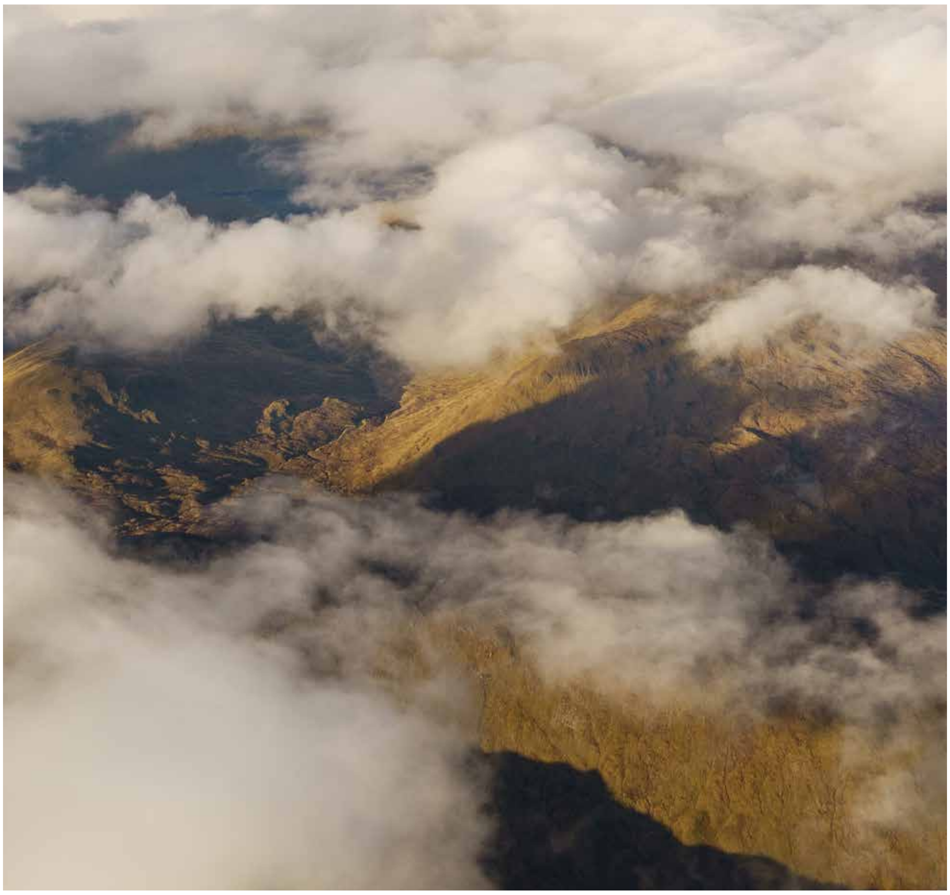
AAIB

Air Accidents Investigation Branch

Annual Safety Review 2019



Published 6 July 2020

Enquiries regarding the content of this publication should be addressed to:

Air Accidents Investigation Branch
Farnborough House
Berkshire Copse Road
Aldershot
Hampshire
GU11 2HH.

enquiries@aaib.gov.uk

This document is also available in electronic (pdf) format at www.aaib.gov.uk

Foreword

I am pleased to introduce this Annual Safety Review which includes information on occurrences and the safety action taken or planned in response to AAIB investigations concluded in 2019. It may seem strange that we are publishing this review in the midst of a pandemic that has had such a profound effect on aviation in 2020. However, last year's events are no less significant because of what has followed. As attention focuses on restart and recovery, the key safety messages are as a relevant as ever.

Investigations

The AAIB received 826 occurrence notifications in 2019 and opened 37 field investigations, eight of which were into fatal accidents in the UK resulting in 10 deaths. A further 124 investigations were opened by correspondence. In addition, the AAIB appointed an accredited representative to 96 overseas investigations, including 45 involving UK registered aircraft.

The AAIB deployed on investigations to Belgium, USA, Ethiopia, Chile, UAE, Italy, Portugal, Montserrat and Kazakhstan. Globally, the most prominent event was the loss of a second Boeing 737 Max in Ethiopia which led to the grounding of the fleet and a fundamental review of certification regimes and other systemic issues.

Closer to home, the loss of a Piper Malibu a few miles north of Guernsey, led to a complex and high-profile investigation that drew attention to two significant safety issues – the risks associated with unlicensed charter operations, and the need for carbon monoxide detectors with an active warning. This was one of two AAIB investigations conducted in 2019 which involved operations to locate and gather evidence from aircraft wreckage on the seabed. An article on how we set about these operations is included in this Annual Safety Review.

In 2019 all the fatal accidents that we investigated in the UK involved general aviation aircraft or gliders with the most common factor being loss of control in flight. The most common factor in commercial air transport accidents and serious incidents was system/component failure or malfunction. The AAIB published two Special Bulletins, 29 Field Investigation Reports and made 12 Safety Recommendations. Details of them all are in the pages that follow, together with updates on the status of responses received and the action being taken. Also included are details of 153 significant safety actions taken by manufacturers, operators and regulators to address safety issues identified during AAIB investigations.

I am pleased to report that some progress has been made by the industry and regulators towards the introduction of takeoff acceleration monitoring systems following safety recommendations of global concern raised by the AAIB and others in 2018. However, the AAIB investigated five more takeoff performance serious incidents in 2019, showing why these systems are urgently needed.

Developments

Within the Branch, major projects last year included the development of a sophisticated case management system that exploits modern digital collaborative tools to manage investigations from notification to closure. It will allow us to meet all legal requirements, including evidence and wreckage management, and provide a rich source of safety data for future exploitation.

Other changes included the introduction of a 'record only' option for some less serious occurrences allowing us to focus AAIB expertise and investigation resources where the safety benefit is greatest. And by publishing our field investigation reports on-line as soon as they are ready, rather than wait for up to six weeks for the next monthly bulletin, we have reduced overall timescales to publication.

Collaboration between the Air, Marine and Rail Accident Investigation Branches has been further strengthened with the Accident Investigation Chiefs' Council driving forward workstreams to maximise the synergy between the three modal branches and form common positions on areas of joint interest. Joint memoranda of understanding have been developed between the branches and other authorities to facilitate cooperation while protecting the AIB's independence.

Engagement

I am very grateful to all those who contributed to our Stakeholder Survey; we greatly valued the feedback. In this Review there is an article to explain how we are using the insights to develop our external communications to reach a wider audience and influence key stakeholders with the important safety messages from our investigations.

In 2019 the AAIB established a global outreach framework. We engaged directly with many safety investigation authorities around the world and participated actively in several international forums. These connections enable us to share experiences and ideas, develop specialist capabilities and train together. This is important as the investigation of civil aviation accidents is an inherently international activity. A short article on our overseas deployments and some of our engagement activities in 2019 is provided in this Review.

Future challenges

2020 is already proving to be an extraordinary year as the UK adjusts to life outside the EU and the world sets about recovering from the impact of the Coronavirus. The AAIB is investigating more and more unmanned air system accidents as the regulatory and technological boundaries are being pushed to the limits. Soon the regulations will be in place for commercial spaceflight from the UK and that may bring a whole new dimension to our work.

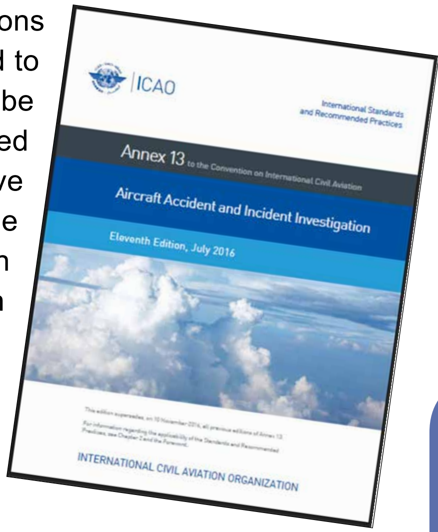
In the meantime, I invite you to peruse this 2019 Annual Safety Review which I trust you will find interesting and useful.

Crispin Orr
Chief Inspector of Air Accidents

Contents


AAIB
Defence AIB
Welcome to the Centre
of
Air Accident Investigation
Dedicated to Improving
Flight Safety

AAIB stakeholder research



Avid followers of our work will know that air accident investigations started in the UK more than 100 years ago. Bound by the need to comply with regulations and international standards, one could be forgiven for assuming that the AAIB would not be overly concerned about people's views on its work. However, while regulations give us and our Inspectors the powers needed to secure valuable evidence to conduct an investigation, our effectiveness in improving aviation safety depends on our collaboration with those we investigate and those with the means to effect changes that we call for in our Safety Recommendations.

For this reason, we recently commissioned research specialists ComRes to undertake research with a wide range of our stakeholders. We had three objectives for the research:

- To understand overall stakeholder perceptions of the Branch and the contribution it makes to improving aviation safety.
- To benchmark stakeholder opinions about the performance and processes of the Branch.
- To understand stakeholder views on the Branch's engagement with stakeholders.

119 stakeholders were surveyed online and ten 30-minute telephone interviews were conducted. The stakeholder types included Government/Regulators, Manufacturers, Operators, Academia, Sporting Associations and Unions.

ComRes research report summary

Overall perceptions

Stakeholders have a good understanding of the AAIB's remit, and the organisation is seen extremely positively. Four in five would speak highly of the AAIB, and the organisation is seen as professional, knowledgeable, trustworthy and impartial. The AAIB's work is seen as highly valuable to the aviation industry worldwide.

Performance

The AAIB's work is seen very positively. The AAIB is seen to be independent and expert, and very capable at making safety recommendations and avoiding apportioning blame. While ratings are lowest for being compassionate, this derives from a lack of knowledge. Those who have relevant experience are very positive about the compassion of inspectors. AAIB is seen as good at investigating incidents involving well established factors such as technical and maintenance issues. While ratings are high for human and operational factors, stakeholders would like to see an increased focus on these, and welcome the

AAIB's appointment of its first Inspector of Air Accidents (Human Factors). Stakeholders are uncertain about the AAIB's ability to investigate incidents involving Unmanned Air Systems, and think it is crucial the organisation is able to cope with the rise of new technologies.

Communications

Stakeholders access reports through a range of channels; primarily the website, but also hard copies, the press and word of mouth. Around half have read guidance documents and the same for the Annual Safety Review. Both are seen as useful by those who have read them, while those who have not read the annual review usually were unaware of its publication. Some stakeholders would like the AAIB to explore new methods of communication.

What we are doing?

This is a sample of some of the actions we are taking following the research.

Unmanned air systems

Since the survey, we have published many correspondence investigations on unmanned air systems (UAS) as part of our monthly bulletins. In January 2020 we published our first Field Investigation involving a UAS, which was an accident to a DJI Matrice 210. In last year's Annual Safety Review we included an article on how we investigate UAS accidents and our 'decision tree' for initiating an investigation. We are now preparing a dedicated section for our website so it will be easier to find out which UAS accidents we investigate and how, and it will bring together those on which we have published a report.

Communication

Since the survey, we have been publishing Field Investigations individually. This means that we can communicate the safety messages from our reports faster, removing the delay that was sometimes caused if reports were finalised just after the monthly bulletin had been produced. In October, we started a new format for less serious incidents. Introducing this 'record only' category is freeing up Inspectors' time to focus on those Field and Correspondence Investigations which will provide the greatest safety benefit, and over the year we expect this initiative to help further reduce the time it takes to publish some of our reports.

We have also started to produce short videos for investigations where we feel there is a public interest or a widely applicable safety message. One of these videos has had more than 140,000 views, so communicating this way is reaching a much wider audience.

Sporting associations

We have improved the frequency and consistency of our engagement with sporting aviation clubs and associations making best use of our established single points of contacts. So the sporting associations, such as the British Gliding Association and Light Aircraft Association, have regular contact with the appointed individual Inspector.

We know there is more to do and over this year we look forward to more exciting developments in the way we communicate and engage with our stakeholders.

AAIB underwater wreckage operations

Introduction

Every aircraft accident brings its own challenges in finding and examining the wreckage. However, when an aircraft accident occurs over water the challenges can become more extreme and require the AAIB to make significant and difficult decisions.

In recent years the AAIB has conducted a number of investigations of accidents where the aircraft wreckage has come to rest under water. The approach in conducting these investigations has been developed over many years and is documented in internal processes and agreements with partner organisations. We continue to develop these processes and techniques through applying lessons learnt after each investigation.

This article will provide some insight into the factors we consider when investigating an accident where the aircraft wreckage is in water.

Who investigates?

The AAIB is responsible for investigating all accidents within the UK, its Crown Dependencies and its Overseas Territories, that occur on land and within their territorial waters. We are also responsible for investigating accidents involving UK registered aircraft (or those registered in UK's Crown Dependencies or Overseas Territories) that occur in international waters. Other States may also delegate their investigations to us. A recent example is our investigation into the accident involving the US registered Piper PA-46 (Malibu), N264DB, which occurred in international waters in the English Channel.

The tail section of N264DB at a depth of 68 m

Where the safety investigation is led by another accident investigation authority, the AAIB may also participate in the search, survey and recovery operation as either an Accredited Representative, Expert or Observer. An example was the accident to the Air France Airbus A330, F-GZCP, in the Atlantic on 1 June 2009. The investigation was led by the French accident investigation authority (BEA) who invited the AAIB to participate in the underwater survey as an observer.

BEA image of wreckage from F-GZCP taken at a depth of 3,980 m

Recovery of wreckage

As with all investigations, our initial objective is to recover and preserve evidence that is considered essential in establishing the cause of the accident. In doing so our priority is the safety of individuals involved in the operation and ensuring that the AAIB's resources are used in the most effective manner possible.

In general terms, the decision to search and recover wreckage from water, either floating or submerged, is made after considering the following questions:

1. Is it safe to do so?
2. Is it necessary to establish the cause of an accident and identify safety issues?
3. Is the cost of the operation proportionate to the expected safety benefit?

If it is possible to establish the cause of the accident and make Safety Recommendations without recovering the wreckage, then we may not recover it. However, we will always consider the feasibility of recovering the wreckage against the three questions above so that an informed decision can be made. The AAIB is not responsible for the recovery of victims from aircraft accidents either on the land or in the water but will always work with and support the relevant authorities.

How the AAIB conducts this type of operation

As diving operations are heavily regulated, and the AAIB are not experts in chartering and operating vessels, we normally work with the MoD Salvage and Maritime Operations Project Team (SALMO) who act as the Government Competent Authority on the recovery and surveying of aircraft wreckage in water. As such, SALMO are the Project Team in any maritime or diving contracts and we act as their adviser. A Memorandum of Arrangement between AAIB and SALMO defines the roles and responsibilities of each organisation.

SALMO are always available to advise the AAIB, identify options and manage risk for finding and recovering wreckage in water. Subject to their available resources at the time, we can ask SALMO to carry out the following tasks:

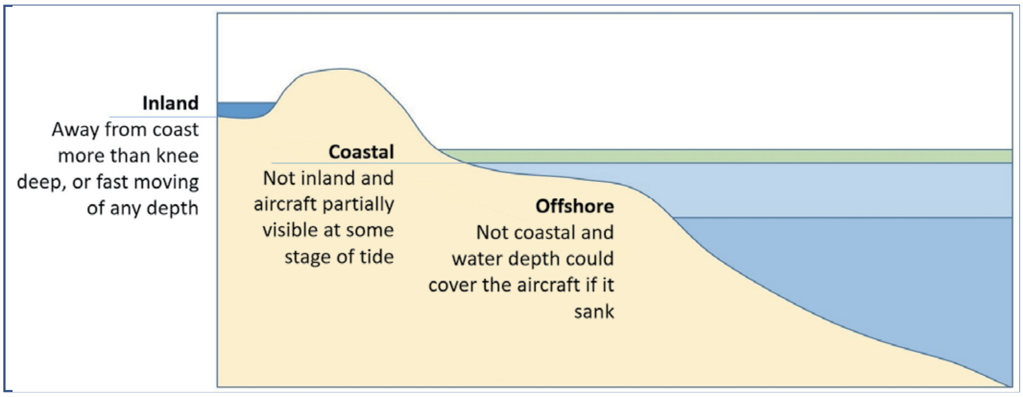
- Work with AAIB personnel in the preservation of evidence.
- Assist with the development and execution of the search, survey and recovery plan.
- Carry out a full onsite risk assessment with regard to the safety of AAIB personnel working in the maritime environment.
- Contract vessels and marine contractors (including survey / diving / Remotely Operated Vehicle (ROV)) to meet the AAIB requirements.
- When required, provide and operate their underwater location / survey and recovery equipment.
- Provide guidance and advice on the training needs for AAIB personnel undertaking maritime operations.

The AAIB will help to identify the likely location of the aircraft by analysing the radar recordings, considering the aircraft performance and by using our equipment to detect the underwater locator beacon. We will also identify the evidence to be recovered and take action to preserve it once it has been recovered to the vessel.

We also have a key role in the safety of the divers, personnel on the recovery vessels and the ROV by providing information on the aircraft and associated hazards. This requires AAIB Inspectors to deploy on the vessels so they need to maintain their qualifications and competencies for working at sea.

Categories of water operation

We categorise the type of water in which an aircraft has crashed to enable us to respond appropriately. These categories are Inland, Coastal and Offshore. It should be noted that these categories are different to the normal maritime definitions.



Categories of water depth when considering aircraft search and recovery

Inland

Inland water can take many forms, including rivers, lakes, lochs and canals. Inland water is defined as 'away from the coast and more than knee deep, or fast moving of any depth'. The factors to consider are varied and may often bring unique challenges.

A shallow waterway or lake, with partially submerged wreckage may require specialist lifting equipment that can reach the wreckage, whereas a deep open expanse of water will first require suitable equipment to find the wreckage and then undertake a survey to determine its condition. Only then can the feasibility of recovering the wreckage be considered. By definition, inland water is away from the coast and can be difficult to access with specialist lifting equipment, which may need to be floated close to the wreckage.

An example of a challenging recovery involved an accident to an AS350 in Loch Scadavay in the Western Isles of Scotland. The helicopter was partially submerged in the remote loch and was lifted using floatation devices. It was then towed ashore and recovered using a shore based mobile crane.

G-PLMH partially submerged in Loch Scadavay prior to recovery

Coastal

Coastal waters are defined as being 'not inland and with the aircraft partially visible at some stage of the tide'. The wreckage will therefore be in relatively shallow water and may be within the tidal range on a beach, at the foot of a cliff or in an estuary. Consequently, the wreckage may be submerged at high tide and above the waterline at low tide. Wave action and strong tidal flows can cause the wreckage, which may have some buoyancy, to move or be buried by sand, silt or mud.

Wreckage close to the coast can be difficult to recover and it might only be accessible at certain stages of the tide. The wreckage may be further damaged if the recovery is delayed, especially if the sea is rough and the wreckage is washed against the shore or cliffs.

We would normally expect to recover wreckage in coastal waters. An example is an accident involving an Augusta Bell 206B Jet Ranger II helicopter (G-SUEX) next to cliffs near Flamborough Head, Yorkshire. The wreckage came to rest on a shale beach in a small inlet at the foot of the cliffs. Although the wreckage could be accessed by sea, we were unable to recover it by boat and so was lifted it using a cliff top winch.

Recovery of G-SUEX, Flamborough Head, Yorkshire in 2014

Offshore

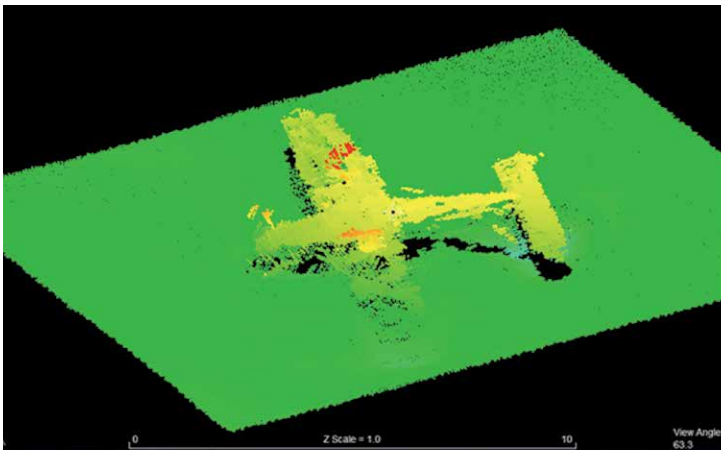
The third type of operation, and normally the most complex and expensive, is finding and recovering wreckage from offshore, which is defined by the AAIB as 'not coastal and in water deep enough to cover the aircraft if it sank'.

Following an aircraft accident at sea, a search and rescue operation, involving a number of different organisations, would be initiated and carried out in accordance with international protocols laid down in Annex 12 to the convention on international civil aviation Search and Rescue and the *International Aeronautical and Maritime Search and Rescue Manual* published by the IMO and ICAO. Although the AAIB would not actively participate in the search and rescue phase, we would work with and provide support to the appropriate authorities. At the same time, we would start preparation for the investigation phase, which would commence once the search and rescue phase had been concluded.

An early priority is to find the wreckage. Although the last position of the aircraft in flight might be known, being able to determine the location of wreckage on the seabed requires an understanding of where the aircraft entered the water and the tidal conditions. This requires an understanding of the aircraft dynamics including the direction, speed and distance travelled. Once the area in which the aircraft entered the water has been identified, an estimation of the tidal drift and sink rate is applied to determine the most likely location on the seabed. This defines the search area. The next step is to conduct the search.

We often use side scan sonar (SSS) to carry out the initial underwater search. This is achieved by "flying" a towed SSS transmitter/receiver close to the seabed that emits a series of sonar pulses that are reflected off the seabed and any underwater objects. The reflected pulses are captured and processed on the vessel to produce an image of the seabed and objects. The SSS operator and the AAIB inspectors then assess the image to identify any potential targets.

SSS was used in the search of a Piper PA-28 (G-CDER) which ditched off the East Sussex coast and came to rest upside down on the seabed. Other surveying techinques, such as multibeam sonar, which use a surface based sonar transmitter/receiver are also used to locate wreckage.



Side scan sonar survey results from search of G-CDER

Commercial aircraft are normally equipped with cockpit voice and flight data recorders that are fitted with an acoustic beacon which is activated when it is submerged in water. The AAIB has its own handheld detectors that can be held over the side of a small boat and a more capable 'towed fish' that can be deployed from a suitable vessel and can be used to detect a beacon at depths of up to 1,000 m. The AAIB does not just use its equipment to locate missing aircraft; we also deployed to the Red Sea to search for the El Salam Boccaccio 98, a ferry which sank on 2 February 2006, 80 km (50 miles) from Duba, Saudi Arabia.

The towed fish being recovered from the water during sea trials

Once a potential target has been identified we need to visually determine if it is wreckage from the aircraft. We do this by using an remotely operated vehicle (ROV) equipped with cameras and if conditions allow this is followed up by divers equipped with handheld cameras. A full survey of the aircraft and wreckage field is always carried out to capture evidence and to allow an assessment to be made as to what items should be recovered and the best way in which to do so.

The survey will also enable us, by assessing the aircraft damage and whether the whole aircraft is there, to establish:

- the attitude and speed of the aircraft when it struck the water,
- whether the aircraft is complete or there has been an inflight break up,
- if the engine(s) had been operating,
- evidence of fire.

Offshore activities require significant planning and early engagement with SALMO to identify suitable vessels and weather windows. It is often necessary to plan the operation over three phases sometimes using different vessels for each phase.

