

Electronic Conspicuity & ADSB for Glider Pilots

Introduction

I'm sure many of you will have seen the announcement by the CAA of a subsidy of up to £250 for equipping your aircraft with "Electronic Conspicuity" (EC). However, as all of us in the gliding community (I hope) already have Flarm you may be wondering what relevance this is, and if you've also gone on to read some of the discussion on the power pilot forums you are now probably completely confused by the religious wars about EC underway there! This short document attempts to explain EC for glider pilots and lay out the options open to us. I will start by giving a very short explanation of the current status, the role of "ADSB" and the pro's and cons; then we'll go on to look at what is available now (that works in glider cockpits) and my own personal view on how to make use of the CAA subsidy.

ADSB, Flarm and the Rest!

As most of you will know Flarm has been around for 15 years or more, it works by transmitting short signals which identify the sender and give their GPS position, height, rate of climb/descent, speed and direction of travel. As well as transmitting this information Flarm devices receive signals from other Flarm units, notify you of nearby traffic and carry some clever computation to decide whether there are any are likely collision risks – raising an appropriate warning if this is the case.

For a long time Flarm was the "only game in town" for low-power/cheap conspicuity equipment, but in 2015 a group in the UK set up a similar, but not compatible, system called "Pilot Aware" (PAW). Both Flarm and PAW work on de-regulated frequency bands and transmit at low power (<500mw). PAW uses an un-encrypted signal format (called P3i) which is "Open", so that (in theory) anyone can build a PAW transmitter/receiver – although only PAW have done so. By contrast Flarm is partially encrypted, manufacturers need to pay a licence to send/receive Flarm, and a number of different vendors have done so.

This obviously raises the issue of two different systems, which did not work with each other. Along comes the CAA who want a single standard to allow all aircraft (including drones) to both "see" and "be seen". They decided that the chosen common ground would be something called ADSB (don't worry about what it stands for!). ADSB is similar in some ways to Flarm or P3i in that it transmits your GPS position and velocity at regular intervals. It has however some differences – in particular the ADSB signals are sent on a "protected" aviation frequency. ADSB was primarily designed to work alongside a Mode-S Transponder, sending out regular information alongside the transponder pulses (the latter are only sent when the transponder is interrogated by a radar system). However, after the general rejection of mandatory transponder installation in the UK, what the CAA did was produce a standard (snappily entitled "CAP 1391") for transmitting ADSB without a transponder. Such a "CAP 1391" device sends out your position on an approved aviation frequency and at about 20W – so is much more powerful than Flarm or PAW system but a lot less powerful (and therefore less battery hungry) than a transponder.

Unfortunately all this leaves us with three incompatible EC systems (Flarm, PAW, ADSB). Manufacturers have tried to cater for this by making it possible for their chosen system to also receive one or more of the other systems (all of the systems can receive ADSB in their latest versions), but this is only a partial solution as no system exists which will both receive and transmit two or more of the available protocols.

Today we are in a situation where most Gliders have Flarm and can see each other, a significant minority of the general aviation (GA) fleet have PAW, so can see each other but are not visible to gliders and the remaining majority of GA aircraft have no EC at all (except for some with transponders). The CAA have indicated they wish ADSB to become the common standard but, so far, have stopped short of mandating it. Instead they have, through the DfT, obtained grants towards getting some form of EC into the whole GA fleet – unfortunately without much guidance on what should be installed – leading to much confusion!

Why is this important to Glider Pilots ?

We could say "we all have Flarm, so we've got EC", and indeed Flarm deals with the greatest threat to us which is Glider vs Glider mid-air collision. Since Flarm became common in the UK the rate of glider collisions and fatalities has dropped noticeably and few have occurred where both aircraft are Flarm equipped. In addition the other vendors of EC have made attempts to detect Flarm, so for example a PAW equipped powered aircraft gets Flarm data relayed up to them from ground stations (using the same OGN network we use for "Spot the Glider" or "Glide and Seek"), while "SkyEcho" users also receive Flarm traffic on their moving map (SkyDemon) notepads.

There are however two problems with this:

1. Flarm transmissions are fairly short range, fine at Glider vs Glider speeds but would give rather late warnings to (eg) a high-performance single travelling at 120-160kt. In addition GA aircraft using PAW rely on ground relay's and the reliability of that system is not always high – at least one Airprox (near Lasham) has occurred when this system failed.

