Air Accidents Investigation Branch

Annual Safety Review 2024

Promoting action to prevent reoccurrence

AAIB
Air Accidents Investigation Branch

www.aaib.gov.uk

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Cover picture courtesy of Sophie Adams.

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CIAA Foreword

I am pleased to present the 2024 Annual Safety Review, which provides a comprehensive overview of occurrences reported to the Air Accidents Investigation Branch (AAIB) during the year, along with the safety actions taken or planned in response to our investigations.

In accordance with Annex 13 to the Convention on International Civil Aviation, the UK AAIB is mandated to investigate civil aircraft accidents and serious incidents occurring within the UK, its Crown Dependencies, and Overseas Territories[1]. Our mission is to enhance aviation safety by identifying the circumstances and causes of these events and promoting measures to prevent their recurrence.

In many respects, 2024 was a relatively typical year. The AAIB received 762 occurrence notifications—slightly fewer than the 790 received in 2023—and initiated 20 field investigations and 57 correspondence investigations. We also supported 53 new overseas investigations involving UK interests. Tragically, there were 10 fatal accidents in the UK, resulting in 11 fatalities, all within General Aviation. These included eight light aircraft and two glider accidents.

Loss of control in flight was the most common factor in these fatal accidents, though the specific circumstances varied widely. Other causes included abnormal runway contact, mid-air collision, and component failure. Human factors played a role in all the fatal accidents, with a range of performance-shaping and contributing factors identified.

Commercial aviation remains one of the safest forms of public transport, with global accident rates continuing their long-term decline. Nevertheless, major accidents in Japan, Brazil, Kazakhstan, and the Republic of Korea in 2024 serve as a sobering reminder that safety must never be taken for granted. Thorough investigations into accidents and serious incidents continue to be needed to uncover remaining vulnerabilities.

In 2024, the AAIB launched investigations into 32 commercial air transport events, most of which were serious incidents rather than accidents. Ten involved system or component failures, including some complex electrical malfunctions. Other events involved heavy landings, tail strikes, severe turbulence encounters, and ground collisions. There were three cases of loss of control in flight, two linked to autopilot mode mishandling—thankfully, none resulted in catastrophic outcomes.

Footnote

[1] A full list of regulations under which the AAIB operates can be found here https://www.gov.uk/government/collections/aaib-regulations-and-mous

FOREWORD

The AAIB issued 20 Safety Recommendations in 2024, addressing a broad spectrum of technical, operational, and organisational safety concerns. This review outlines each recommendation, the rationale behind it, the responses received, and the actions taken. Additionally, the Review highlights 103 significant safety improvements implemented proactively by the industry in response to AAIB investigations, without the need for formal recommendations.

As part of the UK Aviation State Safety Board, the AAIB monitors the implementation of actions taken in response to Safety Recommendations. This review also includes 69 updates on action taken in response to recommendations issued in previous years, enabling the formal closure of 29 recommendations. These updates reflect meaningful changes to regulations, design standards, and guidance materials—changes that will undoubtedly contribute to saving lives.

The 2024 Annual Safety Review consolidates a wealth of safety insights and developments. I trust you will find it both informative and valuable.

Crispin Orr
Chief Inspector of Air Accidents

FOREWORD


AAIB
Air Accidents Investigation Branch

Contents

CONTENTS

AAIB 24-hour Reporting Telephone Number: +44 (0)1252 512299

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

Consulation Period

6

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.

Response Review

7

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.

Approval for publication

8

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.

Pre-Publication

9

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.

Publication

10

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.

Post-Publication

11

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.

ACCIDENT TIMELINE

An overview of AAIB activity in 2024

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 graphics show the AAIB activity statistics for 2024. Of interest is that 2024 saw 762 notifications of an event or an occurrence to the AAIB. In 2023 this figure was 790 (See Appendix 2).

762
Notifications Received by the AAIB

53
Overseas Investigations

20
Field Investigations

This includes 10 Fatal Accidents, with 11 Fatalities

57
Correspondence Investigations

149
Record Only Investigations

447
No Further AAIB Action

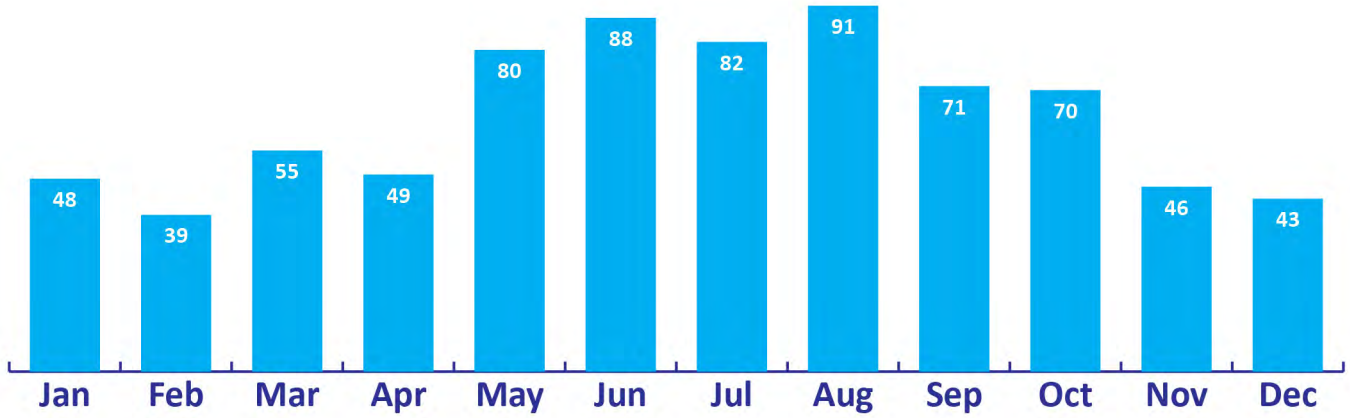
2
Assisting Military Investigations

34
Informed Sporting Association

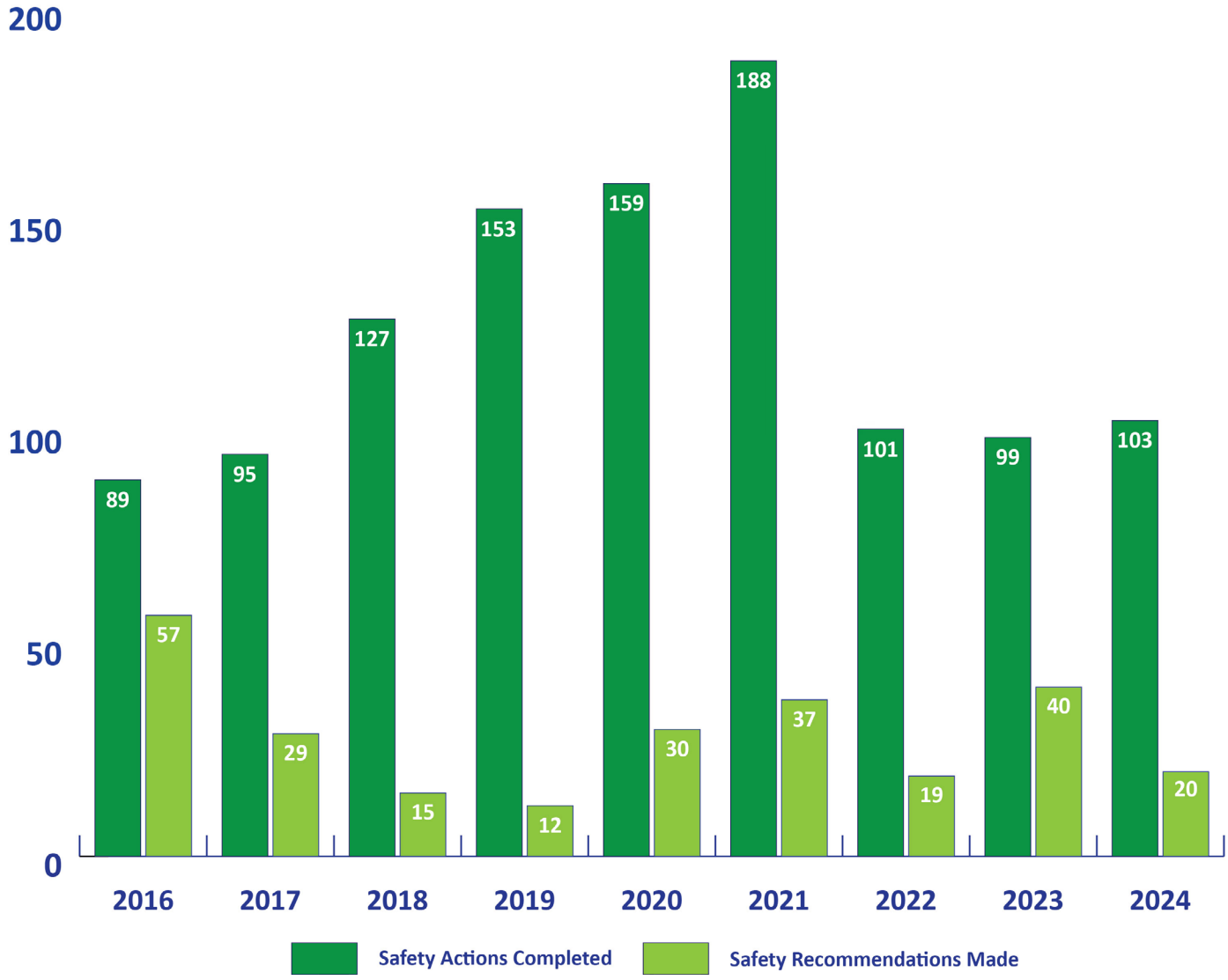
0
Formal Investigations

2024 AAIB OPERATIONAL STATISTICS

Number Of Notifications Received By Month



Number Of Safety Actions Completed & Safety Recommendations Made Between 2016 and 2024



2024 AAIB OPERATIONAL STATISTICS

AAIB
Air Accidents Investigation Branch

AAIB Bulletin 1/2024
AAIB Bulletin 2/2024
AAIB Bulletin 3/2024
AAIB Bulletin 4/2024
AAIB Bulletin 5/2024
AAIB Bulletin 6/2024
AAIB Bulletin 7/2024
AAIB Bulletin 8/2024
AAIB Bulletin 9/2024
AAIB Bulletin 10/2024
AAIB Bulletin 11/2024
AAIB Bulletin 12/2024

AAIB
Air Accidents Investigation Branch

Publications 2024

2024 AAIB OPERATIONAL STATISTICS

2024 AAIB OPERATIONAL STATISTICS

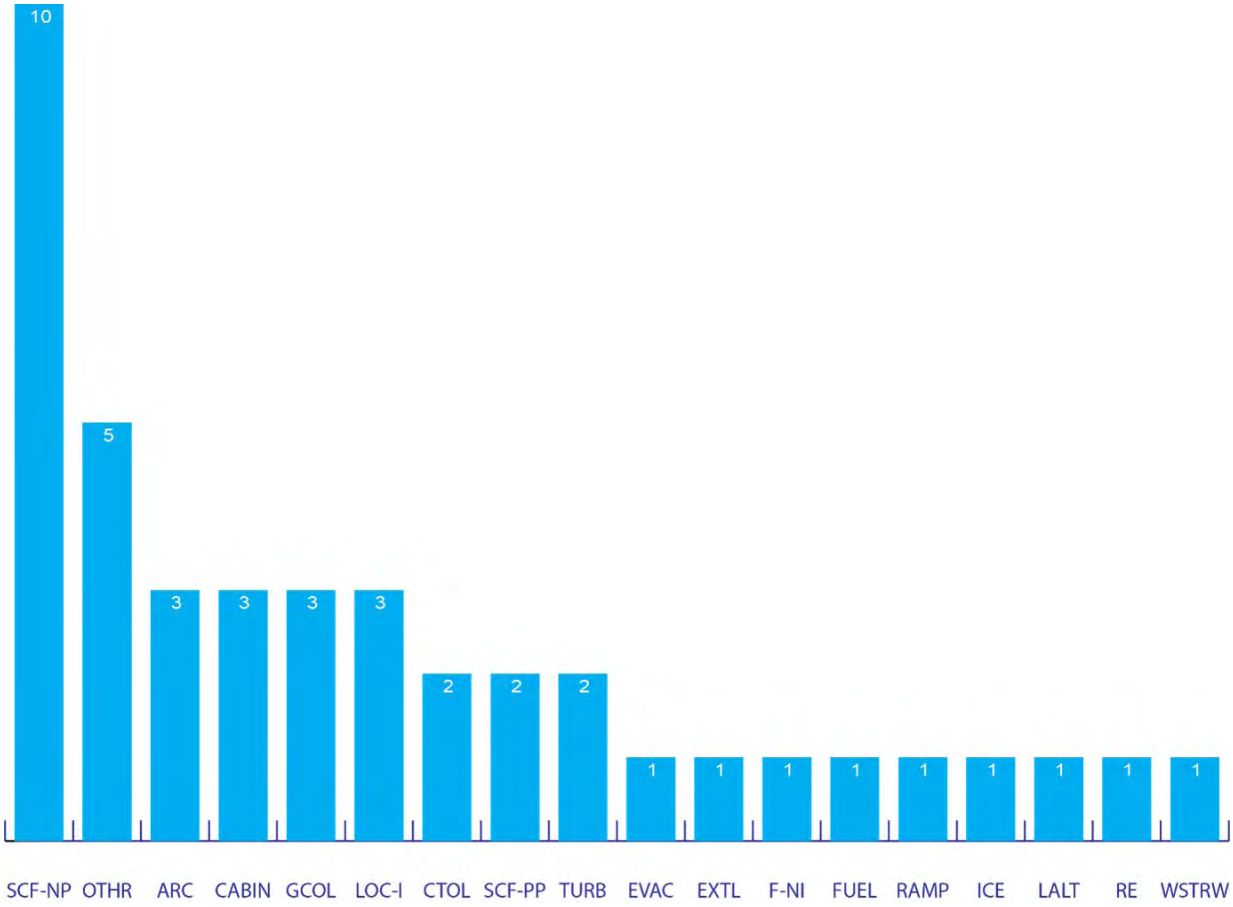
Categorisation of events reported on by the AAIB in 2024

Categorisation of events reported on by the AAIB in 2024

All reported events are categorised in accordance with the joint Commercial Aviation Safety Team (CAST) and the International Civil Aviation Organisation (ICAO) CAST/ICAO Common Taxonomy Team (CICTT) definitions. These categories are a combination of casual factors and outcomes. In this year's Annual Safety Review we have attempted to drill down on some of the themes for three important areas, namely Passenger Transport events, GA fatal accidents and UAS events that have been reported on in 2024.

Categorisation of CAT events

There were 32 Commercial Air Transport events that AAIB reported on in 2024 (12 Field and 20 Correspondence), and these resulted in 43 categorisations see figure below.



CATEGORISATION OF EVENTS

There were 10 'SYSTEM /COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT) (SCF-NP)' categorisations, with a wide variation in the systems that led to these categorisations. Three of the events were electrical. For example, D-AAAY, a Bombardier Challenger 600 business jet, had an uncommanded and unarrested flap movement above the maximum flap extension speed and was able to land with the flaps fully extended. A fault was found in the flap retract relay, four safety recommendations were made, and a number of safety actions were taken by the manufacturer and the regulator. G-NPTF, an ATR 72, suffered a significant electrical malfunction on approach causing the loss of the co-pilot's flight instrument displays and triggered a number of warnings and cautions. A wiring defect, probably caused by incorrect use of mechanical wire stripping tools at a third-party organisation, was the cause of the electrical malfunction. Illustrating the variation of these categorisations, several cabin windows were lost from G-OATW, an Airbus A321, shortly after takeoff; these had been damaged by infrared energy emitted by high intensity lights during filming on the ground the previous day.

There were 5 'OTHER (OTHR)' categorisations, the two most significant of which were G-EZWD and G-JMCU. G-EZWD is an A320 which took off from Jersey Airport with incorrect performance data entered into the Flight Management Guidance Computer; all safety margins were met but had there been an engine failure during takeoff there might have been an accident. G-JMCU is a Boeing 737-300 which took off from at Aberdeen Airport with flap 1 set instead of flap 5 and, whilst the performance was adequate on this occasion it, might have been an issue in other circumstances.

The 3 'Abnormal Runway Contact (ARC)' categorisations comprised two heavy landings with ATR72 aircraft (G-CMMT and EI-HDK), plus G-JMCV which is a 737-400 cargo aircraft that suffered a significant tailscrape as a result the takeoff mass being approximately 10 tonnes higher than the figure used for the takeoff performance calculations.

The 3 'CABIN SAFETY EVENTS (CABIN)' consisted of two events with Boeing 777s that were a result of severe turbulence in June 2023 (G-STBL en route over the Bay of Bengal and G-YMML which was about 15 minutes prior to landing at Beijing); these were both also categorised as 'TURBULENCE ENCOUNTERS (TURB)'. There was also a Boeing cargo 737-400 G-JMCZ in which the cargo shifted during flight.

