Directorate of Airspace Policy

All NATMAC Representatives

18 June 2009

Ref: 8AP/65/02/66

LETTER OF INTENT

Dear Colleagues,

PROPOSAL TO AMEND THE AIR NAVIGATION ORDER 2005 FOR THE PURPOSE OF EXPANDING OF THE USE OF SSR MODE S TRANSPONDERS IN UK AIRSPACE

In our Letter of Consultation, published on 1 February 2008, stakeholders were invited to comment on a proposal to amend the Air Navigation Order 2005 for an incremental expansion of the use of SSR Mode S transponders in UK airspace.

In response to that Letter of Consultation, a total of 1,982 replies were received, of which over 80% were assessed as being from the gliding community. We welcome the large response to the consultation and are grateful to all respondents for their comments and participation. A detailed *Summary of Responses* document, together with a separate *Synopsis of Comments Received* document, has been published; both these documents are available on the CAA website at http://www.caa.co.uk/modes.

Overall, the vast majority of responses to the consultation were from GA stakeholders, particularly from the gliding sector, who were opposed to any extension of the current transponder carriage rules on the grounds of disproportionate costs and a perceived lack of suitable equipment for some types of aircraft. It was also considered that the proposals were not economically justified and that there was no clear or pressing safety need for a change to the current rules. It was further argued that commercial air traffic density and the level of collision risk between commercial and sporting/recreational aircraft was not uniform across UK airspace, and so a general increase in the carriage of SSR transponders would not be appropriate.

The views and concerns of all stakeholders submitted during this and previous Mode S consultations have been carefully considered. In light of the issues raised, the proposals have been refined and a further expansion in the required use of Mode transponders will be targeted at the UK's busiest and most complex airspace volumes, thereby creating the technology-based co-operative environments where they are most needed. Specifically, the following measures will be taken forward:

- **Regulation to require all aircraft (except gliders) flying within Class A to C controlled airspace to carry and operate a Mode S transponder with effect from 1 October 2009**. It is considered that the actual impact of this change will be negligible, as the vast majority of aircraft likely to be affected will already be suitably equipped. The

CAA is content for ATC units to continue to provide mitigation, such as through Letters of Agreement, for non-transponder equipped flights to have access in specified circumstances where safety and efficiency issues can be managed appropriately.

- **An extension of the SSR Mode S transponder carriage regulations to include gliders with effect from 6 April 2012**. Alongside this proposed regulatory change, the CAA will continue to encourage the use of Letters of Agreement between gliding organisations and ATC units to permit access to airspace without transponders in specified circumstances where safety and efficiency issues can be managed appropriately. Current arrangements will continue to be applied to permit gliding activity without transponders in Class C airspace at and above FL 195 when in an active TRA(G). The CAA will also work with the gliding associations and other stakeholders to define specific, notified areas of Class G airspace at and above FL 100 where gliders would continue to be allowed to operate without an SSR transponder, under specified conditions.

- **Amendments to the SSR transponder carriage regulations applicable to Self-Launching Motor Gliders (SLMG)**. As a result of information provided during the Mode S consultations, the CAA is satisfied that some SLMG operators can encounter the same challenges with SSR transponder equipage as those experienced by operators of gliders and Self-Sustaining Gliders (SSG). However, an SLMG is not currently included within the definition of 'glider' in the Air Navigation Order and so, unlike gliders, SLMG have been required to adhere to the SSR transponder carriage requirements unless otherwise authorised by the responsible ATC unit. The proposed regulatory changes for gliders also contain recommended amendments that will align the SSR transponder carriage regulations for SLMG with those applicable to all other gliders.

- **Employment of the Airspace Change Process (ACP) to further extend the SSR transponder carriage requirements in specific volumes of airspace**. The CAA is empowered to introduce additional mandatory transponder carriage requirements without formal public consultation. Where necessary to address pressing safety and efficiency needs it will continue to use these powers. In general , it has decided to employ the airspace change process set out in CAP 725 as the mechanism with which to process applications from external stakeholders for extensions to the transponder carriage requirements in specific volumes of Class D to G airspace on a case-by-case basis. This will include requests for the establishment of TMZs. The CAA is satisfied that use of the ACP ensures that appropriate justification has to be provided and all stakeholders fully consulted by applicants so that the impact of proposed changes can be fully assessed and suitable mitigation arrangement determined.

Under existing transition arrangements associated with the previous expansion of Mode S transponder carriage in UK airspace, operators of aircraft flying outside notified Mode S Enhanced Surveillance airspace that are already equipped with Mode A/C transponders have until 31 March 2012 to complete the necessary upgrades to Mode S Elementary Surveillance compliance. This alleviation will also apply to the increased Mode S transponder carriage requirements arising from these new measures. In addition, the recently notified exemption for SLMGs from the SSR transponder carriage requirements will be extended until the applicability for SLMGs in the Air Navigation Order can be aligned with that specified for gliders and SSGs.

The CAA is satisfied that the views expressed by interested parties have been taken fully into account. The CAA will now recommend to the Secretary of State that Article 20(2), Schedule 5 of the Air Navigation Order 2005 be amended, as detailed in Enclosure 1. The required Impact Assessment, which will accompany the proposed legislation to Parliament for scrutiny, is at Enclosure 2.

Continued (2 of 3 pages)

It is expected that the amendments will come into force on 1 October 2009.

Original signed

M SWAN
Director

Enclosures:

1. Proposed amendments to Article 20(2), Schedule 5 of the Air Navigation Order 2005.
2. Impact Assessment of a Proposal to Incrementally Expand the Use of SSR Mode S Transponders in UK Airspace.

CHANGES TO CAP 393 TO COME INTO FORCE OCTOBER 2009

SCHEDULE 5 **Article 20(2)**

Radio communication and radio navigation equipment to be carried in aircraft

1 Subject to paragraph 3, every aircraft shall be provided, when flying in the circumstances specified in the first column of the Table in paragraph 2 of this Schedule, with the scales of equipment respectively indicated in the second column of that Table; provided that, if the aircraft is flying in a combination of such circumstances the scales of equipment shall not on that account be required to be duplicated.

2 Table

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**J**
(1) All aircraft (other than gliders and SLMG) within the United Kingdom:									
(a) when flying under Instrument Flight Rules within controlled airspace	A				E2	F			
(b) when flying within controlled airspace	A								
(c) when making an approach to landing at an aerodrome notified for the purpose of this sub-paragraph							G		
(d) when flying within controlled airspace of classification A to C					E2				
(1A) All aircraft (other than gliders, SLMG and balloons) within the United Kingdom when flying for the purpose of public transport					E2				
(2) All aircraft within the United Kingdom:									
(a) when flying at or above flight level 195	A								
(b) when flying within airspace notified for the purposes of this sub-paragraph	A								
(2A) Until 5 April 2012, all gliders and SLMG within the United Kingdom flying at or above flight level 195 except when flying within airspace notified as a Temporary Reserved Area (Gliding)					E2				

(2B) With effect from 6 April 2012, all gliders and SLMG within the United Kingdom:									
(a) flying at or above flight level 100 except when flying within airspace notified for the purposes of this sub-paragraph					E2				
(b) when flying under Instrument Flight Rules within controlled airspace					E2				
(c) when flying within controlled airspace of classification A to C except when flying within airspace notified as a Temporary Reserved Area (Gliding)					E2				
(d) when flying within airspace notified for the purposes of this sub-paragraph					E2				

(3) All aircraft (other than gliders and SLMG) within the United Kingdom:									
(a) when flying at or above flight level 245					E2	F			
(b) when flying within airspace notified for the purposes of this sub-paragraph					E2				
(c) when flying at or above flight level 100					E2				

(4) When flying under Instrument Flight Rules within airspace notified for the purposes of this paragraph:									
(a) all aeroplanes having a maximum take-off weight authorised not exceeding 5700kg and a maximum cruising true airspeed capability not exceeding 250 knots					E2				
(b) all rotorcraft					E2				
(c) All aeroplanes having either a maximum take-off weight authorised of more than 5700kg or a maximum cruising true airspeed capability of more than 250 knots					E3				

