Airspace infringement causal factors study focuses attention on general aviation

Safety Letter

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EUROCONTROL

FOREWORD

by Alexander Krastev, Coordinator Airspace Infringement Initiative

Infringement of controlled airspace, danger and restricted areas happens more often than you might imagine and is a serious aviation hazard. According to statistics, airspace infringement events occur several times a day in the busy European airspace and, without prompt action by ATC, could result in mid-air collisions.

The current EUROCONTROL Airspace Infringement Safety Initiative was launched at the beginning of 2006. The initiative is approaching the end of the causal factors analysis phase and this safety letter considers some of the findings of the airspace infringement data analysis study, as well as describing some of the parallel activities which will inform the development of an Action Plan.

ANALYSIS OF SAFETY OCCURRENCE REPORTS

EUROCONTROL commissioned a study of a representative sample of over 3,000 airspace infringement occurrence reports submitted to the authorities of nine European countries in 2004 and 2005. The study report has been published in November 2007. Major findings are as follows:

Who? - General aviation is involved in 80% of airspace infringement events

Previous studies into airspace infringement, most notably conducted by the UK CAA, have highlighted that the majority of airspace infringements involve general aviation (GA) flights. It therefore comes as no surprise to find that the results of the EUROCONTROL study show that nearly 76% of infringements of controlled and restricted airspace involve general aviation non-commercial pleasure flights.

Conversely, the number of airspace infringements committed by commercial or military flights is relatively low, at about 10 % each.

Commercial and military pilots have in average more current flying practice, receive more training and are more experienced than “recreational” pilots.

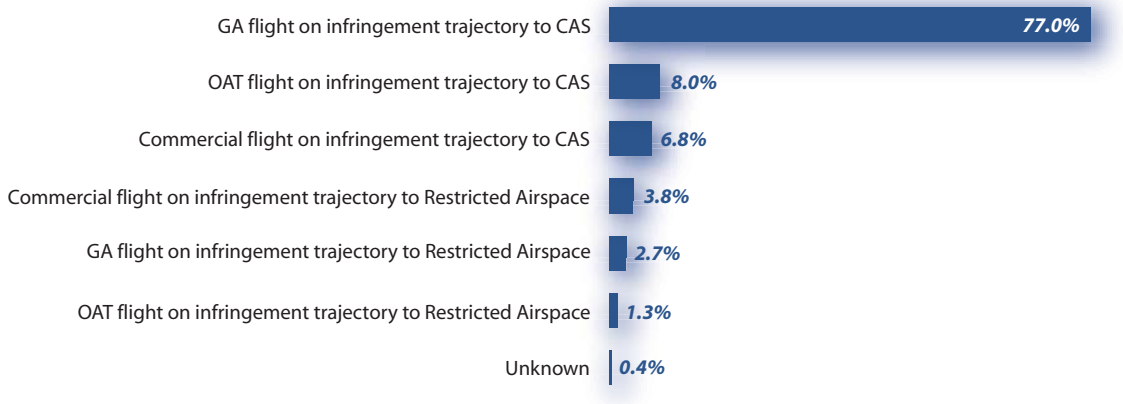

Figure 1: Distribution of airspace infringement scenarios

Extensive automation and close monitoring and control by civil or military ATC, ensure that deviations from flight plans are noticed and corrected more quickly. However, analysis of airspace infringement events involving commercial and military flights does show that both communities of aircrew can still make mistakes, and an important factor appears to be coordination between different civil and military sectors. VFR pilots, on the other hand, fly mainly single crew operated aircraft, often without sophisticated navigation equipment and are provided Flight information or ATC services that vary greatly in scope.

About 96% of airspace infringements involving general aviation are described as "pleasure flights", as distinct from flights conducting parachute dropping, aerial photography, or training, all of which are typically operated by more experienced pilots. The majority of airspace infringements occur in the en-route phase of the infringing flight rather than on departure or approach. Perhaps not surprisingly, because most GA flights are conducted under VFR and, by definition, GA flights conducted under IFR are flown by more experienced pilots, the study shows that at least 75% of airspace infringements occur when the pilot is flying VFR.

Where? - 40% of airspace infringement events occur in terminal control areas

The vast majority of airspace infringements occur in terminal control areas (TMAs) and control zones (CTRs).

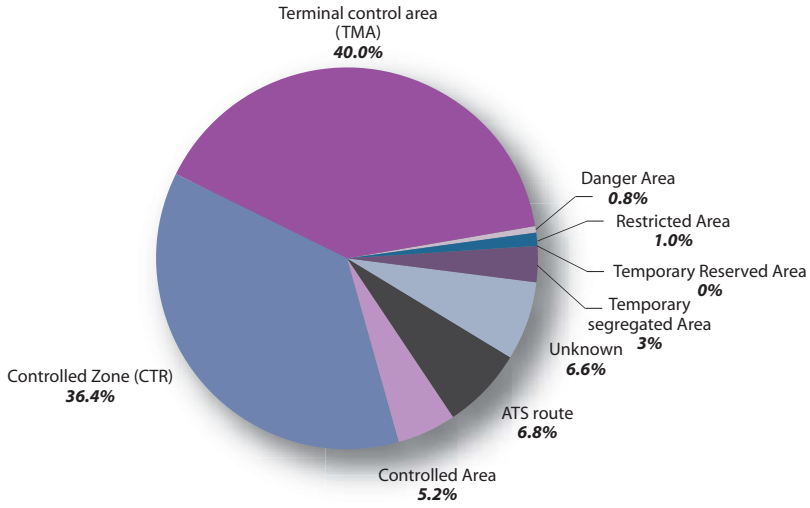

Figure 2: Distribution of the infringed airspace type

Why? - Navigation failure and non-adherence to the established airspace use procedures are the primary causal factors