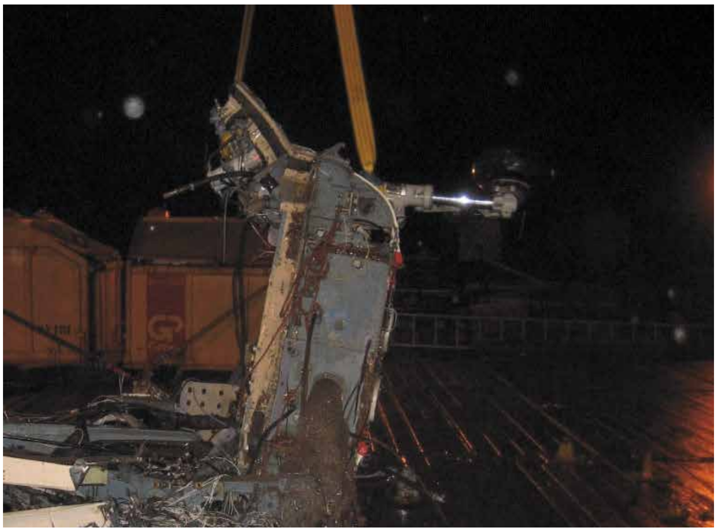
The phases are:

- Phase 1. Finding the wreckage by using vessels either towing SSS or by using hull mounted multi beam sonar equipment.
- Phase 2. Surveying the wreckage with ROVs.
- Phase 3. Recovering the wreckage which may require a dynamically positioned vessel equipped with a stabilised crane, ROV, divers and a decompression chamber.

When planning the search, the depth of water, seabed topography, tidal flows, sea state and weather will all be factored in to determine the most appropriate vessel and survey technique to be used. For shallow waters it may be easier to deploy surface-based divers or a small ROV, which is a relatively cheap way of surveying the wreckage. As the water depth increases the complexity and costs also increase. Critically, as the depth increases it is necessary to change from surface-based divers to saturation divers which require the use of vessels that can remain dynamically positioned and specialised diving equipment with decompression facilities.

If the decision is made to recover all or part of the wreckage, then a plan must be made to ensure the correct assets are in place to ensure the safety of all those involved in the operation and to minimise injury to those undertaking the recovery or destroying evidence.

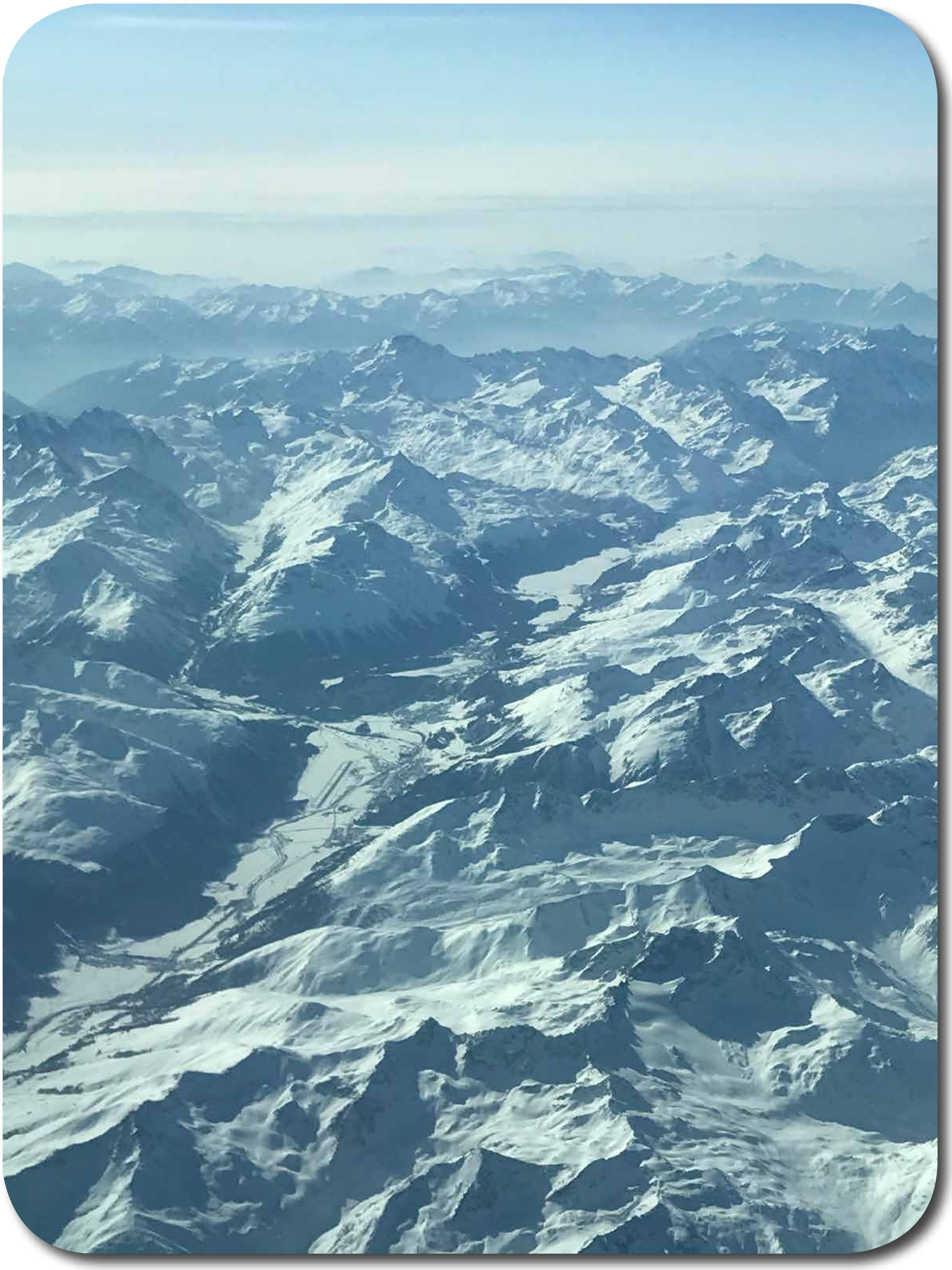
Wreckage may be recovered by attaching lifting straps to move it into cages or bags positioned on the seabed by divers or an ROV, or by lifting it directly to the surface. Air bags can also be attached which are then inflated and float the wreckage to the surface. It might also be necessary to cut the wreckage into manageable pieces before it is moved. The vessel must be large enough to secure the wreckage onboard and to allow AAIB Inspectors to undertake anti-deterioration measures, which is essential to delay the onset of corrosion when the aircraft is removed from saltwater.



Recovering the wreckage of helicopter G-BLUM onto the deck of the vessel in the early hours of the morning. (Irish Sea)

Conclusion

Following an aircraft accident where the wreckage enters the water, the AAIB is prepared and has the necessary support on standby to enable an investigation tto be carried out to determine the cause of the accident. The complexities and difficulties associated with finding, surveying and recovering wreckage make the activity challenging. We will weigh the benefits in surveying and recovering the wreckage against the risk to individuals, and vessels, involved in the operation. Although the cost effectiveness of underwater activities is a consideration, we will attempt to survey and recover wreckage when it is practical to do so and is considered necessary to determine the cause of the accident.



The AAIB worldwide

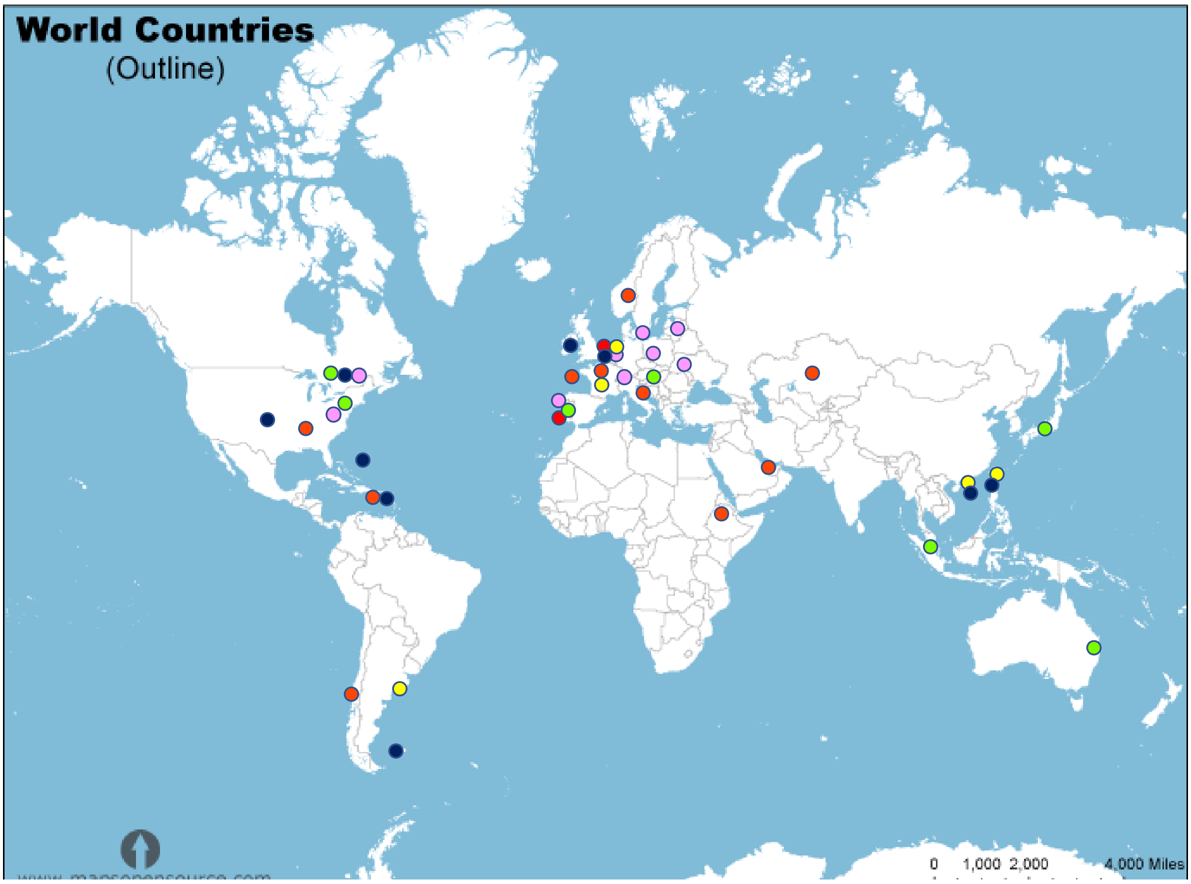
The AAIB is the UK's designated Accident Investigation Authority for the purposes of Annex 13 to the Convention on International Civil Aviation (Air Accident and Incident Investigation). The global nature of commercial and non-commercial aviation, and the aerospace industries, means that we contribute to investigations and related activities around the world.

We are proud that we continue to be held in high esteem by the international investigation community. We are involved with many international aviation safety bodies and are invited to lead or participate in many seminars, forums and training exercises. We have been welcomed as participants in investigations where there is a UK interest and as observers to those that provide training benefit to our Inspectors.

In 2019 we established a global outreach framework to engage directly with accident investigation authorities around the world.

The map on the next page shows some of the overseas activities conducted by the AAIB in 2019 and illustrates our global reach.

As an example an accident to Britten-Norman Islander registration VP-MNI, at John A Osborne Airport, Montserrat on 23 September 2019



Colour key

- Places visited for accident and serious incident investigations
  Belgium, Channel Islands, Chile, UAE, Ethiopia, France, Italy, Kazakhstan, Montserrat, Norway, Portugal, USA

- Places where the AAIB has either provided or received training
  Bermuda, Canada, Cayman Islands, Falkland Islands, Hong Kong, Ireland, Netherlands, Taiwan, USA

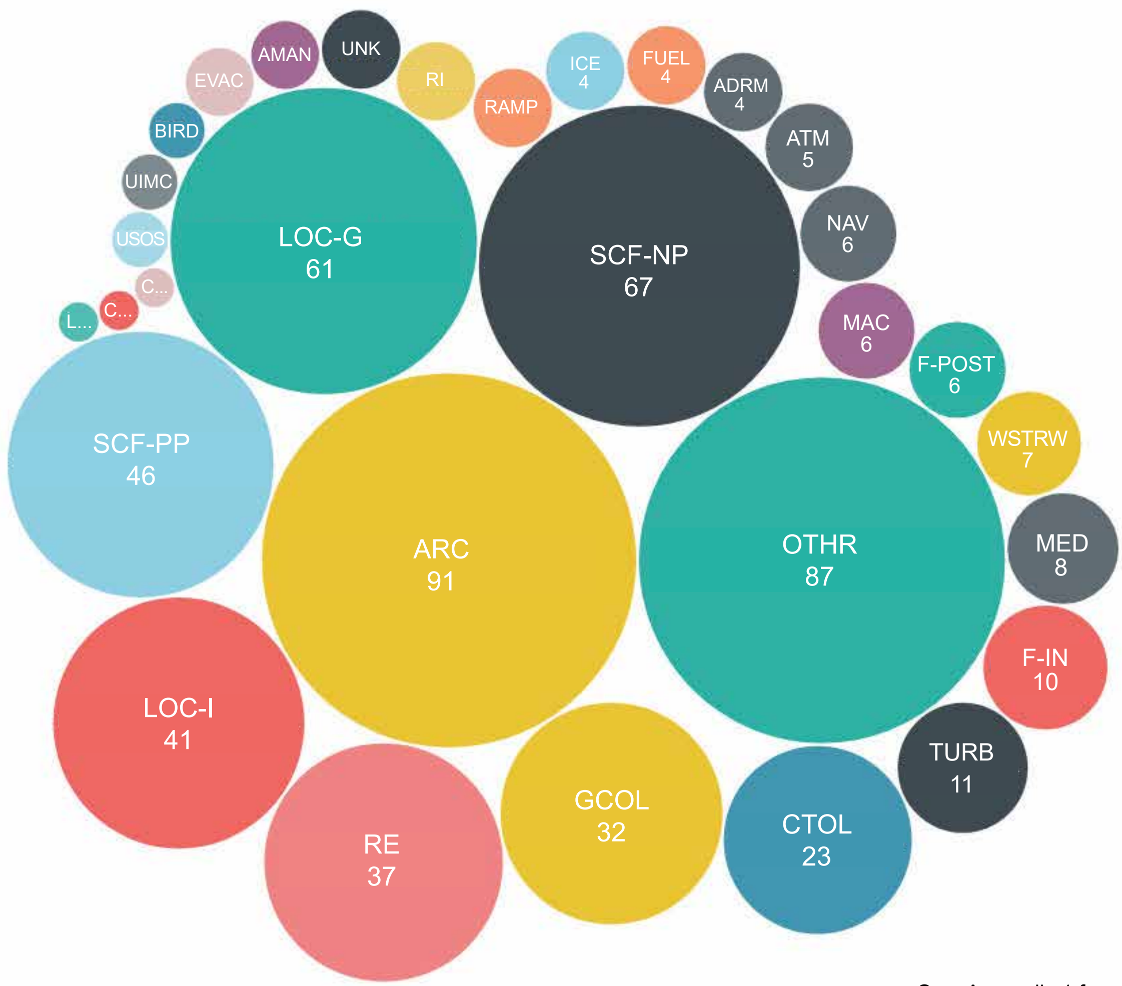
- Places where the AAIB has sent representatives to participate in international organisation meetings
  International Civil Aviation Organisation (ICAO) Canada
  European Union Aviation Safety Agency (EASA) Germany
  European Civil Aviation Conference (ECAC) Hungary, Ukraine
  European Network of Safety Investigation Authorities (ENCASIA) Belgium, Latvia, Poland, Switzerland
  International Society of Air Safety Investigators (ISASI) Netherlands, USA

- Places where the AAIB has participated in international conferences, forums or exercises
  Austria, Australia, Canada, Japan, Portugal, Singapore, USA

- Places visited by the AAIB for liaison and outreach
  Argentina, France, Hong Kong, Netherlands, Taiwan, USA

CICTT factors on investigations by the AAIB in 2019

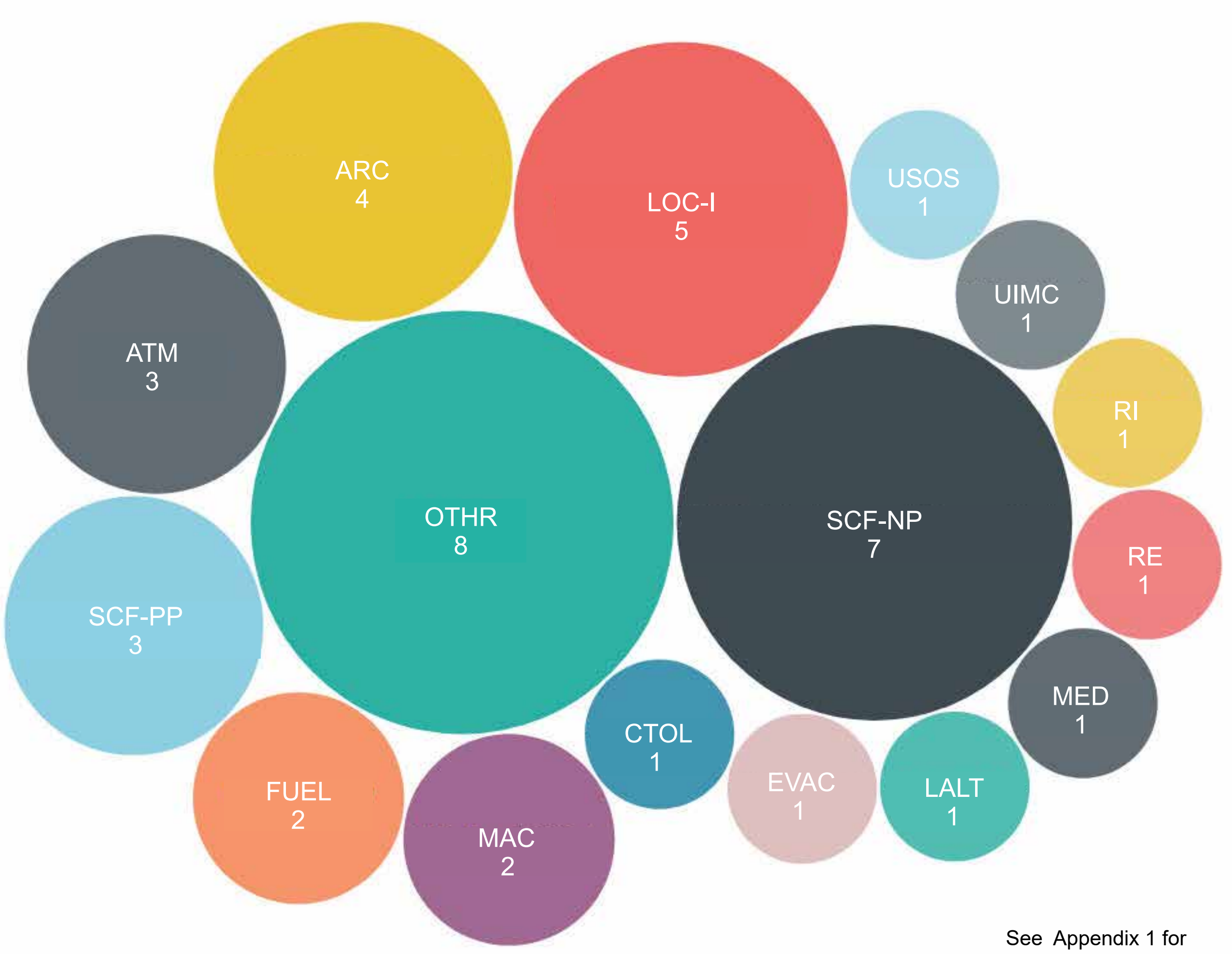
Every occurrence in the UK is recorded on the European Central Repository (ECCAIRS) and is coded using the occurrence taxonomy defined by the CAST/ICAO Common Taxonomy Team (CICTT). This is a worldwide standard taxonomy to permit analysis of data in support of safety initiatives. In the UK the coding of occurrences is carried out by the CAA. It should be noted that they are recorded as multiple factors, for example turbulence (TURB) leading to loss of control in flight (LOC-I). Similarly, other (OTHR) is also used and may include aspects that do not have specific classifications.



See Appendix 1 for category descriptions

Factors for all investigations reported on by AAIB in 2019

Field investigations



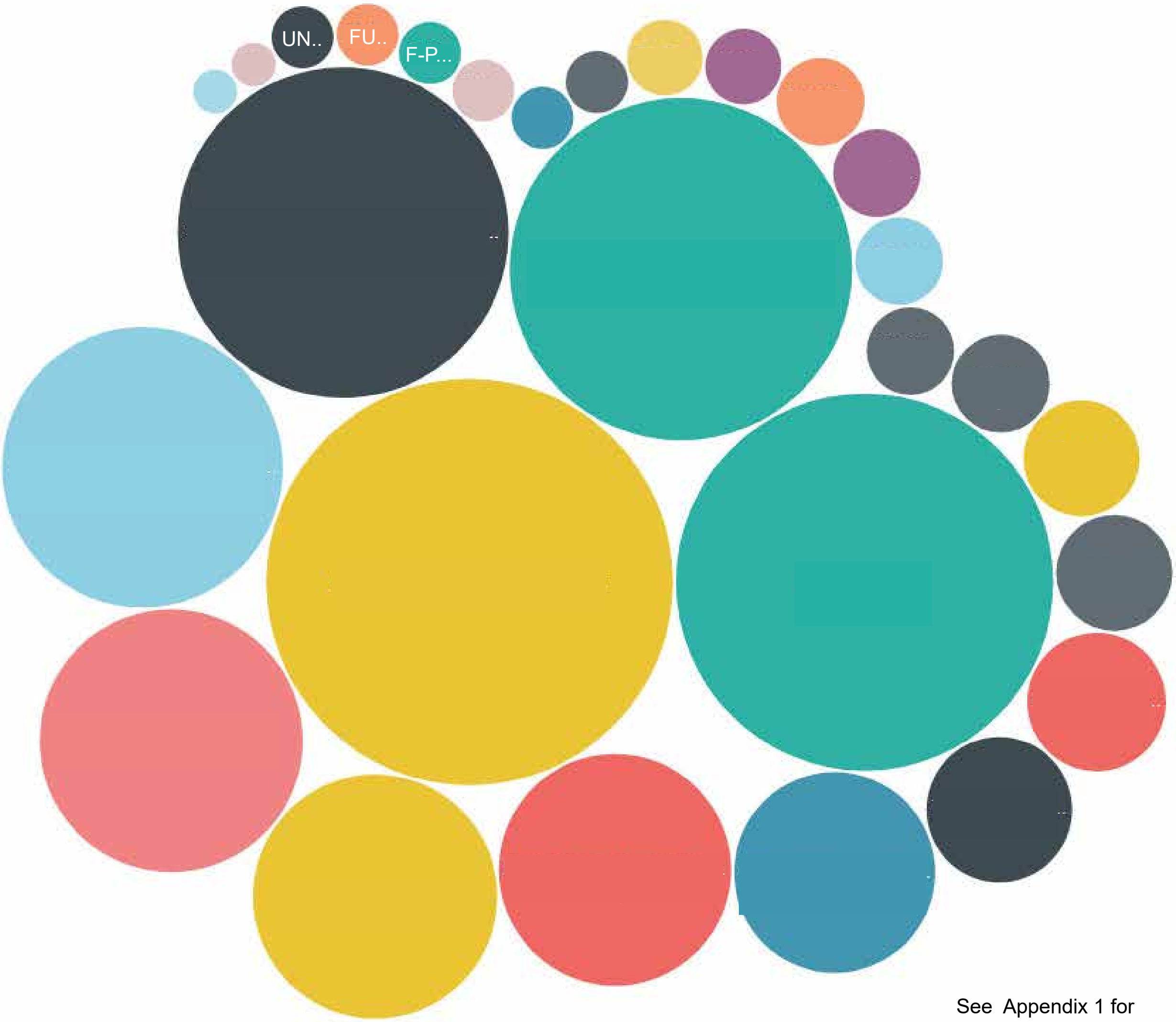
See Appendix 1 for category descriptions

Factors for field investigations reported on by AAIB in 2019

In 2019 the AAIB published 29 field investigation reports, 12 of which were investigations into fatal accidents and 17 were into non-fatal accidents or serious incidents.

