***Note:* ¡*Conspicuity*** *(or in-flight electronic conspicuity plus) means in-flight capability to transmit position of aircraft and/or to receive, process and display positions of other aircraft in a real time with the objective to enhance pilots' situational awareness about surrounding traffic. It is an umbrella term for a range of technologies and solutions, whether airborne or on the ground, that can help airspace users and other affected stakeholders to be more aware of other aircraft in their vicinity or in a given airspace. The ¡Conspicuity (concept) is expected to evolve in time thru the integration of new functionalities and sharing of additional aeronautical information in a real-time (like the weather or airspace related).*

## 1 Why to intervene?

In 2020, the BIS Airborne collision risk concluded that that a broader use of ¡*Conspicuity* solutions and improvement of their interoperability together with a better airspace utilisation and design, while ensuring compatibility with U-space regulatory framework, should be at the heart of the strategy to define future actions.

While the BIS considered all aspects of risk (e.g. ATM and U-space perspectives) the proposed actions focused on the risk of collision involving smaller manned aircraft not subject to air traffic control. This was based on the 2020 safety analysis which concluded that only these aircraft were involved in airborne collisions with fatal consequences.

Safety data[1] from 2009 to 2019 indicated that there were 51 fatal accidents involving 117 fatalities (an average of 13 fatalities and six fatal collisions per year) caused by airborne collisions in EASA states during that period.

The 2020 BIS report led to the following actions introduced in the EPAS for the following Safety Issues.

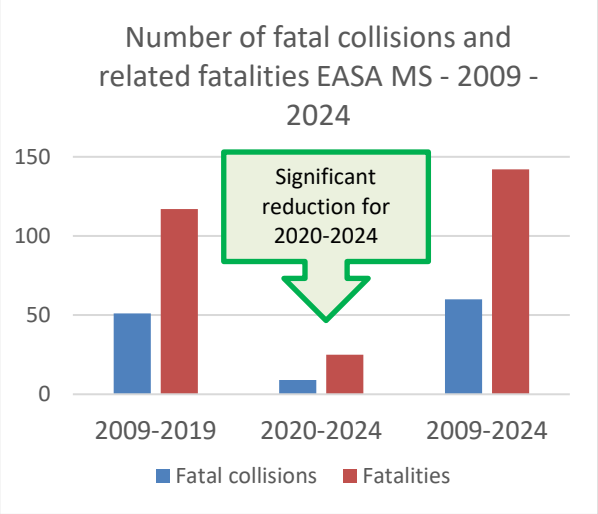
| EPAS actions | The most relevant Safety Issues (SI) addressed by the actions | | |
|---|---|---|---|
| | SI-2025 Airspace infringement | SI-4010 Airborne separation / SI-0043 Deconfliction of IFR and VFR traffic | SI-8028 Inadequate airborne separation under VFR operation |
| MST.0038 Airspace complexity and traffic congestion | X | X | X |
| SPT.0119 Promoting ¡*Conspicuity* | X | X | X |
| SPT.0120 Promoting good practices in airspace design | X | X | X |
| RES.0031 Interoperability of different ¡*Conspicuity* devices/systems | | | X |
| RES.0032 Use of ¡*Conspicuity* devices/systems in flight information services | | X | |

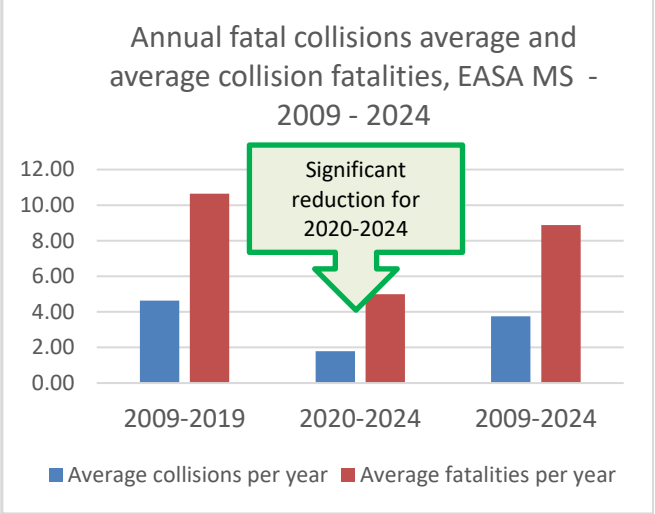
[1] Note: the geographical scope of the safety data covers on EASA Member States (i.e. this does not cover UK compared to the information included in the BIS version in 2020). 10 fatal collisions and 20 fatalities that occurred in UK during the period 2009-2019 were deducted.

| | | | |
|---|---|---|---|
| RMT.0690, RMT.0230, RMT.0519 | x | x | x |

See Annex 1 for the monitoring of the BIS 2020 actions.

The most recent data, covering the period from 2020 to 2024, revealed that there were 25 fatalities in nine fatal collisions during the last five years (an average of five fatalities and two fatal collisions per year). This substantial improvement in safety indicates that the strategy implemented in 2020 is effective.




The above-mentioned information together with outcomes of the actions indicates that the strategy to focus on a set of primarily non-regulatory actions (SPT and RES) complemented by existing regulatory tasks to provide minimum requirements[2] is confirmed. This together with utilisation of broadly available digital technologies contributed to noteworthy safety improvements in a relatively short period.

This supports the continuation of the implementation of the 2020 Strategy, with minor adaptations to incorporate the outcomes of completed actions and other initiatives undertaken since then:

- EASA and Eurocontrol jointly developed roadmap for the ¡*Conspicuity* (Annex 2), with the aim of enhancing situational awareness and safety for manned aircraft not under air traffic control. It proposes a simple, affordable, and interoperable system architecture based on the principles of "one language" (with ADS-L as the key enabler) and "one link" (a direct air-to-air radio link for pilot awareness, complemented by air-to-ground links). The strategy addresses three use cases: voluntary pilot situational awareness in any airspace, U-space airspace compliance and ATM (research). It leverages existing candidate technologies (ADS-B, 1090, UAT, SRD860, mobile networks) while acknowledging the diverse requirements of aviation communities. The implementation process will include progressive milestones from 2024 to 2027+, involving technology assessments, stakeholder engagement, and pilot-driven deployment;

- the recommendations from the SIA airspace infringement report (Annex 3);
- The ¡*Conspicuity* Declaration that is a voluntary policy jointly created by aviation authorities and industry stakeholders to promote the use of electronic conspicuity devices and related data—such as ADS-B, ADS-L and surveillance data—in the General Aviation (GA) sector. Its goal is to enhance

[2] that are objective driven and proportionate to the nature of activity concerned.

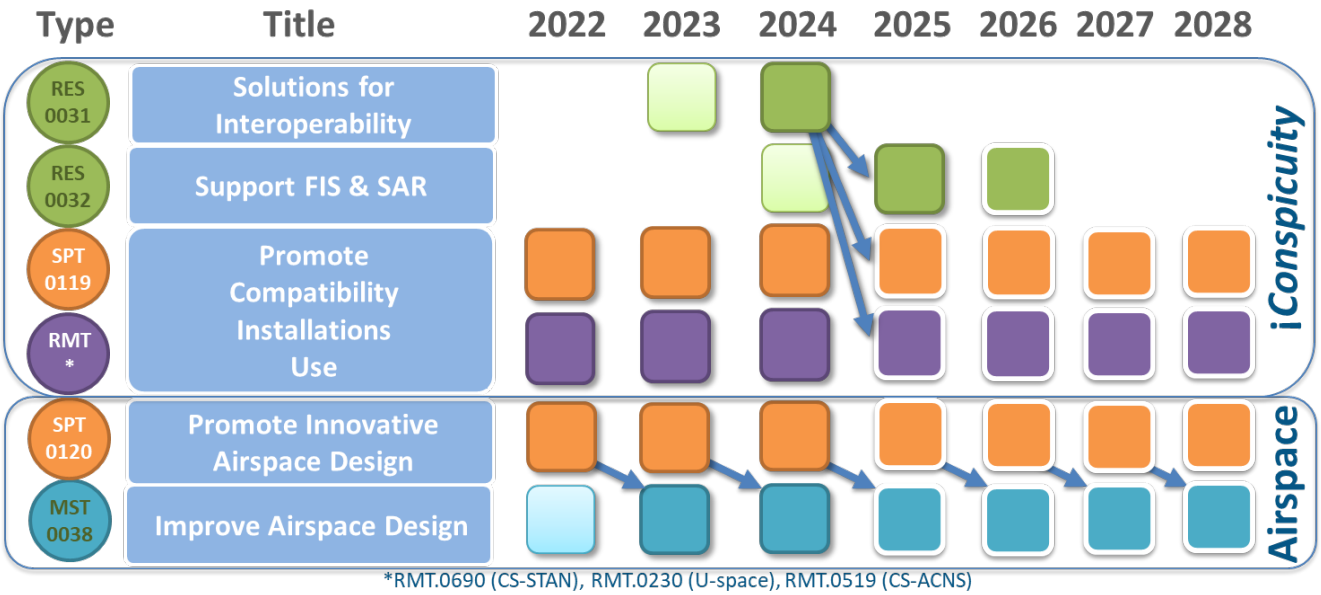
operational safety, foster a proactive safety culture, and support collaborative data analysis. The declaration emphasizes voluntary participation, system-wide insights, transparent monitoring, and compliance with data protection regulations. Expected benefits include reduced collision risk, improved airspace access, faster emergency response, and better incident analysis. Overall, it encourages safer and more efficient European airspace through data-driven collaboration;[3]

- ADS-L technology is the key to making ¡Conspicuity a reality. EASA has partnered with industry and user associations to launch the ADS-L *Coalition*. It is a partnership where participants commit to taking ownership of the ADS-L and supporting its further development to enhance situational awareness for everyone, whether in the air or on the ground.[2]

## 2 BIS 2025 updated actions

The following relevant actions decided in the 2020 BIS (Annex 4) are extended to the period 2026-2028. This covers also the following aspects:

- The EASA and Eurocontrol joint roadmap for the ¡*Conspicuity*
- Incorporation of recommendations from the Safety Issue Analysis "Airspace Infringement" with the objective to prevent collisions caused by airspace infringement.
- ¡*Conspicuity* Declaration
- ADS-L *Coalition*




*Legend: action with circle in white are proposed to be extended until 2028. RES tasks were delayed compared to the plan in BIS 2020 due to pandemic and associated reduction of resources for research.*

¡*Conspicuity cluster: the focus is on the technology and its use.*

[3] https://www.easa.europa.eu/iconspicuity, https://www.easa.europa.eu/ads-l

*Airspace cluster: the focus is on design and use of the airspace.*

No additional actions are foreseen compared to the BIS 2020 version. The implementation and the monitoring of the actions will continue. A new BIS version is expected in the future with the relevant update.

## 3 Annexes

- Annex 1: Monitoring of BIS Airborne Collision 2020 actions
- Annex 2: EASA/EUROCONTROL roadmap
- Annex 3: Safety Issue Assessment "Airspace Infringement"
- Annex 4: Link to the BIS report on Airborne Collision commented by the Advisory Bodies 2020:

Table of content of the BIS 2025 update



## 4 Annex 1: Monitoring of BIS Airborne Collision 2020 actions

**Objective:**

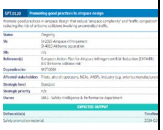
- to monitor whether programmed actions are delivered as planned in EPAS Vol.II (process monitoring);
- to monitor whether programmed actions have mitigated the safety issue (output monitoring).

<table>
<tr><th>N</th><th>Action title</th><th>Type of action</th><th>Status (process)</th><th>Status (output)</th><th>Notes</th></tr>
<tr>
<td>1</td>
<td>EASA with support of technical partners should demonstrate feasibility of achieving interoperability of different ¡Conspicuity devices/systems through ground communication network while respecting data privacy requirements</td>
<td>RES.0031<br>(existing)<br>  </td>
<td>Delivered as planned? (tick the box below)<br><table><tr><th>Yes</th><th>No</th><th>Partially</th></tr><tr><td>X</td><td></td><td></td></tr></table>Justification:<br>The task was launched in January 2023 and completed in June 2024.<br><br>New actions to update BIS? (tick the box below)<br><table><tr><th>Yes</th><th>No</th><th>Partially</th></tr><tr><td></td><td>X</td><td></td></tr></table></td>
<td>https://www.easa.europa.eu/en/research-projects/i-conspicuity-interoperability-electronic-conspicuity-systems-general-aviation</td>
<td>Task delayed by 2 years compared to the original plan due to lack of funding and the COVID-19 pandemic.</td>
</tr>
</table>

<table>
<tr><th>N</th><th>Action title</th><th>Type of action</th><th>Status (process)</th><th>Status (output)</th><th>Notes</th></tr>
<tr><td>2</td><td>EASA should analyse 'Net Safety Benefit' and 'Operational Safety Assessment' concepts for use of ¡Conspicuity devices/systems in Flight Information Service</td><td>RES.0032 (existing)<br>  </td><td>Delivered as planned? (tick the box below)<br><table><tr><td>Yes</td><td>No</td><td>Partially</td></tr><tr><td></td><td></td><td>X</td></tr></table>Justification:<br>Ongoing<br>New actions to update BIS? (tick the box below)<br><table><tr><td>Yes</td><td>No</td><td>Partially</td></tr><tr><td>tbc</td><td>tbc</td><td>tbc</td></tr></table></td><td>Build on RES.0031 results (dependency). Ongoing, the deliverables expected in Q1 2026 (instead of Q3 2024).<br>The expected deliverables are:<br>- List of ATM use cases and identification of related information elements<br>- List of regulatory areas requiring further development/clarification.</td><td>Started 6 months later due to lack of resources, no negative impact expected. Outcomes of the task might trigger additional activity.</td></tr>
</table>

<table>
<tr><th>N</th><th>Action title</th><th>Type of action</th><th>Status (process)</th><th>Status (output)</th><th>Notes</th></tr>
<tr>
<td>3</td>
<td>EASA should facilitate installation and promote use of ¡Conspicuity devices in all relevant aircraft at user affordable cost</td>
<td>SPT.0119<br>(existing)<br>  </td>
<td>Delivered as planned? (tick the box below)<br><table><tr><th>Yes</th><th>No</th><th>Partially</th></tr><tr><td>X</td><td></td><td></td></tr></table>Justification:<br>Completed but to be extended (see the comment)<br><br>New actions to update BIS? (tick the box below)<br><table><tr><th>Yes</th><th>No</th><th>Partially</th></tr><tr><td>X</td><td></td><td></td></tr></table></td>
<td>CS-STAN Issue 4<br>- CS-SC002d — Installation of Mode S elementary surveillance equipment<br>- CS-SC004b — Installation of antennas<br>- CS-SC005b — Installation of an ADS-B OUT system combined with a transponder system<br>- CS-SC031c — Exchange of conventional anti-collision lights, position lights, and landing and taxi lights for LED-type lights<br>- CS-SC032c — Installation of anti-collision lights<br>- CS-SC036b — Installation of visual awareness lights<br>- CS-SC051d — Installation of 'FLARM' equipment<br>- CS-SC057a — Installation of an electronic conspicuity (EC) function<br>- CS-CS058a — Installation of traffic awareness beacon system (TABS) equipment</td>
<td>The action to be extended to cover period 2026-2028 to support update ¡Conspicuity Roadmap endorsed by ESC.</td>
</tr>
</table>

<table>
<tr><th>N</th><th>Action title</th><th>Type of action</th><th>Status (process)</th><th>Status (output)</th><th>Notes</th></tr>
<tr>
<td>4</td>
<td>EASA should actively support initiatives enhancing interoperability of ¡Conspicuity devices/systems</td>
<td>Same as #3</td>
<td>Delivered as planned? (tick the box below)<br><br>
<table>
<tr><th>Yes</th><th>No</th><th>Partially</th></tr>
<tr><td>X</td><td></td><td></td></tr>
</table>
<br>Justification:<br>Same as #3<br><br>New actions to update BIS? (tick the box below)<br><br>
<table>
<tr><th>Yes</th><th>No</th><th>Partially</th></tr>
<tr><td>X</td><td></td><td></td></tr>
</table>
</td>
<td>- ¡Conspicuity website<br>- Sunny Swift: TURN IT ON<br>- Sunny Swift: See and Avoid<br>- Sunny Swift: Collision avoidance - make yourself seen<br>- Sunny Swift: ADS-L: see and be seen<br>- Examples of ¡Conspicuity devices<br>- SERA.13001 Operation of an SSR transponder<br>- CS-STAN Installation of avionics<br>- Sunny Swift issue 5: Turn it on<br>- GA Community: iConspicuity</td>
<td>Same as #3</td>
</tr>
</table>

<table>
<tr><th>N</th><th>Action title</th><th>Type of action</th><th>Status (process)</th><th>Status (output)</th><th>Notes</th></tr>
<tr>
<td>5</td>
<td>EASA should promote good practices in airspace design that reduce 'airspace complexity' and 'traffic congestion' with aim to reduce risk of collisions involving uncontrolled traffic</td>
<td>SPT.0120<br>(existing)<br>  </td>
<td>Delivered as planned? (tick the box below)<br><table><tr><th>Yes</th><th>No</th><th>Partially</th></tr><tr><td>X</td><td></td><td></td></tr></table>Justification:<br>Completed but to be extended (see the comment)<br><br>New actions to update BIS? (tick the box below)<br><table><tr><th>Yes</th><th>No</th><th>Partially</th></tr><tr><td>X</td><td></td><td></td></tr></table></td>
<td>- Sunny Swift: Clearance to enter controlled airspace<br>- Sunny Swift: Airspace Complexity - Part 1<br>- Sunny Swift: Airspace Complexity - Part 2<br>- Sunny Swift: Be aware of TMZ +</td>
<td>The action to be extended to cover period 2026-2028 so that potential outputs that could be implemented as a result of RES.0032 (e.g. ¡Conspicuity in RMZ/TMZ) could be promoted through this task.</td>
</tr>
</table>

