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# TCAS RESOLUTION ADVISORIES DURING CLOSELY SPACED PARALLEL APPROACHES

## 1 INTRODUCTION

1.1 Traffic Collision Avoidance System (TCAS II) Resolution Advisories (RAs) may occur during closely spaced parallel approach operations. These unnecessary TCAS II RAs may be attributed to a mixture of either GNSS interference or TCAS Tau-cap algorithms. This Circular will provide some details on the possible causes of these unexpected RAs.

1.2 Due to the nature of closely spaced parallel approaches aircraft could be within 1NM of each other at similar altitudes on final approach. This increases the chance of a TCAS RA as the processing and reaction time is reduced.

1.3 Flight crews are reminded of the importance of following TCAS RAs as the possibility of a genuine intruder threat cannot be differentiated from a false activation in real time.

## 2 ADS-B GNSS Interference

2.1 Mode-S uses airborne transponders to provide altitude and identification data, with Automatic Dependent Surveillance Broadcast (ADS-B) adding global navigation data typically obtained from a Global Positioning System (GPS) receiver. The position and identification data supplied by Mode S/ADS-B broadcasts are used by aircraft and air traffic controller systems such as TCAS and radar displays. ADS-B relies entirely on GPS position to broadcast the aircraft position. It does not take input from alternative navigation systems that may be available on the aircraft.

2.2 If an aircraft with ADS-B (Out) has been subjected to GNSS Interference, it may broadcast a false ADS-B position. This may show traffic in an incorrect position due to the reception of incorrect ADS-B (Out) data. In most cases, the transmission of MODE-A/C transponder data would overrule incorrect ADS-B position however, if the transponder data is unavailable, faulty ADS-B data can result in an unnecessary TCAS RA.

## 3 TCAS TAU-CAP Mechanism During Parallel Approaches

3.1 TCAS logic will trigger an RA when the distance between two aircraft is projected to fall below a certain threshold, however, there are also additional TCAS algorithms to provide additional protection, such as when two aircraft are converging at a very slow rate (i.e. flying on almost parallel tracks).This is referred to as the tau-cap mechanism and ensures that in close encounters in which there is a late manoeuvre, a timely and effective RA can be issued. The drawback is that in instances of planned proximity (like parallel approaches), a false RA is sometimes issued.

3.2 A false RA may be issued when aircraft are operating on parallel approaches without a stagger, and the vertical separation between the aircraft decreases to below 600 ft, however, not all cases will produce a false RA as the combination of factors that triggers these RAs (altitude, distance, closing speed) are complex and not easily predicted.

3.3 Most aircraft on parallel approaches will not experience this phenomenon. Only a few parallel approaches will lead to these operationally unnecessary RAs. This happens when the aircraft trajectories fall within a narrow window where the tau-cap mechanism produces RAs.

## 4 DEFENCES AND RECOMMENDED ACTIONS FOR PILOTS AND CONTROLLERS

4.1 Standard procedures apply. Regardless of any belief that the alert may be false, pilots must always comply with RAs. Controllers must not issue instructions that contradict an RA, even if they think the alert is a nuisance.

4.2 Pilots and controllers should not try to assess in real time whether the RA is a nuisance or genuine. Alerts during parallel approaches can be generated due to various other reasons such as aircraft blundering off the parallel runway localiser or helicopter traffic not complying with clearances. Being aware of the issue, pilots and controllers should plan for this eventuality and follow the RA or execute a missed approach if an alert is received.

## 5 CONCLUSION

5.1 Pilots should follow all RAs even if they believe they are operationally unnecessary as that cannot be determined in real time.

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