

## **Mode S RIA Consultation - PFA Overall Consideration Draft 2**

This is a poorly constructed paper that sets out to justify installing Mode S on all UK aircraft when the problem that it says it is addressing does not require mode S to solve it. The problem relates to public safety, is important and needs to be addressed in a cooperative way between the regulator and the aviation community. This Paper does not argue sensibly and does not offer the range of solutions the subject deserves. Nevertheless by repetition of assumptions (some of which are quite out of context) and false statements built up from them, it supports the conclusion that all UK aircraft should carry an operational Mode S and ADS(B) by Oct 08.

We need to find out what the DAP actually wants. Do they want to:

1. Solve the underlying issue of risk to CAT aircraft at regional airports? To achieve this would require a Mode A&C or Mode S transponder in certain airspace in certain conditions. For example we could create Class E airspace in the relevant terminal areas and permit SSR equipped aircraft free passage in VMC whilst requiring non-SSR equipped aircraft to obtain a clearance. I think we could support something like that but see below on risk. Mode S is a side issue to that.
2. Fit all aircraft with Mode S and ADS(B) (that cannot be used) to support a European requirement that the paper says does not exist.

There are a number of fundamental deficiencies in the paper. The main ones are:

The cost to GA has been deflated by quite spurious figures that any layman could refute by making phone calls to avionic suppliers and installers – the estimated real cost to GA is in the order of a conservative £100M.

The non-ionising radiation safety issues resulting from carrying a 1000 MHz transmitter close to the person particularly in gliders, non-electrical aircraft and hang gliders do not seem to have been assessed. We know that the damage caused by such transmissions varies significantly with power and with duty cycle, controlled by the binary equivalent of the SSR code set. We have work in hand on this that should be sufficiently authoritative for the CAA. However, we should not be doing this as part of the RIA, the CAA should have done it.

The paper is vague in a number of areas particularly concessions and exemptions. These would be critical to costs and benefits but Annex F indicates that they will be mostly short term and will be decided by the CAA after the consultation. This is a technique for avoiding scrutiny of the detailed proposals which does not do the department credit. The paper cannot proceed until this is resolved and we know what is being proposed in its entirety.

Following on from this and most importantly, the paper does not provide a risk analysis related to the fundamental issue of safety of CAT in the Class G terminal airspace

proposed. With no clear statement of what classes of aircraft will have free circulation in the volumes of airspace that CAT will use, such an analysis is impossible. But it is the very foundation of the proposal. Following the logic in the paper, it is possible to show that flight in this class G airspace is safer than flight in Class A and that cannot be correct.

From the PFA viewpoint, the safety of all airspace users is very important indeed but we are committed to achieving this at an affordable cost. Something along the lines of Item 1 above would achieve this and resolve many of the issues raised in the paper. However, the options presented are structured such that the desired outcome is supported and others are dismissed. Additional options that address the safety issues must be considered and argued out logically once all the facts are available. This subject is not ready to go to RIA.

Finally, the RIA is presented in such a complex and repetitive way that ordinary people who cannot apply professional expertise and many hours of study, will not be able to deal with this at all let alone comment sensibly in 12 weeks. To meet the spirit of the consultation this needs a layman's guide and a road show to explain what it means and why.

Whilst I am sure we can find a way to support DAP's safety concerns, this is not a good basis. Unless we can find an amicable way towards a safety-based solution, we should fight this proposal.

John Brady

Vice Chairman  
The Popular Flying Association

21 June 2006

encl: Comments by paragraph

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## **PFA initial Analysis by paragraph**

### **1 Title of Proposal**

The title is spurious. This should actually be "A measure to permit the use of unregulated terminal airspace by CAT aircraft"

### **2 Purpose and Intended Effect**

#### **2.1 Objective**

### **2.1.1**

The objective is also spurious. This does not relate to safety in all classes of UK airspace, only Class G and only then in terminal airspace and only in relation to encounters involving CAT aircraft. Technical interoperability is only relevant where aircraft with ACAS interact with aircraft with SSR.

### **2.1.2**

The proposition that that risk of collision rises faster than the number of flights is declared as an assumption but it is not substantiated in the document.

