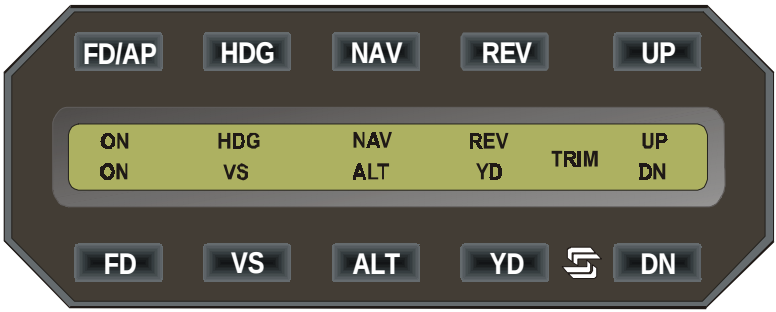
System 65 Autopilot



Pilot's Operating Handbook

MEGGITT AVIONICS

S-TEC

List of Effective Pages	* Asterisk indicates pages changed, added, or deleted by revision.

Record of Revisions	Retain this record in front of handbook. Upon receipt of a revision, insert changes and complete table below.	
Revision Number	**Revision Date**	**Insertion Date/Initials**
1st Edition	20 Feb 2001	
2nd Edition	31 Jul 2002	

Page Intentionally Blank

Table of Contents

Table of Contents

List of Figures

Page Intentionally Blank

SECTION 1
INTRODUCTION

Page Intentionally Blank

.

1.0 Introduction

The primary purpose of the System 65 **Pilot Operating Handbook (POH)** is to provide pilots with step-by-step Functional Preflight and In-Flight Operating Procedures for the installed system.

NOTICE

This manual may be used in conjunction with an **FAA** approved autopilot Airplane Flight Manual Supplement **(AFMS)**, Pilots Operating Handbook Supplement **(POHS)** or Supplemental Flight Manual **(SFM)**. Refer to the specific **AFMS**, **POHS**, or **SFM** for your aircraft specific information and emergency operating procedures.

If the autopilot is to be used during Instrument Flight Rules **(IFR)** operations, we recommend that you develop a thorough understanding of the autopilot system, its functions and characteristics in Visual Meteorological Conditions **(VMC)**. Accomplish this before undertaking an **IFR** flight.

Page Intentionally Blank

SECTION 2
BLOCK DIAGRAM

Page Intentionally Blank

2.0 Block Diagram

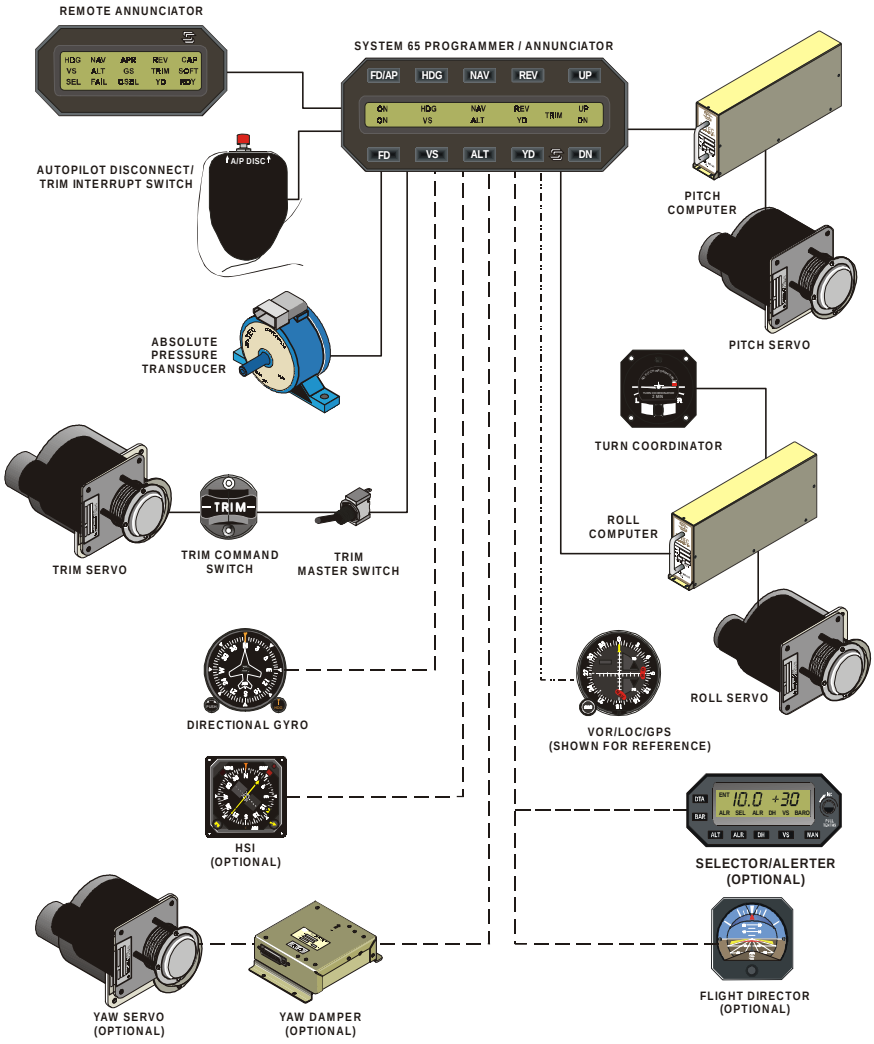


Fig. 2-1. System 65 Block Diagram

Page Intentionally Blank

SECTION 3
AUTOPILOT OVERVIEW

Page Intentionally Blank

3.0 Autopilot Overview

3.1 System 65 Programmer/Annunciator

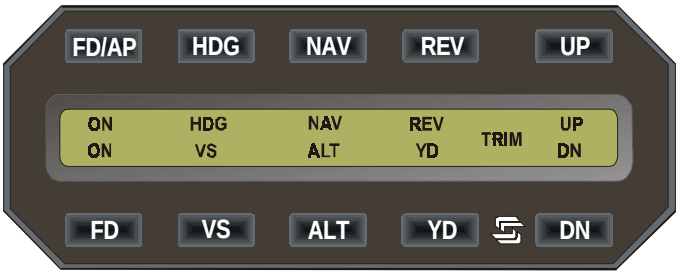


Fig. 3-1. System 65 Programmer/Annunciator

The System 65 Programmer/Annunciator is a rate based autopilot that controls the roll and pitch axis of the aircraft. The autopilot's main function is to convert pilot commands to logic signals for both the roll and pitch computers. As the pilot enters the desired mode by pressing the mode selector switch, the computer acknowledges the selection by illuminating that annunciator.

The Roll Computer receives signal inputs from the turn coordinator, Directional Gyro **(DG)** or optional Horizontal Situation Indicator **(HSI)**, Very High Frequency Omnidirectional Radio Range **(VOR)** / Localizer **(LOC)**, Long Range Navigation **(LORAN)** and the Global Positioning System **(GPS)** navigation receivers. It then computes roll servo commands for stabilization, turns, radio intercepts, and tracking.

The Pitch Computer receives signal inputs from the altitude pressure transducer, internal accelerometer, glideslope deviation indicator, and off warning flag contained in the glideslope receiver. The pitch system provides vertical speed control and altitude hold, as well as automatic/ manual glideslope capture.

Vertical speed reference is provided by the barometric pressure transducer, while automatic and manual pitch trim sensing is provided by the pitch servo. Drive for the elevator trim servo is provided by the pitch computer. All modes use the transducer signal for a **VS** or **ALT** reference.

