

Mode S Consultation – deadline 31 May 2008

A Brief by the Light Aircraft Association

This section of the LAA website deals with the consultation on Mode S transponders. The object is to give you sufficient information to respond to the consultation and to guide you through the CAA documents which are substantial. It is based on input from members and covers most issues. We are grateful to the BGA airspace committee for their significant input. Please use the material to form your own response but do not copy sections wholesale as that will carry much less weight.

The consultation documents are [here](#) with links to the on-line response form. We do not recommend you use that as it restricts what you can say. We suggest you email your responses to modesconsultation@caa.co.uk or send them by post to the address on the CAA website. The deadline is 31 May – please don't forget.

If you are considering fitting a Mode A or A/C transponder to a new build aircraft or an aircraft that is already registered see our [guide here](#).

You can read the draft LAA response [here](#). If you support the LAA response, please say so in your own response to the CAA and then you can keep your own input simpler if you wish. You can leave the technical stuff to us but please identify yourself with the LAA response.

You can download a [skeleton reply form](#) in MS word format with some headings already on to get you started.

Finally, if you want to print this out, here is a [printer friendly version](#) in pdf form.

What The LAA Thinks Of The Consultation

In the pages that follow we have covered these main issues:

- The consultation is not risk/safety based so we cannot make a proper business case for the £44m of your money the CAA proposes to spend.
- If we did all fit Mode S, the UK ATC system would collapse because of the way radar and TCAS systems will work until at least 2012.
- In CAS, transponders are only actually needed for IFR flights
- TMZs are not properly defined so we cannot properly consult on a process to establish them.
- There is no safety case for gliders to carry transponders outside IFR in CAS.
- Stopping flights to and from the UK is not the intention of ICAO

Background and Technical Stuff

In 2006, the CAA proposed to mandate Mode S transponders on all aircraft and gliders in all UK airspace. There was a huge response from the aviation community and the proposal did not proceed.

The one element which did proceed was to make Mode S the "means of compliance" in airspace where Mode A/C was previously mandatory. That is the London TMA and all airspace, including class G, above FL100. That was not an issue for most light aircraft as they do not normally have access to class A airspace and rarely fly above FL100. Gliders are exempt from all the transponder regulations so they were not affected by this at all

That is background. Now here is some slightly technical stuff you can skip if you want but it would be helpful if you read it!

The CAA has said it needs to introduce Mode S to deal with 2 technical issues. First, because Mode A/C transponders respond to every radar interrogator within range they flood the 1090MHz band with responses causing interference. This is mainly a problem for commercial IFR traffic in congested areas such as holding stacks where responses can become garbled. Light aircraft have little effect on this. Secondly, the demand for Mode A codes for commercial IFR flights throughout Europe exceeds the number of codes available. In theory, mode S allows the single code A1000 to be used by all aircraft with their individual identities being obtained from the Flight ID code (FID) it transmits. However, in practice the FID cannot be used safely (airline pilots can't be trusted to type the right number into their computer) so commercial aircraft still need Mode A codes to identify them and there are not enough to go round. So in technical terms, this is a commercial IFR issue but Mode S does not actually solve it.

Commercial aircraft carry Mode S EHS which sends out all sorts of data to controllers, for example it tells them what level the aircraft is climbing or descending to so altitude busts can be prevented and it allows a pictorial representation of stacks of aircraft in holds making for greater safety and efficiency. So mode S is a good thing for commercial operations and all airliners will soon be fitted.

Light aircraft can carry mode S ELS which sends out a limited amount of data. It sends your level (the code C), your unique aircraft address which allows the ATC computer system to track you and it sends the FID you have inserted, normally the aircraft registration. ATC screens display your position and altitude or flight level but not your FID; the label you may have seen on ATC screens comes only from a flight plan so you probably won't have one. However, a controller can check your transponder FID (and your unique aircraft address) by putting a cursor over your radar return

Any altitude encoding transponder will enable ATC to identify you if they need too and aircraft with TCAS (including military aircraft) will be alerted to your presence and are less likely to hit you. Thus, whilst transponders are a good thing, Mode S adds little for the VFR light aircraft going about its normal business.

Practical Issues

Turning now to practical issues, fitting a mode S transponder in many aircraft and gliders is a challenge:

For aircraft with limited or no electrical power and all gliders, the situation is virtually impossible. Since 1989 the CAA has been saying that "industry is developing low power, low cost transponders" but of course that is not true. Mode S transponders use a lot more power than ordinary A/C transponders and recent trials of de-rated Mode S transponders suggest that they do not perform adequately but still consume substantial power. With batteries only it would be possible to operate a Mode S transponder for short periods but this will not work for continuous operation.

In many aircraft and gliders, space and weight constraints make fitting impossible because transponders need instrument panel space with a substantial distance behind. For example, they need a lot more room than a modern radio.