The 17 investigation reports published during 2019 into non-fatal events were balanced between commercial air transport (CAT) and general aviation (GA) aircraft and were attributed to OTHR.

Correspondence investigations

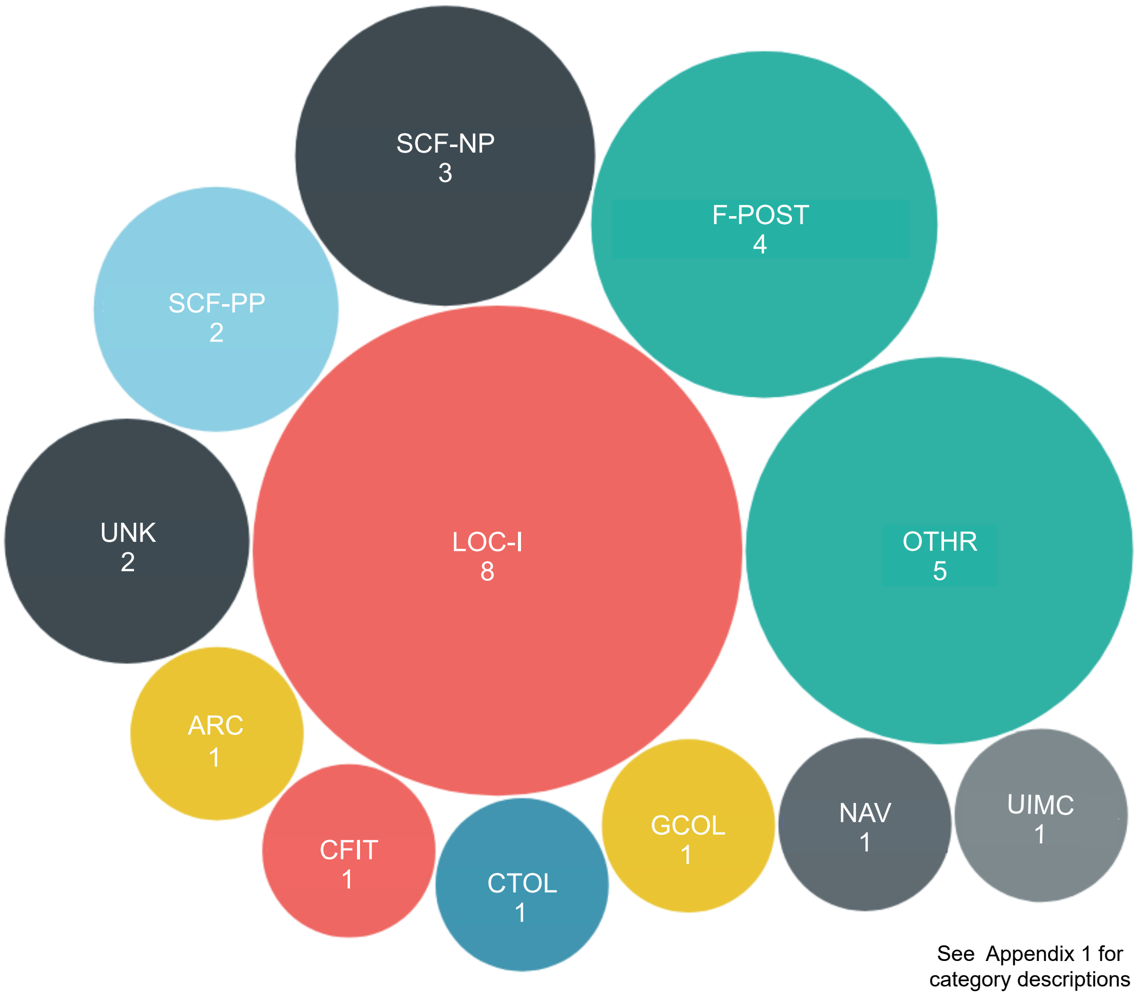


See Appendix 1 for category descriptions

Factors for correspondence investigations reported on by AAIB in 2019

Correspondence investigations are usually conducted into non-fatal accidents on GA aircraft and to some serious incidents on CAT aircraft. The factors most predominant in these occurrences were classified as abnormal runway contact (ARC), commonly the result of a hard or bounced landing or cross wind conditions.

Fatal investigations



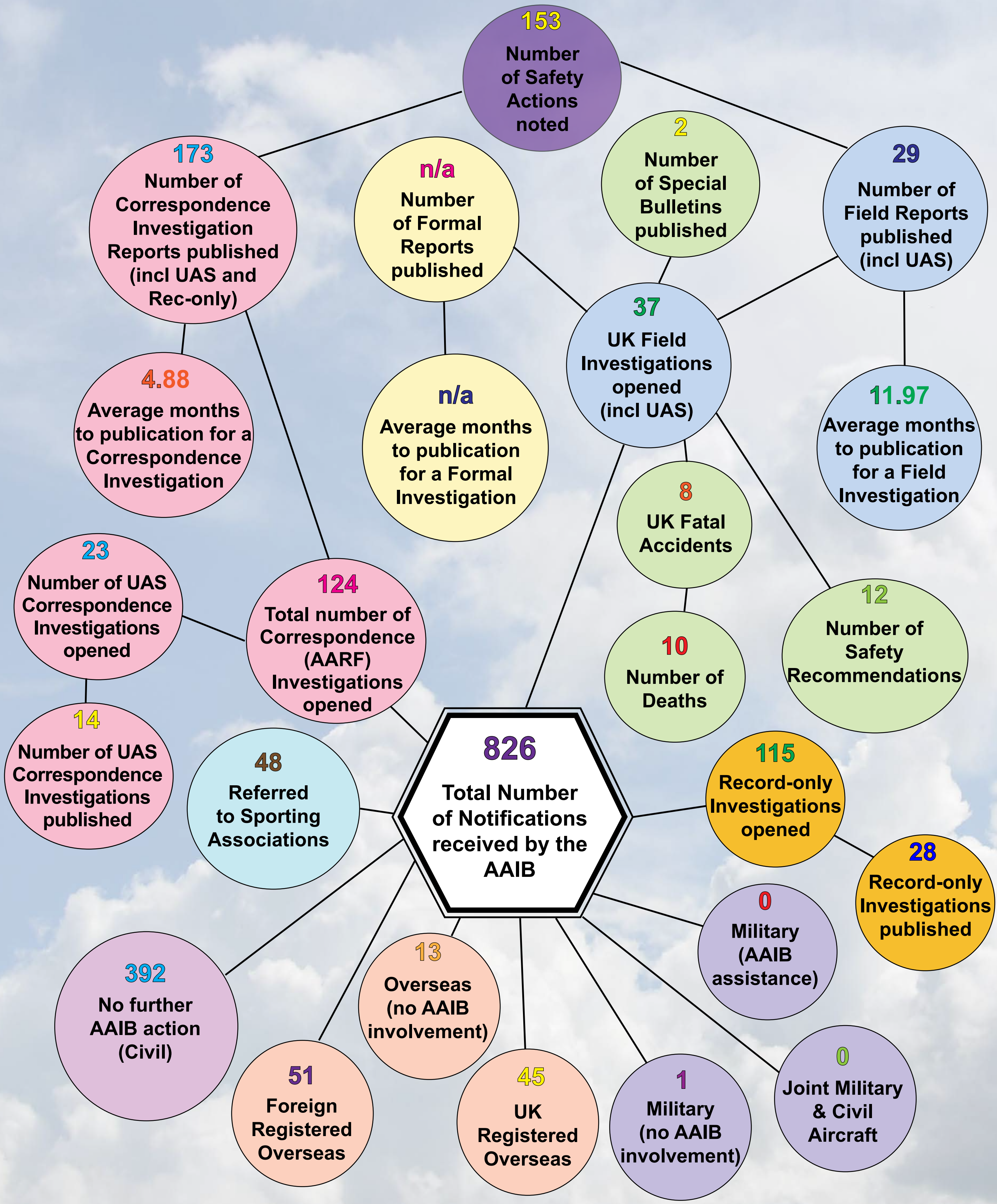
See Appendix 1 for category descriptions

Factors for fatal investigations reported on by AAIB in 2019

The predominant cause of fatal accidents in general aviation, in common with previous years, was loss of control in flight (LOC-I) such as a stall near to the ground. However, other factors identified during our investigations included physiological events.

Statistics for 2019

An overview of what we were involved with during 2019 can be seen below:



Introduction

The following pages provide the statistics for 2019, 2018 and 2017 for accidents and serious incidents notified to the Air Accidents Investigation Branch.

An explanation of the categories is as follows:

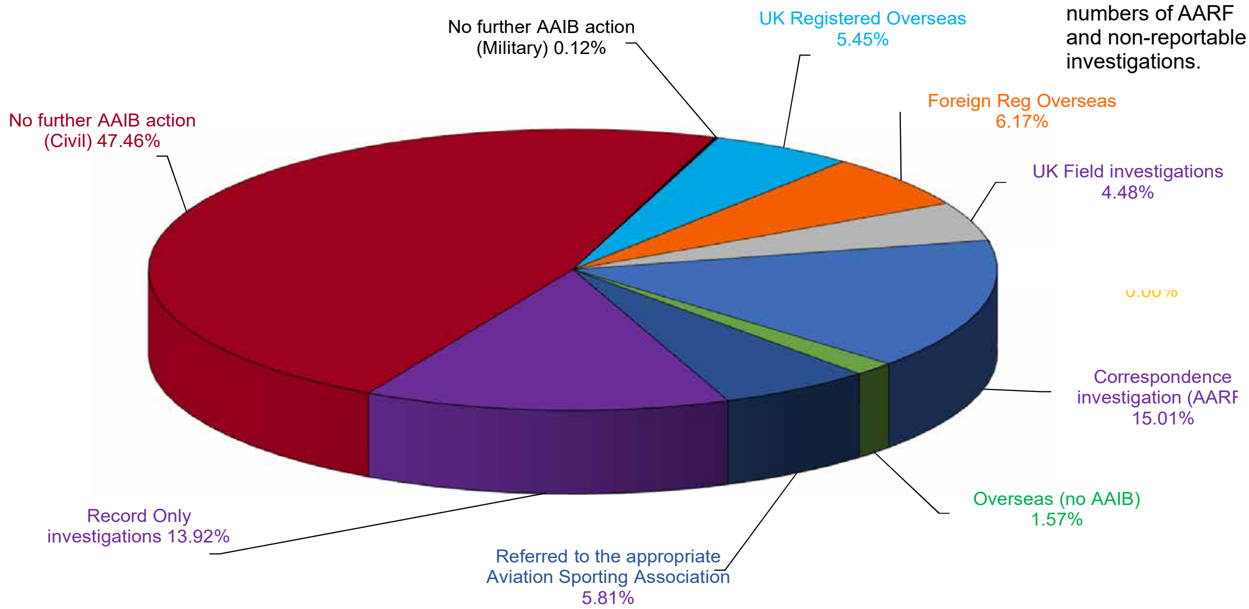
Category definition

UK Aircraft overseas	Investigations involving UK registered aircraft, or aircraft registered in one of the UK Overseas Territories or Crown Dependencies, occurring in a Foreign State where the AAIB has participated in the capacity of Accredited Representative in accordance with ICAO Annex 13.
Foreign Aircraft overseas	Accidents and serious incident investigations to Foreign registered aircraft occurring in a Foreign State where the AAIB has participated in the capacity of Accredited Representative or Expert in accordance with ICAO Annex 13.
UK Field Investigations	Investigations involving the deployment of a 'Field' team within the UK or to one of the UK Overseas Territories or Crown Dependencies and those investigations where a team has not deployed but Safety Recommendations are made. Also includes investigations which have been delegated to the AAIB by another State.
Unmanned Aircraft Systems (UAS)	Accidents and serious incident investigations to UAS where they are operated under a CAA permission, or are privately operated with mass greater than 20 kg.
Military with AAIB Assistance / Observer	Where an MoD aircraft accident, serious incident Service Inquiry may be convened, an AAIB Inspector is appointed to assist or observe.
AARF Investigations	Investigations conducted by correspondence only using an Aircraft Accident Report Form (AARF) completed by the aircraft commander.
Overseas (no AAIB involvement)	Notifications to the AAIB of an overseas event which has no AAIB involvement.
Referrals to Sporting Associations	Investigations referred to the relevant UK Sporting Associations.
No further AAIB action (Civil)	Occurrences notified to the AAIB involving civil registered aircraft which do not satisfy the criteria of an accident or serious incident in accordance with the Regulations.
Military (no AAIB involvement)	Notifications to the AAIB concerning Military aircraft with no AAIB involvement.
Record-Only Investigations	An occurrence that if investigated fully has little likelihood of identifying new safety lessons that will advance aviation safety.

Notifications 2019

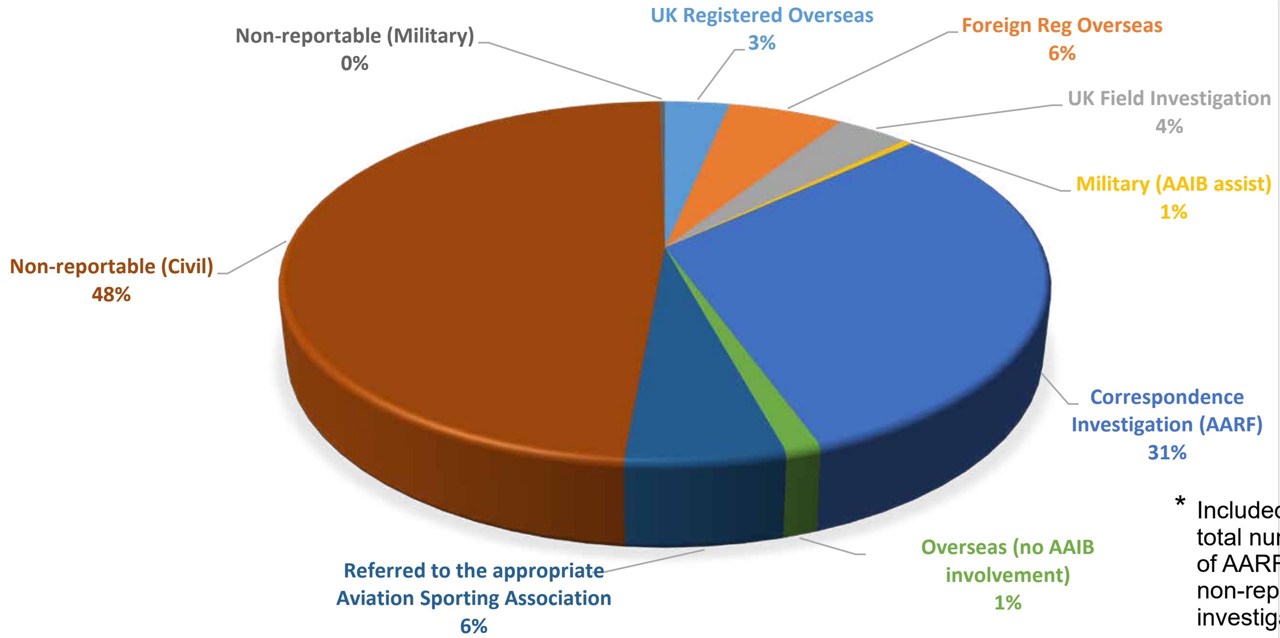
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
UK Registered Overseas	3	1	5	1	8	6	8	6	4	2	0	1	45
Foreign Reg Overseas	3	1	5	4	7	4	5	6	1	6	4	5	51
UK Field Investigations	2	3	2	3	3	4	4	4	4	2	2	4	37
Military (AAIB Assistance)	0	0	0	0	0	0	0	0	0	0	0	0	0
Total no of Correspondence Investigations (AARF)	11	20	11	14	11	10	14	13	6	6	5	3	124
Correspondence Investigations (AARF) involving UAS	3	3	3	2	0	2	1	0	4	2	2	1	23*
Overseas (no AAIB involvement)	2	0	2	1	1	1	0	1	2	2	0	1	13
Referred to the appropriate Aviation Sporting Association	3	1	3	5	6	5	8	7	6	1	2	1	48
Record Only Investigations	1	1	1	7	11	15	22	16	14	7	6	14	115
Total no further AAIB action (civil)	22	23	26	26	23	45	49	33	44	40	36	25	392
Total no further AAIB action (civil) inv UAS	0	0	0	0	0	0	0	0	1	2	1	7	11*
Military (no AAIB involvement)	0	0	1	0	0	0	0	0	0	0	0	0	1
Total	**47**	**50**	**56**	**61**	**70**	**90**	**110**	**86**	**81**	**66**	**55**	**54**	**826**
UK Fatal accidents	**1**	**1**	**0**	**0**	**1**	**0**	**2**	**1**	**0**	**0**	**1**	**1**	**8**
Number of deaths	**2**	**1**	**0**	**0**	**1**	**0**	**2**	**2**	**0**	**0**	**1**	**1**	**10**

* Included in the total numbers of AARF and non-reportable investigations.



Notifications 2018

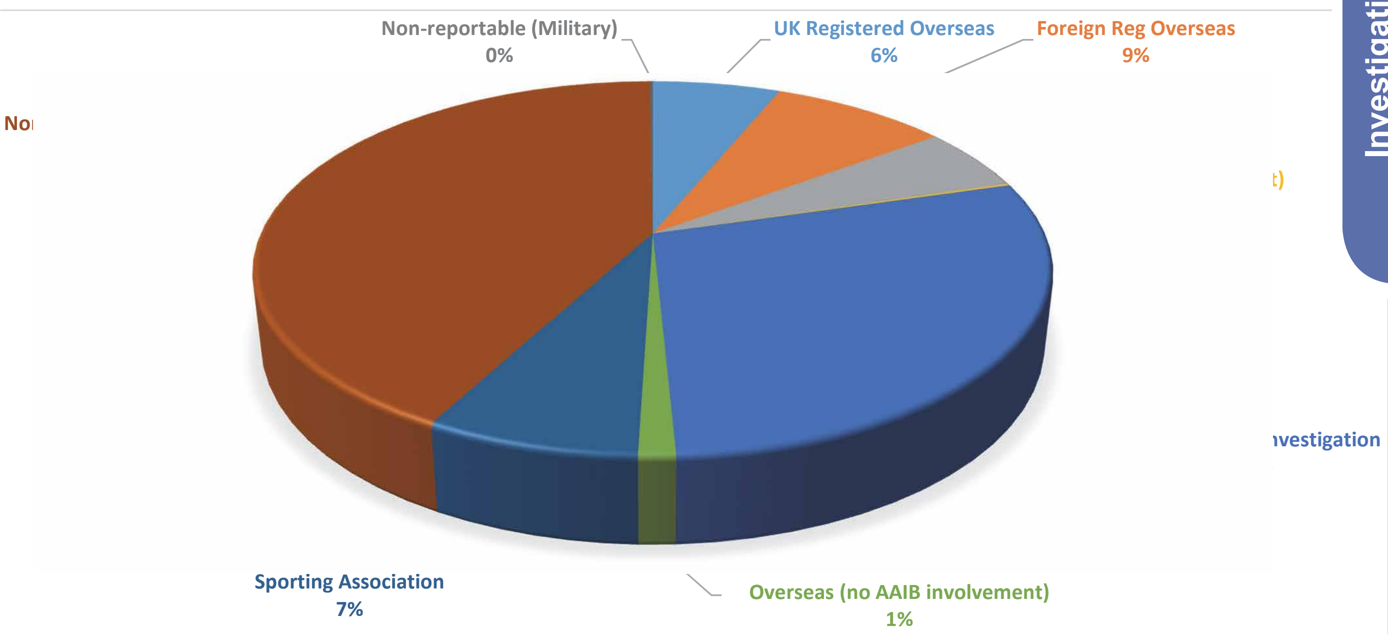
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
UK Registered Overseas	2	1	1	2	4	4	3	0	2	4	0	0	23
Foreign Reg Overseas	5	6	3	1	2	5	4	5	1	3	4	2	41
UK Field Investigations	2	4	0	3	2	3	4	2	0	5	1	0	26
Military (AAIB Assistance)	0	0	1	0	0	1	1	0	0	0	0	0	3
Total no of Correspondence Investigations (AARF)	7	14	9	16	28	29	34	24	20	20	12	8	221
Correspondence Investigations (AARF) involving UAS	1	1	0	0	1	1	1	0	2	3	0	1	11*
Overseas (no AAIB involvement)	1	1	1	0	2	0	1	0	1	0	2	0	9
Referred to the appropriate Aviation Sporting Association	1	4	0	3	8	7	6	6	0	3	0	2	40
Total no further AAIB action (civil)	15	22	29	22	28	44	37	50	28	33	23	10	341
Total no further AAIB action (civil) inv UAS	0	0	2	0	1	1	3	2	0	1	1	1	12*
Military (no AAIB involvement)	0	1	0	0	0	0	0	0	1	0	0	0	2
Total	**33**	**53**	**44**	**47**	**74**	**93**	**90**	**87**	**53**	**68**	**42**	**22**	**706**
UK Fatal accidents	**1**	**0**	**0**	**1**	**1**	**3**	**1**	**0**	**0**	**2**	**0**	**0**	**9**
Number of deaths	**2**	**0**	**0**	**2**	**1**	**3**	**1**	**0**	**0**	**7**	**0**	**0**	**16**



* Included in the total numbers of AARF and non-reportable investigations.

Notifications 2017

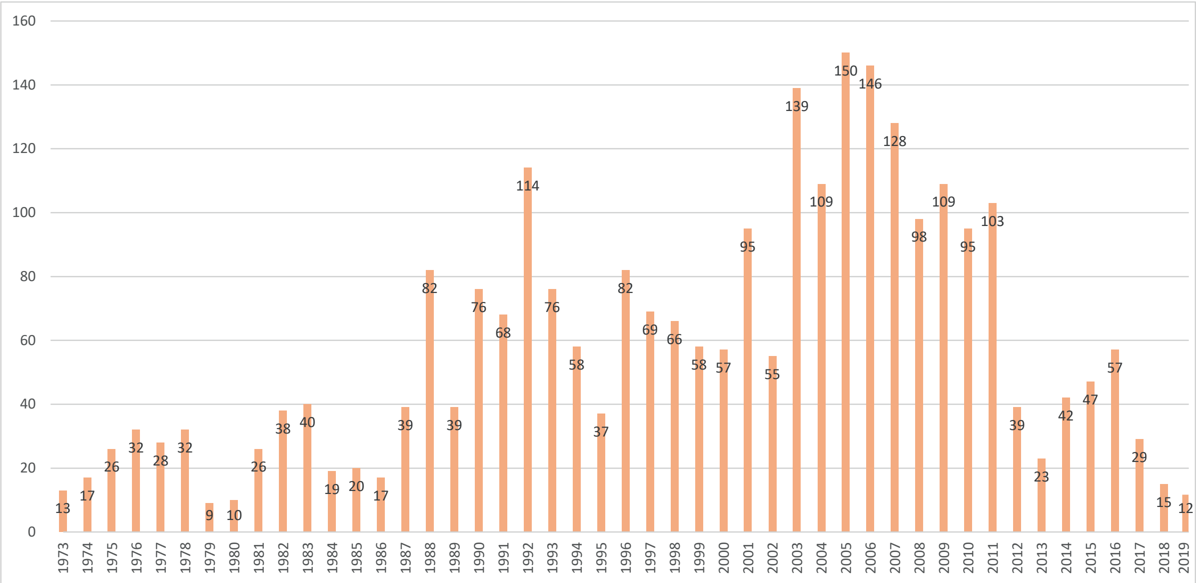
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
UK Registered Overseas	5	4	3	4	5	4	6	2	5	4	2	0	44
Foreign Reg Overseas	3	3	4	9	6	7	8	4	5	2	3	7	61
UK Field Investigations	2	3	4	2	6	3	2	4	5	1	2	4	38
Military (AAIB Assistance)	0	0	0	0	0	1	0	0	0	0	0	0	1
Correspondence Investigations (AARF)	9	7	15	15	36	29	24	25	17	11	10	6	204
Overseas (no AAIB involvement)	2	1	0	1	0	0	1	1	1	1	0	1	9
Referred to the appropriate Aviation Sporting Association	4	2	1	5	9	9	4	9	3	2	2	2	52
No further AAIB action (civil)	15	19	24	22	22	29	33	27	32	34	18	23	298
Military (no AAIB involvement)	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	**40**	**40**	**51**	**58**	**84**	**82**	**78**	**72**	**69**	**55**	**37**	**43**	**708**
UK Fatal accidents	**1**	**0**	**1**	**1**	**3**	**2**	**1**	**1**	**3**	**0**	**1**	**2**	**16**
Number of deaths	**1**	**0**	**5**	**1**	**4**	**2**	**2**	**2**	**4**	**0**	**4**	**3**	**28**



Investigation Statistics

Safety Recommendations in 2019

In 2019 the AAIB issued 12 Safety Recommendations from 5 investigations.



