GA Alliance

18 July 2006

Briefing notes: Mode S and ADSB

CAA have commenced consultation on “Amendment to ANO to improve technical interoperability of all aircraft in UK”. This is a Partial Regulatory Impact Statement and heavily supports Mode S. Consultations started 3 June 2006 and finishes 29 August 2006.

Mode S Briefing Notes

1. Mode S is already mandated for mainly Class A terminal and en-route airspace users. These include many GA aircraft / pilots operating IFR in such airspace and who have fitted Mode S transponders.

2. The CAA now proposes that the requirement be extended to all airspace/ VFR users as it deems there to be a problem in certain Class G airspace with potential conflicts with CAT.

3. Extending the requirement for Mode S to VFR users means that all types of aircraft will be required to fit Mode S transponders and yet a lightweight / low power unit has not been developed as yet. Accordingly microlights, gliders, hang and para gliders and other certain types will not be able to fit such units unless and until they are available if at all. It would therefore seem exemptions will be required and the real benefits of such system will be lost. In addition there are potential health hazards on the latter types of aircraft due to proximity of aerials and inability to shield radiation; these issues need proper investigation before mandating use.

4. In any event it is considered that the 40 year old technology is of limited value. If all VFR users were able to install units it is unlikely the ATC units would be able to make full use of the “returns” due to clutter from high numbers. If benefits are to flow to those who have installed the equipment they must be assured of a full LARS service because even if an aircraft is transmitting via Mode S, it cannot “see” other aircraft doing likewise and there is no safety benefit to the aircraft unless an accompanying radar service is assured. One can contrast this with commercial air transport which will be able to “see” Mode S equipped aircraft on their ACAS systems (which it is unrealistic to think could be installed in 99% of GA aircraft). It is understood the military will not be fitting the equipment further emphasising the futility of the proposal.

5. The costs of installing the equipment are not fully investigated. To install in an aircraft with an existing transponder (Modes A or C) would likely cost c£3,000 (ex VAT) assuming no issues over wiring. To install in an aircraft without an existing transponder and perhaps limited panel space would cost much more. The estimated real cost to GA is in the order of a conservative £100M ignoring, at this stage, the latter issue.
   It is unrealistic to think aircraft owners will willingly agree to such equipment without assurances over real benefits to them.

6. An alternative is ADS(B) which would offer pilots and owners much more as data links are possible that could advise, in the cockpit, of potential traffic conflicts and eg weather information. The USA and some North European States are already trialling / installing such equipment and if adopted in the medium term will make the old technology used for Mode S redundant. With the USA effectively in control of Oceanic airspace their position is likely to prevail.

Meantime there is no justified safety case pressure for installing Mode S transponders for VFR traffic. Provision of a proper LARS service would resolve the short term perceived problems of CAT operating in some Class G airspace.

ADS-B Briefing Notes

Concept for ADS-B surveillance technology

Automatic Dependent Surveillance – Broadcast [ADS-B] is an air traffic surveillance technology on trial in the USA and Australia. The concept is that aircraft automatically broadcast, or squitter, digital data packets which contain the aircraft's 24 bit address, call sign, GPS derived latitude and longitude, barometric altitude plus rate of climb/descent, direction and speed.

Data from aircraft is received by ATC ground stations and used for aircraft tracking without the need for traditional radar. This is important for the USA and Australia with vast tracts of open country and few ATC centres. The data can also be received by other aircraft equipped with ADS-B data receivers and used to display traffic information.

ADS-B can be transmitted in several ways. The USA is proposing 2 systems: air transport aircraft will use Mode S 1090MHz Extended Squitter [1090ES] and GA aircraft will use a Universal Access Transceiver [UAT] 978 MHz link in the DME band. UAT was developed in the USA specifically for ADS-B operation. Australia is proposing to use Mode S for all aircraft. Various trials are underway in Europe (see below).

Airborne avionics

GPS and a pressure altitude encoder provide data to be transmitted. This is ***'ADS-B Out'*** and is the minimum function. A high performance TSO GPS "engine" must be part of this system. "***ADS-B In"*** enables an aircraft to receive and display other aircraft tracks, independently of ATC, plus other information.

Ground Stations

A network of receivers is required. Australia proposes not to replace its ATC radar system but to rely on ADS-B ground stations.

Programmes

The US Next Generation Air Transport System (NGATS), the equivalent of the European Single Sky ATM Research (SESAR) programme, indicated strongly an ADSB solution from 20012 with reduced ground based navigation aids would be implemented. It is noted that there is little or no coordination currently between these proposed projects.

Australia plans to use ADS-B to provide traffic information for commercial aircraft above FL300 where no SSR currently exists.

In the longer term Australia proposes to use ADS-B for lower en-route airspace and has sought tenders for 10,000 aircraft units that it will subsidise for GA aircraft, so allowing it to decommission some radar sites and make substantial savings. Australia recognises that the beneficiary, commercial air traffic, should pay.

Status

Australia has begun a trial but has now suspended work on it and deferred implementation plans. Whilst ADS-B appears very attractive, the use of an omni-directional ground antenna instead of a normal radar head results in a requirement for a 100-fold increase in transmitted power compared to SSR. Unlike mode S, it can be used for proximity detection between small aeroplanes but if normal radars are given up, there is no means to detect uncooperative aircraft in a failure or security situation.

Significant trials and development work are needed to bring the ADS-B concept to the point where policy decisions can be made. There are various trials in process throughout Europe including in Sweden where Kiruna airport is going operational. It is, however, key that a common system is used such that all aircraft can benefit from it.