AAIB
Air Accidents Investigation Branch

Annual Safety Review 2023

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CIAA Foreword

I am pleased to introduce this Annual Safety Review which includes information on occurrences notified to the AAIB in 2023, and the Safety Actions taken or planned in response to investigations which concluded in 2023.

2023 was in many respects an unremarkable year, with aviation activity nearly back to pre-pandemic levels in most sectors. The AAIB received 790 occurrence notifications (compared to 778 in 2022) and opened 25 field and 80 correspondence investigations. In addition, the AAIB provided support to 48 new overseas investigations where there was a UK interest.

Of note, the AAIB undertook joint oversight (with the US Federal Aviation Administration) of the investigation into the failure of a spaceflight launch from the UK – a first investigation for the AAIB in its capacity as the UK's Space Accident Investigation Authority. An investigation was also conducted into an accident during flight test involving a remotely piloted electric vertical take-off and landing (eVTOL) aircraft – a new class of air vehicle being developed for urban air mobility.

In 2023 there were 10 fatal air accidents in the UK resulting in 11 deaths. All involved General Aviation (seven light aircraft, two gliders and one hot air balloon). Whilst this number of fatal accidents was not unusual, they all occurred in the summer months and the fatal glider mid-air collision was the first for nine years. An article in this Review examines the mid-air collision statistics in more detail. Loss of control in flight continues to be the prevalent cause of fatal accidents. The key safety messages to avoid loss of control have been reinforced in revised promotional materials published by the Civil Aviation Authority.

Accidents involving Commercial Air Transport (CAT) continue to be rare with non-fatal runway excursions, ground collisions and tail-strikes being the most common types of occurrences in the UK and globally. In this review there is an article which explains the importance of investigating Serious Incidents ie near misses. These rarely attract much media attention but are a valuable opportunity to identify safety issues before they become manifest in an accident. Over the last 20 years, two-thirds of the CAT field investigations conducted by the AAIB were into Incidents and Serious Incidents rather than Accidents, with a high proportion yielding Safety Recommendations that have proved to be highly significant in further improving air transport safety.

In 2023, the AAIB published 2 special bulletins and 25 field investigation reports which together made 40 Safety Recommendations covering a wide range of safety issues including: the certification and in-service monitoring of critical parts for helicopters; the management of hospital helicopter landing sites particularly with respect to the protection of uninvolved persons from the effects of helicopter downwash; the provision of air traffic services to aircraft in an emergency; and, the effectiveness of the Pilot Medical

Declaration scheme. In this Review there are full details of each Safety Recommendation, together with the response received and updates on the progress of the action taken. In addition, there are details of 99 significant Safety Actions taken proactively by the industry in 2023 to enhance safety as a direct result of AAIB investigations but without the need for a specific recommendation.

In this way the 2023 Annual Safety Review brings together in one place a wealth of safety information which I trust you will find interesting and useful.

Crispin Orr
Chief Inspector of Air Accidents

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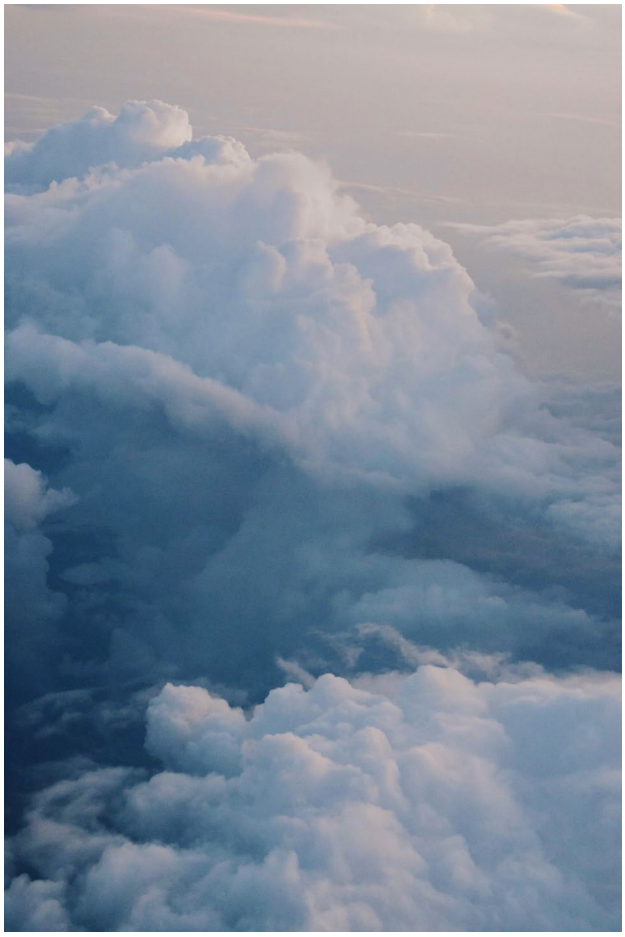


30 years of investigating Serious Incidents – the AAIB's perspective

Background

The International Standards and Recommended Practices for air accident investigation were first adopted in March 1951 by ICAO and were designated Annex 13 to the Convention on International Civil Aviation. In 1992 a major amendment was made to ICAO Annex 13. Importantly it introduced requirements for notification and investigation of Serious Incidents to aircraft and the title of Annex 13 changed to 'Aircraft Accident and Incident Investigation'; thus started a new era in which ICAO States investigated Serious Incidents as well as Accidents.

Annex 13[1] is now in its twelfth edition. The ICAO definition of an Accident is an occurrence associated with the operation of an aircraft in which:

1. a person is fatally or seriously injured,
2. the aircraft sustains damage or structural failure that adversely affects the operation of the aircraft or requires a major repair,
3. the aircraft is missing or completely inaccessible.

An Incident is an occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

A Serious Incident is: *'An incident involving circumstances indicating that there was a high probability of an accident…'* and '*the difference between an Accident and a Serious Incident lies only in the result*'.

The AAIB in its various forms has been investigating air accidents for over 100 years, and has been a key player in the evolution of the international standards for air accident investigation since the post World War II boom in civil aviation transport. The AAIB commissioned a simple computerised accident database in the late 1990s, and this was replaced by a more comprehensive system in 2005. Whilst the AAIB has been investigating Serious Incidents and some Incidents since 1992, this article considers the period from mid-2003 to mid-2023 to assess the importance of the investigation of Serious Incidents and Incidents, which represents a period for which comprehensive data exists.

Accidents and Serious Incidents – the last twenty years

Table 1 contains a summary of all the field investigations[2] undertaken over a 20 year period from mid-2003 to mid-2023. It is broken down into Commercial Air Transport, plus a relatively small number of Emergency Services operations, and General Aviation and Sport operations. There are a small number of UAS cases that have been excluded from this dataset.

Footnote

1 Regulation: International Civil Aviation Annex 13 [accessed 16 Feb 2024].
2 Field investigations are typically where the AAIB have deployed a team for to a significant event, typically a GA fatal accident or a Commercial Air Transport Accident (few of which resulted in a fatality) or a Commercial Air Transport Incident or Serious Incident. Field investigations also include some investigations which are upgraded from a Correspondence to a Field Investigation.

AAIB Field Investigations	Number of Accidents Investigated	Number of Accidents with Safety Recommendations	Number of Incidents and Serious Incidents Investigated	Number of Incidents and Serious Incidents investigated with Safety Recommendations
Commercial Air Transport + Emergency Services Ops	126	65	279	116
General Aviation and Sport	512	174	51	19
Total	638	239	330	135

Table 1

AAIB Safety Recommendations 2003-2023

During this 20-year period the total number of Accidents, Incidents and Serious Incidents investigated is 968 which equates to an average of around 48 field investigations per year. Of these there were 638 Accidents and 330 Incidents and Serious Incidents, so around a third of field investigations were for Incidents and Serious Incidents.

The priority for AAIB, in keeping with the UK's State Safety Programme[3], is Commercial Air Transport safety. Looking at just Commercial Air Transport, plus the small number of investigations into events involving Emergency Service operations, then the situation is very different. AAIB have investigated 126 such accidents but 279, approximately twice the number, for Incidents and Serious Incidents. Importantly, the investigations from which Safety Recommendations are made shows a similar trend with twice the number (116 compared with 65) of investigations into Incidents and Serious Incident having one of more Safety Recommendations made compared with investigations into Accidents.

Examples of AAIB investigations into Commercial Air Transport Incidents and Serious Incidents

G-VATL A340-600 incident in 2007

The AAIB investigated an Incident in 2007 in which, without warning the No 1 engine lost power and ran down on an Airbus A340-600 in cruise. Initially the pilots suspected a leak had emptied the contents of the fuel tank feeding the No 1 engine but a few minutes later, the No 4 engine started to lose power. Still with no fuel warnings the crew opened the fuel cross-feed valves and the No 4 engine recovered to normal operation. The pilots then observed that the fuel tank feeding the No 4 engine was also indicating empty. However, the total fuel on board was as expected for the flight so they realised that they had a fuel management problem. Fuel had not been transferring from the centre, trim and outer wing

Footnote

[3] The UK State Safety Programme Objective can be accessed here https://www.caa.co.uk/safety-initiatives-and-resources/how-we-regulate/state-safety-programme/safety-policy-objectives-and-resources/state-safety-objectives/ [accessed December 2023].

tanks to the inner wing tanks as expected so the pilots attempted to transfer fuel manually. Although transfer was partially achieved, the expected indications of fuel transfer in progress were not displayed so the commander decided to divert to Amsterdam (Schiphol) Airport where the aircraft landed safely on three engines.

The investigation determined several causal factors and the resultant six Safety Recommendations led to a redesign of the A340 and A380 fuel systems, and a change in the Certification requirements for large aircraft[4] requiring independent low fuel warning indications. This is an excellent example of an event that did not receive widespread media coverage but resulted in very significant safety lessons being learned.

ET-AOP Boeing 787 Incident in 2013

In July 2013 a ground fire started in a parked and unoccupied Boeing 787-8 at London Heathrow Airport (Figure 1). The circumstances surrounding the occurrence did not fall within the definitions of an Accident or Serious Incident as defined in ICAO Annex 13, however, the Chief Inspector, exercised his powers under the Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996, initiated an investigation, treating the occurrence as a Serious Incident and invoking the protocols of ICAO Annex 13 with regard to the participation of other interested States. An investigation was commenced immediately and a team of AAIB Inspectors was deployed.

Figure 1
ET-AOP on a remote stand at Heathrow during the incident

Footnote

[4] CS 25.1305 AMDT 12 NPA - NPA 2011-13 - Large Aeroplanes protection against fuel low level and fuel exhaustion | EASA (europa.eu) [accessed March 2024].

The aircraft suffered extensive heat damage in the upper portion of the aircraft's rear fuselage, in an area coincident with the location of the Emergency Locator Transmitter (ELT) shown in Figure 2. The absence of any other aircraft systems in this area containing stored energy capable of initiating a fire, together with evidence from forensic examination of the ELT, led the investigation to conclude that the fire originated within the ELT.

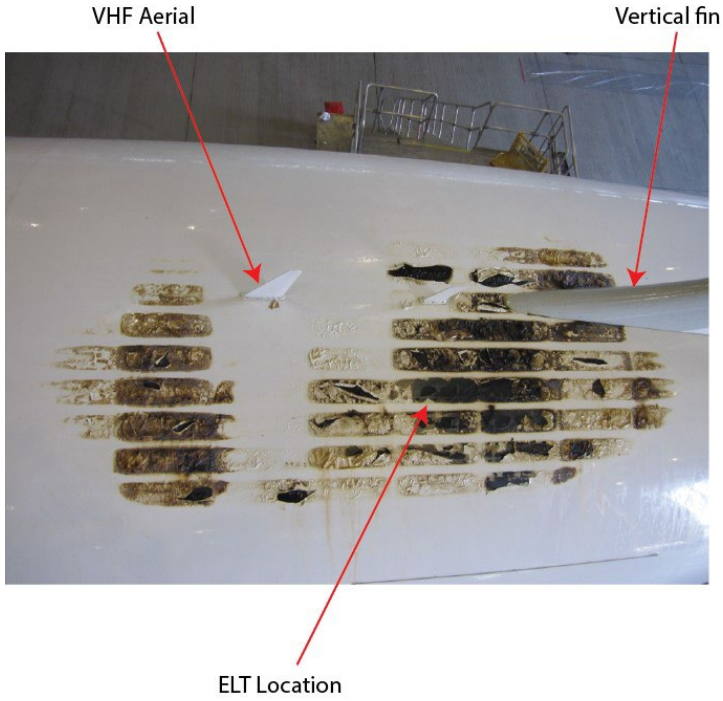


Figure 2
ET-AOP heat damage to the upper fuselage

The ground fire on ET-AOP was initiated by the uncontrolled release of stored energy from the lithium-metal battery in the ELT. It was identified early in the investigation that ELT battery wires, crossed and trapped under the battery compartment cover-plate, probably created a short-circuit current path which could allow a rapid, uncontrolled discharge of the battery. Root Cause testing performed by the aircraft and ELT manufacturers confirmed this latent fault as the most likely cause of the ELT battery fire, most probably in combination with the early depletion of a single cell.

Fourteen Safety Recommendations were made during the course of the investigation. In addition, the ELT manufacturer carried out several safety actions and is redesigning the ELT unit taking into account the findings of this investigation. Boeing and the FAA have also undertaken safety actions.

C-FWGH Boeing 737-800 at Belfast in 2017

In July 2017 the AAIB investigated a Serious Incident in which a Boeing 737-800 took off from Belfast International Airport with insufficient power to meet regulated performance requirements. The aircraft struck a supplementary runway approach light, which was

36 cm tall and 29 m beyond the end of the takeoff runway. Figure 3 contains an image of the damage which at first sight does not convey the seriousness of the event.

Figure 3
Damage to supplementary runway light 29 m from the end of the runway

An outside air temperature (OAT) of -52°C had been entered into the Flight Management Computer (FMC) instead of the actual OAT of 16°C. This, together with the correctly calculated assumed temperature thrust reduction of 48°C, meant the aircraft engines were delivering only 60% of their maximum rated thrust. The low acceleration of the aircraft was not recognised by the crew until the aircraft was rapidly approaching the end of the runway. The aircraft rotated at the extreme end of the runway and climbed away at a very low rate. The crew did not apply full thrust until the aircraft was approximately 4 km from the end of the runway, at around 800 ft aal.

There was no damage to the aircraft, which continued its flight to Corfu, Greece without further incident. However, it was only the benign nature of the runway clearway and terrain elevation beyond, and the lack of obstacles in the climb-out path which allowed the aircraft to climb away without further collision after it struck the runway light. Had an engine failed at a critical moment during the takeoff, the consequences could have been catastrophic.

The investigation determined several causal and contributory factors for this Serious Incident, including the lack of capability in the FMC to alert the crew of the incorrect OAT and that the Electronic Flight Bags (EFB) did not display N_1[5] on their performance application which meant that the crew could not verify the FMC-calculated N_1 against an independently calculated value.

Footnote

[5] N_1 engine fan or LP compressor rotational speed.

The AAIB made six Safety Recommendations, which resulted in significant safety action.

Benefits and challenges

The AAIB has found that in-depth investigation of a Serious Incident may bring considerable benefits for aviation safety.

- By definition, a Serious Incident presented a high risk of an accident. This is clearly not an acceptable situation, and further investigation may be needed to establish the circumstances and to identify how and why the safety of the flight was compromised, so that action can be taken to address the safety issues and prevent recurrence.
- Equally, it may be very beneficial to understand why the occurrence didn't escalate into an Accident so that the importance of any barriers or mitigations that were effective can be recognised and advocated to help prevent future accidents elsewhere.
- Fortunately, Accidents are relatively rare, but Incidents are much more common and provide opportunities to identify safety issues before they become manifest in an accident.
- Following an Incident or Serious Incident, the evidence will often be more accessible than following an Accident. For example, the whole aircraft should be available for examination, data should be relatively easy to retrieve, personnel should be able to explain what they saw, heard and did.
- Accidents sometimes have significant political, economic, social, technological, legal or environmental consequences. They can generate a lot of external attention, emotion and pressure. Free from such issues, Serious Incidents can provide a more conducive environment to gather evidence and complete an in-depth investigation focused on improving safety without concerns over blame or liability.
- Safety Investigation Authorities (SIA) like the AAIB have the authority to organise and lead a multidisciplinary and multinational team of investigators, experts and advisers. They have the legal powers to access all the evidence, and the tools, techniques and procedures to evaluate it thoroughly.
- SIA are acknowledged as the authoritative experts for air accident and incident investigation. They have a uniquely independent position from which to analyse the evidence impartially. Their findings and recommendations will be published and can be very influential in improving aviation safety.

However, Serious Incident investigation depends on the prompt notification of the occurrence to the AAIB so we can make a timely decision whether to investigate or not and the required actions can be taken to preserve the perishable evidence. At the time of initial notification, the information available may be quite limited or inaccurate which can sometimes make it

difficult to assess whether there was a high probability of an accident. If in doubt, report the occurrence to the AAIB so we can gather evidence and assess the occurrence more fully. Further information is available at Report an aircraft accident or serious incident - GOV.UK.

TO REPORT AN AIRCRAFT ACCIDENT or SERIOUS INCIDENT

Telephone the **Air Accidents Investigation Branch (AAIB)** on **01252 512299** (24 Hours)

Note: During normal working hours the above telephone number will be answered directly by personnel from the AAIB. Outside normal working hours calls will be diverted automatically to the Duty Officer who will, after recording some initial details, contact AAIB duty personnel.

Concluding comments

Commercial Air Transport events which involve significant damage and/or significant injuries or fatalities will remain a priority for the AAIB's investigation resources. This is driven by the needs of the general public and the aviation industry. It is however clear the investigation of Incidents and Serious Incidents over the last 30 years has proved to be highly significant in improving aviation safety.

General Aviation and Mid-Air Collision Accident Statistics 2003-2023

Introduction

AAIB investigations often require additional work to understand the context of the aviation environment in which an Accident or Serious Incident takes place. This article shows an example of the results of this type of work and is included to prompt further thought and discussion.

It illustrates how the UK General Aviation (GA) environment has changed regarding mid-air collisions (MAC) over the years. It compares the collision rate between powered and non-powered flight and shows a comparison with the much larger GA environment in the USA.

Background

During the investigation into the fatal MAC involving two gliders over Melton Mowbray on 17 August 2023, a review of MACs over the period 2003-2023 was undertaken. In addition to listing and categorising the MACs during the period, an attempt was also made to estimate the rate of MACs per 100,000 flying hours. This required estimates of annual GA fleet hours, which were obtained from the CAA.

MAC events

A list of all MAC events on the period, totalling 39 accidents, was produced (Table 1).

#	Date	Aircraft	Reg	Location	Fatalities	AAIB accident number	Notes
1	11/08/2003	LS4 glider & Libelle glider	BGA4189 & BGA1630	Didcot	0	-	Collision in a thermal at 4,000 ft during competition. Both landed safely.
2	04/09/2003	ASW-27 glider & Discus glider	BGA4338 & BGA4092	Near Lasham	0	-	Collision in a thermal at 3,000 ft. Both pilots baled out.
3	26/04/2004	Skylark 4 glider & Ventus ct glider	BGA1116 & BGA3259	Near Lasham	1	EW/C2004/04/03	Collision at 4,000 ft during local flying. Skylark pilot baled out.
4	06/07/2004	Robinson 22 & Hybred 44XLR	G-LIDS & G-MTJP	Welham Green	2	EW/C2004/07/02	Collision at 1,200ft. Robinson 22 landed safely.
5	22/7/2004	Grob 103C glider & Vega T65C glider	BGA3574 & BGA2716	Lasham	0	-	Collision occurred on final approach, below 300 ft. Both landed safely.
6	18/12/2005	Cessna 152 & Eurostar EV-97	G-BNXC & G-GHEE	Moreton-in-Marsh	1	EW/C2005/12/01	Collision at approximately 1,000 ft. Eurostar landed safely.
7	26/7/2005	ASW-20 & Janus	BGA3419 & BGA4210	Lasham	0	-	Collision prior to task start during a competition. Both landed safely.
8	02/10/2006	ASW-19 & SF-27	BGA3752 & BGA3934	Sutton Bank	1	EW/C2006/10/02	Collision at 1,500 ft during local flying. SF-27 pilot baled out.
9	16/12/2007	Luscombe 8E & PAC750XL	G-AKUI & ZK-KAY	Rugely	2	EW/C2007/12/02	Collision at 2,000 ft. PAC750XL landed safely
10	14/7/2007	DG-600 & ASW-28	BGA4966 & BGA5161	Southam	0	-	Collision in a thermal during competition. Both landed safely.
11	17/08/2008	Cessna 402 & KR-2	G-EYES & G-BOLZ	Coventry	5	EW/C2008/08/05	Collision on approach path at 3 nm. Both aircraft crashed.
12	29/7/2008	PA-18 tug & ASK-21	N/K & N/K	N/K	0	-	Tug aircraft towrope struck K-21 during aerial photography. Both landed safely.
13	11/02/2009	Grob Tutor & Grob Tutor	G-BYVN & G-BYUT	Porthcawl	4	EW/C2009/02/02	Collison at 2,900 ft. Both aircraft crashed.
14	14/06/2009	Grob Tutor & Cirrus glider	G-BYXR & G-CKHT	Benson	2	EW/C2009/06/04	Collision at 4,200 ft. Cirrus pilot baled out.
15	28/7/2009	Antares 18S & Ventus 2ct	D-KAIB & G-EVII	Wittering	0	-	Collision in a thermal during competition. Both landed safely.
16	04/09/2010	Vans RV-4 & Mooney M20J	G-MARX & G-JAST	Isle of Wight	2	EW/C2010/09/01	Collision at 700 ft during an air race. RV-4 landed safely.
17	04/07/2011	Vans RV-6A & Diamond DA-40	G-RVGC & G-CEZR	Shoreham	1	EW/C2011/07/01	Collision in visual circuit at 1,100 ft. DA-40 landed safely.
18	10/07/2011	P-51D & AD-4N Skyraider	D-FBBD & F-AZDP	Duxford	0	EW/C2011/07/02	Collision during airshow 'break' manoeuvre. Skyraider landed safely.
19	18/12/2011	Taylorcraft & Pitts S2C	G-BVXS & G-IICI	Leicester	1	EW/C2011/12/01	Collision in the visual circuit at 1,000 ft. Pitts landed safely.
20	5/8/2011	K-21 glider & K-13 glider	N/K & N/K	Lasham	0	-	Collision in a thermal at 1,200 ft. Both landed safely.
21	23/07/2012	DG-100G glider & LS-7 glider	G-CKMG & G-CGBY	Newmarket	0	-	Collision in a thermal at 2,000 ft during competition. LS-7 landed safely.
22	30/5/2012	Rallye tug & LS-7	N/K & N/K	N/K	0	-	Tug aircraft overflew landing LS-7. Both aircraft landed safely.
23	18/05/2014	Discus glider & Arcus glider	G-CFFT & G-JKRV	Gransden Lodge	0	-	Collision in a thermal at 2,600 ft. Discus pilot baled out.
24	15/07/2014	ASW-19 glider & Mosquito glider	G-DDZG & G-DDUB	Portmoak	0	-	Collision during ridge soaring at between 1,600 and 2,000 ft. ASW-19 pilot baled out.
25	26/07/2014	Discus glider & LAK17 glider	G-IDER & G-CKOI	Little Paxton	0	-	Collision in a thermal at 4,000 ft during competition. Discus pilot baled out.
26	01/09/2014	Grob 103 glider & Cirrus glider	G-CJOG & G-CHRL	Aboyne	0	-	Collision at 4,000 ft prior to task start during a competition. Both Grob 103 pilots baled out.
27	5/10/2013	PA-25 tug & Discus	N/K & N/K	N/K	0	-	Descending tug aircraft towrope struck Discus in a thermal. Both landed safely.
28	23/09/2014	Kitfox & Cessna 177RG	G-TOMZ & G-AZTW	St. Neots	1	EW/C2014/09/03	Collision at 2,700 ft. Cessna landed safely.
29	05/04/2015	Pioneer 300 & model aircraft	G-OPFA & UAS	Upton-on-Severn	0	EW/G2015/04/12	Collision at 630 ft, Pioneer 300 landed safely.
30	30/04/2015	DR400 & model aircraft	F-GSBM & UAS	Shoreham	0	EW/G2015/04/27	Collision in visual circuit between 600-800 ft. DR400 landed safely.
31	30/09/2016	PA-28 & PA-28	G-CCZV & G-BZBS	Near Elstree	0	EW/G2016/09/23	Collision at 2,000 ft. Both landed safely.
32	04/12/2016	Cessna 150L & SZD-51 glider	G-CSFC & G-CLJK	Leicester	1	EW/C2016/12/01	Collision at 2,300 ft. Cessna landed safely.
33	23/09/2017	P-51D & P-51D	G-SHWN & G-BIXL	Duxford	0	EW/C2017/09/05	Collision during airshow formation flight. Both landed safely.
34	17/11/2017	Guimbal G2 & Cessna 152	G-JAMM & G-WACG	Waddesdon	4	EW/C2017/11/02	Collision at 1,030 ft. Both aircraft crashed.
35	08/06/2018	DR400 tug & K21 glider	G-LGCC & G-CFYF	Dunstable	0	EW/G2018/06/07	Collision at 900 ft. Both landed safely.
36	04/08/2018	DR400 tug & SZD-55	N/K & G-CHHR	Dunstable	0	-	Tug aircraft towrope struck SZD-55 canopy. Both landed safely.
37	23/06/2019	Cessna 172 & Fuji FA-200	G-HAMI & G-BXGV	White Waltham	0	AAIB-25830	Collision, both landed safely
38	17/08/2023	Ventus 2cxt glider & Antares E1 glider	G-KADS & G-CLXG	Melton Mowbray	1	AAIB-29483	Collision in a thermal at 2,300 ft during competition. Antares landed safely.
39	07/10/2023	T21 glider & UAS	WB924 & UAS	Dunstable	0	AAIB-29662	Collision at 100 ft during landing, T21 landed safely.