(4A) All aircraft required to carry scale E2 or E3					EE				
(5) All aircraft registered in the United Kingdom, wherever they may be:									
(a) when flying for the purpose of public transport under Instrument Flight Rules:									
(i) while making an approach to landing	A		C	D				H	
(ii) on all other occasions	A		C					H	
(c) multi-engined aircraft when flying for the purpose of public transport under Visual Flight Rules	A							H	
(d) single-engined aircraft when flying for the purpose of public transport under Visual Flight Rules:									
(i) over a route on which navigation is effected solely by visual reference to landmarks	A								
(ii) on all other occasions	A	B							
(e) when flying under Instrument Flight Rules within controlled airspace and not required to comply with paragraph (5)(a) above	A								
(5A) All aircraft (except gliders, SLMG and balloons) registered in the United Kingdom, wherever they may be when flying for the purpose of public transport					E2				
(6) All aeroplanes registered in the United Kingdom, wherever they may be, and all aeroplanes wherever registered when flying in the United Kingdom, powered by one or more turbine jets or turbine propeller engines and either having a maximum take-off weight exceeding 15,000 kg or with a maximum approved passenger seating configuration of more than 30									J

(7) All aeroplanes powered by one or more turbine jets or turbine propeller engines and either having a maximum take-off weight exceeding 5700kg or a maximum approved passenger seating configuration of more than 19, and:									
(a) registered in the United Kingdom and flying for the purposes of public transport;									J
(b) registered in the United Kingdom and flying within the airspace of member states of the European Civil Aviation Conference; or									J
(c) flying in the United Kingdom									J

3 (1) In the case of sub-paragraphs (1), (1A), (2), (2A), (2B), (3), (4), (5)(e) and (5A) of paragraph 2, the specified equipment need not be carried if the appropriate air traffic control unit otherwise permits in relation to the particular flight and the aircraft complies with any instructions which the air traffic control unit may give in the particular case.

(2) An aircraft which is not a public transport aircraft and which is flying in Class D or Class E airspace shall not be required to be provided with distance measuring equipment in accordance with paragraph (b) of Scale F when flying in the circumstances specified in sub-paragraph (1)(a) of paragraph 2.

Summary: Intervention & Options

Department /Agency:	Title:	
Civil Aviation Authority	**Impact Assessment of a Proposal to Incrementally Expand the Use of SSR Mode S Transponders in UK Airspace**	
Stage: Final Proposal	**Version:** #1.0	**Date:** 20 April 2009
Related Publications: Summary of Responses Document for a Consultation on the Proposed Incremental Expansion of the Use of SSR Mode S Transponders in UK Airspace - Dec 08 - Issue 1.0		

Available to view or download at:

http://www.caa.co.uk/default.aspx?catid=1698&pagetype=90&pageid=9307

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What is the problem under consideration? Why is government intervention necessary?

Commercial air traffic levels are expected to continue to grow significantly in the medium to long term. This growth must be accommodated by the ATC system while maintaining safety levels to realise potential economic and environmental benefits. To enable this, secondary radar technology must be updated and the detection of aircraft by ATC systems and anti-collision safety nets must be improved. Current SSR systems cannot be sustained in the longer term for reasons of spectrum capacity and efficiency. Mandatory equipage is the only way to improve interoperability between aircraft in busy airspace, otherwise inefficient segregation of commercial and recreational flying may be needed to maintain safety levels.

What are the policy objectives and the intended effects?

To mandate the use of SSR Mode S transponders on all aircraft flying within all controlled airspace volumes of Classification A to C.

To extend the SSR Mode S transponder carriage regulations to gliders.

The intended effect is to improve the co-operation of all aircraft operating in busy UK airspace with the safety 'layers' provided by ATC secondary radars, ATC automatic conflict warning tools, and airborne collision avoidance systems used by commercial aircraft.

What policy options have been considered? Please justify any preferred option.

1) Do nothing.

2) Mandatory use of Mode S transponders by all aircraft in all controlled airspace.

3) Extension of the SSR Mode S transponder carriage regulations to all aircraft (except gliders) flying within controlled airspace of Classification A to C with effect from 1 October 2009.. Extension of the SSR Mode S transponder carriage regulations to include gliders with effect from 6 April 2012.

When will the policy be reviewed to establish the actual costs and benefits and the achievement of the desired effects?

The policy will be reviewed in 2014 as this will allow sufficient time to provide a full assessment of the implementation and its associated operational impact.

Ministerial Sign-off For final proposal/implementation stage Impact Assessments:

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Minister:

.....Date:

Summary: Analysis & Evidence

Policy Option: 3	Description: Extend Mode S transponder carriage regulations to gliders and mandate use of Mode S transponders in Class A to C controlled airspace.

COSTS

ANNUAL COSTS	
One-off (Transition)	**Yrs**
£176K to £882K	3
Average Annual Cost (excluding one-off)	
£7.4K to £37.2K	

Description and scale of **key monetised costs** by 'main affected groups' Key costs are from the one-off equipage requirements and these would fall on owners of up to 120-620 gliders by 5 April 2012. Typical one-off costs per glider are expected to be in the range £2,358 to £4,733 with average additional ongoing costs of around £70 per year.

Total Cost (PV) **£595K to £3M**

Other **key non-monetised costs** by 'main affected groups' Costs from having to take aircraft out of service to complete equipage upgrades, associated travel expenses to engineering facilities, and any potential indirect costs on supporting businesses or stakeholders have not been quantified.

BENEFITS

ANNUAL BENEFITS	
One-off	**Yrs**
£ 0	
Average Annual Benefit (excluding one-off)	
£ 0	

Description and scale of **key monetised benefits** by 'main affected groups'

Total Benefit (PV) **£ 0**

Other **key non-monetised benefits** by 'main affected groups' Direct benefits are safety, airspace access and ATC efficiency improvements. Proposals implement a key technology 'enabler' that support wider efforts to ensure that the air traffic system can accommodate commercial air traffic growth in order to realise the economic benefits set out in the Air Transport' White Paper.

Key Assumptions/Sensitivities/Risks Actual costs are dependent on how many operators eventually choose to install Mode S transponders as equipage is only required if operators want to access airspace where transponders are mandatory. Costs assume that most gliders would be in the higher equipage cost range and would equip in 2011/2012. Cost sensitivity assessed to be -45% to +12%.

Price Base Year 2009	Time Period Years 17	**Net Benefit Range** (NPV) **£ -595K to -3M**	**NET BENEFIT** (NPV Best estimate) **£ -£1.2M**

What is the geographic coverage of the policy/option?			UK	
On what date will the policy be implemented?			1 October 2009	
Which organisation(s) will enforce the policy?			CAA	
What is the total annual cost of enforcement for these organisations?			£ Negligible	
Does enforcement comply with Hampton principles?			Yes	
Will implementation go beyond minimum EU requirements?			N/A	
What is the value of the proposed offsetting measure per year?			£ Nil	
What is the value of changes in greenhouse gas emissions?			£ N/K	
Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro **£70/aircraft**	Small **£70/aircraft**	Medium **£70/aircraft**	Large **£70/aircraft**
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices) (Increase - Decrease)

Increase of £ Negligible Decrease of £ Negligible **Net Impact** **£** Negligible

Key: **Annual costs and benefits: Constant Prices** **(Net) Present Value**

Evidence Base (for summary sheets)

[Use this space (with a recommended maximum of 30 pages) to set out the evidence, analysis and detailed narrative from which you have generated your policy options or proposal. Ensure that the information is organised in such a way as to explain clearly the summary information on the preceding pages of this form.]

