CAA RPAS Safety Reporting Project

Discovery Summary Report

From:
The UK Civil Aviation Authority
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1.0 Introduction

1.1 Executive Summary

Our skies are becoming increasingly crowded. Interest in, and use of, drones and model aircraft continues to grow both for hobby and professional use, offering substantial commercial and leisure opportunities.

As part of our remit as the Civil Aviation Authority (CAA), we are committed to ensuring the aviation industry meets the highest safety standards. We are the responsible body in the UK for collating safety information and safety incident reports, also known as Mandatory Occurrence Reports (MORs), although there are potentially 13 other organisations in the UK to whom users could report safety incidents to.

To ensure this growth in the use of Remotely Piloted Aircraft Systems (RPAS) - drones, model aircraft and unmanned aerial systems - happens safely, we needed to better understand the current and likely future safety incident reporting landscape.

At the outset of this report and based on our data, we believed that the level of safety incident reporting is low in relation to the volume of RPAS flyers and RPAS flights taking place every day.

Our information showed that an average of just 44 MORs are reported every month from a community of around 270,000 flyers. Of those 44, just 25% are reported by an actual RPAS user themselves – the others are from crewed operators such as airports and general aviation pilots etc.

The figures prompted some questions. Is this rate low when compared to general and commercial aviation? Is the 44 per month figure correct, or is there a safety risk we are missing? If they are low, what are the barriers to safety reporting, and how could we improve?

If our assumptions were proved true, we wanted to also understand how we can remove or reduce any barriers to reporting, to enable an increase in safety occurrence reporting to improve the safety of RPAS use for everyone.

We commissioned a third-party research consortium of suppliers Ebeni, To70 and Tektowr and entered a six-week discovery phase. This involved sending a survey directly to known RPAS flyers and operators, desktop research and interviews with several internal CAA and external industry and other National Aviation Authority stakeholders.

The research was funded by a successful grant application from the Business, Energy and Industrial Strategy (BEIS) Regulatory Pioneer Fund.

We concluded from the research that the number of RPAS safety reports should be higher than they are currently.

The study also revealed several reasons why RPAS users and flyers are not reporting safety incidents. These ranged from having to report an MOR to more than one organisation, being worried about the implications of reporting and simply not knowing if they should report or who to report to.

The study has also provided extremely useful insight into the RPAS community and the current reporting landscape and provided answers as to how the safety reporting process can be improved.

This document sets out the findings and analyses of our Safety Reporting Project and can be used alongside a summary document of the CAA RPAS Safety Reporting Project - Survey Summary and Results.

This study has helped us map out the future safety landscape of RPAS and identify some immediate and longer-term recommendations and solutions.

Our thanks to everyone who took part in the study.

You have helped us keep the skies as safe as possible by doing so.

1.2 RPAS* Usage

Use of drones and model aircraft has grown rapidly in recent years, and the potential commercial and personal benefits they offer for the UK are significant, with flights continuing to expand as new technologies and capabilities are introduced. To fully realise all of these, remotely piloted aircraft systems (RPAS) will need to continue to be used safely, and future use needs to be safely integrated into the airspace. One of the ways this will be achieved is by understanding the changing nature of safety concerns as aircraft are put to different uses and the number of flights grows.

An effective system for gathering and sharing safety information from the RPAS operations is needed to contribute to the building of the safety landscape and the related regulatory framework, and to ensure the CAA and other relevant parties fully understand the safety considerations. A key element to this is safety reporting of occurrences through ensuring the infrastructure, process, culture, and other factors are in place commensurate with the volumes of RPAS operations and expected reporting levels.

** Remotely Piloted Aircraft Systems (also known as Drones or Unmanned Aerial Systems UAS)*

1.3 Aims and Purposes

The UK CAA aims to increase Mandatory and Voluntary Safety Occurrence Reporting in the RPAS Community in Uncontrolled Airspace. The RPAS Safety Reporting Project has been initiated to investigate the perceived under-reporting of RPAS related safety occurrences, to understand the contributing factors and culture surrounding RPAS safety reporting in the UK through research and by talking to industry stakeholders, and to identify options for reporting, processing, and feedback improvements, potentially through a combination of people, process and technology developments.

This report summarises the conclusions of the Discovery phase of the project to firstly **validate the assumption that the monthly average of 44 reports of RPAS Mandatory Occurrence Reports (MORs)* in uncontrolled airspace is not representative of actual occurrences that require reporting, given the volumes of known RPAS operations.** Assuming this is the case, to secondly understand the reasons behind lower-than-expected RPAS safety reporting. Thirdly, to investigate improvements, potentially through a combination of people, process and technology developments.

* Source: CAA 2018-2020 MORs raised on average a month from a community of ~270,000 RPAS Flyers

Objectives

The high-level objectives for the RPAS Safety Reporting Project are therefore:

Objective 1: Validate the perceived assumption of RPAS occurrence under-reporting

This objective is validated in section 1.12 and 4.1, which then justifies the analysis and solutions associated with Objectives 2 and 3.

Objective 2: Enable improved RPAS occurrence reporting

Objective 3: Improve safety through occurrence investigations and lessons learned

1.4 Report Background

As the CAA we wanted to understand the barriers which prevent Open and Specific category RPAS users from reporting safety issues and incidents. We wanted to understand and remove or lower these barriers. To do so we needed to gauge whether safety reporting is too low given the volumes of known RPAS operations so we could implement plans to encourage safety reporting in the RPAS community.

This CAA RPAS Safety Reporting Project – Discovery Summary Report showcases the findings of the six-week discovery phase, **(See the CAA RPAS Safety Reporting Project - Survey Summary and Results document for more details)** and how we intend to use them to improve safety reporting in the RPAS community. See Anticipated Benefits for improved reporting in Section 1.7 for more.

This project has been made possible by a grant from the £3.7 million Regulators' Pioneer Fund launched by the Department for Business, Energy, and Industrial Strategy (BEIS). The fund enables UK regulators and local authorities to help create a UK regulatory environment that unleashes innovation and makes the UK the best place to start and grow a business.

1.5 Facts and Figures

(Source UK CAA Data October 2021)

Our data indicates there are at least 500,000 RPAS Operators and Flyers registered. In comparison to the manned sector, we believe that the RPAS community under reports around safety issues and incidents, in relation to the volume of activity in the airspace.

In the RPAS sector, 44 MORs* are raised on average a month from a community of ~500,000 known RPAS operators and flyers, (approximately 75% of those MORs are from Airports/Air Traffic Control/the manned party involved in the occurrence, not the RPAS user themselves).

That can be compared to ~2,000 MORs raised on average a month from the manned commercial sector. In General Aviation (GA) there are ~140 MORs raised on average a month per 100,000 GA flying hours. (Source UK CAA Data October 2021)

**Mandatory Occurrence Report (also known as Safety Report)*

1.6 Why is Safety Reporting Important?

‘Data from MORs help us to improve the safety landscape for RPAS and all those directly or indirectly involved.’

Why is Safety Reporting important, what do we use it for and why are we concerned that there may be fewer reports than there should be?

Safety Reporting (MORs) are one of the key data sources we use to understand the current safety picture. They allow us to identify trends that may lead to investigations and in turn changes in permissions/use cases or taking action to prevent an incident from happening in the future. Data from MORs help us to improve the safety landscape for RPAS and all those directly or indirectly involved.

The data might also reveal that certain flying practices are safer than we think therefore allowing us to increase permissions and use cases etc.

If there are fewer reports than there should be, this means we are potentially missing a key source of safety information for our overall safety landscape for RPAS.

So, we requested funding from BEIS to carry out a six-week long discovery phase investigation alongside our third-party supplier consortium of **Ebeni, To70 and Tektowr.**

Through the report we wanted to understand;

Objective 1: Validate the perceived assumption of RPAS occurrence under-reporting

Objective 2: If Objective 1 was confirmed, understand what the barriers to under-reporting are

Objective 3: Improve safety through occurrence investigations and lessons learned

- Are the number of RPAS Safety Reports accurate or are they lower/higher than they should be?
- What’s the benchmark number we should expect? If it’s lower – what are the reasons why people are not reporting (for example, are they are not aware they should? Is the process too difficult?)
- What best practice looks like, what other reporting options might be available, what changes could we make to improve the process end-to-end and hopefully increase reporting if it was found to be low?

Safety occurrences are categorised as accidents, serious incidents and other occurrences. For more details on what constitutes an occurrence and for current open and specific reporting flowcharts see pp71-79 of **CAP 722: Unmanned Aircraft System Operations in UK Airspace – Guidance** at https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=415 [JB1]

1.7 Anticipated Benefits from Improved Reporting

The study findings in sections 1.11 and 1.12 and the safety reporting validation assumption in section 4.1 can be used to address how improvements can be made within the industry to ensure mandatory and voluntary safety occurrences are submitted to the CAA and other bodies.

A review of the triggers for reporting looking at incidents and occurrences which need to be reported (depending on RPAS operator types, specific, open, commercial, leisure, inspection/photography, or First Person View (FPV), etc should take place since there will be different perceptions of what needs to be reported in these categories.

Addressing the reporting issue, improving the processing infrastructure and resources, and thereby increasing the volumes of reporting, will benefit the wider industry and the development towards other case uses, including developments towards Beyond Visual Line of Sight Operations (BVLOS). The lessons learned from reporting will help build the RPAS safety landscape.

This is important as projects which are advancing towards integrated airspace and BVLOS operations, cannot be completed without regulatory guidance on airspace, technology, and infrastructure. In turn, this guidance cannot be progressed without an improved awareness of RPAS safety assurance, including knowing and improving safety risk based on occurrence reporting.

To this end, there is a need to baseline the cost of the problem, so that the benefits of the solutions for both the CAA and industry stakeholders are clearly indicated with measurable improvements.

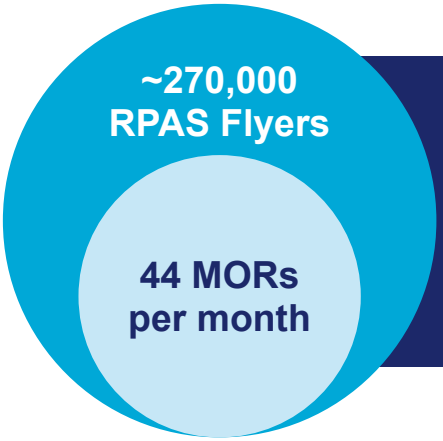
A summary of the benefits include:

- Improved understandings of the safety risks of mid-air collisions and loss of control to enable us as the CAA to have a stable safety overview for our day-to-day regulatory duties (for example safety risk treatment of Loss of Control (LoC) and Mid-Air Collision (MAC)
- Enabling us to see trends and evidence to inform manufacturers where technology needs improvement
- Improving our RPAS authorisations because we'll have a better understanding of what needs to be covered by training, education, specifications, and operations manuals
- Enabling us to review the risk and safety picture for current and emerging trends and technologies (such as routine BVLOS in non-segregated airspace and the associated benefits that such an approval would bring for companies, industry, the economy, the public etc)
- Safety assurance and regulatory support to the UK Airspace Modernisation Strategy
- Technology and infrastructure confidence in support of the Electronic Conspicuity (ie visible to surveillance systems) (EC) and Remote ID projects
- Insurance companies' confidence in operational environments and intended operations.
- Improving the security reporting picture for the Department for Transport; Police, Home Office, and other interested Government agencies
- Evidence to inform research projects, (at universities etc.)
- Improved confidence that Standards Agencies develop appropriate standards.

1.8 The Problem Statement

Based on our safety information, the current average number of MORs recorded in the RPAS community is 44 per month*. The majority of these are sighting of drones (or UAS) and only 25% are reported directly from the RPAS community. In comparison to other sectors, the level of reporting could be considered as low, given the volumes of RPAS operations.

* Source: CAA 2018-2020 MORs raised on average a month from a community of ~270,000 RPAS Flyers



The Problem Statement:

Given the volumes of Flyers, the level of reporting is LOW when compared to the rate observed in GA / Commercial –

Is this correct? Or is there a safety risk we are missing?

1.9 Project Phases

Discovery Phase

As a first step to meet the project objectives, this Discovery Phase researches the industry's understanding of the reporting problem and expectations of solutions. The research includes an analysis of UK and international reporting methods, processes and industry standards, investigative feedback from CAA and industry stakeholders, and further feedback from RPAS users through a structured survey.

An analysis of qualitative and quantitative industry feedback and research has identified themes in reporting problems and solutions, including correlation between industry stakeholder feedback with the existing UK Specific and Open Category Users. The themes and correlations include:

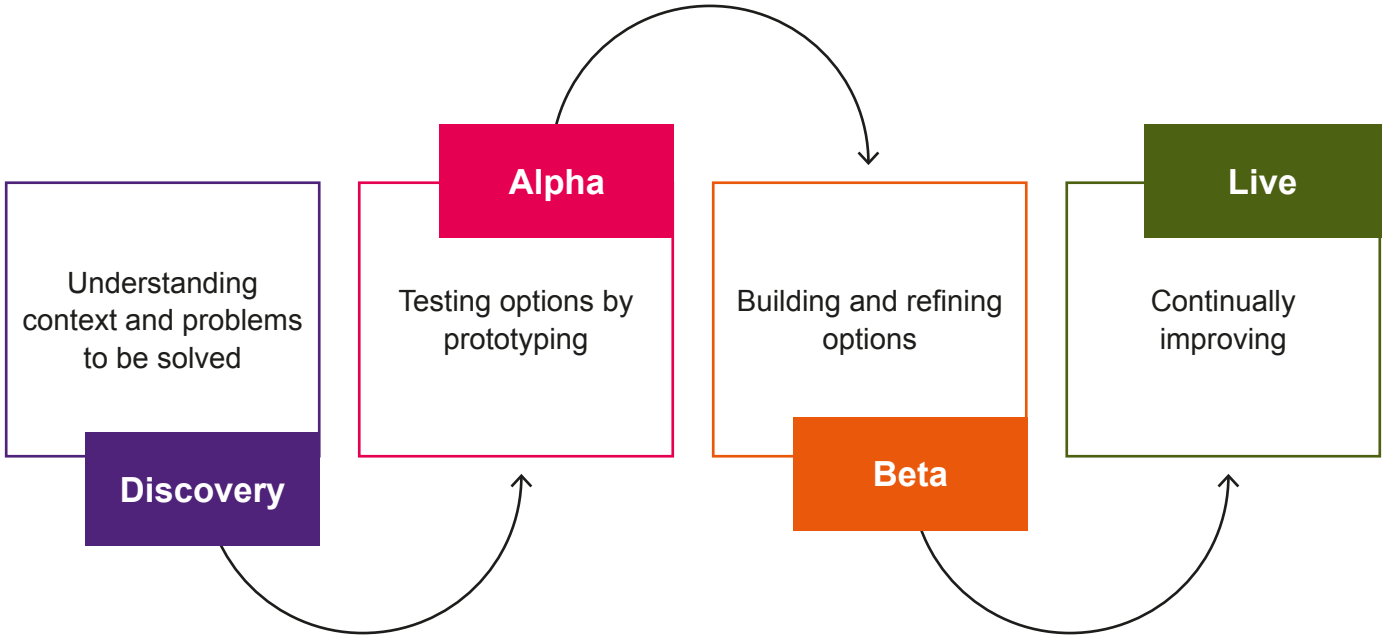
- Similar and different perceptions between industry stakeholders and RPAS users
- Similar and different perceptions between RPAS Specific and Open Category users

Based on the themes and correlations, improvements, potentially through a combination of people, process and technology developments were identified.

1.10 Alpha and Beta Phases

Alpha and Beta Phases

Alpha and Beta project phases were intended to progress the Discovery results, as shown below:

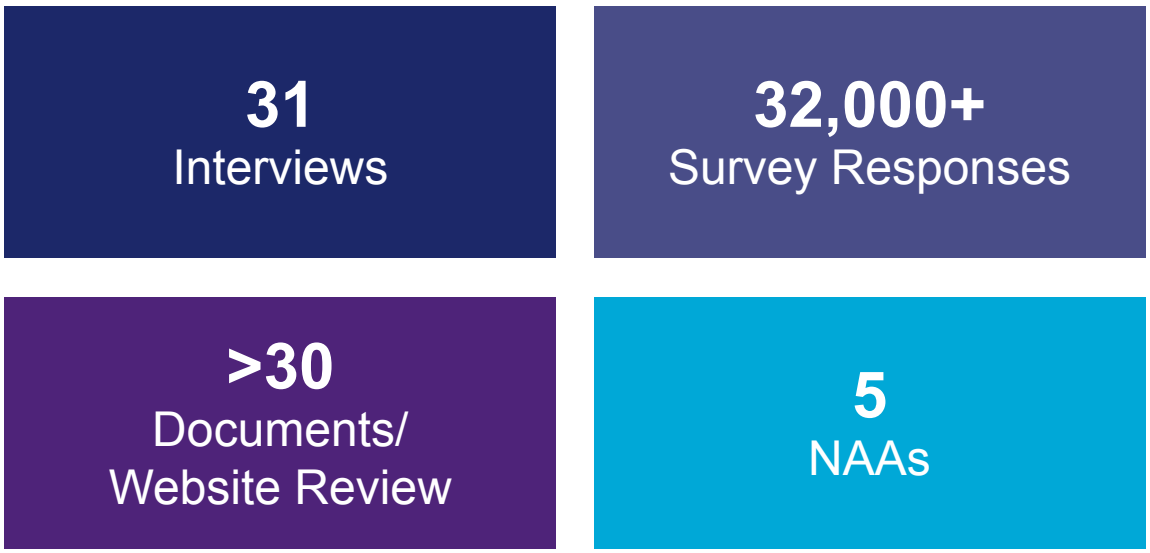


It is important to appropriately prioritise the options from Discovery to practically improve reporting and feedback through the Alpha and Beta phases, including the consideration of a natural progression based on existing cultures, processes, resources, and technology.

This will include a consideration of existing measures and projects already underway in parallel to this project, to ensure no duplication with other activities, and to feed those other activities (or vice versa). This will be informed by the research and stakeholder feedback sessions held during the Discovery Phase.

1.11 What did we do in the Discovery Phase?

Study Activities



What did we do during the six-week Discovery Phase?

Over the course of six weeks;

- We surveyed 277,245 known Flyers and Operators and received 32,933 responses (See the RPAS Safety Incident Reporting Survey summary document for more). https://www.caa.co.uk/consumers/remotely-piloted-aircraft/drone-and-model-aircraft-safety-information/
- We carried out more than 30 interviews with internal CAA stakeholders, external stakeholders in the current RPAS landscape, and with people who could offer examples of safety reporting best practice and lessons learnt etc – see APPENDIX A for full stakeholder list.
- We reviewed more than 30 documents/websites/guides to understand the current landscape and what best practice opportunities were available to ensure any lessons learnt from the study were also incorporated.
- We spoke with five other NAA's* to understand opportunities for benchmarking the numbers of MORs and any opportunities for lessons learnt and best practice.

** National Aviation Authority (equivalent to the UK CAA in other countries)*

1.12 The Discovery Phase Results Overview

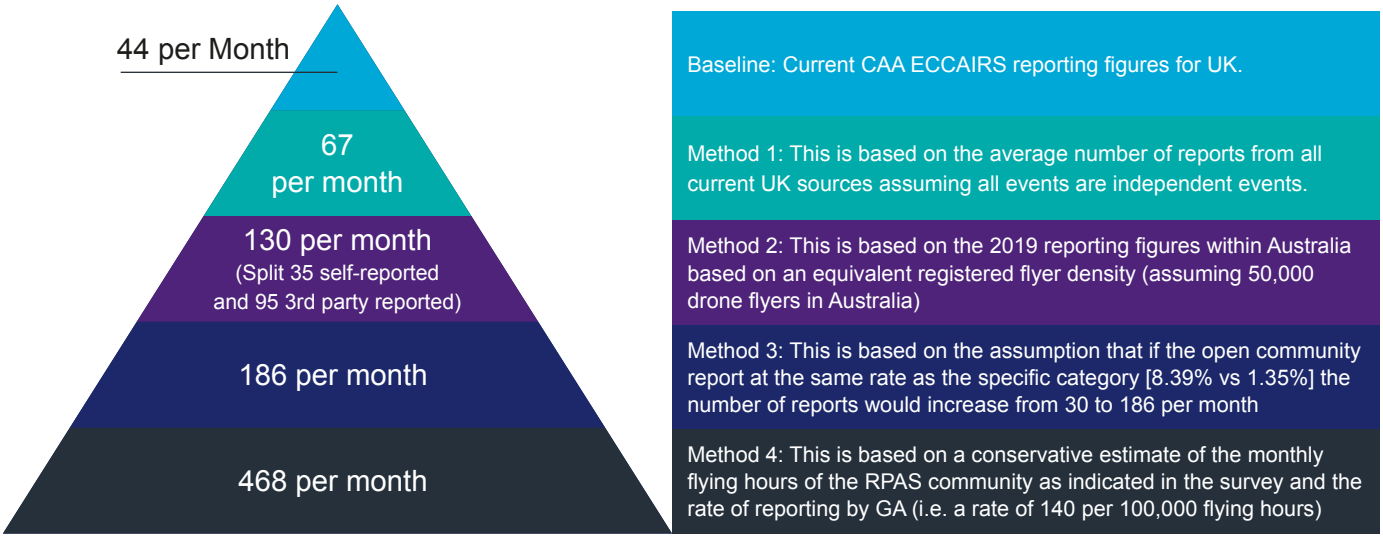
‘We have identified more than 50 different changes we could make to RPAS safety reporting based on feedback from the community and stakeholders.’