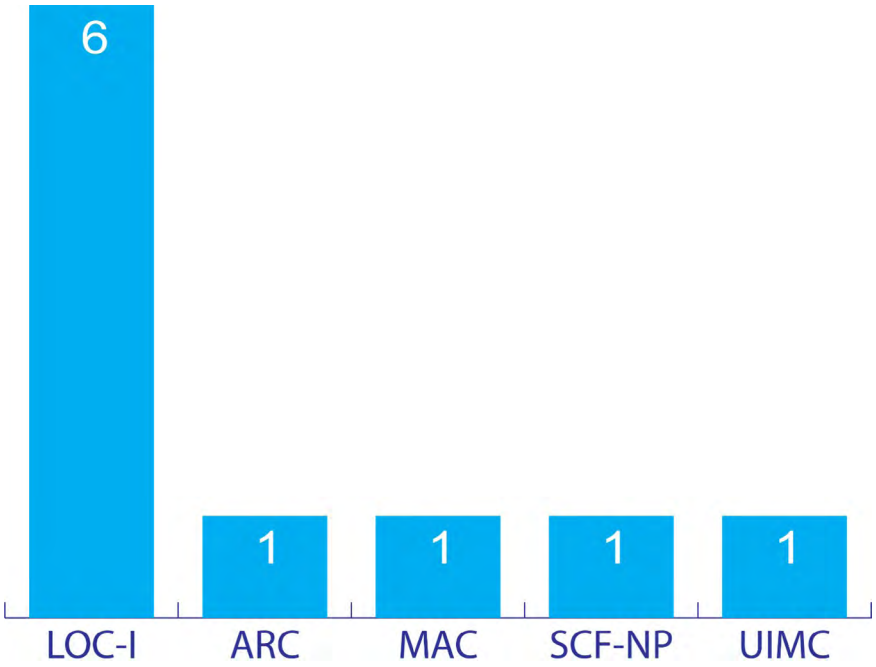
There were 3 'GROUND COLLISION (GCOL)' categorisations with a wide variation in scenarios, including a ground collision involving two passenger transport aircraft (GVDIA a Boeing 787-9 and G-XWBC an A350-1000), an AW139 with registration 5NBOX the rotors for which struck a lamp post while ground-taxiing during a nonrevenue flight, and EI-EGD a taxiing Boeing 737-800 which collided with a ground vehicle.

The 3 'LOSS OF CONTROL - INFLIGHT (LOC-I)' categorisations were EI-HET, a Boeing 737-8200, that committed a level bust during a go-around flying in IMC, G-MCGT an AW189 on a Search and Rescue mission in poor visibility experienced unexpected yaw when a mode in the Automatic Flight Control System was selected (the system was later found to be serviceable and performed as designed), and D-CMSL a Pilatus PC-24 business jet which had stiff elevator controls and lost 800 ft near the top of its climb, although the post flight examination could not find any technical faults.

CATEGORISATION OF EVENTS

Categorisation of GA fatal accidents

There were nine fatal accidents that were reported by the AAIB in 2024. These nine fatal accidents resulted in ten event categories being assigned and are presented in the figure below.



The 6 accidents with LOSS OF CONTROL LOC-I as an event category were as follows:

- G-AYUH a PA28 accident in which the pilot lost control in fog, hence UIMC was also an event category.
- G-CLHJ an accident involving a kit-built replica of a Spitfire Mk 26B in which control of the aircraft was lost during a flight to test the effects of leading edge stall strips.
- G-CMFS a DB-6RS hot air racing balloon that was taking part in a competition which involved dropping markers close to a target. It is likely that the balloon suffered a parachute stall.
- G-CIEF an accident involving a Eurofox 912(S) which lost control.
- G-CHBB an accident involving a Schleicher ASW 24 in which control was lost during an aero tow launch shortly after takeoff.
- G-IFLE an EV-97 teamEurostar. Control of the aircraft was lost at about 700 ft agl and it entered a spin from which it did not recover.

The other categorisations were:

- G-RVSH a Vans- RV-6A that landed on the grass to the side of the grass runway. The nosewheel dug in and the aircraft came to rest inverted. This was assessed as ABNORMAL RUNWAY CONTACT ARC.

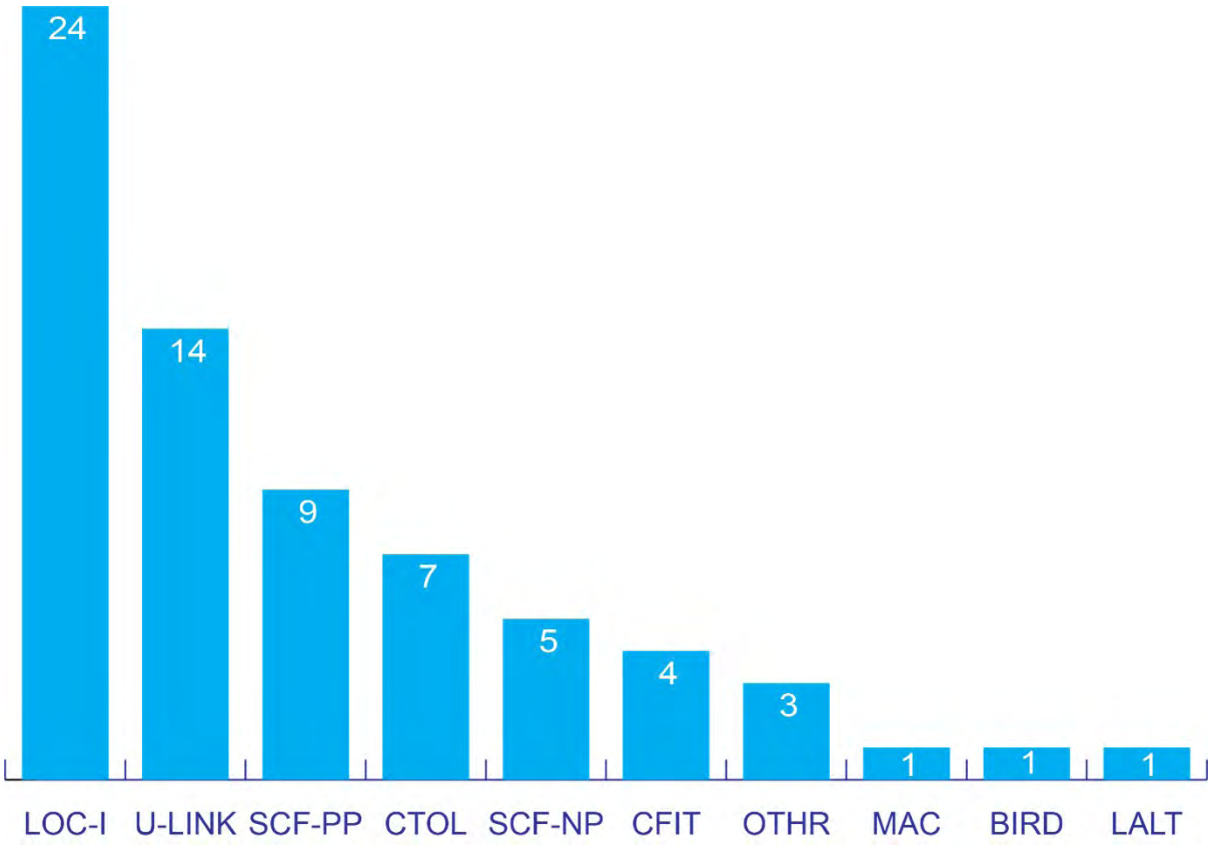
- G-KADS a Ventus-2CT glider that had a mid-air collision in a thermal during a competition. It was assessed as AIRPROX/TCAS ALERT/LOSS OF SEPARATION/ NEAR MIDAIR COLLISIONS MAC.

- G-CKYT a Rotorsport UK Cavalon gyrocopter that suffered a component malfunction hence SYSTEN/COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT) SCF-NP.

LOC-I is the major categorisation for GA fatal accidents, which is consistent with recent years. However, it would be incorrect to summarise these using the much-used phrase "pilot error was the cause". The first three of these LOC-I cases above (G-AYUH, G-CLHJ and D-CMFS) had significant other factors that contributed to the loss of control; clearly the cause of these nine fatal accidents is nuanced and needs to be viewed in context, on a case-by-case basis.

Categorisation of UAS events

The AAIB reported on 54 UAS events in 2024; two were serious incidents and 52 were accidents. The 54 events were broken down into one field report, three Correspondence reports and 50 Record Only reports.



CATEGORISATION OF EVENTS

At first sight these UAS events might not appear to be that significant; to date there has not been a fatality in the UK resulting from a UAS event for example. However, the AAIB has adopted a proactive approach to investigating UAS events because this sector of aviation is developing quickly and has many manufacturers from non-traditional aviation backgrounds.

The trends in number of UAS being operated, size, complexity and level of autonomy are all increasing, and these are likely to result in increases in frequency and severity of UAS accidents in the UK.

The 24 'LOSS OF CONTROL – UNFLIGHT (LOC-I)' categorisations dominate the UAS events. Of these five were model aircraft that were assessed by the AAIB as worthy of reporting; three of these were a result of the remote pilot losing sight of the aircraft and two were also categorised as UAS – LOSS OF LINK (U-LINK). A further eight non-model UAS events were a result of the remote pilot losing control, typically in manual flight. For the remaining 11 events LOC-I was the outcome resulting from another factor.

There were 12 UAS events categorised as 'UAS – LOSS OF LINK (U-LINK)'. This is a UAS specific category, and this relatively high number suggests that this is an area of concern if similar communication technologies are to be used with larger UAs which are likely to have more significant outcomes.

The 9 'SYSTEM/COMPONENT FAILURE OR MALFUNCTION (POWERPLANT) (SCF-PP)' categorisations were mostly a result of electric motor issues. Other issues included batteries detaching, speed controller issues and rotor head failures.

The most notable feature of the 7 'COLLISION WITH OBSTACLE(S) DURING TAKEOFF AND LANDING (CTOL)' is that three involved the UA striking overhead cables, and two of these events were at night.

The 5 'SYSTEM /COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT) (SCF-NP)' cases consisted of three model aircraft. There were two cases in which the fixed wings failed and folded up in flight (one model aircraft and one conducting a survey flight). There also was a correspondence report concerning a swarm of UAs being flown in which a flat battery in the controller resulted in the UAs flying out of formation.

There were 4 'CONTROLLED FLIGHT INTO OR TOWARD TERRAIN (CFIT)' categorisations. One struck a tree on a film set, another struck power cables whilst manoeuvring (and not during takeoff or landing), another was being operated in 'Sport' mode which disabled the collision avoidance feature and struck a tree, and the other was being operated by an unknown remote pilot and struck a ship being towed 300 m from land.

There were 3 UAS events categorised as 'OTHER (OTHR)', and these were all related to pre-programmed flight paths, for example a UA flying out of a lock-off area on a film set.

It is clear from there are a wide variety of factors with UAS events, and many of these are specific to UAS operations and are often different to fixed wing aircraft.

CATEGORISATION OF EVENTS

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, 2024-001 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.

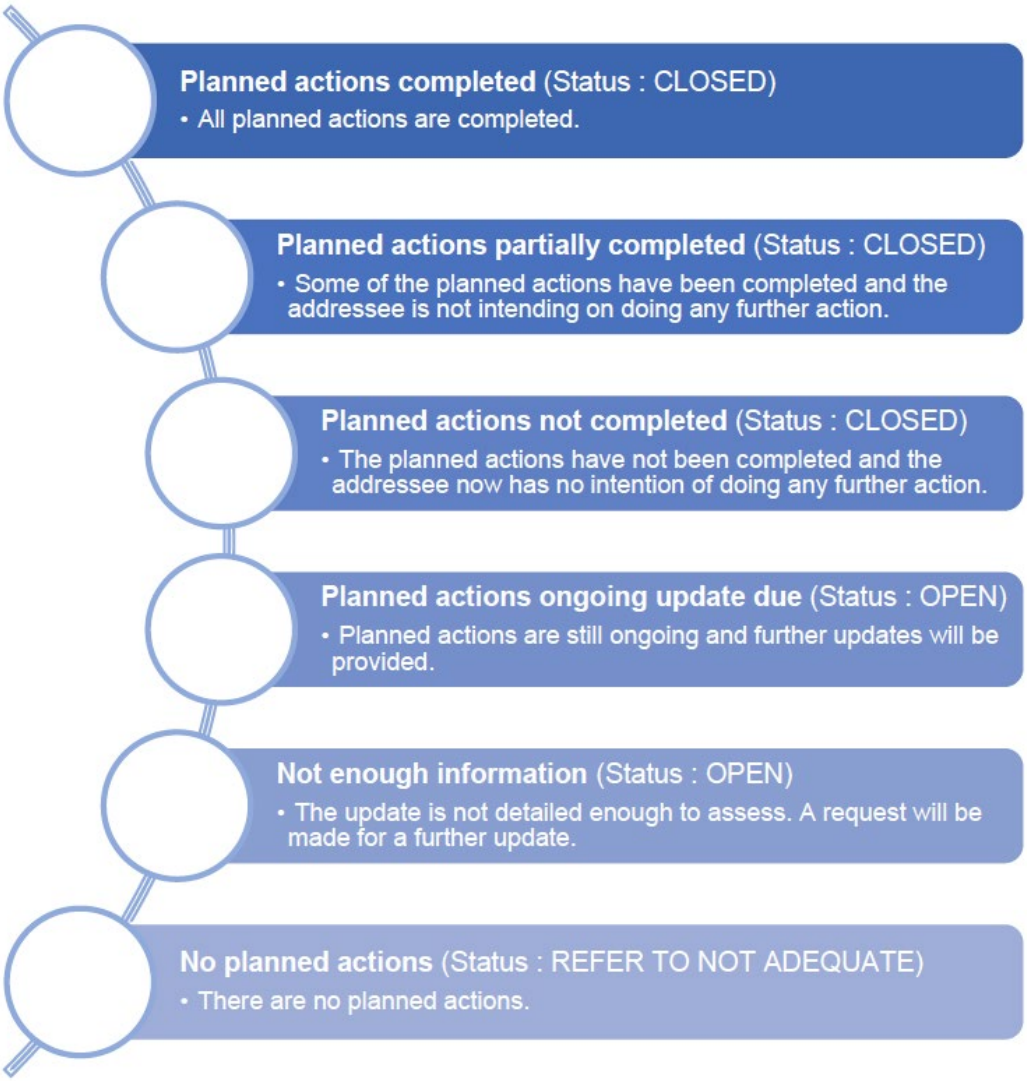
Not Adequate - OPEN the status of 'open' implies that AAIB still has concerns regarding the identified safety deficiency and that there is an expectation that the addressee will provide further responses.

SAFETY RECOMMENDATIONS OVERVIEW

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.

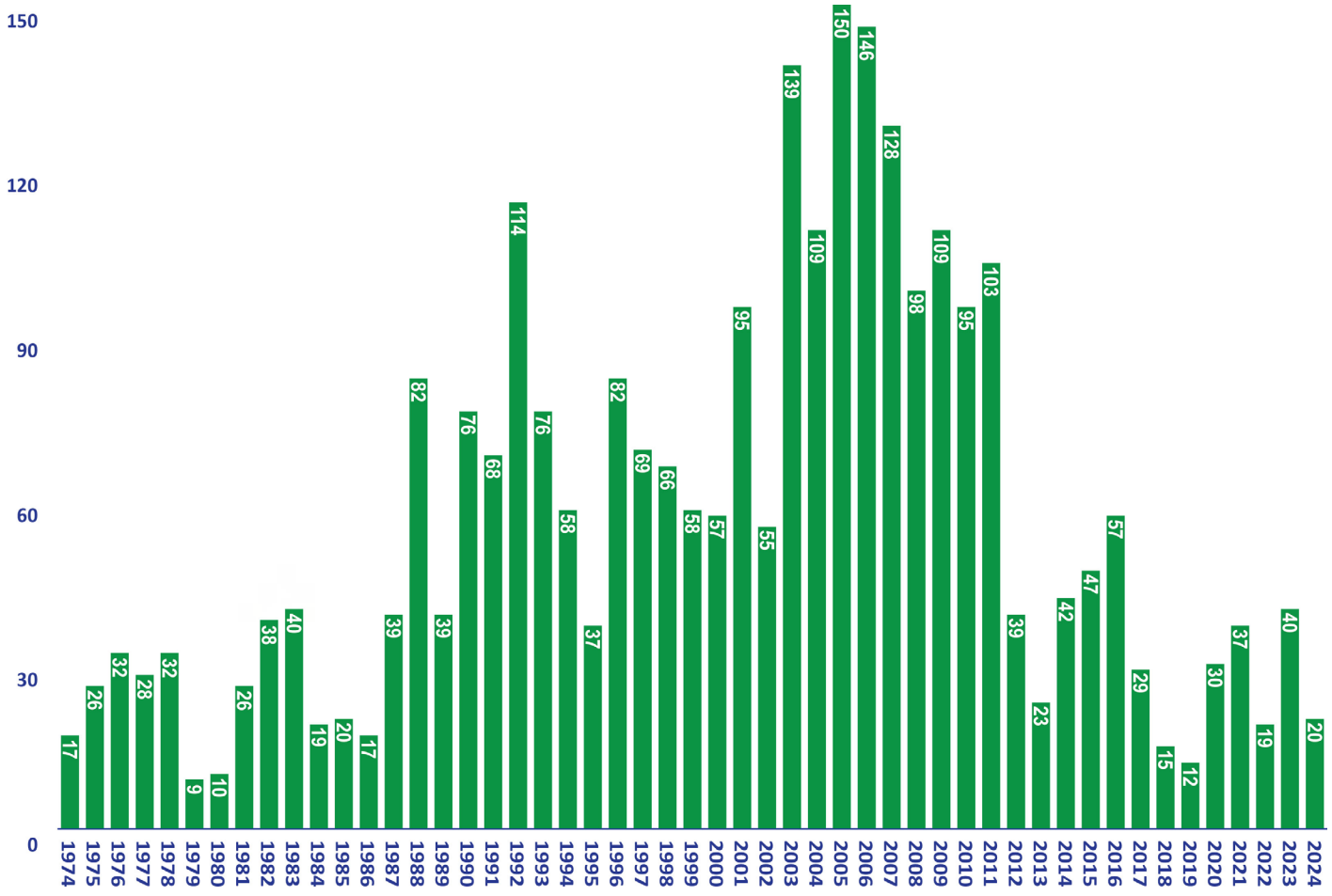
Superseded means the Safety Recommendation has been 'Superseded' either by a 'newer' and more comprehensive Safety Recommendation or actions have subsequently been taken by the addressee that have superseded the recommendation.