The practical issue of cost is important because for many, the cost of a transponder installation will be a high proportion of the value of the aircraft. Proportionality is an important factor in regulations.

Aircraft owners may choose to fit Mode S where they can but many will choose not to do so for these and a whole variety of other considerations and they should not be restricted more than is necessary to achieve the required level of safety.

Why Mode S Transponders and Not A or A/C?

We have already explained about the issue interference and the ability to transmit your callsign, the FID. We have taken advice from a technical expert about interference and found some interesting stuff. First, all the radars in the UK do or will operate in Dual Mode. Essentially this is one sweep of Mode S interrogation then one of Mode A/C, done for safety reasons. Mode S is good for interference as once the radar has established your position and track, it commands your transponder not to reply unless asked. However, because of the dual mode, Mode A/C interrogations are sent out and all transponders reply to that.

You may be getting the drift here: if all 15,000 affected aircraft and gliders were to fit Mode S they would all respond to Mode A/C and the electronic environment would collapse. So actually getting all GA to fit Mode S would be a very bad thing until such time as Mode A is switched off. Please bear this in mind for later. As Mode A/C will continue to work for some years and the information provided to the controller is very similar to Mode S, perhaps it would be sensible to allow Mode A/C to be fully used until such time as the system is switched off. There would be no increase in interference and we could transition to Mode S over time, unlike the proposal that we all fit Mode S now.

Finally in this section, an advertisement from the airline pilot community. We would like to discourage you from using Mode A without Mode C. Imagine you are flying an airliner near a UK airport. Your TCAS system detects all transponders nearby but screens out anything that is away from your level. Anything you see on the NAV display could be a threat. But if a transponder does not have Mode C, TCAS cannot screen it out so displays it as a possible threat. This is a real issue when you fly a non Mode C transponder under a TMA so if you are fitting a transponder, please consider a Mode C or S and if you have Mode A only, please consider fitting an altitude encoder.

The Safety Case

Any commercial organisation undertaking this sort of review would analyse the safety issues against the required level of safety as part of the business case to ensure it was spending its money effectively. But the CAA is not spending its own money, it is spending yours. Between £19M and £44.2M to be precise, that is about £8M a year for the next four years.

You might expect there to be a significant analysis of risk and safety for each of the options before and after. Indeed, the CAA is required by the consultation guidelines to consider the "do nothing" option and this should clearly show the comparative risk in each case but it does not. It talks about maintaining the "target level of safety" but does not disclose what that is or give us quantitative safety figures for each option. The overall "do nothing" consideration says absolutely nothing about risk save for a completely false statement that "ATC would be unable to safely support future airport capacity"

When we talk about safety here we are talking about the risk of collisions between CAT and GA aircraft and gliders so we need to take advice from the UK Airprox Board which is the expert group in that area. In his 17th report the Chairman notes that in 2006 there were only 6 risk bearing airproxes involving CAT aircraft, three involving civilian non-CAT aircraft, two military and one CAT. He finishes: *the conclusion is that such wide variability does not point to a common theme with the need for concerted action in a particular area of operations.* So yes, safety would be improved in some areas by Mode S, but actually safety is already judged satisfactory and this is not a particular area of concern. Safety does not make a business case.

We should point out a statement in the document, (para 12.5) that "the UK Airprox Board supports proposals to mandate mode S transponders to the maximum extent possible". We have asked the UKAB to clarify their position on this but we have not yet had a reply.

The Consultation

Against this background the CAA is now consulting on another phase of Mode S but before we get into the proposals, here are some headline statements from the CAA:

- **This does not propose that all aircraft should carry Mode S in all airspace.**

- **The proposals are not designed to facilitate an increase in commercial air traffic or UAVs in class G airspace**
- **Aircraft that cannot equip will not be grounded**

And from the LAA:

- **Mode S should only be mandated where it can be shown to be necessary.**
- **Not all aircraft will be able to carry and operate Mode S.**
- **They should not be unduly restricted as a result.**

First it will be helpful to look at the consultation as a whole.

Government guidelines require the CAA to be clear about what it is consulting on and to consider alternative options including a do nothing option. In this document the CAA sets out what it calls 4 options but they are really 4 separate policies with each needing its own alternative options and a do nothing option. In the document we find no alternative options and a do nothing option that covers all 4 policies. Because of this the document does not consider if there is another way of achieving each policy and we are not told the consequences of not doing, say, Option 4. As a result we must try to construct the alternatives ourselves and we will do this in the paragraphs that follow.