<table>
<tr><th>N</th><th>Action title</th><th>Type of action</th><th>Status (process)</th><th>Status (output)</th><th>Notes</th></tr>
<tr><td>6</td><td>Member States should consider 'airspace complexity' and 'traffic congestion' as safety relevant factors in airspace changes affecting uncontrolled traffic, including the changes along international borders</td><td>MST.0038 (existing)<br>  </td><td>Delivered as planned? (tick the box below)<br><table><tr><td>Yes</td><td>No</td><td>Partially</td></tr><tr><td></td><td></td><td>X</td></tr></table>Justification:<br>Partially completed but to be extended (see the comment)<br>New actions to update BIS? (tick the box below)<br><table><tr><td>Yes</td><td>No</td><td>Partially</td></tr><tr><td>X</td><td></td><td></td></tr></table></td><td>1) The feedback from standardization activities on MST.0038 - Indirectly yes, but not as specific MST action, this is done via EU Survey on MST actions. Looked at this from the perspective of 373 requirements on airspace structure.<br>2) The feedback collected through SM TeB from the MS on MST.0038 - An informative session was given to the SM TeB but no input was collected.</td><td>The action completed only partially (see status field). It is proposed to be extended to cover period 2026-2028 so that potential outputs of RES.0032 could be implemented by the States (e.g. ¡Conspicuity in RMZ/TMZ).</td></tr>
</table>

<table>
<tr><th>N</th><th>Action title</th><th>Type of action</th><th>Status (process)</th><th>Status (output)</th><th>Notes</th></tr>
<tr><td>7</td><td>EASA should ensure technical and operational compatibility of U-space and ¡Conspicuity solutions</td><td>RMT.0230<br>(existing)</td><td>Delivered as planned? (tick the box below)<br><table><tr><td>Yes</td><td>No</td><td>Partially</td></tr><tr><td></td><td></td><td>X</td></tr></table>Justification:<br>The initial solutions for compliance with SERA.6005(c) are published and applicable. The ADS-L 4 MOBILE technical specification is still under development. The AMC and GM material shall be reviewed taking into account the results of RES.0031 and technological developments.<br>New actions to update BIS? (tick the box below)<br><table><tr><td>Yes</td><td>No</td><td>Partially</td></tr><tr><td></td><td>X</td><td></td></tr></table></td><td>https://www.easa.europa.eu/en/document-library/easy-access-rules/online-publications/easy-access-rules-standardised-european?page=14#_DxCrossRefBm1523704446</td><td>See the justification.</td></tr>
</table>

<table>
<tr><th>N</th><th>Action title</th><th>Type of action</th><th>Status (process)</th><th>Status (output)</th><th>Notes</th></tr>
<tr><td>8</td><td>EASA should conduct Safety Issue Assessment (SIA) of airspace infringements</td><td>Internal SRM task</td><td>Delivered as planned? (tick the box below)<br><table><tr><th>Yes</th><th>No</th><th>Partially</th></tr><tr><td>X</td><td></td><td></td></tr></table>Justification:<br>SIA Airspace Infringement completed in December 2023.<br><br>New actions to update BIS? (tick the box below)<br><table><tr><th>Yes</th><th>No</th><th>Partially</th></tr><tr><td></td><td>X</td><td></td></tr></table></td><td>BIS SIA Airspace Infringement v1.1.do</td><td>The recommendations from the SIA to be incorporated in the existing BIS Airborne collision risk either by updating the existing actions or their timeline.</td></tr>
</table>

<table>
<tr><th>N</th><th>Action title</th><th>Type of action</th><th>Status (process)</th><th>Status (output)</th><th>Notes</th></tr>
<tr><td>9</td><td>EASA to explore the use of ¡Conspicuity data for enhanced safety monitoring of Airborne Collision Risk</td><td>Internal SRM task</td><td>Delivered as planned? (tick the box below)<br><table><tr><th>Yes</th><th>No</th><th>Partially</th></tr><tr><td>X</td><td></td><td></td></tr></table>Justification:<br>Initial discussions with D4S programme manager ongoing. The incorporation of ¡Conspicuity into the programme is expected in 2026+ along the integration of GA.<br>New actions to update BIS? (tick the box below)<br><table><tr><th>Yes</th><th>No</th><th>Partially</th></tr><tr><td></td><td>X</td><td></td></tr></table></td><td>D4S - Follow-up Session SAFESKY v20</td><td></td></tr>
</table>

## 5 Annex 2: EASA/EUROCONTROL roadmap

# ¡*Conspicuity* - a high level concept

*[Version: 2024-02-14]*

**Problem description**

Since 2010, there have been 69 fatal mid-air collisions resulting in 129 fatalities in EASA States. All of these accidents involved small aircraft not subject to air traffic control. The analysis of these accidents revealed that the primary concern was the pilots' lack of situational awareness of the surrounding traffic. Many of these collisions could have been avoided if the aircraft involved had been equipped with interoperable traffic situational awareness systems.

In parallel, the U-space regulations, via SERA.6005(c), requires all manned aircraft not subject to air traffic control to be continuously electronically conspicuous to U-space service providers (e-conspicuity). According to AMC1 SERA.6005(c) this could be achieved by transmitting aircraft's position using ADS-B out on 1090 MHz or (if coordinated and implemented for this purpose in whole Europe) 978 MHz[4] or by transmitting information, in line with the ADS-L technical specification, using SRD860 frequency band or (if coordinated and implemented for this purpose in whole Europe) aerial mobile telecommunications services.

The new SERA.6005(c) requirement provided an opportunity to try to improve the interoperability of systems used by recreational pilots to provide situational awareness of surrounding traffic.

The objective should be a simple architecture ensuring interoperability and affordability with sufficient performance. Following finalization, the strategy needs to be clearly communicated, supporting pilots' equipage decisions as well as USSP and other stakeholder's decisions.

**Current situation**

Several types of systems exist to improve pilots' situational awareness and tens of thousands of these devices are currently in use. However, these systems are not always interoperable.

The main system is ADS-B (in Europe 1090 and in the US 1090 and UAT). There are several other systems transmitting position information in various open or proprietary formats operating on unlicensed but regulated and standardised spectrum (SRD860) or operating on telecommunication networks.

ADS-B 1090 and UAT systems are certified by EASA (ETSO), but systems operating on SRD860 and mobile telecommunication are not. The two latter, when commercially produced, are subject to EU market product regulation (CE marking). The systems on SRD860 use different languages which are not interoperable.

The diverse use of different technological solutions has resulted in a lack of interoperability in terms of communication protocol (language) and means of communication (link).

[4] UAT - Universal Access Transceiver

**Scope (Use Cases) and objectives**

The main objectives of the ¡Conspicuity concept are to:

- Reduce the risk of mid-air collisions by enhancing the pilot's situational awareness to assist in avoidance of collision and/or mitigation of other airborne hazards. It is not intended to serve as a collision avoidance system (i.e., ACAS), nor as a surveillance tool in support of Air Traffic Control (ATC), and,
- Enable electronic conspicuity for manned aircraft in U-space when not provided with air traffic control service. Electronic conspicuity in U-space is only required to operate air to ground and where U-space is established, which is expected to be in environments with higher levels of air-traffic (manned and/or UAS).

Possible additional objectives (subject to further research):

- Complement the Flight Information Service (FIS) and Search and Rescue without requiring changes to existing ATM/ANS principles and/or operational practices.

**Target Situation**

To ensure interoperability and affordability, a simple system design should be used. For the pilot awareness use case, the solution should be independent of any ground networks. While the electronic conspicuity in U-space will use ground networks.

No mandatory equipage is foreseen outside of U-space airspace. Implementation elsewhere is foreseen to be on a voluntary basis.

The objective is to apply the principle of 'one language' and 'one link'.

- *One language*

  A common 'language' is needed to ensure interoperability.

  ADS-B and ADS-L are considered as good candidates for a common interoperable language(s).

- *One link*

  A direct air-to-air radio link will be required and should be defined for the target situation.

  The choice of the link(s) should be based on a comparative assessment of options, taking into account their respective operational acceptability, technical feasibility and business case for ground-based stakeholders and airspace users to meet the Use case requirements.

- *Complementary link*

  It is recognized that *in addition to* (*i.e. not instead of*) the 'one link', 'one language', pilots *may* use other complementary solutions to enable enhanced functions and/or to display aircraft operating beyond radio line-of-sight.

  The complementary link can provide more benefits by allowing additional applications outside the conspicuity solution. It can provide near real-time information to mitigate other airborne hazards such as weather, airspace or other (e.g., glider winch launch, ongoing aerobatics, model flying, etc.). It can also support the exchange of traffic information for situational awareness beyond the direct radio line-of-sight.

**Enabler Technologies**

The proposed enabler technologies are based on existing technologies 1090 ADS-B, UAT, SRD860 and mobile telecom. The main characteristics of these technologies are provided hereafter:

- 1090 ADS-B
  - The ADS-B 1090 systems are in operational use for ATS purposes for many years worldwide. In Europe the ATS ground network is designed based on 1090 ADS-B. It uses a protected aeronautical spectrum and therefore requires formal approval (e.g. airworthiness certification) as well as radio licensing criteria to transmit, which risks making equipment less affordable for the end user. The 1090 MHz link sustainability should be assessed regarding equipage of low-end aircraft. A properly updated ADS-L could converge with a simplified 1090 ADS-B (e.g. low-power) for low-end aircraft.
- UAT ADS-B
  - The ADS-B UAT systems are in operational use for ATS purposes in the USA. It uses a protected aeronautical spectrum and therefore requires formal approval, as such the same constraints as for 1090 applies regarding radio licensing, criteria to transmit, and affordability for the end user. The use of UAT in Europe will require frequency planning. UAT can enable other applications requested by the GA community such as FIS-B. A properly updated ADS-L could converge with UAT ADS-B for low-end aircraft.
- SRD860
  - SRD860 systems use unprotected, unlicensed but regulated and standardised spectrum. Currently it includes several non-harmonized systems, which would need to be upgraded to be interoperable with other SRD860 systems. It is noted that the SRD860 frequency allocation is at risk from ITU International Mobile Telecommunications (IMT) after 7-10 years (i.e. viable at least until 2030).
- Mobile telecommunication

  Existing mobile telecommunications services can already complement the 'one link' for operations at lower levels in much of the terrestrial parts of Europe[5]. The mobile telecom does not enable direct air to air interoperability and requires a ground network in order to operate. The aeronautical use of such services will require a clear specification of communication requirements compatible with existing and future mobile telecommunications networks. The CEPT/ECC Decision (22)07 of 18 November 2007 on harmonised technical conditions for the use of aerial UE for communications based on LTE and 5G NR in the bands 703-733 MHz, 832-862 MHz, 880-915 MHz, 1710-1785 MHz, 1920-1980 MHz, 2500-2570 MHz and 2570-2620 MHz harmonised for MFCN provides the basis for such a specification. Current mobile networks could be further optimized to support this functionality, as has been done in Sweden, but the widespread use of Portable Electronic Devices (PEDs) by General Aviation pilots to view current weather and traffic data on apps has shown that it is also possible at low altitude with current networks.

[5] EASA feasibility study concerning the suitability of use of mobile telecommunication technologies for making manned aircraft electronically conspicuous in U-space as required in the Commission Implementing Regulation 2021/666 of April 22, 2021.

**Approach**

In order to address jointly the two uses cases described above, their different characteristics need to be considered in the assessment of possible solutions.

The conspicuity solutions should recognize that different aviation communities have different needs: The needs of a glider pilot are very different from the needs of the pilots and air traffic controllers of aircraft operating under IFR.

U-space requires all uncontrolled manned aircraft to be electronically conspicuous. It is currently envisaged that U-space airspace will only be introduced in areas of higher air traffic density (manned and/or unmanned), where the induced higher air risk needs to be mitigated. As such, conspicuity equipment will initially only be required in geographically limited low-level airspace.

On the other hand, pilot situational awareness is needed Europe-wide and equipage for this use case will be voluntary.

Furthermore, the conspicuity solutions overlap with existing solutions providing additional use cases, such as ADS-B enabling both ATC service and conspicuity.

It is important to ensure that aircraft are equipped with the appropriate solutions for the respective use case. To ensure this, the strategy needs to be clearly described and communicated, supporting stakeholder equipage decisions.

In order to define the solution, the following steps are envisaged:

1. Review and consolidation of use cases and related performance
2. 'One language' proposal by Q1 2025 (draft Q4 2024) considering the following:
    a. ADS-L 4 SRD-860 Issue 2 and Draft ADS-L 4 MOBILE Issue 1 expected in Q2 2024
    Information forward and uplink using SRD860 frequency band and aerial cellular
    *Note:*
    *- RES.0031 research on ¡Conspicuity interoperability to be completed by Q2 2024*
    *- RES.0032 research on ¡Conspicuity for FIS and SAR task to start in Q4 2024*
    b. Definition of ADS-L enabled on 1090 and UAT reduced capability equipment (RCE/Low power)
3. Comparative assessment of options (Use cases and requirements, Ops acceptability, Technical feasibility, Business Case incl. constraint mitigation for affordability) by 2025
4. Consolidation of 'one link' proposal by 2026 including transitional arrangements
5. Community awareness and endorsement of the concept to avoid proliferation of technologies in the absence of a clear target and intermediate steps.
6. Implementation

## 6 Annex 3: Safety Issue Assessment "Airspace Infringement"

### Executive Summary of the SIA performed in 2022

Airspace infringements present a significant safety risk which has a negative impact on both IFR (instrument flight rules) and VFR (visual flight rules) flights and on the workload of Air traffic controllers.

The continuous increase of airspace infringements indicated that this is an pertinent safety issue.

European Central Repository (ECR) data shows that during 2016-2021 there were over 22,000 reported infringements in the geographic scope of Europe and North Atlantic. Many of these resulted in losses of separation with other aircraft. This continues a trend that has been ongoing for nearly twenty years.

Analysis of the data available from a number of different sources shows some clear trends. The majority of infringement events occur in terminal control areas (TMAs), controlled traffic regions, (CTRs) and control areas (CTAs) they involve general aviation (GA) pilots flying under VFR and occur due to navigation errors, poor pre-flight planning, airspace complexity, distraction in the cockpit, and/or difficulty dealing with unexpected or unfamiliar weather conditions.

The proposed actions are:

- *Reduce airspace complexity*
- *Training on airspace structure and navigation*
- *Availability of up to date data*
- *Airmanship*
- *Reporting culture*
- *Conspicuity*
- *Pre-flight briefing facilities and tools*

They are already included in the existing actions covered by the BIS Airborne Collision

# SIA Report – Table of content

# 1 Safety Issue Assessment

## 1.1 Introduction and purpose

*The EASA Safety Risk Management process aims at managing aviation safety risks, their conditions in an integrated manner, with the objectives of:*

1. *Prioritising safety actions which are most efficient in reducing risk levels*
2. *Ensuring adequate internal and external coordination on both key aspects of the Safety Risk Management, which are:*
   - *The identification and assessment of safety issues,*
   - *Identifying existing mitigating actions, and*
   - *The programming of safety or mitigating actions*
3. *Providing transparency on why the Agency takes certain actions*

In order to achieve these objectives, the Agency has established structured links between safety intelligence processes (safety analysis and performance) and safety action related processes (such as integrated programming, rulemaking, certification, organisations oversight, standardisation, safety promotion, corrective action in reaction to a safety problem/operational directives). These links foresee the need for an assessment of both the risks levels associated to certain safety issues, and the efficiency of the intended safety actions, in order to enable prioritisation of the safety issues. The scope is here limited to global or systemic safety issues that may affect European aviation products, services, or European passengers.

The Safety Risk Portfolio is the domain specific, common repository for recording and documenting the outputs of the above-mentioned tasks. Within the Safety Risk Portfolio for Air Traffic Management / Air Navigation Services (ATM/ANS), the safety issue "Airspace Infringement" has been raised and assessed to be of high priority by the CAG.

This paper documents the safety issue assessment carried out by the Assessment Team. It provides data and expert judgement, in addition to making specific recommendations regarding how best to manage this safety issue. This supports the governing bodies of the SRM process in their evaluation of the need for safety actions.

## 1.2 Definition of the Safety Issue

The term 'airspace infringement' refers to the unauthorised entry into controlled, prohibited, or restricted airspace, or an active Danger Area (where clearance to enter is required), by an aircraft. It occurs when aircraft fly into notified airspace without previously requesting and obtaining approval from the controlling authority of that airspace.

The four potential major consequences which may result from airspace infringements are:

**Airborne collision:** The worst-case scenario. Only the collaboration of all aviation actors can reduce the chance of this consequence to as low as practical (ALARP).

**Loss of separation:** An infringement leading to loss of prescribed standard separation (also known as Separation Minima Infringement) or close proximity of aircraft (where separation minima are not prescribed

between aircraft) could have a number of consequences, e.g. loss of control due to wake vortex encounter, violent avoiding manoeuvres, and injuries to passengers or crew as a result.

**Disruption to flight operations:** Especially in congested airspace, there is potential for a significant increase in controller and pilot workload due to the need to break off an approach, change aircraft sequence for landing, or implement other contingency measures, as well as the resulting radiotelephony (R/T) congestion.

