EXPLANATORY MEMORANDUM TO

THE AIR NAVIGATION (AMENDMENT) (No. 2) ORDER 2007

2007 No. 3467

1. This explanatory memorandum has been prepared by the Department for Transport and is laid before Parliament by Command of Her Majesty.

This memorandum contains information for the Joint Committee on Statutory Instruments.

2. Description

2.1 This Order makes a number of changes to the Air Navigation Order 2005 (ANO) [S.I. No. 2005/1970]

2.2 The first change is intended to reduce the regulatory burden in respect of small microlight aircraft. The amendment will mean that small, single seat microlights will no longer require a certificate of airworthiness or permit to fly in order to be operated in the UK. (Article 3)

2.3 With regard to EASA Permits to Fly, the ANO is amended to allow aircraft issued with a Permit to Fly by any EASA National Aviation Authority to fly within the United Kingdom. (Article 4)

2.4 The changes to the provisions of the ANO concerning the National Private Pilots' Licence (NPPL) simplify the current licence revalidation and renewal provisions; allow NPPL holders to carry out instruction on micro-lights and self-launching motor gliders (SLMG); simplify the medical certification requirements; establish a training requirement for pilots seeking to take off or land on water; and allow a small single-engine aircraft, microlight or SLMG class rating to be included in a UK or Joint Aviation Authority licence as well as in a NPPL. (Articles 5 - 10)

2.5 The amendments will also require the flight crew of those non-commercial aircraft fitted with airborne collision avoidance systems, to be provided with suitable training in the use of the equipment. Without such training, the benefits of this safety system are not fully realised. (Article 11)

2.6 A new licence has been created by the International Civil Aviation Organisation that will allow the holder to act as a co-pilot on specified aircraft that require co-pilots. The new licence supplements rather than replaces, pre-existing pilot's licences and changes to the ANO are required in order to implement the new licence. (Article 12)

2.7 Finally, aircraft currently required to carry Secondary Surveillance Radar transponder equipment operating in Mode A and Mode C, will be required to carry equipment capable of operating in the upgraded Mode S. (Article 13)

3. Matters of special interest to the Joint Committee on Statutory Instruments

3.1 None

4. Legislative Background

Airworthiness deregulation of small micro-light aircraft

4.1 The British Microlight Aircraft Association (BMAA), the sporting organisation representing microlight users in the UK, requested a reduction in the burden of regulation in the recreational aviation sector. The aim of this amendment is to reduce the regulatory burden on this segment of the aviation sector. The amended position in respect of small microlight aircraft would mirror the position of non-EASA gliders and balloons operating private flights.

Acceptance of EASA permits to fly

4.2 The UK is obliged to recognise EASA Permits to Fly issued by other EASA National Aviation Authorities. The current amendment removes the existing restriction whereby the UK recognised only those EASA Permits to Fly issued by the CAA.

Changes concerning the National Private Pilots' Licence

4.3 The National Private Pilots' Licence (NPPL) was introduced in 2002 in response to demands for a private pilots' licence that was less demanding to attain and maintain than the Joint Aviation Requirements-Flight Crew Licensing (JAR-FCL) Private Pilots' Licence. In practice the NPPL has proven a popular and worthwhile addition to the range of pilots' licences available in the UK, and will be retained until the introduction of any European Aviation Safety Agency (EASA) Recreational Private Pilots' Licence.

4.4 However, the NPPL introduced an additional set of requirements for grant, renewal and revalidation of the licence and associated ratings and, when combined with the existing UK national and new JAR-FCL arrangements, led to further confusion and inconsistency in an already confused field.

4.5 It was anticipated that experience with the new licence would reveal matters which could be improved and this has proved to be the case. The aim of the present amendments is to address those matters and to propose appropriate improvements to reduce the complexity of the regulatory framework in this area.

Flight crew training in the use of ACAS

4.6 The introduction of the Airborne Collision Avoidance System Phase 2 (ACAS II) equipment requirements for aeroplanes with a maximum take-off weight between 5700 kg and 15000 kg and having a maximum approved passenger seating capacity between 19 and 30 from 1 January 2005, provided an additional safety feature designed to prevent aeroplane collisions. This has affected a small number of aeroplanes (mainly corporate jets) operated largely in the general aviation industry sector within the UK.

4.7 The International Civil Aviation Organisation (ICAO) requires that, the Pilot in Command of an aeroplane equipped with ACAS II ensure that each flight crew member has been appropriately trained to competency in the use of ACAS II equipment and the avoidance of collisions. While the ICAO training requirements for *commercial* air transport have been established within European level agreed Joint Aviation Requirements, there has been no parallel provision in the ANO to reflect ICAO's training requirements for *general aviation* flight crew.

4.8 The CAA Safety Regulation Group 2006/07 Safety Plan identified this disparity and highlighted the need for such training requirements to be specified in the ANO in order that general aviation flight crew undergo appropriate ACAS II performance-based training.

Multi-crew pilots licence

4.9 After the events of 11 September 2001 worldwide airline passenger traffic suffered a serious downturn which ran counter to the general trend of expansion in air travel. This downturn was never expected to be permanent, and the recovery since then has been strong and sustained. This increase in demand has in turn fuelled pilot recruitment by airlines worldwide.

4.10 Past sources of trained pilots have normally been sufficient to meet the demand from airlines, but this is no longer the case. This has driven airlines to examine the normal training and career paths of airline pilots. Industry has concluded that an additional career path is needed to enable the recruitment of pilots directly as co-pilots of a multi-engine turbine-powered air transport aeroplane certificated for a minimum crew of at least two pilots.

4.11 Subsequently ICAO considered the introduction of a new pilot licence, specifically restricted to co-pilot privileges on multi-pilot aircraft, to meet this demand – the Multi-crew Pilot Licence (MPL). The ICAO Council adopted the provisions related to the MPL on 10 March 2006. The MPL has been designed to take advantage of competency-based training (as opposed to the traditional skills, knowledge and experience route), in a multi-crew environment (as opposed to leading towards a single-pilot licence) and modern simulation. The MPL supplements rather than replaces pre-existing pilots' Licences.

4.12 In response to the introduction of the ICAO MPL, the Joint Aviation Authorities (JAA) considered the introduction of the MPL under Joint Aviation Requirements (JARs). After a period of consultation the JAA released Notice of Proposed Amendment for Flight Crew Licensing (NPA-FCL) 31 for consultation. Following the standard JAA NPA procedure, the amendment was adopted as JAR-FCL 1 Amendment 7 on 1 December 2006.

4.13 Changes to the ANO are required in order to implement the ICAO MPL. NPA-FCL 31 also introduces other changes, principally in the flying experience requirements for the issue of certain licences and type ratings.

Carriage of Mode S

4.14 The UK and other European States have experienced significant growth in the levels of air traffic over the last three decades and this growth is forecast to continue in the long term. It is expected that the number of flights per year in UK airspace will further increase by between 50% and 90% by 2025 when compared to 2005. This growth is highly beneficial in terms of economic prosperity, employment, tourism, exports and the social benefits of access to affordable air travel. In 2003 the Government set out a framework in a White Paper on "The Future of Air Transport" that seeks to ensure the forecast growth in air traffic can be accommodated by UK airports and the associated air traffic control system.

4.15 The growth in air traffic is likely to have an impact on all airspace users in the UK, particularly in the amount and structure of airspace outside of controlled airspace. Greater interoperability between all categories of airspace user will be needed to protect freedom of movement and access to airspace. The current Secondary Surveillance Radar (SSR) system used by air traffic control needs to be updated to be able to cope with the increasing number of aircraft using the airspace.

4.16 The CAA has accordingly commenced a phased approach for the introduction of the new Mode S SSR technology, starting with those aircraft currently required to have fitted the older Mode A/C transponders. In due course, the aim will be to increase the number of aircraft fitted with SSR equipment, technology permitting, in order to maximise the improved technical interoperability that the updated equipment allows.

5. Territorial Extent and Application

5.1 This instrument applies to all of the United Kingdom.

6. European Convention on Human Rights

As the instrument is subject to negative resolution procedure and does not amend primary legislation, no statement is required.

7. Policy background

Airworthiness deregulation of small microlight aircraft
(First Impact Assessment below)

7.1 Safety and noise regulation of UK microlight aircraft was introduced in stages in the early 1980's. Since 1988 the number of single seat microlights in the UK has fallen to around 500. Fewer than 140 have a permit to fly. The UK airworthiness requirements are perceived by industry as more rigorous than those applied by the US and other European Regulators. The cost of proving that a new design meets UK requirements is viewed by the British Microlight Aircraft Association as prohibitive for single seat microlights. No new single seat microlight design has been introduced since 1994. Most new aircraft are US or European built.

7.2 Limited deregulation of small microlight aircraft would be consistent with Government policy on the easing of regulatory burdens on individuals and small businesses, would meet the BMAA's aspirations and encourage the use of small microlights, thus having a positive effect on this area of sport aviation in the UK. The requirements for pilot licensing, operational restrictions and noise certification would remain in place. Retaining the pilot licensing requirements would keep accidents caused by pilot error in check and will continue to provide a viable sanction for non-compliance with low flying or controlled airspace rules through suspension of revocation.

7.3 The Department for Transport consulted 41 representative organisations and interested stakeholders. 31 responses were received, the majority of which supported the proposed deregulation measures.

Acceptance of EASA permits to fly

7.4 Common EASA standards have now been established for Permits to Fly and it is therefore appropriate that Permits issued in accordance with EASA standards in other Member States should be recognised in the UK.

Changes concerning the National Private Pilots' licence
(Second [Regulatory]Impact Assessment below)

7.5 The objective of the changes to the NPPL is two-fold: to harmonise aircraft rating revalidation requirements across all NPPL aircraft classes and to enable flying instructor ratings for micro-light aeroplane and Self Launching Motor Gliders to be included in an NPPL. There are a number of other minor changes, which, taken as a whole, are intended to improve the clarity and consistency of the legislation relating to the NPPL and other non-professional pilot licences.

7.6 The changes have come about in the light of experience since the introduction of the NPPL in 2002. As anticipated, areas of improvement have been identified, most notably the revalidation and renewal requirements which differ from the processes that pilots had previously been used to. The proposed changes to the ANO seek to clarify the licence renewal process and will directly affect all 2,500 (approximately) NPPL holders.

7.7 Direct consultation over the proposed changes was carried out with the leading industry groups, including the Aircraft Owners and Pilots Association, the British Business and General Aviation Association, the British Gliding Association, British Microlight Aircraft Association, Guild of Air Pilots and Air Navigators, National Pilots Licence Group and Popular Flying Association. These groups have supported the decision to amend the ANO and have been heavily involved in the detailed drafting of the amendments.

Flight crew training in use of Airborne Collision Avoidance System (ACAS)
(Third [Regulatory] Impact Assessment below)

7.8 The introduction of ACAS Phase 2 (ACAS II) equipment requirements for aeroplanes having a Maximum Take-Off Mass in of between 5700 kg and 15000 kg and having a Maximum Approved Passenger Seating Capacity of between 19 and 30 from 1 January 2005 was intended to provide an additional safety net and prevent aeroplane collisions.

7.9 The introduction of ACAS II equipment requirements heralded a significant reduction in the risk of aeroplane collision and an improvement in the overall safety level of the airspace environment. However, without suitable training, the full potential of the planned improvement in safety resulting from the introduction of ACAS equipment may not be realised.

7.10 Experience gained in the initial implementation of ACAS Phase 1 for large commercial aircraft demonstrated that deficiencies in flight crew training could lead to a reduction of the overall safety benefit. It was found during this period that where crews lacked a comprehensive understanding of ACAS operational principles and the performance expected from a flight crew member the operation of ACAS was less effective than desired. As a result, ICAO established a requirement for ACAS training and has provided guidance in the development of training programmes for flight crew. Whilst these requirements have been adopted and promulgated by the Joint Aviation Authorities (JAA) through Joint Aviation Requirements for commercial air transport operations, there has been no similar requirement placed on the small number of general aviation operators, whose flight crew now operate the ACAS II Phase 2 equipment required by the ANO. It is therefore necessary to limit the degree of operational risk arising from sub-optimal operation of ACAS, due to the lack of specific flight crew training requirements, on (accepted) aeroplanes operated for purposes other than public transport.

7.11 The proposed amendment is likely to affect approximately 30 general aviation operators of aeroplanes equipped with ACAS. However, since some of these operators' flight crews will have undertaken ACAS training as part of the relevant aircraft type-rating syllabus, only a minority of operators will be directly affected. Consultation regarding the proposed changes to the ANO was carried out with directly with all relevant operators of aeroplanes operating for purposes other than public transport and equipped with ACAS. In addition, the CAA made its Letter of Consultation available on its web site. Responses to the CAA's letter of Consultation were supportive of the proposal.

Multi-crew pilots licence
(Fourth Impact Assessment below)

7.12 The ICAO Multi-crew Pilot Licence (MPL) is intended to provide an alternative program for training those intending to operate as co-pilot of a multi-engine turbine-powered air transport aeroplane certificated for a minimum crew of at least two pilots. It is intended that the training for the MPL will be better tailored to the requirements of operating multi-pilot commercial air transport aircraft.

7.13 In the past, traditional sources of trained pilots have normally been sufficient to meet the demand from airlines, but this is no longer the case. This has driven airlines to examine the normal training and career paths of airline pilots, and the conclusion has been that an additional career path is needed to enable the recruitment of pilots directly into co-pilot positions in commercial air transport multi-pilot operations.

7.14 The airline industry also determined that the existing Commercial Pilot Licence and Air Transport Pilot Licence training courses produced graduates whose skills were not optimised for co-pilots engaged in commercial air transport operations on multi-pilot aircraft, and pressed for revisions to the training syllabus to take advantage of modern teaching techniques, materials and equipment. To accommodate this approach, ICAO made provision for considerable flexibility for training providers in the construction of MPL training courses.

7.15 The CAA consulted over one thousand stakeholders, including UK Air Operating Certificate holders and Type-Rating and Flying Training Organisations. Five responses were received. Some disappointment was expressed that the measures were more restrictive than originally hoped, but little additional information was provided from industry about the likely cost impact of the proposal.

Carriage of Mode S
(Fifth Impact Assessment below)

7.16 The growth of air traffic is likely to have an impact on all airspace users in the UK, particularly in the amount and structure of airspace outside of controlled airspace. The CAA considers that greater interoperability between all categories of airspace user will be needed to protect freedom of movement and access to airspace. Moreover, the current Secondary Surveillance Radar (SSR) system used by air traffic control, and as a basis for safety nets, needs to be updated to be able to cope with the increasing number of aircraft using the airspace.

7.17 In March 2005, the CAA commenced a proposed phased approach for the introduction of new SSR technology when it implemented a requirement for the use of SSR Mode Select (Mode S) within the very high density controlled airspace around major UK airports and along the major UK air routes. At the time of the consultation for this first implementation phase, the CAA also stated its intention to propose a further expansion of the use of SSR Mode S in the remaining UK airspace from March 2008. However, coupled with the proposed technology update, the CAA also proposed that the number of aircraft equipped with SSR technology should be maximised to achieve the improved technical interoperability aims and the concomitant safety benefits.

7.18 A public consultation on the proposed expansion of transponder carriage and use of SSR Mode S was launched in June 2006, which resulted in a significant level of concern and opposition to the policy being raised by the sporting and recreational flying community. Consequently, the CAA decided that a more gradual, phased approach to improved technical interoperability will have to be employed to address these concerns, and further consultation will need to be conducted on some elements of the proposed policy.

7.19 In the busiest portions of UK airspace, however, the CAA considers that the existing SSR technology used on aircraft must be updated as the first stage in the incremental process. Many inputs from the 2006 consultation acknowledged this need, particularly within controlled airspace where the level of public transport activity is at its highest.

Consolidation

7.20 This is the fourth amendment to the ANO. Further amendments are planned in the New Year and a consolidation of the ANO anticipated during the summer of 2008.

8. Impact

8.1 Regulatory Impact Assessments in respect of the Airworthiness deregulation of micro-light aircraft, Changes to the National Private Pilots' Licence, Flight crew training in the use of ACAS, Multi-crew pilots licence and the Carriage of Mode S transponders are attached to this memorandum. A Regulatory Impact Assessment in respect of the changes relating to the acceptance of EASA permits to fly was not carried out as it simply allows the CAA to accept Permits to Fly issued by another EASA National Aviation Authority.

8.2 The impact on the public sector is likely to be low. The amendments are primarily aimed at improving safety, in the case of ACAS training and the carriage of Mode S transponders, or for reducing/simplifying the current regulatory regime. Mechanisms for ensuring compliance with and the enforcement of, the various provisions of the ANO already exist and the CAA anticipates no requirement for additional resources.

9. Contact

David Shephard at the Department for Transport Tel: 020 7944 5881 or e-mail: David.Shephard@dft.gsi.gov.uk can answer any queries regarding the instrument.

Summary: Intervention & Options

Department /Agency: Department for Transport	**Title:** Impact Assessment of the airworthiness deregulation of light single seat microlight aeroplanes	
Stage: Post Consultation	**Version: Final**	**Date: 30 November 2007**
Related Publications: Consultation on deregulation of small single-seat microlights		

Available to view or download at:

http://www.dft.gov.uk

Contact for enquiries: Sandra Iles **Telephone:** 020 7944 5894

Annex 1

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

The British Microlight Aircraft Association (BMAA) is the sporting organisation representing microlight users in the UK and has proposed a regulatory simplification measure for the recreational aviation sector. Government intervention is necessary in order to amend the provisions of the Air Navigation Order 2005 in respect of airworthiness.

What are the policy objectives and the intended effects?

The objective is to de-regulate the airworthiness aspects of single seat microlight aeroplanes (not rotorcraft) which have an empty weight without pilot or fuel of 115kgs or less and a maximum wing loading of 10kg/sq.m and which are being used for private (non-remunerated) flying. The intention is to reduce the burden of regulation in the recreational aviation sector.

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

1. Do nothing - continue to regulate all microlights for airworthiness.
2. Airworthiness deregulation of light single seat microlights. This limited deregulation is consistent with Government policies on easing the regulatory burden on individuals and small businesses.

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

The impact of airworthiness deregulation will be reviewed in five years' time in conjunction with the BMAA, CAA and Air Accidents Investigation Branch (AAIB).

Ministerial Sign-off For consultation 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:

Jim Fitzpatrick..Date: 5th December 2007

Summary: Analysis & Evidence

Policy Option: 1	Description: Do nothing - continue to regulate all microlights for airworthiness

COSTS			
ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups' Nil	
One-off (Transition)	**Yrs**		
£0	0		
Average Annual Cost (excluding one-off)			
£ 0		**Total Cost** (PV)	**£ 0**
Other **key non-monetised costs** by 'main affected groups' Nil			

BENEFITS			
ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups' Nil	
One-off	**Yrs**		
£ 0	0		
Average Annual Benefit (excluding one-off)			
£ 0		**Total Benefit** (PV)	**£ 0**
Other **key non-monetised benefits** by 'main affected groups' Nil			

Key Assumptions/Sensitivities/Risks The do-nothing option is the base case against which all options are assessed against, over the appropriate appraisal period. By definition there are no *additional* costs or benefits associated with it. However, the profile of costs and benefits within the base case are likely to change over time relative to the "current year". If no action is taken, we can expect the burden of regulation to remain and possibly lead to fewer numbers of microlight users. This will have both costs and benefits relative to the current year.

Price Base Year 2006	Time Period Years 0	**Net Benefit Range** (NPV) **£ Nil**	**NET BENEFIT** (NPV Best estimate) **£ Nil**

What is the geographic coverage of the policy/option?	United Kingdom			
On what date will the policy be implemented?	Current			
Which organisation(s) will enforce the policy?	CAA			
What is the total annual cost of enforcement for these organisations?	£ 0			
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?	£ N/A			
What is the value of changes in greenhouse gas emissions?	£ N/A			
Will the proposal have a significant impact on competition?	No			
Annual cost (£-£) per organisation (excluding one-off)	Micro **0**	Small **0**	Medium **0**	Large **0**
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices)			(Increase - Decrease)
Increase of £ 0	Decrease of £ 0	**Net Impact**	£ 0

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

Summary: Analysis & Evidence

Policy Option: 2	Description: Airworthiness deregulation of light single seat microlights

COSTS

ANNUAL COSTS		Description and scale of **key monetised costs** by 'main affected groups'
One-off (Transition)	**Yrs**	
£		
Average Annual Cost (excluding one-off)		
£		**Total Cost** (PV) **£ Nil**

Other **key non-monetised costs** by 'main affected groups' There are likely to be non-monetised costs in terms of possible increase in fatalities and environmental impacts from additional air noise, air quality and climate change impacts. However, the environmental impacts are likely to be minimal given the small scale of microlight users.

BENEFITS

ANNUAL BENEFITS		Description and scale of **key monetised benefits** by 'main affected groups'
One-off	**Yrs**	
£		
Average Annual Benefit (excluding one-off)		
£		**Total Benefit** (PV) **£ Nil**

Other **key non-monetised benefits** by 'main affected groups' The main non-monetised benefits of deregulation would be to stimulate the introduction of new designs in the UK microlight industry leading to growth in use of single seat microlights. Part of this growth would be a transfer from other sectors (e.g. two seater microlights). However, it is also likely that additional usage would come from fresh demand for microlights. It is likely that de-regulation would encourage new machines to appear and it is estimated that the overall number of single seat microlights in this class in the UK could increase to approximately 1400. The increase in usage would convey a benefit not just to the users but also designers and manufacturers of such aircraft, in Europe and the US, who may see increased demand for their products.

Key Assumptions/Sensitivities/Risks We have used Canada as a 'control group' for a deregulated environment. This seemed reasonable as there are no reasons to believe that in terms of income and technological progress the UK is any different from Canada. Statistical values of life are as published in Statistical Value of Life presented in the Highways Economics Note No.1 "2005 Value of the Benefits of Prevention of Road Accidents and Casualties" - January 2007 Department for Transport.

Price Base Year 2006	Time Period Years	**Net Benefit Range** (NPV) **£ Nil**	**NET BENEFIT** (NPV Best estimate) **£ Nil**

What is the geographic coverage of the policy/option?	United Kingdom
On what date will the policy be implemented?	January 2008
Which organisation(s) will enforce the policy?	CAA
What is the total annual cost of enforcement for these organisations?	£ 0
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?	£ N/A
What is the value of changes in greenhouse gas emissions?	£ N/A

Will the proposal have a significant impact on competition?			No	
Annual cost (£-£) per organisation (excluding one-off)	Micro **0**	Small **0**	Medium **0**	Large **0**
Are any of these organisations exempt?	No	No	N/A	N/A

Impact on Admin Burdens Baseline (2005 Prices)		(Increase - Decrease)
Increase of £ 0	Decrease of £ 0	**Net Impact** **£** 0

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. Options Analysis

OPTION 1

DESCRIPTION

Do nothing. This will leave all microlights regulated for airworthiness.