1 POLICY CONTEXT FOR THE PROPOSALS

1.1 Levels of air traffic in the UK have grown significantly in the last three decades and medium-term forecasts[1] estimate an average annual growth rate of commercial flight movements in UK airspace of between 1.8% and 4% from 2008 to 2014. This equates to an additional 331,000 to 804,000 flights per year in UK airspace in 2014 compared to 2007. Notwithstanding the current economic downturn, the Civil Aviation Authority (CAA) considers that traffic levels will continue to rise in the medium to long term and so it is necessary to continue to plan to accommodate this growth despite the short-term uncertainty. Even in the current constrained economic environment, some key volumes of airspace are still reaching their full capacity at certain geographical locations or at certain times of the day. As such, it is necessary to continue to improve safety standards to meet this capacity/ demand requirement.

1.2 Commercial air traffic growth is highly beneficial to the UK in terms of economic prosperity, employment, tourism, exports and the social benefits of access to affordable air travel. In 2003, the Government set out in its White Paper, 'The Future of Air Transport', how it seeks to ensure that the forecast growth in air traffic can be accommodated by UK airports and the associated Air Traffic Control (ATC) system. The 2003 White Paper also acknowledged that the benefits of air traffic growth must be balanced with the environmental consequences of aircraft emissions. The CAA believes that the challenge of increasing capacity while simultaneously addressing environmental considerations and maintaining target levels of safety will need to be achieved through a variety of initiatives. These include:

- More efficient handling and routing of flights within the Air Traffic Management (ATM) system;
- Greater technical interoperability, and hence co-operation, between all classes of aircraft and with the safety layers provided by anti-collision systems and ATC radars;
- A more modern ATC radar surveillance system;
- Measures to reduce the number of airspace infringements and to minimise the adverse consequences of infringements when they occur.
- Changes to controlled airspace structures, together with measures to increase efficiency in the use of controlled airspace;
- Optimal climb-out routes from airports and more direct routing of commercial aircraft between airports;
- Greater use of continuous descent approaches and less holding of commercial aircraft in the terminal phases of flight.

1.3 The consequences of these initiatives are likely to affect all airspace users in the UK to a lesser or greater extent, particularly through changes to the way that aircraft are routed in order to use the limited airspace resource more efficiently. The CAA considers that greater co-operation between all categories of airspace user is needed to protect freedom of movement and access to airspace whilst maintaining or improving safety. The deployment of future concepts of operation for safely managing increased levels of air traffic will require a more co-operative overall environment between airspace users and ATC. Wider deployment of SSR will provide the electronic means of achieving this co-operative environment.

1.4 In particular, the current Secondary Surveillance Radar (SSR) system used by ATC, and which is also the primary technological basis for anti-collision safety systems, needs to be updated to

[1] EUROCONTROL – Medium Term Forecast – IFR Flight Movements 2008-2014 – Volumes 1 & 2 – 29 February 2008.

cope with increasing air traffic levels. Currently, aircraft are required by the Air Navigation Order to carry and operate an SSR Mode Select (Mode S) capable transponder in the following circumstances:

- When flying under Instrument Flight Rules (IFR) in controlled airspace below Flight Level 100. (Gliders do not currently have to comply with this requirement.)
- When flying at and above Flight Level 100. (Gliders do not currently have to comply with this requirement except when operating in controlled airspace of Classification C outside of an active 'Temporary Reserved Area – Gliders', referred to as a TRA(G).)
- When flying within a Transponder Mandatory Zone (TMZ). (Gliders do not have to comply with this requirement.)
- When flying for the purpose of public transport. (Gliders and balloons do not have to comply with this requirement.)

As a consequence of these current regulations, the vast majority of commercial aircraft already carry and operate Mode S equipment.

1.5 Aircraft that operate without SSR transponders are effectively 'invisible' to Airborne Collision Avoidance Systems (ACAS) carried by commercial and some GA aircraft and to ground-based conflict alert tools used by ATC. Visibility of non-transponder equipped aircraft to controllers relies on the aircraft being detected on Primary Surveillance Radars (PSR). This can be problematic with very small aircraft and those made from composite materials because PSR relies on radio energy being reflected off the aircraft back to the radar receiver. Even where aircraft are detected using PSR only, the situational awareness of controllers is reduced compared to detection by SSR because aircraft identity and altitude information is not provided and cannot, therefore, be displayed on controller workstations. The absence of this data increases controller workload when these aircraft require an ATC service because of the need to transmit and receive more radio messages to elicit the information not being provided visually by radar. The lack of visible altitude information on aircraft can also make the sequencing and separation of aircraft under the control of ATC much less efficient while maintaining the required safety levels and renders inoperable controlled airspace infringement tools, such as CAIT used by NATS.

1.6 Therefore, since the turn of this Century, the CAA along with its European neighbours has been pursuing a policy of gradually increasing the use of the modern SSR Mode S technology, both on the ground and in the air.

2 POLICY OPTIONS TESTED THROUGH CONSULTATION

2.1 In 2006 and 2008, the CAA conducted public consultations on proposals to expand the requirements to carry and operate SSR Mode S transponders in UK airspace to deliver a more co-operative overall environment. The following potential options were tested during these two consultations:

- Mandatory SSR Mode S transponder carriage by all aircraft in all airspace;
- Mandatory SSR Mode S transponder carriage by all powered aircraft in all airspace;
- Mandatory SSR Mode S transponder carriage by all aircraft flying within controlled airspace of classification A to E;
- Inclusion of gliders within the SSR transponder carriage regulations that apply to all other aircraft;
- Mandatory SSR Mode S transponder carriage by all powered aircraft conducting international flights;
- Adoption of the Airspace Change Process set out in CAA Publication (CAP) 725 as a mechanism with which to process future applications from stakeholders for TMZs.

2.2 Over 5,000 responses were received during the two consultations, the vast majority coming from sporting and recreational pilots and associations, particularly from the gliding sector, who strongly opposed any extension to the current transponder carriage rules on the grounds of disproportionate costs, lack of direct benefits and a perceived lack of suitable equipment for some types of aircraft. It was also felt by many that the proposals were not supported by fully quantified benefits or a clear and pressing safety need.

3 HOW CONSULTATION HAS HELPED TO DEVELOP THE CAA PROPOSALS

3.1 The CAA has taken into account the views and concerns of all stakeholders submitted during the extensive consultations. Detailed response documents for these consultations were published[2] separately but the following issues, in particular, have been most influential in helping the CAA to develop the final proposals presented in this Impact Assessment:

a. It was argued by General Aviation stakeholders that commercial air traffic density and the level of collision risk between commercial and sporting/recreational aircraft was not uniform across UK airspace. It was also felt that future increases in commercial air traffic would not be evenly spread throughout UK airspace and, in any case, would probably not be realised due to the current environmental, economic and security pressures. Therefore, it was considered by General Aviation stakeholders that a more 'targeted' approach to the expansion of the SSR Mode S transponder carriage requirements should be adopted by the CAA, rather than resorting to a 'blanket' application of new rules.

The CAA's recommendations to Government reflect a targeted approach to extending the transponder carriage rules.

b. It was argued by General Aviation stakeholders that suitable SSR Mode S transponder technology, which has specifically been designed to take account of the operating and financial constraints of very light powered aircraft and gliders, has not yet been developed by industry and brought to market. Some respondents felt that, in certain cases, it would not be possible to install any of the currently available transponders on their aircraft. Therefore, it was felt that a significant part of the General Aviation community could not yet comply with the SSR transponder carriage requirements, as this would result in disproportionate equipage costs and/or significant operating limitations being required.

The CAA has been investigating the feasibility and encouraging the development of an SSR Mode S transponder suitable for light aviation for many years. Despite these efforts, industry perception of a limited market and a lack of a robust regulatory environment has brought about limited results. More recently, there have been reassuring signs that suitable transponders are becoming available in the market, as industry responds to the changing environment.

c. In view of the various perceived technology constraints, it was considered by General Aviation stakeholders that the CAA must provide appropriate mitigation for them in the form of equipage subsidies or by implementing procedures that would continue to allow them access to any expanded mandatory transponder carriage airspace without transponders.