**Adverse environmental and economic impact:** This is a consequence of the disruption to flight operations, which can lead to delays. That in turn results in increased fuel burn by aircraft both in the air and on the ground. Such delays cause disruption to operating schedules and considerable inconvenience to passengers. While seemingly not directly safety-related, these factors increase the overall production pressures on the ATM (Air Traffic Management) system, thus indirectly creating potential safety risk.

### 1.3 Who is affected?

Affected are all airspace users, GA as well as CAT aeroplanes, civil as well as military airspace users and air traffic service providers.

### 1.4 Assessment methodology

This safety assessment was conducted by the Safety Issue Assessment (SIA) working group taking different sources of information into account:

- The expert judgement of the experts in the SIA team,
- occurrence data and the European Action Plan for Airspace Infringement Reduction (EAPAIR) and
- the data that were used for its production.

The scope of the assessment was as follows:

| Criteria | Scope |
|---|---|
| **Time Period (Years)** | 2016-2021 for ECR data, qualitative data analysis based on data till 2021 |
| **Data Sources** | **Primary:** ECR<br>o**ther sources:** Eurocontrol, literature review (see appendix 7.2( |
| **Geographic Scope** | ECAC |
| **Aircraft Information** | CAT, GA powered, glider, hang- gliders, paragliders, Military Aircraft |
| **Operation Type** | CAT, OAT, GA |
| **Occurrence Class** | All |

| Key Risk Area | Airborne Collision |
|---|---|

The SIA team(Appendix 6.19.1) analysed the data available in the European Central Repository (ECR). Occurrences were assessed with regard to the number of events that occurred, their locations and airspace classifications and the typical severity of the event outcomes.

A team of experts from CANSO Civil Air Navigation Service Organisation) ANSPs and Eurocontrol provided data and relevant analysis from across Europe. Over several months, the experts examined the available data from a number of ANSPs (collected via its Annual Safety Template), and conducted a literature review from these and other sources (Appendix 6.29.2) This examination sought to identify the common trends in:

- infringement location.
- airspace classification.
- flight rules under which the aircraft was operated.
- event types.

The team then reviewed the actions taken by a number of ANSPs and studied the effect of these actions on safety performance before drawing conclusions for further action. Actions included in the EPAS dealing with airspace infringements were also reviewed.

## 1.5 Risk assessment approach

The assessment of this safety issue started in 2019 and was paused during the COVID pandemic as the SIA participants did undergo resource relocation during this time within their companies. The data was updated with the latest figures from the ECR in July 2022. Furthermore the SIA team referred to data on contributory factors from 2006 to 2011 ( Appendix 6.7 ) ere used and analysed by the ANSPs in working groups. The team reviewed all the available data to obtain a deeper understanding of the airspace infringements problem and to seek to identify trends.

## 1.6 The total number of airspace infringements

The query in ECR for airspace infringements in Europe and North Atlantic revealed 22003 occurrences for the year 2016-2021.

For Figure 1 only EASA MS were considered to be able to correlate the data with the exposure data (IFR flights in EASA MS). This query revealed 17617 occurrences for the years 2016-2021.

ECR data indicate that airspace infringement occurrences increased from around 1900 to almost 3700 until 2019 and dropped since then. However looking at the occurrence rate, airspace infringement occurrences plateaued till 2020, where they increased and decreased since then again.

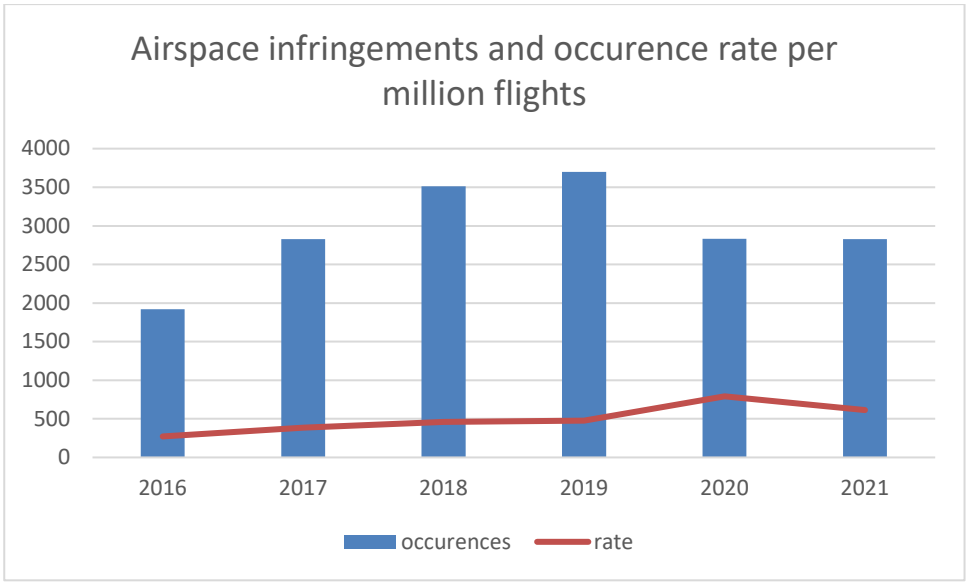



*Figure 1 Airspace infringement rate in EASA MS, ECR 2017-2021*

The following figures outline the number of airspace infringements from 2016- 2021 per month using the entire data sample of Europe and North Atlantic as state of occurrence.

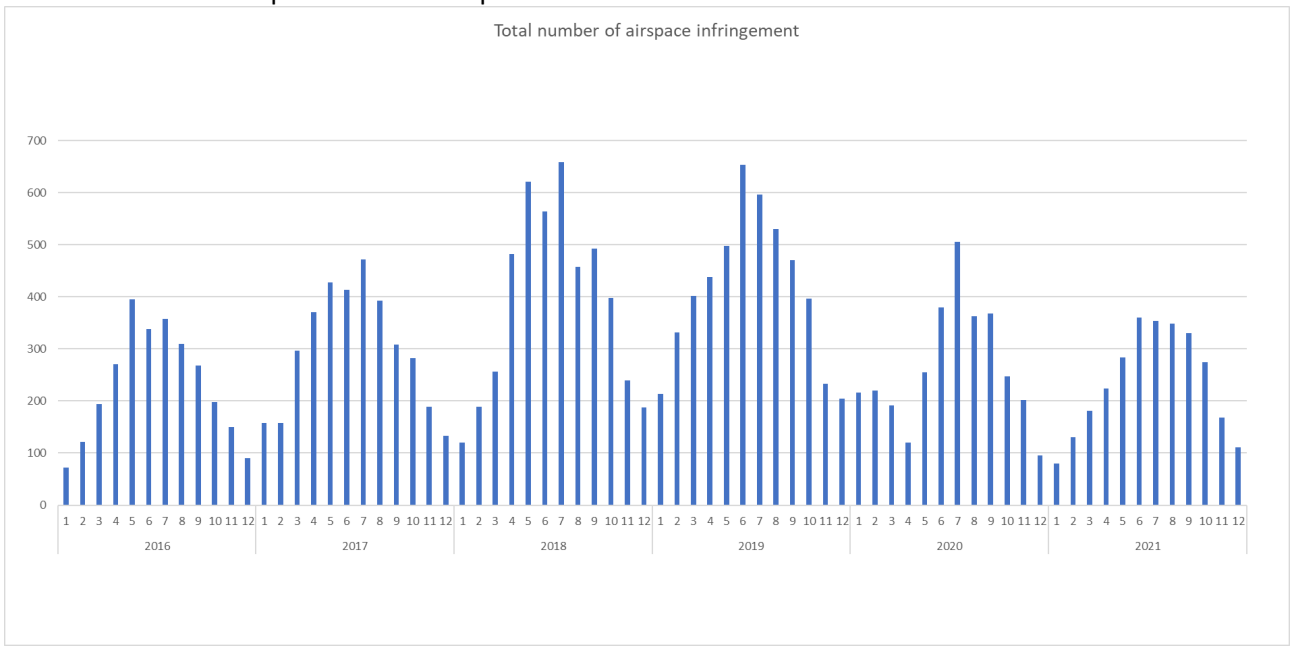



*Figure 2 Total number of airspace infringements, source: ECR,*

Figure 2 depicts the number of airspace infringement over the month of a year and it is visible that airspace infringement peak over the summer period.,

Analysing the occurrence class (Figure 3), 35% of the occurrences are rated as incidents followed by significant incidents (34%). 6 accidents with 2 fatalities occurred. It has to be clarified that the airspace infringement per se was not the cause of the accident with fatalities. It was an aerobatic aircraft that infringed controlled airspace and experienced during the aerobatic manoeuvre loss of control of the aircraft resulting in 2 fatalities. The other accidents involved ultra-light aircraft and paragliders. Occurrence class definitions are in line with ECCAIRS/ECR occurrence classes [Ref. ECCAIRS 2 Central Hub | Taxonomy Browser (aviationreporting.eu)].

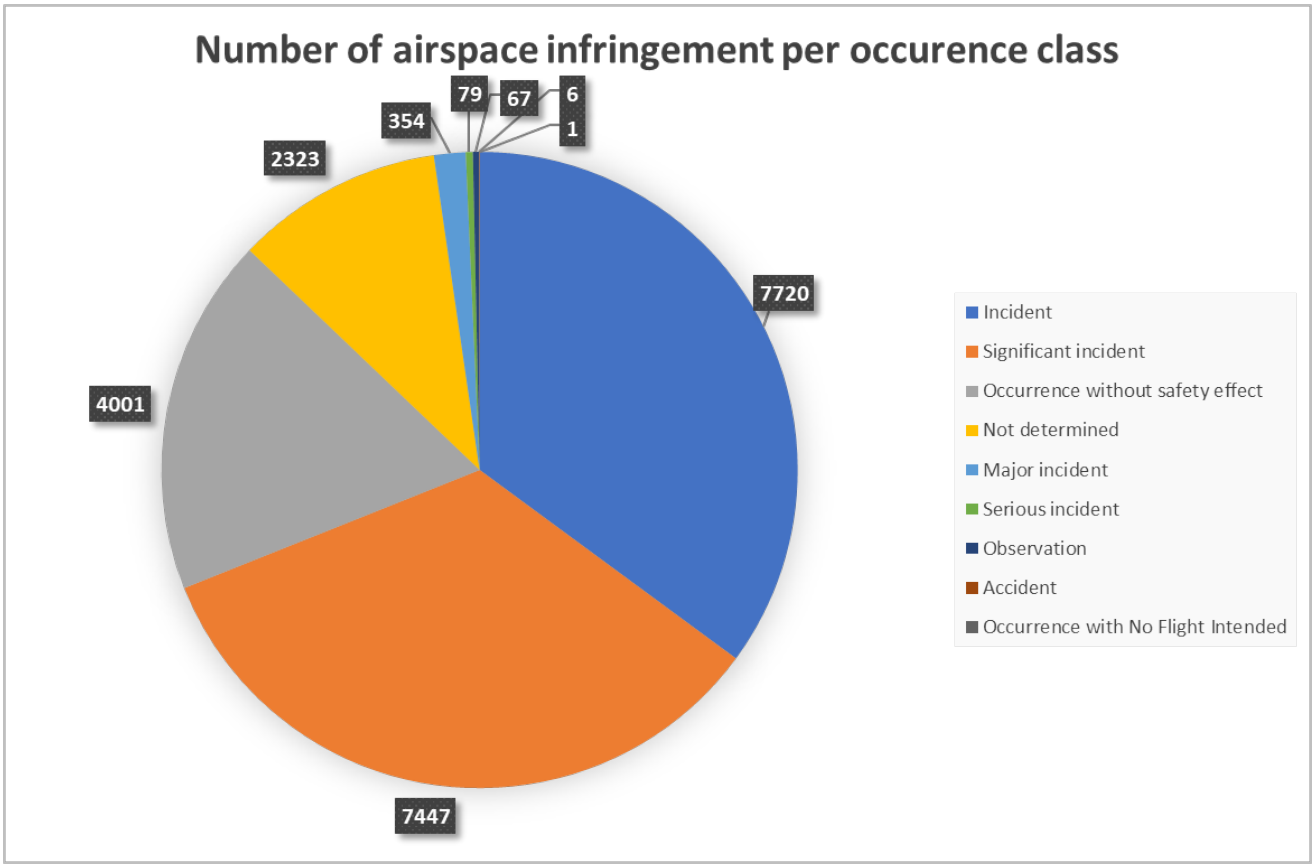



*Figure 3 Number of Airspace Infringement per occurrence class 2016-2021, source: ECR*

## 1.7 The Locations of Airspace Infringements

Airspace Infringements can happen anywhere. However, they are most commonly reported in a limited number of location types. The most commonly infringed airspace structures are TMAs (terminal control area) and aerodrome CTRs (control zones) and CTAs (control areas).

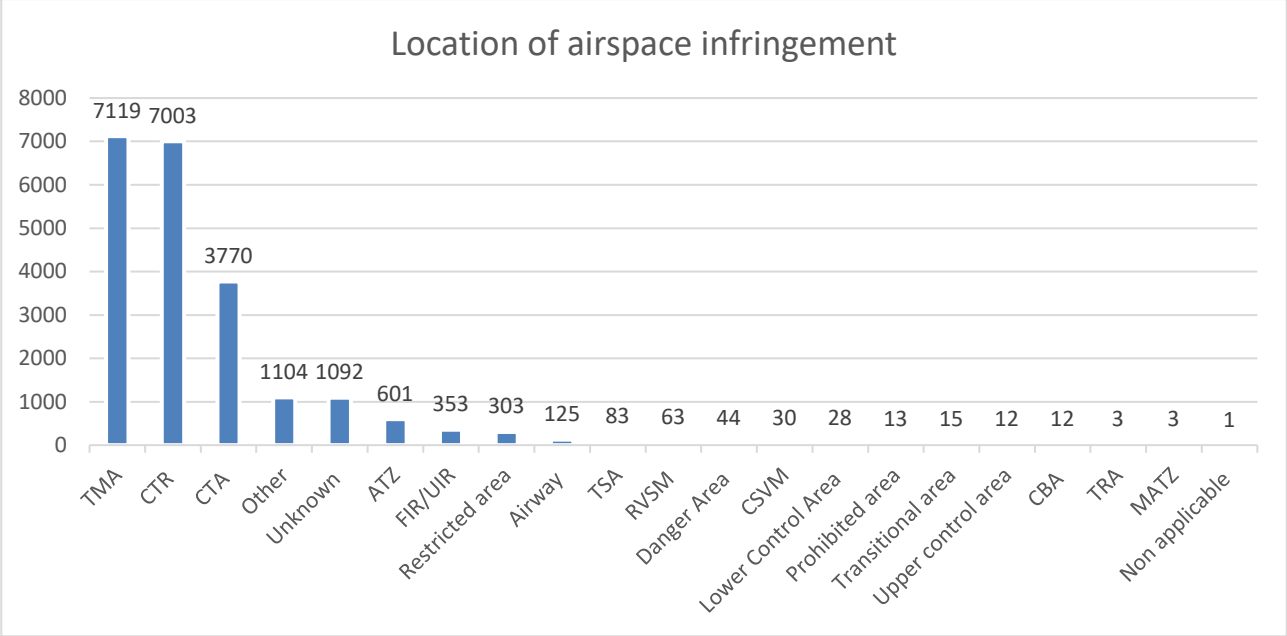



*Figure 4 Location of Airspace Infringement 2016-2021, source ECR*

The majority of infringements occur under circumstances where the infringing aircraft is in en route rather than departing or on approach.

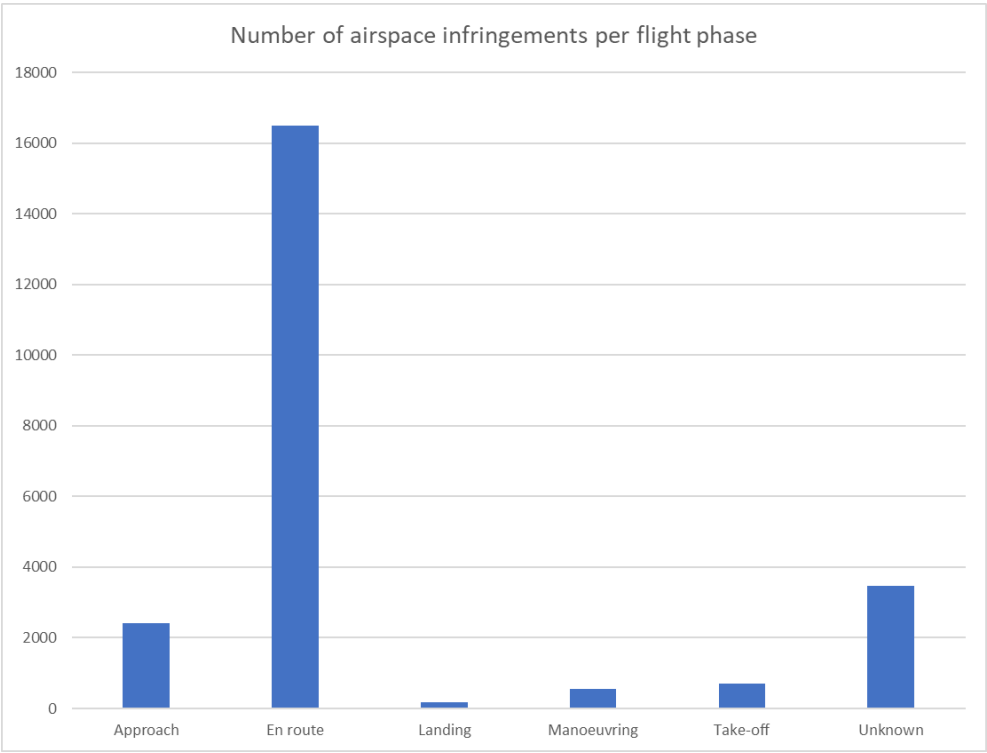



*Figure 5 Airspace infringement per flight phase 2016-2021- Source: ECR*

## 1.8 Airspace Users Infringing Controlled Airspace

While all airspace users are clearly vulnerable to the risk of unintentionally infringing controlled airspace, reporting data shows that around 50% of Airspace Infringement events are reported as to involve aircraft flying under visual flight rules, while 17% are reported as being flown under instrument flight rules. It has to be mentioned that in the reporting system flight rules is not a mandatory field, therefore there are occurrences without any reference to the flight rules.