COSTS

monetised

Nil

Non monetised

Nil

BENEFITS

monetised

Nil

Non monetised

Nil

NET IMPACT

Nil

KEY ASSUMPTIONS

The do-nothing option is the base case against which all options are assessed against, over the appropriate appraisal period. By definition there are no *additional* costs or benefits associated with it. However, the profile of costs and benefits within the base case are likely to change over time relative to the "current year". If no action is taken, we can expect the burden of regulation to remain. This will have both costs and benefits relative to the current year. These are discussed below:

Costs

The main impact of keeping the existing regime might be two fold:

- The existing regulatory regime might continue the decline in the number of single seat microlight users. In other words, it would continue to suppress demand in the microlight industry. This might be a social cost in so far as it prevents individuals from taking part in welfare enhancing activities i.e. microlight related sporting activities. It might also lead individuals to take up other less attractive activities than would have been the case if this class of aircraft were exempted from compliance with airworthiness requirements.
- The other impact might be that if new designs came on stream, we may see further costs to individuals due to the regulatory burden. The BMAA has referred to an estimated cost of between £50,000 and £100,000 to prove that a new design meets the UK airworthiness requirements, depending on the airworthiness route taken and type of aircraft. There have been no new designs since 1994; the costs over time therefore might be minimal.

Benefits

The main benefits of keeping the current regulatory regime from the current year are two fold:

- The regime would continue to act as an incentive for manufacturers to produce new designs with a high level specification for the UK market.
- Where the regulatory regime is successful in pushing up higher standards, it would also continue to lead to fewer fatalities.

SENSITIVITIES

Nil

RISKS

Nil

OPTION 2

DESCRIPTION

The airworthiness deregulation of light single seat microlights.

COSTS

Monetised

Nil

Non Monetised

Option 2 would generate non-monetised costs in terms of potential fatalities and potentially higher noise, air quality emissions and carbon dioxide emissions.

Fatalities

The main economic cost of deregulation is a potential increase in fatalities. Our estimation of monetary costs has followed four stages:

(i) Estimate the number of microlights likely to operate within a deregulated environment - CAA estimates suggest the amount of microlights is expected to increase from 500 to 1400 per year.

(ii) Estimate the number of fatalities that may occur under deregulation. Canada has a deregulated environment and we have used it as our 'control group' to provide some indication of the fatality rates that may occur in the UK without airworthiness regulation. On average over the period from 1999 to 2003 there were 15 deaths per year and there are 4000 microlights users. Thus the fatal accident rate per ultralight registered in Canada is 0.375%. Transferring this percentage to the UK under deregulation, we might therefore expect 5.25 deaths every year associated with single seat microlights.

(iii) Estimate the number of fatalities that may be attributed to the element being deregulated in the UK - relying on Canada as a 'control group', the analysis shows that of the 0.375% ultralight user deaths, 8% of those deaths were attributed to airframe-related incidents. The UK regulatory regime deals with airframe design issues, and therefore deaths are prevented from occurring. With deregulation, we might therefore expect that 8% of the 5.25 annual deaths would be due to airframe related problems that would have been prevented had the regime remained in place. This would roughly equate to 0.42 deaths per year.

(iv) Estimate the value of life lost over different periods of time - we have estimated the monetary cost of life lost over a 10 year appraisal period based on the Department's statistical value of life, adjusted for GDP growth rate and discounted it to 2006 prices. The analysis is shown in **Table 1** below. This suggests that the monetised costs would be around £5.85m over a 10 year period. We have used the Statistical Value of Life presented in the Highways Economics Note No.1 "2005 Value of the Benefits of Prevention of Road Accidents and Casualties" - January 2007 Department for Transport. This gives a value of life based on road users' incomes and earnings. It is possible that microlight users may be more affluent individuals and therefore may have a higher value of statistical life.

Table 1: Cost of Deregulation - 10 Year Assessment (2006 prices)

Year	Assumed Annual Fatality	Assumed Statistical Value of Life	Undiscounted Costs of Fatality	Discounted Costs of Fatality
2008	0.42	1,588,693	667,251	622,886
2009	0.42	1,623,644	681,931	615,062
2010	0.42	1,659,364	696,933	607,337
2011	0.42	1,695,870	712,266	599,708
2012	0.42	1,728,770	726,084	590,669
2013	0.42	1,762,308	740,170	581,767
2014	0.42	1,796,497	754,529	572,998
2015	0.42	1,831,349	769,167	564,361
2016	0.42	1,866,877	784,089	555,855
2017	0.42	1,903,095	799,300	547,477
Total			7,331,717	5,858,121

However, due to the speculative nature of these calculations, especially given that we have used Canada as our control group, rather than direct UK modelling, we have not included these in our "monetised" calculations.

Environmental Impacts

We have identified the following non-monetised costs from deregulation:

- Air noise: Under the new regime air noise regulation will still remain for each microlight. There however may be a cost in terms of a cumulative effect on noise pollution. This negative externality will be contained to those areas in which microlight use is prevalent.
- Air quality: Local air quality may be reduced as a consequence of the increase in microlight users. This negative externality will be contained to those areas in which microlight use is prevalent
- Climate change: With the increase in microlights registered, estimated to increase from 500 to 1400, there will be an associated social cost, as more climate-changing emissions are released into the environment.

BENEFITS

The main benefits of deregulation are the monetised benefits in terms of reduced burden of regulation and the non-monetised benefits in terms of incentivising manufacturers to produce new designs with a high level specification for the UK market.

Monetised
Nil

Non Monetised

The main non-monetised benefits of deregulation would be to stimulate the introduction of new designs in the UK microlight industry leading to growth in use of single seat microlights. Part of this growth would be a transfer from other sectors (e.g. two seater microlights). However, it is also likely that additional usage would come from fresh demand for microlights. It is likely that de-regulation would encourage new aircraft to appear and it is estimated that the overall figure could increase to approximately 1400. This was the number seen in the UK in the 1980s just before regulation introduced in 1984/85 caused a reduction in the numbers of single seat aircraft in favour of 2 seaters.

The increase in usage would convey a benefit not just to the users but also designers and manufacturers of such aircraft, in Europe and the US, who may see increased demand for their products.

NET IMPACT

The monetised impact on microlight usage induced by deregulation is likely to be zero. However, we have also identified non-monetised costs and benefits.

KEY ASSUMPTIONS

N/A

SENSITIVITIES

N/A

RISKS

The main risk in taking forward this option is the uncertainty surrounding the non-monetised costs and benefits. The case for Option 2 relies heavily on comparing two unknowns.

2. Implementation

Option 1 would require no implementation.

Option 2 is to be implemented by way of a Statutory Instrument amending Part 8 of the Air Navigation Order 2005 [S.I. 2005 No. 1970].

3. Enforcement

No compliance showing will be required for de-regulated aeroplanes. The CAA will continue to enforce sanctions for all other aspects of these aircraft where regulation stays in place - Registration, Pilot Licensing, Operating Standards, and Noise.

4. Competition Assessment

There are four key competition filters set out in the OFT Competition Assessment Guidance (August 2007):

- Directly limit the number or range of suppliers?
- Indirectly limit the number or range of suppliers?
- Limit the ability of suppliers to compete?
- Reduce suppliers' incentives to compete vigorously?

We have assessed the questions and concluded that compared to the base case of 'do nothing' this deregulation will not directly or indirectly limit the number or range of suppliers. Nor will it limit the ability of suppliers to compete or reduce their incentives to compete vigorously. Designers and manufacturers of light single seat microlight aeroplanes, in Europe and the US, could see increased demand for their products.

5. Small Firms Impact Test

Consultation feedback on the expected impact of airworthiness deregulation on small firms was positive with likely beneficial effects being identified.

6. Race Equality

The deregulation will not have any race equality impacts.

7. Disability Equality

The deregulation will not have any disability equality impacts.

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	No	No
Sustainable Development	No	No
Carbon Assessment	No	No
Other Environment	Yes	No
Health Impact Assessment	No	No
Race Equality	No	No
Disability Equality	No	No
Gender Equality	No	No
Human Rights	No	No
Rural Proofing	No	No

Annexes

Government response to the consultation on limited deregulation of single-seat microlights -
http://www.dft.gov.uk/consultations/closed/limitedderegulationmicrolights/

FINAL REGULATORY IMPACT ASSESSMENT

Regulatory Impact Assessment of Changes Introduced to the Air Navigation Order 2005 to Rationalise Aircraft Class and Instructor Ratings for the National Private Pilots' Licence and others.

Foreword

The National Private Pilots' Licence was introduced in 2002 in response to Community demand for a private pilots' licence that was less demanding to attain and maintain than the JAR-FCL PPL. The National Private Pilots' Licence (NPPL) introduced an additional set of requirements for grant, renewal and revalidation of the licence and associated ratings, and, when combined with the existing UK national and new JAR-FCL arrangements, led to further confusion and inconsistency in an already confused field.

In practice the NPPL has proven a popular and worthwhile addition to the range of pilots' licences available in the UK, and will be retained until the introduction of any European Aviation Safety Agency (EASA) Recreational Private Pilots' Licence.

It was anticipated that experience with the new licence would reveal matters which could be improved and this has proved to be the case. The aim of the amendments now proposed is to address those matters and to propose appropriate improvements.

First, the revalidation and renewal requirements, particularly in respect of the "rolling revalidation" introduced by the CAA, have caused confusion. It is a different approach to revalidation than pilots are generally used to, and as a result there has been some concern that some pilots might find themselves inadvertently flying in breach of their licence conditions.

Secondly, CAA decided that initially there would be no provision for instructor ratings for microlight aircraft and self-launching motor gliders (SLMG). In light of experience it has since been decided that NPPL holders should be permitted to carry out instruction on these classes of aircraft. This has been achieved by the issue of general exemptions to allow existing instructors privileges in respect of these aircraft classes, but this is not an acceptable long term solution.

Clearly these issues need to be addressed, and the General Aviation community has been pressing for action to ameliorate these shortcomings. The Civil Aviation Authority and interested parties have been considering changes to the Air Navigation Order 2005 through the NPPL Policy and Steering Committee, and after lengthy discussions agreement has been reached as to the changes which should be made to the Air Navigation Order 2005 have been drafted.

This Regulatory Impact Assessment (RIA) has been formulated to assess the potential effects of those changes to the Air Navigation Order 2005.

Contents

Explanatory Notes

Note 1 Where gender specific words are used, they should be read to include the opposite gender.

Section 1 – RIA 01-06 – NPPL ANO Amendments.

0 Responsible Department and Officer.

0.1 Personnel Licensing Department.

0.2 Stephen Williams.
Flight Crew Licensing Policy Co-ordination.

Section 2 – Purpose and Intended Effect.

1 Objective.

1.1 The objective of this amendment to the Air Navigation Order 2005 National Private Pilots' Licence (NPPL) provisions is:

a) to harmonise aircraft rating revalidation requirements across all NPPL aircraft classes; and

b) to enable Flying Instructor ratings for microlight aeroplane and Self Launching Motor Gliders (SLMG) to be included in an NPPL.

There are a number of other minor changes, which taken as a whole, are intended to improve the clarity and consistency of the legislation relating to the NPPL and other non professional pilot licences.

2 Background.

2.1 The Joint Aviation Requirements for Flight Crew Licensing (JAR-FCL) Private Pilots' Licence (PPL) was introduced on 01 July 1999, following the signing of the 1990 Cyprus Arrangements that bound the United Kingdom to comply with Joint Aviation Authority regulation. The JAR-FCL PPL(A) was more onerous and placed greater training, testing, renewal and revalidation requirements on licence holders than the UK Private Pilots' Licence. This discouraged a number of private pilots in the United Kingdom, and private pilots' licence issues declined after the introduction of the JAR-FCL PPL.

2.2 In addition, the JAR-FCL PPL(A) was issued for 5 years as opposed to the lifetime validity of the UK PPL(A).

2.3 To encourage sport and recreational flying following the introduction of Joint Aviation Regulations, the United Kingdom introduced the National Private Pilots' Licence in July 2002. The NPPL is a sub-ICAO pilot licence that is not compliant with Joint Aviation Requirements; consequently it only confers privileges within United Kingdom airspace, to aircraft of certain classes that are of a mass restricted to 2000 kg and below.

2.4 Provision was made for the NPPL in the Air Navigation Order alongside the existing UK PPL and the JAR-FCL PPL. Experience of the law as initially drafted has revealed a number of anomalies that inconvenience NPPL holders markedly.

3 Rationale for Government Intervention.

3.1 The regulatory approach adopted for revalidation of the NPPL has proved unsatisfactory. Pilots used to the more usual revalidation requirements have found the new approach confusing.

3.2 When the NPPL was introduced, it was initially decided not to include instructor ratings. It has now been decided in light of experience that such ratings should be permitted for Microlight aeroplanes and Self Launching Motor Gliders (SLMG).

3.3 Finally, harmonisation of revalidation requirements between the NPPL and other non professional pilot licences will simplify and markedly reduce the administrative workload on the CAA, AOPA, BGA, BMAA and PFA.

Section 3 – Consultation.

1 Within Government and CAA.

1.1 The amendments that are the subject of this impact assessment are the result of extensive work by a number of departments of the CAA. There has already been an extended period of consultation within these departments concerning the drafting of the necessary amendments to the Air Navigation Order 2005.

2 Public Consultation.

2.1 Direct consultation was undertaken with the leading industry groups. These groups were foremost in influencing the decision to amend the Air Navigation Order in order to resolve these issues, and they have also been heavily involved in the detailed drafting of the amendments.

2.2 Groups involved in the consultation process include:

a) Aircraft Owners and Pilots Association (AOPA)

b) British Business & General Aviation Association (BBGA)

c) British Gliding Association (BGA)

d) British Microlight Aircraft Association (BMAA)

e) Guild of Air Pilots and Air Navigators (GAPAN)

f) National Pilots Licence Group (NPLG)

g) Popular Flying Association (PFA)

2.3 This Regulatory Impact Assessment is part of public consultation.

Section 4 – Options.

1 Option 0 – Retain Current Arrangements.

1.1 The first option is to leave the Air Navigation Order 2005 as it currently is, and to continue the use of exemptions or permissions to achieve the provision of ratings and revalidations. However, the existing arrangements have led to confusion in some cases, and this would remain if existing regulation remains unchanged. This is contrary to the general policy aim to reduce the number and type of permissions and exemptions in force.

2 *Option 1 – Amend the Air Navigation Order 2005.*

2.1 All of the outstanding issues can be resolved by amending the Air Navigation Order 2005 in accordance with Annex 1 to this document.

2.2 There are manpower and resource costs to the CAA, and to a lesser extent to industry bodies, and these are detailed in the next section.

3 *Option 2 – Other means of Regulation.*

3.1 As there is unlikely to be any other option that would achieve the desired improvements to the provisions in the current Air Navigation Order, whilst not imposing unnecessary change on industry, it should be considered that other forms of regulation present less favourable alternatives than Options 0 or Option 1 above.

3.2 Furthermore, the CAA and industry have already undertaken considerable work towards the formulation of an acceptable draft amendment that satisfies the requirements of both.

Section 5 – Costs and Benefits.

1 *Sectors and Groups Affected.*

1.1 The changes proposed affect the light general aviation sector of civil aviation and its regulators.

1.2 The changes proposed firstly affect those holding National Private Pilots Licences, particularly those with SLMG and Microlight ratings, and those wishing to add Flight Instructor ratings. The changes to revalidation of licences also affects National Private Pilots Licences holders generally, of which there are approximately 2,500. When the amendments proposed are implemented, NPPL Flying Examiners and Instructors will need to be notified. This will ensure that they are aware of the changes to revalidation requirements so that they can consequently ensure that those examined and instructed are also aware of changes to revalidation of their licences and ratings.

1.3 The representative bodies for the light general aviation sector will also be affected. Currently the CAA, NPLG, BGA and BMAA all have some responsibility in this sector; all will affected to greater or lesser extent as a result of the proposed changes. The CAA is responsible for sponsoring the amendments to the Air Navigation Order, and ensuring that they are introduced. A significant burden of work has already been borne by the NPPL Policy and Steering Committee.

2 *Costs.*

2.1 The most widespread and most obviously quantifiable cost is the cost to individuals resulting from the changes to revalidation requirements. It is impossible to make direct comparison between ‘rolling validity’ requirements and the revised proposals which have a fixed validity period. This is because individual patterns of flying may vary greatly; nevertheless the revised requirement of 12 hours in 24 months is broadly similar both to the current SSEA 'rolling validity' requirements and 5 hours in 13 months requirement for SLMG and Microlights, if considered within the same period. The only additional cost likely to be significant will be to those who will henceforth be required to receive 1 hour of flight instruction in each 24 month period if they wish to maintain passenger carrying privileges. This is unlikely to exceed £50-£100 over a period of 24 months.

2.2 The CAA and representative bodies have faced additional costs for the majority of work undertaken on the proposed amendments to date, and these costs have already been absorbed within the regulators existing budgets. There remains further work to be undertaken and costs will be incurred as a result, but these will also be absorbed within regulators existing budget.

3 Benefits.

3.1 Perhaps the most obvious benefit in the proposed changes is the removal of confusion relating to NPPL revalidation requirements. This amendment will reduce the chances of NPPL holders inadvertently flying in breach of the Air Navigation Order.

3.2 Of particular benefit will be the proposed introduction of consolidated revalidation requirements for those pilots holding more than one type of NPPL aircraft Class Rating. Significant cost reductions will result from the proposal to accept hours flown in aircraft of any class for which a rating is held towards the revalidation of all ratings held.

3.3 The proposed changes also ensure that provision is made, within the Air Navigation Order for the first time, Microlight and Self Launching Motor Glider Flight Instructor ratings for NPPL holders. Though provision has been made for flight instruction in NPPL aircraft classes through the use of exemptions from the Air Navigation Order, the use of such exemptions is not a long term alternative to an amendment to legislation. There is an additional benefit in the reduction in administrative workload in managing such exemptions.

Section 6 – Small Firms Impact Test.

1.0 There is a fundamental difficulty in assessing the number of small firms that exist within the sector, in that a number of individuals who offer flight instruction may do so either as an individual or as a small business operating as a flying club or a similar organisation. Those offering flight instruction may benefit from the slight increase in business resulting from the requirement for a flight of at least one hour of flight instruction as part of the harmonised revalidation requirements introduced by the proposed changes.

1.1 There is also a small impact on the representative bodies which may also be considered small firms. They have been actively involved in the consultation and drafting process for the proposed amendments, are aware of the implications and have raised no objection to the final agreed draft on the grounds of effect on small businesses. It is anticipated that these organisations will continue to contribute to the consultation and drafting process, and will make any objections known through this process.

1.2 There are a number of other organisations that are involved in the sector besides those with some regulatory responsibility. These have the opportunity to be involved directly with the consultation and amendment process, or through NPPL Policy and Steering Committee. Organisations involved in the consultation and amendment process include:

a) Aircraft Owners and Pilots Association (AOPA)

b) British Business & General Aviation Association (BBGA)

c) British Gliding Association (BGA)

d) British Microlight Aircraft Association (BMAA)

e) Guild of Air Pilots and Air Navigators (GAPAN)

f) National Pilots Licence Group (NPLG)

g) Popular Flying Association (PFA)

1.3 The impact of the proposed changes on small firms is considered acceptable, given that significant benefit accrues to those affected, no individual or organisation is specifically adversely affected, and that those affected by the proposed changes have been represented during the amendment process.

Section 7 – Competition Assessment.

1.0 Initial consideration of the effects of the proposed amendments does not yield any obvious adverse effect on the businesses in the sector. The proposed amendments bring net benefits to the sector, and those operating within the sector are uniformly affected. There are no dominant providers within the sector who might unfairly benefit from the proposals.

1.1 As in other areas considered, those potentially affected by the proposals have been able to contribute to the amendment process. This has provided the opportunity for any concerns about competition to be addressed during the process.

1.2 It is not anticipated that there will be any adverse market or anti-competitive effect of these proposals.

Section 8 – Enforcement, Sanctions and Monitoring.

1.0 The existing infrastructure for the monitoring, enforcement and imposition of sanctions for existing Air Navigation Order legislation is well established. The existing process has already highlighted the increase in cases of inadvertent flying in breach of the Air Navigation Order, resulting from the confusion over the present NPPL revalidation arrangements. The proposed amendments are intended to remove this confusion, and thereby lead to a reduction in such cases.

1.1 The existing arrangements for the oversight of Flying Instructors and facilities will suffice. There is always a period of adjustment following the introduction of amendments to legislation, but this should be accommodated within existing capacity.

1.2 It is anticipated that no additional resources will be required for enforcement, sanctions and monitoring.

Section 9 – Implementation and Delivery Plan.

1.0 The amendments to the Air Navigation Order 2005 that are the subject of this assessment have been in draft for some time. The final draft of the amendments has been agreed following acceptance by CAA Personnel Licensing and Legal Departments and industry bodies in September 2006.

1.1 It is anticipated that the proposed amendments will be submitted to the Department for Transport for review in the second quarter of 2007. Subject to the approval of the Department of Transport enactment will follow according to the normal process.

1.2 Once enacted, there are a number of means of promulgating information about changes to regulation. The CAA can promulgate information by means of Training Com, Aeronautical Information Circular (AIC), General Aviation Safety Information Leaflets (GASIL) and others.

Section 10 – Post-Implementation Review.

1.0 The NPPL Policy and Steering Committee will continue its work after enactment of the proposed amendments. Having played the leading role in the process to date, the NPPL Policy and Steering Committee is ideally placed to report on the effects of the proposals post implementation, and arrangements should be made for the Committee to conduct a formal post-implementation review.

Section 11 – Summary and Recommendation.

1.0 It is recommended that the proposed amendments to the Air Navigation Order 2005 are implemented, and that the agreed amendments be forwarded to the Secretary of State for Transport for enactment.

Summary Costs and Benefits Table.

Option	Total Benefit (per annum): - Economic, Environmental, Social.	Total Cost (per annum): - Economic, Environmental, Social. - Policy, Administrative
0	Nil	Nil
1	Greater consistency of revalidation requirements across light GA aircraft classes Provision of instructor ratings for Microlights and SLMGs. Reduction in Exemptions administration for Microlight and SLMG instructors.	Additional potential cost to each NPPL holder that flies minimum hours per year between £50-£100 per 24 months
2	Nil	Continued reliance on exemptions with associated management costs

REGULATORY IMPACT ASSESSMENT FOR THE AMENDMENT OF THE AIR NAVIGATION ORDER 2005 TO INTRODUCE A NEW ARTICLE 61A

Prepared on behalf of:

Group Director Safety Regulation, Civil Aviation Authority

1 Title of Proposal

1.1 Regulatory Impact Assessment (RIA) for the amendment of the Air Navigation Order 2005 (ANO) to insert a new Article 61A.

