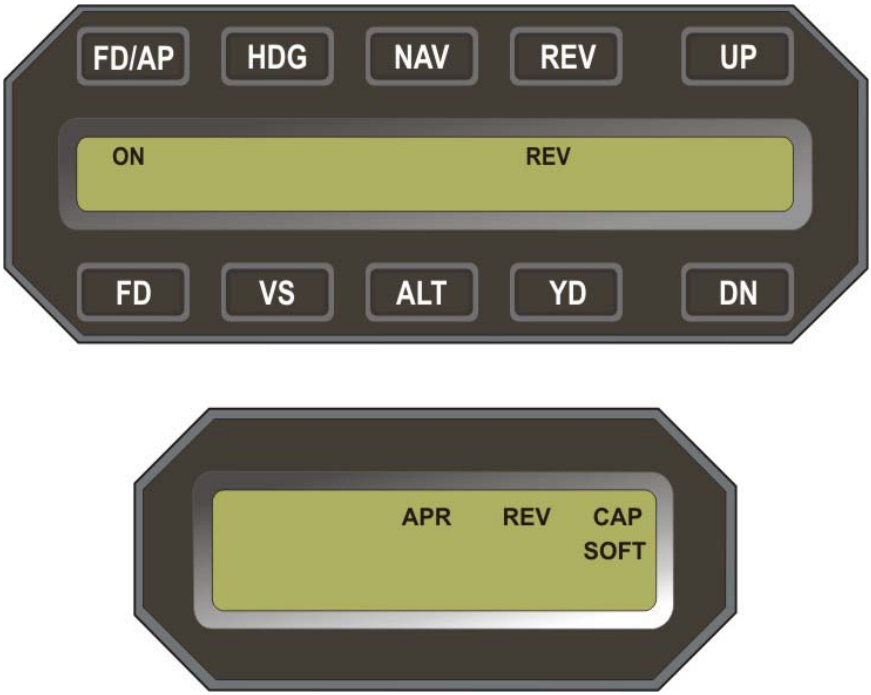



**Fig. 3-33. AP Display, REV APR Mode Engaged, Track LOC Front Course Outbound**

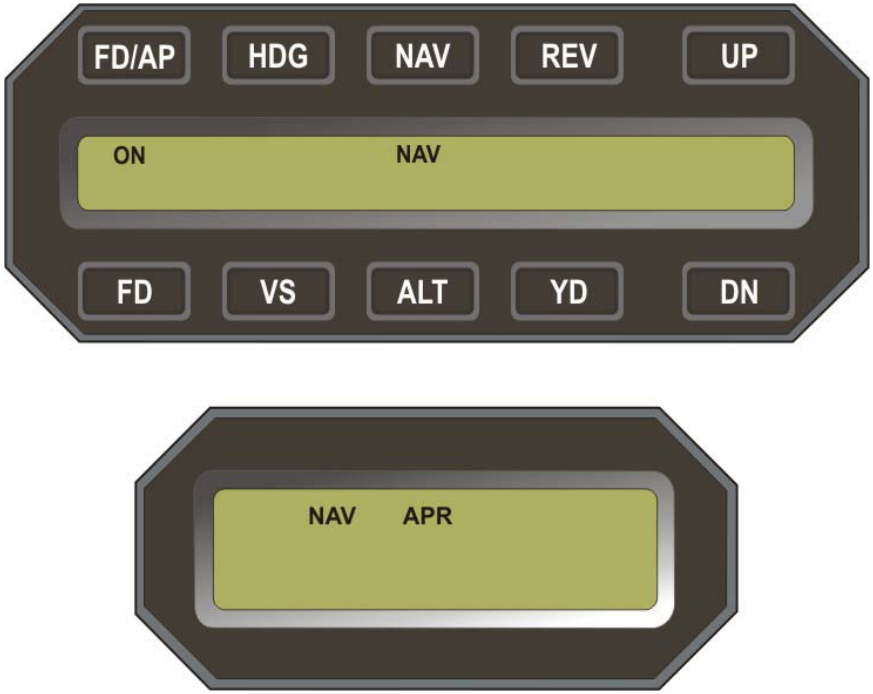



**Fig. 3-34. AP Display, NAV APR Mode Engaged, Before LOC Front Course Intercept**

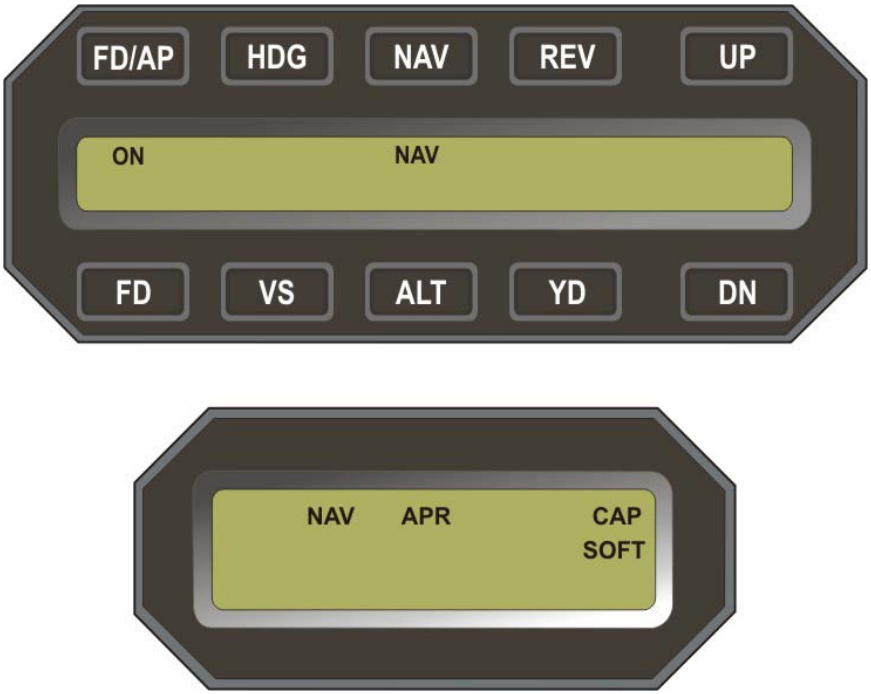
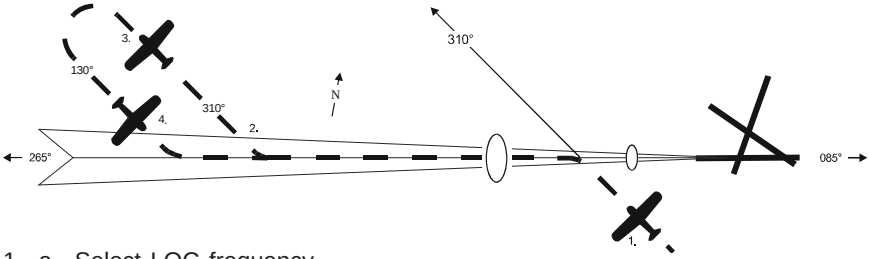



**Fig. 3-35. AP Display, NAV APR Mode Engaged, Track LOC Front Course Inbound**




1. a. Select LOC frequency.

   b. Heading System HSI

      Set Course Pointer to FRONT INBOUND LOC course.

      Heading System DG

      Set Heading Bug to BACK INBOUND LOC course.

   c. Press REV mode selector switch to engage reverse approach mode.

   d. Intercept and track FRONT OUTBOUND LOC course.

2. a. At appropriate time, set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.

   b. Press HDG mode selector switch to engage heading mode.

3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.

4. a. Heading System HSI

      Course Pointer remains unchanged.

      Heading System DG

      Set Heading Bug to FRONT INBOUND LOC course.

   b. Press NAV mode selector switch to engage navigation approach mode.

   c. Intercept and track FRONT INBOUND LOC course.

   d. At middle marker, if missed approach is declared, disconnect autopilot.

   e. Stabilize aircraft.

   f. Set Heading Bug to missed approach heading.

   g. Press HDG mode selector switch to engage heading mode.