What did the six-week Discovery Phase reveal?

The below is a summary of the findings from the six-week Discovery phase. More information on each area can be found in the report.

Are the number of RPAS Safety Reports accurate or are they lower/higher than they should be? - They should be higher than they currently are.

What should be the benchmark number we should expect? – depending on which benchmarking option you use the number could be; 67 a month, 130 a month, 186 a month or 468 a month. An average figure is 213 a month which reflects CURRENT reporting levels. We also need to factor in the growth of the industry which is covered in Section 4 of the report. See the graphic on this page for details.



The study confirms that the rate of reporting in the RPAS community is LOW by up to a factor of 10 (over 460 per month)		
The study identified a range of improvement opportunities		
Culture	**Process**	**Tools**

If they are lower – what are the reasons why people are not reporting? We discovered several reasons. See the table below which documents some of the top reasons from the community based on the survey, research and interviews we conducted.

Open Category	Common across both Open and Specific Categories	Specific Category
Not being aware that the occurrence needed reporting	Having to report an occurrence to more than one organisation	Having a tool that doesn't recognise characteristics of RPAS
Not knowing who to report to	Fear of being penalised if I was at fault	Having to use a tool that does not work on tablet or mobile device
	Believing that the operation was otherwise safe and legal	

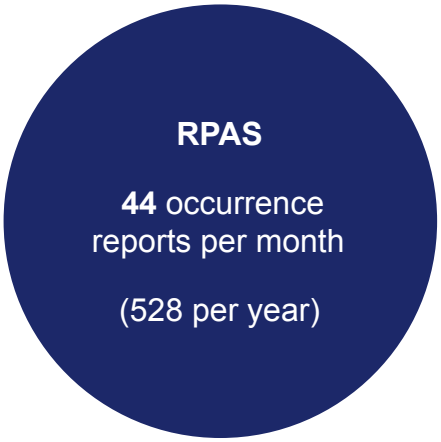
Review best practice/other reporting options and see what changes we could make to try and improve the process end-to-end to increase reporting if it was found to be low – We identified more than 50 different changes we could make based on feedback from the community and stakeholders around the barriers to reporting, and best practice/lessons learnt opportunities.

One of the key elements discovered is that a vast number of stakeholders do not consider themselves to be part of the aviation community and see the operation of their RPAS as more of a 'tool to do their job.' Therefore, traditional aviation techniques and methodologies such as MORs may not be appropriate for all RPAS users.

1.13 Current RPAS Reporting Landscape

RPAS Community

For an RPAS community of ~270,000 Active Flyers registered with DMARES (as of Dec 2021) and ~7,000 Specific Category Operational Authorisation holders, we only receive 44 occurrence reports a month – majority of which are reported by other parties such as air traffic control etc. The reporting landscape within the UK for RPAS is complex with multiple organisations mandating reporting or supporting voluntary reporting. This study explores what could be expected in terms of a level of reporting.



General Aviation Community

There is underreporting in the General Aviation community, although the situation has improved compared to 2017. The monthly rolling average is around 140 reports, of which ~10% are high severity (accidents or serious incidents).

In 2020, there were 27 high severity occurrences per every 100,000 GA hours flown. There is an increasing trend. ~1% of occurrences result in fatal or serious injuries.

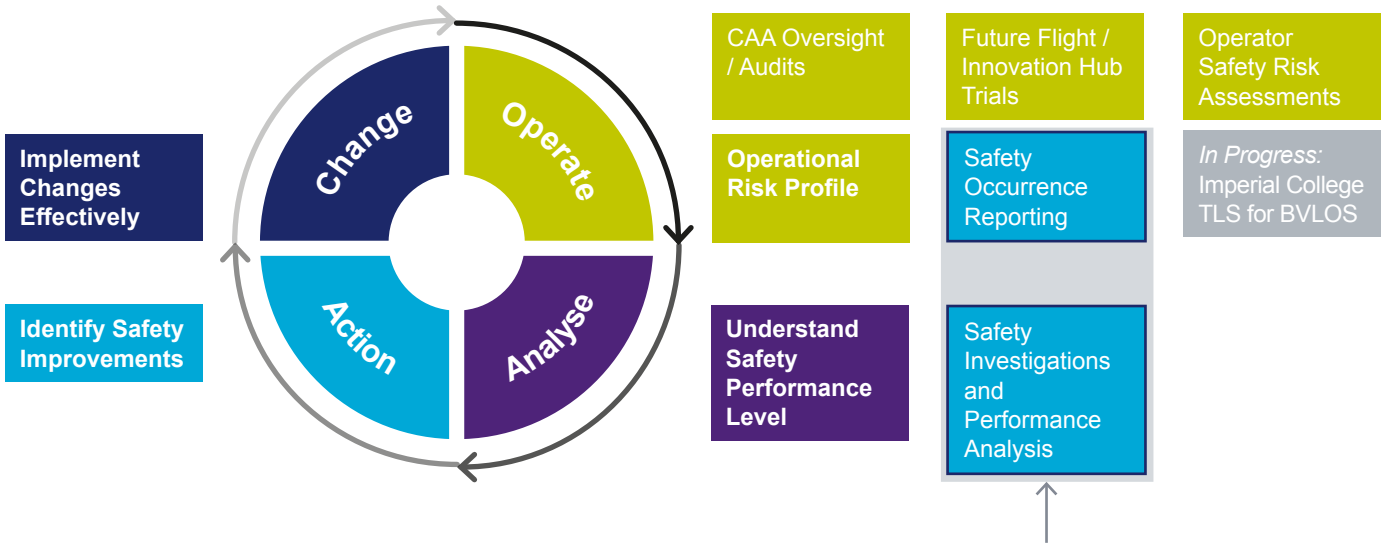
Typical safety occurrence reporting involving a GA aircraft is by the air traffic controller who mostly reports of airborne conflict. Technical malfunction is normally reported by the pilot.

Commercial Manned Aviation Industry

In UK commercial aviation, most airlines, ANSPs, airports, and ground handling and maintenance organisations have established their own internal safety occurrence reporting system(s).

1.14 Why are Safety Occurrence Reporting (MORs) important?

‘The absence of manufacturing standards for drones, and awareness from operators and flyers about the safety of day-to-day operations is of significant concern for regulators.’



The ‘Wheel’ isn’t turning as effectively right now as it could be. The Risk Profile’s need to continue to evolve as the wheel turns with more information feeding in.

The Safety Case relies on the foundation of safety reporting and analysis to help identify the operational and technical factors that can improve safety

Why are Safety Occurrence Reporting (MORs) important?

As we’ve seen MORs provide a key component of the safety measures which allow us to create safety cases which, in turn, mean RPAS users can fly/operate.

The challenge now for the aviation industry is to identify how the safety case for RPAS operations will be developed within this context. The safety case must demonstrate that all users within the airspace can operate safely. The current absence of manufacturing standards for drones, and awareness from operators and flyers about the safety of day-to-day operations is of significant concern for regulators. Standardisation and regulatory certification of drones is developing but there is an opportunity to improve how we facilitate learning within the RPAS community.

Traditional aviation experience provides us with good practice techniques for learning, which should be tailored to suit the needs of different sub-groups in the RPAS community. For example:

- Flyer engagement workshops,
- Operational audits and reviews conducted through the oversight programme of authorised operators,
- The process for operational approvals,
- Learning from other states, and,
- A robust, easy-to-use occurrence reporting system.

The occurrence reporting system can often become the focus of the learning system, but good practice suggests you should not overplay the reporting process to the detraction of other learning opportunities. A reporting system is only one part of the learning system, and the focus should be on ensuring other organisational process steps are effective to make reporting as meaningful and useful as possible. Occurrence reporting remains essential, but the goal is to identify what additional information we need from the RPAS community right now to help us improve the efficiency and safety of operations today and in the future.

The CAA Innovation Sandbox is a great example of where a 'playground' has been created to allow the drone community to learn in a safe place and for the CAA to test out operational and technical concepts like 'UAS Traffic Management' and methods for achieving Electronic Conspicuity.

Things will undoubtedly go wrong but the sandbox can create a 'fail fast and learn quick' mentality in these early stages of regulatory development. The UK Future Flight Challenge, a Government-funded innovation programme, also demonstrates the UK's commitment to learning and building our understanding of RPAS operations. These two initiatives provide significant opportunity for the CAA to learn, and the results of the activities will benefit on-going decisions within the CAA on regulatory development.

In summary, traditional aviation sectors have relied on safety reporting and just culture to support continuous safety improvement, however, with the sheer volume of drone operations, the perceived cultural challenges and the advances in technology and use cases, we need to consider that only focusing on safety reporting is not sufficient to ascertain the safety measures needed for this growing eco-system.

2.0 Safety Reporting Today

2.1 Introduction

This section presents the results of what we discovered in the Discovery Phase:

1. Through the study we analysed the regulatory framework for safety reporting in the UK, the different processes for reporting within the RPAS community and how they are being applied today. The current reporting figures within the CAA RPAS community are also detailed.
2. We conducted a series of stakeholder interviews to explore the findings of current practices and identify opportunities for improvement. The information on current practices and reporting organisations was generated from these stakeholder interviews.
3. We reviewed the current processes for RPAS safety reporting within a selection of other states to identify opportunity for improvement within the UK system.
4. An overview of the potential improvements to the reporting process are presented across a series of generic process steps from the planning stage of RPAS operations to the analysis, investigation, and communication of occurrences.
5. Finally, an analysis of the benefits for reporting along with an estimated benchmark for possible reporting figures is presented.

2.2 Growth in RPAS Operations in the UK

In 2018, PricewaterhouseCooper's *Skies Without Limits Report** predicted that there will be 76,000 commercial drone operators by 2030. Other publications and articles continue to support the sustained growth and investment in the industry.

£42bn
increase in UK gross domestic product (GDP)

£16bn
in net cost savings to the UK economy

76,000
drones operating in the UK's skies

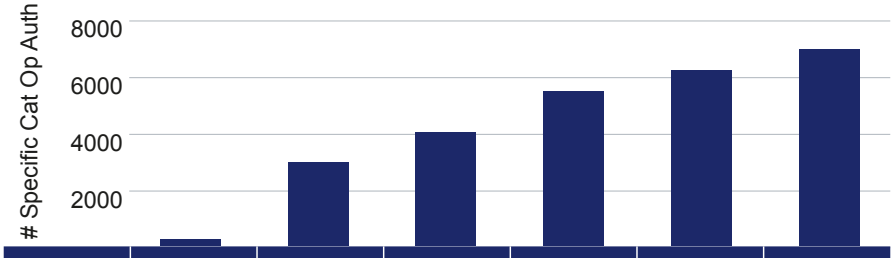
628,000
jobs in the drones economy

**Figures taken from PWC Report*

CAA data supports the continued strong growth of the industry with over 410,000 operators alone registered with the CAA in the ~2 years since DMARES started in November 2019. There are currently 447,189 active users registered - 263,085 Flyers and 184,104 Operators (as of December 2021).

Specific Category Operational Authorisations have increased from 134 in 2015 to 6,939 Active in 2020.

Total CAA Specific Cat Op Auths p/a



	2015	2016	2017	2018	2019	2020
Totals	**134**	**2854**	**4015**	**5416**	**6213**	**6939**

The new CAA Framework came into force on 1st January 2021 and the existing regulatory pathway is in place to help enable the industry benefits as predicted.

**PWC Report "The impact of drones on the UK economy - Skies without limits", 2018*

https://www.pwc.co.uk/intelligent-digital/drones/Drones-impact-on-the-UK-economy-FINAL.pdf

2.3 The Culture Challenge

The CAA promotes a Just Culture with the aims of;

i) encouraging continuous learning from the experiences of front-line professionals and,

ii) to enable anyone in the aviation industry to share essential safety related information in an open and free environment.

The CAA is promoting Just Culture principles within the RPAS community; however, this is likely to require a new perspective on what actions are required to begin building a Just Culture. This study has explored the concept of culture within the RPAS community, and several factors raised create conflicting priorities that are considered new to the industry.

The key factors are:

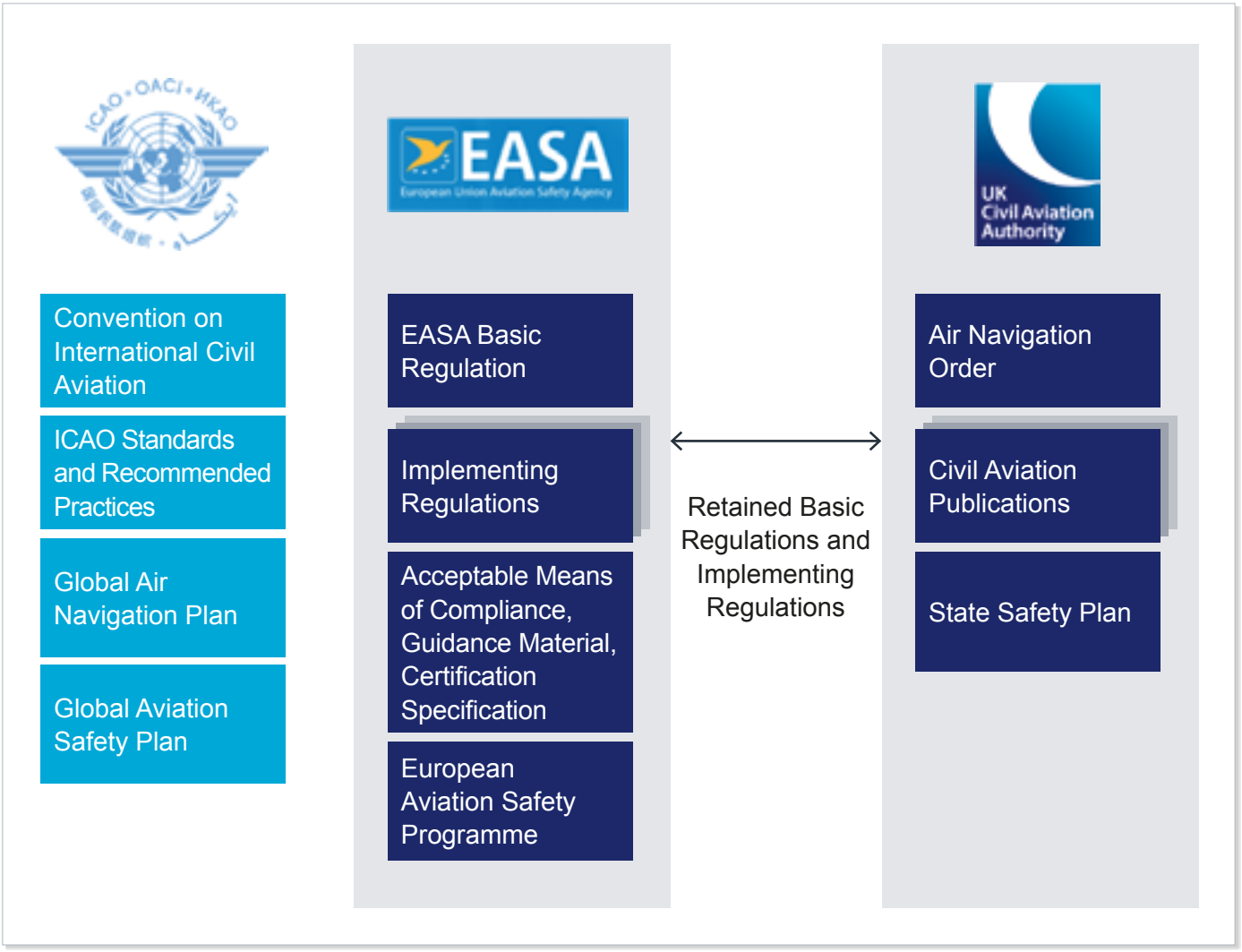
1. Drone users do not consider themselves aviators; primarily because they are not transporting passengers or cargo.
2. New commercial drone operators and other industry parties are often innovative technology start-ups. They are naturally focussed on short cycles of development and investment to demonstrate the viability of their solutions. Safety is not seen as an issue or a priority.
3. Drone flyers are often individuals or small organisations and therefore there is limited sense of organisational community. Social media forums are used as a replacement to share and learn information. As an exception, the Model Flying Associations [eg the BMFA, LMA or FPV] have created a community with their flyers that helps communicate and implement good practices seen in traditional aviation. This is largely due to their long history of being regulated under general aviation.
4. The CAA is filling the role often filled by an industry organisation (eg, an Airline or ANSP or Airport) which take responsibility for promoting just culture and learning programmes. However, the number of drone flyers makes it very difficult to engage them on an individual or group basis. This has resulted in the CAA being viewed as a corporate organisation with no accessible front of house, a daunting proposition to the drone community.
5. Training for most open category drone operators is either light touch, (through the Flyer ID Registration process) or not required, and for specific category the training is conducted by third parties. In some cases, the certification to operate is also managed by third parties creating a disconnect between the flyer, rules for flying and the regulatory requirements ie, the flyer is simply not aware of the rules for flying and what obligations they have.
6. The commercial drone operators are competing, so safety reports could be used to communicate that a competitor is unsafe, putting them at a commercial disadvantage.
7. Insurance companies might increase premiums as a result of an adverse trend in safety reporting.

These factors should be looked at to identify the most suitable approach to learning within the RPAS community in all stages of the learning process. Improvements that will create better engagement with the community and a long-running communication channel for any engagement should be prioritised.

2.4 The Regulatory Landscape

The International Civil Aviation Organisation (ICAO) provides the basis for the regulatory framework for the international aviation industry. The development of regulatory and national regulations for traditional aviation must comply with the requirements laid down in the ICAO Standards and Recommended Practices.

In Europe, the European Union Aviation Safety Agency (EASA) has defined a regulatory framework for aviation. The regulations were applicable within the United Kingdom when originally published. Even so, the Air Navigation Order and supporting Civil Aviation Publications (known as CAPs) remained the basis for UK regulation. At the time of leaving the EU, the UK CAA retained the implementing regulations and transposed those into the UK framework through a series of CAPs.



2.4.1 UK Regulatory Landscape*

The UK Regulatory Framework that applies to RPAS is summarised below. The Air Navigation Order details the articles associated to the safety of flight with specific articles relating to unmanned aircraft systems. A series of CAPs provide the detailed regulatory requirements and guidance. The drone and model Aircraft Code is also part of the framework but is not yet published as a CAP.

Air Navigation Order				
Article 240 Endangering safety of an aircraft	**Article 241** Endangering safety of any person or property	**Article 95** Small unmanned surveillance aircraft	**Article 94** Small unmanned aircraft: requirements	**Article 94A** Small unmanned aircraft; permissions for certain flights

Civil Aviation Publications						
CAP393	**CAP2020A00**	**CAP2034A00**	**CAP1789A**	**CAP1789B**	**CAP722**	**Drone and Model Aircraft Code**
Regulations made under powers in the Civil Aviation Act 1982 and the Air Navigation Order 2016 The Air Navigation Order (ANO) defined safety regulations for aviation; including unmanned systems.	**Basic Regulation 2018/113** Sets out the common rules for civil aviation within the UK. This is a retained version of the BR.	**Occurrence Reporting Regulation 376/2014** UK Consolidated Regulation (EU) 376/2014 Sets out the rules on the reporting, analysis and follow-up of occurrences in civil aviation	**UAS Implementing Regulation** UK Consolidated Regulation (EU) 2019/947 Sets the rules and procedures for the operation of unmanned aircraft. Sets out responsibilities for CAA and UAS Operators on safety information. (Article 19)	**UAS Delegated Regulation** UK Consolidated Regulation (EU) 2019/945 Sets out the rules for unmanned aircraft systems. Sets rules for market surveillance and control of products and its link to Occurrence Reporting (Article 35)	**Unmanned Aircraft System Operations in UK Airspace – Guidance** Primary guidance document for the operation of unmanned aircraft systems within the UK. Sets out the basis and requirements for reporting to AAIB and under the MOR process. (Section 2.9).	**Drone and Model Aircraft Guidance (Not published as a CAP)** For flying drones, model aeroplanes, model gliders, model helicopters, and other unmanned aircraft systems outdoors in the Open A1 and A3 categories

*As of 31 December 2020

EASA Regulations

Reporting, analysis, and follow-up of occurrences in civil aviation is currently regulated in Europe by two main regulations: Regulation (EU) No 376/2014 and Commission Implementing Regulation (EU) 2015/1018. Regulation (EU) No 376/2014 of the European Parliament and of the Council was adopted on 3 April 2014. It deals with the reporting, analysis, and follow-up of occurrences in civil aviation. The regulation also amends Regulation (EU) No 996/2010 on the investigation and prevention of accidents and incidents in civil aviation and repeals Directive 2003/42/EC on occurrence reporting in civil aviation and Commission regulations (EC) No 1321/2007 and (EC) No 1330/2007.

