Safety and Airspace Regulation

Ministry of Defence

Civil Aviation Authority

Operation of IFF/SSR interrogators in the UK: Planning principles and procedures

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Foreword

This document defines the agreed authorities, regulations, functions, procedures and principles that apply when considering the applications for Secondary Surveillance Interrogator approval in the United Kingdom. The National IFF/SSR Policy Board, set-up jointly by the Safety and Airspace Regulation Group (SARG) and the Ministry of Defence (MOD) on behalf of the Cabinet Office, sponsor this document. Any queries concerning this document should be addressed to the Secretariat, at the details provided in Annex C.

Abbreviations

ACAS	Assistant Chief of the Air Staff or Airborne Collision Avoidance System
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
ANO	Air Navigation Order
ATC	Air Traffic Control
ATS	Air Traffic Service
ATM	Air Traffic Management
ATSU	Air Traffic Service Unit
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CWS	Collision Warning System
DE&S	Defence Equipment & Support
DISC	Defence IFF/SSR Committee
DSM	Defence Spectrum Management
EASA	European Aviation Safety Agency
FIR	Flight Information Region
FRUIT	False Returns Unsynchronised in Time
Hz	Hertz
ICAO	International Civil Aviation Organisation
IFF	Identification Friend or Foe
ISR	Intelligence, Surveillance and Reconnaissance
JTEPS	Joint Tactical Exercise Planning Staff

MHz	Megahertz
MICA	Mode S Interrogator Code Allocation (Cell)
MIP	Mode Interlace Pattern
MOD	Ministry of Defence
Mode S	Mode Select
MOR	Mandatory Occurrence Report
NATO	North Atlantic Treaty Organisation
NISC	National IFF/SSR Committee
OFCOM	Office of Communications
PRF	Pulse Repetition Frequency
RF	Radio Frequency
RMU	Radar Measurement Unit
SAC	System Area Code
SARG	Safety and Airspace Regulation Group
SARPS	ICAO Standards and Recommended Practices
SIC	System Identifier Code
SIEM	SSR/IFF Environment Model
SSR	Secondary Surveillance Radar
STANAG	NATO Standardisation Agreement
T & D	Test and Development
ToRs	Terms of Reference
TRD	Test, Research and Development
UIR	Upper Airspace Information Region
UK SSC	UK Spectrum Strategy Committee

References

1. UK IAIP, Part 2 – En Route (ENR), 1-6-2.

2. ICAO Annex 10 – Aeronautical Communications, Vol IV.

3. Radar Surveillance in En-Route Airspace and Major Terminal Areas – Eurocontrol Standard Document, reference – SUR.ET1.1000-STD-01-01, Edition 1 dated March 1997.

4. NATO STANAG 4193 Parts I to VI.

5. Mode S IC Allocation Process (latest version), Eurocontrol.

6. European Mode S (EMS) Station Functional Specification SUR/ModeS/SPE-01 Edition 3.11 dated 9 May 05 (or latest version).

7. AIC 37/2006 (Yellow 199) TCAS I Systems Approvals Policy.

8. Commission Regulation (EC) No 262/2009 for the coordinated allocation and use of Mode S interrogator codes for the single European Sky.

9. Commission Regulation (EU) 1207/2011 and amendment (EU) 1028/2014 for the performance and the interoperability for the single European Sky.

Revision history

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Change of contact point in cases of loss of detection.

Chapter 1

General

Introduction

1.1 The increasing use of Identification Friend or Foe (IFF)/Secondary Surveillance Radar (SSR) systems for both civil and military applications has meant that there is a serious risk of mutual interference from the uncoordinated installation and operation of interrogators. If such installations are not carefully controlled, their operation could have potentially adverse implications for system integrity and hence flight safety.

1.2 To minimise the risk and to secure optimum efficiency for secondary surveillance in its air defence, air traffic radar service and airspace management roles, it is necessary to exercise control over all interrogator installations regardless of whether they are static or mobile and operated on land, sea or in the air for whatever function.

Aim

1.3 All equipment capable of transmitting in the 1030MHz band is required to hold an approval issued by the National IFF/SSR Committee (NISC) Secretariat. The aim of this document is to set out application procedures and the basic planning principles that will be applied before approval of any new interrogator installation or changes to an existing approved interrogator installation.

Priorities

1.4 In applying the planning principles of this document, where conflicting operating requirements cannot be reconciled to satisfy fully the needs of all users, priority will generally be assigned in the following order:

1) **Peacetime situation:**
   a) Air Traffic Services (ATS) requirements.
   b) Other civil and military requirements.
2) **Crisis, tension and war situations:**
   a) Air Defence requirements.
   b) ATS requirements.
   c) Other requirements.

1.5 The environmental benefits of using Mode S interrogators for both civil and military ATS applications are fully recognised by the NISC. Consequently, under Schedule 5 of the Air Navigation Order (ANO) 2009 and European Commission regulation EC 262/2009 the carriage of Mode S transponders for the majority of aircraft operating in designated airspace is mandated[1]. The environmental benefits are only realised fully with widespread Mode S equipage of ground interrogators and airborne transponders. Therefore, the NISC no longer issue approvals for ground-based (including maritime) or airborne[2] IFF/SSR Mode A/C interrogators.

Applicability

1.6 Applications for approval to operate apply to all civil and military, UK based or visiting, secondary surveillance interrogators[3] transmitting within the UK Flight Information Region/Upper Airspace Information Region (UK FIR/UIR).

1.7 Transponders, including those capable of acquisition or extended squitter, do not require approval to operate providing they comply with the requirements of Annex 10 to the Convention on International Civil Aviation Volume IV, or STANAG 4193, as appropriate.

