ASI ECWG Recommendations Paper: Electronic Conspicuity in Class G Airspace

Issue 1.0 August 2014

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Executive Summary

1.1 In response to an Air Accidents Investigation Branch (AAIB) report and through the auspices of the Airspace and Safety Initiative (ASI) Programme, the ASI Electronic Conspicuity Working Group (ECWG) was established as a cooperative work stream to consider how increased Electronic Conspicuity (EC) for users of Class G airspace can improve safety through enhanced situational awareness. The central deliverable for the working group is to develop an industry standard for an EC device against which developers can build new devices to meet the stakeholder requirement.

1.2 This Recommendations Paper is designed to summarise the findings of the ECWG from the last 18 months and to develop on the findings of the EC Options Paper that was produced by the group in December 2013. Ultimately this paper is delivered to the ASI Coordination Group (ASI CG) in order to provide EC recommendations to the CAA to inform the CAA EC Project which is due to launch in September 2014.

1.3 In summary, the members of the ECWG support the concept of appropriate EC in Class G airspace. The launch of the CAA EC Project is strongly encouraged and a draft EC Project Management Plan (EC PMP) is offered at Annex A. There is consensus amongst the group that it will be possible to develop an industry standard for a Radio Frequencies (RF) based EC device and that this device could be based on Automatic Dependent Surveillance – Broadcast (ADS–B) technology. By challenging the current standards and regulatory requirements it may be possible to produce an EC device that is low-cost enough, with sufficient benefits and acceptable downsides, so as to encourage significant voluntary equipage amongst the GA community.

1.4 The ECWG see merit in exploring Camera Based (CB) technology further.

1.5 The ECWG makes the recommendation that the Visual and Electronic Conspicuity Working Groups merge to form a single CAA Conspicuity Project in September 2014.

Background

The Aim of EC

1.6 Class G is an uncontrolled airspace environment where unmanaged and uncoordinated activity takes place on a significant scale; EC is designed to enhance situational awareness. The aim is to enable the transfer of data of appropriate integrity between suitably equipped aircraft, and possibly ground stations, to allow the presentation of that data in a way which enables the pilot to quickly assimilate the information to enhance the awareness of what activity is taking place in the pilots local vicinity and to aid visual acquisition and, if necessary, avoidance in line with the Rules of the Air.

1.7 This paper does not quantify risks nor to what extent they can be mitigated by what EC technology, neither does it quantify risks increased through EC equipage. The ECWG is aware that there are many different risk profiles, many different risk levels, and many different acceptable risk levels, both between and within the different user groups affected by the potential effects of EC measures. The ECWG believes that work into risks, risk levels and acceptable risk levels with respect to collisions in Class G and infringements of CAS is being undertaken elsewhere. To quantify and fully understand the potential effects, both good and bad, of EC it is crucial to marry the work streams together and extend them onward from there. To have an evidence based approach to reducing the Class G collision risk the ECWG believes that it is essential that this is done.

Review of the EC Options Paper

1.8 In December 2013 the ECWG produced an EC Options Paper. The following provides a summary of the paper:

i) The EC Options paper concluded that in order to encourage voluntary equipage it will be essential to ensure that an EC device meets a number of key elements; it must be cost-effective, it must provide a definable or quantifiable benefit for the user, any potential negative effect of an EC device in the aircraft must be clearly understood and it must not hinder or restrict current ways of operating. In addition, the paper also concluded that the EC requirement is scalable and can be grouped into 3 main categories:

- Basic EC Device: A transmit only device with no alerts to the carrier.
- Intermediate EC Device: A transmit/receive device with minimal interoperability and audible or visual alerts.
- Full EC Device: A transmit/receive device interoperable with other air and ground safety nets with visual and audible alerts.

ii) The EC Options Paper concluded that with regards to available technology, the options are promising. There is no 'one-size-fits-all' option that meets all stakeholder requirements for an appropriate cost and some options are prohibitively expensive to promote voluntary uptake. There are, however, a small number of technological options that are aiming at the 'middle ground', and focussed R&D and regulatory assistance could help speed these options into existence at a cost that could be acceptable to the GA community.

iii) The EC Options Paper made a number of recommendations in order to enhance the likelihood of voluntary uptake and to increase the speed at which a viable, cost-effective EC device could be available. A key driver for reducing the cost of a device will be to set an industry standard against which developers can produce a device and stimulate a competitive market. The recommendations were as follows:

- REC 1: Assess the requirement for a shift in regulatory thinking.
- REC 2: Provide quantifiable evidence of risk in Class G airspace.
- REC 3: Monitor global EC developments.
- REC 4: Explore avenues for subsidising the cost of equipage.
- REC 5: Explore all funding options and conduct R&D.
- REC 6: Three options for research were recommended and formed the basis of a bid for DfT funding:
  - Option 1 - Full R&D for a prototype device.
  - Option 2 – Research the use of uncertified devices.
  - Option 3 – Research potential interference issues with EC devices.

