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Subject

Operational



ENABLING ADS-B OUT IN THE UK GENERAL AVIATION FLEET

1 Introduction

- 1.1 In August 2017 the Civil Aviation Authority confirmed that ADS-B using 1090 MHz is its preferred national system to improve electronic conspicuity for general aviation. Ideally this will be achieved through transponders, although other devices can be integrated and interoperable with the CAA's final strategic solution. Two years on, some significant developments and ongoing trials mean that it is timely to provide an update on the options currently available for enabling ADS-B out throughout the General Aviation fleet, via this AIC.

2 Mode S transponders with ADS-B out enabled

- 2.1 For those aircraft capable of fitting a Mode S transponder with ADS-B out enabled, this remains the most technically effective way of making an aircraft or other air system electronically conspicuous and delivering maximum interoperability with other aircraft as well as the ground ATM environment.
- 2.2 Currently, most Mode S transponders, marketed for use by the GA community, include the capability to transmit ADS-B out but require a separate GNSS source to be connected to the transponder in order to enable that ADS-B out functionality.
- 2.3 Several transponder manufacturers have worked to develop cost effective connectivity options for a GNSS source and the connection of that GNSS source to their transponders, either via their own compatible products or via connection of third party GNSS sources. The number of supported combinations of transponder and GNSS source has increased significantly over the past few years.
- 2.4 The CAA encourages all potential purchasers of new Mode S transponders to consider options for enabling ADS-B out from their chosen transponder. This will often be cheaper and easier to enable at the time of purchase and installation rather than as an additional installation at a later stage. It seems likely that the next generation of Mode S transponders will include fully enabled ADS-B functionality 'out of the box'.
- 2.5 For owners of existing Mode S transponders, capable of ADS-B out but without the functionality enabled, there are options available for the connection of a GPS source according to the certification of the aircraft, as detailed below:

3 Enabling ADS-B out on EASA certified aircraft

- 3.1 In April 2019, EASA made important changes to CS-STAN, the document that describes the standard changes that engineers can make to EASA certified aircraft without needing further authorisation. Issue 3 of CS-STAN now includes CS-SC005a which authorises aircraft maintenance engineers to connect a GPS position source to an ADS-B capable transponder to enable ADS-B Out in all EASA certified light aircraft.
- 3.2 Three possible configurations are permissible under this Standard Change using both certified and uncertified GNSS sources, significantly increasing the number connectivity options available and potentially significantly reducing the cost of the installation.
- 3.3 This Standard Change is not suitable for the release to service of the aircraft by the pilot-owner, it must be performed by a licensed aircraft maintenance engineer. However, the engineer does not have to apply for a Minor Change, which significantly reduces costs and saves time.
- 3.4 The relevant update to Certification Specifications for Standard Changes and Standard Repairs (CS-STAN) is available at <https://www.easa.europa.eu/sites/default/files/dfu/CS-STAN%20Issue%203.pdf>

4 Enabling ADS-B out on Permit-to-Fly aircraft

- 4.1 Both the BMAA and the LAA have published detailed procedures for pilot-owners to make the connection of GNSS position sources to an ADS-B capable transponder on aircraft operating under a Permit-to-Fly issued by those organisations.
- 4.2 The LAA application form is available at <http://www.lightaircraftassociation.co.uk/engineering/StandardForms/LAA-MOD%2014%20-%20ADS-B.pdf>

4.3 The BMAA detail their standard minor modification to enable ADS-B out at https://www.bmaa.org/files/tit_118_ads-b_out.pdf

4.4 It should be noted that many pilot-owners have chosen to use a variety of uncertified GPS devices and in many cases, Electronic Conspicuity detection devices, that contain a GNSS source, for connection to their transponder. In this way, a pilot-owner may also be deploying 'sense and avoid' capability whilst also making themselves electronically conspicuous via the preferred national system. However, this may require some associated Mode S Extended Squitter performance values, from the connected transponder, to be set as undetermined (zero) and therefore reduce the interoperability of the installation with some airborne systems and Ground ATM. Please read the above detailed procedures for more information.

5 ADS-B transceivers including 'carry-on' devices

5.1 The CAA, in conjunction with NATS, identified a requirement for affordable ADS-B Out capable devices for General Aviation (GA) users, which employ 1090 MHz Extended Squitter. These products are primarily targeted at those aircraft that are unable to equip with a Mode S transponder with ADS-B out enabled. Several of the currently approved devices are 'carry-on' devices meaning that they have the benefit of being easily transferred between aircraft, if required. If ADS-B transceivers are to be utilised in this way, then it is important that the user understands the functionality of the device including the operating parameters that will need to be changed when transferring the device between airframes.

5.2 Information gathered via experience from users and several operational trials has indicated the importance of positioning in the cockpit of these 'carry-on' devices particularly if they do not utilise an external antenna. Users of these devices should pay careful attention to manufacturer's advice as to positioning and possible shielding of the antenna. Given the relatively low emitted power that these devices produce, it must also be appreciated by users that their detectability by receiving stations on the ground may be limited dependent on range and positioning of the device on the airframe.

5.3 The specification and regulations surrounding the use of such devices is detailed in CAP 1391: Electronic Conspicuity Devices.

6 Simultaneous use of ADS-B transceivers and existing transponder installations

6.1 It has become apparent that a number of pilot-owners of existing transponder installations, would like to take advantage of using an ADS-B transceiver in order to make themselves electronically conspicuous to other GA aircraft (via ADS-B) while continuing to benefit from the interoperability with the ground ATM system and with TCAS equipped aircraft that their existing transponder facilitates.

6.2 The CAA recognises the EASA requirements with respect to transmitting portable electronic devices (T-PEDs) on aircraft as detailed in consolidated Regulation (EU) 965/2012 Annex VII, NCO.GEN.125 and its associated AMC/GM TO ANNEX VII (PART-NCO).

6.3 In this context, the CAA, in conjunction with NATS, has conducted several trials to understand whether the simultaneous use of an ADS-B transceiver and an existing transponder installation could adversely affect the performance of the aircraft's systems and equipment.

6.4 As a result of the above work, the CAA has resolved the following simultaneous use combinations of ADS-B transceivers and existing transponder installations;

	ADS-B transceiver on a UK Permit to Fly Aircraft	ADS-B transceiver on a EASA Certified Aircraft
Mode A and C Transponders	No demonstrable issues	No demonstrable issues
Mode S Transponder without Extended Squitter capability	No demonstrable issues	No demonstrable issues (See Note 2)
Mode S Transponder with Extended Squitter capability	No demonstrable issues providing ES capability confirmed as not enabled. Preferred option to enable ES (ADS-B out) via connection of a GNSS source to transponder dispensing with the need for an ADS-B transmitter.	No demonstrable issues providing ES capability confirmed as not enabled. (See Note 2) Preferred option to enable ES (ADS-B out) via connection of a GNSS source to transponder dispensing with the need for an ADS-B transmitter.

Note 1: Some ADS-B transceivers may be capable of operation in receive only mode and providing this function is enabled may continue to be used enabling ADS-B In, Sense and Avoid capability, regardless of the transponder installation in use.

Note 2: In order for the CAA to continue to gather evidence for presentation to EASA and to monitor any on-going interoperability issues, pilot/owners of EASA aircraft contemplating the simultaneous use of the transmit function of an ADS-B transceiver and an existing transponder installation should notify the CAA of the following details via esr@caa.co.uk prior to commencing simultaneous transmission;

- Applicant's Name
- Applicant's Email Address
- Emergency contact number
- Aircraft Registration
- Hexadecimal Code
- Type of ADS-B Transceiver

7 Contact Information

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