Commission Implementing Regulation (EU) 2015/1018 of 29 June 2015, lays down a list classifying occurrence in civil aviation to be mandatorily reported according to Regulation (EU) No 376/2014.

Regulation (EU) No 376/2014 aims to improve aviation safety by ensuring that relevant safety information relating to civil aviation is reported, collected, stored, protected, exchanged, disseminated, and analysed. The regulation ensures the continued availability of safety information by introducing rules on confidentiality and on the appropriate use of information and through the harmonised and enhanced protection of reporters and persons mentioned in occurrence reports.

Regulation (EU) No 376/2014 lays down rules on:

- The reporting of occurrences which endanger or which, if not corrected or addressed, would endanger an aircraft, its occupants, any other person, equipment, or installation affecting aircraft operations (mandatory reporting); and the reporting of other relevant safety-related information in that context (voluntary reporting).
- Analysis and follow-up action in respect of reported occurrences and other safety-related information.
- The protection of aviation professionals.
- Appropriate use collected safety information.
- The integration of information into the European Central Repository; and
- The dissemination of anonymised information to interested parties for the purpose of providing such parties with the information they need to improve aviation safety.

Study Observations

- The regulation is applicable to all aircraft or ‘any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth’s surface’.
- The Easy Access Rules for Unmanned Systems EU 2019/947 does not reference reporting requirements for either the Open or the Specific Category.
- The regulation references unmanned aircraft but as an exception and therefore it is not immediately clear whether RPAS is covered. Reference to the regulations definition of an aircraft to understand that the regulation applies to RPAS operators and pilots.

2.4.2 UK CAP

CAP 722 is intended to assist those who are involved in the development of Unmanned Aerial Systems UAS to identify the route to certification, outline the methods by which permission for aerial work may be obtained and ensure that the required standards and practices are met by all UAS operators. RPAS is part of UAS. UAS includes ground equipment/infrastructure, whereas RPAS is just the aircraft part of the system.

The document highlights the safety requirements that must be met, in terms of airworthiness and operational standards, before a UAS is allowed to operate in the UK. It is CAA policy that UAS operating in the UK must meet at least the same safety and operational standards as manned aircraft. Thus, UAS operations must be as safe as crewed aircraft insofar as they must not present or create a greater hazard to persons, property, vehicles, or vessels, whilst in the air or on the ground, than that attributable to the operations of crewed aircraft of equivalent class or category.

Policy

The policy regarding accident and occurrence reporting as outlined in CAP 722 states that any person involved (as defined under Regulation (EU) No. 996/2010) who has knowledge of the occurrence of an accident or serious incident in UK airspace must report it to the AAIB. Such persons include (but are not limited to) the owner, operator, and pilot of a UAS.

All other occurrences must be reported under the CAA Mandatory Occurrence Reporting Scheme (with details contained within CAP 382). The aircraft categories that are covered by the MOR Scheme include any aircraft operated under an Air Operator's Certificate granted by the CAA and any turbine-powered aircraft which has a Certificate of Airworthiness issued by the CAA. Whilst these categories may appear to exclude the vast majority of UAS applications, all occurrences related to UAS operations which are considered to have endangered, or might have endangered, any aircraft (including the subject unmanned aircraft) or any person or property, must still be reported to the CAA via the MOR Scheme.

This applies equally to all UAS categories, regardless of the aircraft's mass or certification state. It also includes UK registered UAS operating outside UK airspace.

Types of Occurrences

Appendix B to CAP 382 lists the types of occurrence that are likely to fall into the definition of a 'reportable occurrence'. Whilst some of the listed occurrences would clearly only apply to manned aviation, many will apply equally to UAS, particularly those associated with the operation of the aircraft. In addition to those listed in CAP 382, other, more UAS-specific, reportable occurrences include events such as:

- Loss of control/data link
- Navigation failures
- Pilot station configuration changes / errors
- Crew Resource Management (CRM) failures / confusion
- Structural damage / heavy landings
- Flight programming errors (eg, incorrect speed programmed)
- Any incident that injures a third party.

Voluntary Reporting

CAP722 also includes voluntary reporting concepts applicable to the Open Category.

2.4.3 Other UK Regulatory Requirements and Codes of Practice

In addition to UK CAP722 there are other requirements and methods available to the aviation community for the reporting of aviation incidents, not limited to incidents relating to the RPAS Community.

Drone and Model Aircraft Code

- The Drone and Model Aircraft Code ensures that remote pilots and UAS operators fly safely and legally.
- The information contained within the code covers everything people need to know to pass the test to get a flyer ID.
- Regarding incident and accident reporting, this Code (Article 18) states that any serious incident or near miss involving a drone or model aircraft must be reported to the CAA via the online ECCAIRS system.

CAA Alleged Breaches of Air Navigation Legislation (ABANL)

- Should a person witness a breach of the aviation safety rules and regulations they can report it to the CAA as an ABANL.
- Examples of occurrences that typically would be an ABANL include low flying, unsafe flying, and misuse of drones.
- An ABANL can be reported online via the CAA ABANL website. (It received 56 incidence reports in 2021).

CAA whistle-blower program

The CAA is a ‘prescribed person’ under the Public Interest Disclosure Act 1998 for the purpose of receiving ‘protected disclosures’ (whistleblowing) regarding compliance with the requirements of civil aviation legislation, including aviation safety.

It means remote pilots wanting to lodge a complaint against their UAS Operator (employer) can use the whistleblowing process to make a confidential allegation and/or complaint. The CAA hands public safety concerns submitted through this process to the police for further education - 20 whistleblower reports on RPAS related topics that could have been MORs were received in 2021.

UK Airprox Board

The UK Airprox Board's primary objective is to enhance air safety in the UK by analysing and learning from reports of Airprox occurrences within the UK.

An Airprox is a situation in which, in the opinion of a pilot or air traffic services personnel, the distance between aircraft as well as their relative positions and speed have been such that the safety of the aircraft involved may have been compromised.

Most Airprox reports are currently reported by large commercial operators through the MOR process.

Air Accident Investigation Board

The purpose of the AAIB is to improve aviation safety by determining the circumstances and causes of air accidents and serious incidents and promoting action to prevent recurrence.

All UAS accident and serious incidents are required to be reported to the AAIB, regardless of weight or whether they are being used for commercial purposes - 129 RPAS reports were received in 2021. For more information visit; https://www.gov.uk/guidance/report-an-aircraft-accident-or-serious-incident

Police

Accidents should be reported to the police in parallel to reporting the event to the AAIB. Other safety, privacy and content issues are also required to be reported.

The National Police Chief's Council (NPCC) produces a summary of all reports received on a monthly basis, (over 1,000 every month) from Drone Detection Systems.

2.4.4 Current Occurrence Reporting

Within RPAS safety reporting, there are 14 main bodies to which the aviation community, the RPAS community and the public could potentially report safety incidents to. Reporting guidance often advises them to report to more than one body at a time which can be confusing for RPAS Flyers and Operators. See the sections below for more detail.

Reporting might also have to be done in different formats while information is often rarely shared between them. Where it is shared it is often on an ad hoc basis and often not via an automated system.

The following organisations either mandate reporting of certain event types or support voluntary/ anonymous reporting. The UK Military Aviation Authority (MAA) is not considered here for RPAS operations, but its reporting programme is explained within this section.

Primary Mandatory Occurrence Reporting Bodies

These organisations are prescribed within the UK CAA regulatory framework and, depending on the event, aviation professionals must report those events to these bodies.

UK CAA (ECCAIRS)	AAIB	UK Airprox Board
Fatal or serious accidents, serious incidents and occurrences	Accident or Serious Incident	Aircraft proximity event

Alternative Legal Reporting Requirements

These organisations are other legal bodies that provide alternative arrangements for the reporting of events. These are not meant to replace the primary regulatory reporting bodies but are available for certain circumstances.

Police	ABANL	Whistle-blower
Accidents & other safety, privacy & content issues	Breach of Air Navigation Legislation	Unsafe operations & breaches of regulation within organisation

Industry Trade / Voluntary Reporting Bodies

These organisations are available to the RPAS community to report voluntary information

ARPAS-UK

UTM/ Manufacturers

BMFA/LMA/FPV etc.	CHIRP	UK CAA (ECCAIRS)
Occurrences involving model aircraft or drone community clubs	Confidential Human Factor and Just Culture related reports	Voluntary Occurrences

Company Reporting Programmes

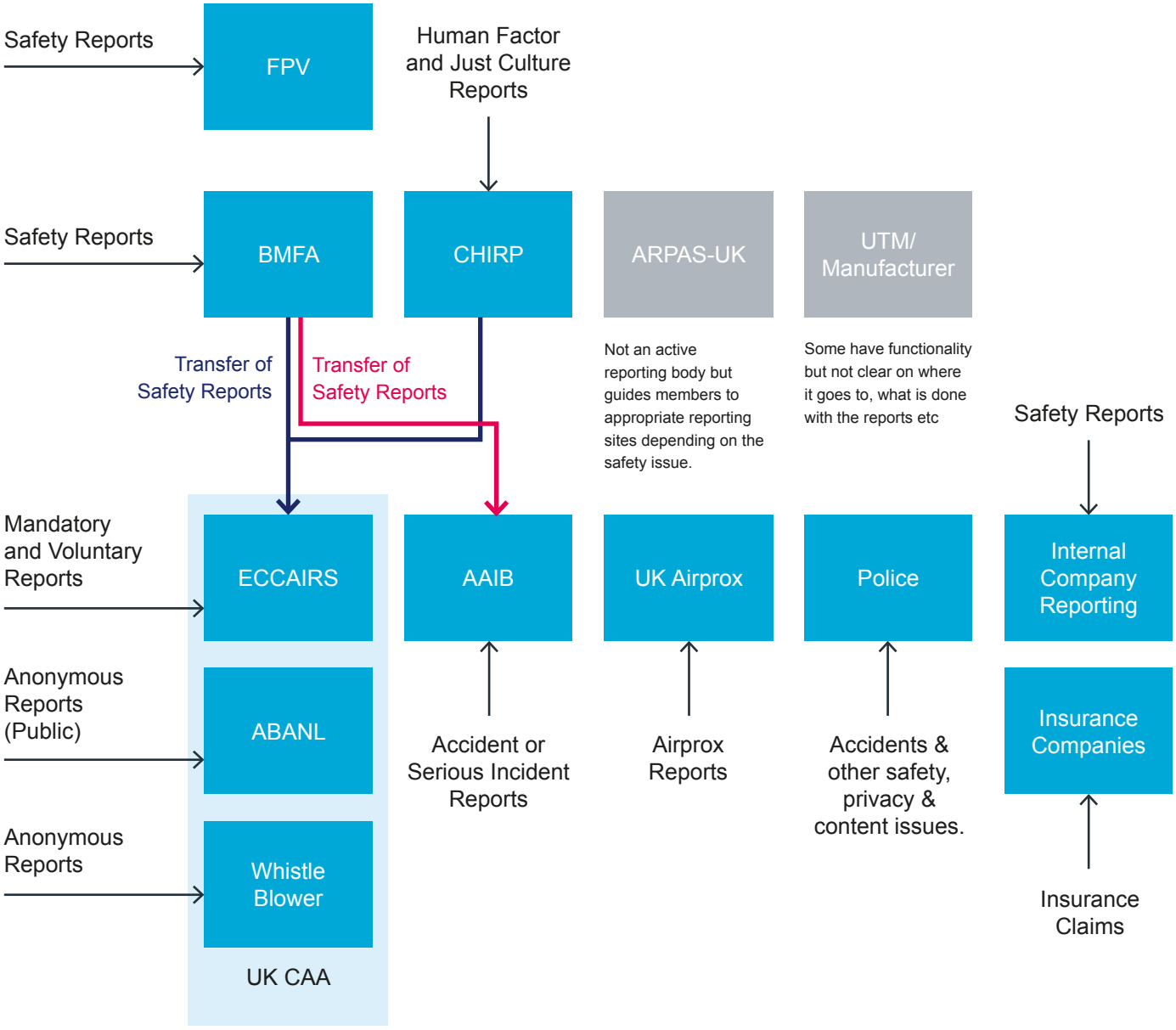
RPAS operators (regardless of size & operation) may have their own reporting processes within their operating systems available to their remote pilots.

Internal Reporting Tools	Insurance Companies
Occurances and Internal Reports	Insurance Claims

2.4.5 Relationship between Reporting Organisations

Study Observation

There are no digital integrations between any of these organisations and where information is passed it is generally not via an automated system. There could be duplication of reports and vital data reported to one organisation may not be passed to any of the others.



2.4.6 It's Confusing for the User!

Study Observation

The reporting landscape is complex for the RPAS community with different rules for what should be reported and to whom – often having to report the same occurrence to multiple organisations.

There are 14 main bodies that could be reported to.

2.4.7 UK CAA ECCAIRS

Two processes are detailed for reporting through the European Co-Ordination Centre for Accident and Incident Reporting Systems (ECCAIRS) for the Open Category and Specific Category.

They include details for what 'must' be reported. For the Open Category the process also introduces voluntary reporting concepts using terms such as 'may'. For events that are designated as 'must be reported' to the CAA the ECCAIRS Aviation Reporting Portal is used.

Reports to the UK CAA are provided through the Aviation Reporting Portal using ECCAIRS. The mission of ECCAIRS is to support digitally the occurrence reporting process (Regulation (EU) 376/2014) of collecting, sharing, and allowing analysis of safety data. This system applies to the UK under its obligation as an ICAO State rather than through the Reg. 376/2014.

Guidance Material

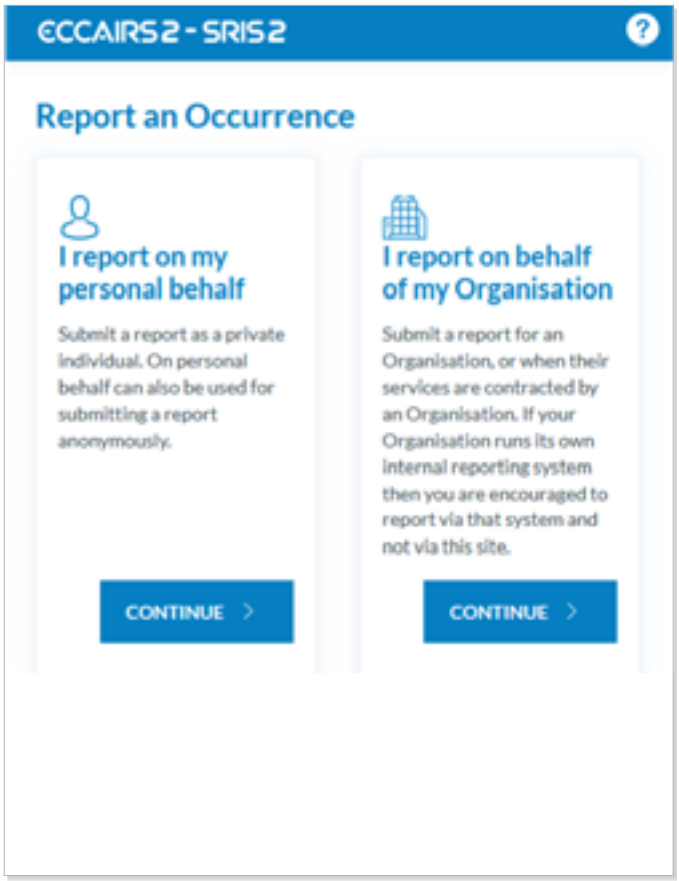
Guidance on the use of ECCAIRS is provided in CAP1496. It is generic guidance material and not tailored to RPAS users. The CAA also has guidance for occurrence reporting on the CAA website here:

https://www.caa.co.uk/Our-work/Make-a-report-or-complaint/MOR/Occurrence-reporting

In addition to the guidance on Mandatory Occurrence Reports the website strengthens the language related to Voluntary Occurrence Reporting (VORs). It explains that VORs "should be reported in the same format as MORs, all reports are triaged and prioritised individually, processed, and analysed together".

ECCAIRS2

There is an ongoing internal CAA project to replace the current ECCAIRS database with the newer version on ECCAIRS2. The current portal already uses ECCAIRS2 and feeds into the EASA ECCAIRS2 database. EASA then convert the ECCAIRS2 files into E5X format so they can be loaded into the CAA's ECCAIRS1 system in the interim. ECCAIRS1 tools and the CAA's 'big data' portal can then be used for analysis of the data. E5X files are currently limited to the reduced interface taxonomy which does not capture all the relevant data from an RPAS occurrence.



Study Observations

There is no ‘report it’ link on the front page of the CAA website. It is necessary to search for ‘report’ and then click four times to get to the http://www.aviationreporting.eu/ page.

ECCAIRS2 is a new database upgrade and does not automatically introduce new functionally or workflows to improve the deficiencies related to the findings in this study - there may be potential to make further improvements once the upgrade has been completed with the assistance of the ECCAIRS team.

2.4.8 ECCAIRS Stakeholder Reporting Feedback

Stakeholder Feedback

- Generally, it is perceived that little feedback is provided on reporting and some reporters feel that their reports vanish ‘into a black hole’ or a ‘bottomless pit’. This causes them to lose motivation and do not see value in going through the arduous reporting process.
- Stakeholders largely agreed that providing feedback will be key to increasing the number of reports as reporters will be able to see what the reported data is being used for.
- An app reporting tool should include some form of flowchart that shows people how to report and where their submission goes and how it used.

2.4.9 AAIB and UK Airprox Board

Air Accidents Investigation Branch (AAIB)

The Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 2018 sets out the basis for the Investigation of Air Accidents and Incidents in the UK.

The regulation designates the AAIB as the safety investigation authority for the United Kingdom for the purposes of Article 4 of Regulation 996/2010; and the accident investigation authority for the United Kingdom for the purposes of Annex 13.

A requirement of the regulation is that all accidents are reported to the AAIB. This is done via the AAIB 24-hour reporting line.

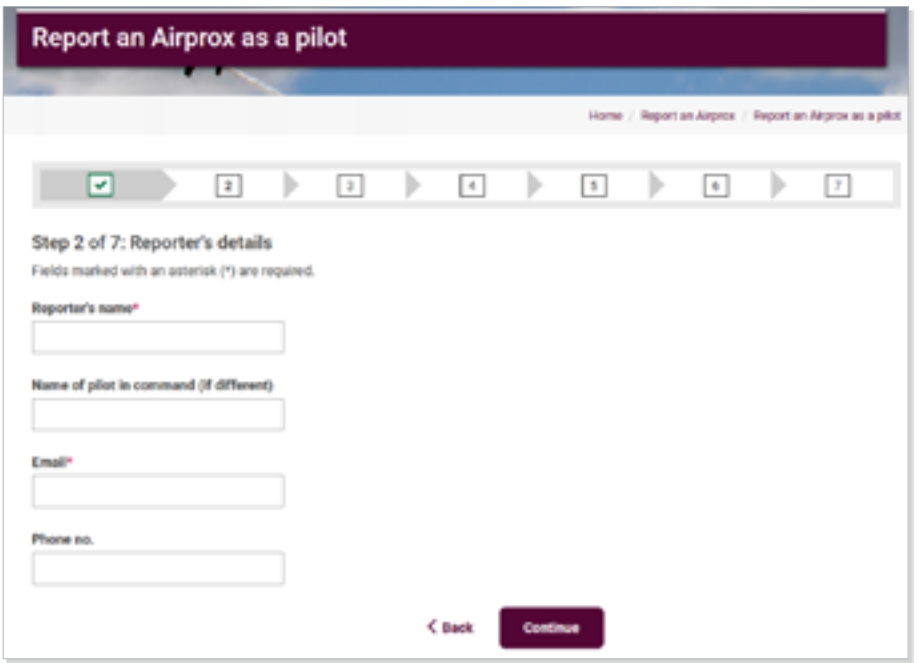
The AAIB receive reports directly from reporters following an aircraft accident. Reports are either via telephone call or email. AAIB then contact each reporter directly to follow up the details. AAIB received 129 reports in 2021 85% of which are from the specific category (roughly one third of the number received from the GA community).