2 Purpose and Intended Effect

2.1 Objective

2.1.1 To amend the ANO to insert a new Article 61A for the purpose of requiring suitable flight crew training in the operation of Airborne Collision Avoidance System (ACAS) II when operating on aeroplanes so equipped for purposes other than public transport.

2.2 Background

2.2.1 The introduction of ACAS II Phase 2 equipment requirements for aeroplanes having a Maximum Take-Off Mass (MTOM) in excess of 5700 kg and not exceeding 15000 kg and having a Maximum Approved Passenger Seating Capacity (MAPSC) of more than 19 but not exceeding 30 from 1 January 2005 provided an additional safety net in the prevention of aeroplane collisions. This has impacted on a small number of aeroplanes (mainly corporate jets) operated largely in the general aviation industry sector within the UK.

2.2.2 ICAO Annex 6 Part II (International General Aviation - Aeroplanes) requires that "The Pilot in Command of an aeroplane equipped with an airborne collision avoidance system (ACAS II) shall ensure that each flight crew member has been appropriately trained to competency in the use of ACAS II equipment and the avoidance of collisions". Whereas the training requirements specified in ICAO Annex 6 Part I for commercial air transport form part of JAR-OPS Part 1 provisions, there has been no parallel provision in the ANO to reflect the training requirements specified in ICAO Annex 6 Part II for general aviation flight crew.

2.2.3 Whilst implementation of ACAS equipage has been achieved, the operation of the equipment is not therefore subject to any training requirements such as those specified in JAR-OPS 1 and applicable to commercial air transport operations. The CAA Safety Regulation Group 2006/07 Safety Plan identified this disparity and highlighted the need for such training requirements to be specified in the ANO in order that general aviation flight crew undergo appropriate ACAS performance-based training.

2.3 Rationale for Government Intervention

2.3.1 The introduction of ACAS II Phase 2 equipment requirements heralded a significant reduction in the risk of aeroplane collision and an improvement in the overall safety level of the airspace environment. However, without suitable training, the full potential of the planned improvement in safety resulting from the introduction of ACAS equipment may not be realised.

2.3.2 Experience gained in the initial implementation of ACAS Phase 1 demonstrated that deficiencies in flight crew training could lead to a reduction of the overall safety benefit. It was found during this period that, where crews lacked a comprehensive understanding of ACAS operational principles and the performance expected from a flight crewmember, the operation of ACAS was less effective than desired. As a result, ICAO established a requirement for ACAS training and has provided guidance in the development of training programmes for flight crew. Whilst these requirements have been adopted and promulgated by the Joint Aviation Authorities (JAA) through JAR-OPS 1 for commercial air transport operations, there has been no similar requirement placed on the small number of general aviation operators, whose flight crew now operate the ACAS II Phase 2 equipment required by the ANO. It is therefore necessary to limit the degree of operational risk arising from sub-optimal operation of ACAS, due to the lack of specific flight crew training requirements, on aeroplanes operated for purposes other than public transport.

3 Consultation

3.1 Within Government

3.1.1 The Department for Transport was consulted.

3.2 Public Consultation

3.2.1 All relevant operators of aeroplanes operating for purposes other than public transport and equipped with ACAS were specifically consulted in the Letter of Consultation. The Letter of Consultation and RIA were also made available to all aeroplane operators on the CAA Safety Regulation Group (SRG) website.

4 Options

4.1 Two options were considered.

Option 1. One option would have been to do nothing. This would have the potential of exposing industry to a continuing higher than necessary level of risk. The full potential of the ACAS equipment may not be realised since crews will lack a comprehensive understanding of the operating principles and the performance expected from a flight crewmember. In addition, the CAA would be required to file a difference against an ICAO Standard.

Option 2. Amend the ANO 2005 to incorporate a requirement for flight crew to receive training in the operational use of ACAS equipment. As a result, the full potential of the planned improvement in safety level from ACAS equipage may be realised. In addition, the UK will be fully compliant with the ICAO Standard.

The CAA believed that Option 2 provided the only solution to ensure the safety benefit provided by ACAS.

5 Costs and Benefits

5.1 Sectors and Groups Affected

5.1.1 The proposed amendment to the ANO could affect approximately 30 general aviation operators of aeroplanes equipped with ACAS. However, since some of these operators' flight crew will have undertaken ACAS training as part of the relevant type-rating syllabus, only a minority of operators will be affected. The proposed amendment to the ANO would have no effect on voluntary organisations and charities and would not have any race equality impacts.

5.2 Benefits

Option 1. There may have been a small financial benefit by not implementing the proposal. However, there was no safety benefit gained by this option. The full potential of the ACAS equipment would not be realised since crews could lack a comprehensive understanding of the operating principles and the performance expected from a flight crewmember. In addition, the CAA would be required to file a difference against an ICAO Standard.

Option 2. The intended level of safety benefit planned for by ACAS equipage will be available through the requirement for universal and effective training. Operators will ensure effective use is made of their investment in ACAS equipment and thus provide enhanced operational safety. Additionally, the UK will be fully compliant with the ICAO Standard.

5.3 Costs

5.3.1 Compliance Costs

5.3.1.1 As identified above, about 30 general aviation operators, mainly in the corporate sectors of the industry, who operate aircraft equipped with ACAS could be affected. Some of these operators' flight crew will have undertaken ACAS training as part of the relevant type-rating syllabus. For the remainder, the training requirements could be met by undertaking a short course provided by an approved training organisation. As a result, the compliance costs are estimated to be minimal. Since the training could be achieved in-house (when the cost would be negligible) as well as on a course offered by a training organisation (where a cost would be applied), an estimate is not possible. (See paragraph 5.3.2 below.)

5.3.2 Costs for a Typical Business

5.3.2.1 Operators who were likely to be affected by this proposal were invited to submit estimates to the CAA contact listed in paragraph 10 below. Of the four responses received, none made any reference to costs.

6 Small Firms Impact Test

6.1 Small firms that might be affected by this proposal were specifically targeted by the Letter of Consultation. As the general aviation/corporate sectors of the industry, by their nature, would probably come under the classification of small firms, the proposal was thoroughly discussed with these sectors and various means of complying with the proposal were investigated.

7 Competition Assessment

7.1 Many training establishments will have the ability to conduct ACAS training and therefore there are no competition issues to record. Operators will have the opportunity to “shop around” if costs are an issue but it is more likely that the existing arrangements for meeting training requirements will be preserved.

8 Enforcement, Sanctions and Monitoring

8.1 The mechanism for enforcement through the ANO already exists, and no additional resources will be required in this regard.

9 Implementation and Delivery Plan

9.1 The training requirements have been specified in ICAO Annex 6 Part II for general aviation flight crew. This proposed amendment is to align the ANO to reflect that training requirement. Publicising of the requirement will be undertaken through briefing and periodic publications to ensure that provisions are in place once the ANO amendment is published.

10 Post-implementation Review

10.1 The CAA, as part of its continuing oversight of aircraft operations, will assess the effectiveness of the policy. Should further regulation be required the CAA will consult further on proposals that would modify or supersede the requirements proposed in this RIA.

11 Summary and Recommendation

11.1 The CAA believes that Option 2 would provide the intended level of safety benefit planned for by ACAS equipage through the requirement for universal and effective training. Operators will ensure effective use is made of their investment in ACAS equipment and thus provide enhanced operational safety. The CAA will continue to be aligned with ICAO Standards.

11.2 Option 1 was rejected because there was no safety benefit gained by this option. The full potential of the ACAS equipment might not be realised since crews could lack a comprehensive understanding of the operating principles and the performance expected from a flight crewmember. In addition, the CAA would be required to file a difference against an ICAO Standard.

11.3 Summary Costs and Benefits Table

Option	Total benefit per annum: economic, environmental, social	Total cost per annum: - economic, environmental, social - policy and administrative
1	No benefit	No cost
2	Operators will ensure effective use is made of their investment in ACAS equipment and thus provide the enhanced operational safety. The requirement will ensure that pilots receive the appropriate level of training in the use of the equipment.	Some of the operators will have undertaken ACAS training as part of the relevant type-rating syllabus. For the remainder, the training requirements could be met by undertaking a short course provided by an approved training organisation. As a result, the compliance costs are estimated to be minimal. Since the training could be achieved in-house (when the cost would be negligible) as well as on a course offered by a training organisation (where a cost would be applied). There would be a small administrative cost in managing the requirement but there should be no environmental or social impact.

11.4 The CAA is minded to recommend to the Secretary of State for Transport that the ANO be amended to incorporate a new Article 61A as detailed in the Attachment.

12 Contact Point

Mr C Finnigan
Flight Operations Policy (General Aviation) Section
Safety Regulation Group
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex RH6 0YR

Telephone:01293 573529

E-mail: **chris.finnigan@caa.co.uk**

Attachment

DETAILED PROPOSAL TO AMEND THE AIR NAVIGATION ORDER

Add new Article 61A as follows:

"Training in use of airborne collision avoidance system

61A (1). This article applies to an aeroplane to which article 38 does not apply.

(2) In this article an ACAS equipped flight means a flight on which an airborne collision avoidance system is required by article 20 and Schedule 5 to be carried.

(3) Before commencing an ACAS equipped flight in an aeroplane to which this article applies the commander shall reasonably satisfy himself that every member of the flight crew has had the training specified in paragraph (5).

(4) No person shall act as a member of the flight crew on an ACAS equipped flight in an aeroplane to which this article applies unless he has had the training specified in paragraph (5).

(5) The training referred to in paragraphs (3) and (4) is:

(a) suitable training in the operation of the airborne collision avoidance system in the aeroplane; and

(b) suitable training in the use of the procedures referred to in article 61(b)."

REGULATORY IMPACT ASSESSMENT

Regulatory Impact Assessment of JAA NPA-FCL 31 – Introduction of the ICAO Multi-crew Pilot Licence and other changes.

Foreword

After the events of 11 September 2001 worldwide airline passenger traffic suffered a serious downturn which ran counter to the general trend of expansion in air travel. This downturn was never expected to be permanent, and the recovery since then has been strong and sustained. This increase in demand has in turn fuelled pilot recruitment by airlines worldwide.

Past sources of trained pilots have normally been sufficient to meet the demand from airlines, but this is no longer the case. This has driven airlines to examine the normal training and career paths of airline pilots, and the conclusion has been that an additional career path is needed to enable the recruitment of pilots directly as co-pilots of a multi-engine turbine powered air transport aeroplane certificated for a minimum crew of at least two pilots. This led the International Civil Aviation Organisation (ICAO) to consider the introduction of a new pilot licence, specifically restricted to co-pilot privileges on multi-pilot aircraft, to meet this demand – the Multicrew Pilot Licence (MPL). The ICAO Council adopted the provisions related to the MPL as part of Amendment 167 to Annex 1 on 10 March 2006, the provisions then became applicable on 23 November 2006. The MPL has been designed to take advantage of competency-based training (as opposed to the traditional skills, knowledge and experience route), in a multicrew environment (as opposed to leading towards a single-pilot licence) and modern simulation. The MPL supplements, rather than replaces, pre-existing pilots' Licences.

In response to the introduction of the ICAO MPL, the Joint Aviation Authorities (JAA) considered the introduction of the MPL under Joint Aviation Requirements (JARs). After a period of consultation the JAA released Notice of Proposed Amendment for Flight Crew Licensing (NPA-FCL) 31 for consultation. Following the standard JAA NPA procedure, the NPA was adopted as JAR-FCL 1 Amendment 7 on 01 December 2006.
It is the opinion of the CAA that changes to Air Navigation Order 2005 Schedule 8 and Articles 28 and 29 will be required in order to implement the ICAO MPL. NPA-FCL 31 also introduces other changes, principally in the flying experience requirements for the issue of certain licences and type ratings. It is not anticipated that the introduction of NPA-FCL 31 will have any broadly deleterious effects on the aviation industry. This Regulatory Impact Assessment is issued to assess the impact of NPA-FCL 31, and to ensure compliance with government policy on consultation of changes to legislation.

Contents

Explanatory Notes

Note 1 Where this document uses gender-specific words, the context should be taken to include the other gender.

Section 1 – RIA – JAA NPA-FCL 31 – ICAO MPL.

1.0 Responsible Department.

1.0.1 CAA Personnel Licensing Department.

1.1 Title of Proposal.

1.1.1 This document is entitled Personnel Licensing Department (PLD) RIA – JAR NPA-FCL 31, including the ICAO Multicrew Pilot Licence, and constitutes a Full Regulatory Impact Assessment of changes introduced by JAR NPA-FCL 31.

1.2 Associated Legislation and Regulation.

1.2.1 The principal document associated with this RIA is the JAA NPA-FCL 31 document bundle. Whilst this is no longer valid because the changes proposed in NPA-FCL 31 have now been incorporated in JAR-FCL 1 Amendment 7, it presents a much clearer overview of the amendments that have now been adopted. It should be noted that the UK CAA will continue to use JAR-FCL 1 Amendment 5 and JAR-FCL 2 Amendment 3 until further notice.

1.2.2 The JAA NPA-FCL 31 Consultation Documents will be available here:
http://www.caa.co.uk/default.aspx?pageid=7722

The Explanatory Note included an RIA which is essential reading in conjunction with this RIA.

1.2.3 Information relating to the MPL can be found in Subpart K of JAR-FCL 1
Amendment 7, which is available here:

http://www.jaa.nl/publications/jars/607069.pdf

1.2.4 Also associated with this RIA is the Air Navigation Order 2005. The changes introduced by NPA-FCL 31 have not yet been incorporated in the Air Navigation Order 2005, but there is an expectation that changes will be required if the changes in NPA-FCL 31 are introduced. Prior to any changes to the Air Navigation Order being enacted, there will be a consultation process with those in the aviation community potentially affected by the changes. This RIA is part of that consultation process.

Section 2 – Purpose and Intended Effect.

2.1 Objective.

2.1.1 The ICAO Multicrew Pilot Licence (MPL) is intended to provide an alternative program for training those intending to operate as co-pilots of co-pilot of a multiengine turbine-powered air transport aeroplane certificated for a minimum crew of at least two pilots. It is intended that the training for the MPL will be better tailored to the requirements of operating multi-pilot commercial air transport aircraft. The MPL has been designed to take advantage of competency-based training (as opposed to the traditional skills, knowledge and experience route), in a multicrew environment (as opposed to leading towards a single-pilot licence) and modern simulation. The MPL supplements, rather than replaces, pre-existing pilots' Licences.

2.2 Background.

2.2.1 After the events of 11 September 2001 worldwide airline passenger traffic suffered a serious downturn which ran counter to the general trend of expansion in air travel. This downturn was never expected to be permanent, and the recovery since then has been strong and sustained. This increase in demand has in turn fuelled pilot recruitment by airlines worldwide.

2.2.2 In the past, traditional sources of trained pilots have normally been sufficient to meet the demand from airlines, but this is no longer the case. This has driven airlines to examine the normal training and career paths of airline pilots, and the conclusion has been that an additional career path is needed to enable the recruitment of pilots directly into co-pilot positions in commercial air transport multi-pilot operations.

2.2.3 The airline industry also determined that the existing CPL and ATPL training courses produced graduates whose skills were not optimised for co-pilots engaged in commercial air transport operations on multi-pilot aircraft, and pressed for revisions to the training syllabus to take advantage of modern teaching techniques, materials and equipment. To accommodate this approach, ICAO made provision for considerable flexibility for training providers in the construction of MPL training courses.

2.2.4 In addition to the MPL, NPA-31 introduces changes to JAR-FCL 1 that reflect Amendment 167 to ICAO Annex 1 and do not require changes to the law, including changes to the experience requirements for the ATPL(A) and CPL(A)/IR integrated courses, multi-pilot type ratings and the ATPL(A) (see the Appendix to this RIA). The CAA has already adopted some of these changes, as notified to certain training providers in a letter from Head of Policy and Standards of CAA PLD. These changes, and those of a similar benefit to the industry contained in other adopted NPAs, will be promulgated by AIC in due course.

2.2.5 The JAA undertook a period of internal consultation prior to releasing NPA-FCL 31 for wider consideration. Following the standard JAA NPA process NPA-FCL 31 was adopted as JAR-FCL 1 Amendment 7, and this was published on 01 December 2006. The CAA has not yet adopted this amendment state.

2.3 Rationale for Government Intervention.

2.3.1 It is accepted United Kingdom policy, as a signatory to the Chicago Convention of 1944, to comply wherever possible with ICAO Standards and Recommended Practices (SARPS).

2.3.2 It is also United Kingdom policy, being a signatory to the 1990 Cyprus Arrangements, to comply with JAR-FCL. The United Kingdom is one of the JAA states accepted for mutual recognition in respect of JAR-FCL 1 (Aeroplane), 2 (Helicopter) and 3 (Medical).

2.3.3 Whilst compliance with ICAO and JAA standards is not obliged by law, compliance with international standards is an accepted policy of the government and the CAA.

2.3.4 It is also accepted policy duly to consider regulatory change in response to industry demand, so that United Kingdom industry is not unfairly disadvantaged in competition with industries abroad.

Section 3 – Consultation.

3.1 Within Government and CAA.

3.1.1 Government, industry and the regulator are all aware of the changes proposed by NPA-FCL 31 as a consequence of the JAA NPA process. CAA internal consultation has also been undertaken as part of a process of planning for the implementation of NPA-FCL 31.

3.2 Public Consultation.

3.2.1 The CAA undertook formal public consultation between 22 March 2007 and 27 July 2007. In addition UK industry has been involved in the JAA NPA process, and have already had the opportunity to comment as part of that process. Furthermore, having anticipated delays to the publication of JAR-FCL 1 Amendment 7, the CAA welcomed informal responses from training providers to the JAA NPA as part of the process of planning for implementation.

3.2.2 This RIA forms the major part of formal consultation on the implementation of the ICAO MPL by the United Kingdom.

Section 4 – Options.

4.1 Option 0 – Retain Current Arrangements.

4.1.1 The MPL is currently an ICAO standard, so there is no obligation on the United Kingdom to implement it. Existing licences will remain available as before.

4.1.2 The option to leave the current flight crew licensing provision in place is also a very viable one in the context of the assumption of competence for flight crew licensing by EASA from 2008 onwards. The final course of EASA licensing provision is not yet established, and the implementation of provision for the MPL by any of the EASA states under JAA regulation may well be overtaken by EASA regulation prior to full implementation.

4.1.3 The disadvantage of this option is that UK training providers would not be able to respond to the market by gaining approval under UK regulation. If they decide to introduce MPL training courses the approval would have to be given under the regulation of another state, and the licences of graduate pilots would also have to be issued under the authority of another state. Inevitably this would increase the cost to those UK training providers who wished to take advantage of the MPL in their business plans.

4.1.4 Another disadvantage would accrue to UK airlines who might wish to take advantage of the MPL in order to train new pilots. MPL training courses may offer benefits over existing ATPL courses in that, because there is a higher proportion of simulator based training, they may be less vulnerable to delays due to poor weather. There may well be other advantages for the airlines, which would not be realised if the UK decided not to implement the MPL.

4.2 Option 1 – Implement NPA-FCL 31 in Full.

4.2.1 It is the opinion of the CAA that changes to Air Navigation Order 2005 Schedule 8 and Articles 28 and 29 will be required in order to implement the ICAO MPL. There are other changes introduced by NPA-FCL 31 that do not require changes to legislation.

4.2.2 There is the option to implement NPA-FCL 31 in its entirety. The advantage to this approach is that the UK maintains fuller compliance with JAR-FCL. However, there are a number of factors that conspire against the straightforward implementation of NPA-FCL 31. First, the JAA has released a number of NPA-FCLs in a short period in preparation for the assumption of competence for Flight Crew Licensing by EASA. Consequently, given the lead time for implementation of JAR-FCL amendments, and for the amendment of legislation, there are a number of JAR-FCL amendments in various stages of implementation. Currently the CAA is considering the implementation of NPAs-FCL 25, 26 and 31, whereas the CAA remains working to JAR-FCL 1 Amendment 5 and JAR-FCL 2 Amendment 3 (as used in LASORS 2007).

4.2.3 Despite this the CAA considers that the changes introduced by NPA-FCL 31 have a generally beneficial effect, and that this option is to be preferred.

4.3 Option 2 – Partial Implementation of NPA-FCL 31.

4.3.1 There is the option to NPA-FCL 31 in part. However, the provisions relating to the ICAO MPL cannot be implemented partially.

4.3.2 Partial implementation of NPA-FCL 31 would entail decisions as to:

a) Implementation or otherwise of all MPL provision.
b) Partial implementation of other changes introduced by NPA-FCL 31.

4.3.3 The advantage of this approach is that those parts of NPA-FCL 31 that are favourably received by consultees can be implemented immediately, whereas those that are not can be postponed pending further consultation or even not adopted at all.

4.3.4 The disadvantage of this approach is that the UK would not be fully compliant with JAR-FCL, and if this approach is adopted in common with other JAR-FCL Amendments currently under consideration there is a risk that the consistency of JAR-FCL would be undermined.

4.4 Preferred Option

4.4.1 The preferred option of the CAA is Option 1 – full Implementation of JAA NPA-FCL 31.

Section 5 – Costs and Benefits.

5.1 Sectors and Groups Affected.

5.1.1 The provision for the ICAO MPL and other changes in NPA-FCL 31 will primarily affect airlines, pilot training organisations and pilots seeking airline employment.

5.1.2 The provisions relating to changes in experience requirements for the issue of various pilot licences will affect those pilots seeking issue of the relevant pilot licence.

5.2 Costs.

5.2.1 It is not anticipated that any of the provisions of NPA-FCL 31 will have significant adverse cost impact on individuals or organisations in aviation in the UK, with the exception of set-up costs for airlines and pilot training organisations.

5.2.2 Information from industry regarding costs, particularly where an increased cost or loss of revenue is anticipated, is particularly welcome. The CAA is also specifically seeking information relating to the loss of business and revenue that may be incurred by training providers should the MPL provisions of NPA-FCL 31 not be implemented.

5.2.3 It should be noted that, despite a specific request for information from industry about the costs and benefits of implementing NPA-FCL 31, no such information was forthcoming.

5.2.4 The introduction of the ICAO MPL will increase workload for the CAA until the initial approvals of training courses for the MPL are complete. This is due to the fundamentally different nature of the MPL and associated training. There will be a small permanent increase in workload due the anticipated slight increase in number of approvals.

