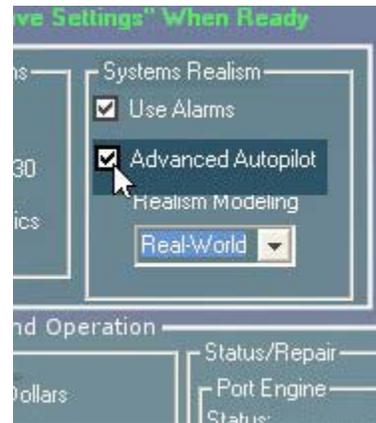# Autopilot Operating Instructions

Overview

The instructions in this document relate to the functionality of the Advanced Autopilot option of the Aerostar. This option provides you with an authentic autopilot that functions the same way as its real-world counterpart.

If you do not have this option selected the aircraft will use a "standard FS" autopilot.

If the standard FS autopilot is configured you will observe an altitude selector module is added next to the autopilot control module on the pedestal. Also, a vertical speed bug will appear on the Vertical Speed Indicator. These are not present if the advanced autopilot is used.

Advanced Autopilot

The autopilot is a 2-axis Flight Director System which provides pitch and roll commands, which are displayed as visual references on the V-bar of the Flight Command Indicator.

The Flight Director system for the Aerostar consists of four main components:
- Mode Control Unit (MCU)
- Annunciator Display
- Flight Command Indicator (FCI)
- Pictorial Navigation Indicator

Components

ANNUNCIATOR DISPLAY

This panel annunciates all vertical and lateral Flight Director System modes, including all "armed modes" prior to capture. It tells the pilot when the selected mode has been received and accepted by the system and if an "armed" mode is selected when capture has been initiated. It also has integral beacon lights and vertical trim failure warning.

PICTORIAL NAVIGATION INDICATOR / HSI

Indicator displays constantly slaved gyro magnetic information, along with VOR/LOC/RNAV course deviation and glideslope deviation indications.

FLIGHT COMMAND INDICATOR (FCI)
Displays the following information:
- Pitch and roll attitude
- Pitch and roll commands

The FCI contains an air driven vertical gyro. Engine(s) must be running and pressure system operating before system will operate.


MODE CONTROL UNIT (MCU)
Located on the pedestal, it contains six pushbuttons for turning on the Flight Director System and selection of all FD modes. A solenoid-held switch for autopilot engagement, and a vertical trim rocker switch and preflight test button.

Note
The Flight Director (FD) switch must be in the on position to enable the system. Otherwise no vertical or lateral modes will be available.

Modes of Operation – Flight Director System
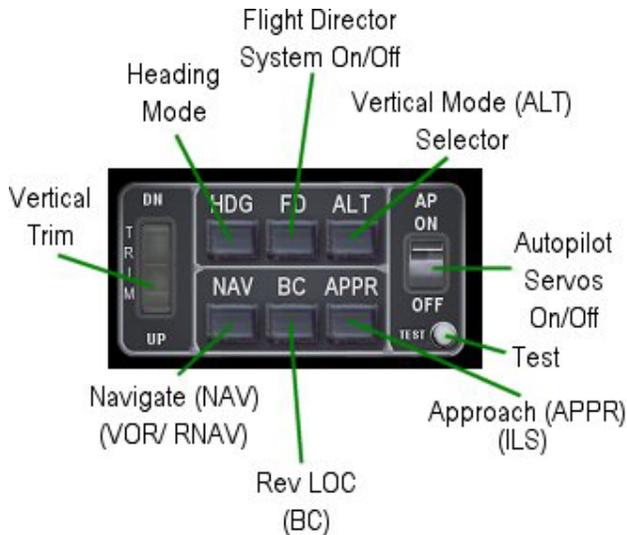
Note:
Test mode should be selected during ground operations and prior to taxi. If the test for each mode is successful it's indicator light will illuminate. If all modes test successfully an audible signal will be annunciated at the end of the test cycle.

Important!
The autopilot servos MUST be engaged or the aircraft pitch/trim, roll and bank will not update automatically!

Heading Mode	Select desired heading on HSI then select the HDG button and the system will command the necessary bank and turn to maintain the selected heading.
Navigate (NAV) (VOR/RNAV)	Bank command to capture and track a selected VOR or RNAV course.
Approach (APPR) (ILS)	Bank and pitch commands to capture and track LOC and glideslope for precision approaches.
Reverse Localizer (BC)	Bank command to capture and track a reverse LOC course…glideslope is locked out.
ARM (annunciator)	Standby mode to compute automatic capture point for NAV, APPR and BC.
CPLD (annunciator)	Active mode for NAV, APPR and BC.
Altitude Hold (ALT)	Pitch command to maintain engaged altitude.
Autopilot (AP) Engage	Aircraft control surfaces respond to all selected

Flight Director mode commands with automatic pitch trim. The red TRIM indicator (annunciator) will illuminate if the system fails to maintain the correct trim.

Operating the Flight Director System

OVERVIEW

There are eight (8) modes of operation provided by the FDS to offer the pilot Flight Director/Autopilot commands in response to the selection modes on the Mode Controller Unit (MCU). Most of these modes are activated by pushbuttons on the MCU. The first depression of a button activates the mode, and the respective indicator will illuminate. The second depression cancels it. Annunciation of the mode selected appears on the annunciator panel.

System safety is assured by integrity monitors which alert the pilot when sensor information is faulty or when the system cannot respond correctly to the command signals. In such a case an operation mode may be locked out. Fault information is also transmitted to the HSI in the form of flags. For example, when no VOR signal or NAV command can be validated, the NAV flag will appear. Failures in the slaved compass system will be annunciated by a HDG flag.