UK Airprox Board

The UK Airprox Board's primary objective is to enhance air safety in the UK, in respect of lessons learned and applied from Airprox occurrences reported within UK airspace.

An Airprox is a situation in which, in the opinion of a pilot or air traffic services personnel, the distance between aircraft as well as their relative positions and speed have been such that the safety of the aircraft involved may have been compromised.

A small but increasing number of RPAS pilots report an airprox on their own drone involving another aircraft. Generally, these reports come from flights below 2,000ft. There is a perception that manned aircraft will not be below 400ft – however, emergency helicopters, military and some GA do fly below 400ft. There were seven reports in 2021, some belonging to the emergency services and some in military danger zones.



2.4.10 CHIRP

The aim of the Confidential Reporting Programme for Aviation and Maritime (CHIRP) is to contribute to the enhancement of aviation safety in the UK and maritime safety worldwide by providing a totally independent and confidential (not anonymous) reporting system for all individuals employed in, or associated with, these industries.

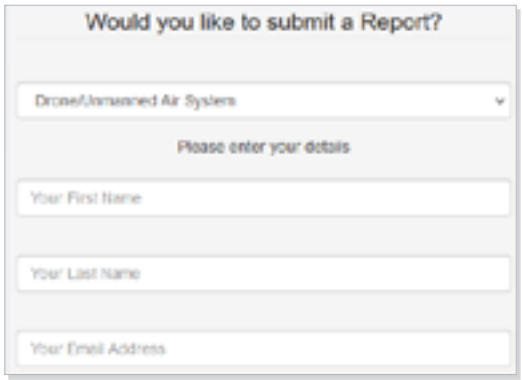
The role of the CHIRP Drone Programme is to manage an independent, voluntary, and confidential reporting programme for the drone industry that provides a place for individuals to report incidents, safety deficiencies and safety concerns that might not be otherwise reported through the MOR (ECCAIRS) scheme due to fear of punitive action. CHIRP's mission is to improve the safety of the public and that of individuals employed within or associated with drone operations.
https://www.chirp.co.uk/about-us/drone-and-uas-reporting

The CHIRP Drone programme commenced in late 2019 with the reporting system operational from August 2020. CHIRP focusses primarily on events related to human factors and Just Culture issues. CHIRP meets the requirements of ICAO Annex 13 and Annex 19 regarding safety investigations and management. Nationally, the UK State Safety Programme acknowledges CHIRP as a voluntary scheme compliant with ICAO recommendations.

CHIRP provide three ways to submit reports; online, by email or by post.

The number of drone reports submitted to CHIRP is approximately 30 since its inception in 2020. There is evidence that flyers start the process and then do not complete.

CHIRP analyse the events that are reported and publish a Drone Feedback report via the CAA Skywise platform (they have published three editions with the latest on 24 January 2022). This provides access to approximately 16,000 registered users.



Stakeholder feedback

- The relationship between the CAA reporting system and the CHIRP reporting system could be streamlined or integrated.
- The reasons why reporters start reports but do not complete them could be reviewed to gain further insight in to any improvements proposed to the CAA reporting process.
- The sharing of lessons by CHIRP is the only example of feedback to the community but it is limited by the number of people who access Skywise; compared to the CAA RPAS registration numbers.

2.4.11 BMFA AND LMA

The British Model Flying Association (BMFA) is the National Governing Body for the sport of model flying. There are around 780 affiliated clubs and a combined membership of 25,500 members (with 7,100 individual members of which 1,100 are drone flyers).

The BMFA ensure that model fliers have a voice, and their rights are recognised by the authorities. Model Flyers have the option to register their Operator ID with the BMFA rather than the CAA directly. 80% of members are registered directly with the BMFA. A recent survey of BMFA members said that 90% of those that registered with the BMFA wanted to continue to be registered with them.

When changes to EU Regulations were introduced on 31 December 2020, given the safety record established by model flyers throughout Europe, the EU agreed that model flying conducted within the framework of associations like the BMFA should be subject to more flexible regulation to allow them to continue largely 'as they do today'.

The mechanism to facilitate this is referred to as an 'Article 16 Authorisation', (within the 'Specific Category') and it provides a guide to how the updated Authorisation negotiated with the CAA, applies to BMFA members.

The Article 16 Authorisation includes the requirement to report certain accidents, serious incidents, and other occurrences. This is based on pre-existing legal requirements previously included in the BMFA Members Handbook and CAP 658 and the CAP 722 Section 2.9.

Details of the BMFA actions and promotion of safety reporting can be found here: https://rcc.bmfa.uk/art16-occurrence-reporting

Extract of BMFA Reporting Form

Q1. Was anyone fatally or seriously injured? *
○ Yes ◉ No

Q1.1 Did anyone suffer a minor injury? *
○ Yes ○ No ○ Unknown

Q2. Was there a high probability that the occurrence could have led to someone being fatally or seriously injured? *
○ Yes ○ No

Q3. Did the occurrence involve a manned aircraft being damaged? *
○ Yes ○ No

Submit

Guidance is provided to members on reporting in a Quick Start guide. They also provide online reporting on the BMFA website. The reporting form [see right] provides guidance on the correct process to file an occurrence and who to report it to. The tool was developed in consultation with the AAIB. The AAIB continues to support the BMFA and attends their Safety Committee.

Prior to the introduction of the regulation, reporting in the BMFA community was based on insurance claims. Since the introduction of the Article 16 authorisation around 20 reports are received per year.

The BMFA reports are sent via CSV file to the UK CAA and the AAIB. Member to member insurance claims are not reported. The AAIB has followed up on reports and conducted further investigation. BMFA is considering distribution of safety reports to CHIRP as well in the future.

BMFA follow traditional safety management system activities and analyse the data, identify trends, issue safety bullets to members. They use different articles and styles of communication to engage their members.

The LMA

The Large Model Association (LMA) was formed in the UK in 1982 to represent to the CAA and other bodies, the views, and concerns of those who fly large models. The LMA regards large model flying as a hobby and recreation, not a competitive sport. They actively promote safety and the competence in building and flying large models to ensure that their activities do not become a nuisance or a danger to the public or aviation authorities.

The LMA do not have a reporting system. They promote reporting accidents and serious incidents to the AAIB and the CAA via the traditional channels.

2.4.12 FPV UK

FPV UK is an association of recreational radio control drone and model aircraft (technically 'unmanned aircraft') pilots. They have approximately 5,500 members. The association was formed in 2009 to champion and protect the hobby/sport of First-person view (FPV) flying. In 2009, an exemption was provided by the CAA for FPV. The provisions of this FPV exemption were renewed every year until 2021 – when they were rolled into EU and UK law. FPV UK members now operate under an Article 16 Operational Authorisation.

FPV UK Handbook

FPV UK has developed a handbook for flyers. Some of the topics covered in the FPV UK handbook are:

- Information about how FPV UK membership works
- Guidance for flying your unmanned aircraft (drone or model aircraft) safely
- Guidance on how to run an FPV racing event
- Details for how to report an accident or incident
- How to make an insurance claim
- The terms and conditions of the public liability insurance
- Guidance on how to do a risk assessment (which for example is required if flying in a park, under the Article 16 Operational Authorisation)

The FPV UK handbook accompanies the CAA Article 16 Operational Authorisation and was reviewed and approved by the CAA as part of the process of issuing the Article 16 Operational Authorisation. Members are required to follow the guidance in the FPV UK Handbook in order to fly under the Article 16 Operational Authorisation. https://fpvuk.org/faq/new-fpv-uk-handbook/

Reporting an occurrence to FPV UK

FPV UK guides members to report accidents and incidents in the first instance directly to FPV UK by email (occurrences@fpvuk.org). FPV UK then log and store, exchange, analyse and disseminate occurrence information to promote good air safety culture.

FPV UK can also then guide members on any further reporting requirements applicable to the particular occurrence - such as reporting to the CAA and/or the AAIB.

At the time of publication of this report, in the thirteen years that FPV UK has existed, they have received a total of four insurance claims (all in 2016). Beyond that, FPV UK have had two occurrence reports, both of which did not result in claims.

2.4.13 ARPAS UK

The Association of Remotely Piloted Aircraft Systems (ARPAS-UK) is the only industry trade association and professional body focused on the UK drone community. Founded in 2013, ARPAS supports members from start-up businesses to larger established operations, operators, manufacturers, software, and service companies through promotion of innovation and best practice.

ARPAS-UK has approximately 1,000 members including RPAS members and other trade organisations.

ARPAS-UK promote the safe application of the UAV industry. They provide guidance to operators on safety reporting but do not have their own reporting system. http://www.arpas.uk/about-us/reporting-form/

The guidance provided references a range of options including:

1. UAVEnquiries@caa.co.uk
2. Alleged Breach of Air Navigation Legislation Form FCS1520 online Click Here

With regards to accidents then in addition to reference to the flyers Operations Manual they recommend reporting to the following bodies:

1. AAIB (Air Accident Investigations Branch). Remember to include your CSV files.
2. ECCAIRS (European Coordination Centre for Accident and Incident Reporting Systems)
3. CHIRP (Confidential Human Factors Incident Reporting Programme)

Members' experiences

The following key observations from the ARPAS-UK members were shared for this report;

1. Reporting to the AAIB has simple messaging; if you have an accident then call us.
2. There is greater clarity needed around the application process/inputs and regulatory documents to provide further details to the industry to allow RPAS operations to continue to evolve.

2.4.14 Internal Company Reporting

The RPAS operator is responsible for developing procedures that are adapted to the type of operations and to the risks involved, and for ensuring that those procedures are complied with.

The extent of the detail that needs to be provided within those procedures will vary depending on the relative complexity of the operation and/or the organisation involved.

Open Category

Open category - written procedures may not always be necessary, especially if the UAS operator is also the only remote pilot. The limitations of the Open Category and the operating instructions provided by the UAS manufacturer may be considered sufficient. If more than one remote pilot is employed, the UAS operator should:

- Develop and produce procedures to coordinate the activities between its employees; and
- Establish and maintain a list of their personnel and their assigned duties.

Specific Category

Specific category – an operations manual, detailing the scope of the organisation and the procedures to be followed would be required as a minimum. This should be expanded as necessary to cover any increased complexity in the types of UAS being flown, or of the types of operation being conducted. CAP 722 references the importance of applying a sensible yet effective Safety Management System to UAS operations and includes comprehensive detail of Safety Management Principles including Safety Reporting.

Insurance Claims

All commercial operators need insurance for drones in the UK, meeting the minimum requirements of EC785/2004 for third party liability.

Some recreational remote pilots also choose to cover their drones in case of a mishap. Some insurance firms have begun to support the UAS operator or remote pilot to report an occurrence in which the drone sustained damage as part of the insurance claim process. The insurance firms that provide cover for RPAS operations include Coverdrone, Moonrock and Flycovered.

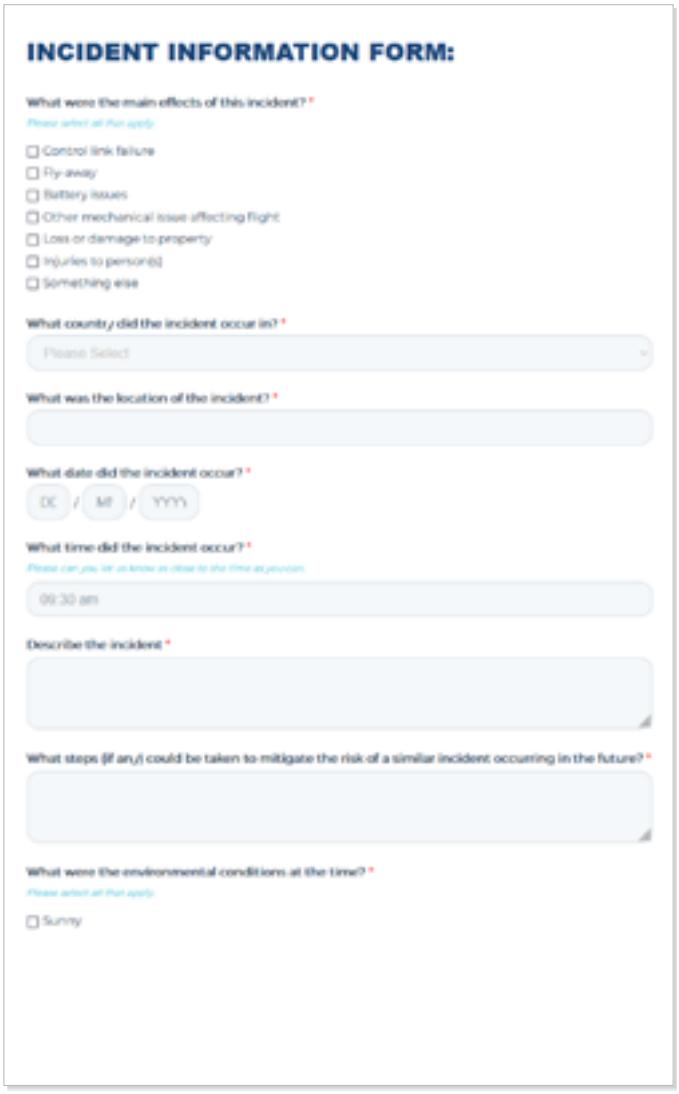
Insurance cover is provided as part of membership to BMFA, LMA and FPV UK. NB: The BMFA also accept insurance claims within their reporting system.

Study Observation

Insurance brokers could be encouraged or even legally required to ask for evidence of the pilot submitting a report before paying out an insurance claim.

2.4.15 UTM Industry

Several UTM providers were interviewed as part of the discovery research. They all expressed their commitment to the improvement of aviation safety. One UTM provider said they had completed some development in the Safety Reporting space and had a live solution already deployed in the field to allow user to submit Incident Reports, with the aim for users who submit fly plans could attach information to their forms. The aim was to provide a simple and easy to use tool for flyers to report issues and safety concerns that can then be shared with others to help ensure those issues are not repeated. The process is not a replacement for the MOR process but complimentary. The reporting is anonymous, submitted reports are analysed and their results will be shared by the UTM provider to the RPAS community.



INCIDENT INFORMATION FORM:

What were the main effects of this incident? *

Please select all that apply

- Control link failure
- Fly-away
- Battery issues
- Other mechanical issue affecting flight
- Loss or damage to property
- Injuries to person(s)
- Something else

What country did the incident occur in? *

Please Select

What was the location of the incident? *

What date did the incident occur? *

DD / MM / YYYY

What time did the incident occur? *

Please can you let us know as close to the time as you can.

09:30 am

Describe the incident *

What steps (if any) could be taken to mitigate the risk of a similar incident occurring in the future? *

What were the environmental conditions at the time? *

Please select all that apply

- Sunny

Another UTM provider raised the possibility of using the Discovery and Synchronization Service (DSS), a service defined in the ATSM standard service list, to support safety reporting obligations in the long-term. The DSS API provides a mechanism for all actors within the RPAS community communicate throughout the network and helps to identify real-time constraints on the entire UTM system (weather avoidance, emergency airspace closures, etc). Distribution of safety report could be included.

Study Observation

The simplicity and the fact that it is anonymous provides an opportunity to engage users in the process of sharing lessons learned and incidents from flying. The gap between the mandatory fields required for the MOR process and the simplicity needed to ensure users report should be considered in the CAA reporting process.

If UTM providers, or any other third party, are to be included as part of the reporting system then governance arrangements must be agreed to ensure sharing of information between all parties.

The use of Discovery and Synchronisation Service [DSS] could be used in the long-term as the means to standardise reporting within the international RPAS community.

2.5 Existing Tools and Processes

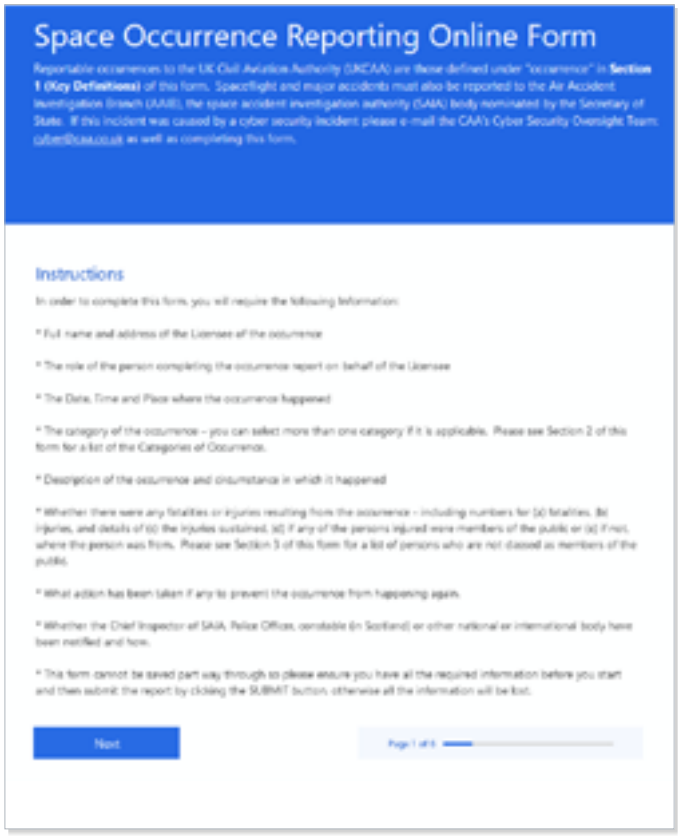
2.5.1 Previous CAA Reporting Work – Lessons Learnt

Spaceflight

A Space Industry Act 2018 and a series of statutory instruments have been created in the UK to manage spaceflight.

The Spaceflight Activities (Investigations of Spaceflight Accidents) Regulations 2021 established a spaceflight accident investigation authority. The AAIB has been appointed as the Space Accident Investigation Authority SAIA, and now has the authority to conduct safety investigations when there are spaceflight accidents in or over the UK.

The regulations for traditional aviation (ie the requirements of Reg EU 376 / 2014) do not apply to the Spaceflight sector.



Orbital Occurrence Reporting

The CAA Spaceflight Team was provided funding and approval to pursue a safety reporting system independently of the existing systems developed for current occurrence reporting at the CAA (eg ECCAIRS).

The CAA now has a new occurrence reporting system for Orbital or ‘Space’ operators. Occurrence reporting is a mandatory requirement under the Space Industry Regulations 2021.

They describe an occurrence as an unexpected event, fortuitous or otherwise arising during spaceflight activities or in the preparation for those activities. It is also an incident that, if not corrected or addressed, could or has resulted in an incident or major accident.

For more information visit;
https://www.caa.co.uk/space/orbital-satellite-operator/occurrence-reporting-for-orbital-operators/

Study Observations

Space users were identified as a discrete category of aviation and a regulatory framework including occurrence reporting was tailored to the specific use cases of the space industry. This approach should be considered for the RPAS community who also have their own needs, which requires a solution that is different to that provided for traditional aviation stakeholders.

2.5.2 Good Practice from other NAAs

EASA and four other National Aviation Authorities were consulted/reviewed as part of this study.

- For EASA the only mandatory occurrence reports are those that involve injury, loss of life, or involving a manned aircraft. They are less interested in drones that crash in a safe area. Work is ongoing to redefine what occurrences are mandatory to report, with the aim to update the taxonomy to match the categorisation of RPAS and users defined in EU 2019/947.
- The United States is the only state that is considered comparable to the UK in terms of size and scale of the RPAS industry. In the US, there are 860,983 registered drones (of which 328,670 are commercial drones and 528,725 are recreational drones) and 261,952 certified Remote Pilots. In other states the number of registered operators is in the tens of thousands.

The key notes for each country are as below;

EASA	FAA	Australia	Netherlands	Switzerland
• Most European states use their own tools and taxonomies as the reporting regulation is not sufficiently focussed on drones to provide an adequate framework. • EASA are running a project to create a connected data sharing system between NAAs, OEMs and operators.	• The FAA has identified different rules for the reporting of accidents compared to traditional aviation. • The FAA's Aviation Safety Reporting Programme [ASRP] enables a non-punitive avenue for voluntary reporting. • No reporting figures for drones have been identified.	• Air Transport Safety Bureau (ATSB) has three main reporting systems. A Mandatory scheme, a Voluntary scheme (REPCON) and the Aviation Self-Reporting System (ASRS). • In 2019, there were 198 reports from other airspace users and 76 self-reports from drone users.	• Drone reports are provided through the General Aviation online web-form. • The Dutch CAA has an online Aviation Incident Analysis Dashboard that provides list of drone reports and their location. • There are approximately 50 reports per year from all sources.	• The FOCA run a Drone Safety Group with members from across the RPAS industry. This is the main channel for communication within Switzerland. • The FOCA website, illustrates in a visual and simple manner the occurrence reporting requirements for drones and remote pilots.

