



# Causal Factor Analysis of Airspace Infringements in the United Kingdom

1 January – 31 December 2018

A report by the Causal Factor Working Group, a sub-group of the CAA's Airspace Infringement Working Group

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## Introduction

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An airspace infringement is the unauthorised entry of an aircraft into notified airspace. This includes flight in controlled airspace (CAS) comprising Control Areas, Control Zones and Terminal Manoeuvring Areas, or in Prohibited or Restricted airspace (either permanent or temporary in establishment), active danger areas, aerodrome traffic zones (ATZ), radio mandatory zones (RMZ) or transponder mandatory zones (TMZ).

Any airspace infringement has the potential to be a serious safety incident which may result in a mid-air collision or AIRPROX. An airspace infringement is a reportable occurrence in accordance with Regulation (EU) 376/2014 and Commission Implementing Regulation (EU) 2015/1018.

In 2018 there were a total of 1,358 airspace infringements reported through Mandatory Occurrence Report (MOR) or Alleged Breach of Air Navigation Legislation (ABANL) reports compared with 1,162 in 2017; this equated to an increase of circa 17% between 2017 and 2018. The rise in number can be attributed to improved reporting standards by ANSPs, activity sponsors (in the case of temporary airspace structures such as TDA and RA(T)) and pilots. Of these, 519 were investigated by the CAA's Infringement Coordination Group. The reasons for the selection of these infringements is shown in Appendix 1.

Not all occurrences were reported against UK licenced pilots. Investigations into airspace infringements by military pilots are administered by the Ministry of Defence; infringements by non-UK licenced pilots in UK airspace are administered collaboratively with the relevant pilot licencing state. However a UK-based civilian pilot will, where known, be contacted and asked to submit a report, either in the form of a pilot-initiated MOR, the use of the Post-infringement Questionnaire (found at <https://airspacesafety.com/infringement/infringement-form/>) or via free text emails or letters. These reports are analysed annually by the Airspace Infringement Working Group (AIWG) to identify causal factors and trends, allowing the CAA and industry partners to identify work streams and focal areas that will enable cross industry groups to work towards reducing the number and consequences, of airspace infringements.

This analysis was carried out by the Causal Factor Working Group (CFWG) (part of the AIWG). The Group comprised three experienced General Aviation pilots with a span of operations over several areas of aviation; one of the members was also a PhD student in Human Factors who is researching their role in airspace infringements in particular, and pilot error generally. The report is not to serve as a download of statistical data; relevant statistics on monthly and annual airspace infringements may be found on the Airspace and Safety Initiative website at (<https://airspacesafety.com/facts-stats-and-incidents/>). Some data relating to airspace infringements from 1 January 2018 to 31 December 2018 can be found at appendix 2.

## Analysis and Findings

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This report comprises findings from 175 MOR reports relating to infringements and the associated pilot reports.

Of these, four reports were found to contain no useful causal factor information. There were 104 (61%) narrative reports such as email responses from infringing pilots and 66 (39%) standard infringement questionnaire responses.

### Causal Factors

Despite the advice given by the CAA and General Aviation organisations, a large number of airspace infringements still occur due to the pilot-in-command (PIC) failing to use, or failing to correctly use, a moving map with airspace alerting. In addition, a significant number of pilots still do not use a Frequency Monitoring Code preferring instead to squawk 7000 when operating in proximity to controlled airspace and not in receipt of an air traffic service.

Infringing pilots reported a number of factors that may have contributed to their airspace infringement. In descending order, the following were reported:

1. Flying too close to controlled airspace was a factor in a significant proportion of cases, in particular when infringing vertically. Leaving too small a gap can lead to an infringement when distraction occurs or during turbulent conditions.
2. Misreading of the VFR chart was mentioned several times, particularly with respect to southwest and southeast of Stansted controlled airspace
3. Distraction. Examples include where an ill passenger and an inflight emergency or instrumentation problems were suggested as contributors in a few reports, as were poor communications, poor planning or airmanship.
4. Using the wrong radio frequency emerged a few times, including failing to obtain 8.33KHz updates.
5. In three reports having to take avoiding action (weather, drone-sighting and avoidance of birds) were cited as factors resulting in airspace infringements. In a number of cases, poor understanding of airspace was a factor; this could be viewed as poor planning or inattention to Threat and Error Management (TEM) during the planning stage.