1 For further information refer to AIP GEN 1-5-3 paragraph 1.3 'Carriage of SSR Transponders'.

2 Airborne in this context refers to military ISR platforms used for surveillance in the UK FIR/UIR. Mindful of the RF footprint of IFF interrogator equipped combat aircraft, the NISC will review the Mode S requirements for these on a platform-by-platform basis.

3 Interrogator as defined in Section 3, paragraph 2.

1.8 Equipment capable of unsolicited transmissions on 1090MHz, excluding transponders as defined above, shall not be operated without informing the NISC.

Chapter 2

IFF/SSR management structure

Introduction

2.1 The purpose of this section is to describe the authority under which policy and approval decisions relating to the IFF/SSR frequency bands are made. This section will detail the individuals or agencies and their responsibilities within this structure. See diagram at paragraph 6.

National IFF/SSR policy board

2.2 The Cabinet Office sponsored National Frequency Planning Group has delegated authority for frequency assignments in the Band 960 - 1215MHz jointly to the Ministry of Defence (MOD) and the Safety and Airspace Regulation Group SARG. In respect of the 1030 and 1090MHz sub-bands (IFF/SSR), MOD and SARG have established a National IFF/SSR Policy Board to manage this delegated authority. The Policy Board reports to the Cabinet Office committee on spectrum strategy, the UK Spectrum Strategy Committee (UK SSC).

2.3 The Director SARG and the Assistant Chief of the Air Staff (ACAS MOD) jointly chair the National IFF/SSR Policy Board. The membership also consists of representatives from Defence Equipment & Support (DE&S), NATS and OFCOM. Terms of Reference for the Board are maintained by the NISC Secretariat.

2.4 The Policy Board does not generally meet unless there is a policy issue that cannot be resolved in the subordinate committee.

National IFF/SSR Committee

2.5 Executive authority for IFF/SSR matters is vested in the National IFF/SSR Committee (NISC), which is subordinate to the Policy Board. It meets at least twice a year to review policy and planning matters.

2.6 The Committee is chaired by the CAA's Manager Infrastructure and comprises representatives from NATS, CAA, DE&S, Defence Airspace and Air Traffic Management, Royal Navy (RN), Royal Air Force (RAF), MOD Defence Spectrum Management (DSM) and QinetiQ Ltd. The Army can send representatives if they see fit.

2.7 The NISC membership and ToRs are at Annex A.

NISC Secretariat

2.8 The NISC Secretariat is responsible for the day-to-day management of NISC policy. This work includes the assessment and processing of IFF/SSR applications for approval, technical studies and compliance monitoring.

2.9 The Infrastructure section, SARG staffs the Secretariat, with the Frequency Management Specialist post fulfilling the role of Secretary to the NISC. The contact details of the Secretariat are at Annex B.

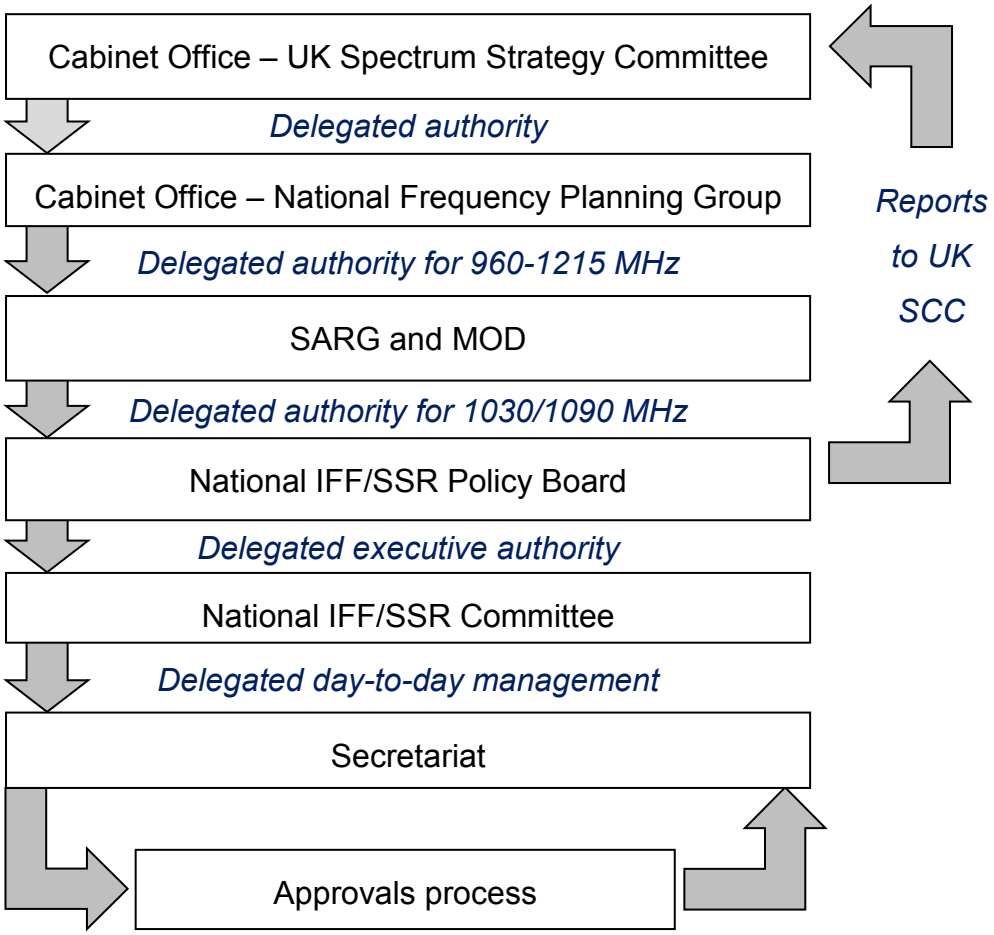
Defence IFF/SSR Committee

2.10 The Defence IFF/SSR Committee (DISC) is the MOD body responsible for the co- ordination of military policy for the use of IFF systems in the IFF/SSR spectrum.