**Fig. 3-36. LOC Approach with Procedure Turn**

### 3.3.6 VOR Approach with Procedure Turn

Select the VOR frequency on the Navigation Receiver.

Heading System HSI

Set Course Pointer to FRONT INBOUND VOR course on compass card.

Heading System DG

Set Heading Bug and OBS to BACK INBOUND VOR course on each respective compass card.

Press the REV mode selector switch to engage the reverse mode. The REV annunciation will appear as shown in Fig. 3-37, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT OUTBOUND VOR course. It will track this course in the SOFT condition, which is acknowledged by the appearance of that annunciation and the extinguishment of the CAP annunciation, as shown in Fig. 3-38.

At the appropriate time, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading, and then press the HDG mode selector switch to engage the heading mode. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the FRONT INBOUND PROCEDURE TURN heading.

Heading System HSI

Course Pointer remains unchanged on compass card.

Heading System DG

Set Heading Bug and OBS to FRONT INBOUND VOR course on each respective compass card.

Press the NAV mode selector switch to engage the navigation mode. The NAV annunciation will appear as shown in Fig. 3-39, to acknowledge that this mode is engaged. The autopilot will intercept and track the FRONT INBOUND VOR course. It will track this course in the SOFT condition, which is acknowledged by the appearance of that annunciation and the extinguishment of the CAP annunciation, as shown in Fig. 3-40.

A summary pictorial of this procedure is shown in Fig. 3-41.

For those aircraft equipped with both the Garmin 400W/500W Series GPS Navigation Receiver or equivalent unit, and the S-TEC ST-901 GPSS Converter, with its heading mode engaged the autopilot is capable of executing virtually this entire lateral approach sequence, if it has been programmed into the GPS Navigation Receiver and the GPSS Converter's GPSS mode is engaged.

Once on the FRONT INBOUND VOR course, with the GPS Navigation Receiver set to VLOC, press the APR mode selector switch to engage the NAV APR mode and complete the front course approach.

