ACAS II Bulletin – TA-only mode

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On the TCAS and transponder control panel, the pilot can select the operating capability level of the TCAS system. Details vary by aircraft and transponder type, but generally speaking TCAS II can be set into one of three modes:

- a full protection mode known as TA/RA mode;
- TA-only mode;
- Standby.

When it is in Standby, no alerts will be generated and no other aircraft will be shown on the TCAS traffic display. In the full mode, TAs and RAs will be issued as needed. However, in the TA-only mode TCAS II operates normally performing all tracking functions, but will issue only TAs; RAs are inhibited. While other TCAS-equipped aircraft can generate uncoordinated RAs against a TA-only aircraft (which will be treated as an unequipped aircraft), there will be no RA protection against conflicts with unequipped aircraft or other aircraft in TA-only mode.

RAs generated in encounters between two aircraft with TCAS II in TA/RA mode will be coordinated ensuring that they are complementary and typically will require less vertical evasive action (as each aircraft will climb or descend to achieve the desired vertical spacing).

Typically, the crew will switch TCAS into the full mode just before entering the departure runway. In normal circumstances, an aircraft should always fly in the TA/RA mode. The TA-only mode is permitted in certain performance limiting conditions (such as during an engine failure or emergency descent) when the crew may not be able to safely follow an RA. Some operators also permit TA-only mode during closely spaced parallel approaches.

During a recent investigation of a separation loss, it was discovered that one of the two aircraft involved did not receive an RA, which was surprising given the proximity of the aircraft (horizontal separation of 0.1 NM at the Closest Point of Approach). The response to the RA by one of the crews provided sufficient vertical spacing but the investigators wanted to establish why the other crew did not get an RA.

As is routinely done is such cases, Mode S radar data recordings were examined. An aircraft's transponder provides to the ground station not only the altitude and SSR code, but also many other details, including information about any RA that has been issued, as well as the operational status of the transponder.

Based on the radar recordings, it was determined that the aircraft that did not receive an RA was operating in TA-only mode. The investigation could not unambiguously determine whether this was due to human error or a technical malfunction.

The examination of radar data collected in core European airspace shows that on average 50 flights a day were conducted in TA-only mode (that excludes aircraft performing parallel approaches). While it is a small percentage of all operations, these aircraft did not benefit from the protection offered by TCAS II Resolution Advisories. It is rather unlikely that in all these cases the aircraft suffered a performance-limiting event that prompted the crew to select the TA-only mode. Most likely, each crew for some reason selected the TCAS mode incorrectly or forgot to select it altogether, or the transponder suffered from some technical problems.

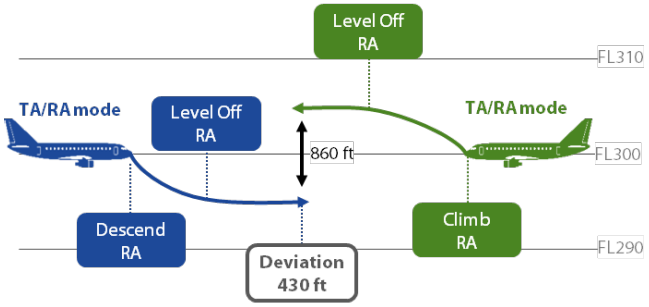
While pilots may easily spot if TCAS is in Standby mode (i.e. off) as no surrounding traffic will be visible on the TCAS traffic display, the incorrect selection of TA-only might be more difficult to notice, as the surrounding traffic will be displayed. On some aircraft types, a TA-only message might be displayed on the primary flight display.

TA/RA vs. TA-only mode – theoretical example

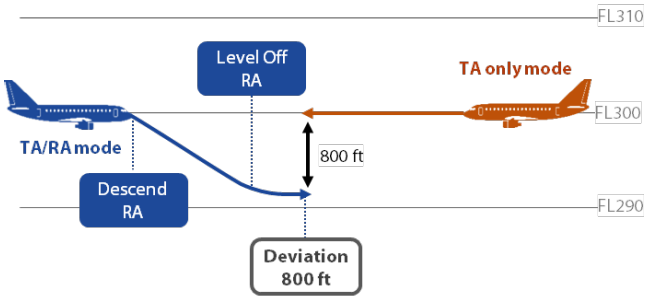
A theoretical example below will illustrate how the vertical deviation and miss distance will change depending on TCAS operational mode.

Two aircraft at FL300 are on crossing tracks (90° angle) with a horizontal miss distance of 0.1 NM.

If **both aircraft are operating in TA/RA mode**, both will receive complementary RAs (one to climb, the other to descend) which will weaken to Level Off once the pilots have responded and the vertical miss distance has started to increase. The vertical deviation for each aircraft (from its original cruising level) will be approximately 430 feet and the vertical spacing at the closest point of approach will be approximately 860 feet.



However, if **one of the aircraft operated in TA-only mode**, the deviation of the aircraft operating in TA/RA mode would have been approximately 800 feet. That significantly increases a chance for another conflict with an aircraft at the adjacent flight level.



Learning points:

- Pilots should ensure that their TCAS equipment remains in TA/RA mode throughout the flight, so their aircraft can benefit from TCAS II conflict resolution advice.
- Aircraft with TCAS in TA-only mode will be treated as unequipped by aircraft operating in TA/RA mode.

Further reading:

- The assessment of pilot compliance with TCAS RAs, TCAS mode selection and serviceability using ATC radar data (EUROCONTROL report)
- EUROCONTROL ACAS Guide

Short awareness video on TA-only operations

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