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



SAFETY RECOMMENDATIONS OVERVIEW

Number Of Safety Recommendations Made Between 1974 and 2024



Number of Safety Recommendations made between 1974 and 2024

Of the 20 Safety Recommendations issued in 2024, as of 23 January 2025, responses have been received for 16 Safety Recommendations. The AAIB response assessment has classified those responses as follows:

- One was assessed as Adequate and is **Closed**.
- Seven were assessed as Adequate, with planned actions ongoing and remain **Open**.
- Seven were assessed as Partially adequate, with planned actions ongoing and remain **Open**.
- One was assessed as Partially adequate but is **Closed.**
- Four were assessed as **Awaiting response**.

SAFETY RECOMMENDATIONS OVERVIEW

SAFETY RECOMMENDATIONS OVERVIEW

Summary Table for Safety Recommendations made during 2024

Number	Case	AAIB Response	Status
2024-001	G-AXSG	Adequate, planned action completed	Closed
2024-002	G-MPSB	Adequate, planned action ongoing, update due 01 December 2024	Open
2024-003	G-MPSB	Partially adequate, planned action ongoing, update due 28 February 2025	Open
2024-004	G-MIIL	Partially adequate, planned action ongoing, update due 01 May 2025	Open
2024-005	G-MIIL	Partially adequate, planned action completed	Closed
2024-006	G-CICF	Partially adequate, planned action ongoing, update due 30 April 2025	Open
2024-007	N709EL	Adequate, planned action ongoing, update due 31 March 2025	Open
2024-008	G-CMFS	Adequate, planned action ongoing, update due 28 February 2025	Open
2024-009	G-CMFS	Adequate, planned action ongoing, update due 31 January 2025	Open
2024-010	G-CMFS	Adequate, planned action ongoing, update due 31 January 2025	Open
2024-011	G-CMFS	Partially adequate, planned action ongoing, update due 31 January 2025	Open
2024-012	G-CMFS	Adequate, planned action ongoing, update due 28 February 2025	Open
2024-013	G-CDFK	Partially adequate, planned action ongoing, update due 31 March 2025	Open
2024-014	G-CDFK	Partially adequate, planned action ongoing, update due 31 March 2025	Open
2024-015	N197DN	Partially adequate, planned action ongoing, update due 31 December 2024	Open
2024-016	UAS Malloy T150	Adequate, planned action ongoing, update due 01 March 2025	Open
2024-017	G-CKYT	Awaiting response	Open
2024-018	G-CKYT	Awaiting response	Open
2024-019	G-CKYT	Awaiting response	Open
2024-020	G-CKYT	Awaiting response	Open

SAFETY RECOMMENDATIONS OVERVIEW

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

The AAIB did not assess any Safety Recommendations issued in 2024 as being a 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 that was initially 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 addresses. 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 2024 by the AAIB are shown in the figure below.

Safety Recommendations issued during 2024

Piper PA-28-180, G-AXSG

7 April 2023, St Mary's Airport, Isles of Scilly

Investigation synopsis

On touchdown the left main landing gear collapsed. The cause of the collapse was failure of both upper torque link attachment lugs on the landing gear cylinder due to fatigue cracking. There is a known history of fatigue cracking on cast landing gear cylinders and a manufacturer's Service Bulletin exists to regularly inspect the area around the attachment lugs. There is currently no Airworthiness Directive to mandate the Service Bulletin.

Detached torque link lugs and wheel assembly

Safety Recommendation 2024-001

Justification

While Service Bulletin SB1131A is still current, the EASA AD mandating it was cancelled in 2020 as EASA determined that an acceptable level of safety existed. Cast main landing gear cylinders are still fitted to aircraft and fatigue cracking of the lugs continues to occur. To ensure that an acceptable level of safety still exists for the cast cylinders fitted to PA-28 and PA-32 aircraft, and to provide appropriate guidance on inspecting the cylinders, the following Safety Recommendation is made to the CAA.

2024-001

It is recommended that the Civil Aviation Authority undertakes an unsafe condition assessment, in accordance with the requirements of UK Regulation (EU) No 748/2012 Annex I Part 21.A.3, for the cast main landing gear cylinder cracking affecting PA-28 and PA-32 aircraft, and take appropriate action based on the outcome of the assessment.

SAFETY RECOMMENDATIONS ISSUED IN 2024

Date Safety Recommendation made: **25 January 2024**

Latest response received: **24 April 2024**

The CAA accepts this Safety Recommendation.

The CAA has undertaken an 'unsafe condition assessment' in accordance with UK Reg (EU) No 748/2012, Annex I, Part 21.A.3B for landing gear failures involving UK registered Piper PA-28 and PA-32 aircraft for the period 2017-2023 (inclusive).

The assessment calculated an effective occurrence rate for the fleet by taking the number of PA-28/PA-32 landing gear failures over the seven-year period and dividing it by the total hours accumulated by the UK PA-28/PA-32 fleet for that period. That figure was then compared against an 'allowable' quantitative probability of one in 10,000 flying hours for a 'Major' failure condition, as defined in FAA AC23.1309-1E. The CAA considers this approach to be conservative.

The occurrence rate was found to be well within the allowable quantitative probability (by approximately three times) and indicates that mandatory action to mitigate landing gear failures affecting the UK PA-28 and PA-32 fleet is not warranted.

Nevertheless, the CAA recognises the importance of raising awareness around this issue and will therefore be publishing a Safety Notice, recommending that owners, operators, and maintainers of PA-28 and PA-32 aircraft carry out landing gear inspections at the next routine maintenance check with any findings of cracking to be reported to the CAA. The Safety Notice will also highlight Piper Service Bulletin SB1131A and recommend that it be incorporated into the aircraft maintenance programme. The CAA expects the Safety Notice to be published before the end of June 2024.

The CAA considers the above actions satisfy the intent of the Safety Recommendation.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The unsafe condition assessment that has been carried out to establish an effective occurrence rate for landing gear failures on the PA-28 and PA-32 aircraft, and issue of the Safety Notice on 2 May 2024 meets the intent of the Safety Recommendation.

SAFETY RECOMMENDATIONS ISSUED IN 2024

MBB-BK 117 C-2, G-MPSB

12 March 2021, North Weald Airfield, Essex

Investigation synopsis

This Serious Incident occurred during the demonstration of an engine failure after takeoff emergency procedure on a revalidation flight for the commander's type rating instructor qualification. The engine failure was simulated by the commander reducing Engine No 1's throttle to idle. Shortly afterwards the commander increased the throttle setting, but Engine No 1 did not respond. During attempts to resolve the problem, the throttle setting for Engine No 2 was inadvertently reduced, resulting in insufficient power being available for continued safe flight. The commander rejected the takeoff and executed a firm landing within the airfield boundary.

G-MPSB landing gear (viewed from front looking rear)

While the aircraft's skid assembly was deformed as a result of the landing, the touchdown forces did not exceed the manufacturer's threshold for it to be classified as a 'hard landing.' The subsequent engineering investigation did not find any evidence of malfunction in the engine control systems. Engine No 1 probably did not respond because the rotor rpm droop compensation had been inadvertently trimmed in the wrong direction.

Safety Recommendations 2024-002 and 2024-003

Justification

The investigation found that the event might have been avoided by using a different throttle handling technique when simulating the engine failure, and the helicopter manufacturer stated that it intended to take two safety actions:

- To develop formal guidance to pilots delivering simulated one engine inoperative (OEI) training in the helicopter using the one engine at idle technique.
- Review the appropriateness and scope of the rotorcraft flight manual (RFM) limitation requiring the use of the manufacturer's training device when conducting OEI training at maximum training gross mass (MTGM).

The helicopter manufacturer had not taken the intended safety action. Accordingly, the following two Safety Recommendations were made.

2024-002

It is recommended that Airbus Helicopters Deutschland GmbH develop formal guidance to pilots delivering simulated one engine inoperative training in MBB-BK 117 helicopters using the one engine at IDLE technique.

Date Safety Recommendation made: **13 March 2024**

Latest response received: **5 July 2024**

Please Note: The corresponding one engine inoperative (OEI) training procedure is limited to those MBB-BK117 versions only with a Twist Grip installed. To be precise – the Flight Crew OEI Training Material/Guideline will be limited to the MBB-BK117 C-2 version.

At this point in time Airbus Helicopters (AH) is developing a dedicated OEI Training Material/ Guideline in collaboration between the project & flight safety pilots of the flight test department and the corresponding AHD ATO chief flight instructor team. As soon as a reliable publication date is defined and a document draft version is available, AH will promptly pass this information on to the AAIB.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**

Update due 01 December 2024

Safety Recommendation Status: **Open**

2024-003

It is recommended that Airbus Helicopters Deutschland GmbH review the appropriateness and scope of the MBB-BK 117 rotorcraft flight manual limitation requiring the use of the manufacturer's training device when conducting one engine inoperative training at maximum training gross mass.

Date Safety Recommendation made: **13 March 2024**

Latest response received: **05 July 2024**

It is intended by Airbus Helicopters to enhance the document by a dedicated CAUTION within the Rotorcraft Flight Manual Section 9. Flight Manual Supplements, Sub-chapter 9.1 Special Operations, 9.1-3 OEI Training, A.4. Normal Procedures:

"OEI training without the training device (P/N B032M0820101), with manipulation of the twist-grip, bears a greater risk to exceed engine limitations as well as the risk of an inadvertent operation of the wrong twist grip."

SAFETY RECOMMENDATIONS ISSUED IN 2024

Please Note: The reference with regard to operating weight and the usage of the OEI training device as defined within the chapter Rotorcraft Flight Manual Section 9. Flight Manual Supplements, Sub-chapter 9.1 Special Operations, 9.1-3 OEI Training, D.2. Limitations - "For CAT A Training with max. training gross mass the OEI Training device must be installed and operating." - will remain unchanged.

The up-issue of the Rotorcraft Flight Manual will be scheduled within the next common washup revision. As soon as a reliable authority approval and publication date is defined, Airbus Helicopters will share this information with the AAIB accordingly.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**

Update due 28 February 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB invites Airbus Helicopters to reconsider how the Rotorcraft Flight Manual expresses the requirement to use the training device at maximum training gross mass. As currently written, it appears that the training device would not be required at maximum training gross mass minus 1 kg, which would, in effect, mean the device was never required. There might, for example, be a mass that is less than the training gross mass above which the device is required but below which it is not.

The AAIB requests a further response on this issue by the end of February 2025.

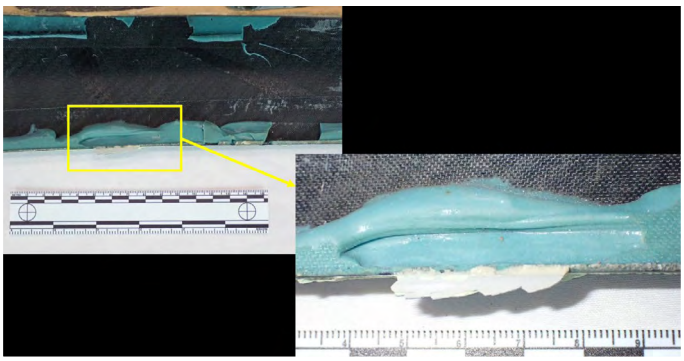
SAFETY RECOMMENDATIONS ISSUED IN 2024

Extra NG, G-MIIL

2 April 2022, Upper Heyford, Oxfordshire

Investigation synopsis

Whilst the aircraft was in straight and level flight at 184 KIAS, the canopy broke up without warning. The pilot, the only occupant of the aircraft, sustained serious injuries and was unable to continue flying the aircraft. He was wearing a parachute and bailed out, the aircraft entering a descent and colliding with an unoccupied block of flats.



Area of epoxy bond showing there was no contact with the inner frame

The investigation identified a lack of appropriate bonding between the inner and outer canopy frame around the front of the canopy. This caused localised and increased stresses within the transparency which under flight loads promoted fatigue crack development. When these cracks reached a critical length, catastrophic failure resulted.

Safety Recommendation 2024-004

Justification

The canopy fitted to G-MIIL broke up whilst operating within the aircraft's certified flight envelope due to fatigue cracking of the acrylic transparency. The cracking was initiated by differential forces acting on the canopy frame, induced by inadequate bonding between the inner and outer frame. This, in turn, caused localised stresses being imparted into the transparency, presenting conditions which promoted fatigue crack development. This resulted in a catastrophic failure of the canopy when cracks reached a critical length.

Therefore, the following Safety Recommendation was made:

> **2024-004**
>
> It is recommended that the European Union Aviation Safety Agency (EASA) ensure the canopies fitted to all Extra NG aircraft are manufactured to meet the required certification standards and can withstand expected aerodynamic and flight loads.

Date Safety Recommendation made: **16 February 2024**

Latest response received: **26 April 2024**

The European Union Aviation Safety Agency (EASA), together with the aircraft manufacturer, has reviewed the design data of the EXTRA NG canopy. The manufacturing process, used to bond

the inner and outer canopy frames with each other, and the canopy glass with the previously bonded canopy frame, is unchanged compared to the earlier Type Design EA 300 for which no similar in-service occurrence was recorded. Additionally, the Type Certificate Holder (TCH) has conducted a computational fluid dynamics (CFD) analysis under conservative assumptions which has shown that the canopy assembly meets the required certification standards.

Nevertheless, EASA is evaluating, with the aircraft manufacturer, the need to perform on a voluntary basis, a one-time Non-Destructive Test (NDT) to verify the correct bonding of the in service canopy frames as precautionary measure.

EASA is also considering the scenario presented by Bundesstelle für Flugunfalluntersuchung (BFU) on the role that the change in the locking mechanism of the canopy of the Extra NG compared to the previous models might have had in the accident.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**

Update due 01 May 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges the EASA response and the suggested testing of the canopy. The AAIB will await the results of the proposed actions with an update due by May 2025.

Safety Recommendation 2024-005

Justification

SB-NG-2-22 was introduced by the manufacturer to address inadequate bonding of areas of the cockpit canopy during the manufacture of early production Extra NG aircraft. The investigation was unable to establish the effectiveness of the SB due to the unknown adhesive ability of the foam used, the existing state of surfaces it contacts and the extent to which it penetrates voids due to existing epoxy bond bead lines and exposed peel ply surfaces. In addition, as the foam adhesive is only applied at the front of the canopy, the SB does not rectify the anomalies found in the quality of the inner and outer canopy frame bonding on both sides of the canopy or its hinge pin brackets.

Therefore, the following Safety Recommendation was made:

2024-005

It is recommended that the European Union Aviation Safety Agency (EASA) assess the effectiveness of SB-NG-2-22 in rectifying inadequate bonding.

SAFETY RECOMMENDATIONS ISSUED IN 2024

Date Safety Recommendation made: **16 February 2024**

Latest response received: **28 November 2024**

The European Union Aviation Safety Agency (EASA) considers the conclusion received on 28/06/2024 (AAIB-28120) concerning the scope of the SB-NG-2-22 is correct. Notwithstanding the above, EASA's view is that Extra NG aircraft canopies comply with the applicable certification requirements even without the incorporation of the aforementioned SB. As a precautionary measure, the manufacturer is willing to recommend a one-off inspection of canopy frames as per Aircraft Maintenance Manual 20-10-06 on aeroplanes in service. Furthermore, not overlooking the possibility that the canopy was not correctly latched, the manufacturer is offering an improvement on the latching system together with a proactive replacement of the outer canopy frame, or even replacing with a new canopy as an alternative. Together, EASA finds that these improvements fully satisfy the intent of this Safety Recommendation.

EASA Status: Closed – Partial Agreement

AAIB Assessment: **Partially adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

EASA's response to the adequacy of SB-NG-2-22 does not address the direct concerns of the AAIB in ensuring that the injected foam bond will spread across all the surfaces within the frame void or that the composite surfaces themselves will be prepared to ensure adequate bonding.

In addition, EASA remains of the opinion that all Extra NG aircraft canopies comply with the applicable certification requirements, even without the incorporation of the aforementioned SB. This certification requirement includes drawings, material selection and the assembly process, with the manufacturer needing to demonstrate that component testing conforms, in his case, to CS 23. However, achievement of certification requirements relies on components being consistently manufactured exactly to the drawings. The canopy fitted to G-MIIL was not.

As a precautionary measure, EASA states the manufacturer is willing to recommend a one-off inspection of canopy frames as per Aircraft Maintenance Manual 20-10-06 on aeroplanes already in service. Furthermore, the manufacturer is offering an improvement on the latching system with a proactive replacement of the outer canopy frame, or entire canopy.

The AAIB concluded that the accident was not a result of improper latching of the canopy. The AAIB, however, accepts EASA's position that these improvements by the manufacturer, once completed, should ensure the airworthiness of the canopy and, as such, the response to the recommendation is deemed Partially Adequate and the recommendation closed.