## Instructional Flights

In total, 26% of the total analysed infringements occurred during instructional flights.

32 (19%) of airspace infringements occurred during dual instructional flights, one during a flight examination and 10 (6%) involved solo student pilots operating solo under supervision.

In 31 (18%) cases the pilot had a professional licence, either an Airline Transport Pilot Licence (ATPL) or Commercial Pilot Licence (CPL).

(39 contained no information relating to the nature of the flight (instructional or otherwise) or information regarding the type of licence held).

The reports from instructional flights suggested that the most significant factor in causing airspace infringements was flying too close to CAS, followed by a failure to use a moving map. Some instructors reported carrying the equipment but not using them because they were teaching navigation.

Distraction was the next significant issue due to a number of factors, not least the difficulties associated with focusing on the student, the aircraft and navigation, leading to loss of situational awareness. Other issues reported included poor chart reading and planning, in particular, involving weather.

There were two examples, including one on GFT, where the instructor/examiner was deliberately waiting to see whether the student/candidate would notice and correct the error and accordingly didn't intervene.

What is unknown, of course, is what proportion of all flights that take place outside controlled airspace are instructional and therefore whether instructional flights are particularly at risk of infringement, but the 20% figure is disturbing, and an increase on the previous suggested figure, 14% in 2017).

It is acknowledged that instructional flights involve a high workload (with a number of potential distractions) on both instructor and student, and that the primary goal of the flight is to achieve an educational outcome. This must be done in a constrained time, while checking for terrain, traffic, fuel, serviceability as well as airspace; in addition, the instructor is not usually handling the controls, and therefore cannot always intervene fast enough, particularly in terms of altitude deviations. However, instructors and examiners are aware of the workload and potential distractions and should, therefore, be even more careful to remain well away from CAS, and, particularly when operating close to CAS, be particularly vigilant.

The CFWG was surprised in the 2018 figures how many instructors did not use moving maps. It acknowledged that the CAA communications on the use of moving maps has

been more recent and it hoped that this guidance will be noted and ‘trickle down’ through instructors to students as the message continues to be emphasised.

The most frequent causal factors on instructional flights included:

1. Loss of situation awareness of position due to distraction associated with student interaction;
2. Commencing a climb too early or descent too late to maximize time available to conduct exercises, such as stalling, under the London Control Area (LTMA) where maximum altitude possible is required; and
3. Flying out of the planned exercise area due to, for example, winds being stronger than forecast.
4. Limited planning due to a lack of time between flights with different students leading to a failure to establish sufficient situational awareness from the start of the flight.

## Professional licence holders

Although most professional licence holders were acting as instructors, there were 13 (8%) of non-training infringing pilots who held professional licences. Two were deliberate (one in avoiding weather and a second involved a helicopter on an operational task), but the rest involved a range of causal factors not dissimilar to those affecting private pilots. Several were flying faster/higher performance aircraft (business jets and warbirds) and that exaggerates small errors into larger infringements, which may be relevant.

## Altimetry

The CFWG was asked to investigate whether the use of Regional Pressure Setting (RPS) was a significant contributor to infringements when operating close to CAS. The outcome of the analysis was that it was not. There were two infringements where it may have played a secondary role, but none were directly caused by using the RPS.

There were several examples however, of other altimetry issues, mainly using QNH instead of the Standard Altimeter Setting and vice versa, students mis-setting altimeters and continued use of a distant QNH rather than establishing and using the local value.

There were some instances of incorrect altimeter setting procedures and errors in entering the correct pressures. Examples of the latter include using RPS or Standard Altimeter Setting when beneath controlled airspace and continuing en-route with the QFE set.

