DISENGAGING THE AUTOPILOT

The Autopilot is manually disengaged by pushing the disconnect button on the autopilot unit, or by pressing the autopilot disconnect button on the control stick or yoke or by pressing the **AP** Key on the GMC mode controller. Manual disengagement is indicated by a five-second flashing yellow 'AP' annunciation and an aural alert. Cancel the aural alert by pressing and releasing the **AP/CWS** Button again (GSA 28 autopilot only)

Automatic disengagement is indicated by a flashing red 'AP' annunciation and an aural alert. The flashing indication continues until acknowledged by pressing the **ENT** Key. Automatic disengagement occurs due to:

- System failure
- Invalid sensor data
- Inability to compute default autopilot modes

Disengaging the Autopilot When a Malfunction is Suspected

If an autopilot failure or trim failure is suspected to have occurred, perform the following steps:

1) Firmly grasp the control wheel.

2) Press and hold the AP DISC Switch. The autopilot will disconnect and power is removed from the trim motor. Power is also removed from all primary servo motors and engaged solenoids. Note the visual and aural alerting indicating autopilot disconnect.

3) Retrim the aircraft as needed. Substantial trim adjustment may be needed.

4) Pull the appropriate circuit breaker(s) to electrically isolate the servo and solenoid components.

5) Release the AP DISC Switch.

Overpowering Autopilot Servos

In the context of this discussion, "overpowering" refers to any pressure or force applied to the pitch controls when the autopilot is engaged. A small amount of pressure or force on the pitch controls can cause the autopilot automatic trim to run to an out-of-trim condition. Therefore, any application of pressure or force to the controls should be avoided when the autopilot is engaged.

Overpowering the autopilot during flight will cause the autopilot's automatic trim to run, resulting in an out-of-trim condition or cause the trim to hit the stop if the action is prolonged. In this case, larger than anticipated control forces are required after the autopilot is disengaged.

The following steps should be added to the preflight check:

1) Check for proper autopilot operation and ensure the autopilot can be overpowered.

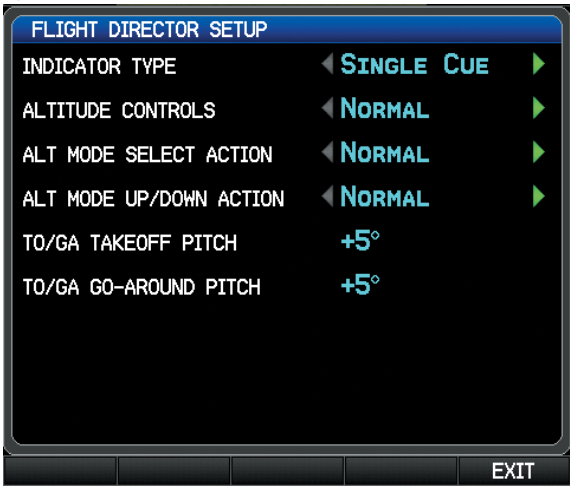
2) Note the forces required to overpower the autopilot servo clutches.

FLIGHT DIRECTOR OPERATION

The flight director function provides pitch and roll commands to the pilot and autopilot, which are displayed on the PFD. With the flight director active, the aircraft can be hand-flown to follow the path shown by the Command Bars. The Flight Director has the following maximum commands: pitch (-15°, +20°) and roll (30°) angles.

FLIGHT DIRECTOR SETUP

The Flight Director Setup Page allows the user to set the indicator type, TO/GA Pitch, and simplified flight director operation for certain modes.



Flight Director Setup Page

SECTION 9 AUTOMATIC FLIGHT CONTROL SYSTEMS (OPTIONAL)

NOTE: *The approved Pilot's Operating Handbook (POH) always supersedes the information in this Pilot's Guide.*

NOTE: *Refer to the approved Pilot's Operating Handbook (POH) for emergency procedures.*

NOTE: *VOR, LOC, and GS modes are all GPS-aided. You must have a GPS position to use VOR, LOC, or GS modes.*

AFCS SYSTEM ARCHITECTURE

An Automatic Flight Control System (AFCS) is typically comprised of two major components: A Flight Director (FD) and Autopilot servos. The Flight Director provides pitch and roll commands to the autopilot servos. These pitch and rolls commands are displayed on the PFD as Command Bars. When the Flight Director is active the pitch and roll commands can be hand-flown by the pilot or when coupled with the autopilot, the autopilot servos drive the flight controls to follow the commands issued by the Flight Director. The Flight Director operates independently of the autopilot servos, but in most cases the autopilot servos can not operate independent of the Flight Director. On G3X installations that do not have a separate and independent Flight Director, the Flight Director is always coupled to the autopilot.

AUTOPILOT AND YAW DAMPER OPERATION

The autopilot and optional yaw damper operate the flight control surface servos to provide automatic flight control. The autopilot controls the aircraft pitch and roll attitudes following commands received from the flight director. Pitch, Roll, and Yaw (if installed) auto-trim provides trim commands to each servo to relieve any sustained effort required by the servo(s). Autopilot operation is independent of the optional yaw damper.