Note
The GPS system will override the Flight Director System.
In this case both NAV and HDG flags will be visible on the HSI. This should not be interpreted as a system failure.

Any operating mode not compatible with a newly-selected mode will be automatically cancelled in favor of the pilot's most recent selection.

When a NAV/RNAV or ILS mode is selected, and the system is not yet coupled with the NAV signal, the annunciator will display as armed (ARM)

When coupling occurs the ARM light will go out and the CPLD light will illuminate.

Whenever a condition exists while the FDS is in VNAV (ALT) mode where the vertical trim cannot be validated the TRIM light will illuminate on the annunciator.

TEST MODE

Preflight test determines, before takeoff, that the FDS is operating normally. With avionics power ON, AP Servos (AP) OFF, both engines started, Autopilot/FD circuit breakers IN, and gyros to speed, depress the TEST button. A normal test will be observed when each mode indicator illuminates in sequence, followed by an audible annunciation.

Note
This is a ground test ONLY prior to taxi. Not for use after aircraft is in motion.

BASIC MODE OF OPERATION

The system will be in the basic or "Gyro" mode with engines running and aircraft/avionics power ON, but with no modes selected. In this case the annunciator panel will be blank. The FCI V-bar is biased out of view in Gyro mode. All annunciator and MCU indicators will be dark.

FLIGHT DIRECTOR (FD) MODE

The Flight Director Mode is activated by depressing the FD button on the MCU. The V-bar will appear on the FCI and provide the pilot with steering commands. To fly the command V-bar the pilot will pitch and bank the aircraft accordingly.

> **Note**
> **The Flight Director (FD) switch must be in the on position to enable the system. Otherwise the autopilot servos cannot be engaged!**

HEADING SELECT MODE

Select the desired heading by turning the OBS knob on the HSI. The heading bug will turn to the selected heading.

Depress the HDG button on the MCU to activate the HDG mode. The respective light will illuminate on the annunciator.

The V-bar on the FCI will deflect to the direction of the shortest turn to satisfy the commanded turn of the pre-selected heading. If the autopilot servos (AP) are engaged the aircraft will bank, turn to rollout and hold the pre-selected heading.

When in the HDG mode of operation, subsequent changes in the heading bug on the HSI will immediately cause the V-bar on the FCI to call a turn to the new heading.

The HDG mode is cancelled when NAV or APPR coupling occurs, or when the FD mode button is pushed off.

NAVIGATION (NAV ARM AND NAV CPLD) MODE

The NAV mode provides bank commands and deviation guidance on the HSI to intercept and track a VOR.

Procedure:
1. Tune the frequency of the selected VOR station.
2. Set the HSI OBS pointer on the desired course.
3. Establish angle of intercept by setting the heading bug and make sure the HDG mode is active.
4. Depress the NAV button on the CMU.

The NAV and ARM lights should illuminate on the annunciator. This indicates that the automatic capture circuit is armed. Upon capture a bank command will be displayed on the FCI, the HDG mode will be cancelled, and the NAV and CPLD lights will be illuminated on the annunciator panel.

When the autopilot servos (AP) are engaged the aircraft will turn in response to the FD command automatically.

APPROACH (APPR/ARM AND APPR/CPLD, GS/CPLD MODE

The approach mode provides visual roll and pitch commands on the FCI V-bar to capture and track precision ILS/LOC and glideslope beams.

Procedure:
1. Set the NAV receiver frequency
2. Set the HSI OBS pointer to the inbound runway heading.
3. Set the heading bug on the HSI to the desired intercept angle. Make sure the HDG mode is activated.
4. Depress the APPR button on the CMU.

The APPR and ARM lights will illuminate on the annunciator panel. Once the FD captures the localizer beam the ARM light will go out and the CPLD light will illuminate on the annunciator panel.

When the autopilot servos (AP) are engaged the aircraft will turn in response to the FD command automatically.

When an ILS channel is selected on the NAV receiver and a valid glideslope signal is received, the glideslope pointers will drop into view.



When ILS coupling occurs the ARM light

BACK COURSE (BC) MODE

Whenever an LOC or ILS frequency is selected, the BC mode may be activated by depressing the BV button on the CMU. The ARM light will illuminate.

When in BC mode and localizer capture occurs, the system will turn and track the back course. The ARM light will go out and the CPLD light will illuminate on the annunciator panel when capture occurs.

ALTITUDE HOLD (ALT) MODE
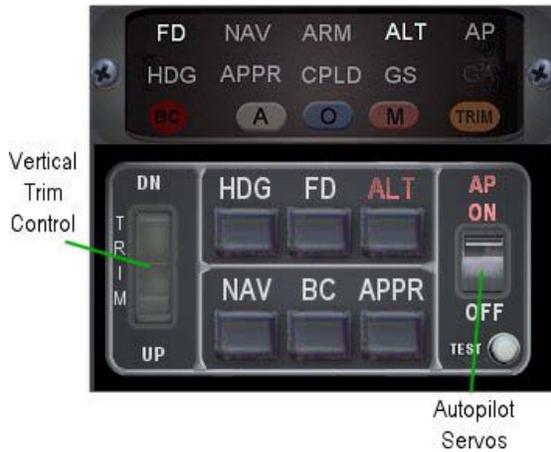
This mode will induce a pitch command to the V-bar on the FCI. It is activated by depressing the ALT button on the CMU.

If the autopilot servos (AP) are engaged the aircraft it will hold the aircraft at the present altitude.

In order to climb to altitude or descend, the AP servos must be ON and the ALT button OFF. Pitch control is induced via the Vertical Trim Control and displayed on the V-bar on the FCI. Depress the pitch control Up or DOWN until the desired climb or descent rate is achieved.

If the FD pitch trim control fails the TRIM light will illuminate on the annunciator panel.