# Mitigations

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The four possible mitigation measures may have helped prevent the vast majority of the occurrences reviewed. None of the measures are new to General Aviation flying activity, but it is apparent that the pilots involved were not making the best use of them.

## 1 Planning

Detailed planning and the application of TEM in relation to airspace and associated requirements during the pre-flight stage remains a critical aspect in the prevention of airspace infringements. Every flight, even remaining in the visual circuit, requires an element of planning such as reading NOTAM and formulating a secondary plan (Plan B) if a diversion is necessary due to the runway or landing area becoming unavailable due to an incident or accident.

## 2 Use of Moving Maps

There remains a worrying trend of pilots failing to accept, and adopt, the recommended practice of using Moving Maps. This is particularly evident amongst Flight Instructors despite the guidance being not only issued by the CAA and Airspace and Safety Initiative in almost all its communications but it also being taught on Flight Instructor Seminars by the General Aviation Safety Council (GASCo). Effective use of a Moving Map enhances situation awareness and increases capacity.

## 3 Plan in 3D, Take 2,

Plan a route in relation to the 3-dimensional airspace in which the flight will be conducted. Don't climb too early or descend too late in anticipation of changes in airspace level. Always plan to 'Take 2' to remain 2nm or 200 feet clear of CAS if not in receipt of a clearance to enter.

## 4 Altimeter Awareness

While the CFWG considered that the use of Regional Pressure Setting (RPS) was a not significant contributor to 2018 infringements, future infringements would be avoided if: Pilots operate on the QFE or QNH depending on the aerodrome's operating procedures when operating in the vicinity of the aerodrome pattern, and when operating in proximity to controlled airspace, operate on the QNH relevant to that volume of airspace. ANSPs should only issue the RPS to pilots when there is not a more appropriate QNH setting, and a pilot should not accept an RPS as the sole altimeter setting when they are leaving a frequency to operate autonomously.



## Appendix 1: Reasons for Investigation of Airspace Infringement

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519 airspace infringements during 2018 were investigated by the CAA's Infringement Coordination Group.

These infringements were selected because:

1. The airspace infringement resulted in a loss of standard separation between air traffic operating within notified airspace and an infringing aircraft;

or

2. The airspace infringement resulted in a safety implementation measure (controlling action) being initiated to establish or maintain standard separation between air traffic operating/intending to operate within controlled airspace and an infringing aircraft. Historically this was known as 'service disruption'. It should be noted that this action is taken as a safety measure to prevent point 1 above from occurring. This may include one or more of the following actions:

- a) Avoiding action;
- b) Airborne holding instructions or tactical vectors;
- c) A cessation/suspension of planned departures or modification of a departure route.

or

3. The airspace infringement was carried out in an aircraft where the pilot, registration and/or callsign (if different) has been recorded as having previously infringed.

## Appendix 2: 2018 Airspace Infringement Statistical Data

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<b>Total number of reported airspace infringements</b>	1358
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<b>Percentage by aircraft category:</b>	
Aeroplane	70%
Helicopter	9%
Ultralight/Microlight	4%
Sailplane/Hang-glider/Paraglider	2%
Balloon	1%
Military aeroplane/helicopter	2%
Unknown aircraft	12%

<b>Number by airspace type:</b>	
Control Zones (CTR)	285
Control Areas (CTA) (inc airways)	706
Restricted/Prohibited/Danger Areas	87
Radio Mandatory Zone (RMZ)	74
Transponder Mandatory Zone (TMZ)	76
Aerodrome Traffic Zone (ATZ)	130

<b>Number by airspace location:</b>	
Stansted (CTR/CTA/TMZ)	170
Southampton CTR/Solent CTA	115
Manchester CTR/CTA/TMA	68
Luton CTR/CTA	65
Birmingham CTR/CTA	48
Gatwick CTR/CTA	53
London CTR	28
Liverpool CTR/CTA	21
Doncaster/Sheffield CTR/CTA	29
London City CTR/CTA	16
Other UK airspace	745