1.9 As a demonstration of a visible spectrum CB electronic collision avoidance system was not given to the ECWG until after the production of the EC Options Paper, CB technology was not considered in that paper.

1.10 The EC Options Paper forms the foundation of this Recommendations Paper. The ECWG have continued to build on the initial findings, with the addition of CB technology, and are now able to offer a more detailed set of recommendations to the CAA with the addition of a draft EC Project Management Plan (PMP), found at Annex 1. The EC PMP is offered to the CAA as a basis for the launch of the CAA EC Project in September 2014.

The Requirement for EC

Overview of Stakeholder Requirements

1.11 When reviewing the stakeholder requirements for EC, input has been obtained from the following members of the ECWG:

- British Balloon and Airship Club (BBAC)
- British Hang Gliding and Paragliding Association (BHPA)
- British Gliding Association (BGA)
- British Microlight Aircraft Association (BMAA)
- Light Aircraft Association (LAA)
- Aircraft Owners and Pilots Association (AOPA)
- NATS

1.12 Further analysis of stakeholder requirements concludes that EC devices are likely to have a common set of universal requirements applicable to all stakeholders. Some EC devices may also have other functionality to meet additional requirements of certain stakeholders. The following will briefly address the universal and additional functional requirements:

i) Universal Requirements:

- Light weight: stakeholders identified a weight of approximately 200g including batteries could be acceptable.

- Low bulk: a device would ideally be no larger than approximately 140mm x 80mm x 25mm including batteries.
- User friendly: any EC device would be easy to operate, with minimal or no inputs required during flight. The device should not reduce 'look out' capabilities or have a negative impact upon safety.
- Appropriate antenna fit: the required antenna fit must be easily achievable and appropriate to the aircraft.
- Portable: there should be no barrier, either physical or regulatory, to moving the EC device from one aircraft to another instantly.
- Voluntary equipage: The ECWG supports voluntary equipage of an EC device. There is no appetite for mandating carriage.
- Minimal regulatory requirements: stakeholders identified a requirement to have as few regulatory hurdles as possible. This will provide further positive encouragement for voluntary carriage.

