AIRSPACE & SAFETY INITIATIVE

UK Civil Aviation Authority

Report from the Airspace Infringement Working Group's Causal Factors Working Group 2020

The Causal Factors Working Group is a sub-group of the Civil Aviation Authority's Airspace Infringement Working Group (AIWG). It includes three people, all independent of the UK Civil Aviation Authority: two industry experts whose experience covers microlight flying and instruction, higher performance commercial and IFR flying and instruction alongside a third member with experience in SEP flying and PhD level work in causal factors.

The members of the Causal Factors Working Group are:

- T Nathan, PPL/IR Board member, ATPL holder and Instrument Rating Instructor
- G Weighell, who at the time of the analysis was Chief Executive BMAA
- M Evans, PhD Student at University College, London, and SEP Pilot

The Airspace & Safety Initiative is a joint CAA, NATS, AOA, GA and MoD initiative to tackle major safety risks in UK airspace: airspacesafety.com

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Introduction

An airspace infringement is the unauthorised entry of an aircraft into notified airspace. This includes controlled, prohibited or restricted airspace (both permanent and temporary), active danger areas (both permanent and temporary), aerodrome traffic zones (ATZ), radio mandatory zones (RMZ) and transponder mandatory zones (TMZ).

This sub-group of the AIWG meets annually to analyse and discuss the previous year's infringements and are subject to Non-Disclosure Agreements.

Of the 748 reported airspace infringements in 2020, the Group had access to 545 casefiles (72.9%) which contained MORs and pilot reports. Where an incident is supported by an initial ATC report and a pilot report the working group has recorded certain numerical details and other information in order to establish trends and causes.

The categories which were considered are:

- Pilot qualification and experience
- Use of an air traffic service
- Altimetry
- Use of a moving map
- Planning
- Weather
- NOTAM
- Distraction
- Overload

Where numbers are expressed as a percentage it refers to the number of reports of that particular item, not of the total number of reports considered. Percentages are generally rounded to the nearest whole number.

Pilot qualification and experience

From data taken directly from pilot report forms it was established that the type of licence held by the pilot in command was as follows:

Students (no licence)	4%
PPL/LAPL/NPPL	69%
Professional (half of which also held an Flight Instructor qualification)	27%

Eight pilots (1.4%) held Federal Aviation Authority (FAA) qualifications. This low number suggests that holding a licence other than a UK issued licence is not a significant causal factor.

Total Hours

The pilot report form asks for pilot experience in terms of both total hours as Pilot-in-Command and hours flown within the periods of 90, 28 and 1 day prior to the incident. The Working Group collated the reported Total Hours which are grouped as follows:

less than 100 hours	10%
have more than 200 hours in total	75%
more than 1000 in total	38%

Although it might be expected that very low-hour pilots (in this case defined as less than 100 hours) would be more likely to infringe due to inexperience, there were very few that did. The Working Group noted that a significant number of very high-hour pilots (in this case defined as 1000 hours or more) had infringed. A factor which might have influenced this is that the higher-hour pilots are exposed to the possibility of infringement more often than low-hour pilots by virtue of flying a greater number of hours.

The Working Group also noted that there has been an increased workload on Flight Instructors, usually in the higher hour group, throughout certain periods of 2020 due to the need to carry out refresher training for private pilots following the easing of COVID

associated lockdown/restrictions. Some Flight Instructors reported having flown many flights in a day and cited being tired as a cause of an infringement. Lack of currency in the role of Instructor also caused some incidents of overload, leading to an infringement.

Recency

0 - 10 hours in the 90-day period prior to the event	48%
0 – 5 hours flown in the 28-day period prior to the event.	47%
up to 10 hours flown in the 28-day period prior to the event.	22%

It was considered whether a lack of recency had been a root cause of an infringement. The way that the post-infringement questionnaire allows pilots to report hours does not give a clear indication of recency, for example of the 47% who reported less than 5 hours in the previous 28 days; the Working Group members could not establish how many pilots had zero or at the extreme had flown 5; nor at what stage within the 28-day period when these hours were flown. It does appear, however, that there were fewer infringements by the group who had flown more in the 28-day period, suggesting that maintaining skill by practise is a worthwhile preventative measure.

The Working Group also recognise that the infringement occurrences in 2020 were heavily influenced by three significant factors.

COVID-19 lockdowns prevented pilots from maintaining skills, created pressure to fly when lockdown allowed and put a significant strain on the flight training industry to get pilots back in the air following a lay-off. These factors were obvious in many reports.

Airspace. In the early part of 2020, many reports relate to pilots who had failed to understand and comply with the new airspace for Farnborough. A particular hot spot was associated with the visually circuit for Runway 25 at Blackbushe Airport where the new airspace boundary is close to established circuit patterns. Although there has been significant publicity about the airspace introduction, both nationally and locally, some pilots were unaware of the changes and infringed following procedures predating the new airspace.