3.2 System 65 Remote Annunciator

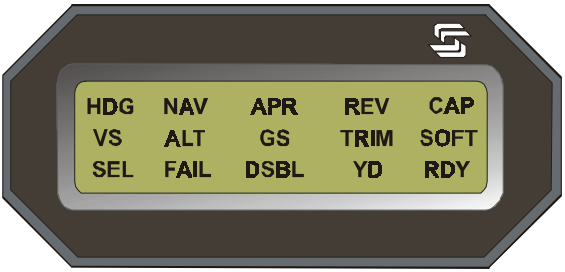


Fig. 3-2. System 65 Remote Annunciator

The System 65 Remote Annunciator is standard equipment (not optional) with the System 65 Autopilot. The remote annunciator displays all the modes selected on the autopilot programmer, as well as conditions of those modes. Examples of these conditions include: **NAV** gain, **NAV** failure, **GS** disable **(DSBL)** and out of trim conditions.

In addition, both **SEL** and Glideslope **(GS)** are annunciated only on the remote annunciator. The "**SEL**" annunciator indicates that the optional Altitude Selector / Alerter is in use. The **GS** annunciator indicates that the autopilot is in glide-slope mode and the pitch annunciator in the autopilot programmer will be blank.

NOTE: It is very important that the pilot monitor the remote annunciator as well as the autopilot programmer during all autopilot operations and especially during approach operations.

3.3 Roll Modes of Operation

3.3.1 Heading (HDG)

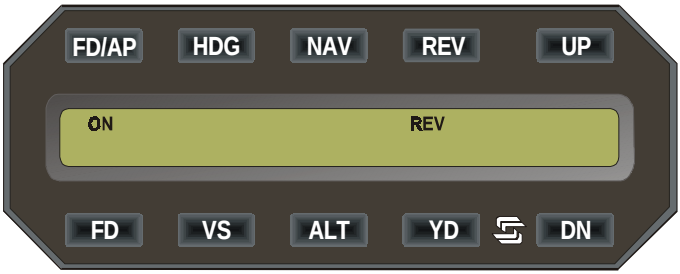
The HDG mode provides heading preselect and turns through the use of the heading bug on the Directional Gyro **(DG)** or optional Horizontal Situation Indicator **(HSI)**.

3.3.2 Navigation (NAV)

The **NAV** mode provides roll commands for automatic intercept and tracking of selected **VOR/LOC/LORAN/GPS** navigational signals.

3.3.3 Reverse (REV)

REV mode provides roll commands for automatic intercept and tracking of the back course localizer inbound or the front course localizer outbound.



3.4 Pitch Modes of Operation

NOTE: Before engaging a pitch mode of operation, a roll mode must first be engaged.

3.4.1 Vertical Speed (VS)

The **VS** mode provides pitch synchronization of the autopilot to the aircraft vertical speed. To activate, press the **VS** mode switch. This activates the **UP/DN** (Down) pitch modifier switches for pilot commanded changes of vertical speed, up to a maximum of **+/- 1600** feet-per-minute (rate of climb / descent).

3.4.2 Altitude (ALT)

The **ALT** mode engages the altitude hold mode, capturing the altitude attained at the time of activation.

3.4.3 UP

When the **VS** mode is activated, the **UP** modifier switch will increase the rate-of-climb or decrease the rate-of-descent at **160 FPM** for each second of continuous switch depression.

3.4.4 Down (DN)

When the **VS** mode is activated, the **DN** switch will increase the rate-of-descent or decrease the rate-of-climb **160 FPM** for each second of continuous switch depression.

When the altitude hold mode is engaged, the **UP** and **DN** switches may be used to adjust the altitude. The **UP** and **DN** switches produce a 20 foot change in altitude for each second of depression, up to a maximum of 200 feet. Altitude changes of more than 200 feet require reactivation of the VS mode.

NOTE: For aircraft without auto trim, or where auto trim is disabled or turned off, the **UP/DN** annunciators are used to annunciate out of trim conditions when either the VS or **ALT** modes are engaged. If up trim is required, the **UP** annunciator will illuminate. If down trim is needed, the **DN** annunciator will illuminate. In both cases, the **TRIM** annunciation will also illuminate. The pilot should manually trim the aircraft in the direction indicated, until the light extinguishes. The aircraft will then be trimmed for existing flight conditions.

NOTE: There are four ways to disengage the autopilot **(A/P)**:

1. Press the **A/P** disconnect/trim interrupt switch (normally mounted on the control wheel).
2. If pitch axis is engaged, operate the trim switch either way. (This will not disconnect the **A/P** if Autotrim is disabled or not installed).
3. Push the **FD / AP** switch. The ON annunciator will extinguish.
4. Locate and pull the autopilot circuit breaker.

Page Intentionally Blank

SECTION 4
PROCEDURES

Page Intentionally Blank

4.0 Procedures

4.1 Pre-Flight Procedures

NOTE: To perform the system function check, adequate **DC** voltage must be supplied to the system, either 12 or 24 **VDC**, depending on the aircraft.

4.1.1 Roll Axis

The following is a step by step procedure for preflighting the Roll Axis:

1. Push the System 65 Flight Director **(FD)** /Autopilot **(AP)** Switch to turn on the autopilot (This is the Autopilot Master Switch). Note that **"ON"** is displayed in the autopilot programmer upper left corner.
2. Verify within three minutes Ready **(RDY)** alone becomes annunciated on the **A/P** Remote Annunciator.
3. Verify that the low voltage flag on the Turn Coordinator is out of view.
4. Rotate the heading knob on the Directional Gyro **(DG)** to position the heading bug under the lubber line.
5. Engage the **HDG** mode, and observe the **HDG** annunciation. Move the heading bug left and right. The control wheel should move in the direction of bug travel. Return the bug to center.
6. Grasp the control wheel and manually turn it left and right to overpower the roll servo. There should be a noticeable increase in control wheel friction, no excessive looseness, no ratcheting or noise.
7. Turn on the **NAV** radio and tune a valid **VOR** signal. Then engage the **NAV** mode, observing the **NAV** annunciation. Move the **VOR/Omni** bearing Selector **(OBS)** so that the needle swings left and right. The control wheel should move in the direction of needle travel (works with Standard **DG** not **HSI**). NAV annunciation should flash when Course Deviation Indicator **(CDI)** deflection is over 50%.
8. Select **REV** mode, and observe the **REV** annunciation. Again, rotate the **VOR/OBS** knob. The control wheel should move opposite to direction of needle travel (Only works with Standard **DG** not **HSI**). **NAV** annunciation should flash when **CDI** deflection is over 50%.
9. Channel a nonvalid **VOR** signal. **NAV** annunciation should flash, and **FAIL** annunciation should illuminate (if the radio has a **NAV** flag output).

10. Disconnect by pressing and releasing the control wheel mounted **A/P** disconnect switch. Move the control wheel to ensure freedom of controls, and check to see that the **RDY** annunciator is flashing for approximately 5 seconds to indicate autopilot disconnect.

4.1.2 Pitch/Altitude and Vertical Speed

The following is a step by step procedure for preflighting the Pitch/ Altitude and Vertical Speed Systems:

1. Be sure the **FD/AP** switch indicates **ON**, and that a roll axis mode has been selected (for example: **HDG** mode).

2. Move the control wheel to level flight position and engage the **VS** mode. Press the **UP** modifier switch and hold. The control wheel should move aft, slowly. Press the **DN** switch and hold. The control wheel should move slowly forward.

   NOTE: On some aircraft the autopilot may not be able to lift the elevators without pilot assistance during ground operation.

3. Place Trim Master Switch to **OFF** (if autotrim is installed).

4. Overpower the pitch function by pulling the control wheel slowly aft. The **TRIM** and **DN** annunciator should illuminate after 3 seconds. Slowly push the control wheel forward. After 3 seconds, the **TRIM** and **UP** annunciator should illuminate. During overpower, there should be no excessive play in the controls or ratcheting noise.