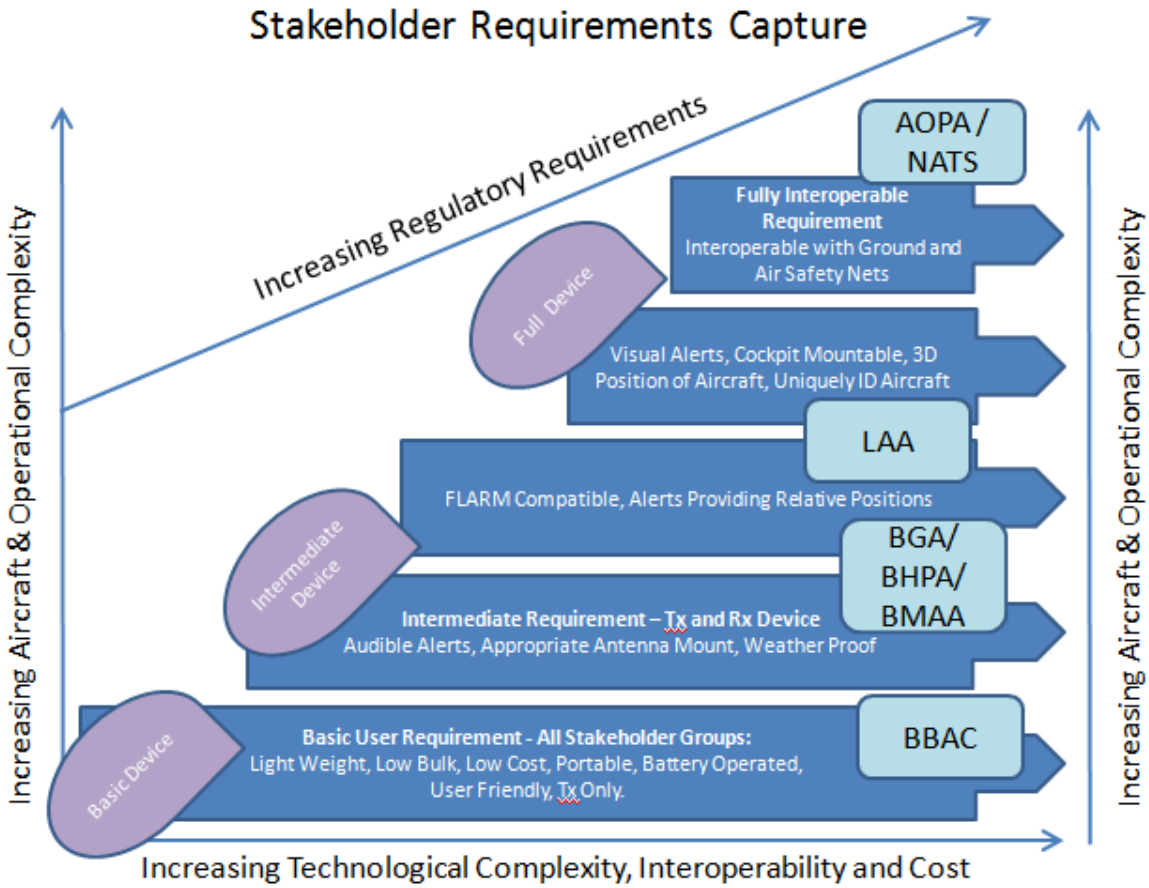
ii) Additional Requirements:

- Aural alerts: aural alerts were identified as essential by most user groups. An aural alert must be unique from other inputs received by the pilot. All alerts must be timely and useful and any alert must not unduly distract the pilot from the ability to operate the aircraft or maintain good look-out practices.
- Visual alerts: when desired, must be user friendly on an appropriately sized and fitted display.
- Low cost to the stakeholder: stakeholders assessed that an acceptable cost for the most basic EC device would be approximately £250.00 including VAT. Minimal to nil through-life costs would also be desirable. Stakeholders recognise that additional functionality will result in additional cost to the stakeholder.
- Cock-pit mountable or user carried: the EC device must be safe to carry on a person or be easily mountable onto the aircraft or in the cockpit.

- Self-contained EC device: some stakeholders will require an EC device that is completely separate from all other aircraft systems. However, some stakeholders may require interoperability with other devices in the cockpit. It is recognised that a device that is not self-contained may attract additional regulatory burdens.
- Power options: stakeholders who operate aircraft with internal power require an option to connect to the internal power source. Stakeholders without internal power assessed that a battery life of 12 hours would be acceptable and would ideally include the ability to rapidly charge the EC device.
- Capable of operating within close proximity of handheld radios without detriment to either system.
- Full weather proofing and low temperature capable to at least the same standard as the GPS systems used by walkers, as in some aircraft the equipment will be fully exposed to the elements.
- Operable when wearing ski gloves.

1.13 Diagram 1 is a visual summary of stakeholder requirements for an RF based solution. A similar diagram can be created for CB systems with the Tx being visible or infrared light and zero interoperability with ground based systems.

Diagram 1:



Review of EC Technical Options

1.14 The ECWG has reviewed a number of EC devices. The group has concluded that the technologies that afford the most promise are those that operate using ADS–B. The review below includes devices that solely operate using ADS-B but it should also be noted that there is the option of enabling ADS-B functionality in existing devices such as Mode S transponders. The following paragraphs summarise the EC technologies that have been considered with reasons as to why they do or do not meet the stakeholder requirements.

TCAS

1.15 TCAS systems look for proximate transponder-equipped aircraft by interrogating and are designed as an aid to visual acquisition. The interrogation reply is used to calculate the proximate aircraft's range, bearing, relative altitude and closure rate typically to a range of about 10 miles. Aural traffic alerts are delivered through the aircraft audio

system and visual data through a cockpit display. TCAS would fall in the category of a 'full' EC device; with the capability to transmit, receive and display information to the pilot. The cost would almost certainly prohibit the majority of GA stakeholders from purchasing such equipment. Further to this, many GA aircraft including gliders and microlights will not be suitable candidates for equipage for technical reasons. The ECWG do not view TCAS as a viable EC option for the GA community as a whole.

