

# ACAS II Bulletin – Crossing RAs

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A Crossing RA requires the aircraft to pass through the altitude of the other aircraft. Crossing RAs can be less intuitive than other RAs as they may give the pilots an impression that they are being wrongly guided towards the other aircraft.

TCAS II is designed to select non-altitude crossing RAs if these provide sufficient vertical separation at the Closest Point of Approach. Only when it is estimated that sufficient vertical separation cannot be achieved at the Closest Point of Approach, will an RA with altitude crossing be posted. Crossing RAs should be responded to in the same way as all other RAs.

Crossing RAs are rare as they account for less than 1% of all RAs in European airspace.

One of the following aural annunciations will be heard when crossing RAs are issued:

- Climb, crossing climb; climb crossing climb
- Descend, crossing descend; descend, crossing descend
- Maintain vertical speed, crossing maintain

Crossing Maintain Vertical Speed RAs are issued only when the aircraft is already climbing or descending (in the correct vertical sense) at 1500 ft/min. or more and the altitude of the threat aircraft will be crossed. Maintain Vertical Speed RAs require that the current vertical rate is maintained. Crossing Climb and Crossing Descend RAs will be issued to aircraft with the current vertical below 1500 ft/min. and require the climb or descent at between 1500 and 1800 feet/min. to be attained.

In very rare cases, other RAs, like a Level Off RA, may lead to altitude crossing; however, no "crossing" aural annunciation will be made in these cases.

For illustration, let's take a look at two events, in which crossing RAs were issued.

#### Event 1

An Airbus 321 is level at FL150 while an Embraer 190 on a crossing track is cleared to climb to FL140. However, the Embraer busts its cleared level and continues the climb at approximately 1400 ft/min. The controller notices the level bust but the frequency is busy and by the time the Embraer crew is reminded to maintain FL140 both aircraft receive coordinated TCAS II RAs: the Embraer receives a Crossing Climb RA which requires the Embraer to climb at between 1500 and 1800 feet/min., while the A321 receives a Crossing Descent RA. Both pilots respond promptly to the RAs, the vertical separation ultimately increases and then RAs weaken to Level Off RAs. Finally, Clear of Conflict annunciations are made.

NETWORK

MANAGER



### Event 2

A TCAS-equipped Boeing 737 is cleared to climb to FL150 after take off. The controller does not notice that the clearance takes the departing B737 through the level of a TCAS-unequipped EC-145 helicopter at 4500 feet on a crossing track.

The 737 receives a TA against the helicopter while passing through 3800 feet and as it is passing through 4100 feet it receives a Maintain Crossing Climb RA (announced *"Maintain vertical speed, crossing maintain"*).

This RA requires that the aircraft continues its climb at the current vertical speed so it will cross through the altitude of the helicopter. The 737 is light and it is climbing at a rate of 2500 ft/min. The 737 pilot follows the RA maintaining the vertical speed. When the 737 is above the helicopter, the RA terminates with a "Clear of Conflict" message.



#### Learning points:

- Crossing RAs, like all other RAs, are to be responded to promptly.
- Crossing RAs require that the level/altitude of the threat aircraft is crossed. They are issued when TCAS computes
  that sufficient vertical separation would not otherwise be achieved.

#### **Further reading:**

- ACAS Bulletin no. 13 (events 1 & 3)
- ACAS Bulletin no. 12 (events 2 & 3)
- <u>EUROCONTROL ACAS Guide</u>

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