Study Observations

There are limited safety reporting numbers from other states. Australia provides an appropriate benchmark for UK and is used in the benchmark analysis in the proceeding section of the report.

2.5.3 European RPAS Reporting - EASA

In 2011, EASA established the Network of Analysts (NoA) to provide a mechanism to support analysis of safety data for the EPAS and to assist States in assessing their priorities for the State Safety Programmes (SSP).

The publication of Regulation (EU) 376/2014 on the reporting, analysis, and follow-up of occurrences in civil aviation formalises the role of the NoA to enable collaboration on the improvement of aviation safety.

The UK CAA has previously been a member of the NoA.

RPAS Reporting Improvement

The NoA, effectively a network of national authority safety analysts, established a UAS working group in 2022 to provide a better understanding on the UAS domain, occurrence reporting requirements, current taxonomy and how to simplify the life of the UAS user when reporting occurrences.

The work covers the reporting requirements in all three categories ie certified, specific, and open categories.

The UAS working group has developed a report to present their findings. They did not conduct any user research to assist them in writing this report at the time of being interviewed. This report is in its final stage and is planned for release in Q2 2022.

The report is expected provide a set of attributes both to enhance the taxonomy and to simplify the reporting process. It is encouraging manufacturers to automate the reporting as much as possible by using the data already in the drone software to prefill the reports. This would minimise the user input. By standardising the taxonomy and creating an interface that software developers can use, they can ensure their own data is correctly interfacing with the taxonomy being used by EASA.

New Safety Reporting Tool

A new Safety Reporting Tool is planned, and a Requirements Specification is expected to be developed in 2022, alongside the main report, to define the requirements for the new tool in 2022. The tool will contribute to EASA's aim to encourage a more connected data sharing system between National Aviation Authorities, Manufacturers and flyers/operators.

The UK CAA should closely follow the EASA project developing the new reporting processes and tools for RPAS users. The findings from the UAS Workgroup report should be examined to identify opportunities for the UK CAA safety reporting improvement programme.

2.5.4 EASA Safety Reporting – Switzerland

Progress in Switzerland

The Federal Office of Civil Aviation (FOCA) in Switzerland has 25-30k registered users on the UAS Gate Registration Platform. It is not mandatory to register. There are approximately 100 specific category operators who have received approval to operate from FOCA. Reporting statistics were not available from the FOCA.

The FOCA run a Drone Industry Association, and this is the main engagement mechanism they use to communicate and share knowledge with the RPAS community.

Swiss Reporting Rules Summary

For unmanned aircraft, there are two different procedures in the reporting system;

1. All drone operators/remote pilots are obliged to report accidents and serious incidents immediately to the Aviation Division of the Swiss Transportation Safety Investigation Board (STSB) via the REGA alarm center.
2. All drone operators/remote pilots must report all incidents related to safety (such as incidents in connection with failure or malfunction of the emergency systems, navigation systems or propulsion systems without damage) to the Federal Office of Civil Aviation (FOCA) or the reporting system of the organisation concerned within 72 hours. Incidents, serious incidents, and accidents involving unmanned aircraft are exempted from this obligation to report, provided that no serious or fatal injury to persons is recorded and no crewed aircraft are involved.

Voluntary reports can be submitted and are encouraged, which are not covered by the mandatory reporting obligation. Further information on what is considered an accident, serious incident or an incident can be found on the SRM section of the FOCA website.

The figure here is an excerpt from the Guidance Material on Emergency Response Plan (ERP) available in the FOCA website, which illustrates in a visual and a simple way the occurrence reporting requirements.

2.5.5 Netherlands CAA

The Netherlands CAA has a small team of experts looking after certification and oversight of drone flyers and operators. The registration of drones is managed by the Dutch CAA for all categories including certification of the specific category operators.

There are approximately 33,000 registered users within the Netherlands. Oversight is only conducted on the specific category operators with the Police responsible for oversight of the open category.

There are approximately 170 operators with specific operational authorisations within the Netherlands.

Oversight of operators within the Netherlands is focused on the progressive implementation of Safety Management Systems within the specific operators. Safety reporting has been identified as an improvement opportunity in the Netherlands. Cultural activities are noted as critical by the Netherlands CAA.

The Netherland CAA Reporting Tool

In accordance with Regulation (EU) No 376/2014 it is mandatory to report occurrences in civil aviation.

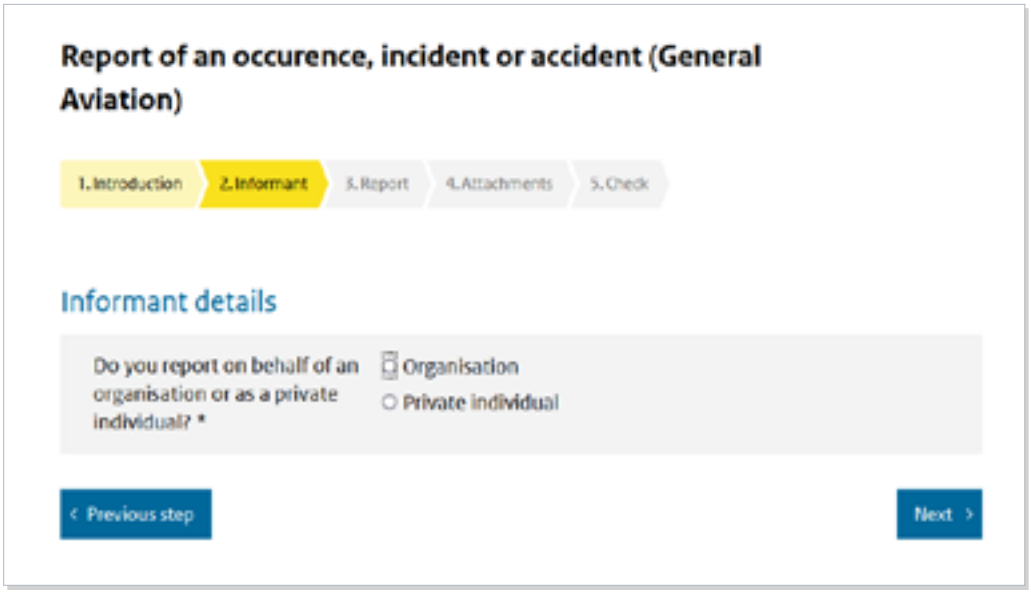
The CAA has provided guidance to all operators to clarify to what authorities that individual should report an incident.

Online Reporting Guidance:
Voorvallen luchtvaart | Inspectie Leefomgeving en Transport (ILT) (ilent.nl)

There is a specific category for ‘drones’ and the guidance is as follows:

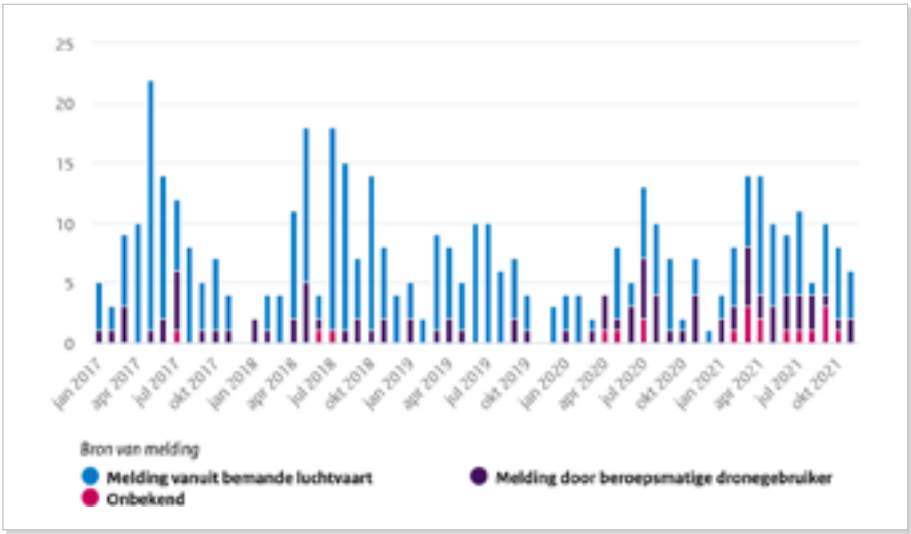
“I am a pilot who flies drones. Report an incident via the safety management system of your flying club or company or use the General Aviation report form.”

Report of an occurrence, incident or accident (General Aviation) | MijnILT (ilent.nl)



The Netherlands has a public access Aviation Incident Analysis Dashboard that presents statistics on aviation incidents. The dashboard includes a category for drones/RPAS. A snapshot of the information can be seen on the map below. The three categories are:

1. Blue - The Notifications from manned aviation.
2. Purple - Notification by professional drone users
3. Unknown aircraft



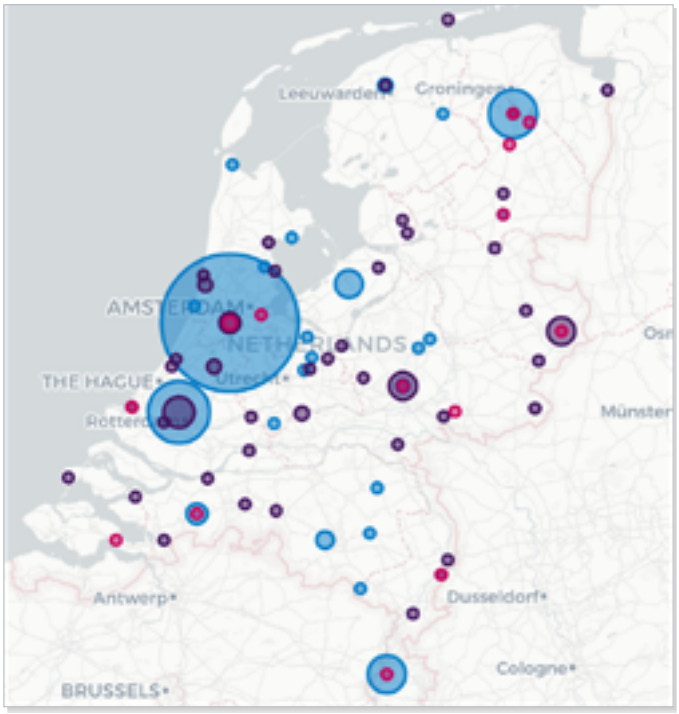
Aviation Incident Analysis Dashboard (Analysebureau Luchtvaartvoorvallen) (rijkscloud.nl

The trend for 2021 is for no more than 14 per month with self-reporting by drone users at a rate of less than 5 per month. The AIA dashboard also presents a geographical layout of the incidents by post-code.

Anecdotal evidence of studies within the Netherlands of auto-detection of infringements at major airports.

Study Observation

The CAA should look to see how dashboards with information on reports could be utilised to engage with the RPAS community.



2.5.6 North Amercia RPAS Reporting – USA

Regulations

The Federal Aviation Administration (FAA) define rules for drone or UAS operations under 25kg within Title 14 of the Code of Federal Regulations (CFR) Part 107, referred to as the Small UAS Rule. However, they provide a limited statutory exception to those who wish to fly purely for recreational purposes provided a basic set of requirements are met.

Authorisation and Training

The Recreational UAS Safety Test or TRUST is available for recreational flyers.

All other operators require a Part 107 certification.

Registered Drones and Operators

As of 15 February 2022, the following number of registrations and certifications were communicated by the FAA:

1. 859,998 drones registered
   a) 328,171 commercial drones registered
   b) 529,239 recreational drones registered
   c) 2,588 paper registrations
2. 262,964 Remote pilots certified
3. 204,565 TRUST completion certificates issued by test administrators

https://www.faa.gov/uas/resources/by_the_numbers/

Reporting Systems

Part 107 defines the rules for accident reporting (shown as an extract here).

§ 107.9 Accident reporting.

No later than 10 calendar days after an operation that meets the criteria of either paragraph (a) or (b) of this section, a remote pilot in command must report to the FAA, in a manner acceptable to the Administrator, any operation of the small unmanned aircraft involving at least:

(a) Serious injury to any person or any loss of consciousness; or

(b) Damage to any property, other than the small unmanned aircraft, unless one of the following conditions is satisfied:

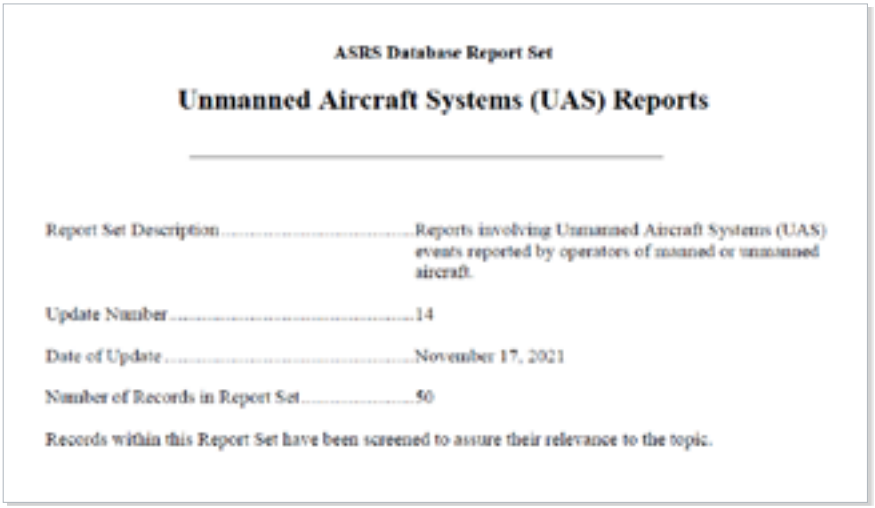
(1) The cost of repair (including materials and labor) does not exceed $500; or

(2) The fair market value of the property does not exceed $500 in the event of total loss.

Accident reporting is managed by the Office of Accident Investigation & Prevention within the FAA and analysis and sharing of information managed by the ASIAS Programme.

Other deficiencies within the system can be reported on a voluntary basis to the NASA Aviation Safety Reporting Program (ASRS) Program, defined under AC 00-46F Aviation Safety Reporting Program. This system has been recently extended to cover UAS operations and provides certain protections to those that report. https://asrs.arc.nasa.gov/uassafety.html

A sample of occurrence reports are provided publicly via the ASRS.



ASRS Database Report Set

Unmanned Aircraft Systems (UAS) Reports

Report Set Description	Reports involving Unmanned Aircraft Systems (UAS) events reported by operators of manned or unmanned aircraft.
Update Number	14
Date of Update	November 17, 2021
Number of Records in Report Set	50

Records within this Report Set have been screened to assure their relevance to the topic.

https://asrs.arc.nasa.gov/docs/rpsts/uas.pdf

The FAA has extended the Aviation Safety Reporting Program (ASRP) to UAS operators, including the protections offered through National Aeronautics and Space Administration's (NASA) Aviation Safety Reporting System (ASRS). NASA's ASRS has a reporting form tailored to the UAS community. This will ensure that the safety data that is collected will result in actionable information for the entire aviation community.

The FAA's ASRP enables a non-punitive avenue for anonymous reporting. If users file a report with NASA's ASRS, the FAA considers this to be evidence of a constructive attitude.

Therefore, even if a finding of a violation is made, a civil penalty or certificate suspension will not be imposed if:

- The violation was inadvertent and not deliberate;
- The violation did not involve a criminal offence, accident, or action under 49 U.S.C. § 44709, which discloses a lack of qualification or competency, which is wholly excluded from this policy;
- The person has not been found in any prior FAA enforcement action to have committed a violation of 49 U.S.C. subtitle VII, or any regulation promulgated there for a period of five years prior to the date of occurrence; and
- The person proves that, within 10 days after the violation, or date when the person became aware or should have been aware of the violation, he or she completed and delivered or mailed a written report of the incident or occurrence to NASA.

ASRS captures confidential reports, analyses the resulting aviation safety data, and disseminates vital information to the aviation community. This system is completely confidential, voluntary, and non-punitive. Anyone can use this reporting system, including bystanders.

Study Observation

The CAA could adopt some of the different triggers that the Federal Aviation Administration (FAA) has such as having a financial threshold upon which to report and extending the time period for report submission from 72 hours to ten days – these trigger changes may encourage reporting and therefore improve reporting levels.

ASRP Report Processing Flow

2.5.7 Asia/Pacific RPAS Reporting – Australia

Australian Government
Australian Transport Safety Bureau

Date range: From 01/09/2020 to 01/10/2022
Location: All
Occurrence Type: All
Aircraft and Airspace: Aircraft Type: Remotely Piloted Aircraft
Highest Injury Level: All

Date	ATSB Reference Number	Category	ATSB Investigation	Location	State	Aircraft Manufacturer	Model	Operation Type	Operation Sub Type	Airspace Type	Airspace Class	Summary
[redacted]												
[redacted]												
[redacted]												
[redacted]												

Australian RPA Community

The number of remotely piloted aircraft (RPA) in Australia is unknown. Estimates of the number of RPAs used for recreational purposes range from 50,000 to hundreds of thousands. As of October 2020, there were over 2,000 remote operator certificate holders.

Air Transport Safety Bureau (ATSB)

The ATSB has three main reporting systems. A mandatory scheme, a voluntary scheme (REPCON) and the Aviation Self-Reporting System (ASRS).

Mandatory Occurrence Reporting

On 30 September 2021, new Transport Safety investigation Regulations 2021 came into force, requiring remotely piloted aircraft operator certificate holders to report safety incidents to the ATSB.

The new requirements will allow the ATSB to properly measure, investigate and report on safety trends in the RPA sector with the aim to assist safety investigations and help prevent future accidents.

Under the revised requirements, operators will be required to report immediately to the ATSB any occurrences involving death or serious injury, accidents, loss of a separation standard with aircraft and serious damage to property.

Less serious incidents and occurrences are required to be reported to the ATSB within 72 hours.

Reports can be made via online notification or by calling 1800 011 034.
https://www.atsb.gov.au/mandatory/asair-form/

Voluntary System (REPCON)

REPCON is a voluntary and confidential reporting scheme. REPCON allows any person who has an aviation safety concern to report it to the ATSB confidentially. Protection of the reporter's identity and any individual referred to in the report is a primary element of the scheme.

https://www.atsb.gov.au/voluntary/repcon-aviation.aspx

Aviation Self-Reporting System

In addition to REPCON, and similar to the FAA system, the ASRS accepts voluntary reports. The ASRS allows for self-reports of unintentional regulatory breaches by pilots who are seeking to claim protection from administrative action by CASA. Within the ASRS, If the report is accepted, evidenced by the return receipt, the reporter may use the receipt to claim protection from administrative action by CASA for the contravention. https://www.atsb.gov.au/voluntary/asrs/asrs_more.aspx

RPA Safety Occurrence Statistics

The ATSB report that since 2016, remotely piloted aircraft (RPA) have surpassed helicopters to become the second most common aircraft type involved in an accident. A summary of the occurrence data from the publicly available ATSB National Aviation Occurrence Database site can be seen below.

Year	Encounter with RPA	RPA Only Occurrences
2016	88	41
2017	147	40
2018	159	84
2019	198	76
2020	46	74
2021 (July)	23	65
Total	**661**	**380**

These figures relate to other aircraft encounters with an RPS or just an RPS only event. The RPA encounters are split into the following three categories

- Airspace - Encounter with RPA - Collision with RPA
- Airspace - Encounter with RPA - Near encounter with RPA
- Airspace - Encounter with RPA - Sighting

Review of the information highlights that 380 events are reported directly by the RPA flyer / operator. These events generally occur in Class G airspace and only involved damage to the aircraft with no impact to other vehicles or humans.

Australian Government
Australian Transport Safety Bureau

Date range: From 01/01/2020 to 07/10/2022
Location: All
Occurrence Type: All
Aircraft and Airspace: Aircraft Type: Remotely Piloted Aircraft
Highest Injury Level: All

Date	ATSB Reference Number	Category	ATSB Investigation	Location	State	Aircraft Manufacturer	Model	Operation Type	Operation Sub Type	Airspace Type	Airspace Class	Summary
[illegible]	[illegible]	Accident		[illegible]	QLD	[illegible]	[illegible]	Aerial Work	Survey / Photography	DCTA	G	During aerial survey operations, the remotely piloted aircraft lost power and collided with terrain resulting in substantial damage. The post-flight inspection revealed corrosion on the battery terminals.
[illegible]	[illegible]	Accident		[illegible]	QLD	[illegible]	[illegible]	Aerial Work	Survey / Photography	DCTA	G	While conducting aerial mapping, the remotely piloted aircraft descended uncommanded and collided with terrain resulting in substantial damage.
[illegible]	[illegible]	Incident		[illegible]	NSW	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	During aerial surveillance, the crew of the remotely piloted aircraft (RPA) observed an aircraft at the same level approximately 100 m from the RPA. Both aircraft manoeuvred to establish separation.
[illegible]	[illegible]	Incident		[illegible]	QLD	[illegible]		Aerial Work	Survey / Photography	DCTA	G	While conducting aerial work, the RPA malfunctioned resulting in the remotely piloted aircraft losing altitude and subsequently colliding with terrain.
[illegible]	[illegible]	Incident		[illegible]	NSW	[illegible]	[illegible]	Aerial Work	Survey / Photography	[illegible]	G	During survey operations, the remotely piloted aircraft lost power and collided with terrain resulting in minor damage.
[illegible]	[illegible]	Accident		[illegible]	QLD	[illegible]		Aerial Work	Survey / Photography	DCTA	G	During aerial operations, the remotely piloted aircraft became unresponsive to control inputs and collided with terrain resulting in substantial damage.