Notwithstanding the CAA's existing powers to notify mandatory SSR transponder carriage airspace to address pressing safety and efficiency needs, the CAA has decided that the Airspace Change Process will be employed as the mechanism with which to consider requests from stakeholders to extend the transponder carriage requirements in specific volumes of airspace of Classification D to G. This process requires that potential mitigation must be considered for stakeholders that would be adversely affected by a proposed airspace change and that the applicants conduct appropriate consultation with these affected stakeholders. For defined scenarios within controlled airspace, the CAA supports the adoption of airspace access arrangements for General Aviation aircraft through the use of Letters of Agreement between air traffic service units and General Aviation organisations. The recommendations to Government will continue to permit the use of Letters of Agreement as mitigation for controlled airspace access by non-transponder equipped aircraft in specified circumstances where safety and efficiency issues can be managed appropriately.

[2] 'Summary of Responses' and 'Response to Consultees' documents for a "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" were published in December 2006. 'Summary of Responses' and 'Synopsis of Comments Received' documents for a "Consultation on a Proposal for an Incremental Expansion of the Use of Secondary Surveillance Radar Mode Select transponders in UK Airspace" were published in December 2008.

d. It was argued by General Aviation stakeholders that SSR transponder carriage regulations should be harmonised throughout Europe and the CAA should not adopt unilateral measures that are out-of-step with regulations in neighbouring States.

The CAA's recommendations to Government are consistent with requirements in neighbouring States that are implementing SSR Mode S Technology. TMZs are already in use within several other European States, as is mandatory Mode S transponder carriage within complex and busy controlled airspace structures.

e. It was stated by General Aviation stakeholders that the CAA had not provided any convincing evidence that increased SSR transponder carriage would realise benefits for General Aviation pilots, and particularly, within airspace of Classification G and many volumes of Classification D or E controlled airspace around airports.

Under its existing powers and responsibilities, the CAA will, where necessary, notify mandatory transponder carriage within specific airspace to address pressing safety or efficiency needs. However, the recommendations to Government for extending the transponder carriage requirements in airspace of Classification D to G provide a robust and transparent mechanism for considering applications from aviation stakeholders on a case-by-case basis, taking into account evidence of the need for change in a particular area or circumstance. It will be a requirement of this mechanism that the potential benefits for all airspace users are considered.

f. It was stated by the gliding sector of General Aviation that a requirement for gliders to carry and operate SSR Mode S transponders at and above Flight Level 100 would decimate gliding clubs and related small businesses in the UK. It was argued that there was virtually no risk of collision between gliders and commercial aircraft above Flight Level 100 because the disparate activities did not operate within the same areas and there had not been a history of collisions and near misses.

The low radar cross-section of gliders and modern light aircraft of composite construction are not easily detected by primary radar. If these aircraft do not carry a transponder, it is difficult for ATC to detect their presence. This is of particular concern in airspace shared with large commercial air transport aircraft. The CAA's recommendations to Government advocate replacing the current general alleviation for gliders from the transponder carriage requirements at and above Flight Level 100 with specific, targeted exceptions. The CAA intends to work closely with the gliding associations and ATC providers to identify volumes of airspace currently classified F and G at and above Flight Level 100 where transponder carriage by gliders could be specifically notified as not being required. The overall aim will be to minimise the impact on gliding activity and build on the existing measures for non-transponder equipped glider access to controlled airspace of Classification C at and above Flight Level 195 while broadening the benefits that transponder carriage brings to many other airspace users.

g. A major ATC organisation in the UK supported the CAA's proposals and further argued that the full benefits of its many initiatives to accommodate commercial air traffic growth and reduce safety-related incidents would not be realised if technical interoperability was to remain at its current level. It argued that future concepts of operation would require an ever more co-operative environment in order to be able to achieve radically improved safety and efficiency in the future. The ATC organisation also stated that the increasing use of composite material in General Aviation aircraft was problematic for ensuring predictable tracking of aircraft and the maintenance of an ATC 'picture' using PSR technology.

The CAA intends to employ the Airspace Change Process as the mechanism through which ATC stakeholders can apply for an extension to the SSR transponder carriage rules to support specific safety and efficiency requirements in particular circumstances and airspace volumes.

4 POLICY DEVELOPMENT AND MANAGEMENT PROCESS

4.1 The CAA has been providing advance notification of its proposed Mode S policy to the UK aviation industry since 1989 through the use of Aeronautical Information Circulars, consultation

papers, press releases and briefings. Since 2001, various departmental stakeholder consultation groups have been routinely apprised of the policy development, and a specific CAA inter-departmental Mode S working group was established to assist with the detail of the policy elements.

4.2 Management oversight and endorsement of the developing policy has been provided by the CAA Board and the Airspace Policy Committee.

5 CAA RECOMMENDATIONS FOR THE NEXT STAGE OF REGULATORY CHANGE

5.1 General

In light of the issues raised during the consultations, the CAA has refined its original proposals and is now recommending an incremental expansion of the SSR Mode S transponder carriage requirements as set out below. Overall, the CAA considers that these proposals ensure that the expansion of the SSR Mode S transponder carriage requirements is targeted at the UK's busiest and most complex airspace volumes, thereby creating the technology-based co-operative environments where they are most needed.

5.2 Extension of the SSR Mode S transponder carriage regulations to all aircraft (except gliders) flying within controlled airspace of Classification A to C with effect from 1 October 2009.

5.2.1 Currently, the Air Navigation Order requires all aircraft (except gliders) operating in all classes of airspace at and above Flight Level 100 or when operating under Instrument Flight Rules (IFR) within controlled airspace below Flight Level 100 to carry and operate an SSR Mode S transponder. Controlled airspace of Classification A to C can be the busiest and most complex airspace in the UK and yet, under these existing requirements, transponder carriage is not mandatory in all circumstances within that airspace.

5.2.2 The CAA is recommending that all aircraft operating in controlled airspace of Classification A to C, irrespective of altitude and flight rules, should be equipped with an SSR Mode S transponder unless specifically authorised otherwise by the responsible ATC unit. This would be applicable to gliders (except when operating within an active TRA(G) in Classification C airspace) with effect from 6 April 2012 and all other aircraft with effect from 1 October 2009. However, it is assessed that the actual impact of this proposed change will be negligible, as the vast majority of aircraft likely to be affected will already be suitably equipped. The CAA is content for ATC units to continue to provide mitigation, such as through Letters of Agreements, for non-transponder equipped flights to have access in specified circumstances where safety and efficiency issues can be managed appropriately.

5.3 Extension of the SSR Mode S transponder carriage regulations to include gliders with effect from 6 April 2012.

5.3.1 The CAA considers that the safety and efficiency benefits of SSR transponder carriage in the mandatory circumstances are undermined if the requirement does not apply to all users of that airspace. Currently, gliders are required to operate with an SSR Mode S transponder when at and above Flight Level 195 outside of an active TRA(G). In all other circumstances where transponder carriage and operation is mandatory, gliding is the only UK aviation sector that is excluded from the requirements the Air Navigation Order.

5.3.2 UK airspace and its use has evolved considerably since this exception was put in place for gliding, as has the use of technology to improve safety, such as collision avoidance equipment carried by commercial aircraft. The adverse transponder equipage issues raised by the gliding community during the consultations apply equally to many very light powered aircraft, to which this legacy exception does not apply. In the modern airspace context, and mindful of the need for a more co-operative overall environment for the future, the CAA view is that the presumption should now be that all aircraft, including gliders, must be equipped with an SSR Mode S transponder as previously described, unless specifically authorised otherwise by the responsible ATC unit. The CAA is, therefore, recommending that the current general exception for gliders should be removed from the transponder carriage regulations with effect from 6 April 2012.

5.3.3 The CAA is satisfied that the impact of removing this general exception for gliders will be far less severe than considered by the gliding community if specific mitigation measures are implemented and if adequate time is provided to bring any new arrangements into being. Alongside this proposed regulatory change, the CAA will continue to encourage the use of Letters of Agreement

between gliding organisations and ATC units to permit access to airspace without transponders in specified circumstances where safety and efficiency issues can be managed appropriately. The current arrangements for gliding operations without transponders in active TRA(G) airspace above Flight Level 195 will continue to be applied. The CAA will work with the gliding associations and other stakeholders to define specific, notified areas of Classification G airspace at and above Flight Level 100 where gliders would still not be required to operate with an SSR transponder and that will provide the necessary connectivity to the upper airspace gliding boxes.