Recommendation numbers made in previous years

Each addressee to a Safety Recommendation has to respond within 90 days in accordance with European Regulation EU 996/2010 Article 18, and detail what actions have been taken or are under consideration and the time expected to be taken for their completion. If no actions are being considered by the addressee they have to provide their reasoning for the decision.

Monitoring of Safety Recommendations

From 1 January 2019 the AAIB took responsibility for monitoring not only the responses but also the action taken by the addressees to Safety Recommendations. This is in accordance with the amendment that was made to ICAO Annex 13 in November 2018. The specific Paragraph 6.12 requires that; '*A State that receives a safety recommendation shall implement procedures to monitor the progress of the action taken in response to that safety recommendation*'.

The AAIB carries out this function on behalf of the State Safety Board (SSB) for the UK, its Overseas Territories and Crown Dependencies.

It is important to note that the AAIB monitors the progress of actions taken in response to a Safety Recommendation. The AAIB is not a regulator and cannot require action to be taken. The AAIB reports the progress to the SSB which then considers whether further regulatory intervention is required.

This monitoring of actions is not only for Safety Recommendations issued by the AAIB but also those that have been issued to addressees in the UK from other State Accident Investigation Authorities.

When the AAIB receives a response to a recommendation from the addressee it is assessed as to its adequacy under the requirements of Article 18 of Regulation (EU) 996/2010. The AAIB applies the following assessment criteria to the Safety Recommendation responses:

- **Adequate** means that the response fully meets the intent of the Safety Recommendation and the action is expected to address the safety issue.

- **Partially Adequate** means the response goes someway to meeting the intent of the Safety Recommendation and the action will address the safety issue to a certain extent, but further action would be required to fully address the issue identified.

- **Not Adequate** means that the response does not address the intent of the Safety Recommendation nor does it address the safety issue concerned. The AAIB will apply an open or closed status depending on the expectation of whether the addressee will reassess their response.

    - **Not Adequate - Open** The status of 'open' implies that AAIB still has concerns regarding the identified safety deficiency and that there is an expectation that the addressee will provide further responses.

    - **Not Adequate - Closed** The status 'closed' implies that there is a low likelihood that the addressee will act on the recommendation or provide any further responses.

- **Superseded** means the Safety Recommendation has been 'Superseded' either by a 'newer' and more comprehensive Safety Recommendation or actions have subsequently been taken by the addressee that have superseded the recommendation.

Actions taken on a Safety Recommendation are reported as meeting one of the following:

ACTION STATUS	Meaning	Status
• Planned actions complete	All planned actions are completed.	Closed
• Planned actions partially completed	Some of the planned actions have been completed and the addressee is not intending on taking any further action.	Closed
• Planned actions not completed	The planned actions have not been completed and the addressee now has no intention of taking any further action.	Closed
• Planned actions ongoing update due (XX/XX/XXXX)	Actions are still on-going and a new date for completion has been submitted	Open
• Not enough information	The update is not detailed enough to assess. A request will be made for a further update.	Open
• No planned actions	There are no planned actions	Refer to Not Adequate

A Safety Recommendation issued after 1 January 2019 will therefore remain **Open** until such time as the addressee has completed its activity in relation to that recommendation. It is therefore possible for the response to a Safety Recommendation to be assessed as **Adequate** but it will remain **Open** until the planned actions are completed.

Of the 12 Safety Recommendations issued in 2019, as of the of 15 June 2020, responses have been received for 11 Safety Recommendations. The AAIB response assessment has classified those responses as follows:

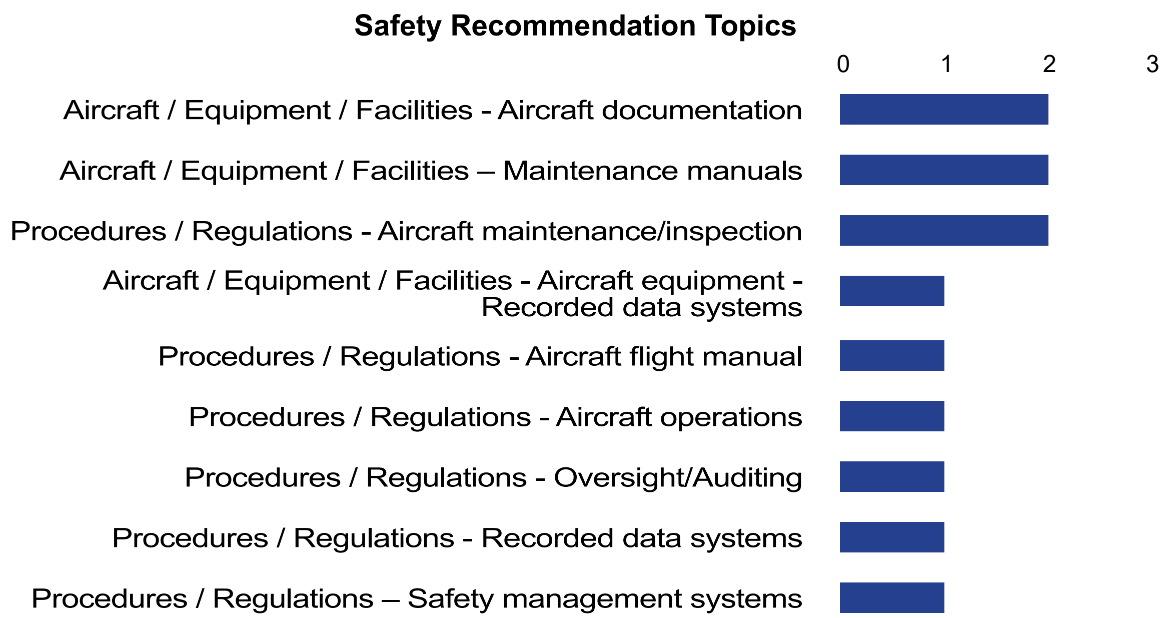
- Four are **Adequate**, with planned actions completed, and are **Closed.**
- One is **Adequate**, with planned actions ongoing, and remains **Open**.
- Two are **Partially Adequate** with planned actions ongoing, and remain **Open.**
- Two are **Partially Adequate** with not enough information on the planned actions, and remain **Open.**
- Two are **Not Adequate** and are **Closed.**
- One is awaiting a response from the addressee.

Summary table

Number	Response Assessment	Action Status	Status
2019-001	Partially Adequate	Planned actions ongoing update due 28 February 2020	Open
2019-002	Not Adequate	No planned actions	Closed
2019-003	Adequate	Planned actions ongoing update due 1 June 2020	Open
2019-004	Adequate	Planned actions complete	Closed
2019-005	Partially Adequate	Not enough information	Open
2019-006	Adequate	Planned actions complete	Closed
2019-007	Partially Adequate	Not enough information	Open
2019-008	Adequate	Planned actions complete	Closed
2019-009	Adequate	Planned actions complete	Closed
2019-010	Awaiting Response		Open
2019-011	Not Adequate	No planned actions	Closed
2019-012	Partially Adequate	Planned actions ongoing update due 31 July 2020	Open

Each Safety Recommendation is also defined as to whether it is a Safety Recommendation of European Union Wide Relevance (SRUR) or a Safety Recommendation of Global Concern (SRGC). Of those issued in 2019, nine were SRUR and three were SRGC. The AAIB, as well as all EU Member States, is required to record on the European Central Repository Safety Recommendation Information System (SRIS) all recommendations it raises and the response that are received. Data from SRIS is available to view publicly at:

http://eccairsportal.jrc.ec.europa.eu/index.php?id=114&no_cache=1



The chart above shows the recommendation topics using the ENCASIA taxonomy.
Note - a recommendation can include several topics within the classification system.

Safety Recommendations issued in 2019

Notes: Safety Recommendation classification correct at time of publication.

Safety Recommendations can also be made through AAIB Special Bulletins and are then also reflected in the final report.

Reflects the situation with Safety Recommendations at 15 June 2020.

British Aerospace BAe ATP, SE-MHF, on 3 May 2018

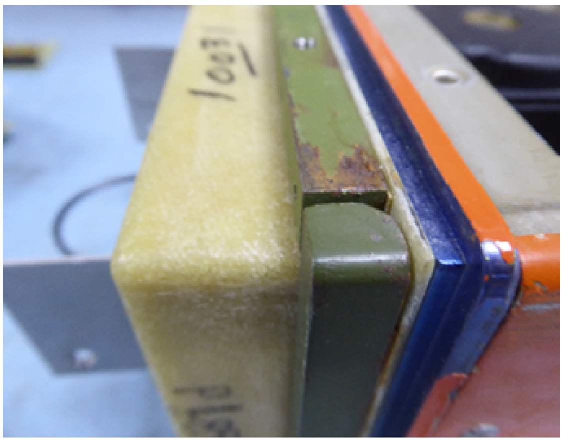
Synopsis

The aircraft experienced a loss of DC electrical power during the cruise whilst operating a cargo flight from East Midlands Airport to Stansted Airport, resulting in the loss of a significant number of flight deck instruments and systems. The crew decided to return to East Midlands Airport where they made a normal landing, following which DC electrical power was restored without crew action. The loss of electrical power was consistent with a failure of the No 1 Transformer Rectifier Unit (TRU) or its contactor, followed by a subsequent failure of the DC essential busbar couple function. Subsequent testing of the aircraft's electrical system did not identify the cause of either failure.

The investigation identified that the aircraft's FDR was recording intermittently due to corrosion caused by moisture ingress. Two Safety Recommendations are made, relating to the prevention of moisture entering the FDR on BAe ATP aircraft with the Large Freight Door (LFD) modification and for the replacement of flight recorders using magnetic tape.

Intermittent fault within the FDR system

The PV1584 FDR fitted to SE-MHF had an intermittent fault that caused nine hours of data not to be overwritten and the loss of data during several other flights. Inspection of the FDR found evidence of moisture within the electronics module. This most likely caused the intermittent operation of the magnetic-tape recording function. The moisture may have also prevented the correct operation of the BITE as no fault was noticed during the period of incorrect operation.



Records showed that between 2010 and 2018, 35% of the PV1584 FDRs removed from BAe ATP aircraft contained evidence of moisture within the unit's electronic module. The majority of these units required replacement of damaged connectors, with 22 FDRs confirmed as having failed due to moisture damage.

The majority of FDRs found with moisture ingress were those that had been fitted to BAe ATP aircraft with the LFD. Discussions with engineers, and inspection of SE-MHF, indicate that rainwater can enter the cargo bay area during loading, which may then find its way into the rear equipment bay and the FDR. There was also some evidence that rainwater had dripped onto the FDR. Over time this will increase the probability of moisture entering the FDR and cause it to fail as corrosive products develop. Although tested for resistance to moisture ingress at certification, the PV1584 is not hermetically sealed and therefore moisture and liquids can easily enter the unit. Unlike later generation solid-state recorders, the unit was not required to be tested for its waterproofness or the potential effects of dripping water.

Therefore, to minimise the effects of moisture ingress on the performance of the FDR fitted to the ATP, the following Safety Recommendation is made:

Safety Recommendation 2019-001 made on 18 April 2019

It is recommended that the European Union Aviation Safety Agency (EASA) require BAE SYSTEMS to protect the flight data recorder fitted to those ATP aircraft equipped with large freight doors from the effects of rainwater and other liquids.

Addressee response

Received 3 July 2019

The European Union Aviation Safety Agency (EASA) has contacted BAE SYSTEMS to discuss the protection of the flight data recorder fitted to those ATP aircraft equipped with large freight doors from the effects of rainwater and other liquids.

Response Assessment	Partially adequate
Action Status	Planned actions ongoing, update due 28 February 2020
Safety Recommendation Status	Open

Magnetic tape obsolescence

In response to an ICAO recommendation to discontinue the use of magnetic-tape FDR and CVR technology, EASA required the replacement of all magnetic-tape CVRs with a solid-state CVR by 1 January 2019. However, although EASA acknowledged that magnetic tape is unreliable, obsolete and 'have an insufficient recording quality', they did not require the replacement of magnetic tape FDRs.

In addition to the operator of SE-MHF, which has indicated that it intends operating their BAe ATP fleet for several more years, there are also a small number of UK-operated aircraft that are equipped with a magnetic-tape FDR. Discussions with UK based MROs indicate that long-term support for this obsolete technology is declining. However, it may still be several years before aircraft operating in Europe with magnetic-tape FDRs are finally retired from service, or a lack of spares require an operator to install an alternative solid-state FDR.

It is important that FDR systems are reliable and ensure high quality data is available to accident investigation authorities. Therefore, the following Safety Recommendation is made:

Safety Recommendation 2019-002 made on 18 April 2019

It is recommended that the European Union Aviation Safety Agency (EASA) set an end date to prohibit the use of flight data recorders that use magnetic tape as a recording medium, to ensure compliance with ICAO Annex 6 from that date.

Addressee response

Received 3 July 2019

Prohibiting the use of flight data recorders (FDRs) that use magnetic tape as a recording medium was considered under European Union Aviation Safety Agency (EASA) rulemaking tasks RMT.0400 & RMT.0401 'Amendment of requirements for flight recorders and underwater locating devices'.

The results of the related regulatory impact assessment (RIA) are contained in the associated notice of proposed amendment NPA 2013- 26, which was published on 20 December 2013. As described in the RIA, a conservative assumption was that, on 1 January 2013, 20% of FDRs installed on aeroplanes operated for commercial air transport by EASA Member State operators were using magnetic tape technology. The proportion of magnetic tape FDRs was assumed to decrease at a rate corresponding to the renewal rate of the fleets of aeroplanes of EASA Member State operators. Assuming an economic life cycle of 30 years for an aeroplane, the proportion of magnetic tape FDRs on board aeroplanes was expected to decrease by 10% every 3 years. With this assumption, by 1 January 2019 the proportion of aeroplanes fitted with a magnetic tape FDR was estimated to be close to 0%. Therefore, requiring the replacement of magnetic tape FDRs for a few residual inservice aeroplanes was considered not to be justified.

Furthermore, prohibiting the use beyond 01 January 2019, of FDRs that use magnetic tape as a recording medium would need to be considered through a new rulemaking task which would be allocated a priority according to EASA's established rulemaking planning process. The FDR is not needed for safe flight and landing, it does not directly improve the survivability of aircraft accidents, and the number of aeroplanes of EASA Member State operators potentially impacted by phasing out of magnetic tape FDRs is minimal, so that such a rulemaking task would most probably be allocated a low priority.

Response Assessment	Not adequate
Action Status	No planned actions
Safety Recommendation Status	Closed

Airbus A320, EI-CVB, on 3 February 2018

Synopsis

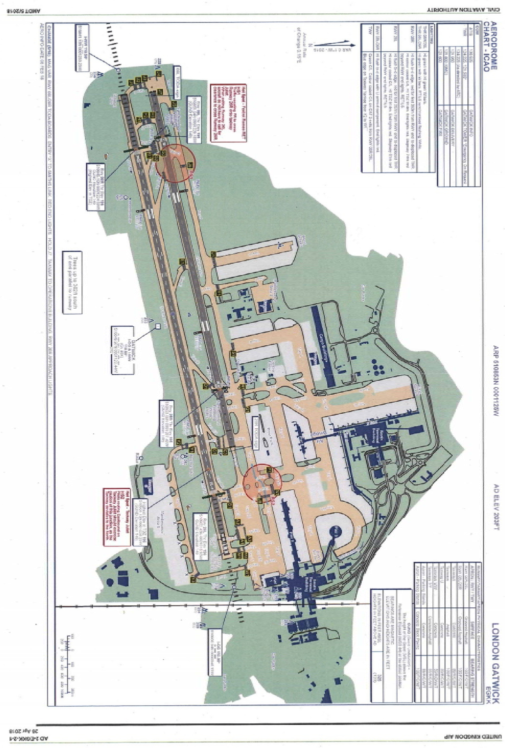
A vehicle carrying out a runway inspection was cleared onto the active runway ahead of an aircraft decelerating after landing. The investigation identified shortcomings in runway inspection procedures and the management of the internal review conducted after the incident.

Runway inspections

The importance of effective runway inspection is borne out by the number of foreign objects found over a relatively short period at Gatwick Airport and the potential safety risk these pose to aircraft. Whilst this problem is not unique to Gatwick Airport, in its drive to maximise the use of its single runway, the airport has created an intensity of operations that makes the task of runway inspection more difficult to achieve.

It is apparent from the investigation that both ATC and the airside operations teams were striving to carry out runway inspections under the prevailing working environment. There was, however, evidence of a lack of understanding of how each discipline's work impacted on others operating at the airport and had potentially normalised procedures that would otherwise have been considered undesirable, or at worst unacceptable. The ATC and airport investigations were triggered by the pilot declaring his intention to file a safety report. The ATC report, subsequently adopted by the airport operations department, saw nothing wrong in what happened. This was reinforced by subsequent interviews with ATC staff and was in direct contrast to the opinion of the airline operator involved and of other airline operators, when asked.

The ATC report justified the actions of the controller and operations staff as it considered the aircraft was committed to vacating at RET Foxtrot Romeo. This was based on the radio transmissions during the landing roll and ground radar recordings showing the aircraft moving off the centreline towards the exit as the operations vehicle entered the runway. The report, however, gave no consideration to the fact the aircraft appeared to be still on the centreline at the time the instructions were issued to the operations vehicle, the speed of the aircraft, the wet state of the runway and the implications had the aircraft, for whatever reason, needed to continue on the runway past RET Foxtrot Romeo. There was also no apparent understanding of the potential distraction caused by asking the crew questions at a time of high workload.



These conclusions were inconsistent with the comments of the ATC manager who justified the actions based on the aircraft having been re-cleared, after it touched down, to vacate at RET Foxtrot Romeo: in effect an instruction during the landing to stop short of a particular position on the runway. It is not clear that this is in accordance with any recognised ATC procedure.

In confirming the procedure to be adopted, SI 021 made no reference to re-clearing aircraft, but specified the need to ensure an aircraft 'must clearly be established in the turn off the runway-centreline into the runway exit' before a vehicle can be cleared onto the runway ahead of it. This statement leaves the risk, as already outlined, of an aircraft subsequently turning again to continue along the runway past the exit. In addition, SI 021 contains no information on the direction runway inspections should be performed.

The guidance available to the controllers both in SI 021 and MATS Part 2 lacks relevant information published in the airport's runway inspection SOP, such as communication procedures and actions in the event of a vehicle breakdown on the runway. There was also a lack of consistency between the existing guidance in MATS Part 2 and SI 021 on the desirability of conducting the runway inspection in one run.

Safety Recommendation 2019-003 made on 15 August 2019

It is recommended that Air Navigation Solutions Ltd amend the wording of the Gatwick Airport Manual of Air Traffic Services Part 2, Chapter 10 and Supplementary Instruction 021 to specify how an aircraft is determined to have fully committed to vacating the runway, and ensure a vehicle cannot be cleared onto the runway ahead of an aircraft until the aircraft has done so.

Addressee response

Received 11 November 2019

- The ANSP and the airport company have introduced a new regime for runway inspections including the introduction of planned (rather than ad-hoc) delivery of inspections and requirements to only accept inspections in blocks meaning urgent on/off access (as in the incident being reported upon) is no longer required and not used.

- The appendix to this letter contains the original text and the new text that has been submitted to the CAA to address the recommendation. The process to introduce this as an instruction included a review with the local examiners and an assessment of the effect that this change may have on workload and/or complexity. The instruction is now with the CAA for review and approval. Upon receipt of the CAA approval this instruction will be published.

- A follow-on review of safety performance regarding runway inspections in light of this incident and subsequent to the changes to the procedures implemented. The review revealed no incidents or reported events and standards reporting showed the introduction has been delivered safely.

Response Assessment	Adequate
Action Status	Planned actions ongoing, update due 1 June 2020
Safety Recommendation Status	Open

Boeing 737 4Q8, G-JMCR, on 12 October 2018

Synopsis

The aircraft was operating a night flight to East Midlands Airport, with the left engine generator disconnected, and had just commenced its descent when the crew faced an unusual array of electrical failures on the flight deck. Despite the loss and degradation of a number of systems, the aircraft landed safely at East Midlands.

The electrical failures were caused by the right engine Generator Control Unit (GCU) which had been incorrectly secured in its mounting tray and had disconnected in flight. The investigation also uncovered a number of contributory factors including: the management of defects and Acceptable Deferred Defects (ADD), recording of maintenance, and a number of weaknesses in the operator's Safety Management System with regards to managing risk.

Use of the minimum equipment list

The operator did not appear to use the MEL in the spirit of EASA's Acceptable Means of Compliance or its own procedures. Rather than using the MEL to allow the aircraft to return to its main operating base where the faults could be rectified, it appears to have been used to enable the aircraft to meet operational commitments. Fault finding, and rectification was frequently stopped before the root cause had been identified and on a number of occasions the aircraft was dispatched from a location where the work could have been carried out.

The burnt pins on the feeder cable was a known fault. On 10 October 2018, an engineer correctly identified that there was a FF on Gen 1 and inspected the connector between the engine and pylon but ran out of time to check the connector between the pylon and wing where the burnt pin was located.

The Rectification Interval Extensions (RIE) for the defect on Gen 1 should only have been granted in exceptional circumstances. However, while resources were available to identify and fix the fault within the specified time, the RIE was approved to enable the operator to meet operational commitments.

There also seemed to be confusion with operations and engineering staff within the LMC and the Part M organisation as to what constituted a main operating base. It was commonly believed that a number of locations across their operating network that had Part 145 organisations could be considered as a main operating base and that it was acceptable for aircraft to be dispatched from East Midlands with an ADD operating in accordance with the limitations in the MEL. This was, however, contrary to the operator's Operation Manual.

The confusion as to what constituted a main operating base and the routine deviation from the operator's procedures on the use of the MEL and RIE might have partly been due to the operator's policy and procedures not being suitable for its routine operations. Therefore, the following Safety Recommendation is made:

Safety Recommendation 2019-004 made on 28 August 2019

It is recommended that West Atlantic UK revises its policy and procedures for approving and clearing Minimum Equipment List entries and Rectification Interval Extensions to ensure that it conforms with the guidance contained within the European Union Aviation Safety Agency Acceptable Means of Compliance.

Addressee response

Received 17 December 2019

Signatories for RIE have received additional training in RIE approval, including detailed analysis of FSR to ensure application is within the regulatory requirements.