The proposition that safety improvements have to be put in place before air traffic levels can be allowed to increase relies entirely on the assumption. It does not follow from the earlier discussion. Increasing traffic levels do not necessarily prejudice safety. If they did the CAA would be culpably negligent for allowing them to rise to current levels. They would have to be reduced immediately.

The forecast by Eurocontrol of doubling traffic applies to Europe and may not be justified (*need to test this forecast*) and anyway applies to CAT across Europe. It cannot be mapped onto Class G terminal airspace in the UK.

A traffic forecast for 2020 in Europe is no basis for mandating SSR in UK Class G terminal airspace.

Aviation growth is not, of itself fundamental to the success of the UK economy. Indeed if CAT did double, doubling fuel consumption and pollution of all types, would cause a crisis. It is not a tenable scenario.

As it is inconceivable that traffic will double, the conclusion on accident rates is unfounded. If safety is to be improved, this needs to be as part of an overall analysis to identify cost effective options. The act of encouraging CAT into Class G airspace needs to be tested to see if it increases risk. An integrated approach to safety management is mandatory here. This just disguises a change under a cloak of undefined safety.

### **2.1.3**

This is a false statement. The proposal only relates to Class G terminal airspace.

I think the UKAPB refers to the interaction of SSR and ACAS.

UKAPB data needs analysis. Particularly 092/05,

### **2.1.4**

Whilst the interaction of systems is interesting the only thing relevant is the airproxes in Class G terminal airspace where a GA aircraft without transponder was involved.

The 4 to 10 fold increase relates to successful interaction with ACAS. This paper is about SSR and this must be separated.

Safety levels may not be increased if CAT are encouraged into Class G terminal airspace.

## **2.2 Background Issues and Risks**

### **2.2.1**

The technical interoperability is not the issue. It is safety for CAT in Class G terminal airspace.

SSR alone does not improve safety

What is this “general surveillance”? Is this the airspace charging system that many people seem to suspect is behind this? It is not mentioned or supported anywhere else so it must be spurious.

Again, whilst it is repeated many times, this change does not apply to all UK airspace, only certain Class G. It is also not to do with sharing all UK airspace, only with CAT being able to use Class G.

### **2.2.2**

The sharing of UK airspace suggests there should be a linked review of existing and future CAS to identify where CAS can be given up or where the new environment will apply. After all it is asserted that allowing CAT to use Class G airspace when SSR is mandated will increase safety. As the current system routes CAS inside Class A or D, it must follow that Class G with SSR is safer than Class A for CAT. Therefore we can dispense with at least some Class A and D and increase safety levels.

There needs to be a risk analysis associated with the use by CAT of Class G airspace in the new SSR environment. This has to be done first and must form part of their RAI. Otherwise, GA could be spending large sums for no reason.

### **2.2.3**

The optimum way to futureproof requirements is to delay the implementation as much as possible and certainly until all European requirements are frozen.

### **2.2.4**

The bicycle lights analogy is grossly misleading and is designed to mislead non-experts.

### **2.2.5**

Argument for the replacement of ‘Classical’ SSR is erroneous. Whilst the proposed traffic growth might have exceeded SSR capabilities, the introduction of Mode S in CAS has reduced the load significantly. There is no technical reason why existing SSRs in GA aircraft should be replaced by 2008

To say that safety levels will be eroded is blatantly untrue

There is no shortage of SSR codes for GA in the UK or Europe. The Mode S SSR code 1000 (used by SSR equipped aircraft) solves all these issues and GA uses common 7000 anyway. To say that existing UK GA mode S transponders will result in delay to CAT is deceitful. No UK GA SSR code allocation will ever result in CAT being delayed.

Leaving the existing transponders in current GA aircraft will not change the safety and enabling economic benefits of the ground ATC equipment. Equipments are backwards and forwards compatible and can operate side by side beyond March 2008.

The issues of bunching relate to CAT aircraft in CAS in busy terminal areas and particularly to holding and stacking. None of this is anything to do with GA in class G airspace. The statement that therefore ALL aircraft need mode S is untrue.

If all traffic used old SSR, the frequency might become overloaded. As it is, phasing out old SSR equipment installed in DA aircraft will not have any effect on interference. The fact is that with Mode S in all CAT aircraft and with very few traditional SSRs likely to be installed in current GA aircraft, loads will be reduced. Maybe it needs to be phased out eventually but not by the March 2008.

