



Partial Regulatory Impact Assessment

**CONSULTATION ON A PROPOSAL TO AMEND THE AIR NAVIGATION ORDER
2005 FOR THE PURPOSE OF IMPROVING THE TECHNICAL
INTEROPERABILITY OF ALL AIRCRAFT IN UK AIRSPACE**

Response to Consultees

Foreword

On behalf of the Directorate of Airspace Policy (DAP), I would like to take this opportunity to sincerely thank all respondents for providing detailed feedback, in the form of both the questionnaire and written comments, on our proposal to revise the Air Navigation Order 2005 for the purpose of improving the technical interoperability of all aircraft in UK airspace. Information and comments received from consultees has been collated into a single *Summary of Responses* (SoR) document which can be downloaded from the CAA website (<http://www.caa.co.uk/modes>). The SoR document does not incorporate all the individual comments received, as there were over 3100 respondents to the consultation. However, it contains a synopsis of consultees' comments grouped by main themes. It should be noted that even though an individual consultee's comments may not be specifically included in the SoR document, DAP staff have reviewed and analysed all responses received. The Directorate has taken account of all the comments received from consultees and has published this *Response to Consultees* document, which addresses those issues within the main grouped themes that the CAA considers are key to the further development of its policy.

Introduction

The purpose of this document is to provide an initial formal response to the comments and feedback that were received as a result of the consultation exercise on the proposals to revise the Air Navigation Order 2005 For The Purpose Of Improving the Technical Interoperability of All Aircraft in UK Airspace. In order to present this information succinctly, the Directorate has taken the individual comments, identified recurrent themes and then provided a CAA response. It is, however, important to keep in mind the Directorate's assurance that all remaining concepts will be considered and, where it is considered appropriate, integrated as part of final proposal to Government.

For further clarification on the Directorate's responses, the reasons for inclusion/exclusion of comments/suggestions or to answer any other queries, please write to:

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Overview of the Consultation Process

During the twelve-week period from 3 Jun 06 to 29 Aug 06, CAA DAP consulted on proposals to amend the Air Navigation Order 2005 for the purpose of improving the technical interoperability of all aircraft in UK airspace. A Partial Regulatory Impact Assessment (RIA) was issued as part of the consultation and all sectors of the aviation industry and members of the general public were invited to respond with feedback and additional information on the proposals.

A questionnaire was issued to focus the responses on particular issues and aspects of the proposals but several 'free text' areas were also provided to permit expanded comments. Respondents were provided with a choice of mechanisms for submitting completed questionnaires as follows:

- a. A Microsoft Word document that could be requested from DAP staff or downloaded from the CAA website and completed electronically or by hand. Completed questionnaires could then be posted or emailed to DAP. A total of 1083 responses were received by email and 481 responses were received by post.
- b. A secure, on-line survey facility that could be completed and submitted over a suitable internet connection. A total of 1549 responses were submitted using this method.

Additionally, the CAA received many ad-hoc comments via letter or email and at various consultation workshops and presentations. These inputs have also been reviewed and taken into account. There has also been considerable correspondence in the aviation media of which the CAA has also taken note.

It is worth noting that, although the consultation questionnaire did not specifically seek to break out glider and sailplane owners as a specific group, in excess of 80% of respondents come from this sector.

Next Steps

Many of the issues raised by the consultation material were related to applicability and transition arrangements, and the resulting exemptions policy. In Annex F of the Partial RIA, it was stated that the final detail of any exemptions would be developed once a recommended option had been determined following the public consultation process. Additionally it was stated that any new regulation would specify applicability criteria with which to identify the situations when aircraft would be expected to carry and operate the required equipment. These criteria could include aspects such as aircraft weight and/or performance, airspace type, class of aircraft, class of flight or types of activity.

The CAA intends to conduct further investigation into a number of specific issues raised by this consultation. Consequently, the CAA has concluded that a second round of consultation would be helpful.

The Directorate has identified recurrent themes during the review of the SoR document. The themes have been included in this document and answered accordingly in a separate paragraph directly below each theme box.

1. Partial RIA Document

Consultees expressed concern that the Partial RIA document lacked clarity, lacked objectivity and had not been produced in accordance with the Cabinet Office Code of Practice. It was suggested that the document was biased towards the interests of commercial aviation and that the CAA had already settled on the conclusions. It was also felt that there was insufficient evidence of investigation into alternative solutions other than SSR Mode S.

CAA Response:

The Partial RIA was produced in close consultation with the Cabinet Office Better Regulation Executive and DfT. The CAA made best endeavours to ensure that the RIA met the voluntary Code of Practice to the greatest extent possible. Notwithstanding it is recognized that the subject matter is of a complex and technical nature and the CAA understands and regrets the difficulty that some consultees encountered in interpreting the information. Whilst the CAA may have already formed an opinion in certain areas in order to proceed with consultation, no predetermined decisions had been reached. Alternative options had been determined on the basis of the Initial RIA process, which considered a wide range of potential solutions. In accordance with Government guidance, this was an internal review process but one that had been discussed with representatives of the community in the sub-groups of National Air Traffic Management Advisory Committee (NATMAC) over a long period of time.

Consultees expressed concern that the Partial RIA document did not contain a detailed risk assessment, business case, comprehensive research and lacked adequate justification and evidence. Moreover, it was felt that the proposed implementation dates were unrealistic given the lack of available supporting technology for aircraft equipage, particularly LPST, and immature deployment of ground infrastructure.

CAA Response:

The Partial RIA sought to inform consultees of the issues which were under review as well as to trigger comment/discussion. As part of this exercise, the process relies on receiving additional information from respondents to the consultation in order to further develop the impact assessment and conduct further studies as necessary. Any proposals that are developed as a result of the consultation will include a full justification for the recommended option. The CAA wishes to make clear that it will not mandate the carriage of equipment where a suitable technological solution is not available in the market place at a proportionate cost. This will be addressed through the exemptions policy.