5.3.4 Self-Launching Motor Gliders (SLMG) are not currently included within the definition of 'glider' in the Air Navigation Order and so, unlike gliders, SLMG have been required to adhere to the SSR transponder carriage requirements unless otherwise authorised by a responsible ATC unit. As a result of information provided during the Mode S consultations, the CAA is satisfied that some SLMG operators can encounter the same challenges with SSR transponder equipage as those experienced by operators of gliders and Self-Sustaining Gliders (SSG). The proposed regulatory changes for gliders also contain recommended amendments that would align the SSR transponder carriage regulations for SLMG with those applicable to all other gliders.

5.4 Additional Non-Regulatory Change

Under its existing powers and responsibilities, the CAA will, where necessary to address pressing safety and efficiency needs, notify additional mandatory transponder carriage requirements within specific volumes of airspace.

However, in addition to the proposed regulatory changes for mandatory Mode S transponder carriage in all controlled airspace of Classification A to C, the CAA has decided to employ the Airspace Change Process set out in CAP 725 as the umbrella mechanism with which to process applications from external stakeholders for extensions to the transponder carriage requirements in specific volumes of Class D to G airspace on a case-by-case basis. This will include requests for the establishment of TMZs. It is envisaged that ATC organisations and other stakeholders will be able to use this mechanism to address transponder carriage needs in specific, targeted volumes of airspace not covered by the general transponder carriage regulations. Use of the Airspace Change Process ensures that appropriate justification has to be provided by applicants, and stakeholders fully consulted so that the impact of proposed changes can be fully assessed and suitable mitigation determined.

5.5 Transition Arrangements

Under existing transition arrangements associated with a previous expansion of Mode S transponder carriage in UK airspace, operators of aircraft flying outside of notified Mode S Enhanced Surveillance airspace that are equipped with legacy Mode A/C transponders have until 31 March 2012 to complete the necessary upgrades to Mode S Elementary Surveillance compliance. This alleviation would also apply to the increased Mode S transponder carriage recommendations set out in this Impact Assessment.

A specific exemption from the general transponder carriage requirements for SLMGs, which are classed as aeroplanes in the Air Navigation Order, has been previously notified by the CAA. This exemption would be extended until the proposed regulatory amendments come into force that would align the Mode S transponder carriage requirements for SLMG with those for gliders and SSGs.

5.6 Monitoring and Evaluation

The CAA proposes to evaluate the actual impact of the recommended policy in 2014, which allows a period of two years following full implementation in which to gather the necessary data and statistics. It is envisaged that the following sources of information would be used in this process:

a. Relevant metrics gained through the Airspace and Safety Initiative (ASI);

b. Relevant incident data, such as: Airspace Infringement statistics; Mandatory Occurrence Reports (MORs); and Airprox Reports;

c. Increases in transponder equipage levels on aircraft, especially for gliders, identified through the Wireless Telegraphy Act (WTA) licensing database;

d. The number and dimensions of any TMZs established;

e. Ongoing liaison with General Aviation stakeholder associations.

6 BENEFITS SUMMARY

6.1 SSR Mode S is an enabling technology that facilitates wider initiatives designed to safely accommodate the predicted growth in air traffic movements, thus helping to realise the significant economic and social benefits of air travel that were set out in 'The Future of Air Transport' White Paper. As Mode S is only one of the enablers, it is not possible to monetise any directly attributable benefits arising from its implementation in a meaningful way.

6.2 Global and European safety studies consistently show that interaction with ACAS significantly reduces the risk of mid-air collision and it has been assessed that aircraft equipped with SSR transponders operating in airspace where ACAS-equipped aircraft are present can halve their risk of collision when compared to the situation where they are not carrying a transponder[3]. These proposals increase the number of aircraft that will be electronically visible to airborne and ground-based collision avoidance systems operating within, and in support of, the busiest controlled airspace areas and in the busiest mixed operating areas of Classification G airspace. Therefore, the measures will maintain or improve safety levels as traffic levels rise through greater possibilities for ACAS interaction.

6.3 Mid-air collisions involving commercial passenger carrying aircraft are classed as low probability but high impact events. The ICAO recommended 'Target Level of Safety' when designing an air traffic system is for no more than 5 fatal accidents in every 1,000 million flight hours per defined airspace dimension arising from collisions[4]. It should be noted that single mid-air collision may comprise two fatal aircraft accidents. To put this 'Target Level of Safety' into context, during 2007 the total number of flights hours by passenger carrying aircraft in the whole of the UK airspace dimension was around 1.62 million[5]. On this basis, when taking the entire UK air traffic system as the "defined airspace dimension" the 'Target Level of Safety' would not be met if there was more than one mid-air collision every 246 years that resulted in a fatality on both of the aircraft. This illustrates the stringent measures that have to be considered for an air traffic system to try and ensure that the 'Target Level of Safety' is achieved. The maximum estimated cost of the proposals is £3M over the next 17 years. By comparison, the Government's typical figure for the 'Value of a Prevented Fatality' is around £1.5M[6] per individual, and so just 2 fatalities would need to be prevented by these measures over the same period for there to be net economic benefit arising from the improved collision avoidance potential.

6.4 The proposals will provide ATC with a means to increase controller situational awareness through the creation of 'known' traffic environments on radar displays in busy/complex airspace volumes. These 'known' traffic environments provided by SSR data are essential for achieving the overall levels of co-operation needed to deploy future ATM concepts of operation and improve safety and efficiency levels.

6.5 The proposals contribute towards realising improved access to controlled airspace for all users, because the initial identification and subsequent maintenance of identity of all aircraft will be easier for controllers. Consequently, controller workload is reduced, thereby providing an opportunity for improved safety and ATC capacity.

7 EQUIPAGE AND OPERATING COSTS SUMMARY

7.1 The cost impact of these proposals falls on the gliding sector of the General Aviation community. For all other aviation sectors, the directly quantifiable costs are assessed to be negligible. The costs accrued from potential future case-by-case extensions of the transponder carriage requirements, through the Airspace Change Process, can only be assessed as part of that process for the specific applications.

7.2 Estimated total average one-off equipage costs for gliders between 2009 and 2012 of £176,000 to £882,000 per year.

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[3] ACAS Programme, ACASA Project, Work Package 1, Final Report on Studies on the Safety of ACAS II in Europe, Edition 1, March 2002, paragraph 4.5.4.4.
[4] Source: ICAO Review of the General Concept of Separation Panel (RGCSP) – Working Group A - 5/95.
[5] Source: Analysis of Airprox in UK Airspace – Report Number 19.
[6] Assumption based on "Highways Economics Note No.1" issued by the Department for Transport, January 2007.

7.3 Estimated total additional average on-going costs for gliders between 2009 and 2026 of £7,400 to £37,200 per year.

7.4 Estimated total Present Value cost for gliders between 2009 and 2026 of £595,000 to £3M at a discount rate of 3.5%. By varying some of the assumptions, such as equipage timing and equipage cost proportions, the sensitivity of these estimates is assessed to be in the region of -45% to +12% for each of the equipage numbers scenarios.

7.5 The aim will be to work with gliding and ATC stakeholders to try and achieve costs at the lower end of the aforementioned estimated ranges or less.

8 DETAILED EQUIPAGE AND OPERATING COST CALCULATIONS

8.1 The total cost impact of mandating Mode S transponder carriage by all flights in airspace of classification A is assessed to be negligible, as virtually all aircraft conducting these flights will already be transponder equipped. Although, some of these aircraft may still be equipped with legacy SSR Mode A/C transponders, they should already be in the process of upgrading them to SSR Mode S by 2012 under the existing regulations.

