

Using Transponders

Transponders are a vital tool for safety. They are not only useful for the Traffic Collision Avoidance Systems (TCAS) systems in large aircraft but also with the advance of electronic conspicuity technology, sport and recreation General Aviation aircraft are now incorporating the systems, such as SkyEcho, that can give the pilot greater situational awareness and may prevent a mid-air collision.

Equally this applies for controller's situational awareness and the ability for them to help aircraft particularly if it looks like they are going to stray into controlled airspace. This has been further enhanced with the advent of Mode S technology and ADS-B.

The benefits of using transponders are now effectively the same for both sides of the air traffic management equation:

MONITOR – the aircraft's position and altitude can be monitored from the air or the ground.

ACQUIRE – information about the aircraft can be acquired by many different users. Once acquired the system or controllers can identify if there is a threat to safe operations.

SEPARATE – information is used to achieve separation of aircraft from each other.

CO-ORDINATE – the information supplied can allow simple co-ordination (between aircraft or air traffic units) to aid the progress of the flight or to co-ordinate separation.

Practical steps

Always ensure your transponder is on before taking off and, if it is able to give altitude information that this function is selected. Standardised European Rules of the Air (SERA) Section 13 refers to SSR transponder use and outlines the legal requirements; a summary of the key operating requirements in is detailed at the end of this narrative.

Transponders should also be regularly maintained; this ensures they are giving the correct altitude information to controllers and other aircraft. Air Traffic Units equipped with surveillance equipment are able to provide a further serviceability check.

Pilots of non-powered aircraft are also encouraged to operate the transponder during flight outside airspace where carriage and operation of SSR transponder is mandatory.

Whilst there is a safety risk associated with an airspace infringement, there is also the issue of major disruption. Controllers must try and avoid the infringing aircraft by 5 miles or 5,000 feet

Don't forget the **MASC!**

Using Transponders

(in some airspace this may be reduced to 3NM or 3,000 feet). This will inevitably lead to delays to other aircraft and an increased workload for controllers and pilots alike. A transponder will aid in identifying the aircraft earlier and ultimately reduce these consequences. It is usually possible for a controller or London/Scottish Flight information Service to actually contact aircraft before entering controlled airspace. This is particular the case if you are speaking to LARS unit or using a Flight Information Service and using one of their squawks. A Frequency Monitoring Code (FMC) ([listening squawk](#)) is also particularly useful and most large airports have them. Make sure you use the correct code and listen on the correct frequency. This can also help prevent infringements in the first place.

Many air traffic units are also equipped with an airspace infringement tool as an integral part of the radar display. These systems use transponder information to 'monitor' the boundaries of controlled airspace and provide an alert to the controller that an infringement has possibly occurred.

What about if the transponder is unserviceable or turned off?

If in any doubt speak to someone - Controllers and Flight Information Services are there to help you. Even if your transponder is not working or is turned off, the flight can still be identified, monitored and traced by controllers using primary radar.

It is also a good idea to regularly obtain an altitude readout check from a LARS or another radar unit. ATC will also normally verify the accuracy of the Mode C readout when assigning discrete transponder codes to aircraft.

Controllers will assume (also known as 'deem') that aircraft without a transponder will be remaining underneath Control Areas when they may not be. Unless they believe an aircraft to be lost, they will continue to vector aircraft in their vicinity or allow aircraft to follow published Instrument Flight Procedures. This may result in an increased risk of mid-air collision as the infringing traffic will have no alerting capability to TCAS.

And the legal responsibilities?

SERA 13001(a) states:

It being an offence for a UK registered aircraft to commence a flight if any of the equipment which is required to be carried (e.g. a transponder where required for the notified airspace being flown) is not carried or is not in a fit condition for use (Article 78A Air Navigation Order 2016 (ANO)).

Rendering a transponder unserviceable may be a breach of Article 77 ANO which states that that a UK-registered aircraft not on a public transport flight must not fly unless, in the case of a transponder where required, the transponder is 'installed in a manner approved by EASA or the CAA'.