SAFETY RECOMMENDATIONS ISSUED IN 2024

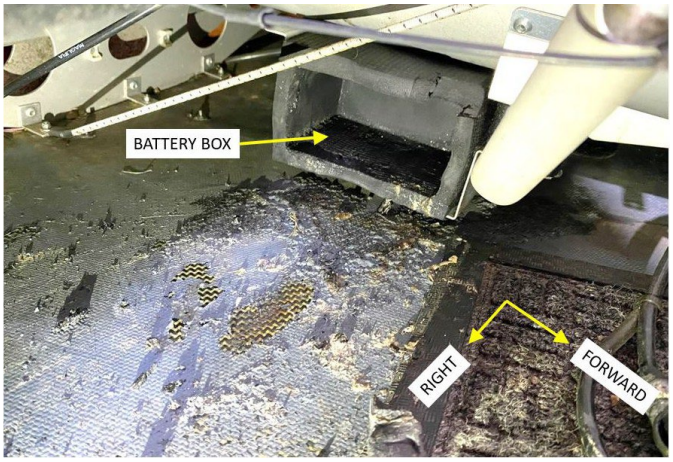
Ikarus C42 FB80 Bravo, G-CICF

8 December 2022, Headcorn Aerodrome, Kent

Investigation Synopsis

The aircraft's lithium-ion main battery caught fire shortly after takeoff, creating significant quantities of smoke and hazardous gases within the aircraft cabin that affected the ability of the pilot to safely control the aircraft. A passenger, sitting in the right seat, was able to open the cabin door in flight, which reduced the level of smoke in the cabin and the aircraft landed safely.

The investigation did not identify the cause of the battery fire. The location of the battery within the aircraft's cabin exposed the occupants to significant hazards when the battery caught fire, as the battery box did not contain the combustion products or heat from the fire.



Damage to the cabin floor caused by the battery fire

Safety Recommendation 2024-006

Justification

The aircraft's lithium-ion main battery caught fire shortly after takeoff, creating significant quantities of smoke and hazardous gases within the aircraft cabin that affected the ability of the pilot to safely control the aircraft. The location of the battery within the aircraft's cabin exposed the occupants to significant hazards when the battery caught fire, as the battery box did not contain the combustion products or heat from the fire. A similar airborne battery fire to the same aircraft type and lithium-ion battery type was found to have occurred in Germany, resulting in destruction of the aircraft.

Therefore, the following Safety Recommendation was made:

> **2024-006**
>
> It is recommended that the Civil Aviation Authority amends the design and installation requirements for lithium-ion main batteries that are located in the cabin areas of Non-Part 21 aircraft, to minimise the hazard to aircraft occupants following a thermal runaway.

Date Safety Recommendation made: **16 February 2024**

Latest response received: **31 October 2024**

The CAA has completed an initial review of the Part 21 and non-Part 21 design and installation requirements for lithium-ion main batteries located in cabin areas of general aviation (GA) aircraft.

The initial airworthiness requirements contained in BCAR Section S, CS-VLA, CS-LSA, CS-22, and CS-23 were considered as part of this review. We found that each design code includes requirements to protect occupants from hazardous quantities of explosive or toxic gas emitted by batteries, both in normal operation and following probable malfunctions. Part 21 aircraft fitted with lithium battery installations are held to a higher safety standard and are required to comply with the additional requirements in SC-ELA.2015-01 as well as the requirements in the relevant Certification Specification. The CAA therefore considers Part 21 aircraft to be adequately protected from the risk of a lithium battery fire at this time.

The CAA recognises that non-Part 21 aircraft fitted with a lithium main battery are at increased risk in this regard and we endeavour to address this.

The CAA will work with the Light Aircraft Association (LAA) and British Microlight Aircraft Association (BMAA) to review and, where necessary, amend their existing standard modifications for fitment of lithium main batteries in place of standard lead-acid batteries to ensure the installations comply with the relevant design and installation requirements.

The CAA will also be reminding organisations holding an A8-1 approval of their responsibility to promulgate safety information (e.g. service bulletins) issued by the aircraft manufacturer to ensure that critical safety information is provided to operators in a timely manner.

The CAA will provide an update on the actions taken to address this Safety Recommendation by 30 April 2025.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**

Update due 30 April 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges the CAA's initial response to SR 2024-006 and looks forward to a further update on the actions taken to address this Safety Recommendation.

SAFETY RECOMMENDATIONS ISSUED IN 2024

Beech 400A, N709EL

7 October 2022, Newquay Airport, Cornwall

Investigation Synopsis

Immediately after touchdown the flight crew noticed the deceleration was greater than normal. Reverse thrust and speed brakes were applied, and as the aircraft slowed below about 50 kt the aircraft started to drift towards the right side of the runway. A combination of weathercocking into the wind and applying left pedal brought the aircraft back to the runway centreline where it came to rest angled about 45° to the left of the centreline, with the mainwheel tyres deflated and the brakes seized.

The rapid deceleration on touchdown was caused by either the tyres having already deflated due to the fuse plugs having melted, or the brakes being seized, or a combination of both. This was the result of the brakes having been heated during the takeoff run because the parking brake had been left on with partial pressure applied.

The lack of a light or caption to indicate that the parking brake is on, or an aural or visual warning that the parking brake is on when takeoff power is applied, may have contributed to the incident, as may have the lack of a 'release parking brake' item in the 'Before Takeoff' checklist.

Left and right mainwheel tyres after the incident landing

Safety Recommendation 2024-007

Justification

The lack of a 'release parking brake' item in the 'Before Takeoff' checklist may have contributed to this accident.

Therefore, the following Safety Recommendation was made:

> **2024-007**
>
> It is recommended that Textron Aviation Inc. amend the checklists for the Beech 400 series of aircraft to include a 'release parking brake' item in the 'Before Takeoff' checklist.

Date Safety Recommendation made: **28 March 2024**

Latest response received: **22 August 2024**

Textron Aviation (TAI) has reviewed the subject Safety Recommendation, AAIB-28705, and TAI will voluntarily update all commercial Airplane Flight Manuals and/or Pilot Checklists related to the Models listed on TCDS A16SW to create textual harmonization in relation to releasing the parking brake, if set, prior to Takeoff in the 'Before Takeoff' section of these respective documents. Note that Model 400T Airplane Flight Manuals and/or Pilot Checklists will not be addressed as these are military aircraft and the checklists are not under the control of TAI.

A follow-up letter will be provided once this action is completed, and a copy of the change will be included. This change is estimated to be completed in the 4th quarter of 2025.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**

Update due 31 March 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges the response and requests an update once the implementation is completed.

SAFETY RECOMMENDATIONS ISSUED IN 2024

Amateur Built Balloon (DB-6R), G-CMFS

25 June 2023, Ombersley Court, Worcestershire

Investigation synopsis

The pilot was taking part in a balloon competition. One part of the competition involved dropping a marker as close as possible to a target location. The accident occurred whilst the balloon was climbing rapidly away from this target. The balloon envelope collapsed, and the basket descended to the ground, fatally injuring the pilot.

Example parachute in a stalled condition (Looking up through the balloon envelope from the basket)

The investigation found the balloon was likely to have suffered a parachute stall[1]. The balloon design, the weather conditions, and the rapid climb are all likely to have contributed to the accident.

Safety Recommendation 2024-008

Justification

There is no written guidance or best practice to assist amateur designers in ensuring their balloons avoid features that might impinge on safety, such as the potential for parachute stall. There are no requirements for amateur designers and amateur manufacturers to determine essential performance limits. The finished product is not required to be inspected, and there are no inspection criteria to apply to amateur-built competition balloon designs other than the general criteria that would be applied regardless of type.

Therefore, the following Safety Recommendation was made:

> **2024-008**
>
> It is recommended that the Civil Aviation Authority publish guidance on the design, testing and inspection of amateur-built balloons to reduce the risk of accidents due to unsafe conditions such as parachute stall.

Footnote

[1] There was a circular piece of material inside and at the top of a balloon envelope known as the parachute. It is operated by the pilot using a shroud line and acts as a valve to release hot air from the envelope the control ascent and descent. In some circumstances differential pressures above and around the parachute can prevent proper closure. This is known as parachute stall and may cause the uncontrolled loss of hot air.

Date Safety Recommendation made: **16 May 2024**

Latest response received: **16 August 2024**

The CAA accepts this recommendation and will publish guidance to mitigate the risk of accidents caused by unsafe conditions arising from the design, testing, and inspection of amateur-built balloons. The CAA will liaise with the British Balloon and Airship Club (BBAC) in producing this guidance.

The CAA will provide an update on the actions taken to address this Safety Recommendation by the end of February 2025.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**

Update due 28 February 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges the work being done by the CAA and awaits an update by the end of February 2025.

Safety Recommendation 2024-009

Justification

Twelve previous parachute stall events were reported to the AAIB during the course of the investigation. These occurred in various balloon types and under similar conditions to G-CMFS, suggesting that the risk was not unique to the DB-6R design. The reports also suggested that a parachute stall is more likely in a climb than in a descent. However, none of these events had been formally reported, meaning that any opportunity to learn from them has not been captured. An effective reporting culture is an important way to improve safety.

Therefore, the following Safety Recommendation was made:

> **2024-009**
>
> It is recommended that the British Balloon and Airship Club (BBAC) routinely communicate the importance of safety reporting to its members to promote an effective reporting culture, capture safety learning and help prevent a recurrence of ballooning accidents and serious incidents.

Date Safety Recommendation made: **16 May 2024**

Latest response received: **27 August 2024**

The BBAC accepts this recommendation.

SAFETY RECOMMENDATIONS ISSUED IN 2024

The BBAC is committed to fostering a robust safety culture and ensuring the highest standards of safety within the ballooning community. To this end, the BBAC is undertaking the following actions:

1. Regular Communication

A routine schedule will be implemented for communicating the importance of safety reporting to all members. This will include newsletters, email updates, and dedicated sections in the organisation's magazine.

2. Educational Initiatives

The BBAC is developing educational materials and workshops to inform members about the critical role of safety reporting. These initiatives will emphasise how timely and accurate reporting can prevent accidents and improve overall safety.

3. Reporting Mechanisms

The BBAC is reviewing and enhancing its reporting mechanisms to ensure they are user-friendly and accessible. This includes providing clear guidelines on how to report incidents and ensuring confidentiality to encourage more members to come forward.

4. Feedback Loop

The BBAC is establishing a feedback loop where members who report incidents are kept informed about the outcomes and safety improvements resulting from their reports. This transparency will help build trust and encourage continuous participation in safety reporting.

5. Safety Culture Promotion

The BBAC will actively promote a safety culture by recognising and encouraging members who contribute to safety through reporting. This may include awards, acknowledgments in publications, and other incentives. By taking these steps, the BBAC aims to capture valuable safety learning and prevent the recurrence of ballooning accidents and serious incidents. The BBAC appreciates the AAIB's guidance and is committed to enhancing the safety of our operations through effective reporting practices.

6. The BBAC will annually review the success of these measures and adjust or add to them as indicated by its analysis

The BBAC expects to have established the above list of initiatives by the end of the 2024, although much of this is established already.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**

Update due 31 January 2025

Safety Recommendation Status: **Open**

SAFETY RECOMMENDATIONS ISSUED IN 2024

Feedback rationale

The AAIB acknowledges the measures being taken by the BBAC in response to this Safety Recommendation and requests an update on progress by the end of January 2025.

Safety Recommendation 2024-010

Justification

The evidence suggested that the pilot of G-CMFS tried to reinflate the balloon by burning through the fabric after the envelope and throat collapsed, which was an action taken by some of those who shared with the AAIB their experiences of a parachute stall. Whilst the AAIB has learned of these parachute stall events in which pilots recovered successfully, the knowledge and best practice has not been collated and published.

Therefore, the following Safety Recommendation was made:

> **2024-010**
>
> It is recommended that the British Balloon and Airship Club (BBAC) publish guidance on best practice for the prevention of and recovery from unsafe conditions such as parachute stalls.

Date Safety Recommendation made: **16 May 2024**

Latest response received: **27 August 2024**

The BBAC accepts this recommendation.

The BBAC technical committee has created an initial response document, reference TC2024/0601, to share with its members. This material will be discussed in forthcoming instructor training days and in members workshops. In addition, the subject of parachute stalls will be discussed in forthcoming instructor training days, and the panel of examiners for the BBAC will consider the addition of simulated parachute emergency situations as part of the skills test (formally known as the General Flight Test). In addition, the BBAC Declared Training Organisation(DTO) and the BBAC panel of examiners will consider the addition of simulated parachute emergency situations as part of the flight training syllabus and the skills test (formally known as the general flight test).

It should be noted that many of the manufacturers do not offer clear guidance on the MLM (minimum landing mass), certainly for smaller sport type envelopes. The MLM is a known factor in terms of parachute behavioural characteristics. The BBAC will approach the manufacturers for help in the clarification of the MLM for each size of envelope they produce.

In terms of the potential for other factors (apart from a parachute stall) that may cause unsafe conditions, this will be further explored and the relevant actions will be taken as appropriate.

Much of the work for this initiative has already been completed with the exception of understanding of actions in the event of unsafe conditions. This will be completed by the summer of 2025.

SAFETY RECOMMENDATIONS ISSUED IN 2024

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**

Update due 31 January 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges the measures being taken by the BBAC in response to this Safety Recommendation and requests an update on progress by the end of January 2025.

Safety Recommendation 2024-011

Justification

Jettisoning one of the cylinders to reduce weight, which has been suggested as one possible action a pilot could take in these circumstances, in order to slow the descent. This is only likely to be effective in cases when a balloon is still partially inflated and exerting a buoyancy force, which is not the case when in a streamered state. Experienced balloon pilots shared varying opinions with the AAIB on the effectiveness of jettisoning heavy cylinders during an emergency. A lack of guidance on this subject means it is unclear whether this is the best course of action in either an uncontrolled descent due to a parachute stall, or in some other emergency.

Therefore, the following Safety Recommendation was made:

2024-011

It is recommended that the British Balloon and Airship Club publish guidance material on best practice regarding jettisoning of fuel tanks during an emergency.

Date Safety Recommendation made: **16 May 2024**

Latest response received: **27 August 2024**

The BBAC partially accepts this recommendation.

The BBAC has carefully considered the Safety Recommendation 2024-011 from the AAIB regarding the jettisoning of fuel cylinders during an emergency.

In UK aviation law (reference the ANO, section 89, Paragraph 3) only water or finely divided sand may be jettisoned from a balloon in free flight. The serious ramifications of jettisoning fuel cylinders has been discussed at length at many safety meetings, and the consensus is that jettisoning of a leaking flight cylinder must never be considered or take place over a congested or inhabited area, as the potential for a more serious incident is very high indeed.

SAFETY RECOMMENDATIONS ISSUED IN 2024

A leaking flight cylinder has the potential for a fire in the basket. Managing the problem of a leaking cylinder can be done by attaching the cylinder to the crown line or handling line, and allowing it to dangle outside the basket. This is also standard teaching, though not captured in any present syllabus.

The action of jettisoning a cylinder to help reduce descent rate is difficult to give any guidance on as several factors must be considered, including time to ground impact, height above the ground prior to release of a cylinder, and the estimated time required to release the cylinder in the basket.

These issues will be discussed at Instructor training days in the autumn of 2024 and the spring of 2025, and will be incorporated into other contexts. However, the BBAC does not wish to condone, promote or indeed offer any best practice advice on the jettisoning of fuel cylinders.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**

Update due 31 January 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges the points made by the BBAC and notes that guidance not to jettison fuel tanks (for the reasons given in the response) would meet the intent of this Safety Recommendation.

Safety Recommendation 2024-012

Justification

It is important that competition pilots balance the desire to do well and compete with the need to operate safely. The advice in strong wind gradients, to climb slowly and fly at a relatively heavy weight (which results in an increased pressure in the envelope), can conflict with the desire to push the balloon to its limits to win the competition. It is vital that all competition organisers ensure that this risk is well managed.

Therefore, the following Safety Recommendation was made:

2024-012

It is recommended that the Civil Aviation Authority publish guidance for the safe oversight of competition balloon flying in the UK, to ensure the risks associated with the activity are appropriately understood by competitors and managed by competition organisers.

Date Safety Recommendation made: **16 May 2024**

Latest response received: **16 August 2024**

SAFETY RECOMMENDATIONS ISSUED IN 2024

The CAA accepts this recommendation and will publish safety guidance for balloon events to ensure the risks associated with competition balloon flying are understood by competitors and managed by competition organisers. The CAA will liaise with the British Balloon and Airship Club (BBAC) in producing this safety guidance.

The CAA will provide an update on the actions taken to address this Safety Recommendation by the end of February 2025.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**

Update due 28 February 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges the work being done by the CAA and awaits an update by the end of February 2025.

SAFETY RECOMMENDATIONS ISSUED IN 2024

Jabiru UL-450, G-CDFK

4 April 2023, Damyns Hall Aerodrome, Upminster, Essex

Investigation synopsis

During the climb after what was thought to be a normal takeoff the aircraft did not climb as expected. When at 300 ft, the pilot identified that the engine was not developing full power. With insufficient height or speed to return to the runway, and no suitable landing sites immediately available, the pilot attempted to remain airborne. The engine then stopped, the aircraft stalled and entered a spin before striking the ground.

Split carburettor coupling from G-CDFK

The loss of engine power was probably caused by an age-related split in the rubber coupling attaching the carburettor to the engine's plenum chamber. No issues with the engine were identified during a 100-hour engine service or the subsequent check flight, carried out in January 2023. The location of the coupling and its mounting clips made inspection problematic. The engine manufacturer's manual for the engine stated that the coupling had a 1,000 hour, or five-year life but there was no evidence that the coupling had been replaced since the aircraft had been built in 2006.