Table 1

List of UK MAC events, 2003-2023

The types of MAC were categorised according to aircraft types involved, and the results plotted (Figure 1).

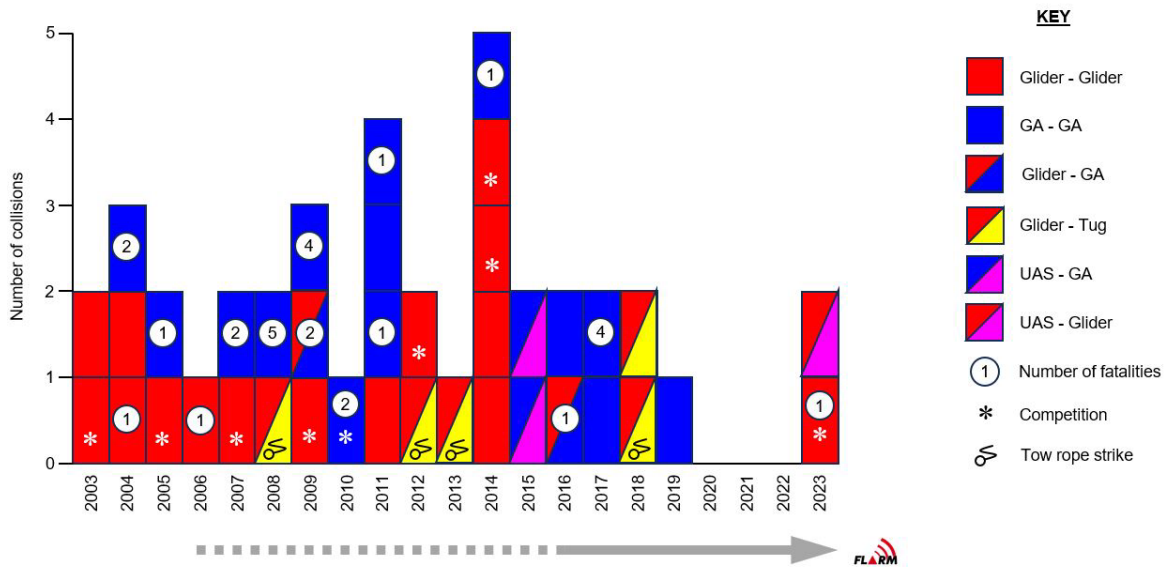


Figure 1

Mid-air collision events in UK airspace, 2003-2023

This categorisation showed that the 14 collisions which occurred between powered GA aircraft in the period often resulted in fatalities to the occupants of one or both aircraft involved, as half the aircraft involved crashed and only one occupant managed to successfully escape by parachute (P-51D D-FBBD, Duxford, 10 July 2011).

There were 15 collisions between gliders during the period, resulting in 12 of the gliders involved crashing, however all the glider occupants wore parachutes and 10 pilots managed to bale out safely following a collision. Slightly more than half the collisions (8) involved gliders taking part in competitions. The introduction of FLARM (a collision warning system) in the UK glider fleet appears to have significantly reduced the number of collisions between gliders and the 2023 Melton Mowbray MAC event was the first glider-glider collision to have occurred for nine years.

Two collisions occurred between a GA aircraft and a glider, resulting in three of the four aircraft involved crashing and three fatalities. One glider pilot managed to safely escape by parachute from one of these collisions.

Four collisions occurred between the tow rope of a glider tug aircraft and a glider, all resulting in minor damage to the glider followed by successful landings. One collision between a tug aircraft and a glider occurred, however both aircraft were able to land safely. There were three collisions between a UAS and an aircraft in the period, all resulting in safe landings for the aircraft involved.

GA fleet hours

The CAA provided estimates of all GA aircraft (including gliders and aircraft operating on a Permit-to-Fly) on the UK register, based on aircraft hours reported during annual ARC or maintenance renewals (Figure 2). The data for 2015 and 2016 was only partially complete, and estimates were made to arrive at an annual fleet figure.

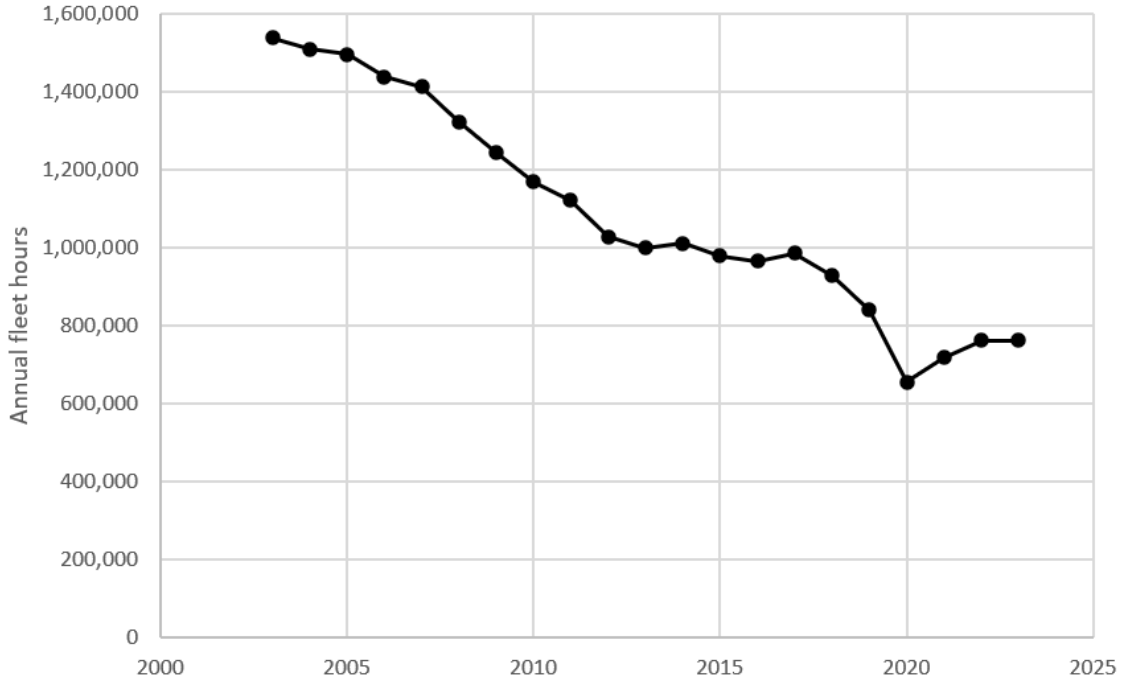


Figure 2

Annual hours flown by the UK General Aviation fleet, 2003-2023

The annual hours flown by the UK general aviation fleet fell by approximately half during the period, with a steady decline between 2003 to 2012. This initial decline was followed by relatively constant period of annual hours flown between 2012 and 2017, however a second steep decline then occurred which started before but also encompassed the COVID-19 pandemic. Annual fleet hours have still not recovered to pre-pandemic levels as of 2022-23.

Fatal accidents in the period

The annual number of GA fatal accidents in the period was obtained from AAIB annual safety statistics (Table 2). Accidents involving commercial air transport operations were excluded.

Year	Fatal accidents	Fatal Accident Rate/100,000hr	Fatalities	Notes
2003	10	0.65	15	
2004	13	0.86	20	
2005	18	1.20	31	
2006	12	0.83	14	
2007	20	1.42	39	
2008	12	0.91	24	
2009	21	1.69	33	Excludes G-REDL
2010	9	0.77	15	
2011	14	1.25	16	
2012	13	1.27	16	
2013	12	1.20	26	Includes G-SPAO, excludes G-WNSB
2014	10	0.99	16	
2015	18	1.84	39	Includes G-BXFI
2016	14	1.45	18	
2017	16	1.63	28	
2018	9	0.97	16	
2019	8	0.95	10	
2020	4	0.61	4	
2021	5	0.70	7	
2022	9	1.18	11	
2023	10	1.31	11	

Table 2

UK General Aviation fatal accidents and fatalities, 2003-2023[6]

The fatal accident rate per 100,000 flying hours was plotted, with a three-year rolling average line included to reduce the annual statistical variation in the accident rate (Figure 3).

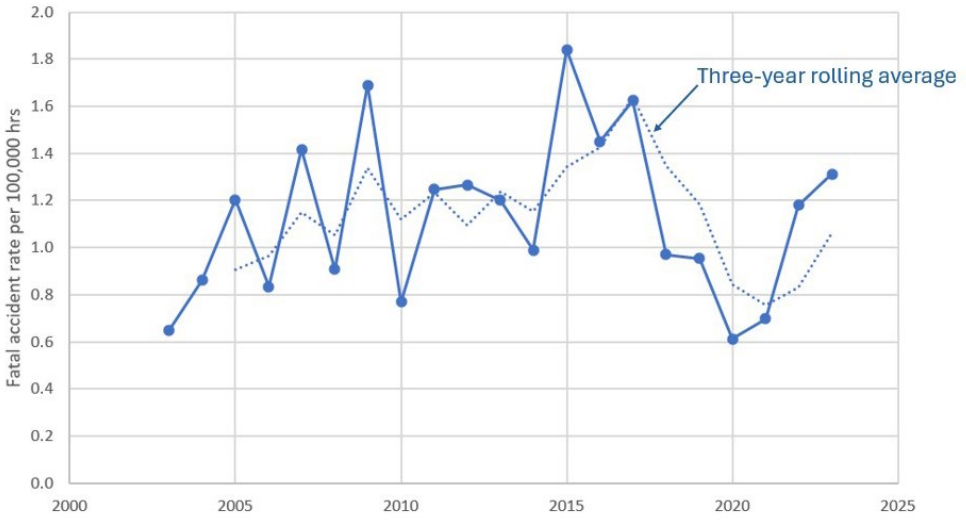


Figure 3

UK General Aviation fatal accident rate per 100,000 flying hours, 2003-2023

Footnote

[6] G-REDL accident to an AS322 Super Puma helicopter in the North Sea on 1 April 2009 with the loss of 16 lives.
G-SPAO accident an EC135 helicopter in central Glasgow on 29 November 2013 with the loss of 10 lives.
G-WNSB accident to an AS322 Super Puma helicopter off Sumburgh 23 August 2013 with the loss of 4 lives.
G-BXFI accident to a Hawker Hunter aircraft at Shoreham on 22 August 2015 with the loss of 11 lives.

The three-year rolling average showed that the fatal accident rate was approximately constant between 2007 – 2015, before then rising to a peak of about 1.6 per 100,000 hours in 2017. Since 2017, the rolling-average rate fell to a low in 2021, before then rising again closer to a long-term average trend. The increase in the fatal accident rate since 2021 is concerning, although it is below the peak level during the period studied. In 2023 there were 10 fatal accidents, the same number as in 2003, despite approximately only half the GA hours being flown.

MAC rate and comparison with USA

The total GA fleet hours flown in the period 2003-2023 is estimated to be 22,882,078 hours, during which 39 collisions involving 78 aircraft occurred. This equates to a collision rate of 0.341 per 100,000 hours flown, which is equivalent to a collision occurring every 293,360 hours.

MAC event statistics were obtained from NTSB annual safety statistics reports, which also include FAA estimates of the annual hours flown by the US GA fleet. Figures for the period 2010-2018 (excluding 2011) were available. In this period 77 MAC events occurred, involving 154 aircraft. The estimated annual GA fleet hours flown in the period averaged 20,896,382 (ie approximately 20 times the annual fleet average hours flown in the UK). The resulting collision rate was 0.092 per 100,000 hours flown, which is equivalent to a collision occurring every 1,084,124 hours.

Therefore, the MAC rate in the USA is approximately one quarter of the rate in the UK.

Further study would be required to analyse the contributory factors to this large difference in MAC rates between the UK and the USA, and to also compare the MAC rates in other European countries.

Summary

There has been a dramatic and sustained reduction (~50%) in the annual amount of GA flying over a 20-year period in the UK, starting in 2003. The annual fatal accident rate has recently risen following a low point in 2020. The reasons for this rise in the accident rate are not clear.

The mid-air collision rate in the UK is considerably higher, by a factor of four, than in the USA. Again, it would be helpful to understand why this is the case, and whether the introduction of electronic conspicuity has helped to reduce the rate of collisions, as appears to be the case for FLARM in reducing the glider-glider collision rate.

The AAIB plans to work with stakeholders to identify underlying factors for both the GA fatal accident rate and the MAC rate, to support further safety promotion on these topics.

Accident timeline

The timeline illustrated here shows the various steps taken by the AAIB from the initiation of an investigation to the publication of a report. It shows a typical accident where the AAIB deploy a team to investigate the causes and contributory factors in a commercial air transport or general aviation accident or serious incident.

1 Notification

The AAIB are notified of an incident to an aircraft or unmanned air system (UAS). The notification is usually by telephone call or electronic media. Notifications are immediately acted upon; 24 hours a day 7 days a week.

2 Assessment

An AAIB Principal Inspector in the role of Duty Coordinator will assess the information received and if necessary, seek further clarification. A response decision is taken which can range from no further action to initiating a major deployment of an AAIB team.

Most accidents require a small team of three or four Inspectors. There are two teams available at any one time.

A team will prepare and depart to the scene of the accident as soon as possible. In the UK this is usually by road but further afield, such as Northern Ireland or Scotland, the team may use commercial flights

3 Evidence Gathering

On arrival the Inspectors commence the investigation and gather evidence.

Depending on the nature of the accident, small aircraft wreckage will be recovered to the AAIB headquarters. Large commercial aircraft may require local hangarage or, if they are relatively undamaged, will be formally handed back to the owner or operator.

On average the work at the accident site takes three or four days.

4 Investigation

On return to the AAIB HQ, the evidence and initial findings are presented to the Chief Inspector of Aircraft Accidents (CIAA) and all the AAIB staff. A decision is then made on the scope of the investigation with agreed resources and timelines where possible.

Work continues using the evidence to establish the causal and contributory factors of the accident. This may require testing and research and additional witness interviews, data analysis as well as forensic examination of the aircraft and its components.

This work often takes several weeks if not months to complete. The AAIB aim to publish a report within a year of the event, if that is not possible an anniversary statement is published.

Should safety information need to be provided promptly or safety action taken, the AAIB will publish a Special Bulletin.

5 Report Review and Preparation

The investigation team prepares the report as the investigation progresses. The facts and evidence are analysed, with regular analysis reviews and in some cases with peer reviews too. During this analysis the casual and contributory factors, and safety issues are identified that may require a safety recommendation. These safety issues are discussed with the responsible authority and where action is being taken this will be reflected in the report. If a Safety Recommendation is proposed this is assessed under a specific peer review.

The time necessary to review and prepare the draft report is dependent on the complexity of the accident and the report can go through several iterations.

Accident Timeline cont

6 Consultation Period

A confidential draft report is prepared and provided to those States and authorities that have been involved in the investigation and to anyone whose reputation is likely to be affected. The consultation is carried out under the relevant regulations with a response, containing any substantive representations, required within 28 days, which can be extended on request.

7 Response Review

When all the responses have been received from those that have been consulted the IIC will consider each response along with the investigation team and decide on whether there is a need to amend the report. It is also possible that new evidence may be presented by consultees that requires further investigative work and may result in a further consultation.

8 Approval for publication

The draft report is submitted by the IIC to the CIAA for final approval for publication, after which it is passed to the publications team for preparation for publication – including proof reading.

9 Pre-Publication

Prior to publication, the final report is provided to those involved in the accident and the relatives of the victims. The report is also provided to the other States involved in the investigation, the relevant authorities and advisers, so that they are fully aware of the contents of the report and can prepare for any public or media enquiries. The pre-publication report is a protected document and cannot be disclosed until it is published.

10 Publication

The report is published either online as soon as it is ready for field and formal investigations or in the monthly bulletin for others. All reports are publicly available on the AAIB website. Letters are sent to the addressees of the safety recommendations in the report asking for their response within 90 days on the action they are likely to take or if no action is being taken as to the reason why.

11 Post-Publication

Following publication, for fatal accidents, the investigation team provide Statements to the Coroner or Procurator Fiscal and may subsequently appear in the Coroner's Inquest or Fatal Accident Inquiry.

Where a safety recommendation has been made, the AAIB will assess the responses and track the action taken.

The investigation could be "reopened" if in the opinion of the Chief Inspector there is new and significant evidence which will require a return to Step 4.

2023 AAIB Operational Statistics

An overview of our involvement during 2023

This graphic shows the AAIB activity statistics for 2023. Of interest is that 2022 saw 790 notifications of an event or occurrence to the AAIB. In 2022 this figure was 778. The figures for 2023, 2022 and 2021 are broadly similar and reflect a return to a relative aviation normality in commercial, general and UAS after the upheavals of 2020.

790

Number of Notifications received by the AAIB

Investigations Opened

Formal	Field	Correspondence	Record-only (RO)
0	25	80	176

Number of Notifications Year-on-Year Difference

2023 vs 2022	2023 vs 2021	2023 vs 2020
+1.5%	+5.9%	42.9%

UK Fatal Accidents and Number of Deaths

		2023 vs 2022
10	Number of UK Fatal Accidents	+11.1%
11	Number of Deaths	+0.0%

AAIB Activity Overseas

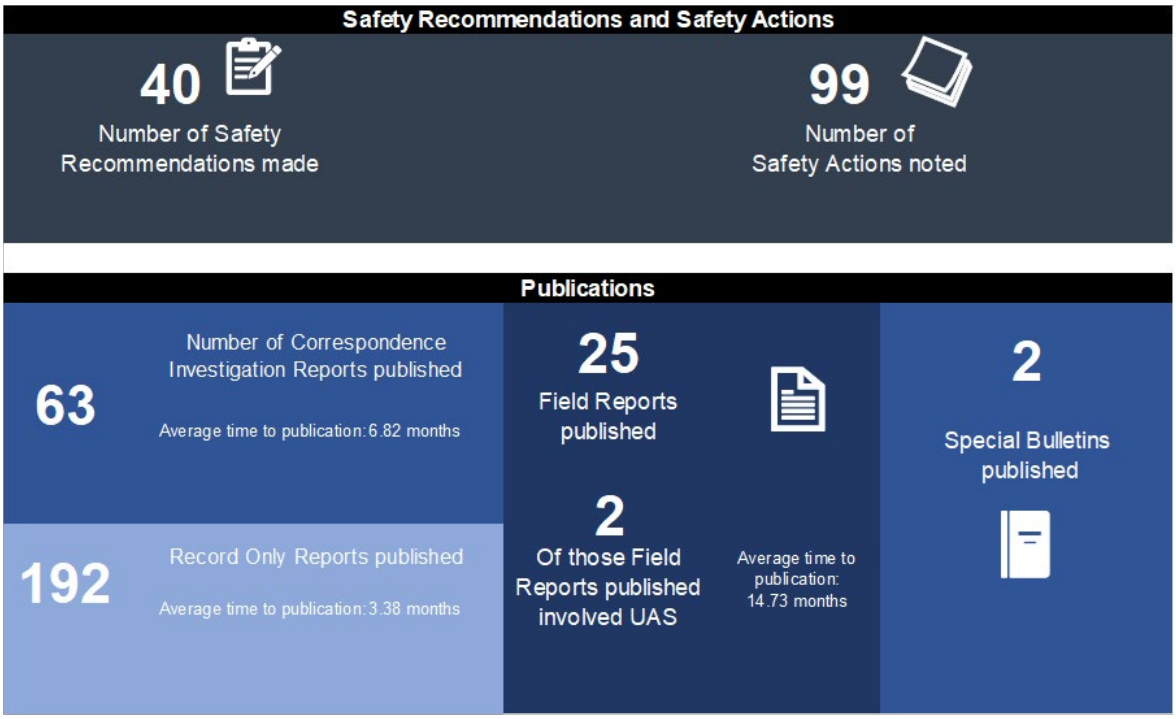
10	UK Registered Aircraft Overseas
38	Foreign Registered Aircraft Overseas

External Involvement

0	Military (AAIB assistance)
30	Sporting Associations informed

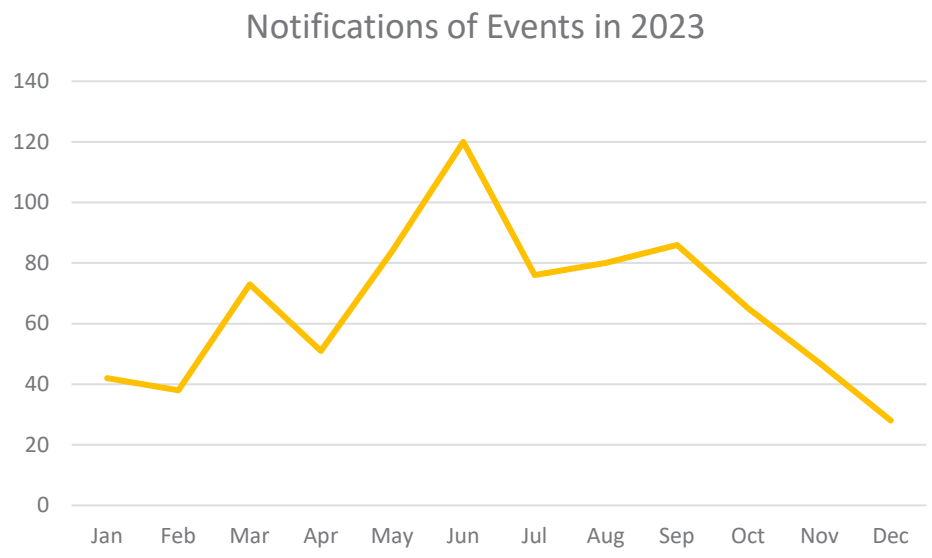
398

No Further AAIB Action



Notification statistics year on year

Notifications to the AAIB are calls and communications received which give information on an aviation related occurrence which usually result in a case being raised. Information is received from a variety of sources and are assessed by AAIB staff to determine a response. The following graphs show trend comparisons month by month notification statistics for 2023.



Occurrence Factors

The AAIB uses the taxonomy defined by the CAST/ICAO Common Taxonomy Team (CICTT) to codify each investigation with at least one occurrence factor.

The CICTT occurrence factors are from a worldwide standard taxonomy, and permits analysis of data in support of safety initiatives. Although each investigation will have at least one factor it should be noted that there are usually multiple factors codified, for example turbulence (TURB) leading to abnormal runway contact (ARC).

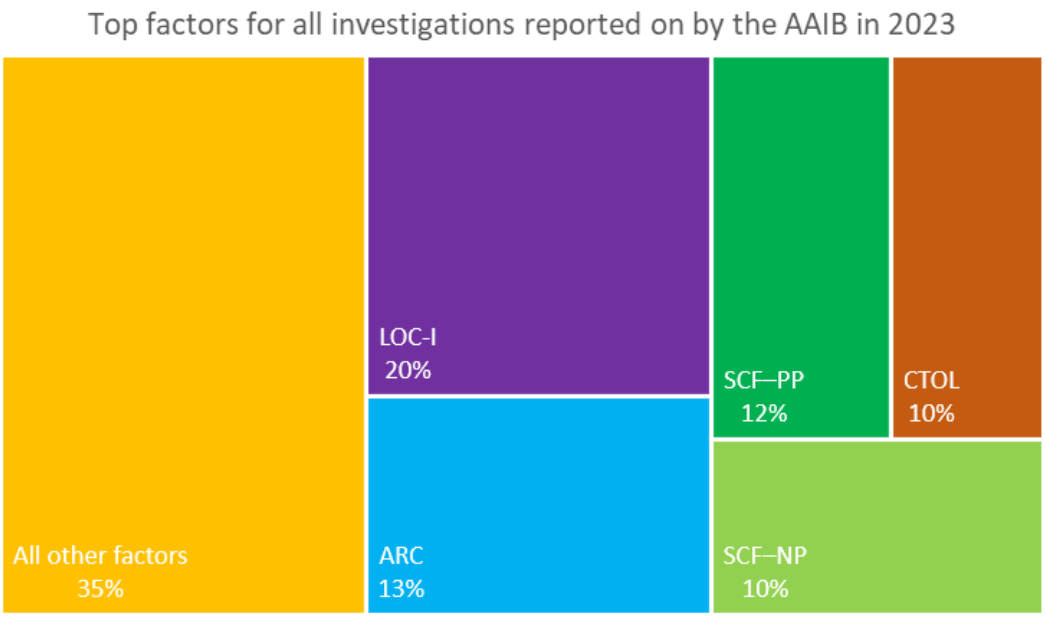
Many of the factors do feature as low percentages, between 1% and 6% and are usually more contributory factors rather than causal factors – these don't feature in the graphics in this report and have been grouped under an 'all other factors' descriptor for this publication.

The following set of graphics show the top occurrence factors as codified for investigations published in 2023 and include:

- All Investigations
- Field Investigations
- Correspondence Investigations
- Record Only Investigations
- UAS Investigations
- Field Investigations into Fatal Accidents
- CAT Field Investigations

A full list of the occurrence factor category abbreviations used in the graphics can be found in the list at Appendix 1.

