GARMIN

G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft

3.5 ELECTRONIC STABILITY & PROTECTION (ESP) (GFC 500)

WARNING: *Do not assume ESP will provide stability protection in all circumstances. There are in-flight situations that can exceed the capabilities of ESP technology.*

WARNING: *A GPS navigator that can provide AGL height data is required for low-airspeed protection.*

WARNING: *The autopilot (or ESP) will disengage if the roll attitude exceeds 75° or the pitch attitude exceeds 50°.*

Electronic Stability and Protection (ESP) is a feature that is intended to monitor the aircraft and provide control input feedback when necessary to discourage operating the aircraft at potentially unsafe attitudes and/or airspeeds. If enabled, this feature will automatically arm when the aircraft is above 500 feet AGL and the autopilot is not engaged, and disarm when below 200 feet AGL (if AGL height data is unavailable, ESP can be armed on the ground, but low-airspeed protection will not be available).

When selected, ESP engages automatically when the aircraft approaches or exceeds one or more predetermined airspeed or attitude limitations. Stability protection for each flight axis is provided by the autopilot servos, which apply force to the appropriate control surface(s) to discourage pilot control inputs that would cause the aircraft to exceed the normal or "protected" flight envelope. This is perceived by the pilot as resistance to control movement in the undesired direction when the aircraft approaches a steep attitude, and/or the airspeed is below the minimum or above the maximum configured airspeed.

As the aircraft deviates further from the normal attitude and/or airspeed, the force increases proportionally (up to an established maximum) to encourage control movement in the direction necessary to return to the normal attitude and/or airspeed range.

When ESP has been engaged for more than 10 seconds (cumulative; not necessarily consecutive seconds) of a 20-second interval, the autopilot can be configured to engage with the flight director in Level Mode, bringing the aircraft into level flight. An aural "Engaging Autopilot" alert is played and the flight director mode annunciation will indicate 'LVL' for vertical and lateral modes.

Level mode as activated by ESP is limited by altitude. ESP will not be able to activate Level mode until the aircraft climbs above 2000 feet AGL. ESP will be locked out of automatically activating Level mode after the aircraft descends below 1500 feet AGL as well. Also note that Level mode as activated by ESP is different than manually selected Level mode. Manually selected Level mode is not limited by altitude at all.

NOTE: *If AGL height data is unavailable automatic engagement of Level mode is not supported.*

ESP is enabled or disabled from the PFD Page Menu.

Enabling/Disabling ESP using the G5 Menu:

1) From the PFD Page, press the **Knob** to display the Menu.
2) Turn the **Knob** to highlight **ESP**.
3) Press the **Knob** to enable or disable ESP.

Figure 3-25 AFCS (ESP Enabled)

3.5.1 ROLL ENGAGEMENT

Roll Limit Indicators displayed on the roll scale are configurable between 45º and 60º right and left, indicating where ESP will engage. As roll attitude exceeds the configured limit, ESP will engage and the Roll Limit Indicators will move to 15º less than the configured ESP bank limit. The Roll Limit Indicator now indicates where ESP will disengage as roll attitude decreases.

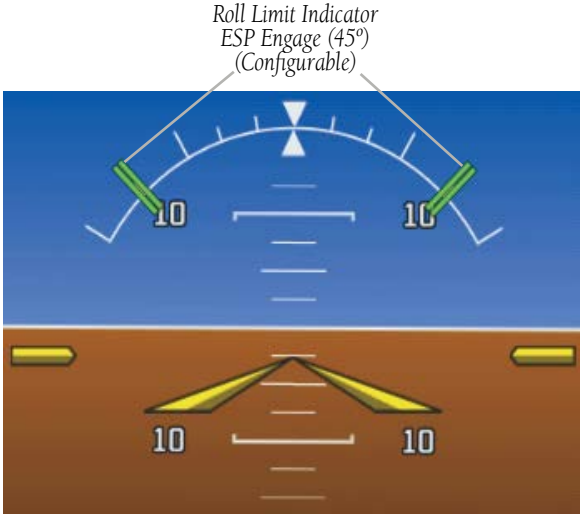

Figure 3-26 ESP Roll Engagement Indication (ESP Enabled but NOT Engaged)