MEL Revision 14, May 2019 updated to include: Changes to section 9.3.8 defining "maintenance bases" and "transit station" within a night program. Changes to section 9.5.3 giving the commander detail on the risk assessment of multiple defect within the context of the operation they expect. This guidance is meant as the last action before aircraft operation and supports the risk analysis process adopted by Part M within the LMC. The processes have been developed in conjunction with each other.

All RIE's have an accompanying SMS report filed which is investigated by Part M.

A policy/organisational change has been implemented introducing a dedicated team of engineers tasked with monitoring on daily bases all deferred and repetitive defects (MEL).

The defect control process started in May 2019 and was fully effective as from October 1, 2019. The defect control team is part of the Line Maintenance Control process and reports to the NPCA via the LMC Manager.

For this purpose, a Defect Control application was introduced called Chronic'X. In addition, all aircraft defects are recorded in the FSR with actions taken, risk assessment and recovery plan in place.

Daily meeting at 08:45, 7 days a week assess all open defects using the data in the FSR and Chronic'X.

Defect control team arrange parts, manpower and rectification plan to ensure rectification is completed expeditiously or before the open defect (MEL) expiry date.

This system gives full control on approving and clearing of MEL entries. Weekly meeting the NPCA is briefed to ensure MEL oversight.

The process is described in the LMC Company operating Procedure CoP 4.0 chapter 12- A follow-on review of safety performance regarding runway inspections in light of this incident and subsequent to the changes to the procedures implemented. The review revealed no incidents or reported events and standards reporting showed the introduction has been delivered safely.

Response Assessment	Adequate
Action Status	Planned actions complete
Safety Recommendation Status	Closed

Operational management of defects

The operator recognised that the management of defects and rectification across their fleet was challenging due to the nature of their operations. The aircraft were rarely in the same place on consecutive days and there were frequently changes to the flying programme, which made the provision of spares, specialist engineers and equipment difficult. The operator's staff were also conscious of the tight turnaround times that their customers expected and whilst there was no evidence of external pressure having been applied to any individuals, there may have been an element of self pressure to ensure that aircraft were not delayed. Fault finding was frequently stopped part way through and on three separate occasions the GCU were swapped without the aircraft documentation having been completed in accordance with Commission Regulation (EU) No 1321/2014, (continuing airworthiness). The following Safety Recommendation is made:

Safety Recommendation 2019-005 made on 28 August 2019

It is recommended that West Atlantic UK ensures that all work undertaken on its aircraft is documented in accordance with the requirements of Regulation (EU) No 1321/2014 (regarding continuing airworthiness).

Addressee response

Received 17 December 2019

The work undertaken on the aircraft are either covered by an SRP (Sector Record Page) entry with action taken and action reference of via a dedicated Work Order (WO)

For Deferred Defects and or repetitive defects (MEL's) dedicated Work Orders are raised by LMC for defect trouble shooting as required to either give trouble shooting advise and or have spare parts available.

The procedure for issuing WO is laid down in CoP 4.0 chapter 12 in order to ensure work is properly documented and traceable in case of repetition.

The FSR Fleet status listing log and Chronic'X and LMC shift handover application are put in place to monitoring and control that the correct MEL references and Airworthiness documentation is applied.

Response Assessment	Partially adequate
Action Status	Not enough information
Safety Recommendation Status	Open

Management of defects policy

The management of defects was primarily carried out by staff in the LMC. These individuals may be required to manage a number of issues on separate aircraft during their shift. Their main aim is to ensure that the company meets its operational commitments during their period of duty. The main oversight was undertaken during the 0600 hrs morning conference which involved representatives from LMC and the Part M organisation using the updates provided on the operator's messaging system. Despite numerous entries on FSR highlighting concerns with the electrical system on G-JMCR, and the difficulty in completing the fault finding during the tight turnaround times, there was no evidence of a plan to ensure that the aircraft was given sufficient downtime to rectify the faults and clear the ADD. Instead, the issue drifted on with an RIE approval and a number of engineers at different locations repeating similar fault-finding tasks until eventually the GCU was incorrectly secured and disconnected in flight.

The operator has addressed the situation by establishing the post of Defect Controller who reports through the Part M organisation. However, this individual is not available outside normal office hours or during periods of holiday or sickness. Moreover, the morning conference calls only take place during the normal working week which means that frequently only the operations supervisor and the LMC staff are in a position to undertake a dynamic risk assessment of the ongoing airworthiness of individual aircraft. While these individuals have the authority to prevent an aircraft flying if they believe it is unsafe to do so, it might not be apparent to them that this dynamic oversight is a key part of their job. The following Safety Recommendation is made:

Safety Recommendation 2019-006 made on 28 August 2019

It is recommended that West Atlantic UK revises its policy and procedures to ensure effective management of defects, and the undertaking of dynamic risk assessments of the airworthiness of aircraft during all hours of operation.

Addressee response

Received 17 December 2019

A new risk assessment application integrated into the FSR requires a risk assessment in the event an aircraft develops multiple deferred defects.

The monitoring of deferred defect risk assessment is the responsibility of the LMC controller. LMC controller will take appropriate actions to mitigate identified hazards.

The process is described in CoP 4.0 chapter 13 The process is described in CoP 4.0 chapter 1.

Response Assessment	Adequate
Action Status	Planned actions complete
Safety Recommendation Status	Closed

Communicating with other Part 145 organisations

The electrical fault that occurred during the landing at Amsterdam was unusual. Lights and screens that can only be on or off were flashing which indicated that there was an intermittent fault within the No 2 electrical system that eventually caused the circuit breaker for GCU 2 to trip. The Part 145 engineers did not have access to the operators FSR and would not have known the history of the electrical problems on the aircraft, which LMC described to the commander as serious. While the commander gave a detailed explanation to LMC as to the problems he had experienced, this was not relayed to the engineer who was tasked with rectifying the problem with Gen 2 and resetting the system so that the aircraft could return to East Midlands. No written tasking document, recent history of the aircraft or the concerns from LMC that there was a serious electrical problem on the aircraft were provided to the engineer. The engineer reset the system as requested and reported back to LMC who did not ask him to undertake any further work. The total time from the engineer being tasked to travelling to the aircraft and completing the work was 35 minutes.

In completing the trouble shooting as laid out in the Maintenance Manual, the engineer had satisfactorily completed the task he was given, which was to investigate why the two serviceable generators were inoperative. But the circuit breaker that was found to have tripped could not have caused the intermittent electrical supply to the flight deck instruments. Significantly, no one appeared to address the potential increase in risk to the safe operation of the aircraft should the fault reoccur in flight while operating with one generator already inoperative in accordance with MEL 21-1b.

The commander initially felt uneasy at the fault being cleared but was reassured when the engineer discussed what he had done with LMC: the engineer felt that his conversation with LMC was more to do with when the aircraft could be returned to service. In turn, the LMC was reassured by the commander, who was new to the company, and the engineer that the aircraft was now serviceable. However, the engineer in Amsterdam did not have knowledge of the ongoing electrical problems on the aircraft and none of the three parties discussed the impact of the fault on Gen Bus 2 reoccurring during the next flight. In summary, none of the three individuals involved had the full picture on the condition of the aircraft and a risk assessment was not carried out to determine if the aircraft was in a safe condition to continue flying with one generator inoperative. The following Safety Recommendation is made:

Safety Recommendation 2019-007 made on 28 August 2019

It is recommended that West Atlantic UK revises its policy and procedures for the tasking of maintenance activities by Line Maintenance Control and the sharing of relevant aircraft technical history to ensure that maintenance organisations undertaking work have access to all appropriate information.

Addressee response

Received 17 December 2019

The technical log records all maintenance defects actioned against each airframe and is transferred into RAL, our approved maintenance management system.

The WAcloud application "FSR" collects additional maintenance information on deferred maintenance activities.

The Chronic'X system access data in both RAL and the FSR to provide a comprehensive source of information and feedback on defect control to support line maintenance with trouble shooting.

The station engineers have access to the FSR for consultation if so required.

Response Assessment	Partially Adequate
Action Status	Not enough information
Safety Recommendation Status	Open

Safety management system

This investigation identified safety issues across a number of areas that had not been identified or addressed by the Operator's SMS. Therefore, the following Safety Recommendations are made:

Safety Recommendation 2019-008 made on 28 August 2019

It is recommended that West Atlantic UK revises its Safety Management System to meet the requirements of the scale and nature of their operation.

Addressee response

Received 17 December 2019

1. To support the Head of Risk, Safety and Compliance a full-time Part M Quality Engineer has been employed as of 1st November 2019. This will provide a dedicated resource with direct responsibilities for ensuring the policy of the Management System is effectively managed.
2. The Safety Management System has been modified to include additional quality assurance and verification processes to monitor corrective and preventative actions introduced to mitigate risks within the operation.
3. Four additional part-time auditors have been employed in support of the Compliance Monitoring programme.
4. Additional training courses have been implemented and delivered;
   a) Advanced Safety and Compliance Course for Managers.
   b) Internal Auditors Course.
   c) Investigators Course.

Response Assessment	Adequate
Action Status	Planned actions complete
Safety Recommendation Status	Closed

Safety Recommendation 2019-009 made on 28 August 2019

It is recommended that the Civil Aviation Authority assess West Atlantic UK's Safety Management System to ensure it meets the requirements of the scale and nature of their operation.

Addressee response

Received 25 October 2019

The Civil Aviation Authority accepts this recommendation. The CAA has conducted an initial assessment of West Atlantic UK's Safety Management System and continues to monitor compliance and effectiveness of this element of the organisation's approval.

Further assessments, including effectiveness, are scheduled to be completed by no later than February 2020.

Response Assessment	Adequate
Action Status	Planned actions complete
Safety Recommendation Status	Closed

DHC-8-402 Dash 8-Q400, G-JECR, 15 November 2018

Synopsis

Whilst climbing to FL190 en-route to Charles De Gaulle Airport, Paris the pilots received an ALT MISMATCH message and they elected to return to Exeter Airport. Following an inspection after landing, a small white crystalline deposit was found covering three of the four static pressure holes on the left primary pitot static probe. It is probable that the use of a non-approved product, to improve the seal between a test adaptor and the pitot static probe during maintenance immediately prior to this flight, may have resulted in the blockage of the static holes and led to the ALT MISMATCH message. Two Safety Recommendations have been made; one to the air data accessory kit manufacturer and one to the aircraft manufacturer to improve the instructions for the use of testing kits when carrying out leak tests of the pitot/static system and to only use approved lubricants. The maintenance organisation has taken Safety Action to introduce tighter controls on the test kit equipment.

Instructions for use of air data accessory kits

The kit manufacturer stated that the instructions for use of the air data accessory kit should be described in the relevant section of the AMM. The work orders issued by the maintenance organisation state that to accomplish a task it is to be done in accordance with the specific AMM task. However, the AMM does not provide any details on how to install the adaptors, which products should be used, or any additional information to aid the technicians to achieve a good seal between the probe and the adaptor.

Therefore, to improve the information with the air data accessory kits, which are used on several different aircraft types, the following Safety Recommendation is made:

Safety Recommendation 2019-010 made on 24 October 2019

It is recommended that Nav-Aids Ltd amend the manual supplied with air data accessory kits to include more specific installation instructions, and to include warnings against using non-approved materials to aid sealing.

Addressee response

Awaited

Response Assessment	Awaited
Action Status	Awaited
Safety Recommendation Status	Open

AMM instructions

To improve the information in the AMM for the De Havilland Aircraft of Canada Ltd DHC-8-402 the following Safety Recommendation is made:

Safety Recommendation 2019-011 made on 24 October 2019

It is recommended that De Havilland Aircraft of Canada Ltd amend the instructions in the Aircraft Maintenance Manual for the DHC-8-402 for testing pitot static probes to include more specific installation instructions, and to include warnings against using non-approved materials to aid sealing.

Addressee response

Received 22 April 2020

De Havilland Aircraft of Canada Ltd appreciates the chance to respond to your proposed Safety Recommendation.

While safety is of upmost concern in our industry, it is our belief that, in this particular situation, any qualified technical staff should review and utilize the manual for any of the required pieces of test equipment that are external to the basic airframe. The information necessary to utilize the test equipment is specific to the each type of test equipment and different again, depending on each supplier of the various types of test equipment.

Furthermore, these types of instructions are already available, as well as being authored by those who manufacture the equipment.

One of the manufacturers has an on-line video available to aid use of a preferred lubricant for installation of the adapter (http://navaidsltd.net/LF5050-Lubricating-Fluid.html)

Response Assessment	Not adequate
Action Status	No planned actions
Safety Recommendation Status	Closed

Boeing 737-8AS, EI-GJT, 9 October 2018

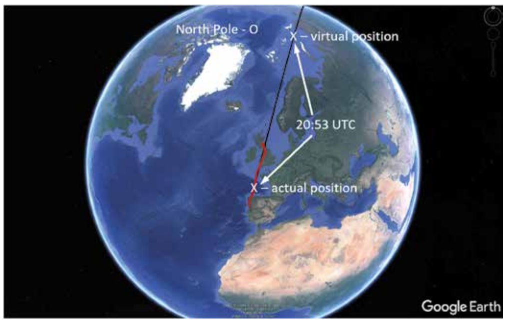
Synopsis

Shortly after reaching cruise at FL360 the commander's attitude indicator malfunctioned affecting numerous aircraft systems, and the aircraft climbed 600 ft. After a significant time delay an IRS caution was displayed. The Quick Reference Handbook (QRH) was followed by the crew and the left Air Data Inertial Reference Unit (ADIRU) was put into ATT mode. The left Primary Flight Display (PFD) continued to display erroneous attitude information to the pilot, and other systems were also affected. The aircraft was flown manually to Edinburgh where it landed safely.

The left Inertial Reference System (IRS) suffered a transient fault in one of its accelerometers which led to an erroneous calculation of position. False position information led to the incorrect attitude information on the commander's PFD, and the autopilot (AP) responded by initiating a slow climb.

QRH guidance

There was a significant period between the first symptoms of faulty attitude information and the appearance of the IRS FAULT indication. Shortly after the attitude information failed, pitch and roll comparator annunciations appeared on both PFDs. While these flags indicate a failure, they do not decisively indicate where it lies. Pilots must use standby instruments to determine where the failure is and, if necessary, recover to the correct attitude through manual flight. Selecting a different source for the faulty PFD would remove the flags and restore valid attitude information on both pilots' PFDs, although it would lead to a reduction in redundancy because all PFD attitude information would be from a single source. Information is available in the FCOM to aid crew understanding, but because of the expressed philosophy in the QRH discouraging troubleshooting, and the training discouraging the use of QRH checklists except in response to relevant associated warnings, it is unlikely crews will act unless specifically directed to do so by the QRH checklist.



In these events, the failure occurred in VMC and straight and level flight and the outcome was benign. However, the PFD is a primary instrument which dominates a pilot's display panel, and a failed attitude display presents a powerful disorientating stimulus to the relevant pilot. The comparator annunciation appears simultaneously in both PFDs and, if no action is taken, can remain as a significant distraction for the remainder of the flight. In manoeuvring flight it could be unclear where the failure lay, and the presence of the failed display would continue to constitute a disorientating factor.

Boeing decided to amend the QRH checklist for IRS FAULT but this would not address the situation where there was faulty attitude information but no IRS caution message.

Therefore, the following Safety Recommendation is made:

Safety Recommendation 2019-012 made on 24 October 2019

It is recommended that Boeing Commercial Aircraft amend the Boeing 737 Quick Reference Handbook to include a non-normal checklist for situations when pitch and roll comparator annunciations appear on the attitude display.

Addressee response

Received 24 April 2020

Boeing has reviewed the Quick Reference Handbook (QRH) procedures for the 737 and compared the handbook to other Boeing models. The current PITCH and ROLL comparator annunciations are classified as flags in our certification documentation. Adding corresponding non-normal procedures to the QRH would require reclassifying the flags as alerts for certification purposes. Boeing is currently reviewing our certification documentation to understand all the potential effects of making the proposed changes.

We will update the AAIB on the QRH change status by July 31, 2020. Boeing will also provide the AAIB with a copy of any changes upon their release.

Response	Partially adequate
Action Status	Planned actions ongoing, update due by 31 July 2020
Safety Recommendation Status	Open

Safety Actions from investigations reported on in 2019

Early in an investigation the AAIB will engage with authorities and organisations which are directly involved and have the ability to act upon any identified safety issues. The intention is to prevent recurrence, and to encourage proactive action whilst the investigation is ongoing, and not for those involved to wait for the issue of official Safety Recommendations.

When safety action is taken, it may mean there is no need to raise a Safety Recommendation as the safety issue is likely to have been addressed. The published report details the safety issues and the safety action that has taken place.

In 2019 there were 153 Safety Actions recorded directly as a result of 18 field and 36 correspondence investigations. There were 88 commercial air transport (CAT), 48 general aviation (GA) and 17 unmanned air systems (UAS) Safety Actions undertaken in 2019.

FIELD INVESTIGATIONS

Auster AOP.9, G-BXON on 18 June 2017

The pilot was undertaking his second flight on the recently-restored vintage ex-military aircraft. Shortly after taking off from Spanhoe Airfield, the aircraft was observed to bank left into a steep descent and strike the ground to the left of the runway. The pilot was fatally injured, and the passenger sustained serious injuries. The investigation determined that the aircraft stalled at a low height, from which it did not recover before striking the ground. The investigation also identified several issues relating to the aircraft and engine performance, maintenance documentation, the Permit to Fly application process, and guidance for pilots preparing for their first flight on a new type. The Light Aircraft Association (LAA) has taken a number of safety actions.

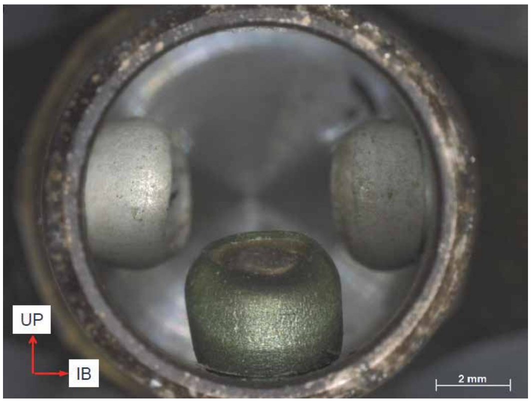
Safety actions:

The Light Aircraft Association (LAA) has:

- Created a database of initial flight test performance results and introduced a process to compare future aircraft against other examples of the same type prior to permit issue. In the case of factory-built aircraft, scheduled performance figures, when available, will also form part of this consideration.
- Clarified the wording of the stall requirement in the Flight Test Schedule which relates to the speed at which stall warning will occur. The new wording emphasises that this requirement relates only to aircraft with artificial stall warning devices and reflects that some LAA aircraft may not be so equipped.
- Introduced a procedure whereby, when it issues a newly-constructed or newly-rebuilt aircraft with a Permit to Fly, it will write to the owner with any safety related observations on the submitted flight test results. The observations will include highlighting the absence of any stall warning features, particularly

when the reported characteristics deviate markedly from that expected or from published data for the type.

- Produced guidance for pilots preparing for their first flight on a new type: it has published two magazine articles on the topic and has also produced a Technical Leaflet, TL 2.30 'Converting to a new type', for use as a preparation tool, similar to the one provided for testing pilots. Subjects addressed include: researching a new aircraft type (eg by reviewing its operating manual, operating limitations and handling peculiarities); the planning and content of a first flight on type to become familiar with the aircraft alongside a suitably experienced pilot; the importance of beneficial weather conditions (eg consideration of density altitude); choice of appropriate flying clothing; and consideration of the desirability of carrying passengers both in terms of aircraft weight, and pilot recency and experience on type.
- In October 2018, revised TL 2.21 'Rebuilding an aircraft under the LAA system' to include additional guidance on the completion of worksheets, the expected level of detail to be recorded, and reiterated the respective responsibilities of owners and inspectors for the quality and conformity of rebuild projects. Additional guidance relating to the integrity of riveted joints in rebuilt aircraft was also included, as was updated information to bring the LAA's published guidance on minimum flight testing hours into line with actual practice, and to describe the factors that LAA Engineering considers when determining the initial flight test requirements for a given aircraft.
- In January 2019, issued Airworthiness Information Leaflet MOD/920/001 'AOP.9 Inspection of rivets securing the aileron operating rod end fittings' which requires an inspection of the aileron control rod rivets on all AOP.9s within its fleet to identify the type and condition of rivets installed, and appropriate rectification according to the findings of the inspection.



Piper PA-31, N250AC on 6 September 2017

Approximately 20 minutes after takeoff from a private airstrip in Cheshire the pilot reported pitch control problems and stated his intention to divert to Caernarfon Airport. Approximately 5 minutes later, the aircraft struck Runway 25 at Caernarfon Airport, with landing gear and flaps retracted, at high speed, and with no noticeable flare manoeuvre. The aircraft was destroyed. The elevator trim was found in a significantly nose-down position, and whilst the reason for this could not be determined, it is likely it would have caused the pilot considerable difficulty in maintaining control of the aircraft.

The extensive fire damage to the wreckage and the limited recorded information made it difficult to determine the cause of this accident with a high level of confidence. A possible scenario is a trim runaway, and both the CAA and the EASA are taking safety action to promote awareness for trim runaways as a result of this accident.

Safety actions:

As a result of this investigation the EASA have undertaken action to promote awareness of trim runaways as part of its General Aviation safety promotion plan. It also intends to include trim runaway as part of a wider technical safety project, studying various technical failure scenarios. Also, as a result of this investigation the CAA plans to produce a coordinated package of educational information on trim runaway, including a video, Clued Up article and online information which will be targeted at GA pilots.

Both authorities have indicated that they intend to work together on the subject for a coordinated approach and to ensure a broad reach.

DHC-8-402 Dash 8 Q400, G-JEDU on 10 November 2017

The aircraft was carrying out the third sector of a four-sector day from Belfast City Airport to Inverness Airport. After takeoff, the landing gear was selected UP. Cockpit indications indicated that the main landing gear (MLG) retracted normally but the nose landing gear (NLG) did not. The crew carried out the actions in the relevant abnormal checklists and were unable to lower the NLG. After burning off fuel, the aircraft was diverted to Belfast International Airport where it landed with the NLG retracted. The crew initiated an emergency evacuation.

It was determined that a damaged electrical harness on one of the nose landing gear proximity sensors caused an erroneous signal, which resulted in the forward NLG doors starting to close while the NLG was still in transit to the UP position. The nose landing gear tyres contacted the forward doors, causing the NLG to rotate off-centre. Although the NLG subsequently retracted, the forward doors remained open and the tyres became jammed in the NLG bay. This prevented the nose landing gear from extending when subsequently commanded.

The damage to the harness resulted from a cyclically-driven fatigue failure mechanism, which occurred because the harness had been secured with a non-flexible cable tie which restricted it from flexing during normal nose landing gear operation.

Safety actions:

The aircraft manufacturer has:

- In October 2018, issued a Service Letter to inform operators of the Dash 8 Q400, of the correct routing of the nose landing gear lock (NGLK) sensor harnesses.
- In November 2018, issued Service Bulletin 84-32-157 to inspect the NGLK sensors for correct routing and signs of wear, abrasion or fretting.
- In January 2019, updated three AMM tasks in order to clarify the harness routing, provide instructions for the location of the rubber lacing, to add cautions indicating that harnesses should not be retained or restricted at locations other than the specified p-clips and to correct a routing installation illustration.

The operator has:

- Throughout August and September 2018, the operator carried out an inspection of the nose landing gear proximity sensor harness routing on its Dash 8 Q400 fleet and undertook rectification of any anomalies noted.