2. Response Questionnaire

Consultees expressed concern that the Response Questionnaire limited the scope of inputs from stakeholders. Furthermore, it was felt that some sections contained leading questions designed to elicit support for the CAA's preferred solution. Consultees who responded using the on-line survey facility and email facility complained that they did not receive and acknowledgement of their submissions.

CAA Response:

The Response Questionnaire contained free-text areas for several of the specific questions asked and a general comments section was provided at the end of the document. There was no intention to lead consultees responses on any of the questions and the responses have been analysed on their own merit. Unfortunately, the product used for the on-line submissions was not technically capable of automatically acknowledging responses but the CAA sought to acknowledge individual submissions

on request. Processes to generate automatic receipts will be investigated for any future public consultations conducted on-line.

3. Consultation Process

Consultees expressed concern that the time allowed for consultation was too short and that it was deliberately conducted over the busy Summer flying and holiday period. It was also felt that the CAA had not adequately consulted with representative organizations before the consultation commenced and that the workshops were conducted too late in the consultation process. Furthermore, the publicity was considered inadequate and that not all regions of the UK were visited by the CAA presentation team.

CAA Response:

The CAA followed the advice of DfT and Cabinet Office Better Policy advisors in determining the length of the consultation period. Regarding timing, the CAA published the Partial RIA and supporting documentation as soon as it was ready. Representative organizations of all GA activity have been aware of the proposals through their participation in the various consultative committees such as NATMAC and the General Aviation Consultative Committee (GACC) over a number of years. Having received in excess of 3100 responses the CAA is entirely satisfied that it has obtained comments from a wide and representative selection of the various stakeholders. The CAA held a number of regional consultation workshops as timescales and resources permitted. The CAA considers that sufficient representative feedback was obtained from the events that were held.

Consultees considered that the proposals were rushed and expressed concern that a second period of public consultation was not planned once their views had been taken into consideration.

CAA Response:

The CAA has been developing this policy over a number of years. In line with current advice from Government, the need for further consultation can only be established once data from the first round has been analysed and any supporting studies completed. Following the initial response to the Partial RIA, the CAA has concluded that a second round of consultation would be helpful.

4. Traffic Growth

Consultees felt that the traffic growth estimates used in the justification of these proposals were based purely on historical data and failed to adequately consider the potential effects of environmental concerns, oil prices, security, runway availability and recent Government transport policy/studies. There was further concern that the growth figure were based on EUROCONTROL estimates that took into account overall European-wide growth rather than UK-specific data.

CAA Response:

The traffic growth estimates given in Paragraph 2.1.2 of the Partial RIA were taken from the EUROCONTROL Air Traffic Management Strategy for the years 2000+, Volume 2 – 2003 Edition. The figures are based on an average growth rate of approximately 3.7% per annum across Europe. The figures for the increase in the numbers of flights published by NATS for the year to August 2006 also showed growth of 3.7%. In addition, flights into UK regional airports show annual growth figures of up to 12%. The CAA recognizes that Government policy and environmental concern may have a long-term effect on growth of commercial air transport but there is no evidence of this to date. Consequently, it is considered wise to assume that the recent trends will continue until there is evidence to the contrary. Nevertheless, in further developing the policy proposals, the CAA will take into account up-to-date advice and comment from DfT and NATS on potential future growth of air traffic.

Consultees were concerned that the traffic growth estimates used in the justification applied only to CAT and this did not relate directly to increased CAT activity outside of the existing controlled airspace structures. Furthermore, consultees reported that there was little or no growth expected for GA activity and that military activity was in decline.

CAA Response:

The CAA recognizes that growth figures relate to commercial air transport and that growth in GA and military aircraft is relatively static. This, along with other factors such as changes in airspace utilisation, affects the type and location of airspace where most growth is taking place. This will be considered as one of the driving factors for any applicability and any resulting exemptions policies that are developed. However, even if growth in general aviation and military activity is relatively static, the nature of their airspace requirements is likely to evolve and impact on the environment. For example, the operational requirements of military fast jets and Very Light Jets (VLJ) continue to evolve.

5. Airspace Utilisation

Consultees from the GA community considered that CAT use of Class G airspace should be curtailed and should not be detrimental to GA activity. In particular, light aircraft operators expressed concern that increased use of Class G airspace would result in increased risks. Some also expressed views that Class G airspace exists primarily for the benefit of GA aircraft and that airspace segregation from CAT was entirely appropriate. Furthermore, it was considered that controlled airspace could be used more efficiently than at present, thereby negating the need for these proposals.

CAA Response:

Class G airspace exists for the benefit of all airspace users. Mindful of its statutory duties, the CAA considers it to be unacceptable to totally prohibit access to Class G airspace to any class of airspace user. The CAA has an obligation to preserve the joint and integrated nature of UK airspace, which exists to meet the needs of disparate airspace users as far as practicable.

Consultees stated that different types of aircraft and activity in Class G airspace meant that it was not possible to implement a single solution that would meet all the objectives in the proposal. For example, some glider pilots suggested that the use of 'wave boxes' in conjunction with local ATC arrangements provided sufficient mitigation for the risks identified in the Partial RIA. Other consultees also stated that they only operated from remote locations far from controlled airspace.

CAA Response:

The CAA accepts that whilst it seeks to maximize technical interoperability, no single solution will totally meet all the objectives of the proposal for all aircraft in all airspace. In fact, it is stated in Section 5 of the Partial RIA that in some stakeholder categories, all the benefits might not apply to all individuals and organisations within those categories. Consequently, the final proposals to Government will recognize the need to base applicability criteria and any associated exemptions policy on the feasibility of equipage and airspace use. The CAA has noted the comments of those users that operate exclusively in remote locations far from controlled airspace and will seek to make provision for this during development of the policy. However, GA/MOD interactions still occur and the proposals are designed to address a number of operating environments.

6. Need to Replace Classical SSR

Consultees felt that this issue was irrelevant to operations in Class G airspace, particularly with regard to the shortage of SSR codes, the garbling effects and the fact that non-SSR equipped GA aircraft were not contributing to the problems with 'Classical' SSR. Consultees felt that aircraft operating in

Class G airspace and already equipped with Mode A/C transponders could be allowed to continue to operate them without adversely affecting the SSR environment. Many also stated that the implementation of SSR Mode S on CAT aircraft in controlled airspace would also allow the continued use of Mode A/C transponders in Class G airspace. It was stated that there was insufficient modelling data to support this issue.