On then to the 4 proposals each covered in the sections that follow. In looking at these we must bear in mind some statements extracted here from various parts of the document:

The CAA says it does not want to mandate Mode S for all aircraft in all airspace but that in addition to these proposals they:

- *have an aspiration to widen the circumstances where aircraft have to carry and operate transponders and:*
- *their overall aspiration is to maximise the carriage of Mode S in UK airspace as well as:*
- *this is part of a phased introduction of proposals.*

This can only mean that the CAA intends mandating mode S in all class G airspace later on as in reality that is all the airspace that will be left. In writing your responses please remember that this is just part of the plan.

Option 1

Mandate the carriage and operation of Mode S transponders on all aircraft operating within controlled airspace of classification A to E.

The aim of this Option is to create an environment where the position and altitude of all aircraft within CAS is 'known' to ATC and TCAS systems. Well, the position of all aircraft is already known to ATC through radar control or procedural clearance because that is what CAS is about. If we were flying in IFR, interacting with TCAS would form a sensible safety net but if we are VFR, we have visual sighting aided by traffic reports as a safety net in the rare case that radar control or procedural clearance breaks down. VFR aircraft flying

under control within CAS do not need to be interoperable with TCAS to maintain the target level of safety. This is already accepted in principle because we are told that non-transpondering aircraft will be able to gain access through agreements or exceptionally through temporary ATC clearance. Indeed in the series of roadshows the CAA team has been quite positive about the continuation of ATC clearances as they are today. If it was less safe, that would not be proposed or allowed. So we have a situation proposed where Mode S is essentially optional.

So perhaps we should look at a real alternative to the way this is set out whilst still achieving what the CAA expect from this policy. None of us would disagree that Mode S should be mandated in Class A airspace and for IFR flights in Class B to E airspace; TCAS can then form a backstop safety net against collisions with CAT. There appears to be no safety case to argue against VFR flight, subject to ATC clearance, in Class B to E airspace for the reasons above using visual sighting as the safety net. As we all know, clearance is easier to obtain with a transponder than without, so recommending Mode S would be straightforward and none of us would challenge such a sensible policy. This would satisfy the CAA's remit from the Transport Act 2000, *"to satisfy the requirements of operators and owners of all classes of aircraft"* and it would do so without compromising safety. The consultation points out that as airspace becomes more crowded, clearances will become more difficult. Well, no problem with that; if you want a clearance through busy airspace you will have to install a transponder but that will then be your choice and your own business case for the costs.

Therefore an acceptable alternative might then be that Mode S is mandated in Class A airspace and IFR in Classes B to E. For VFR flight in Classes B to E with ATC clearance and control, Mode S could be recommended, noting that without a transponder, access will be more difficult than with. To improve interoperability with TCAS systems we also propose that approvals be removed from transponders without Mode C.

But the overarching requirement must be for reasonable access for VFR flights in Class B to E airspace for those aircraft without a transponder.

Option 2

Implement a formal process to support applications for 'Transponder Mandatory Zones' (TMZs) outside of controlled airspace.

The CAA already has the authority to introduce these zones but has not used it often. This policy option does not propose to introduce TMZs but to develop a process to allow bodies such as NATS to apply for TMZs in a similar way that they currently apply for controlled airspace. They say they consider that the current Airspace Change Process (ACP) should be the basis for this and the LAA agrees because we are involved in that and would be consulted on every occasion. However, the CAA goes on to say that the process could be "scalable to reduce the burden on applicants". We have been told that the CAA intends to

apply TMZs around airspace incursion hot spots and that NATS wants TMZs under "stubs" the areas of TMA that extend out from CTRs.

In addition to helping to mitigate airspace infringements, the consultation proposes that TMZs would be used:

- To provide airspace in which all traffic can be detected by TCAS
- To provide airspace in which all traffic can be detected by ATC
- To mitigate risk in busy airspace
- To provide detection when primary radar is inadequate
- For national security

On that basis, TMZs could be established anywhere. Moreover, the CAA has not told us what a TMZ will be. Will it be mode S only or will other transponders be satisfactory? Will procedural clearances be available for non-transponding aircraft? Will access be available through standing agreements and if so how will they be established? It does say that ATC service may need to be available and risk assessments may be needed. We believe these would be fundamental to such proposals but they are only possibilities according to the consultation.

Now you would expect any proposal would be for the purpose of reducing risk but we have already shown that the UKAB does not consider any specific action necessary for the purpose of avoiding collisions. Neither do we. However, this part of the consultation is about the process not the actual TMZs themselves. The LAA considers that the current Airspace Change Process (CAP 725) should be used to consider possible TMZs and that risk analysis and the provision of an ATC service and access for non-transponding aircraft should be mandatory requirements. We recommend you take a similar line.

This part of the consultation has been difficult because it does not actually say what is being consulted on. It asks for opinions but offers no actual firm proposal but the consultation says "once it has been developed it will be effective immediately". So whilst you may offer views as to what might be done, you have no way to put a contrary view to any specific proposal. Although it is titled as an option it is actually one of the policy strands being proposed and there are no real alternative options being proposed, in particular there is no "do nothing" option which would involve an analysis of retaining the status quo in this area alone. This is a mandatory item for consultations.

