

ELEVENTH AIR NAVIGATION CONFERENCE

Montreal, 22 September to 3 October 2003

Agenda Item 1: Introduction and assessment of a global air traffic management (ATM) operational concept

**1.4 The role of airborne collision avoidance systems (ACAS) technologies
:**

COMPATIBILITY BETWEEN ACAS AND THE AIR TRAFFIC CONTROL SYSTEM

(Presented by France)

SUMMARY

The purpose of this working paper is to present various aspects of compatibility between ACAS and ATC: 1) a report on the operational experience gained by France through the constant and coordinated operational follow-up of TCAS events in French airspace; 2) the analysis of such events using simulation tools; 3) the use of some of these events for staff training (using the RITA tool, developed jointly with Eurocontrol).

Action by the Conference is in paragraph 7.

1. INTRODUCTION

1.1 In order to monitor the introduction in the 1990s of ACAS in transport aeroplanes, there was a need to develop operational, technical and regulatory follow-up activities. Such activities have made it possible to shed light on several aspects, such as:

- a) the ability of ACAS to fulfil its role as a safety net, independent of the ATC system;
- b) operational experience gained through event analysis;
- c) the importance of training not only crews, but also controllers.

1.2 In a context where a global operational concept for ATM is to be adopted, it is important to ensure that ACAS will continue to play its role as a tool of last resort. Its functional independence from ATM must be reaffirmed, but it may also require some changes in operational procedures.

2. OPERATIONAL EXPERIENCE

2.1 In France, a team of experts has ensured the operational follow-up of ACAS for over 10 years, centralizing reports from crews and control centres. We can thus confirm that some dangerous situations have been averted at the last minute thanks to ACAS, even if we cannot say for sure that collisions were avoided. We can also see that the effectiveness of ACAS in collision avoidance depends closely on the crew's correctly following resolution advisories (RAs).

2.2 Furthermore, the implementation of ACAS has drawn attention to some operational situations that could give rise to safety problems. This is confirmed in particular when the safety net is invoked.

2.3 In 2002, 420 events with RAs were reported by crews.

- 32 per cent of the RAs were issued when traffic was being established at 1 000 feet separation from other aircraft;
- 11 per cent of the RAs were related to ATC malfunctions;
- 7 per cent of the RAs resulted from a failure to comply with the clearance or level.

The proportion of RAs considered “necessary” after analysis was around 25 per cent.

3. ANALYSIS AND SIMULATION

3.1 Several tools have been developed for detailed event analysis, in particular using simulations. An analysis of each event makes it possible to bring to light dangerous situations, errors or misinterpretations.

3.2 Using simulation, it is possible to confirm that the ACAS has functioned according to specifications. In many cases, it is thanks to ACAS that the vertical distance between two aeroplanes remains sufficient to avoid a collision.

3.3 The analysis of each event is subsequently forwarded to the control centre and to the airlines concerned. This stage is very important to improving mutual understanding among those involved (controllers and crews). Positive feedback stimulates the exchange of information and increases the compatibility between ACAS and the ATC system.

3.4 The RAs analysed in 2002 showed:

3.4.1 On-board:

- a need for crew training. Several repeated cases of wrong reactions to RAs prompted the team of experts to take action with the airlines;

- a failure to use the proper phraseology;
- on some equipment, difficulty in interpreting TCAS information;
- after the RA is issued, a lack of control over the vertical deviation.

3.4.2 For ATC:

- issuance of clearances contrary to the RA (often related to the use of improper phraseology by the pilot);
- difficulty in managing traffic between IFR with TCAS and VFR at regional airports with heavy VFR traffic.

4. TRAINING

4.1 The operational analysis made it possible to select certain events that are of particular interest for training; they have been included in a replay tool called RITA, for “Replay Interface for TCAS Alerts”. This tool was devised for instructors at control centres, but it may also be used to supplement crew training. RITA was developed by the *Centre d’études de la Navigation Aérienne* (CENA) jointly with Eurocontrol. Several training sessions based on the RITA tool have been held in control centres in 2003.

5. EVOLUTION OF ACAS

5.1 The operational follow-up of the implementation of ACAS has also made it possible to detect certain deficiencies, and in some cases to make the necessary corrections. This culminated in the definition of the TCAS V7 logic, along with the development of SARPs for ACAS II. It is vital to continue monitoring the operational performance of ACAS II.

5.2 In a context where a global operational concept for ATM is to be adopted, it is important to ensure that ACAS will continue to play its role as a tool of last resort. Its functional independence from ATM must be reaffirmed, but it may also require some changes in operational procedures.

6. CONCLUSIONS

6.1 The role of ACAS as a safety net of last resort must be maintained as a global concept of air traffic evolves. In particular, ACAS must remain independent in establishing the safety level.

6.2 The maintenance of this essential independence does not preclude both present and future measures to improve the operational compatibility between ACAS and the ATC system.

7. ACTION BY THE CONFERENCE

7.1 The Conference is invited to:

- a) maintain or develop a programme for operational follow-up by States or by groups of States;
- b) ensure that structured training activities exist not only for crews, but also for controllers, based on tools such as RITA.