

an unusual attitude, but would not meet the upset parameters. While the information that follows in this section could apply to unusual attitudes, the focus will be on UPRT.

The top four causal and contributing factors that have led to an upset and resulted in LOC-I accidents are:

1. Environmental factors
2. Mechanical factors
3. Human factors
4. Stall-related factors

With the exception of stall-related factors, which were covered in the previous section, the remaining causal and contributing factors to LOC-I accidents will be discussed further below.

Environmental Factors

Turbulence, or a large variation in wind velocity over a short distance, can cause upset and LOC-I. Maintain awareness of conditions that can lead to various types of turbulence, such as clear air turbulence, mountain waves, wind shear, and thunderstorms or microbursts. In addition to environmentally-induced turbulence, wake turbulence from other aircraft can lead to upset and LOC-I.

Icing can destroy the smooth flow of air over the airfoil and increase drag while decreasing the ability of the airfoil to create lift. Therefore, it can significantly degrade airplane performance, resulting in a stall if not handled correctly.

Mechanical Factors

Modern airplanes and equipment are very reliable, but anomalies do occur. Some of these mechanical failures can directly cause a departure from normal flight, such as asymmetrical flaps, malfunctioning or binding flight controls, and runaway trim.

Upsets can also occur if there is a malfunction or misuse of the autoflight system. Advanced automation may tend to mask the cause of the anomaly. Disengaging the autopilot and the autothrottles allows the pilot to directly control the airplane and possibly eliminate the cause of the problem. For these reasons the pilot must maintain proficiency to manually fly the airplane in all flight conditions without the use of the autopilot/autothrottles.

Although these and other inflight anomalies may not be preventable, knowledge of systems and AFM/POH recommended procedures helps the pilot minimize their impact and prevent an upset. In the case of instrument failures, avoiding an upset and subsequent LOC-I may depend on the pilot's proficiency in the use of secondary instrumentation and partial panel operations.

Human Factors

VMC to IMC

Unfortunately, accident reports indicate that continued VFR flight from visual meteorological conditions (VMC) into marginal VMC and IMC is a factor contributing to LOC I. A loss of the natural horizon substantially increases the chances of encountering vertigo or spatial disorientation, which can lead to upset.

IMC

When operating in IMC, maintain awareness of conditions and use the fundamental instrument skills—cross-check, interpretation, and control—to prevent an upset.

Diversion of Attention

In addition to its direct impact, an inflight anomaly or malfunction can also lead to an upset if it diverts the pilot's attention from basic airplane control responsibilities. Failing to monitor the automated systems, over-reliance on those systems, or incomplete knowledge and experience with those systems can lead to an upset. Diversion of attention can also occur simply from the pilot's efforts to set avionics or navigation equipment while flying the airplane.

Task Saturation

The margin of safety is the difference between task requirements and pilot capabilities. An upset and eventual LOC-I can occur whenever requirements exceed capabilities. For example, an airplane upset event that requires rolling an airplane from a near-inverted to an upright attitude may demand piloting skills beyond those learned during primary training. In another example, a fatigued pilot who inadvertently encounters IMC at night coupled with a vacuum pump failure, or a pilot fails to engage pitot heat while flying in IMC, could become disoriented and lose control of the airplane due to the demands of extended—and unpracticed—partial panel flight. Additionally, unnecessary low-altitude flying and impromptu demonstrations for friends or others on the ground often lead pilots to exceed their capabilities, with fatal results.

Sensory Overload/Deprivation

A pilot's ability to adequately correlate warnings, annunciations, instrument indications, and other cues from the airplane during an upset can be limited. Pilots faced with upset situations can be rapidly confronted with multiple or simultaneous visual, auditory, and tactile warnings. Conversely, sometimes expected warnings are not provided when they should be; this situation can distract a pilot as much as multiple warnings can.