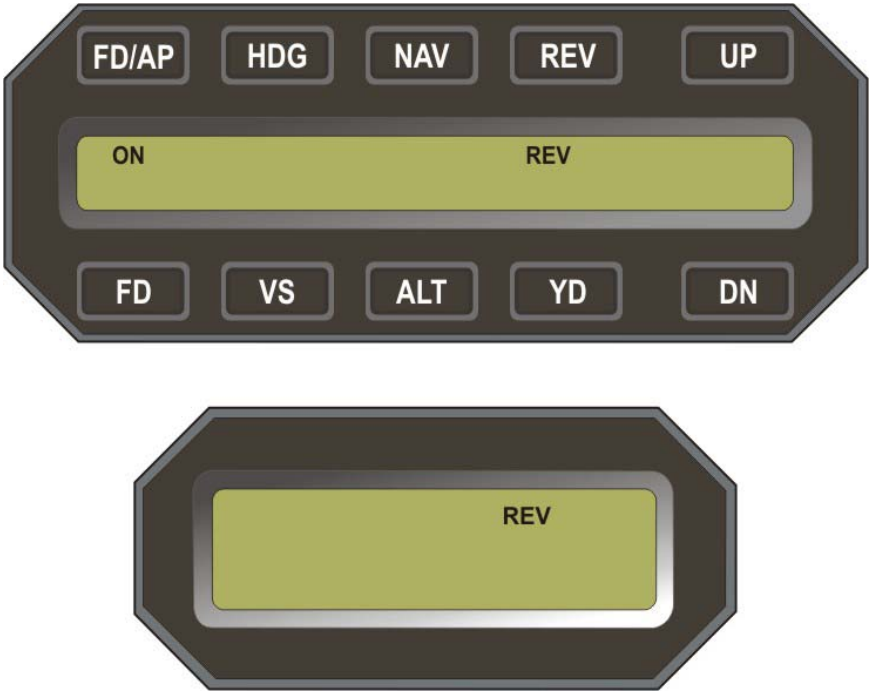



**Fig. 3-37. AP Display, REV Mode Engaged, Before VOR Front Course Intercept**

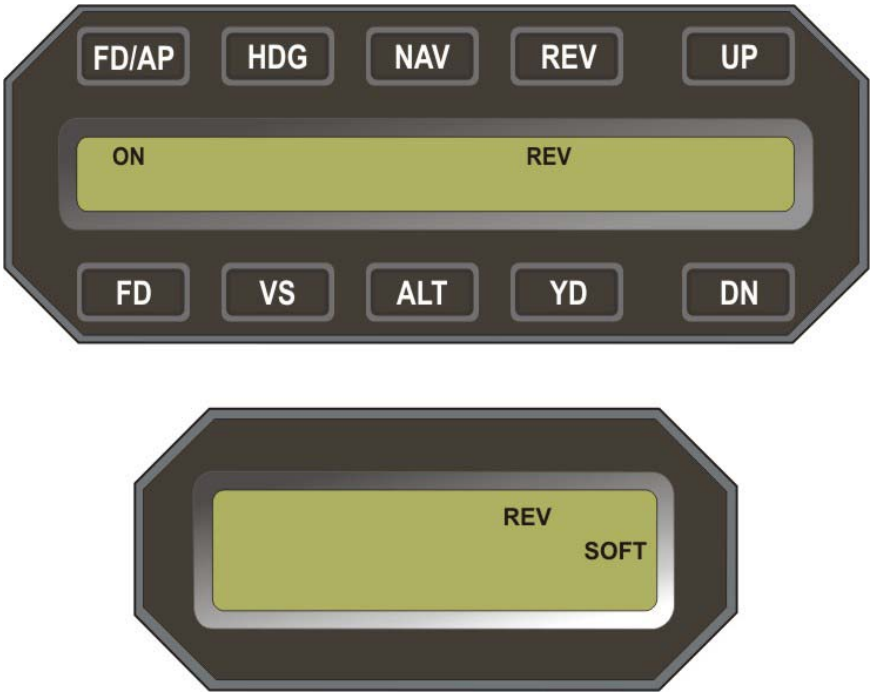



**Fig. 3-38. AP Display, REV Mode Engaged, Track VOR Front Course Outbound**

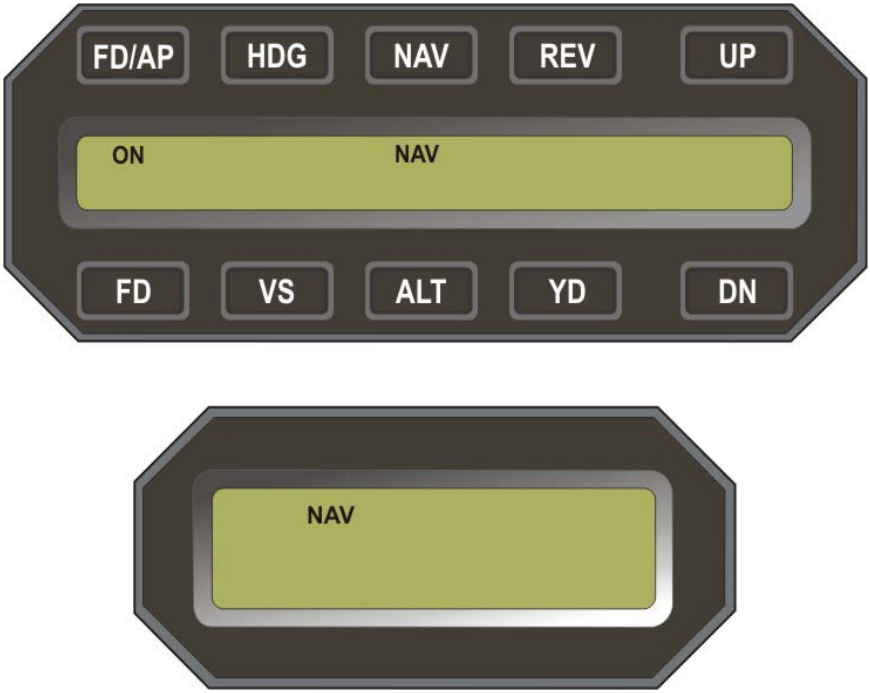



**Fig. 3-39. AP Display, NAV Mode Engaged, Before VOR Front Course Intercept**

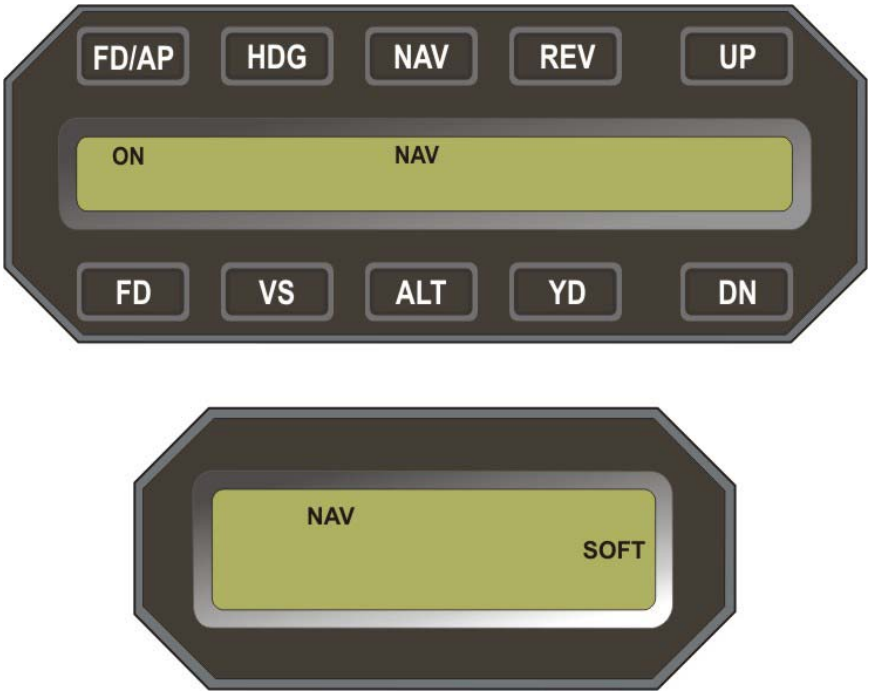
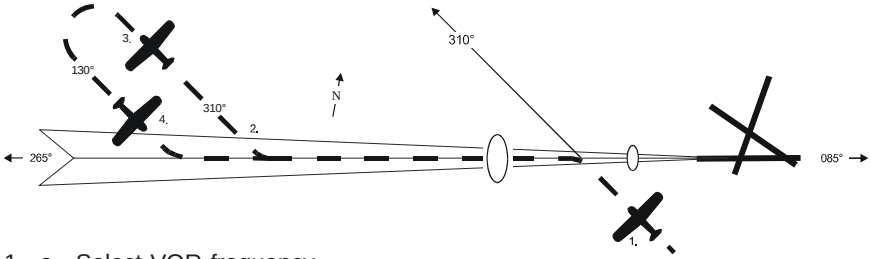



**Fig. 3-40. AP Display, NAV Mode Engaged, Track VOR Front Course Inbound**




1. a. Select VOR frequency.

   b. Heading System HSI

      Set Course Pointer to FRONT INBOUND VOR course.

      Heading System DG

      Set Heading Bug and OBS to BACK INBOUND VOR course.

   c. Press REV mode selector switch to engage reverse mode.

   d. Intercept and track FRONT OUTBOUND VOR course.

2. a. At appropriate time, set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.

   b. Press HDG mode selector switch to engage heading mode.

3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.

4. a. Heading System HSI

      Course Pointer remains unchanged.

      Heading System DG

      Set Heading Bug and OBS to FRONT INBOUND VOR course.

   b. Press NAV mode selector switch to engage navigation mode.

   c. Intercept and track FRONT INBOUND VOR course.

   d. At middle marker, if missed approach is declared, disconnect autopilot.

   e. Stabilize aircraft.

   f. Set Heading Bug to missed approach heading.

   g. Press HDG mode selector switch to engage heading mode.