Safety Recommendation 2024-013 and 2024-014

Justification

LAA processes have been clarified to help prompt the owner to review whether any life-limited components are fitted to their aircraft, unless a component has a mandated life limit it could be operated on-condition indefinitely. With the knowledge that the carburettor coupling in question cracks from the inner diameter and is therefore not able to be inspected in situ and to prevent cracking associated with age-related degradation and subsequent partial or complete loss of power. Therefore, the following Safety Recommendations were made:

2024-013

It is recommended that the UK Civil Aviation Authority mandate a suitable life limit for the carburettor to plenum chamber coupling, Jabiru part number 4691084 (or equivalent parts), to ensure the couplings are removed from use before a crack can propagate.

SAFETY RECOMMENDATIONS ISSUED IN 2024

Date Safety Recommendation made: **13 June 2024**

Latest response received: **13 September 2024**

BCAR Section A (CAP 553), Chapter A3-7, paragraph 12 requires life limited components to be identified, recorded and checked to ensure that life limits are not exceeded. At the time of the accident the carburettor to plenum chamber coupling (part number 4691084) had exceeded its life limit by 11 years. There was no evidence of the coupling having been inspected in the years prior to the accident, recognising that it was operating beyond its life limit. Had such a check been performed, the CAA considers it likely that the deterioration would have been identified, resulting in the coupling being replaced.

The CAA also recognises that it may be acceptable to exceed manufacturer life limits for some components if an assessment has been conducted and a suitable justification is recorded in the continuing airworthiness record system. Such an approach should ensure that components like the Jabiru coupling remain airworthy and may be as effective as a mandate.

Before considering issuing a mandate, the CAA believes it is appropriate to first liaise with the LAA and the BMAA with respect to their processes for conducting airworthiness reviews to ensure life limited components are identified and recorded, with any exceedances suitably justified.

The CAA will provide an update on the actions taken to address this Safety Recommendation by the end of March 2025.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**

Update due 31 March 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges the response from the CAA and requests and update on progress before 31 March 2025

2024-014

It is recommended that the UK Civil Aviation Authority consider mandating a suitable life limit for components used in similar applications to the Jabiru carburettor to plenum chamber coupling on other engine and aircraft types, to ensure the components are removed from use before their condition deteriorate beyond an airworthy condition.

Date Safety Recommendation made: **13 June 2024**

Latest response received: **13 September 2024**

SAFETY RECOMMENDATIONS ISSUED IN 2024

The CAA acknowledges that it may be acceptable to exceed manufacturer life limits for certain components if a thorough assessment is conducted and a valid justification is documented in the continuing airworthiness record system. The CAA considers that such an approach will help ensure that life-limited components remain airworthy and may be similarly effective to a mandate.

Before considering issuing a mandate, the CAA believes it is appropriate to first liaise with the LAA and the BMAA with respect to their processes for conducting airworthiness reviews to ensure life limited components are identified and recorded, with any exceedances suitably justified.

The CAA will provide an update on the actions taken to address this Safety Recommendation by the end of March 2025.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**

Update due 31 March 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges the response from the CAA and requests and update on progress before 31 March 2025

SAFETY RECOMMENDATIONS ISSUED IN 2024

Boeing 767-332(ER), N197DN

10 February 2023, Prestwick Airport

Investigation Synopsis

During takeoff from Edinburgh Airport bound for New York, a high-pressure turbine blade fractured in the right engine. The blade damaged a further five blades, but the engine was still capable of producing thrust. The out of balance turbine caused vibrations sufficient to cause a slat track housing drain tube to fracture in the wing which allowed fuel to escape from the right wing fuel tank.

Image from a passenger's video

Due to the high engine vibration, the flight crew diverted the aircraft to Prestwick Airport. During the diversion, fuel escaping from the wing was ignited by the hot engine exhaust, and this was recorded on video by a passenger, but the flames extinguished before the landing. The aircraft landed promptly, with full emergency service attendance. After the aircraft arrived on stand, the airport fire service noticed the fuel coming from the right wing and put provisions in place to capture the fuel, preventing it igniting on the hot engine or brakes. The passengers were rapidly disembarked, with no injuries.

Safety Recommendation 2024-015

Justification

The manufacturer has taken safety action to launch a project to review the design of the slat track housing drain tube for reliability improvements, hence the following Safety Recommendation was made.

2024-015

It is recommended that the Federal Aviation Administration requires the Boeing Airplane Company to demonstrate that following this serious incident, the design of the slat track housing drain tube on the Boeing 767 family of aircraft continues to comply with the certification requirements for large transport aircraft.

Date Safety Recommendation made: **11 July 2024**

Latest response received: **23 August 2024**

The FAA is currently reviewing the AAIB's final report in order to determine an appropriate action plan to address this Safety Recommendation.

It is anticipated an update to SR 2024-015 will be provided by 31 August 2025.

AAIB Assessment: **Partially adequate**

Action Status: **Planned action ongoing**

Update due end of 2024

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges that the FAA is taking steps to determine an action plan to address the Safety Recommendation. An update on the action plan is requested by the end of 2024.

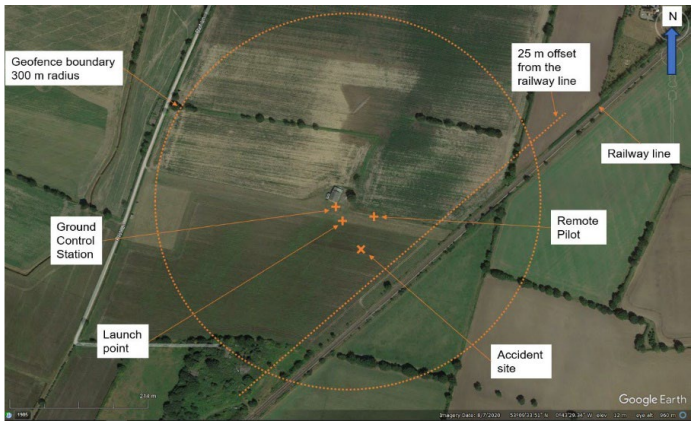
SAFETY RECOMMENDATIONS ISSUED IN 2024

UAS Malloy Aeronautics T150

27 June 2023, Field in South Scarle, Lincoln

Investigation Synopsis

Whilst being operated in a manual flight mode, the unmanned aircraft breached the geofence and changed to an automated flight mode. In response, the remote pilot reduced the throttle and changed back to the manual mode. Control of the aircraft was lost because the mode was changed at a low throttle setting and the subsequent actions to regain control were unsuccessful. The aircraft struck the ground and was destroyed.



Accident site and geofence

The operator no longer uses the manual mode and has promoted the use of standardised phraseology between the ground control station operator and the remote pilot. Further action has been taken to consider and apply a suitably sized geofence for each operational flight.

Safety Recommendation 2024-016

Justification

The use of a geofence was the mitigation identified in the Operational Safety Case (OSC) to reduce the impact of several risks to as low as reasonably practicable. The OSC did not contain any information on the definition of a geofence, the response of to the unmanned aircraft to a breach of the geofence or the actions to be taken by the remote pilot. As part of the Operational Authorisation review process, the granting authority should ensure that the OSC contains sufficient detail regarding the definition of the safety feature and the procedures by which it is implemented.

Therefore, the following Safety Recommendation was made:

2024-016

It is recommended that the UK Civil Aviation Authority, when granting Operational Authorisations for Unmanned Aircraft Systems in the specific category, ensure that any safety feature that is used to mitigate risks, is adequately defined in the Operational Safety Case and includes the necessary operational procedures.

Date Safety Recommendation made: **3 September 2024**

Latest response received: **16 October 2024**

The CAA acknowledges and accepts the above recommendation. Actions intended to close this recommendation are detailed below.

Planned CAA Actions

In addition to reviewing our internal procedures and training, we shall improve guidance to UAS Operators applying for UAS Operational Authorisation (OA) in the Specific Category of operations.

1. Amend CAP 722A

CAP 722A, Unmanned Aircraft System Operations in UK Airspace – Operating Safety Cases, provides guidance material for use by applicants for an OA in the Specific Category of operations. This helps applicants to comply with Article 111 of the UK Reg (EU) 2019/947 (the UK UAS Implementing Regulation).

The CAA will:

- Amend CAP 722A, to ensure UAS Operators are aware that their Operations Manual must include procedures for safety features they intend to use to mitigate risk.
- Amend Appendix A: OSC Compliance Checklist Template to include procedures for the use of UAS safety features.

2. Amend CAP 2606

- CAP 2606 PDRA01, Operations Manual template, shall be amended to include the procedures for the use of safety features.

The CAA will provide an update on these actions to address this Safety Recommendation by 01 Mar 2025.

AAIB Assessment: **Adequate**

Action Status: **Planned action ongoing**

Update due 01 March 2025

Safety Recommendation Status: **Open**

Feedback rationale

The AAIB acknowledges the response and the actions being taken by the CAA in response to this Safety Recommendation and request an update by 01 March 2025.

SAFETY RECOMMENDATIONS ISSUED IN 2024

Rotorsport UK Cavalon, G-CKYT

12 November 2020, Farmland between Avoch and Munlochy, Black Isle

Investigation Synopsis

A solo student pilot was on a local general handling flight when the rotor head of the gyroplane he was flying, separated from the fuselage in flight. The separation was caused by a structural overload failure from exposure to dynamic flight loads, judged to be due to a specific sequence of aircraft manoeuvres.

Rotor head showing gimbal block failure, rotor blade deformation and teeter stop contact mark

The gyroplane was found to have been correctly released to service. There were no maintenance issues identified relevant to the accident. A number of operational factors were considered and it was likely that the pilot inadvertently allowed the aircraft to enter a low g flight regime close to, or potentially exceeding, that prohibited by the Cavalon Pilot's Operating Handbook.

The accident highlighted limitations in the design, testing, manufacture and operating limits for the Cavalon and Cavalon Pro gyroplane types. Based on an assessment of the requirements within British Civil Airworthiness Requirements (BCAR) Section T, these limitations could be relevant to other gyroplane types certified to this standard. The investigation also highlighted issues with gyroplane training material regarding the awareness of rotor load factor by pilots.

Safety Recommendation 2024-017

Justification

To ensure actions to mitigate the risk of roll stop contact on all models of gyroplanes fitted with the Rotorkopf III certified under BCAR Section T are both independently assessed as adequate and mandated where appropriate.

Therefore, the following Safety Recommendation was made:

2024-017

It is recommended that the Civil Aviation Authority introduces mitigations to reduce, as far as reasonably practicable, the risk of a catastrophic failure resulting from contact between the gimbal block and the roll stop bar on all gyroplanes fitted with the Rotorkopf III rotor head and those of similar design.

SAFETY RECOMMENDATIONS ISSUED IN 2024

Date Safety Recommendation made:	**31 October 2024**
Latest response received:	**Awaiting response**
AAIB Assessment:	**Awaiting response**
Action Status:	**Awaiting response**
Safety Recommendation Status:	**Open**

Safety Recommendation 2024-018

Justification

To ensure actions to mitigate the risk of roll stop contact on future gyroplane types are both independently assessed as adequate and mandated where appropriate.

The following Safety Recommendation was made:

> **2024-018**
>
> It is recommended that the Civil Aviation Authority reassess the requirements and acceptable means of compliance in BCAR Section T for issuing approvals to gyroplanes, in light of the failure mode identified from the dynamic loading of the gyroplane rotor head in flight, to ensure manufacturers demonstrate to an acceptable level, through appropriate test and/or analysis, mitigation of the risk of catastrophic structural failure from dynamic loads in flight.

Date Safety Recommendation made:	**31 October 2024**
Latest response received:	**Awaiting response**
AAIB Assessment:	**Awaiting response**
Action Status:	**Awaiting response**
Safety Recommendation Status:	**Open**

Safety Recommendation 2024-019

Justification

The investigation highlighted the criticality of pilot awareness of the load factor being applied to the rotor during all flight manoeuvres. There is currently no relevant guidance for gyroplane instructors and examiners in CAA Standards Document 44: *Gyroplane Licensing.* The recommendation is intended to ensure standardisation of training delivery and examination of the subject of low g manoeuvres in gyroplanes.

SAFETY RECOMMENDATIONS ISSUED IN 2024

Therefore, the following Safety Recommendation was made:

> **2024-019**
>
> It is recommended that the Civil Aviation Authority publishes guidance on the subject of rotor load factor during flight manoeuvres for the theoretical training and testing of pilots undertaking the gyroplane PPL syllabus and the gyroplane instructor and examiner qualifications.

Date Safety Recommendation made: **31 October 2024**

Latest response received: **Awaiting response**

AAIB Assessment: **Awaiting response**

Action Status: **Awaiting response**

Safety Recommendation Status: **Open**

Safety Recommendation 2024-020

Justification

The accident demonstrated that catastrophic structural failure could occur from flight loads which are encountered inadvertently by the pilot, because such scenarios were not adequately defined and analysed during the certification process, due to the simplified requirements of BCAR Section T. The investigation considered that this represents a safety concern for aircraft intended for commercial operations.

Therefore, the following Safety Recommendation was made:

> **2024-020**
>
> It is recommended that the Civil Aviation Authority reassess the certification and acceptable means of compliance requirements for issuing Certificates of Airworthiness to gyroplanes intended to be used for commercial operations, to ensure manufacturers demonstrate, through appropriate test and analysis, mitigation of the risk of catastrophic structural failure from dynamic loads to a level comparable with equivalent Certificate of Airworthiness aircraft certified to design regulations such as Certification Specifications 23 and 27.

Date Safety Recommendation made: **31 October 2024**

Latest response received: **Awaiting response**

AAIB Assessment: **Awaiting response**

Action Status: **Awaiting response**

Safety Recommendation Status: **Open**

SAFETY RECOMMENDATIONS ISSUED IN 2024

Responses received by the AAIB during 2024 to Safety Recommendations issued in previous years

The AAIB assesses the responses to Safety Recommendations (SRs) made in previous years as part of its ongoing task. During 2024 the AAIB received 69 responses to previously published SRs and of those, the AAIB was able to formally close 29 Safety Recommendations
.
The table below summarises the AAIB assessments to the responses received during 2024 to SRs issued in previous years.

SR Number	Case	Date Response Received	AAIB Response	Status
2009-080	G-OJMC	22/07/2024	Partially adequate, planned action ongoing, update due 31 December 2024	OPEN
2014-019	G-CHCN	28/11/2024	Partially adequate, planned action completed	CLOSED
2015-001	G-EUOE	16/10/2024	Adequate, planned action completed	CLOSED
2016-013	G-WNSB	28/11/2024	Partially adequate, planned action ongoing, update due 28 November 2025	OPEN
2016-014	G-WNSB	07/06/2024	Not adequate, no planned actions	CLOSED
2016-016	G-WNSB	28/11/2024	Partially adequate, planned action completed	CLOSED
2016-053	G-LGNO	11/06/2024	Partially adequate, planned action ongoing, update due 31 May 2025	OPEN
2018-014	G-FWGH	19/07/2024	Partially adequate, planned action ongoing, update due 31 December 2024	OPEN
2020-008	N264DB	31/10/2024	Adequate, planned action completed	CLOSED

OTHER RESPONSES RECEIVED

SR Number	Case	Date Response Received	AAIB Response	Status
2021-015	Alauda Airspeeder	16/10/2024	Adequate, planned action completed	**CLOSED**
2021-017	G-ZBKF	17/05/2024	Partially adequate, planned action ongoing, update due 29 May 2025	**OPEN**
2021-018	G-POWN	22/03/2024	Adequate, planned action ongoing, update due 30 April 2025	**OPEN**
2021-019	G-POWN	22/03/2024	Adequate, planned action ongoing, update due 30 April 2025	**OPEN**
2021-020	G-POWN	19/12/2024	Partially adequate, planned action ongoing, update due 19 April 2025	**OPEN**
2021-025	G-LAWX	01/02/2024	Adequate, planned action completed	**CLOSED**
2021-032	G-LAWX	18/12/2024	Adequate, planned action ongoing, update due 31 July 2025	**OPEN**
2022-001	DJI Matrice M210 V1	07/01/2024	Not adequate, no planned actions	**CLOSED**
2022-002	DJI Matrice M210 V1	07/01/2024	Not adequate, no planned actions	**CLOSED**
2022-003	DJI Matrice M210 V1	25/01/2024	Not adequate, no planned actions	**CLOSED**
2022-004	DJI Matrice M210 V1	22/04/2024	Adequate, planned action completed	**CLOSED**
2022-005	G-BBSA	30/08/2024	Adequate, planned action ongoing, update due 31 May 2025	**OPEN**
2022-006	G-BBSA	30/08/2024	Adequate, planned action ongoing, update due 31 May 2025	**OPEN**
2022-007	G-BBSA	30/08/2024	Adequate, planned action ongoing, update due 31 May 2025	**OPEN**
2022-008	G-HYZA	18/12/2024	Adequate, planned action completed	**CLOSED**
2022-009	G-HYZA	18/12/2024	Adequate, planned action completed	**CLOSED**
2022-010	G-HYZA	18/12/2024	Adequate, planned action completed	**CLOSED**
2022-011	G-HYZA	18/12/2024	Adequate, planned action completed	**CLOSED**