All Investigations

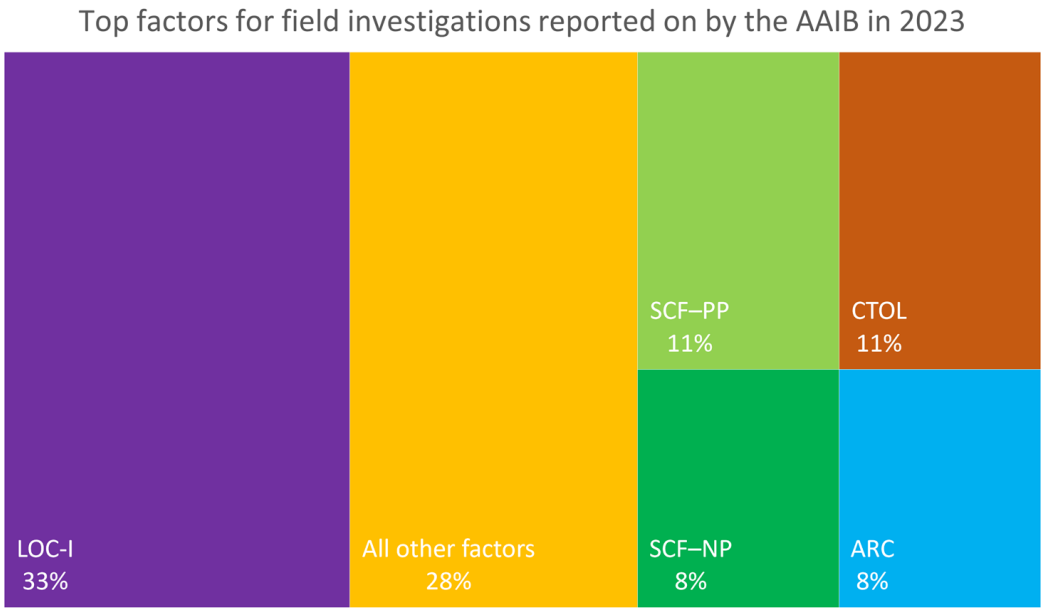


As in previous years, the overall predominant main factor in aircraft Accidents and Serious Incidents is loss of control in flight (LOC-I).

Quick reference key

LOC-I Loss of control in flight
ARC Abnormal runway contact
SCF-NP System or component failure – non powerplant
SCF-PP System or component failure – powerplant
CTOL Collision with obstacle during takeoff and landing

Field Investigations

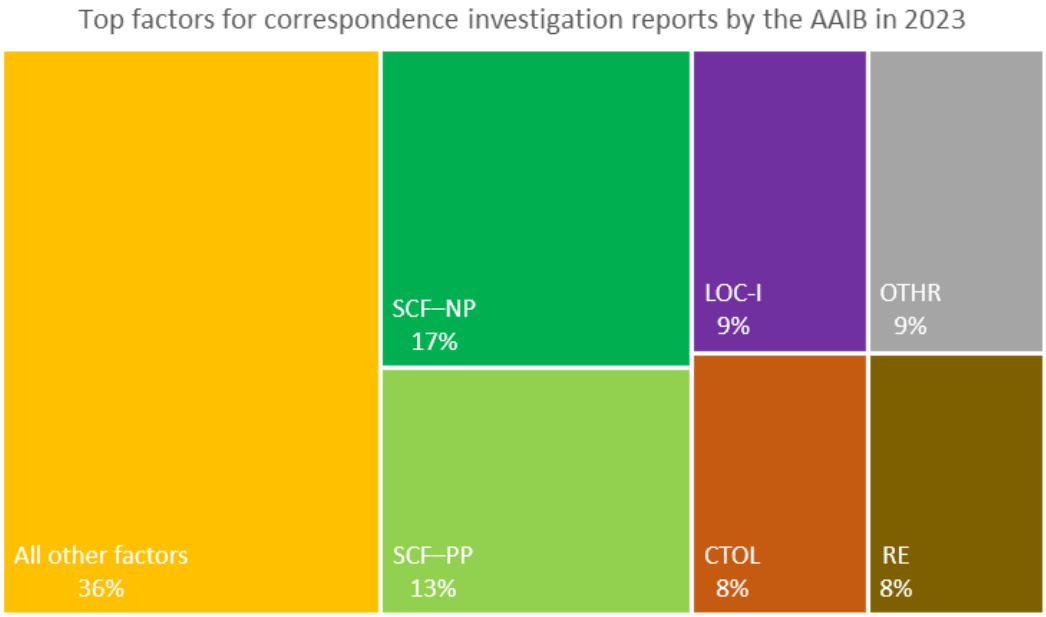


In 2023 the AAIB published 25 field investigation reports, LOC-I, CTOL and SCF-PP were the predominant causal factors.

Quick reference key

LOC-I Loss of control in flight
ARC Abnormal runway contact
SCF-NP System or component failure – non powerplant
SCF-PP System or component failure – powerplant
CTOL Collision with obstacle during takeoff and landing

Correspondence Investigation

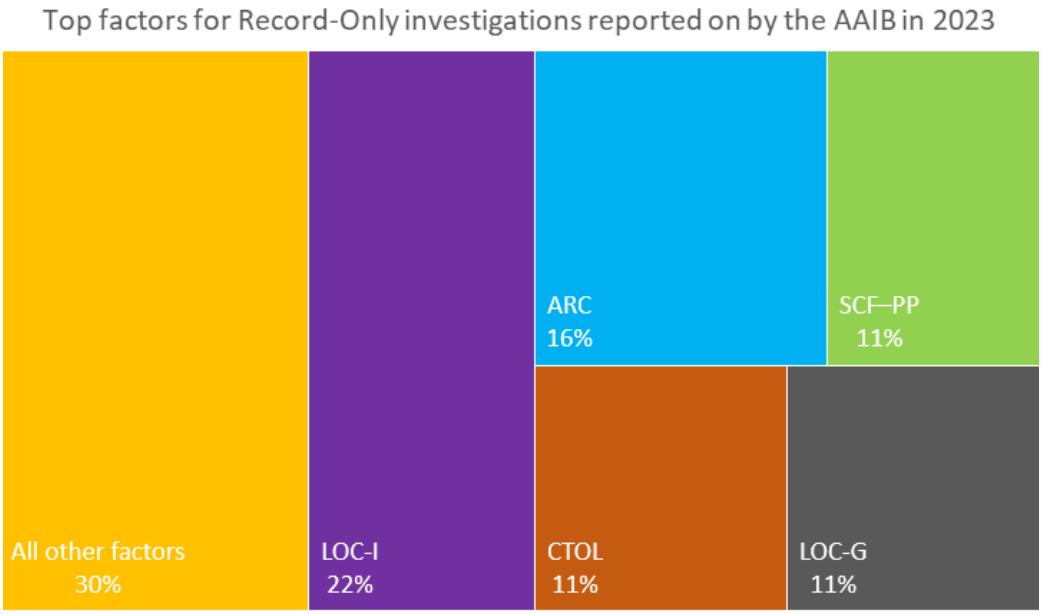


Correspondence investigations are usually conducted into non-fatal Accidents and Serious Incidents on GA and CAT aircraft and Unmanned Air Systems that do not warrant deployment of an AAIB team. They use the information provided by the aircraft commander and in most cases with follow up enquiries by AAIB Inspectors. During 2023 the overall trend was the same as 2022 and 2021 with SCF-NP being the predominant factor followed by SCF-PP.

Quick reference key

LOC-I Loss of control in flight
RE Runway excursion
SCF-NP System or component failure – non powerplant
SCF-PP System or component failure – powerplant
CTOL Collision with obstacle during takeoff and landing
OTHR Other events, for example, an unsecured panel

Record Only (RO) investigations

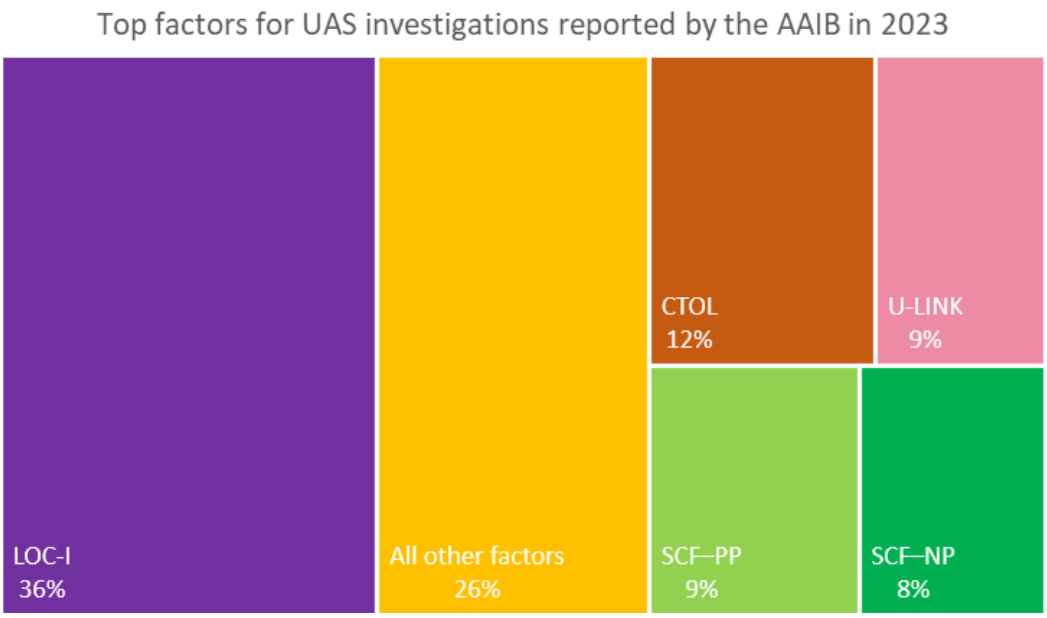


Record Only investigations are those in which there are minor or no injuries, that if investigated fully have little likelihood of identifying new safety lessons that will advance aviation safety. Most RO cases are for light and sport aircraft below 2,250 kg maximum takeoff weight, as well as UAS. This reflect the overall trend in field and correspondence investigations, and so LOC-I and ARC are also the predominant factors in Incidents which fall into the RO category.

Quick reference key

LOC-I Loss of control in flight
ARC Abnormal runway contact
SCF-NP System or component failure – non powerplant
SCF-PP System or component failure – powerplant
CTOL Collision with obstacle during takeoff and landing
LOC-G Loss of control on the ground

UAS Investigations

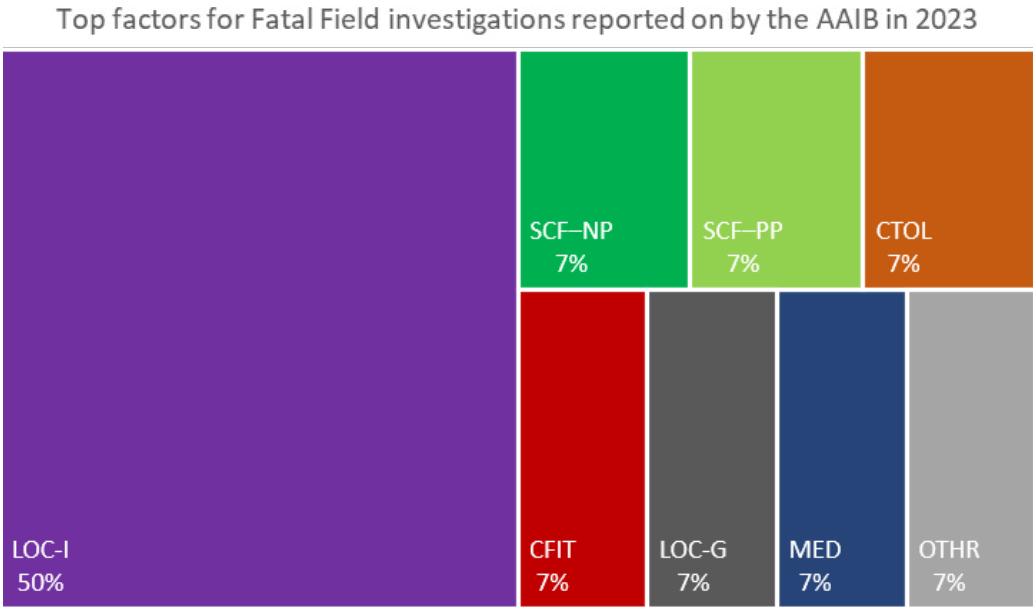


This covers all investigations specifically related to unmanned aircraft systems. The predominant cause of UAS accidents, was LOC-I usually resulting from the UAS becoming unresponsive to control inputs or displaying erratic or uncommanded responses.

Quick reference key

LOC-I Loss of control in flight
SCF-NP System or component failure – non powerplant
SCF-PP System or component failure – powerplant
CTOL Collision with obstacle during takeoff and landing
U-LINK UAS loss of data link

Field Investigations into Fatal Accidents



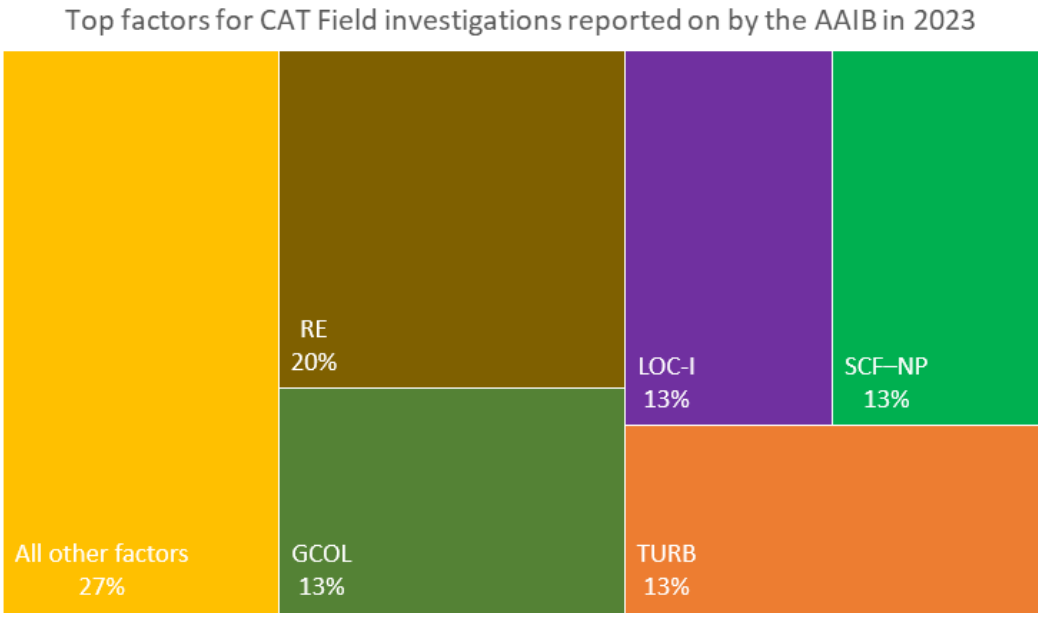
There were no fatal accidents involving commercial air transport in 2023. The fatal accidents all related to general aviation. The predominant factor in these GA fatal accidents was LOC-I. This usually resulted from low speed near to the ground and the aircraft stalling leading to an incipient or fully developed spin.

The CAA has issued an updated Safety Sense leaflet to inform, remind and educate pilots on the avoidance of LOC-I. Which can be found on their website Safety Sense Leaflet 30: Safety Sense: Loss of control. They have also provided some guidance as part of their Stay in Control campaign Stay in Control | Civil Aviation Authority (caa.co.uk).

Quick reference key

LOC-I Loss of control in flight
ARC Abnormal runway contact
SCF-NP System or component failure – non powerplant
SCF-PP System or component failure – powerplant
CTOL Collision with obstacle during takeoff and landing
LOC-G Loss of control on the ground
CFIT Controlled flight into terrain
MED Medical event

Commercial Air Transport Field Investigations



There were no fatal accidents involving commercial air transport (CAT) in 2023. Runway excursions (RE) were the predominant factor in CAT Accidents and Serious Incident reports published during 2023. The CAA has initiated a series of actions under a State Safety Plan (SSP) to address and mitigate the RE risk. The information on the actions can be accessed with this link: Runway incursions and excursions | Civil Aviation Authority (caa.co.uk).

Quick reference key

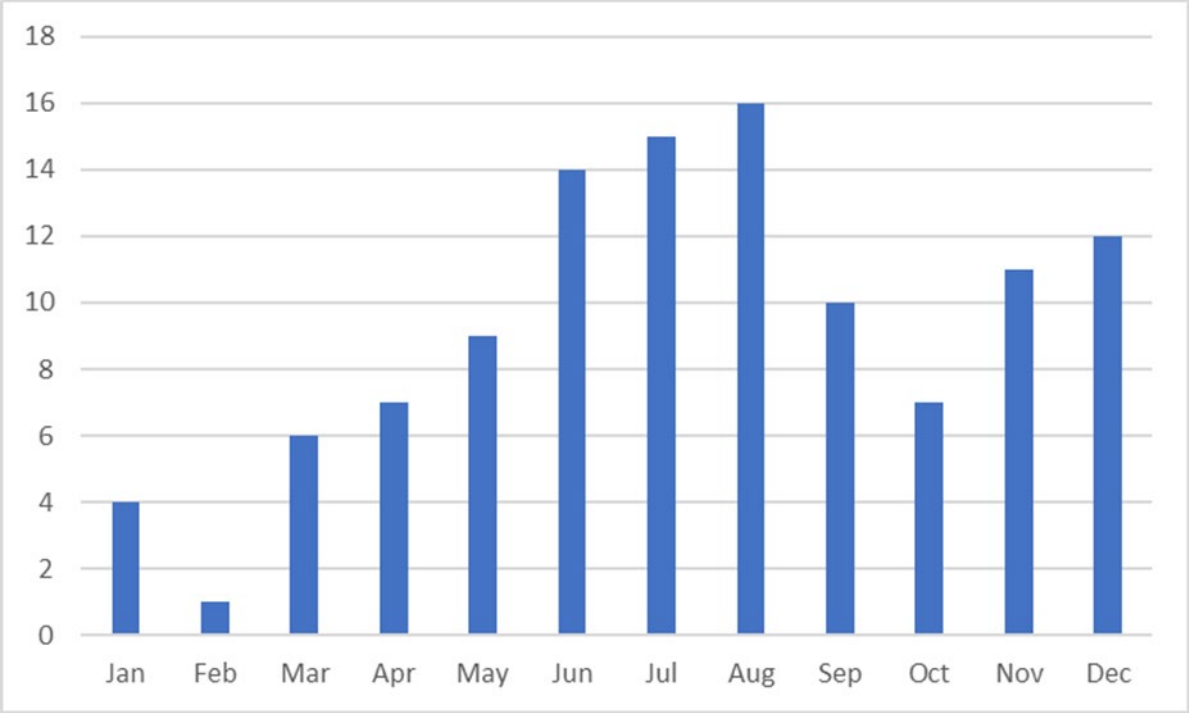
RE Runway Excursion
LOC-I Loss of control in flight
TURB Turbulence
SCF-NP System or component failure – non powerplant
CTOL Collision with obstacle during takeoff and landing
GCOL Ground collision

Note on the AAIB Case Management System (CMS)

Since March 2020 the AAIB has been using CMS to store and manage all of the data generated by notifications and investigations. An article published in the 2020 Annual Safety Review described the CMS in detail.

It is proving itself to be an excellent tool not only for the accurate cataloguing and storage of data but also its functionality in generating statistical information. The articles and graphics on the preceding pages were drawn from data held in the AAIB CMS. The table below is another example of this and came about when an Inspector required more detail for a piece of research during an investigation.

Total Number of AAIB Fatal Field investigations from Jan 2014 to Jan 2024, by month



Considering these figures, it does indicate that more fatal accidents occur in the summer months and is probably related to the increased flying activity in GA with better weather and longer daylight hours. Within CMS there is other data that can be extracted and analysed. This information is being used during AAIB safety investigations to understand the differences and more importantly, the similarities in aircraft Accidents and Serious Incidents. This can lead to much more targeted Safety Recommendations thereby further enhancing aviation safety.

Safety Recommendations

Introduction

The AAIB will make Safety Recommendations based on the findings of an investigation and the need for action to be taken to maintain and improve aviation safety. Each Safety Recommendation made by the AAIB is given a unique reference number based on the year issued. For example, 2023-001 and so on.

The AAIB is responsible for assessing the responses to Safety Recommendations and monitoring the action subsequently taken. The AAIB carries out this function for the UK, its Overseas Territories and Crown Dependencies.

The AAIB monitors the progress of actions taken in response to a Safety Recommendation but does not undertake the role of the regulator nor provide opinion on the efficacy of the action. The AAIB reports regularly to the Board of Accident Investigation Branches (BAIB) and the State Safety Board (SSB) on progress toward completion. It is for the SSB to decide whether there is a need for any additional intervention.

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

Response assessment

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 retained 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.

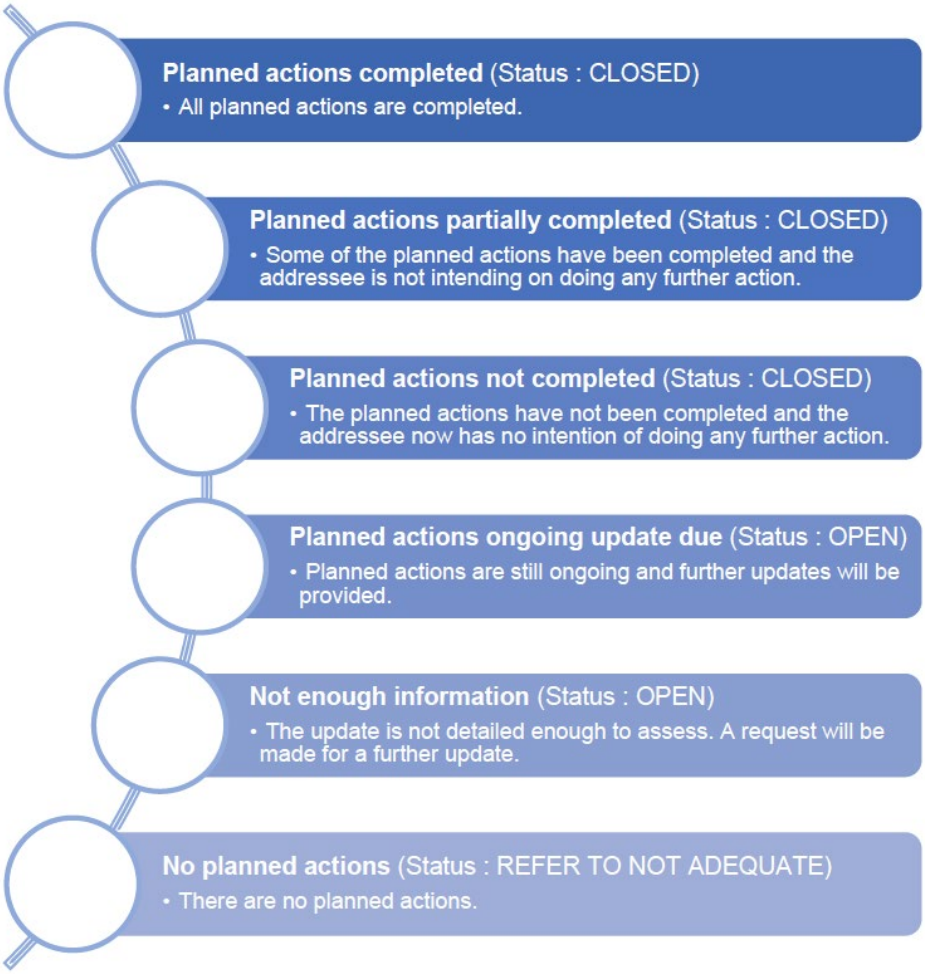
Not Adequate means that the response does not address the intent of the Safety Recommendation, nor does it address the safety issue concerned. The AAIB will apply an open or closed status depending on the expectation of whether the addressee will reassess their response.

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.

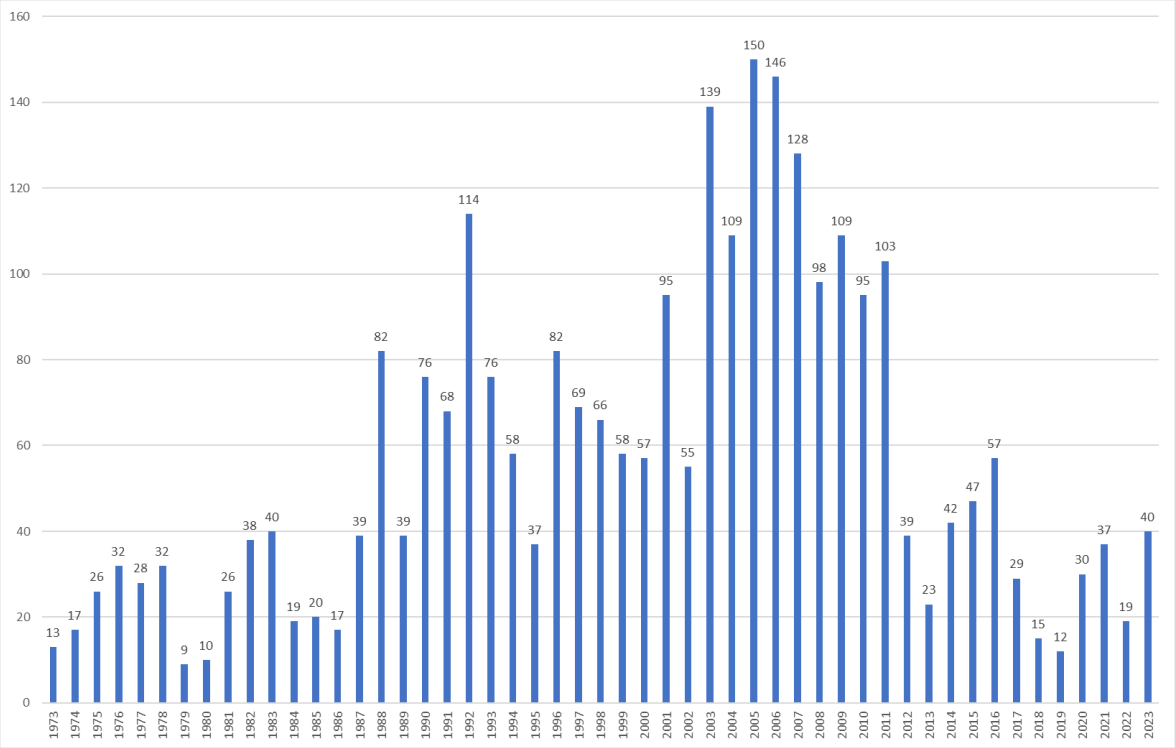
Not Adequate - CLOSED the status 'closed' implies that there is a low likelihood that the addressee will act on the recommendation or provide any further responses.