CAA Response:

The CAA accepts that the shortage of SSR codes is currently of less importance to GA aircraft operating in Class G than CAT aircraft in controlled airspace. The CAA also realizes that non-transponder equipped aircraft are not contributing to the problem of RF pollution. However, it is important to recognize that the classical SSR environment is not sustainable in the long-term, regardless of whether there is a mandate for increased equipage.. Complex computer modelling carried out over a number of years has shown that, given the expected growth figures, the classical SSR environment is likely to be significantly degraded in UK airspace with 10-15 years due to mutual RF interference reaching unacceptably high levels. Moreover, as RF interference does not stop at the boundaries of controlled airspace, the overall RF environment must be considered. The CAA accepts that it may be possible in the medium term for a limited number of aircraft to continue to operate Mode A/C transponders without major detriment to the environment provided that clustering of such aircraft can be avoided. These issues will be addressed within the transition arrangements.

Consultees felt that SSR Mode S was already outdated as a potential replacement technology for 'Classical' SSR and the proposed implementation date of 2008 was also premature given that there would not be an appropriate ground infrastructure until 2012. Furthermore, some consultees felt that the benefits of implementing Mode S would be outweighed by the increased carriage of transponders and requirement for 1090MHz Extended Squitter transmission. It was stated that there was insufficient business case data available to support this issue.

CAA Response:

The CAA recognizes that Mode S is already a mature technology but, given the timescales by which it needs to sanitize the RF environment, the CAA sees this as a benefit rather than a disadvantage. Alternative technologies are emerging but International Standards are not yet fully mature and the requisite interoperability is not available. It is recognized that ADS-B and multilateration are rapidly evolving but these are not interoperable with safety-net technologies such as ACAS. Furthermore, ICAO and EUROCONTROL have already declared Mode S 1090MHz Extended Squitter as the initial means of compliance for these technologies, as stated in the Partial RIA. ADS-B could be made available using other means of compliance, such as UAT, but the costs would likely be of the same order. It is not possible to provide comparative costs for UAT at this stage because the market is still developing, but there is one product available commercially at a suggested retail price of \$8,000. Mode S radars have already been installed and commissioned throughout UK and Europe.

Consultees felt that the carriage of transponders on GA aircraft would be problematic due to unreliability issues and the lack of regular ATC monitoring to check serviceability. Furthermore, SSR transponders were not designed to be carried by non-motorised aircraft and the need for a Mode S Aircraft Address would result in all aircraft having to be brought onto the UK register. Some consultees also felt that the need to use Mode S Aircraft Identification on GA aircraft was a policing issue and was not related to the safety objective of the proposals.

CAA Response:

The CAA considers it essential that any avionics equipment brought to market must be sufficiently robust and reliable to meet the demands of the airframe in which it is intended to be installed. Additionally, it is recognised that processes will be required to routinely check transponder serviceability. The CAA will be in a position to allocate 24-bit aircraft addresses, either directly or in consultation with representative user groups and associations as the need arises. Individual users requiring an address can currently obtain one through the CAA Safety Regulation Group. The current

process already makes provision for aircraft not on the UK register. The unique 24-bit aircraft address provides improved resolution of radar targets and enhanced spectrum efficiency. Therefore, aircraft addresses are directly related to safety functions and not a policing issue as suggested.

7. Threats to Primary Radar

Consultees felt that this issue was irrelevant as Primary Radar was vital for national security reasons and it was inconceivable that the Government would sell off this spectrum for commercial gain. Some also felt that this issue was only relevant to controlled airspace. Others also felt that the use of more modern Primary Radar technology could result in more efficient use of spectrum to overcome this threat.

CAA Response:

Whilst primary radar is likely to be with us for some years to come for various security and operational reasons, developments in Administrative Incentive Pricing are expected to result in reduced spectrum usage and increased pressure to share spectrum with non-aviation sectors. Some of this spectrum efficiency can be gained through increased use of alternative surveillance technologies such as Mode S. This effect may also be seen in Class G airspace as some LARS units currently use primary radar data.

8. Wind Turbine Issue

Consultees felt that this was irrelevant to the CAA's proposals as evolving Primary Radar technology could overcome the detection problems or a GPS solution for airborne equipment would resolve the issue. In addition, many consultees felt that Wind Turbines were inefficient, of limited benefit and that the aviation industry should not have to meet significant equipment costs in order to permit these developments. Some consultees also believed that this was just an obstacle issue for aircraft that would not be overcome by increased transponder carriage on aircraft or on the wind turbines themselves.

CAA Response:

It was clear from a number of responses that the issues surrounding the impact of wind turbines on aviation had not been universally understood. The CAA's proposed policy could, in specific designated airspace, use Mode S carriage in mitigation for wind farm development in relative proximity of primary radar heads. The proposals do not seek to provide business gains for the wind energy industry at the expense of general aviation. It is recognised that there are other technical solutions to this problem that could also be deployed but significant further work is required before these are likely to be implemented. Given increasing reliance on renewable energy sources, the CAA believes that the aviation industry has a responsibility to be actively finding ways to resolve the problem.

9. UAV Activity

Consultees expressed significant concern that existing airspace users should not have to meet significant equipment costs in order to permit the integration of UAVs into UK airspace. Moreover, CAP722 requires that UAVs must be able to use 'Sense and Avoid' without reliance on ACAS systems or co-operative equipment on other aircraft. Many consultees felt that there should be a much wider public debate on the integration of UAV activity and that UAVs should not be allowed to operate in Class G airspace.

CAA Response:

Some responses appeared to interpret the Partial RIA as seeking views on changes to the present rules such that UAV operation would be allowed in unsegregated airspace. The intention was that the proposed policy could, in specific circumstances, use Mode S carriage in mitigation for integration of

UAVs with other airspace users. Any potential changes to the present rules relating to UAV operations in UK airspace will be the subject of separate consultation. However, UAV use is yet another legitimate use of airspace that, over time, will need to be accommodated more widely.