2.11 Although the DISC is responsible for the co-ordination of military IFF policy, it has no authority to approve the use of any systems in the IFF/SSR frequency bands.

2.12 The Chairman and Secretary of the DISC are both members of the NISC.

IFF/SSR management structure diagram



Chapter 3

Overview of approval cycle

Introduction

3.1 The purpose of this section is to detail what types of systems require approval, how approvals are administered and monitored and the principles that should be used for the planning of interrogators.

Definition

3.2 For the purpose of this document, the generic term ‘interrogator’ shall be applied to all equipment capable of transmitting in the 1030MHz frequency band. This includes Airborne Collision Avoidance Systems (ACAS), some Collision Warning Systems (CWS) and Non-Passive Multilateration Systems.

3.3 All civil interrogators shall comply with the standards and recommendations of Annex 10 to the Convention on International Civil Aviation Volume IV, unless specifically stated otherwise within this document.

Application

3.4 Applications for approval to operate all IFF/SSR interrogators must be submitted on the appropriate forms at Annexes D to E. No applications are necessary for ICAO SARPS compliant ACAS II equipment, which have a generic clearance. However, all other CWS in the 1030MHz band, including ACAS I[4], require approval and these applications should be submitted on the form at Annex F. The routing of applications is as follows:

[4] Except for those ACAS I equipment listed in Annex J.

- **Military**. Applications shall be forwarded to the Secretariat through the single service co-ordinator as at Annex I. Foreign military formations wishing to operate IFF/SSR within the UK FIRs are to submit applications in the first instance to MOD DSM or through the appropriate Exercise Sponsor. For example applications for Joint Warrior should be submitted through Joint Tactical Exercise Planning Staff (JTEPS).

NOTE: Planners of military exercises should ensure that there is full prior co- ordination with the Secretariat during the planning phase.

- **Civil.** Applications for civil interrogators, where they are in support of the provision of ATS, shall be made in conjunction with the application for approval of ATS equipment, which is submitted to the Air Traffic Management Division (ATM) of SARG. In addition, an application for a Wireless Telegraphy Act Licence should be submitted to the Radio Licensing Section of SARG.
- **ACAS (ACAS I/CWS)**. Applications for ACAS approvals should be made in conjunction with the application for airworthiness approval. The ACAS I installation airworthiness approval process varies dependent on whether the aircraft falls under EASA or the CAA. Further details are available under the Modifications and Repairs heading of the Continuing Airworthiness & Maintenance section of the CAA website (www.caa.co.uk/Commercial-industry/Aircraft/Airworthiness/Aircraft-equipment/Aircraft-equipment/).

Mode S interrogator codes

3.5 Mode S Interrogator Code (IC) allocations are co-ordinated centrally by the Mode S IC Allocation (MICA) Cell within Eurocontrol. In accordance with Commission Regulation 262/2009 fixed civil Mode S interrogators will be required to be capable of locking-out replies to their All Call interrogations using an allocated IC code. The Secretariat acts as the UK Focal Point for this process. Applications for ICs should be submitted on

the application form contained within the Eurocontrol MODE S Interrogator Code Allocation Process.

Interrogator SAC/SIC codes

3.6 Operators wishing to exchange/transmit unambiguous data in ASTERIX format from any primary or secondary surveillance source must be allocated a unique identifier composed of two values known as the System Area Code (SAC) and System Identifier Code (SIC). These codes are managed and issued by the NISC Secretariat. Applications for SAC/SIC codes are to be presented to the NISC Secretariat by letter or e-mail. Further details on SAC/SIC and ASTERIX can be found on the EUROCONTROL ASTERIX website (www.eurocontrol.int/asterix).

Test and development

3.7 Applications for test and development interrogators are to be submitted direct to the Secretariat on the appropriate form, at Annex C to E.

Application period

3.8 The Secretariat requires at least 4 months' notice of any proposed interrogator installation, or changes to an existing approved installation, in order to assess the effect of the new equipment or changes on the current IFF/SSR environment. In exceptional circumstances, emergency approval may be given where 4 months prior notification is not possible. Applicants should note that there is a six- month cycle for Mode S Interrogator Code allocation. Approval for a test model or prototype does not imply consent for the finished model. Therefore, submission of a further application for the final system is required before it can be approved for operational use.

ATS approval

3.9 It must be noted that National IFF/SSR Policy Board approval to operate an interrogator does not imply approval to use the data for ATS purposes. The authority for this approval is vested in SARG and covered under CAP 670.

Compliance monitoring

3.10 The Secretariat will conduct compliance monitoring periodically to verify that interrogators are operated in accordance with the conditions set out in their approval. This verification forms an essential part of the approvals process as it helps to validate the 1030/1090MHz RF environment.

Interference or loss of detection reporting and investigation

3.11 The maintenance of the integrity of the IFF/SSR RF environment is dependent on the ability of interrogators to operate free from interference from other sources. The NISC approvals process ensures that the risk of mutual interference between IFF/SSR systems is minimized. However, the prevention of interference from other systems is outside the control of the NISC. In order to investigate occurrences of interference to IFF/SSR systems in an expeditious and efficient manner, it is essential that the Secretariat be given access to the details of any interference at the earliest opportunity. Steps can then be taken to identify the source of the interference and prevent re-occurrence. Consequently, it is a condition of any approval that the operator reports incidents of interference This reporting scheme is in addition to existing processes such as Mandatory Occurrence Reports (MORs) which may not necessarily seek the assistance of the Secretariat.