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.

In reporting on the monitoring of the actions taken to a Safety Recommendation they are reported as meeting one of the following:



Number of Safety Recommendations made per year



Of the 40 Safety Recommendations issued in 2023, as of 25 January 2024, responses have been received for 28 Safety Recommendations. The AAIB response assessment has classified those responses as follows:

- 3 are assessed as **Adequate** and are **Closed**.
- 8 are **Adequate**, with planned actions ongoing and remain **Open**.
- 13 are **Partially Adequate**, with planned actions ongoing and remain **Open**.
- 1 is **Partially Adequate** but is **Closed**
- 2 are **Not Adequate** but remain **Open**.
- 1 is **Not Adequate** but is **Closed.**
- 12 are **Awaiting Response**.

Summary Table

Number	Response Assessment	Action Status	Status
2023-001	Adequate	Planned action completed	Closed
2023-002	Adequate	Planned action completed	Closed
2023-003	Partially adequate	Planned action completed	Closed
2023-004	Partially adequate	Planned action ongoing Update due 28 March 2024	Open
2023-005	Not adequate	No Planned Action	Closed
2023-006	Adequate	Planned action completed	Closed
2023-007	Adequate	Planned action ongoing Update due 30 June 2024	Open
2023-008	Adequate	Planned action ongoing Update due 30 June 2024	Open
2023-009	Partially adequate	Planned action ongoing Update due 30 June 2024	Open
2023-010	Adequate	Planned action ongoing Update due 30 June 2024	Open
2023-011	Partially adequate	Planned action ongoing Update due 29 February 2024	Open
2023-012	Partially adequate	Planned action ongoing Update due 29 February 2024	Open
2023-013	Not adequate	Not enough information	Open
2023-014	Partially adequate	Planned action ongoing Update due 29 February 2024	Open
2023-015	Not adequate	Planned action ongoing Update due 29 February 2024	Open
2023-016	Adequate	Planned action ongoing Update due 29 February 2024	Open
2023-017	Adequate	Planned action ongoing Update due 29 February 2024	Open
2023-018	Partially adequate	Not enough information	Open
2023-019	Partially adequate	Not enough information	Open
2023-020	Partially adequate	Not enough information	Open
2023-021	Partially adequate	Not enough information	Open
2023-022	Partially adequate	Not enough information	Open
2023-023	Partially adequate	Not enough information	Open
2023-024	Partially adequate	Not enough information	Open
2023-025	Partially adequate	Not enough information	Open
2023-026	Adequate	Planned action ongoing Update due 29 March 2024	Open
2023-027	Awaiting response		Open

2023-028	Adequate	Planned action ongoing Update due 01 April 2024	Open
2023-029	Adequate	Planned action ongoing Update due 01 January 2025	Open
2023-030	Awaiting response		Open
2023-031	Awaiting response		Open
2023-032	Awaiting response		Open
2023-033	Awaiting response		Open
2023-034	Awaiting response		Open
2023-035	Awaiting response		Open
2023-036	Awaiting response		Open
2023-037	Awaiting response		Open
2023-038	Awaiting response		Open
2023-039	Awaiting response		Open
2023-040	Awaiting response		Open

Safety Recommendations of Global Concern (SRGC)

A Safety Recommendation assessed to be SRGC is defined as:

A Safety Recommendation regarding a systemic deficiency having a probability of recurrence, with significant consequences at a global level, and requiring timely action to improve safety.

SRGC provided to ICAO can be found on their website:

https://www.icao.int/safety/airnavigation/AIG/Pages/Safety-Recommendations-of-Global-Concern-(SRGC).aspx

Of the 40 Safety Recommendations issued by the AAIB in 2023, there were eight, 2023-018 to 2023025 inclusive, all for the accident to an AW169 registration G-VSKP, that were designated SRGC.

Note - The regulations and a link to ICAO Annex 13 can be found on the AAIB website:

https://www.gov.uk/government/collections/aaib-regulations-and-mous

The AAIB use the taxonomy initial derived for use with the European Safety Recommendation Information System to allocate at least one Safety Recommendation topic to identify the areas that the Safety Recommendation addressees. The number of topics that can be assigned to a Safety Recommendation is unlimited.

The topics are split into four main areas: aircraft/equipment/facilities; personnel; procedures/ regulations; QMS/SSP/SMS. Under these areas there are two further levels to identify the detailed topics.

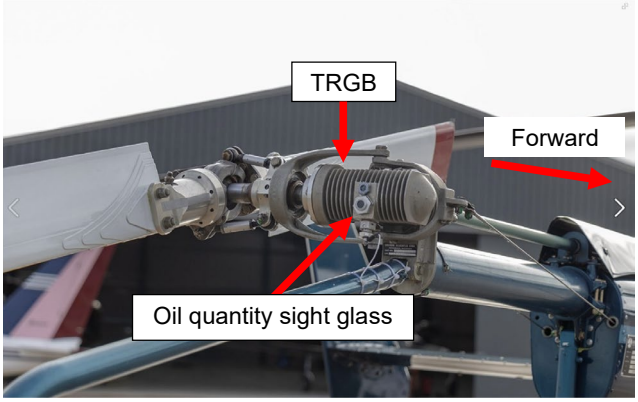
The topics covered by Safety Recommendations issued in 2023 by the AAIB are shown in the above figure.

Safety Recommendations Issued During 2023

Enstrom 280 FX, G-OJBB

25 August 2021, Dolgellau, Gwynedd

Investigation Synopsis



TRGB viewed from rear of 280FX helicopter

The helicopter suffered a loss of thrust from the tail rotor while hovering close to the ground near a mountain top, resulting in a loss of control and hard landing. Subsequent examination of the tail rotor gearbox (TRGB) revealed damage to the bevel gears and failure of a bearing, which was consistent with a lack of lubrication. The investigation found inconsistencies in the way maintenance was performed on the tail rotor gearbox, compared to the helicopter manufacturer's maintenance instructions. It is likely that insufficient oil was added to the TRGB when it was serviced 25 flying hours prior to the accident.

Three Safety Recommendations were made relating to information in the helicopter Maintenance Manual (MM) regarding the required oil quantity and maintenance servicing interval for the TRGB.

Safety Recommendation 2023-001

Justification

The engineer's target fill level when replenishing the TRGB oil was the centre of the sight glass. This differed from the Maintenance Manual (MM) Section 4-15 servicing requirement which stated: *'Add 5oz./0.147 litre of oil if servicing the transmission after draining or slowly add oil until oil flows from the filler port.'*

It was not clear how the engineer had come to this understanding, but the investigation considered factors which may have contributed. Of note is that the target oil level for the main rotor gearbox is at the centre of the sight glass, and this may have been a source of confusion. Additionally, MM Section 4-15 included a note which stated that: *'When the tail rotor transmission is properly serviced (5 oz/.147 l), the sight glass will be completely full. The [tail rotor] transmission oil level is serviceable until the oil level is at the center [sic] of the sight glass.'* The language employed in the second sentence of this note focuses solely on the serviceable condition. It does not draw attention to the point at which the TRGB oil level would become unserviceable, nor contain any cautions or warnings regarding the TRGB oil level. Nor did this section highlight the different target fill levels for the main and tail rotor gearboxes.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-001**
>
> It is recommended that Enstrom Helicopter Corporation amends the wording in Section 4-15 of the Enstrom F28F and 280F series Maintenance Manual, to clearly identify the minimum and maximum oil levels required for tail rotor gearbox operation.

Date Safety Recommendation made: **29 December 2022**

Latest response received: **07 April 2023**

Enstrom are reviewing the wording of section 4-15 with the intent of clarifying the proper minimum and maximum oil levels and clarifying when oil should be added and when the oil should be changed. Enstrom also anticipate adding guidance as to when the sight glass should be cleaned.

This will be covered in the Service Information Letter initially, and it will be transferred into the appropriate maintenance manual as they are revised.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Safety Recommendation 2023-002

Justification

The MM was not consistent in the quantity of oil specified for the TRGB, with three differing values quoted: '5 ounces/.15 litres', '5 US Ounces/.15 Litres' and '5 oz /.147 l'. Although the difference between 5 US ounces and 5 imperial ounces is less than 6 ml, and which alone would not result in significant underfilling of the TRGB oil level such that it was unserviceable, it could result in less than the optimum amount of oil being added during maintenance. Additionally, inconsistency in the specified quantity could create confusion.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-002**
>
> It is recommended that Enstrom Helicopter Corporation amends the Enstrom F28F and 280F series Maintenance Manual to achieve a consistent reference to the required quantity of oil for the tail rotor gearbox.

Date Safety Recommendation made: **29 December 2022**

Latest response received: **07 April 2023**

Enstrom agrees. This is a potential source of confusion and should be corrected. Initially, the Service Information Letter will confirm the correct quantity. As with the previous recommendation, the manuals will be corrected the next time they are revised.

AAIB Assessment:	**Adequate**
Action Status:	**Planned action completed**
Safety Recommendation Status:	**Closed**

Safety Recommendation 2023-003

Justification

Up to August 2020 G-OJBB was maintained under the CAA's Light Aircraft Maintenance Programme (Helicopters) LAMP(H), which stated that 50 hour, 100 hour and annual check items should be accomplished at an annual inspection. For the task specifically relating to transmission oil change it stipulated a maintenance interval of 100 hours or 'in accordance with the type design organisation recommendations.' G-OJBB's maintenance programme (SDMP) at the time of the accident was based entirely on the helicopter and engine manufacturer's recommended maintenance schedule. Part-M Light[7] (ML) does not define a minimum inspection programme (MIP) for light rotorcraft and therefore contains no additional requirements for the periodicity of specific maintenance inspections. The absence of such information in regulation places emphasis on the need for clarity in the manufacturer's maintenance instructions.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-003**
>
> It is recommended that Enstrom Helicopter Corporation amends the 100 hr/ Annual checklist and other related sections of the Enstrom F28F and 280F series Maintenance Manual to clearly reflect the intended periodicity for changing the tail rotor transmission oil.

Date Safety Recommendation made: **29 December 2022**

Latest response received: **7 April 2023**

Enstrom believes the issue surrounding this safety recommendation is a result of the mechanic's (engineer's) somewhat loose interpretation of required maintenance period combined with some ambiguity as to what constitutes "servicing" the transmission. The Service Information Letter will attempt to clarify the maintenance period, however as the AAIB noted, some of the "flexibility" in the interpretation is a result of the CAA's regulations.

Footnote

[7] Part 145 and Part M maintenance organisation approvals for light aircraft and rotorcraft.

Safety Recommednations Overview

Enstrom cannot anticipate all of the possible inconsistencies of all of the regulatory authorities around the world. Enstrom will clarify when the transmission oil should be changed, when it should be “topped off’, and when it can be checked (via the sight glass) and returned to service without further action.

[Enstrom] expect to be able to release this Service Information Letter on or before 28 April 2023.

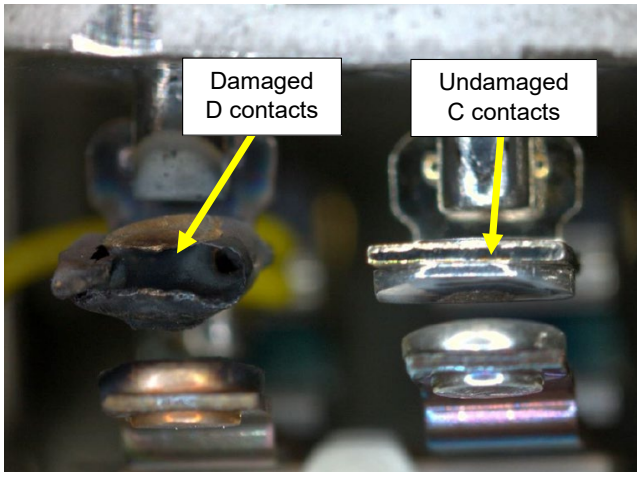
AAIB Assessment:	**Partially adequate**
Action Status:	**Planned action completed**
Safety Recommendation Status:	**Closed**

Bombardier CL-600-2B16 (604), D-AAAY

10 August 2022, In the climb after departing Farnborough Airport, Hampshire

Investigation Synopsis

In the climb, after departing Farnborough Airport, D-AAAY had an uncommanded[8] flap movement above the maximum flap extension speed during which the flaps moved to their fully extended position. The aircraft returned to Farnborough with the flaps extended where it landed without further incident. An uncommanded and unarrested flap movement requires the flaps to move without movement of the flap lever and then for a failure in the flap arrest system to stop this movement. The flap surfaces are moved by two drive motors that are commanded by the sequencing of four extend and retract relays. These four relays also form part of the system to arrest an uncommanded flap movement.



Damaged D contact (left) and undamaged C contact (right)

The reason for the uncommanded movement of the flaps during the flight, and later during fault finding on the ground, could not be determined. It was established that there had been a latent failure in the No 1 flap retract relay for at least the previous 64 flights, which caused the flaps to retract at half their normal retraction speed and prevent the arrest of an uncommanded flap movement. The failure of the relay resulted from damage to the D contacts which provide electrical power to the flap Brake Detector Units. This damage was caused by electrical arcing resulting from an unsuppressed back-EMF generated when the Brake Detector Units were de-energised to apply the flap brakes when the flaps reached their selected position.

Safety Recommendation 2023-004

Justification

The failure of the relays was caused by damage to the D[9] contacts which switch electrical power to the Brake Detection Units (BDUs). The damage was consistent with arcing between the contacts, which caused metal transfer and the welding of the contacts. As all the contacts in the relay are mounted on a common shaft, the welding of the D contacts stop the other three sets of contacts from working properly.

Footnote

[8] The term 'uncommanded flap movement' means movement of the flap that was not commanded by the pilot by operation of the flap control lever.

[9] The contact terminal identification letter on the relay. The D contacts close to supply power to the BDU solenoid.

Safety Recommednations Overview

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-004**
>
> It is recommended that Bombardier Aviation introduce a modification on the Challenger 600 series of aircraft to protect the D contacts within the extend and retract relays of the flap operating system from unsuppressed back-electromotive force (EMF) electrical arcing.

Date Safety Recommendation made: **01 March 2023**

Latest response received: **04 June 2023**

Bombardier is still collecting data and evaluating potential design changes to address the findings from the investigation. The AAIB's specific proposals will be taken into consideration. Bombardier has committed to introducing a design change to the Challenger 604/605/650 flaps system no later than February 28th, 2025, and a design change to the Challenger 600/601 flaps system no later than November 30th, 2025.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**
Update due 28 March 2024

Safety Recommendation Status: **Open**

Feedback rationale

The planned action by Bombardier Aviation meets the intent of the Safety Recommendation to prevent damage to the flap operating relays from unsuppressed back- EMF electrical arcing. The AAIB would request an update on the revised design and its implementation by 28 March 2024.

Safety Recommendation 2023-005

Justification

The relays have a component manufacturer inductive load life of 20,000 operating cycles. During a normal flight there will be four flap extensions and two flap retractions, with each movement energising and deenergising the BDU brake solenoids. This would mean the relays would reach their life after 5,000 flight cycles for the extend relays and 10,000 flight cycles for the retract relays. The three aircraft on which the relays had failed had flown 3,900 (retract), 4,687 (extend) and 4,344 (extend) flight cycles.

The maintenance policy is for the relays to remain fitted to the aircraft until a failure is detected; however, detection can be many flight hours after a failure has occurred. The correct function of these relays is required for the operation of the safety critical, uncommanded flap movement arrest system.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-005**
>
> It is recommended that Bombardier Aviation introduce a life policy for the flap operating system relays on the Challenger 600 series of aircraft, which takes account of the component's specified life and is sufficient to ensure that any in-service damage on the D contacts on the extend and retract relays remains acceptable for continued operation.

Date Safety Recommendation made: 01 March 2023

Latest response received: 27 October 2023

Bombardier has evaluated the risk to the fleet following an industry-standard continuing airworthiness risk assessment process. This process has resulted in several mitigation actions being taken by Bombardier, as well as a terminating action to address the safety risk to the fleet, as outlined below.

On December 29th, 2022, Bombardier published Service Bulletins recommending initial and repeat measurement of the flap extension and retraction times in order to detect faulty flap relays. These Service Bulletins have since been mandated via Airworthiness Directive (AD) by Transport Canada, EASA, and the FAA.

On January 30th, 2023, Bombardier's Corrective Action Review Board (CARB) mandated that Bombardier revise the Challenger 600 series Airplane Flight Manuals (AFMs) to include a procedure for in flight uncommanded unarrested flaps operation, no later than June 30th, 2024. The CARB further mandated that Bombardier recommend Transport Canada issue an AD requiring that operators incorporate the new procedure in their flight manuals.

Finally, Bombardier's Corrective Action Review Board (CARB) convened again on March 31st, 2023, and committed Bombardier to introducing a design change to the Challenger 604/605/650 flaps system no later than February 28th, 2025, and a design change to the Challenger 600/601 flaps system no later than November 30th, 2025.

With the mitigating action already taken, the mitigating action scheduled for second quarter 2024, and the terminating action scheduled for 2025, Bombardier's industry-standard continuing airworthiness risk assessment process indicates that the residual safety risk to the fleet is at an acceptable level.

Bombardier believes that the AAIB's proposal to introduce a life policy for the flap operating system relays on the Challenger 600 series of aircraft represents an undue burden to operators. As the safety risk to the fleet is already at an acceptable level, Bombardier does not agree that imposing such an undue burden on its operators is justified.

Bombardier continues to monitor the in-service fleet and will reassess the risk and mitigating actions should that become necessary.

AAIB Assessment:	**Not adequate**
Action Status:	**No planned actions**
Safety Recommendation Status:	**Closed**

Feedback rationale

The response from Bombardier Aviation has been assessed as Not Adequate as it does not satisfy the intent of the Safety Recommendation to introduce a life policy for the flap operating system relays.

The relay manufacturer has set a minimum life of 20,000 cycles; in-service aircraft can exceed this life and the investigation has shown that relays have failed before reaching this minimum life. While the Service Bulletins will detect a failure at the time it is carried out, it cannot establish the condition of the D contact in the relay. Latent failures are not enunciated to the crew or engineers.

The proposed changes to the Aircraft Flight Manuals are not due to be published until mid-2024 and the proposed design changes are not expected to be introduced until 2025. Safety Recommendation 2023-006 has been made to Transport Canada to reassess the safety case for the flap operating system.

The AAIB acknowledges that, at this time, Bombardier Aviation does not intend to take any further action and has, therefore, Closed Safety Recommendation 2023-005.

Safety Recommendation 2023-006

Justification

The uncommanded, unarrested movement of the flaps is potentially catastrophic and requires two concurrent failures. The original safety case considered this to be extremely improbable. However, this investigation has identified that on at least three different aircraft a relay was in a failed condition for a significant number of flights, and the failure was not detected even though the flaps moved in one direction at half speed. The failure of any one of these relays is a latent failure because it is not enunciated to the operating crew or maintenance staff. The undetected latent failure of these relays suggests that the original safety case for the uncommanded, unarrested flap movement may no longer be valid. This is because the protection offered by the flap brake system is no longer available and a single failure of another part of the system could be sufficient to cause a catastrophic outcome. This possibility is unlikely to satisfy the ‘extremely improbable’ requirement. At the time of certification, FAR 25.1309 required that the occurrence of any failure condition which would prevent the continued safe flight of the airplane is ‘extremely improbable’.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-006**
>
> It is recommended that Transport Canada reassess the safety case for the flap operating system on the Challenger 600 series of aircraft to ensure it meets the requirements of Title 14 of the Code of Federal Regulations Part 25.1309.

Date Safety Recommendation made: **01 March 2023**

Latest response received: **03 November 2023**

Transport Canada Continuing Airworthiness' investigation into the CL-600 series flap system performance has concluded that system improvements are required. As a result, Transport Canada has required Bombardier Inc. to develop and implement corrective actions that reduce the safety risks to an acceptable level.

Bombardier Inc., under the oversight of Transport Canada, is currently developing various corrective action options which are expected to be finalized no later than June 30th, 2024.

Airworthiness Directive CF-2023-07, which requires recurrent operational checks of the flap system, remains in effect as an interim risk mitigation measure.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The planned action by Transport Canada meets the intent of the Safety Recommendation to reassess the safety case for the flap operating system on the Challenger 600 series of aircraft.

Flight Design CT2K, G-CBDJ

24 March 2022, Beccles Aerodrome, Suffolk

Investigation Synopsis

The aircraft was on a flight from Temple Bruer airstrip, Lincolnshire to Beccles Aerodrome, Suffolk. The approach was described as "unstable". The aircraft bounced on landing and probably stalled. The pilot was fatally injured when the aircraft subsequently struck the ground.

The pilot was familiar with his aircraft and in recent practice, but the landing diverged from his intended plan. Given that he was 87 years old and recognised that he would likely have to stop flying in the near future, it is possible that some age-related deterioration in human performance was a factor in this accident. The investigation highlighted a lack of medical guidance for both pilots and medical professionals, as well as a cohort of private pilots who are not subject to an independent professional assessment of age-related deterioration in piloting ability. Four Safety Recommendations were made to the CAA, three about the Pilot Medical Declaration and one about the revalidation of ratings.

Safety Recommendation 2023-007

Justification

The CAA informed the AAIB that a review of the PMD scheme is underway. However, to clarify the medical standards required for pilots to make an online medical declaration. the following safety recommendation was made:

> **Safety Recommendation 2023-007**
>
> It is recommended that the UK Civil Aviation Authority provides comprehensive guidance for pilots on the medical factors that must be considered when making an online Pilot Medical Declaration.

Date Safety Recommendation made: 13 April 2023

Latest response received: 08 December 2023

The 2020 post-implementation CAA review of the Pilot Medical Declaration (PMD) scheme concluded that the PMD process ought to be examined and potentially amended. The CAA subsequently published a public consultation in October 2022 to assess the current PMD system and offer the general aviation community an opportunity to help shape any changes to it.

The CAA has since launched the second phase of the PMD review and formed an internal working group made up of medical, licencing, operations, legal and policy specialists, who have considered the Safety Recommendations issued to the CAA following the

fatal accident involving G-CBDJ. The working group have proposed a set of changes designed to improve the PMD process, which are currently the subject of a public consultation (closing 4 Jan 2024).

The CAA intends to create webpage dedicated to PMDs, which will include a range of comprehensive guidance for pilots including the medical factors that must be considered when making a self-declaration of medical fitness. The new webpage will include a link to the relevant UK Driver and Vehicle Licensing Agency (DVLA) webpage describing the Group 1 medical standard for drivers that must also be adhered to by pilots who are self-declaring their medical fitness to fly.

The CAA will provide an update on the actions taken to address this safety recommendation by the end of June 2024.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**
Update due 30 June 2024

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB looks forward to an update from the CAA by the 30 June 2024.

Safety Recommendation 2023-008

Justification

The DVLA publishes a summary of medical guidelines intended to assist medical professionals in advising their patients whether the DVLA requires notification of a medical condition, and the potential licensing outcome from the notification. However, medical professionals may not be aware if their patients engage in private aviation and there is no requirement for pilots to declare this. The obligation to take medical advice received on fitness to drive and translate this to flying activity is placed solely on the pilot.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-008**
>
> It is recommended that the UK Civil Aviation Authority provides guidance for medical professionals to promote awareness of the medical standards required by the Pilot Medical Declaration scheme.

Date Safety Recommendation made: **13 April 2023**

Latest response received: **08 December 2023**

As advised in the response to SR 2023-007 above, the CAA intends to create a webpage dedicated to PMDs, the exact content of which will be influenced by the outcome of the aforementioned public consultation. Nevertheless, it will include information for health professionals to improve their understanding of the medical requirements of the PMD scheme and signpost them to the DVLA Group 1 medical standards. In addition, the CAA will publish a PMD guide for health professionals and another for applicants. The guide for applicants will also include information on the aircraft environment, fitness to fly and when to seek medical advice. These publications will be accessible from the PMD webpage and will be launched via a CAA SkyWise notification.

The CAA will provide an update on the actions taken to address this safety recommendation by the end of June 2024.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**
Update due 30 June 2024

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB await an update by the end of June 2024.

Safety Recommendation 2023-009

Justification

To augment the CAA's ongoing review of the PMD scheme, the following safety recommendation was made:

> **Safety Recommendation 2023-009**
>
> It is recommended that the UK Civil Aviation Authority engages with the UK Driver and Vehicle Licensing Agency to understand their process for managing medical related driving licence decisions, and ensure that the UK Civil Aviation Authority's process for managing the Pilot Medical Declaration scheme is as effective.