EMB-145EP, G-CKAG on 22 December 2017

The flight crew were conducting an ILS Category II[1] approach and landing on Runway 27 at Bristol Airport. On touchdown they noticed that the aircraft de-rotated sharply. The pilot flying (PF) was unable to maintain directional control during the landing roll and the aircraft ran off the left side of the runway onto the grass. At some point during the landing the throttles were moved forward, reducing the rate of deceleration. As the aircraft left the paved surface the crew realised that the landing had been carried out with the Emergency/Parking brake set. The aircraft may have remained on the runway surface but for the addition of forward thrust during the landing roll.

Safety action:

The operator introduced a revision to the Landing Checklist in the Operations Manual which requires the handling pilot to confirm the parking brake is OFF.

[1] Decision height lower than 200 ft but not lower than 100 ft and RVR of not less than 350 m.

Agusta Westland AW189, G-MCGR on 17 February 2018

The helicopter was tasked to rescue three climbers in the area of the Beinn Narnain mountain. The flight was at night and the crew made several attempts to reach them from different directions but due to low cloud were unable to do so. On the fourth attempt, from another direction, the visual references seen through each pilot's Night Vision Imaging System (NVIS) were lost and a turn back down the re-entrant was attempted. Due to the proximity of the ground, the pilot climbed the helicopter but lost airspeed after which the helicopter yawed to the right. The Pilot Flying (PF) attempted to use the Automatic Flight Control System (AFCS) upper modes to assist him but decoupled them because they caused the collective control lever to lower. The helicopter spot-turned through some 370° before regaining VMC on top. Control was regained and the aircraft subsequently landed. The crew liaised with the Mountain Rescue Team (MRT) who recovered the climbers on foot.

Safety action:

Shortly after the incident, the operator introduced a scenario-based training exercise for all pilots that reproduced the incident during six-monthly recurrent training and testing. The training was continued with an emphasis on unusual attitude recovery.

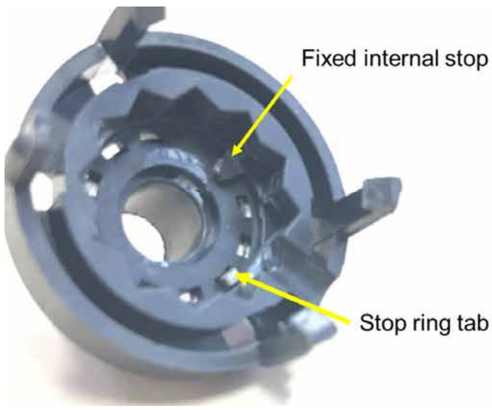
EC135 P2+, G-POLA on 5 April 2018

During a maintenance flight to adjust engine speed, main rotor rpm varied between its maximum and minimum continuous limits. A mechanical stop within the adjusting potentiometer had failed in such a way that main rotor speed could not be controlled accurately, putting the helicopter at a significant risk. The pilot had not been specially trained to carry out the flight test but his actions in flight prevented rotor speed exceeding its limits and a more serious outcome. The manufacturer and operator have taken safety action regarding the conduct of airborne engine speed adjustments.

Safety actions:

The manufacturer has:

- Issued an AMM amendment regarding the N_2 adjuster installation procedure (76-11-00,8-4), a caution to install the stop ring correctly / take care that the ring is not forgotten.



Safety Recommednation and Safety Action Overview

- Issued an AMM amendment regarding N_2 adjustment maintenance flights (05-60-00, 6-4), to check, prior to flight while on ground without power, that the N_2 adjustment switch works properly (only three switch positions are possible - decrease, neutral, increase). After successful check the switch must be turned into the neutral position.
- Issued Safety Information Notice AH 3254-S-76: 'Engine Controls – Engine Power Turbine Speed (N_2)' to draw attention to this occurrence, remind operators of the procedure, and to highlight the difference in N_2 adjustment procedures between the P2 and T2 Series EC135 helicopters.
- Has undertaken to inform operators of all its helicopter types of the circumstances of the occurrence to G-POLA, reminding them of the importance of the specific pilot skills required by all AMM post maintenance flying tasks.

The operator:

- Has categorised its flight test activities according to which of its pilots should perform them. It has restricted the N_2 adjustment flight procedure to the remit of specially trained type rating instructor and examiner pilots.
- Intends to incorporate the incident scenario in to its newly established simulator training package.

Cessna 152, G-UFCO on 19 April 2018

The purpose of the flight was to carry out aerial photography. During a manoeuvre at low level the aircraft stalled and descended rapidly, passing through some trees, before striking the ground. There was a post-crash fire and neither occupant survived.

Safety action:

Since the accident the flying club has issued instructions to their pilot members to remind them of their responsibility to understand and comply with the privileges of their licences and ratings. The club flying instructors have been reminded not to authorise any rental flight where there may be any doubt as to its purpose. The club is also re-drafting the flying order book and aircraft hire/rental agreements to make it clearer as to what can and cannot be undertaken in a hired aircraft. Additionally, the club intends to provide warning signage/posters to remind pilots and passengers of the restrictions and implications of travelling for any kind of payment in light aircraft.

Cessna 172M Skyhawk II, N9085H on 30 April 2018

Shortly after takeoff the aircraft exhibited a tendency to pitch nose down despite the application of NOSE UP trim. During the subsequent approach to land, the forces required to maintain the approach path increased to the point where the pilot could no longer control the glidepath and the aircraft struck the ground short of the runway. The investigation found that the drive chain for the elevator trim actuator had been fitted incorrectly, which resulted in the elevator trim tab moving in the opposite sense to the movement of the trim wheel.

The maintenance organisation has introduced procedures to ensure that duplicate inspections of all flight critical systems are carried out following maintenance.

Safety action:

The Bermuda-based maintenance organisation has introduced procedures to ensure that duplicate inspections of all flight critical systems are carried out, in line with its BCAA-approved maintenance procedures, on any aircraft that they operate or maintain, regardless of its State of Registration.

Guimbal Cabri G2, G-PERH on 8 June 2018

While conducting a Simulated Engine Failure from the Hover (SEFH) the helicopter yawed rapidly to the left. Despite the actions of the pilots the helicopter continued to yaw rapidly, and control was not recovered. The helicopter was seen to climb while spinning before descending rapidly and contacting the ground, sustaining severe damage. Both occupants suffered serious injuries.

Safety actions:

As a result of this, and other similar events, the manufacturer published in February 2019 two Service Letters to prevent reoccurrence. They are available on its customer support portal.

- SL19-001 - Throttle management during simulated engine failure.

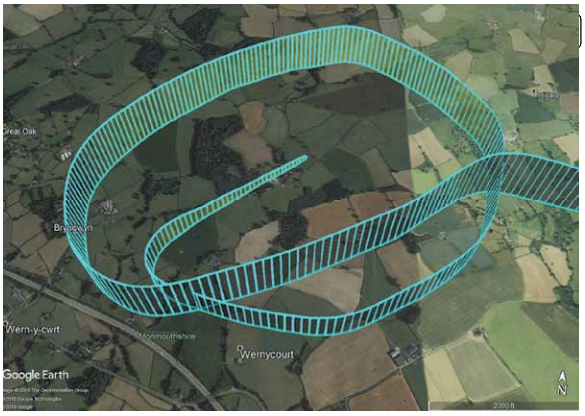
  This service letter provides an explanation of the engine governor / correlator system and the need to ensure the twist grip throttle is fully closed whilst practicing certain manoeuvres. It proves advice to flight instructors on how to position the hand on the throttle grip to enable the throttle to be closed in one movement and therefore ensuring the engine throttle does not open when the collective is raised.

- SL19-002 - Controllability in yaw at low rotor speed.

  This service letter proves advice on yaw control when operating with low rotor speeds. It includes a list of scenarios where yaw control could be lost and mitigating actions to prevent loss of control. One scenario is Simulated Engine Failure from the Hover. When operating at low rotor speeds with full or almost full right pedal applied it is recommended not to raise the collective but keep it as low as possible and increase forward airspeed by cyclic input, and not to increase the rotor speed by turning the twist grip.

Grob G109B, G-KHEH on 10 June 2018

The aircraft collided with a dead tree whilst conducting a field landing exercise. It has not been possible to determine conclusively whether the aircraft was suffering from an engine problem, most likely carburettor icing, during the descent, however, the engine was under power at the point it collided with the tree. Had it been necessary, the aircraft should have been able to avoid the tree and carry out a landing in the field beyond. It was considered most likely that the pilots did not see the tree until it was too late to avoid it.



Safety action:

The BGA publication on 11 July 2018 in response to this and previous field landing accidents sets out the main hazards and precautions required in conducting field landing training.

AS350B2 Ecureuil, G-PLMH on 13 June 2018

Whilst the helicopter was performing an underslung load operation at Loch Scadavay the boat it was carrying became unstable and flew upwards, causing the lifting line to strike the helicopter's tail rotor. The helicopter became uncontrollable and descended rapidly into the loch, fatally injuring the pilot.

The physical characteristics of the boat and the method by which it was carried increased the probability of it becoming unstable.

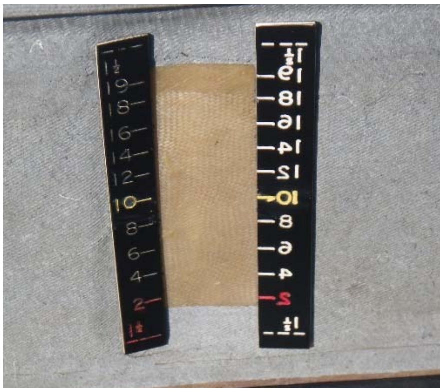
Safety actions:

As a result of this accident, the operator has taken a number of safety actions intended to prevent similar accidents in the future.

These are as follows:

- Temporarily curtailed Helicopter Exernal Sling Load Operation (HESLO) involving the carriage of boats, caravans and aeroplanes.
- Released a Safety Information notice reminding pilots and Task Specialist Air (TSA) that helmets must be worn onboard, which must fit and be properly secured at all times.
- Increased the length of the standard lifting line for Identification of Unstable or Potentially Unstable Loads (UoPULs) to 20 m, with an associated airspeed limit of 60 KIAS. Where shorter lifting lines are required, the airspeed limit is 40 KIAS and, for some operations, 30 KIAS.
- Added a section on UoUPL to its HESLO 1 pilot training syllabus. This contains sections on low-density loads and aerodynamic shape, and refers to load orientation. It states that 'any change in the status of a load in flight calls for an immediate reduction of speed below 40 KIAS'.
- Significantly expanded its Specialist Operation (SPO) Manual and Ground Handler's Manual guidance on the preparation and acceptance of loads to emphasise UoPULs. This includes information on low-density loads and aerodynamic shape, and methods of rigging loads to increase their stability, eg cargo nets, and amalgamation.
- Provided guidance in its Ground Handler's Manual which explains that pilots and Task Specialist Ground (TSG) should examine UoPULs together. Adequate time must be allowed to assess and rig UoPULs, and to put adequate control measures in place. Customer expectations should be managed accordingly.
- Added a section on flying techniques for UoPUL to its SPO Manual, which includes: accelerate in 10 KIAS increments; continually observing the load in the mirror; if the line goes slack, jettison the load; and states that 'the company will support any pilot who declines to carry [a UoPUL] on the grounds that he is not able to put in place adequate control measures'.
- Undertaken to continue with its plan to extend its Crew Resource management (CRM) training throughout the organisation and bring more of that training 'in-house'.
- Undertaken to produce written guidance on decision making. Furthermore, to select and endorse a decision making aid company-wide and incorporate it in to CRM training.

Rutan Long-Ez (Modified), G-BPWP on 7 July 2018



The pilot was operating his aircraft with a mixture of automotive gasoline (Mogas) and aviation gasoline (Avgas) 100LL in the left fuel tank and Avgas 100LL in the right fuel tank. While on base leg to land on Runway 04 at Dunkeswell Airfield the engine, which was being supplied with fuel from the left fuel tank, suddenly stopped. The pilot established a glide to land in a field in the undershoot, but at a late stage in the approach he spotted a fence running across his chosen landing site. Whilst manoeuvring to avoid the fence the aircraft touched down firmly, seriously injuring the pilot; the passenger sustained minor injuries.

The likely cause of the engine stopping was either carburettor icing or a vapour lock in the aircraft fuel supply to the engine.

Safety action:

The LAA have advised that they will use this accident to publicise the risk from vapour lock when operating piston engines on Mogas.

Cessna 150M, N66778 on 18 July 2018

N66778 was taking off from Beef Island, in the British Virgin Islands (BVI), on the sixth sector of a delivery trip from Florida to Argentina. After takeoff the aircraft was seen to fly along the length of the runway at slow speed in a nose-high attitude. It then turned left before entering a steep nose dive and hitting the sea.

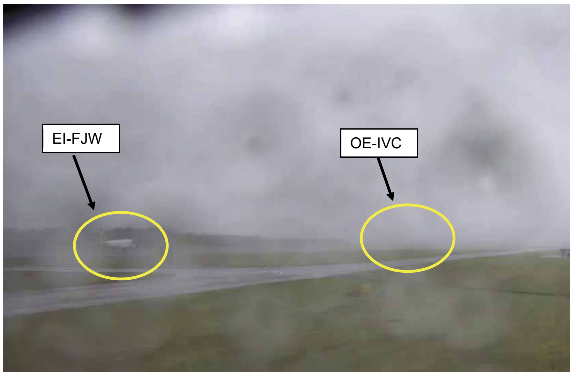
The investigation concluded that the aircraft stalled during the left turn. No evidence of any mechanical failure was found.

The aircraft was likely to have been operating slightly above the Maximum Takeoff Weight and with the centre of gravity aft of the approved limit. Several items were not secured in the cabin which could have shifted aft during the takeoff roll moving the centre of gravity further aft. It is possible that this aft centre of gravity caused control difficulties resulting in the stall. Improvements in emergency communications on BVI have been made following the accident.

Safety action:

As a result of this accident the BVI Airports Authority (BVIAA) has taken action to ensure that Virgin Island Search and Rescue (VISAR) can now be contacted directly by ATC if they cannot be alerted via the 911 operator.

Boeing 737-800, EI-FJW and Airbus A320-214, OE-IVC on 13 August 2018



A landing Boeing 737 closed to within 875 m of a departing Airbus A320 when landing at Edinburgh Airport. The airport air traffic control service provider defined this as a runway incursion as the 737 was over the runway surface when the A320 was still on its takeoff roll.

A combination of factors, including brief delays to the departure of the A320 and the speed of the Boeing 737 being higher than normal, led to the reduction in separation before the controllers became aware of the closeness of the aircraft. The trainee controller lacked the experience to resolve the situation in a timely manner and the supervising OnTheJob Training Instructor judged it safer to let the 737 land than to initiate a goaround in proximity to the departing aircraft.

The Air Navigation Service Provider (ANSP) has conducted a review of High Intensity Runway Operations at Edinburgh and taken a number of safety actions to improve procedures and on-the-job training for trainees.

Safety actions:

The ANSP at Edinburgh has taken the following safety actions in response to this incident:

- Published procedures in the Edinburgh MATS Part 2 regarding what events must be entered as Manditory Occurrence Reporting (MOR) on the TOKAI[2] system.
- Conducted a review of High Intensity Runway Operations at Edinburgh.
- Conducted a review of On the Job Training Instructor (OJTI) competency and introduced refresher training for all OJTIs as an outcome of the review.
- Has introduced additional higher OJTI chairs to provide OJTIs with a better view of the trainee, the screens and the trainee interactions with the equipment.
- Has reminded OJTIs of the requirement in the Unit Training Plan which mandates the requirements for a pre-training briefing between the OJTI and the trainee controller prior to every training session or at least every training day.
- Has incorporated a one-sheet overview of trainee ATCO's experience in their training file covering what key conditions and procedures they have experienced (eg fog, wind, go-arounds, significant slot delays, weather avoiding, snow etc).

[2] TOKAI - web-based application for air traffic management that enables users to report, investigate and take corrective action following incidents and accidents.

Czech Sport Aircraft Sportcruiser, G-CGEO on 7 October 2018

The aircraft's right main landing gear (MLG) leg was damaged following a normal landing at Fowlmere Aerodrome. Investigation of the failed MLG leg revealed a manufacturing defect that caused the progressive delamination of the leg during service.

Safety action:

The aircraft manufacturer is currently certifying a reinforced MLG leg, part number SG0160L/P, intended to increase the durability of the legs in service. This new MLG will be available for retrofit to all models of Sportcruiser and PS-28 Cruiser aircraft. In addition to slightly enlarging the MLG leg cross-section, the inflatable tubes and stretch film material used during leg manufacture are now surrounded by a woven glass fibre 'sock', to prevent radial migration of the stretch film into the leg's composite structure.

Boeing 737-8AS, EI-GJT on 9 October 2018

Shortly after reaching cruise at FL360 the commander's attitude indicator malfunctioned affecting numerous aircraft systems, and the aircraft climbed 600 ft. After a significant time delay an IRS caution was displayed. The Quick Reference Handbook (QRH) was followed by the crew and the left Air Data Inertial Reference Unit (ADIRU) was put into ATT mode. The left Primary Flight Display (PFD) continued to display erroneous attitude information to the pilot, and other systems were also affected. The aircraft was flown manually to Edinburgh where it landed safely.

The left Inertial Reference System (IRS) suffered a transient fault in one of its accelerometers which led to an erroneous calculation of position. False position information led to the incorrect attitude information on the commander's PFD, and the autopilot (AP) responded by initiating a slow climb.

One Safety Recommendation is made concerning the Boeing 737 QRH.

Safety action:

Following this incident, Boeing decided to amend the QRH checklist for IRS FAULT. The reference to ATT mode would be removed and the checklist would direct crews to use the IRS Transfer Switch to supply relevant aircraft systems from the serviceable side.

Boeing 737-4Q8, G-JMCR on 12 October 2018

The aircraft was operating a night flight to East Midlands Airport, with the left engine generator disconnected, and had just commenced its descent when the crew faced an unusual array of electrical failures on the flight deck. Despite the loss and degradation of a number of systems, the aircraft landed safely at East Midlands.

The electrical failures were caused by the right engine Generator Control Unit (GCU) which had been incorrectly secured in its mounting tray and had disconnected in flight. The investigation also uncovered a number of contributory factors including: the management of defects and Acceptable Deferred Defects (ADD), recording of maintenance, and a number of weaknesses in the operator's Safety Management System (SMS) with regards to managing risk.

Safety actions:

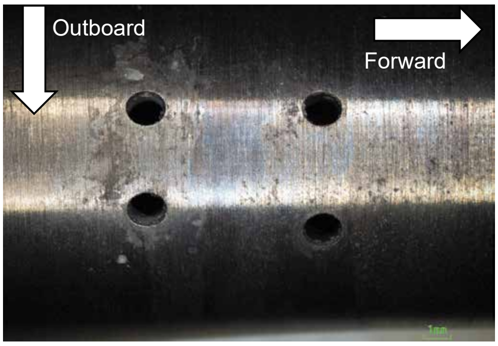
As a result of this serious incident, and the findings of the AAIB, the operator has stated that they will take the following safety actions:

- Redefine the criteria of a maintenance base with each aircraft allocated to a specific maintenance base dependent on the route flown.
- All ADDs will be monitored daily and best endeavours made to rectify them within 48 hours. Where this time limit is not achieved an occurrence report will be raised to enable an investigation to be carried out to establish why this was not possible.
- A Safety Report will be raised via the SMS for all RIE applications.
- Monitor in real-time the management of ADD and RIE applications using a number of Performance Indicators over a 12-month rolling period.
- Line Maintenance Control (LMC) will be informed of all intended deferred defects before actual deferral.
- Prior to deferral of a defect, a risk assessment based on the source of the fault and subsequent impact on the aircraft systems and operational limitations will be carried out by an engineer in consultation with the crew. LMC will provide historical defect information relevant to the unserviceable system in question and knowledge of the aircraft's historical airworthiness generally.
- An additional status header of 'Risk Assessment' has been added to the Flight Safety Reporting (FSR). A summary of the risk assessment will be documented in the FSR against the deferred defect highlighting significant risks that are associated with the aircraft's airworthiness status.
- A review of persons authorised to ground a serviceable aircraft without reason and with good reason following a risk assessment has been carried out.

- Procedural deficiencies were identified in the following processes. A compliance review of these areas had been planned for completion by 31 July 2019 with corrective and preventative actions identified implemented by 30 September 2019.
  - Risk management of deferred defects.
  - Rectification management of deferred defects.
  - Interface between LMC and remote Part 145 organisations.
  - Standardisation of policy across all departments concerning deferred defect control.

DHC-8-402 Dash 8 Q400, G-JECR on 15 November 2018

Whilst climbing to FL190 en-route to Charles De Gaulle Airport, Paris the pilots received an ALT MISMATCH message and they elected to return to Exeter Airport. Following an inspection after landing, a small white crystalline deposit was found covering three of the four static pressure holes on the left primary pitot static probe. It is probable that the use of a non-approved product, to improve the seal between a test adaptor and the pitot static probe during maintenance immediately prior to this flight, may have resulted in the blockage of the static holes and led to the ALT MISMATCH message. Two Safety Recommendations have been made; one to the air data accessory kit manufacturer and one to the aircraft manufacturer to improve the instructions for the use of testing kits when carrying out leak tests of the pitot/static system and to only use approved lubricants. The maintenance organisation has taken Safety Action to introduce tighter controls on the test kit equipment.



The air data accessory kit manufacturer recommends the use of LF5050 to aid installation and the avionics technicians stated that it is often missing from the kit box due to kit control issues. It is possible therefore that to 'get the job done' the technicians may resort to other more easily available products with the unintended consequence, in this case, of residual grease blocking some of the static holes. As a result of this investigation the following safety action has been taken:

Safety action:

The maintenance organisation has purchased new air data accessory kits and implemented tighter tool control of the kits to ensure all the components are always available.

CORRESPONDENCE INVESTIGATIONS

Aeryon Skyranger R60, (UAS) SR9112798 on 18 January 2018

After takeoff the unmanned aircraft (UA) experienced winds exceeding the manufacturer's stated limitations and was unable to hold its position position. A culmination of the subsequent position warning and automatic attempt to return "home" and land triggered a software error, commanding the UA to land while not over its home position. As the UA descended there was a loss of link with the ground control unit and the UA collided with a tree. The loss of signal was probably caused by the loss of radio line of sight between the UA and ground control unit when it drifted in the high wind over a five-storey building.

Safety actions:

As a result of the accident, the operator carried out a comprehensive review of their procedures as well as liaising with the manufacturer on the technical aspects of the accident. As a result, the operator has introduced a number of safety actions. These include:

- Ensuring software checks and updates are integrated into the maintenance procedures.
- Ensuring at least one member of the operating team is experienced in operating the system and introducing a mentoring scheme to provide opportunities to increase experience levels with appropriate oversight.
- Providing information on the most appropriate sources of weather information to be used in planning and operating flights and ensuring these take into account actual, as well as forecast, weather conditions.
- Providing pilots and observers with training on weather effects experienced in a built-up environment, especially related to wind.
- Introducing reduced wind limits on the operation of UAS to allow a safety factor, mitigating the risk of exceeding the limits. These will also be varied to take account of each pilot's experience.
- Revised training on the assessment of ground station transmitter siting to minimise the likelihood of signal loss.
- Review of incident and accident reporting procedures.

MBB-BK 117 D-2 EC145, G-RMAA on 3 May 2018

The pilot of the Helicopter Emergency Medical Service (HEMS) helicopter took off from a car park in variable wind conditions. Once airborne the helicopter yawed to the left and the pilot attempted to correct by applying opposite anti-torque pedal, but it continued to rotate. He lowered the collective and as the helicopter landed, its fenestron contacted a low wall on the perimeter of the car park. Most of the pilot's experience had been on another type of helicopter and he had made inputs consistent with controlling that aircraft, which were insufficient in this instance. The operator has reviewed the circumstances of the accident and has taken two safety actions as a result.