2. Some powered aircraft, particularly the higher-end singles and twins, will use certified panel mounted systems (from the likes of Garmin etc) that will only receive ADSB and will not see Flarm at all.

So, if we wish to increase the chance of “being seen” by other (powered) GA an ADSB based system gives us the widest visibility and at ranges 3-4 times that achieved with Flarm. Similarly, if we wish to “See” other GA then, as ADSB becomes more common, systems that receive ADSB will become desirable.

How do I transmit ADSB?



At the moment there are only two options available to glider pilots. If you have a transponder, or are getting one fitted, then it is a relatively simple job to feed it with a GPS signal (probably from one of your existing GPS systems), turn on the (amusingly named) “Extended Squitter” function and your transponder will, as well as transponding, send out ADSB. If you have a transponder already this is the preferred option.

For most of us without transponders the only choice available at the moment is the “SkyEcho 2” (SE2). This is a self-contained ADSB ‘beacon’ that has its own GPS, batteries and antenna all in a small (cigarette packet sized) device. It runs for 10 hours on a single charge and will send out ADSB signals to the CAA CAP1391 standard, letting people know where you are. In a glider it is most conveniently mount on the cockpit side or canopy rail – indeed many older gliders already have pre-tapped camera mounts in just the right position. SkyEcho 2 sells for just under £500, so spookily gains the maximum subsidy from the CAA (£250 up to 50% of the purchase value).

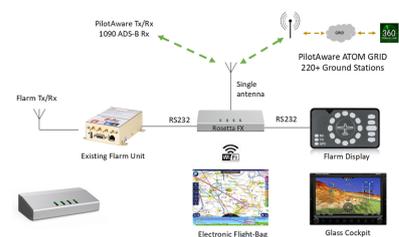
How do I receive ADSB?

For glider pilots this gets a bit more complex. If you have a modern PowerFlarm system there is an option which will allow it to receive ADSB signals, but only recently installed Flarm systems will have this and the upgrade path for older systems is not cheap!

If you use SkyEcho 2 to send ADSB then it also receives it. Unfortunately it is of limited use to us in gliding, because the information will not display on any of our commonly used gliding software (such as XCsoar or LK8000). Traffic from SE2 will display on power-flying software such as SkyDemon or EasyVFR (including the free version), but these need something like a mobile phone or notepad/ipad to run on, which may not be convenient or visible in a glider cockpit.

You could also use a PAW system as a receiver (it will display on XCSoar), but at the moment the only available system (Rosetta) is rather large and power-hungry for glider cockpits. A smaller system to be called Rosetta-FX is promised, but not available yet and technical details are light.

So, at the moment, unless you are fortunate enough to have a PowerFlarm installed or planned, there is no ideal solution for receiving ADSB traffic data in a glider cockpit. It is possible that the Rosetta-FX will give us an affordable solution, but this is unlikely to be available till early 2021.



So, what should I do?

My personal view is that at the BGGC owners/syndicates should all try and take advantage of the CAA subsidy. You need to decide which is more important to you, being visible to the power community or seeing power traffic. The easy and simple route is to solve the “be seen” issue first and get a SkyEcho or enable an existing transponder – this is simple and (with the CAA subsidy) relatively cheap. It is possible, but not guaranteed, that transmitting ADSB will have other advantages which I will discuss later, in the Q&A section.

Affordable options for “seeing” ADSB traffic at the moment are few, but I think this will improve, either through devices or software that talks to SkyEcho or by newer PAW devices. However, the CAA subsidy may have gone by the time they are available so you may want to tackle the “see” after the “be seen” component. If “seeing” is definitely your priority over “being seen” then an upgrade to PowerFlarm with ADSB is the obvious choice, but even with the CAA subsidy this will cost over £1,000.

It’s tempting to say “I’ll wait for one device that does it all”, but such a device could be a long way off. Similarly it is possible the technology will evolve and more/different options become available. However, given the (glacially slow) rate of CAA decision making, my own view is that an investment now will be good for several years and this is an opportunity to improve our safety at a reasonable cost.

Q&A and FAQ

Q: Why don't I just wait for a new Flarm type device that transmits ADSB as well?