Date Safety Recommendation made: **13 April 2023**

Latest response received: **8 December 2023**

The CAA has been in discussion with the UK DVLA about entering into a data-sharing arrangement, but this has so far proved unsuccessful. Nevertheless, the CAA continues to engage with the UK DVLA to understand their processes for managing medical related licence decisions to ensure that the equivalent CAA processes are as effective.

The outcome of the public consultation that is currently open will also influence what

changes are made to the PMD system to make it more effective by introducing spot checks, removing ambiguity and providing clearer guidance to applicants.

The CAA will provide an update on the actions taken to address this safety recommendation by the end of June 2024.

AAIB Assessment:	**Partially adequate**
Action Status:	**Planned action ongoing** **Update due 30 June 2024**
Safety Recommendation Status:	**Open**

Feedback rationale

The AAIB recognises that the CAA does not administer the DVLA's process for managing medical related driving licence decisions. However, the AAIB feels that the CAA's PMD scheme would benefit from a review using the DVLA's processes as an exemplar for administrative approaches and procedures. The AAIB looks forward to an update from the CAA by the 30 June 2024.

Safety Recommendation 2023-010

Justification

A self-declared medical that does not require input from a GP, combined with a method of licence revalidation that does not require a training flight with an instructor, exposes a missed opportunity for at least one independent professional assessment of age-related deterioration in piloting ability.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-010**
>
> It is recommended that the UK Civil Aviation Authority assesses the continued appropriateness for holders of UK PPLs with microlight class ratings issued before 1 February 2008 to revalidate that rating solely by providing evidence of experience.

Date Safety Recommendation made: **13 April 2023**

Latest response received: **08 December 2023**

In September the CAA took the interim measure of reissuing the exemption (ORS4 No.1582) for those licence holders whose licence was issued prior to 1 Feb 2008, to enable them to revalidate their microlight and motorglider class ratings in accordance with the previous revalidation requirements.

The CAA is considering the future of this exemption within the GA Pilot Licensing and Training Simplification review and will feature this topic in the public consultation that is due to take place in February 2024.

The CAA will provide an update on the actions taken to address this safety recommendation by the end of June 2024.

AAIB Assessment:	**Adequate**
Action Status:	**Planned action ongoing** **Update due 30 June 2024**
Safety Recommendation Status:	**Open**

Feedback rationale

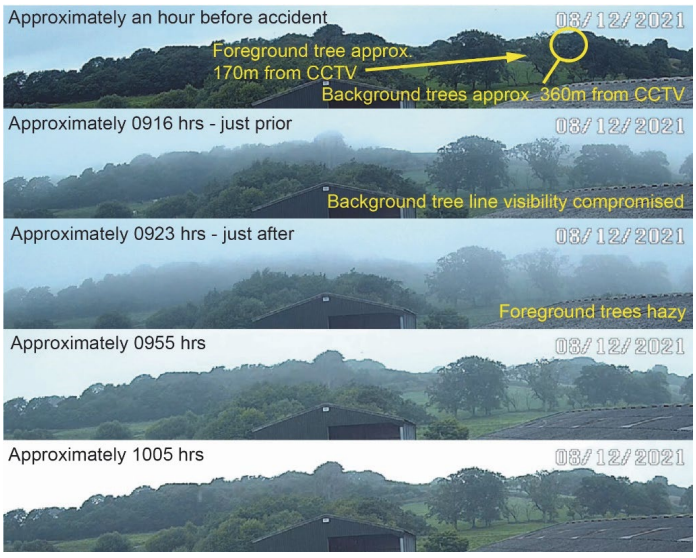
The AAIB looks forward to an update from the CAA by the end of June 2024.

CAP10B, G-BXBU

12 August 2021, Lower Colley Farm, Buckland St Mary, Somerset

Investigation Synopsis

The pilot found himself stuck above cloud during a cross-country flight under Visual Flight Rules. After contacting the Distress & Diversion Cell for assistance he was transferred to the radar frequency of a nearby airport, at which the cloud base was below the minimum required for the approach offered. The pilot, who was not qualified to fly in cloud, lost control of the aircraft during the subsequent descent and the aircraft was destroyed when it hit a tree. Both occupants were fatally injured.



Cropped snapshots from one of the CCTV cameras on a local farm showing changing visibility in the area

The investigation found that air traffic service providers did not obtain or exchange sufficient information about the aircraft and its pilot to enable adequate assistance to be provided. There was an absence of active decision making by those providers, and uncertainty between units about their respective roles and responsibilities.

Seven Safety Recommendations were made to address shortcomings identified in the provision of air traffic services in an emergency.

Safety Recommendation 2023-011

Justification

Planning the response to an abnormal or emergency situation in advance increases the chance of success, saving time and mental capacity when dealing with the emergency in flight.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-011**
>
> It is recommended that the Civil Aviation Authority publish guidance for general aviation pilots on responding to unexpected weather deterioration, highlighting the factors affecting their performance and the benefits of planning before the flight how they will respond.

Safety Recommednations Overview

Date Safety Recommendation made: **24 April 2023**

Latest response received: **21 July 2023**

The CAA accepts this safety recommendation and has identified several publications, listed below, that cover handling unexpected weather deterioration including the factors affecting pilot performance, and the benefits of pre-flight planning. The General Aviation Unit (GAU) team has created a webpage dedicated to weather in GA operations, which will be populated with useful guidance for pilots, including flying in cloud.

The following publications provide useful guidance for pilots with regards to the topics highlighted in the safety recommendation.

- Inadvertent IMC[10] Workshop replay - Astral Aviation Consulting
- Inadvertent IMC Workshop replay - Astral Aviation Consulting
- CAA Safety Sense Leaflet 05: Flight under VFR
- Weather guide to day trip planning - Astral Aviation Consulting
- Weather Forecast Decision Making - Astral Aviation Consulting
- Pre-flight planning - Airspace Safety

The GAU will continue to identify the best ways to draw pilot's attention to this guidance and will also assess the need for additional material.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**
Update due 29 February 2024

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB notes that the CAA and its partners have produced documents covering pre-flight planning and, to some extent, the factors affecting pilots' performance, and that the CAA General Aviation Unit intends to identify the best way to draw pilots' attention to this guidance. The response does not fully address the intent of the Safety Recommendation to publish guidance for general aviation pilots on responding to unexpected weather deterioration.

Recognising that in this occurrence the pilot had avoided flight in IMC until contacting an ANSP, and that control of the aircraft was lost in circumstances that involved flight in IMC, this Safety Recommendation addresses the need to plan and execute a safe avoidance of IMC. It is not concerned with recovery from flight in IMC.

The AAIB requests, by the end of February 2024, an update on the actions the CAA intends to take to address this Safety Recommendation, and a timescale within which it intends to complete them.

Footnote

[10] IMC – Instrument Meteorological Conditions

Safety Recommendation 2023-012

Justification

The Manual of Air Traffic Services Part 1 does not specifically address pilot stress reactions and the assistance which might be provided to account for it, therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-012**
>
> It is recommended that the Civil Aviation Authority require air traffic controllers to receive training regarding the human performance characteristics and limitations associated with stress. This should include the verbal cues that may indicate that a pilot is operating under high stress, and mitigation strategies to help controllers deal with such events.

Date Safety Recommendation made: **24 April 2023**

Latest response received: **21 July 2023**

The power to amend the legal requirements for the training of air traffic controllers rests with the Department for Transport (DfT).

The current, initial training syllabus for civilian air traffic controllers already includes recognition of stress and its symptoms, in self and in others (UK Regulation (EU) 2015/340). Equivalent training for military air traffic controllers, which would apply to any Distress and Diversion ("D&D") cell controller, is outside the scope of the CAA's oversight.

In addition to the existing material for civil air traffic controllers, the CAA recognises that additional educational material to highlight the verbal cues that might indicate stress could be beneficial, and will consider such material in the context of acceptable means of compliance to UK Regulation (EU) 2015/340 and our nascent work with the UK Flight Safety Committee to update CAP 745 - Aircraft Emergencies: Considerations for air traffic controllers.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**
Update due 29 February 2024

Safety Recommendation Status: **Open**

Feedback rational

The AAIB acknowledges the action the CAA intends to take and requests an update by the end of February 2024.

General note on Safety Recommendations 2023-012, 2023-013, 2023-014, and 2023-015:

The AAIB recognises that the CAA does not regulate the D&D cell.

Safety Recommednations Overview

The report has made separate recommendations to the DfT regarding the organisation of ATC assistance to civil aircraft in an emergency, and notes that the MOD intends to address the intent of Safety Recommendation 2023-012, 2023-013, 2023-014, and 2023-015 made to the CAA.

Safety Recommendation 2023-013

Justification

The ATC units involved do not appear to have considered what options were available to the pilot, to have communicated them effectively to each other, or to have gathered sufficient information to inform this process.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-013**
>
> It is recommended that the Civil Aviation Authority specify the types of information that air traffic controllers will obtain and record when responding to aircraft in an emergency to ensure that pilots' needs are met and reported correctly if communicated to other air traffic control units.

Date Safety Recommendation made: 24 April 2023

Latest response received: 21 July 2023

The types of information that shall be contained in the emergency message passed by pilots are described in the Radiotelephony Manual (CAP 413) (Chapter 8 Paragraph 8.13). This information is reiterated in the Manual of Air Traffic Services (MATS) Part 1 (CAP 493), which is the manual used by civil air traffic controllers. Civil air traffic controllers (being those over which the CAA has oversight) are therefore advised through MATS of the pertinent information and are instructed through courses of basic and initial training to recognise pertinent data and to record it appropriately; this is a basic competency for air traffic controllers. This provides sufficient flexibility for an air traffic controller to consider what information they require from the pilot in an emergency and, importantly, when it is appropriate to obtain that information taking into account the human factors involved in such a situation.

However, a D&D cell will often, as in this case, be the first point of contact in an emergency and the Military Aviation Authority (MAA) is responsible for their oversight. The CAA is aware that Acceptable Means of Compliance 3201(1) to MAA Regulatory Article (RA) 3201(1) states that air traffic services provided by the MOD should be provided in accordance with the Radiotelephony Manual (CAP 413) and the RA 3000 series: Air Traffic Management Regulations; these latter Regulations being broadly analogous to the CAA's MATS Part 1. As such, any military air traffic controller (including any D&D Cell controller) should be aware of the required content of a pilot's emergency message.

AAIB Assessment:	**Not adequate**
Action Status:	**Not enough information**
Safety Recommendation Status:	**Open**

Feedback rational

The response does not address the intent of the Safety Recommendation. The response does not address the intent of the Safety Recommendation.

Safety Recommendation 2023-013 seeks to improve the gathering and exchange of information by ATC units responding to aircraft in an emergency so that those units can consider the practical options available to the pilot. This may include information, for example about ground facilities and weather conditions, that are not known to the pilot. The AAIB acknowledges the CAA's view that this task is considered a basic competency for air traffic controllers. Shortcomings in the performance of this task by two separate ATC units indicate that the existing provisions are not sufficient.

The AAIB requests that the CAA provide an update on its intended response by the end of February 2024.

Safety Recommendation 2023-014

Justification

More formal use of checklists may assist the conduct of routine and emergency ATC procedures.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-014**
>
> It is recommended that the Civil Aviation Authority encourage the use of checklists in air traffic management operations when dealing with abnormal and emergency situations.

Date Safety Recommendation made:	**24 April 2023**
Latest response received:	**21 July 2023**

The CAA acknowledges the potential safety benefits from the use of checklists in many (comparatively predictable) circumstances. Such checklists are already widely used by civil air traffic services providers.

The CAA expects civil Air Navigation Service Providers (ANSPs) to review the use of checklists (if used) during their internal investigation of Accidents and Incidents and requires civil air traffic controllers to undertake training in Abnormal and Emergency Situations (ABES). The CAA will consider whether to highlight the benefits of checklists in the context

of our nascent work with the UK Flight Safety Committee to update CAP 745 - Aircraft Emergencies: Considerations for air traffic controllers.

The use of checklists within D&D by military air traffic controllers / assistants is a matter for the MAA.

AAIB Assessment:	**Partially adequate**
Action Status:	**Planned action ongoing** **Update due 29 February 2024**
Safety Recommendation Status:	**Open**

Feedback rational

The investigation found that the formal use of checklists was not established in the relevant ATC units, and that there may be a view that checklist are not helpful in dynamic situations. This indicates a misunderstanding of the value of checklists, especially in those situations.

The AAIB requests, by the end of February 2024, an update on the actions the CAA intends to take to address Safety Recommendation 2023-014.

Safety Recommendation 2023-015

Justification

The current arrangements for interaction between civil and military units in the provision of ATC services to civil aircraft in an emergency may be reducing its effectiveness.

Therefore the following safety recommendation was made:

> **Safety Recommendation 2023-015**
>
> It is recommended that the Civil Aviation Authority determine the effect the D&D Cell's executive control has on civil ATCOs and inform civil ATCOs of any differences in their responsibilities whilst executive control is exercised.

Date Safety Recommendation made:	**24 April 2023**
Latest response received:	**21 July 2023**

Executive control is an aspect of the D&D Cell's services which are provided as a State obligation under agreement between the DfT and MOD, not the CAA, and for which the primary delivery is through the D&D cell. Executive control is exclusively a function of the D&D cell, and the CAA does not believe that this concept has a material impact on the operational control of an aircraft, which rests with the unit (whether civilian or military) in contact with the pilot. Where operational control is passed from one unit (whether civilian or military) to another, a full handover should take place.

Notwithstanding the above, the CAA will engage with the MAA to undertake a review of the applicability of the D&D term executive control and to clarify any effect that the D&D controllers believe the use of this term may have on civil air traffic controllers' responsibilities. This activity will be commenced once the DfT has concluded its review/activity in relation to SRs 2023-16 and 2023-017.

AAIB Assessment: **Not adequate**

Action Status: **Planned action ongoing**
Update due 29 February 2024

Safety Recommendation Status: **Open**

Feedback rationale

The intent of Safety Recommendation 2023-015 is that the Civil Aviation Authority inform civil ATCOs of any differences in their responsibilities whilst executive control is exercised by the D&D cell. Whilst action to address Safety Recommendations 2023-016 and -017 may change the arrangements for providing assistance to aircraft in an emergency, Safety Recommendation 2023-015 is intended to address shortcomings in the existing arrangements in the areas identified.

The AAIB therefore invites to the CAA to specify, by the end of February 2024, how it intends to address the intent of Safety Recommendation 2023-015.

Safety Recommendation 2023-016

Justification

The investigation indicates that the need to review the effectiveness of arrangements for the provision of ATC service to civil aircraft in an emergency.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-016**
>
> It is recommended that the Department for Transport review the current provision of emergency communications in the UK to determine if the involvement of a dedicated emergency air traffice service unit is the most effective way to assist civil aircraft in an emergency, and publish its findings.

Date Safety Recommendation made: **24 April 2023**

Latest response received: **25 July 2023**

The DfT accepts this recommendation and will consider how best to undertake this review.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**
Update due 29 February 2024

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges that the DfT intends to conduct the recommended review and requests an update on its actions within 6 months.

Safety Recommendation 2023-017

Justification

There is no formal agreement between the DfT and the MOD defining the responsibilities of the D&D Cell in providing services to civil aviation.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-017**
>
> It is recommended that the Department for Transport specify and publish details of the emergency air traffic service it requires the D&D Cell to provide.

Date Safety Recommendation made: **24 April 2023**

Latest response received: **25 July 2023**

The DfT accepts this recommendation. The function of the D&D Cell is noted in the Strategic Overview of Search and Rescue in the United Kingdom of Great Britain and Northern Ireland, published January 2017. This sets out the role of D&D insofar as it is relevant to the fulfilment of the UK's SAR responsibilities; however, it does not represent a formal agreement between DfT and MOD. This deficit will be addressed subject to the outcomes of the review recommended at recommendation 2023-016.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**
Update due 29 February 2024

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges that the DfT plans to address the intent of this Safety Recommendation and that its actions are subject to the outcomes of the review recommended in Safety Recommendation 2023-016.

The AAIB requests an update on these actions within 6 months.

Leonardo AW169, G-VSKP

27 October 2018, King Power Stadium, Leicester

Investigation Synopsis

Bearing in new condition - (A) Housing and outer race, (B) inner race, cage and balls assembled, (C) cage, seal and inner race disassembled

At 1937 hrs the helicopter, carrying the pilot and four passengers, lifted off from the centre spot of the pitch at the King Power Stadium. The helicopter moved forward and then began to climb out of the stadium on a rearward flightpath while maintaining a northerly heading and with an average rate of climb of between 600 and 700 ft/min. Passing through a height of approximately 250 ft, the pilot began the transition to forward flight by pitching the helicopter nosedown and the landing gear was retracted. The helicopter was briefly established in a right turn before an increasing right yaw rapidly developed, despite the immediate application of corrective control inputs from the pilot. The helicopter reached a radio altimeter height of approximately 430 ft before descending with a high rotation rate. At approximately 75 ft from the ground the collective was fully raised to cushion the touchdown.

The helicopter struck the ground on a stepped concrete surface, coming to rest on its left side. The impact, which likely exceeded the helicopter's design requirements, damaged the lower fuselage and the helicopter's fuel tanks which resulted in a significant fuel leak. The fuel ignited shortly after the helicopter came to rest and an intense post-impact fire rapidly engulfed the fuselage.

The investigation found the following causal factors for this accident:

1. Seizure of the tail rotor duplex bearing initiated a sequence of failures in the tail rotor pitch control mechanism which culminated in the unrecoverable loss of control of the tail rotor blade pitch angle and the blades moving to their physical limit of travel.

2. The unopposed main rotor torque couple and negative tail rotor blade pitch angle resulted in an increasing rate of rotation of the helicopter in yaw, which induced pitch and roll deviations and made effective control of the helicopter's flightpath impossible.

3. The tail rotor duplex bearing likely experienced a combination of dynamic axial and bending moment loads which generated internal contact pressures

Safety Recommednations Overview

sufficient to result in lubrication breakdown and the balls sliding across the race surface. This caused premature, surface initiated rolling contact fatigue damage to accumulate until the bearing seized.

Safety Recommendation 2023-018

Justification

Where subcontract suppliers hold the sole expertise to analyse the significance of a component they design and qualify against a specification, it is essential that the type design manufacturer shares all the subsequent data obtained from the installed rig and flight tests during development. This provides the opportunity for a 'closed loop' validation by the specialist manufacturer of their component within the system application in which it will be used. This is particularly significant for critical parts, where component failure has catastrophic implications.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-018**
>
> It is recommended that the European Union Aviation Safety Agency amend Certification Specification (CS) 29.602 to require type design manufacturers to provide the results of all relevant system and flight testing to any supplier who retains the sole expertise to assess the performance and reliability of components identified as critical parts within a specific system application, to verify that such components can safely meet the in-service operational demands, prior to the certification of the overall system.

Date Safety Recommendation made: **25 August 2023**

Latest response received: **20 November 2023**

The European Union Aviation Safety Agency (EASA) is reviewing the proposal contained in this safety recommendation and the existing regulatory framework. EASA will then decide if a rulemaking or other action is needed. This response will be updated as soon as an orientation is decided on this matter, which is anticipated to happen by Q1 2024.

AAIB Assessment: **Partially Adequate**

Action Status: **Not enough information**

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB recognises the planned review by EASA in Q1 2024 and requests an update by 03 June 2024.

Safety Recommendation 2023-019

Justification

AMC for CS 29.571 provides guidance to manufacturers to at consider rolling contact fatigue within their analysis. However, this regulation is aimed at Principal Structural Element (PSE) components within a power drivetrain, rather than critical components within a control system, such as the duplex tail rotor bearing. The tail rotor which included the duplex bearing was certified to CS 29.547, so the manufacturer would not have considered CS 29.571 during the tail rotor design process. Only the Acceptable Means of Compliance has been amended and this states RCF should be considered during the analysis, as such it does not introduce any specific criteria, which must be met and demonstrated during certification, to ensure an appropriate minimum safety standard when dealing with components whose failure is assessed as catastrophic or hazardous.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-019**
>
> It is recommended that the European Union Aviation Safety Agency introduce additional requirements to Certification Specification 29 to specifically address premature rolling contact fatigue failure across the full operating spectrum and service life of bearings used in safety critical applications.

Date Safety Recommendation made: **25 August 2023**

Latest response received: **20 November 2023**

The European Union Aviation Safety Agency (EASA) is reviewing the proposal contained in this safety recommendation and the existing regulatory framework. EASA will then decide if a rulemaking or other action is needed. This response will be updated as soon as an orientation is decided on this matter, which is anticipated to happen by Q1 2024.

AAIB Assessment: **Partially Adequate**

Action Status: **Not enough Information**

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB recognises the planned review by EASA in Q1 2024 and requests an update by 03 June 2024.

Safety Recommendation 2023-020

Justification

The duplex bearing was identified as a critical part, as defined by CS 29.602, by the helicopter manufacturer because its failure was assessed as catastrophic, an assessment which has

been validated by the circumstances of this accident. Analysis by its manufacturer of the bearing against the development load spectrum has also determined that it would have a finite life in this application, the mitigation for which is replacement before it reaches its anticipated failure life. The airworthiness considerations for non-structural critical parts are identified through assessment to demonstrate compliance with CS 29.602, but this regulation does not currently address life limits or their equivalent status to the airworthiness limitations section (ALS) limits identified to comply with CS 29.571. As such, no specific rules or guidance are available to manufacturers to provide clarity on this issue.

Therefore, the following safety recommendation was made:

Safety Recommendation 2023-020

It is recommended that the European Union Aviation Safety Agency amend Certification Specification 29.602 to define the airworthiness status of life limits on non-structural critical parts and how they should be controlled in-service.

Date Safety Recommendation made: **25 August 2023**

Latest response received: **20 November 2023**

The European Union Aviation Safety Agency (EASA) is reviewing the proposal contained in this safety recommendation and the existing regulatory framework. EASA will then decide if a rulemaking or other action is needed. This response will be updated as soon as an orientation is decided on this matter, which is anticipated to happen by Q1 2024.

AAIB Assessment: **Partially adequate**

Action Status: **Not enough information**

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB recognises the planned review by EASA in Q1 2024 and requests an update by 03 June 2024.

Safety Recommendation 2023-021

Justification

The duplex bearing was identified as a critical part, as defined by CS 29.602, by the helicopter manufacturer because its failure was assessed as catastrophic, an assessment which has been validated by the circumstances of this accident. Analysis by its manufacturer of the bearing against the development load spectrum has also determined that it would have a finite life in this application, the mitigation for which is replacement before it reaches its anticipated failure life. The airworthiness considerations for non-structural critical parts are identified through assessment to demonstrate compliance with CS 29.602, but this

regulation does not currently address life limits or their equivalent status to the ALS limits identified to comply with CS 29.571. As such, no specific rules or guidance are available to manufacturers to provide clarity on this issue.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-021**
>
> It is recommended that the European Union Aviation Safety Agency define the airworthiness status of life limits and how they should be controlled for existing non-structural critical parts approved to Certification Specification 29.602 requirements, already in-service.

Date Safety Recommendation made: **25 August 2023**

Latest response received: **20 November 2023**

The European Union Aviation Safety Agency (EASA) is reviewing the proposal contained in this safety recommendation and the existing regulatory framework. EASA will then decide if an action is needed toward rotorcraft under EASA responsibility as primary certification authority. This response will be updated as soon as an orientation is decided on this matter, which is anticipated to happen by Q1 2024.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB recognises the planned review by EASA in Q1 2024 and requests an update by 03 June 2024.

Safety Recommendations 2023-022 and 2023-023

Justification

The classification of the tail rotor duplex bearing as a critical part by the helicopter manufacturer meant that additional control measures were introduced during manufacture and installation of the bearing and required that duplicate and recorded inspections be carried out during maintenance. However, there was no requirement in place to conduct a sample assessment of the bearing condition after removal from service. This could have helped to validate the assumptions used for the calculated L_{10}[11] life and discard time calculations by flagging up potential premature degradation issues.

Footnote

[11] L_{10} - the life of a rolling bearing is defined by the number of revolutions that a bearing can perform before incipient macropitting (material loss) occurs. It is a statistical prediction that gives 90% reliability that similar bearings will achieve the same number of revolutions given the same operating conditions.

Therefore, the following safety recommendations were made:

Safety Recommendation 2023-022

It is recommended that the European Union Aviation Safety Agency amend Certification Specification 29.602 to require manufacturers to implement a comprehensive post removal from service assessment programme for critical parts. The findings from this should be used to ensure that reliability and life assumptions in the certification risk analysis for the critical part or the system in which it operates remain valid.

Safety Recommendation 2023-023

It is recommended that the European Union Aviation Safety Agency require manufacturers to retrospectively implement a comprehensive post removal from service assessment programme for critical parts, approved to Certification Specification 29.602 requirements, already in-service. The findings from this should be used to ensure that the reliability and life assumptions in the certification risk analysis for the critical part or the system in which it operates remain valid.

Date Safety Recommendations made: 25 August 2023

Latest response received for both: 20 November 2023

The European Union Aviation Safety Agency (EASA) is reviewing the proposal contained in this safety recommendation, the existing regulatory framework, and other actions recently made on the matter. EASA will then decide if a rulemaking or other action is needed. This response will be updated as soon as an orientation is decided on this matter, which is anticipated to happen by Q1 2024.

AAIB Assessment: **Partially Adequate**

Action Status: **Not enough information**

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB recognises the planned review by EASA in Q1 2024 and requests an update by 03 June 2024.