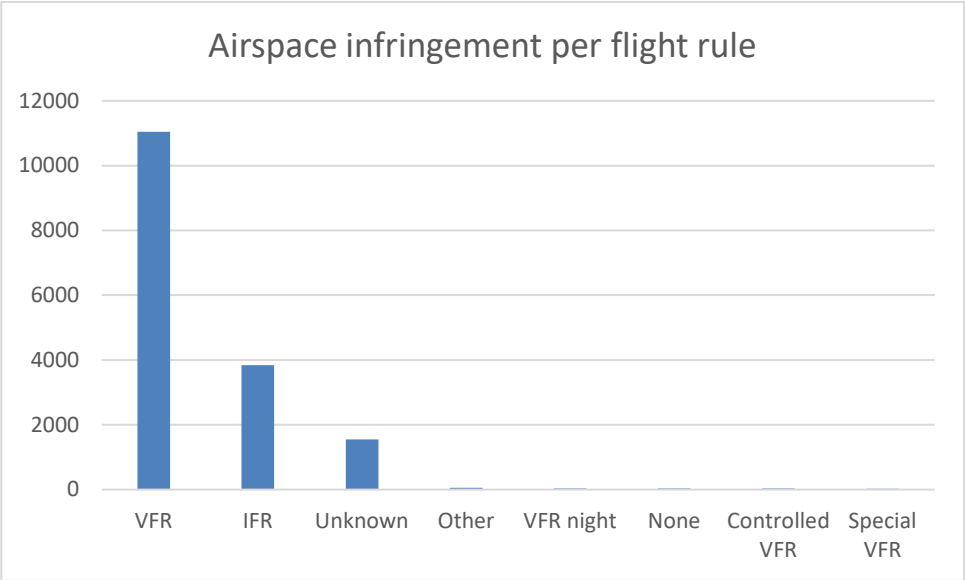



*Figure 6 Airspace infringement per flight rule 2016-2021, source: ECR*

*Table 1 Airspace Infringement occurrences per type of operations and flight rule*

Table 4 indicates that around 33% of the occurrences are reported as being non-commercial operations.

| | Flight rule | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Type of operations** | Controlled VFR | IFR | Special VFR | VFR | VFR Night | Unknown | None/ Other | **Grand Total** |
| Non-Commercial Operations | 20 | 464 | 12 | 6346 | 26 | 405 | 18 | **7158** |
| Commercial Air Transport | 0 | 2275 | 2 | 1156 | 8 | 453 | 0 | **3767** |
| Nationally Regulated Operations | 2 | 287 | 3 | 412 | 1 | 112 | 36 | **829** |
| Specialised Operations (Aerial Work) | 1 | 13 | 1 | 297 | 0 | 23 | 1 | **317** |
| Others | 0 | 0 | | 3 | 1 | 10 | 8 | **22** |
| Unknown | 11 | 720 | 6 | 2272 | 3 | 575 | 27 | **3502** |
| **Grand Total** | **33** | **3699** | **24** | **11955** | **39** | **1500** | **90** | |

In line with the flight rule data are also the data indicating the location of an airspace infringement in terms of airspace class. c)

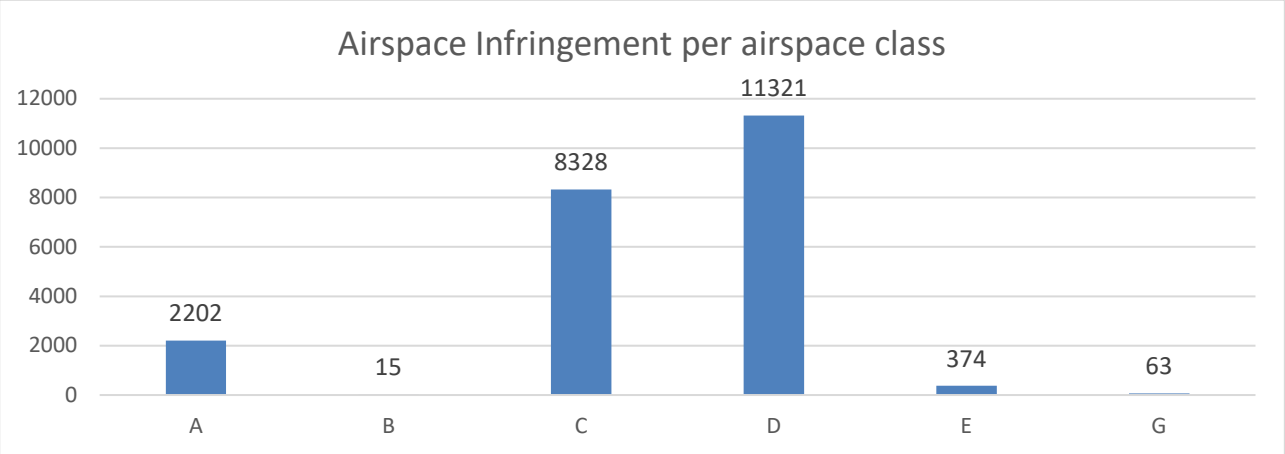



*Figure 7 Airspace infringement per airspace class source ECR, states: Europe and North Atlantic*

## 1.9 Causal Factors of the Infringements

For the following analysis the occurrences where IFR, VFR or both flight rules IFR and VFR in one occurrence were reported were considered. For simplicity and because of the minor numbers the specific categories night VFR, controlled VFR and special VFR flights were not considered.

All event types that were filed for more than 100 occurrences can be found in Figure 8. The top 3 event types for VFR flights are ATM Regulation Deviation, Personnel Attention and Vigilance Events and Flight Planning and Preparation.

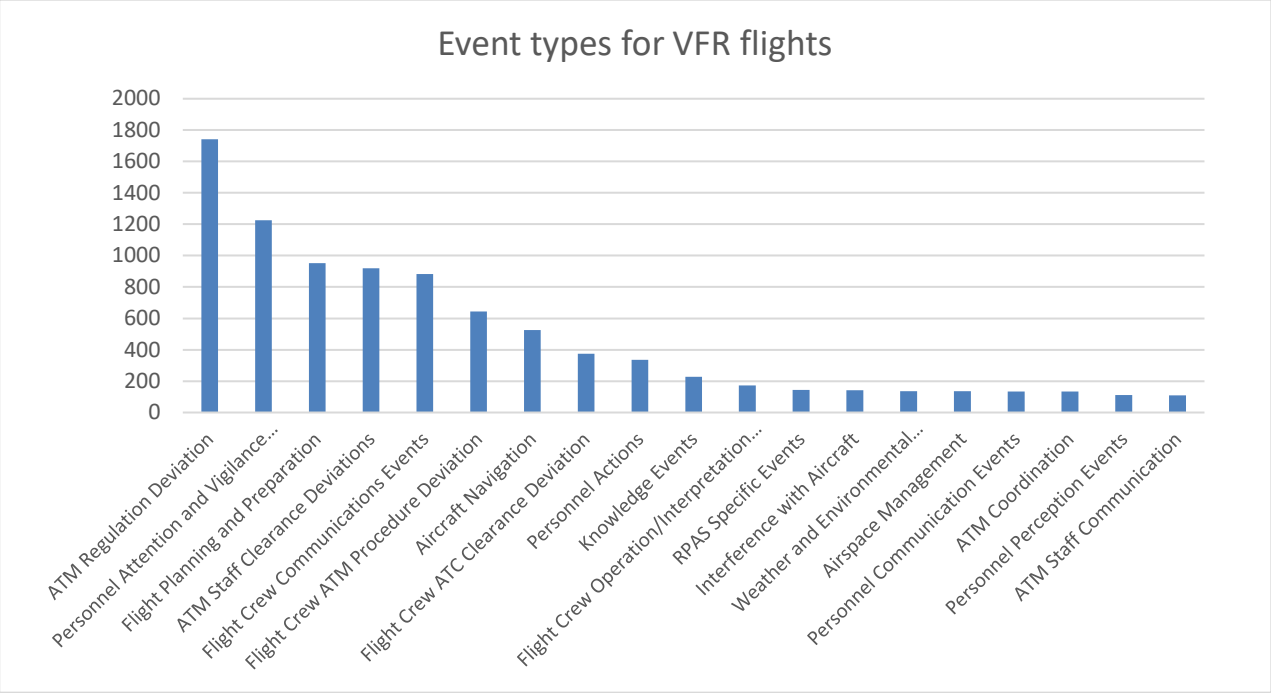



*Figure 8 event types for VFR flights if more than 100 occurrences were filed for one event type. Source ECR 2016-2021*

Figure 9 depict the analyses of IFR flights and their associated reported event types.

All event types that were filed for more than 100 occurrences can be found in Figure 9.

The top 3 event types for IFR only flights are ATM Staff Clearance Deviations, ATM Regulation Deviation and Flight Crew ATM Procedure Deviation

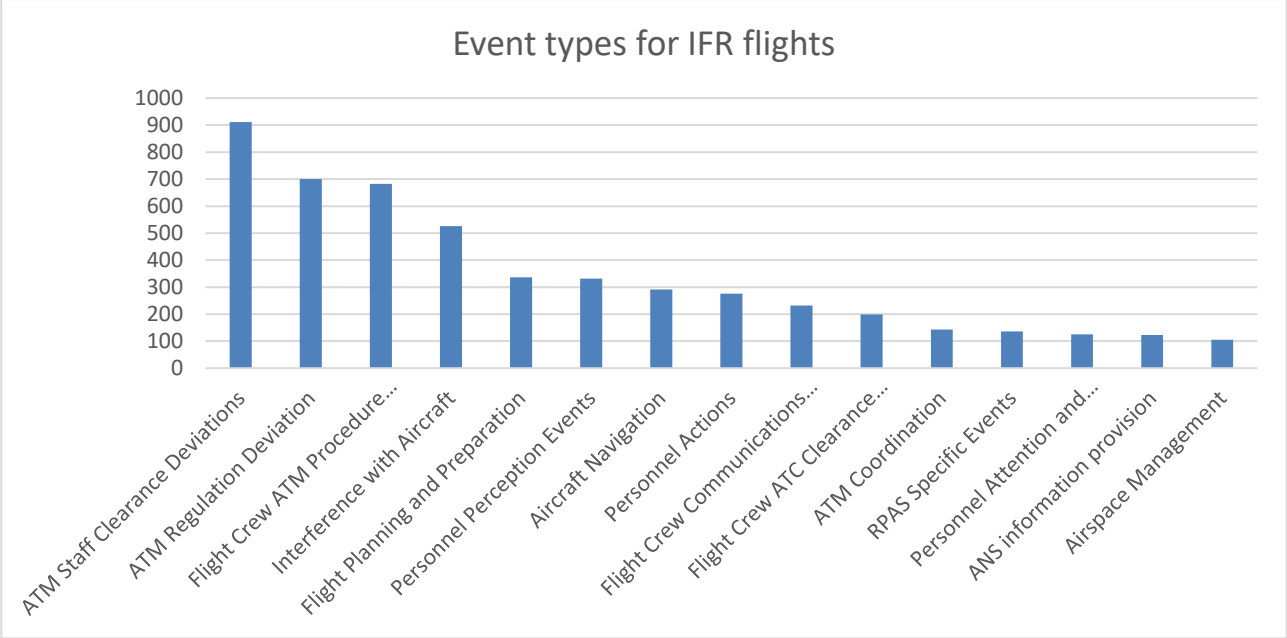



*Figure 9 Event types for IFR flights if more than 100 occurrences were filed for one event type; Source ECR 2016-2021*

## 1.10 Existing Actions

As stated by the EAPAIRR Working Group, for an ATCO an airspace infringement is can be a startling, risky, difficult, and stressful events to deal with. It is explained by the fact that the ATCO often has limited ability to resolve the event because the infringing party is usually not in contact with the controller meaning that the flying intentions of the infringing party are unknown.

### 1.10.1 ANSP Actions

ANSPs have been in action for almost 20 years in order to tackle the risks associated with airspace infringements. Those involved in compiling this paper have taken many actions, including the following:

- Publication of a separate VFR guide (collections of parts of the AIP relevant for VFR)
- Publication of conspicuity SSR codes
- Introducing TMZs (100% success in reducing infringers in some areas)
- Introduction of airspace Infringement Alerting Tools for ATCOs (e.g. Area Proximity Warning: APW)
- Publication of mandatory or recommended transit corridors
- Implementation of EAPPAIR actions in the (limited) field of ANSPs
- Creation of GPS navigation 'satnav' mapping with controlled airspace alerts for GA pilots
- Conducting GA flying (local VFR) clubs liaison visits – education & awareness presentations
- Delivering education and awareness for training pilots, flying schools, aerial works companies, federation representatives, etc.
- Creating GA awareness websites
- Holding annual meetings/ conferences with airspace users, e.g. GA flying associations
- Establishing infringing pilot questionnaire programme
- Publishing articles in widely-read VFR magazines
- Changing lower boundary of TMA to altitude rather than 1000ft AGL
- Including the above actions in ANSP safety plans

### 1.10.2 Airspace Users (civil and military) Actions

Also, airspace users have worked on their part to raise awareness and apply procedures where applicable. For an Airspace User it is suggested to:

- Contact Flight Information Services (FIS) when it's available
- Update regularly the database of the GPS system used as navigation support
- Implement EAPPAIR actions in the field of Airspace Users (civil and military)
- Improve the pre-flight preparation of pilots through briefing including aeronautical and meteorological information
- Use of refresher training to achieve and maintain an adequate level of navigation and communications skills for GA pilots
- Use of knowledge exchange programs between ATCOs, FISOs and Airspace Users
- Enhance pilot proficiency checks beyond simple aircraft handling to include navigation and R/T communication skills check carried out in the form of learning exercises

- Improve pilot awareness of airspace infringement risk via safety promotion activities such as safety seminars, events, Internet fora, publications
- Improve the pre-flight preparation of pilots thru the capabilities of briefing facilities at the various GA locations
- Offer training courses to incentivise training for GA pilots
- Encouraged pilots to be aware of their own training
- Deliver additional training opportunities for "low-hours" pilots.
- Designing of refresher training to achieve and maintain an adequate level of navigation and communications skills
- Implementing of knowledge exchange program

### 1.10.3 EPAS Actions

The latest version of EPAS 2022-2026 contains a group of actions addressing the risk of airspace infringement:

- MST.0024: 'Due regard' for the safety of civil traffic over high sea
- MST.0038: Airspace complexity and traffic congestion
  Member States should consider 'airspace complexity' and 'traffic congestion' as safety-relevant factors in airspace changes affecting uncontrolled traffic, including the changes along international borders.
- RES.0021: SESAR 2020 research projects aiming to prevent mid-air collision risks (on hold)
- RES.0022: SESAR 2020 research projects aiming to safely integrate drones in the airspace
  The following research activities are being addressed under the SESAR 2020 programme: surface operations by UAS (PJ.03a-09); IFR UAS Integration (PJ. 10-05).
- RES.0023: SESAR exploratory projects on U-space
  SESAR JU has launched the U-space exploratory research as a step towards realising the EC U-space vision for ensuring safe and secure access to airspace for drones.
- RES.0031 Interoperability of different ¡*Conspicuity* devices/systems EASA, with the support of technical partners, should demonstrate and validate the feasibility of achieving interoperability of different ¡*Conspicuity* devices/systems through network of stations while respecting data privacy requirements.
- RMT.0727: Alignment of Part 21 with Regulation (EU) 2018/1139 (including simple and proportionate rules for General Aviation)
  Subtask 3: In a third phase, EASA will address all the other amendments required, including on the certification of non-installed equipment.
- RMT.0729, and RMT.0730: Regular update of Regulation 2019/947 and AMC/GM (drones in the open and specific category)
- RMT.0729: Dependencies to SI-2014 Integration of RPAS/drones
- RMT.0230 Introduction of a regulatory framework for the operation of drones
  Includes all the actions that are relevant to ensure the safe integration of UAS and eVTOL operated

in the 'certified' and 'specific' (high-risk) category, including manned eVTOL aircraft operated in the 'certified' category into the aviation system.

- RMT.0690 Regular update of CS-STAN: The objective of this RMT is to regularly address miscellaneous issues of non-controversial nature, in order to ensure that the CS are fit for purpose, cost-effective, can be implemented in practice.
- RMT.0519 Regular update of CS-ACNS The objective of this RMT is to regularly address miscellaneous issues of non-controversial nature, in order to ensure that the CS are fit for purpose, cost-effective, can be implemented in practice, and are in line with the latest ICAO SARPs. In particular, a regular update is used to incorporate SCs, certification memoranda and other material supporting the application and interpretation of existing CS as established by EASA during previous certification projects, and to address non-complex and non-controversial issues raised by
- SPT.0091: European safety promotion on civil drones
  Coordinate European activities to promote safe operation of drones to the general public.
- SPT.120: Promoting Good Practises in Airspace Design
  Promote good practices in airspace design that reduce 'airspace complexity' and 'traffic congestion' with the aim of reducing the risk of airborne collisions involving uncontrolled traffic.
- SPT.0119: Promoting ¡*Conspicuity*

  Facilitate installation of ¡*Conspicuity* devices in all aircraft holding an EASA TC and promote their use by airspace users at an affordable cost for them.

