

# ACAS II Bulletin – RAs with no loss of separation

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In the previous issue of the [ACAS Bulletin](#) (published earlier this month), we described an event in which no Resolution Advisories had been generated despite a loss of ATC separation and aircraft proximity. In the current ACAS Bulletin, we will discuss an opposite situation, a case in which RAs were generated when there was no loss of separation.

A westbound Embraer 190 (blue aircraft on the diagram below) was climbing to FL330 with the rate of 1500 ft/min. In the almost opposite direction, a Boeing 747 had left its cruising level and was descending to FL340, also at 1500 ft/min. Both crews read back their clearances correctly, received traffic information and their Selected Flight Level was set correctly, which was verified by the air traffic controller who had the SFL available on the radar screen via the Mode S downlink. The aircraft were correctly separated and the crews were following ICAO's recommendation regarding the vertical rates before level off.

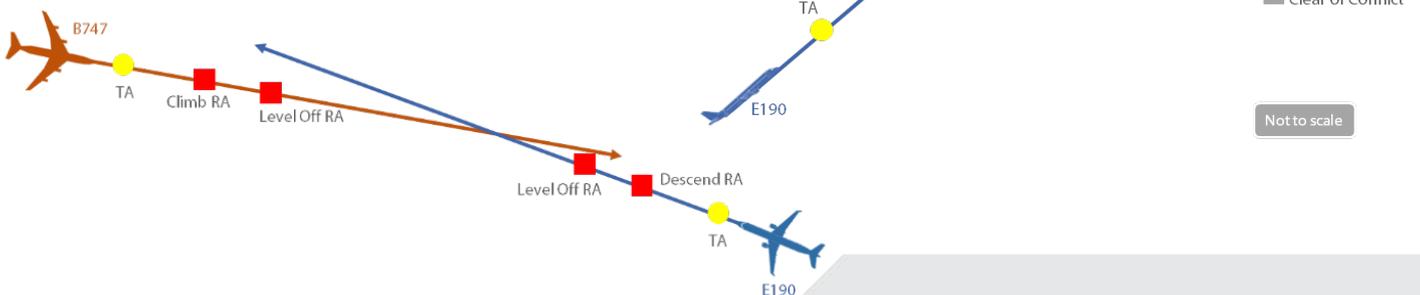
When the aircraft were approximately 2100 ft apart, Traffic Advisories were issued for both aircraft. Thirteen seconds later, the two aircraft simultaneously receive RAs: the climbing E190 a Descend RA and the descending B747 a Climb RA. At this point, the vertical separation was 1435 ft and horizontal 8 NM head on. Both crews responded promptly to their RAs. Both RAs weakened to Level Off after 10 seconds. Aircraft passed each other 25 seconds later separated by almost 1600 ft and RAs terminated with Clear of Conflict messages.

It is clear that in this case there was no risk of collision and the ATC separation minima were not going to be violated, which naturally brings a question – why were the RAs issued?

### ICAO Recommendation:

Unless otherwise specified in an air traffic control instruction, to avoid unnecessary airborne collision avoidance system (ACAS II) resolution advisories in aircraft at or approaching adjacent altitudes or flight levels, operators should specify procedures by which an aeroplane climbing or descending to an assigned altitude or flight level, especially with an autopilot engaged, may do so at a rate less than 8 m/sec or 1 500 ft/min (depending on the instrumentation available) throughout the last 300 m (1 000 ft) of climb or descent to the assigned level when the pilot is made aware of another aircraft at or approaching an adjacent altitude or flight level.

Source: ICAO Annex 6, part I, 4.4.10



It happened because the TCAS II alerting criteria are time-based, not distance-based like ATC separation standards. TCAS – using a set of altitude depended parameters – will issue an RA when it calculates a risk of collision based on the closing speed and vertical rates. See [EUROCONTROL ACAS Guide](#) chapter 10 for more information.

An aircraft climbing or descending towards its cleared level, may cause the TCAS logic to predict a conflict with another aircraft even when appropriate ATC instructions are being correctly followed by each crew. If two aircraft simultaneously approach adjacent flight levels, the combined vertical rates make RAs even more likely. This is because TCAS does not know aircraft intentions; autopilot or flight management system inputs are not taken into account, so TCAS II can remain an independent safety net.

Observing ICAO recommended vertical rates before level off (1500 ft/min. in the last 1000 feet if aware of another aircraft, **unless** ATC instructed the aircraft to maintain a specific vertical rate) will limit the possibility of RAs but it cannot entirely eliminate it. In the case described here, a relatively small horizontal miss distance (0.2 NM) at the Closest Point of Approach was a contributing factor in the generation of the RAs. Had the spacing between aircraft at CPA been 2 NM, no RAs would have been issued.

Without any doubt in this scenario, the RAs were operationally unnecessary (nuisance) as they were issued where there was no risk of collision. It needs to be emphasised that in real time pilots cannot and should not assess whether the RAs are in fact operationally required; it can be done reliably in hindsight only through data analysis. This is why all RAs – as it was in this case – must be followed promptly and accurately.

#### Learning points:

- RAs can be generated before ATC separation minima are violated and even when ATC separation minima will not be violated.
- RAs must be followed promptly and accurately, even though they may appear operationally unnecessary (unless doing so would clearly jeopardise the safety of the aircraft).
- Limiting vertical speed to 1500 ft/min. or less in the last 1000 feet before the cleared level (as per ICAO recommendation) will help to avoid unnecessary RAs. However, any ATC-given vertical speeds must be followed.

#### Further reading:

- [EUROCONTROL ACAS Guide](#)
- [EUROCONTROL ACAS Bulletin no. 15 \*Not so fast\*](#)
- [EUROCONTROL ACAS Bulletin no. 17 \*"Level off, level off" RA\*](#)
- [A short animated video about a TCAS RA due to high vertical rates](#)