8.2 The total cost impact of extending the current transponder carriage requirements in other specific circumstances using the Airspace Change Process on a case-by-case basis cannot be quantified or estimated accurately. The extent of new Mode S transponder equipage requirements for aircraft in these cases will depend on the number and extent of successful applications made by ATC providers or other parties, and/or on the mitigation arrangements that can be put in place for non-transponder equipped sporting and recreational aircraft. Any impact will have to be considered by the applicants and the CAA during the Airspace Change Process for each specific case.

8.3 Estimates of the cost impact on the gliding sector from the proposals to remove the general exception for gliders from the transponder carriage rules can only be calculated in a meaningful way for the requirement to operate a transponder at and above Flight Level 100. Below Flight Level 100 in Classification A airspace, mitigation arrangements using Letters of Agreement can still be available to negate the need to equip gliders with transponders. Access to other volumes of controlled airspace under VFR would still not require equipage of a glider with a transponder unless an application to extend the transponder carriage requirements had been approved for a particular volume of airspace through the Airspace Change Process. In which case, mitigation arrangements and the cost impact on gliders would need to be considered on a case-by-case basis with each specific application. Similarly, this would be the case with any TMZs established through the Airspace Change Process that potentially affected gliding activity.

8.4 For the purposes of this Impact Assessment, detailed costs estimates have focussed only on the likely need to equip gliders with Mode S transponders for continued access to some volumes of airspace at and above Flight Level 100 with effect from 6 April 2012. This would affect operators of gliders, including SSGs, and SLMGs. Operators of Touring Motor Gliders (TMGs) are already required to equip their aircraft with Mode S transponders for flights in circumstances where the carriage and operation of a transponder is mandatory. In the case of Hang Gliders and Paragliders wishing to access airspace at and above Flight Level 100, and for which there are currently no suitable Mode S transponder products, it has been assumed that these aircraft would have to be restricted to operating within the foreseen notified areas where gliders would still not require a transponder. The other potential impacts on the gliding sector, which may result in indirect costs, are considered in para 9 below.

8.5 Through consultation with the British Gliding Association, the estimated maximum numbers of gliders that could be affected by the need to carry and operate a transponder at and above Flight Level 100 are shown in Table 1 below.

Summary of Gliders/SLMG Numbers	Total	Mode S	No Mode S
Private	1793	12	1781
Non Private	697	0	697
Total	2490	12	2478

Table 1: Numbers of Glider/SLMG in the UK

8.6 Through analysis of consultation responses, Impact Assessment workshops with General Aviation representative associations, and research with avionics suppliers and maintenance

organisations, typical Mode S transponder equipment and one-off installation costs for gliders have been estimated as shown in Table 2 below. The estimates are based on December 2008 prices.

Estimated Equipage Cost Ranges for Gliders/SLMG	Low Cost	Medium Cost	High Cost
Mode S Transponder Unit	£1,449	£1,673	£2,250
Transponder Related Minor Parts	£200	£224	£274
Installation/Other Attributable Changes	£500	£1,500	£2,000
EASA Approval Fees (€250)	£209	£209	£209
Total (inc VAT)	**£2,358**	**£3,606**	**£4,733**

Table 2: Estimated One-Off Equipage Costs for Gliders/SLMG

8.7 There are also ongoing costs associated with operating an SSR Mode S transponder. Consultation with industry indicates that the cost of routine maintenance checks of Mode S transponders is equivalent to that for Mode A/C transponders. Those operators required to upgrade Mode A/C transponders to Mode S capability would, therefore, not incur any additional expense, as they already have to meet this ongoing cost. Transponder checks are required every 24 months. In addition, the use of an SSR transponder requires operators to hold a Wireless Telegraphy Act (WTA) licence. Once again, those operators required to upgrade Mode A/C transponders to Mode S would not be affected by this element, as they will already hold the required licence. Any existing WTA licences for other radio equipment already carried on a glider would also just be amended to include the new Mode S transponder equipment without any additional charge.

8.8 Notwithstanding the above, the CAA is aware that only a handful of SLMG airframes are currently equipped with Mode A/C transponders and there are no gliders recorded as being equipped with Mode A/C. Therefore, as the number is negligible, for the purposes of the cost calculations, assumptions have been made that all gliders/SLMG would be equipping with a transponder for the first time and that 86% of gliders do not currently hold a WTA licence due to other radio equipment carriage. The estimated additional ongoing costs per glider, resulting directly from the CAA's proposals, are shown in Table 3 below.

Description	Estimated Cost
2-Yearly Check of Mode S Transponder	Nil additional cost for Mode A/C equipped aircraft
	£100 for new Mode S equipage
Annual WTA Radio Licence Fee (required for an SSR transponder even where a radio is not fitted)	Nil additional cost for Mode A/C equipped aircraft
	£20 for aircraft with <3,700 kg take-off mass

Table 3: Estimated Additional Ongoing Cost of Mode S Transponder Equipage

8.9 The number of gliders potentially affected by the CAA's proposals is dependent on the number, extent and locations of 'transponder free' areas above Flight Level 100 that can be identified. From reference to activity data on the British Gliding Association's website, the CAA estimates that, potentially, up to around 25% of the total glider fleet in the UK accesses this airspace. However, the aim will be to work with the gliding associations and ATC providers to identify suitable areas that would significantly reduce the likelihood of all these 25% of gliders needing to equip with Mode S. It is not yet possible to determine precisely to what extent this will be achieved. Therefore, for the purposes of this Impact Assessment, three potential equipage scenarios have been considered in order to help provide a range of likely implementation costs:

a. **Low Equipage Numbers Assumption**. Under this scenario it has been assumed that only 5% of the total glider fleet would be affected by the CAA's proposals;

b. **Medium Equipage Numbers Assumption**. Under this scenario it has been assumed that only 10% of the total glider fleet would be affected by the CAA's proposals;

c. **High Equipage Numbers Assumption**. Under this scenario it has been assumed that 25% of the total glider fleet would be affected by the CAA's proposals.

8.10 Through consultation, it was apparent that the glider fleet is extremely diverse in terms of age, types and capabilities. Consequently, the cost of equipping gliders with Mode S transponders will

vary considerably, depending on how much work is involved and how difficult it is to accomplish. For example, in some cases it was reported that totally new instrument panels and avionics would be required to provide the necessary space for a Mode S transponder. Therefore, a profile of estimated one-off equipage costs has been calculated to provide low, medium and high equipage cost assumptions. From the assessment of the responses to the consultations from glider pilots, the CAA has assumed that the likely profile for most gliders would be towards the medium/higher end of the cost estimates. Taking into account this assumption and the equipage numbers scenarios, the following tables provide an estimate of the numbers of aircraft likely to be affected in each scenario and in each of the equipage cost ranges. Table 4 provides the assumptions for privately owned gliders/SLMG and Table 5 shows the assumptions for gliders/SLMG owned by businesses, gliding clubs and voluntary organisations.

Private Gliders/SLMG Equipage Numbers Scenarios	Proportion	Total Equipage Assumption	Low Cost Proportion	Medium Cost Proportion	High Cost Proportion
			10%	20%	70%
Low Equipage Numbers Assumption	5%	89	9	18	62
Med Equipage Numbers Assumption	10%	178	18	36	125
High Equipage Numbers Assumption	25%	445	45	89	312

Table 4: Equipage Numbers and Cost Profile Assumptions for Private Gliders

Non-Private Gliders/SLMG Equipage Numbers Scenarios	Proportion	Total Equipage Assumption	Low Cost Proportion	Medium Cost Proportion	High Cost Proportion
			10%	20%	70%
Low Equipage Numbers Assumption	5%	35	3	7	24
Med Equipage Numbers Assumption	10%	70	7	14	49
High Equipage Numbers Assumption	25%	174	17	35	122

Table 5: Equipage Numbers and Cost Profile Assumptions for Non-Private Gliders

8.11 The other variable in determining the estimated costs of the proposals concerns the timing of the likely equipage and, therefore, the impact on the Present Value calculations. It is expected that most glider operators will wait until nearer 6 April 2012 before deciding whether or not to equip their aircraft. Details of the 'transponder free areas' may not be available until 2011 and the prices of transponders may continue to decrease over time with increased competition in the market and technological advances. Therefore, the equipage timing assumptions that have been used for the cost estimates are shown in Table 6 below.