Study Observation

The ATSB National Aviation Occurrence Database is an easy-to-use website where the public can access information related to other reported occurrences.

The number of reports directly by the RPA community represents a higher level than the UK and the opportunity for reporting numbers in the UK.

The use of the ASRS enables reporters to claim protection from administrative action by CASA.

2.6 Good Practice – UK Military Aviation Authority

2.6.1 Overview of Military Aviation Authority (MAA) Reporting

The MAA promotes proactive reporting of air safety concerns by personnel from across the Defence Air Environment (DAE) and views it as fundamental in maintaining continual awareness of the risks facing military operations and personnel.

To enable and facilitate such reporting, the MOD provides a standardised reporting format and management system for DAE personnel to use. Unlike the civil aviation reporting process, the MAA's Reporting Process is similar but not strictly based on Reg (EU) 376/2014 or CAP722.

Air Safety Information Management System (ASIMS)

Military personnel can create and submit a safety occurrence report ASIMS - an internal Ministry of Defence tool used for the reporting, management and exploitation of air safety occurrence and investigation information.

ASIMS is a dynamic system allowing the most up to date information to be recorded as it becomes available. However, the reporter must undertake the appropriate training package for their role/ requirements prior to gaining access to the reporting function of the system.

The reports received by the MAA through ASIMS are generally complete and do not lack any relevant detail. Most reports are currently received from a military testing unit conducting drone and RPAS flights for research purposes.

General overview

A regiment can acquire a drone using its own regiment funds allocated to equipment. When doing so, the regiment is required to provide the MAA with details on its operating intent and foreseen use in operations and training exercises.

However, the regiment is not obliged, legally or otherwise, to keep the MAA updated on the status of its drone fleet, nor must it gain permission for swarm flights or BVLOS operations.

2.6.2 Good Practice – Recognised Assessment Entity

RAEs

RAEs (Recognised Assessment Entities) are managed under CAP722B 'Unmanned Aircraft System Operations in UK Airspace – The UK Recognised Assessment Entity'. This document contains the requirements, administrative processes, instructions, and guidance related to the operation of the Recognised Assessment Entity (RAE) scheme within the United Kingdom.

It also describes the related remote pilot examinations and practical flying tests that will be administered under the RAE scheme. It is primarily intended for the use of organisations that are, or wish to be, approved as an RAE. Two RAEs were interviewed as part of the study;

RAE1

Summary of findings

There is a general concern within RAEs community about the effectiveness of two-day training courses considering the extent of the syllabus. Standardisation of training activities and ensuring a balance of practical and theory is required.

Training is provided to Specific Category and Open Category A2 Certificate of Competency (A2 CofC). These are the approvals where commercial operators work. It was noted that the ability to do commercial work across Open and Specific categories creates a grey area that creates opportunity for operators to not follow the desired rules.

The RAEs provide training on the reporting requirements of CAP722. However, a standardisation of approaches to filing occurrences between CAA, RAEs and RPAS operators would be very beneficial.

Anonymised reporting should also be considered. This would mitigate the view that reporting an accident results in a competitive disadvantage and might result in punitive action.

Access to submitted reports to share within training activities is important. Skywise provides useful information. Anonymised reports would be useful as they provide material for learning lessons with candidates and clients.

The RPAS community is keen to learn and seek latest messages on drone developments. RPAS flyers note the absence of information/regular updates from the CAA (eg on ECCAIRS updates, Legacy versus CE marking on drones, updates to CAP722). As a result, uncontrolled messages from within social media forums drives the messaging.

RAE2

Summary of findings

There are generally two types of members; those from a traditional or military background (their processes are often too complicated or focused on very large drones) and those from a small RPAS operator background who try to be more practical and on the level of the average drone user.

The relationship between RPAS pilots and the CAA varies significantly. New entrants view them as large, distant, and corporate, without any way to communicate with them.

For those that engage via the authorisation process then there is frustration at the lack of consistency in approval process. There is also limited communication on upcoming changes to regulations.

The development of Operations Manuals is often done by third parties or includes additional detail considered too prescriptive to align with the certifying requirements. As a result, RPAS pilots will bend the documented operating procedures to match their needs. They then don't report in fear of being found out that they did not follow their own procedures.

The risk level of drones as perceived by traditional aviation is disproportionately high. RPAS flyers do not see the seriousness of an RPAS crash because no one is hurt.

Similarly, a builder might not report a hammer falling at their building site. CAP722 gives people a choice to report to the CAA (must/may). Simplifying the rules and making it consistent for all will help. Generally, reporting is associated with negative outcomes, eg your insurance can go up.

Reporting tools should be simplified to promote reporting. The number of reporting organisations should also be reduced. Functionality should be introduced to provide initial triage of reports and guide reporter on next steps eg 'Call the AAIB now'.

Study Observation

Training and initial registration/authorisation methods employed by RAEs influence the culture of the RPAS community. For example, RAEs providing end-to-end support to flyers for operational authorisations. Standardisation of RAEs should be considered to ensure consistency of training messages and support activities.

Anonymised reports would encourage more reporting within the industry. Commercial operators believe that reporting will put them at a commercial disadvantage as customers and other suppliers may exploit the report against them.


A2
LUMIX

3.0 Stakeholder Engagement and RPAS Survey

3.1 Stakeholder Engagement Summary

A total of 31 stakeholder interviews were conducted as part of this study. Stakeholders ranged from internal CAA and external stakeholders. In both cases, the stakeholders were either directly involved in the overall process or were invested in the outcome of the process*

The list of stakeholders is provided in Appendix A.

Lessons Learnt and Findings

The summary of findings are included in 2.5 Existing Tools and Processes section (which describes different organisations contribution to the reporting process) and the Good Practice Summary (which describes industry good practice on CAA reporting) in 2.6.

RPAS Survey

Engagement with Open and Specific RPAS Flyers was conducted via a Survey. The results are provided in the document **CAA RPAS Safety Reporting Project - Survey Summary and Results**.

In summary;

The purpose of the survey was to engage the RPAS community on their involvement in the reporting process and to learn about the following topics:

1. RPAS Flyers' previous involvement in the reporting process
2. RPAS Flyers' views on potential obstacles to reporting
3. RPAS Flyers' ideas on potential areas for improvement

Survey Development

The Survey was developed around the following categories:

- Part 1: Awareness of safety-related reporting
- Part 2: About your experience of reporting occurrences
- Part 3: About your views on reporting or sharing the details of a safety-related occurrences
- Part 4: Learning about how the CAA can help and provide support
- Part 5: About how you use drones and model aircraft.

Methodology

Direct Mail
The Survey was sent via email to all open and specific category flyers registered in the UK CAA DMARES System. The survey was sent on 28 January 2022 and was open for responses for two weeks.

Social Media and Supporting Organisations
The following organisations supported the survey distribution through social media or directly to their members / partners and we thank them for their support.

- Knowledge Transfer Network
- UKRI Future Flight Challenge
- ARPAS-UK

CAA Website
The survey was also available via the CAA website and provided extra information to support the survey. The website was viewed 472 times during the survey period.

www.caa.co.uk/consumers/remotely-piloted-aircraft/drone-and-model-aircraft-safety-information/

3.2 Analysing Survey Responses

Analysing Survey Responses

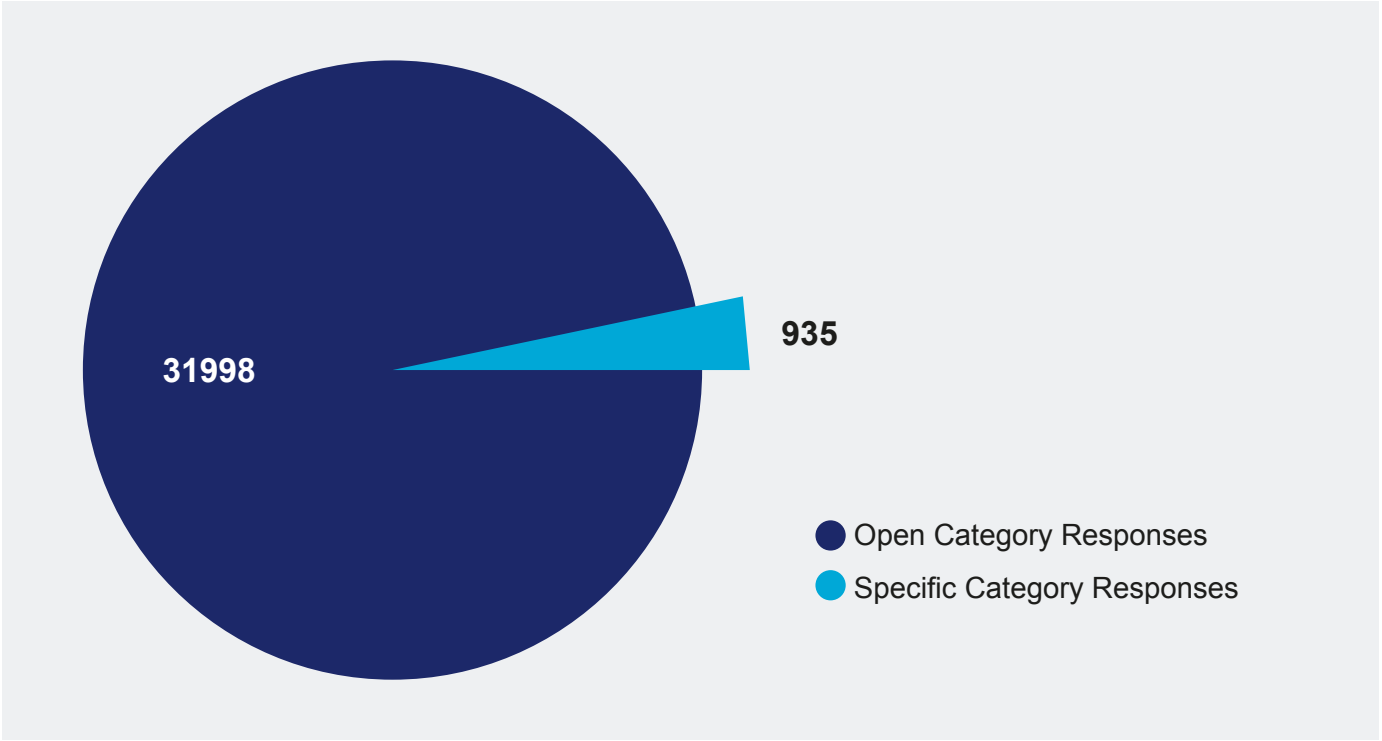
The following responses for the Direct Email Distribution were recorded. A detailed analysis is provided by the document RPAS Safety Reporting Survey Results which inform the overall results and analyses in this report.

Category	Emails Delivered	Opened	Opens %	Survey Responses	Response %
Open	269,726	153,455	56.90%	31998	11.90%
Specific	7,519	4,650	61.80%	935	12.80%
TOTAL	**277,245**	**158,105**	**57%**	**32,933**	**12%**

Responses by Question Area

Category	Question Set	Open	Specific
Part 1: Awareness of safety-related reporting	Q3 to Q4	~26,000	~850
Part 2: About your experience of reporting occurrences	Q5 to Q11	~ 25,000	~830
Part 3: About your views on reporting or sharing the details of a safety-related occurrences	Q12 to Q13	~21,000 (Q12)	~430 (Q12)
Part 4: Learning about how the CAA can help and provide support	Q14 to Q21	~19,000	~630
Part 5 - About how you use drones and model aircraft	Q22 to Q33	~18,500	~636

Responses by Category



The separate CAA RPAS Safety Reporting Project - Survey Summary and Results contains the full details of the Survey purpose, development and results.

4.0 Results and Analyses

4.1 Current UK RPAS Reporting Numbers (All Sources)

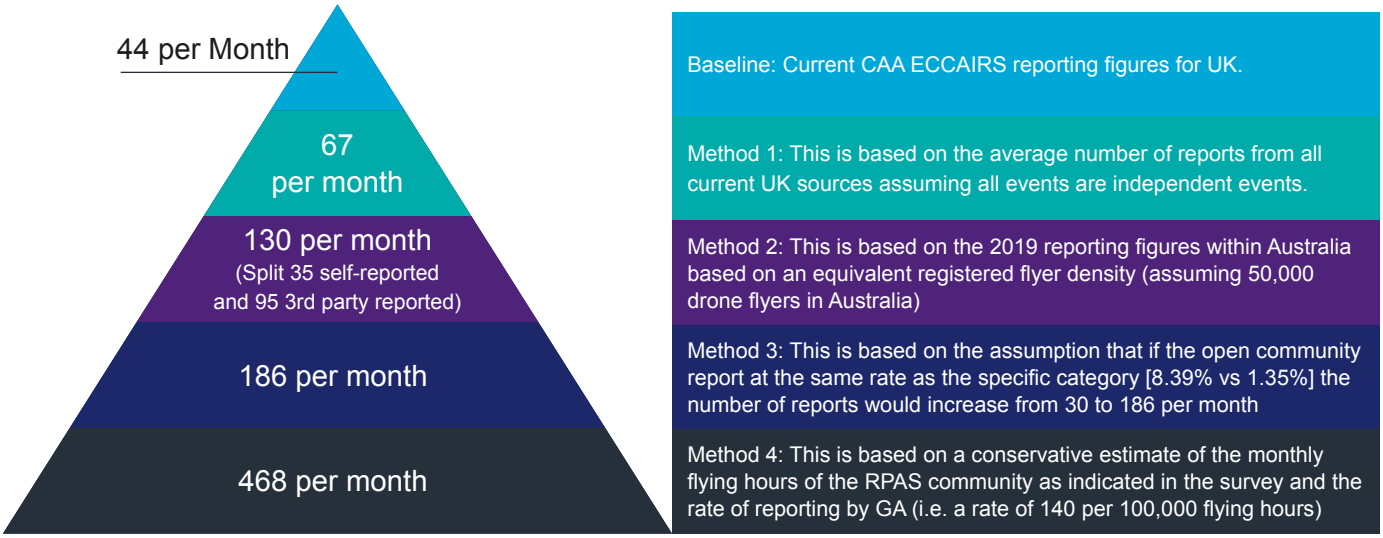
A summary of the UK reporting numbers for RPAS across all sources is presented here. This includes self-reported by the RPAS community and from other third parties including the public.

The reports may also include issues unrelated to safety. It is worth noting that figures are only available from most organisations since 2021 when the new reporting regulations were introduced. During this time, it is considered that flight numbers are not representative due to the restrictions placed on public movement as a result of the COVID-19 pandemic.

The other observation is that the number of automatically generated infringements reports from drone detection systems at airport is significantly higher compared to any other type of event. These events are not considered as part of the benchmark analysis.

Reporting Body	Reports in 2021	Reports in 2020
UTM Provider Reporting Options	Not provided	Not Provided
Air Accident Investigation Branch [AAIB]	129	Not Provided
ARPAS	n/a	n/a
British Model Flying Association [BMFA]	~30	Not Provided
CAA (ECCAIRS)	532	332
CAA Whistle-blower scheme*	20	34
CAA Alleged Breaches of Air Navigation Law [ABANL]	56	70
Confidential Human Impact Reporting Process [CHIRP]	~30	Not Provided
FPV UK	0	0
Insurance Company	Not provided	Not provided
Military Aviation Authority [MAA]	6	Not provided
Own Company SMS	Not provided	Not provided
Police	~12,000**	Not provided
UK Airprox Board [UK AB]	7	Not provided
TOTAL	**810**	**436**
(with Police Automated Infringement) TOTAL	**13,620**	**-**

**Police numbers include automated infringement data which is currently being investigated.



Please note that the number of automatically generated infringements reports from drone detection systems at airport is significantly high compared to any other type of event. These events are not considered as part of the benchmark analysis as they are currently being investigated.

Current UK RPAS Reporting Numbers (All Sources)

The current mandatory occurrence reporting numbers collected by the UK CAA are not considered to be representative of the number of occurrences expected to be reported, based on the comparison with other UK aviation sectors.

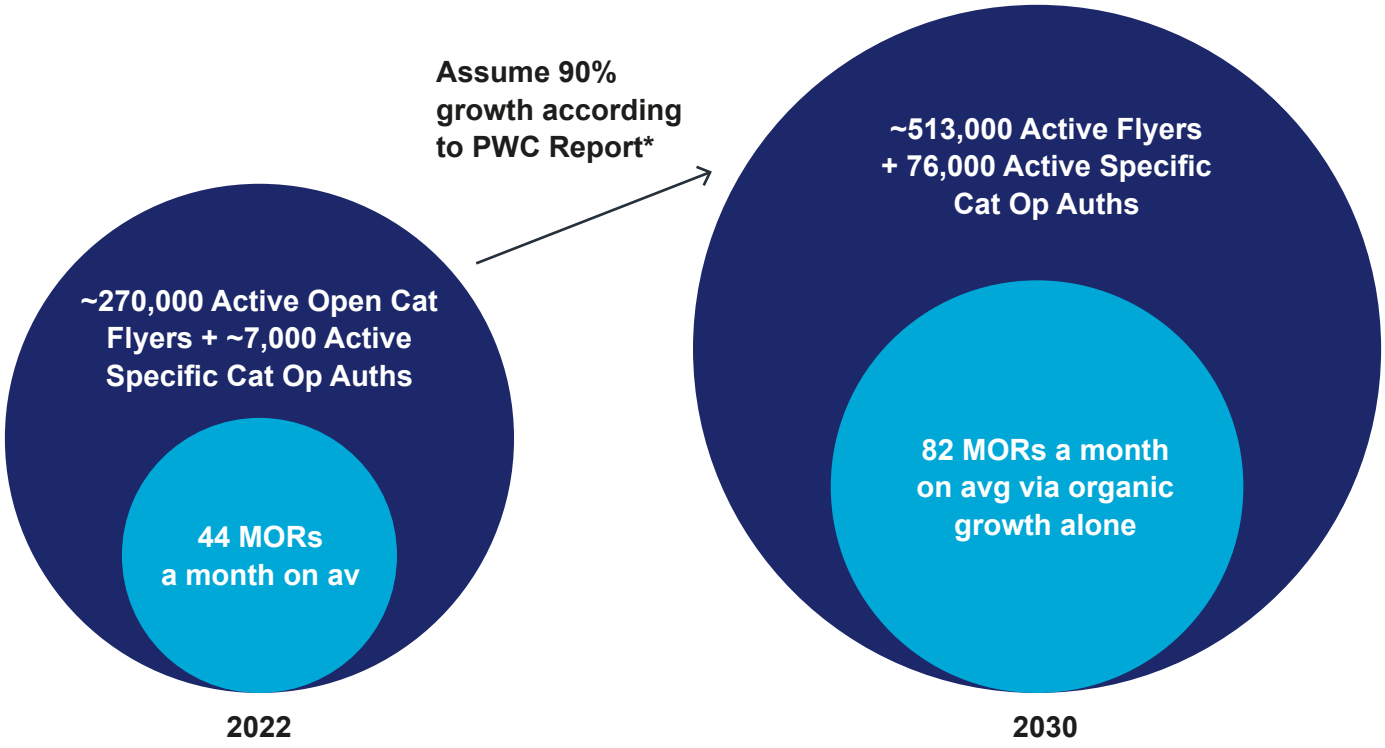
However, as explained in this report earlier, it is not possible to correlate the reporting numbers within the RPAS sector with other aviation sectors with any confidence. This is because there is no relationship between number of aircraft, number of pilots or flyers, the number of flying hours and the number of resulting reports.

Using these different methods a benchmark of number of potential occurrence reports is shown above compared to the current average reporting figures.

Study Observation

The CAA should look to see if they can capture additional data that is used in manned aviation such as number of flying hours, relationship between number of RPAS and flyers etc to ensure there is a baseline of data to compare reporting numbers against.