The optional yaw damper reduces Dutch roll tendencies, coordinates turns, and provides a steady force to maintain directional trim. It can operate independently of the autopilot and may be used during normal hand-flight maneuvers. Yaw rate commands are limited to 6 deg/sec by the yaw damper.

FLIGHT CONTROL (GSA 28 AND GMC 305/307/507)

Pitch and roll commands are provided to the servos based on the active flight director modes. Yaw commands are provided by the yaw servo. Servo motor control limits the maximum servo speed and torque. The servo mounts are equipped with electronic slip-clutches. Slip-clutch torque values are set at installation, see the G3X installation manual for installation instructions. This allows the servos to be overridden in case of an emergency. Third party autopilot systems my not allow servos to be overridden, consult third party autopilot documents for limitations.

Pitch Axis and Trim

The autopilot pitch axis uses pitch rate to stabilize the aircraft pitch attitude during flight director maneuvers. Flight director pitch commands are rate and attitude-limited, combined with pitch damper control, and sent to the pitch servo motor. The pitch servo measures the output effort (torque) and provides this signal to the pitch trim motor. The pitch trim servo commands the motor to reduce the average pitch servo effort.

NOTE: *Auto-trim may also be configured for the roll and/or yaw axis. Consult the G3X installation manaul for configuration and installation options.*

Roll Axis

The autopilot roll axis uses roll rate to stabilize aircraft roll attitude during flight director maneuvers. The flight director roll commands are rate- and attitude-limited, combined with roll damper control, and sent to the roll servo motor.

Yaw Axis

The yaw damper uses yaw rate and roll attitude to dampen the aircraft's natural Dutch roll response. It also uses lateral acceleration to coordinate turns and reduce or eliminate the need for the pilot to use rudder pedal force to maintain coordinated flight during climbs and descents.

AFCS ALERTS (OPTIONAL)

AFCS Alerts

STATUS ALERTS

If the commanded operation cannot be achieved due to the limitations configured, the following messages can be displayed over the pitch ladder. The annunciation is removed once the condition is resolved.

Alert Condition	Annunciation	Description
Up-elevator Trim Required	↑ TRIM UP ↑	The autopilot does not have the required elevator authority to reach the desired flight condition.
Down-elevator Trim Required	↓ TRIM DOWN ↓	

Status Alerts

CRUISE

The aircraft has excellent stability and control characteristics under all conditions of speed, power, load factor, and altitude. The controls are effective throughout the speed range of stall to Vne and aircraft response to control movement is quite rapid. Nice handling characteristics, in both accelerated and unaccelerated flight are evident. The rate of roll and pitch are brisk. The trim tabs are also effective at all speeds so that the aircraft may be easily trimmed to fly “hands off”. Flight without an operational pitch trim system is difficult. In fact, flight is difficult without an operable pitch trim and may be uncontrollable at higher speeds. Operation of the gear affects yaw stability only slightly with an oscillation as the mains extend asymmetrically. Don’t flight it. Wing flap extension causes the nose to pitch down, requiring up elevator trim.. The Legacy possesses neutral static stability and positive dynamic stability in roll, and both positive static and positive dynamic stability in the pitch and yaw axis. When the aircraft is placed in an angle of bank, its tendency is to remain in that angle of bank and neither continue to roll nor return to wings level. However, if a yaw or pitch displacement is induced, the aircraft has a tendency to dampen out the resulting oscillation and returns quickly to aerodynamic equilibrium. This gives the Lancair IV a control feel very similar to many modern fighters such as the McDonnell Douglas F/A-18 Hornet. This airplane is a real pleasure to fly.

DESCENT

A timely descent, particularly from high, fast cruise in the Legacy requires that you be well ahead of the aircraft. In smooth air conditions descent can be accomplished at the Vne of 274 kts until reaching 10,000 feet MSL, where it should be reduced to 250 KIAS to comply with FARs. In turbulent air the aircraft must be slowed to its Vno of 220 kts. Throughout the letdown, monitor your engine instruments. If your aircraft has speed brakes, allow 3nm from destination from each 1,000 feet to descend to reach pattern or FAF altitude, or if your aircraft does not have speed brakes allow 4nm per 1,000 feet. Power should be reduced so as to maintain cylinder head temperature and oil temperature well in the green arcs.

APPROACH & LANDING

Approaching the terminal area, keep the airspeed less than 170 KIAS to allow for 10 degrees of flaps, if necessary. A shallow descent at 15 to 18 in. Hg. and 2500 rpm will allow for this. Monitor that cylinder head temperature and oil temperature are still well within their green areas. Enter the pattern as directed, or at a 45° degree angle to downwind, at 1,500 feet AGL as appropriate. On the downwind leg, a power setting of 11 to 13 in. Hg., 2500 rpm will hold the aircraft at 140 KIAS. Lower the gear at the abeam position-- opposite the intended point of touchdown. While beginning your base turn, reduce power to 10 in. Hg. and add full flaps. You will need to lower the nose to maintain 110 KIAS. Halfway through base leg your altitude should be approximately 700 feet AGL. Turn final with at least ¼ mile straight away and at approximately 300 feet AGL. Cross the threshold at 100 KIAS. Allow airspeed to decay to arrive at the intended touchdown point at 80 KIAS. Fly the aircraft onto the runway. Very little if