Safety Recommendation 2023-024

Justification

The exposure durations for the load conditions used to calculate the L_{10} life, and discard time of the bearing, are an approximation using an amalgamated flight profile, combining all

the different roles the helicopter can be used for. This produces an estimated percentage of the operating life occurring at the various loads from the maximum to zero. Unlike Chapter Four airworthiness limitations in the Approved Maintenance Planning Information (AMPI), in practice there is:

- No requirement to operate in accordance with this profile.
- No in-service monitoring of actual operating profiles.
- No penalty life tariff applied to the tail rotor bearings for helicopters which operate for longer at higher loads and contact pressures.

Therefore, the following safety recommendation was made:

Safety Recommendation 2023-024

It is recommended that the European Union Aviation Safety Agency amend Certification Specification 29.602 to provide guidance and set minimum standards for the calculation of design load spectrums for non-structural critical parts. They must encompass, with an appropriate and defined safety margin, the highest individual operating load and combination of dynamic operating loads, and the longest duration of exposure to such loads that can be experienced in operation.

Date Safety Recommendation made: **25 August 2023**

Latest response received: **20 November 2023**

The European Union Aviation Safety Agency (EASA) is reviewing the proposal contained in this safety recommendation and the existing regulatory framework. EASA will then decide if a rulemaking or other action is needed. This response will be updated as soon as an orientation is decided on this matter, which is anticipated to happen by Q1 2024.

AAIB Assessment: **Partially adequate**

Action Status: **Not enough information**

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB recognises the planned review by The EASA in Q1 2024 and requests an update by 03 June 2024.

Safety Recommendation 2023-025

Justification

The change to the AMC for CS 29.571 in CS 29, Amendment 11 recommends taking a fail-safe approach to critical component design, but this is only aimed at structural components

rather than control systems. This does not go far enough to address the need to review the entire system for mitigation options for failures initially assessed as catastrophic. This regulation was also not considered as part of the demonstration of compliance for either the tail rotor (including the duplex bearing) or the tail rotor hydraulic actuator.

Therefore, the following safety recommendation was made:

Safety Recommendation 2023-025

It is recommended that the European Union Aviation Safety Agency amend the relevant requirements of Certification Specification 29 and their Acceptable Means of Compliance to emphasise that where potentially catastrophic failure modes are identified, rather than rely solely on statistical analysis to address the risk, the wider system should also be reviewed for practical mitigation options, such as early warning systems and failure tolerant design, in order to mitigate the severity of the outcome as well as the likelihood of occurrence.

Date Safety Recommendation made: **25 August 2023**

Latest response received: **20 November 2023**

The European Union Aviation Safety Agency (EASA) is reviewing the proposal contained in this safety recommendation and the existing regulatory framework. EASA will then decide if a rulemaking or other action is needed. This response will be updated as soon as an orientation is decided on this matter, which is anticipated to happen by Q1 2024.

AAIB Assessment: **Partially adequate**

Action Status: **Not enough information**

Safety Recommendation Status: **Open**

Feedback rationale

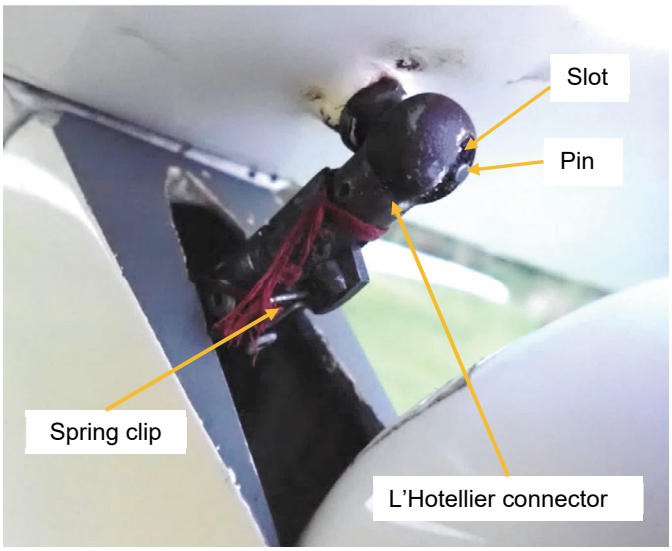
The AAIB recognises the planned review by EASA in Q1 2024 and requests an update by 03 June 2024.

Schleicher ASW20 L, G-CFRW

24 September 2022, Near Pulborough, West Sussex

Investigation Synopsis

Shortly after an aerotow takeoff and during a noise abatement turn to the left, the glider released the tow at approximately 300 ft agl. The glider then pitched down rapidly and struck the ground in a nose low attitude at high speed. The pilot was ejected from the aircraft during the accident sequence and was found approximately 26 m from the aircraft. He sustained fatal injuries.



An example of correct elevator connection with spring clip fitted

An on-site inspection of the aircraft revealed that the elevator was not connected to the elevator control rod. Two Safety Recommendations were made; the first to mandate Positive Control Checks and the second to amend the Flight and Operations Manual (FOM) to include relevant information on the limitations of pitch control using flaps.

Safety Recommendation 2023-026

Justification

An independent Positive Control Check is an effective barrier against mis-rigging and this is not a formal requirement for BGA members. Therefore to increase the likelihood of Positive Control Checks being conducted before flight, the following safety recommendation was made:

> **Safety Recommendation 2023-026**
>
> It is recommended that the British Gliding Association should mandate the conduct and documenting of Positive Control Checks as part of glider Daily Inspections.

Date Safety Recommendation made: **24 August 2023**

Latest response received: **20 September 2023**

Safety Recommednations Overview

The BGA accepts the recommendation that will be the subject of a proposed amendment to a BGA Operational Regulation that will be subject to approval at a General Meeting as required by the BGA Articles of Association. The next General Meeting will take place in February 2024.

Meanwhile, BGA publications will describe Positive Control Checks as essential.

Several associated developments are underway including relating to pilot training.

AAIB Assessment:	**Adequate**
Action Status:	**Planned action ongoing** **Update due 29 March 2024**
Safety Recommendation Status:	**Open**

Feedback rationale

The AAIB welcomes the action taken and looks forward to an update after the BGA's next General Meeting.

Safety Recommendation 2023-027

Justification

In order to address the lack of clarity in the FOM regarding the level of pitch control available for a range of elevator control circuit failure scenarios, the following Safety Recommendation is made:

> **Safety Recommendation 2023-027**
>
> It is recommended that Alexander Schleicher GmBH amend the Jammed Elevator Control Circuit section of the ASW 20 Flight and Operations Manual to include relevant information on the limitations of pitch control using flaps and its likelihood of allowing a safe landing.

Date Safety Recommendation made:	**24 August 2023**
Latest response received:	**Awaiting response**
Safety Recommendation Status:	**Open**

Sikorsky S92A, G-MCGY

4 March 2022, Derriford Hospital, Plymouth, Devon

Investigation Synopsis

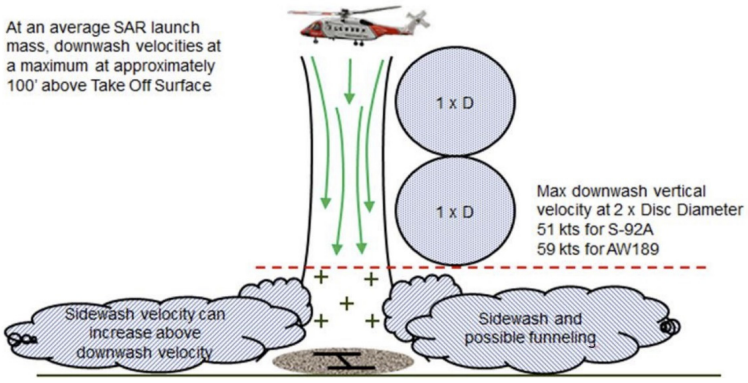


Diagram of maximum downwash from operator's OM

The helicopter, G-MCGY, was engaged on a Search and Rescue mission to extract a casualty near Tintagel, Cornwall and fly them to hospital for emergency treatment. The helicopter flew to Derriford Hospital (DH), Plymouth which has a Helicopter Landing Site (HLS) located in a secured area within one of its public car parks. During the approach and landing, several members of the public in the car park were subjected to high levels of downwash from the landing helicopter. One person suffered fatal injuries, and another was seriously injured.

The investigation identified the following causal factors:

1. The persons that suffered fatal and serious injuries were blown over by high levels of downwash from a landing helicopter when in publicly accessible locations near the DH HLS.
2. Whilst helicopters were landing or taking off, uninvolved persons were not prevented from being present in the area around the DH HLS that was subject to high levels of downwash.

The investigation identified the following contributory factors:

1. The HLS at DH was designed and built to comply with the guidance available at that time, but that guidance did not adequately address the issue of helicopter downwash.
2. The hazard of helicopter downwash in the car parks adjacent to the HLS was not identified, and the risk of possible injury to uninvolved persons was not properly assessed.
3. A number of helicopter downwash complaints and incidents at DH were recorded and investigated. Action was taken in each case to address the causes identified, but the investigations did not identify the need to manage the downwash hazard in Car Park B, so the actions taken were not effective in preventing future occurrences.

Safety Recommednations Overview

4. Prior to this accident, nobody at DH that the AAIB spoke to was aware of the existence of Civil Aviation Publication (CAP) 1264, which includes additional guidance on downwash and was published after the HLS at DH was constructed. The document was not retrospectively applicable to existing HLS.
5. The operator of G-MCGY was not fully aware of the DH HLS Response Team staff's roles, responsibilities, and standard operating procedures.
6. The commander of G-MCGY believed that the car park surrounding the DH HLS would be secured by the hospital's HLS Response Team staff, but the co pilot believed these staff were only responsible for securing the HLS.
7. The DH staff responsible for the management of the HLS only considered the risk of downwash causing harm to members of the public within the boundary of the HLS and all the mitigations focused on limiting access to this space.
8. The DH staff responsible for the management of the HLS had insufficient knowledge about helicopter operations to safely manage the downwash risk around the site.
9. The HLS safety management processes at DH did not result in effective interventions to address the downwash hazard to people immediately outside the HLS.
10. HLS safety management processes at DH did not identify that the mitigations for the downwash hazard were not working well enough to provide adequate control of the risk from downwash.
11. Communication between helicopter operators and DH was ineffective in ensuring that all the risks at the DH HLS were identified and appropriately managed.
12. Safety at hospital HLS throughout the UK requires effective information sharing and collaboration between HLS Site Keepers and helicopter operators but, at the time of the accident, there was no convenient mechanism for information sharing between them.

Safety Recommendation 2023-028

Justification

CAP 1264 contains references to CAP 738. The CAP 738 introductory text indicates that the guidance is applicable to certificated and licensed aerodromes, but it also states that non-licensed aerodromes, heliports and HLS may find the information of assistance. The focus of CAP 738 is to ensure the continued safety of aircraft operating at the location. It states that a downwash zone should be agreed with helicopter operators, and that someone should be responsible for monitoring this zone to ensure it is kept free of persons, property,

and parked vehicles as necessary. CAP 738 is available on the CAA's website but, like CAP 1264, it is unlikely that many hospital Trusts will be aware of its existence or that its contents could be relevant to the routine operations of their own HLS. It would be of benefit to hospital Trusts, or any other organisation that manages an HLS, to be able to find all the applicable downwash guidance in one document without the need to cross refer.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-028**
>
> It is recommended that the UK Civil Aviation Authority includes the appropriate downwash guidance relevant to hospital helicopter landing sites in one published document.

Date Safety Recommendation made: **30 October 2023**

Latest response received: **03 January 2024**

The CAA accepts this recommendation and will be publishing (Q1 2024) consolidated downwash guidance within Version 2 of CAP1264 - Standards for Helicopter Landing Sites at Hospitals.

Workstreams:

1. The benefit of consolidation of downwash guidance had been identified before the publication of the Derriford Report; the appropriate Policy Specialist has worked closely with Flight Operations to update CAP1264 to Version 2.
2. In conjunction with Recommendation 2023-29 (below), work on Version 3 of CAP1264 has now started, with the aim of expanding it further to adequately cover both the Design and Operational aspects of HHLS. This is estimated to be ready for publication Q4 of 2024.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**
Update due 1 April 2024

Safety Recommendation Status: **Open**

Feedback rational

The AAIB notes the work proposed to consolidate the downwash guidance into CAP1264 and requests an update on progress by 1 April 2024.

Safety Recommendation 2023-029

Justification

For the HLS Site Keepers, performing adequate risk assessments is a task requiring specialist knowledge that is not readily available within the health service. Hospital HLS managers would benefit from enhanced guidance on how to risk assess their sites and the range of potential mitigations that might be used to reduce the risk of uninvolved persons being exposed to the hazards associated with HLS.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-029**
>
> It is recommended that the UK Civil Aviation Authority, in conjunction with the Onshore Safety Leadership Group and the relevant NHS organisations in the UK, develop and promulgate enhanced risk management guidance for hospital helicopter landing sites, and provide information on the range and use of potential mitigations for the protection of uninvolved persons from helicopter downwash.

Date Safety Recommendation made: 30 October 2023

Latest response received: 03 January 2024

The CAA accepts this recommendation and has initiated the following workstreams:

1. The OnSLG HHLS Sub Committee met post publication of the Derriford Report and the Chair presented an Action Plan reporting to all of the AAIB's Recommendations. The OnSLG will continue to work closely with the CAA and NHS in order to ensure close cooperation across all workstreams.
2. The stated tasks in Recommendation 2023-29 are 'to develop and promulgate enhanced risk management' and 'provide information on the range and use of potential mitigations'. Both will be achieved by a number of coordinated workstreams, including:
    a. Version 3 of CAP1264 to include specific and detailed chapters on:
        - Downwash
        - Risk Assessments
        - Heliport Operations Manual (HOM - see below)
        - ACANS (see below)
        - Case studies and examples.
        - Templates for Standardisation

b) The development of a Heliport Operations Manual. This will mirror the system used for a regulatory AOC Operations Manual suite as follows:

Part A

1. Administration and Control of Manual
2. Organisation and Responsibilities
3. Operational Control and Supervision
4. Safety Management
5. Compliance Monitoring
6. Qualification Requirements
7. Dangerous Goods
8. Security
9. Handling and Notification of Accidents / Incidents

Site Specific Procedures

Part B

1. Normal Procedures
2. Emergency Procedures
3. Minimum Equipment List
4. Helicopter Operating Procedures

Change Management

Part C

1. Heliport Change Notification
2. Heliport Safeguarding Procedures
3. Operator / Airdesk Contact Details
4. Training

Part D

1. Awareness Course Applicability
2. Management Course Applicability
3. Training Records

c) The CAAi led 'Responsible Person HHLS Awareness Training Courses' are now being offered to all NHS Trusts and the initial uptake has been very positive, with courses fully booked into 2024.

Hospital Helipad – Aviation Awareness | Training Course by the UK CAA (caainternational.com)

d) ACANs is currently used by all Blue Light Operators as an EFB mapping and information tool. Discussions with Airbox (developer of ACANS) indicate that a number of cross usage (Hospital and Operators) developmental safety features would be possible. These include:

1. HHLS Warnings
2. HHLS Incident Reporting
3. HHLS 'Traffic Light' system
4. Possible Webcam integration

AAIB Assessment:	**Adequate**
Action Status:	**Planned action ongoing** **Update due 1 January 2025**
Safety Recommendation Status:	**Open**

Feedback rational

The AAIB notes the proposed workstreams to address this Safety Recommendation and requests an update on progress by 1 January 2025.

Safety Recommendation 2023-030

Justification

There are currently no minimum competency requirements for those personnel who are responsible for managing hospital HLS. To manage the risks effectively, these personnel need to have the knowledge to understand the risks and to also have effective systems in place for the communication and management of safety risks that may be highlighted by other organisations.

Therefore, the following safety recommendation was made:

Safety Recommendation 2023-030

It is recommended that NHS England Estates, in conjunction with the Onshore Safety Leadership Group and the UK Civil Aviation Authority, develop competency requirements, and introduce training, for all hospital helicopter landing site managers that includes, as a minimum, a basic introduction to helicopter operations and safety management practices appropriate for such facilities.

NHS England Estates should seek participation from the healthcare organisations in Scotland, Wales, and Northern Ireland to develop these competency requirements.

Date Safety Recommendation made: **30 October 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Safety Recommendation 2023-031

Justification

There are approaching 200 hospital HLS in the UK, many of which were built prior to the publication of CAP 1264. The AAIB safety investigation did not conduct a survey of these other sites, and so is unable to judge any degree of compliance with the guidance that is provided in CAP 1264, CAP 738 and current ICAO documents. In the absence of knowledge of the guidance provided in CAP 1264, it is possible that a number of these other sites do not have adequate downwash zones, nor effective measures in place to manage public movements in such hazardous areas.

If downwash zones were implemented to the guidance in CAP 1264 and ICAO documents at all hospital HLS in the UK, the risk of injuries to uninvolved persons would be reduced. Note: This justification applies to Safety Recommendations 2023-032, 033 and 034.

Therefore, the following safety recommendation was made:

> **Safety Recommendation 2023-031**
>
> It is recommended that NHS England Estates review all existing hospital helicopter landing sites for which it has responsibility against the latest guidance and instigate appropriate actions to minimise the risk of injury from downwash to uninvolved persons.

Date Safety Recommendation made: **30 October 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Safety Recommendation 2023-032

Justification

As for 2023-031

Therefore, the following safety recommendation was made:

Safety Recommendation 2023-032

It is recommended that NHS Wales Health Boards and Trusts review all existing hospital helicopter landing sites for which they have responsibility against the latest guidance and instigate appropriate actions to minimise the risk of injury from downwash to uninvolved persons.

Date Safety Recommendation made: **30 October 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Safety Recommendation 2023-033

Justification

As for 2023-031

Therefore, the following safety recommendation was made:

Safety Recommendation 2023-033

It is recommended that NHS Scotland Assure review all existing hospital helicopter landing sites for which it has responsibility against the latest guidance and instigate appropriate actions to minimise the risk of injury from downwash to uninvolved persons.

Date Safety Recommendation made: **30 October 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Safety Recommendation 2023-034

Justification

As for 2023-031

Therefore, the following safety recommendation was made:

Safety Recommendation 2023-034

It is recommended that the Northern Ireland Health and Social Care Trusts review all existing hospital helicopter landing sites for which they have responsibility

against the latest guidance and instigate appropriate actions to minimise the risk of injury from downwash to uninvolved persons.

Date Safety Recommendation made: **30 October 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Safety Recommendation 2023-035

Justification

A national database would avoid some duplication of work by operators and be highly beneficial for the industry to have a centralised database of HLS that is able to be updated quickly in an operational environment by helicopter operators and HLS Site Keepers.

An HLS database could, provided that everyone is able to openly share information, lead to better cooperation and communication between the HLS Site Keepers and the helicopter operators using them.

Therefore, the following safety recommendation was made:

Safety Recommendation 2023-035

It is recommended that the Onshore Safety Leadership Group (OnSLG), in conjunction with the UK Department for Transport, facilitate and support the development and introduction of a dedicated national hospital helicopter landing sites (HLS) database that can be updated in an operational environment by helicopter operators and hospital HLS Site Keepers.

In addition to helicopter operators and other stakeholders, the OnSLG should seek participation from the healthcare organisations in England, Scotland, Wales, and Northern Ireland.

Date Safety Recommendation made: **30 October 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Safety Recommendation 2023-036

Justification

Although there have been some steps towards addressing the issues raised in this report, progress could be accelerated if there was centralised leadership from an organisation in a position to secure resources and drive the improvements in safety required. There are a diverse range of stakeholders involved in the decisions around hospital HLS; business needs, local planning, design, risk assessment and ongoing risk management responsibilities are distributed over a number of government departments and current improvement efforts appear to be somewhat fragmented. Healthcare, emergency services and transport are all State functions in the UK, so it would be appropriate for a State organisation with the necessary expertise and channels of communication between other government departments to provide the necessary leadership. The DfT has such expertise and remit for aviation safety policy and therefore the following safety recommendation was made:

Safety Recommendation 2023-036

It is recommended that the UK Department for Transport, in conjunction with the Onshore Safety Leadership Group, establish and lead a national initiative to improve the protection of uninvolved persons from helicopter operations at hospital helicopter landing sites (HLS).

This initiative should have sufficient authority, representation, resources, and expertise to ensure that coordination between the various risk owners and stakeholders is effective.

The various stakeholder roles and responsibilities (in particular those of HLS Site Keepers and helicopter operators) should be clear to all those involved, and the planning, design, and ongoing risk management of hospital HLS should be considered appropriately.

Date Safety Recommendation made: **30 October 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Pegasus Quik, G-CCPC

1 June 2022, East fortune Airfield, East Lothian

Investigation Synopsis

During start up, the engine suddenly went to a high rpm. The aircraft accelerated over the ground and became airborne with the base bar attached to the front strut. It struck the ground in a field adjacent to the airfield and the pilot died from head injuries eight days later.

It is likely that the pilot started the engine with the hand throttle open and did not free the base bar, reduce the rpm or stop the engine before the aircraft became airborne. The pilot might have survived if he had been wearing his shoulder (diagonal) harness and his helmet had been designed to protect him from rotational head injuries.

Front seat diagonal shoulder strap positioned as found at the accident site

Safety Recommendation 2023-037

Justification

Following this accident, the aircraft manufacturer prepared SB 159 to classify the starter inhibitor switch as a compulsory modification on their range of flexwing aircraft equipped with an electric starter. To prevent a reoccurrence of this type of accident, the following Safety Recommendation is made to the CAA to require the starter inhibitor switch to be fitted to all electric start, in-service Pegasus Sport Aviation Ltd flexwing aircraft:

> **Safety Recommendation 2023-037**
>
> It is recommended that the UK Civil Aviation Authority issue a Mandatory Permit Directive to mandate Pegasus Sport Aviation Ltd Service Bulletin 159 to embody a Starter Inhibitor Switch on all in-service Pegasus Sport Aviation Ltd aircraft.

Date Safety Recommendation made: **30 November 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Safety Recommendation 2023-038

Justification

The finding from Royal Air Force Centre for Aviation Medicine (RAFCAM) and the experience of the AAIB that there is a greater risk of serious and fatal injury when a shoulder strap is not worn during an accident, is contrary to the CAA's position that a properly worn lap strap, in combination with a safety helmet, provides adequate protection.

The aircraft manufacturer warns that the full harness should be worn and if correctly adjusted does not compromise full and free control inputs. However, pilots of the Pegasus Quik who expressed concern at wearing the shoulder harness quoted the exception in British Civil Airworthiness Requirements (BCAR) Section S 1307 as justification not to wear it. To ensure that the exception in BCAR Section S1307 is still appropriate, the following Safety Recommendation is made to the CAA:

Safety Recommendation 2023-038

It is recommended that the UK Civil Aviation Authority review the suitability of the Configuration Specific Provision in British Civil Airworthiness Requirements, Section S 1307 (a) Miscellaneous equipment which states, 'except that only a lap strap need be provided for front seat occupants of a weight-shift controlled aircraft'.

Date Safety Recommendation made: **30 November 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Safety Recommendation 2023-039

Justification

The pilot wore a helmet designed to conform to BS EN 966: 2012 'Helmets for airborne sports'. This Standard does not protect wearers from the most likely cause of serious and fatal head injuries in aircraft accidents that result from rotational motion of the head when it is subject to an oblique impact. In this accident, the pilot died from a severe rotational head injury which his helmet was not designed to protect him from. Therefore, to ensure that BS EN 966: 2012 provides protection from oblique impacts that are likely to occur in aircraft accidents, the following Safety Recommendation is made to the BSI:

Safety Recommendation 2023-039

It is recommended that the British Standards Institute introduce a requirement in BS EN 966 'Helmets for Airborne Sports' to protect wearers from rotational head injuries.

Date Safety Recommendation made: **30 November 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Safety Recommendation 2023-040

Justification

The helmet worn by the pilot was categorised for use in ultralight aircraft; however, this term has not been defined by either the BSI or the CAA. To ensure microlight pilots select helmets suitable for their airborne activity, the following Safety Recommendation is made to the BSI:

> **Safety Recommendation 2023-040**
>
> It is recommended that the British Standards Institute adopts the definition of a microlight from Schedule 1 of the Air Navigation Order (UK Statutory Instruments No. 765) in BS EN 966 'Helmets for Airborne Sports'.

Date Safety Recommendation made: **30 November 2023**

Latest response received: **Awaiting response**

Safety Recommendation Status: **Open**

Response Summary to Safety Recommendation Issued in Previous Years

The table below shows the AAIB assessments to the responses received during 2023 to Safety Recommendations issued in previous years.

