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TCAS I SYSTEMS APPROVALS POLICY

1 Introduction

1.1 The purpose of this Circular is to inform operators and industry of the National IFF/SSR Committee (NISC) policy for approving Airborne Collision Avoidance Systems (ACAS) for use in UK airspace and a reminder of the need to apply for NISC approval to transmit for ACAS I systems. ACAS is often referred to as the Traffic Alert and Collision Avoidance System (TCAS) and the terms used interchangeably. However, in its strictest sense, ACAS refers only to the concept of collision avoidance, whereas TCAS is associated with commercially available technology that satisfies ICAO standards. For example, TCAS II (v 7.0) is the only approved commercially available implementation of ACAS II.

1.2 This Circular applies to those aircraft fitted, or intended to be fitted, with ACAS equipment **not** covered by the current mandated requirements specified in Schedule 5 of the Air Navigation Order (CAP 393) and at Section GEN 1.5.3 to the UK AIP. In the context of this Circular, TCAS I refers to an Active Traffic Alert and Collision Avoidance System as defined in Minimum Operational Performance Specification RTCA/DO-197A or its predecessors. This includes TCAS I equipment operating in accordance with TSO-C118 and Traffic Advisory Systems (TAS) operating in accordance with TSO-C147.

1.3 Any ACAS system fitted to a UK registered aircraft must be installed in accordance with the equipment and airframe manufacturers' recommendations and must be approved by the European Aviation Safety Agency (EASA). Additionally, any ACAS system that operates by interrogating transponders using the 1030 and 1090 MHz frequencies must obtain an approval to transmit from the NISC before operation within UK airspace will be permitted. For ACAS II equipment only, provided they are fully compliant with ICAO Annex 10 Vol IV, a generic approval to transmit has been granted by the NISC.

2 Background

2.1 TCAS I offers basic collision avoidance information to pilots as an aid to 'see and avoid'. The main difference from TCAS II is that it does not generate 'Resolution Advisory' (RA) warnings. Because of this principle difference, TCAS I systems are less costly and smaller, making them attractive for those operating at low levels and/or outside controlled airspace where extra information to assist with 'see and avoid' is most welcome.

2.2 The minimum operational performance specification of TCAS I equipment is defined in RTCA DO-197A and its predecessor DO-197. Amongst other things, these RTCA standards define maximum interrogation rates and power levels permitted for TCAS I systems. This is known as 'interference limiting' and is designed to ensure that TCAS and Secondary Surveillance Radar (SSR) systems are not adversely affected by TCAS I transmissions. DO-197 and DO-297 also allows manufacturers of TCAS I systems to elect to use TCAS II interference limiting techniques as defined in RTCA DO-185. TCAS II interference limiting techniques permit higher interrogation rates and power levels than TCAS I interference limiting.

2.3 Use of TCAS II interference limiting by TCAS I equipment is a cause for concern because under some circumstances it could adversely affect the surveillance performance of nearby ACAS II equipped aircraft. This is because certain aircraft (typically rotorcraft and gliders) are known to cluster in greater densities than were assumed for the design of ACAS II (TCAS II v7.0). Consequently, there is a risk that proximate TCAS II aircraft will suffer an inappropriate reduction in surveillance range that would result in a delay in issuing Traffic Advisory (TA) or Resolution Advisory (RA) warnings.

2.4 This issue is raised in the Guidance Material Related to Airborne Collision Avoidance System, Attachment to Volume IV of ICAO Annex 10, which states '...TCAS I systems (which employ ACAS II interference limiting techniques) must not be used for aircraft which are known to be in close proximity to each other for sustained periods of time'.

3 Environmental Modelling

3.1 The NISC commissioned computer simulations of the IFF/SSR Radio Frequency (RF) environment. The aim of the modelling was to determine:

- (a) The effect that a slow-moving cluster of TCAS I aircraft would have on proximate ACAS II equipped aircraft and ground SSR interrogators, and;
- (b) The effect large populations of TCAS I equipped aircraft would have on the overall RF environment.

The effect of the 2 different TCAS interference limiting techniques described above was modelled.