5. Manual Pitch Limiter Test:

   A. Disconnect the autopilot. Push the **FD/AP** switch to extinguish **"ON"** in the programmer.

   B. Move the aircraft control wheel until the elevator is in the neutral position and hold there.

   C. Press and hold the **UP** modifier switch while maintaining a grasp on the control wheel. Audible warning should sound.

   D. Verify the pitch servo momentarily engages and then disengages. Release the **UP** switch.

   E. Press and hold the **DN** switch while maintaining a grasp on the control wheel. Audible warning should sound.

   F. Verify the pitch servo momentarily engages and then disengages. Release the **DN** switch.

6. Verify that the autopilot is disconnected and move controls to ensure freedom of movement. Trim aircraft for takeoff.

CAUTION

If the pitch servo does not disengage when either the UP or DN modifier switch is pressed, the limit accelerometer may have failed. Do not use the autopilot pitch section until the problem is corrected. This check should be performed once per flight day. (Check Federal Aviation Administration (FAA) approved AFMS).

NOTE: If optional autotrim is not installed, this is the end of the preflight test.

7. If the autopilot is equipped with optional autotrim, proceed with the following steps:

   A. Trim Master Switch to **ON**.

   B. Operate manual trim switch (both segments) nose **DN**, autopilot **TRIM** annunciator flashes, trim moves nose down (check manual trim wheel).

   C. Operate trim switch (both segments) **UP**, autopilot **TRIM** annunciator flashes, trim moves nose up (check manual trim wheel). Grasp aircraft trim control and overpower electric trim.

   D. Operate each segment of the trim switch separately. Trim should not operate unless both halves of the trim switch are operated simultaneously in the same direction.

   E. With trim operating, press trim interrupt switch. Trim motion should cease while interrupt switch is activated. Trim motion should resume when interrupt switch is released.

4.1.3 Autotrim

1. Trim Master Switch **ON**, engage autopilot **HDG** and **VS** modes.

2. Grasp control wheel, slowly push forward. After approximately 3 econds, trim should run nose up.

3. Slowly pull control wheel aft. After approximately 3 seconds, trim should move nose down.

4. Move manual trim switch up and down. Autopilot disengages, trim should operate in commanded direction (trim switch will disengage autopilot only when pitch is engaged).

5. Reengage **HDG** and **VS** modes and press **TRIM INTR/AP DISC** switch. Autopilot should disengage.

6. Trim aircraft for takeoff and check controls for freedom of movement. Be sure the autopilot and trim are disengaged.

CAUTION

If either the manual electric trim or autotrim fails during any portion of the preflight, turn trim master switch OFF. Do not use the electric trim until the fault is corrected. With trim master switch OFF, the autopilot trim indicators and audio warning are reactivated. If the electric trim fails, or has an in-flight power failure, the system automatically reverts to indicator lights and audio warning. Should this occur, turn trim master switch OFF, and revert to aircraft manual trim until the fault is corrected.

4.2 NORMAL OPERATING PROCEDURES

NOTE: **RDY** must be illuminated on the remote annunciator and **ON** must be displayed on the autopilot programmer, in order to activate any mode of the System 65 autopilot.

4.2.1 Roll Axis Modes

4.2.1.1 Heading

1. Trim the aircraft for existing flight conditions.
2. Set the heading bug on the **DG** or optional **HSI** to the desired **HDG** and press the **HDG** switch.

NOTE: The **HDG** annunciator will illuminate. A new **HDG** can be selected by repositioning the heading bug. When operating in the **HDG** mode, the system is not coupled to any ground navigation device. It flies a specific heading, only. It will be necessary to monitor navigation instruments for course deviation due to wind drift, and to establish wind correction angles.

Fig. 4-1. Directional Gyro

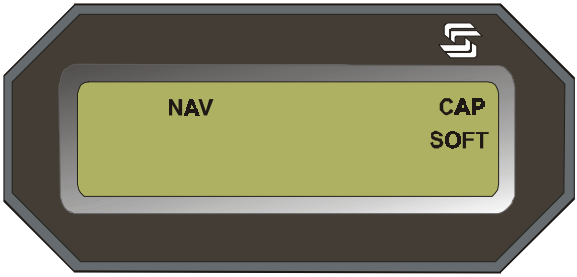
4.2.1.2 VOR Intercept and Tracking (DG)

1. To intercept and track a **VOR** signal, tune the navigation radio receiver to the proper frequency.
2. Select the desired **VOR** radial on the **NAV** indicator.
3. Move the heading bug in the direction of desired travel, to match the course of selected radial.
4. Engage the **NAV** mode.

NOTE: If the **VOR** needle is at full-scale deviation, the autopilot will establish a 45º intercept angle to the desired course. As the aircraft approaches the selected radial, the autopilot senses the closure rate, and gradually, smoothly, shallows the intercept angle. The point that this turn begins is variable, depending on the aircraft position and closure rate to the radial. 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 can command 90% of a standard rate turn.

When the selected course is intercepted and the needle is within 15% of centered, the **CAP** annunciator illuminates indicating course capture and initiation of the tracking gain sequence. This high sensitivity level is maintained for approximately 15 seconds while wind correction angle is established. Turn rate capability is then reduced to 45% standard turn rate (Capture/Soft Gain) identified by both the **CAP** and **SOFT** annunciation's.

Approximately 60 seconds later, the maximum turn rate is reduced to 15% of standard rate (Soft Gain), and the lowest level of sensitivity is achieved, identified by the **NAV** and **SOFT** annunciation's. **CAP** annunciation extinguishes. This condition provides low activity levels during station passage when **VOR** signals are erratic.



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

NOTE: When operating in the **NAV/ SOFT** mode, and needle deflection of 50% or more is experienced for 1½ 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 10º or more is required at an enroute waypoint, select the new course, and reset the **NAV** mode to reinstate the capture sequence. Set the **DG** heading bug to the new course.

4.2.1.3 VOR Approach (DG)

Fig. 4-2. VOR/LOC/GPS

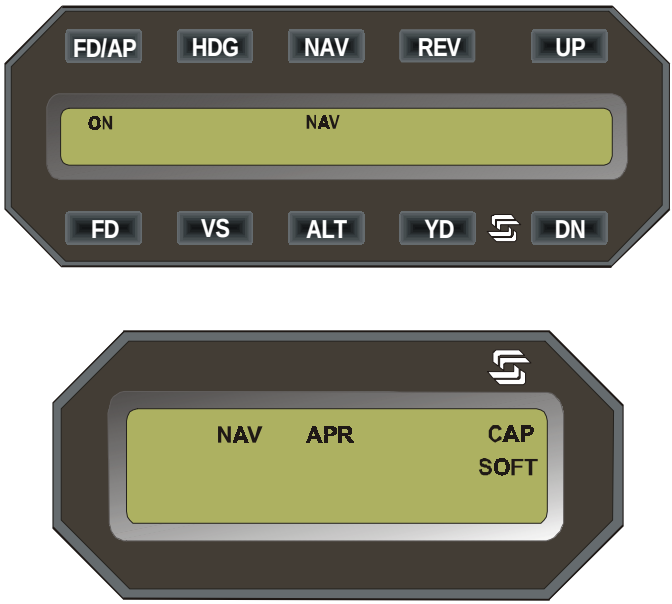
During a **VOR** approach, it is recommended that the **NAV** mode switch be depressed just after **TO/FROM** reversal after the needle has stabilized at the Final Approach Fix **(FAF)** inbound .

This returns the system to capture dynamics and reinstates the high sensitivity gain scheduling.