3.12 Interference or Loss of Detection should be reported either via email or on a DAP1913 to the NISC as a matter of urgency: Emails to vikas.dangi@caa.co.uk or nisc@caa.co.uk, telephone 020 7453 6536 or 020 7453 6530. The form DAP1913 which can be found on the CAA website can be used to assist in this process.

3.13 The secretariat will use its best efforts to assist in the resolution of any issue.

Principles for the planning of interrogators

3.14 The guidelines given in ICAO Annex 10 to the Convention on International Civil Aviation, at Reference B, and NATO Standardisation Agreement (STANAG) 4193, at Reference D, concerning interrogator planning, installation and operation, will be taken into consideration. Additionally, since secondary surveillance cover already exists over much of the United Kingdom, the Board will apply the following principles:

- The requirement for secondary surveillance information at a particular location does not automatically establish a need for a secondary surveillance interrogator at that location. Wherever technically possible and operationally acceptable, data should be obtained from existing SSR sensors. Advice may be obtained from the Secretariat.
- If the provision of secondary surveillance information cannot be made available from existing sensors, any proposed new interrogator should be sited so as to enhance or contribute further to national area coverage as far as possible. It should also be capable of exporting SSR data to adjacent Air Traffic Service Units (ATSUs).
- Interrogation rates and power shall be limited to that necessary to meet the operational requirement and shall use side-lobe suppression, where possible. Although the applicant may have a preferred Pulse Repetition Frequency (PRF), the actual PRF will be discussed and agreed with the Secretariat as part of the approval process, and will be added to the National PRF Plan.
- Interrogators must comply with the National PRF Plan and wherever possible a staggered PRF should be adopted to reduce mutual interference between users.

Approval period

Permanent approvals

3.15 Permanent approvals are normally issued for 5 years.

Temporary approvals

3.16 Temporary approvals will only be issued for the period during which they are intended to be operational. Generally this will not exceed 1 year.

Renewals

3.17 Permanent approvals require review prior to renewal. Requests to renew approval of interrogators may be submitted by letter or e-mail provided that none of the technical or operational details of the system has changed from the extant approval. If, however, a change to the technical or operational details is required, applicants are to reapply using the appropriate application form at least 60 days in advance of the expiry of the extant approval. Applicants should note that the Board has the authority to revoke an approval should it be found that the interrogator is causing an unacceptable deterioration of the IFF/SSR environment. Furthermore, SARG has the authority to revoke a civil operational approval. Should the requirement for an interrogator, for which an approval has already been granted cease to exist then the Secretariat must be informed.

Modifications

3.18 Applicants are required to submit a new application prior to making any significant changes or modifications to the interrogator system. In this context, a significant change is defined as any of the operational or technical details listed on the application form.

Additional interrogator information

Antenna patterns

3.19 Antenna patterns in both azimuth and elevation shall be supplied that clearly indicate the characteristics of the antenna type employed. These shall include the gain compared to a standard calibrated antenna. The pattern will be dealt with as ‘Commercial in Confidence’.

SSR monitors

3.20 Applicants shall provide details of any SSR ground-based monitors and transponders associated with the interrogator equipment for which application is being made. Details should include position and the pre-set Mode C response, which should indicate a negative or false level that would be above an aircraft's reasonable operating height. The IFF/SSR Mode 3/A code is to be set to 7776 or 7777 in accordance with the UK SSR Code Assignment Plan as published in Reference A. For Mode S radar, the applicant shall also supply the unique ICAO 24-bit Addresses of the monitors[5]. In addition, where ground-based transponders have the capability to squitter, applicants will be instructed to disable this functionality unless they are an integral part of a passive squitter based surveillance system.

Unsolicited 1090MHz transmissions

3.21 The Secretariat requires written notice of the intention to operate any equipment, other than a Mode S transponder, which transmits 1090MHz signals other than those initiated by a 1030MHz interrogation signal. The Secretariat will not issue an approval to transmit for these equipments, nor does it intend to impose operational restrictions. However, records of the equipment deployment will be retained in order that they can be included in any RF environment modelling. If the cumulative effect of these types of equipment is found to have a detrimental effect on the RF environment at some point in the future, it may be necessary to impose approval procedures or restrictions on use.

5 Requests for ICAO 24-bit Addresses for site monitors should be sent to the Secretariat at the address detailed at Annex C.

Security

3.22 The Secretariat is staffed to handle and store information up to and including SECRET. Where necessary approval documents can be annotated to withhold sensitive information.

Further information

3.23 Should applicants need further information on other related IFF/SSR issues, they should seek advice from the Secretariat in the first instance. Military applicants needing additional details concerning specific issues, such as any requirement to conduct specific IFF jamming exercises and trials, or procedures regarding visiting military forces or general Mode 4 operations, should refer to the appropriate single service point of contact.

Chapter 4

Rationale for approval

Introduction

4.1 It is essential that applications be assessed in an equitable, logical and consistent manner. The purpose of this Section is to provide an insight into the IFF/SSR approvals process so that applicants have an understanding of the way in which applications are processed. In addition, the Section describes problems that can occur within the IFF/SSR environment that can affect system performance.

4.2 Furthermore the key parameters that enable an assessment of system performance are identified, together with a description of the various tools and techniques that are used in the assessment of applications.

IFF/SSR environment problems

4.3 The main problems that can occur in the IFF/SSR environment are as follows:

- **Synchronous Interference.** Synchronous interference may occur where two interrogators with overlapping cover are operating with PRFs that are extremely close together, typically within 1 Hz, and unstaggered. This may lead to one interrogator being repeatedly denied replies from a transponder because of the synchronous interrogations from another interrogator. In addition, replies to one interrogator may appear to correlate in range when received by another interrogator, and may produce false plots.
- **Transponder Capture.** In line with Commission Implementing Regulation 1207/2011 Article 6 -2 transponder occupancy shall not exceed rates specified in Annex 10 to the Chicago Convention Volume IV fourth edition.