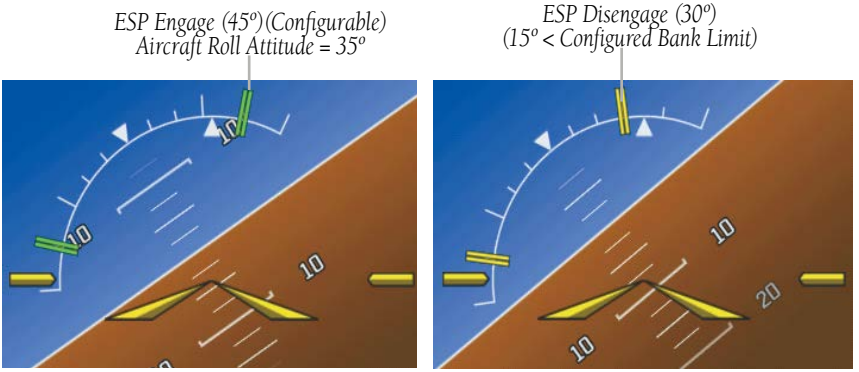

Figure 3-27 Roll Increasing to ESP Engagement

Once engaged, the torque applied by ESP is at its maximum when bank angle is 15º more than the configured bank limit, and tapers to the minimum applied torque when the bank angle is 15º less than the configured bank limit. The force increases as roll attitude increases and decreases as roll attitude decreases. The applied force is intended to encourage pilot input to return the airplane to a more normal roll attitude. When beyond 15º of the configured bank limit, the maximum torque is held until the aircraft returns inside the protected envelope.

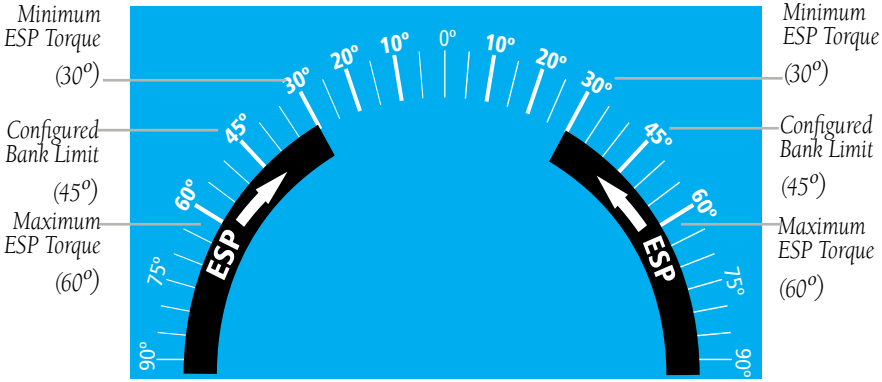

Figure 3-28 ESP Roll Operating Range When Engaged (Force Increases as Roll Increases & Decreases as Roll Decreases)

3.5.2 PITCH ENGAGEMENT

ESP pitch engagement is configurable between 10º and 25º nose-up and between 5º and 25º nose-down. Once engaged, the torque applied by ESP is at its maximum when pitch is 5º more than the configured nose-up and nose-down pitch limits, and tapers to the minimum applied torque when pitch is 5º less than the configured nose-up and nose-down pitch limits. When beyond 5º of the configured pitch limit, the maximum torque is held until the aircraft returns inside the protected envelope.

The opposing force increases or decreases depending on the pitch angle and the direction of pitch travel. This force is intended to encourage movement in the pitch axis in the direction of the normal pitch attitude range for the aircraft.

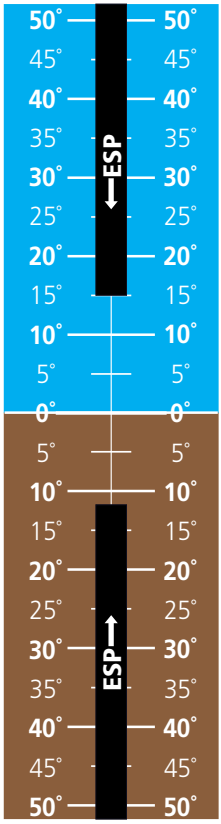

Figure 3-29 ESP Pitch Operating Range When Engaged
(Force Increases as Pitch Increases & Decreases as Pitch Decreases)

3.5.3 AIRSPEED PROTECTION (GFC 500 ONLY)

NOTE: *If AGL height data is unavailable low-airspeed protection is not supported.*

An airspeed below the minimum configured airspeed or above maximum configured airspeed will result in ESP applying force to raise or lower the nose of the aircraft. When the high or low airspeed condition is remedied, ESP force is no longer applied.