Interagency Aviation TECH BULLETIN

Subject: Attitude and Heading Errors After Sustained Turns

Area of Concern: All Aviation

Distribution: All Fixed-Wing Operations

Discussion: During operations involving sustained turns lasting between three and four hours, aircraft have experienced errors with attitude and heading indications resulting in mis-compare alerts and caution annunciations. In one instance, an autopilot was engaged while incorrect information was displayed resulting in unanticipated yaw inputs.

Drift is a phenomenon inherent in all gyro systems. Attitude Heading and Reference Systems (AHRS), including those equipped with solid-state sensors, are susceptible to the same effects. While aircraft systems include designs to counteract drift, turns lasting multiple hours can overwhelm these designs causing the system references to drift to a false zero. When this happens and the aircraft levels off, the attitude and heading indications may be off by several degrees. Typically, these inaccuracies can be corrected by maintaining level flight for approximately 90 seconds.

All systems are susceptible to this issue; however, modern systems equipped with multiple sensors cross-compare data and provide alerts on the user's electronic displays. This feature draws attention to errors that may have previously gone unnoticed or been deemed minor following self-correction. These errors may be difficult to notice in mechanical and single gyro systems. As one prominent attitude computer manufacturer states in their documentation, "This is not a safety problem. Aircraft have been flying for many years with gyro systems that perform similar…" This includes all our past aerial supervision operations (Leadplane, ASM and Air Attack). Additionally, VFR restrictions for aerial supervision operations mitigate potential impacts to the crew.

Recommendations:

- Pilots should be aware of the potential for drift and ensure that accurate indications are confirmed before engaging the autopilot.
- Crews should remain vigilant for possible errors and take steps to correct them if they occur. Follow the instructions in the flight manual to realign the system if necessary.
- After one hour of a sustained turn, pilots should level off and fly for at least two minutes before resuming a sustained turn.
- Pre-Flight Discussions: Crews should discuss these concerns before flight. Not all aircraft react the same way or within the same timeframe. It is acceptable to extend the duration of turns between level flight if the operator has demonstrated that their aircraft is capable.

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