A: Firstly, such a device may never be produced, the CAA "CAP 1391" standard is only legal in the UK (and Australia), not the rest of Europe or the USA – so there may be no commercial driver for Flarm producers to do this. In addition, given that the "ADSB Receiver" adds £500 to the basic Flarm price, any integrated Flarm transmitter is unlikely to be cheaper than SkyEcho.

Q: Will Flarm become obsolete?

A: This is not likely. Flarm is specifically tailored to glider use, the Flarm data stream and traffic algorithms are setup so that we don't get overwhelmed with alarms when thermalling or ridge soaring – any ADSB traffic alarm system would be going off all the time in these situations. In addition, Flarm devices carry out other functions such as acting as loggers or obstacle avoidance for Alpine soaring, so I believe Flarm will continue in the gliding community for a long time yet.

Q: Why doesn't everyone just get Flarm ?

A: A good question! In parts of Europe Flarm has become very much the "de facto" standard and is used by power and gliding communities alike. However, in the UK there is a strong power flying lobby against Flarm and the CAA is not minded to promote what they see as being a proprietary system.

Q: Do ATC units "see" ADSB emitters"?

A: At the moment trials are underway where the controllers managing the Barton ATZ are using ADSB traffic information screens. The expectation is that this will become formally supported by the CAA, and much more common (its vastly cheaper than a radar system); Informal systems are already in use at places like Popham, Kemble and Turweston. If more gliders equip with ADSB it may put us in a stronger position with airfields like Gloucester to get them to use such a system if they seek to protect their ILS approaches.

Q: Don't I need a Transponder anyway for Brize and Oxford proposed airspace?

A: As it stands you will either need a Transponder or get permission by radio to enter the proposed TMZ's. The GA Alliance is lobbying for ADSB to be accepted as well, but there is no guarantee this will happen. However, Brize ATC should have access to ADSB receivers/screens by mid-2021, so even if you still need to call them, they should be able to see where you are, and this could ease passage through their proposed "Class E+" airspace

Q: Should I get a Transponder instead?

A: This is really a separate question. If you feel you need/want a Transponder to ease or enable access to controlled airspace then the sensible thing to do is get one installed, connect it to a GPS source and enable ADSB on the transponder. However this does not allow you to see more power traffic, so you may need to upgrade the receive side of your EC anyway.

Q: Would an ADSB receiver allow me to see everyone else?

A: Maybe in the long term, but in the short term there will be aircraft who do not yet transmit ADSB. Some of these might have no transmitter at all, or some might be sending out transponder signals without the ADSB element. Long term it is hoped (by the CAA) that small ADSB transmitters such as SkyEcho would be suitable for a wide range of aircraft including paragliders, gliders and others where transponder fitment is difficult or impossible. In addition, their aim is that all transponder equipped aircraft will also send out ADSB (this is mandatory for large commercial aircraft from 2021). Experiments are also underway to allow drones to send and receive ADSB signals.

Q: What's the difference between Electronic Conspicuity and a Transponder?

A: An EC device broadcasts its GPS position all the time (several times a second). A transponder sends out a response when interrogated by a ground or airborne radar system – it sends out some information (eg altitude and callsign) but it is the radar that calculates the location – not the aircraft's GPS signal. If transponders are not being interrogated they will not transmit, so you only know where a transponder equipped aircraft is when it is in range of a radar system.

Q: What about commercial traffic?

A: Commercial aircraft are normally equipped with a traffic avoidance system (TCAS). Most of these work by interrogating other aircraft transponders; however newer TCAS systems also receive ADSB signals. At the moment there is much debate about whether these systems will "see" a SkyEcho broadcast - due to some technical issues about signal & position quality. If (when) CAP1391 devices like SkyEcho become more common then it's possible that these issues will start to be addressed. As glider pilots this may not be a major issue, as we tend to steer clear of the classes of airspace where this applies.

Q: Why do I have to do anything at all?

A: You don't "have" to do anything at the moment. It is not yet clear whether the CAA will make ADSB carriage mandatory or not, but they have stated in their airspace strategy that they are considering this or that they may also introduce zones where carriage is mandatory, so this is an opportunity to enable your glider for relatively low expenditure

Web References

SkyEcho 2 : <https://uavionix.com/products/skyecho/>

PilotAware: <https://www.pilotaware.com/fx>

CAA: <https://www.caa.co.uk/General-aviation/Aircraft-ownership-and-maintenance/Electronic-Conspicuity-devices/>