10. Collision Risks and Accident Data

Consultees expressed concern that available accident data did not support the CAA's views on collision risks or the purported relationship between traffic growth and increased risks. Many argued that no relevant fatal collisions had occurred between GA aircraft and CAT or military aircraft, especially involving gliders, sailplanes and balloons. Many felt that existing 'See and Avoid' techniques were very effective, especially with balloons, and that a CAA report had stated that operations in Class G airspace were safe. Many consultees felt that the greatest collision risk was between GA aircraft and that this proposal would do nothing to improve this risk area.

CAA Response:

The CAA considers that a primary aim of a national supervisory authority is to have the lowest tolerable accident rate. The UK has an excellent safety record and the CAA will continue to be proactive in efforts to maintain and improve on this record. It is the CAA's view that the accident risk does increase if traffic growth occurs without supporting safety initiatives. Some consultees argued that recent history showed increased commercial traffic but reduced numbers of mid-air collisions. However, the CAA would point to major safety initiatives such as the mandating of ACAS and increases of controlled airspace as significant contributory factors to continued improvements in air safety in recent years. As ACAS mandates are aircraft, rather than airspace specific, the CAA wishes to enhance the effectiveness of ACAS where these systems operate in Class G airspace. The CAA has noted concerns both on reducing collision risks between GA aircraft, and the growth of regional commercial transport. The CAA will seek further discussions with user groups on these issues.

Consultees expressed concern that the proposals could result in increased collision risks through greater reliance on technology or greater use of Class G airspace by CAT aircraft. Many believed that military aircraft would be exempt from carrying Mode S transponders and CWS and so the collision risks between GA aircraft and military aircraft would not be resolved. Furthermore, many felt that the need for exemptions stated in Annex F of the Partial RIA would mean that collision risks would not be overcome by these proposals. Moreover, some consultees felt that even if fitted with electronic collision warning systems, GA aircraft would not be able to manoeuvre away from fast jet aircraft.

CAA Response:

It is the CAA's view that Mode S should never be used as an alternative to 'see and avoid'. Its purpose in Class G airspace will be to enhance the effectiveness of this primary method of collision avoidance. Applicability criteria and any resulting exemptions would take account of the need to maximize the benefit of the proposals as far as is practicable. Moreover, military aircraft will be subject to the same exemption policy as civil aircraft and the MOD is currently engaged in a major transponder equipage programme, which includes Mode S functionality, and a CWS research and equipage programme for fast jets and training aircraft. SSR interaction with ACAS and CWS facilitates effective avoiding action, often initiated by the military pilot.

Some consultees were of the opinion that the CAA was exhibiting double standards by licensing regional airports to commence operations without protective controlled airspace, such as Doncaster Sheffield, and yet arguing that there were significant collision risks in Class G airspace between CAT and GA aircraft.

CAA Response:

The CAA in considering proposals for controlled airspace must be cognisant of its obligations to all

airspace users. Robust processes exist to ensure that safety issues at new and expanding regional airports that do not meet the criteria for the establishment of controlled airspace are fully addressed. However, the proposals in the Partial RIA seek to support these existing processes and further enhance safety through greater technical interoperability of aircraft operating in the vicinity of the airport.

11. Airprox Data

Consultees expressed concern that highly subjective and statistically insignificant Airprox data had been used to support the proposals. Moreover, many expressed views that the UK Airprox Board's comments in its reports did not support the CAA position and that Airprox trends showed decreasing risks despite recent traffic growth. Glider pilots also argued that a significant amount of their operations occurred above 3,000 feet and, therefore, above the levels where the majority of Airprox incidents occur. Several consultees submitted detailed analysis of Airprox data that they believed demonstrated minimal collision risks for particular sectors of GA operations.

CAA Response:

The UK Airprox Board has informed the CAA that the RIA proposals to increase the carriage and operation of SSR transponders and the need to improve collision avoidance measures in UK Airspace are supported unanimously by the Airprox Board members. The CAA considers that Airprox statistics are a reliable barometer of aircraft safety and it is believed that they broadly mirror AAIB statistics in terms of factored rates. Moreover, Airprox numbers have not recently reduced dramatically. Since the introduction of ACAS II, which was the last substantial change factor, there has only been a very small overall downward trend. Furthermore, non-motorised aircraft have been involved in Airprox incidents above 3,000 feet.

12. Airspace Infringements

Consultees expressed concern that increased transponder carriage would not prevent airspace infringements and that resources could be used more appropriately on other solutions to stop them occurring rather than just trying to managing them more efficiently after the event. Some consultees felt that the use of GPS and stringent policing by the BGA meant that airspace infringement by gliders was insignificant. Others felt that infringements were mainly conducted by 'maverick' airmen and these proposals would not resolve this situation. Moreover, some consultees felt that the growth of controlled airspace was exacerbating the problem.

CAA Response:

The CAA accepts that increased transponder carriage, in itself, does not prevent airspace infringement. However, it provides essential situational awareness to ATC, which can significantly improve safety and reduce inconvenience for the users of protected airspace. The CAA also recognizes that other measures could be introduced which reduce the likelihood of an infringement occurring and is currently addressing these issues through the Airspace Infringements Working Group. However, the numbers of airspace infringements continue to be a major safety concern and they are proving difficult to reduce. The CAA believes that these proposals will provide a major safety benefit when infringements occur through increased interoperability with ACAS and ground-based safety nets.

13. Requirements for Further Research

Consultees felt that the proposals had been inadequately researched and the following non-exhaustive list of issues should be progressed before the proposals were further developed or taken forward: cost benefit analysis; risk assessment; equipage and operational trials of Mode S transponders in GA aircraft, especially non-motorised; electromagnetic compatibility assessments; radiological assessments; a more detailed analysis of a larger Airprox sample; Airprox prevention schemes used in other States such as Germany and New Zealand; effectiveness of SSR at low levels; use of transponder mandatory zones; risks of misuse of ADS data; better educational strategies to

reduce collision risks.