As there is no actual proposal and there is no clear definition of the TMZ which would result from that process, this not in accordance with the Cabinet Office guidelines on consultation which requires the CAA to "be clear about what your proposals are". If you feel strongly about this, in addition to sending your comments to the CAA you may want to email the DfT consultation coordinator to say so. He is

Andrew D Price (Departmental Consultation Co-ordinator)
Department for Transport
Zone 9/9 Southside
105 Victoria Street
London SW1E 6DT

Email: consultation@dft.gsi.gov.uk

Option 3

Include gliders in the SSR transponder carriage regulations.

Gliders are currently exempt from transponder carriage which is otherwise mandatory throughout the UK above FL100. It is very difficult to fit a transponder in most gliders because of space and with no power they have to rely on batteries. Mode S transponders draw significant power so it is not possible to rely on batteries except for short periods making serious cross country wave flying impossible. The CAA suggests that special areas may be made available for gliders but that has not gone down well with the BGA. Overall this is a significant problem for them and they need our support.

Issues raised by the BGA include:

There has never been a collision between a glider and CAT so the safety record is 100% and cannot be improved by this measure.

Gliders have been cleared into CAS for many years without great difficulty and with no safety issues arising.

TRAs above FL100 for gliders will restrict operations substantially and there is no actual commitment in the consultation even for them.

The proposal is said to deliver ATC efficiencies. However, the CAA has also said that this will not facilitate increased CAT traffic in Class G airspace so it is unclear why this is relevant.

If you would like to look at this in more detail, please go to the [BGA Website](#)

Option 4

Mandate the carriage and operation of Mode S transponders on all powered aircraft conducting international flights.

The CAA says that they need to do this so the UK can become compliant with ICAO practices which recommend that all aeroplanes and helicopters conducting international flights should carry and operate pressure-altitude reporting SSR transponders. In common with all other European states the UK has filed a difference on this but the CAA now wants to comply as part of this proposal.

Aircraft without transponders would be able to fly in class G airspace within the UK FIR or within the FIR of our neighbours right up to the boundary but would not be able to actually cross it. Such aircraft from Europe could fly legally within the UK but will not be able to cross the FIR boundary to get here. The UK will be closing its borders to these aircraft.

Clearly there is no safety case for UK GA here. The ICAO recommendation is designed to increase safety in parts of the world where adjacent countries' ATC systems do not speak to each other and

commercial flights have to arrange their own handover and separation. The Eastern Mediterranean, the Middle East and Central Africa are just some examples of this where transponders are critical to safety. A light aircraft flying VFR to or from France or Ireland is not relevant to this.

The suggestion that special corridors for non-transponding aircraft could be established is ill considered. Such corridors did once exist but were removed because they greatly increase the risk of mid-air collision over the sea which would inevitably lead to the death of those involved.

It is of note that the CAA has currently filed 603 specific differences to ICAO recommendations but it is now proposing to remove just this one.

Transition and Exemption Arrangements

We have already discussed the problems resulting from "mixed mode" and have proposed a more gradual introduction process which would avoid risk to the UK ATC system and allow Mode A/C transponders to die naturally when "mixed mode" is switched off. We strongly recommend that altitude encoding transponders should be encouraged for voluntary fit in light aircraft because of the safety benefits from interoperability with ACAS systems in fast jets flying at low level in class G airspace. That is a real and quantifiable safety risk to our sector.

However, the proposed transition arrangements would discourage the fitment of recycled Mode A/C transponders after March 2009 because the CAA will no longer issue exemptions. There is no safety or business case for this date and operators should be encouraged to fit recycled equipments right up to the date that "mixed mode" is switched off. We have already explained why this will not adversely affect the RF environment and the decision on return on cost must be left to the operator and not prescribed by the regulator who has no knowledge of the circumstances.

These equipments could then be useful right up to the date that they die naturally when "mixed mode" finishes and the equipments will no longer work. Taking this up will enable simplification of the exemption rules for new-build aircraft as that would be subsumed by this proposal.

What Next

You need to send your views to the CAA by 31 May. Constructive views are always best so where you challenge the consultation, offer reasons and an alternative whenever possible. It really is important that you respond but please also ask all your aviation contacts if they will respond as well. Please direct them to the LAA website as they do not need to be a member. Remember that "this is part of a phased introduction of proposals" and the CAA's "overall aspiration is to maximise the carriage of Mode S in UK airspace". So your freedom to fly sensibly and safely is at stake here.

Finally, please use but do not copy the LAA response. The CAA wants your views so tell them what this means to you.

The deadline is 31 May 2008