Airplane State Awareness

Loss of Control – In-flight (LOC–I) is, and has historically been, one of the largest categories of commercial aviation fatal accidents. In August 2010, the Commercial Aviation Safety Team (CAST) chartered the Airplane State Awareness Joint Safety Analysis Team (ASA JSAT) as a follow-on activity to previous CAST work done by the Loss of Control Joint Safety Analysis Team (LOC JSAT) in 2000. The primary purpose of the ASA JSAT was to analyze a subset of LOC–I accidents and incidents in which the flight crew lost awareness of their airplane's state, defined as:

- Attitude (pitch or bank angle or rate), or
- Energy (the combination of airspeed, altitude, vertical speed, thrust, and airplane configuration)

A review of worldwide accidents over the past 10 years reveals that more than half of all LOC–I accidents and resulting fatalities involved flight crew loss of airplane state awareness.

The ASA JSAT identified 12 major themes that appeared across many of the events in the ASA data set, and may be representative of common issues present in similar events (for example, automation awareness is the focus of a related effort, the PARC/CAST Flight Deck Automation Working Group). These themes represent notable correlations only and do not necessarily imply causation. The ASA JSAT did not assign a ranking to these themes, and their ordering should not imply the level of importance of the themes. The identified themes are:

Energy (the combination of airspeed, altitude, vertical speed, thrust, and airplane configuration); Lack of External Visual References; Flight Crew Impairment; Training; Airplane Maintenance; Safety Culture; Invalid Source Data; Distraction; Systems Knowledge; Crew Resource Management (CRM); Automation Confusion/Awareness; Ineffective Alerting; and Inappropriate Control Inputs

The Airplane State Awareness Joint Safety Implementation Team (ASA JSIT), chartered by CAST on December 1, 2011, studied the feasibility of implementing the interventions identified by the ASA JSAT. The ASA JSIT launched in March 2012 and completed its work in June 2013, proposing 11 new CAST safety enhancements (SE), which are available at the link at the bottom of the page.

The SEs include recommendations to enhance flight crew training, aircraft equipment, and aviation operational procedures. Suggested mitigations include equipping future aircraft with systems to provide virtual daytime visual displays to flight crews regardless of actual flight conditions, bank angle alerting and recovery assistance, increased flight crew training for handling aircraft upsets and recovery, additional training on conducting go-arounds at low altitude, and other procedural/training areas.

Today:

The CAST Metrics Working Group continues to monitor LOC-I indicators in U.S. air carrier operations. The Joint Implementation Measurement Data Analysis Team is monitoring the effectiveness of stall warnings by monitoring the crew response in the flight deck. Additionally, the Federal Aviation Administration Aviation Safety Information Analysis and Sharing program continues to track worldwide ASA events for themes that could occur in U.S. air carrier operations, and whether factors are present that require additional mitigations beyond those in the ASA SEs.

The ASA SEs (192 through 211) are available for review at http://www.skybrary.aero/index.php/Portal:CAST_SE_Plan