Traffic Collision Avoidance System (TCAS)

Although no commercial airplane has suffered a midair collision in the United States for decades, the Aviation Safety Information Analysis and Sharing (ASIAS) program discovered during its Aviation Safety InfoShare meetings that flightcrews were experiencing Traffic Collision Avoidance System (TCAS) alerts in which no action was required. ASIAS analyzed its data and found these alerts were a systemic issue in the National Airspace System (NAS).

In October 2008, the ASIAS Executive Board (AEB) directed its Issue Analysis Team (IAT) to conduct a study of TCAS alerts. The study had the following objectives:

- Determine areas within the NAS where TCAS resolution advisories (RA) occur with high frequency.

- Use NAS-wide results and expert input to guide focused investigations of key hot spots.

- Characterize the causes of RAs.

- Categorize pilot responses to RAs.

The IAT used the following data sources to analyze these five objectives:

- Flight Operational Quality Assurance (FOQA) flight data recorders.

- Radar data run through simulators to determine where RAs occur.

- TCAS Operational Performance Assessment Data.

- Pilot incident reports.

Using these data sources, the research team determined TCAS RAs fall into two main categories: interactions between instrument flight rules (IFR) and visual flight rules (VFR) traffic, and interactions among IFR traffic. Some examples of VFR traffic interacting with IFR traffic include VFR aircraft operating at a general aviation airport near a larger Class B airport, loitering VFR aircraft (for example, a news helicopter) operating in or near Class B airspace, and structured VFR flow near IFR arrivals or departures. Some examples of IFR traffic interactions that lead to RAs are visual approaches to parallel runways and arrival/departure interactions triggered by high closure rate. The TCAS sensitivity logic at high-altitude airports also influenced RAs on parallel approaches.

Based on the results of this analysis, the study team proposed three safety enhancements (SE) to address technological, procedural, and infrastructure changes that would reduce TCAS RAs. Commercial Aviation Safety Team (CAST) Safety Enhancement (SE) 186 recommends conducting a study on the feasibility of reducing TCAS sensitivity at high-altitude airports. TCAS sensitivity is determined by mean sea level altitude instead of actual altitude above the ground, which leads to increased unnecessary RAs at airports like Denver, Colorado. SE 188 calls for the FAA to examine amending procedures at prioritized airports to minimize interactions between VFR and IFR traffic. SE 191 requests the FAA conduct a study to determine if current versions of TCAS are adequate to support the traffic levels predicted in the Next Generation Air Transportation System (NextGen) and to create a strategy for the development of NextCAS.

Recently, additional TCAS issues were identified by the interaction of arriving aircraft in Class B airspace that may experience RAs during a Class B excursion. The CAST Metrics Working Group continues to monitor TCAS and the implementation of mitigation strategies at known hotspot locations.

The TCAS SEs (186, 188, and 191) are available for review at http://www.skybrary.aero/index.php/Portal:CAST_SE_Plan.