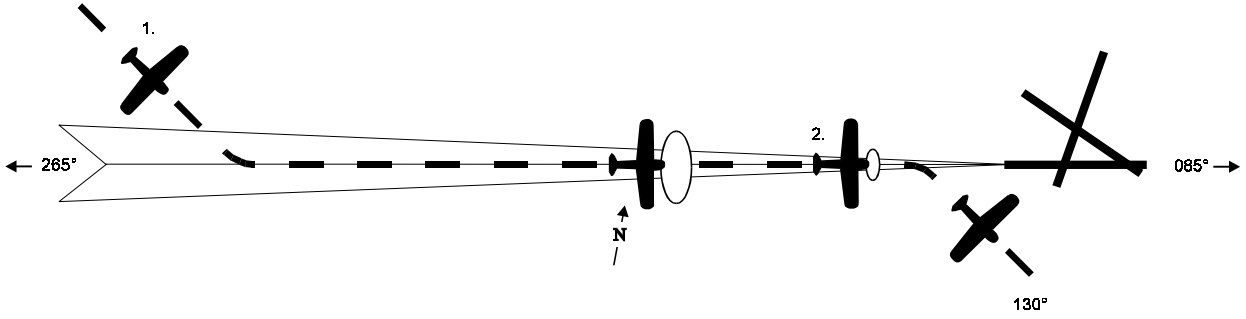
4.2.1.4 Localizer Intercept and Tracking (DG)

When a localizer frequency is channeled, and NAV mode is selected, the system will automatically execute high sensitivity gain for the approach and automatically activates the APR mode. NAV/APR illuminates on the remote annunciator.

Set the heading bug to the inbound localizer course, and engage the NAV mode to intercept and track the localizer front course inbound or back course outbound.



Straight-in Localizer Approach and Tracking (DG)

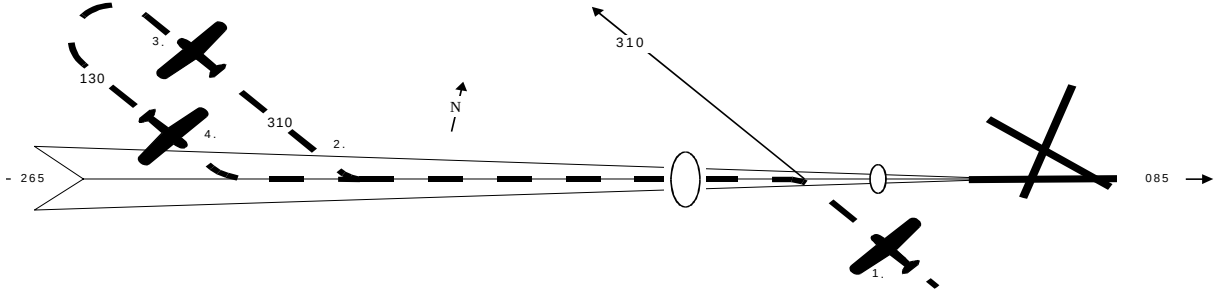


1. a. Tune navigation radio to localizer frequency.
   b. Set **HDG** bug to published **inbound** course.
   c. Press **NAV** mode switch. Autopilot will intercept, capture and track the localizer course.

2. If a missed approach is declared at the middle marker:
   a. Disconnect the autopilot and stabilize the aircraft for the missed approach climb.
   b. Set the **HDG** bug to the published missed approach heading.
   c. Press the **HDG** mode switch.
   d. Press the **VS** mode switch if desired.

Fig. 4-3

Procedure Turn Localizer Approach and Tracking (DG)



1. **a.** Tune navigation radio to **LOC** frequency.
b. Set heading bug to published outbound **LOC** heading.
c. Push **REV** mode switch.

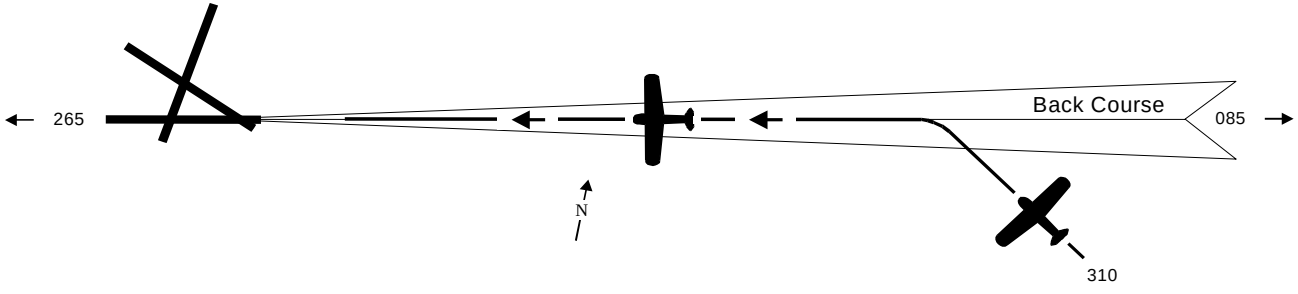
2. **a.** Set heading bug to outbound procedure turn heading.
b. Press **HDG** mode switch.

3. In 90 increments, set heading bug to ***inbound*** procedure turn heading.

4. **a.** Set heading bug to inbound **LOC** heading.
b. Press **NAV** mode switch. Autopilot will intercept, track, and capture localizer course inbound to the airport.

Fig. 4-4

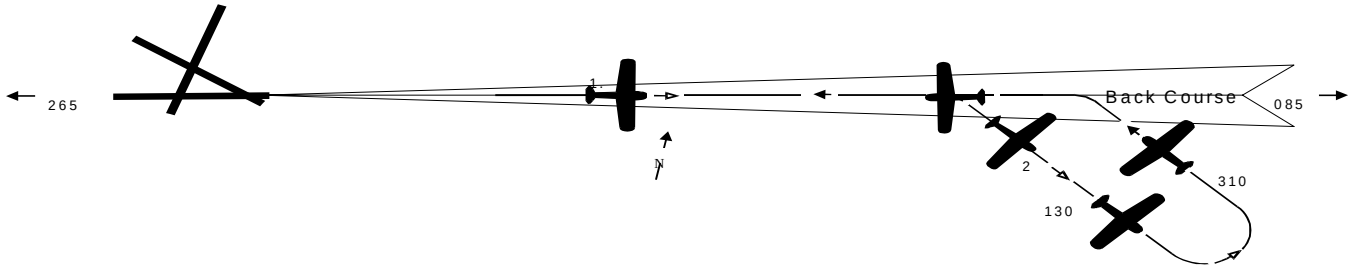
Back Course Straight-In Approach (DG)



1. a. Tune navigation radio to **LOC** frequency.
   b. Set heading bug to the back course inbound final approach heading.
   c. Press **REV** mode switch. Autopilot will intercept and track the back course to the airport.

Fig. 4-5

Back Course Procedure Turn (DG)



1. a. Tune navigation receiver to **LOC** frequency.
   b. Set heading bug to published inbound front course heading.
   c. Press **NAV** mode switch.
2. a. Set heading bug to outbound procedure turn heading.
   b. Press **HDG** mode switch.
3. In 90 increments, set heading bug to inbound procedure turn heading.
4. a. Set heading bug to published final approach course heading.
   b. Press **REV** mode switch. Autopilot will complete intercept, capture and tracking of localizer back course, inbound.

Fig. 4-6

4.2.1.5 VOR/Localizer Intercept and Track (HSI Option)

If your aircraft is equipped with an optional **HSI**, the autopilot will receive both **VOR** left/right information and course information. With an **HSI**, the heading bug is not used during radio tracking. To make a **VOR** or Localizer Approach, tune the navigation receiver to the required frequency. Set the desired **VOR** radial or Localizer course with the course selector. Press and release the **NAV** mode switch.

