

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
:

AIRBORNE COLLISION AVOIDANCE SYSTEM II (ACAS II)

(Presented by the Secretariat)

SUMMARY

This paper outlines steps taken by ICAO to strengthen and clarify provisions in ICAO documentation concerning the operation of ACAS II, particularly provisions on pilot responses to resolution advisories, in light of the safety recommendations of the investigation report of the near mid-air collision over Japan on 31 January 2001.

Action by the Conference is at paragraph 6.

1. INTRODUCTION

1.1 ICAO provisions relating to the operation of airborne collision avoidance system II (ACAS II) were reviewed by the Air Navigation Commission following the publication of an accident investigation report dated 12 July 2002, concerning a near mid-air collision over Japan on 31 January 2001. This accident involved two wide-bodied aircraft equipped with ACAS II and resulted in injuries to passengers and crew. At the time it was also noted that there was an on-going accident investigation of a mid-air collision over Germany on 1 July 2002 which involved two aircraft equipped with ACAS II.

1.2 Factors common to both accidents were that air traffic control (ATC) had issued instructions which conflicted with an ACAS II resolution advisory (RA), and flight crews had manoeuvred their aircraft in the opposite sense to the RAs that had been issued.

1.3 ACAS II provides a proven, independent safety net to prevent mid-air collisions. Operational monitoring programmes have highlighted, in numerous actual events, the significant ACAS II contribution to

improved flight safety. However, its ability to fulfil that role is dependent on the correct performance of the necessary operational procedures by flight crews and air traffic control.

2. ICAO PROVISIONS CONCERNING ACAS II

2.1 ICAO State letter AN 11/19-02/82, dated 30 August 2002, requested urgent action by States, to ensure that national aviation documentation, and that of aircraft operators under their authority, highlight the critical importance of following an ACAS resolution advisory, and of not manoeuvring opposite to the sense of a resolution advisory, even if ATC issues conflicting instructions. The importance of following the RA is based on the possibility that ATC may not be aware of an RA, and may unknowingly issue instructions that are contrary to the RA. The importance of avoiding manoeuvres opposite to the sense of an RA is based on the fact that in an ACAS-ACAS coordinated encounter, the RAs complement each other in order to reduce the potential for collision. Manoeuvres, or lack of manoeuvres, that result in vertical rates opposite to the sense of an RA could result in a collision with the threat aircraft.

2.2 For ACAS to function as intended, it is essential that flight crews follow the procedures contained in their aircraft operating manuals concerning responses to RAs. After reviewing the ACAS II operating procedures in *Procedures for Air Navigation Services — Aircraft Operations*, Volume I — *Flight Procedures* (Doc 8168, PANS-OPS), the Commission agreed to consult States concerning a proposal to strengthen and clarify the operating procedures in PANS-OPS, Volume I, by highlighting the importance of following an RA, and of not manoeuvring in a sense opposite to that of an RA. The Commission also agreed to circulate a proposal for amendment of Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* to include a new Standard in Appendix 2 concerning the content of an operations manual in regard to policy, instructions, procedures and training requirements for the avoidance of collisions and the use of ACAS II. These proposals were contained in State letter AN 11/1.1.23, AN 11/19.1-02/99.

3. AMENDMENTS TO ICAO DOCUMENTATION CONCERNING OPERATION OF ACAS II

3.1 The amendment proposals were widely supported by States. The proposed amendment to Annex 6, Part I was adopted by the Council on 13 March 2003 and will become applicable on 27 November 2003. The amendment inserted the following new text into Appendix 2:

“2.1.31 Policy, instructions, procedures and training requirements for the avoidance of collisions and the use of the airborne collision avoidance system (ACAS).

Note.—Procedures for the operation of ACAS are contained in Procedures for Air Navigation Services — Aircraft Operations, Volume I — Flight Procedures (PANS-OPS, Doc 8168), Part VIII, Chapter 3, and in Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444), Chapters 12 and 15.”

3.2 The proposed amendments to PANS-OPS, Volume I were approved by the Council for applicability in 2003. The amended ACAS II operational procedures are shown in the Appendix. Guidance material concerning the training of pilots in ACAS II operational procedures was introduced as a new Attachment A to PANS-OPS, Volume I, Part VIII, by Amendment 12 to PANS-OPS, Volume I.

4. FURTHER WORK BY ICAO

4.1 To further enhance the effectiveness of ACAS II in an ATC environment, a number of issues should be investigated. These issues include:

- a) the feasibility of down-linking RAs to ATC, using such technologies as secondary surveillance radar (SSR) Mode S and automatic dependent surveillance — broadcast (ADS-B) (AN-Conf/11-WP/7 refers);
- b) the feasibility of an automatic indication to ATC that an aircraft has received an RA, using conventional ATC radar (SSR Modes A and C);
- c) a review of ATC operational procedures with respect to ACAS;
- d) introduction of new provisions in Annex 6, Part II concerning the training of pilots of general aviation aeroplanes in the operation of ACAS II; and
- e) other technical and operational issues that may arise from the investigation of the mid-air collision over southern Germany on 1 July 2002, which involved two aeroplanes equipped with ACAS II.

5. CONCLUSION

5.1 For ACAS to function as intended, it is essential that flight crews follow the procedures contained in their aircraft operating manuals concerning responses to RAs. States must ensure that operating manuals reflect the procedures in PANS-OPS, Volume I, which have been reproduced in the Appendix.

6. ACTION BY THE CONFERENCE

6.1 The Conference is invited to note the information contained in this paper and that ICAO intends to study further initiatives to enhance the effectiveness of ACAS II as outlined in paragraph 4.1.

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