

LAA Response to CAA Consultation on Mode S

DRAFT 24 APR 08

Thank you for consulting the LAA on the proposed introduction of Mode S. The LAA has some 8,000 members and supervises the airworthiness of some 2000 light aircraft on behalf of the CAA. We have a particular remit to promote affordable flying and air safety and on this matter we respond on behalf of our membership.

Noting the technical nature and complexity of this consultation, we have suggested to our members that they consider this response which has been available to them on our website and indicate to you their support or otherwise for the issues we raise. Where they do this we trust that you will give appropriate weight to their abbreviated comments and note the fuller consideration and arguments in this document.

Our Policy on Mode S

We recognise the importance of Mode S EHS for public transport aircraft operating in a controlled environment as it clearly increases the safety and efficiency of their operations. For this reason we strongly support the regulatory change to mandate it in Class A airspace. We also recognise that Mode A/C interrogators, both ground ATC systems and TCAS will be switched off at some time in the future leaving Mode S as the only secondary radar system in use for all airspace. We encourage the fitment of altitude encoding transponders in light aircraft where it is practicable and cost effective but we discourage the use of Mode A only transponders because of the inadequate interaction with TCAS. Whilst your focus is on interaction with CAT aircraft, our concern is more with interaction with fast jets and gliders.

Thus we support many of the policy aims of the CAA in relation to transponders but we differ on a number of areas of application. We believe strongly in risk assessment and have considered this in each of the policy proposals you have made. This has not been without difficulty because your proposals are not wholly based on the safety case. In addition, as a medium sized enterprise, we apply a business case test to proposals on behalf of our members to judge if expenditure is justified and will provide a worthwhile return. Because of the lack of data this has not been possible in a number of areas.

The Nature of the Consultation

Turning now to the nature of the consultation, the "Options" you present are in reality 4 separate policy proposals. They are not options within the meaning of the Cabinet Office consultation guidelines, that is to say alternatives to what is proposed. Each policy proposal (or "Option") should have alternative options and a do nothing option but these are not presented or considered. Without these it is not possible to understand the effect of the proposed policy and what other means might exist to achieve your policy aims. Neither is it possible to assess the business case as there is no baseline. This is fundamental to the government consultation process. The "Alternatives" which you decided not to

consult on are not really alternatives but other policies. Moreover, each policy proposal must have a "do nothing" option but that has not been presented or considered. The one global "do nothing" option is not appropriate as it only considers the whole set of "Options" taken together. As we look at each "Option" we need to see your views on the consequences of not taking that particular policy forward but we cannot do that. For example, not doing "Option 4" will not cause airlines to relocate to Europe or cause restrictions in CAT movements as para 15.1 suggests. You leave us to construct our own alternatives including do nothing but we are not equipped for this work and each consultee will have different views.

It is not possible to respond properly to "Option 2" because you are not clear on what you are consulting about. You want views on a process to establish TMZs but you have not defined what these are or the rules which may apply in them. How can we make a judgement on the process when we don't know what result the process is intended to achieve? You say the process will be different from the CAP 725 process but you do not say in what way. If you propose to omit only environmental considerations, this may be reasonable but as we do not know the rules that will apply to TMZs, we cannot make a judgement. In addition, that is a judgement for environmental stakeholders to make and it is unclear if you have consulted them. Rather than being a consultation on a policy proposal, this appears to be a means for gathering views and opinions but you say that the process which results "will be effective immediately". Surely the gathering of stakeholder views and developing a policy is something which must precede a consultation.

Thus, we are not able to fully respond to the consultation in the way we would wish because you have not set out proper alternative options for the 4 policy proposals including valid "do nothing" options and it is not clear on what is proposed by "Option 2". Because this consultation does not follow the normal consultation guidelines in these regards, we have drawn this to the attention of the DfT consultation coordinator.

Issues For Aircraft And Gliders Unable To Comply

You recognise that not all aircraft will be able to fit transponders and have made a number of proposals to provide airspace access. Whilst we support the philosophy of the line you have taken here, your proposals are heavily caveated with "may", "possibly" and "could" throughout. You will appreciate that this makes it impossible for us to fully understand any proposal because of the uncertainty you have introduced on the boundaries of the policies.

Technical Risk In Increasing Mode S Use By Light Aircraft And Gliders

You have explained that it is necessary to replace the current Mode A/C system because if the number of A/C transponders was increased to accommodate traffic growth, safety and efficiency would be compromised and that the old system is already at or beyond its limit. We note that virtually all public transport aircraft have already changed to Mode S so this consultation is almost entirely about light aircraft and gliders. In Annex D you discuss the need to operate the UK ground environment in "mixed mode", that is to say, all radars interrogate in both Mode S and Mode A/C because of safety issues. So all Mode

S transponders reply in both modes and we understand this is likely to continue for some years, certainly until 2012 and beyond if equipment programmes are not delivered by then.

Until the day that Mode A/C interrogation is turned off, all Mode S transponders will also respond in Mode A/C. This has not been a problem so far as virtually all aircraft that have fitted Mode S, previously had Mode A/C so the number of units has remained broadly constant.