5.3 Benefits.

5.3.1 The major benefit of the introduction of NPA-FCL 31 is the introduction of provision for the ICAO MPL. This has potential to be of benefit to airlines, flying training providers and pilots.

5.3.2 Other minor changes introduced in NPA-FCL 31 are potentially of benefit to pilots seeking the issue of various pilot licences and ratings, in that the requirements for issue may be reduced (see the Appendix to this RIA).

5.3.3 Airlines may benefit from the introduction of the MPL in that the training of pilots for employment on commercial air transport multi pilot aircraft may be better tailored to the role, may be less dependent on good weather and thus shorter, and may take advantage of new training techniques to ensure a better standard of training.

5.3.4 Flying training providers may also benefit in that the MPL will enable them to provided a broader range of products, thus attracting new customers.

5.3.5 Pilots seeking a career in multi pilot commercial air transport operations may also benefit from the MPL training course in achieving their desired employment quicker and at lower cost.

Section 6 – Small Firms Impact Test.

6.1 Most of the businesses in the fields affected by the introduction of NPA-FCL 31 would qualify as small firms under government guidelines for RIAs.

6.2 Initial response from industry during the NPA-FCL 31 consultation process appears to have been favourable, but more detailed industry comment is expected during the UK consultation process.

6.3 It should be noted that the response to the NPA-FCL 31 public consultation yielded only 5 comments, and whilst there was one negative comment concerning the loss of handling skills, this was based on a misunderstanding of the proposed MPL implementation. One response did express support for the MPL proposal, but also expressed similar concerns to other responses about the detailed implementation of the MPL. There were insufficient responses to draw any general conclusion either in support of or against the MPL.

6.4 The effect of the proposed changes is, in the long term, generally beneficial and a significant detrimental effect is not anticipated to any specific organisation, group or individual. Comments from small businesses about this specific impact of the introduction of NPA-FCL 31 are welcome.

6.5 Again it should be noted that, despite a specific request to industry, no specific information relating to benefit or detriment to industry was provided in the responses.

Section 7 – Competition Assessment.

7.1 Initial consideration of the effects of the proposed amendments does not yield any obvious adverse effect on the businesses in the sector. The proposed amendments bring net benefits to the sector, and those operating within the sector should be uniformly affected. There are no dominant providers within the sector who might unfairly benefit from the proposals.

7.2 As in other areas considered, those potentially affected by the proposals have been able to contribute to the amendment process. This has provided the opportunity for any concerns about competition to be addressed during the process.

7.3 It is not anticipated that there will be any adverse market or anti-competitive effect of these proposals.

Section 8 – Enforcement, Sanctions and Monitoring.

8.1 The existing infrastructure for the enforcement of standards under the JAA system is well established and functions satisfactorily. It is not anticipated that any changes to JAR arrangements will be required, although it is anticipated that changes will be introduced by EASA in due course.

8.2 The existing arrangements for the auditing, inspection and oversight of Flight Training Organisations by the UK CAA will need to be revised to take account of the MPL.

8.3 The changes required to United Kingdom legislation have been determined by the CAA Legal Department, and are to Air Navigation Order 2005 Schedule 8 and Articles 28 and 29. These changes will be kept to the minimum required to introduce NPA-FCL 31, and are largely confined to those necessary to provide for the MPL. There are other changes introduced by NPA-FCL 31 that do not require changes to legislation (see Appendix).

8.4 The effects of the introduction of NPA-FCL 31 will be monitored through existing channels, such as joint CAA and industry meetings. Examples of these are the General Aviation Consultative Committee and the Chief Ground Instructors meetings. There is no perceived requirement for additional monitoring measures.

8.5 JAR-FCL 1.535 (in Amendment 7 of JAR-FCL 1) also provides for monitoring the implementation of the MPL and establishes the MPL Advisory Board.

Section 9 – Implementation and Delivery Plan.

9.1 The NPA-FCL 31 changes have already been adopted by the JAA as JAR-FCL 1 Amendment 7. It now remains for individual JAA member states to implement this Amendment as they require.

9.2 The UK CAA has been an active contributor to the JAA NPA process, and the aviation industry has also had the opportunity to contribute. Consequently industry groups and organisations should be familiar with the changes proposed, and are expected to be active and early contributors to the UK consultation process. The timetable for delivery, particularly of ICAO MPL training courses, will be driven by industry demand. It is anticipated that the changes other than ICAO MPL provision could be introduced in reasonably short order following the close of RIA consultation and ministerial sign-off, or even, in the event of no adverse comment from consultees, before this. If no changes are adopted early then non-MPL related changes will be implemented as soon as possible in 2007.

9.3 The timetable for the introduction of the ICAO MPL provision will be dictated by the airlines' and flying training organisations' desire to provide MPL training. Since the close of public consultation on NPA-FCL 31 CAA Personnel Licensing Department has received expressions of interest in MPL training provision from 4 training providers, but as yet no applications for formal MPL training course approval.

9.4 As has been stated previously, the Air Navigation Order 2005 will require amendment to provide for the MPL. The lead time for Air Navigation Order amendments can be lengthy.

9.5 Legislative provision for the MPL is being made in the form of amendments to the Air Navigation Order 2005. These are expected to be enacted in the first quarter of 2008.
9.6 It is anticipated that final notification of the introduction of NPA-FCL 31 will be by AIC, to be published on 06 December 2007.

Section 10 – Post-Implementation Review.

10.1 As stated in Section 8 of this RIA, there is provision for monitoring the progress of introduction and effectiveness of the proposed changes, through the medium of existing CAA and industry meetings. The requirement for a review will be based on information provided to the CAA through these existing channels.

10.2 It is also too early to determine when such a review might be appropriate, but initial provision for such a review will be made.

Section 11 – Summary and Recommendation.

11.1 Industry reaction to the initial ICAO MPL provision was very enthusiastic, but this was tempered by the JAR-FCL implementation as proposed in NPA-FCL 31. This was reflected in the responses to public consultation, which, whilst generally supportive of the MPL, could not be described as unrestrainedly enthusiastic.

11.2 It is recommended that the UK introduce NPA-FCL 31 in full, including full industry consultation and according to an Introduction and Delivery Plan to be developed by the CAA in conjunction with industry.

Appendix 1 to RIA

Changes to JAR-FCL 1 that reflect Amendment 167 to ICAO Annex 1 and do not require changes to the law (see para 2.2.4 of the RIA).

Subpart A – General Requirements

JAR-FCL 1.050 (a)(2)(ii) and (a)(2)(iii):

Reducing credit for student pilot-in-command instrument time (SPIC) from 50 hours to 20 hours;

Subpart D – CPL (A)

Appendix 1 to JAR-FCL 1.160 & 1.165(a)(1):

Reduction of pilot-in-command hours from 100 to 70 in paragraph 13(b) and SPIC hours from 50 to 20 in 13(e)(ii);

Also in para 13(b), delete '50 hours' twice as minimum number of hours for VFR and SPIC.

Appendix 1 to JAR-FCL 1.160 & 1.165(a)(2):

Reduction of pilot-in-command hours from 100 to 70 in paragraph 12(b) and SPIC hours from 50 to 20 in 12(e)(ii);

Also in para 12(b), delete '50 hours' twice as minimum number of hours for VFR and SPIC.

Subpart F – Class and Type Ratings
JAR-FCL 1.250(a)(1):

Reduction of pilot-in-command hours as a pre-requisite for a first multi-pilot type rating from 100 to 70 hours;

Subpart G – ATPL (A)
JAR-FCL 1.280(a)(2):

Changes to experience required for ATPL(A) to require only 70 hours pilot-in-command and the remainder as pilot-in-command under supervision.

Full Regulatory Impact Assessment

PROPOSAL FOR PHASE 1 OF AN INCREMENTAL EXPANSION OF THE USE OF SSR MODE S TECHNOLOGY FOR FLIGHTS IN UK AIRSPACE

Version 1.2

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Contents

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Executive Summary

The UK and other European States have experienced significant growth in the levels of air traffic over the last three decades and this growth is forecast to continue in the long term. It is expected that the number of flights per year in UK airspace will further increase by between 50% and 90% by 2025 when compared to 2005. This growth is highly beneficial to the nation in terms of economic prosperity, employment, tourism, exports and the social benefits of access to affordable air travel. Therefore, in 2003 the Government set out a framework in a White Paper on 'The Future of Air Transport' that seeks to ensure the forecast growth in air traffic can be accommodated by UK airports and the associated air traffic control system.

The White Paper also acknowledged that the environmental impact of traffic growth must be minimised. The CAA believes that this difficult balance of increasing capacity, addressing environmental considerations and maintaining world-leading safety levels can be achieved through a variety of individual enabling measures. Examples of these include:

- More efficient handling and routing of flights;
- A more modern supporting air traffic radar surveillance system;
- Greater technical interoperability of all classes of aircraft with anti-collision safety nets and air traffic control radars.
- Helping to prevent and reduce the impact of airspace incursions or infringements.

Initiatives in new airspace design will need to incorporate the following:

- Enhancements to all types of controlled airspace and maximum efficiency in the use of existing and new controlled airspace;
- Optimal climb-out routes from airports and more direct routing of aircraft between airports;
- Greater use of continuous descent approaches and less holding of aircraft in the terminal phases of flight.

This is likely to have an impact on all airspace users in the UK, particularly in the amount and structure of airspace outside of controlled airspace. The CAA considers that greater interoperability between all categories of airspace user will be needed to protect freedom of movement and access to airspace. Moreover, the current Secondary Surveillance Radar (SSR) system used by air traffic control, and as a basis for safety nets, needs to be updated to be able cope with the increasing number of aircraft using the airspace.

In March 2005, the CAA commenced a proposed phased approach for the introduction of new SSR technology when it implemented a requirement for the use of SSR Mode Select (Mode S) within the very high density controlled airspace around major UK airports and along the major UK air routes. At the time of the consultation for this first implementation phase, the CAA also stated its intention to propose a further expansion of the use of SSR Mode S in the remaining UK airspace from March 2008. However, coupled with the proposed technology update, the CAA also proposed that the number of aircraft that are equipped with SSR technology should also be maximised to achieve the aforementioned improved technical interoperability aims and the concomitant safety benefits.

A public consultation on the proposed expansion of transponder carriage and use of SSR Mode S was launched in June 2006, which resulted in a significant level of concern and opposition to the policy being raised by the sporting and recreational flying community. Consequently, the CAA has decided that a more gradual, phased approach to improved technical interoperability will have to be employed to address these concerns, and further consultation will need to be conducted on some elements of the proposed policy.

Notwithstanding, the CAA considers that the existing SSR technology used on aircraft in the busiest portions of UK airspace must be updated as the first stage in the incremental process. Many inputs from the 2006 consultation acknowledged this need, particularly within controlled airspace where the level of public transport activity is at its highest. Therefore, this proposal to amend the Air Navigation Order (ANO) also seeks to address this particular issue.

The 2003 White Paper set out set out the significant potential net economic benefits of increased capacity at UK airports. SSR Mode S, as an enabling technology, is needed to indirectly contribute towards the realisation of these benefits. Without the further expansion of the use of SSR Mode S in the UK, capacity, efficiency and safety levels in the wider UK air traffic management system may not be sufficient to provide the necessary throughput of traffic into and out of the major South East England airports and regional airports. Consequently, the future increased airport capacity anticipated by the White Paper would not be utilised to its maximum efficiency.

Option 2 in this proposal provides a limited, incremental expansion of SSR Mode S outside the major London terminal airspace area into the remaining UK airspace where SSR transponders are currently required to be used. The proposed implementation date is 31 March 2008, with a four-year transition period in which to allow operators time to upgrade the existing equipment on their aircraft. The proposal will ensure that the enabling benefits of SSR Mode S can be realised within all UK controlled airspace for Instrument Flight Rules (IFR) flights and for all powered flights conducted at and above Flight Level 100. Option 2 also ensures that the UK air traffic surveillance technology will remain fully interoperable with neighbouring European States, and it provides consistency with an ongoing European Commission initiative for the carriage and operation of SSR Mode S on IFR flights.

The estimated average cost per year of Option 2 for the equipage of aircraft between 2008 and 2012 is between £1M and £3.6M, of which £0.65M to £2.5M is estimated to fall on businesses and other organizations. The total present value cost of Option 2 between 2008 and 2012 is estimated to be between £4M and £13.5M.

The CAA is minded to recommend to the Secretary of State for Transport that the ANO 2005 be amended to adopt Option 2 and mandate SSR Mode S Elementary Surveillance as the minimum technology standard in the circumstances where SSR transponders have to be operated. This complements the previous implementation of SSR Mode S Enhanced Surveillance in major terminal and en route airspace. It is also in line with the strategic framework set out in the White Paper by taking a further necessary incremental step for ensuring that the capacity of UK airspace and the supporting air traffic management systems will match future airport capacity. It also ensures continued consistency with SSR Mode S implementation developments in neighbouring European States.

It is intended that other issues, not included in this first phase but which follow on from the initial consultation, will be addressed in subsequent phases of this strategy. This will include the expansion of the circumstances under which transponders are required to be carried. Public consultation for the next phase is planned to commence towards the end of 2007 with the aim introducing further regulation from 31 March 2009.

1 Title of Proposal

Phase 1 of an expansion of the implementation of Secondary Surveillance Radar Mode Select technology for flights in UK Airspace[1].

2 Purpose and Intended Effect

2.1 Objective

To replace existing 'classical' Secondary Surveillance Radar (SSR) transponder equipment with SSR Mode Select (Mode S) technology on all aircraft that operate in the circumstances where the use of SSR transponders is currently mandatory.

2.2 Background

2.2.1 In 2003, the Government's White Paper on "The Future of Air Transport" set out an approach that provides a strategic framework for the development of air travel in the UK over the next 30 years. The White Paper acknowledged that air travel is essential to the UK economy and continued prosperity in terms of business, tourism, exports, employment and the social benefits of UK citizens having access to affordable air travel. However, there has been a five-fold increase in air travel over the last 3 decades, with almost a 50% growth in the number of commercial air transport movements at UK airports since 1996. This growth is forecast to continue, with the level of air traffic movements in UK airspace expected to rise by at least a further 50% by 2025 when compared to 2005[2] in the lowest growth forecast scenario. **The currently available traffic growth data and forecasts are set out in Annex A**. This growth presents significant challenges in terms of accommodating increased traffic levels within the air traffic system, protecting the environment, and maintaining the UK's world-leading aviation safety record. These views were re-stated in the "The Future of Air Transport Progress Report" that was published in 2006.

2.2.2 The White Paper also acknowledged that for any additional airport capacity to be utilised, this would need to be matched by a corresponding increase in airspace capacity in the UK[3]. The Civil Aviation Authority (CAA) considers that increased commercial demand and environmental pressures can be managed through the redesign of airspace and the introduction of new air traffic systems. Measures will need to include more efficient handling of flights within the Air Traffic Management (ATM) system and a more modern air traffic radar surveillance system. Initiatives in new airspace design will need to incorporate: enhancements to all types of controlled airspace; more direct routing of aircraft between airports; less holding of aircraft in the terminal phases of flight; optimal climb-out routes from airports; and greater use of continuous descent approaches. The Government is now looking to the CAA to make early progress in these areas with a view to a phased implementation of changes to eliminate capacity constraints and permit the integration of the forecast increases in aircraft movements[4]. The CAA considers that a key enabler to meet these challenges is new radar technology that will adequately cope with more flights and improve interoperability between aircraft from disparate groups; thereby protecting freedom of movement and access to airspace for aircraft operators, permitting efficient airspace design and use, and maintaining or increasing safety levels.

[1] This includes airspace outside the UK for which the UK has in pursuance of international arrangements undertaken to provide air navigation services.
[2] The highest forecast growth scenario indicates that traffic levels could nearly double by 2025 compared to 2005.
[3] DfT White Paper "The Future of Air Transport", December 2003, Chapter 12, Paragraph 12.25.
[4] DfT White Paper "The Future of Air Transport", December 2003, Chapter 12, Paragraph 12.26.

2.2.3 The Government also sees growth at existing regional airports across the country as an essential element of accommodating demand. Since 2002, overall movements of commercial air traffic per year at airports outside of those located within the London terminal airspace have increased by nearly 250,000, which is an overall growth of 23%[5]. Some of the individual regional airports have seen growth of commercial air traffic movements of over 50% during this period. In order to accommodate continued growth at regional airports and meet environmental requirements, available Class F and G[6] airspace may have to become increasingly dissected by controlled airspace routes originating from these airports. This will be necessary to afford appropriate protection to large passenger and freight carrying aircraft and to permit more environmentally efficient flight profiles. Without greater interoperability between all classes of aircraft, non-commercial aviation activity may have to be increasingly confined to unconnected, segregated operating areas of ever decreasing dimensions. However, the CAA believes that greater interoperability, rather than increased segregation, best serves the interests of all airspace users and would also facilitate a more efficient overall design and use of UK airspace structures.

2.2.4 The major anti-collision safety nets currently used in aviation are: Airborne Collision Avoidance Systems (ACAS), ground-based anti-collision safety nets, and Air Traffic Control (ATC) separation and information services based on the positional references of aircraft shown on radar displays. All of these systems share a common baseline technology, which is known as SSR. The technological principles behind the currently deployed ‘classical’ SSR systems date back to the post-World War II development of the military Identification Friend or Foe (IFF) system. Over the last 2 decades, the significant increase in traffic levels within UK and core European airspace has highlighted the inherent limitations of this outdated technology and has stretched the capacity and capability of the system to its limits. Traffic growth cannot continue to be safely sustained using this old technology. **A more detailed explanation of the need to phase out ‘classical’ SSR is at Annex B**.

2.2.5 In order to ensure the efficient ATC handling of the forecast future traffic volumes in a safe, orderly and expeditious manner, and to improve the effectiveness of anti-collision safety nets, a new and more advanced SSR system must be introduced to replace the existing SSR infrastructure in the UK and other European States. Alternatively, the capacity of the ATM system may have to be capped, which could have serious economic consequences both at a national and regional level, or consideration will have to be given to significantly increasing the amount of available controlled airspace as part of any separate redesign of airspace made for environmental reasons.

2.2.6 In March 2005, the CAA commenced its proposed phased approach for the introduction of new SSR technology when it implemented a requirement for the use of the new SSR Mode Select (Mode S) within the very high density controlled airspace around major UK airports and along the major UK air routes. **A more detailed description of SSR Mode S and its benefits over ‘classical’ SSR is provided in Annex C**. SSR Mode S has now been deployed around the major London airports by National Air Traffic Services (NATS) and the use of Mode S is expected to be expanded to the Manchester and Scottish Terminal Manoeuvring Areas (TMAs) over the next two to three years. Nearly all aircraft (around 94%) over 5,700 kg maximum take-off mass on the UK register are now also equipped with Mode S transponders as a result of this first implementation stage.

2.2.7 At the time of the consultation for the 2005 implementation of Mode S, the CAA also stated its intention to propose a further expansion of the use of the technology in the remaining UK airspace from March 2008. Mode S will reduce the amount of SSR

[5] Source: CAA UK Airport Statistics available on the CAA website at http://www.caa.co.uk/default.aspx?categoryid=80&pagetype=88&pageid=3&sglid=3

[6] Class F and G airspace are the classes of airspace in the UK that are outside of controlled airspace.

interference and manage replies from aircraft transponders more effectively, thereby enabling increased numbers of aircraft to be handled within a given volume of airspace. Coupled with the proposed update of 'classical' SSR to Mode S technology, the CAA also considers that the number of aircraft that are equipped with SSR technology must be increased in order to improve the opportunities for anti-collision safety nets and ATM systems to detect aircraft and decrease collision risks. Currently, unless aircraft are equipped with a suitable SSR transponder, collision avoidance systems, safety nets and ATC SSR interrogators are effectively 'blind' to the presence of these aircraft. A public consultation and accompanying Partial Regulatory Impact Assessment (RIA) was launched in June 2006 on these second phase proposals, and the results of this are set out in Paragraph 3.2 below. The revised options presented in this RIA take into account the feedback received during that consultation.

2.3 Rationale for Regulatory Intervention

The policy objective is an important element for accommodating the forecast increases in the levels of UK air traffic in an environmentally sound manner, while simultaneously maintaining or improving levels of safety and efficiency of airspace use. It is considered that a non-regulatory approach could not be applied to resolve the aforementioned issues for the following reasons:

a. The CAA considers that the achievement of the overall objective is a key technology enabler for the strategic policy set out by the Government in the White Paper on "The Future of Air Transport", which will require extremely high levels of compliance to realise the benefits. Voluntary equipage would result in costs to stakeholders without necessarily providing benefits without high levels of take-up. This issue may also actually have the effect of deterring voluntary equipage, as stakeholders may be reluctant to meet the expenditure requirements until equipage levels are high and benefits can be realised immediately.

b. A common technology baseline to maximise the safety benefits of collision avoidance safety nets cannot be assured through voluntary equipage, as it would not guarantee carriage of the required avionics by aircraft in UK airspace. If left to market forces or voluntary equipage, different sectors of the industry might chose alternative technologies that are not interoperable.

c. Wholesale voluntary equipage with SSR transponders will only occur if the net benefits of the equipage can be clearly and unequivocally demonstrated to aircraft operators in monetary terms, particularly to those in the General Aviation sector. The financial cost of equipage of individual aircraft can be easily demonstrated but it is difficult to accurately quantify, in monetary terms, the direct value of the safety and operational interoperability benefits of SSR. Therefore, the equipage costs for new SSR technology could be perceived as unacceptably high by many aircraft operators without, in their view, sufficient tangible monetary benefits to justify the expenditure. This is especially the case because a significant justification for these proposals arises from the future airspace and environmental needs of the UK aviation industry, which many Stakeholders in the General Aviation community believe are speculative at this stage. Consequently, it may not be possible to encourage or rely on voluntary equipage using purely quantitative monetary cost-benefit arguments.

3 Consultation

3.1 Within Government

The CAA has liaised with the following Government departments and bodies to discuss the policy proposals for the introduction of SSR Mode S and the wider carriage of SSR transponders:

a. Department for Transport (DfT).

b. Department of Trade and Industry (DTI).

c. Ministry of Defence.

d. Cabinet Office Better Regulation Executive.

e. Small Business Service (SBS).

f. UK Spectrum Strategy Committee (UK SSC).

g. National IFF/SSR Policy Board.

3.2 Public Consultation

3.2.1 **A summary of the consultation activity that has been conducted to date on the proposed introduction of SSR Mode S is at Annex D**, which includes a synopsis of the issues raised by Stakeholder inputs. Detailed results from the specific formal public consultation on proposals to expand the use of SSR Mode S and increase the carriage of transponders, which was held between 3 June and 29 August 2006, have been published separately and are available on the CAA website[7].