NOTE: Localizer approaches with an **HSI** require that the inbound front course be set on the course selector for either front course or back course operations. To track inbound on the front course, activate the **NAV** mode. **NAV** mode also is used for tracking outbound on the back course.

To fly the back course, activate the **REV** mode. It is used to track inbound on the back course, and outbound on the front course. The course selector must be set to the inbound front course.

4.2.1.6 Dual Mode Intercept

NOTE: During operations with an **HSI**, simultaneous activation of both the **HDG** and **NAV** modes will provide selected angle intercepts. Selected angle intercepts may be used during **VOR**, localizer front course and back course **(REV)** operations. In flying a radial or localizer intercept, the autopilot will follow the heading bug until the aircraft reaches the proper on course turn point. It will then switch from **HDG** to **NAV** mode automatically.

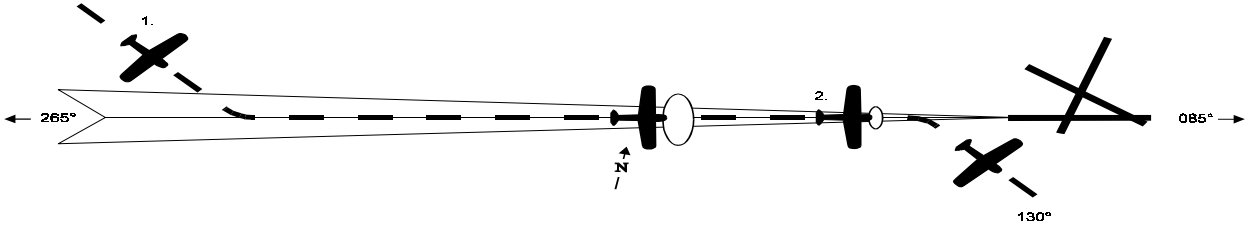
Localizer intercept angles greater than 45º usually result in some course overshoot, depending on the distance from the station and speed of the aircraft. Therefore, angles greater than 45º are not recommended.

4.2.1.7 GPS Intercept and Tracking

The System 65 Autopilot can also be used to intercept and track valid **GPS** signals for cross country or approach operations using the autopilot **NAV** mode as follows:

1. Program the desired waypoint or initial approach fix into the **GPS** navigator and verify a valid signal is being received.
2. If using a **DG**, set the heading bug on the desired track to the waypoint, then select the NAV mode. The autopilot will intercept and track the bearing to the waypoint.
3. If using an **HSI**, set the course arrow (instead of the heading bug), to the desired track to the waypoint before selecting the **NAV** mode.
4. If conducting a **GPS** approach, be sure to note the suggested bearing to each new waypoint as each segment of the approach is completed and set the heading bug or course arrow as appropriate. If making course changes of more than 10º when crossing a waypoint, press the **NAV** switch again to reinstate the capture sequence.
5. For procedure turns, the pilot must select the **HDG** mode and fly the aircraft through the turn then select the **NAV** mode again.

Straight-in Localizer Approach and Tracking (Optional HSI)



1. a. Tune navigation radio to **LOC** frequency.

   b. Set course pointer to published inbound **LOC** course heading.

   c. Press **NAV** mode switch. Autopilot will intercept, capture, and trackthe localizer.

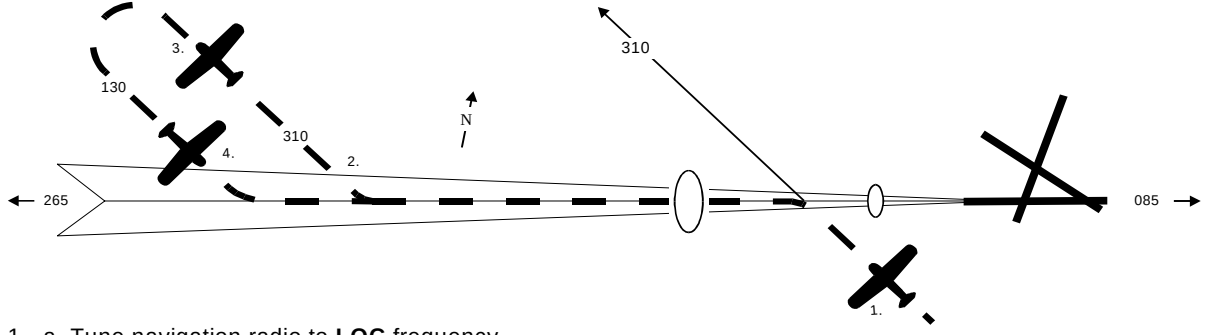
2. a. Once **NAV** mode is established, heading bug can be set to published missed

   b. At the middle marker, if a missed approach is declared, disconnect the autopilot and stabilize th aircraft for the missed approach climb before engaging **HDG** mode.

NOTE: To establish a pilot selectable angle of intercept (dual mode intercept), set the course pointer to the published inbound front course heading, and the heading bug to the desired heading to establish the selected angle intercept or to the Radar Vector **HDG**. Press the **HDG** and **NAV** mode switches simultaneously. Upon capture of course, the autopilot automatically cancels **HDG** mode and tracks the final approach course. Heading bug can be set to missed approach heading after course capture.

Fig. 4-7

Procedure Turn Localizer Approach and Tracking (Optional HSI)



1. a. Tune navigation radio to **LOC** frequency.
   b. Set published inbound **LOC** course heading with course pointer.
   c. Push **REV** mode switch.

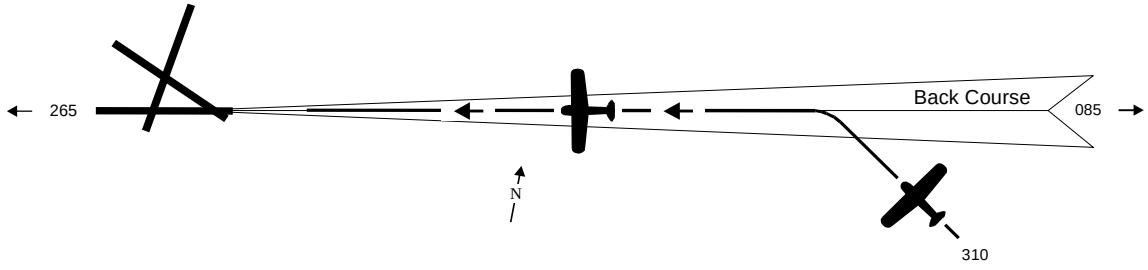
2. a. Set heading bug to published outbound procedure turn heading.
   b. Press **HDG** mode switch.

3. a. In 90 increments, set heading bug to inbound procedure turn heading.
   b. When established on inbound procedure turn heading, press **NAV** mode switch. Autopilot will intercept, track, and capture the localizer.

4. Once established in **NAV/APR** mode, the heading bug can be set to the published missed approach heading.

Fig. 4-8

Back Course Straight-In Approach (Optional HSI)



1. a. Tune navigation radio to **LOC** frequency.

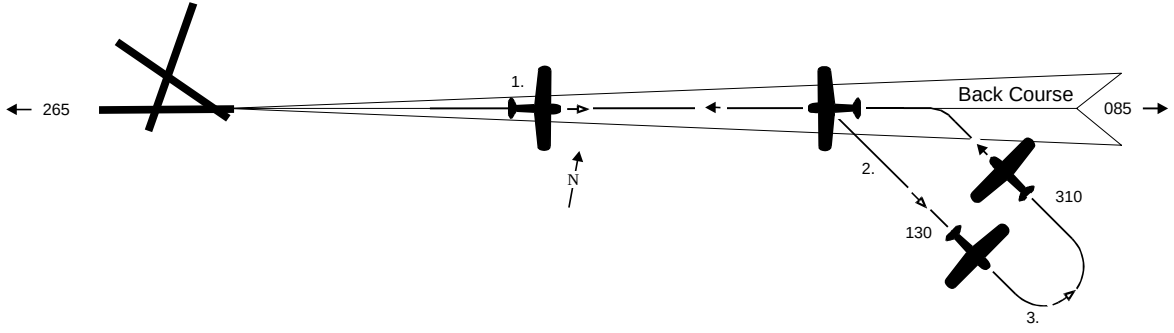
   b. Set **HSI** Course Pointer to published inbound front course heading.

   c. Press **REV** mode switch. Autopilot will intercept, capture, and track Localizer back course to the airport.

