

# Mode S Interrogation Pattern – Operator’s Fact Sheet

## What is the current situation?

As part of the transition to Mode S, NATS radars were configured such that Mode S equipped aircraft would respond with both a Mode S and a Mode A/C reply as a failsafe to protect against possible transponder anomalies.

Whilst using this mixed interrogation pattern does provide a belt and braces approach to detection it also has the following issues:

- It places the radio spectrum under much greater strain increasing the risk of corruption or reduced detection.
- It causes a number of false targets to be presented to controllers, including:
  - Reflections (where a radar detects a second copy of a real aircraft in a false position some way from the true aircraft)
  - Splits (where the Mode A/C and Mode S returns appear as two separate aircraft side by side)

## What do these False Targets look like to controllers?

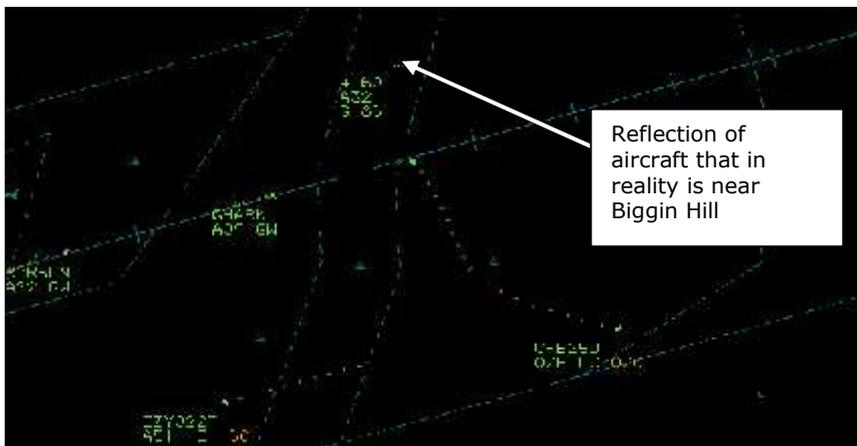


Figure 1 - Reflection of aircraft near Biggin Hill appears close to Luton Approach – this would not appear had the radar be configured in the new Mode S pattern.



Figure 2 - Splits and Corruption in the Lamborne Stack. One aircraft is detected as two with the same identity (505) but corrupt and different heights this then leads to a false conflict alert with a second non existent aircraft, that results from a subsequent corruption of identity (505->168) –this would not have occurred in the Mode S pattern.

## What is changing?

In response to The National IFF/SSR Committee (NISC) letter (Ref. 8AP/65/02/58\_SS3/07/102) we have now started to reconfigure our radars so that Mode S equipped aircraft will **only** respond to Mode S interrogations. The requirement they have set, is to complete this by 31/12/2011.

Mode A/C equipped aircraft are unaffected by this change.

## When is the change being made?

- Five radar stations spread across the UK have already been switched across - these are being used to identify aircraft faults through analysis.

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- NATS is planning to re-configure the remaining radars to a Mode S interrogation pattern by the end of June 2011.

## ***So what’s the catch?***

A small number of Mode S transponders do not reply correctly to Mode S interrogations and these aircraft will therefore be undetected by a Mode S interrogation pattern. This may happen for a number of reasons:

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

Controllers will inform the pilots of aircraft that they cannot see and amend their clearance as appropriate – this may involve aircraft being refused access to controlled airspace. Reports on these occurrences will be raised in the normal way and the aircraft operator informed.

NATS are working with other ANSPs and the UK CAA through Eurocontrol to address the issue and are also engaged in offline analysis to provide early notification to operators of issues before an event occurs.

## ***What should Operators do?***

- Respond as soon as possible to resolve any issue with a particular airframe if it is reported to you by CAA, NATS or another ANSP.
- Be proactive in looking at airworthiness directives and manufacturers service bulletins to identify and fix issues which may exist within your fleet.
- If you are a military operator and have the ability to disable Mode S responses from within the cockpit please ensure that any time you have Mode A/C enabled you also have Mode S enabled.

## ***What Types are affected?***

Many different types of aircraft are affected (Micro-lights to 747s), and a random fault may occur with any type of transponder. However systematic design or implementation issues account for a large proportion of faults observed, associated Air Worthiness Directives have been published on the following transponder types:

- Rockwell Collins TDR-94 and TDR-94D
- Honeywell MST-67A
- Funkwerks/Filser Avionics TRT-800 and TRT-600
- Narco Avionics AT-150
- Terra TRT-250

For more information, search for “transponder” at <http://ad.easa.europa.eu/>

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