CAA Response:

On the basis of the consultation responses the CAA will determine what further research is required to support the further development of the policy and the subsequent recommendation to Government. This could include consideration of other solutions not included in the Partial RIA document.

14. Exemptions and Applicability

Consultees expressed concern that the exemption principles contained in the proposals were too generic, were unworkable, and showed little understanding of GA operations and activity. Many felt that widespread generic exemptions would be required for GA aircraft until proportionate equipage solutions were available and, in particular, a suitable low-priced LPST product retained by several manufacturers. However, further information was also requested on how and when exemptions could be removed by the CAA, and what consultation would be conducted prior to the removal of exemptions. BGA members expressed particular concern that they had previously been assured of a general exemption by the CAA that was not reflected in the proposals.

CAA Response:

The CAA considers that until the final proposals and recommendations to Government have been finalized, it would not be appropriate to provide definitive applicability policies and recommendations for any associated exemptions. It is recognized that exemptions will need to be awarded on the grounds of technical feasibility and the CAA will ensure that these exemptions remain in place until such time as suitable, proportionate technical solutions exist. The CAA will not remove exemptions until it is considered reasonable to do so and will consult with stakeholders and representative associations as part of the modification process. Any such exemption policy will address issues relevant to all types of airframes and airspace use.

Consultees expressed opinions that the proposals should not be applicable in all UK airspace. Many suggested controlled airspace only and some suggested implementation be limited to around 3000 feet to FL060 and above in Class G airspace. Other consultees felt that a long transition period should be provided for aircraft already equipped with Mode A/C transponders and that balloons, gliders, sailplanes and vintage aircraft should be exempt. Others felt that if all GA aircraft had to be equipped then the proposals would need to be extended to model aircraft and meteorological balloons.

CAA Response:

On the basis on consultation feedback, the CAA will further develop its proposals. Full account will be taken of the issues raised surrounding applicability.

Consultees expressed concern that no guidance or criteria had been provided on what aircraft would be expected to equip with ICAO compliant transponders (including LAST) or LPST units. Some felt that this should be based on the weight and speed of the aircraft. Concern was also raised that the proposals for GA aircraft were stricter than for CAT aircraft with regard to transponder failure handling and the time allowed for defective transponders to be rectified.

CAA Response:

To achieve compliance with any proposed regulatory change, the CAA intends that those aircraft that are technically capable of fitting an ICAO Annex 10 compliant transponder will normally be required to do so. For those aircraft that cannot meet these requirements, it is envisaged that LPST will then be applicable, but will be subject to weight and speed limitations. In both cases, feasibility, operational use and proportionality will be taken into account within the applicability criteria. Proposals relating to measures for rectification of faulty transponders are yet to be developed but will not be more stringent

than the current requirements for CAT.

15. European and International Policy

Consultees expressed concern that the proposals were not harmonized with ICAO or European requirements and that they were premature as no common policy on transponder carriage for VFR flights had yet been agreed within the Single European Sky (SES) initiative. Many consultees stated that other European States were only implementing SSR Mode S in controlled airspace and that ICAO specifically required States to provide uncontrolled airspace for non-transponder equipped aircraft. Moreover, concern was expressed that SSR Mode S was not an Annex 6 requirement and that the proposals were an example of the 'gold plating' of international regulations.

CAA Response:

The ICAO Annex 6 requirement would be fulfilled by the Partial RIA Options 2 and 3. However, due to concerns over RF interference, the CAA does not consider that it is viable to meet these ICAO standards using 'Classical' Mode A/C technology in the longer term. Therefore, although it is not a specific ICAO requirement, compliance can only be based on SSR Mode S in UK airspace. In terms of non-transponder equipped aircraft, ICAO only makes a recommendation that these aircraft should be operated in segregated airspace away from those aircraft equipped with ACAS. The Mode S implementing States of France, Germany, Belgium, The Netherlands, Luxembourg and Switzerland all have policies for the carriage of SSR Mode S ELS transponders for VFR flight. The CAA seeks to pursue a European harmonised approach where practicable whilst recognising the significant differences in national airspace arrangements. Some policies are based on existing transponder carriage requirements and some are based on meeting the ICAO Annex 6 standards. The proposals are not just confined to controlled airspace. Through the Mode S Regulators Group, CAA staff are working with European partners to harmonise the proposals, but recognizing that specific national requirements must also be met. The CAA does not see its proposals as being contradictory to developments within the SES programme. Furthermore, these States, through EUROCONTROL, have taken steps for the production of a European Concept of Operations (CONOPS) for an LPST.

Consultees expressed concern that international sporting competitions in the UK and freedom of movement between the UK and other European States would be prevented by these proposals. Many providers of aviation training and services felt that the proposals would disadvantage UK businesses with European competitors. These concerns were primarily related to the perceived lack of harmonization with other EU States and on the UK requirement for the operation of a non-ICAO compliant LPST unit that would not be recognized in other States.

CAA Response:

The CAA has noted these concerns and will take account of them in the development of applicability policies and exemption arrangements for specific purposes. Furthermore, liaison with relevant Government departments and the Small Business Service on the issues raised will be conducted as part of any further development of the proposals. Furthermore, it is considered that harmonization work within the Mode S Regulators Group and on the LPST CONOPS will help to address these issues at international level.

16. Specific Issues for Gliders/Hang Gliders/Paragliders

Consultees expressed concern that the proposals and consultation events demonstrated that the CAA had a very poor understanding of sporting and recreational aviation, particularly concerning glider and sailplane operations and activity levels. In particular, it was felt that the proposals did not adequately consider the practicalities for equipment and operation of SSR transponders in non-motorized aircraft. Issues surrounding equipment weight, power requirements, and licensing for transponders had not been addressed in the proposals. Consultees from the gliding community expressed major concern

that the proposals would curtail IFR flight by gliders and that this would severely restrict their activity.