  Support initiatives enhancing interoperability of ¡*Conspicuity* devices/systems

Note:

- RES.0032 was not initiated at the time of the SIA, therefore not considered in the SIA. The result of this task expected to be completed in 2026 will drive further the recommendations from the SIA.

## 1.11 Results of the Safety Issue Assessment

The continuous increase of airspace infringements indicated that this is an pertinent safety issue.

European Central Repository (ECR) data shows that during 2016-2021 there were over 22,000 reported infringements in the geographic scope of Europe and North Atlantic. Many of these resulted in losses of separation with other aircraft. This continues a trend that has been ongoing for nearly twenty years.

Analysis of the data available from a number of different sources shows some clear trends. The majority of infringement events occur in terminal control areas (TMAs), controlled traffic regions, (CTRs) and control areas (CTAs) they involve general aviation (GA) pilots flying under VFR and occur due to navigation errors,

poor pre-flight planning, airspace complexity, distraction in the cockpit, and/or difficulty dealing with unexpected or unfamiliar weather conditions.

The proposed actions are:

- *Reduce airspace complexity*
- *Training on airspace structure and navigation*
- *Availability of up to date data*
- *Airmanship*
- *Reporting culture*
- *Conspicuity*
- *Pre-flight briefing facilities and tools*

## 2 Baseline scenario-– What would happen if there is no additional action?

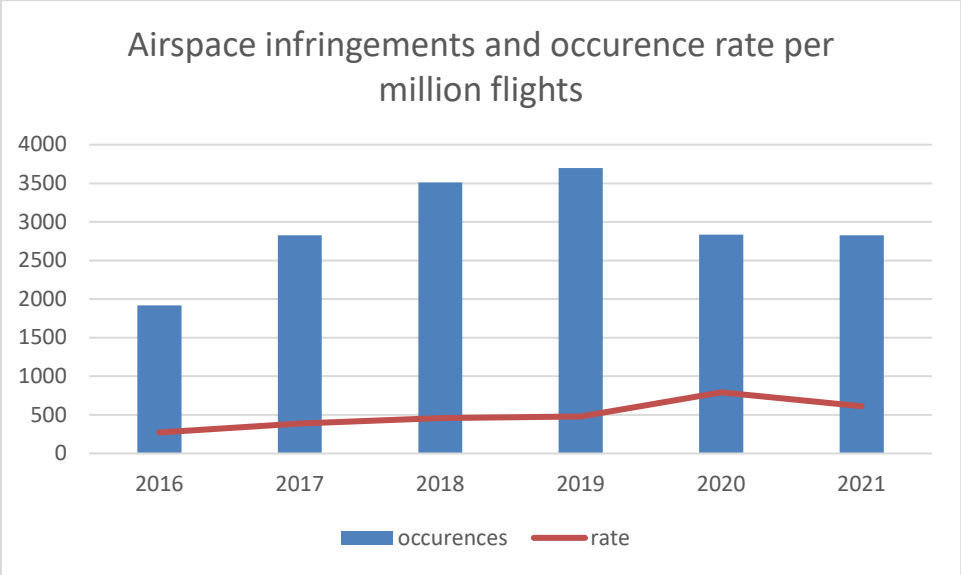



*Figure 10 Airspace infringement and occurrence rate per million flights*

*Figure 10* indicates that airspace infringements have in increased with time and therefore. Without mitigation measures, the safety risks will remain.

The data and analysis presented in this paper demonstrate the airspace infringements poses still a risk to airspace users. Given the limited control that ATCOs and other pilots have over each situation, there is an increased risk of airborne collision caused by airspace infringements.

There is an increasing incidence of airspace infringement by unmanned aerial vehicles (UAVs), commonly referred to as drones. However, the risk posed by drones infringing CAS is, as yet, not clearly quantifiable and is, therefore, considered outside the scope of this SIA.

## 3 Intervention objectives

The objective of this safety issue assessment is to formulate actions than can prevent airspace infirngments and with that mid-air collisions.

## 4 List of proposed actions and assessment of their integration in the BIS Airborne Collision

### 4.1 List of proposed actions and assessment

| SIA "Airspace Infringement" recommendations for actions | | | | | | BIS/IA assessment |
|---|---|---|---|---|---|---|
| **Action number** | **Action title** | **Issue** | **Objective** | **Action type (RMT, SPT, RES, MST)** | **Scenario number** | |
| *1* | Reduce airspace complexity | Airspace complexity is a contributing factor to airspace infringments. | To reduce the risk of airspace infringements caused by airspace complexity in European Airspace and to avoid segregation of airspace for exclusive or restricted use as much as possible. EASA to support the MST and to review the EAPAIRR actions (see appendix 6.6), facilitating their incorporation into EPAS and/or SSPs, where appropriate. | MST | na | This is already covered in MST.0038 and SPT.0120, which are extended to 2026-2028. |
| *2* | Training on airspace structure and navigation | Pilot navigation skills appear to play a role in airspace infringments. | To improve pilot training on airspace structure, navigation and use of navigation aids e.g. GPS | SPT, MST | Pre-flight planning, Training | Navigation is one of the key skills tranined during initial training of pilots and is regularly checked.<br>GNSS spoofing and jamming to be considered.<br>Design of airspace along topographical features is considered in MST.0038<br>SPT.120 covers airspace complexity part. Therefore, the recommendation "Training on |

| SIA "Airspace Infringement" recommendations for actions | | | | | | BIS/IA assessment |
|---|---|---|---|---|---|---|
| **Action number** | **Action title** | **Issue** | **Objective** | **Action type (RMT, SPT, RES, MST)** | **Scenario number** | |
| | | | | | | airspace structure and navigation " does not need to be reflected as a separate action. |
| *3* | Availability of up to date data | If pilots have incorrect and unprecise data available for their flight planning the risk of an airspace infringement increases | To promote via GA roadmap that GA pilots have up to date information available<br><br>EASA, States, ANSPs and private flying associations to facilitate public access to airspace information in commonly used digital formats that are typically used by pilots | SPT | Pre-flight planning, Flight planning sources | This is already covered by SPT.0119 and SPT.0120. |
| *4* | Airmanship | If transponders are not used correctly or pilots are not aware of the airspace they are flying in it increases the airspace infringement risks. | Continue safety promotion campaigns regarding the use of transponder , flight at proximity of controlled airspace, distraction)<br><br>EASA, states, ANSPs, and private flying associations continue to raise awareness among flying schools, instructors, clubs, and | SPT,MST | Escalating factor in UK bow tie (Appendix 6.8) | This is already covered by MST.0038, SPT.0119 and SPT.0120.<br><br>No MST need. |

| SIA "Airspace Infringement" recommendations for actions | | | | | | BIS/IA assessment |
|---|---|---|---|---|---|---|
| **Action number** | **Action title** | **Issue** | **Objective** | **Action type (RMT, SPT, RES, MST)** | **Scenario number** | |
| | | | individual pilots of the impact of airmanship on the ATM system. | | | |
| *5* | Reporting culture | Reporting of airspace infringement should not lead immidiatly to a penalty. | Improve reporting culture and recognise just culture for GA pilots | MST | na | MST.0027 is already in place (continuous). ¡*Conspicuity* Declaration was published in 2025. |
| *6* | Conspicuity | If aircraft are not visible for all involved actors the risk of airspace infringement increases. | To improve conspicuity across the European region. | SPT (RES.0031,RES.0032, SPT.0119) | na | SPT.0119 Extension to 2026-2028 |
| *7* | Pre-flight briefing facilities and tools | If the planning of the flight is not facilitated appropriately and therefore not carried out properly the risk | To facilitate access to pre-flight briefing facilities and tools. | SPT,MST | Pre-flight planning, Flight planning sources | This is already covered by MST.0038, and SPT.0120. |

| SIA "Airspace Infringement" recommendations for actions | | | | | | BIS/IA assessment |
|---|---|---|---|---|---|---|
| **Action number** | **Action title** | **Issue** | **Objective** | **Action type (RMT, SPT, RES, MST)** | **Scenario number** | |
| | | of airspace infringement increases. | | | | |

## 4.2 Detailed definition of proposed actions

Action 1 Airspace complexity:

Complex airspace with multiple CTAs or differing levels and complex shapes are inherent airspace infringement hot spots. For example the numerous boundary level changes of TMAs and CTRs that can contribute to vertical navigation error.

The design should consider adjacent controlled airspaces to avoid creating narrow corridors that increase funnelling and risk of airspace infringement and airborne collision.

The action proposes for states to perform an assessment of the impact of airspace complexity on the workload for all affected airspace users and publish the results of an agreed objective measurement either for each airspace change or at regular intervals. Further more it proposes EASA to support the MST and to review the EAPAIRR actions (see appendix 6.6), facilitating their incorporation into EPAS and/or SSPs, where appropriate.

Action 2 Training on airspace structure and navigation

Pilot navigation skills and appear to play a role in airspace infringments. Therefore continuous skill development and pilot training on airspace structure, navigation and use of navigation aids e.g. GPS shall be ensured.

EASA, States, and private flying associations to act to create a framework for assisting flying schools, instructors, clubs, and individual pilots to actively seek to maintain and/or increase pilot competence through continuous skills development. *(see appendix 6.6)*

Action 3 Availability of up to date data

Pilots can only use the navigation aids appropriately if they have up to date information at their hand. Therefore EASA, States, ANSPs and private flying associations 39ecogn facilitate public access to airspace information in commonly used digital formats that are typically used by pilots. This should be promoted via the GA roadmap.

Action 4 Airmanship

In the UK bow (Appendix 6.8) tie for airborne conflict in class A airspace with the threat "Unauthorisised penetration of UK class airspace by sport/ recreation or military flight the lack of secondary radar conspicuity due to non transponding traffic" is an escalating factor.

It is proposed to continue safety promotion campaigns regarding the use of transponder and flight at proximity of controlled airspace.

The action proposes for EASA, states, ANSPs, and private flying associations continue to raise awareness among flying schools, instructors, clubs, and individual pilots of the impact of airmanship on the ATM system.

Action 5 Reporting culture

Improve reporting culture and 39ecognize just culture for GA pilots. The action proposed for authority to consider just culture when GA pilots report a self-made error.

Action 6 Conspicuity

To improve conspicuity across the European region. The UK CAA's bow tie analysis of the risk posed by airspace infringement (Appendix 6.8) identifies two major threats which are present: aircraft conspicuity and crew proficiency. The CAA's analysis identifies a number of conspicuity issues, such as aircraft types with poor

radar cross-section and a lack of SSR and ACAS conspicuity due to non-transponding aircraft, which is a violation of the rules of the air.

The action proposed for EASA and states to accelerate and promote equipage of ADS-B technology or alternative electronic conspicuity devices to broadcast information to ground, where ANSPs should use this information for surveillance purposes.

*Action 7 Pre-flight planning facilties and tools*

This action goes hand in hand with action 3. It proposed for EASA, states, schools, and clubs to support the way briefing is carried out and to identify appropriate facilities and tools to improve flight preparation effectiveness. This should facilitate access to pre-flight briefing facilities and tools. (see appendix 6.6)

## 5 Conclusion

The proposed SIA recommendations were reviewed. As a result, no new actions are necessary, all proposals are in the scope of existing actions reflected in the BIS Airborne Collision.

# 6 Appendices

## 6.1 SIA Team composition

The assessment team was drawn from 7 organisations and comprised 7 contributors. The areas of expertise covered by the team were:

| Role | Organisation |
|---|---|
| Senior Expert Safety Intelligence | DFS |
| Senior Safety Performance Expert ATC | DSNA |
| Head of Operational and Consulting Services Dept. (former Safety Post Holder) | ENAV |
| Safety Manager | IAA |
| Principal Safety Specialist | NATS (UK) |
| Safety and Security Manager | PANSA |
| Strategy Development Officer | EASA |

*Table 2: Assessment Team Composition*

## 6.2 Occurrence Reporting Data

i. **European Central Repository (ECR) database.**
The European Coordination Centre for Accident and Incident Reporting Systems (ECCAIRS) provides the European Central Repository (ECR) for accident and incident reports in aviation.

ii. **EUROCONTROL Airspace Infringement Initiative FIS Survey and Analysis parts 1-3**.
EUROCONTROL, 2008. Surveys and analysis of Airspace Infringement data within Europe, covering the time period of 2002-2008

iii. **FABEC Airspace Infringement Analysis.**
Data analysis of Airspace Infringements within the FABEC area of responsibility of (ANA Lux, Belgocontrol, DFS, DSNA, LVNL, MUAC, Skyguide), covering the time period of 2013-2016.

iv. **NATS (UK) Airspace Infringement Analysis**
Data analysis of Airspace Infringement reports in UK airspace, covering the time period of 2012-2015.

**v.** **IAA Airspace Infringements Analysis**
Data analysis of Airspace Infringement reports in Irish airspace, covering the time period of 2012-2016.

vi. **ENAV Airspace Infringements**
ENAV case study of Airspace Infringements within the Milano CTA-TMA, covering the time period of 2013-2016.

## 6.3 Existing Bow Tie Models

- **UK CAA Bow-tie analysis of Airspace Infringement Risk, 2012** (Appendix *6.8*A)
- **SESAR AIM Mid-Air Collision Risk Model (en route and TMA operations), 2016** (Appendix B)

## 6.4 Documents Reviewed

- **European Plan for Aviation Safety (EPAS) 2022-2026**
  EASA, 2022
- **Safety Issue Assessment: Deconfliction with IFR/VFR traffic**
  EASA, 20189
  Note: this SIA was then integrated in the BIS Airborne Collision consultated with the Advisory Bodies in 2020
- **European Action Plan for Airspace Infringement Risk Reduction (EAPAIRR), Version 2.0,**
  EUROCONTROL, CANSO, 2022
  https://www.eurocontrol.int/sites/default/files/2022-03/eurocontrol-airspace-infringement-action-plan-v2-0.pdf
- **PRB Monitoring Report. Safety Volume, years 2015, 2016, 2017**
  Performance Review Body of the Single European Sky, European Union
- **Airspace Infringement: Guidance for GA Pilots**
  EUROCONTROL, 2009
- **Communication Guide for General Aviation VFR Flights**
  EUROCONTROL, 2009 https://www.easa.europa.eu/en/document-library/general-publications/egast-radiotelephony-guide-vfr-pilots
- **Top Ten Tips for GA Pilots**
  Eurocontrol, 2010
  https://skybrary.aero/airspace-infringement-poster-top-ten-tips-ga-pilots
- **Airspace Infringement Prevention Toolkit**
  EUROCONTROL, based on a collection of best practises from all over Europe.
  https://skybrary.aero/tutorials/airspace-infringement-prevention-toolkit
- **Decision Making for General Aviation Pilots**
  EASA, European General Aviation Safety Team (EGAST), 2011
  https://www.easa.europa.eu/sites/default/files/dfu/EGAST_Brochure_Decision-making_low_110404.pdf
  **General Aviation Safety Sense Leaflets** from UK CAA, 2003-2016
- **CAP1535 – The Skyway Code**
  UK CAA, 2021
  https://publicapps.caa.co.uk/docs/33/CAP1404%20Edition%205%20(August%202021).pdf
- **Avoiding Airspace Infringements Videos Campaign by**:

  EASA, UK CAA, Finnish CAA, Belgian CAA, Swiss CAA, Norwegian CAA
  https://www.easa.europa.eu/airspace-infringement

## 6.5 European Action Plan for Airspace Infringement Risk Reduction

In 2019 EUROCONTROL and CANSO jointly undertook a round of stakeholder engagement with ANSPs, national authorities, and European General Aviation associations. The stakeholder engagement resulted in the formation of a EAPAIRR Working Group consisting of representatives from a number of ANSPs, state

regulators, and General Aviation representatives as well as EASA representation. The Working Group met for the first time in September 2019 and continued to meet throughout the COVID-19 pandemic. They realised its aim of publishing a renewed EAPAIRR V2.0 in April 2022. The purpose of the new EAPAIRR is to reduce risk and support airspace users, civil and military service providers, and national authorities in implementing the recommended safety improvement measures for the timeframe 2022-2030. EAPAIRR contains recommendations and best practice examples which can be partly or wholly incorporated in the EPAS and/or the SSPs.