Be a responsible operator, demonstrate good airmanship and remember your legal responsibilities.

Using Transponders

SERA.13001(c) exempts aircraft without sufficient electrical power supply from the requirement to operate the transponder at all times, except for flight in airspace designated by the competent authority for mandatory operation of transponder. However, Pilots of non-powered aircraft are also encouraged to operate the transponder during flight outside airspace where carriage and operation of SSR transponder is mandatory.

SERA 6005(b) and where the carriage of a functioning transponder is mandatory (e.g. in a TMZ) and the transponder has failed and cannot be restored before departure, pilots must inform ATS as soon as possible (SERA.13020).

The altitude encoder (and therefore transponder) altitude and the indicated altitude must correspond to within +/- 125ft. Static system accuracy (position error of static port on small aeroplane per CS-23.1525) is +/- 30ft per 100kts

Note: the 200 ft 'accuracy' that may pilots talk of is actually based on ATC level occupancy and not the permitted accuracy of a transponder.

In summary:

- use a transponder as much as possible and especially where the airspace classification (e.g. TMZ) requires it,

- make sure the transponder is well maintained, and you make regular checks for accuracy, AND
- if in any doubt about the serviceability then check with ATC.

SERA SECTION 13 SSR TRANSPONDER under the Regulation (EU) 2016/1185

Below are key aspects of SERA section 13 relating to the carriage and operation of SSR transponders. This, along with Guidance Material (GM) and Acceptable Means of Compliance (AMC) can be found at [SERA IR + AMC/GM eRules](#)

SERA.13001 Operation of an SSR transponder

- (a) When an aircraft carries a serviceable SSR transponder, the pilot shall operate the transponder at all times during flight, regardless of whether the aircraft is within or outside airspace where SSR is used for ATS purposes.
- (b) Pilots shall not operate the IDENT feature unless requested by ATS.
- (c) Except for flight in airspace designated by the competent authority for mandatory operation of transponder, aircraft without sufficient electrical power supply are exempted from the requirement to operate the transponder at all times.

Be a responsible operator, demonstrate good airmanship and remember your legal responsibilities.

Using Transponders

SERA.13010 Pressure-altitude-derived information

- (a) When the aircraft carries serviceable Mode C equipment, the pilot shall continuously operate this mode unless otherwise dictated by ATC.
- (b) Unless otherwise prescribed by the competent authority, verification of the pressure-altitude derived level information displayed to the controller shall be effected at least once by each suitably equipped ATC unit on initial contact with the aircraft concerned or, if this is not feasible, as soon as possible thereafter.

SERA.13015 SSR transponder Mode S aircraft identification setting

- (a) Aircraft equipped with Mode S having an aircraft identification feature shall transmit the aircraft identification as specified in Item 7 of the ICAO flight plan or, when no flight plan has been filed, the aircraft registration.
- (b) Whenever it is observed on the

situation display that the aircraft identification transmitted by a Mode S-equipped aircraft is different from that expected from the aircraft, the pilot shall be requested to confirm and, if necessary, re-enter the correct aircraft identification.

- (c) If, following confirmation by the pilot that the correct aircraft identification has been set on the Mode S identification feature, the discrepancy continues to exist, the controller shall take the following actions:
 - (1) inform the pilot of the persistent discrepancy;
 - (2) where possible, correct the label showing the aircraft identification on the situation display; and
 - (3) notify the next control position and any other unit concerned using Mode S for identification purposes that the aircraft identification transmitted by the aircraft is erroneous.

Remember

- The correct use of transponders with accurate pressure-altitude-derived information (MODE C/ALT) is a major barrier in preventing a mid-air collision.
- It also enables air traffic control to quickly render assistance to you in the event of an emergency (squawk 7700), radio failure (squawk 7600) or if you are lost (squawk 0030).
- It may be tempting to switch off MODE C if you fear you have infringed controlled airspace; however, this is dangerous, illegal and very poor airmanship.
- The CAAs [Skyway Code](#) provides extensive information on the correct use of transponders.

Be a responsible operator, demonstrate good airmanship and remember your legal responsibilities.