CAA Response:

A Partial RIA is a consultation tool that is designed to elicit information and comment from Stakeholders; it does not purport to include all the answers on all of the issues. The LPST is key to addressing both practicality and operational concerns for non-motorised aircraft; and the CAA recognizes that a suitable product is still in development. Any future mandate would, therefore, include necessary applicability criteria and, where necessary, exemption arrangements for non-motorised aircraft until suitable equipment becomes available. The CAA will be working to address the issues surrounding IFR or height specifications for LAST and LPST units with ICAO, European partners, EUROCAE and representative GA bodies. It is not the CAA's intention to curtail IFR flights by sailplanes.

Consultees felt that numbers of aircraft had been incorrectly estimated in the Partial RIA document and that the temporary leasing of portable transponder units was totally impractical.

CAA Response:

The purpose of an RIA is to elicit data on matters such as this. Estimated numbers of aircraft affected by these proposals will be refined in light of consultation feedback as the policy is further developed. The CAA notes the concerns of Stakeholders on transponder leasing and provision for this facility will not be included in any cost estimates presented to Government.

17. Costs

Consultees expressed concern that the costs of the proposals set out in the Partial RIA document had been underestimated by up to a factor of three. In particular, costs of installation and certification had either not been included or were widely inaccurate. Many consultees also expressed concern that the likely cost of LPST units was mere conjecture as a suitable product did not yet exist and market forces would not work to ensure that the unit cost estimated by the CAA would be realized. Concern was also expressed that VAT had not been included in the cost estimates and many affected stakeholders in the GA community would not be able to recover this charge.

CAA Response:

The CAA is dependent on industry for providing cost information. The consultation was aimed at gaining information with which to refine initial cost estimates and the CAA is grateful for the many quantitative inputs that were received from consultees. The likely cost of LPST units that was included in the RIA was based on liaison with prospective manufacturers and vendors. Based on further recent feedback, the CAA still considers that a unit cost of less £1,000 for an LPST is not unrealistic. VAT will be taken into account and represented in any cost data presented to Government.

Consultees expressed concern that the capital costs were disproportionate to the perceived marginal benefits and the value of many aircraft. The estimated annual running costs were also felt to have been ignored in the proposal and would be disproportionate to the current running costs of many GA aircraft. One unintended impact was stated as being a potential increase in insurance premiums and not a decrease as stated in the proposals. Concern was also expressed that the CAA would also charge separate licence fees for the mandatory operation of transponders. Consultees also felt that the cost of suitable test equipment had not been taken into account when estimating the costs of annual transponder checks.

CAA Response:

Cost data will be updated and refined to take account of the valuable inputs from consultees. In determining the applicability of a mandate, the CAA will consider disproportionate technical impacts,

both in terms of capital or annual running costs. Until viable products are freely available on the market, exemptions and applicability criteria would be employed to maximize the benefits of transponder carriage as far as is reasonably feasible. To support this aim, close consultation with representative associations will be maintained.

Consultees felt that the proposals could decimate sporting and recreational flying by making it too expensive to continue, particularly for the current low cost activity of gliding, hang gliding, and paragliding. The cumulative burden of this proposal with recent other regulations was also cited by many as meaning that they would have to give up the sport or, in the case of businesses and flying clubs, cease operating. It was also felt that the resale value of GA aircraft in the UK would plummet. Some business owners stated that they would have little or no opportunity to pass on costs to customers without disadvantaging the UK market compared to other European States. Consultees also expressed concern about the adverse impact that a resultant reduction in GA flying would have on supporting industries, such as tourism, and on the social costs of the loss of a major leisure activity.

CAA Response:

It is not the CAA's intention to adversely affect sporting and recreational activity, either through unreasonable imposition of cost or through the grounding of aircraft that cannot be suitably equipped with SSR transponders. Applicability arrangements and any associated exemptions will reflect this. Business issues and concerns will be further researched in close consultation with the Small Business Service and representative associations.

Consultees felt that the major beneficiaries of the proposals would be CAT operators, the UAV industry, the wind energy industry and Government. Therefore, many felt that the implementation costs should be met by the industries or that a PPP should be established. Some felt that certification and licensing charges should be waived by the CAA.

CAA Response:

Inputs on possible funding arrangements have been noted and will be represented to Government in any final proposal. Potential simplification measures will also be further explored.

Consultees expressed concern that the CAA had agreed with the Cabinet Office that the total economic impact to all businesses was expected to be less than £20M, and would not, therefore, be scrutinized by the Prime Minister's Panel for Regulatory Accountability (PRA).

CAA Response:

Current Cabinet Office guidelines set a value of £20M cost to business in any one year as criteria for PM PRA scrutiny. Many respondents mistakenly assumed that £20M estimate applied to the total equipage costs. The CAA would reiterate that the initial estimates only indicated that the estimated cost to business would be less than £20M. All estimated costs will now be updated and refined to take account of inputs from consultees. The CAA will continue to liaise closely with DfT, SBS and the Cabinet Office and will follow their advice and requirements for further scrutiny by Government.

18. Benefits

Consultees from the GA community felt that all the benefits would accrue to CAT, UAV and wind turbine operators, especially as very few aircraft operating in Class G airspace would be equipped with electronic collision avoidance systems or receive an Air Traffic Service. It was also felt that the proposals would still not guarantee GA aircraft access to controlled airspace, would not reduce the amount of controlled airspace, and would not be accompanied by an expanded and more accessible

LARS system. The benefits were felt to be inequitable for GA given that this sector comprises 92% of the UK aircraft fleet in numerical terms. Consultees expressed difficulty in commenting on the benefits as they had not been quantified or broken out into specific sectors of the aviation industry.

CAA Response:

The CAA in discharging its obligations to all airspace users must consider all relevant issues which may affect the management of the UK's joint and integrated airspace structure and ensure that the environment meets future needs whilst maintaining and enhancing flight safety. Whilst all users may not accrue the same level of benefit, the CAA believes a holistic approach best serves this goal. However, the general concerns are acknowledged and will be addressed as the policy develops.