OTHER RESPONSES RECEIVED

SR Number	Case	Date Response Received	AAIB Response	Status
2022-012	G-HYZA	18/12/2024	Adequate, planned action completed	**CLOSED**
2022-014	SE-LPS	09/08/2024	Partially adequate, planned action ongoing, update due 31 July 2025	**OPEN**
2022-015	SE-LPS	09/08/2024	Adequate, planned action completed	**CLOSED**
2022-017	D-AAAY	04/07/2024	Adequate, planned action completed	**CLOSED**
2022-018	G-JZHL	26/02/2024	Partially adequate, planned action ongoing, update due 28 February 2025	**OPEN**
2022-019	G-JZHL	26/02//2024	Adequate, planned action ongoing, update due 28 February 2025	**OPEN**
2023-004	D-AAAY	30/07/2024	Adequate, planned action ongoing, update due 31 May 2025	**OPEN**
2023-005	D-AAAY	30/07/2024	Adequate, planned action ongoing, update due 31 May 2025	**OPEN**
2023-006	D-AAAY	12/01/2024	Adequate, planned action completed	**CLOSED**
2023-007	G-CBDJ	19/12/2024	Adequate, planned action ongoing, update due 30 June 2025	**OPEN**
2023-008	G-CBDJ	19/12/2024	Adequate, planned action ongoing, update due 30 June 2025	**OPEN**
2023-009	G-CBDJ	19/12/2024	Adequate, planned action ongoing, update due 30 June 2025	**OPEN**
2023-010	G-CBDJ	19/12/2024	Adequate, planned action ongoing, update due 30 June 2025	**OPEN**
2023-011	G-BXBU	31/05/2024	Adequate, planned action completed	**CLOSED**
2023-012	G-BXBU	06/01/2025	Adequate, planned action ongoing, update due 06 July 2025	**OPEN**
2023-013	G-BXBU	06/01/2025	Partially adequate, planned action ongoing, update due 06 July 2025	**OPEN**
2023-014	G-BXBU	06/01/2025	Partially adequate, planned action ongoing, update due 06 July 2025	**OPEN**
2023-015	G-BXBU	06/01/2025	Adequate, planned action ongoing, update due 06 July 2025	**OPEN**
2023-016	G-BXBU	03/12/2024	Adequate, planned action ongoing, update due 30 May 2025	**OPEN**
2023-017	G-BXBU	03/12/2024	Adequate, planned action ongoing, update due 30 May 2025	**OPEN**

OTHER RESPONSES RECEIVED

SR Number	Case	Date Response Received	AAIB Response	Status
2023-018	G-VSKP	29/11/2024	Not adequate, no planned actions	**CLOSED**
2023-019	G-VSKP	06/02/2024	Partially adequate, planned action ongoing, update due 06 February 2025	**OPEN**
2023-020	G-VSKP	06/02/2024	Adequate, planned action completed	**CLOSED**
2023-021	G-VSKP	29/11/2024	Not adequate, no planned actions	**CLOSED**
2023-022	G-VSKP	06/02/2024	Partially adequate, planned action ongoing, update due 06 February 2025	**OPEN**
2023-023	G-VSKP	29/11/2024	Not adequate, no planned actions	**CLOSED**
2023-024	G-VSKP	06/02/2024	Partially adequate, planned action ongoing, update due 06 February 2025	**OPEN**
2023-025	G-VSKP	19/07/2024	Not adequate, no planned actions	**CLOSED**
2023-026	G-CFRW	23/07/2024	Adequate, planned action completed	**CLOSED**
2023-028	G-MCGY	25/03/2024	Adequate, planned action completed	**CLOSED**
2023-029	G-MCGY	30/04/2024	Adequate, planned action completed	**CLOSED**
2023-030	G-MCGY	04/02/2024	Adequate, planned action ongoing, update due 31 December 2024	**OPEN**
2023-031	G-MCGY	04/02/2024	Adequate, planned action ongoing, update due 31 December 2024	**OPEN**
2023-032	G-MCGY	19/12/2024	Adequate, planned action ongoing, update due 31 July 2025	**OPEN**
2023-033	G-MCGY	18/12/2024	Partially adequate, planned action ongoing, update due 31 July 2025	**OPEN**
2023-034	G-MCGY	30/01/2024	Adequate, planned action ongoing, update due 31 July 2025	**OPEN**
2023-035	G-MCGY	01/02/2024	Adequate, planned action ongoing, update due 31 December 2024	**OPEN**
2023-036	G-MCGY	03/03/2024	Adequate, planned action completed	**CLOSED**
2023-037	G-CCPC	19/12/2024	Adequate, planned action completed	**CLOSED**
2023-038	G-CCPC	23/02/2024	Adequate, planned action ongoing, update due 02 June 2025	**OPEN**

OTHER RESPONSES RECEIVED

SR Number	Case	Date Response Received	AAIB Response	Status
2023-039	G-CCPC	31/12/2024	Adequate, planned action ongoing, update due 31 December 2025	**OPEN**
2023-040	G-CCPC	31/12/2024	Adequate, planned action ongoing, update due 31 December 2025	**OPEN**

The Safety Recommendations that have been closed by the AAIB as a result of responses received in 2024 are set out below.

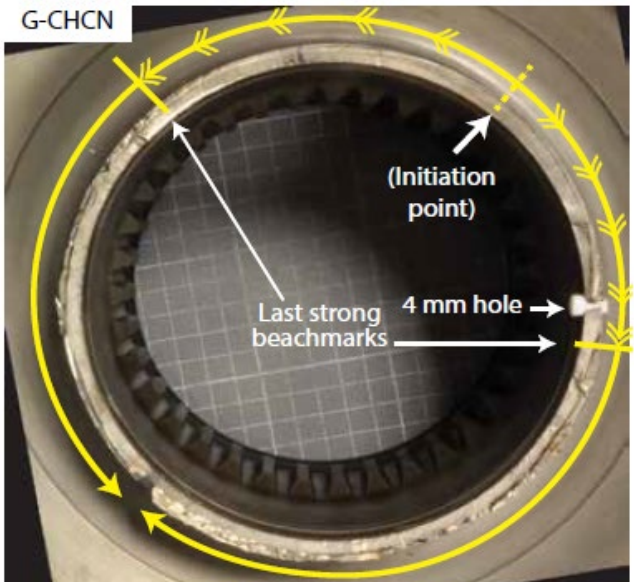
OTHER RESPONSES RECEIVED

EC225 LP Super Puma, G-CHCN

32 nm southwest of Sumburgh, Shetland Islands, 22 October 2012

Investigation synopsis

(Note: Owing to the similarities of the circumstances that led to two accidents to same type of helicopters (G-CHCN and G-REDW), the Chief Inspector of Air Accidents ordered that the investigations be combined into a single report.)



G-CHCN fracture surface

While operating over the North Sea, in daylight, the crews of G-REDW and G-CHCN experienced a loss of main rotor gearbox oil pressure, which required them to activate the emergency lubrication system. This system uses a mixture of glycol and water to provide 30 minutes of alternative cooling and lubrication. Both helicopters should have been able to fly to the nearest airport; however, shortly after the system had activated, a warning illuminated indicating that the emergency lubrication system had failed. This required the crews to ditch their helicopters immediately in the North Sea. Both ditchings were successful and the crew and passengers evacuated into the helicopter's liferafts before being rescued. There were no serious injuries.

The loss of oil pressure on both helicopters was caused by a failure of the bevel gear vertical shaft in the main rotor gearbox, which drives the oil pumps. The shafts had failed as result of a circumferential fatigue crack in the area where the two parts of the shaft are welded together.

On G-CHCN, the crack initiated from a small corrosion pit located on a feature on the shaft described as the inner radius. Debris that contained iron oxide and moisture had become trapped on the inner radius, which led to the formation of corrosion pits. The shaft fitted to G-CHCN had accumulated 3,845 flying hours; this was more than any other EC225 LP shaft.

Safety Recommendation

Justification

Availability of short crack data for high strength steels.

High strength low alloy steels, such as 32CDV13, are being used at relatively high stress levels in helicopter drive systems. In considering the fatigue life of such systems it is necessary to have an understanding of the effect of high stress components containing small defects such

SAFETY RECOMMENDATIONS CLOSED IN 2024

as the 60 µm deep corrosion pits. While extensive research has previously been carried out into the fatigue performance of metallic materials in general containing small defects, a literature search undertaken as part of this investigation identified few papers that dealt with the fatigue response of high strength steels containing small defects. Moreover, the findings from this previous research were not directly applicable to the situation involving the material and construction of rotating components fitted to helicopters such as the AS332 variants and the EC225 LP for the following reasons:

- Previous research involved different alloys such as aluminium alloy and stainless steel.
- The steel data available was for a much lower strength steel and had a different microstructure (ferritic or bainitic as opposed to martensitic) from that used in the bevel gear vertical shafts.
- The research did not consider the influence of residual stresses on the growth of short fatigue cracks and fatigue strength.

In order for the regulators to fully understand, during the certification process, the effect on the high cycle fatigue life of defects, such as corrosion pits and scratches, on highly stressed components manufactured from high strength low alloy steel, such as 32CDV13, the following Safety Recommendation is made:

2014-019

It is recommended that the European Aviation Safety Agency commission research into the fatigue performance of components manufactured from high strength low alloy steel. An aim of the research should be the prediction of the reduction in service-life and fatigue strength as a consequence of small defects such as scratches and corrosion pits.

Date Safety Recommendation made: **11 June 2014**

Latest response received: **28 November 2024**

In the context of rotorcraft design and certification activities, an evaluation by Type Certificate Holders and the European Union Aviation Safety Agency (EASA) of the effect of corrosion on fatigue strength for high-strength steels had been carried out. This had already resulted in changes to the means provided by applicants to show compliance with CS 29.571 fatigue tolerance requirements.

EASA has completed the research project into "Integrity Improvement of Rotorcraft Main Gear Box (MGB)" (ref. European Plan for Aviation Safety RES.0008).

The outcome of the research project is published at https://www.easa.europa.eu/en/research-projects/integrity-improvement-rotorcraft-main-gear-box-mgb.

EASA Status: Closed – Agreement

SAFETY RECOMMENDATIONS CLOSED IN 2024

AAIB Assessment: **Partially adequate**

Action Status: **Planed action complete**

Safety Recommendation Status: **Closed**

Feedback rationale

The EASA response points to research that had been carried out on improving the integrity of rotorcraft gearboxes. The research appears to concentrate on reliability and tolerance to flaws in rotor and rotor drive system gears and bearings when subject to rolling contact fatigue following recommendations from AIB-Norway after the investigation into the accident involving LN-OJF. It is not entirely clear how this research related to the issue identified in the report into the accidents to G-REDW and G-CHCN that led to this Safety Recommendation. The AAIB's recommendation was to address the effect on the high cycle fatigue life of defects, such as corrosion pits and scratches, on highly stressed components manufactured from high strength low alloy steel, such as 32CDV13. The first part of EASA's research has reviewed design criteria to prevent single point catastrophic failure, but it is not clear if this considered the effect of flaws in high strength steels in any application and in particular in the drive systems such as the bevel gear vertical shaft.

It therefore remains, although research has been undertaken, whether there is a need for further detailed research into the fatigue performance of components to enable the assessment of service life of highly stressed components with small defects. For that reason the AAIB has assessed the response as partially adequate.

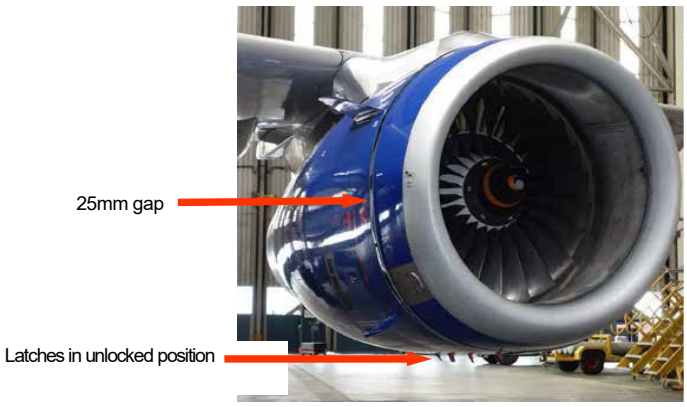
SAFETY RECOMMENDATIONS CLOSED IN 2024

Airbus A319-131, G-EUOE

24 May 2013, London Heathrow Airport

Investigation synopsis

During takeoff from Runway 27L at London Heathrow Airport, the fan cowl doors from both engines detached from the aircraft, damaging the airframe and a number of aircraft systems. The flight crew elected to return to Heathrow and on the approach to land on Runway 27R, leaking fuel from a damaged fuel pipe on the right engine ignited and an external fire developed. The left engine continued to operate satisfactorily throughout the flight. The right engine was shut down promptly, reducing the intensity of the fire, and the aircraft landed safely. It was brought to a stop on the runway and the emergency services were quickly in attendance. The fire in the right engine was extinguished and the passengers and crew evacuated via the emergency escape slides on the left side of the aircraft.



Fan cowl doors on the hold-open device; latches in unlocked position

The investigation determined that a maintenance error had led to the fan cowl doors on both engines being left unlatched following scheduled overnight maintenance on the aircraft. The unlatched condition of the fan cowl doors was not identified prior to the aircraft's departure the next morning. A number of organisational factors were contributory to the maintenance error. The operator has since taken action to address these issues.

This, and numerous other similar events, shows that Airbus A320-family aircraft have a history of departing with the fan cowl doors unlatched. It is also evident that, in practice, the flight crew walk-around inspection is not entirely effective in detecting unlatched fan cowl doors and therefore a design solution is necessary. Enhanced methods of detection through design solutions are being considered by the aircraft manufacturer.

Safety Recommendation 2015-001

Justification

The reliance on bi-annual human factors continuation training to provide shift planners with effective tools to manage fatigue within the operator's maintenance staff appears to have been ineffective. The effect of fatigue accumulated across the normal shift pattern, and augmented by overtime working, was not accounted for or measured in an objective way.

The company's existing working time policy is closely aligned with the Acceptable Means of Compliance (AMC) material proposed by EASA, as published in NPA 2013-01(C). Therefore, if implemented, the AMCs in Notice of Proposed Amendment (NPA) 2013-01(C) would not have prevented the technicians' working patterns, and therefore their potential fatigue levels experienced in this event.

Therefore, the following Safety Recommendation was made:

2015-001

It is recommended that the European Aviation Safety Agency publishes amended Acceptable Means of Compliance and Guidance Material in Part 145.A.47(b) of European Commission Regulation (EC) No 2042/2003, containing requirements for the implementation of an effective fatigue risk management system within approved maintenance organisations.

Date Safety Recommendation made: **14 July 2015**

Latest response received: **16 October 2024**

Regulation (EU) 2021/1963 of 8 November 2021 introduced amendments to Regulation (EU) No 1321/2014, among others, requiring the establishment of a Safety Management System (SMS) in all maintenance organisations approved in accordance with Annex II (Part-145) to Regulation (EU) No 1321/2014. The amendment is applicable as of 2 December 2022, with some transition time until 2 December 2024.

On the 10 May 2022 the European Union Aviation Safety Agency (EASA) published Executive Director Decision 2022/011/R (available at; https://www.easa.europa.eu/en/document-library/agency-decisions/ed-decision-2022011r) that provides Acceptable Means of Compliance (AMC) and Guidance Material (GM) to the amended Regulation (EU) No 1321/2014. In particular, AMC1 145.A.47(b) "Production planning" includes a chapter titled "Consideration of Fatigue in the Planning of Maintenance" to ensure that the SMS adequately considers effective fatigue risk management.

As of 2 December 2024, all maintenance organisations approved in accordance with Part-145 must have implemented an SMS, which is expected to include an effective fatigue management.

Additionally, EASA has taken several measures since the subject accident, e.g. publication of Safety Information Bulletin (SIB) 2015-15, which can be downloaded at EASA Safety Publications Tool to raise awareness about the risk of taking off with unlocked fan cowl doors.

AAIB Assessment: **Adequate**

Action Status: **Planned action complete**

Safety Recommendation Status: **Closed**

SAFETY RECOMMENDATIONS CLOSED IN 2024

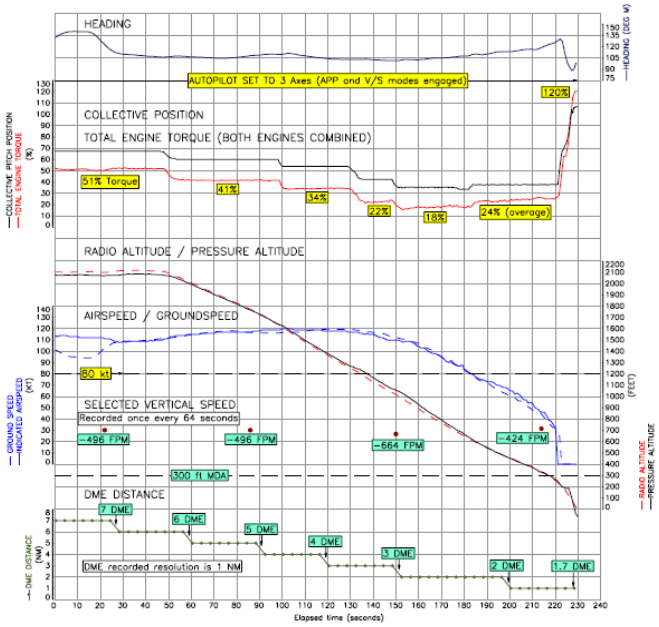
AS322 L2 Super Puma, G-WNSB

23 August 2013, On approach to Sumburgh Airport, Shetland Islands

Investigation synopsis

At 1717 hrs UTC on 23 August 2013, an AS332 L2 Super Puma helicopter with sixteen passengers and two crew on board crashed in the sea during the approach to land at Sumburgh Airport.