4.2 Growth in RPAS Operations in the UK



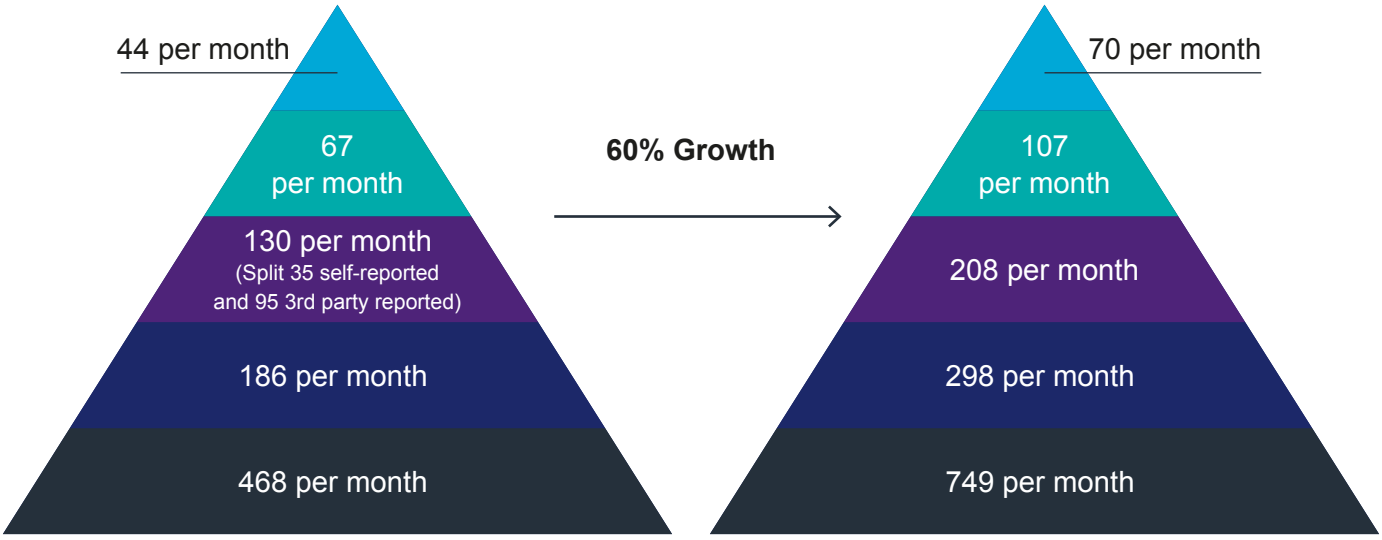
*PWC Report "The impact of drones on the UK economy - Skies without limits", 2018

The organic level of growth within the industry would naturally increase the number of MORs as operations expand that will require action to address the back-end processes regardless of whether additional steps are taken to facilitate an increase in the level of reporting.

4.3 RPAS Reporting Benchmark Future Forecast

Current RPAS Reporting Benchmark of MORs per month we should be receiving for 2022

Forecast of RPAS Reporting Benchmark of MORs per month we should be receiving for 2030



	2022	Benchmark Forecasts for 2030		
		30% growth	60% growth	90% growth
Baseline	44	57	70	84
Method 1	67	87	107	127
Method 2	130	169	208	247
Method 3	186	242	298	353
Method 4	468	608	749	889

The figures within the PWC Report* would require a 90% growth rate on 2022 figures to reach those predicted for 2030 for commercial operations. As previously mentioned, as we do not currently have access to all of the data needed to validate these growth assumptions (number of drones sold, number of drones mapped to a Flyer or Operator, number of drones not registered, number of drones used in the Open Category for Commercial purposes etc) this is intended to offer an estimated growth benchmark to provide some guidance for potential growth in MOR's to be planned to be accommodated for. In order to mitigate some of the unknowns in the data, we have calculated the benchmarks for reporting by 2030 at 30/60/90% growth values to provide a range of optimism and pessimism – but all metrics are a significant increase on current 2022 volumes which need to be planned for.

*PWC Report "The impact of drones on the UK economy - Skies without limits", 2018


CORONAVIRUS
COVID-19
Vaccine

5.0 Improvement Roadmap

5.1 The Roadmap to Change

"The goal of the RPAS Safety Reporting project is to improve the occurrence reporting rates from the RPAS community."

Defining clear goals for the learning system based on the needs of the CAA and the RPAS community is a priority. This will then guide definition of the goals for the reporting system, and not just for mandatory occurrence reporting.

The goal of the RPAS Safety Reporting project is to improve the occurrence reporting rates from the RPAS community. This study has demonstrated that there is indeed a risk with underreporting of events within the RPAS community. Notwithstanding that the reporting system is only one option available to the CAA to learn, there remains significant opportunity to improve the reporting system.

This report has identified a range of measures that are available to the CAA to improve the end-to-end process.

Every process step from;

1. First registration of the drone or model aircraft to…
2. initial training and authorisation and…
3. the flyers' involvement in a report and the sharing of wider industry trends, provides an opportunity to foster a culture that recognises value in being part of an aviation community.

Improving the technical infrastructure and processes within the CAA will also be a key enabler to achieve the CAA's goals.

Finally, the role of the CAA in the reporting system should be clearly defined in the context of the many other stakeholders that require or provide alternative means for both mandatory and voluntary reporting for the RPAS community. Simplifying the reporting landscape is highlighted as a priority.

A strategy is required that demonstrates the value of reporting to the RPAS community and in parallel improves the effectiveness and efficiency of the CAA internal processes. The latter point covers not only the process for RPAS occurrences, but the entire CAA reporting and investigation process managed by the ECCAIRS portal.

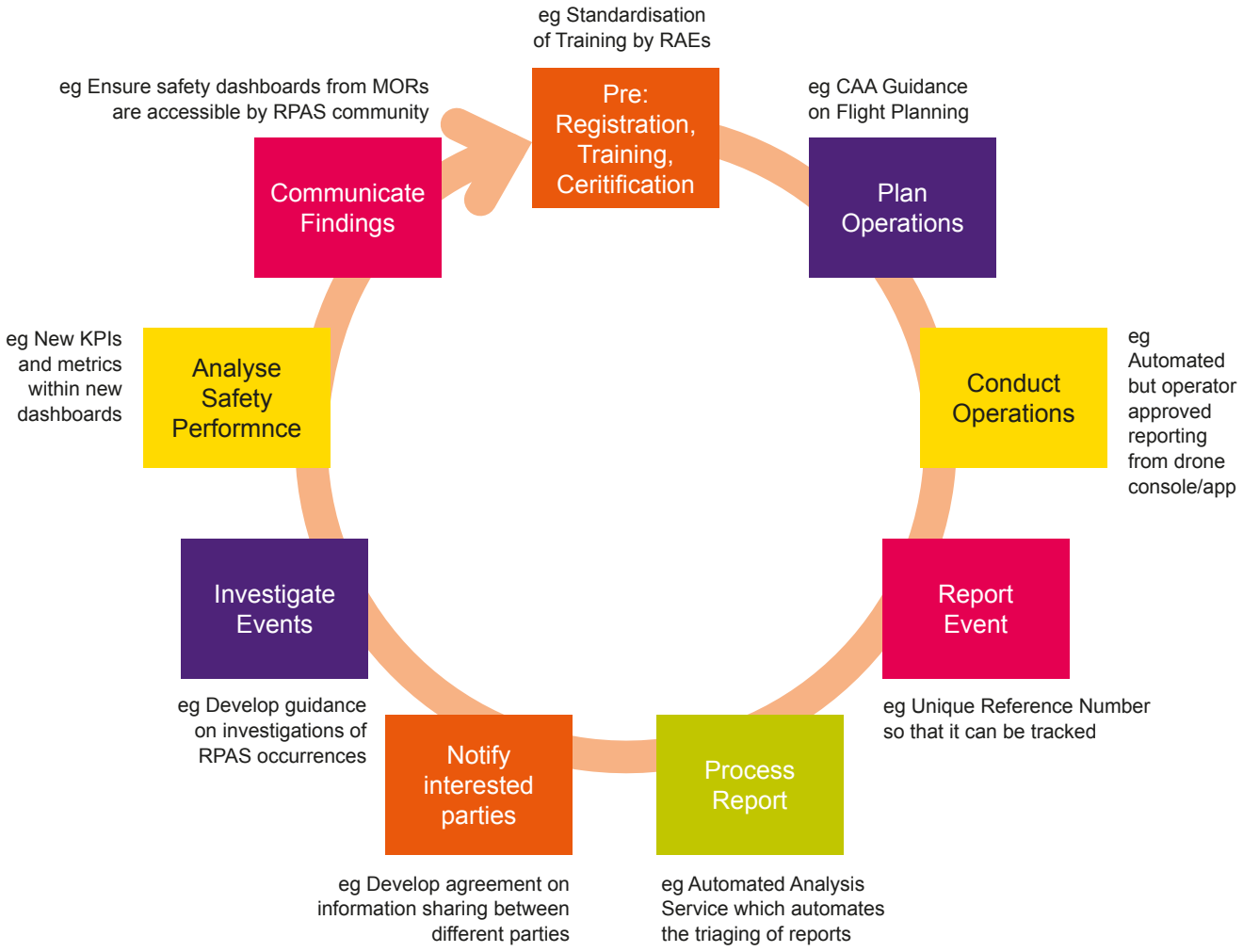
In effect, no matter how many reports are received, if the process is not able to manage the increased number, then the entire system remains ineffective and undermines any reporting improvement.

Strategic capability improvements should then be identified to get the cycle working better and more efficiently over time. Once the goals of a learning system are clear within the CAA then the roadmap can be tailored to ensure that the goals are achieved.

5.2 Improvement Opportunities

Improvement opportunities have been identified covering the end-to-end process. Combined together, they are aimed at improving the relationship between the RPAS Community and the CAA and improving the methods for sharing of information between each other (ie RPAS flyer submitting reports and the CAA shares learnings to all).

Opportunities require internal CAA changes and cross-industry opportunities such as the RPAS community, working with other reporting bodies, UTM providers etc.



5.3 Key Drivers Behind Potential Tech Solutions and Automation

The following outputs from the research and stakeholder feedback have influenced recommendations on technology solutions and automation, examples of which can be seen on the pages below.

- There is mixed feedback from both the stakeholder interviews and survey feedback regarding reporting of occurrences. For example, both Open and Specific Category RPAS users and organisations have "stated" that they have no problem reporting. However, contrary to this, results from other questions clearly demonstrate that there are problems with existing reporting mechanisms.
- Those operators who have formal training, particularly in CAP722 along with organisational operational manual through RAE training, are more likely to report an occurrence. Indeed, the data shows that such users are the ones who are reporting, though numbers are still very low.
- Whilst there is a fear of being penalised, there is evidence to show that operators want to improve overall safety.
- RPAS users are content to report an occurrence, provided they have a level of control over the information submitted (see Q17 of the survey in the **CAA RPAS Safety Reporting Project - Survey Summary and Results**) and that there is reduced confusion on where to report.
- In terms of scale and ensuring the technology and architecture are fit for purpose, the literature research and stakeholder engagement have deduced that the CAA should expect around 468 MORs per month. However, the aim is to ensure the technology will be ready. In terms of scale and ensuring the technology and architecture are fit for purpose, the literature research and stakeholder engagement have deduced that the CAA should expect around 468 MORs per month. However, the aim is to ensure the technology will be ready to scale, as growth predictions could be up to as much as 889 MORs per month by 2030.

5.4 CAA Back-End As-Is Process

A number of opportunities have been identified that could optimise/ improve back-end processing of MORs within the CAA. These could ensure speedier feedback to the RPAS users reporting and to allow the CAA to handle a potential increase in reports in the future.

Stakeholder feedback summary

Generally, it is perceived that little feedback is provided on reporting and some reporters feel that their reports vanish ‘into a black hole’ or a ‘bottomless pit’.

It means potential reporters often lose motivation and do not see value in going through what is perceived as being an arduous reporting process. However, stakeholders largely agreed that providing feedback will be key to increasing the number of reports as reporters will be able to see what the reported data is being used for.

Furthermore, a reporting tool such as an app should include some form of flowchart that shows people how to report and where their submission goes/how it is used.

Tech Solutions

There were several technology solutions suggested for a potential Alpha phase. These included;

- Optimising the back-end processing to include workflow improvements and using robotics and automation
- Creating a new single reporting portal for all reports,
- Creating an API framework to then share those reports between the different bodies for reporting,
- Creating auto-reporting functions via the API from the manufacturers/UTM providers etc.

These technology proposals are being reviewed with internal CAA departments to see what improvements are possible to be adopted and which would require more extensive collaboration and investment to progress.

6.0
What’s Next?

6.1 Foundation of an Effective Reporting System

In the RPAS community, consideration should be given to exploring that all incident reporting should be voluntary, perhaps in the short-term until the community is more mature. Some feedback shows that there may be limited value to mandating further regulatory requirements onto the flyers to report.

Instead, to create an effective reporting process, and in addition to listing the types of activities that we seek to learn about, the CAA should:

1. Work with RPAS operators and flyers to identify types of information that could potentially benefit the industry.
2. Explain why the information is useful and stress that the CAA operates a just and open reporting culture.
3. Provide examples to show flyers what you would like them to report.
4. Make reporting tools as simple as possible. It is more important to receive the notification and then start looking for the details.
5. Communicate and explain the process of reporting, including what the CAA does with the report and what happens to the learning points.
6. Provide feedback to the reporter on the outcome of specific reports and communicate trends in events to the entire RPAS community.

The results of the RPAS Reporting survey conducted as part of this study showed that there is willingness within the community to report.

When asked to document what was considered valuable to report 10,000 people (or one third of the survey population) provided at least one suggestion.

This information should be used to influence the learning process within the CAA and for the CAA to demonstrate that through their responsibilities they can support improvement in the industry that directly benefits the flyers and operators.

Whilst there remains significant benefit in learning from the RPAS community through reporting, it should be accepted that underreporting will always be a problem and therefore should not be made into a prominent problem.

There are other channels to learn, and with targeted effort the CAA can find the information required to support decision making.

6.2 Next Steps

The original aim of this study was for us at the CAA to take the learnings from the Discovery Phase and if we found that the number of safety reports was low, to trial some options of how we could increase the number of safety reports in an Alpha phase before progressing some of these through a Beta phase. However, we decided to not proceed in that direction of travel for the following reasons;

- Key finding that a vast number of stakeholders do not consider themselves to be part of the aviation community and see the operation of their RPAS is more of a 'tool to do their job'. Therefore, traditional aviation techniques and methodologies such as MORs may not be appropriate for all RPAS users. So even if we pursued some options to try and increase reporting, this may 'fall on deaf ears' as this key cultural hurdle is in place.
- A key piece of feedback from the stakeholders was that they do not always receive timely updates from the CAA when they do submit a report – this is largely due to legacy technology and complex back-end processes across multiple teams/departments. So, if we did take actions to increase the volumes of reports – the legacy technology and back-end processes would need to be optimised beforehand. If they were not, an increase in reports could provide further detriment to the feedback already being received on response timings.
- There are a number of smaller initiatives and projects in progress such as an upgrade project to ECCAIRS2, work being conducted on CAP722 etc that may already provide optimisations for reducing some of the barriers to safety reporting that were identified during discovery.

Therefore, the decision was taken to not proceed in to an Alpha phase, and instead do some further work on refining what we found during the Discovery phase – this work was called Discovery Plus – please see the next section for further detail.

6.3 Discovery Plus

'Discovery Plus' will create a roadmap of what actions we can proceed with to address the following;

1. What options do we have to address the key finding that some RPAS stakeholders do not consider themselves to be part of the aviation community? How can we address the fact that they see the operation of their RPAS is more of a 'tool to do their job' and that traditional aviation techniques and methodologies such as MORs may not be appropriate for all RPAS users?
2. What options do we have to optimise the legacy technology and back-end processes to ensure they can handle an increase in reporting volumes to an agreed benchmark current and target level without further detriment to the feedback already being received on response timings?
3. What existing initiatives/projects are already in progress that we believe will provide optimisations for reducing some of the barriers to safety reporting that were identified during discovery?
4. What options were identified during discovery that can reduce some of the barriers to safety reporting outside of the constraints of the above three points, (ie not for those that don't consider themselves to be part of aviation, not back-end processing and not an existing initiative).

This roadmap covering these four key areas will provide a logical path (including any dependencies, pre-requisites etc) with an understanding of cost/time/effort and benefits and success measures for us to complete this programme of work in the future. This is to ensure we are addressing the potential risk that we are not receiving as many safety reports from the RPAS community as we should be and that we do not lose opportunities to influence the RPAS safety landscape through industry feedback and improvements.

7.0 Appendices

Appendix A – Stakeholder Interview List

The following **internal** stakeholders were consulted as part of the discovery phase.
A wide range of Civil Aviation Authority teams, including;

- ABANL and Whistle-blower teams
- CAA Communications
- CAAi
- ECCAIRS2 Project Team
- Head of GA/RPAS unit
- Innovation Hub
- ISD Team
- RPAS Policy Team
- RPAS Sector and SRP teams
- SARG Assurance Team
- SARG ATSI
- SARG Safety Intelligence Team
- Shared Service Centre [SSC]
- Space Team

The following **external** stakeholders were consulted as part of the discovery phase.

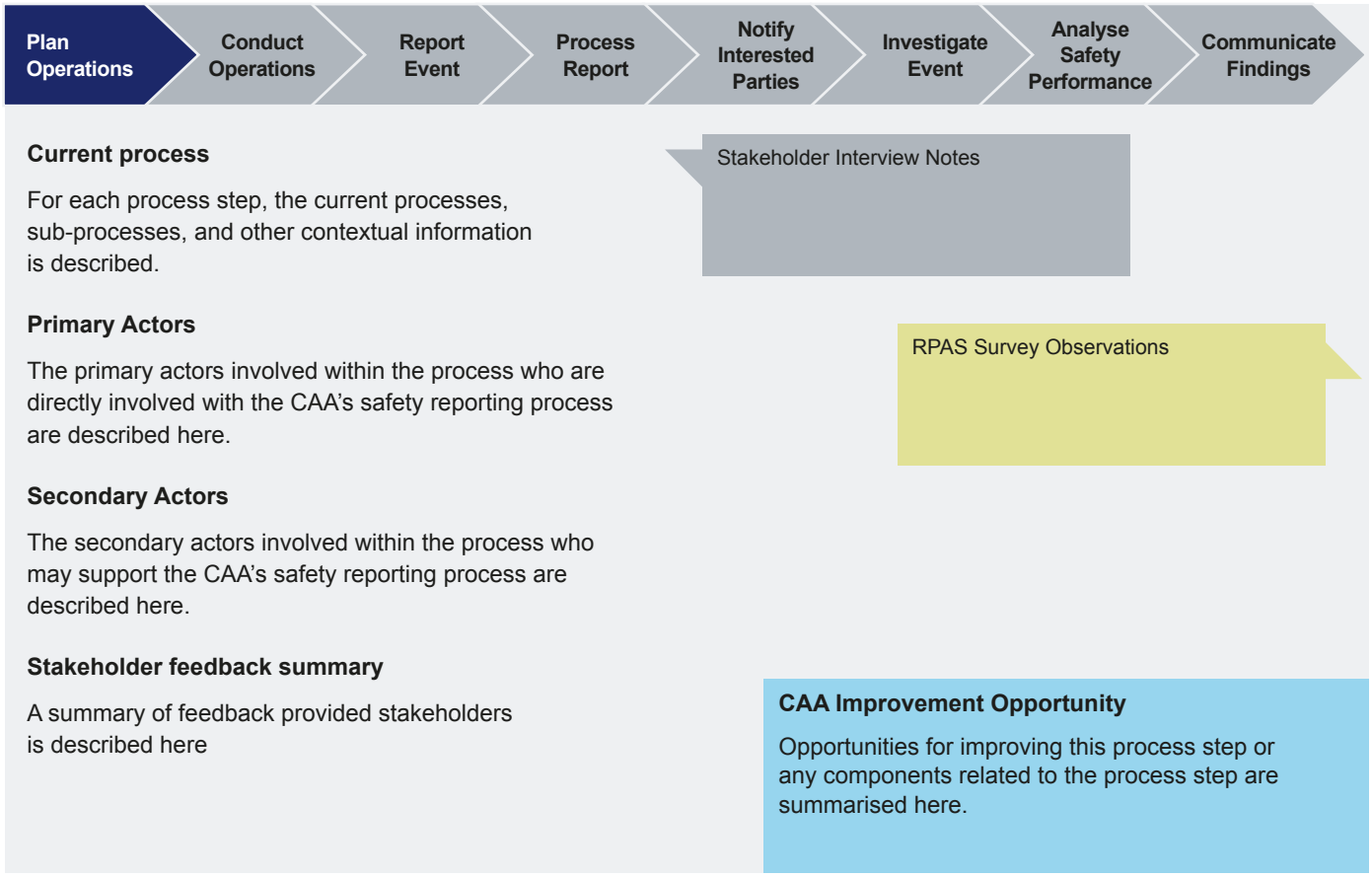
- AAIB
- ARPAS UK
- Astral Aviation
- BJSS Team (support to DMARES)
- BMFA
- CAA (ILT) (The Netherlands)
- CASA (Civil Aviation Safety Authority Australia)
- CHIRP
- Drone Major Group
- Drone Safe Register
- EASA
- FAA (USA)
- FOCA – Swiss Regulator
- FPV
- Military Aviation Authority (MAA)
- RAE's
- RPAS and Model Aircraft Flyers & Operators
- The Department for Transport
- The Police
- UKAB
- UTM Providers

Appendix B – Summary of Process Improvement Opportunities

The results of the findings from the desktop research, stakeholder interviews, and the RPAS flyers survey are described in this section using a series of generic steps that represent the end-to-end process where safety reporting activities can be influenced.

