ACAS II Bulletin – Level Off RA not followed

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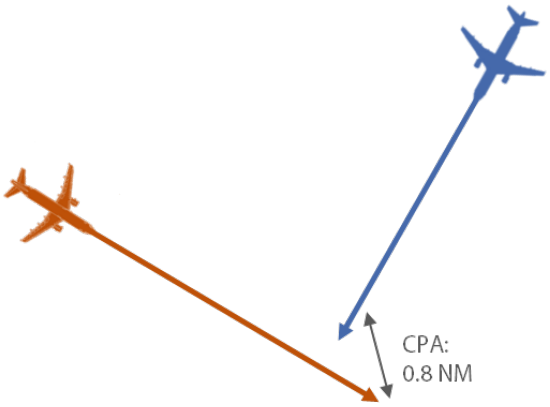
In this issue of ACAS Bulletin, we will look into a case where a crew reacted in the opposite direction to the received Level Off RA. Again, we must emphasize that correct and prompt pilot responses to TCAS RAs are essential to mitigate the risk of midair collision.

Both aircraft involved in this incident were equipped with TCAS II version 7.1.

As the two aircraft – on crossing tracks – were simultaneously approaching adjacent levels and the predicted horizontal separation was relatively small (just under 1 NM), the combined vertical rates caused TCAS to determine there was a collision risk and, consequently, RAs were issued.

Both aircraft received a Level Off RA, first the Orange aircraft and then – 6 seconds later – the Blue aircraft. The response to a Level Off RA requires a prompt reduction of the vertical rate to 0 ft/min (i.e. level off). The crew must maintain level flight until a TCAS "Clear of conflict" message or another RA is issued.

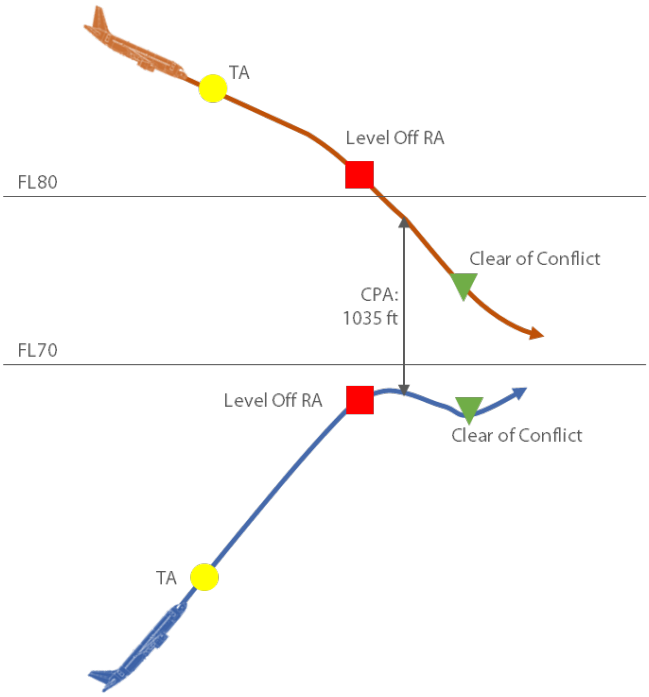
The crew of the Orange aircraft responded to their Level Off RA by increasing the rate of descent, rather than levelling off, reaching –2700 ft/min. at closest approach. The aircraft passed each other with the vertical separation of 1035 feet and horizontal of 0.8 NM.



Vertical rate before levelling off

It is best to reduce vertical rate to 1500 ft/min. or less in the last 1000 feet before the cleared level (as per ICAO Annex 6 recommendation). Especially if the pilot is aware of another aircraft at an adjacent flight level. This will help to avoid unnecessary RAs.

Once the aircraft started to diverge horizontally, TCAS issued a Clear of Conflict announcement. The Blue aircraft pilots responded to the Level Off RA in a timely manner by correctly reducing the vertical rate to zero 5 seconds after the RA, followed by a shallow descent until the RA termination.



The Orange crew did not realise that their response was in the opposite sense to the RA, which was only discovered during the subsequent investigation. Analysis of this event concluded that the vertical miss distance between the aircraft would have increased to 1293 feet had the Orange aircraft crew responded correctly to their RA.

Cases like the one described above are unfortunately not uncommon – a 2021 EUROCONTROL study concluded that only approximately half of RAs are followed promptly and correctly.

Learning points:

PILOTS

- Respond to a "Level off, level off" RA by reducing the vertical speed as close as possible to 0 ft/min.
- Maintain level flight until a TCAS "Clear of conflict" message or another RA is issued.
- 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.

AIRCRAFT OPERATORS

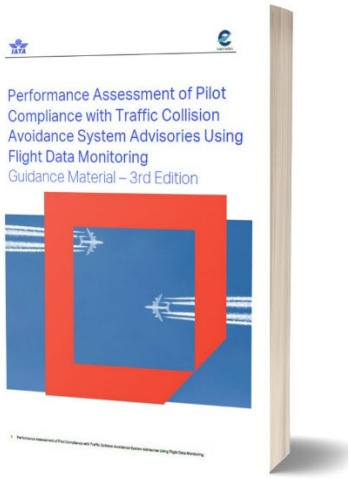
- Assess all RAs to detect any cases of non-compliance (opposite, too weak or excessive responses, or late reactions).
- Debrief the involved pilot to provide them with feedback regarding their RA responses.
- Include non-compliance cases in pilot recurrent training modules.

Further reading:

IATA and EUROCONTROL have jointly produced guidance on the assessment of pilot compliance to TCAS RAs using Flight Data Monitoring (FDM). This document highlights that the most important single factor affecting the performance of TCAS is the response of pilots to RAs.

The document provides general guidance on the assessment of pilot responses to RAs and contains a set of indicators and measurements to support such assessment. Third edition of the Guidance Material introduces two methods of the assessment of pilot responses to TCAS RAs and provides a tool to score the responses using both methods.

The Guidance Material is available from IATA website.



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