- Transponder capture, such that the transponder is prevented from replying to an interrogation, can occur as a result of a number of interference effects, including the following:
  - The transponder is busy replying to interrogations from another interrogator.
  - The transponder is suppressed by side-lobe interrogations from another interrogator.
  - The interrogation is interfered with by transmissions from another interrogator.
- **Loss of wanted signals.** Other factors that may affect a transponders ability to respond include:
  - The transponder's reply rate is being limited by overload controls.
  - The transponder is being suppressed by some other on-board system.
  - The transponder is making an unsolicited reply (squitter).

4.4 As a result of these effects, the transponder's availability (i.e. the ability to make a reply to a particular interrogator) will deteriorate as more interrogations from other systems are present in the environment. As transponder availability decreases, the probability that an interrogator will be able to trigger sufficient replies from the transponder for the aircraft to be recognised will also decrease. The effects will be worst for targets where the interrogator is operating at the edge of cover where only a limited number of interrogations in the antenna beam are above the link margin.

- **FRUIT.** False Returns Unsynchronised In Time (FRUIT) replies are unwanted replies received by an interrogator from transponders triggered by other interrogators and may be received in the antenna main beam or side-lobes. Such replies, if they are received at the same time as a wanted reply, will degrade detection in various ways, depending on the characteristics of the FRUIT signals in relation to the wanted reply and the capabilities of the reply decoder design. Inevitably, some of the wanted signals that an interrogator triggers

from a transponder will fail to be detected or will be corrupted by the presence of FRUIT. The amount of FRUIT will depend on the distribution of the aircraft in the environment and the number of interrogations replied to by each aircraft. Consequently, FRUIT replies will generally increase in proportion to the number of aircraft in the environment and the number of interrogators.

- **Mode S IC Conflicts.** Mode S ICs are used to lockout replies from transponders to All-Call interrogations, thereby reducing FRUIT levels. Consequently, re-use of an IC within overlapping coverage may induce a situation in which one of the interrogators would not see an aircraft locked-out by the other interrogator. Such IC conflicts should be avoided. Implementing Rule 262/2009 Article 7 details contingency requirements for ANSP's should this occur.
- **Non-Recognised Transponder Replies.** Systems that employ transponders that produce reply waveforms that are not recognised by civil SSR systems will present special problems. Such systems will generally require detailed qualification, testing and verification, so that the impact of their eventual introduction into the IFF/SSR environment can be fully quantified.

Tools and techniques

4.5 Tools and techniques are available to enable an assessment to be made of the likely impact that the introduction of a new or modified interrogator will have on the IFF/SSR environment. These also provide a means of managing that environment such that possible interference effects are minimised. Principally they are as follows:

- **National PRF Plan.** The National PRF Plan is maintained and updated by the Secretariat. It includes details of all interrogators for which IFF/SSR approval has been given including their location and operating PRF. By maintaining such a plan it is possible to ensure that PRFs are allocated in a manner that ensures that the possibility of synchronous interference between interrogators is minimised and

that the recommendations of References B and C are met. Wherever possible, all new applications are allocated the PRF that has been requested. However, if it is outside the allowable range or is considered to be inappropriate for the stated task, then the PRF requirements are discussed with the applicant in order to find and agree a suitable alternative.

- **SIEM.** The SSR/IFF Environment Model (SIEM) is a computer-based model that is used to assess the possible mutual interference effects of existing civil and military IFF/SSR systems. The model processes scenarios, detailing interrogators and transponders assumed to be operating in the environment, in order to produce statistical output quantifying the interference effects. The input scenarios detail the following:
  - Antenna beam patterns (main beam and control).
  - Interrogator equipment operating characteristics.
  - Interrogator locations (including airborne interrogators).
  - Transponder characteristics (various types and modes).
  - Aircraft locations (static snapshot).

4.6 The principal statistical outputs from the SIEM are as follows:

- Interrogation rates.
- Transponder availability.
- FRUIT rates.
- Reply decoding.
- Plot detection.
- **Bench testing.** Bench testing and/or field trials are not normally necessary when assessing applications involving operations on any of the currently approved systems or modes of operation. However the introduction of new systems using modes of operation for which there is no previous approval, may require sufficient testing to have been carried out to determine their likely impact on the current environment before an approval can be recommended.

Approval decisions

4.7 All applications are assessed in the same manner and with the intention, wherever possible, of permitting operation in line with that requested. However there are occasions where this is not immediately possible and where some discussion with applicants is required in order to agree suitable alternative operating conditions. For all but the simplest of systems, use may be made of the SIEM in determining those areas in the environment where the impact of a new system is most significant in terms of reduction in transponder availability and loss of plot detection to existing interrogators.

4.8 Completeness and Accuracy. The application form is scrutinized to ensure that all required technical details have been submitted. In addition, a check is made to establish whether it is possible to complete the assessment before the requested start date (Section 3, paragraph 3 – Application Period). If it is not, the applicant will be notified as soon as practicable. Where possible physical location of the proposed interrogator will be checked for consistency.

4.9 Where it is likely to affect the number and type of interrogations, it is essential that the applicant provide as much information as possible on the interrogator control system. For typical fixed site ‘turn and burn’ systems this will not normally be necessary. However, for interrogators that employ target specific interrogation, the following information will be required:

- Whether acquisition is manual, auto target specific or both.
- The criteria that are applied when selecting targets to be interrogated (e.g. proximity, bearing, speed and threat assessment).
- Re-interrogation criteria, where applicable.

4.10 Where the Secretariat does not already hold full technical details of the interrogator antenna, the applicant will be required to provide this information. This will normally be required in the form of horizontal and vertical radiation patterns.