### 6.6 EAPPAIR recommendations

European Airspace Infringement Action Plan | SKYbrary Aviation Safety

EAPAIRR v2.0 Recommendations (European Action plan for Airspace Infringement Risk Reduction, EAPAIRR version 2.0; CANSO, Eurocontrol, March 2022)

EAPAIRR

# Airspace Design

| REF | Recommendation | Rationale |
|---|---|---|
| AD1 | The design principles should encompass the safety, environmental and operational criteria, and the strategic policy objectives that the change sponsor seeks to achieve in developing the airspace change proposal. | Design principles must be set through a two-way process and involve effective engagement.<br>The change proposal should include the maintenance of a high level of safety and avoid overflying densely populated areas where possible.<br>The proposal should also include other design principles that reflect local considerations or impacts on other airspace users so that they are considered as part of the design process. The development of these design principles can be undertaken by the change sponsor without additional engagement. All design options will need to demonstrate how they meet (or don't meet) the design principles. The design principles should consider U-Space and UAS operations. |
| AD2 | Any change must be transparent and involve stakeholder engagement throughout the entire process. | Those potentially affected by a change in airspace design should feel confident that their voice has a formal place in the process if trust is not to be eroded. Openness also allows change sponsors to see more clearly what is expected from them.<br>The change should include assessing the impact of airspace changes on certified navigation systems and apps. |
| AD3 | Maintain and enhance safety by design | States should perform an assessment of the impact of airspace complexity on the workload for all affected airspace users and publish the results of an agreed objective measurement either for each airspace change or at regular intervals. |
| AD4 | Where possible, design airspace boundaries with ground features that are not susceptible to significant change, and do not delimit airspace by national borders | Features such as roads, railways and major topographical features aid navigation and situational awareness. This is less true of towns, cities, and industrial parks as they grow with economic expansion. |
| AD5 | Where new airspace is established provision should be made for ATS outside of controlled airspace to facilitate airspace infringement prevention. See also recommendation ANSP8 | ATS should provide airspace infringement warning and navigational assistance. |
| AD6 | The design should be as simple as possible to avoid confusion or pilot overload in interpreting the airspace. | Complex airspace with multiple CTAs or differing levels and complex shapes are inherent airspace infringement hot spots. The design should consider adjacent controlled airspaces to avoid creating narrow corridors that increase funnelling and risk of airspace infringement and mid-air collision. |
| AD7 | Base levels of CTA should be as high as possible to allow containment of SIDs and STARs but also elevate lower limits of TMAs where possible. | Enable the retention of as much uncontrolled airspace as possible. |
| AD8 | National authorities should play the leading role in establishing and promoting local implementation priorities and actions in consultation with airspace users and service provider organisations. | While airspace infringement is an important operational risk across much of Europe, the nature and scale of the problem varies between States. There are several key factors which will shape the local airspace infringement risk reduction strategies. These will determine the most appropriate and effective actions to be taken by individual States. These are: the complexity of the airspace structure; the scale of military flying activity; the scale and maturity of both commercial and general aviation sectors; the scope and nature of air traffic service provision; and the State's regulatory and legislative frameworks. Therefore, the number of Action Plan recommendations that can be implemented is likely to vary from State to State. |

| REF | Recommendation | Rationale |
|---|---|---|
| AD9 | Review the controlled airspace structure and simplify boundaries where possible. | A safety assessment must be made for all changes at the functional system level with regard to the Airspace Structure.<br><br>This action is particularly relevant to areas of dense VFR traffic. It should aim to simplify, where possible, the numerous boundary level changes of TMAs and CTRs that can contribute to vertical navigation error. It should also aim to ensure the protection of the IFR traffic established on the extended runway centreline and within 15 NM from the runway threshold from nearby uncontrolled VFR traffic. This would reduce the number of operationally unnecessary RAs generated by TCAS. Alignment of the <FL195 airspace structure, boundaries and of ATS routes for VFR flights (hereinafter referred to VFR routes) with prominent ground features and landmarks should be sought to make them more easily identifiable by pilots during flights. The review should be informed by identification of hot spots based on the analysis of incident reports (e.g. airspace infringements) or other appropriate methods. Automated tools may also be used to plot actual flight tracks in a particular area onto the existing airspace structures in order to identify potential inconsistencies in the design of protected (controlled) airspaces. Such methods will also facilitate the identification of under-utilised portions of controlled or restricted airspaces that may be released for use by GA VFR flights. This action concerns ANSPs that have been delegated the responsibility of developing and implementing changes to the airspace organisation subject to the approval of the National authorities. |
| AD10 | Harmonise airspace classification below FL195 in line with the strategic airspace design principles. | An appropriate strategic design of the airspace is crucial in permitting the ATM System to provide the right services, at the right time and in the right places decreasing routine tasks and the requirement for tactical intervention. Harmonisation of airspace classification below FL195 should be based on the ICAO-defined airspace classes. It should aim for the establishment of common vertical limits, as far as practicable. It should also include harmonised application of associated rules, procedures, and air traffic services.<br><br>It is highly recommended deploying airspace structures that provide a greater degree of strategic de-confliction with particular consideration of cross-border operations. The EUROCONTROL Agency should support and facilitate the harmonisation efforts of the Member States within the framework of the existing EATM working arrangements (NETOPS and sub-groups) providing the required expertise, and in line with the approved Strategic Guidance in support of the execution of the European ATM Master Plan and SES regulations. |
| AD11 | Eliminate class A from TMAs and airspace below FL195 wherever and whenever possible. | This increases the availability of airspace for General Aviation while providing a more tailored approach to retaining the necessary controlled airspace for commercial flights to operate. |
| AD12 | Resize CTRs and TMAs on a case-by-case basis, especially at lower levels. | This increases the availability of airspace for General Aviation while providing a more tailored approach to retaining the necessary controlled airspace for commercial flights to operate. |
| AD13 | Create VFR routes in the CTRs if they are deemed beneficial in accordance with the needs of all stakeholders in this area. | This may lead to a more predictable traffic behaviour for both pilots and controllers, with routes between easily identifiable points. |
| AD14 | Resize special activities airspace to limit them to the minimum required and restrict their activation to what is strictly necessary.<br><br>Eliminate those areas/zones that are no longer needed. | This increases the availability of airspace for General Aviation and reduces the frequency of 'technical' airspace infringements, i.e., those 'infringements' where the airspace is notified as restricted but eventually no activity is taking place in it.<br><br>This concerns: Prohibited, Restricted and Danger Areas<br><br>Military Exercise Area, Military Training Area, Air Defence Identification Zone (ADIZ), Cross-Border Area (CBA), Temporary Reserved Area (TRA), Temporary Segregated Area (TSA)<br><br>Flight plan Buffer Zone (FBZ) |

EAPAIRR

# ANSPs

| REF | Recommendation | Rationale |
|---|---|---|
| ANSP1 | Ensure ATCO and FISO communication skills and discipline is included in FIS training and licensing/certification.<br>See also recommendation AU8 | This action reinforces the objectives and provisions of the Action Plan for Air Ground Communications, focusing on the aspects that are of particular importance in the communication exchange between ATS units and VFR flights. ATS staff should be trained to: Strictly apply the readback/hearback procedure; Actively seek confirmation in case of doubt; Use unambiguous call-signs - full call-sign or call-sign coupled with type of aircraft; Use published reference points in ATS messages to pilots as far as possible; Use simple ATC clearances and instructions; Use more concise transmissions, if necessary broken into shorter segments; Use reduced rate of speech and better articulation when talking to VFR pilots; Issue pre-warning of instructions to be passed; Provide FIS in English language; Acquire adequate knowledge of and apply communication failure procedures as required.<br>Improve and harmonise FISO training curriculum. The training curriculum should be improved to adequately match the level of service to be provided. FIC staff should receive dedicated training to improve their awareness and understanding of VFR flights' needs, specificities, and light aircraft performances. Best practices already exist (e.g., in Germany) to deliver emergency situation training to FIC staff and VFR pilots in a coordinated manner. A sufficient number of FIC staff should be made available to support the provision of enhanced FIS. A number of ATS providers have already implemented dedicated training programmes for staff that become redundant or underutilised due to the increasing automation of ATS provision (e.g., implementation of OLDI). See also 6.20 and 6.23 above.<br>Add familiarization basic training for: ATCO and FISO in training meetings; for Pilots at ATC/FIS Centres. |
| ANSP2 | Implement a properly tuned Area Proximity Warning function. | The objective is to implement an automated safety net function that should systematically alert controllers of airspace infringements, i.e., of unauthorised entries into controlled and restricted airspaces. Implementation decision should be based on positive cost-benefit-analysis and safety assessment. Area Proximity Warning (APW) is a ground-based safety net intended to warn the controller of unauthorised penetration into an airspace volume by generating, in a timely manner, an alert of a potential or actual infringement.<br>Use APW Safety net data to highlight "hotspots" where potential or actual airspace infringements have occurred. This can in turn be used to focus work on airspace infringement causes and mitigations This can also be used for the investigation of the causes of the potential airspace infringements and later for the mitigations.<br>It is recommended that a survey is undertaken to determine the relevant implementation of this function and its effectiveness. |
| ANSP3 | Establish a platform to discuss procedures, incidents and hotspots between aerodromes, local ATS units and flying clubs. See also recommendation AU7. | This action aims to establish standard coordination procedures between closely located ATS units, military, and user sites. The implementation of such procedures will reduce the volume of routine coordination, and thus controller and pilot workload. The FUA concept implementation work should also take account of the specific needs of the GA VFR flights with regard to the timely dissemination of information about the activation/deactivation of reserved airspaces (including those for glider activity). Implementation of (direct) communication lines or means between local ATS units, military units and GA airports/airfields should be considered in this respect. The implementation of the above referred coordination procedures, which would enhance the FUA procedures in <FL195 airspace at local level, should be preceded by careful safety assessment<br>Establish Local Airspace Infringement Teams (LAITs) to be run by the airspace owner. Participants should be included from ANSP's, airspace users (GA, CA and MA), local airports and regulators. Provide more general information on hotspots and ways of communication. |

| REF | Recommendation | Rationale |
|---|---|---|
| ANSP4 | The ANSP & Regulator should establish a procedure to provide feedback on individual incidents to the 'Airspace Infringer'. | Set up a process to allow direct access to individual pilots to acquire the relevant information immediately after an incident.<br><br>Be aware that information provided «right after an incident» may not be sufficiently considered. It is useful to have information as soon as possible in order to avoid repeated mistakes if the infringer continues operating. However, all parties should assess whether the completeness of the available information might risk cancelling out the advantages brought by immediate access to the pilot.<br><br>This direct process should respect Just Culture principles to avoid any negative consequences e.g., TXPD off. Anonymous ways of providing the relevant safety information could be considered. |
| ANSP5 | Enhance and harmonise FIS provision to VFR flights | Harmonisation of FIS provided to VFR flights should be based on European IRs/AMCs/GMs, ICAO SARPs and existing best practices. Examples of best practices are thus the Low Airspace Radar Service provided in UK airspace and the radar information services provided in German airspace.<br><br>Radar-derived information available at ATS units should be used to enhance the information passed to pilots. It should include, as appropriate, navigational assistance, coordination of controlled airspace entry/crossing clearance, passing traffic information and information about restricted airspace activation/deactivation and concerned traffic, as well as provision of other aeronautical information and information about potentially hazardous conditions. The service could include provision of warnings to pilots of any unfavourable factors including airspace infringement and traffic warnings. FIS "level" could be raised to enable proactive prevention of potential conflict situations. The scope of this action should include the harmonisation of services provided by civil and military FIS provider organisations.<br><br>Provision of FIS across Europe is not consistent.<br><br>There are good reasons for different levels of service provision under FIS. Level of service is a decision that rests with the state. As long as the service meets the minimum required by the state then the state is deemed compliant. At the moment there are no ongoing initiatives to harmonise FIS at the European level. EASA is waiting for the implementation of Part ATS and will review this later to see if any further action is needed.<br><br>The principles and fundamentals of provision of FIS are established in Commission Implementing Regulation No. 923/2012. The upcoming PART-ATS which will be included in Commission Implementing Regulation 2017/373, will further detail the specific technical requirements for FIS and provide harmonization to the suitable extent. Based on the implementation feedback, consideration for further refinement of existing FIS provision could be undertaken. |
| ANSP6 | Review the controlled airspace structure and simplify boundaries where possible | This action is particularly relevant to areas of dense VFR traffic. It should aim to simplify, where possible, the numerous boundary level changes of TMAs and CTRs that can contribute to vertical navigation error. It should also aim to ensure the reliable protection of the IFR traffic established on the extended runway centreline and within 15 NM from the runway threshold from the nearby VFR traffic. This would reduce the number of operationally unnecessary RAs generated by TCAS. Alignment of <FL195 airspace structure boundaries and of VFR routes (corridors) with prominent ground features and landmarks should be sought to make them more easily identifiable by pilots during flights. The review should be informed by identification of hot spots based on the analysis of incident reports (e.g. airspace infringements) or other appropriate methods. Automated tools may also be used to plot actual flight tracks in a particular area onto the existing airspace structures in order to identify potential inconsistencies in the design of protected (controlled) airspaces. Such methods will also facilitate the identification of underutilised portions of controlled or restricted airspaces that may be released for use by GA VFR flights. This action concerns ANSPs that have been delegated the responsibility of developing and implementing changes to the airspace organisation subject to the approval of the National authorities.<br><br>Introduce, where necessary, standard VFR entry, exit and crossing procedures and/or routes in busy controlled airspaces.<br><br>Meet with relevant stakeholders for review of proposals, e.g., Airlines, ANSP's, GA, etc.<br><br>Add the promotion of implementing VFR routes/corridors in controlled airspace – if they are deemed beneficial – where simplification is not possible. |

| REF | Recommendation | Rationale |
|---|---|---|
| ANSP7 | Facilitate the exchange of information and operational experience between ATCOs/FISOs and pilots at local level. | "Open doors days" at ATS units and familiarisation visits by ATS staff to flying clubs and military sites should improve the understanding of each other's operational needs, capabilities, and concerns. ATS staff will improve their awareness of single-pilot aircraft operation (pilot workload, limits, priorities, etc.) and mission/training requirements (for military). Pilots will improve their knowledge of controllers' tasks, ways of working and the assistance that may be provided to them by ATS. Other approaches that could be adopted are dedicated safety seminars with the participation of all airspace user types, service provider organisations and regulatory authorities, or periodic safety analyses (e.g., bi-annual) of the common use of airspace. Pilot associations and flying clubs could play a role in improving the interface with ATC. Knowledge exchange programmes should include pilots with different experience from the various type of operations, e.g., pilots of light aircraft, gliders, helicopters, etc. |
| ANSP8 | Ensure adequate Radio and Surveillance data coverage in the airspace where FIS is provided.<br>See also recommendation AD5 | Review and improve, if necessary, the low-level radio coverage in particular around CTRs/TMAs and of airspaces containing high density VFR routes and choke points. Some receiver/transmitter sites, built for IFR traffic, may not be appropriate for FIS provision due to the terrain. Subject to availability, the number of ATS frequencies for the provision of FIS in busy areas may need to be reviewed and increased to ensure the required quality of service provision and better controlled airspace protection.<br>There are new and increasing options available in non-radar surveillance available, e.g. Non-cooperative Radar Air Target Identification radar detection, ADS-B, multi-static primary, RadNet etc. |
| ANSP9 | For VFR traffic in uncontrolled airspace, transfer services from ATC sectors to dedicated FIS positions at ACCs, Mil centres or aerodromes. | The objective is to ensure provision of FIS from dedicated positions that will not reduce the level of service to VFR flights when there is a high level of IFR traffic in the airspace assigned to the ATC sector(s). Procedures may be established for the delegation of services to VFR flights in class E airspace from the control sectors to FIC, if appropriate and depending on the specific operational environment and regulatory framework.<br>The aim should always be to have a dedicated FIS position at an ACC ideally with a Surveillance display, including offshore services. |
| ANSP10 | Include a dedicated and harmonised VFR services training module in ATCO/FISO training curriculum. | The objective is to ensure that ATS staff: Are aware of the different levels of training and experience of PPL holders, military, and airline pilots:<br>• Have improved knowledge of light aircraft, ultra-light, gliders and balloons and their performance characteristics, which will ensure correct understanding and communication with GA pilots. (ATS/FIC controllers should be trained to ask, not to assume).<br>• Are familiar with the cockpit workload of VFR flights (mostly single-pilot operated aircraft) in the various conditions and flight phases.<br>• Are aware of the fact that a VFR GA flight might not be able to follow the clearance due to the need to stay in VMC.<br>Inclusion of dedicated limited training in VFR flying may be considered. It will improve ATCO/FISO understanding of VFR flying |
| ANSP11 | Optimise SSR code assignment procedures to make best use of transponders' MODE-S, MODE A/C data and other surveillance methods, e.g., ADS-B, etc. | Better utilisation of SSR codes can assist in the identification of traffic in congested airspace. Existing best practices should be applied as widely as possible. For example, a "FIR or AC lost" SSR code applied by FIS units to aircraft when pilots are unsure of their position draws attention to the aircraft and its predicament without multiple communications taking place across sectors.<br>MODE-S data, and ADS-B are all useful tools for reducing the risk of airspace (and even separation) infringements by increasing the controller's ability to monitor and anticipate aircraft intentions.<br>Implementing Frequency Monitoring SSR codes would identify that the aircraft is listening on their frequency should the ATCO/FISO wish to call them. It is specifically valuable for aircraft operating outside of a busy CTR. Other examples are: implementation of mandatory transponder areas or zones (e.g., at and above a certain altitude or flight level); SSR codes and frequency coupling; GA single event codes; dedicated codes for VFR routes etc. |