Although the approach vertical profile was maintained initially, insufficient collective pitch control input was applied by the commander to maintain the approach profile and the target approach airspeed of 80 kt. This resulted in insufficient engine power being provided and the helicopter's airspeed reduced continuously during the final approach. Control of the flightpath was lost and the helicopter continued to descend below the MDA. During the latter stages of the approach the helicopter's airspeed had decreased below 35 kt and a high rate of descent had developed.



G-WNSB final approach vertical profile

The decreasing airspeed went unnoticed by the pilots until a very late stage, when the helicopter was in a critically low energy state. The commander's attempt to recover the situation was unsuccessful and the helicopter struck the surface of the sea approximately 1.7 nm west of Sumburgh Airport.

The investigation identified the following causal factors in the accident:

- The helicopter's flight instruments were not monitored effectively during the latter stages of the non-precision instrument approach. This allowed the helicopter to enter a critically low energy state, from which recovery was not possible.
- Visual references had not been acquired by the Minimum Descent Altitude (MDA) and no effective action was taken to level the helicopter, as required by the operator's procedure for an instrument approach.

SAFETY RECOMMENDATIONS CLOSED IN 2024

Safety Recommendation 2016-014

Justification

It has been acknowledged, in a number of previous investigations, that cockpit image recordings can provide air safety investigators with vital information to aid in establishing the facts, conditions and circumstances of an occurrence. The CVR and FDR recordings from G-WNSB provided information on the helicopter's performance and its operation by the flight crew, but did not provide a complete picture of their focus of attention and workload. Such additional information may have enabled the human factors investigation to reach a more definitive conclusion.

Furthermore, had recorded images of the cockpit instrumentation been available, the anomaly of the difference between the commander's verbal references to speed and the recorded data could have been resolved.

Therefore, the following Safety Recommendation was made:

> **2016-014**
>
> It is recommended that the European Aviation Safety Agency introduces a requirement for the installation of cockpit image recorders, in aircraft required to be equipped with Flight Data and Cockpit Voice Recorders, to capture flight crew actions within the cockpit environment.

Date Safety Recommendation made: **17 March 2016**

Latest response received: **07 June 2024**

In 2018, the International Civil Aviation Organization (ICAO) adopted a new standard on 'Flight crew-machine interface recordings' (FCMIR) in Annex 6 Part I (International Commercial Air Transport — Aeroplanes) Chapter 6, section 6.3.4, and the corresponding Appendix 8) with an applicability to aeroplanes of a maximum take-off mass of over 27 000 kg and for which the application for type certification was submitted on or after 1st January 2023. No standard similar to this one has been introduced to helicopters in Annex 6 Part III (International Operations — Helicopters).

This standard requires the aeroplane to be equipped with a crash-protected flight recorder which shall record the information displayed to the flight crew from electronic displays, as well as the operation of switches and selectors by the flight crew as defined in Appendix 8. Compliance with this standard may be achieved by means of an airborne image recorder, or by other means capable of meeting the objective of the standard. The use of image recorders in the cockpit was not required due to privacy concerns.

ICAO Doc 10101, published in 2021, provides guidance material for the implementation of appropriate provisions for FCMIRs as required by Annex 6 Part I, Chapter 6, 6.3.4 and provides references to the protective measures needed for these recordings.

SAFETY RECOMMENDATIONS CLOSED IN 2024

The European Union Aviation Safety Agency (EASA) will continue to follow the developments in ICAO and will assess the need for transposition of such standards into EU requirements via its rulemaking process. EASA does not intend to propose a rule mandating a FCMIR for helicopters if no corresponding ICAO standard exists, however an assessment of the introduction of these recorders on aeroplanes will be done through Rule Making Task .0392, Subtask 2.

AAIB Assessment: **Not adequate**

Action Status: **No planned actions**

Safety Recommendation Status: **Closed**

Feedback rationale

EASA have stated that it does not intend to propose a rule mandating Image Recorders for helicopters if no corresponding ICAO standard exists. EASA has also stated that an assessment of the introduction of image recorders will be done through Rule Making Task .0392, Subtask 2. This sub-task deals with EASA alignment with ICAO SARPs on the function to erase CVR and AIR recordings. It does not deal with the introduction of Image Recorders on helicopters.

Safety Recommendation 2016-016

Justification

There is very little evidence available on the reasons why passengers who drowned in accidents were not successful in evacuating the helicopter, when others onboard survived. Regulators have therefore relied on extrapolation from historical data and use of assumptions, rather than on baseline data derived from contemporary empirical evidence. This issue becomes significant when defining new regulations to better facilitate underwater evacuation with respect to cabin layout, emergency exit size and location, evacuation time limits or personal survival equipment. Whilst the difficulties associated with gaining this evidence are acknowledged, it is preferable to carry out controlled testing and analysis, rather than relying extensively on accident investigation evidence to validate certification assumptions.

The following Safety Recommendation is therefore made:

2016-016

It is recommended that the European Aviation Safety Agency instigates a research programme to provide realistic data to better support regulations relating to evacuation and survivability of occupants in commercial helicopters operating offshore. This programme should better quantify the characteristics of helicopter underwater evacuation and include conditions representative of actual offshore operations and passenger demographics .

Date Safety Recommendation made: **17 March 2016**

Latest response received: **28 November 2024**

SAFETY RECOMMENDATIONS CLOSED IN 2024

An initial review into the nature of the research that could be envisaged to provide realistic data to better support regulations relating to evacuation and survivability of occupants in helicopters operating offshore was commissioned by the European Union Aviation Safety Agency (EASA) in 2020.

The results of this first Helicopter Underwater Escape research project provided a comprehensive review of currently available information on underwater escape, identified shortfalls, and recommended further work to rectify this lack of information.

The final report is published on the EASA website: https://www.easa.europa.eu/en/research-projects/helicopter-underwater-evacuation.

Two of the highest-priority recommendations identified in the initial review were investigated in a subsequent research project: evaluation of the forces required to jettison push-out underwater emergency exits and underwater escape from a passenger cabin with a full complement of passengers.

The final report of this additional research is published on the EASA website: https://www.easa.europa.eu/en/research-projects/helicopter-underwater-escape-2.

The main objective of the second research project was to review the related rules, requirements, Acceptable Means of Compliance (AMC) and guidance material and propose areas for future rulemaking. The research activity concluded that the current Certification Specifications and Regulations are adequate and, however, provided recommendations for updates to AMC material.

As a result, EASA has decided to further review these recommendations, which will now be expedited by re-opening rulemaking task RMT.0120 or, alternatively, as a complement to another ongoing helicopter RMT.

Following the successful completion of two successive research programmes, EASA considers that these activities adequately address the intent of the Safety Recommendation and the results obtained will now be further followed up within EASA's continuous rulemaking programme aimed at improving helicopter certification standards.

EASA Status: Closed – Agreement

AAIB Assessment: **Partially adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

SAFETY RECOMMENDATIONS CLOSED IN 2024

Feedback rationale

The AAIB acknowledges the EASA's response. The report referenced in the EASA response summarised existing research and proposed seven new research projects of which the EASA completed two projects, the forces required to jettison push-out underwater emergency exits and underwater escape from the passenger cabin with a full complement of passengers.

The five remaining recommended projects, passenger training fidelity and frequency, brace position, energy absorbing seats, harness release and underwater vision have not been undertaken.

SAFETY RECOMMENDATIONS CLOSED IN 2024

Piper PA46 310P Malibu, N264DB

21 January 2019, 22 nm north-north-west of Guernsey

Investigation synopsis

The investigation established that the aircraft departed from Nantes Airport, France, at 1906 hrs on 21 January 2019 carrying a passenger on a commercial basis to Cardiff Airport in the UK. At 2016 hrs, probably while manoeuvring to avoid poor weather, the aircraft was lost from radar and struck the sea 22 nm north-north-west of Guernsey. Neither the pilot nor aircraft had the required licences or permissions to operate commercially.

The investigation identified the following causal factors:

1. The pilot lost control of the aircraft during a manually-flown turn, which was probably initiated to remain in or regain Visual Meteorological Conditions (VMC).
2. The aircraft subsequently suffered an in-flight break-up while manoeuvring at an airspeed significantly in excess of its design manoeuvring speed.
3. The pilot was probably affected by carbon monoxide (CO) poisoning.

The investigation identified the following contributory factors:

1. A loss of control was made more likely because the flight was not conducted in accordance with safety standards applicable to commercial operations. This manifested itself in the flight being operated under Visual Flight Rules (VFR) at night in poor weather conditions despite the pilot having no training in night flying and a lack of recent practice in instrument flying.
2. In-service inspections of exhaust systems do not eliminate the risk of CO poisoning.
3. There was no CO detector with an active warning in the aircraft which might have alerted the pilot to the presence of CO in time for him to take mitigating action.

Safety Recommendation 2020-008

Justification

CO poisoning is known in the UK as the 'silent killer' as the gas cannot be seen, smelt or tasted and its effects can lead to a reduction in performance, permanent injury or death. Even the minor effects of CO poisoning can have a fatal consequence when operating an aircraft. As the existing two barriers to prevent CO poisoning (design and inspections) are not always effective, there is a need for a third barrier to alert pilots to the presence of CO in the cabin in time to take effective action. Low cost warning devices are readily available, and their carriage is actively encouraged by the regulators. Regulators have also produced specifications for CO detectors with active warnings. Although the carriage of a CO detector is at the owner's and

pilot's discretion, it is unlikely that passengers, pilots under training and individuals who use cost sharing websites understand the risk.

Therefore, the following Safety Recommendation was made:

> **2020-008**
>
> It is recommended that the Civil Aviation Authority require piston engine aircraft which may have a risk of carbon monoxide poisoning to have a CO detector with an active warning to alert pilots to the presence of elevated levels of carbon monoxide.

Date Safety Recommendation made: **14 March 2020**

Latest response received: **31 October 2024**

The CAA has been highly engaged on the issue of carbon monoxide (CO) in general aviation (GA) over the last four years and has pursued multiple safety initiatives to highlight the risk posed by CO and what can be done to mitigate it. The main initiatives undertaken include launching a webpage dedicated to CO in GA, publishing (and updating) Safety Notice SN-2020/003, releasing two podcasts, publishing a Clued Up article, running two GA pilot surveys (Results), and conducting a 12-month in-depth study of active CO detectors in GA aircraft (Report).

In February 2024, we also ran a public consultation seeking stakeholder views on the challenges facing pilots in obtaining an active CO detector, the importance of protecting passengers from CO, the role that maintenance plays in combatting CO, and whether active CO detectors ought to be mandatory for some operations. The consultation ran for four weeks and the results were published in a Comment Response Document (CRD) in August.

Based on the findings from the recent consultation as well as the extensive work conducted over the last four years, we have taken the decision to introduce a limited mandate requiring an active CO detector for specified piston engine aircraft operations. On August 30th 2024, we published Safety Directive SD-2024/001 requiring a functioning active CO detector, capable of alerting pilots via aural and/or visual warnings, to be present in specified piston engine aircraft when operating with passengers on board who do not hold a recognised pilot qualification. The directive comes into force from January 2025.

By introducing Safety Directive SD-2024/001, the CAA has sought to balance safety and proportionality, whilst prioritising the protection of passengers who are not expected to be aware of CO in piston engine aircraft. Although the safety directive focusses on passenger protection, we nevertheless strongly recommend that all pilots of piston engine aircraft at risk of CO fly with an active CO detector. We will continue to monitor the risk of CO in piston engine aircraft operations to determine the effectiveness of the safety directive and whether any changes are required.

The public consultation also highlighted the need for additional guidance on selecting an active CO detector, securely mounting the devices in aircraft, and responding to alerts. We recently published a dedicated CO Safety Sense Leaflet covering these topics, as well as others.

SAFETY RECOMMENDATIONS CLOSED IN 2024

The CAA considers the actions taken over the last four years satisfy the intent of Safety Recommendation 2020-008.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The CAA has pointed to the balance that was required between safety and proportionality while it carried out its work in response to this Safety Recommendation. The AAIB acknowledges the need for balance and notes the extensive work the CAA has carried out in relation to active CO detectors, specifically, and the threat from CO more generally. It is welcome that the carriage of active detectors is being mandated in circumstances where occupants of the aircraft may be unaware of the risk of CO poisoning, and noted that such circumstances formed part of the justification for this Safety Recommendation.

In light of the narrative above, the AAIB agrees that the actions taken by the CAA meet the intent of the Safety Recommendation.

SAFETY RECOMMENDATIONS CLOSED IN 2024

Alauda Airspeeder Mk II (UAS)

04 July 2019, Goodwood Aerodrome, West Sussex

Investigation synopsis

Whilst performing a demonstration flight, the remote pilot lost control of the 95 kg Alauda Airspeeder Mk II scale demonstrator. After the loss of control had been confirmed by the remote pilot, the safety 'kill switch' was operated but had no effect. The unmanned aircraft (UA) then climbed to approximately 8,000 ft, entering controlled airspace at a holding point for flights arriving at Gatwick Airport, before its battery depleted and it fell to the ground. It crashed in a field of crops approximately 40 m from occupied houses and 700 m outside of its designated operating area. There were no injuries.

Airspeeder in flight prior to the accident (used with permission)

Safety Recommendation 2021-015

Justification

The frequent reports of UAS loss of control and fly-away events indicates the potential hazard to uninvolved persons. The kinetic energy level of these impacts, even for a typical small UA, is likely to be well above the 80 joules of kinetic energy limit for a UAS operated intentionally over 'uninvolved people', set in EU Commission Implementing Regulation (IR) (EU) 2019/947, and would typically be at levels where fatal injuries could occur. This UA crashed with 24,800 joules of kinetic energy and had it crashed in a populated or congested area, it is likely there would have been fatalities. It would be prudent to take appropriate action to reduce the risk of this type of event to avoid a fatal accident.

Therefore, the following Safety Recommendation was made:

> **2021-015**
>
> It is recommended that the European Union Aviation Safety Agency adopt appropriate design, production, maintenance and reliability standards for all Unmanned Aircraft Systems with aircraft capable of imparting over 80 joules of energy.

Date Safety Recommendation made: **11 February 2021**

Latest response received: **16 October 2024**

SAFETY RECOMMENDATIONS CLOSED IN 2024

The European Union Aviation Safety Agency (EASA) assisted the European Commission and the European Committee for Standardisation (CEN) in the development of a set of industry standards for the design, production, maintenance and reliability of drones capable of imparting over 80 Joule of energy. In summary, the applicable standards are:

- ASD-STAN prEN 4709-001 P1, published at https://stan-shop.org/en/catalog/item/75627?search=4709-001
- DIN EN 4709-002:2024-03, published at https://www.dinmedia.de/de/norm/din-en-4709-002/373551874
- ASD-STAN prEN 4709-003 P1 - Corrigendum 1, published at https://stan-shop.org/en/catalog/item/75419
- ASD-STAN prEN 4709-004 P1, published at https://stan-shop.org/en/catalog/item/75302

Following the publication in July 2024 of the last of this set of industry standards, the actions of EASA resulting from the Safety Recommendation may be considered closed.

The above standards are in the process of being adopted by the European Commission as harmonised EU norms for the placing on the market of Unmanned Aircraft Systems (UAS) in the open category, according to Regulation (EU) 2019/945.

EASA Status: Closed - Agreement

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

SAFETY RECOMMENDATIONS CLOSED IN 2024

Sikorsky S-92A, G-LAWX

14 October 2019, Near Shipston-on-Stour, Warwickshire

Investigation synopsis

On an approach to a private landing site in conditions of reduced visibility shortly before night, the pilots became uncertain of their position and the helicopter descended to within 28 ft of rising terrain close to a house. During the subsequent emergency climb at low indicated airspeed, engine torque increased to 131% and the pitch attitude of the helicopter was unstable. The helicopter made another approach to the landing site and landed without damage or injury to the occupants.

View of LS to the West at 1720 hrs, 10 minutes before departure from Birmingham (used with permission)

The investigation identified the following factors:

- Standard operating procedures for altitude alert setting, stabilised approach criteria and crew communication were either absent or not effective.
- a strong desire as a customer-facing director not to inconvenience the client, which was potentially in tension with his obligation as the commander to ensure a safe flight.
- Uncertainty about the Rules of the Air when landing.
- Attitudes, behavioural traps and biases likely to have contributed to the occurrence.

The circumstances of this serious incident indicate the need for greater awareness of the hazards of operating in degraded visual conditions and highlight the potential safety benefits of Point-in-Space approaches at landing sites.

Safety Recommendation 2021-025

Justification

The evidence of this serious incident, and the other occurrences to which Civil Air Publication CAP1864 refers, indicates that the effect of the regulations when landing is not well understood, and may be causing pilots to act unsafely.

SAFETY RECOMMENDATIONS CLOSED IN 2024

Therefore, the following Safety Recommendation was made:

2021-025

It is recommended that the Civil Aviation Authority publish guidance on the meaning and intention of the phase of flight alleviations in UK Standardised European Rules of the Air (SERA) where detailed as "except for take-off and landing" to better enable pilots to plan and act on minimum height requirements for safe operations.

Date Safety Recommendation made: **11 June 2021**

Latest response received: **01 February 2024**

CAP2613 was published on 29 November 2023 and as such, the CAA consider that Recommendation 2021-25 is now closed.