SR Number	Case	Date Response Received	Latest Response Assessment
2016-053	G-LGNO 15 Dec 2014	24 Jul 2023	Partially adequate Planned action ongoing update due 31 Jul 2024 Open
2020-007	N264DB 21 Jan 2019	23 Aug2023	Not adequate Planned action completed Closed
2020-008	N264DB 21Jan 2019	30 Nov2023	Partially adequate Planned action ongoing update due 31 May 2024 Open
2020-020	G-FBEJ 28 Feb 2019	27 Apr 2023	Not adequate No planned actions Closed
2020-021	G-FBEJ 28 Feb 2019	13 Dec 2023	Partially adequate Planned action ongoing update due 31 Dec 2024 Open
2020-022	G-FBEJ 28 Feb 2019	27 Apr 2023	Partially adequate Planned action ongoing update due 31 Mar 2024 Open
2020-023	G-FBEJ 28 Feb 2019	13 Dec 2023	Partially adequate Planned action ongoing update due 31 Dec 2024 Open
2020-025	G-FLBE 14 Nov 2019	30 Mar 2023	Not adequate Planned action completed Closed
2021-017	G-ZBKF 01 Oct 2020	23 Nov 2023	Partially adequate Planned action ongoing update due 31 May 2024 Open
2021-025	G-LAWX 14 Oct 2019	03 Nov 2023	Adequate Planned action ongoing update due 31 May2024 Open
2021-027	G-LAWX 14 Oct 2019	03 Nov 2023	Adequate Planned action completed Closed
2021-031	G-LAWX 14 Oct 2019	03 Nov 2023	Adequate Planned action completed Closed

SR Number	Case	Date Response Received	Latest Response Assessment
2021-032	G-LAWX 14 Oct 2019	03 Nov 2023	Partially adequate Planned action ongoing update due 28 Jun 2024 Open
2022-002	UAS DJI Matrice M210 Version 1 19 Nov 2020	10 Jul 2023	Not adequate No planned actions Closed
2022-004	UAS DJI Matrice M210 Version 1 19 Nov 2020	28 Jun 2023	Adequate Planned action ongoing update due 26 Jul 2024 Open
2022-005	G-BBSA 25 Sep 2021	15 Dec 2023	Partially adequate Planned action ongoing update due 30 Aug 2024 Open
2022-006	G-BBSA 25 Sep 2021	15 Dec 2023	Partially adequate Planned action ongoing update due 30 Aug 2024 Open
2022-007	G-BBSA 25 Sep 2021	15 Dec 2023	Partially adequate Planned action ongoing update due 30 Aug 2024 Open
2022-008	G-HYZA 29 Apr 2021	21 Dec 2023	Adequate Planned action ongoing update due 27 Sep 2024 Open
2022-009	G-HYZA 29 Apr 2021	21 Dec 2023	Adequate Planned action ongoing update due 27 Sep 2024 Open
2022-010	G-HYZA 29 Apr 2021	21 Dec 2023	Adequate Planned action ongoing update due 27 Sep 2024 Open
2022-011	G-HYZA 29 Apr 2021	21 Dec 2023	Adequate Planned action ongoing update due 25 Jul 2024 Open
2022-012	G-HYZA 29 Apr 2021	21 Dec 2023	Adequate Planned action ongoing update due 27 Sep 2024 Open
2022-013	G-CTSB 12 Dec 2020	13 Nov 2023	Adequate Planned action completed Closed
2022-014	SE-LPS 09 Apr 2021	19 Oct 2023	Adequate Planned action ongoing update due 30 Apr 2024 Open

SR Number	Case	Date Response Received	Latest Response Assessment
2022-015	SE-LPS 09 Apr 2021	19 Oct 2023	Adequate Planned action completed Closed
2022-017	D-AAAY 10 Aug 2022	14 Feb 2023	Partially adequate Planned action ongoing update due 30 Jun 2024 Open
2022-018	G-JZHL 01 Dec 2021	29 Jun 2023	Partially adequate Planned action ongoing update due 29 Feb 2024 Open
2022-019	G-JZHL 01 Dec 2021	29 Jun 2023	Partially adequate Planned action ongoing update due 29 Feb 2024 Open

Latest responses and assessments can be found on the AAIB website for each investigation.

Safety Actions from investigations reported on in 2023

Early in an investigation the AAIB will engage with authorities and organisations which are directly involved and can act upon any identified safety issues. The intention is to prevent recurrence and to that end 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 means there is usually no need to raise a Safety Recommendation as the safety issue has been addressed. The published report details the safety issues and the Safety Action that has taken place. (By convention Safety Issues are published in the reports with a green highlight box).

Note: If the issue remains then a Safety Recommendation may be raised accordingly and this will then require a formal response by the addressee.

In 2023, 99 safety actions directly resulted from AAIB investigations. These arose from two Special Bulletins, 25 Field Investigations and 63 Correspondence Investigations .

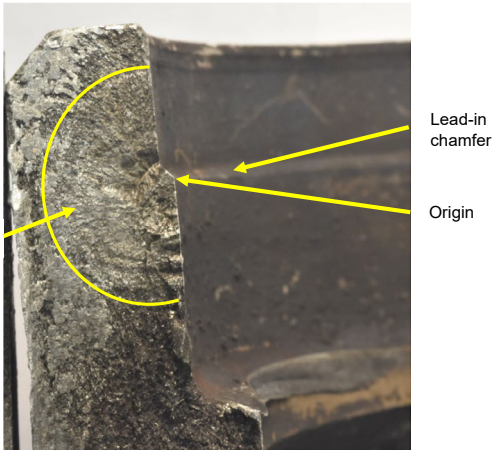
Index of Safety Actions Recorded in Field and Correspondence Investigations
(Listed by aircraft weight, manufacturer and type)

Boeing 737-8AS, EI-ENF
17 March 2022, Manchester Airport

Synopsis

Whilst taxiing to the gate after landing, the outboard wheel on the left main gear failed because of a fatigue crack in the wheel hub. The wheel failure caused a hydraulic leak from the brake piston and the heat generated by the misaligned wheel, caused the hydraulic fluid to combust resulting in a fire.

The fatigue crack originated from a corrosion pit in the wheel hub. Following this occurrence, the wheel manufacturer developed an ultrasonic inspection technique to identify cracks in this location on the hub and the operator has incorporated the new inspection into their maintenance programme.



Radial fracture surface with area of fatigue highlighted (reproduced with permission)

Safety actions taken by the wheel manufacturer

- The wheel manufacturer has developed an ultrasonic inspection to assess the condition of the internal bore of the wheel hub to identify the presence of cracks originating at the lead in chamfer of the bearing bore.
- The wheel manufacturer stated that they would amend the component maintenance manual to introduce an ultrasonic inspection of the inner wheel half hub lead in chamfers.

Safety action taken by the operator

- The operator has introduced this optional ultrasonic inspection on their fleet of Boeing 737-8AS aircraft.

Safety Actions Overview

Bombardier Global 6000, LX-NST
April 2022, London Luton Airport

Synopsis

On approach to Runway 25 at London Luton Airport in gusty conditions, the right wing of LX-NST made contact with the runway causing damage to the wingtip, flap fairing, aileron and slat. The runway contact occurred during a baulked landing in which the pitch and roll combination was sufficient for the right wing to touch the runway for approximately 18 m.

Damage to LX-NST. Clockwise from top left – slat, winglet, aileron, flap fairing

The risk of wingtip contact is well known in this aircraft type and has been the subject of numerous previous reports including by the AAIB. As a result of this known risk, the manufacturer has taken a number of actions including improving training and publishing new guidance for pilots on techniques for wingtip strike avoidance. Before this Serious Incident, the manufacturer applied to Transport Canada for approval to make crosswind training a Training Area of Special Emphasis (TASE) for the Global Fleet. This would ensure that all training providers have a standardised approach to crosswind techniques and training, for both initial and recurrent training programs. At the time of publication, the manufacturer was in the midst of ongoing discussions with Transport Canada regarding the details of the proposed TASE.

Safety actions

The operator completed their own investigation into the incident and took the following safety actions:

- Simulator training to include new scenarios of crosswind landings and low-energy go-arounds.
- The circumstances of this event was shared amongst all crews.
- A number of other recommendations made in the operator's report are under consideration, including the introduction of a specific threat and error matrix for line training captains to assess the risk level of sectors, and a reduced crosswind limit for trainee pilots until they reach a certain level of experience.
- The manufacturer continued to engage with pilots and operators of the aircraft type regarding the correct crosswind technique and the risk of wingtip strikes.
- They also developed a TASE proposal to further mitigate the risk, which was being assessed by Transport Canada at the time of publication.

Safety Actions Overview

BAe ATP, SE-MAP
27 November 2021, Belfast International Airport

Synopsis

Whilst flying in storm conditions the crew experienced difficulties in controlling the aircraft elevator but managed to land the aircraft safely. The cause could not be established but whilst investigating the problem, the Operator identified and implemented maintenance policy enhancements.

Safety action

- During these investigations the operator identified that inspection of the wiring in the steering columns was challenging due to access constraints. Consequently, a new procedure has been developed to enable a more extensive inspection. The operator is pursuing the completion of the steering column inspections across its ATP fleet as a priority.

Safety Actions Overview

ATR 72-211, G-CLNK
25 October 2022, East Midlands Airport

Synopsis

After landing in a light crosswind, as the aircraft decelerated through 80 kt, it swerved right and hit a runway edge light, damaging the nosewheel tyre. The operator has taken action to address aircraft handling during the ground roll in crosswinds.

Safety actions

- The crew underwent further training in the simulator on the aircraft handling technique in crosswinds during landing.
- The syllabus for the operator conversion course is being rewritten to maximise crew exposure to crosswinds.
- The operator advised all involved in training on the ATR 72 to be alert to and monitor for incorrect crosswind techniques or inappropriate use of nosewheel steering through the tiller.

Sikorsky S-92A, G-MCGY
4 March 2022, Derriford Hospital, Plymouth, Devon

Synopsis

Warning sign on the perimeter of the HLS

The helicopter, G-MCGY, was engaged on a Search and Rescue mission to extract a casualty near Tintagel, Cornwall and fly them to hospital for emergency treatment. The helicopter flew to Derriford Hospital (DH), Plymouth which has a Helicopter Landing Site (HLS) located in a secured area within one of its public car parks. During the approach and landing, several members of the public in the car park were subjected to high levels of downwash from the landing helicopter. One person suffered fatal injuries, and another was seriously injured.

Following this accident, Safety Actions are being taken by the helicopter operator, Derriford Hospital and NHS England Estates to control and mitigate the risk.

Safety actions taken by the helicopter operator

- The approval for its S92 and AW189 helicopters to operate into the HLS at DH was removed from its Flying Staff Instruction (FSI) until further notice.
- Since the accident, more frequent reviews of the FSI are being conducted and additional information has been added for each site as to whether it has facilities for it to be secured and by whom, ie coastguard rescue team, police and/or hospital staff.

Safety action taken by the DH HLS Site Keeper

- No helicopters >5,000 kg MTOW were permitted to land on the HLS at DH until further notice. A Notice To Airmen (NOTAM) was issued to publicise.
- Car Park B was closed to all vehicles other than ambulances until further notice.
- All pedestrian movements in Car Park B would be controlled during all future helicopter landings and takeoffs.
- All pedestrian movements on the public highway pavement along Derriford Road would be controlled as far as reasonably practical during helicopter operations, but DH has no legal authority to prevent pedestrian movements on the public highway.
- The risk assessment for Car Park B was amended to include an assessment of the risk to pedestrians from helicopter downwash.

- Additional visual and audible signs around the landing pad on the main pedestrians' routes around the location have been installed.
- Yellow hatched floor markings have been installed outside each of the gated entrances to the pad, warning pedestrians not to stand in that location to view helicopters landing or taking off.
- Audible message points around the external walls of the landing pad, activated by the security team once they reach the pad, have been installed. The audible message will warn pedestrians of helicopter movements, the risks of downwash and asking them to move to a different location quickly.

Safety action taken by the QEH HLS Site Keeper

- As a result of the incident involving G-RESU[12], the hospital has established a monthly road sweeping programme.

Safety action taken by NHS England Estates

- They have hosted online events for stakeholders at NHS hospitals to draw attention to the guidance in CAP 1264 on the safe and compliant design and management of HLS sites amongst the industry and local planning authorities.

Safety action taken by the Health and Safety Executive (HSE)

- On 10 May 2023, the HSE wrote to all NHS Trust and Board Chief Executives with a 'reminder of legal health and safety duty and how it should be discharged to effectively manage risk associated with hospital helipad use'.

Additional safety action planned or in progress by the DH HLS Site Keeper

- Designs to secure and control access to Car Park B have been finalised and works are currently being tendered.
- The procedures for the security staff were reviewed with additional responsibilities added. These procedures were issued to security staff and are being trialled in conjunction with advice from an aviation consultant appointed by DH. They had not been approved for wider circulation at the time of publication of this report.

Additional safety actions planned or in progress by NHS England Estates

- They have instigated a national data collection with all NHS hospital Chief Executives in England to seek assurance on levels of compliance with the standards in CAP 1264 and to identify any staff training requirements. The results of this had not been made available at the time of publication of this report, but they are intended to inform NHS England Estates of any additional next steps that may be required.

Footnote

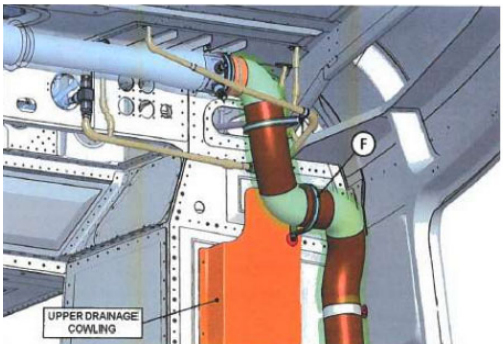
[12] EC135 downwash during takeoff causing debris (gravel) to become airborne causing damaged to parked vehicles.

- NHS England Estates, working with the CAA, is considering introducing a package to develop training in ground operations and oversight of hospital HLS facilities. The objective is to roll out such a training programme to the Accountable Managers of all the hospital HLS in England, Wales, and Scotland.
- They are working with other hospital HLS towards a common database for all operators.

Agusta-Westland AW189, G-MCGV
7 January 2022, Lydd Airport, Kent

Synopsis

A heating duct failed in flight releasing fragments of duct insulation material into the cabin and cockpit, causing respiratory irritation to the occupants. The aircraft landed safely. Similar heating duct failures had previously occurred in several of the operator's other AW189 aircraft and were investigated by the AAIB (AAIB Bulletin 4/2022 report AAIB-27128 refers). As a result of those failures the aircraft manufacturer had published a Service Bulletin (SB) to inspect and modify the installation of the heating duct and this had been embodied on G-MCGV.



Heating duct on AW189 showing flexible sections in brown and rigid sections in green (Circle 'F' indicates a securing 'P-clamp')

At the time of publication of the AAIB report, the aircraft manufacturer stated its intention to publish a revision to its SB to make the installation of the existing duct configuration more robust, as an interim solution. In parallel, the duct manufacturer is redesigned the heating duct.

The operator has also taken action to replace the heating ducts on those aircraft in its fleet which had not already experienced a duct failure.

Safety actions taken by the manufacturer

- As a result of the duct failure on G-MCGV, the aircraft manufacturer plans to publish Revision A of SB189-296 in the fourth quarter of 2022, to provide further instructions on the installation of the heating duct. Revision A will require removal of the duct from the aircraft and reinforcement of the duct joints by the application of aramid lacing tape and silicon covered glass cloth tape. It will also require additional fixing points to be added and will introduce a change to the sequence of the duct installation instructions to avoid introducing any pre-load on the duct. The intention is that helicopters already compliant with the original issue of SB 189-296 must also comply with Revision A.
- The aircraft manufacturer considers that SB 189-296 Revision A will be an interim solution to make the present duct configuration more robust. In parallel, the heating duct is being redesigned by the duct manufacturer as a long term solution. At the time of publication of the AAIB report, the installation drawings for the redesigned duct were undergoing approval and qualification/testing for the new design of duct is planned to take place throughout the remainder of 2022. The aircraft manufacturer intends to issue a separate SB for replacement of the present duct configuration with the new design in 2023.

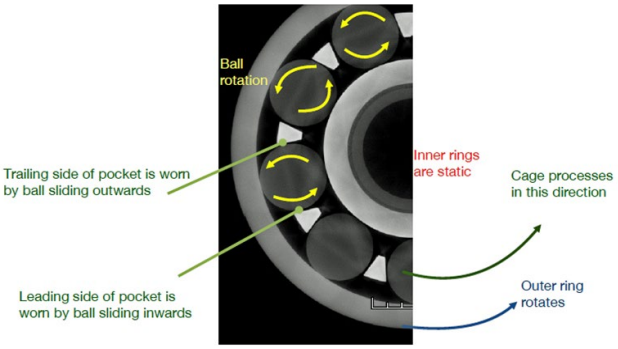
Safety actions taken by the operator

- Separately, following the duct failure on G-MCGV, in March 2022 the operator issued an internal Technical Directive requiring replacement of the heating duct on the remaining AW189s in its fleet that had not previously had the duct replaced following a duct failure. The ducts will be replaced on applicable aircraft at the next annual inspection and the replacement programme will be complete by January 2023. The aircraft manufacturer requested the removed ducts to be returned to the duct manufacturer so that their condition can be assessed against aircraft operating hours.

Leonardo AW169,G-VSKP
27 October 2018, King Power Stadium, Leicester

Synopsis

At 1937 hrs the helicopter, carrying the pilot and four passengers, lifted off from the centre spot of the pitch at the King Power Stadium. The helicopter moved forward and then began to climb out of the stadium on a rearward flightpath while maintaining a northerly heading and with an average rate of climb of between 600 and 700 ft/min. Passing through a height of approximately 250 ft, the pilot began the transition to forward flight by pitching the helicopter nosedown and the landing gear was retracted. The helicopter was briefly established in a right turn before an increasing right yaw rapidly developed, despite the immediate application of corrective control inputs from the pilot. The helicopter reached a radio altimeter height of approximately 430 ft before descending with a high rotation rate. At approximately 75 ft from the ground the collective was fully raised to cushion the touchdown.



Rotation of balls and cage within the bearing

The helicopter struck the ground on a stepped concrete surface, coming to rest on its left side. The impact, which likely exceeded the helicopter's design requirements, damaged the lower fuselage and the helicopter's fuel tanks which resulted in a significant fuel leak. The fuel ignited shortly after the helicopter came to rest and an intense post-impact fire rapidly engulfed the fuselage.

Safety actions

During the course of the investigation and as a result of the findings made, the helicopter manufacturer has issued sixteen Service Bulletins and EASA has published nine Airworthiness Directives for the continued airworthiness of the AW169 and AW189 helicopter types.

Safety actions by the airworthiness authority

- Emergency AD 2018-0241-E was issued 7 November 2018 to mandate ASB 169-120 and 189-213. This required a one-time visual inspection of the servo-actuator installation to identify movement of the castellated locking nut.
- Emergency AD 2018-0250-E was issued on 19 November 2018. In addition to the requirements of the first AD, a precautionary one-off inspection of the duplex bearing was introduced.
- EASA issued Emergency AD 2018-0252-E on 21 November 2018 to mandate

ASB 169-125 and ASB 189-214. This introduced a one-time inspection and breakaway torque check of the duplex bearing, inspection and reinstallation of the servo-actuator castellated locking nut.

- EASA issued Emergency AD 2018-0261-E on 30 November 2018 to mandate ASB 169-126 and ASB 189-217 to introduce repeat inspections.
- EASA issued AD 2019-0023 on 1 February 2019 to mandate ASB 169-135 and ASB 189-224. These introduced a modification developed by the helicopter manufacturer to install and repetitively inspect a thermal strip on the bearing end of the tail rotor actuator control shaft.
- EASA issued AD 2019-0121 on 3 June 2019, later revised to AD 2019-0121(R1), to require accomplishment of ASB 169-148 and 189-237, which provided instructions for more in-depth inspections of the duplex bearing.
- EASA issued AD 2019-0193 on 7 August 2019, which mandated reporting from the new Vibration Health Monitoring modification introduced by the helicopter manufacturer, it also included all the other inspection requirements and superseded AD 2019-0121(R1).
- EASA issued Airworthiness Directive 2020-0048 on 6 March 2020, which superseded AD 2019-0193. This AD mandated the fitment of the new standard control actuator, with one-way interchangeability2. Fitting of the modified actuator alleviated the requirement to conduct an inspection of the lock nut every 10 flight hours. All the additional inspections were retained in the new AD.
- EASA issued AD 2020-0197 on 24 September 2020 to mandate the replacement of the tail rotor duplex bearing with a new design which used steel ball bearings rather than ceramic. The new bearing was introduced with a life limit of 400 flight hours. This allowed an extension of the inspection intervals on the thermal strip and bearing.

Safety actions by the helicopter manufacturer

- ASB 169-120 and 189-213 were issued on by the helicopter manufacturer. This required a one-time visual inspection of the servo-actuator installation to identify movement of the locking nut.
- The helicopter manufacturer published ASB 169-125 and ASB 189-214. This introduced a one-time inspection and breakaway torque check of the duplex bearing, inspection and reinstallation of the servo-actuator castellated nut.
- The helicopter manufacturer published ASB 169-126 and ASB 189-217 to introduce repeat inspections of the bearing and lock nut.
- A modification was developed by the helicopter manufacturer to install and repetitively inspect a thermal strip on the bearing end of the tail rotor actuator control shaft. This was introduced in ASB 169-135 and ASB 189-224.

- Operator feedback from the repetitive tail rotor inspections allowed improved techniques to be developed and the helicopter manufacturer published ASB 169-148 and 189-237, to provide instructions for more in-depth inspections of the duplex bearing.
- The helicopter manufacturer introduced into service a modification to the Vibration Health Monitoring (VHM) system fitted to the AW169 and AW189 by issuing SBs 169-140 and 189-227. The modification relocated an existing accelerometer sensor on the tail to the servo-actuator control lever, to allow monitoring of the vibration signature of the duplex bearing as an optional aid to continued airworthiness.
- In early 2020 the helicopter manufacturer issued modification Service Bulletins 169-153 and 189-249. These introduced a new standard of tail rotor actuator with a left-hand thread on the castellated lock nut and a washer, fitted to the actuator end of the shaft.
- The manufacturer introduced a new tail rotor duplex bearing into service by issuing Service Bulletins 169-162 and 189-254 on 4 August 2020. Replacement with the new bearing was required within 400 flight hours or 4 calendar months of the SB issue date. The new bearing replaced the ceramic balls with steel balls. The new bearing had an introductory life limit of 400 flight hours. The Service Bulletin also required time expired bearings to be returned to the manufacturer for inspection following replacement.
- Service Bulletins 169-178 and 189-272 were also issued on 4 August 2020 to increase the inspection intervals for the new bearing. The 10 hour repeat inspections of the thermal strip and the bearing were extended to 50 hour repeat inspections. While the 20 and 50 hour checks were extended to 100 hours and the 200 hour check reduced to 100 hours.

Safety action by the helicopter operator

- The operator grounded all company operated AW169 the day after the accident and, in accordance with its SMS procedure, did not resume operations until the 30 November 2018 when they were satisfied that sufficient action had been taken to establish the airworthiness of the aircraft.

AW109SP, G-TAAS
12 August 2022, Cardiff

Synopsis

The helicopter landed at a hospital elevated helipad that was not prepared with fire cover and traffic management because the hospital was not aware of its imminent arrival. The message reporting the departure was sent too late and using an unreliable communication method. The method for pilots to visually confirm the helipad was ready during the approach was not emphasised in the site-specific procedures provided by the hospital and the operator. The operator has taken action to improve communications and review the procedures for all elevated hospital helipads it uses.

Safety action

- Following the occurrence, the operator reviewed all elevated Final Approach and Take Off (FATO) area surveys and stated that it intends to reissue them with specific guidance for each site, subject to communication with the hospitals.

Safety Actions Overview

AS-350, D-HKMB
17 September 2022, Auchmacoy, Aberdeenshire

Synopsis

The helicopter was conducting a survey operation which required flight on closely-spaced parallel tracks at low height. During the turn between two tracks it descended, and the underslung sensor array struck an electricity supply pylon. The impact severed the electricity supply cables causing a loss of power to approximately 1,682 properties. The pilot was unaware of the event and continued his planned sortie.

Following this event, the Civil Aviation Authority (CAA) stipulated enhanced risk mitigation measures for such operations.

Safety action

- Following the CAA's withdrawal of the permission to operate below the Standardised European Rules of Air (SERA) 5005 limitations, the operator cancelled the remainder of the survey. The CAA issued the operator with an enhanced requirement for mitigations that would be required for any similar operation in future, as follows:

    1. The Risk Assessment (RA) to be revaluated and have more detail.
    2. The 60 m lateral distance from the Load to be included in the standard operating procedures (SOPs)/RAs, matching the more specific 60 m 'bubble' of the new permission.
    3. A 45 m agl minimum height limitation for the load.
    4. The use of an observer in the left seat. This crew member would be responsible for lookout, obstruction identification and having mapping with an obstruction overlay.
    5. Mapping, ideally digital, with obstruction overlay to be used for both planning and whilst in flight.
    6. The pre-flight planning processes should be demonstrated to the CAA before operations commence.
    7. The quality and acceptability of the obstruction data and mapping should be demonstrated to the CAA before operations commence.

Bell 206B, G-TOYZ
5 September 2022, West Usk Lighthouse, Newport, Gwent

Synopsis

During a landing of a Bell 206B Jet Ranger, the combination of downwash and wind caused a sign to detach and strike a waiting passenger, who suffered minor injuries. The sign was not secured properly because the ground crew were distracted and under time pressure.

New method of securing the sign (Image used with permission)

Safety actions

- The operator took immediate action on the day to increase the distance between the landing helicopter and the passenger area.
- The operator issued a flying staff instruction that required the sign to be secured with two cable ties on each corner and ordered metal lanyards to secure the sign in future.
- The flying staff instruction also required the ground team leader to check the safety of the site before the first flight of the day and before each start of the helicopter engine.

Safety Actions Overview

Piper PA-23-250, G-BJNZ
2 April 2022, Enfield, Greater London

Synopsis

During an IFR flight from Le Touquet to Wellesbourne, the pilot observed oil leaking from the left engine followed by engine vibration. He shut the engine down and descended but elected to continue the flight toward Wellesbourne. On reaching 2,000 ft he found he was unable to maintain level flight on one engine and decided to land in a field.