| REF | Recommendation | Rationale |
|---|---|---|
| ANSP12 | Improve tactical coordination procedures between adjacent civil/military control units. | Improved civil - military coordination (ASM level 3) will enable: The provision of up-to-date, correct information to all flights about current airspace restrictions and their use; Timely action by the controllers/officers (in the control units concerned) in the case of imminent or actual infringement of controlled or restricted airspace to reduce the severity of the possible consequences. Implementation of this action should be considered within the scope of efforts for further enhancement of the FUA concept. |
| ANSP13 | Early provision of weather data to assist GA pilots in avoiding adverse weather in accordance with SERA.9005. | Additional navigation support should be provided to VFR flights in compliance with ICAO Doc 4444 PANS-ATM, section 15.4.1 "Strayed VFR flights and VFR flights encountering adverse meteorological conditions" in order to help pilots avoid flying into meteorological conditions not conforming with the required minima<br><br>Technology now allows for data uplink with weather information directly to the aircraft, although it should be noted that this kind of ADS-B is not yet mandated in Europe.<br><br>The requirement to provide relevant weather information as part of the FIS is already included in SERA.9005, without specifying the means of transmission.<br><br>An EASA Best Intervention Strategy to promote existing methods to facilitate the availability of weather information to pilots (CA and GA) in flight is being developed and will be submitted to stakeholders for consultation. |
| ANSP14 | Promote the use of SSR and/or radio mandatory airspace in the vicinity of busy and/or complex controlled airspace. | The objective of this action is to ensure the protection of high-density controlled airspaces, like busy TMAs and CTRs. Implementation decisions should be taken following analysis of safety data and records. It should be noted that establishing mandatory R/T buffer zone may not always be possible. Indeed, the feasibility of implementing such buffer airspace depends on the typology of adjacent airspace (continuous controlled airspace, military airspace, etc.) and relevant consultation with other stakeholders and airspace users. Implementation of mandatory R/T buffer zones should also include a review of existing «buffer airspace» at the TMA or CTR boundaries and corresponding optimisation of such airspace to the necessary minimum due to the additional protection provided by the R/T buffer zone. A possible implementation may include tracking all flights operating within a certain range of the controlled airspace in question. Depending on the operational need a minimum altitude/ level above which the requirement will be applicable may be defined. Since radio communication is not required in class G airspace, an alternative means of reducing the probability of severe airspace infringement incidents occurring is to require GA flights to maintain listening watch on 121.5 MHz, except when in contact with an ATS unit. This would help ATC contact an airspace infringing aircraft early enough to prevent the infringement from evolving into high-risk incident.<br><br>A potential solution for a buffer is the use of Transponder Mandatory Zones around/below Controlled Airspace, with a co-located Radio Mandatory Zone. |

| REF | Recommendation | Rationale |
|---|---|---|
| ANSP15 | Harmonise the requirements for the provision of FIS and licensing of ATCOs/ FISOs, including: a harmonised FISO training curriculum and improved communication training of FISOs. | Improve and harmonise FISO training curriculum. Training curriculum should be improved to adequately match the level of service to be provided. FIC staff should receive dedicated training improving their awareness and understanding of the VFR flights' needs, specialties, and light aircraft performance characteristics. Best practices already exist to deliver emergency situation training to FIC staff and VFR pilots in a coordinated manner. Enough FIC staff should be made available to support the provision of enhanced FIS. Several ATS providers have already implemented dedicated training programmes for staff that become redundant or underutilised due to the increasing automation of ATS provision.<br><br>This action reinforces the objectives and provisions of the Action Plan for Air Ground Communications, focusing on the aspects that are of particular importance in the communication exchange between ATS units and VFR flights. ATS staff should be trained to: Strictly apply the readback/hearback procedure; Actively seek confirmation in case of doubt; Use unambiguous call-signs - full call-sign or call-sign coupled with type of aircraft; Use published reference points in ATS messages to pilots, to the extent possible; Use simple ATC clearances and instructions; Use more concise transmissions, if necessary broken in segments; Use reduced rate of speech when talking to VFR pilots; Issue pre-warning of instructions to be passed; Provide FIS in English language; Acquire adequate knowledge of and apply communication failure procedures as required<br><br>Harmonisation of FIS provided to VFR flights should be based on European IRs/AMCs/GMs, ICAO recommendations and existing best practices. Examples of best practices are i.e the Low Airspace Radar Service provided in UK airspace and the radar information services provided in German airspace. Radar-derived information available at ATS units should be used to enhance the information passed to pilots. It should include, as appropriate, navigational assistance, coordination of controlled airspace entry/crossing clearance, passing traffic information and information about restricted airspace activation/deactivation and concerned traffic, as well as provision of other aeronautical information and information about potentially hazardous conditions. The service could include provision of warnings to pilots of any unfavourable factors including airspace infringement and traffic warnings. FIS level could be raised to enable proactive prevention of potential conflict situations. The scope of this action should include the harmonisation of services provided by civil and military FIS provider organisations.<br><br>In some states, this is believed to be urgently required, including the provision of FIS with Surveillance data by FIS staff (not ATC). |
| ANSP16 | Ensure all MORs are timely and comprehensive to enable review/ investigation and collation of causal factors. | This is particularly important in states where there is post-infringement communication between the ANSP and the pilot. Timely reporting and investigation allow for greater accuracy in causal factor identification when recollections are fresh in the memories of all parties. |

EAPAIRR

# Airspace Users

| REF | Recommendation | Rationale |
|---|---|---|
| AU1 | Enhance pilot proficiency checks beyond simple aircraft handling<br>to include navigation and R/T communication skills check | Pilot proficiency checks should include verification and assessment of navigation and R/T communication skills. The verification of air-ground communication skills could include typical scenarios of air-ground communication exchange, such as requesting clearance to cross controlled airspace. It is important that the check is planned and carried out in the form of a learning exercise, not just a test. Proficiency checks should be included in the licensing schemes for PPL and glider pilot licenses. |
| AU2 | Improve pilot awareness of<br>airspace infringement risk. | Airspace user organisations should organise and encourage member participation at safety seminars and other events aimed to improve pilot awareness of airspace infringement risk. Internet fora should also be considered. Examples of good practice are the flight safety seminars, "Open Day's", booths on trade fairs organised by national AOPAs, ANSPs and CAAs. Awareness materials, such as posters, leaflets, safety letters produced by international and national organisations and authorities can be used directly or adapted according to local needs.<br>Improve communication strategies to raise awareness for pilots.<br>Publish real airspace infringement cases to create awareness.<br>Split the objective from the means of communication.<br>Establish Local Airspace Infringement Teams (LAITs) to be run by the airspace owner. Participants should be included from ANSP's, airspace users (GA, CA and MA), local airports and regulators. Provide more general information on hotspots and ways of communication. |
| AU3 | Contact FIS when it's available. | In some states a dedicated FIS is available and capable of providing the appropriate flight information to help pilots with many aspects of flight, including the avoidance of airspace infringement.<br>Give consideration to who is the most suitable air traffic unit to contact. |
| AU4 | Regularly update<br>GPS systems' database. | GA organisations and establishments should encourage their members, the owners, and operators (pilots) of GA aircraft to regularly update the database of the GPS systems used as navigation support means during VFR operations. The recommendation is relevant to both hand-held GPS receivers and those permanently installed on the aircraft. Reminders could be issued to pilots in case of planned implementation of considerable airspace changes. The database update procedure should also include verification of the parity between the GPS database and the VFR en-route chart(s) used during flight. The 28-day cycle for aeronautical information publication used by most GPS manufacturers and database providers need be considered in this respect.<br>The GPS manufacturers and database providers should be asked to support this effort. They have the opportunity to provide regular notifications to the users of their services to download the relevant data upon update.<br>Data providers have the opportunity to assist in this regard by providing data in a format that is easy to use for GPS manufacturers. |
| AU5 | Improve pre-flight briefing capabilities | This action is designed to improve the pre-flight preparation of pilots. It calls for improvements to capabilities of existing briefing facilities and the implementation of new facilities, where they do not exist at the various GA locations, for example at flying clubs. Cooperation with the AIS and MET service providers (or ANSPs) is essential for successful implementation of this action. Support from the regulatory authorities should be sought and obtained. A typical briefing facility available at flying clubs should include provision of aeronautical and meteorological information, but also support the filing and submission of flight plans by means of PC's, information screens and Wi-Fi availability for access with personal devices. Remote access of members to the briefing facility should be ensured. |

| REF | Recommendation | Rationale (for chapter 4, GM) |
|---|---|---|
| AU6 | Incentivise innovative training for GA pilots | Refresher training should be designed to achieve and maintain an adequate level of navigation and communication skills by all PPL holders. GA organisations, flying clubs and schools should offer such training courses to private pilots. Refresher training should be provided for all PPL types and include glider pilots as well. Refresher courses are considered of particular importance for recreational pilots, but this is relevant to the GA pilots in general. Implementation of refresher training every two years appears to be reasonable for PPL holders. Pilots should be encouraged to be aware of their own training needs. A refresher might involve a one-hour flight with an instructor including pre-flight paperwork.<br><br>Flying clubs should ensure additional training opportunities for 'low-hours' pilots. Rallies and cross-country tours are an example of good practice implemented by many flying clubs. The communication training may be based on typical scenarios of R/T exchange and associated basic radio discipline rules (e.g.: think what you are going to say before pressing the button; keep transmissions clear and concise; listen before talking on the frequency, etc.). |
| AU7 | Implement knowledge exchange programs between ATCOs/FISOs and Airspace Users.<br><br>See also recommendation ANSP3 | The knowledge exchange programmes should aim to support controllers and pilots in sharing their knowledge of airspace and aircraft, improve understanding of each other's needs, limitations, and way of working. Programmes should include pilots with different experience, e.g., pilots of light aircraft, gliders pilots, helicopters, etc. Such knowledge exchange programmes should be organised at local level in order to maximise effectiveness. Meeting events should be held at the flying schools and clubs and ATS facilities. Pilots' associations and flying clubs should play an essential role for improvement of the interface to ATC.<br><br>Establish Local Airspace Infringement Teams (LAITs) to be run by the airspace owner. Participants should be included from ANSP's, airspace users (GA, CA and MA), local airports and regulators. Provide more general information on hotspots and ways of communication. |
| AU8 | Review private pilots' initial<br><br>training content and ensure there is improved R/T training coverage.<br><br>See also recommendation ANSP1 | Private pilots should be taught to: Use unambiguous call-signs - full call-sign or call-sign coupled with type of aircraft; Contact ATS for assistance in complex situations (e.g. unsure of position); Actively seek confirmation in case of doubt; Strictly apply the readback/hearback procedure; Use 121.5 MHz in complex/unusual and emergency situations if not in contact with an ATS unit on another frequency; Adhere to communication failure procedures; Use standard phraseology in English for essential air-ground communication exchanges, like clearance requests. The training course should include practicing R/T skills for the most common R/T exchange scenarios, like crossing controlled airspace, reporting basic flight plan data, and requesting information.<br><br>This recommendation is also applicable to ULM pilots whose training and licensing are not covered by the EASA regulations. |
| AU9 | Ensure adequate proficiency of flight instructors in terms of navigation and R/T skills | The navigation and communication skills requirements for flight instructors should be reviewed and updated, as needed, to meet the training syllabus needs.<br><br>The risk awareness of instructors at flying schools should be raised through dedicated workshops, safety seminars and publications.<br><br>Support from the regulatory authorities should be sought and obtained. |
| AU10 | Promote extended flight corridor and alternate route planning for VFR flights | Promote awareness of the need and encourage private pilots to plan alternative/secondary routes to be flown in the event of unexpected/unforeseen circumstances, e.g., clearance to cross controlled airspace is refused, weather changes occurring faster than predicted, etc. |

EAPAIRR

# AIM/MET

| REF | Recommendation | Rationale |
|---|---|---|
| AIM1 | Examine ways of making AIS available to pilots, with real-time information, in a format that is suitable for handheld devices. | Real-time AIS information increases the situational awareness of the pilot. By providing ways to have this information available in the cockpit, activation of various types of special airspace and other NOTAMs can be pushed by the software. Careful and thorough flight preparation is still key to a safe flight execution, tools like this will help to reduce the risk of airspace infringements. |
| AIM2 | Standardise (harmonise) VFR en-route charts. | Improved VFR publications will contribute to better IFR traffic protection. Standardisation of VFR en-route charts is considered the highest priority. The products provided by commercial sources (different from the State AIS organisations) should be considered within the scope of this standardisation effort. There must be a standard representation of airspace to prevent confusion in cross-border flights. Compliance with and common interpretation of ICAO Annex 4 requirements needs to be achieved. This includes common map layout conventions, consistent use of colour coding, symbols etc. High priority should be assigned to the standardisation of the most commonly used ICAO VFR chart (1:500 000). The action aims to improve the readability and simplify VFR en-route charts as much as possible. Only information relevant to VFR flights should be printed. There are instances of VFR en-route charts saturated by the volume of printed information. It takes the pilot too long to consult during flight and may lead to distraction. However, simplification should not lead to loss of important features. The clarity of frequency information should be improved. Frequencies should be indicated clearly on electronic and paper maps, allowing easy reference by pilots during flights. Harmonisation may include a review of needs and an agreement to publish charts with more appropriate scales (e.g., 1:250 000) for local flights. Harmonisation of VFR AIPs (manuals) should also be considered. The involvement of GA representatives in such reviews and in the process of VFR publications' standardisation is essential. The EUROCONTROL Agency should support and coordinate AIS providers' chart harmonisation efforts through the existing working arrangements. |
| AIM3 | Investigate the feasibility of providing aeronautical information free of charge for GA. | The action aims to make aeronautical and MET information, that is relevant to airspace and airports/airfields open to VFR flights, freely available to the GA VFR flying community. This would reduce the probability of inadequate pre-flight preparation. For example, VFR en-route charts should be freely accessible and downloadable via internet from the service provider sites. There is a need for a dedicated study to identify what kind of information will bring the highest benefit to the users of the concerned airspace. EUROCONTROL, national authorities and AIS service providers should support GA establishments in their efforts to improve the briefing facilities on airfields (for example feeding them with the relevant aeronautical data, making necessary HW/SW available, etc.). A variety of solutions and business models (or combinations thereof) could be considered in this context. For instance, the service provision cost could be recovered through license fees or public (state or European Community) funds. The development of the SES2 package offers an opportunity to support the implementation of a high quality and «publicly accessible» AIS portal. |
| AIM4 | Provide and enhance on-line (web-based) accessibility of aeronautical information services | NOTAMs, maps, charts, and current weather information should be made easily accessible at the service provider websites. Dedicated pages for GA VFR flights that provide access to all information needed for a flight could be designed. Visualisation of information should be improved: it should be user-friendly and intuitively comprehensible. The mechanisms, processes and means for delivery of the actual airspace structures' status to users (in particular GA) should be reviewed and optimised. Online AIS provision should not totally replace the traditional methods. Pilots should be provided with the option to obtain pre-flight briefing materials in hard copy or to contact the appropriate briefing office whichever is the preferred method of preparing for the flight. |

| REF | Recommendation | Rationale |
|---|---|---|
| AIM5 | Harmonise, enhance, and classify AIS provision to VFR flights and promote classification rules and usage of keywords. | The implementation of this action should include: Provision of dedicated VFR sections in the AIPs or VFR AIPs (manuals); Provision of up-to-date VFR charts; Implementation of a user-friendly NOTAM system for VFR flights.<br><br>The NOTAM briefing facilities should provide for: Graphical visualisation of information about changes to airspace structures and activation/deactivation of restricted airspaces; Narrow route briefing for (long distance) route flights; NOTAM selection and prioritisation tool; Grouping NOTAMs by topic.<br><br>Enabling the generation of briefing packages tailored to the needs of the various user types may be considered (e.g., a glider pilot would need different information to a pilot planning a cross country flight). In case of generation of NOTAM update packages, the type of users the update is intended for should be taken into account (e.g., GA VFR flight). It would be desirable to include a short summary outlining the changes in traffic schemes and airspace. The readability of NOTAMs and other publications (AIC) of potential interest to VFR flights should be improved using plain language rather than encoded text where possible. The names of towns, villages and other well-known geographic notions should be used instead of coordinates, which most of pilots cannot use in-flight.<br><br>In the case of military ATS providers, the airspace status information should be made available to the units providing services to the VFR flights. Military controllers should pass this information to concerned flights which maintain radio contact. In cases where FIS is provided by a civil entity, the airspace status information should be made available according to the implemented FUA procedures. Concerned FIC(s) may be informed directly or through the responsible FUA structures. |
| AIM6 | Improve availability of and access to VFR en-route charts and dissemination of updates to pilots. | Both electronic and hard copy (paper) versions of maps/charts should be maintained in order to provide the preferred means of flight briefing to the different generations of GA pilots. Enabling downloads of current charts or sections thereof is an improved service requested by pilots. Further improvement could be achieved by alerting subscribers (users) to implemented changes/updates, for example by means of e-mail notification messages. In addition, site visits and seminars should be considered in the case of major airspace changes. |
| AIM7 | Include geographical coordinates in information items containing position details wherever possible. | Geographical coordinates are a major issue in GPS systems. Most GPS systems provide an extensive data file including all kinds of way points, navigational aids etc. The availability of LAT/LONG information on VFR maps would support the crosscheck and input of correct data in the GPS set. However, increasing clutter on VFR en-route charts must be avoided. Therefore, more appropriate vehicle appears to be ENR and/or AD part of the AIP, rather than charts. This information can also be provided on-line (on the service provider or CAA website) and can be picked up by commercial data providers. |
| AIM8 | Implement MET products tailored to low level VFR flights in line with ICAO requirements. | The recommendation concerns the implementation of weather reports and forecasts in line with ICAO Annex 3 requirements, e.g., GAMET and AIRMET. Where possible, integrated on-line provision of aeronautical and meteorological information should be ensured, for example on the AIS/ATS providers websites. |
| AIM9 | Promote standard and free maps on GPS. Promote standards to describe maps and add-ons. | GPS moving maps on portable devices provide the pilot with real time information on position and airspace. When used correctly, the increase in situational awareness is a benefit to the safety of air traffic. By providing free maps, according to set standards, the number of users is likely to increase. |