**Fig. 3-41. VOR Approach with Procedure Turn**

### 3.4 Flight Director Operation

The optional Flight Director (FD) is a display of the flight profile. It is commanded by the autopilot. A pair of Steering Command Bars and an Aircraft Reference Symbol (ARS) are the principal FD components of interest. The position of the Steering Command Bars can be adjusted by the pilot, using the Parallax Adjustment shown in Fig. 3-42. The FD operates in either the FD/AP mode or the FD mode.


**Fig. 3-42. FD Parallax Adjustment**

#### 3.4.1 FD/AP Mode

Press the FD/AP switch. The ON annunciation will appear directly below this switch, to acknowledge that the Programmer is ON and the FD/AP mode is engaged. Engage a roll mode (HDG, NAV, NAV APR, REV, REV APR). At this point the Steering Command Bars remain stowed, but the subsequent engagement of a pitch mode (ALT HOLD, VS, GS) will cause the Steering Command Bars to move into view. The autopilot will steer the aircraft toward the Steering Command Bars, until the ARS is tucked into them. The FD provides a visual indication of how accurately the autopilot is tracking its own roll and pitch commands. A typical view of the FD with the FD/AP mode engaged is shown in Fig. 3-43.


**Fig. 3-43. FD Display, FD/AP Mode Engaged**

### 3.4.2 FD Mode

With a roll mode (HDG, NAV, NAV APR, REV, REV APR) and a pitch mode (ALT HOLD, VS, GS) engaged, press the FD switch. The ON annunciation will appear directly above this switch, whereas the ON annunciation directly below the FD/AP switch will extinguish, to acknowledge that the Programmer is ON and the FD mode is engaged. This disengages both the roll servo and pitch servo, although the previously engaged roll mode and pitch mode annunciations will still appear on the AP display. The pilot must steer the aircraft toward the Steering Command Bars, until the ARS is tucked into them. The FD provides a visual indication of how accurately the pilot is tracking the autopilot's roll and pitch commands. A typical view of the FD with the FD mode engaged is shown in Fig. 3-44.


**Fig. 3-44. FD Display, FD Mode Engaged**

## 3.5 Wide Area Augmentation System (WAAS) Procedures

### 3.5.1 GPS Approach (With Vertical Guidance)

For those aircraft equipped with both the Garmin 400W/500W Series GPS Navigation Receiver or equivalent unit, and the S-TEC ST-901 GPSS Converter, with the autopilot's heading mode engaged and the GPSS Converter's GPSS mode engaged, when conducting a WAAS approach the autopilot will execute virtually the entire lateral approach sequence (i.e., intercept and track front outbound course, complete procedure turn, intercept and track front inbound course).

In addition, the autopilot will execute the following vertical approaches:

1. LPV (precision and LNAV/VNAV)

2. LNAV+V (non-precision)

Once on the front inbound course, the NAV APR and ALT HOLD modes must be engaged in order to intercept and track either GPS glidepath listed above. The remainder of the approach should be flown like a Straight-In ILS (reference section 3.2.1).

**Caution:**

**The aircraft will not automatically level off at the Decision Height (DH) or Minimum Descent Altitude (MDA). The pilot must maintain an awareness of their altitude at all times, and disconnect the autopilot at DH or MDA for either landing or Go-Around (GA).**

### 3.5.2 Missed Approach

During a missed approach, once established in a climb and with the autopilot's heading mode engaged, engaging the GPSS Converter's GPSS mode will cause the aircraft to follow the missed approach procedure, if it has been programmed into the Garmin 400W/500W GPS Navigation Receiver or equivalent unit.

If the missed approach procedure includes holding, then the autopilot will enter the aircraft into the holding pattern. In that event, maintain vertical speed and altitude using the VS and ALT HOLD modes, respectively.

## 3.6 Yaw Damper Operation

The optional Yaw Damper serves to dampen excessive adverse yaw. The yaw damper (YD) mode will become engaged upon the initial engagement of any roll mode (HDG, NAV, NAV APR, REV, REV APR). The YD annunciation will appear to acknowledge that the yaw damper mode is engaged. This mode can be subsequently disengaged by pressing the YD mode selector switch, causing the YD annunciation to extinguish.