Analysis of occurrence reports identifies the following causal factors:

- Navigation error. Inadequate knowledge of airspace structure, misidentification of airspace boundaries, loss of situational awareness, or simply getting lost.
- Non-adherence to procedures. Unintentional and intentional violation - ATC clearance not requested/obtained, procedures not followed, inability to comply with ATC clearance limits.
- Communication. Communication not established with controlling agency, misunderstanding of ATS information or ATC clearance.
- Aircraft Control. Inadequate flight path management.

The most common factor contributing to airspace infringements is navigation error, cited in over 50% of reports. Predominantly this involves pilots flying into controlled or restricted airspace, often because they are unaware of their own position relative to controlled airspace, unaware of the existence of the controlled airspace or, in a few cases, simply lost. In some 26% of airspace infringements, the GA pilot's inadequate knowledge of the airspace structure is cited as a factor. This is then the root cause of other causal factors such as failure to contact appropriate controlling agencies and obtain clearance.

Is this the typical scenario?

Occurrence reports frequently list the same causal factors over and over again, painting a common picture – VFR pilot getting airborne without having conducted sufficient pre-flight preparation, often with out-of-date map, seemingly unable to follow the correct procedures for entering controlledairspace.

The safety impact? - In a quarter of all airspace infringement events the only safety barrier available to prevent a mid-air collision appears to be "see and avoid"

Based upon a five-barrier model developed by EUROCONTROL to assist the data analysis, for each event analysed, the safety study considered what safety barriers were in place to prevent a mid-air collision.

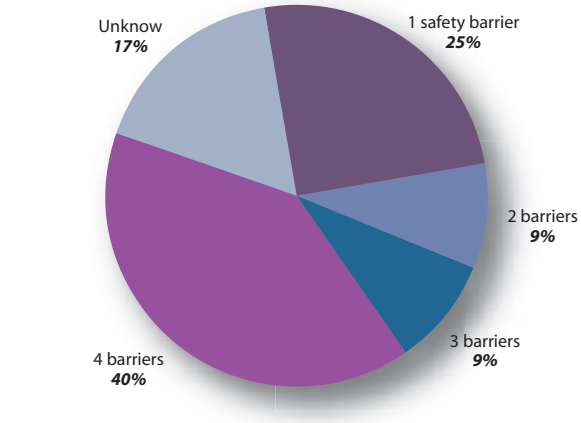

Figure 3: Safety barriers remaining following flight infringement of CAS

- Barrier 1 – the airspace infringement or loss of separation was prevented or halted by basic air-ground communication (controller) OR by the pilot.
- Barrier 2 – the airspace infringement or loss of separation was prevented or could have been halted by activation of an airspace penetration warning function.
- Barrier 3 – the airspace infringement or loss of separation was prevented or could have been halted by STCA (ATC system safety net function).
- Barrier 4 – mid-air collision due to airspace infringement was prevented or could have been prevented by the activation of TCAS.
- Barrier 5 – only "see and avoid" was available to prevent a mid-air collision.

The outcome was that in 25% of cases, had there been another aircraft in close proximity to the aircraft committing the infringement, the only safety barrier left was "see and avoid", all other safety barriers being unavailable in that particular operational environment or having failed.

Cause and effect? – The link between causal factors and reduced safety barriers

How can we reduce the number of airspace infringements? Consideration of the causal factors identified in the report, along with the role played by safety barriers suggests two courses of action. Firstly, awareness of controlled airspace, understanding of airspace procedures, and basic flying skills (navigation and communication) within the GA community needs to be improved. Secondly, the availability of safety barriers needs to improve, for example through wider use of transponders (Mode S), not just for IFR flights.

GA AIRSPACE INFRINGEMENT SURVEY

The safety study has given researchers an insight into the causal factors behind airspace infringements but in many cases the level of detail included in occurrence reports was limited. To ensure that the measures taken to reduce airspace infringements are fully effective and practical, it is essential to involve the GA community in the development of solutions. In July 2007, a survey of GA pilots' experience was initiated in order to elicit detailed information about the causal factors that could not be derived from formal occurrence reports. Results will be published before the end of 2007.

If you are a GA pilot, please visit the dedicated airspace infringement reporting point at www.cis.bg, and share your experience and ideas how to make the sky safer for all users.

AIRSPACE INFRINGEMENT WORKSHOP

On 24 January 2008 EUROCONTROL will be hosting a workshop in Brussels to consolidate the knowledge acquired by the airspace infringement safety initiative and hear the views of the general aviation community, civil and military authorities and air navigation service providers. The objective of the workshop is to develop safety recommendations which will form the baseline of an Action Plan aimed at reducing the airspace infringement risk in European airspace. EUROCONTROL's objective is not to discourage enjoyment of flying by private individuals, but to work with all aviation safety stakeholders to promote best practice and ensure that flights are conducted safely.

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