EAPAIRR

# Regulators

| REF | Recommendation | Rationale |
|---|---|---|
| REG1 | Increase harmonisation for navigation and communication licensing requirements for private pilots, to include the use of VFR Moving Maps in PPL training. | Basic navigation and communication skills training requirements for all private pilot licences should be harmonised. Knowledge and use of GPS systems should be addressed as well. A minimum adequate level of pilot navigation and communication skills should be achieved and maintained by the introduction of mandatory refresher training. Competence checks should include exercises on basic navigation and communication exchange (e.g., requests for clearance to cross controlled airspace) irrespective of the pilot's qualification. The flight check should include "pass/fail" criteria and could include some basic theory as well. Oversight of the pilot training process should be improved by strengthening the regulatory oversight of flying schools, training, and licensing process. The competency and proficiency of instructors and examiners will need to be assessed and appropriate standards established. The currency of instructors' knowledge of aviation regulations should be ensured.<br><br>Integrate the use of VFR Moving maps in PPL training curriculums. Enable pilots to use mobile devices like smartphones and tablets with VFR Moving maps effectively during training. By learning to use the devices and software in a training environment, pilots will be better prepared to use them in flight while not compromising lookout, scan, or pilot capacity. |
| REG2 | Harmonise the licensing of FIS staff and ATC staff across the Europe in the use of Surveillance data to provide FIS.<br><br>See also recommendation ANSP15 | Harmonisation of FIS provided to VFR flights should be based on European IRs/AMCs/GMs, ICAO recommendations and existing best practices. Examples of best practices are i.e. the Low Airspace Radar Service provided in UK airspace and the radar information services provided in German airspace. Radar-derived information available at ATS units should be used to enhance the information passed to pilots. It should include, as appropriate, navigational assistance, coordination of controlled airspace entry/crossing clearance, passing traffic information and information about restricted airspace activation/deactivation and concerned traffic, as well as provision of other aeronautical information and information about potentially hazardous conditions. The service could include provision of warnings to pilots of any unfavourable factors including airspace infringement and traffic warnings. FIS level could be raised to enable proactive prevention of potential conflict situations. The scope of this action should include the harmonisation of services provided by civil and military FIS provider organisations.<br><br>Other types of surveillance data (e.g., ADS-B) are now available in addition to Radar. The use of these new sources of available information can increase the situational awareness of the FISO or ATCO.<br><br>To support the best practices and information sharing in this area, a working Group on FIS provision has been created.<br><br>According EASA, at the time of writing, there is no initiative to establish a harmonised FISO licensing and training scheme.<br><br>Additionally, the qualification and training of ATCOs and FISOs is a national prerogative, with observed noteworthy differences.<br><br>Moreover, the use of ATS surveillance in FIS provision is a subject for which various practices are observed throughout the EU Member States, and for which a thorough technical debate is being initiated.<br><br>The proposed harmonization should be verified and addressed carefully. |

| REF | Recommendation | Rationale |
|---|---|---|
| REG3 | The National Regulator should form an Airspace Infringement Strategic Working Group to review airspace infringement risk dimensions and establish national safety improvement priorities. | The responsible national authority should review in consultation with the concerned airspace user and service provider organisations the dimensions of airspace infringement risk in their particular operational environment and establish local safety measure implementation priorities. This will enable the identification of the most relevant (for the given operational environment) recommended and proposed actions contained in this plan for implementation at national and local level. Risk awareness should be raised by dedicated safety seminars and workshops with the participation of the service providers and all airspace user types. The safety related efforts of GA organisations should be supported. Strengthening the voice and influence of GA organisations and establishments will help proactively shape pilot safety culture by campaigning on different safety issues. Various means and best practices could be used to this effect: publications (safety letters, notices, magazines), dedicated safety evenings at flying clubs, participation at flight safety seminars, dedicated safety webpages, etc.<br><br>This brings together GA Associations, ANSPs, Airport Operators, Weather Service Providers, and safety partners to develop strategies. It should be an ongoing and permanent process.<br><br>Promote the establishment of Local Airspace Infringement Teams (LAITs). |
| REG4 | Ensure that airspace change processes take due account of the different airspace users' requirements. | The applicable airspace change processes, methodology and practices should be reviewed and, as necessary, modified to ensure that the needs of the various airspace user categories are fairly considered in the process of designing and implementing changes to airspace organisation. All stakeholders affected by the intended change should be afforded the chance to (at best) influence the shapes and volumes of airspace structures, or (at least) to make change sponsors aware of airspace user requirements so that the impacts of an airspace change can be minimised or mitigated through, for example, operating arrangements (that in effect be in the spirit of the FUA concept). Changes to airspace structures should be introduced following consultation with GA user representatives and organisations. See also 6.50 below.<br><br>It is important to have a transparent and comprehensive consultation/engagement process in line with national practices. |
| REG5 | Harmonise airspace classification below FL195 in line with the strategic airspace design principles. | An appropriate strategic design of the airspace is crucial in permitting the ATM System to provide the right services, at the right time and in the right places decreasing routine tasks and the requirement for tactical intervention. Harmonisation of airspace classification below FL195 should be based on the ICAO-defined airspace classes. It should aim for the establishment of common vertical limits, as far as practicable. It should also include harmonised application of associated rules, procedures, and air traffic services. It is highly recommended deploying airspace structures that provide a greater degree of strategic de-confliction with particular consideration of the cross-border operations.<br><br>The design of airspace should be as simple as possible, whilst not compromising safety.<br><br>Where possible, reduce the amount of controlled airspaces and mitigate risk through establishment of TMZ/RMZ. |
| REG6 | Establish a requirement for regular update of the on-board GPS systems database. | It is recognised that there is no mandatory requirement for VFR pilots to have a GPS set in their aircraft. However, a considerable number of incidents occurred due to use of out-of-date GPS maps or due to other GPS use related issues (e.g., power failure). Therefore, aircraft operators and pilots, who intend to use a GPS set in the planning and execution phases of a flight, should be required to operate a GPS system with the correct database only. The suitability of placing appropriate requirements on GPS database providers could be considered in this context. See also 6.2. |

| REF | Recommendation | Rationale |
|---|---|---|
| REG7 | Review and harmonise requirements for the carriage and use of transponders and other conspicuity devices by light aircraft. | To reduce the risk on a mid-air collision. The use of transponder equipment is recommended. It improves:<br>• Situational awareness for pilots and FISOs/ATCOs<br>• Occurrence reporting regarding airspace infringements<br>• The ability to provide traffic information<br>There are several options to be considered when reviewing the requirements for the use of transponders:<br>• ADS-B<br>• FLARM<br>• Mode-S |
| REG8 | Optimise and harmonise occurrence reporting requirements and taxonomy, including those related to airspace infringement. | Regulation (EU) No. 376/2014 is clear in the ANSP and pilot reporting requirements.<br>It is recommended to increase the scope to include ULMs, gliders and paragliders as reporting is currently not mandatory for these users. This type of airspace infringement is mainly notified if another pilot or ATC reports. |
| REG9 | Ensure updated maps and charts are made available to flying clubs and schools and encourage the use of VFR moving map technology. | Updated VFR en-route charts should be available on-line. Frequent changes should be avoided. Sponsorship should be considered to ensure that as a minimum the GA clubs directly affected by airspace changes (located in the vicinity) obtain the updated maps and charts for use by their members.<br>Both electronic and hard copy (paper) versions of maps/charts should be maintained in order to provide the preferred means of flight briefing to the different generations of GA pilots. Enabling downloads of current charts or sections thereof is an improved service requested by pilots. Further improvement could be achieved by alerting subscribers (users) to implemented changes/updates, for example by means of e-mail notification messages. In addition, site visits and seminars should be considered in the case of major airspace changes.<br>Moving maps provide enhanced situational awareness and timely warnings of airspace and airspace activity. The safe use of moving maps is beneficial to minimizing the risk of airspace infringements. Regulators should encourage the use, and work with ATOs and flying clubs on a safe concept to operate the devices in flight. |
| REG10 | Undertake periodic reviews of airspace allocation and structures within the respective FIRs and improve oversight of airspace management. | The action is designed to support the implementation of an optimised airspace organisation that takes into account, to the extent possible, the requirements of the different airspace user categories, while ensuring the safe use of airspace. Improved efficiency of airspace allocation and management will reduce the probability (hence the risk) of airspace infringements caused by the practice of 'cutting the corners' of controlled and restricted airspaces. It should include a review and optimisation of the number and volume of restricted airspace volumes according to their actual utilisation parameters. The regime of restricted airspaces should be reviewed, and tactical airspace management procedures improved, if needed. The review should include all airspace structures within the respective FIRs. It should be carried out in consultation with the concerned military organisations, airspace users and service providers. Given its scope and the amount of effort required, it is expected that the optimisation of the airspace structure will be performed in incremental steps over a number of years. Priorities may be established, as necessary (For example areas of dense VFR traffic may be reviewed first). |

| REF | Recommendation | Rationale |
|---|---|---|
| REG11 | Promote membership of flying clubs and GA associations among private pilots. | Encouraging private pilots to become members of flying clubs, schools and/or GA associations (for example AOPA, FAI, etc.) would support an improved downward flow of aeronautical information (e.g., notification of airspace changes), guidance materials and information supply in general. It would improve availability and accessibility of education and awareness materials and thus contribute to raising pilots' general knowledge and awareness of risk. However, flying schools and clubs may have to accept that this will place additional responsibility on them. |
| REG12 | Establish requirements for correct GPS equipment installation and maintenance. | Implementation of the action should reduce the probability of GPS system failure, in particular due to loss of power supply or signal. |
| REG13 | Harmonise the regulation of flights by ultra-lights, microlights and gliders (including hang-gliders and para gliders). | A minimum level of pilot navigation and communication skills should be achieved. While the operation and licensing of sailplane/glider pilots is under EASA's remit and action has already been taken, the other mentioned categories (e.g., micro-lights) are operated under national rules because they are Annex II aircraft.<br>Subject to individual national air navigation orders/regulations. |
| REG14 | Introduce formal Just Culture and Human Factors training as part of all flight crew licensing training | By introducing a formal Just Culture and Human Factors training, as part of all flight crew licensing training, pilots will acquire information to help their performance in flight but also in briefing/ debriefing, Topics to be included are: improved reporting, safety awareness, airmanship and Threat and Error Management. |
| REG15 | Introduce a process for Regulatory post-Infringement review and action. | Conduct this process under a "Just Culture", where blame is not apportioned for an infringement. Instead, the facts are sought to fully-understand why the infringement occurred and actions are identified to prevent a repeat. |
| REG16 | National Regulators to reassess requirements for obtaining a private pilot license. | NSAs should consider other measures to enhance pilot skill levels. These measures are collated in the toolbox below. The necessity/applicability of these recommendations differs per country and therefore have no separate listing in the recommendations' list.<br>1. NSA's to review the competencies required to maintain for their licenses. Evidence would be needed to justify changes.<br>2. Pilot associations to encourage Pilots to consider voluntary hours with instructors to improve proficiency.<br>3. Pilot associations to recommend/suggest a list of items for the mandatory annual flight with an instructor (refresher training). To include R/T communication and navigation. |

## 6.7 Historic data on contributional factors

Individual ANSPs, the States, Eurocontrol, and EASA all hold a variety of data sets derived from their reporting systems, but also from other initiatives such as questionnaires which have been returned by those infringing pilots who have been identified. These data sources give the possibility to further analyse the data in a qualitative way. The following figures depict data from 2006-2011 as an analysis considering this timeframe was executed by the safety partners. Even if the data are "historic" data their validity is still assumed.

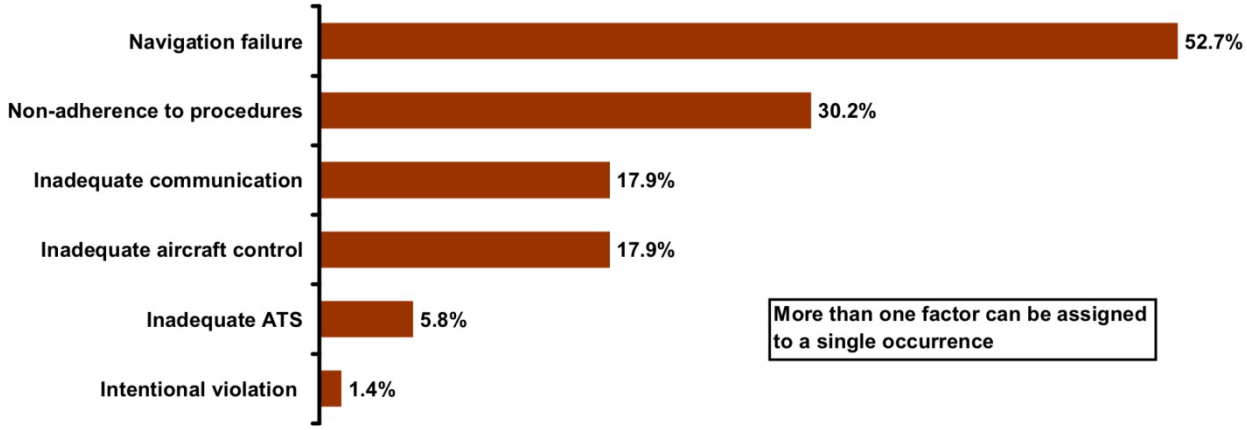



*Figure 11 Airspace Infringements – Causal Factors, 2006-2011 - Source: Eurocontrol*

The main causal facture for airspace infringement revealed in the data review was navigation failure, followed by non-adherence to procedures, inadequate communication and inadequate aircraft control. These data broken down further revealed that the navigation failure is impacted by the inadequate knowledge of the airspace structure and procedures as can be seen in Figure 10.

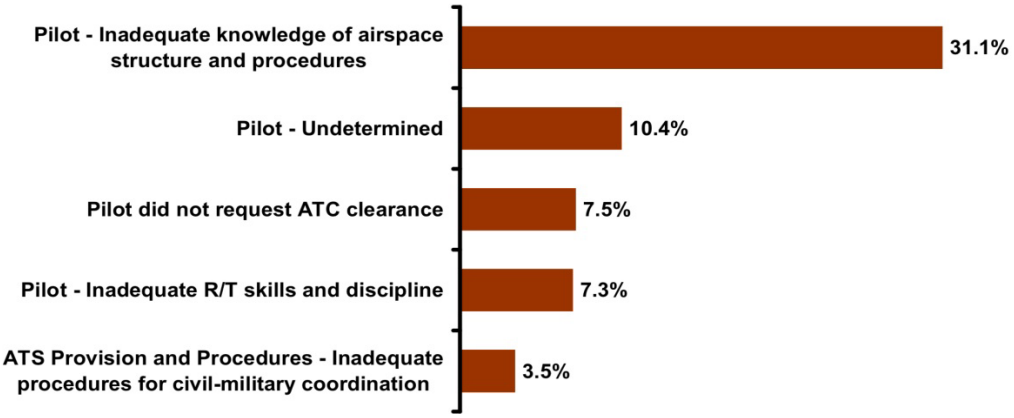



*Figure 12 Airspace Infringements – Causal Factors (for Navigation Failure), 2006-2011 - Source: Eurocontrol*

The complexity of airspace is cited by GA pilots particularly, as a major problem which can cause a loss of or recurring gaps in situational awareness, and even loss of orientation. Complex airspace can contribute to misidentification of ground features. EUROCONTROL's Airspace Infringement Risk Analysis (2007) revealed a strong consensus of opinion among pilots that the considerable number of restricted zones and areas

(including temporary segregated areas) and their dynamic management (activation/deactivation by NOTAMs) cannot easily be followed by GA. It may also result in pilots deciding to take shortcuts.

The UK CAA's bow tie analysis of the risk posed by airspace infringement (Appendix A) identifies two major threats which are present: aircraft conspicuity and crew proficiency. The CAA's analysis identifies a number of conspicuity issues, such as aircraft types with poor radar cross-section and a lack of SSR and ACAS conspicuity due to non-transponding aircraft, which in CAS is a violation of the rules of the air. Crew proficiency includes airmanship and the knowledge and/or ability to properly use navigation and transponder equipment.

Further follow-up action and analysis by the ANSPs involved in this study (Eurocontrol, 2007) show more detail behind the headline causes. Investigation and questionnaires across a number of the states involved provide the following granularity:

- Poor/inadequate pre-flight planning occurred
- Pilots were unaware of airspace classification
- Airspace complexity was contributory
- Limited use of technology during pilot training was a factor
- Limited availability of technology in cockpit of GA aircraft was a factor
- Limited use (or non-availability) of transponders had a role
- Diminishing skills of "low-hours" pilots was significant
- Pilots not being aware of crossing vertical boundary of airspace.
- Pilots were climbing according to FPL without clearance from ATC
- Lack of experience/confidence when encountering bad weather contributed
- Mis-identification of terrain features was a factor
- Pilot distraction/complacency was present
- Lack of pilot refresher training (for non-CAT pilots) aggravated the situation
- Lack of commonality in procedures for GA pilots flying across multiple European airspace boundaries is a factor
- Reluctance or fear of contacting air traffic controllers
- Aeronautical Information timely acquisitions

The data from ANSPs and Eurocontrol supports the view that in the majority of cases involving GA pilots, the principal reasons for the infringement occurring were navigation errors and distraction in the cockpit whilst airborne. Weather, and the need to unexpectedly avoid it, also played a significant part in creating the chance for infringements to occur. Furthermore, although not identifiable within the data, the occasions where pilots fly within 500ft of the base of controlled airspace gives rise to an anomaly, whereby no Airspace Infringement has occurred; nor has there been any 'loss of separation'; but separation minima have been infringed as a result of the positions of the aircraft inside/outside controlled airspace. It may be worth considering the extent to which this situation increases the likelihood of airspace infringement and whether it has a significant impact on controller workload.

## 6.8 UK CAA Bow-Tie Analysis

Risk of mid-air collision due to Airspace Infringement