Safety actions:

> As a result of this event the operator has re-briefed all of its pilots on the possible consequences of remaining light on the skids when lifting into the hover.
>
> The operator has also updated their Operations Department Communication (ODC) to reflect the most recent EASA Acceptable Means of Compliance and refer to dimensions of both the EC135 and the EC145.

Cameron A-300 hot air balloon, G-VBAD on 18 May 2018

A passenger fell off the basket onto the ground whilst attempting to board before flight and was seriously injured.

Safety action:

> The operator has stated that it now briefs passengers to take extra care when climbing in or out of the basket and suggests to some passengers that preloading might be a better option for them than climbing in after the envelope has been inflated.

Just Super STOL XL, G-SSXL on 10 June 2018

The aircraft was on a test flight prior to being issued with a Permit to Fly. Shortly after takeoff the engine failed. During the subsequent forced landing the aircraft landed firmly, sustaining severe damage. One of the two pilots suffered serious injuries.

It is believed that the engine failure was caused by fuel vaporisation as a result of high engine compartment temperatures.

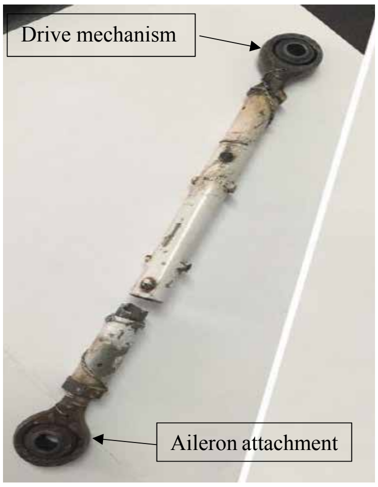
Safety actions:

> In consultation with the engine manufacturer, the owner stated he would have the engine cowlings redesigned to increase the intake airflow and modify the engine

layout by relocating the fuel pumps and cooling fuel returning to the header tank. These changes are intended to reduce the possibility of a fuel vapour lock recurring.

- LAA Technical Leaflet TL 2.26[3] highlights the procedures for using unleaded Mogas in piston engines. Due to the greater risk of vapour lock the LAA has stated that when using Mogas the temperature of fuel in the tank must not exceeding 20°C and the aircraft must fly below 6,000 ft.
- The LAA plans further flight tests over a range of weights to gain more accurate approach speed data for this aircraft type.
- The LAA has stated that it will review how it manages the testing of new engine types and engine installations. One option being considered is the download of the ECU's data as part of the engine's initial testing, so that all available measured parameters can be checked against the manufacturer's stated limitations.

Britten-Norman BN-2B-21 Islander, VP-AEJ on 4 July 2018



During a short flight between the islands of Saint Eustatius and Saint Kitts, in the Caribbean, the pilot noticed that the ailerons felt "sluggish" but the aircraft landed successfully at Saint Kitts. It was found that a drive rod for the right aileron had broken and a spherical bearing, fitted to one end of the rod, had corroded heavily and was seized. Several safety actions have been taken to reduce the maintenance interval for control rods due to an increased risk of corrosion from the environmental factors where the aircraft operated. This investigation was delegated by the Dutch Safety Board to the AAIB in accordance with paragraph 5.1 of ICAO Annex 13.

Safety actions:

The following safety actions have been taken by:

The aircraft manufacturer

- Service Letter SL127 published to remind operators of the greasing requirements and to provide relevant feedback.

Maintenance organisation

- A reduction in the lubrication task interval from 1,000 hours to 100 hours for the aileron drive rod bearings.
- A fleet-wide corrosion inspection of all drive rod/bearing assembles.

3 LAA leaflet TL 2.26 can be found here: https://www.lightaircraftassociation.co.uk/engineering/TechnicalLeaflets/Operating%20An%20Aircraft/TL%202.26%20Procedure%20for%20using%20E5%20Unleaded%20Mogas.pdf [accessed April 2019]

Boeing 787-9 Dreamliner, G-TUIM on 6 July 2018

The aircraft was on approach to Runway 26L at London Gatwick Airport and was being configured to land. After FLAPS 1 was selected, there was a progressive deterioration in normal flight controls, landing gear lowering and nosewheel steering capabilities. The crew performed a go-around and actioned the relevant checklists. The aircraft landed safely with FLAPS 20 set but with the nosewheel steering inoperative.

The cause of the system degradation was a failure of the Nose Landing Gear Isolation Valve (NLGIV). Following this event, the manufacturer changed its procedures in relation to the manufacturing and testing of the NLGIV.

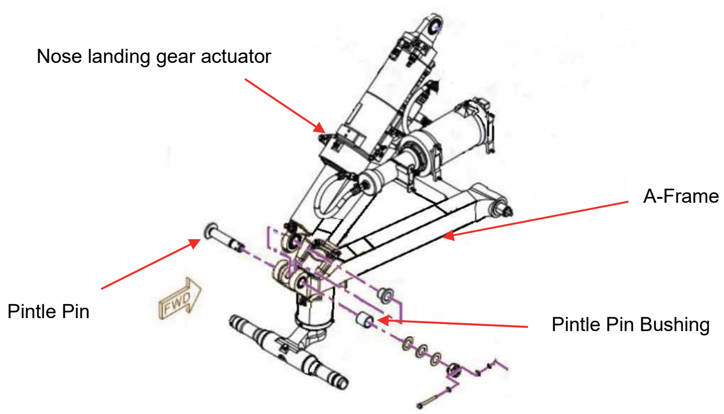
Safety actions:

Following this incident, the aircraft manufacturer:

- Introduced changes to the component Acceptance Test Procedure for the NLGIV
- Made changes to the manufacturing procedures of the NLGIV to prevent brinelling.
- Made amendments to the Fault Isolation Manual (FIM) and Aircraft Maintenance Manual (AMM) to add operational tests of the NLGIV.

Airbus Helicopters EC175B, G-EMEA on 10 July 2018

The helicopter was returning to Aberdeen after a routine passenger flight. During a normal approach to land the landing gear appeared to deploy normally but at touchdown the nose landing gear collapsed due to the failure of the A-frame pintle pin. Owing to a low fuel state the passengers were disembarked whilst the helicopter was in a low hover. The aircraft was then landed safely, using sandbags to support the fuselage.



During the subsequent investigation, the operator identified that a bush, which should have supported the pintle pin, had not been fitted into the A-frame when it was installed 50 flying hours before the incident flight. The investigation identified several human factors issues which contributed to the accident, including shift staffing levels, lack of experience and fatigue. The helicopter manufacturer subsequently published Service Information Notice 3259-S-32 notifying operators of this failure mode and an Alert Service Bulletin (ASB) 32A003, requiring an inspection to ensure the correct installation of the pintle pin bushing. The ASB was subsequently mandated by EASA Airworthiness Directive 20180190.

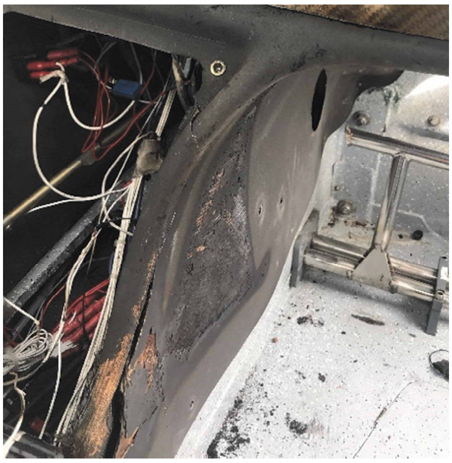
Safety actions:

Following this incident to G-EMEA, the operator revised its procedures regarding work time monitoring and reminded staff of their responsibilities to follow company fatigue management procedures. The operator introduced a 'complex task' job card for the H175 nose landing gear leg replacement task. Additionally, the operator reviewed the engineering manpower, supervision and experience levels needed for base maintenance inputs.

On 13 July 2018, the helicopter manufacturer published Safety Information Notice (SIN) No 3259-S-32 which notified other operators of this, and previous, nose landing gear pintle pin failures. The SIN highlighted the need to remove and reinstall the pintle pin bushing during A-frame replacement.

As a result of another operator identifying an incorrectly fitted pintle pin bushing, the helicopter manufacturer published Emergency Alert Service Bulletin (ASB) 32A003 in August 2018. This required a one-off inspection of the EC175 nose landing gear pintle pin bushing. In addition, operators were required to review helicopter maintenance records to identify any occasions where bushings had been misinstalled or found not fitted. ASB 32A003 was subsequently mandated by the EASA with the publication of Airworthiness Directive 2018-0190 on 31 August 2018.

Flight Design CTSW, G-KUPP on 19 July 2018



An electrical fire in the instrument console developed shortly after takeoff and the pilot returned to land on the active runway. An electrical short circuit with the composite instrument console, resulting in a resin fire, was traced to a damaged wire. The wiring had been previously modified and a Service Bulletin has been released to reduce the risk of electrical and fuel fires.

Safety action:

The UK type approval organisation has issued a Service Bulletin No 150 to modify Flight Design CTSL, CTSW and CT2K aircraft, to reduce the risk of electrical and fuel fires.

Piper J5A Cub Cruiser, G-BSXT on 20 July 2018

During a check flight, a newly repaired Piper J5A Cub Cruiser overran the runway and struck a gate at Felthorpe Airfield near Norwich. This was because the aircraft was travelling too fast in the final stage of the landing. It floated a long distance and landed a long way down the runway. The pilot had no time on type and the aircraft had heel brake controls that he found difficult to use.

The LAA did not have the opportunity to assess the suitability of the check pilot, in part due to a misunderstanding between the LAA and one of its Inspectors about what airworthiness process to follow. In response to this accident, the importance of clear and unambiguous communications with members has been reinforced at LAA HQ. The LAA has also informed inspectors of the circumstances of this event and issued a decisionmaking flow chart to help them determine what process should be followed.

Safety actions:

In response to this accident, the LAA has re-emphasised to its staff the importance of clear and unambiguous conversations between LAA headquarters, aircraft owners and LAA inspectors.

The LAA has also produced a communication for LAA inspectors that describes this event and provides advice regarding inspector responsibilities in this type of case. It has also produced a decision-making flow chart to assist inspectors to determine what process should be followed.

As a safety action in response to the accident involving G-BXON, the LAA has published Technical Leaflet 2.30 Converting to a new type[4]. This contains relevant guidance for pilots transitioning between aircraft types.

Boeing 737-8Q8, YR-BMF on 28 July 2018

Prior to departure the aircraft's takeoff data was calculated on an electronic flight bag (EFB) using its zero fuel weight (ZFW) instead of its takeoff weight (TOW). The pilots did not crosscheck or independently calculate the data. During the takeoff the aircraft suffered a tailstrike.

Despite ATC asking the pilots if they had a tailstrike, the error subsequently being noticed in the EFB and a member of

[4] LAA (2018). Technical Leaflet 2.30. *Converting to a new type.* Issue 1. 19 December 2018. http://www.lightaircraftassociation.co.uk/engineering/TechnicalLeaflets/Operating%20An%20Aircraft/TL%202.30%20Converting%20to%20a%20New%20Type.pdf (accessed on 15/01/2019).

the cabin crew hearing a strange noise during the takeoff, the tailstrike checklist was not actioned. The aircraft continued to its destination and, after landing, damage was discovered on the underside of the aircraft.

Safety actions:

As a result of this event the operator issued Safety Information Bulletin No 7/2018 to its pilots, highlighting the background to it and highlighted the following:

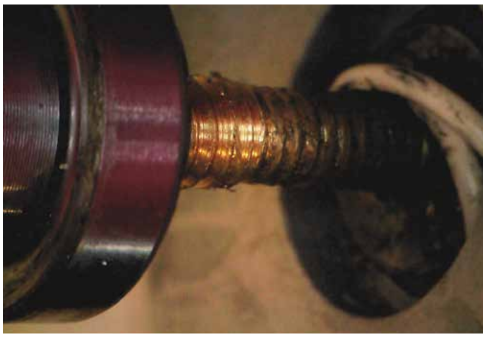
- 'The flight crew members are advised to strictly follow the provisions of OMB 4.6 "AFTER COMPUTING INDEPENDENTLY, THE CREW SHALL PERFORM A CROSSCHECK OF THE RESULTS",
- When feeding the Flight Management Computor (FMC) with data that can affect performance or carrying out a correction, a cross-check shall be initiated before executing the task,
- To take into consideration the importance of the information provided by the cabin crew and ATC,
- QRH shall be used any time a non-normal situation occurs (ie NNC Tail Strike).'

Skystar Kitfox Mk 7, G-FBCY on 5 August 2018

While returning to its home airstrip, the aircraft experienced a loss of engine thrust coincident with an uncommanded increase in engine speed. The pilot made a forced landing in a ploughed field during which the nosewheel collapsed, resulting in substantial damage to the aircraft. Subsequent examination of the propeller hub revealed that the threads on the lead screw within the propeller pitch-change mechanism had been stripped. This had caused the propeller blades to move to a very fine pitch setting, leading to the loss of thrust.

Safety actions:

Prior to this accident, the LAA had embarked on a long-term project to transfer aircraft, engine and propeller information from SPARS[5] to a web-based Type Acceptance Data Sheets (TADS) system, in order to make this information, including Airworthiness Information Leaflet (AIL), easily available to its members. This activity is ongoing and the transfer of aircraft-specific data is almost complete, and it is planned that the transfer of engine and propeller information will follow. It is envisaged that the propeller TADS will include any relevant limitations or modifications for each propeller type and the LAA considers that this will provide a useful reference for aircraft owners when deciding what propellers to fit to their aircraft.



[5] SPARS - LAA paper based Inspectors manual.

Safety Recommednation and Safety Action Overview

The LAA also intends to reissue the AIL originally issued in 2008 for the Arplast PV50 propeller and is currently identifying all LAA aircraft to which this propeller is fitted. Owners of projects still under construction who may have this propeller but who have not yet identified the propeller type to the LAA, will be identified when an application for an initial permit to fly or modification is made.

The LAA published a 'Safety Spot' article in the November 2018 issue its 'Light Aircraft' magazine, to alert owners to the issues arising from this accident.

ERJ 170-200 STD, Embraer 175, G-FBJK on 11 August 2018

When advised that the takeoff runway had changed the pilots recalculated the takeoff performance from an intersection. This produced a different flap setting, which they did not notice, despite them cross-checking the information. The aircraft subsequently took off with an incorrect flap setting for the calculated takeoff performance data.

Safety actions:

The operator has taken the following safety actions:

- Changed its SOPs on EFB performance calculation procedures, in OM Part A, to align them with the current EASA regulation where both pilots independently calculate the departure performance and cross-check the other pilots, before being accepted for use.
- The operator has introduced the use of a takeoff and landing data card on their Embraer 175 fleet. It believes the process of transferring data from the EFB to the card could potentially act as an additional safety barrier**.**

The operator is considering the following safety action:

- Changing the format, font or colour of the calculated takeoff speeds and flap setting on the EFB to make the calculated data stand out differently from the rest of the inputted data.

CZAW Sportcruiser, G-CGJS on 18 August 2018

The aircraft suffered an engine failure while climbing through 1,400 ft after takeoff, and a forced landing was carried out into a ploughed field. The aircraft was damaged but the occupants were not injured. The flywheel had detached due to failure of its attachment bolts which were found to have broken; fatigue was evident on at least one bolt. There was a discrepancy in the time intervals for replacement of the bolts in the engine manufacturer's documentation.

Safety Recommendation and Safety Action Overview

Safety actions:

By the engine manufacturer

- The engine manufacturer made a series of improvements to the configuration of the flywheel attachment system on this engine type. The improvements included the introduction of Nordloc washers, which the manufacturer stated 'should be implemented on existing engines whenever flywheel bolts are replaced'. The various configurations that have been used, and the installation process for Nordloc washers are detailed in Service Bulletin JSB 012.
- On 12 February 2019, the engine manufacturer issued Service Bulletin JSB 0143, which aligned the maintenance requirement for 'non-approved propellers' to that described in the Maintenance Manual.

By the LAA

- The LAA was proactive in highlighting the failures of flywheel attachment bolts after first becoming aware of the problem.

Sikorsky S-92A, G-CKXL on 23 August 2018

The pilots were operating the S-92A helicopter on a multi-sector route between platforms in the Brae field in the northern North Sea, approximately 150 nm north-east of Aberdeen. On the third sector from the East Brae platform to the Brae Alpha platform, the pilots mis-identified the Brae Bravo platform as the destination and made an approach to the hover above the deck of the platform. The radio operator on the Brae Bravo platform told the pilots that they had made an approach to the wrong deck; following clearance to depart, the pilots continued the flight without further incident.

The operator stated that it would conduct additional training addressing the task management requirements and complexity during shuttling[6] to prevent a recurrence.

Safety actions:

The operator identified the following safety actions to be carried out:

- Training to highlight complex requirements of shuttling and need to concentrate on all aspects of SOPs.
- Highlight of importance of following checklists at appropriate times.
- Review shuttle checks.
- Highlight task management during the brief for a shuttling line training flight.

6 Shuttling is the act of flying between installation helidecks which are less than 10 nm apart.

Airbus Helicopters AS 350, VP-CIH on 30 August 2018

The AS 350 helicopter suffered tail rotor control problems in flight due to a rupture of the tail rotor gearbox (TGB) actuating rod. The pilot carried out a successful run-on landing. On 20 March 2019 the EASA issued Airworthiness Directive 2019-0060, mandating an inspection of TGB actuation rods to check for cracks.

Safety action:

- As a result of these findings, on 20 March 2019 the EASA issued Airworthiness Directive 2019-0060, mandating dye penetrant crack checks of TGB actuating rods on affected AS 350 and AS 355 helicopters.

DJI Matrice 210 (UAS, registration n/a) on 4 September 2018

After about six minutes into the flight, a battery low voltage condition was detected by the UAS causing it to enter an automatic landing mode. Shortly afterwards, while the aircraft was 20 m above the ground, it powered down and the electric motors stopped, causing it to fall to the ground. An investigation of this and similar accidents was conducted by the manufacturer which found that the batteries' State of Charge (SOC) was indicating an erroneously high level of charge remaining. Safety actions were taken by the CAA to introduce operational restrictions while a fix was being found, and by the manufacturer to develop and 'push out' firmware changes to the battery and aircraft.

Safety actions:

A number of safety actions have been made by the aircraft manufacturer and UK regulator.

These are summarised as follows:

- Provided battery firmware updates to correct the erroneously high SOC issue.
- Provided aircraft firmware updates to perform a gross check of the batteries' SOC and trigger a RTH or Automatic Landing if a difference of greater than 10% is detected at specified trigger points.
- The DJI Pilot app has been updated to provide a clear warning when the battery firmware is out of date. The manufacturer is also planning improvements to the DJI Go 4 app.

- A planned update to the Matrice 200 series user manual will specify that the DJI Pilot app is recommended and will specify that the batteries contain firmware that must be individually updated.

- The CAA issued four safety notices and Skywise Alert SW2019/067 to raise awareness of the battery issues and firmware updates to DJI Matrice 200 series users, as well as introducing operational limits depending on the version of firmware installed. These limitations have now been removed with the publication of Skywise Alert SW2019/116 which also reminded operators to have appropriate mitigations in place if flying over persons or property.

Cirrus SR20, G-GCDA on 19 October 2018

The aircraft owner was collecting his aircraft after its annual inspection. The pre-flight checks and takeoff roll were normal. However, just as the aircraft lifted off, the pilot became aware of smoke in the cockpit. He landed immediately and despite shutting down all the electrical equipment, the smoke persisted. With the assistance of an engineer, the source of the smoke and a small fire was identified and extinguished. It was caused by a 'circuit track' in a switch panel, which had been electrically overloaded because of an unidentified problem with a diode in the standby battery wiring harness. The aircraft manufacturer has taken several safety actions to ensure the significance of the diode is understood and have included an additional circuit protection device. The aircraft manuals and circuit diagrams have also been amended to clarify the circuit maintenance information.

The aircraft manufacturer has examined the switch panel circuit and reviewed this sequence of events. The position and unremarkable look of the diode was understood by the manufacturer. In addition, they have also identified that there is a slight risk of misassembly.

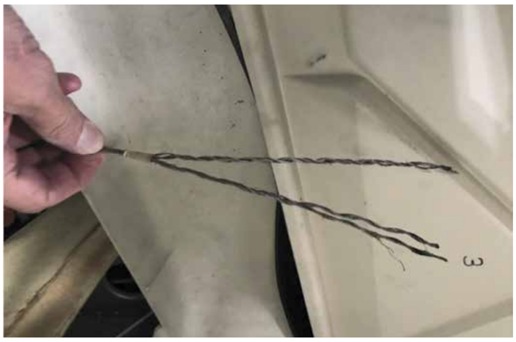
Safety actions:

The following safety actions are being carried out by the manufacturer:

- An update to the parts catalogue, wiring manual and electric CAPS service bulletins have been released.

- The addition of a fuse to the harness assembly to prevent damage. The engineering drawings for this are now released and will be used in new aircraft. Issuing new CAPS kits is planned but not released yet. Adding the fused harness will require another round of revisions for the service bulletins. The fused harness is field retrofittable and can be installed in existing aircraft and listed as the field spare.

Piper PA-34-220T Seneca V, G-OXFF on 2 November 2018



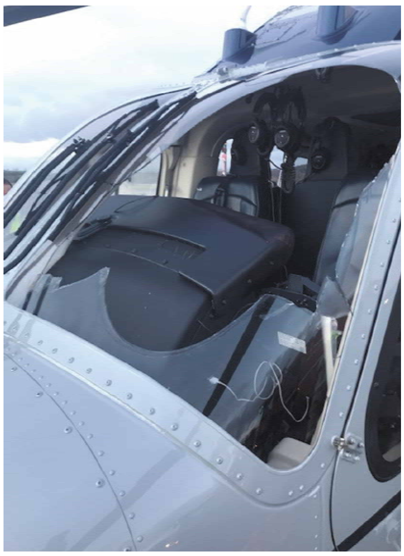
The aircraft was about to enter the runway for takeoff when the instructor became concerned about the feel of the left rudder pedal. He aborted the flight and taxied the aircraft back to the hangar. The subsequent engineering inspection found the left rudder cable had parted, with evidence that it had melted through due to chafing against the standby battery cable. Safety actions have been taken by the Civil Aviation Authority and the manufacturer has issued a mandatory Service Bulletin (No 1337) to reroute the emergency power wiring to give more clearance from the rudder cables.

Safety actions:

Safety actions taken by the regulator and manufacturer;

- This potentially serious risk to airworthiness was brought to the attention of the manufacturer, the CAA, EASA and the FAA. The CAA took immediate steps to inform owners and operators of similarly configured Piper Seneca V aircraft.
- The manufacturer has subsequently issued a mandatory Service Bulletin (No 1337) which gives instructions to reroute a portion of the emergency power wiring to improve the clearance from the rudder control cables.

Bell 429, M-YMCM on 25 November 2018



Whilst on short final to Edinburgh Airport, at approximately 100 kt, the helicopter suffered a bird strike to the left windscreen. The windscreen shattered and debris entered the cockpit, injuring the occupant in the left seat, who required hospital treatment.

The Bell 429 windscreen is not designed to withstand bird strikes and the design certification requirements do not require it to do so. A recent study by the Rotorcraft Bird Strike Working Group has recommended the introduction of bird strike protection requirements for Normal category rotorcraft to minimise the risk of damage or injury.

Safety actions:

By the European Union Aviation Safety Agency (EASA)

- In November 2018, the EASA published the European Plan for Aviation Safety (EPAS) for 2019 – 2023[7]. Rule Making Task 0726 is entitled 'Rotorcraft occupant safety in event of a bird strike'.