3.2.2 As a result of the consultation inputs from Stakeholders and further recent meetings with representatives of General Aviation associations, the CAA has refined the original policy proposals. In particular, it has identified what it considers to be a pragmatic way forward for achieving the overall aim while addressing concerns and issues of operators in introducing new technology into their aircraft. It is the view of the CAA that the overall aim of attempting to improve interoperability between all aircraft is still valid and achievable but that any increase in the number of aircraft that will be required to carry and operate SSR transponders must be subject to further consultation and a more clearly defined phased implementation. Further analysis on the challenges of equipping very light aircraft with SSR transponders will also need to be conducted. However, the need to upgrade the existing 'classical' SSR installations on aircraft operating in airspace and circumstances where transponders are currently required, is generally accepted as being a necessary next step.

3.2.3 Option 2 set out in Paragraph 4.2 below reflects the refinement of the proposals since the Partial RIA was published for consultation. In particular, as a result of feedback from Stakeholders, the CAA has decided that any decision to 'future-proof' aircraft equipage under these proposals for emerging data link technologies, such as Automatic Dependent Surveillance – Broadcast (ADS-B) should be left to voluntary arrangements by aircraft operators and not mandated at this stage. However, the CAA is monitoring the progress of a recently circulated European Commission (EC) draft interoperability Implementing Rule (IR) that relates to this issue. Furthermore, any interim steps towards a full implementation of the carriage and operation of Mode

[7] http://www.caa.co.uk/default.aspx?categoryid=810&pagetype=90&pageid=4601

S transponders on all aircraft in UK airspace should be subject to further formal and informal consultation with stakeholders.

3.2.4 The CAA is convinced that the overall policy aims of enhancing safety through technical interoperability to deliver efficient use of the airspace, without a wholesale expansion of controlled airspace, remain valid. This is particularly relevant in balancing the public's desire to fly in a scenario where environmental concerns must be addressed. As direct routing and more efficient approach paths are required to minimise fuel burn, it is inevitable that commercial air traffic will seek to fly outside the existing controlled airspace structure. Whilst increasing controlled airspace could revise the airspace structure to account for this change in operational requirement, this would not necessarily serve the best interests of all airspace users. Furthermore, this approach would be contrary to the CAA's air navigation duties set out in the Transport Act 2000[8]. However, it is clear that the majority of Stakeholders in the General Aviation community are not convinced by arguments put forward to date and further consultation on this aspect would be beneficial. Notwithstanding these views, further consultation on the need to phase out the use of existing 'classical' SSR technology in current mandatory transponder carriage scenarios is considered unnecessary.

4 Options

4.1 Option 1 – Do Nothing

4.1.1 Option 1, the status quo, would be to do nothing and not expand the use of SSR Mode S in the UK or increase the number of aircraft that would have to be equipped with SSR transponder technology. The SSR transponder carriage requirements on aircraft in the UK would continue to be mainly linked to specific airspace rather than aircraft type or operating activity. Therefore, under Option 1, only aircraft operating at and above Flight Level 100, or operating under Instrument Flight Rules (IFR) in controlled airspace below this level, or operating for the purposes of public transport, would need to be equipped with an SSR transponder. The current exemptions set out in the Air Navigation Order 2005 for gliders would remain extant. Moreover, where SSR transponders are required outside of major terminal and en route controlled airspace, these would not need to be upgraded to SSR Mode S technology.

4.2 Option 2 – Update Current SSR Transponder Carriage Rules to Require Mode S Technology

4.2.1 Option 2 would be to upgrade the existing SSR transponder carriage rules to mandate SSR Mode S technology as the means of compliance. The aim would be to phase out the use of 'classical' SSR transponders in the circumstances and airspace where the use of a transponder is currently mandatory. In effect, it would provide an incremental expansion of SSR Mode S airspace outside of the major terminal and en route controlled airspace to all the other airspace and circumstances where SSR transponders are currently required. Visual Flight Rules Flights (VFR) flights below Flight Level 100 within controlled airspace would not be affected by this option, and an SSR transponder would not need to be carried and operated in Classes F and G airspace below Flight Level 100 by non-public transport aircraft.

4.2.2 Option 2 would not increase the overall number of aircraft required to carry and operate transponders in the UK above the current requirements. Moreover, unlike the requirements for SSR Mode S inside the major terminal and en route airspace, this expanded implementation would only require the basic version of SSR Mode S to be installed, which is known as Elementary Surveillance. The existing criteria for SSR

[8] Transport Act 2000, Part I, Chapter III, Section 70.

Mode S equipage for operations in major terminal and en route airspace would remain unchanged[9].

4.2.3 Option 2 is broadly similar to how the use of SSR Mode S is currently being expanded out from busy IFR airspace in some other European States[10]. Furthermore, a draft EC Single European Sky (SES)[11] interoperability IR has recently been circulated for consultation, which contains a preferred option for all IFR flights operating as General Air Traffic (GAT) in European airspace to be equipped with SSR Mode S. Option 2 would be compliant with this EC initiative. Option 2 is also consistent with the SES ATM Research (SESAR)[12] requirement to support 'managed' airspace.

4.2.4 In recognition of some of the challenging equipage and cost issues raised by Stakeholders during the public consultation on the options presented in the Partial RIA, the need to install SSR Mode S technology under Option 2 would be phased in over a Transition Period of 4 years from an implementation date of 31 March 2008. These arrangements would apply only to aircraft that require access to existing mandatory transponder carriage airspace where the Mode A/C transponder was installed prior to 31 March 2008. Where operators have voluntarily equipped with SSR transponders prior to 31 March 2008 for use in airspace where carriage is not currently mandated, the upgrade of these transponders to SSR Mode S technology would continue to be left to voluntary arrangements for the present time. However, any new installations of SSR equipment, or new aircraft being brought into service with an SSR transponder already installed, whether this is for voluntary purposes or to meet regulatory requirements, will need to be Mode S compliant from 31 March 2008.

5 Costs and Benefits

5.1 Sectors and Groups Affected

The sectors and groups affected by the 2 options are **set out in Annex E**.

5.2 Benefits

5.2.1 Option 1

The benefit of doing nothing and maintaining the status quo is that Stakeholders would not have to meet any new aircraft equipage costs, associated administrative costs, or a potential increase in costs associated with periodic checking and certification of SSR transponders.

[9] These criteria require all aeroplanes with a maximum take-off mass exceeding 5,700 kg or a maximum cruising true airspeed capability exceeding 250 knots operating as GAT under IFR to be equipped with SSR Mode S Enhanced Surveillance capability in the notified airspace. Aeroplanes below these weight and speed limits, and all helicopters, must be equipped with SSR Mode S Elementary Surveillance.

[10] Belgium, France, Germany, Luxembourg, The Netherlands and Switzerland will require VFR and IFR flights operating within notified airspace to be equipped with SSR Mode S Elementary Surveillance with effect from 31 March 2008.

[11] The SES is an EC initiative to reform the management of European airspace to meet future capacity and safety needs via legislation.

[12] SESAR is the SES implementation programme, which brings together civil and military legislators, industry, operators and users to define, commit to and implement a pan-European programme. The objectives of SESAR are to eliminate the fragmented approach to ATM, transform the European ATM system, synchronise the plans and actions of the different partners and national resources.

5.2.2 Option 2

A summary of the benefits of SSR Mode S Elementary Surveillance over the existing 'classical' SSR technology is set out at Paragraph 5 to Annex D. It is extremely difficult to quantify these benefits in directly attributable monetary terms because SSR Mode S is an enabling air traffic surveillance technology from which air traffic capacity benefits can be derived. Direct benefits from Mode S accrue by reducing controller workload and by providing the technical ability to detect more aircraft within a given volume of airspace while maintaining the required safety levels. SSR Mode S does not, by itself, increase capacity but the reduced controller workload and improved safety it provides can then be employed in conjunction with other supporting measures, such as airspace redesign or new procedures, to help increase capacity and productivity within the air traffic system.

The White Paper on "The Future of Air Transport" in 2003, its additional supporting analysis and the recent progress report in 2006, set out the potential net economic benefits of increased capacity at UK airports as follows:

a. £13.7 billion from maximum use of existing airport capacity.
b. £9 billion from one new runway at Stansted.
c. £5 billion from one short new runway at Heathrow.
d. £3 billion from relief of aircraft delays due to increased capacity.
e. Potential increase in productivity across the economy as a whole due to an increase in aviation capacity.
f. Increase in foreign direct investment and trade.
g. Benefits to particular industries, such as tourism, which are heavily dependent on aviation.

Capacity of the overall ATC system in the UK must match airport capacity and it is essential that new enabling air traffic surveillance systems, such as SSR Mode S, are deployed to replace the outdated infrastructure and support ever-greater traffic levels. The current air traffic management arrangements for some UK airports are already nearing capacity, especially in the South East, and the related airspace is among the most congested in the world.

The White Paper recognised the need for a structured programme for the redesign of UK airspace that would help protect safety standards, relieve current constraints, take account of environmental impacts and accommodate the forecast increase in air transport movements. SSR Mode S, as an enabling technology, is needed to indirectly contribute towards this strategy. Without the further expansion of the use of SSR Mode S in the UK, capacity, efficiency and safety levels in the wider UK ATM system may not be sufficient to provide the necessary throughput of traffic into and out of the major South East England airports and regional airports. Consequently, the future increased airport capacity supported by the White Paper would not be utilised with maximum efficiency.

Option 2 provides a limited incremental expansion of SSR Mode S outside the London area into the wider regional airspace where SSR transponders currently have to be used. This will ensure that the enabling benefits of SSR Mode S can be realised within all UK controlled airspace for IFR flights and for all powered flights above Flight Level 100. Option 2 also ensures that the UK air traffic surveillance technology will be fully interoperable with neighbouring European States and it provides consistency with an ongoing EC initiative for the carriage and operation of SSR Mode S on IFR flights.

5.3 Costs

5.3.1 Option 1

There would be no direct costs for maintaining the status quo that can be identified in a meaningful way. However, there would be indirect disbenefits if the air traffic surveillance infrastructure was incapable of safely supporting increased traffic levels to match future airport capacity. These disbenefits could accrue from restrictions having to be placed on the number of flights that could be handled by the ATM system, increased departure delays at airports, and lack of progress in implementing environmentally efficient aircraft routing and flight profiles. Scarce capacity would adversely affect businesses in the UK regions that rely on access to the extensive route networks available at the major South East and other main regional airports. Unmet demand might result in some connecting air traffic relocating to airport hubs in Continental Europe.

5.3.3 Option 2

The detailed assumptions and calculations for the estimated costs of Option 2 are set out in Annex F. It is assumed that only aircraft with a maximum take-off mass below 5,700 kg would be affected by this proposal, as heavier aircraft will be suitably equipped because of the earlier implementation of SSR Mode S in major terminal and en route airspace. Table 1 below sets out the estimated range of **average annual equipage costs** for aircraft below 5,700 kg requiring an upgrade to SSR Mode S capability during the transition period for this first phase. The CAA considers that around 1,700 to 1,900 aircraft would be affected by Option 2, including those aircraft based in the UK but registered overseas. The cost estimates include institutional elements such as certification and VAT. It should be noted that many of the affected businesses and organisations may be able to reclaim the VAT element of these costs.

Average Cost Per Year (2008-2012)	**Low Estimate**	**Medium Estimate**	**High Estimate**
Privately Owned Aircraft	£380,000 - £440,000	£690,000 - £790,000	£940,000 - £1.1M
Aircraft Owned by Business/Organisations	£665,000 - £730,000	£1.3M - £1.4M	£2.3M - £2.5M
All Affected Aircraft	£1M - £1.2M	£2M - £2.2M	£3.2M - £3.6M

Table 1: Estimated Average Aircraft Equipage Costs Per Year (2008-2012)

Table 2 below sets out the **estimated total present value cost** of upgrading affected aircraft below 5,700 kg to SSR Mode S capability. It includes an estimate for those aircraft based in the UK but registered overseas. These estimates also include VAT and institutional costs. A discount rate of 3.5% has been used in accordance with the requirements of the Treasury Green Book.

Overall Total Present Value Cost by 2012	**Low Estimate**	**Medium Estimate**	**High Estimate**
Privately Owned Aircraft	£1.4M to £1.7M	£2.7M to £3M	£3.5M to £4.1M
Aircraft Owned by Business/Organisations	£2.5M to £2.8M	£5M to £5.5M	£8.6M to £9.4M
All Affected Aircraft	£4M - £4.4M	£7.6M - £8.5M	£12M - £13.5M

Table 2: Estimated Total Present Value Aircraft Equipage Costs by 2012

The CAA considers that there would be no additional administrative burdens associated with the implementation of this proposal, as it centres on the procurement and installation of replacement transponders. It is expected that much of this process would be undertaken by the design organisations completing the installations on behalf of the businesses. There would also be no ongoing additional administrative burden or operating costs over and above what is already required for operating the existing 'classical' SSR transponders on the aircraft. Checks will be incorporated into the airworthiness certification process.

6 Small Firms Impact Test

6.1 An analysis of the latest accounts submitted to Companies House by a sample of small companies operating aircraft with 'classical' SSR transponders has compared the estimated cost of equipage of SSR Mode S under Option 2 with the latest annual profits and turnover reported by those companies. All companies required to return accounts to Companies House must submit a balance sheet from which annual profit or loss can be derived. Only those companies required to submit a full return, usually the larger ones, need reveal their turnover for the year. As a result, figures for profits of a small business are much more readily available than those for turnover.

6.2 Nearly half of the companies studied registered losses in the last accounts submitted to Companies House. Since all of these companies consider themselves 'going concerns', the size of the equipage cost of SSR Mode S compared to the size of their annual loss is as significant as the comparison to the profits of the remainder of the companies studied. Of the 49 companies whose accounts were sampled, for 15 the estimated initial cost of equipage for SSR Mode S under Option 2 was less than 10% of their last reported profit (or loss) and for 24, it was less than 25%. However, for 17 of the companies, the cost of Mode S equipage under Option 2 would be greater than the total reported profit (or loss) for the year. Only 17 of the sampled small companies needed to submit full accounts for the year and so reported their turnover. For 13 of these the total cost of aircraft equipage represented less than 10% of the annual turnover and for 16 it was less than 25%.

6.3 During the public consultation, many small aviation-related companies reported that margins were small and that any requirement to install new transponders in their aircraft would have a severe impact on their businesses. Many reported that they would have to cease trading or sell aircraft to raise sufficient funds to equip the remaining fleet. This would impact the revenue earning capability of the business. Alternatively, the increased costs would have to be passed on the customers with the potential resultant loss of business. In particular, profit margins were cited as already being extremely low in the flying training market. Therefore, a potential unintended consequence on small flying schools could be that any costs passed on to customers may potentially make the price of obtaining a Private Pilot's Licence in the UK more expensive than travelling abroad for 3 to 4 weeks to obtain the training.

6.4 To try and assist businesses with the equipage requirement for Option 2, the CAA, in conjunction with Government, is currently investigating the potential for funding lines with which to offset institutional and certification costs related to the installation of

SSR transponders. The administrative and financial burden for these areas is now mainly related to the role of the European Aviation Safety Agency (EASA), and this is outside the control the CAA. However, it may be possible to use any potential funding identified for the benefit of all affected parties, not just businesses in the General Aviation sector. In addition, the CAA intends to implement an extended Transition Period, which is set out in Paragraph 9.2 below, to allow businesses a significant period of time in which to arrange for the procurement of the required equipment.

7 Competition Assessment

7.1 These policy proposals would affect only those businesses that did not need to equip aircraft in response to the earlier introduction of SSR Mode S into major terminal and en route airspace with effect from 31 March 2005. Therefore, in terms of competition issues, the following two cases need to be considered:

a. Markets where some aircraft owned and operated by businesses are currently mandated to be equipped with SSR Mode S and some are not.

b. Markets where no aircraft are currently mandated to be equipped with SSR Mode S.

7.2 In the former case highlighted in Paragraph 7.1a, these are the markets where some but not all users were affected by the earlier regulation. These new policy proposals are, in effect, the reverse of the earlier requirements; those companies that were obliged to equip with SSR Mode S transponders from 31 March 2005 would not need to do so now, and those companies that did not need to equip by 2005 would now need to do so with effect from 31 March 2008. Therefore, the effects on competition can be assumed to be the reverse of those experienced in response to the earlier regulation. The markets affected by the earlier regulation were set out in the published RIA consultation documents as: commercial air transport, air taxi and air ambulance operations, pilot training schools, corporate aircraft services and aerial work services. The CAA sought representations from these sectors as to the likely effect of the earlier SSR Mode S regulation on competition issues but none were received. Nevertheless, a number of responses were received commenting on the burden of the initial equipage costs.

7.3 For the second case highlighted in Paragraph 7.1b above, concerning those markets where no aircraft are currently mandated to be equipped with SSR Mode S, two scenarios can be considered. In the first scenario, all users are currently mandated to carry SSR transponders and will all be affected by the proposed regulation; therefore, all users will need to upgrade to SSR Mode S. Since all users will be affected equally, any competition effects that arise will be transitory. In the second scenario, only some of the users are currently mandated to carry SSR and so only these users will be mandated to switch to SSR Mode S. There may be some initial adjustments in some of the markets where the costs of equipage are passed on to customers. In these cases, it is considered likely that some of the larger businesses may be able to absorb the initial equipage costs more easily than small firms, which would place them at a competitive advantage for pricing their services during the early years of any implementation. A small proportion of the customers of these businesses may also look to overseas companies for cheaper services.

7.4 Since the ongoing maintenance costs of SSR Mode S transponders are not likely to be significantly different to 'classical' SSR then, once the transition period is complete, competition in these markets will remain the same as at present. Also, since, in most cases, the cost of equipping with SSR Mode S is not significantly different to the cost of 'classical' SSR, the proposed regulation will not create any barriers to entry in the market.

8 Enforcement, Sanctions and Monitoring

8.1 Through its responsibility to issue permits under Air Navigation Order (ANO) 2005 Article 138, the DfT could enforce the requirement for operators of foreign registered public transport aircraft to equip with SSR Mode S before being allowed to fly in UK airspace. Similarly, permits for foreign registered aircraft conducting aerial work could be issued under ANO 2005 Article 140.

8.2 The issue and renewal of Certificates of Airworthiness and equipment approvals to aircraft operators in the UK, and the conduct of inspections of aircraft to confirm equipage, would supplement this process. EASA and the CAA Safety Regulation Group would conduct these functions under existing arrangements. The Wireless Telegraphy Act (WTA) Licensing process for radionavigation equipment carried on aircraft, which is managed by the CAA, would also be used to monitor and enforce equipage. Furthermore, those air traffic service providers equipped with SSR Mode S surveillance sensors will be able to monitor the equipage state of aircraft and report any deficiencies. It is considered that these mechanisms will be sufficient for monitoring the effectiveness of this regulation.

9 Implementation and Delivery Plan

9.1 Option 1, maintaining the status quo, would require no implementation or delivery.

9.2 For Option 2, it is the intention that the amended transponder carriage regulations would take effect from 31 March 2008, with a four year Transition Period until 31 March 2012 in which to allow aircraft operators sufficient time to upgrade existing transponder installations on their aircraft to SSR Mode S capability. This is aligned with the implementation of SSR Mode S in the ground-based radars and ATM systems by NATS, which is due to be completed in 2012.

9.3 The requirements for the carriage and operation of SSR transponders are contained within Article 20(2) and Schedule 5 of the Air Navigation Order 2005 and in Part 6 of the Air Navigation (General) Regulations 2006. Therefore, Option 2 would require the preparation of a suitable amending Statutory Instrument. The aim would be to lay this RIA and the associated draft regulatory amendments before Parliament by December 2007.

9.4 SSR transponder carriage requirements are further promulgated to Stakeholders in the UK Aeronautical Information Publication (General Section) at Paragraph 1-5-3. Therefore, under Option 2, this would need to be amended to specify that SSR Mode S Elementary Surveillance would be the minimum means of compliance where transponders have to be operated. Advance notice of any new requirements would also be promulgated to Stakeholders via Aeronautical Information Circulars, informative letters through the CAA's formal consultation mechanisms, and Press Notices. Information about new transponder carriage requirements, including this RIA, would also be promulgated on the CAA website.

9.5 Any general exemptions applied to the requirements by the CAA will be promulgated in the CAA's Official Record Series.

10 Post-Implementation Review

10.1 Under Option 2, the CAA would analyse the UK aircraft register during the transition period to identify progress with the level of equipage with SSR Mode S transponders. Exemption processing during the transition period would also provide information on aircraft equipage. The effectiveness of the implementation of SSR Mode S on safety and capacity, and the level of aircraft equipage, would also be monitored and reviewed in conjunction with NATS, the UK Airprox Board, and through the review of reports arising from the CAA's Mandatory Occurrence Reporting Scheme.

10.2 Routine, periodic consultation with Stakeholders through the CAA's formal and informal consultation mechanisms will also provide regular information on the level of equipage, actual implementation costs and any realised benefits.

11 Summary and Recommendation

11.1 Summary Costs and Benefits Table

Option	Total benefit per annum: economic, environmental, social	Total cost per annum: - economic, environmental, social - policy and administrative
1	No additional costs to Stakeholders.	No directly attributable costs.
2	Mode S will reduce the amount of SSR interference and manage replies from aircraft transponders more effectively, thereby enabling increased numbers of aircraft to be handled within a given volume of airspace. This provides an enabling contribution to the realisation of the benefits identified in the White Paper on “The Future of Air Transport” through improved safety, increased capacity of the ATM system and reduced controller workload.	Between £1M and £3.6M average cost per year between 2008 and 2012, of which £0.65M to £2.5M is estimated to fall on businesses and other organizations.

Table 3: Summary of Costs and Benefits

11.2 Recommendation

The CAA is minded to recommend to the Secretary of State for Transport that the ANO 2005 be amended to adopt Option 2 and mandate SSR Mode S Elementary Surveillance as the means of compliance in the circumstances where SSR transponders have to be operated outside of major terminal and en route airspace. This complements the previous implementation of SSR Mode S Enhanced Surveillance in major terminal and en route airspace and would address the safety and ATM productivity deficiencies associated with the current ‘classical’ SSR system. It is also in line with the strategic framework set out in the White Paper on “The Future of Air Transport” by taking a further necessary incremental step for ensuring that the capacity of UK airspace and the supporting ATM systems will match future airport capacity. It also ensures consistency with SSR Mode S developments in the rest of Europe.