***NOTE*:** To establish a pilot selectable angle of intercept (dual mode intercept), on the back course, set the course pointer to the published inbound front course heading, and the heading bug to the desired heading to establish the selected angle intercept or to the Radar Vector **HDG**. Press the **HDG** and **REV** mode switches simultaneously. Upon capture of the back course, the autopilot automatically cancels **HDG** mode and tracks the final approach course. The heading bug can be set to the missed approach heading after course capture.

Fig. 4-9

Back Course Procedure Turn (Optional HSI)



REVerse mode is used to track the front course outbound or the back course inbound to the airport. The **HSI** Course Pointer ***MUST*** be set to the front course inbound heading.

1. a. Tune the navigation receiver to the **LOC** frequency.
   b. Set the course pointer to the published inbound **LOC** front course heading.
   c. Press the **NAV** mode switch. The autopilot will track the back course outbound.

2. a. Set the heading bug to the published outbound procedure turn heading.
   b. Press the **HDG** mode switch.

3. a. In 90 increments, set the heading bug to the inbound procedure turn heading.
   b. Position the aircraft on the localizer Back Course with the **HDG** bug.
   c. Press **REV** mode switch. The autopilot will track the back course inbound to the airport.

Fig. 4-10

4.2.2 Pitch Axis Modes

NOTE: A Roll Mode must be selected before selecting a Pitch Mode.

4.2.2.1 Vertical Speed (VS)

When establishing an automatic climb out to a desired altitude (without optional **ALT** Selector Alerter), press and release the **VS** mode switch to engage the vertical speed mode. The autopilot automatically synchronizes to the established rate-of-climb or descent.

If the established rate-of-climb exceeds **1600 FPM**, at **VS** engagement, the autopilot will seek to maintain **1600 FPM**. Should a specific rate-of-climb/descent be required, press the appropriate **UP/DN** modifier switch.

For each second of depression **(UP or DN)**, there is a **160 FPM** change of vertical speed. For example, to establish a **500 FPM** rate-of-climb, press and hold the **UP** modifier switch for approximately 3 seconds to transition from level flight to a **500 FPM** climb. To descend at approximately **500 FPM**, press the **DN** switch for approximately 3 seconds.

NOTE: If the **VS** mode annunciator flashes, it indicates an excessive error between the actual **VS** compared to the selected **VS**. The pilot should adjust the aircraft power or correct the **VS** that has been selected.

CAUTION

Vertical speed change is time related: 160 FPM for each second of switch depression. Autopilot response to a commanded VS change is precise. DO NOT continue to depress modifier switches beyond the time required to program the desired vertical speed change. In other words, until the attitude change "looks right". The autopilot will change attitude very slowly in the direction of the command.

Operation of the optional altitude / vertical speed selector is contained in a separate manual.

4.2.2.2 Altitude Hold (ALT)

Upon reaching the desired or assigned altitude, press and release the **ALT** switch. The altitude hold mode will engage at the altitude reached at the time of engagement. There is typically no need to "lead" the desired altitude. If there is a difference between the altitude engagement point and the altimeter, use the appropriate **UP/DN** modifier switch to make the necessary altitude correction.

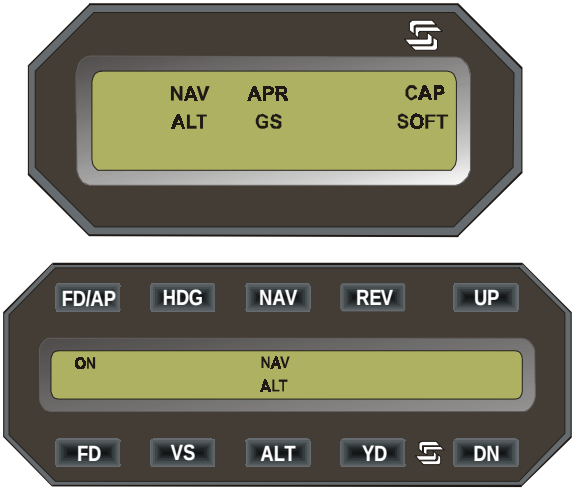
NOTE: While in the altitude mode, 1 second of modifier switch depression will change the altitude approximately 20 ft., up to a maximum of 200 feet.

NOTE: If more than 200 feet of altitude correction is necessary, re-engage the **VS** mode, fly to the desired altitude, and re-engage the **ALT** mode.

4.2.2.3 Intercepting and Coupling the Glideslope

To arm the automatic glide-slope **(GS)** capture function, the following conditions must be met:

1. **NAV** receiver must be tuned to the appropriate frequency.
2. The glide-slope signal must be valid; no flag.
3. The autopilot must be in **NAV / APR / ALT** modes.
4. The aircraft must be 60% or more below the **GS** centerline during the approach to the intercept point, and within 50% needle deviation of the localizer centerline at the point of intercept, usually the outer marker.



NOTE: **GS** arming will occur when the above conditions have existed for 10 seconds. Illumination of the **GS** annunciator will occur, indicating arming has been accomplished. The **ALT** annunciator remains on. **GS** capture is indicated by extinguishing of the **ALT** annunciation at **GS** intercept. This should occur at 5% below the **GS** center-line.

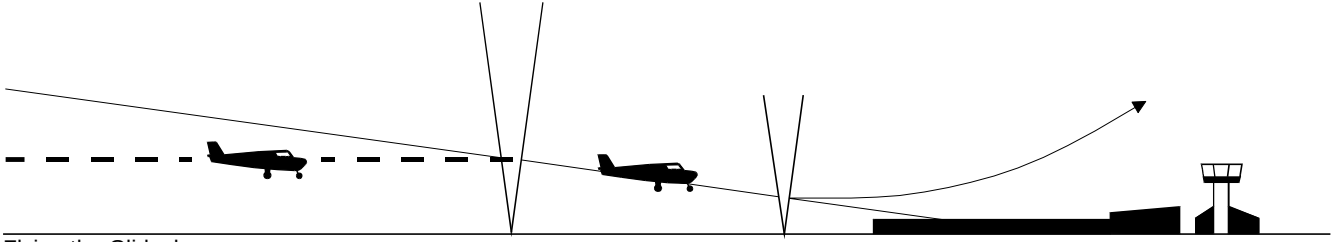
4.2.2.4 Manual Arm / Automatic Capture

If approach vectoring locates the aircraft above or too near the **GS** center-line at the intercept point, usually the outer marker, it becomes necessary to execute a manual arming of the **GS**. This is done by:

1. Pressing the **ALT** switch once if operating in the altitude hold mode.
2. Pressing the **ALT** switch twice if operating in the **VS** mode. Once capture is achieved, the **GS** annunciation will illuminate, and the **ALT** annunciation will extinguish.

NOTE: If it becomes necessary to establish a holding pattern at the outer marker, automatic glide-slope arming can be disabled by pressing the **NAV** switch a second time while in the **NAV / APR** mode. The **GS** annunciator will flash, and the Disable **(DSBL)** annunciator will illuminate, to indicate that the **GS** mode is disabled. To re-establish **GS** arming, press the **NAV** mode switch again. The **DSBL** condition annunciator will extinguish, the **GS** annunciator will cease to flash.