If all 15,000 aircraft that are now proposed for Mode S fit were to do so by March 2009, they too would respond to Mode A/C interrogation and UK ATC systems would be overwhelmed.

Your Annex D notes this at para 6, reporting high levels of mutual interference from just 1800 aircraft.

This scenario would be of no great consequence to light aircraft and gliders as they don't actually need to be controlled but we understand that it would have consequences for TCAS effectiveness. However, and most importantly, this would be a very serious safety and operational issue for public transport aircraft that you cannot allow to happen. You may think that not all 26,000 aircraft and gliders will equip by March 2009 but it is your intention that they should do so before March 2012 so this situation will develop as we have described. We have taken expert advice on this and our concerns have been confirmed. We have been told that TCAS overload is already occurring in busy areas such as the Los Angeles TCA and that as TCAS interrogation will continue to operate in a Mode C manner, this will be an issue even into the long term.

Although this problem will be partly resolved in due course, once Mode A/C interrogations are switched off, your policies must cater for the interim situation in a realistic way. Indeed, if as you say, the Mode A/C system and the RF environment are already at their limit, you must not allow a large increase in transponder carriage. Neither could we be party to it.

We wish to offer a solution to this issue and we will develop it in our comments on each of the "Options". Whilst Mode S may be necessary today for IFR traffic in CAS, it is not practicable for all VFR aircraft and gliders to operate transponders until Mode A/C is switched off because of the effect on the RF environment and consequently on CAT safety and regularity. We propose a more measured approach so the negative consequences can be assessed and managed.

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 before 1989 the CAA has been that "industry is developing low power, low cost transponders" but of course that has not happened. 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.

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 and we wish to do this for our members. The cost will be between £19M and £44.2M, that is about £8M a year for the next four years which is substantial, especially as those on whom the cost will fall do not obtain any direct gain in the areas on which you are consulting.

In the consultation executive summary you mention the Target Level of Safety but do not say what this is. The consultation does not then consider what level of safety is currently achieved in the various situations nor what change in safety would result from each of the "Options". This is absolutely basic to business management in safety critical areas and we do not believe you can proceed without this basic decision making data. From our viewpoint, we cannot construct a business case without this data and as it is our member's resources you are proposing to commit, we consider that you must provide it.

When we discuss safety here, your focus is on the risk of collision involving CAT. As the MOD has already decided to fit Mode S to all its air platforms, they can be set aside in this consideration. This leaves the risk between CAT and light aircraft and gliders. We note that the Chairman UK Airprox Board in his 17th report says 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 although safety would be improved in some areas by Mode S, actually safety is already judged sufficient and this is not a particular area of concern. Safety does not make a business case here.

We note the statement in the consultation (para 12.5) that

"The UK Airprox Board supports proposals to mandate mode S transponders to the maximum extent possible".

We consider that this appears to be very bad safety management policy as it does not relate to any particular level of safety improvement nor to any assessment of existing risk. If that really is the UKAB policy we will challenge them on it. We have asked them to clarify their position on this but at the time of writing have not received a reply.

The Policy Proposals

In the consultation and supplementary material you have said:

- *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*

Our position is:

- *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.*

These two positions should be compatible and we should be able to find a common position. However in the consultation you also say:

- *You have an aspiration to widen the circumstances where aircraft have to carry and operate transponders and:*
- *Your 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 you actually intend to mandate Mode S in all class G airspace at a later stage; we conclude this because class G would be the only remaining area. We do not support this because it is not based on any safety case and demonstrates that you have already made your policy decision and it is actually no different from your last proposal, it is just presented differently and in stages. We would be pleased to find this was not the case but it is what you have written.

"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 said to be to create an environment where the position and altitude of all aircraft within CAS is 'known' to ATC and TCAS systems. However, the position of all aircraft is already known to ATC through radar

control or procedural clearance because that is what CAS is all about. If a light aircraft or glider were flying in IFR, interacting with TCAS would form a sensible safety net should ATC separation fail. However, an aircraft or glider flying VFR has visual sighting, focussed by traffic information, as a safety net in the rare case that radar control or procedural clearance breaks down.

Let us not forget that TCAS and visual sighting are not the means of separation in CAS, they are secondary safety nets should the primary means fail.

VFR aircraft flying under control within CAS do not need to be interoperable with TCAS to maintain safety (although we do not actually know what the target level of safety is). This is already accepted by you in principle because we are told that non-transponding 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 much as they are today, something rather more than "exceptional". If it was less safe you would not propose it so we conclude that access for non-transponding aircraft is acceptably safe and you will allow it.

We therefore find a situation where for light aircraft and gliders, Mode S is mandated but non-transponding aircraft are also allowed. This results in a CAS safety environment identical to one where Mode S is recommended but not mandated. We propose an alternative option (as required by the Consultation Guidelines) that changes the way this is presented whilst still achieving the policy (and safety) objective you desire.

The LAA proposes that Mode S should be mandatory for all flights in Class A airspace and for IFR flights on Class B to E airspace. For VFR flights in Class B to E airspace, altitude encoding transponders should be recommended.