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Annex A. UK Air Transport Movement Statistics and Forecasts

CAA Airport Movement Statistics[13]

London Area Airports	1996	2006	Change	%
	(000s of Movements)			
GATWICK	209	254	45	22%
HEATHROW	427	471	44	10%
LONDON CITY	25	66	41	164%
LUTON	28	79	51	182%
STANSTED	75	190	115	153%
Total London Area Airports	**765**	**1061**	**296**	**39%**

Other UK Airports	1996	2006	Change	%
	(000s of Movements)			
ABERDEEN	78	98	20	26%
BELFAST CITY	35	37	2	6%
BELFAST INTERNATIONAL	33	48	15	45%
BIRMINGHAM	77	109	32	42%
BLACKPOOL	7	13	6	86%
BOURNEMOUTH	4	12	8	200%
BRISTOL	26	66	40	154%
CARDIFF WALES	16	22	6	38%
COVENTRY	5	8	3	60%
DONCASTER SHEFFIELD	-	7	-	-
DURHAM TEES VALLEY	10	12	2	20%
EDINBURGH	66	116	50	76%
EXETER	6	15	9	150%
GLASGOW	75	97	22	29%
HUMBERSIDE	8	13	5	63%
INVERNESS	6	17	11	183%
ISLE OF MAN	19	32	13	68%
KIRKWALL	8	10	2	25%
LANDS END (ST JUST)	-	4	-	-
LEEDS BRADFORD	24	37	13	54%
LIVERPOOL	23	48	25	109%
MANCHESTER	141	213	72	51%
NEWCASTLE	39	58	19	49%
NEWQUAY	-	10	-	-
NORWICH	12	21	9	75%
NOTTINGHAM EAST MIDLANDS	35	56	21	60%
PLYMOUTH	6	5	-1	-17%
PRESTWICK	9	19	10	111%
SCATSTA	4	11	7	175%
SOUTHAMPTON	24	46	22	92%
STORNOWAY	3	7	4	133%
SUMBURGH	20	7	-13	-65%
WICK	4	3	-1	-25%
Total Other UK Airports	**863**	**1315**	**452**	**52%**
Total All Reporting UK Airports	**1630**	**2376**	**746**	**46%**

[13] Source: http://www.caa.co.uk/default.aspx?categoryid=80&pagetype=88&pageid=3&sglid=3

Figure 1: Commercial Air Transport Movements UK Airports – 1996 to 2006 (Thousands)

London Area Airports	2002	2006	Change	%
	(000s of Movements)			
GATWICK	234	254	20	9%
HEATHROW	460	471	11	2%
LONDON CITY	53	66	13	25%
LUTON	55	79	24	44%
STANSTED	152	190	38	25%
Total London Area Airports	**955**	**1061**	**106**	**11%**

Other UK Airports	2002	2006	Change	%
	(000s of Movements)			
ABERDEEN	80	98	19	23%
BELFAST CITY	37	37	0	0%
BELFAST INTERNATIONAL	39	48	10	25%
BIRMINGHAM	112	109	-3	-3%
BLACKPOOL	8	13	5	67%
BOURNEMOUTH	8	12	4	58%
BRISTOL	46	66	20	44%
CARDIFF WALES	19	22	3	18%
COVENTRY	4	8	4	116%
DONCASTER SHEFFIELD	-	7	-	-
DURHAM TEES VALLEY	9	12	3	29%
EDINBURGH	105	116	11	11%
EXETER	5	15	10	183%
GLASGOW	87	97	10	11%
HUMBERSIDE	15	13	-2	-12%
INVERNESS	10	17	7	77%
ISLE OF MAN	25	32	7	30%
KIRKWALL	8	10	2	25%
LANDS END (ST JUST)	-	4	-	-
LEEDS BRADFORD	29	37	8	29%
LIVERPOOL	33	48	15	46%
MANCHESTER	178	213	36	20%
NEWCASTLE	44	58	14	32%
NEWQUAY	-	10	-	-
NORWICH	14	21	7	50%
NOTTINGHAM EAST MIDLANDS	49	56	7	15%
PLYMOUTH	5	5	0	6%
PRESTWICK	15	19	4	25%
SCATSTA	10	11	1	7%
SOUTHAMPTON	28	46	18	66%
STORNOWAY	4	7	3	59%
SUMBURGH	6	7	2	27%
WICK	2	3	1	25%
Total Other UK Airports	**1069**	**1315**	**247**	**23%**
Total All Reporting UK Airports	**2023**	**2376**	**353**	**17%**

Figure 2: Commercial Air Transport Movements UK Airports – 2002 to 2006 (Thousands)

Medium-Term Forecast for UK Air Traffic Movements[14]

Forecast Scenario	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	IFR Movements (000s)									
High				2,480	2,567	2,670	2,769	2,864	2,957	3,043
Base	2,155	2,265	2,384	2,460	2,535	2,603	2,674	2,763	2,845	2,928
Low				2,441	2,499	2,550	2,606	2,663	2,716	2,771

Forecast Scenario	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average Annual Growth 2005 - 2012
	Growth Rates										
High				4.0%	3.5%	4.0%	3.7%	3.4%	3.2%	2.9%	3.5%
Base		5.1%	5.3%	3.2%	3.0%	2.7%	2.7%	3.3%	3.0%	2.9%	3.0%
Low				2.4%	2.4%	2.1%	2.2%	2.2%	2.0%	2.0%	2.2%

Figure 3: EUROCONTROL Growth Forecasts for UK Airspace 2005-2012 (Thousands)

Long-Term Forecast for UK Air Traffic Movements[15]

Forecast Scenario	2003	2004	2005	2012	2015	2020	2025	Average Annual Growth 2005 - 2025	Traffic Multiple 2005 - 2025
	IFR Movements (000s)								
A				3,183	3,428	4,010	4,566	3.3%	1.9
B				3,027	3,192	3,676	4,151	2.8%	1.7
C	2,156	2,265	2,385	3,027	3,114	3,558	3,959	2.6%	1.7
D				2,885	2,988	3,298	3,627	2.1%	1.5

Figure 4: EUROCONTROL Growth Forecasts for UK Airspace 2005-2025 (Thousands)

[14] Source: EUROCONTROL Medium-Term Forecast: IFR Flight Movements 2006-2012 Volume 2.
[15] Source: EUROCONTROL Long-Term Forecast: IFR Flight Movements 2006-2025.

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Annex B. The Need to Phase Out 'Classical' Secondary Radar in the UK

1 Accurate Detection of Aircraft

1.1 The information that current 'classical' Secondary Surveillance Radar (SSR) systems can obtain from suitably equipped aircraft comprises position, altitude (known as SSR Mode C) and a 4-digit identity code (known as SSR Mode A). It is the SSR transponders fitted to aircraft that provide this information. A general request for this information is sent out by the radars on one radio frequency and the replies from aircraft transponders flying within the coverage of the radars are then received on a second frequency. As the number of radars installed in the UK and adjacent European States has increased and traffic levels have grown, there are now more aircraft being asked to provide replies containing this information more often. This is leading towards a potential eventual saturation of the radio frequency used for SSR replies. If frequency saturation does occur, the ability of the radars to detect and identify aircraft accurately will be compromised and levels of safety will decrease.

1.2 The National IFF/SSR Committee, which is the body responsible for the day-to-day management of the SSR frequencies, believes that a new SSR system must be deployed gradually over the next 5 years in order to reduce the loading on the SSR frequencies and facilitate continued safe detection of increasing levels of traffic.

1.3 Another important limitation of the current SSR system is that information in replies received simultaneously from multiple aircraft flying in close proximity can overlap; this leads to the information becoming 'garbled' and unreadable, and false radar responses may also be produced. This is a particular risk in busy controlled airspace, such as that around airports. Height information received from aircraft can also be corrupted, denying information to Air Traffic Controllers that is critical to the safe conduct of flights.

1.4 Furthermore, while in the process of replying to one radar, an aircraft SSR transponder cannot respond to other requests from radars or collision avoidance safety nets. This can, therefore, affect the ability of radars to detect aircraft, or update the position of the aircraft, quickly. As traffic levels are forecast to increase still further, this situation could become unsustainable in the busy portions of UK airspace. Currently, these risks are managed by employing Air Traffic Control (ATC) constraining procedures to limit the flow of aircraft. Without a new technology, the delays associated with these flow controls will increase, resulting in increased costs to the aviation industry and passengers.

1.5 Ageing 'classical' SSR interrogators have capacity limitations on the number of aircraft that can be displayed simultaneously, which could constrain traffic growth. In addition, as the current SSR technology is old, the techniques for correcting information errors are relatively basic. This can result in instances where false radar tracks are created when the radio waves that are carrying the information are reflected from large objects, such as tall buildings. Some modern replacement SSR systems have greater track capacity but, within Europe, the 'classical' SSR systems are mostly being replaced by SSR Mode Select (Mode S) technology, which offers other benefits in addition to the increased track capacity. National Air Traffic Services (NATS) has committed to a programme replacing all its 'classical' SSR systems throughout the UK with Mode S radars by 2012 and it also has a future upgrade programme for its Flight Data Processing Systems to be able to process Mode S data. There is a risk that the safety and enabling economic benefits of the investment being made in SSR Mode S radars in the UK will not be maximised unless 'classical' SSR transponders currently fitted to aircraft are also updated to Mode S standards.

1.6 The ability to allow the military authorities to employ new Identification Friend of Foe (IFF) systems in peacetime could also eventually be compromised if the congestion on the SSR radio frequencies becomes unsustainable. This is because these military IFF systems utilise the same 2 radio frequencies as civil SSR.

2 Use of SSR Identity Codes

2.1 The replies of the four-digit identity codes that are received from SSR transponders fitted to aircraft are used on ATC displays to identify individual flights. Unfortunately, the current SSR system was designed to support a total of only 4096 codes. Consequently, with current traffic levels, ATC units already run out of codes to allocate to flights during peak periods and aircraft have to be held on the ground until spare codes become available. This increases delays and costs to the aviation industry and passengers. As the levels of traffic are set to increase still further in the future, this situation will become progressively worse.

2.2 Currently, increasingly complex procedural methods and ATC system functionality are employed to reduce this risk. These activities impact on both controller and pilot workload and hence reduce traffic handling capacity. Furthermore, with the current SSR system, there is a phenomenon whereby ATC tracking systems can accidentally transfer the four-digit information between aircraft tracks that have crossed on radar displays. There is also the risk that one code could be allocated accidentally to 2 aircraft at the same time. If either situation occurs, controllers can lose their situational awareness of aircraft. To protect against these situations, procedural measures that constrain traffic currently have to be employed, thereby further contributing to delays and costs.

3 Controller Workload

3.1 Using an SSR system, information received from aircraft can be employed to automatically alert controllers when conflicts arise between aircraft. Ground-based systems such as ‘Short Term Conflict Alert’ rely on the data provided by SSR being accurate. SSR frequency congestion and height data corruption increase the incidence of false alarms on these systems. False alarms increase the workload of controllers significantly and produce distractions. Increased controller workload means that less traffic can be handled safely and so these false alarms already contribute to delays and costs to the aviation industry and passengers.

3.2 This situation will worsen as traffic levels continue to rise. Moreover, the current complexity of ATC procedures and the need for many radio messages increases the workload of pilots and controllers. Currently, limitations on the flow of traffic have to be introduced to alleviate this workload. This high workload also means that there is limited spare capacity available to implement measures that would increase traffic flow in the UK. Mindful of the White Paper on “The Future of Air Transport” in the UK, it is vital that airspace design and the Air Traffic Management system can handle the flow of traffic necessary to ensure that increased airport capacity benefits are delivered. A new SSR system is therefore needed as soon as possible to help reduce controller workload.

4 Interoperability with European Neighbours

4.1 ATC systems throughout the European mainland are currently being modernised to incorporate SSR Mode S. If this new SSR system is not implemented in the UK, workload at the UK airspace boundaries will be increased significantly as controllers transfer traffic to and from the more modern ATC systems.

4.2 Current plans in the States neighbouring the UK will implement Mode S fully in airspace where SSR transponders are mandatory from 31 March 2007 for IFR flights and from 31 March 2008 for VFR flights. Potentially, the UK’s ability to take maximum advantage of the opportunities offered by the ‘Single European Sky’ initiative would be at risk if the UK SSR system was not completely interoperable with these new European mainland Mode S systems. In any case, the UK may soon be obliged to introduce the wider use of SSR Mode S on aircraft, as a European Commission (EC) draft interoperability implementing rule has recently been circulated for consultation that contains a preferred option for the carriage of Mode S on all IFR flights operating as General Air Traffic.

5 Interoperability with Airborne Collision Avoidance Systems (ACAS)

5.1 On 1 Jan 2005, ACAS II fitment was mandated within the UK and the rest of Europe for all civil fixed-wing turbine-powered aeroplanes having a maximum take-off mass exceeding 5,700 kg, or a maximum approved passenger seating configuration of more than 19. This mandate was not related to specific airspace and so ACAS II is now being used in all classifications of UK airspace in which aircraft that are captured by the mandate operate.

5.2 ACAS equipment operates on the same radio frequencies that are used by SSR systems. Due to the congestion problems on the SSR frequencies, and the fact that ACAS shares some common technical aspects with SSR Mode S systems, ACAS cannot currently operate to maximum efficiency in UK airspace. Moreover, no safety net benefits are provided to ACAS II equipped aircraft when in confliction with aircraft that are not carrying and/or operating an SSR transponder. Therefore, the full benefits of having this widespread ACAS fitment are not currently being maximised in UK airspace.

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Annex C. Description of SSR Mode Select

1 Overview

1.1 Secondary Surveillance Radar (SSR) Mode Select (Mode S) is a co-operative surveillance and communication system for Air Traffic Control (ATC) purposes. It employs ground-based interrogators and airborne transponders. Furthermore, ground-air-ground data link communications can be accommodated integrally with surveillance interrogations and replies. Mode S has been designed as an evolutionary improvement to the existing 'classical' SSR system operating in Modes A and C, and it provides the necessary improved surveillance, communication capability and capacity required to handle the forecast increased levels in air traffic. Both ground and airborne Mode S installations are backwards compatible in that Mode S interrogators will provide surveillance of aircraft equipped with Mode S and Mode A/C transponders and Mode S transponders will reply to existing SSR Mode A/C and Mode S interrogations. Mode S and Mode A/C interrogations are all made on 1030 MHz and all replies are made on 1090 MHz.

1.2 The 'monopulse' technique used in Mode S surveillance affords excellent position determination of SSR targets and, furthermore, selective interrogation techniques used by Mode S radars reduce the number of required replies by transponders. This reduction of replies is extremely beneficial to the SSR Radio Frequency (RF) environment. This means that full safety and effective airspace management benefits can be realised in a sustainable environment.

2 Principles of Mode S Operation

2.1 **Aircraft Addressing**. A principal feature of Mode S is that each aircraft is assigned an individual and unique identification number. This is known as an ICAO 24-bit Aircraft Address (AA), which is preset and cannot be changed from the cockpit. Although bound to the individual airframe identity, it has no direct relationship to the operational aircraft identification (i.e. callsign used in flight), other than during a specific flight. For the same reason that aircraft identification, and not the airframe identity, is used as the primary Air Traffic Management (ATM) reference, except in specific circumstances where the two are the same, the ICAO 24-bit AA will not be exposed to, or used by, operational ATC staff. Using this unique address, interrogations can be directed selectively to a particular aircraft and replies identified unambiguously. Channel interference is minimised because a radar can limit its interrogations to targets of interest. In addition, by proper timing of interrogations, replies from closely spaced aircraft can be received without mutual interference. The unique address in each interrogation and reply also permits the inclusion of data link messages to or from particular aircraft. There are nearly 17 million AAs available for use worldwide and the first few digits of each address identify the country of registration or origin. This is more than sufficient to accommodate the envisaged traffic growth in the ATC environment. In the UK, ICAO 24-bit AAs are assigned to civil aircraft by the CAA.

2.2 **Interrogator Codes**. Another key feature of Mode S is the use of Interrogator Codes (ICs), which are codes assigned to the Mode S radars so that their transmissions can be identified uniquely by aircraft transponders. The ICs comprise 15 Interrogator

Identifier (II) and 63 Surveillance Identifier (SI) codes[16]. The purpose of both these types of ICs is to allow for unambiguous data exchange between radars and aircraft transponders. Unlike ‘classical’ SSR sensors, a Mode S radar has two methods of interrogating aircraft transponders: a general ‘All Call’ and a selective ‘Roll Call’. An ‘All-Call’ request is used by a Mode S radar to acquire Mode S equipped aircraft entering its area of radar coverage, which will reply with their unique ICAO 24-bit AAs. After acquisition of an aircraft’s ICAO 24-bit AA has been achieved, ‘lock-out’ protocols can then be used (based on the IC that the radar is using) to suppress further replies from the aircraft to any ‘All-Call’ requests by the same interrogator. The aircraft transponder will, however, continue to reply to ‘All Call’ requests from other Mode S radars using different ICs until they also apply ‘lock out’; they will also continue to reply to ‘classical’ SSR interrogations. In effect, the ICs identify the Mode S radars to which the transponders should reply or ignore. Following an ‘All-Call lock-out’ by a particular Mode S radar, that radar will then selectively address an aircraft transponder using a ‘Roll-Call’ interrogation. Only the specifically addressed aircraft will reply and this is commonly referred to as the ‘Mode S period’. The use of ICs also allows radars to discard replies that are not intended for them. It is this implementation of the ‘All-Call lock-out protocols’ and the ‘Roll-Call’ interrogations that reduces RF pollution and the problems associated with an interference phenomenon known as FRUIT (False Replies Unsynchronised In Time) and the general levels of over interrogation, which are typical of conventional SSR.

3 Mode S Surveillance Functionality

3.1 **Elementary Surveillance**. Mode S Elementary Surveillance (ELS) is the minimum surveillance functionality foreseen for aircraft equipped with any type of Mode S transponder. For Mode S ELS, the following information is provided by a transponder:

a. **Range and Azimuth**. Range and azimuth measurement is made from a single reply to a selective addressed interrogation. Position information will be of a similar accuracy to monopulse ‘classical’ SSR but it will not suffer from the same plot resolution problems when aircraft are very close together.

b. **Mode A and Mode C Decodes**. The routine selective addressed interrogation that is made each scan will request pressure-altitude information from an aircraft transponder. The same information is available as with the present Mode C but with a capability to decode altitudes to 25 ft precision. Selective addressed interrogations are also used to obtain Mode A ‘identity’ codes. Mode A information need not be requested on every scan as there is a ‘bit set’ in the ‘Roll-Call’ reply from the aircraft to highlight when its Mode A code has changed. Therefore, the Mode A code will only be requested when the aircraft is first acquired, re-acquired or when the Mode A code value is changed. This differs from existing systems when the Mode A code is requested from all aircraft within coverage on every scan.

c. **ICAO 24-bit AA**. Mode S ELS provides the ICAO 24-bit AA to enable discrete identification of the aircraft by the interrogating radar system.

[16] II codes and SI codes function in the same way for ‘locking out’ transponders from replying to the general acquisition ‘All Call’ interrogations from radars. However, the use of SI codes limits the range of air-ground protocols that can be supported by radars. For example, the periodic extraction of ‘dataflash’ information is not possible for radars using SI codes. Nevertheless, radars using SI codes can support Mode S Elementary Surveillance and Enhanced Surveillance protocols.

d. **Aircraft Identification**. In addition to the Mode A code, an aircraft identification is provided in the form of a Downlinked Aircraft Parameter (DAP). This is an alpha-numeric string set that the flight crew are required to set on the transponder for transmission to correspond with the aircraft identification specified in Item 7 of the ICAO Flight Plan. If no Flight Plan has been filed, the transponder is required to report the aircraft registration. This information will be displayed to air traffic controllers and will form the primary means of identifying flights on controller workstations at suitably equipped units. The information will also be used by operational systems as a suitable aircraft identifier and will eventually replace the current usage of the 4096 Mode A Codes for this purpose. Requirements for the data contained in the Mode S aircraft identification feature are detailed in Appendix 2 to ICAO Annex 10, which have recently been reinforced by the CAA in AIC 4/2006 (Yellow 187) dated 5 January and in AIC 37/2007 (Yellow 240) dated 26 April.

e. **Transponder Capability**. The Transponder Capability Report is, in effect, a 'Data Link Capability Report'. Its purpose is to indicate to the radar the ability of the aircraft transponder to handle additional Mode S data link functionality. It is extracted when the aircraft is first acquired and is transmitted in the form of a DAP.

f. **Flight Status**. The Flight Status functionality will indicate whether the aircraft is airborne or on the ground and could also be used to notify emergency conditions. The Flight Status report includes the 'Squawk Ident' function and takes the form of a DAP.

3.2 **Enhanced Surveillance**. Mode S Enhanced Surveillance (EHS) provides all the functionality of ELS but, in addition, it provides data link functionality and access to additional DAPs. In order to achieve this, the aircraft must have an interface between the transponder and its avionics system. It is, therefore, generally only supported by aircraft with modern 'digital' avionics and is most useful to the ATC community in the busy terminal and en route environments. The additional DAPs available are divided into the following 2 categories:

a. **Aircraft Current State Vector Information**. The aircraft current state vector information indicates the current state of motion of the aircraft. The information available can include:

(1) Ground Speed.

(2) Track Angle.

(3) Turn Rate.

(4) Roll Angle.

(5) Climb Rate.

(6) Magnetic Heading.

(7) Indicated Air Speed.

(8) Mach No.

b. **Aircraft Intention Information**. Aircraft intention information may be available from the avionics to indicate the future path of the aircraft. This information may be displayed to controllers and used to enhance safety net systems such as 'Short Term Conflict Alert (STCA)'. The information available includes Selected Altitude and the Barometric Pressure Setting on which this is based; this is of considerable importance for helping controllers to notice and prevent potential 'level busts' by aircraft.

3.3 **Differing Levels of Transponder Capability**. In accordance with ICAO Annex 10, Volume IV, to the Chicago Convention on international civil aviation, all SSR Mode S-capable transponders must conform to one of the following five levels:

a. **Level 1**. This permits radar surveillance of aircraft based on pressure-altitude reporting and the Mode A identity code using the selective addressing. Level 1 Mode S transponders are no longer valid in UK and other European airspace.

b. **Level 2**. This has the same capability requirements as Level 1 but also permits aircraft identification reporting and other standard length data link communications to be conducted. Level 2 is the minimum standard required for SSR Mode S transponders in UK and other European airspace.

c. **Level 3**. This has the same capability requirements as Level 2 but also permits extended length ground-to-air data link communications.

d. **Level 4**. This has the same capability requirements as Level 3 but also permits extended length air-to-ground data link communications.

e. **Level 5**. This has the same capability requirements as Level 4 but also permits extended length link communications with multiple interrogators without requiring the use of multi-site reservations.

f. **Suffixes**. SSR Mode S transponders that are capable of 1090 MHz 'Extended Squitter', which is explained below, are annotated with the suffix "e". For example, a Level 2 transponder with 'Extended Squitter' capability would be designated 'Level 2e'. Additionally, SSR Mode S transponders with the ability to process SI codes, which is explained above, are annotated with the suffix "s". Hence, a Level 2 transponder capable of 'Extended Squitter' and of processing SI codes would be designated 'Level 2es'. Under Option 2 set out in this policy proposal, the SSR Mode S ELS capable transponders would have to be a minimum of 'Level 2s' to be compliant.