Consultees disagreed with the benefits of Mode S in Class G airspace as it was considered to be outdated technology, did not future-proof equipage requirements, would not be accompanied with the supply of the Traffic Information Service (TIS), and existing Mode C already provided interoperability with ACAS. Furthermore, consultees expressed concern that ATC units would not have the capability to monitor Mode S data in Class G airspace. Many also felt that ATC units would just filter out returns from GA aircraft to prevent display screen clutter.

CAA Response:

Whilst it is correct that Mode C is interoperable with ACAS, and regardless of the fact that classical SSR is not sustainable in the long term, studies have shown that Mode S is more efficient and effective in its interaction with ACAS. The proposals aim to enhance situational awareness of both participating and non-participating traffic to ATC units operating in Class G airspace. It is not believed that this proposal will impact on airspace monitoring capability. The filtering of traffic not of operational interest is a common practice. However, this does not deny the information to other ATC providers, collision avoidance systems and safety nets. The CAA recognises the need to future-proof regulatory requirements insofar as practicable and would point out that Mode S and 1090MHz extended squitter are included in the Eurocontrol roadmap for future surveillance solutions.

Consultees expressed concern that the proposals were just a precursor to wider airspace charging, the abolition of Class G airspace, and facilitated easier surveillance and prosecution of misdemeanours by GA pilots. Some also felt that there were no benefits to GA aircraft currently equipped with Mode A/C transponders and so none would accrue from any upgrade to Mode S. Many also stated that a greater use of technology for collision avoidance would actually result in greater risks.

CAA Response:

Airspace charging is not an aim of these proposals and would have to be the subject of a separate formal consultation process. The CAA accepts that many of the potential benefits of the proposals could be realised through the use of 'Classical' Mode A/C transponders but believes that continued reliance on this legacy technology is no longer sustainable. The CAA has noted the concerns of consultees on the impact of technology on pilot 'lookout' and reliance on electronic collision avoidance rather than robust 'see and avoid' techniques.

19. Installation and Integration

Consultees expressed concern that installation issues for GA aircraft had not been adequately researched and addressed in the proposals. In particular, issues such as available space, power and wiring requirements, antenna location and fitment, the impact of EASA, and the availability of suitable suppliers and trained maintenance organizations to meet the 2008 deadline, had been overlooked. Concerns were also raised about the fitting of non-certified aircraft and the ability of inspectors to conduct annual checks of transponders.

CAA Response:

The CAA would point out that the wide variation in GA aircraft design and performance makes it difficult to comment on the availability of space, power and suitable antenna location without generalizing. There is existing Mode S equipment available that will fit into a standard avionics stack or into an instrument panel, some of which can also be fitted into a portable power supply/antenna. Consequently, options are available for a wide range of GA aircraft. In addition, the development of a LPST will provide further possible solutions where limited real estate is an issue. The CAA recognizes, however, that there may be some cases where it is not technically feasible to fit equipment and this will be considered within the development of the exemption criteria. The CAA does not envisage that EASA will have a significant negative impact on the installation of Mode S on GA aircraft. It is anticipated that the installation approval process will be a minor change and the technical assessment by CAA will be conducted promptly once the technical data has been received from the applicant. The CAA would point out that there have already been numerous relatively simple minor changes approved for installing Mode S on GA aircraft. Discussions are planned with associations representing the interests of non-EASA aircraft (e.g. BMAA/PFA) to agree a means to design and approve modifications installing Mode S. The challenges in making available the resources to meet a 2008 implementation are recognized, but it should be noted that it is not absolutely necessary for a DOA or a EASA Part 145 organisation to be involved in the design, installation and testing of Mode S installations on GA aircraft. Many licensed engineers have successfully submitted minor changes for approval in similar areas. Additionally, as with the previous mandate for Mode S equipage in major en-route and TMA airspace, it has always been envisaged that there will be a suitable transition period to allow for smooth implementation.

Consultees expressed reservations that equipage with transponders in many GA aircraft would have to be classed as a 'Major' modification and not 'Minor' as indicated in the proposal documentation. Furthermore, some consultees noted that airworthiness requirements would require installations for LPST units and so these could not be classed as 'portable' equipment.

CAA Response:

The CAA considers that installation of Mode S ELS on GA aircraft, where the antenna installation is not on a pressurised hull would normally be covered under a minor change. There are already many examples of this. It is envisaged that it will be possible to install an LPST as a transportable unit which could be interchanged between a number of airframes providing it is suitably mounted. The CAA recognizes the need to address technical installation issues including antenna positioning and battery life.

Consultees from the foot-launched gliding community expressed concerns that equipage with transponders would never be feasible due to the lack of a suitable location for installation of an antenna or LPST unit.

CAA Response:

The CAA would point out that this issue was acknowledged within Annex F of the Partial RIA and, where necessary, further analysis will be carried out.

20. LPST

Consultees expressed many concerns and reservations about the lack of a suitable and low cost LPST. Some felt that the market would be too small to result in any significant costs savings over existing LAST products, would probably be too large or heavy for many GA aircraft, would have a high battery drain, be of limited range, and would not be ICAO compliant. Moreover, the 15,000 feet operating limit for the LPST would render it unsuitable for some glider activity. Other concerns centred on the suitability of the LPST for use on hang gliders and paragliders in terms of ruggedness,

reliability, operation from remote locations, and manipulation during flight. Consultees also cited the results of the QinetiQ flights trials of a prototype LPST as indicating that the LPST concept was still too immature and unproven to be required by legislation.

CAA Response:

The CAA recognizes that there is not a commercially available LPST at the present time. It is, however, aware that a number of potential manufacturers have conducted a significant amount of research and development on the LPST but will be unwilling to commit further resources to making their product ready for the market until such time as they assess that a suitable market exists. The CAA further recognizes that existing LASTs are likely to be technically incompatible with some types of airframe and in consequence any future mandate will include exemptions for these airframes until suitable equipment becomes available. The CAA wishes to assure consultees that it will not accept LPST for use until it is fully satisfied that it is suitable for the intended purpose. CAA studies have concluded that the existing EUROCAE specification for LAST (ED-115) should be used for LAST. However, there is concern that this specification does not make provision for IFR flight and the CAA intend to seek amendment by making representations to the drafting group. The CAA is aware that both LPST and LAST do not fall within ICAO Annex 10 technical requirements for flight above 15,000ft and will seek to address this issue within any future proposal. The QinetiQ flight trials were merely intended as a proof of concept and were conducted several years ago and were designed solely to validate requirements for further work and research.