Glideslope Intercept and Track



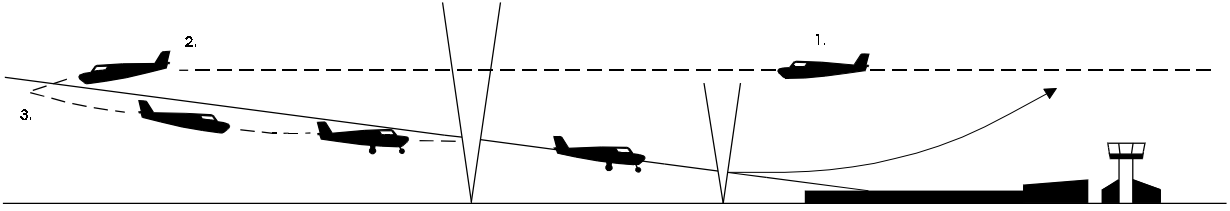
Flying the Glideslope

NOTE: When making an **ILS** approach, be sure to follow the published procedure for the approach you have been cleared to make. (See text for Localizer Intercept and Tracking.)

1. Approach the glide-slope intercept point with the aircraft stabilized in the Altitude Hold **(ALT)** mode.
2. If the aircraft requires approach flaps, lower the flaps to the proper position. (refer to **FAA/AFM** supplement for flap use limitations.)
3. At glide-slope intercept, lower the landing gear (if applicable) and adjust power for the desired descent speed and published rate of descent. For best tracking results, make small power adjustments to maintain the desired rate of descent and airspeed.
4. At the decision height, or the autopilot's minimum operating altitude, whichever is higher, disengage the autopilot to execute a manual landing, or a go-around manuver. If a missed approach is declared, the autopilot can be re-engaged after a stabilized climb has been established.

Fig. 4-11

Procedure Turn for Glideslope Approach



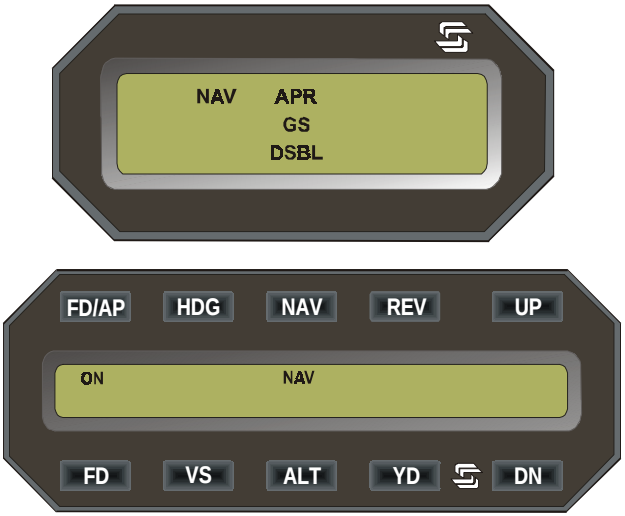
1. a. Tune navigation radio to **ILS** frequency.
   b. Follow the procedure(s) for **LOC** Approach Intercept and Tracking in this manual.

2. a. If a procedure turn is required, enter the procedure turn at the published procedure turn altitude or descend to it.
   b. At the procedure turn altitude, press the **VS** mode switch.
   c. Inbound to the Final Approach Fix **(FAF)** engage **ALT** mode, if not already in altitude hold.]
   d. When the **NAV** mode switch is pressed, and if the aircraft is below the glide-slope, the **APR** and **GS** annunciations will illuminate.

3. a. Upon capture of **LOC** course, **NAV**, **APR**, **ALT** and **GS** will illuminate if all conditions for glide-slope operation are met (see text, ref. Glide-slope Operation). This signifies automatic arming of the glide-slope function.
   b. Upon glide-slope capture, the **ALT** annunciation will extinguish, signifying **GS** capture.

NOTE: If the final approach flown locates the aircraft above the glide-slope prior to reaching the outer marker, follow the procedure outlined in the text for manual arming of the glide-slope.

Fig. 4-12



NOTE: To fly a holding pattern, if inbound to the outer marker while in **NAV** mode, press the **NAV** switch a second time to disable the **GS** arming. When the outer marker is reached, press and release the **HDG** switch, and rotate the heading bug in the direction of the turn. It is best to select the reciprocal course in increments of 90º, rather than the full 180º. When the outbound leg is completed, rotate the **HDG** bug in the direction of the turn, in 90º increments, to re-establish the inbound course, and press and release the **NAV** switch twice. On the inbound leg, when ready to complete the approach, rearm the **GS** function by pressing and releasing the **NAV** switch once again. Rearming will occur when all other required functions have been met.

4.2.2.5 Elevator Trim Indicator

The autopilot pitch servo contains a sensor for detection of elevator out-of-trim loads. Without optional Autotrim, when such forces exceed a preset level, the **TRIM** annunciator will illuminate, and either the **UP** or **DN** annunciator will light up, indicating the direction of required trim. Annunciation will be steady for about 5 seconds, then will flash until proper trim conditions have been met.

NOTE: If the **TRIM** annunciation is illuminated and the autopilot is disengaged, there will be a residual out-of-trim force at the control wheel. Be alert for this condition if the autopilot is disengaged while the **TRIM** lights are on.

4.2.2.6 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 Trim Master Switch is **ON**, the trim annunciators are disabled. If the switch is **OFF**, or a power failure occurs, the annunciators automatically become functional.

The 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. (See Airplane Flight Manual / Pilot Operating Handbook.)

4.3 Flight Director Operations, Single Cue (Optional)

This system, which integrates both the roll and pitch axis, offers synchronized display of the flight profile. It is automatically activated when the autopilot pitch axis is engaged. A Flight Director **(FD)** provides a visual indication of how accurately the pilot or autopilot is tracking the commands of the active mode of operation.

To activate only the Flight Director, press the **FD** switch in the lower left corner of the autopilot programmer (Note that **"ON"** is annunciated in the lower left corner of the programmer display panel). The Flight Director is now ready to be programmed by selecting a roll mode and then a pitch mode. The steering bar will not come into view until a pitch mode is selected. A remote parallax adjustment is provided to change the height of the horizontal display to compensate for different seat heights. **FD** mode disables the autopilot servos, allowing the pilot to control the aircraft to flight director commands. To return to autopilot flight simply push the **FD / AP** switch.

For proper flight technique, the system presentation requires the pilot to roll and pitch the aircraft toward the display until the delta shaped reference is tucked into the steering command bars, indicating that commands have been satisfied. For example, if the display is up and left, the pilot would be required to establish a left turn, pitch up attitude.

As bank angle and vertical speed approach the required amounts, bank angle and pitch up attitude are shallowed. When the delta reference and the steering bars are matched, the commands have been met. Thereafter, it is necessary to maneuver the aircraft to keep the display elements matched in order to accurately fly the selected modes.

Accurate flight-director operation requires alertness by the pilot and monitoring the movement of the display. Keeping it matched is quite simple. However, control inputs must be timely and smooth for accurate flight director responses following the desired command.

4.4 Yaw Damper/Rudder Trim System (Optional)

The **S-TEC** accelerometer controlled Yaw Damper / Rudder Trim System substantially improves autopilot performance, as it senses both yaw and slip in a single sensor. It also contains a trim potentiometer that allows centering of the turn and slip ball. It replaces the commonly used rate gyro with a sensitive accelerometer.

The **S-TEC** system offers two modes of operation:

1. When the optional Yaw Damper **(YD)** is used with the System 65 Autopilot, activation of any roll axis mode **(HDG, NAV, etc.)** will also engage the Yaw Damper. The Yaw Damper can be disengaged anytime by pressing and releasing the **YD** switch on the autopilot.
2. If Yaw Damper use without the autopilot is desired, simply press the **YD** switch on the autopilot.