Year of Equipage Profile Assumption	2009/2010	2010/2011	2011/2012
Proportion of Total Equipage	10%	20%	70%

Table 6: Equipage Timing Assumptions

8.12 Taking into account the assumptions, the detailed calculations of the potential one-off transponder equipage costs for gliders/SLMG requiring access to airspace at and above Flight Level 100 are as follows:

a. **Low Equipage Numbers Assumption**. The detailed calculations for the assumption that up to 5% of the glider fleet would need to equip with a Mode S transponder are shown in Table 7 below. In line with HM Treasury recommendations, as set out in the Green Book, Present Value (PV) discounted costs are shown at a 3.5% rate with 2009 as the price base year.

Estimated Cost Per Year Analysis - Private Gliders/SLMG	Low Equipage Numbers Assumption			
	2009/2010	2010/2011	2011/2012	TOTAL
Low Cost Proportion	£2,100	£4,200	£14,699	£20,998
Discounted PV @ 3.5%	£2,100	£4,058	£13,721	£19,879
Medium Cost Proportion	£6,422	£12,845	£44,956	£64,223
Discounted PV @ 3.5%	£6,422	£12,410	£41,966	£60,799
High Cost Proportion	£29,503	£59,006	£206,522	£295,032
Discounted PV @ 3.5%	£29,503	£57,012	£192,788	£279,303
Total Discounted PV Cost per Year	£38,025	£73,480	£248,476	**£359,981**
Estimated Cost Per Year Analysis - Non-Private Gliders/SLMG	**Low Equipage Numbers Assumption**			
	2009/2010	2010/2011	2011/2012	TOTAL
Low Cost Proportion	£822	£1,644	£5,752	£8,218
Discounted PV @ 3.5%	£822	£1,588	£5,370	£7,780
Medium Cost Proportion	£2,513	£5,027	£17,594	£25,134
Discounted PV @ 3.5%	£2,513	£4,857	£16,424	£23,794
High Cost Proportion	£11,546	£23,092	£80,823	£115,462
Discounted PV @ 3.5%	£11,546	£22,312	£75,448	£109,306
Total Discounted PV Cost per Year	£14,881	£28,757	£97,242	**£140,880**
Estimated Cost Per Year Analysis - All Gliders/SLMG	**Low Equipage Numbers Assumption**			
	2009/2010	2010/2011	2011/2012	TOTAL
Low Cost Proportion	£2,922	£5,843	£20,451	£29,216
Discounted PV @ 3.5%	£2,922	£5,646	£19,091	£27,658
Medium Cost Proportion	£8,936	£17,871	£62,550	£89,357
Discounted PV @ 3.5%	£8,936	£17,267	£58,390	£84,593
High Cost Proportion	£41,049	£82,099	£287,345	£410,493
Discounted PV @ 3.5%	£41,049	£79,324	£268,237	£388,610
Total Discounted PV Cost per Year	£52,907	£102,237	£345,718	**£500,861**
			Average Cost per Glider	**£4,270**
			Average Cost per Year	**£176,355**

Table 7: One-Off Equipage Cost Calculations for the Low Numbers Assumption

b. **Medium Equipage Numbers Assumption**. The detailed calculations for the assumption that up to 10% of the glider fleet would need to equip with a Mode S transponder are shown in Table 8 below.

Estimated Cost Per Year Analysis - Private Gliders/SLMG	Medium Equipage Numbers Assumption			
	2009/2010	2010/2011	2011/2012	TOTAL
Low Cost Proportion	£4,200	£8,399	£29,397	£41,996
Discounted PV @ 3.5%	£4,200	£8,115	£27,442	£39,757
Medium Cost Proportion	£12,845	£25,689	£89,912	£128,446
Discounted PV @ 3.5%	£12,845	£24,821	£83,933	£121,598
High Cost Proportion	£59,006	£118,013	£413,044	£590,063
Discounted PV @ 3.5%	£59,006	£114,024	£385,577	£558,607
Total Discounted PV Cost per Year	£76,050	£146,960	£496,952	**£719,962**
Estimated Cost Per Year Analysis - Non-Private Gliders/SLMG	**Medium Equipage Numbers Assumption**			
	2009/2010	2010/2011	2011/2012	TOTAL
Low Cost Proportion	£1,644	£3,287	£11,505	£16,435
Discounted PV @ 3.5%	£1,644	£3,176	£10,740	£15,559
Medium Cost Proportion	£5,027	£10,054	£35,187	£50,268
Discounted PV @ 3.5%	£5,027	£9,714	£32,847	£47,588
High Cost Proportion	£23,092	£46,185	£161,646	£230,923
Discounted PV @ 3.5%	£23,092	£44,624	£150,897	£218,613
Total Discounted PV Cost per Year	£29,763	£57,513	£194,484	**£281,760**
Estimated Cost Per Year Analysis - All Gliders/SLMG	**Medium Equipage Numbers Assumption**			
	2009/2010	2010/2011	2011/2012	TOTAL
Low Cost Proportion	£5,843	£11,686	£40,902	£58,431
Discounted PV @ 3.5%	£5,843	£11,291	£38,182	£55,316
Medium Cost Proportion	£17,871	£35,743	£125,099	£178,713
Discounted PV @ 3.5%	£17,871	£34,535	£116,780	£169,186
High Cost Proportion	£82,099	£164,197	£574,690	£820,986
Discounted PV @ 3.5%	£82,099	£158,647	£536,473	£777,219
Total Discounted PV Cost per Year	£105,813	£204,473	£691,436	**£1,001,722**
			Average Cost per Glider	**£4,270**
			Average Cost per Year	**£352,710**

Table 8: One-Off Equipage Cost Calculations for the Medium Numbers Assumption

c. **High Equipage Numbers Assumption**. The detailed calculations for the assumption that up to 25% of the glider fleet would need to equip with a Mode S transponder are shown in Table 9 below.

Estimated Cost Per Year Analysis - Private Gliders/SLMG	High Equipage Numbers Assumption			
	2009/2010	2010/2011	2011/2012	TOTAL
Low Cost Proportion	£10,499	£20,998	£73,493	£104,990
Discounted PV @ 3.5%	£10,499	£20,288	£68,606	£99,393
Medium Cost Proportion	£32,111	£64,223	£224,780	£321,114
Discounted PV @ 3.5%	£32,111	£62,052	£209,832	£303,996
High Cost Proportion	£147,516	£295,032	£1,032,610	£1,475,158
Discounted PV @ 3.5%	£147,516	£285,059	£963,942	£1,396,517
Total Discounted PV Cost per Year	£190,126	£367,400	£1,242,380	**£1,799,906**
Estimated Cost Per Year Analysis - Non-Private Gliders/SLMG	**High Equipage Numbers Assumption**			
	2009/2010	**2010/2011**	**2011/2012**	**TOTAL**
Low Cost Proportion	£4,109	£8,218	£28,762	£41,088
Discounted PV @ 3.5%	£4,109	£7,940	£26,849	£38,898
Medium Cost Proportion	£12,567	£25,134	£87,968	£125,669
Discounted PV @ 3.5%	£12,567	£24,284	£82,118	£118,970
High Cost Proportion	£57,731	£115,462	£404,115	£577,308
Discounted PV @ 3.5%	£57,731	£111,559	£377,242	£546,531
Total Discounted PV Cost per Year	£74,406	£143,783	£486,209	**£704,399**
Estimated Cost Per Year Analysis - All Gliders/SLMG	**High Equipage Numbers Assumption**			
	2009/2010	**2010/2011**	**2011/2012**	**TOTAL**
Low Cost Proportion	£14,608	£29,216	£102,255	£146,078
Discounted PV @ 3.5%	£14,608	£28,228	£95,455	£138,291
Medium Cost Proportion	£44,678	£89,357	£312,748	£446,783
Discounted PV @ 3.5%	£44,678	£86,336	£291,951	£422,965
High Cost Proportion	£205,247	£410,493	£1,436,726	£2,052,465
Discounted PV @ 3.5%	£205,247	£396,618	£1,341,184	£1,943,049
Total Discounted PV Cost per Year	£264,533	£511,183	£1,728,589	**£2,504,305**
			Average Cost per Glider	**£4,270**
			Average Cost per Year	**£881,776**

Table 9: One-Off Equipage Cost Calculations for the High Numbers Assumption

8.13 Routine ongoing costs associated with operating a Mode S transponder were calculated for the period 2009 to 2026 for each of the equipage numbers assumptions, using the equipage timing assumptions described in para 8.11 above. The costs over this period were discounted at 3.5% under Treasury rules to provide Present Value. The results of the calculations are shown in Table 10 below.