Mode S Transponders

1.16 The CAA has previously consulted the GA community with regards to the possibility of mandating carriage of transponders, including a low power variant. The results were such that the idea of mandating carriage was not deemed suitable for the GA community and that argument remains valid. Mode S transponders are fully compatible with all operational ground surveillance systems and would interoperate with the majority of commonly used airborne safety nets. In addition, some Mode S transponders are able to act as the data repository and data link for ADS-B systems deploying 1090 MHz extended squitter (1090ES). For a number of reasons; cost, fitting, maintenance and the lack of means to generate the power required to operate such a system, the ECWG view Mode S transponders as not being a viable EC option for the majority of the GA community.

1.17 The ECWG recognises that some members of the GA community with ADS-B OUT capable transponders will also have uncertified Commercial Off The Shelf (COTS) portable GPS devices which, if connected to the transponder, could enable ADS-B OUT EC. For these users this represents a very low cost EC capability as there is minimal incremental expense. Clarification is required regarding the regulatory requirements to authorise such a configuration.

TIS-B

1.18 TIS-B is the broadcast of traffic information to ADS-B-IN equipped aircraft to provide enhanced situational awareness. The traffic information is derived from ATC ground-based surveillance systems. Typically this would be primary and secondary surveillance radars possibly supplemented by ADS-B or multilateration receivers. TIS-B is intended to provide suitably equipped aircraft with a more complete traffic picture where not all proximate aircraft are equipped with ADS-

B-OUT. For an aircraft to receive a TIS-B service it must be equipped with ADS-B-IN and be flying within the coverage of the TIS-B ground station. Although TIS-B has the potential to provide the required interoperability between air and ground safety nets, TIS-B would require a robust regulatory approach in both ground and air environments at high cost and potentially duplicating infrastructures. For this reason, this technological option is also not seen as a viable EC solution for the task of increasing SA to the GA community.

FLARM

1.19 FLARM was designed to address a specific issue for use by gliders and the voluntary uptake of the technology supports the idea that when a particular benefit is derived from a piece of technology, the GA community may be willing to purchase such equipment. FLARM is not designed to provide position and identity reporting compatible with existing ground and airborne safety nets, however, some other technologies can detect the FLARM system. In addition, PowerFLARM has an integral 1090 MHz receiver. This provides no transmit capability but can display aircraft installed with Mode S extended squitter (ES) transmitting positional data. This may give improved situational awareness to equipped aircraft but it does not deliver full interoperability with air or ground safety nets. FLARM delivers some but not all of the stakeholder requirements; importantly the cost of such equipment may still be deemed too expensive for the majority of users.

ADS-B Devices

1.20 The ECWG offer that ADS-B provides the most promising option for EC technology. An ADS-B equipped aircraft determines its own position and periodically broadcasts it to surveillance ground stations or aircraft with ADS-B-IN capability. ADS-B technology is likely to be easier and less expensive to deploy than the aforementioned options. ADS-B offers the opportunity for increasing interoperability with other existing air and ground safety nets but this comes with additional cost to the stakeholder. It also requires those ground stations and aircraft to be equipped to receive and decode ADS-B data. There are a number of ADS-B devices available on the market and others in development. They are generally categorised in 3 options:

- ADS-B-IN/OUT (receive and transmit capability)

- ADS-B-IN (receive only capability)
- ADS-B-OUT (transmit only capability)

1.21 The ECWG agree that the most basic and essential requirement for an RF EC device should be ADS-B-OUT. The device with the most uptake is likely to be an ADS-B-IN/OUT device which would provide the maximum electronic RF visibility. The ECWG view ADS-B-IN devices as the least useful for enhancing situational awareness and safety in Class G airspace. The following will provide a brief overview of EC devices available in each category.