The Yaw Damper Trim Knob is shown in Fig. 3-45. Turn it as required, to center the slip/skid ball whenever the yaw damper mode is engaged.

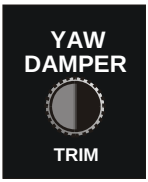



**Fig. 3-45. Yaw Damper Trim Knob**

### 3.7 Autopilot Disconnect

The autopilot can be disconnected by any of the following means:

1. Press AP DISC / TRIM INTR Switch typically located on Control Wheel.
2. Press either forward or aft on both segments of Manual Electric Trim Switch located on Control Wheel, whenever a pitch mode (ALT HOLD, VS, GS) is engaged.
3. Press FD/AP Switch whenever ON annunciation appears directly below it.
4. Press FD Switch whenever ON annunciation appears directly above it.
5. Pull Autopilot Circuit Breaker.

### 3.8 Automatic Trim Disable

In the event of a trim runaway, the automatic trim function can be disabled by executing the following sequence:

1. Press/Hold AP DISC / TRIM INTR Switch typically located on Control Wheel.
2. Set Trim Master Switch to OFF position.
3. Pull Trim Circuit Breaker.

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# SECTION 4
# OPERATING PARAMETERS

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### 4.1 Roll Axis Limits

Turn Rate

Piston A/C:

90% Standard Rate Turn (HDG, NAV, NAV APR, REV, REV APR Modes)

Turboprop A/C:

75% Standard Rate Turn (HDG, NAV, NAV APR, REV, REV APR Modes)

### 4.2 Pitch Axis Limits

Altitude

32,000 FT

Vertical Force Due to Acceleration

0.60 g

Vertical Speed

1600 FPM Climbing or Descending

Modes

A pitch mode (ALT HOLD, VS, GS) can only be engaged after a roll mode (HDG, NAV, NAV APR, REV, REV APR) has been engaged.

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# SECTION 5
# GLOSSARY

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| Term | Meaning |
|---|---|
| A/C | Aircraft |
| ADJ | Adjustment |
| ALT | Altitude |
| AP | Autopilot |
| APR | Approach |
| ARS | Aircraft Reference Symbol |
| CAP | Capture |
| CCW | Counter–Clockwise |
| CDI | Course Deviation Indication |
| CRS | Course |
| CW | Clockwise |
| DG | Directional Gyro |
| DH | Decision Height |
| DISC | Disconnect |
| DSBL | Disable |
| FAA | Federal Aviation Administration |
| FD | Flight Director |
| FPM | Feet–per–Minute |
| FT | Feet |
| GA | Go Around |
| GDI | Glideslope Deviation Indication |
| GPS | Global Positioning System |
| GPSS | Global Positioning System Steering |
| GS | Glideslope |
| HDG | Heading |
| HSI | Horizontal Situation Indicator |
| IFR | Instrument Flight Rules |
| ILS | Instrument Landing System |
| INTR | Interrupt |
| KTS | Knots |
| LNAV | Lateral Navigation |
| LNAV+V | Lateral Navigation with Advisory Vertical Guidance |
| LOC | Localizer |
| LPV | Lateral Precision with Vertical Guidance |
| MAP | Missed Approach Point |
| MDA | Minimum Descent Altitude |
| NAV | Navigation |
| NM | Nautical Miles |
| OBS | Omnibearing Selector |
| PFGC | Pitch Flight Guidance Computer |
| PLX | Parallax |
| PN | Part Number |
| POH | Pilot's Operating Handbook |
| RDY | Ready |
| REV | Reverse |
| RFGC | Roll Flight Guidance Computer |
| SEL | Selector |
| VLOC | VOR or LOC Frequency |
| VMC | Visual Meteorological Conditions |
| VNAV | Vertical Navigation |
| VOR | Very High Frequency Omnidirectional Radio Range |
| VS | Vertical Speed |
| WAAS | Wide Area Augmentation System |
| YD | Yaw Damper |

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Notice:

Contact S-TEC Customer Support at 800-872-7832 for a Service Repair Order (SRO) number prior to the return of any component for any reason.

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