  The document states:

  - 'Since the 1980s there have been an increasing number of accidents involving rotorcraft bird strikes where the rotorcraft was not certified in accordance with the latest bird strike protection provisions. This has resulted in a number of occurrences where rotorcraft bird impacts have had an adverse effect on safety. The objective of this RMT is to improve rotorcraft occupant safety in the event of a bird strike. This will be achieved by considering the development of new CS27 provisions for bird strike and also considering proportionate retrospective application of applicable CS-27 and CS-29 to existing fleets and types that are not compliant with the latest provisions.'

  The document indicates that associated timescales are 2024.

By the Federal Aviation Administration (FAA)

- In a presentation at the 12th rotorcraft symposium[8], the FAA indicated that their Rotorcraft Standards Branch (RSB) is reviewing the Bird Strike Working Group report. Further FAA study and evaluation will influence potential rulemaking and indications are that the RSB will pursue rulemaking in fiscal year 2020. This will be a multi-year process to achieve a final rule and they will 'coordinate and harmonize to maximum extent with EASA'.

- The FAA indicated that they consider pilots and operators to be the first line of defence. They will consider how to address appropriate rotorcraft flight manual procedures. These are not considered to be flight limitations but 'best practices'. They will continue discussion and studies with industry. Guidance material such as Advisory Circulars will be issued where appropriate.

7 European Plan for Aviation Safety 2019 – 2023 https://www.easa.europa.eu/document-library/general-publications/european-plan-aviation-safety-2019-2023 [Accessed 28 February 2019]

8 Presentation number 28 Bird Strike Rotorcraft Protection https://www.easa.europa.eu/newsroom-and-events/events/12th-rotorcraft-symposium#group-easa-downloads [Accessed 28 February 2019]

DHC-8-402 Dash 8, G-ECOC on 13 December 2018

During the climb to cruising altitude the flight crew took the precautionary action of using the fixed oxygen system following a pressurisation event. The aircraft pressurisation system was reset and functioned normally, however the oxygen system failed to provide the pilots with oxygen. The oxygen cylinder regulator was later disassembled, and the crew oxygen supply port was found blocked with a piece of debris. It is suspected that the debris was the tip of a screw extraction tool, but no evidence could be found to explain how it came to be in the regulator. The operator has changed the 'first flight' checks to ensure the flight deck emergency oxygen system is functioning correctly.

Safety action:

The operator has taken the following safety action:

- The Operations Manual for the Flight Deck Fixed Oxygen Checks has been updated to include a one-second flow of oxygen to ensure that system pressure is maintained during the first flight check.

DJI Matrice M210 RTK, (UAS, registration n/a) on 14 January 2019

The unmanned aircraft system (UAS) was fitted with a third-party lidar[9] pod for its planned survey mission which involved flights of around 8 minutes duration. As it commenced its pre-programmed route, it appeared to continue to climb above the 30 m height that had been set. The remote pilots observed that is was too high and attempted to land it immediately. The aircraft appeared unresponsive to the remote pilot's inputs and it then commenced an uncontrolled descent, rapidly increasing speed, until it struck the ground.

Safety actions:

The UAS operator is updating its procedures to include the following checks:

- Before any new aircraft / payload combination is flown, its actual weight will be established and recorded, by weighing, to ensure it is within specified limits.
- Before any new app or software is flown, confirmation, in writing, of its compatibility with other equipment by either the airframe manufacturer or the app developer is required.

9 Lidar is a surveying device that uses laser light to measure distances.

Airbus A330-243, G-TCCF on 6 February 2019

Coffee was spilled onto the commander's audio control panel (ACP). This resulted in failure of his ACP and later, the ACP on the co-pilot's side. During the failures, the ACPs became very hot and produced an electrical burning smell and smoke. The commander decided to divert to Shannon, Republic of Ireland. The failure of two ACPs caused significant communication difficulty for the flight crew. The operator has taken safety action to reduce the chance of spillage.

Safety action:

> The operator changed their procedure to ensure that cup lids are provided for flights on all routes and reminded cabin crew of the requirement to use them. The operator also issued a flight crew notice reminding pilots to be careful with liquids. The operator raised an action to source and supply appropriately sized cups for the aircraft's cup holders.

Evolve Dynamics Sky Mantis (UAS, registration n/a) on 7 February 2019

During a demonstration flight, the UAS dropped to the ground from a height of 50 m when the electric motors stopped, despite the battery being fully charged. The UAS struck the ground and was destroyed in the subsequent post-impact fire. The UAS manufacturer determined that the loss of power was caused by the battery not being fully locked in place.

Safety action:

> The manufacturer has since updated the Sky Mantis Operations Manual to include an instruction to check that the battery is locked in place and will include this requirement in customer training. It also intends to install sensors in the battery lock mechanism which will prevent the aircraft from being able to fly if the battery is not correctly locked in place.

Socata TB20 Trinidad, G-BMIX on 7 February 2019

The aircraft, whilst taxiing at night at Dundee Airport, departed the right side of Taxiway E at the point where the taxiway curves to the left prior to joining the main apron. The aircraft's left main landing gear oleo was damaged as it rolled over the paved edge of the main apron. A contributory factor in the pilot's loss of situational awareness of his position on Taxiway E may have been his loss of sight of the taxiway edge lights against the brightly-lit main apron. Excessive taxiing speed may have also been a contributing factor.

Safety action:

Dundee Airport conducted an investigation into the event and plan to take two actions resulting from their investigation. A taxi speed limit is to be inserted into the warnings section of the textual data of the Aeronautical Infomation Publication (AIP) document for Dundee Airport. The airport also plans to reduce the severity of the lip between the grass and the main apron surface at the point where Taxiway E joins the main apron.

Airbus A320-214, G-EZOI on 25 February 2019

A louder than usual noise was observed from an avionics vent fan before flight. During flight the noise increased and vibration became apparent. The crew then noticed a strong burning smell so they donned their oxygen masks and diverted the flight. An Electronic Centralised Aircraft Monitoring (ECAM) message, associated with an avionics ventilation system fault, was generated and the crew performed the associated actions.

A subsequent investigation revealed the cause of the event to be worn bearings in the avionics extract fan. The fan manufacturer and the aircraft manufacturer both took safety action to prevent similar incidents in future.

Safety actions:

Fan manufacturer

- The fan manufacturer issued service bulletin 3454HC-21-101 on 18 April 2018, which provided details of an optional modification which introduced a ball bearing health monitoring (BBHM) function to continuously monitor the condition of the ball bearings and preventively stop the fan before its failure.

Operator

- Following the fan manufacturer's original service bulletin and information letters between 2005 and 2013, the operator introduced a soft-life campaign to incorporate the recommendations to reduce the inflight failure rate of these fans. This commenced in 2016.
- In November 2018 the operator commenced a soft-life campaign to install the BBHM function and at the date of this report 23 modified fans had been installed.

Airbus A300b4-622R(F), D-AEAD on 26 February 2019

The aircraft's takeoff clearance was cancelled because a maintenance vehicle that had been manoeuvring on an adjacent taxiway entered the runway. The vehicle driver had become disorientated.

Safety actions:

The airport operator has carried out the following safety actions;

- A runway safety guide has been produced by Heathrow Airport Limited for issue to contractors holding A Class driving permits but driving airside on manoeuvring areas and runways.
- A Temporary Advice Notice (Airside_ASD_TAN_0119) has been published updating procedures for setting up work sites adjacent to runways, including the requirement to place Bolton barriers across runway access points prior to any work commencing.
- A Safety Alert (ASWorks_SA_017) has been issued to contactors at the airport advising of the updated procedures.

Spitfire Mk.T IX (Modified), G-CTIX on 27 February 2019

The landing gear warning horn sounded during the approach to land. The undercarriage had been selected down and the green light indicating it was safe was illuminated, but the right undercarriage leg collapsed towards the end of the landing ground roll. Neither occupant was injured. The operator has provided additional information to its pilots concerning the landing gear systems on each of its aircraft and the aircraft will be modified to standardise system functionality with its other Spitfires.

The right main undercarriage was not locked down and retracted under the weight of the aircraft on landing.

It is likely the undercarriage was serviceable and capable of operating correctly, but excessive air load or incomplete selection of the undercarriage lever to the down position meant that the hydraulic system returned to idle before the undercarriage was locked down.

The undercarriage warning horn operated as intended but the right undercarriage down switch was stuck closed, providing an incorrect indication that the undercarriage was safe. The pilot's previous experience and incomplete knowledge of the systems fitted to G-CTIX led him to believe that the green down indication alone confirmed that the undercarriage was safe.

Safety actions:

As part of the repairs and return to service, the Operator has taken the following safety action to standardise the operation and functionality of its Spitfires:

- Individual switches for the undercarriage DOWN position and the warning horn have been replaced with a single switch for both purposes.
- A switch has been added to the throttle quadrant so that the undercarriage warning horn will sound if the throttle is closed, flaps are DOWN and the undercarriage position switch is not closed.
- Having reviewed the circumstances of the accident, the operator held a safety briefing for its pilots aimed in part at improving their awareness of the various undercarriage operating and indication systems fitted to its aircraft.
- Recognising the differences between different marks of the same basic design, and the fact that aircraft have been fitted with a variety of systems that are not necessarily original, the operator intends to provide its pilots with handling notes for each aircraft that correctly describe the systems currently fitted to it.

DHC-8-402 Dash 8, G-JECN on 2 March 2019

The aircraft had landed at Southampton and was being taxied to its allocated stand. The No 1 engine had been shut down in accordance with the operator's SOPs. As it approached the stand, at walking pace, the commander applied the brakes, which had no effect and the aircraft hit signage and the rotating No 2 (right) propeller struck a nearby ground power unit (GPU). The accident was caused by the aircraft standby (hydraulic) power unit (SPU) not being selected to ON. This selection was normally made during the approach checks. However, on this occasion, the approach checks were not completed prior to landing. This meant that the aircraft mainwheel brakes did not work with the No 1 engine shut down. During the collision the aircraft sustained damage to the nose fuselage behind the radome, a nose landing gear door and right propeller tips.

The Operator considers several safety barriers failed in the lead up and during the accident. The approach checks and after landing checklist should have captured the incorrect aircraft configuration. The use of the emergency brakes may have prevented the outcome.

Safety actions:

Because of this event, the Operator has carried out a safety study looking into previous occurrences. This has produced several additional observations to be considered, regarding the approach checklist design and the single engine taxi risk assessment.

In addition, a Notice to Air Crew (NOTAC) has been raised implementing a No 1 hydraulic system check during taxi.

Tecnam P2006T, G-SACL on 17 March 2019

During taxi the pilot manoeuvred the aircraft to the left to avoid a Piper PA-28 parked on the right side of the taxiway. Whilst he was looking to the right to ensure sufficient clearance from the PA-28, he was also looking ahead to identify the centreline, which he found difficult due to road markings on the apron. The road markings were white and faded with older markings visible. As he was attempting to regain the centreline the aircraft's left wing tip struck a large metal generator which was positioned close to the left apron edge. The pilot stated that the colour of the generator blended with the hangar behind and he had not noticed it.

The aircraft slewed to the left and came to rest after the nose struck an articulated lorry parked next to the generator.

Safety actions:

An aerodrome inspector from the CAA visited Redhill after the accident and inspected the apron. The following changes were agreed with the airport operator:

- The existing edge of white road marking will remain in front of the hangars.
- A yellow taxiway centreline marking will be placed 6 m from this edge.
- A red safety line (behind which aircraft will be parked) will be marked 6 m from the other side of the yellow centreline.
- Instructions to aircraft operators will be issued to ensure that the main wheels of parked aircraft are pushed back on to the edge of the grass.
- A warning will be added to the UK AIP[10] to request that pilots unsure of wing tip clearance request assistance.

[10] Aeronautical Information Publication.

Airbus A320-232, HA-LPL on 23 March 2019

The aircraft was being pushed back from its stand by a 'towbarless' tug when the pilots detected a "major shake" from the aircraft nose landing gear. On inspection, damage was found on the torque link pivot of the nose landing gear and the aircraft had to be taken out of service. The damage had been the result of incorrect alignment of the tug lifting paddles. This was caused by the tug laser alignment system being lined up on the nose gear main forging whilst the nosewheels were 10° to 15° off centre. Correct alignment with the nosewheels is vital. Lining up on the nose gear leg, rather than the nosewheels, potentially leads to misalignments of up to 250 mm. This can result in significant damage to the components on the lower articulated part of the nose landing gear on this and many other aircraft types.

Safety actions:

The handling company have taken four safety actions to prevent recurrence.

- The towbarless tug training was reviewed to confirm the correct procedures are being taught. There is now a specific emphasis made on the requirement to ensure the tug is always aligned with the nosewheels.
- Pushback crews have been briefed to be more aware of the importance of the nosewheel position and have been asked to make the aircraft crew aware that, if possible, the nosewheels should be straight.
- The handling company are consulting with the tug manufacturer to identify and if possible, trial a system, that warns the tug operator of wheel misalignment.
- The A320 has been identified as the most potentially susceptible aircraft type to sustain nose landing gear damage whilst using the TLD 200MT tug. When possible on the A320 series of aircraft, the handling company will use either the conventional tow bar and tug or the TLD 100E towbarless tug.

DJI Inspire 2 (UAS, registration n/a) on 25 March 2019

The DJI Inspire 2 UAS was returning from a surveillance flight when it unexpectedly yawed and uncontrollably descended, contacting the ground. An object was seen to be released from the aircraft prior to the loss of control which was thought to be a part of a propeller blade. The operator has implemented safety action as a result of this investigation.

Safety actions:

During warm starts the operator has introduced physical checks, including an inspection of the propellers, before the next flight.

The operator has also instructed its pilots not to overfly people.

Airbus A320-214, G-EZWC on 3 April 2019

While being pushed back from Stand 18 at Belfast International Airport, the aircraft was stopped with the tug and tow bar positioned at a significant angle to the aircraft's nose. The tow bar disconnected from the nose landing gear, and the aircraft rolled forward and struck the tug.

Safety actions:

Following this incident, the handling agent acted to prevent a reoccurrence of the incident:

- A Safety Alert was issued to all staff regarding the incident.
- A training awareness training module was developed covering the use of pushback tugs and gear selection.
- Refresher training was instigated for headset procedures and action to be taken in the event of a shear pin to bar head separation.
- A Safety App was developed that all managers and supervisory assessment staff could use on pushback and/or headset evaluation.
- Bluetooth headsets would be issued to tug drivers to improve communication with the flight deck.

Colomban MC-30 Luciole, G-CIBJ on 10 April 2019

After a local flight, the ground taxi route back to the hangar involved several tight turns and when full left rudder pedal was applied the cockpit filled with smoke. The pilot exited the aircraft without injury and the ensuing fire consumed the aircraft. It is suspected that the terminals of the starter solenoid were not insulated, and the rudder pedal created an electrical short circuit which damaged a fuel pipe and ignited the fuel.

Safety action:

The LAA has recommended that all UK-registered Colomban Luciole aircraft be modified to the higher heat-resistant fuel pipe specification.

Boeing 737-73S, EI-SEV and Boeing 737-33A, G-GDFB on 30 April 2019

EI-SEV was taxiing to park on Stand 22 (S22) at East Midlands Airport (EMA) and the routing passed behind G-GDFB on Stand 24 (S24). As EI-SEV passed behind G-GDFB its winglet struck the other aircraft's right horizontal stabiliser.

Low Visibility Procedures (LVPs) were in force, and controllers could not see the apron area and were unaware that S24 was occupied. Neither the UK Aeronautical Information Publication (AIP) nor the pilots' airfield charts indicated that wingtip clearance could be compromised when taxiing behind parked aircraft in that location.

Safety actions:

Following this event:

- The airport operator closed Stand 22 pending a safety review and conducted a survey of parking stands across the airport to identify any similar aircraft taxi separation hazards.
- The operators of both aircraft alerted their EMA-based flight crew to the hazard of reduced separation when using Stands 20 to 25.
- The operator of EI-SEV issued a Company NOTAM to alert its pilots to the reduced separation hazard on Stands 20 to 25 at EMA.

Ace Aviation As-tec 13, G-CKUL on 15 May 2019

After an uneventful local flight the pilot was returning to Shotteswell Airfield at an altitude of 2,100 ft when he noticed the engine speed suddenly increase. He observed that the pusher propeller had detached from the aircraft and so he shut the engine down and commenced a glide descent back to Shotteswell Airfield, which was approximately 1 nm to the north. A successful power-off landing was made.

The flex-wing aircraft's single-cylinder engine rotates a pusher propeller using a reduction drive belt, driven by a pulley on the engine crankshaft. Drive belt tension may be adjusted using an eccentrically-mounted bearing on the propeller driveshaft. Inspection of the engine revealed that the eccentric bearing assembly and propeller had detached at the support bracket due to a fatigue failure of the bearing support. The propeller was not located following the event.

Safety action:

Following this event, the engine manufacturer issued a safety notice[11] to all owners and operators of the Mini 3 engine, requiring the eccentric bearing support to be replaced before the next flight.

Boeing 737-89P, SP-LWA on 20 May 2019

After an uneventful takeoff from London Heathrow the flight crew were informed that the aircraft was 953 kg heavier than indicated on the load sheet. The flight crew corrected the figures in the aircraft's flight management computer and the flight continued without incident.

The load sheet error occurred because a consignment of mail was initially recorded twice in the operator's computer load management system. A correction was applied by both the dispatcher and by an electronic message from the cargo company, which resulted in both entries being removed.

Safety actions:

The handling agent has taken safety action to remind all dispatchers of the importance of checking that the load sheet reflects the actual loading of the aircraft. They have also changed work patterns to ensure dispatchers will remain familiar with the IT systems used by all the operators they service.

The operator has taken safety action by asking for all future occurrence for duplicate cargo figure to be report to them so that they can determine the cause.

[11] Simonini Racing SRL Security Campaign No. 1, 31 May 2019.

Index of Safety Actions (by aircraft weight)

Appendix 1 - CICITT occurrence categories

CODE	DESCRIPTION
ARC	ABNORMAL RUNWAY CONTACT
AMAN	ABRUPT MANEUVER
ADRM	AERODROME
MAC	AIRPROX/TCAS ALERT/LOSS OF SEPARATION/NEAR MIDAIR COLLISIONS/MIDAIR COLLISIONS
ATM	ATM/CNS
BIRD	BIRD
CABIN	CABIN SAFETY EVENTS
CTOL	COLLISION WITH OBSTACLE(S) DURING TAKEOFF AND LANDING
CFIT	CONTROLLED FLIGHT INTO OR TOWARD TERRAIN
EVAC	EVACUATION
EXTL	EXTERNAL LOAD RELATED OCCURRENCES
F–NI	FIRE/SMOKE (NON-IMPACT)
F–POST	FIRE/SMOKE (POST-IMPACT)
FUEL	FUEL RELATED
GTOW	GLIDER TOWING RELATED EVENTS
GCOL	GROUND COLLISION
RAMP	GROUND HANDLING
ICE	ICING
LOC–G	LOSS OF CONTROL–GROUND
LOC–I	LOSS OF CONTROL–INFLIGHT
LOLI	LOSS OF LIFTING CONDITIONS EN ROUTE
LALT	LOW ALTITUDE OPERATIONS
MED	MEDICAL
NAV	NAVIGATION ERRORS
OTHR	OTHER
RE	RUNWAY EXCURSION
RI	RUNWAY INCURSION
SEC	SECURITY RELATED
SCF–NP	SYSTEM/COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT)
SCF–PP	SYSTEM/COMPONENT FAILURE OR MALFUNCTION (POWERPLANT)
TURB	TURBULENCE ENCOUNTER
USOS	UNDERSHOOT/OVERSHOOT
UIMC	UNINTENDED FLIGHT IN IMC
UNK	UNKNOWN OR UNDETERMINED
WILD	WILDLIFE
WSTRW	WIND SHEAR OR THUNDERSTORM

GLOSSARY OF ABBREVIATIONS

aal	above airfield level
ACAS	Airborne Collision Avoidance System
ACARS	Automatic Communications And Reporting System
ADF	Automatic Direction Finding equipment
AFIS(O)	Aerodrome Flight Information Service (Officer)
agl	above ground level
AIC	Aeronautical Information Circular
amsl	above mean sea level
AOM	Aerodrome Operating Minima
APU	Auxiliary Power Unit
ASI	airspeed indicator
ATC(C)(O)	Air Traffic Control (Centre)(Officer)
ATIS	Automatic Terminal Information Service
ATPL	Airline Transport Pilot's Licence
BMAA	British Microlight Aircraft Association
BGA	British Gliding Association
BBAC	British Balloon and Airship Club
BHPA	British Hang Gliding & Paragliding Association
CAA	Civil Aviation Authority
CAVOK	Ceiling And Visibility OK (for VFR flight)
CAS	calibrated airspeed
cc	cubic centimetres
CG	Centre of Gravity
cm	centimetre(s)
CPL	Commercial Pilot's Licence
°C,F,M,T	Celsius, Fahrenheit, magnetic, true
CVR	Cockpit Voice Recorder
DFDR	Digital Flight Data Recorder
DME	Distance Measuring Equipment
EAS	equivalent airspeed
EASA	European Aviation Safety Agency
ECAM	Electronic Centralised Aircraft Monitoring
EGPWS	Enhanced GPWS
EGT	Exhaust Gas Temperature
EICAS	Engine Indication and Crew Alerting System
EPR	Engine Pressure Ratio
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
FAA	Federal Aviation Administration (USA)
FIR	Flight Information Region
FL	Flight Level
ft	feet
ft/min	feet per minute
g	acceleration due to Earth's gravity
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
hrs	hours (clock time as in 1200 hrs)
HP	high pressure
hPa	hectopascal (equivalent unit to mb)
IAS	indicated airspeed
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IP	Intermediate Pressure
IR	Instrument Rating
ISA	International Standard Atmosphere
kg	kilogram(s)
KCAS	knots calibrated airspeed
KIAS	knots indicated airspeed
KTAS	knots true airspeed
km	kilometre(s)
kt	knot(s)
lb	pound(s)
LP	low pressure
LAA	Light Aircraft Association
LDA	Landing Distance Available
LPC	Licence Proficiency Check
m	metre(s)
mb	millibar(s)
MDA	Minimum Descent Altitude
METAR	a timed aerodrome meteorological report
min	minutes
mm	millimetre(s)
mph	miles per hour
MTWA	Maximum Total Weight Authorised
N	Newtons
N_R	Main rotor rotation speed (rotorcraft)
N_g	Gas generator rotation speed (rotorcraft)
N_1	engine fan or LP compressor speed
NDB	Non-Directional radio Beacon
nm	nautical mile(s)
NOTAM	Notice to Airmen
OAT	Outside Air Temperature
OPC	Operator Proficiency Check
PAPI	Precision Approach Path Indicator
PF	Pilot Flying
PIC	Pilot in Command
PM	Pilot Monitoring
POH	Pilot's Operating Handbook
PPL	Private Pilot's Licence
psi	pounds per square inch
QFE	altimeter pressure setting to indicate height above aerodrome
QNH	altimeter pressure setting to indicate elevation amsl
RA	Resolution Advisory
RFFS	Rescue and Fire Fighting Service
rpm	revolutions per minute
RTF	radiotelephony
RVR	Runway Visual Range
SAR	Search and Rescue
SB	Service Bulletin
SSR	Secondary Surveillance Radar
TA	Traffic Advisory
TAF	Terminal Aerodrome Forecast
TAS	true airspeed
TAWS	Terrain Awareness and Warning System
TCAS	Traffic Collision Avoidance System
TODA	Takeoff Distance Available
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
USG	US gallons
UTC	Co-ordinated Universal Time (GMT)
V	Volt(s)
V_1	Takeoff decision speed
V_2	Takeoff safety speed
V_R	Rotation speed
V_{REF}	Reference airspeed (approach)
V_{NE}	Never Exceed airspeed
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOR	VHF Omnidirectional radio Range

Air Accidents Investigation Branch

Annual Safety Review
2019