ADS-B-IN/OUT

Low Powered ADS-B Transceiver (LPAT)

1.22 In collaboration with the ECWG and the CAA, NATS are assessing options for a portable, low cost device that provides RF EC and enhanced situational awareness to GA. The LPAT is a prototype device that will enable the development and validation for a regulatory specification for low cost RF EC and will help provide clarity and prioritisation for the GA user requirements. NATS assessed various aspects and options for low-cost EC, including interoperability, performance and safety assessments, and market and production research. It was determined that an ADS-B transceiver operating at low power on 1090Mhz was the most likely option to fulfil the stakeholders' safety requirements. Initial concept validation was conducted using a commercial GPS chipset and a Trig TT21 transponder, which was modified to transmit at low power. A requirements' specification was constructed that referenced relevant specification from the European ADS-B Regulation (ED102A) and a call for tender was issued to three companies to provide LPAT prototypes. NATS selected FUNKE as its partner to develop LPAT and three prototype devices will be available during the third quarter of 2014, which will enable the validation and verification activities. It is anticipated that a device that is similar to the LPAT prototypes will be commercially available during the second quarter of 2015.

1.23 The LPAT has 2 options; a transmit only device and also a transmit and receive device. The range of the LPAT is intended to be 3-5nm with 8 hours battery life. The GPS source and antenna will be integral to reduce fitment issues. Discussions are being held with US and European experts to determine the viability of displaying ADS-B

targets on TCAS, however the LPAT will not be interoperable with TCAS in the near future. The LPAT will detect aircraft carrying FLARM, standard transponders and Mode S transponders transmitting an ADS-B signal, although only the latter and other ADS-B OUT devices will be displayed with an altitude, relative bearing and range. The LPAT information can also be received by ADS-B ground systems and hence would contribute to reducing airspace infringements. The ECWG view the LPAT as a very promising device, meeting more stakeholder requirements than other ADS-B devices available on the market and will potentially be available at a cost comparable to other receive only devices.

FAA Light Aircraft Surveillance Equipment (LASE)

1.24 The intent of the LASE device is to increase safety by encouraging the voluntary equipage of a low cost, compact, easy to install device that will allow other aircraft equipped with collision avoidance systems and traffic advisory systems to track and display the LASE aircraft. LASE devices are intended to be used on aircraft that are exempted under Federal Aviation Authority (FAA) regulations from carrying a transponder or Automatic Dependent Surveillance - Broadcast (ADS-B) equipment, such as gliders, balloons and aircraft without electrical systems. LASE will enable an aircraft to be visible to other aircraft equipped with TCAS.

ADS-B-IN

Funkwerk Traffic Monitor 250 (TM 250)

1.25 This is designed as a compact traffic monitoring and warning system with integrated GPS, Mode S and FLARM receivers. This is designed as a receive-only device and would need to be used in combination with extended squitter-capable transponder in order to be transmit capable. However, for Mode S and FLARM data received a depiction of direction, altitude or position of these aircraft is not feasible.

1.26 It has a range of 8nm, acoustic alerts, a colour display and the option for an internal or external antenna. It is small in size and weight and meets a number of the stakeholder requirements but the fact that an additional serial interface to an ADS-B capable Mode S transponder is required to provide increased interoperability will almost certainly make the full device too expensive for the GA stakeholders.

Stratus

1.27 The Stratus is available in the US and links via Wi-Fi to multiple iPad and/or iPhones to deliver weather, ADS-B traffic, GPS position and attitude information. Again, it is marketed as a receive-only device. It has a dual band ADS-B receiver which displays traffic information on ForeFlight maps. The Stratus meets some of the stakeholder requirements; small in size, it has a user friendly one-button operation, an internal antenna for wire-free operation in most cockpits and a battery life of up to 8 hours which recharges via a standard USB cable. The Stratus is slightly less interoperable than the previous device as is only displays ADS-B traffic either from ADS-B-OUT equipped aircraft or an ADS-B ground station. It also does not have an audible warning. Whilst this technology is promising and does prove the market for using existing technology such as the iPad/iPhone, the device does not fully meet the requirement at an acceptable cost for the majority of the GA community.

Garmin GDL 39

1.28 The GDL 39 is also available in the US and is a receive-only ADS-B device that allows it to receive weather information and traffic data. ADS-B-IN technology allows the GDL 39 to receive Traffic Information Service-Broadcast (TIS-B) information and data from other ADS-B-OUT equipped aircraft and ground stations. The GDL-39 correlation technology automatically displays the highest-integrity traffic data from multiple sources, preventing ghost or duplicate targets. Traffic alerts are both audible and visual and using Bluetooth will provide wireless data to 2 devices while hardwired to a third. The device has a shorter battery life of 4 hours and overall meets less of the stakeholder requirements than previous devices. However, this device does have some unique characteristics that could be taken forward for potential new developments.