#### **2.2.6**

Mandating mode S will not change inter-GA airproxes and will not significantly change military/GA airproxes or Military/CAT airproxes. Military aircraft will be exempted from the requirement and will not be required to carry ACAS

Whilst Collision Warning Systems (CWS) may make flying safer, that is not under discussion here so is irrelevant.

Mode S is not required to interact with ACAS, Mode C is required so existing SSRs satisfy the requirement. It is thus a false conclusion to say that mode S is needed for this.

If ACAS is not fitted to all MOD aircraft, the benefits of fitting transponders to GA aircraft will not be maximized. It is essential that the MOD programmes and the GA requirement are aligned. This is fundamental argument. Also only Mode A & C are required. Replacing Mode A & C with Mode S is irrelevant.

#### **2.2.7**

This is perhaps the most important paragraph in the paper as it contradicts at least half of the arguments put forward and their conclusions

ICAO does not specify SSR for gliders, hang gliders, parachutists etc. Nor does it specify Mode S. Mode A & C will do so this argument does not support the replacement of existing Mode A & C equipments

Whist ACAS II may be designed for a Mode S environment, it is entirely compatible ACAS 1 and with Mode A & C so mentioning it here is fraudulent.

ICAO does not specify Mode C so existing SSRs need not be replaced to comply.

I do not understand what purpose the phrase *contiguous Mode S coverage* serves and why the full benefits can only be maximised with it. For GA aircraft flying in Class G airspace, the European issue is irrelevant. This case concerns Class G only. We have no need to maximize anything except safety. The full benefits of mode S may allow ATC systems to be changed fundamentally, but these sorts of benefits will not be realized in 2008. Only benefits that can be achieved by 2008 can be included in the case for mode S to be introduced by then. Continuity of regulation in the vicinity of the FIR boundary has no relevance for GA aircraft although it is important for CAT.

It is false to suggest there is a European programme to introduce mode S into Class G airspace. There is none. The important text in relation to this is:

*However, these will not legislate for the carriage and operation of SSR transponders on aircraft, and appropriate mandates in this regard are not currently being muted. The SES initiative is still somewhat embryonic and the work programme has to be prioritised within available resources. Indeed, the initial SES rules are likely to just support existing programmes and projects.*

And

*The UK policy proposal contained within this Regulatory Impact Assessment (RIA) is, therefore, complementary to foreseen future SES requirements for SSR transponder carriage*

This paragraph says that SES has no plans to do what the CAA is proposing. Therefore all European conformity arguments placed elsewhere in this paper must be struck out as being false. The interoperability rules relate to standards, codes and procedures only so are irrelevant to this proposal.

*“In any case, mandating the carriage and operation of SSR Mode S in UK airspace from 31 March 2008, ahead of any potential European legislation, is essential because of national concerns. These concerns are elaborated throughout this RIA but centre on the need to introduce measures that sustain or improve levels of safety in a joint and integrated UK airspace, while managing the increasing complexity of this airspace and the increasing density of air traffic using it.”*

**This is the core issue. All the rest is padding**

**2.2.8**

## **ADS-B**

Is ECAC Surveillance Strategy Issue 20 adopted as policy by the EU or the UK? If not this para is false.

I cannot find agreement on ADS(B) strategy in Europe

The statement on ADS(B) requirements is false. Requiring users to install ADS-B by 2008 against an undefined requirement for 2020 is not futureproofing. What is, is deferring the requirement to fit this capability until the requirement is fully approved and agreed worldwide. It would be sensible to provide users with sufficient information to make their own decision. Why should existing mode S systems have to be scrapped by 2008 to be replaced by something that cannot be used for 12 years and is anyway not mature.

A recommendation that buyers should consider provision for ADS(B) would be sensible and is the limit that can be ordered by the CAA.

### **2.2.9**

Making temporary airspace reservations is not new and happens now. Requests for temporary airspace for GA events has never been approved to my knowledge so the proposal that this will be done for GA is not believable.

Permanent segregation is what we have now. Again mode S is irrelevant. So is ADS-B. The requirement here seems to be for a means to detect airspace infringements.

