



TWELFTH AIR NAVIGATION CONFERENCE

Montréal, 19 to 30 November 2012

Agenda Item 3: Interoperability and data – through globally interoperable information management

3.1: Performance improvement through the application of system-wide information management (SWIM)

ACAS RESOLUTION ADVISORY DOWN LINK TO CONTROLLER WORK POSITION

(Presented by the International Federation of Air Traffic Controllers' Associations)

SUMMARY

This paper will examine the introduction of ACAS RA down link to controller working positions (CWP), highlighting the need for close examination of the consequences to safety and the impact on current ICAO provisions for collision avoidance and separation responsibility.

The danger of crews following conflicting ATC-instructions during an active ACAS RA is accepted as a significant safety issue. Pilot training is seen as one of the weak points of the current ACAS-operations, resulting in inconsistent responses to displayed ACAS RAs.

It is therefore necessary that more complete testing and safety analysis be conducted surrounding ACAS RA-DL and to evaluate other less intrusive solutions to determine if they are more suitable to eliminating potential airborne collisions before ICAO SARP revisions are proposed.

Action: The Conference is invited to agree to the recommendations and conclusions in paragraph 5.

1. INTRODUCTION

1.1 ACAS is a simple, robust and independent system that functions as a stand-alone airborne anti-collision safety net. It is collision avoidance technology, not a separation tool. Currently, ACAS procedures require that a crew, being confronted with an ATC-clearance during an ACAS RA, should disregard the clearance and when possible advise ATC of the RA and explicitly refuse the ATC-clearance.

1.2 In 2001 over Japan and in 2002 over Southern Germany (Lake Constance), the interface between ACAS and ATC exposed a serious safety issue. The Lake Constance incident revealed the worst-case scenario and tragic consequence of a crew following conflicting ATC-instructions during an active ACAS RA.

1.3 Pilot training has been identified as one of the weak points of current ACAS-operations. A presentation from the German DFS to Eurocontrol revealed the results of their 3-month survey of crew compliance to ACAS RA's over the whole of Germany (March-May 2012). Of the 772 RA's downloaded and analysed (4.3/day; 63% IFR/IFR, 27% IFR/VFR) Crew Compliance was only 72%.

2. BACKGROUND – ACAS RA DL TO CWP

2.1 As a reaction to the fact that aircrews were complying with conflicting ATC clearances during a ACAS RA event, some states have required that ACAS RA's be down linked and displayed on ATCO radar displays to provide ATCO's with greater situational awareness to prevent the controller from providing conflicting instructions. However, this proved to be problematic.

2.2 Of the seven States and ANSP's that have implemented ACAS RA DL, three are currently disabled (Tokyo, Belfast, and Cardiff). Initial information indicates one of the reasons for disabling ACAS RA DL can be explained by the addition of another "alert" to a system of numerous alerts and an already clustered radar display. Furthermore, while independent consultants study and survey the issue of multiple alerts distraction, the RA display can create even more confusion for the ATCO when considering the likelihood of pilot compliance and if and when the ATCO is responsible again for separation. The result is a tremendous amount of ambiguity about what to do and what is expected from the ATCO when such a situation occurs.

2.3 Currently, there are three possible operational solutions of how ACAS-RA's down-linked to CWP's could be handled:

- a) no ACAS RA DL displayed on CWP;
- b) ACAS RA's displayed at CWP's "**for information only**", meaning no particular/special procedures are attached to this data, and no controller action is expected; and,
- c) Eurocontrol is proposing an operational scenario where ATCO's shall stop transmitting flight-path modifying clearances to these aircraft once they are showing a ACAS-RA on their radar display. ATCO's would be required to consider ACAS RA's displayed as if receiving a voice report by the crew.

Note.– This will require an amendment to ICAO-SARPs.

3. DISCUSSION – OPERATIONAL ISSUES OF DISPLAYING ACAS RA'S ON CWP'S

3.1 Excluding option (a) above, despite certain benefits, both scenarios (b) and (c) have significant operational problems, as well as technical drawbacks. In some cases the delay at which ATCO's would become aware of an active ACAS RA present in their sector could be improved over current R/T procedures. This advance information has value only if the ATCO can be assured that the RA manoeuvre will be executed and that during the lapse of time – gained by the ACAS RA-D/L – an ATC clearance (contrary to the ACAS RA shown) would be transmitted to the aircraft involved in the RA manoeuvre.