21. Radiological and EMC Issues

Consultees expressed concern about the potential harmful radiological effect of transponder carriage in GA aircraft and on the apparent lack of research and testing by the CAA into this issue. In particular, many felt that transponders were much more harmful than mobile phones and would have to be sited close to the human body, particularly in many sporting and recreational aircraft.

CAA Response:

The CAA was involved in the development of a Mode A/C LPST technology demonstrator during the late 1990s. Within this work, a report was produced by the National Radiological Protection Board which indicated that ICNIRP reference levels of exposure for the general public were not exceeded providing the antenna was greater than 12cm from the body. It is expected that this distance would be reduced for a Mode S transponder because duty cycles are lower. However, it is also recognized that International standards have evolved since the report was produced in 1999. Consequently, the CAA has commissioned a new study for a Mode S LPST by the Health Protection Agency. The report is expected early in 2007.

Consultees raised concerns that issues surrounding the electromagnetic compatibility of transponder installations with existing instruments carried by sporting and recreational aircraft had not been adequately considered by the CAA. Some felt that this existing equipment would need to be given 'grandfather rights' or further costs would have to be met by GA operators in replacing the existing equipment with suitably protected variants.

CAA Response:

The CAA intends that an LPST will meet the requisite EMC directives but it is recognised that some existing equipment may be susceptible to RF interference. However, suitable positioning of the LPST antenna should mitigate this risk in most cases. Notwithstanding, the CAA would point out that equipment mandated to be carried must take precedence over existing non-certified equipment. The CAA will conduct further research into this issue as part of the policy development. If it transpires that wide-scale replacement of existing equipment is necessary, this will be factored into the cost analysis of the proposal to Government.

22. Impact on ATC Systems

Consultees expressed concern that ATC systems, radars and controller displays would become overloaded with information if all aircraft operating in Class G airspace were equipped with SSR transponders. Furthermore, the unusual flight profiles of gliders, hang gliders and paragliders would render any SSR data from these aircraft useless for ATC purposes. Examples of failures of similar initiatives in other States were cited by some consultees, and some ATCO respondents expressed reservations about display screen clutter and increased workload for label management. Some consultees also reported that they were already being told to deselect their transponders by ATC in some Class G airspace on occasion. Many consultees felt that the potential benefits of transponder carriage would be negated because many ATC units would just routinely filter-out SSR returns from their aircraft.

CAA Response:

The CAA will ensure that sufficient research, trials, simulation and modelling are undertaken as necessary. In addition there will be further consultation with ANSPs to ensure that any potential safety issues are fully assessed. The ability for ATC to filter-out specific targets for operational reasons is an essential part of the air traffic controllers toolbox. However, this does not negate the other benefits to ATC including the various ground-based safety nets already in use. Moreover, the CAA is proposing a policy which can be sustained for many years and it is anticipated that radar and other related safety systems will be further developed to make optimum use of Mode S data.

Consultees felt that trials of SSR transponder operations on large clusters of GA aircraft would need to be conducted to test the impact of GA activity on ATC systems prior to any legislative change being enacted. The potential impact of a potentially large number of faulty transponders being operated in Class G airspace should also be assessed, together with the impact of many SSR transponders on hang gliding and paragliding activity conducted from hill sites.

CAA Response:

The CAA has already conducted a significant amount of research and consultation on this issue and will ensure that further research, trials, simulation and modelling are undertaken as necessary.

23. Impact on ACAS

Concern was expressed that ACAS and CWS would become overloaded with information if all aircraft operating in Class G airspace were equipped with SSR transponders. Furthermore, the unusual flight profiles and large clusters of gliders, hang gliders and paragliders would render any SSR data from these aircraft useless for ACAS purposes. Examples of current problems for ACAS equipped aircraft operating close to transponder equipped GA aircraft were cited as demonstrating that the CAA proposals would be unworkable. Specific concern was expressed on the effectiveness of electronic collision warning systems at low level in Class G airspace and at the base levels of controlled airspace with GA activity operating beneath.

CAA Response:

The CAA has already conducted modelling and consultation on this issue and will ensure that further research, trials, simulation and modelling are undertaken as necessary. In addition there will be further consultation with aircraft operators to ensure that any potential safety issues are fully assessed. ACAS is most effective when interacting with Mode S transponders.

24. Alternative Solutions

Consultees submitted many ideas for alternative solutions that the CAA should take assess instead of

its currently preferred solution. The following is a non-exhaustive list of the ideas received:

Transponder Mandatory Zones around controlled airspace.
Implement SSR Mode S only above FL050 and inside controlled airspace.
Wait to implement ADS-B instead of SSR.
Increase airspace segregation of CAT and military aircraft from GA activity.
Develop a two-tier system with FLARM in Class G airspace and Mode S/ACAS elsewhere.
Develop and ADS-B and ACAS hybrid solution.
Develop a hybrid solution incorporating ADS-B and FLARM technology.
Mandate the carriage of passive radar reflectors.
Implement Wide Area Multilateration in ground systems.
Implement a fully Government funded LARS scheme.
Develop affordable moving map technology to prevent airspace infringements.
Improve pilot education methods.
Widen the use of 'Wave Boxes' to support and promulgate gliding activity.
Mandate the carriage and operation of strobe lighting.
Improve the colour schemes used on aircraft to enhance visual conspicuity.
Improve the UK NOTAM system.
Develop an RFID tag system.

CAA Response:

The CAA accepts that some of the proposed alternative solutions may be deployed in the future development of the proposal. In particular, TMZs may provide suitable mitigation in specific airspace. The CAA has concerns about the alternative technical solutions proposed as they do not address the interoperability requirements of the proposal, they are technically immature or adequate International standards are not available. Notwithstanding, the CAA will carry out a further assessment of the proposed alternative solutions as part of the development of future proposals.

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