Photograph taken inflight of the oil leak from the left engine

The investigation found the left engine failed due to a fatigue crack in one of the cylinder barrels. It is likely that the pilot was unable to maintain level flight on the right engine due to a combination of engine wear resulting in reduced power available and the prevailing weather conditions. His decision to continue the flight following the engine shutdown was likely to have been influenced by high workload and plan continuation bias.

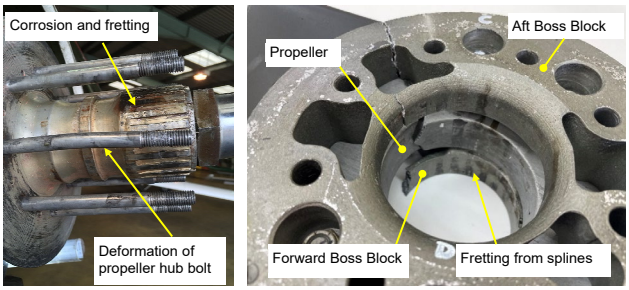
Safety action

- The aircraft's maintenance organisation has amended its maintenance programme for aircraft fitted with piston engines operating beyond the manufacturer's recommended overhaul life. The revised maintenance programme includes a rate of climb air test to detect a loss of engine power output and introduction of an oil sample analysis monitoring programme.

DHC-1 Chipmunk 22, G-BXHA
22 March 2022, Sevenoaks, Kent

Synopsis

During the flight the aircraft developed severe vibration requiring the pilot to return to the airfield where fatigue cracks were found in the propeller and its two mounting blocks. The cracks originated from fretting between the propeller assembly and splines on the engine hub.



Engine hub corrosion and fretting, and fretting of inner surfaces of blocks and propeller

The aircraft's Type Responsibility Agreement holder, CAA and the Light Aircraft Association (LAA) are taking combined safety action to promulgate enhanced guidance for continued airworthiness of Fairey Reed propellers. This action is in addition to existing inspection and maintenance requirements to owners of aircraft using this propeller type.

The initiating failure of the propeller assembly was caused by fatigue cracking of the forward boss block and propeller, resulting from fretting and corrosion. The existing SB to inspect the propeller assembly does not specify inspection of the inner diameter of the boss blocks for wear or corrosion.

Safety actions

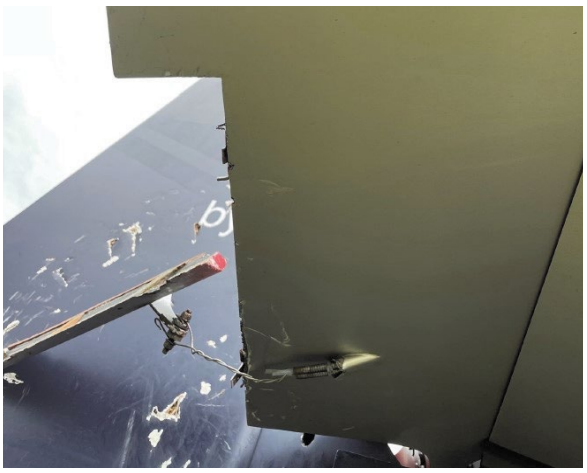
- Aircraft Type Responsibility Agreement holder will promulgate a Technical News Sheet to its subscribers which will include enhanced guidance for continued airworthiness of Fairey Reed propellers. This will include the use of Non-Destructive Testing, and inspections for corrosion, fretting and correct surface finish.
- The CAA and the LAA will work together to promulgate the content of the Technical News Sheet to owners of this propeller type operating under a UK CAA Certificate of Airworthiness, UK CAA Permit-to-Fly, or LAA administered Permit-to-Fly.

Safety Actions Overview

Extra EA 300/L, G-ZXEL
19 June 2022, Near Duxford Airfield, Cambridgeshire

Synopsis

During a formation display routine the aircraft's elevator trim tab detached at its hinges. The tab was still attached to the aircraft via control cables, and this caused it to flap in the slipstream causing the elevator to move up and down and causing a loud banging noise as it repeatedly struck the side of the rudder. The pilot was able to control the aircraft and make a successful landing.



G-ZXEL lower side of right elevator showing trim tab detached at the hinge points but still connected via the control cables

The elevator trim tab had detached due to a combination of the wrong hinge type being fitted (with only one third of the glue bonding area compared to the type of hinge that should have been fitted) and insufficient glue having been applied. Other aircraft with cracked hinge tabs were found which indicated that insufficient glue had also been applied between the hinges and the tab structure.

Safety actions

- As a result of this accident, the aircraft manufacturer published Mandatory Service Bulletin SB-300-2-22 on 10 August 2022 which explains the issues identified during this investigation and requires a detailed visual inspection of the elevator trim tab hinges within 25 hours, and a recurring detailed visual inspection as part of the normal 50-hour inspection programme.
- The aircraft manufacturer also advised the external trim tab manufacturer to ensure that sufficient glue is used when bonding the hinges to the tabs.

Piper PA-28-161, G-EKIR
22 March 2023, Sandtoft Airfield, Belton, North Lincolnshire

Synopsis

Damage to the aircraft wingtip (top) and to the vehicle panel side panel (left) and below the wing mirror (right). (Images used with permission)

Having flown into Sandtoft Airfield earlier in the day the pilot was preparing for his return flight to Gloucester. Having started the engine, he proceeded to taxi from his parking position (Stand 7) across the runway and along Taxiway A to uplift fuel. There was a vehicle parked on Taxiway A completing a delivery to the cafe. Having judged the gap to be sufficient for the aircraft wingspan, the pilot proceeded at a slow walking pace but clipped the port wingtip of G-EKIR on the side and wing mirror of the vehicle. The port wing navigation light and casing were damaged and there was paintwork scuffing to the wing tip area. The vehicle had damage to the right panel and below the right wing mirror. There were no injuries. The vehicle did not have permission to enter or park on the taxiway.

Safety actions

- The delivery company have instructed their drivers to park in the car park for deliveries to the cafe rather than entering the taxiway.
- The airfield operator will review the signage at the entry to the airfield to ensure it is appropriate for ensuring users are aware they are entering an active airfield.

Safety Actions Overview

Pitts S-1C (Modified), G-BTOO
27 March 2022, Popham Airfield, Hampshire

Synopsis

Whilst on a test flight, after an extensive rebuild, the pilot became aware the elevator was no longer connected to the control column. He was able to maintain control, but during the final stages of approach, the aircraft pitched nose down and landed heavily on the forward fuselage; it came to rest inverted. The pilot received a severe laceration to the head and was assisted from the aircraft before being taken to hospital.

The investigation identified that a pivot joint at the end of an elevator pushrod had become disconnected, most probably due to the lack of a split pin to prevent the securing bolt's castle nut from loosening.

Although not directly linked to this accident, discrepancies were found regarding adherence to LAA guidance for recording work. Inconsistencies were identified within LAA Technical Leaflets regarding who can sign for duplicate inspections. It was also noted that the extent to which the 51% rule for amateur built aircraft needs to be applied in relation to overhaul, repair, and restoration of amateur built aircraft was not clear in regulatory material.

Safety actions taken by the CAA

- The CAA will be reviewing the regulatory framework with respect to British Civil Airworthiness Requirements A8-26, '*Approval of organisations supporting recreational aviation*' and A3-7, '*Permit-to-Fly Aircraft – Initial and Continuing Airworthiness*', in conjunction with the approved organisations. The review will include an evaluation of the requirements relating to duplicate inspections.
- The CAA will engage separately with the approved organisations on the applicability of the '51% rule' in relation to overhaul, repair, and restoration of amateur built aircraft.

Safety actions taken by the LAA

- The Light Aircraft Association will be reviewing the guidance provided to LAA members and Inspectors regarding worksheets. TL 2.21 *'Rebuilding an aircraft under the LAA system'* and other documents will be reviewed and will result in a revised TL 2.21. This review will include.
    1. Reviewing the minimum acceptable standard for worksheets.
    2. Expanding the recommendation that a photographic record of the work is kept, to include the recommendation for inspectors to make a photographic record of what they have inspected.
    3. Clarification of 'stage inspections' and when they should be made and how they should be recorded.

- Once complete the revision of TL 2.21 will be publicised to LAA members and Inspectors.
- A new LAA worksheet proforma specifically for larger projects such as rebuilds has been created. The intention that this proforma will guide the restorer towards presenting the worksheet in a format closer to the ideal. This has already been published on the LAA website.
- A short item on the importance of full and complete worksheets to properly record work undertaken is included in the 'Engineering matters' column of the December edition of the Light Aviation magazine.
- The Light Aircraft Association have stated they have amended their Technical Leaflets to ensure the information relating to who can sign a duplicate inspection is consistent.

Reims Cessna F152, G-BLJO
2 January 2023, Near Shoreham Airport, West Sussex

Synopsis

G-BLJO Accident site

While on late downwind the engine started coughing and losing power. The pilot carried out some checks, but the engine subsequently lost all power. He picked a field and glided to it but touched down nosewheel first causing the nose landing gear leg to collapse. The pilot had recently practised forced landings with an instructor and this likely contributed to the safe outcome. An aircraft examination did not reveal any faults, and the conditions were conducive to serious carburettor icing at any power, but the cause of the loss of power could not be determined.

The maintenance organisation's engine and fuel system examinations did not reveal any faults, although the engine core had yet to be examined. The conditions were conducive to carburettor icing at any power, so this was a possible cause, but no conclusive cause could be determined.

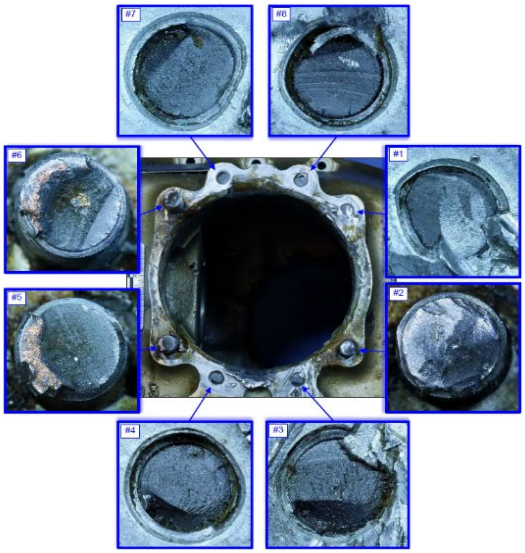
Safety action by the flying school

- The flying school has updated its electronic booking system to show in red any pilot who is out of currency or not checked out when they try to book an aircraft. Pilots' licence and rating validities are now checked by admin staff and daily checks are carried out by a flight instructor.

Reims Cessna FRA150M, G-BDNR
1 August 2021 4 miles NNE of Retford Gamston Airport, Nottinghamshire

Synopsis

The number 3 cylinder and piston broke free from the engine causing engine failure during flight. A forced landing was carried out in a field resulting in significant damage to the aircraft but only minor injury to the passenger.



A closer view of the in-situ stud fracture surfaces

Examination of the engine crankcase found that the number 3 cylinder's base studs had all failed in fatigue due to crack progression. When cylinder studs were replaced with new items on other engines of this type during overhaul or maintenance, some of the studs' threads stripped before the required torque values could be achieved. Analysis revealed that the nuts used to fasten the cylinders were distorting and stripping the threads of the studs before reaching their required torque value or were failing at values just above the published maximum, leaving only a small safety margin. The investigation revealed that there was a mismatch of tensile strength between the nuts and studs.

Safety action

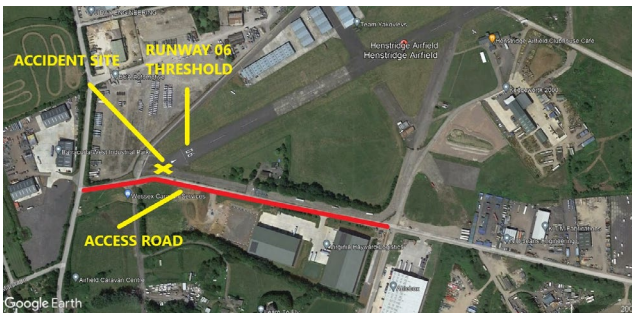
- The Type Certificate Holder will issue a Service Bulletin to replace the current cylinder base studs in RR O-204 engines, with studs which achieve consistent torque values above the maximum stated in their engine manuals when using the current nuts.

Safety Actions Overview

Vans RV-9A, G-CCGU
2 March 2023, Henstridge Airfield, Somerset

Synopsis

Late in the final approach to Henstridge Airfield, which is unlicensed, the aircraft struck a heavy goods vehicle on a road which crossed the undershoot. The aircraft then struck the ground inverted, short of the runway. The pilot sustained only minor injuries, but the passenger was seriously injured.



Henstridge Airfield and accident site

The aircraft was on a standard 3° approach path when it struck the lorry.

Safety action

- The airfield operator decided to displace the threshold of Runway 06 by a further 100 m. The point at which the incident occurred would now be approximately 170 m from the threshold, the obstacle clearance surface would be 7 m above the road, and Runway 06 at Henstridge would fulfil the obstacle clearance requirements of CAP 168. A 3° path drawn from the new threshold would cross the road approximately 9 m agl.

Safety Actions Overview

Vans RV7, G-RVDB
29 August 2022, Ronaldsway Airport, Isle of Man

Synopsis

After attending to an uneasy passenger while orbiting over the sea, the pilot inadvertently approached and landed on Runway 03 instead of the active Runway 08. The ATCO, who was attending to ground activities, did not observe the aircraft during its final approach.

View of Runway 03 approach with similar glare and sunblind position as the incident (Photograph from the ATS unit's investigation report on the incident)

Safety action taken by the Air Traffic Services Unit (ATSU)

- The ATSU has published a reminder to controllers to monitor all stages of an aircraft's final approach to recognise when an aircraft might be incorrectly or dangerously positioned. It intends to provide TRM training for all members of the ATS section and to replace the VCR sun blinds if a better solution can be found.

Safety Actions Overview

Aeroprakt A32 Vixxen, G-ENVV
19 July 2022, Newtownards Airfield, County Down

Synopsis

On the evening of 19 July 2022, two pilots were flying circuits around Newtownards Airport in G-ENVV an Aeroprakt Vixxen. After approximately 20 mins of circuits they flew a low pass parallel to Runway 03 followed by a steep right turn passing over several people on the ground. Recorded data showed the aircraft passed over the people with 70° angle of bank at 72 ft above the ground. During this turn the aircraft was seen to descend and hit the ground.

Flight path of accident flight

The investigation could not determine exactly why the aircraft descended in the turn but no defects could be found with the aircraft or engine. There was evidence that the aircraft's electronic displays lost power before the accident and this could have caused a distraction. However, it was being flown in a manner that exposed the aircraft, the occupants and the people on the ground to a high risk of an accident.

The investigation identified several shortcomings in the build process and the registration of the ballistic parachute recovery system (BPRS), which did not contribute to the outcome. The LAA and CAA have taken action to address these.

During an inspection carried out immediately before the accident the CAA identified shortcomings in the aerodrome's safety management system, which the CAA stated have now been addressed.

Safety actions taken by the CAA and LAA

- The CAA has amended form CA1 *Application for Aircraft Registration or Change of Ownership*, introducing a field to indicate whether an emergency ballistic device such as BPRS is fitted.
- The LAA has amended form CA3 *Permit-to-Fly Application*, introducing a field to indicate whether an emergency ballistic device is fitted, which is flagged to the CAA Aircraft Registration Team to subsequently update the G-INFO database.
- Retrospective installations of BPRS must be notified to the LAA by an application to install BPRS as a new modification to the aircraft type, or notification that BPRS has been installed as a manufacturer's standard option. The LAA will then notify the CAA of the installation.

- The LAA has included the requirements for BPRS markings and notification of installation to the CAA for inclusion on G-INFO register in articles within the *'Engineering Matters'* section of the member publication *Light Aviation*.
- New LAA Inspector induction briefings given by the LAA Chief Inspector now include a specific topic explaining BPRS installations and associated aircraft marking requirements.

Alpi Pioneer 300, G-IPKA
20 August 2022, Fenland Airfield, Lincolnshire

Synopsis

Whilst taxiing after landing the left main landing gear collapsed due to the failure of the swinging leg. The leg had fractured in overload initiating close to the weld between the swinging leg and its pivot tube. As a result of this investigation the Light Aircraft Association (LAA) are reviewing design and manufacturing aspects of the type's landing gear, including whether ongoing maintenance action is required.

Alpi Pioneer left main landing gear

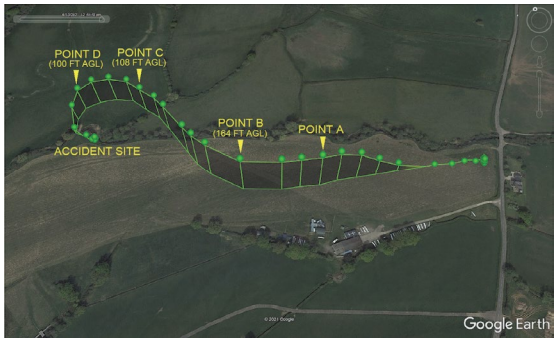
Safety action

- As a result of this investigation the LAA are reviewing the design and manufacturing aspects of the Alpi Pioneer 300 landing gear, including whether on-going maintenance action is required.

Grob G103C Twin III Acro, G-CFWC
13 June 2021, Usk Airfield, Monmouthshire

Synopsis

The accident occurred during a simulated failed winch launch. The glider was initially flown away from the airfield at a low height and, whilst turning back to land, stalled and collided with trees on the edge of the airfield. Both occupants were seriously injured. With assistance from the British Gliding Association (BGA), the gliding club has taken several safety actions to improve elements of the club's operation.



Recorded GPS flightpath of aircraft

Safety actions

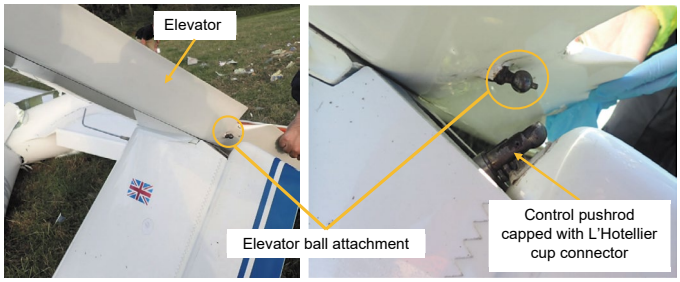
- The club operations manual has been rewritten for clarity.
- An improved engagement with club members on safety matters.
- A review and changes to some airfield and flight operations.
- Instructor refresher training from the BGA.
- A review of resourcing current and future training needs within the club.

Safety Actions Overview

Schleicher ASW 20 L, G-CFRW
24 September 2022, Near Pulborough, West Sussex

Synopsis

Shortly after an aerotow takeoff and during a noise abatement turn to the left, the glider released the tow at approximately 300 ft agl. The glider then pitched down rapidly and struck the ground in a nose low attitude at high speed. The pilot was ejected from the aircraft during the accident sequence and was found approximately 26 m from the aircraft. He sustained fatal injuries.



Images at the accident site showing that the L'Hotellier ball and cup were not connected

An on-site inspection of the aircraft revealed that the elevator was not connected to the elevator control rod.

Safety actions taken by the British Gliding Association

- Published an online 'Safe Rigging Toolkit' with significant emphasis on the human factors associated with mis-rigging.
- At the time of publication of the AAIB report the BGA is planning an animated video to provide guidance to BGA members for rigging gliders.
- The BGA is also reviewing the DI book format to include a dedicated box to record a Positive Control Check. A signatures box for when 'rigging is complete' and 'independent rigging checks if required' are also being considered.

Tekever AR5 Evolution Mk 2, G-TEKV
17 January 2023, Temporary Danger Area EG D098, over English Channel

Synopsis

Tekever AR5 Evolution

The unmanned aircraft encountered a loss of the communications link due to a fault in the Satcom antenna, such that it was not under the direct control of the remote pilot for a period of several minutes. In accordance with contingency procedures, the aircraft entered a holding pattern and the communications link was subsequently re-established. The remainder of the flight proceeded without incident.

Safety action

- As a result of this occurrence, the operator indicated that all future variants of the Tekever AR5 will be equipped with a feature that automatically enables Satcom backup when fewer than two C2 links are available. It considered that this change will further mitigate the hazard associated with loss of the C2 link.

Safety Actions Overview

Tekever AR3
2 July 2022, English Channel

Synopsis

During a Beyond Visual Line of Sight (BVLoS) flight over the English Channel, the engine stopped. The aircraft descended on a parachute into the sea and was subsequently recovered. Investigation revealed an issue with the low pressure (LP) fuel pump which caused it to fail and trip its associated electrical fuse. This fuse also provided electrical power to the high pressure (HP) fuel pump and, with both pumps stopped, the engine was starved of fuel.

The operator ceased operating the aircraft type until a number of improvements had been implemented.

The operator identified that the loss of the LP fuel pump, triggering of the fuel pump fuse and the internal failure of the LP fuel pump were all design issues that could lead to engine fuel starvation.

Safety action

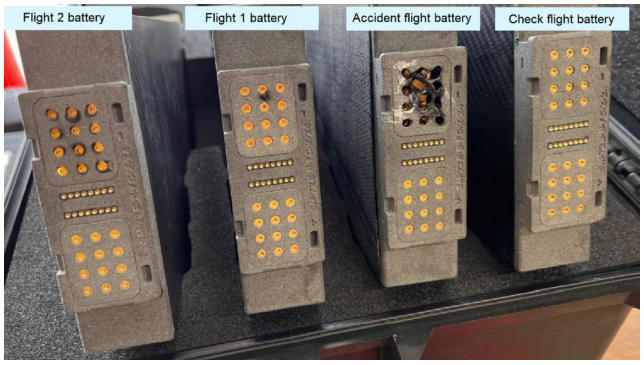
As a consequence, the operator has implemented the following design improvements:

- A modification to the fuel tank such that if the LP pump fails, the HP pump is able to draw fuel into the header tank.
- The LP and HP fuel pumps are provided with separate electrical fuses.
- Use of an upgraded version of the LP fuel pump.

Evolve Dynamics Sky Mantis
25 July 2022, St Albans, Hertfordshire

Synopsis

The unmanned aircraft fell to the ground from a height of 20 m due to a loss of electrical power. This was caused by separation of electrical connections due to thermal damage of the UA and battery connectors. Damage was also found to the batteries fitted during the three previous flights.



Damage to battery connectors

Safety action

- The manufacturer has updated the Sky Mantis Operations Manual to include an instruction during pre-flight to check that the aircraft and battery connections are clean and undamaged.

Safety Actions Overview

DJI Inspire 2
19 July 2022, Morlais Quarry, Mid Glamorgan

Synopsis

During a film shoot involving a large group of actors performing in close proximity to an Unmanned Aircraft (UA), an actor deviated from the briefed path and ran into one of the UA's propellers. The propeller struck him on the back of the neck, but the injuries were superficial.

The CAA's CAP 722 document provides guidance for operating Unmanned Aircraft Systems (UAS) in UK airspace but is ambiguous about the UAS operator gaining explicit consent from involved third parties for operating in close proximity to a UA.

How a UAS operator obtains explicit consent or permission from a large group of involved persons, 50 plus in this event, is not defined in CAP722. Nor does it appear practicable to ask each involved person simple questions to check their understanding when such a large group is involved.

Safety actions

- The CAA has taken action to review and amend CAP722 guidance to clarify the definition of an uninvolved person.
- The UAS operator and film director have agreed to do complete walk throughs of each scene with the actors and film crew before filming starts. More time has now been allocated for set up prior to close proximity shots so those involved can understand the location and flight path of the UA. This also allows time to fit the propeller bumpers when necessary.
- The operator has updated their risk assessment to include guidance and mitigation measures for future work of this nature.

DJI Mavic 2 Enterprise
7 August 2022, Bangor Train Station Car Park, Gwynedd

Synopsis

The UAS was being used in a police operation over an abandoned building near a public car park and train station. During hover over the building the aircraft's motors stopped and the aircraft fell vertically with no prior warning to the remote pilot. The aircraft struck the roof of the building and the battery separated. Recorded data indicated that the battery probably disconnected in flight. This could have been caused by the battery not having been fully latched prior to takeoff, or the latching mechanism or battery being worn from repeated use resulting in an in flight disconnection.

Image from the pilot's bodycam prior to takeoff

Safety actions

- The operator has shared the learning from this accident with all its UAS pilots and reminded them of their responsibility to turn on their body worn camera before they carry out the UAS pre-flight checks so that the checks are captured, and of their responsibility to take time on the UAS checks that are completed at a local air base to ensure the aircraft is fit for use.
- They also planned to reinforce the briefing of observers, and to carry out routine checks of the batteries.

Safety Actions Overview

Appendix 1

Commercial Aviation Safety Team (CAST) / ICAO Common Taxonomy Team (CICTT) 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/CNS	AIR TRAFFIC MANAGEMENT/COMMUNICATIONS NAVIGATION OR SURVEILLANCE
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 used in AAIB Reports

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
DME	Distance Measuring Equipment
EAS	equivalent airspeed
EASA	European Union 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)
FDR	Flight Data Recorder
FIR	Flight Information Region
FL	Flight Level
ft	feet
ft/min	feet per minute
g	acceleration due to Earth's gravity
GNSS	Global Navigation Satellite System GPS
GPWS	Ground Proximity Warning System
HP	high pressure
hPa	hectopascal (equivalent unit to mb)
hrs	hours (clock time 1200 hrs)
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

Glossary of Abbreviations used in AAIB Reports cont

km	kilometre(s)
kt	knot(s)
lb	pound(s)
LP	low pressure
LAA	Light Aircraft Association
LDA	Landing Distance Available
LPC	Licence Proficiency
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

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