3.2 Air traffic controllers are only aware that an RA has been issued once notified by the pilot via radio. Being unaware of an RA, the controller might instruct the aircraft to manoeuvre in a manner contrary to the RA. While the controller, unaware of the RA, is required to resolve an imminent conflict and assure safe separation, it must be stressed that the current ACAS procedures state that a crew confronted with an incompatible ATC-clearance during an active ACAS RA, should explicitly refuse the ATC-clearance, using the "UNABLE, TCAS RA" phraseology. Continual recurrent training of pilots should reinforce this requirement.

3.3 Although contrary to the requirement, pilots in some cases follow the ATC clearance rather than an ACAS RA. Compliance with the contradictory ATC clearance severely degrades the effectiveness of ACAS. RA Downlink has been proposed as a possible method of improving controller awareness of ACAS events, thereby reducing the probability of the controller intervening during an RA. It is important that any safety

assessment evaluate the possibility of “ghost RAs”, that is an RA displayed to the controller that is not present in the cockpit, and any other spurious alerts not present.

3.4 If enhanced controller situational awareness is the goal, robust pilot training to ensure notification of ATC of the RA manoeuvre as soon as practical and to refuse to act on any ATC clearances contrary to the RA solution, could achieve the same result without introducing new system risks.

4. DISCUSSION – SAFETY ISSUES AND PROBLEMS CREATED FROM ACAS RA DL

4.1 From a conceptual point of view it must be accepted that down linked RA’s would bring new parties and stakeholders into the "system". Down linking RA’s to the CWP may improve awareness to the controller, it would likewise increase the complexity of the different procedures and interactions of the system and its actors (pilots or controllers – including the tools and machines). These new complexities beget the likelihood that something can either go wrong or not perform as planned or expected. The simplicity of the crew reacting to a ACAS RA has been thoughtfully studied and clearly defined in ICAO SARP’s.

4.2 The addition of RA down linking will add new safety concerns and operational consequences. Current ICAO procedures do not contain provision for operational use of RA Downlink, and clear delineation of controller and pilot responsibilities needs to be addressed before the potential implementation of RA downlink.

4.3 A more promising and robust technology to study is currently installed (and certified) in the new A380 aircraft. ACAS is connected to the Flight Director and thus the autopilot. This solution permits an automatic and correct execution of the aircraft to all ACAS RA’s posted in the cockpit. "Correct execution" means that all ACAS parameters and - assumptions of the ACAS system are fully matched and respected. Further study and analyses is essential before considering this potential solution. IFATCA believes we must always be careful when we chose to use technology to solve problems and safety issues. However, based on the data, automated execution of ACAS RA’s appear promising, as:

- a) it increases the likelihood that the ACAS RA’s are correctly followed;
- b) it keeps the stress level down for the crews facing such an event; and,
- c) it gives the crew much more time to visually acquire the intruder.

5. CONCLUSION AND RECOMMENDATIONS

5.1 There is a history of aircrews following ATC clearances contrary to an ACAS RA.

5.2 Controllers are not aware of an ACAS event until notified by the crew, which has been problematic.

5.3 ACAS RA down linking to the controller work position may provide an additional level of awareness to preclude ATCO’s from issuing conflicting instructions.

5.4 ACAS RA DL to CWP also creates unintended consequences such as operational problems associated with multiple alerts and radar display congestion, as well as safety issues relating to new procedures and uncertain responsibilities not incorporated in ICAO SARPs.

5.5 Other solutions to mitigate and even alleviate aircrews from following a conflicting ATC clearance during an ACAS RA event range from increasing and improving simulation training of pilots, to automating the ACAS RA manoeuvres through the Flight Director and autopilot.

5.6 We invite the Conference to:

- a) note the content of the paper; and
- b) urge ICAO to take the following steps before considering SARPs for ACAS down link:
 - 1) complete a comprehensive study and analysis on the impact of ACAS RAs on controller work positions, specifically human factors studies and the consequences to operational efficiency and safety including those unrelated to the aircraft involved in the RA;
 - 2) emphasize increased pilot training on the responsibilities and requirements associated with communicating and correctly reacting to ACAS RA events; and
 - 3) complete comprehensive study and analysis on the benefits that automated execution of ACAS RA manoeuvres provides to operational efficiency and safety.

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