Traffic Situation Awareness with Alerts (TSAA)

1.29 TSAA is an ADS-B-IN device specifically aimed at those aircraft that do not carry TCAS. TSAA has now progressed as far as a flying prototype. The application was conceived by the FAA. There are two versions of the application; one that uses a Cockpit Display of Traffic Information (CDTI) and one that does not. Both versions have audio alerts. The fundamental idea is that an aircraft which broadcasts ADS-B position information has its position relative to own aircraft displayed

on the CDTI. If an aircraft is calculated to be a threat, meaning that the extrapolation of its current trajectory and own aircraft trajectory will result in a close encounter (within 500ft), an aural and visual warning is generated. The equipment does not recommend a resolution manoeuvre.

ADS-B-OUT

1.30 The options for ADS-B-OUT EC devices are limited but the ECWG view this product as being essential; the most basic device that will enable aircraft to be electronically visible at a potentially very low cost. As discussed above, the NATS LPAT product should have a transmit-only EC device option. Regulatory enablement of connectivity of uncertified COTS portable GPS devices to ADS-B OUT capable transponders should also be pursued.

Camera Based Technology

1.31 In addition to electronic devices the ECWG has also monitored other types of technology that aim to increase situational awareness in Class G airspace. Devices include those which use cameras (visible and infrared spectra) to detect conflicting aircraft. This technology could more likely fall under the auspices of the ASI Visual Conspicuity Working Group. As far as the ECWG is aware, this genre of technology is at the early stages of development, although the RPAS industry could well have equipment at a more mature state. The prototype system demonstrated to the ECWG had a number of potential limitations and possible improvements, identified by ECWG members. However, on the whole, the ECWG see merit in exploring this type of technology further and also make the recommendation that the Visual and Electronic Conspicuity Working Groups merge to form a single, CAA Conspicuity Project.

The Industry RF Standard: Certification and Regulation

1.32 The ultimate deliverable for the ECWG is to develop an industry standard against which developers can build new devices to meet the stakeholder requirement. The ECWG conducted a review to ascertain what certification and regulatory requirements may affect an RF EC device. Following the review of available technology it was decided that this would initially focus on the most basic form of ADS-B technology; a portable, transmit-only device using ADS-B technology carried inside the aircraft. Such a device will consist of:

- a COTS GNSS receiver
- a COTS altitude transducer
- an ADS-B transmitter

1.33 Since the device will not be qualified to an avionics industry standard (TSO/ETSO), but would need to provide a level of interoperability with other airspace users, the transmitter accuracy and integrity metrics must report 'zero' unless the 3D position and velocity are obtained from a certified or approved GNSS source. The downlink format must indicate that the device cannot be interrogated, i.e. it is a 'non-transponder device' (DF18).

1.34 Based on similar work undertaken in 2013 involving UK CAA approval of VHF handheld radios, the existing ADS-B transmit requirements were identified so that the important aspects of interoperability and reduction of hazards rather than integrity, continuity and availability of the device itself, could be captured from the following existing regulations:

- ICAO Annex 10 Section IV
- DO-303
- DO-260
- AMC 20-24/CS-ACNS
- SPI IR

1.35 This requirements capture focuses on the ADS-B transmitter, positioning and altitude sensing functions. Once complete, the functional characteristics and requirements for the device will be identified as follows:

- Relevant ADS-B out requirements derived from the ICAO/MOPS/ SPI IR/AMCs.
- A suitable subset of requirements relevant to device functionality established by:
  - Comparing and contrasting subset requirements.
  - Assessing risks of using a reduced requirements subset.

- Evaluation and adoption of relevant commercial standards if necessary.

1.36 A suitable subset is currently being drawn from the above requirements and commercial standards are being researched.

1.37 Taking into account the intended function of this basic RF EC device and since the proposal is for a portable device, the grant of an Equipment Approval would seem inappropriate, but desire has been expressed for a CAA UK Equipment Approval to be granted along similar lines to that of some existing portable equipment, like Skymaps, and laying down certain design and performance criteria.

1.38 These ICAO/MOPS standards and regulations will be distilled into a specific requirements list especially for the device and, from this, a specification will be produced for device manufacturer(s) to comply with. In addition, there would be commercial standards for the control of RF radiation and susceptibility to RF interference plus any restrictions on the selected battery technology to consider.