### **2.2.10**

CAA UAV policy is that UAVs must be able to see and avoid without the use of ACAS. Again, Mode S as such is not relevant. UAVs are not planned for approval by 2008. Moreover, if the public became aware that the CAA intended to approve UAVs the size of a 737 flying at lower levels in the open FIR, some having flown direct from other continents, I think they might have something to say to the government. If the CAA intends to use this in their public RIA and wants us to pay to establish the necessary environment, the public at large will need to be made aware of the CAA's intention to approve large UAVs being flown at low levels over their homes.

### **2.2.11**

There is currently no requirement for primary radars to detect GA aircraft in class G airspace. No regional airport I know of uses a primary radar for the purposes of providing radar separation. Everything is synthetic. Mode S not relevant. Existing SSR transponders will do. 2008 is not a cut off line

### **2.2.12**

The suggestion that somehow we need to buy Mode S so primary radars can be shut down is nonsense in the 2008 timeframe.

## 2.3 Guiding Policy Principles

### 2.3.1

*Principle 1: Maximise Effectiveness of Collision Avoidance Technology. Provide a suitable airborne environment with which to maximise the effectiveness of ACAS in all UK airspace.*

To achieve this requires all military aircraft to carry ACAS in the same timescale. For GA, existing A & C transponders satisfy this requirement so it is irrelevant to the Mode S case. This proposal goes beyond the underlying issue of allowing CAT to use Class G in terminal areas.

This principle must be revised to align with the aim of the paper.

*Principle 2: 'Future-Proof' the Introduction of New Airspace Surveillance Technology. Create an airborne environment in which all aircraft operating in UK airspace are equipped with a common technology that will ease the introduction of new airspace surveillance systems and ATC tools for the years up to 2020 and beyond. This is considered to be a major Simplification Measure for all sectors of the aviation community.*

Future upgrades are facilitated by making provision for something or by deferring the change until the requirement is mature and stable. Why should existing mode A & C and Mode S systems be scrapped in 2008 to provide ADS(B)? Why should existing Mode S systems be scrapped to enable ADS(B) which cannot be used and for which there is no requirement?

The UK is going alone on this and the rest of the world may take a different route by 2020. This is a very long time in technology terms. This unilateral decision is not simplification for anybody. Mandating an operational ADS(B) communication system in GA aircraft by 2008 would provide no additional capability .

The proposals in the paper would achieve the reverse of the first part of this Principle in that they would not permit technology which has yet to be developed to be included as it becomes available without major equipment change.

The second part relates to 2020 and beyond and the CAA cannot mandate equipment now when they cannot possibly know what systems may be needed then.

Therefore this Principle is self-contradictory and must be disregarded.

*Principle 3: Facilitate Measures to Enhance 'See and Avoid' Techniques. Provide an airborne environment with which to facilitate technology-based measures that could enhance the 'see and avoid' techniques used by pilots to prevent mid-air collisions in unregulated Class G UK airspace. Similarly, by facilitating the use of suitable 'sense and*

*avoid' technology, this airborne environment must also support the future integration of UAV operations into UK airspace in a safe and interoperable manner.*

Enhancing see and avoid does not need mode S with ADS-B. Mode A&C would satisfy the operational requirement set out in the aim. In addition, to meet the main aim of the paper SSR is only needed in terminal airspace. Support for UAVs can wait until a policy is agreed and required and only requires A & C as well. None of this is needed by 2008.

This is not a valid Principle and must be disregarded.

*Principle 4: Facilitate Improved ATC Efficiency in the UK FIR. Provide a suitable airborne environment with which to facilitate efficiency improvements in the provision of Air Traffic Services (ATS) in the UK FIR.*

No efficiency improvements are required in the paper to meet the aim. This issue has not been mentioned elsewhere in the paper. ATS providers are commercial organizations and if their efficiency (ie costs) is to be improved, they must make the investment. Causing a third party to absorb the costs of improving commercial efficiency in one segment is something the CAA, as the Industry Regulator, should be preventing not prescribing. If this relates to airspace efficiency (don't think it does) then it should say so.

This is not a valid Principle and must be disregarded.