4 Additional Mode S Functionality

4.1 **Controller Access Parameters (CAPs)**. CAPs are those DAPs that are available for display to air traffic controllers. These CAPs will typically include magnetic heading, indicated airspeed and selected altitude.

4.2 **System Access Parameters (SAPs)**. SAPs are those DAPs that are available to ATC systems and tools. These SAPs will typically include selected altitude, ground speed, true track angle, roll angle, vertical rate and track angle rate.

4.3 **'Squitter' Transmissions**. A Mode S transponder will periodically emit an unsolicited transmission of position and other parameters. This transmission is commonly referred to as a 'Squitter'. The functionality can be used to support the passive acquisition of a Mode S target by either ground or airborne users. The 'Squitter' transmission is issued on the Mode S reply frequency 1090 MHz and its functionality includes the following:

a. **Acquisition Squitter**. Acquisition Squitter is used primarily by Airborne Collision Avoidance Systems (ACAS) and by ground-based 'multilateration' systems, particularly to support surface movement surveillance techniques. The Acquisition Squitter contains the unique ICAO 24-bit AA.

b. **Extended Squitter**. Mode S 1090 MHz 'Extended Squitter' is a means by which Mode S can provide Automatic Dependant Surveillance - Broadcast (ADS-B), which is a surveillance system based on unsolicited broadcasts of information from aircraft. The 'Extended Squitter' messages are transmitted every half second and contain additional information to the Acquisition Squitter, including position reports, altitude, aircraft identity and other Aircraft Derived Data (ADD) parameters. It is one of the three recognised ADS-B data links and is sometimes referred to as 1090ES.

5 Summary of the Specific Benefits of Mode S Elementary Surveillance

5.1 The benefits of the use of SSR Mode S ELS over the current 'classical' SSR technology are as follows:

a. SSR Mode S uses the SSR radio frequency spectrum much more efficiently and reduces the risk of interference. In turn, this reduced radio frequency 'congestion' permits a greater number of aircraft to be handled within a volume of airspace without adversely affecting the detection of aircraft on radar. Consequently, SSR Mode S is an enabler for increased capacity and reduced delays by maintaining or improving current levels of safety. This is particularly important in controlled airspace where there is generally a greater density of air traffic.

b. Every aircraft equipped with SSR Mode S is assigned a unique technical address that significantly improves the ability of ATC systems to discretely identify aircraft, particularly in high density airspace such as controlled airspace. In turn, this enables the safe and efficient handling of increased levels of air traffic, which facilitates increased capacity, optimises climb and descent profiles for the best environmental fit and reduced delays.

c. Aircraft equipped with SSR Mode S transponders can automatically transmit the callsign used in flight or an aircraft's registration marking directly to ground ATC systems. This means that the four-digit identity codes currently assigned by ATC units to aircraft for identification purposes are no longer required. As there are only 4096 of these four-digit codes available with 'classical' SSR for global use, there are now serious shortages for meeting increasing traffic demand. Therefore, use of the SSR Mode S aircraft identification feature completely overcomes these shortages and enables further traffic growth through increased capacity and reduced delays. It also overcomes safety risks associated with the unauthorised or inadvertent use of the four-digit codes, which can lead to the misidentification of aircraft on ATC systems when two aircraft appear with the same code.

d. SSR Mode S is being introduced by the neighbouring European States of France, Belgium, and The Netherlands for IFR and VFR flights in designated airspace. Germany, Switzerland and Luxembourg also have similar implementation plans. Therefore, the proposed policy Option 2 in this RIA would enable improved interoperability and harmonisation of the UK ATM system with our immediate European neighbours.

e. SSR Mode S improves the effectiveness with which ground-based and airborne collision avoidance safety nets, such as STCA and ACAS, operate. For example, ACAS II, which is fitted to all aircraft over 5,700 kg or with greater than 19 seats, uses Mode S technology. Although ACAS II is backwards compatible with ‘classical’ SSR transponders, it works much more efficiently when interacting with aircraft equipped with SSR Mode S transponders.

f. SSR Mode S reduces controller workload by reducing the amount of time a controller may need to spend resolving aircraft identification, radar detection and aircraft tracking anomalies.

g. The Mode S 1090 MHz ‘Extended Squitter’ functionality on transponders provides a means by which ADS-B based services can be delivered. ADS-B is one pillar of the European surveillance strategy and ‘Extended Squitter’ has been accepted by ICAO as the initial means by which these services will be provided. Consequently, Mode S can provide a migratory path to the implementation of ADS-B in the UK.

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Annex D. Summary of Consultation Conducted

1 Notification and Informal Consultation

1.1 The CAA has been providing pre-notification of these proposals to the UK aviation industry since 1989. Publications that have been issued include the following:

a. Aeronautical information Circular (AIC) 121/89 (Yellow 156) published in 1989. *[This has since been superseded by subsequent AICs.]*

b. AIC 100/1997 (Yellow 268) published in 1997. *[This has since been superseded by subsequent AICs.]*

c. CAA Directorate of Airspace Policy (DAP) consultation paper entitled "Information on the Future Employment of Secondary Surveillance Radar (SSR) in the UK and the Associated Regulatory Impact", dated 31 January 2000.

d. AIC 88/2001 (Yellow 65) published in 2001. *[This has since been superseded by subsequent AICs.]*

e. AIC 105/2004 (Yellow 155), 'Secondary Surveillance Radar (SSR) – Mode S', published in November 2004. *[This has since been superseded by a subsequent AIC.]*

f. AIC 49/2005 (Yellow 171), 'SSR Mode S – Transition Arrangements', published in June 2005. *[This has since been superseded by a subsequent AIC.]*

g. AIC 27/2007 (Yellow 238), 'Carriage of SSR Mode S Transponders for IFR Flights Operating as General Air Traffic', published in April 2007.

1.2 The following informal consultation has also been undertaken within the last five years:

a. Informal consultation with CAA and aviation industry consultation groups:

(1) National Air Traffic Management Advisory Committee (NATMAC).
(2) Spectrum and Surveillance Working Group (SASWG).
(3) General Aviation Working Group (GAWG).
(4) General Aviation Consultative Committee (GACC).
(5) National IFF/SSR Committee (NISC).

b. Briefings and presentations to airspace user groups and their representatives, including:

(1) PPL/IR Europe.
(2) Aircraft Owners and Pilots Association (AOPA).
(3) CAA Safety Evening at the Fairoaks Airport Flight Centre to General Aviation pilots.
(4) Military Civil Air Safety Day at RAF Linton-on-Ouse to General Aviation pilots and military personnel.

c. Press briefings for aviation journalists.

2 Formal Public Consultation

2.1 Formal public consultation on the first stage of the CAA's proposals to phase out the use of 'classical' SSR in the UK commenced in October 2002. This consultation was aimed at introducing the use of SSR Mode S in major terminal and en route controlled airspace from 31 March 2005. A second round of formal consultation on the proposals was then commenced in January 2004. As a result, legislation was introduced to require the carriage and operation of SSR Mode S transponders in high density major controlled airspace. However, during the consultation for this first phase, the CAA also stated its intention to conduct further consultation on the expansion of the use of SSR Mode S in the rest of the UK from 31 March 2008, and to increase the number of aircraft required to be equipped with SSR transponders.

2.2 Formal public consultation on proposals for increased SSR transponder carriage and an expansion of the use of SSR Mode S was conducted between 3 June and 29 August 2006. A Partial RIA and accompanying questionnaire was issued to support this consultation. During the consultation period, the following consultation events were also conducted:

a. Consultation forum organised by the Royal Institute of Navigation and held at the RAF Club in London on 10 July 2006.

b. Consultation forum held at CAA House in London on 15 August 2006.

c. Consultation forum organised by the Lasham Gliding Society and held at the Lasham aerodrome on 17 August 2006.

d. Consultation forum organised by the Royal Institute of Navigation and held at the Barton aerodrome in Manchester on 23 August 2006.

3 Summary of Issues Arising From the Recent Formal Public Consultation

3.1 Over 3,100 responses were received from the most recent formal public consultation on expanding the deployment of SSR Mode S and increasing the carriage of SSR transponders. The CAA has published detailed results of the feedback received in these responses in the following two separate documents, both of which are freely available on the CAA website:

a. A "Summary of Responses Document", Issue 1.0, dated December 2006[17].

b. A "Response to Consultees Document", Issue 1.0, dated December 2006[18].

3.2 The CAA reviewed and analysed every response received and it was noteworthy that over 80% of consultees who responded were from the sailplane community, on whom some of the presented options would potentially have the greatest impact.

3.3 It was apparent from the feedback received that many stakeholders considered the issues involved to be extremely complex and the CAA's rationale and justification for the proposals to have not been clearly expressed within the required Partial RIA format. Many also felt that the period allowed for submission of responses was too short given the level of complexity of the proposals. Overall, a significant level of concern about the proposals was raised by sporting and recreational flyers, particularly in the gliding community, and the majority of these concerns were related

[17] Available on the CAA website at:
http://www.caa.co.uk/docs/810/Summary%20of%20Responses%20Document.pdf
[18] Available on the CAA website at:
http://www.caa.co.uk/docs/810/Response%20to%20Consultees.pdf

to the applicability of transponder carriage requirements to unpowered and very light aircraft, and on what transition and exemptions arrangements might be provided. Many also argued that the CAA's proposals would do little to improve the overall safety of General Aviation operations in Class G airspace and yet there would be a disproportionate aircraft equipage cost to this sector of the aviation industry.

3.4 There were some fundamental misconceptions in the responses from many stakeholders, such as:

a. Many consultees were under the mistaken impression that the MOD would not be expected to equip military aircraft.

b. Many consultees incorrectly believed that the proposals were just a precursor for a new airspace charging regime for VFR flights.

c. Many consultees incorrectly assumed that those aircraft that would not be technically able to equip with SSR transponders would be simply 'grounded' by the CAA after 31 March 2008.

d. Many respondents felt that the proposals were designed solely for the benefit of commercial air transport operators by allowing them greater use of Class G airspace.

e. Many consultees felt that the consultation was about proposals to introduce unrestricted flights by Uninhabited Aerial Vehicles (UAV) into Class G airspace.

f. Many consultees assumed that the CAA would insist on aircraft equipage, even if installation and through-life running costs of freely available and suitable SSR transponders would be totally disproportionate in relation to the overall value for some aircraft.

3.5 The CAA was also heavily criticised by many consultees for putting forward proposals that were dependent on an, as yet, unavailable Low Power SSR Transponder (LPST) that would suitably address the technical obstacles and operational requirements for use of transponders in gliders and very light aircraft at a reasonable price. The LPST is undoubtedly a significant element of the proposals and the CAA has been working with industry for several years to encourage the development of a transponder suitable for these types of aircraft. The CAA considers that the proposals would provide suitable regulatory encouragement to those manufacturers who are currently interested in producing an LPST. However, until suitable LPST products are available at a reasonable price, any applicability criteria and transitional arrangements would need take into account the operational, technical and financial barriers that would preclude certain aircraft from carrying and operating an SSR transponder. The CAA does not intend to 'ground' aircraft from 2008 under these proposals if suitable LPST units cannot be brought to market. Moreover, creating the regulatory framework will, without doubt, spur the market into action.

3.6 Another significant issue raised by Stakeholders during the public consultation was the potential adverse impact that an increased level of SSR transponders would have on existing ATC systems, particularly controller displays, and on collision avoidance safety net systems. Many consultees felt that existing systems would be 'swamped' with data and that the soaring profiles of gliders would render useless any 3D positional information provided by SSR transponders. Research into this area has been conducted, particularly in France, and more is planned by the CAA. There was also a misconception that ATC units would just filter out the responses in busy areas, such that there would be no benefits from equipage. However, SSR filtering is already an established ATC practice to manage the radar picture; SSR track labels are minimised by this procedure to reduce clutter. However, filtering does not deny the information to controllers should it be needed, nor does filtering inhibit automated safety systems such as Short Term Conflict Alert or 'switch off' transponders to deny the SSR information to other ATC units and collision avoidance systems in the area.

3.7 A major concern for the CAA is the feedback from many consultees that they did not perceive any safety benefits from the equipage of SSR transponders in the sporting and recreational aircraft that operate only in Class G airspace. Many felt that traffic growth predictions were either unrealistic or not relevant to operations outside of controlled airspace, and that collision risks with commercial and military aircraft were already minimal and would not be improved by these proposals. There was also considerable criticism of the CAA's reliance on "near-miss" Airprox statistics to support the proposals rather than on actual accident data.

3.8 The CAA was disappointed by this feedback, especially considering the support for increased transponder carriage that has been regularly expressed by members of the UK Airprox Board (UKAB) in their incident reports. Moreover, the CAA considers that the UK has maintained its world-leading safety record by being proactive with safety initiatives rather than waiting for a body of accident statistics to build up before action can be justified. Like the UKAB, the CAA is convinced that increased carriage and operation of SSR transponders in UK airspace will improve safety levels by reducing the risks of mid-air collisions. In particular, the utility of SSR data from aircraft for the warning and management of airspace infringements is invaluable. However, due to the limitations of current 'classical' SSR, any increased use of SSR transponders would have to be based on the new SSR Mode S technology. Additionally, the CAA considers that increased commercial demand and environmental pressures are likely to lead to significant future changes in the airspace structure, which will demand enhanced technical interoperability between all aircraft. Measures could include more direct routing of aircraft and greater use of continuous descent approaches.

3.9 There was some recognition in many responses that the use of 'classical' SSR transponders needed to be replaced in airspace where transponders are currently required, but particularly within controlled airspace. However, many felt that existing voluntary equipage with 'classical' SSR transponders for operation in open airspace should not be affected by the proposals, as the airspace was less congested and the transponders were already providing the necessary collision avoidance benefits to pilots and controllers.

4 Impact of the Consultation Feedback on the CAA Proposals

4.1 As a result of the assessment of the responses received during the public consultation, the CAA has reviewed the overall regulatory approach and revised it to obtain the most effective balance of delivering benefits, whilst managing the transition to offer mitigations where appropriate.

4.2 The CAA considers that the overall aim of maximising the carriage of SSR transponders in UK airspace based on SSR Mode S technology is still necessary and achievable. The policy objectives of enhancing safety through greater technical interoperability to deliver efficient use of the airspace, without wholesale expansion of controlled airspace, remain valid. This is particularly relevant in balancing the nation's desire to fly in a scenario where environmental concerns must be addressed. As direct routing and more efficient approach paths are required to minimise fuel burn, it is inevitable that commercial air traffic will seek to fly outside the existing controlled airspace structure. Whilst increasing controlled airspace could revise the airspace structure to account for this change in operational requirement, this would not serve the best interests of all airspace users. Furthermore, this approach would be contrary to the CAA's duties set out in Section 70 of the Transport Act 2000.

4.3 Nevertheless, the CAA recognises that a pragmatic and, potentially, more gradual phased introduction of the proposals may need to be employed in order to address the considerable concerns of the General Aviation community about cost and technical challenges. Several areas will also need further investigation to be able to provide information and evidence with which to convince several sectors of the General Aviation community that the CAA proposals are in their best interests for providing continued access to airspace and freedom of movement as levels of commercial traffic continue to grow.

4.4 Mindful of the above, the revised Option 2 presented in this Full RIA reflects what the CAA considers to be the minimum next step that should be taken towards phasing out the use of 'classical' SSR in UK airspace; and it takes into account the majority of the concerns raised during the public consultation. Option 2 is also broadly similar to the extent with which the use of SSR Mode S is being expanded from busy IFR airspace in other European States to all airspace where that carriage and operation of transponders is mandatory.

4.5 In parallel with, and subsequent to, the submission of this Full RIA to Government on the Phase 1 proposals, the CAA now intends to also continue consulting and working with the General Aviation sector to propose a further expansion of the use of SSR Mode S beyond what is required by Option 2 in this RIA, and to continue to propose an increase in the numbers of aircraft that carry and operate transponders. This is seen as essential for meeting the challenges within the White Paper on "The Future of Air Transport" and meeting the requirements of all airspace users through increased technical interoperability.

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Annex E. Sectors and Groups Affected

The following groups and sectors would be affected by the 2 options:

a. **Commercial Air Transport**. Commercial air transport operators not already equipped with SSR Mode S to meet the existing requirements would be affected by Option 2. However, any adverse impact on this sector is expected to be minimal due to the introduction of SSR Mode S into major en route and terminal airspace on 31 March 2005, which will have already required most commercial air transport operators to equip their aircraft to continue to access the Mode S airspace in the UK and rest of Europe. This sector would be adversely impacted under Option 1 if the current 'classical' SSR system became a limiting factor for continued traffic growth in UK airspace. This sector includes the following:

(1) Airlines.
(2) Freight carriers.
(3) Businesses operating aircraft with a maximum take-off mass of 5,700 kg and above or a maximum cruising true airspeed of 250 knots and above.

b. **Small Aviation Businesses**. Small businesses that use aircraft, but which are not commercial air transport operators, are hard to define. However, small businesses comprising the following would be affected by Option 2:

(1) Aerial work companies.
(2) Flying clubs.
(3) Flying training schools.
(4) Air taxi and air ambulance companies.

c. **Private Pilots**. The majority of private pilots would probably not be affected by these options, particularly those from the sporting and recreational community. However, some private pilots will have equipped their aircraft with 'classical' SSR transponders in order to access airspace where carriage is mandatory. These operators would need to replace those existing transponders with new Mode S units within the transition period.

d. **General Aviation User Groups**. There are many individual user groups and representative associations in the General Aviation community, some of which are currently responsible for regulating particular activity on behalf of the CAA. Option 2 could, therefore, affect these groups; particularly if increased equipage costs means that their memberships decrease significantly.

e. **Aircraft and Avionics Manufacturers and Suppliers**. Aircraft manufacturers and suppliers would need to ensure that new aircraft were suitably equipped and avionics companies would need to ensure an adequate supply of compliant SSR Mode S transponders was available to meet demand.

f. **Aircraft Maintenance Organisations**. These organisations would be responsible for installing SSR Mode S transponders into aircraft and for the periodic maintenance and checking of transponders in accordance with certification requirements. In particular, this would apply to European Aviation Safety Agency (EASA) Part 145 Maintenance Organisations.

g. **Airworthiness Certification Authorities and Organisations**. EASA and the Safety Regulation Group of the CAA would be affected by Option 2 in terms of establishing, approving, monitoring and enforcing the certification of SSR Mode S transponder installations in the affected aircraft. Furthermore, EASA Part 21 Design Organisations would need to approve design data for 'minor' modifications for some transponder installations.

h. **Aviation Goods and Equipment Suppliers**. There is a considerable supporting industry to the General Aviation community in terms of goods and equipment for aircraft, pilots and enthusiasts. If the number of pilots in the General Aviation community decreased significantly as a result of the costs of Option 2, this sector would be adversely affected.

i. **State Aircraft Operators**. The Ministry of Defence and other operators of 'State Aircraft', from both EU and non-EU member States, would need to ensure that their aircraft were suitably equipped with SSR Mode S under Option 2.

j. **Search and Rescue (SAR)**. SAR agencies and the emergency services would need to ensure that their aircraft were suitably equipped with SSR Mode S under Option 2 for access to mandatory transponder carriage airspace.

k. **Air Navigation Service Providers (ANSPs)**. Air traffic agencies, such as National Air Traffic Services (NATS) and military ATC authorities, would need to ensure that their systems had adequate capabilities and facilities to use the Mode S data provided by transponder equipped aircraft under Option 2. Furthermore, controllers would need to be adequately trained and associated procedures created. Under Option 1, those ANSPs that are equipped with Mode S systems would be adversely impacted by the lack of available Mode S data from aircraft transponders.

l. **Aerodrome Operators**. Airport and independent airfield operators could be adversely affected by Option 2 if the amount of General Aviation activity was to reduce significantly as a result of increased costs. Private landowners, including farmers, also derive income from General Aviation activity; therefore, they could also be impacted by any adverse effects of Option 2.

m. **CAA**. The CAA would be responsible for implementing, monitoring and enforcing any new regulations. It would also have to ensure that any exemption arrangements were adequately resourced.

o. **Government Departments**. The Department of Transport would be affected by these proposals, as it has a remit to enforce the requirement for operators of foreign registered public transport aircraft to be suitably equipped before being allowed to fly in UK airspace. It also has a remit to issue permits for foreign registered aircraft conducting aerial work under ANO 2005 Article 140.

p. **Vintage Aircraft Restorers**. Restorers of vintage aircraft would be affected by Option 2 from the potential need to incorporate SSR Mode S transponders into these aircraft. Moreover, a downturn in business opportunities for restorers may occur if the requirements were to reduce the number of vintage aircraft being operated.

q. **Visiting Aircraft Operators**. Under Option 2, overseas pilots would need to ensure that their aircraft were suitably Mode S equipped to operate in the UK airspace where transponders are required. Pilots from France, Germany, The Netherlands, Belgium, Luxembourg and Switzerland are likely to be unaffected, as these States are introducing similar proposals to Option 2 in their own national airspace.

r. **Charities**. Feedback from consultation indicated that there are charities supported by and operating within the General Aviation community that provide flying experiences for disabled and disadvantaged groups. Under Option 2, the costs of compliance could affect the viability of these charities.

s. **Tourism Industry**. The tourist industry would be affected by continued access to affordable commercial air transport and so both options could impact on this sector. Moreover, General Aviation activity provides support and an income stream for the tourism sector, which would be adversely affected if General Aviation activity was reduced significantly under Option 2.