1.39 A degree of requirements adaptability seems inevitable to account for the limitations of the device, which would include the following:

- Use of Low Cost GNSS Receiver.
  - COTS chipsets and receiver characteristics.
- Use of COTS Pressure Sensor.
  - Performance capability compared to MOPS and AMCs requirements.
- Transmitter.
  - Capability reporting.

1.40 To establish the required Design Assurance Level, additional requirements will have to be considered to ensure appropriate build standard and integrity of the device are maintained. These are related to the following:

- Design and Production Assurance
  - Equipment specification
  - Production control and consistency

- Quality system e.g. would ISO 9000 be acceptable?
- Software/Firmware – design assurance level equivalence
- Battery technology
  - Lithium technology and associated hazards
  - Qualification (UL1642 standard)

1.41 In addition to the above, the functional characteristics of the device against the requirements of RTCA/DO-260B will be established and the formats and contents of the relevant report registers examined and defined.

CAA EC Project: A Way Forward?

1.42 The ECWG strongly support the launch of the CAA EC Project which is scheduled for September 2014 and the members wish to remain involved in the project as it evolves. The CAA has obtained funding from DfT and submit the draft CAA EC PMP at Annex A as a potential way forward for the project.

Work Packages

1.43 The ECWG are now more informed than when the initial bid to DfT was submitted and as such the ECWG recommend that the potential work packages are changed slightly to take advantage of the priorities identified by the ECWG. In the longer term, this will result in more valuable and wise use of the funds.

1.44 Within the CAA EC PMP, the ECWG suggest four potential work packages and they are listed below in priority order (further detail is contained within the PMP):

i) Work Package 1: Research the use of uncertified GPS devices, including the connection of uncertified COTS portable GPS devices to ADS-B OUT capable transponders, and the regulatory enablement thereof.

ii) Work Package 2: Research potential interference issues with RF EC devices.

iii) Work Package 3: Research interoperability issues for RF EC devices; both operational and regulatory.

iv) Work Package 4: Research potential options for Camera Based technology.

1.45 In addition to the work packages, the CAA EC PMP also suggests a governance structure for the project.

Issues and Risks

1.46 The ECWG have identified a number of potential issues and risks with regards to the CAA EC Project which are also detailed in the CAA EC PMP. In summary the following has been identified:

i) RPAS - The ECWG is aware that developments are continuing within the RPAS community. As RPAS technology evolves it will be vital that the CAA EC Project is closely aligned with the RPAS work stream to understand the RPAS approach to safety of flight and situational awareness. The ECWG therefore recommends that the CAA EC Project is formally linked with the relevant RPAS team.

ii) UK ADS-B Policy - As discussed above, the most promising EC devices are based on ADS-B technology. Currently there is no formal UK ADS-B policy. The ECWG understand that the CAA is in the process of producing this. However, it will be vital for the CAA EC Project to have this policy in place.

iii) Effects of EC devices - Any potential negative effects of an EC device in the aircraft must be clearly understood. This will be done through detailed R&D as suggested in the CAA EC PMP.

iv) The extent to which military (both UK and foreign) aircraft operating in UK Class G airspace will be compatible or not. As the military are a significant user of Class G there is a significant interaction with GA and so it is fundamental to many GA pilots that this mutual risk is mitigated by the EC device.

Conclusions & Recommendations

1.47 The ECWG agrees that there is a way forward for EC; the overall benefit of EC is that it should, if done properly, improve the existing safety nets therein raising the level of safety in Class G and adjoining airspace structures for all users by reducing the Significant 7 risk of Airborne Conflict.

1.48 The ECWG agree that an industry standard can be developed for a

RF device and it is highly likely that this device will operate using ADS-B technology.

1.49 The ECWG sees a priority in four work streams which should be taken forward without delay. It is essential that the range of existing and resultant risks are fully understood, quantified and assessed.

1.50 The ECWG recommends that the CAA continue to launch the CAA EC Project in September 2014 and that initial research results should aim to deliver in September 2015.

1.51 The ECWG recommend that UK ADS-B Policy is developed as a priority in order to inform any decisions made as part of the CAA EC Project.

1.52 The EC PMP recommends a governance structure for CAA EC Project; the Project Lead for Airborne Conflict being the Project Lead or Technical Specialist for the CAA EC Project.

1.53 The ECWG recommend that the Electronic and Visual Conspicuity Projects merge to become the CAA Conspicuity Project in September 2014.

1.54 The ECWG recommends that the CAA EC Project is formally linked with the relevant RPAS work stream.