

Automatic Airborne Collision Avoidance Systems (Auto ACAS)

Definitions and background

- ▶ Airborne collision avoidance system (ACAS): An aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders.
- ▶ Traffic advisory (TA): An indication given to the flight crew that a certain intruder is a potential threat.
- ▶ Resolution advisory (RA): An indication given to the flight crew recommending:
 - a. a maneuver intended to provide separation from all ACAS-identified threats; or
 - b. a maneuver restriction intended to maintain existing separation.
- ▶ Preventive RA: A resolution advisory that advises the pilot to avoid certain deviations from the current flight path but does not require any change in the current flight path.
- ▶ Corrective RA: A resolution advisory that advises the pilot to deviate from the current flight path.

The information provided by an ACAS is intended to assist pilots in the safe operation of aircraft by providing advice on appropriate action to reduce the risk of collision. This is achieved through Traffic Advisories (TAs), which are intended to prompt visual acquisition and to act as a warning that an RA may follow. TAs indicate the approximate position of intruding aircraft that may later cause an RA that proposes vertical maneuvers that are required to increase or at least maintain separation from threatening aircraft.

Pilots are expected to initiate the appropriate RA manoeuvre within 5 seconds and respond to any “increase” or “reversal” RA within 2-1/2 seconds.

References: Annex 10 Vol. IV, PANS-OPS Doc. 8168, PANS-ATM Doc. 4444, ACAS Manual Doc. 9863, ICAO Doc. 7030, ICAO Annex 6.

EASA has recently certified a new Auto-Pilot/Flight Director (AP/FD) TCAS mode for the Airbus A380. This system allows the aircraft to automatically respond to RAs generated by TCAS and resume the previously selected Flight Level after the “Clear of Conflict” message. This enhanced TCAS mode avoids potential overreactions or opposite reactions to the RAs. However, if the pilot decides to fly the RA manually, the Flight Director bars provide an intuitive display and guide the pilot to fly the RA maneuver.

Auto ACAS Requirements

- 1) The system should work through the Flight Director (FD) system and have the capability to be coupled to the autopilot or hand-flown by the pilot using FD guidance.
- 2) The system should have the capability to fly all RA maneuvers.
 - a. The magnitude of each RA maneuver should be large enough to ensure resolution of the predicted conflict, avoiding excessive deviations from ATC-cleared flight path.
 - b. The system should be inhibited below 1,500 feet AGL to mitigate nuisance activations during takeoff and landing.
 - c. The system should maneuver the aircraft in such a way so that positive or negative load factors are minimized, whilst achieving adequate resolution, to avoid injury to persons in the cabin.
- 3) The system should allow the pilot to disengage the autopilot either before or during an RA maneuver.
- 4) The system should include a warning to the pilot before any automatic flight path adjustment.

- 5) The system should have the capability to provide commands to return the aircraft to its previously cleared flight path following a “Clear of Conflict” message.
- 6) Flight information displays should clearly indicate that the RA maneuver being commanded will avoid the projected point of closest approach.
- 7) The system should be integrated with other critical warnings to ensure warning prioritization.