*e. Principle 5: Meet International Obligations. Implement the ICAO Chicago Convention Annex 6 requirements for the carriage and operation of pressure-altitude reporting transponders on all aeroplanes and helicopters. Furthermore, continue to support the European Mode S programme.*

Need to review ICAO Annex 6. Note that it applies to aeroplanes and helicopters only.

As the CAA proposal goes beyond this, it seems ICAO is being used as a cover to go beyond its actual requirement. There is no European programme for Mode S envisaged so what are we supporting? This is not a football match that needs supporters; it is a safety and business case that must rely on analysis of cost benefit. There is no European Mode S Programme to support, as the paper explicitly says in para 2.2.7 c

This is not a valid Principle and must be disregarded.

*Principle 6: Protect the SSR Frequencies. Preserve and protect the integrity of the radio frequencies on which SSR operates, and hence the safe use of ACAS, SSR and ATM systems, in the face of the forecast growth in air traffic movements.*

All CAT aircraft are already required to carry Mode S so traffic growth will not have any effect as the proposed growth applies to CAT only not GA. Provided the number of GA

Mode A & C transponders does not increase significantly, there is no risk to the SSR frequency. Therefore this Principle is meaningless.

This is not a valid Principle and must be disregarded.

*Principle 7: Update Existing SSR Transponders on Aircraft. Update those SSR transponders that are currently fitted to aircraft, and which operate in 'classical' SSR Mode 3A/C, with new SSR Mode S technology.*

Upgrades are only necessary when the technical standard is changed, equipment becomes unreliable, impossible to support or unfit for purpose. Mode A & C and Mode S are backwards and forwards compatible so there is no technical or fitness for purpose issue. There is no suggestion that they are not reliable therefore there is no reason to change by Oct 2008. Updating for its own sake must be a matter for individual owners and operators. The CAA should recommend that new transponders should be Mode C and have provision for ADS(B) but the commercial decision is with the owner/operator not the CAA. The only technology change is 25ft level discrimination vs 50ft, which has no relevance to the aim of the paper.

This is not a valid Principle and must be disregarded.

*Principle 8: Maximise the Use of New SSR Mode S Technology. Maximise the carriage and operation of SSR Mode S transponders on all flights in UK airspace operating under IFR and VFR.*

This has no connection with anything else in the consultation. Maximising something for its own sake is not efficient or worthwhile. Transponders in aircraft are needed to meet an operational requirement. They are not fashion statements or style items. Nor is this a marketing strategy although it does read like one. This para suggests the real aim of the paper is to fit Mode S rather than to improve safety. Such decisions are not a matter for the CAA.

This is not a valid Principle and must be disregarded.

*Principle 9: Facilitate Measures for Flexible Use of Airspace in the UK FIR. Provide an environment where all aircraft operating in the UK FIR are interoperable so that measures to use airspace flexibly can be enhanced.*

Mode S not required to satisfy this Principle. A Mode A & C transponder only is required in terminal airspace at lower levels to meet this principle. Mode A & C will satisfy the operational requirement and carriage is only necessary in terminal airspace.

There must be an associated and linked review of UK airspace to reduce existing Class A and D airspace otherwise this Principle will not be valid at all.

As it stands, this is not a valid Principle and must be disregarded until it is changed.

*Principle 10: Provide Potential Mitigation for Impact of Wind Turbines on Aviation. Provide a suitable airborne environment with which to facilitate measures to provide potential mitigation for the effects of wind turbine developments on aviation operations; and, in particular, mitigation for the impact of wind turbine structures on the performance of primary radar.*

The aim of the consultation relates to interoperability in flexible airspace. The performance of primary radar is not an issue for that. Therefore the wind turbine issue is not relevant to GA or indeed to anything else in the consultation. The discussion on the effect of wind turbines on busy terminal areas and stacks is entirely an issue for CAT. It does not affect GA at all. To proceed at all this issue must be supported by research relating wind turbines to the collision risk between GA and CAT aircraft in Class G terminal airspace.

As it stands this is not a valid Principle and must be disregarded.

### **2.3.2 Simplification.**

Table 3 is a summary of the principles. The same comments above apply here.

### **2.4 Rationale for Government Intervention**

As the opening paragraph relies on the earlier logic, which can be shown to be false, the rationale collapses. The following sub-paragraphs draw on the earlier work and suffer the same logic flaws.

