Factual Report – Attachment 30

Atlas GPWS Recovery Guidance

OPERATIONAL FACTORS

DCA19MA086

General

This section describes the aircraft specific procedures associated with recovery from GPWS cautions and warnings.

Note: The terrain data display is intended to serve as a situational awareness tool only. It does not provide the accuracy or fidelity on which to solely base terrain avoidance maneuvering decisions.

Ground Proximity Alerts

GPWS provides the following cautions and warnings:

- BANK ANGLE
- CAUTION TERRAIN
- CAUTION OBSTACLE
- DON'T SINK
- GLIDESLOPE
- SINK RATE
- PULL UP
- TERRAIN - PULL UP
- OBSTACLE - PULL UP
- TOO LOW FLAPS
- TOO LOW GEAR
- TOO LOW TERRAIN

If a "GLIDESLOPE" caution occurs, fly the aircraft back to the glideslope. The caution will cease when the aircraft is within 1 dot of the glideslope. The glideslope caution may be cancelled or inhibited:

- For localizer or backcourse approach
- For circling maneuver from an ILS
- If the glideslope signal is unreliable

On a front course ILS, the inhibit function should only be used when flight below the glideslope is intentional (e.g., when following the glideslope to touchdown precludes landing at the normal touchdown point). Never cancel an actual "GLIDESLOPE" caution until clear of all clouds and the runway is clearly in sight.

"TOO LOW GEAR" and "TOO LOW FLAPS" cautions require a go-around. All other GPWS cautions and warnings require an immediate flight path adjustment.

In day VMC, and positive visual verification is made that no terrain hazard exists, the alert may be regarded as cautionary and the flight continued.

Ground Proximity Warning

GPWS warnings include the aural "PULL UP" annunciation. A warning occurs if an unsafe distance or closure rate is detected with terrain below or, using the enhanced feature, ahead of the aircraft. If a "PULL UP" warning occurs in IMC or at night:

- Disengage the autopilot and autothrottle and advance the thrust levers to the forward limit (mechanical stops)
- Roll wings level, retract the speedbrakes, and execute an immediate pull-up, rotating toward an initial pitch attitude of 20°. Do not use flight director commands. Smooth, steady control will avoid a pitch overshoot and stall.
- The PM will verify that maximum thrust is set and that the speedbrakes are retracted
- If terrain clearance remains a threat, continue rotation to pitch limit indicator, stick shaker, or initial buffet
- The PM should monitor and call out airspeed and vertical flight path indications (VSI, altimeter, radio altimeter) to assist the PF in maintaining a positive vertical flight path
- Maintain flap and gear configuration until terrain clearance is assured
- Do not attempt to engage the autopilot or autothrottle until terrain clearance is assured
- The climb should be continued until the warning ceases or it is obvious terrain clearance is no longer a factor
- When terrain clearance is assured, adjust thrust and resume normal speed and configuration

In day VMC, and positive visual verification is made that no terrain hazard exists, the alert may be regarded as cautionary and the flight continued.

Aft control column forces increase as airspeed decreases. Adjust pitch as necessary to stay out of stick shaker. The pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Do not fly in stick shaker for an extended time; a rapid loss of lift will occur as stall speed is approached.

If flaps are extended, the pitch limit indicator indicates the attitude at which stick shaker activates, and may be used as a maximum pitch reference during the maneuver. The pitch limit indicator should not be used as a pitch command.

Terrain Avoidance During Low RNP Operations

During low RNP operations (less than 0.3) in close proximity to terrain on departure or approach, an occasional momentary terrain caution may be generated. If the caution is of short duration and ceases, verify the aircraft is on the required path and consider continuing the procedure using LNAV and VNAV. Depending upon where initiation occurs, the risks of terrain contact while executing a terrain avoidance maneuver may be higher than continuing on the required track. GPWS "PULL UP" warnings always require immediate action.

Inhibiting or Deactivating the GPWS

GPWS may be inhibited or deactivated for any of the following reasons:

- A warning occurs during VFR conditions and it is obvious that the aircraft position, altitude, and gear/flap configuration are satisfactory
  - Proximity to a strong temperature inversion (thermocline) can cause the radio altimeter to show height above the differing air densities.
- The GRD PROX SYS message is displayed and the fault cannot be corrected
- When a planned abnormal condition requires aircraft operation within the boundaries of the GPWS warning envelope (i.e., abnormal gear or flap landing configurations)

GPWS Recovery Procedure

PF	PM
Immediately and simultaneously: • Disengage the autopilot • Disengage the autothrottle • Apply maximum thrust • Roll wings level and rotate to an initial pitch attitude of 20° • Retract the speedbrakes If terrain remains a threat, continue rotation to the pitch limit indicator, stick shaker, or initial buffet. When clear of terrain, slowly decrease pitch attitude and accelerate.	Verify: • Max thrust is set • Autopilot is disengaged • Appropriate recovery attitude is selected • All required actions have been completed Monitor vertical speed, altitude, and pitch attitude. Call out any trend toward terrain. Call out any omitted action item.
Maintain flap and landing gear configuration until terrain clearance is assured. Do not attempt to engage the autopilot or autothrottle until terrain clearance is assured.	