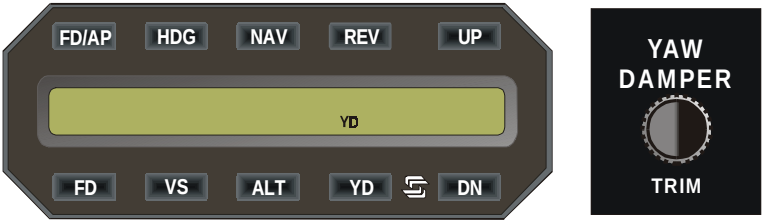


Fig. 4-13 Yaw Damper Controls

4.4.1 Pre-Flight Procedures

1. Press the **FD/AP** switch on the System 65 Programmer. Next press the **HDG** switch. Note that the Yaw Damper has engaged and causes increased rudder pedal force. The **YD** annunciator is displayed on both the autopilot and the remote annunciator.
2. Turn the Trim Control counter-clockwise and note that the left rudder pedal slowly moves forward. Turn the Yaw Trim Control clockwise and note that the right rudder pedal slowly moves forward. Re-center the trim control.
3. Press the **YD** switch on the System 65 Programmer or the **A/P** disconnect switch and verify that the Yaw Damper disconnects.
4. The Yaw Damper should be off for takeoff.

4.4.2 In-Flight Procedures

1. Trim the aircraft for the phase of flight being conducted (climb, cruise or descent).
2. Adjust the Yaw Trim Control to center.
3. Engage the autopilot; the Yaw Damper should also engage.
4. Make small Yaw Trim adjustments as required, to keep the slip/skid ball centered.
5. To use the Yaw Damper without the autopilot, press the **YD** switch.
6. Disconnect the Yaw Damper for landing.

NOTE: After making large power, configuration, or flight profile changes, it is advisable to disconnect the Yaw Damper to verify that the rudder is in trim, then re-engage the Yaw Damper. The Yaw Damper will not trim the rudder automatically. If the aircraft is not equipped with rudder trim, the Yaw Trim Control may be used as a trim device to help keep the slip/skid ball centered.

SECTION 5
APPENDICES

Table of Contents

Appendix A

System Failure and Caution Annunciations

Roll Axis

ANNUNCIATION	CONDITION	ACTION
Flashing **RDY** for 5 seconds.	Indicates autopilot disconnect. All annunciations except **RDY** are cleared.	**N/A**
Flashing **RDY**, then extinguish.	Turn coordinator gyro rotor speed low. Auto-pilot disconnects and can't be re-engaged.	Check instrument power; **A/P** not ready may indicate **TC** problem. Investigate before **IFR** flight
Flashing **NAV** or **REV**.	Indicates off course by 50% needle deflection.	Use **HDG** mode until problem is identified. Cross check raw **NAV** data, compass **HDG**, and radio operation.
Flashing **NAV** or **REV**, steady **FAIL** mode.	Indicates invalid radio navigational signal.	Check navigation radio. Use **HDG** until problem is corrected.

NOTE: If any of the above annunciations's occur at low altitude or during an actual instrument approach, disengage the autopilot, execute a missed approach, and inform Air Traffic Control **(ATC)** of the problem. Do not attempt to troubleshoot or otherwise determine the nature of the failure until a safe altitude and maneuvering area are reached. The **NAV** flag failure annunciation depends upon the availability of radio flag outputs and radio type.

Appendix A

System Failure and Caution Annunciations

Pitch Axis

ANNUNCIATION	CONDITIONS	ACTION
Flashing **GS**	Indicates off glideslope center-line by 50% or more.	Check attitude and power. Add or reduce power as appropriate.
Flashing **GS** with steady **FAIL**	Indicates non-valid glide-slope radio navigation signal.	Disconnect **A/P**, initiate missed approach, inform **ATC**.
Flashing **VS**	Indicates excessive vertical speed error over selected **VS** (usually in climb).	Reduce command **VS** and/or adjust power.
Flashing **GS**, steady **DSBL**	Indicates manual glide-slope disable.	To re-enable, reset **NAV** switch.

NOTE: If any of the above annunciations occur at low altitude or during an actual instrument approach, disengage the autopilot and execute a missed approach. Inform **ATC** of the problem. Do not attempt to troubleshoot or otherwise identify the nature of the failure until a safe altitude and maneuvering area are reached.

Appendix B

Specifications

Programmer

Power required	**14/28 VDC**
Weight	0.6 lbs
Dimensions	2.0 x 2.0 x 5.1 in.

Remote Annunciator

Power Required	**14/28 VDC**
Weight	0.90 lbs.
Dimensions	3.42 x 1.60 x 6.50 in.

Turn Coordinator

Power required	**14/28 VDC**
Flag voltage detector operating limits	**9 VDC** (Approx.)
Flag **RPM** detector operating limits	Nominal less 20%
Current requirements	0.8 amp
Weight	1.8 lbs.
Dimensions	3.275 x 3.275 x 5.62 in.

Roll Computer

Power required	**14/28 VDC**
Weight	2.3 lbs.
Dimensions	5.25 x 2.1 x 13.3 in.

Pitch Computer

Power required	14/28 **VDC**
Weight	3.0 lbs.
Dimensions	5.25 x 2.1 x 13.3 in.

NOTE: Unit will operate with either **14 or 28 VDC**. However, the servo-amplifier circuit board must be set up for a specific voltage.

Appendix B

Specifications (Cont'd)

Roll/Trim Servo

Power required	**14/28 VDC**
Current	Included in system value power required.
Weight	2.9 lbs.
Dimensions	7.25 x 3.75 in.

Pitch Servo/Trim Sensor

Power required	**14/28 VDC**
Current	Included in system value power required.
Weight	2.9 lbs.
Dimensions	7.25 x 3.75 in.

Altitude Pressure Transducer

Power required (supplied by pitch computer)	**10 VDC**
Pressure range	**0-15 PSI** absolute
Overpressure	150% operating maximum

System Current Requirement

Average operating current	1.0 amp
Maximum current	5.0 amp

SECTION 6
GLOSSARY

Page Intentionally Blank

TERM	MEANING
AFMS	Airplane Flight Manual Supplement
ALT	Altitude
A/P	Autopilot
ATC	Air Traffic Control
CDI	Course Deviation Indicator
CAP	Capture
DC	Direct Current
DG	Directional Gyro
DN	Down
DSBL	Disable
FAA	Federal Aviation Administration
GPS	Global Positioning System
GS	Glideslope
HDG	Heading
HSI	Horizontal Situation Indicator
IFR	Instrument Flight Rules
IN.	Inches
LBS	Pounds
LOC	Localizer
LORAN	Long Range Navigation
N/A	Not Applicable
NAV	Navigation
REV	Reverse
OBS	Omnibearing Selector
POH/(S)	Pilot Operating Handbook/ (Supplement)
PSI	Pounds Per Square Inch
RDY	Ready
RPM	Revolutions Per Minute
SFM	Supplemental Flight Manual
TC	Turn Coordinator
VMC	Visual Meteorological Conditions
VOR	Very High Frequency Omni-directional Radio Range
VS	Vertical Speed
YD	Yaw Damper

Page Intentionally Blank

S-TEC Corporation
A Meggitt Aerospace Systems Company
One S-TEC Way · Municipal Airport
Mineral Wells, Texas 76067-9236 USA
Telephone: (940) 325-9406; FAX: (940) 325-3904
1-800-USA-STEC
www.s-tec.com

P/N: 87107
Date: July 31, 2002
Printed in USA