3.2 The results of the modelling showed that:

- (a) The use of conventional TCAS I interference limiting techniques had no significant adverse effect on the performance of proximate ACAS II equipped aircraft.
- (b) The use of conventional TCAS I interference limiting techniques in large populations of aircraft had no significant adverse effect on the overall RF environment and ground SSR radar performance.
- (c) The use of TCAS I equipped aircraft deploying TCAS II interference limiting and fitted with a Mode S transponder would cause proximate ACAS II equipped aircraft to suffer an inappropriate reduction in surveillance range. This effect occurred when as few as 3 of these aircraft were operating in a local cluster within 6 miles of an ACAS II equipped aircraft.
- (d) The use of TCAS I equipped aircraft deploying TCAS II interference limiting and fitted with a classical Mode A/C transponder would cause similar effects to (c) when operating in larger clusters.

3.3 The modelling results were used to determine the maximum number of higher power TCAS I units (with TCAS II interference limiting) that the NISC could licence without adversely affecting the safety performance of nearby ACAS II equipped aircraft. These limits have now been reached.

4 Future TCAS Developments

4.1 In the event that there are future developments in TCAS I specifications and/or equipment performance, the NISC will evaluate these and, if appropriate, will amend the licensing policy outlined below.

5 NISC Approval

5.1 The NISC Planning Principles and Procedures for Operation of IFF/SSR Interrogators in the UK are contained in CAP 761 which is available on the CAA website. TCAS I systems fall within the definition of an IFF/SSR interrogator and in consequence individual NISC Approvals for the operation of such equipment is required.

5.2 The NISC has adopted an Approvals policy that takes account of the type of interference limiting used in the two different types of TCAS I but does not preclude operators from fitting a basic collision avoidance system.

5.3 Equipment Employing TCAS I Interference Limiting Techniques.

5.3.1 There is currently no limit on the number of Approvals issued for equipment using TCAS I interference limiting techniques. Approval Certificates will be issued in accordance CAP 761 and will be valid for a period of 5 years. Where dense clustering of TCAS I equipped aircraft is likely to take place and is deemed as unusual aerial activity, special TCAS I operating conditions may be imposed through an Airspace Co-ordination Notice.

5.4 TCAS I equipment Employing TCAS II Interference Limiting Techniques.

5.4.1 With immediate effect, the NISC will not issue new Approvals for TCAS I equipment employing TCAS II interference limiting techniques. Existing Approvals will be re-issued on a temporary basis and will be valid for up to 5 years or until such time as there is a mandatory requirement for the carriage of a Mode S transponder within the UK airspace in which the aircraft operates. Any future mandate to carry a Mode S transponder may necessitate the withdrawal of the NISC Approval for this type of TCAS I equipment.

6 Airworthiness Issues

6.1 The installation and configuration of TCAS I and any associated transponder equipment is an airworthiness issue. However, any airworthiness certification of TCAS I equipment shall be commensurate with the restrictions stated in the approval to transmit, issued by the NISC. This measure is necessary to ensure that aircraft operators do not subsequently install a Mode S transponder, which could then impact on the performance of nearby ACAS II systems.

6.2 The Air Navigation Order 2005 Article 20 (5) requires all radio and radio navigation equipment to be of a type approved by EASA or the CAA in relation to the purpose for which it is to be used. Information on aircraft radio equipment approvals is available on the CAA web site at www.caa.co.uk/srg/airworthiness/aea or www.easa.eu.int

7 Further Advice

7.1 In view of the requirement to obtain approvals for the installation and operation of TCAS I from each of the NISC and EASA, it is strongly recommended that those planning to install equipment contact the NISC and CAA SRG prior to making any financial commitment.

Contact details are as follows:

For NISC applications for approval:

Surveillance and Spectrum Management
SS6
Directorate of Airspace Policy
CAA House
45-59, Kingsway
London
WC2B 6TE

Tel: 020-7453 6536
Fax: 020-7453 6556
E-mail: nisc@dap.caa.co.uk

For equipment and installation approvals:

Civil Aviation Authority
Safety Regulation Group
Systems Department
Aviation House
Gatwick Airport South
West Sussex
RH6 OYR

Tel: 01293-573134
E-mail: aircraft.systems@srg.caa.co.uk

This Circular is issued for information, guidance and necessary action.