Summary of Total Ongoing Costs for the Period 2009-2026 (PV Discounted @ 3.5%)	Individual Cost	Assumption Totals		
		Low Equipage Numbers	Medium Equipage Numbers	High Equipage Numbers
2-Yearly Transponder Check Fee	£100	£71,352	£142,704	£356,760
WTA Licence Fee	£20	£24,545	£49,090	£122,725
		£95,897	£191,794	£479,485

Table 10: Summary of Total Ongoing Costs for the Period 2009 to 2026

8.14 An overall summary of the estimated costs for gliders is set out in Table 11 below.

Cost Element	Period	Low Equipage Numbers	Medium Equipage Numbers	High Equipage Numbers
Average Non-Discounted One-Off Equipage Costs Per Year	2009 – 2012	£176,355	£352,710	£881,776
Average Non-Discounted Ongoing Costs Per Year	2009 – 2026	£7,434	£14,868	£37,170
Total Discounted Cost (Present Value @ 3.5%)	**2009 – 2026**	£596,758	£1,193,516	£2,983,789

Table 11: Overall Summary of Costs for Gliders

8.15 By working with gliding associations and ATC agencies, the CAA considers that total costs of less than the 'Low Equipage Numbers' scenario are achievable.

9 IMPACT TEST RESULTS

9.1 **Competition Assessment**. The proposals do not directly or indirectly limit the number of suppliers of air services, and their ability and their incentives to compete are not limited. There may be some cost differences generated by the proposed policy option in certain markets (such as flying schools) between suppliers that operate within Classification A controlled airspace or above Flight Level 100 and those that do not. As noted in the Impact Assessment, this effect could be mitigated by local arrangements with ATC or the definition of specific airspace volumes to provide access for non-transponder equipped aircraft.

9.2 **Small Firms Impact Test**.

These proposals primarily affect the gliding sector of the General Aviation community. This sector mainly comprises recreational and sporting flyers, supported by a network of around 90 clubs and many maintenance and repair organisations. Many of the gliding clubs are operated as voluntary or non-profit making organisations, but most have some permanent and/or part time employees and many gliding clubs are run along the lines of small businesses. The supporting maintenance and repair businesses, and the companies that supply gliding equipment, are assessed to be mostly SMEs. Gliding clubs are mostly based in rural areas and activities at many clubs indirectly support other local businesses, particularly those reliant on tourism and visitors from outside the immediate area.

Consultation with stakeholders has indicated that the main impact on the gliding community would be from having to meet the initial costs of equipage and the ongoing servicing costs for SSR transponders. It was argued that, as gliding is attractive because it is a low-cost aviation sport, a significant proportion of the gliding community could just cease flying rather than attempt to meet these costs, and it may also become very difficult to attract new participants into the sport. It was argued strongly that many gliding clubs would then become unsustainable and have to close, with the resultant adverse knock-on impact on supporting businesses and local economies.

Local arrangements with ATC were acknowledged to be one way to mitigate these costs, but stakeholders also suggested broader exemptions and/or transferring some of the cost to commercial air transport operations, which, they consider, would stand to benefit most from the proposed policy.

Having revised its original proposals, the CAA considers that the current recommendations will address the concerns of the gliding sector about the potential direct and indirect impact of costs on small firms. Activity at and above Flight Level 100 without the need for SSR transponders will still be possible in defined areas, and the CAA will request the assistance of gliding associations and ATC providers to help identify these areas. Access to other volumes of mandatory transponder carriage airspace without transponders will still be possible in defined circumstances where existing Letters of Agreement with the appropriate ATC agencies can be maintained, or new ones put in place, to mitigate safety and efficiency concerns.

The CAA recognises that equipage of some gliders with transponders will inevitably be required in some areas and that the cost of this may result in some participants deciding to leave the sport or that some clubs may become unviable. The CAA does not consider that the current recommendations will result in a major reduction in UK gliding activities.

9.3 **Legal Aid**. The proposals do not introduce new criminal sanctions or civil penalties.

9.4 **Sustainable Development**. The proposals contribute towards wider efforts for achieving the sustainable approach to aviation that the Government is seeking to promote in ‘The Future of Air Transport’ White Paper. The option is an enabling measure to help ensure that airspace capacity can match the airport capacity aims, and to ensure that the limited airspace resource is used to maximum efficiency.

9.5 **Carbon Assessment**. The proposals aim to contribute to wider efforts to reduce the ‘track miles’ flown by commercial aircraft. By itself, the option will have a negligible direct impact on carbon emissions from aircraft but it is an enabling measure to help achieve greater efficiency in the way that UK airspace and aircraft routing is managed. Some sporting and recreational owners may decide to increase ‘track miles’ during their activities to avoid mandatory transponder carriage airspace rather then meet the expense of equipping their aircraft with Mode S. However, it is not possible to quantify this accurately.

9.6 **Other Environment**. The proposals aim to contribute to wider efforts to support the use of continuous descent approaches. This seeks to reduce the noise of arriving aircraft by ensuring that aircraft remain as high as possible for as long as possible and that segments of level flight during descent, which increase engine noise, are avoided. Where the Airspace Change Process is used to extend, on a case-by-case basis, the circumstances in which SSR transponders must be operated, consideration of potential direct and indirect environmental impacts is a mandatory requirement.

9.7 **Health Impact Assessment**. The CAA considers that a health impact assessment is not necessary for these proposals, as they do not have a significant adverse health impact on the whole population or a major sub-group of the population.

9.8 **Race, Gender and Disability Equality**. The proposals merely prescribe equipage requirements for aircraft that will be operated in certain airspace. The requirements would apply to any owner/operator of such aircraft, irrespective of race, gender or disability, who wishes to operate in this airspace. Consultation with stakeholders has raised no issues that lead the CAA to believe that the proposal would not be race, gender or disability neutral.

9.9 **Human Rights**. The CAA considers that the proposals have no direct implications on Human Rights.

9.10 **Rural Proofing**. The proposals could have an impact on rural areas in that many of the aircraft that are potentially affected by the equipage requirements are based at airfields in rural locations. If the proposals were to result in a significant number of recreational and sporting aircraft being taken out-of-service because of the equipage costs, this could have an adverse impact on some rural economies, particularly those reliant on tourism. The CAA considers that the impacts will not be as significant as some stakeholders forecast during the consultations, because operators who choose not to equip their aircraft could still operate in airspace where the equipment is not mandatory, and there will still be opportunities to put mitigation in place for non-transponder equipped glider access to mandatory transponder carriage airspace in defined scenarios.

Specific Impact Tests: Checklist

Use the table below to demonstrate how broadly you have considered the potential impacts of your policy options.

Ensure that the results of any tests that impact on the cost-benefit analysis are contained within the main evidence base; other results may be annexed.

Type of testing undertaken	*Results in Evidence Base?*	*Results annexed?*
Competition Assessment	Yes	No
Small Firms Impact Test	Yes	No
Legal Aid	Yes	No
Sustainable Development	Yes	No
Carbon Assessment	Yes	No
Other Environment	Yes	No
Health Impact Assessment	Yes	No
Race Equality	Yes	No
Disability Equality	Yes	No
Gender Equality	Yes	No
Human Rights	Yes	No
Rural Proofing	Yes	No

Annexes

Not Applicable.