Airspace Status NOTAM. During the period of reduced flying throughout the UK several airports published NOTAM reclassifying existing controlled airspace to Class G. In some cases, there was confusion when a further NOTAM was issued to revert the airspace to Class D for a limited period within the notified period. Some pilots misunderstood the

overall picture and assumed that the first NOTAM was the only NOTAM and that the airspace was classified as Class G for the duration and entered without a clearance during a period of NOTAM activity. Had the airport issued a single NOTAM to include all active and non-active periods the confusion may have been avoided.

Air Traffic Service

The pilot report form asks the pilot to record whether they were receiving an air traffic service at the time of the infringement and if so, the type.

No contact with Air Traffic Control (ATC)	26%
Basic Service	57%
Traffic or Deconfliction Service	11%

There was some evidence of misunderstanding of the Basic Service where a pilot thought that the ATC agency might have alerted them to an airspace boundary before they infringed.

Although the pilot report form does not specifically ask if the aircraft was using a Frequency Monitoring Code, text within the report showed that 30 (6%) were. Some reports showed a lack of understanding of use of the FMC; the Working Group also noted some instances of misunderstanding of the scope of the Basic Service.

Altimetry

It is noted that misuse / misunderstood altimetry was not a significant causal factor in 2020. There were just 16 (3%) incidents where altimetry played a part.

VFR Moving Maps

From the information that could be extracted from the pilot report form the following statistics were recorded:

Operating without the use of a VFR Moving Map	39%

Of those who used a VFR Moving Map:

Unit Failed	3%
Unit was not switched on properly	3%
Unit not set up to provide warnings/alerts	13%
Warnings/alerts were not noticed	35%
Misunderstanding of information (mix of misreading charts and misunderstanding warnings)	7%

In reading many pilot reports, it seems that among this group there was some lack of understanding of the facilities available on their device and once in use a lack of attention paid to the information that was being given, e.g. airspace warnings.

Planning and Threat and Error Management

The Working Group noted comments from the pilot report forms in relation to flight planning in relation to infringements.

Poor airspace Planning/Threat and Error Management was identified as a cause in 337 (62%) of infringements.

There were two significant causes.

Some pilots did not plan climbs or descents far enough ahead. Although the pilot was aware of the approaching need to climb or descend, the action was initiated too late leading to an infringe. Entries into the Manchester Low Level Route from the south appear to frequently infringe the Manchester Control Zone above.

Flying too close to edge or base of airspace.

Although the 'Take2' initiative[1] has been published for several years, many infringements are caused by the inadvertent entry into controlled airspace due to pilots flying with minimal margins. Vertical infringements, entering from below, are often caused by thermals lifting the aircraft into controlled airspace before the pilot can correct. Horizontal infringements, entering the airspace horizontally from the outside, are often caused by inaccuracy of flying or strong winds. In both types of event planning to fly with a greater margin, 'Take 2' or maybe more, could reduce the number of infringements significantly.

The Working Group also noted that there appear to be a disproportionate number of infringements where the base of controlled airspace is 2,000 feel amsl rather than at 2,500 amsl. This is perhaps because pilots flying below a base of 2,000 feet are more inclined to fly closer to the base being as far away from the ground as possible whereas when the base is 2,500 feet, they feel more comfortable flying further from the base at, for example, 2,200 feet. However, 2,000 feet also seems disproportionate from 1,500 feet; the Working Group opined that maybe pilots are just not used to flying at 1900' or 1800' to remain clear.

Weather

Weather was a factor in 85 (16%) of incidents. The most common cause was the pilot experiencing a stronger than expected wind and being 'blown off' track, or out of position. There were instructor reports of a strengthening wind throughout the day going unnoticed and subsequently affecting the accuracy of their upper-air work.

Cloud was another factor. A number of pilots encountered cloud at their planned transit altitude/level and then mane a vertical adjustment without proper reference to a chart.

NOTAM

NOTAM were cited as causal factors in 15 (3%) of infringements. As members of the AIWG, the Working Group members are aware of limitations within the NOTAM system which can lead to infringements. The poor/inability to carry out filtering to obtain information only relevant to the flight leads can lead to an excessive number of NOTAM

[1] As part of Threat and Error Management, pilots are advised to maintain adequate separation from notified airspace through the application of the 'Take 2' guidance (where able, plan to remain at least 2NM from the edge or 200 feet below the base of the subject airspace) to avoid airspace infringements. The recommended 200 feet distance may need to be increased during flights where turbulence or thermic conditions are encountered to prevent inadvertent climbs into controlled airspace.

which can result in relevant information being missed. Within the reports there were some pilots who had not carried out a NOTAM brief, others who had not checked the latest NOTAM and some who, as reported above, were confused by the complexity of a group of NOTAM.