It would be noted that VFR access to Class B to E airspace is likely to more easily available to aircraft with altitude encoding transponders than without.

We also recommend that transponder installations without altitude reporting be removed from approvals lists.

Such a policy would allow individual operators to make their own business case balancing airspace access against cost. Appropriate safety nets would be available for all flights through electronic or visual interoperability as appropriate. We have also taken the opportunity to propose removing the risk caused to CAT when encountering TCAS targets without altitude information in any airspace thus removing a safety ambiguity. We believe that when compared with the "do nothing" option for this specific policy proposal, the level of safety achieved is at least that of your "Option 1"

You will note that we have recommended only altitude encoding transponders and not Mode S for VFR flight in Class B to E airspace. This is based on a safety and business case. Whilst "mixed mode" is operating it will not matter (either technically or operationally) which equipment is carried by VFR aircraft and gliders as the interoperability with ATC systems and TCAS will be identical.

Moreover we have shown that RF interference will be no worse and we do not want to encourage a proliferation of transponders until "mixed mode" ceases for the reasons discussed earlier. Once mixed mode does cease, Mode A/C transponders will no longer work and thus equipments will die naturally, achieving your longer term policy aim of transferring all transponders to Mode S technology.

We argue that this would satisfy your 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.

Option 2

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

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. You say you consider that the current Airspace Change Process (ACP) should be the basis for this and we agree. However, you go on to say that the process could be "scalable to reduce the burden on applicants". We have been told that you intend to apply TMZs around airspace incursion hot spots and it has been suggested that NATS want TMZs under "stubs" the areas of TMA that extend out from CTRs. In addition to helping to mitigate airspace infringements, you propose 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 universal basis, TMZs could be established anywhere for an reason. Moreover, you have 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? The consultation does say that ATC service may need to be available and risk assessments may be needed. We believe these would be absolutely fundamental to such proposals but they are only possibilities according to the consultation.

We would expect this proposal to 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 so you have not made a safety or business case for the establishment of TMZs beyond the powers you already have. You need to do that before asking about the application process.

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.

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 we may offer views as to what might be done, we 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 proposals for which no real alternative options being proposed, in particular there is no "do nothing" option which would involve an analysis of the safety and business case for retaining the status quo in this area alone. This is a mandatory item for consultations and you have not provided it.

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 you to "be clear about what your proposals are". We believe that this needs to be revisited covering the issues we have raised and particularly the safety and business case for the establishment of TMZs at all and including alternative options including do nothing. Once that is done we would be content for NATMAC to decide on the application process.

Option 3

Include gliders in the SSR transponder carriage regulations.

It is very difficult to fit a transponder in most gliders because of space and with no power supply they have to rely on batteries. Mode S transponders draw significant power, especially when operating in "mixed mode" so it is not possible to rely on batteries except for short periods making serious cross country wave flying impossible. We were given to understand that special high power lightweight batteries would resolve this but they are very expensive and would not be commonly available in gliders. Many gliders will not be able to fit transponders. Those that are able to fit them will need to turn them on solely when in mandatory airspace to preserve battery capacity. We consider that the installation and operation of Mode S transponders is sufficiently difficult that a strong safety and business case needs to be presented for consideration. This has not been done.

You propose that this "Option" is not intended to allow an increase in CAT in class G airspace. But the UKAB considers that no safety action is needed to protect CAT at current levels and the CAA policy statement on Flight Outside Controlled Airspace states that "If suitable mitigating measures are taken, there is little evidence to suggest that an aircraft is exposed to significant additional risk (through flight outside CAS)". It goes on to list the mitigating measures and notes that the principle risk is at very low level, an area not normally used by CAT.

Although you suggest that special areas may be made available for gliders that is again uncertain and we cannot support something where you are not clear on what you are proposing. Moreover, the nature of cross country gliding above FL100 is such that the policy you propose would seriously damage the competitive position of the UK.

Again, no alternative is proposed in the consultation and there is no proper risk analysis or business case. The LAA proposes an alternative which would be to:

Include gliders in transponder regulations as per our alternative proposal for "Option 2" but continue their exemption from mandatory carriage above FL100.

Option 4

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

You say that you 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 you now want 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 and the ICAO recommendation was never intended to be interpreted in this way.

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.

We note that you have currently filed 603 specific differences to ICAO recommendations and have more differences which you have not defined. But you are now proposing to remove just this one. We were not convinced by being told that you need to do this because of a forthcoming audit. A public consultation on this scale does not appear to be considered for the other 603 differences.

We suggest that during your forthcoming audit by or with ICAO you should impress upon them the issue that this raises and invite them to change the wording of this recommendation along the lines of our earlier discussion.

As there is no safety case and no business case for this "Option" and it is just an administrative issue we recommend you delete it forthwith.

Some stakeholders have formed the view that you have only included this as a hostage to fortune so that you can show you have given way on this when upholding the other "Options". We would not hold that view and doubt that you would even consider employing such a tactic.

Transition and Exemption Arrangements

We have some issues with the transition 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, your proposed transition arrangements would discourage the fitment of recycled Mode A/C transponders after March 2009 because you 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.

Summary

To be drafted

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