The eight generic steps are shown below. A summary of the current process and the improvement opportunity is described using the format below. Reference to key learnings from stakeholder interviews and the RPAS survey are included to provide evidence and context to the results.

This relates to section 5. Improvement Roadmap.



Appendix B – UK RPAS Reporting Process

Current process

Before take-off, an RPAS operator or pilot may plan their operation (more likely for commercial or complex operations). There are many online tools and apps that allow operators to check whether the area they are planning to fly in is restricted, for example. Furthermore, an operator may consider meteorological forecasts and local features such as trees, buildings, roads and pedestrinised areas before conducting their flight. In some cases, operators may also be required to obtain a permission from local authorities, particularly if the operation is planned to take place near or within restricted airspace.

Primary Actors

Remote Pilot; UAS Operator

Secondary Actors

UTM Providers; ANSPs; Airport / Airfield Operators; Restricted Zone Authority (Non-aviation); Councils

Stakeholder feedback summary

There were varied views shared by stakeholders on the planning of RPAS operations. Firstly, it is felt that CAP722 provides too much guidance and that more clarity on rules would help in communicating the importance of conducting pre-flight risk assessments and detailing information on what to report and how/when to report it is also valuable on the day of flying.

CAP 722 and other regulations and policy documents provide guidance material.

User organisations (like GA flying clubs) could provide support and training in pre-flight planning and operations.

Open Category Users' Feedback: The CAA website dominates the source of knowledge within the open Category at 48.94% with the Drone and Model Aircraft code second at 38.89%. Training or other courses is third most popular at 24.65%.

Specific category Users' Feedback: A range of sources were indicated as being the source of familiarity, but the Training or Other Courses was selected by 73.89% of respondents. CAP722 was the second most selected option with 53.86%.

Educational material could be added as leaflets or stickers to drone merchandise as well as the drones themselves.

CAA Improvement Opportunity

1. *Development of planning guidance / checklists for RPAS community to be published on CAA website.*
2. *Engage organisations with planning tools to identify opportunities to include reporting requirements, other guidance within the tool such as sharing good practices or known hazards in the area they are flying.*

Appendix B – UK RPAS Reporting Process

Current process

RPAS pilots use digital apps or traditional radio controls to fly their aircraft. In general, model aircraft flying requires significant training to successfully fly. For drones, for basic operations the drone can be used very quickly 'out of the box' with limited training.

For recreational flyers, operations are generally conducted either alone or in flying clubs away from other people or restricted zones. For commercial operations these flights are conducted more in urban areas closer to people and also adjacent to restricted airspace such as airports or other critical infrastructure.

During flight, pilots are generally aware of the factors that can compromise the safety of the aircraft, its operator as well as third parties. Weather, communication links, battery performance, obstacles and buildings. Flying adjacent to controlled airspace is also recognized as a key factor in operations. Drone pilots rely on geo-fencing capabilities within the drone to ensure flights do not infringe restricted airspace. However, limitations in implementation of the technology and awareness make this ineffective. Pilots also have tools available to them to support operations.

More broadly, operational considerations related to public confidence, privacy and security impact operations. The lack of awareness in the public about what is allowed is influencing restrictions in the development of the industry.

Primary Actors

Remote Pilot; RPAS Operator

Secondary Actors

UTM Providers

Some commercial companies outsource the production of their ops manuals. If the operator is not involved in writing their own operating manuals, does the pilot know what their own operating parameters are and what and when to report?

There is a vast amount of rules, documents and processes that pilots and operators need to take in to consideration, there is opportunity to streamline.

Open Category Users' Feedback: The majority of responders indicated that they fly their drones a few times a year (60%). With 34% flying several times a month week and only 5% flying a few times a week. The time they fly is largely 1 to 3 hours per month (~75%) with 42% flying less than 1 hour per month.

Specific category Users' Feedback: The responders indicated that they fly through drones several times a month (60%). With only 15% flying several times a week and only 5% flying most days. The time they fly is largely 1 to 3 hours per month.

CAA Improvement Opportunity

1. *Establish and communicate guidance on drone flights, operational considerations and key types of incidents to be aware of – intelligence from RPAS community and previous incidents is a key input.*
2. *Automated but operator approved reporting from drone console / app*
3. *Automated reporting from counter UAS but where CAA can inform operator of infringement (by SMS, email, etc.) and allow operator to respond faster and conversationally.*
4. *Operator approved reporting from the UTM.*

Appendix B – UK RPAS Reporting Process

Current process

To report the event, the reporter has multiple options available to them and the landscape is unclear on who to report to. The CAA promote the online ECCAIRS reporting tool. BMFA and CHIRP have new user friendly systems for reporting and these tools are being used for self-reporting in higher numbers than the ECCAIRS tool. Often, events of a more serious nature (ie, infringements on controlled airspace, Losses of Separation) are reported by third parties such as ATCOs, drone defence systems. Other non-safety related events are being reported through other CAA channels or to the police.

Primary Actors

Remote Pilot; RPAS Operator; Aircrew or ATCOs; Bystanders

Secondary Actors

UTM Providers; ANSPs; Airport / Airfield Operators; Restricted Zone Authority (Non-aviation);

Stakeholder feedback summary

The ECCAIRS portal does not provide RPAS friendly terminology and syntax (eg flight commander, runway, aircraft type etc).

The difficulty in finding the ECCAIRS form for reporting an event is a significant barrier to occurrence reporting within the RPAS community. Furthermore, pilots who have a drone malfunction, lost drone or accident may feel that if the consequences are very minor that the occurrence is simply not worth reporting (eg, a hobbyist whose drone crash lands in a field which nobody sees and where nobody is hurt, no property is damaged is unlikely to make a report).

Drone pilots should be encouraged to report whatever feels unsafe – trust your gut, if it feels unsafe, report it (See it, Say it, Sorted!)

Most RPAS Operators and Remote Pilots are not trained or supported in reporting safety events, unlike e.g. commercial airline pilots.

Commercial pilots usually do not report straight into ECCAIRS but via a dedicated team in their organisation – there is generally no equivalent in RPAS community.

All manufacturers apps used to fly drones should have a 'Report MOR' button that, uses data pre-populated by the pilot (name, location, type of drone etc.) and allows pilot to say why the drone crashed.

Flight plan apps could include a 'Report it' button further reminding the pilot before take-off of their reporting obligations

Open Category Users' Feedback: ~1% of respondents indicated that they had reported a safety-related occurrence in the open category. This is 359 of 26,687 who answered the question. 2.5% of responders [634 responses] indicated that they had given up reporting an occurrence because of the process

Specific category Users' Feedback: Less than 9% of respondents indicated that they had reported a safety-related occurrence. The CAA and AAIB were the primarily bodies that responders reported to. Only a very small number of people had given up reporting an occurrence because of the process.

The severity of many occurrences is perceived as very low and not requiring to be reported

CAA Improvement Opportunity

1. *Re-define the criteria for occurrence reporting to make it easier and more proportionate to the risk of RPAS. (Such as the FAA with an increased reporting window and financial thresholds etc).*
2. *Implement clear voluntary occurrence reporting scheme for RPAS community (in line with other international good practice).*
3. *Simplify the reporting landscape for voluntary and mandatory and ensure there is connectivity between all parties to share information.*
4. *Create a single reporting form for all RPAS reporting that mops up all the others and is on the CAA site. Make it super easy to find and make fields relevant for drone operators.*
5. *Develop form in MS Dynamics (as per the Space reporting) and ensure track and trace on the reports so operator gets feedback.*
6. *Develop a drone reporting API which can be integrated into drone console and UTM – that way reporting can be tailored to what they already do.*

Appendix B – UK RPAS Reporting Process

Current process

MORs and Occurrence reports undergo a manually intensive process upon receipt by the CAA for triaging, cataloguing and analysis. The processing of a report is currently very labour and time intensive and is aided by minimal automation. However, it is important to note that manual processing currently ensures that all pieces of information and evidence relating to an event are assimilated correctly and accurately and that reports are of high quality. Occurrences are passed to the RPAS sector Team as executors and to the Aerodrome / ATS inspectors for information. Other organisations who have reporting tools also triage and analyse the reports and in some cases (CHIRP and BMFA) provide batch reports to the CAA.

Primary Actors

CAA SDT Team, Other Reporting Tool Organisations.

Secondary Actors

Reporter; RPAS Sector Team

Stakeholder feedback summary

There are opportunities to mechanise the process and integrate the workflow processes between departments. It is also essential that the mechanisation processes are designed for management of the process as well as satisfying the technical requirements. Regardless of the number of MORs generated, mechanisation of the data handling process would deliver significant benefit for the CAA.

There are occasional backlogs that build in processing MORs which raises concerns that a significant increase in MORs could overwhelm the SSC team.

There is an urgent need for RPAS / drones specific forms in ECCAIRS to ease the burden and improve the relevance of reporting.

An increased number of reports wouldn't be an issue if the process is more automated and includes an element of machine learning.

Open Category Users' Feedback: Most reporting systems are found relatively easy to use. Outliers are the ABANL, Whistleblower and Police reporting systems where ~10-15% of reporters found them difficult to use.

Specific category Users' Feedback: The AAIB was noted as Very Easy or Fairly Easy to report and it's noted that this a Phone Call reporting system. The CAA ECCAIRS was noted as 'Fairly Easy', but the CAA was the tool that had the largest percentage of responders indicating fairly difficult or very difficult. ABANL and Whistleblower reports were found the most difficult

MORs related to RPAS infringement are not automatically provided to the CAA Airspace Infringement Coordination Group (ICG). This process could be reviewed for improvements.

CAA Improvement Opportunity

1. *Introduce new taxonomy for RPAS events based on intelligence on what is valuable to report (mandatory and voluntary).*
2. *Develop Automated Analysis Service which automates the triaging and field filling. Also correlates MORs for the same incident and ensures conformance to E5X format.*
3. *Develop MS Dynamics workflow – to ensure SDT managers know the workload and also that reporters get feedback*
4. *Integrate automation that exists within other teams in the CAA – including the Safety Intelligence Team as well as external APIs*

Appendix B – UK RPAS Reporting Process

Current process

Once the report has been processed and stored on the ECCAIRS data base, the reports are circled within the CAA to the relevant teams for analysis and subsequent closure once analysis is complete. The report may also be disseminated to other interested parties such as the AAIB, the Police, ANSPs, Airport Operators, and Drone or Model Flying Associations if appropriate.

Primary Actors

CAA (Shared Service Centre)

Secondary Actors

CAA Sector Teams (e.g., RPAS Sector Team); UK Airprox, AAIB; ANSPs; Airports; Associations, Police, other.

Stakeholder feedback summary

Many parties and stakeholders involved observe that there is little to no system-wide information sharing between the receivers of reports, such as the AAIB, CAA, the Police and UK Airprox Board.

You have to be approved to submit a report already in the E5X file format. Heathrow, BA, and Drone Defence are examples of approved reporters who can submit E5X files by email to the CAA. Sometimes you get 4 or 5 reports of the same incident which then often requires human intervention to make sense of it.

Users make reports via the ECCAIRS 2 portal. EASA export the data to the CAA in E5X format for input to the CAA's legacy ECCAIRS 1 database.

"EASA has access to the backend of the data base, while the CAA only has access to the front end. At the moment its quite hard to interrogate the data in ECCAIRS 1."

Data is notified to interested parties within the CAA [and UKAB] by a mailbox based process flow.

Open Category Users' Feedback: Learning from others [77.32%] and receiving feedback from the CAA [53.95%] were the most important issues reported

Specific category Users' Feedback: Learning from others [84.3%] and more freedom in flying due to better understanding of hazards [69.36%] were the most important issues reported

CAA Improvement Opportunity

1. *Identify methods to confirm receipt to originator and explain what may happen (or not) in the next stages of the process.*
2. *Develop agreement on information sharing between different parties.*
3. *Enable track and trace features to give feedback to original reporter.*
4. *Ensure the integrations with UTMs and drone consoles / drone apps are two way and allow feedback*

Appendix B – UK RPAS Reporting Process

Current process

The AAIB investigates reported accidents and provides feedback to the reported. The CAA will also open an investigation in this case. Reported AIRPROX events are investigated separately by the UKAB.

Occurrences reported via ECCAIRS are logged and triaged by the CAA shared services centre and passed to the RPAS sector team for investigation. ATS inspectors are notified of the occurrences in their areas of responsibility. The AAA ATSI team are not involved in the investigation process.

During an investigation, further information and evidence may be gathered to better understand the event and its causes. If details are available, a CAA Analyst may contact the reporter to clarify any information provided. This information is added to the analysis and final investigation report.

Primary Actors

CAA (RPAS Sector Team); Reporter, AAIB, UKAB

Secondary Actors

UTM Providers; ANSPs; Airport / Airfield Operator; Restricted Zone Authority (Non-aviation); Councils

"The safety data team will, if applicable, open an investigation (this is always true when the AAIB is involved)."

"Issues with the reporting portal and anonymised submissions make subsequent investigations very difficult."

Open Category Users' Feedback: Responders (80%) are supportive of using data stored within the aircraft or the mission planning applications to support reporting and thus investigation. 65% of respondents said that control of what is submitted remains with the pilot.

Specific category Users' Feedback: Responders (81%) are supportive of using data stored within the aircraft or the mission planning applications to support reporting. 66% of respondents said that control of what is submitted remains with the pilot.

CAA Improvement Opportunity

1. *Develop guidance on investigations of RPAS occurrences.*
2. *Ensure these longer workflows are incorporated into the MS Dynamics workflows and good integrations with other internal teams within CAA*
3. *Ensure that correlations between MORs for the same incidents are (as far as possible) automatically identified – or at least recommended to CAA / AAIB staff.*

Appendix B – UK RPAS Reporting Process

Current process

The Safety Intelligence Team are responsible for collating, analysing and presenting the UK Aviation Industry's Safety Performance data using all occurrence reports (mandatory and voluntary). The results of the team's Safety Performance Analysis are published with the CAA's publicly available 'Aviation Safety Reviews'. In addition to the CAA, the UK Airprox Board analyses safety performance from an Airprox perspective. Similarly, other stakeholders such as AAIB and the Police conduct further analyses to identify safety performance and other trends.

Primary Actors

CAA (Safety Intelligence Team)

Secondary Actors

UK Airprox Board; Police; AAIB

Stakeholder feedback summary

Reports are generally quite detailed, but the system is not really set up for RPAS. It thus is difficult to make trend analyses tailored and relevant to RPAS with criteria used for manned aircraft. Similarly, trend analyses are not meaningful given the very small volume of data available. Other stakeholders have also expressed lack of resources as a barrier to more comprehensive safety performance analyses, but there is generally a desire to make trend analyses and safety performance data publicly available for the RPAS community.

"The CAA feed reports into ECCAIRS where they are categorised."

The RPAS Sector Team deals with occurrences that are associated with aircraft technical errors, MACs involving UAS, occurrences involving model above 25kg and occurrences

Open Category Users' Feedback: Safety reports from other flyers (65%) and rules on where to fly (74%) and training or other briefing material (58%) are the most preferred information types that the open category would welcome

Specific category Users' Feedback: Safety reports from other flyers (73%), rules on where to fly (60%), training or other briefing material (55%) and statistics on reporting across the RPAS industry (43%) are the most preferred information types that the specific category would welcome

"Reports come in various formats through automated E5X others come as emails and then we have to upload them to the system. There's a significant amount of manual processing of reports."

CAA Improvement Opportunity

1. *With the new API, workflow and forms that they reflect the RPAS community whilst still able to comply with ECCAIRS E5X format*
2. *Ensure that KPIs and metrics within new dashboards are not just cookie cut of General Aviation but are relevant and specific to RPAS community*
3. *Ensure trends and safety feedback is given back to the RPAS community.*

Appendix B – UK RPAS Reporting Process

Current process

In some cases, the aviation authority investigating the event (eg, AAIB) will facilitate a dialog with, and will feed back to, the reporter. However, the CAA's ECCAIRS process does not currently provide feedback to reporters on the status or value of their report. Furthermore, there are few dashboards easily accessible to the RPAS community that share safety insights and trends arising from reports from which the RPAS community can learn.

Primary Actors

CAA; AAIB; Remote Pilot; UAS Operator

Secondary Actors

UTM Providers; ANSPs; Airport / Airfield Operators; Restricted Zone Authority (Non-aviation); Councils

Stakeholder feedback summary

Generally, very little feedback is provided, and reporters feel that their reports are not actions. Reporters note this as an obstacle and do not see value in going through the arduous reporting process. Stakeholders agreed that providing feedback will be key to increasing the number of reports as reporters will be able to see what the reported data is being used for.

Reporters should be given feedback on the status on their report or whether their report made a positive change.

The current reporting process is perceived by some in the industry as a 'blackhole' which is demotivating.

Any developed APP or API should include some form of flowchart that shows people how to report and where their submission goes / how it is used.

Open Category Users' Feedback: Learning from experiences of others is seen as the most significant benefit (77%) to reporting. Linked to this was the most importance of providing feedback to the reporter of the events (54%). Second most indicated (70%) was the benefit of more freedom in flying due to better understanding of hazards.

Specific category Users' Feedback: Learning from experiences of others is seen as the most significant benefit (85%) to reporting. Linked to this was the most importance of providing feedback to the reporter of the events (55%). Second most indicated (69%) was the benefit of more freedom in flying due to better understanding of hazards.

CAA Improvement Opportunity

1. *Ensure that a Unique Reference Number (URN) not necessarily tied to E5X (which is further in the process) is given straight away – so that an operator knows that their report hasn't vanished but somebody is looking at it.*
2. *When reports transition through stages, feedback (appropriately) to original reporter and automate logging of comments that arrive via email or via the web form. Ensure they have access all the way through the process*
3. *Ensure there is only a single place they need to report and that it is easy to find and at the start of the reporting process, where the report goes is fully given.*
4. *Ensure safety dashboards from MORs are accessible by RPAS community so they can see the improvements and participate in Just Culture*
5. *Identify other information types that could be made available within the reporting tool to support RPAS community (e.g. rules on where to fly etc).*

Appendix C – About The Consortium

Civil Aviation Authority – CAA

The CAA is a public corporation established by Parliament in 1972 as an independent specialist aviation regulator. The UK Government requires that the CAA's costs are met entirely from charges to those they provide a service to or regulate.

As the UK's aviation regulator, the CAA works so that:

- the aviation industry meets the highest safety standards,
- consumers have choice, value for money, are protected and treated fairly when they fly,
- through efficient use of airspace, the environmental impact of aviation on local communities is effectively managed, and CO_2 emissions are reduced,
- the aviation industry manages security risks effectively.

For more information about the CAA and its work, visit:
https://www.caa.co.uk/Our-work/About-us/Our-role/

Ebeni

Ebeni is a Safety Consultancy enterprise whose core business is the assessment and assurance of safety and mission-critical operations, applications and products in the aerospace, defence, and ATM markets. Ebeni also provides regulatory and airworthiness support, project and risk management services. Ebeni assembled and led the RPAS Safety Reporting project delivery team for the CAA.

For more information, visit; https://www.ebeni.com/about/

To70

To70 is an international aviation consultancy providing research and advisory services to the aviation community. To70 support aviation authorities, service providers and airspace users develop strategies to improve the safety, efficiency and environmental performance of the airspace system. In the UK, To70 provide support to the Future Flight Challenge and led the recent development of the UK Future Flight Vision and Roadmap published in August 2021.

For more information, visit; https://to70.com/

TekTowr

TekTowr is an engineering solutions company. Founded in December 2018, TekTowr brings to market new, innovative products and services within safety-critical, security-critical software environments. It uses DevOps, machine learning, virtual and augmented reality, distributed ledger, embedded and IoT technologies in the aviation, manufacturing and automotive sectors.

For more information, visit; https://www.tektowr.com/about#about