## **3 Consultation**

### **3.1 Within Government**

No comment

### **3.2 Public Consultation**

#### **3.2.1**

I have no knowledge of pre-notifications

#### **3.2.2**

I have no knowledge of previous consultations – If there were any was anything taken up?

#### **3.2.3**

##### **a.**

How has the CAA taken a leading role? At the press briefing they said it was a matter for industry and the CAA had to stand back.

##### **b.**

It is not true to assert that

*the safety benefits of greater technical interoperability with ATC and ACAS accrue to all airspace users.*

Where airspace users do not presently interact with ATC nor fly in the vicinity of CAT, they gain nothing. On the other hand the CAT operators and the travelling public gain profit and access when the costs are borne **solely** by GA. The principle that the beneficiary pays is well known and must apply here

**c.**

The proposal does not provide future proofing. This is best achieved by not mandating something that is not mature. Demanding an operational ADS-B aircraft capability by Oct 08 when the requirement is not defined and the necessary ground environment does not exist is folly. Better to advise owners that an ADSB requirement is likely in the future and they should consider making provision for it. If they choose not to do so that is their choice. The aims of the consultation do not require it.

**d.**

This is an unrealistic scenario. Whilst it is true that a few gliders and light aircraft may never leave their local area, weather conditions permitting cross country flight arise and will be taken advantage of. Transponders will be necessary. Competition events will involve aircraft that can compete and therefore can fly outside the immediate vicinity of their airfield. To do this they will have to be transponder equipped. Therefore this paragraph is spurious. Leasing transponders is just imagination. The CAA cannot base a major paper on such weak support.

An exemptions policy must be a central part of this policy going forward. It cannot go to RIA when key features like this are just "*envisioned*". If this is policy the paper should say so. If it is not known the paper is clearly immature and must be withdrawn.

**e.**

We can accept that clusters of Mode S equipped aircraft will not overload ATC radar processing but they will definitely overload ACAS systems which are designed to deal with individual discrete responses. Therefore the proposition that ACAS will still work is false.

We need to do some research to prove this.

The last sentence on LPST is nothing to do with the issue being addressed here unless they think that low power transponders will not be able to communicate with ground radars. Initial research work suggests this may be true and LPST will serve no purpose

**f.**

If the LPST is suitable for some aircraft it must by definition be suitable for all. It may not be suitable for ex-military jet aircraft operating above 250kts in upper airspace but other types of historic and vintage aircraft must be acceptable. If the LPST is inadequate it should not be considered for any aircraft type.

## **4 Options**

Before we can look at the options, we have to resolve the fundamental issues raised earlier. Because of the lack of safety analysis, the lack of consideration of existing mode A & C transponders and of restricting the requirement to terminal airspace, the options do not represent a sensible solution set. They must be restructured when the paper is rewritten. They may suit the CAA in that they guide the reader to the preferred solution but they are not adequate for a RAI.

It is however necessary to review para 4.7. as it relates to airspace segregation.

### **4.7 Other Options Discounted After the Initial RIA Development Stage**

#### **4.7.1**

Only ADS(B) via 1090ES data link was carried forward into the options because alternative carriers for Mode S would be more expensive and complicated to integrate into the ground environment. However, the GE is not yet defined worldwide and the datalink standard is not an ICAO standard (we think – this needs research)

#### **4.7.2 and 4.7.3**

A Segregation option was considered but rejected because (notional) economic costs would accrue in future years. However, the comparison of costs was not set out. In a cost effectiveness analysis it is not possible to cost one side and make vague statements about the other. This has to be re-evaluated seriously and not dismissed because it is not the preferred solution.

Importantly, the CAA did not consider an option to give choice to the GA operator by allowing transponder equipped aircraft to use the airspace judged to be at risk, whilst placing airspace and clearance restrictions on aircraft whose owner/operators had decided not equip. This would achieve the proposed safety levels whilst setting a balance between extensions of CAS and volumes of accessible airspace.