Distraction

The Working Group looked at how distraction might have been a causal factor. Some 294 (54%) pilots reported distraction as a contributory factor that led to the airspace infringement. There were several causes of the distraction; of the 294:

Communications with ATC (including poor radios, frequency changes and inability to communicate due to density of transmissions)	30% of which: 7% change of clearance 57% not getting expected clearance 36% unable to establish contact
external (often traffic, often in the circuit)	23%
Pilot became overloaded	19%
Unfamiliar systems (mostly avionics)	15%
Passenger distraction	10%

Flight Instruction

Some 14% of airspace infringements occurred during an instructional flight; this is in line with recent years' data where 1 in 7 infringements involved an instructional flight. Common themes noted by the Working Group were:

Instructors carrying out multiple flights without replanning. (wind and/or weather changes)

An actual or perceived urgency to get everyone back in the air post COVID-19 'lockdown', leading to errors

Fatigue following multiple flights in a short period

Instructors out of practise having not flown during periods of COVID-19 'lockdown'

Although in previous years the number of infringements during flight training has been at a similar level it was obvious that the multiple effects of COVID-19 'lockdowns' had a

significant bearing on the number of occurrences in 2020. It should also be noted that it is likely that the total number of instructional hours in 2020 was less than in previous years questioning whether there has been an improvement in this area.

Conclusions

From the information available, the Working Group made the following conclusions:

Pilots with few or many hours do infringe although the number of lower hour pilots who have infringed is less than might be expected if experience is taken as a mitigation.

A significant number of professional licence holders infringed, around half of which were Flight Instructors.

Recency appears to be a preventative measure, although as the pilot report information is given it was not possible to be more certain.

Some infringing pilots may have made better use of an Air Traffic Service to assist them, although there appears still to be some misunderstanding of what to expect from such services and which service to use.

Although it seems that more pilots are making use of VFR Moving Maps to assist their navigation it also appears that many are not used to their best advantage. Misunderstanding the operation and benefits of such devices may be caused by lack of training in their use; do most pilots buy them after qualifying? Should there be more training at PPL?

Planning with a particular focus on airspace and in Threat and Error Management, in many cases, did not seem to be a priority and poor in-flight handling led to many infringements. Planning to fly very close to an airspace boundary or leaving changing level too late are examples of lack of Threat recognition or positive planning.

Weather, altimetry and NOTAMs are causal factors which can be mitigated by careful planning ahead of the flight.

Distraction will usually affect the less experienced although the full range of pilot experience was represented in the distraction events. Minimising the chance for distraction by thoughtful pre-flight planning together with giving adequate margins from the boundary of controlled airspace to allow for some errors arising from distraction are ways to mitigate.

Appendix 1
Reasons for Investigation of Airspace Infringements

The CAA's Infringement Coordination Group reviewed 293 airspace infringements that occurred during 2020.

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. 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) Suspension of planned departures or modification of a departure route.

   or
3. The airspace infringement was carried out by a pilot who has been recorded as having previously infringed notified airspace2.

A further 359 airspace infringements were reviewed by the CAA's Infringement Team. These occurrences were categorised as minor in accordance with CAP1404 as they either did not compromise flight safety, there was no requirement for the implementation of a safety intervention measure or where the pilot had not previously infringed.

[2] A previous infringement will only be considered relevant if the related CAA decision on education/retraining requirements for that previous event sits within a period of 2 years of the reported date of the current event.

Appendix 2
2020 Airspace Infringement Statistical Data

Total number of reported airspace infringements	748

Percentage by aircraft category:	
Aeroplane	72.8%
Helicopter	10.5%
Ultralight/Microlight	6.1%
Sailplane/Hang-glider/Paraglider	2.2%
Hot air Balloon	0.3%
Military aeroplane/helicopter	2.0%
Unknown aircraft	6.1%

Number by airspace type:	
Control Zones (CTR)	194
Control Areas (CTA) including airways	295*
Terminal Control Areas (TMA)	130
Prohibited/Restricted/Danger Areas (permanent and temporary)	42
Radio Mandatory Zones (RMZ)	14
Transponder Mandatory Zones (TMZ)	15
Aerodrome Traffic Zones (ATZ)	63

*includes one CAS-T

Number by airspace location: **(LAIT locations in 2020 or locations with above 10 infringements listed)**	
Farnborough CTR/CTA	90
Southampton CTR/Solent CTA	58
Stansted CTR/CTA/TMZ	55
Gatwick CTR/CTA	53
Luton CTR/CTA	36
Manchester CTR/CTA/TMA	32
Birmingham CTR/CTA	28
Brize Norton	20
London CTR	16
Hawarden RMZ	14
East Midlands CTR/CTA	10
Leeds Bradford CTR/CTA	10
Liverpool CTR/CTA	6
Barton ATZ	6
Bournemouth CTR/CTA	5
Doncaster Sheffield CTR/CTA	4
London City CTR/CTA	4
Humberside ATZ	0
Other UK airspace	301