4.11 Validation of Operational Requirement. The Secretariat will assess whether the requested coverage volume is compatible with the technical details provided, i.e., whether the transmitter power is suitable to meet the operational range. Radiated power will need to be sufficient to meet the required field strength within the service volume in accordance with ICAO Annex 10, but should not be excessive as this detrimental to the RF environment.

4.12 Calculations will be conducted to ensure that potential targets are not under or over interrogated. This is calculated from the details provided on preferred PRF, Mode Interlace Pattern (MIP), Scan Rate, required DAPS, roll-call rate and Antenna Beamwidth.

4.13 Interrogation modes are compared against the operational requirement with the aim of ensuring that interrogations are only made on those modes that are needed. For peacetime operations, unnecessary interrogations in Mode 3/A, C and/or S are undesirable. Modes and transmission formats other than those currently approved may require additional information and/or evidence of testing to be provided for use in assessing the application.

4.14 Operational aspects considered include the area of deployment and the modes of operation of the system for which approval is being sought. This particularly concerns non-standard systems. Factors to be taken into account include the location and number of interrogators planned, hours and frequency of operation and the proximity of airways or other areas of significant aerial activity.

4.15 Environmental Aspects. The requested PRF is checked against the National PRF Plan to determine whether it, or one of its harmonics, is already in use elsewhere. If so an alternative may have to be proposed (Section 4, paragraph 2 – Synchronous Interference). Use of stagger is highly desirable, as this helps to mitigate the effects of synchronous interference. It is preferred that, where possible, Stagger is set in the order of +/-5% in order to reduce the effects of synchronous interference.

4.16 The Secretariat will assess the likely impact that the introduction of the interrogator would have on the IFF/SSR environment and, in particular, on transponder availability, mutual interference and FRUIT rates. This is a function of many of the items already considered above, including the operating PRF, radiated power and modes of interrogation. However it is essential to ensure that in the overall environment, there are no areas where the effects of interference on the performance of any existing interrogator will be unacceptably impaired.

4.17 Mode S. For Mode S interrogators, additional steps are required to minimise FRUIT generated as a result of All-Call interrogations. This is managed through the use of interrogator code (IC) allocation and various acquisition techniques. The Secretariat requires details of the parameter configuration for each interrogator to ensure that they do not adversely affect the environment or the performance of neighbouring interrogators.

4.18 The allocation of ICs is co-ordinated by the MICA Cell, through a six-month allocation cycle; see MODE S IC ALLOCATION PROCESS. Therefore, timely submission of Mode S applications and associated IC applications is essential. Due to the paucity of available ICs and the large number of interrogators located throughout Europe, it is possible that any approval issued may impose coverage restrictions. Therefore, it is strongly recommended that interrogators meet the European Mode S (EMS) station functional specification, and are capable of Coverage Map functionality and Cluster[6] capability. Those Mode S ground stations that are not Coverage Map and Cluster capable may face significant operational restrictions. Furthermore, it must be noted that allocation of a single IC for an interrogator is not guaranteed for the lifetime of the interrogator. It may be necessary to change the allocated IC in order to meet future demands for ICs through re-optimisation.

NOTE: Guidance for applicants can be found at Annex F.

6 Mode S fixed ground interrogators have the capability of being networked into functional groups known as ‘clusters’. By this means, greater efficiency of IC allocation can be achieved. Consequently, use of clustering is considered desirable. Further details are given in the MODE S IC ALLOCATION PROCESS.

Annex A

National IFF/SSR committee

National IFF/SSR committee membership

CAA

DAATM MOD

NATS

APS IDENT

RN

DSM

National IFF/SSR committee terms of reference

Introduction

The aim of the National IFF/SSR Committee is to secure optimum efficiency for secondary radar in its air traffic radar service, airspace management, air defence and other military roles, by minimising the risk of mutual interference between interrogators through the exercising of frequency clearance control of IFF and SSR installations and their RF emissions throughout the United Kingdom, on behalf of the National IFF/SSR Policy Board.

Role

The role of the National IFF/SSR Committee is to ensure, with the aid of the Secretariat, the day-to-day integrity of the IFF/SSR environment is maintained thereby ensuring that civil and military requirements are effectively met.

Specific responsibilities

Specifically, the National IFF/SSR Committee is to:

1. examine and resolve, within its competence, all technical proposals, problems and incompatibilities stemming from planned changes to

IFF/SSR systems and the proposed introduction of new systems into the RF environment;

2. through its Secretariat, apprise itself of, and where necessary, co-ordinate policy and procedural matters affecting UK interests for presentation or discussion at international meetings, or arising from correspondence with international bodies;

3. maintain a close liaison with those agencies responsible for current and alternative identification systems, and be satisfied that proposals are not in conflict with agreed National Policy. The Committee is to bring any incompatibilities to the notice of the Policy Board;

4. maintain a close liaison with those agencies responsible for future secondary radar systems;

5. assist and advise appropriate UK Authorities, including UK operating Authorities, on the interpretation of declared UK policy affecting their activities, acting through its constituent members;

6. the authority of the Committee to rule on non-contentious matters lies within the collective responsibility of its corporate members. Rulings on matters that cannot be resolved in Committee must be sought through the Policy Board;

7. members are to ensure that their views expressed in Committee have been fully co-ordinated with all interested agencies in the respective departments. They are also to ensure that decisions affecting their respective departments are fully disseminated.

Annex B

NISC Secretariat

1. Secretariat membership

Head of Infrastructure	CAA (SARG)
Desk Officer – Infrastructure	CAA
Secretary – Infrastructure	CAA SARG

2. Contact details of Secretariat

Address: Secretariat
National IFF/SSR Committee Surveillance and Spectrum Management
Safety and Airspace Regulation Group
Civil Aviation Authority
2W, Aviation House
Gatwick Airport South
West Sussex
RH6 0YR

Telephone: +44 (0) 20 7453 6536 (t)

Email: General – nisc@caa.co.uk
Secretary – vikas.dangi@caa.co.uk

NOTE: All correspondence and applications should be addressed to the Secretary. New applications require a signature and may be faxed, posted or scanned and e-mailed. Requests to renew approval for interrogators may be submitted by letter or e-mail provided that none of the technical details of the system have changed from extant approval.