## **5 Costs and Benefits**

As the options are set to provide the desired outcome, the cost/benefit analysis is not a valid comparison. Moreover the method of presentation of this analysis does not place actual comparative values against the parameters but merely provides a qualitative indication that some measure is included in the option or not. This type of analysis is not appropriate for an RIA

### **5.1 Sectors and Groups Affected**

No comment

#### **5.2.1 Option 1**

No change no surprise

#### **5.2.2 Option 2**

#### **5.2.2.1**

No comment

#### **5.2.2.2**

It is not valid to introduce the VOSL and then not use it. This is just an attempt to introduce a large unquantified benefit without defining the costs related to it.

To say that the introduction of this technology could help prevent collisions is not an adequate expression for a cost benefit analysis. If it cannot be quantified beyond that it is not a valid element in the calculation.

#### **5.2.2.3**

This is a paragraph of benefits that have no relevance to the GA operator who will bear the cost. ATC providers, UAV operators and wind turbine owners will reap specific commercial gains from this expenditure. However, the GA users of Mode S will gain nothing except some protection from collision with the CAT aircraft that they have supported with their expenditure.

To use a version of the earlier analogy:

Bus lanes are becoming crowded so bicycles will have to carry special lights in order that buses can also use cycle lanes without being damaged by collisions with bicycles. Cyclists must pay for the special lights. Cyclists will benefit from this as they will be at less risk of being struck by buses.

Whilst the CAA may not be minded to “subsidise” the fitment of Mode S into GA aircraft, it cannot adopt this one sided commercial attitude in a RAI. It is untrue to assert that GA pilots will gain access. Their loss may be limited but the commercial interests will gain most and at no cost to themselves.

#### **5.2.2.4**

It is not true to say that “*it is not possible to attribute the proportion of the economic benefits that could be derived by individual groups or sectors*”. It is possible and in an RAI such as this it is absolutely mandatory

#### **5.2.2.5**

This paragraph denigrates Mode A&C by repetition of the false statements made earlier in the paper.

#### **5.2.3 Option 3**

This is a statement that Option 3 (the desired outcome) is the best. Unfortunately the conclusions cited are all false.

#### **5.2.4 Options 2(a) and 3(a)**

Reaching a crescendo of false logic, this section asserts that installing ADS(B) by 2008, somehow protects the user against future changes in the operational policy and requirement for this immature system. It clearly is not so.

### **5.2.5 Summary of the Qualitative Benefits of the Options**

An RAI need quantitative benefits not qualitative. None are provided.

## **5.3 Costs**

### **5.3.1 General Cost Assumptions**

#### **5.3.1.1**

The table of costs is said to include VAT, the cost of a minor modification and fitting as well as antennae, panels etc. But the cost listed is the advertised current cost of the unit only. The cost of a CAA minor modification plus the professional cost to prepare it plus the cost of professional installation will come to many times this. Therefore the costs are invalid and invalidate the decision to proceed with a RIA.

We need to take a sample cost for installing an existing equipment (say a Filser TST800) into a common CofA aircraft, and repeat that for several suppliers/installers

#### **5.3.1.2**

I do not believe the annual costs asserted are reasonable. Extending the radio licence to 3 years would be a simplification if the 3-year cost were the same as the 1-year cost. The paper does not say this so we must assume the 3-year cost will be 3 times the 1-year cost, making the assertion fraudulent. It will be simpler for the CAA but not for the user.

#### **5.3.1.3**

CAA high figure for all relevant aircraft used in the paper = 24714

CAA figure from regulatory review = 26123 of which 4% (1044) are commercial aircraft.

As the real cost of installation is easily double the equipment costs we can multiply the CAA cost estimate by 2.11 giving a conservative order of cost of £96,552,863. Say £100M. Somewhat different from the range of £13.6M to £45,7M given in the paper. At their press briefing the CAA said they relied on industry for cost estimates but perhaps they have not been forthright on this matter.

#### **5.3.1.4**

The suggestion of using leased transponders does not seem practicable or cost effective and should not be considered for costing purposes. Therefore it should not be mentioned.

#### **5.3.1.5**

No comment

### **5.3.2 etc**

The options have not been considered in detail as they cannot be supported from the paper as presented.

**7 Competition Assessment**

Not assessed

**8 Enforcement, Sanctions and Monitoring**

Not assessed

**Annexes**

Not assessed