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Safety

AIRCRAFT FAILING TO RESPOND TO MODE S INTERROGATION.

1 Introduction

1.1 NATS in common with other UK and European Air Navigation Service Providers are in the process of transitioning their radar surveillance infrastructure to Mode S. During the initial deployment of Mode S, NATS secondary surveillance radars (SSRs) were configured such that Mode S equipped aircraft would respond with both a Mode S and a Mode A/C reply (known as Mixed MIP). However to improve the overall quality of the radar picture displayed to Air Traffic Controllers and in compliance to The National IFF/SSR Committee (NISC) letter (Ref: 8AP/65/02/58_SS3/07/102) these are now being reconfigured such that Mode S equipped aircraft will reply to interrogations with only a Mode S reply (known as Mode S MIP).

1.2 Mode S MIP continues to support both Mode A/C and Mode S transponders (as a standards compliant Mode A/C transponder will respond Mode A/C to a Mode S MIP interrogation). However there are a small number of faulty transponders which will not respond to the Mode S MIP. At the completion of the transition to Mode S MIP such aircraft will not be visible by NATS SSRs.

2 Expected Response to Mode S MIP

2.1 The Mode S MIP is fully compliant with the international standards and is already widely in use across Europe. All standards compliant transponders will be interoperable with Mode S MIP. In Mode S MIP the following repeating pattern of interrogations will be used during the All-Call period:

SAs, SCs.

The S (Mode S-Only All-Call) element within this pattern is defined by ICAO Annex 10, Vol IV, 3.1.2.5.2 and the As and Cs (Mode A/C only All-call) element is defined by ICAO Annex 10, Vol IV, 3.1.2.1.5.1.2.

2.2 As defined by ICAO Annex 10, Vol IV, Chapter 3 the following responses are expected from transponders during the all call period in response to Mode S MIP:

Interrogation Element	SAs	SCs
Mode S Transponder (during acquisition)	S (DF11)	S (DF11)
Mode S Transponder (once locked-out)	Nil	Nil
Legacy Mode A/C Transponder	A	C

Note: Mode S roll-call replies (DF4, 5, 20, 21) not shown as not in all-call period.

3 Air Traffic Services for Aircraft Failing to Respond to Mode S MIP

3.1 SSR transponder carriage is mandatory for all flights within Class A, B & C Airspace and all IFR flights within Class D & E Airspace (Para. 5.3, GEN 1-5 UK AIP) and also within defined Transponder Mandatory Zones (TMZs). Within such airspace, aircraft failing to respond to Mode S MIP will be considered as having suffered a transponder failure and will be dealt with in accordance with Paragraph 4 of ENR 1-6-2 of UK AIP. As a transponder failure event can lead to a large increase in controller workload, this may include the modification of clearances.

3.2 Aircraft operating outside of airspace for which transponder carriage is mandatory and which fail to respond to Mode S MIP will be at increased risk in the event of infringement into controlled airspace and will be limited in their ability to receive certain ATSOCAS or LARS service. Ground based electronic 'safety nets' such as NATS Controlled Airspace Intrusion Tool and Short Term Conflict Alert are severely impaired where a transponder is not functioning. Additionally some known transponder faults which preclude a response to Mode S MIP also prevent the transponder's correct interoperation with the Traffic Collision Avoidance System carried by most large aircraft.

4 Why Aircraft Transponders Fail to Respond to Mode S MIP

4.1 There are a number of reasons why a transponder might fail to respond to the Mode S MIP:

- A design fault with a particular transponder type;
- A systematic fault with the way an aircraft manufacturer fitted a transponder to an aircraft type (eg. crossed wires);
- A random fault which has occurred with a particular installation (eg. a loose connection, damaged feeder cable, faulty weight on wheels switch or sync phase reversal tolerance issue)

4.2 The following Airworthiness Directives and manufacturer's Service Bulletins have been published pertaining to such issues and operators are encouraged to ensure that their aircraft are in compliance.

Transponder	Airworthiness Directive/ Service Bulletin
Rockwell Collins TDR-94 and TDR-94D	'EASA AD No.: 2010-0003R1' and 'Rockwell Collins Service Information Letter 07-2 (ref: 523-0810069-001000)'
Honeywell MST-67A	'EASA AD No.: 2006 - 0269' and 'Honeywell Software Bulletin SWB MST 67A-SW2'
Filser (Funkwerks) TRT-800A and TRT-800H	'EASA AD 2008-0183' and 'SERVICE BULLETIN SB TRT800-A-H-1'
Filser (Funkwerks) TRT-800, TRT-800A and TRT800H	'Service Letter SL-1/2009' and 'Service Letter SL-1/2010'
Filser (Funkwerks) TRT-600	'EASA AD 2008-0158R2' and 'Service Letter SL-1/2008'
Terra TRT-250 / TRT-250D	'FAA AD 95-01-01'
NARCO Avionics AT-150	'EASA AD No.: 2009-0200' and 'NARCO Service Bulletins #1 and #6'

4.3 NATS has been working to identify affected airframes through offline radar data analysis. Operators affected airframes will have been contacted either directly by NATS or via CAA. Due to the limits of NATS radar coverage and the sheer numbers of airframes which transit UK airspace it will not however be possible to contact every operator prior to completion of the transition process.

5 Further Information

5.1 Further general information concerning SSR Mode S in the UK is available at the CAA Mode S website: http://www.caa.co.uk/mode_s/

5.2 More general information concerning SSR Mode S in the context of the European Air Traffic Management Programme (EATMP) is available at the EUROCONTROL website: http://www.eurocontrol.int/mode_s/