Annex C

Application to operate a secondary surveillance interrogator in the UK – ground based platform

INTENTIONALLY LEFT

DAP1910

Please note a form is no longer required for a renewal if the technical details have not changed and the current approval is less than three months expired. An email to nisc@caa.co.uk, confirming that the technical details have not changed will suffice.

Application to Operate a Secondary Surveillance Interrogator in the United Kingdom – Ground Based Platform

National IFF/SSR Policy Board

Civil Aviation Authority

1. Application Summary

◯ New Application ◯ Amendment

Interrogator Name

Operating Start Date | End Date | Purpose

Operating Organisation ◯ Civil ◯ Military

2. Applicant Details

Title	First Name	Last Name	
Job Title		Company	
Address		Postcode	
		Country	United Kingdom
		Email	
		Fax	
		Phone	

3. Interrogator Details

Can the operational requirement be met by a feed from an existing interrogator? ◯ Yes ◯ No

Location ° ' " North ° ' " ◯ East ◯ West

Maximum Range Required (NM)		Scan Rate (RPM)	
Peak Output Power (dBW)		Estimated Cable Loss (dB)	
Site Elevation (amsl) (m)		Stagger Type	
Antenna Height (agl) (m)		Interrogation Type	1

Additional Remarks

Interrogator Patterns | Add Pattern

	Pattern	PRF (Hz)	Stagger (+/- %)
X			

4. Equipment Details

Manufacturer | Model | SLS Type

5. Antenna Details

Manufacturer | Model

Please note that if the equipment / antenna has not been used in the UK FIR before, you may be contacted for further details.

6. Mode S

Functionality

☐ ELS Only

EHS BDS registers:

☐ 4,0 ☐ 5,0 ☐ 6,0

Mode 3/A and C interrogations are to include a short P4 pulse. If your interrogator does not comply with this requirement, please explain why:

A P5 pulse is to be transmitted during UF=11 interrogations. If your interrogator does not comply with this requirement, please explain why:

Site Monitor A

Name | Flight Level

Location ° ' " North

° ' " ◯ E ◯ W

24 Bit Address (Hex)

Site Monitor B

Name | Flight Level

Location ° ' " North

° ' " ◯ E ◯ W

24 Bit Address (Hex)

Note: For new applications with Mode S compliant site monitors, the ICAO 24-bit allocation will be assigned as part of the approval process and included on the certificate.

7. Emergency Shutdown Details

Name | Phone

8. Consent Details

☐ By ticking this box and submitting this form you undertake to operate this interrogator only under the conditions laid down by the National IFF/SSR Policy Board, and confirm that before making any proposed change to the technical or operating characteristics of the system, a new application must be submitted and approved.

NOTE 1: All civil interrogators shall comply with the standards and recommendations of Annex 10 to the Convention on International Civil Aviation Volume IV, unless specifically stated otherwise within this document.

NOTE 2: Any equipment that emits signals in the 1030/90 MHz band, excluding ICAO SARPS and NATO STANAG compliant transponders.

(Submission button will appear when you have given consent) ***[Submit by Email]*** Print Form

When the application is processed, you will receive a flat copy of the submitted form for your records.

Annex D

Application to operate a secondary surveillance interrogator in the UK – marine or airborne platform

INTENTIONALLY LEFT

DAP1911

Please note a form is no longer required for a renewal if the technical details have not changed and the current approval is less than three months expired. An email to nisc@caa.co.uk, confirming that the technical details have not changed will suffice.

Application to Operate a Secondary Surveillance Interrogator in the United Kingdom – Airborne or Maritime Based Platform

National IFF/SSR Policy Board

1. Application Summary

◯ New Application ◯ Amendment

Unique Platform Name

Operating Start Date | End Date | Purpose

Operating Organisation

2. Applicant Details

Title	First Name	Last Name	
Job Title		Company	
Address		Postcode	
		Country	United Kingdom
		Email	
		Fax	
		Phone	

3. Interrogator Details

Can the operational requirement be met by a feed from an existing interrogator? ◯ Yes ◯ No

Operating Area

Maximum Range Required (NM)		Scan Rate (RPM)	
Peak Output Power (dBW)		Estimated Cable Loss (dB)	
		Stagger Type	
Antenna Height (m)		Interrogation Type	1

Additional Remarks

Interrogator Patterns

Add Pattern

	Pattern	PRF (Hz)	Stagger (+/- %)
X			

4. Equipment Details

Manufacturer | Model | SLS Type

5. Antenna Details

Manufacturer | Model

Please note that if the equipment / antenna has not been used in the UK FIR before, you may be contacted for further details.

6. Mode S

Functionality

☐ ELS Only

EHS BDS registers:

☐ 4,0 ☐ 5,0 ☐ 6,0

Mode 3/A and C interrogations are to include a short P4 pulse. If your interrogator does not comply with this requirement, please explain why:

A P5 pulse is to be transmitted during UF=11 interrogations. If your interrogator does not comply with this requirement, please explain why:

7. Emergency Shutdown Details

Name | Phone

8. Consent Details

☐ By ticking this box and submitting this form you undertake to operate this interrogator only under the conditions laid down by the National IFF/SSR Policy Board, and confirm that before making any proposed change to the technical or operating characteristics of the system, a new application must be submitted and approved.

NOTE 1: All civil interrogators shall comply with the standards and recommendations of Annex 10 to the Convention on International Civil Aviation Volume IV, unless specifically stated otherwise within this document.