Annex F. Estimated Equipage Cost Calculations for Option 2

1. The following general assumptions have been made in deriving cost estimates for aircraft equipage under Option 2:

   a. It is assumed that all aircraft above 5,700 kg maximum take-off mass will already be equipped with SSR Mode S transponders under the existing UK and other European legislation for Mode S on IFR flights in designated airspace from 31 March 2007. Indeed, an examination of the UK register reveals that 94% of these aircraft are already equipped with Mode S capable transponders.

   b. Many organisations would be able to reclaim the VAT added to the equipage cost estimates. However, it is not possible to derive an accurate figure; therefore, for the purposes of estimating the overall costs of Option 2 it has been assumed that no VAT can be reclaimed. Consequently, the estimated policy cost figures likely to be overestimated by 17.5% for many aircraft.

   c. The costs of equipping aircraft will vary widely depending on the choice of Mode S transponder and specific installation issues for individual aircraft. The usual cost of replacing an existing Mode A/C transponder with Mode S in a general un-pressurised piston-engined aircraft seems to be £2,800 plus VAT. This includes supply, installation and certification elements. However, it depends on the type of transponder that is fitted and on the configuration of the aircraft involved. Therefore, based on liaison with stakeholders and aircraft maintenance organisations, average low, medium and high estimates have been employed to try and capture the likely range of overall costs. The CAA considers that the medium estimates represent the most likely average policy costs for the majority of aircraft involved.

   d. The analysis for UK registered aircraft is based on the CAA Aircraft Register as at 5 March 2007. However, a recent study estimated that there could also be around 890 foreign-registered General Aviation aircraft based in the UK[19]. Accurate details of the equipage state or operation of these aircraft are difficult to determine and so it is assumed that all these aircraft will currently be equipped with SSR transponders and that the proportion already equipped with an SSR Mode S capability will be similar to those on the UK Aircraft Register. It is also assumed that the proportion owned and operated by businesses and organisations will be similar and that a similar proportion of these aircraft would require an upgrade to SSR Mode S as a result of Option 2.

2. In order to refine the ranges of equipage cost estimates, the calculations have been broken down into four main categories of affected aircraft in order to try and reflect the likely complexity of the aircraft and SSR installations. The categories are delineated by the maximum take-off mass (MTOM) of aircraft, as shown in Table 4 below. Separate low, medium and high costs have then been applied to each category in the overall calculations.

[19] Strategic Review of General Aviation, July 2006.

Aircraft Type	MTOM Range
Simple Single Engine Piston Aircraft	<1,100 kg
Complex Single Engine Piston Aircraft	≥1,100 kg <1,690 kg
Complex Multi-Engine Piston Aircraft	≥1,690 kg <3,800 kg
Turboprop/Turbojet	≥3,800 kg <5,700 kg

Table 4: Breakdown of Aircraft Categories by MTOM

3. Consultation inputs from Stakeholders indicated that the proportion of aircraft operating in airspace where transponders are mandatory would also vary in accordance with these different aircraft categories. Therefore, the proportion of Mode A/C transponder-equipped aircraft requiring an upgrade to SSR Mode S under Option 2 in each category would also vary. For the purposes of estimating the equipage costs, Table 5 below sets out the percentages of required aircraft upgrades that have been assumed for each category.

Aircraft Type	Proportion of Aircraft Requiring Mode S Upgrade	
	Privately Owned	Business Owned
Simple Single Engine Piston Aircraft	10%	20%
Complex Single Engine Piston Aircraft	30%	40%
Complex Multi-Engine Piston Aircraft	40%	50%
Turboprop/Turbojet	95%	100%

Table 5: Estimated Proportion of Aircraft Requiring Upgrade to SSR Mode S

4. The most difficult category for estimating average equipage costs is for those aircraft in excess of 3,800 kg MTOM. Although this category contains a relatively small number of aircraft, there is a large variety in the complexity and performance of the aircraft types involved. Also, those aircraft with a maximum cruising true airspeed capability in excess of 250 kt, such as the Cessna 525 and a Beech KA200, would be required to operate with two transponder antennae. A modification like this for aircraft with pressurised airframes adds significantly to the overall equipage costs. These costs could range between £10,000 and £45,000, dependent on what equipment is fitted; the latter amount is considered to be an exceptional extreme and around £25,000 is considered to be more representative as an average ‘high end’ cost estimate for this category. This weight category of aircraft also contains many ex-military platforms, ranging from Spitfires to Jet Provosts and Hunters. Consequently, the estimated range of equipage costs in this category is necessarily broad. However, it is considered that the medium cost figures represent the most likely overall average equipage costs.

5. The ‘supply’ costs of Mode S transponders vary considerably by manufacturer and standard of transponder fitted. Research shows that typical ranges for individual off-the-shelf purchases are around £1,200 to £1,500 plus VAT at the lower end for

simple aircraft, around £2,300 to £2,800 plus VAT as a mid range estimate, and around £4,400 plus VAT as a high-end estimate. However, aircraft maintenance organisations can normally obtain discounted prices for transponder units.

6. Certification charges depend on whether the installations are deemed to be ‘minor’ or ‘major’ changes and are set by EASA; but maintenance organisations will also need to charge for the design work to support the certification process. The minimum EASA charge is €250 (£170) for a ‘minor’ change. For the simple and complex single-engined piston aircraft, it is assessed that most work to replace transponders will be classed as a minor change, for which the certification related fee element should be only around £300 to £500. The certification related costs for major changes to a complex turbojet or turboprop aircraft could be as much as £5,000.

7. Table 6 below sets out how the high, medium and low equipage costs for different classes of aircraft have been estimated. Where appropriate, the figures are inclusive of VAT.

Aircraft Type	Range	Transponder	Installation	Certification	Total
Simple and Complex Single Engine Piston Aircraft	Low	£1,600	£350	£170	£2,120
	Medium	£2,700	£700	£300	£3,700
	High	£3,300	£700	£300	£4,300
Complex Multi-Engine Piston Aircraft	Low	£1,800	£350	£300	£2,450
	Medium	£2,700	£700	£500	£3,900
	High	£3,300	£1,000	£600	£4,900
Turboprop/Turbojet	Low	£2,700	£700	£300	£3,700
	Medium	£3,300	£6,000	£600	£9,900
	High	£5,200	£15,000	£5,000	£25,200

Table 6: Breakdown of Equipage Costs

8. Figure 5 below sets out the detailed calculations for the estimated equipage costs of aircraft below 5,700 kg that are owned and operated by businesses and organisations. The estimates include allowances for equipment purchase, installation, certification and VAT. In order to derive Present Value estimates, a discount rate of 3.5% has been applied in accordance with the Treasury Green Book.

Simple Single Engine Piston Equipage with Filser TRT 600/800 or Garmin GTX 330								
<1,100kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	1195	1299						
Mode S Equipped	33	33						
Estimate of Foreign Registered	96	96						
Estimate Mode S Equipped	3	3						
Max Potential Upgrade	1255	1359	£2,660,600	£2,881,080	£4,643,500	£5,028,300	£5,396,500	£5,843,700
Predicted Required Upgrade (20%)	251	272	£532,120	£576,640	£928,700	£1,006,400	£1,079,300	£1,169,600
	Cost Per Aircraft		Low Cost		Medium Cost		High Cost	
			£2,120		£3,700		£4,300	

Complex Single engine Piston Equipage with Garmin GTX 330 or Honeywell KT73								
>1,100<1,690kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	826	883						
Mode S Equipped	142	146						
Estimate of Foreign Registered	146	146						
Estimate Mode S Equipped	25	25						
Max Potential Upgrade	805	858	£1,706,600	£1,818,960	£2,978,500	£3,174,600	£3,461,500	£3,689,400
Predicted Required Upgrade (40%)	322	343	£682,640	£727,160	£1,191,400	£1,269,100	£1,384,600	£1,474,900
	Cost Per Aircraft		Low Cost		Medium Cost		High Cost	
			£2,120		£3,700		£4,300	

Complex Multi-Engine Piston Equipage with Garmin GTX330 or Honeywell KT70								
>1,690<3,800kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	574	655						
Mode S Equipped	102	107						
Estimate of Foreign Registered	108	108						
Estimate Mode S Equipped	19	19						
Max Potential Upgrade	561	637	£1,374,450	£1,560,650	£2,187,900	£2,484,300	£2,748,900	£3,121,300
Predicted Required Upgrade (50%)	281	319	£688,450	£781,550	£1,095,900	£1,244,100	£1,376,900	£1,563,100
	Cost Per Aircraft		Low Cost		Medium Cost		High Cost	
			£2,450		£3,900		£4,900	

Turboprop/Turbojet Equipage with Garmin GTX330 or Honeywell KT70 or Rockwell Collins TDR 94D								
>3,800<5,700kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	171	196						
Mode S Equipped	58	65						
Estimate of Foreign Registered	139	139						
Estimate Mode S Equipped	47	47						
Max Potential Upgrade	205	223	£758,500	£825,100	£2,029,500	£2,207,700	£5,166,000	£5,619,600
Predicted Required Upgrade (100%)	205	223	£758,500	£825,100	£2,029,500	£2,207,700	£5,166,000	£5,619,600
	Cost Per Aircraft		Low Cost		Medium Cost		High Cost	
			£3,700		£9,900		£25,200	

TOTALS	No of Aircraft		Low Cost		Medium Cost		High Cost	
<5700kg	Active	All	Active	All	Active	All	Active	All
Max Potential Upgrade	2826	3077	£6,500,150	£7,085,790	£11,839,400	£12,894,900	£16,772,900	£18,274,000
Predicted Required Upgrade	1059	1157	£2,661,710	£2,910,450	£5,245,500	£5,727,300	£9,006,800	£9,827,200

Average Cost Per Year Analysis	2008/2009	2009/2010	2010/2011	2011/2012	TOTAL
Active Aircraft (Low Cost)	£665,428	£665,428	£665,428	£665,428	£2,661,710
Discounted PV @ 3.5%	£665,428	£642,936	£621,177	£600,149	£2,529,689
All Aircraft (Low Cost)	£727,613	£727,613	£727,613	£727,613	£2,910,450
Discounted PV @ 3.5%	£727,613	£703,019	£679,226	£656,234	£2,766,092
Active Aircraft (Medium Cost)	£1,311,375	£1,311,375	£1,311,375	£1,311,375	£5,245,500
Discounted PV @ 3.5%	£1,311,375	£1,267,051	£1,224,169	£1,182,729	£4,985,323
All Aircraft (Medium Cost)	£1,431,825	£1,431,825	£1,431,825	£1,431,825	£5,727,300
Discounted PV @ 3.5%	£1,431,825	£1,383,429	£1,336,609	£1,291,363	£5,443,226
Active Aircraft (High Cost)	£2,251,700	£2,251,700	£2,251,700	£2,251,700	£9,006,800
Discounted PV @ 3.5%	£2,251,700	£2,175,593	£2,101,962	£2,030,808	£8,560,063
All Aircraft (High Cost)	£2,456,800	£2,456,800	£2,456,800	£2,456,800	£9,827,200
Discounted PV @ 3.5%	£2,456,800	£2,373,760	£2,293,423	£2,215,788	£9,339,771

KEY:
- Active Aircraft
- All Aircraft
- Low Cost
- Medium Cost
- High Cost

Figure 5: Cost Calculations for Non-Privately Owned Aircraft Below 5,700 kg

9. Figure 6 below sets out the detailed calculations for the estimated equipage costs of privately owned aircraft below 5,700 kg that are registered and/or based in the UK. The estimates include allowances for equipment purchase, installation, certification and VAT. In order to derive Present Value estimates, a discount rate of 3.5% has been applied in accordance with the Treasury Green Book.

Simple Single Engine Piston Equipage with Filser TRT 600/800 or Garmin GTX 330								
<1,100kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	1920	2222						
Mode S Equipped	45	48						
Estimate of Foreign Registered	154	154						
Estimate Mode S Equipped	4	4						
Max Potential Upgrade	2025	2324	£4,293,000	£4,926,880	£7,492,500	£8,598,800	£8,707,500	£9,993,200
Predicted Required Upgrade (10%)	203	232	£430,360	£491,840	£751,100	£858,400	£872,900	£997,600
	Cost Per Aircraft		Low Cost		Medium Cost		High Cost	
			£2,120		£3,700		£4,300	

Complex Single engine Piston Equipage with Garmin GTX 330 or Honeywell KT73								
>1,100<1,690kg	No of Aircraft		Low Cost		Average Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	1015	1135						
Mode S Equipped	77	80						
Estimate of Foreign Registered	179	179						
Estimate Mode S Equipped	14	14						
Max Potential Upgrade	1103	1220	£2,338,360	£2,586,400	£4,081,100	£4,514,000	£4,742,900	£5,246,000
Predicted Required Upgrade (30%)	331	366	£701,720	£775,920	£1,224,700	£1,354,200	£1,423,300	£1,573,800
	Cost Per Aircraft		Low Cost		Medium Cost		High Cost	
			£2,120		£3,700		£4,300	

Complex Multi-Engine Piston Equipage with Garmin GTX330 or Honeywell KT70								
>1,690<3,800kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	250	306						
Mode S Equipped	30	31						
Estimate of Foreign Registered	47	47						
Estimate Mode S Equipped	6	6						
Max Potential Upgrade	261	316	£639,450	£774,200	£1,017,900	£1,232,400	£1,278,900	£1,548,400
Predicted Required Upgrade (40%)	104	126	£254,800	£308,700	£405,600	£491,400	£509,600	£617,400
	Cost Per Aircraft		Low Cost		Medium Cost		High Cost	
			£2,450		£3,900		£4,900	

Turboprop/Turbojet Equipage with Garmin GTX330 or Honeywell KT70 or Rockwell Collins TDR 94D								
>3,800<5,700kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	26	35						
Mode S Equipped	4	5						
Estimate of Foreign Registered	21	21						
Estimate Mode S Equipped	3	3						
Max Potential Upgrade	40	48	£148,000	£177,600	£396,000	£475,200	£1,008,000	£1,209,600
Predicted Required Upgrade (95%)	38	46	£140,600	£170,200	£376,200	£455,400	£957,600	£1,159,200
	Cost Per Aircraft		Low Cost		Medium Cost		High Cost	
			£3,700		£9,900		£25,200	

TOTALS	No of Aircraft		Low Cost		Medium Cost		High Cost	
<5700kg	Active	All	Active	All	Active	All	Active	All
Max Potential Upgrade	3429	3908	£7,418,810	£8,465,080	£12,987,500	£14,820,400	£15,737,300	£17,997,200
Predicted Required Upgrade	676	770	£1,527,480	£1,746,660	£2,757,600	£3,159,400	£3,763,400	£4,348,000

Average Cost Per Year Analysis	2008/2009	2009/2010	2010/2011	2011/2012	TOTAL
Active Aircraft (Low Cost)	£381,870	£381,870	£381,870	£381,870	£1,527,480
Discounted PV @ 3.5%	£381,870	£368,963	£356,476	£344,409	£1,451,717
All Aircraft (Low Cost)	£436,665	£436,665	£436,665	£436,665	£1,746,660
Discounted PV @ 3.5%	£436,665	£421,906	£407,627	£393,828	£1,660,026
Active Aircraft (Medium Cost)	£689,400	£689,400	£689,400	£689,400	£2,757,600
Discounted PV @ 3.5%	£689,400	£666,098	£643,555	£621,770	£2,620,823
All Aircraft (Medium Cost)	£789,850	£789,850	£789,850	£789,850	£3,159,400
Discounted PV @ 3.5%	£789,850	£763,153	£737,325	£712,366	£3,002,694
Active Aircraft (High Cost)	£940,850	£940,850	£940,850	£940,850	£3,763,400
Discounted PV @ 3.5%	£940,850	£909,049	£878,283	£848,553	£3,576,735
All Aircraft (High Cost)	£1,087,000	£1,087,000	£1,087,000	£1,087,000	£4,348,000
Discounted PV @ 3.5%	£1,087,000	£1,050,259	£1,014,715	£980,365	£4,132,339

KEY:	
(purple)	Active Aircraft
(light blue)	All Aircraft
(green)	Low Cost
(yellow)	Medium Cost
(pink)	High Cost

Figure 6: Cost Calculations for Privately Owned Aircraft Below 5,700kg

10. Figure 7 below sets out the detailed calculations for the estimated equipage costs of all aircraft below 5,700 kg that are registered and/or based in the UK. The estimates include allowances for equipment purchase, installation, certification and VAT. In order to derive Present Value estimates, a discount rate of 3.5% has been applied in accordance with the Treasury Green Book.

Simple Single Engine Piston Equipage with Filser TRT 600/800 or Garmin GTX 330								
<1,100kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	3115	3521						
Mode S Equipped	78	81						
Estimate of Foreign Registered	250	250						
Estimate Mode S Equipped	7	7						
Max Potential Upgrade	3280	3683	£6,953,600	£7,807,960	£12,136,000	£13,627,100	£14,104,000	£15,836,900
Predicted Required Upgrade	454	504	£962,480	£1,068,480	£1,679,800	£1,864,800	£1,952,200	£2,167,200

	Low Cost	Medium Cost	High Cost
Cost Per Aircraft	£2,120	£3,700	£4,300

Complex Single engine Piston Equipage with Garmin GTX 330 or Honeywell KT73								
>1,100<1,690kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	1841	2018						
Mode S Equipped	219	226						
Estimate of Foreign Registered	325	325						
Estimate Mode S Equipped	39	39						
Max Potential Upgrade	1908	2078	£4,044,960	£4,405,360	£7,059,600	£7,688,600	£8,204,400	£8,935,400
Predicted Required Upgrade	653	709	£1,384,360	£1,503,080	£2,416,100	£2,623,300	£2,807,900	£3,048,700

	Low Cost	Medium Cost	High Cost
Cost Per Aircraft	£2,120	£3,700	£4,300

Complex Multi-Engine Piston Equipage with Garmin GTX330 or Honeywell KT70								
>1,690<3,800kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	824	961						
Mode S Equipped	132	138						
Estimate of Foreign Registered	155	155						
Estimate Mode S Equipped	25	25						
Max Potential Upgrade	822	953	£2,013,900	£2,334,850	£3,205,800	£3,716,700	£4,027,800	£4,669,700
Predicted Required Upgrade	385	445	£943,250	£1,090,250	£1,501,500	£1,735,500	£1,886,500	£2,180,500

	Low Cost	Medium Cost	High Cost
Cost Per Aircraft	£2,450	£3,900	£4,900

Turboprop/Turbojet Equipage with Garmin GTX330 or Honeywell KT70 or Rockwell Collins TDR 94D								
>3,800<5,700kg	No of Aircraft		Low Cost		Medium Cost		High Cost	
	Active	All Register	Active	All Register	Active	All Register	Active	All Register
SSR Equipped on Aircraft Register	197	231						
Mode S Equipped	62	70						
Estimate of Foreign Registered	160	160						
Estimate Mode S Equipped	50	50						
Max Potential Upgrade	245	271	£906,500	£1,002,700	£2,425,500	£2,682,900	£6,174,000	£6,829,200
Predicted Required Upgrade	243	269	£899,100	£995,300	£2,405,700	£2,663,100	£6,123,600	£6,778,800

	Low Cost	Medium Cost	High Cost
Cost Per Aircraft	£3,700	£9,900	£25,200

TOTALS	No of Aircraft		Low Cost		Medium Cost		High Cost	
<5700kg	Active	All	Active	All	Active	All	Active	All
Max Potential Upgrade	6255	6985	£13,918,960	£15,550,870	£24,826,900	£27,715,300	£32,510,200	£36,271,200
Predicted Required Upgrade	1735	1927	£4,189,190	£4,657,110	£8,003,100	£8,886,700	£12,770,200	£14,175,200

Average Cost Per Year Analysis	2008/2009	2009/2010	2010/2011	2011/2012	TOTAL
Active Aircraft (Low Cost)	£1,047,298	£1,047,298	£1,047,298	£1,047,298	£4,189,190
Discounted PV @ 3.5%	£1,047,298	£1,011,899	£977,652	£944,558	£3,981,406
All Aircraft (Low Cost)	£1,164,278	£1,164,278	£1,164,278	£1,164,278	£4,657,110
Discounted PV @ 3.5%	£1,164,278	£1,124,925	£1,086,853	£1,050,062	£4,426,117
Active Aircraft (Medium Cost)	£2,000,775	£2,000,775	£2,000,775	£2,000,775	£8,003,100
Discounted PV @ 3.5%	£2,000,775	£1,933,149	£1,867,723	£1,804,499	£7,606,146
All Aircraft (Medium Cost)	£2,221,675	£2,221,675	£2,221,675	£2,221,675	£8,886,700
Discounted PV @ 3.5%	£2,221,675	£2,146,582	£2,073,934	£2,003,729	£8,445,920
Active Aircraft (High Cost)	£3,192,550	£3,192,550	£3,192,550	£3,192,550	£12,770,200
Discounted PV @ 3.5%	£3,192,550	£3,084,642	£2,980,245	£2,879,361	£12,136,798
All Aircraft (High Cost)	£3,543,800	£3,543,800	£3,543,800	£3,543,800	£14,175,200
Discounted PV @ 3.5%	£3,543,800	£3,424,020	£3,308,137	£3,196,153	£13,472,110

KEY:
- Active Aircraft
- All Aircraft
- Low Cost
- Medium Cost
- High Cost

Figure 7: Cost Calculations for All Aircraft Below 5,700kg

Annex G. Glossary of Terms

AA	ICAO 24-bit Aircraft Address
ACAS	Airborne Collision Avoidance System
ADD	Aircraft Derived Data
ADS-B	Automatic Dependent Surveillance - Broadcast
AIC	Aeronautical Information Circular
ANO	Air Navigation Order
AOPA	Aircraft Owners and Pilots Association
ATC	Air Traffic Control
ATM	Air Traffic Management
CAA	Civil Aviation Authority
CAP	SSR Mode S Controller Access Parameter
DAP	CAA Directorate of Airspace Policy SSR Mode S Downlink Aircraft Parameter
DfT	Department for Transport
DTI	Department of Trade and Industry
EASA	European Aviation Safety Agency
EC	European Commission
EHS	SSR Mode S Enhanced Surveillance
ELS	SSR Mode S Elementary Surveillance
FRUIT	False Replies Unsynchronised In Time
GACC	General Aviation Consultative Committee
GAT	General Air Traffic
GAWG	General Aviation Working Group
IC	Mode S Radar Interrogator Code
ICAO	International Civil Aviation Organisation
IFF	Identification Friend or Foe
IFR	Instrument Flight Rules
II	SSR Mode S Interrogator Identifier Code
IR	European Commission Implementing Rule
LPST	Low Power SSR Transponder
MHz	Megahertz
MODE S	SSR Mode Select
MTOM	Maximum Take-Off Mass
NATMAC	National Air Traffic Management Advisory Committee
NATS	National Air Traffic Services (En Route) plc
NISC	National IFF/SSR Committee
PV	Present Value
RF	Radio Frequency
RIA	Regulatory Impact Assessment
SAP	SSR Mode S System Access Parameter
SASWG	Spectrum and Surveillance Working Group
SBS	Small Business Service
SES	Single European Sky
SESAR	Single European Sky ATM Research
SI	SSR Mode S Surveillance Identifier Code
SSR	Secondary Surveillance Radar
STCA	Short Term Conflict Alert System
TMA	Terminal Manoeuvring Area
UAV	Unmanned Aerial Vehicle
UKAB	UK Airprox Board
UK SSC	Cabinet Office Spectrum Strategy Committee
VAT	Value Added Tax
VFR	Visual Flight Rules

WTA	Wireless Telegraphy Act