NOTE 2: Any equipment that emits signals in the 1030/90 MHz band, excluding ICAO SARPS and NATO STANAG compliant transponders.

(Submission button will appear when you have given consent) ***[Submit by Email]*** Print Form

When the application is processed, you will receive a flat copy of the submitted form for your records.

Annex E

Application to operate ACAS (TCAS) within the United Kingdom

INTENTIONALLY LEFT

Application to Operate ACAS (TCAS) within the United Kingdom

Civil Aviation Authority

National IFF/SSR Policy Board

1. GENERAL DETAILS

Aircraft Registration/Tail Number:
Name of Organisation/Individual:
Address: Post Code:
Cease Transmission Name: Cease Transmission Tel:

2. OPERATIONAL DETAILS

PERMANENT / TEMPORARY*	FIXED / ROTARY*
Airfield (Normally) Operated From:	
Dates of Operation, from:	to:
Interrogator is for CONTINUOUS / OCCASIONAL* use (for Occasional please provide times)	Times of Operation, between: and:
Purpose: EMERGENCY SERVICES / COMMERCIAL / PRIVATE / LOW LEVEL AERIAL WORK / OTHER*	
Details of Other Purpose:	
Application is for a NEW / AMENDMENT TO / RENEWAL OF* an ACAS approval Previous certificate number (if applicable):	

3. TECHNICAL DETAILS (NOTE 2)

Aircraft

Aircraft Manufacturer:	Model/Type:

ACAS

ACAS Equipment Manufacturer:	Model/Type:
Peak Output Power: dBW	Estimated Cable Loss: dB

Transponder

Transponder Equipment Manufacturer: Model/Type:

Antenna

Antenna Manufacturer: Model:
Are the Antenna Horizontal and Vertical Radiation Pattern attached? YES / NO*

Mode S

Does the ACAS equipment make Mode S interrogations? YES / NO*
Is the Transponder equipment Mode S? YES / NO*
Mode S ICAO 24-bit address: (hex)

4. CONSENT DETAILS

We hereby undertake to operate this interrogator only under the conditions laid down by the National IFF/SSR Policy Board, and confirm that any proposed change to the technical or operating characteristics of the system will be notified immediately.

Signed	Date:
Name:	For and on behalf of:
Telephone:	E-mail:

*Delete as appropriate

NOTE 1: All civil interrogators shall comply with the standards and recommendations of Annex 10 to the Convention on International Civil Aviation Volume IV, unless specifically stated otherwise within this document.

NOTE 2: ACAS II (TCAS II) equipment compliant with ICAO SARPS and those ACAS I (TCAS I) equipments listed in Annex J to CAP 761, have a generic approval and individual application is not necessary.

Annex F

Guidance information for applicants

Introduction

The assessment of all applications for IFF/SSR Approvals is aimed at ensuring that for the introduction of any new system or interrogator:

- any consequent reduction in transponder availability is minimised such that there is no noticeable degradation to existing services;
- any possibility of mutual interference between systems or interrogators is minimised;
- any interference suffered by systems due to increased FRUIT levels is minimised. To ensure that the above aims are met, there are some system modes of operation that are more desirable than others and potential applicants are recommended to take these into account when considering their own operational requirements and operating conditions.

Peacetime

Preferences for peacetime operations are as follows:

- Operating PRFs to be proposed such that, while they enable the operational requirement to be met, they are not excessively high. Staggered PRFs, particularly those with multi-period pseudo random variations should be used wherever possible;
- Modes of interrogation to be limited to those necessary. It is desirable for non-ATC applications in peacetime to avoid using Mode 3/A, C and S;
- The effective radiated power from any interrogator to be sufficient but not greatly in excess of that necessary to enable the requirement to be met. Consideration should be given to the choice of antenna and hence antenna gain as well as transmitter power output;
- For the mean and peak interrogation rate on each mode of interrogation to be minimised while still enabling the operational requirement to be met.

Low PRFs and continuously rotating narrow beamwidth antennas are desirable;

- Compliance with the European Mode S;
- Coverage Map functionality and Cluster capability for Mode S interrogators.
- Mode S interrogators to be configured to avoid the extraction of EHS parameter that are not used by the system and interrogators should not attempt re-extracting the same parameter more than 2 times in a beam or in a second.

The following system operating features are undesirable:

- Multiple interrogators operating in close proximity at the same time, particularly at high and unstaggered PRFs;
- Slow moving or stationary antennas, particularly those with wide beam widths, interrogating continuously and with high PRFs;
- Operations on non-standard modes of interrogation or reply.

Annex G

Single service points of contact

Royal Navy.....HQ Navy Cmd, IW-TDL WO

Army.....HQ DRA, SO2 (W) ASM

Royal Air Force ..... HQ Air Cmd, SO2 TDL (A3)

Defence Spectrum Management.....MOD Main Building, CBM J6 POL 5

NATS…….....NATS, Whiteley, Fareham, PO15 7FL

Annex H

ACAS I equipment holding a generic approval to transmit

Certain models of certified TCAS I equipment has been given a generic approval to transmit. The criteria by which this approval is given is based on the interference limiting algorithm of the equipment, see Reference H. Table 1 contains a list of equipments holding generic approval to transmit.

Equipment	
Manufacturer	**Model**
Honeywell	KTA-870/970 KMH-880
B F Goodrich	791/A
B F Goodrich	SKY 897 (Skywatch HP)
B F Goodrich	SKY 497 (Skywatch)
Ryan International	9900 BX
Avidyne	TAS 600 Series

Operators of any other model of TCAS I equipment must apply for approval to transmit using the application form at Annex F of this document.

Manufacturers of TCAS I equipment seeking to obtain generic approval of systems not listed above should contact the Desk Officer, Annex C, in the first instance.