CAP2613: Definition of Helicopter Take Off and Landing Phase of Flight (caa.co.uk)

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

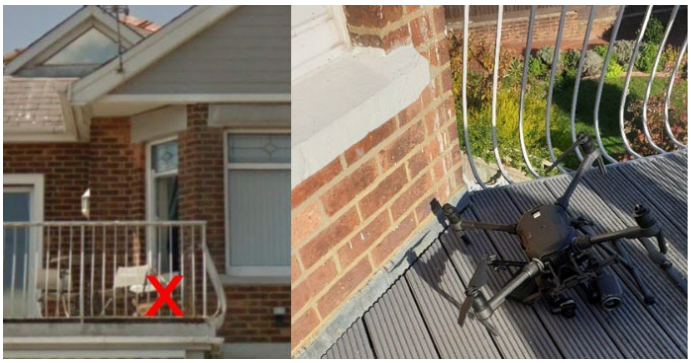
SAFETY RECOMMENDATIONS CLOSED IN 2024

DJI Matrice M210 Version 1 (UAS)

19 November 2020, Poole, Dorset

Investigation synopsis

The quadcopter unmanned aircraft (UA) was being flown over the city of Poole during a police operation when the wind at 400 ft exceeded the forecast wind, the manufacturer's wind limit and the maximum restricted speed of the UA. The UA drifted beyond visual line of sight and then communication with it was lost. When the battery level was low it entered an auto-land mode but collided with the wall of a house, damaging its propeller blades before coming to rest on a balcony.



Accident site location and damage to UA

The investigation revealed that shortly after takeoff one of the UA's two batteries had disconnected which resulted in its maximum speed being restricted, but this restriction is not referenced in the user manual and neither the remote pilot nor operator were aware of it. When the UA detected that the manufacturer's wind limit had been exceeded, the message triggered on the pilot's controller display was '*Fly with caution, strong wind*' instead of advising the pilot that the limit had been exceeded and that the UA should be landed as soon as possible.

Safety Recommendations 2022-001 and 2022-002

Justification (2022-001)

The manufacturer appears to have used the same message for both a level 1 and a level 2 wind warning, causing confusion to the remote pilot on the action to take. The manufacturer had set a wind limit of 27 mph, and therefore the level 2 wind warning should have advised the pilot to land as soon as possible.

Therefore, the following Safety Recommendation was made:

2022-001

It is recommended that DJI amend the DJI Pilot and DJI GO4 apps to warn the remote pilot when the wind limit has been exceeded and that the UA should be landed as soon as possible.

Justification (2022-002)

The pilot is required to maintain visual line of sight with the UA and therefore could miss an alert message on the controller screen if they are concentrating on manoeuvring the UA visually. If messages related to safety of flight had an associated aural warning the pilot's attention could be drawn to them.

Therefore, the following Safety Recommendation was made:

> **2022-002**
>
> It is recommended that DJI amend the DJI Pilot and DJI GO4 apps so that an aural alert is triggered when alert messages relating to safety of flight appear.

Date Safety Recommendations made: **05 April 2022**

Latest response received: **07 January 2024**

The Matrice 210 V1 has been out of production for a long time and the DJI Pilot and DJI GO4 apps are already very outdated, it is technically very challenging for us to update the two apps with the warning messages indicated in Safety Recommendations 2022-001 and 2022-002.

AAIB Assessment: **Not adequate**

Action Status: **No planned actions**

Safety Recommendations Status: **Closed**

Feedback rationale

The AAIB recognises that modification of the DJI GO4 app to include the warnings may be technically challenging however the app remains available for use with the M210 and it remains the only practical method for the provision of warning to remote pilots.

Safety Recommendation 2022-003

Justification

At low battery voltages the DJI Matrice 200 series activates a pitch limiting system which reduces the maximum speed of the UA and the wind limits it can operate in. The manufacturer's user manual for the Matrice 200 series does not provide details of the operation of the pitch limiting system.

Therefore, the following Safety Recommendation was made:

> **2022-003**
>
> It is recommended that DJI amend the Matrice 200 series user manual to provide information on the pitch attitude limiting system, including the new maximum speed which results from the limit, and the battery level at which it triggers; and communicate this change widely to pilots and operators.

Date Safety Recommendations made: **05 April 2022**

Latest response received: **None**

AAIB Assessment: **Not adequate**

Action Status: **No planned actions**

SAFETY RECOMMENDATIONS CLOSED IN 2024

Safety Recommendations Status: **Closed**

Feedback rationale

No response has been received and the AAIB has concluded that the addressee has rejected the Safety Recommendation. The response has been classified as "Not Adequate".

Safety Recommendation 2022-004

Justification

The operator had adopted a distance of 500 m for their VLOS operations in part because of the CAA's guidance in CAP 722 at this distance the Matrice has an apparent size of just 0.4 by 0.3 mm on a piece of paper held at normal reading distance and its orientation cannot be determined. It is not clear from the regulation or CAP 722 whether this is acceptable.

Therefore, the following Safety Recommendation was made:

> **2022-004**
>
> It is recommended that the Civil Aviation Authority review the Visual Line of Sight distance figures in CAP 722 and amend the guidance to make it clear that just being able to see an unmanned aircraft is not sufficient for Visual Line of Sight operations and that pilots need to be able to demonstrate that at the distance they are flying, they can manoeuvre it rapidly to avoid a collision and can also land the unmanned aircraft safely following a loss of position-holding without reference to video or telemetry.

Date Safety Recommendations made: **05 April 2022**

Latest response received: **22 April 2024**

The CAA accepts the update to the recommendation. We have reviewed the content contained within CAP722 and will amend the text accordingly to ensure that the requirement to manoeuvre the UA without the use of video or telemetry is emphasised.

This new wording will, initially, be held in our amendments log and will be implemented at the next revision cycle.

The draft wording is included below for information.

The proposed additional text is to be included in CAP722 2.1.1 Notes.

"It is important to note that the sole use of video aids or telemetry to control the UA does not meet the requirements for VLOS."

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendations Status: **Closed**

SAFETY RECOMMENDATIONS CLOSED IN 2024

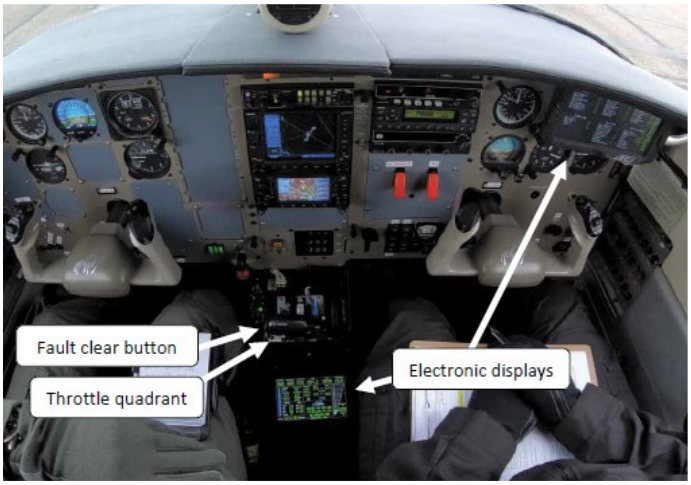
Piper PA-46-350P (Modified), G-HYZA

29 April 2021, Near Cranfield Airport, Bedfordshire

Investigation synopsis

The electrically powered aircraft was undertaking experimental flight tests, under E Conditions CAP1220, when power to the electrical motors was lost. A forced landing was carried out close to Cranfield airfield during which the aircraft was severely damaged.

The loss of power occurred during an interruption of the power supply when, as part of the test procedure, the battery was selected off with the intention of leaving the electrical motors solely powered by the hydrogen fuel cell. During this interruption the windmilling propeller generated a voltage high enough to operate the inverter protection system, which locked out the power to the motors. The pilot and observer were unable to reset the system and restore electrical power.



View from onboard camera of cockpit instrument panel

Safety Recommendation 2022-008

Justification

During the accident flight the aircraft flew outside of the test area twice. The opportunity to switch power sources at the end of the downwind leg was missed and the pilot appeared not to recognise his proximity to the ground and his position in relation to the runways when it became clear that he had to conduct a forced landing. One potential factor, which might also have delayed the diagnosis of the power loss, was the design and positioning of the pilot's electronic display which contained important information, such as the rpm and motor power setting, that the pilot required to control the aircraft. However, the display did not conform to aviation good practice for the following reasons:

- The pilot's display unit was not positioned in his primary field of view.
- Most of the display was obscured by the pilot's hand on the throttle, including the warning and caution captions.
- The display was densely populated with many parameters in a small font.
- The warning and caution indications had no attention getting properties.

SAFETY RECOMMENDATIONS CLOSED IN 2024

The cockpit video showed that during the emergency the pilot's attention appeared to be mostly in the cockpit moving between the overhead panel, main instrument panel and his electronic display located beneath the throttle quadrant. While CAP1220 did not require the aircraft to conform with the airworthiness requirements of a Permit to Fly or Certificate of Airworthiness, there are safety benefits in following existing design guidelines, where possible, to ensure that operational risk is kept as low as reasonably practicable and tolerable. In this case, the location of the aircraft controls did not present any issue but the principle of following existing design guidelines remains applicable.

Therefore, the following Safety Recommendation was made:

2022-008

It is recommended that the Civil Aviation Authority develops guidance in CAP1220, Operation of Aircraft Under E Conditions, regarding the use of existing guidance on the design and positioning of controls and displays used in the operation of the aircraft.

Date Safety Recommendation made: **20 July 2022**

Latest response received: **18 December 2024**

The CAA has now finalised its considerations with respect to these Safety Recommendations.

CAP1220, Operation of Aircraft under E Conditions at Edition 3, was published in November 2024 and the CAA feel the intent of all five Safety Recommendations have been satisfactorily addressed in this latest edition.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The AAIB has reviewed Edition 3 of CAP1220 and is satisfied the changes incorporated meet the intention of this Safety Recommendation.

Safety Recommendation 2022-009

Justification

The reduction in the burden of regulation makes E Conditions attractive to a wide range of parties who wish to test a proof of concept ranging from relatively simple designs to high-profile, leading-edge technology. The scope of CAP1220 allows for a wide range of experimental projects some of which may be beyond the original intent of the authors in 2015 and beyond the experience and resources of some parties. Complex and commercially dynamic projects, or those involving multi-crew aircraft operation, may require additional provisions to ensure that they can be safely managed.

SAFETY RECOMMENDATIONS CLOSED IN 2024

Therefore, the following Safety Recommendation was made:

> **2022-009**
>
> It is recommended that the Civil Aviation Authority clarify the scope of projects considered suitable to be carried out under CAP1220, Operation of Aircraft Under E Conditions, and any additional provisions that might be required for more complex projects.

Date Safety Recommendation made: **20 July 2022**

Latest response received: **18 December 2024**

The CAA has now finalised its considerations with respect to these Safety Recommendations.

CAP1220, Operation of Aircraft under E Conditions at Edition 3, was published in November 2024 and the CAA feel the intent of all five Safety Recommendations have been satisfactorily addressed in this latest edition.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The AAIB has reviewed Edition 3 of CAP1220 and is satisfied the changes incorporated meet the intention of this Safety Recommendation.

Safety Recommendation 2022-010

Justification

Apart from the basic details submitted on the declaration, there is no independent review of the suitability of a project for E Conditions or if all the required conditions have been fully addressed in the Dossier. That judgement is delegated to the competent person who may be supported in this decision by the operator and the experimenting team where one exists. There is an option for the CAA to review the Dossier, but it is unclear what would trigger this additional scrutiny. It was not triggered for G-HYZA, which at the time of the accident was one of the more complex projects conducted under E Conditions.

Therefore, the following Safety Recommendation was made:

> **2022-010**
>
> It is recommended that the Civil Aviation Authority require an independent review of the Dossier for aircraft operating under the provisions of CAP1220, Operation of Aircraft Under E Conditions, to ensure the project meets the intent of the guidance and can be safely managed by a competent person.

SAFETY RECOMMENDATIONS CLOSED IN 2024

Date Safety Recommendation made: **20 July 2022**

Latest response received: **18 December 2024**

The CAA has now finalised its considerations with respect to these Safety Recommendations.

CAP1220, Operation of Aircraft under E Conditions at Edition 3, was published in November 2024 and the CAA feel the intent of all five Safety Recommendations have been satisfactorily addressed in this latest edition.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The AAIB has reviewed Edition 3 of CAP1220 and is satisfied the changes incorporated meet the intention of this Safety Recommendation.

Safety Recommendation 2022-011

Justification

Currently, there is no assessment required to ensure the competent person is able to fulfil their responsibilities, considering factors such as organisational relationships, conflicting interests, availability, skills and knowledge. A closer assessment could identify if the individual is suitable, or if additional measures are required, to assist the competent person manage the project.

Therefore, the following Safety Recommendation was made:

2022-011

It is recommended that the Civil Aviation Authority requires that the individual nominated as a competent person under CAP1220, Operation of Aircraft Under E Conditions, has the knowledge, skills, experience, and capacity to manage and oversee the experimental test programme registered on the Declaration.

Date Safety Recommendation made: **20 July 2022**

Latest response received: **18 December 2024**

The CAA has now finalised its considerations with respect to these Safety Recommendations.

CAP1220, Operation of Aircraft under E Conditions at Edition 3, was published in November 2024 and the CAA feel the intent of all five Safety Recommendations have been satisfactorily addressed in this latest edition.

SAFETY RECOMMENDATIONS CLOSED IN 2024

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The AAIB has reviewed Edition 3 of CAP1220 and is satisfied the changes incorporated meet the intention of this Safety Recommendation.

Safety Recommendation 2022-012

Justification

It is recommended that the Civil Aviation Authority requires that the individual nominated as a competent person under CAP1220, Operation of Aircraft Under E Conditions, has the knowledge, skills, experience, and capacity to manage and oversee the experimental test programme registered on the Declaration.

Therefore, the following Safety Recommendation was made:

2022-012

It is recommended that the Civil Aviation Authority enhance the guidance for the competent person and principal test pilot in the organisation, management, and conduct of the flight of an experimental aircraft project operating under CAP1220, Operation of Aircraft Under E Conditions.

Date Safety Recommendation made: **20 July 2022**

Latest response received: **18 December 2024**

The CAA has now finalised its considerations with respect to these Safety Recommendations.

CAP1220, Operation of Aircraft under E Conditions at Edition 3, was published in November 2024 and the CAA feel the intent of all five Safety Recommendations have been satisfactorily addressed in this latest edition.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The AAIB has reviewed Edition 3 of CAP1220 and is satisfied the changes incorporated meet the intention of this Safety Recommendation.

SAFETY RECOMMENDATIONS CLOSED IN 2024

BAe ATP, SE-LPS

09 April 2021, Ronaldsway Airport, Isle of Man

Investigation synopsis

SE-LPS was on approach to Ronaldsway Airport, Isle of Man with the co-pilot as PF. As the aircraft approached the minimum descent altitude, the co-pilot attempted to disengage the autopilot. There was no audio tone to indicate the disengagement and the co-pilot felt there was resistance in the flying controls. Both pilots checked the cockpit indications which seemed to show that the autopilot had disengaged. The commander took control and also felt resistance in the flying controls. He pressed and held the synchronisation (SYN) button on the control column which he felt released the controls and was able to land the aircraft normally.

A definite cause could not be found for the autopilot not disengaging as designed. The manufacturer responsible for the design of the autopilot identified a possible scenario where the autopilot servomotors could remain engaged after the autopilot disengaged. This would result in higher-than-normal forces at the cockpit controls.

On 2 December 2021, another autopilot occurrence on an ATP, registration SE-MAJ, was reported to the AAIB. The results of this investigation are included in the SE-LPS report.

For the occurrences on SE-LPS and SE-MAJ, the better-quality recordings of the same data stored in the QAR solid state memories were used in the investigations. This may not be possible in the event of an energetic accident for which crash protected FDRs are designed to survive, whereas QARs are not crash protected. ICAO required magnetic tape FDRs and CVRs to be discontinued by 1 January 2016. EASA reviewed this requirement under '*Notices of Proposed Amendment 2013-26*', which resulted in the prohibition on the use of magnetic tape CVRs but not FDRs: by extrapolation of the reduction in usage, EASA calculated that magnetic tape FDRs would no longer be in use by 2019.

However, magnetic tape recorders are still being used on aircraft beyond the date that EASA believed they would no longer be in service and a number of them have been involved in AAIB investigations.

Safety Recommendation 2022-015

Justification

The quality of magnetic tape recordings can vary significantly throughout the recording, and currently only a quality check of a sample of the recording is required.

Therefore, the following Safety Recommendation was made:

2022-015

It is recommended that the Civil Aviation Authority require that magnetic tape flight data recorders, used in aircraft operated by UK Air Operator Certificate holders, comply with the Civil Aviation Authority Specification No 10, regarding the error rate requirements, by checking the complete recording rather than by undertaking a sample check.

Date Safety Recommendation made: **19 August 2022**

Latest response received: **09 August 2024**

The CAA have reviewed CAP731 which details the UK requirements for maintenance of Flight data recorders.

A review and amendment of this publication has now taken place with the amendment of the CAP now complete. This amended version of CAP731 has now been sent for publication.

This amended version captures the updated maintenance requirements within Chapter 7, (FDR System Serviceability and readout) within the chapter "Establishing the Limitations of the readout".

Chapter 8, General requirements for a readout, retains the requirements of Specification No.10 or ED-55/ED-112 as applicable to be included in the procedures for staff training.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The actions taken by the CAA meets the intent of the Safety Recommendation and therefore no further updates are required. The Safety Recommendation has been closed.

SAFETY RECOMMENDATIONS CLOSED IN 2024

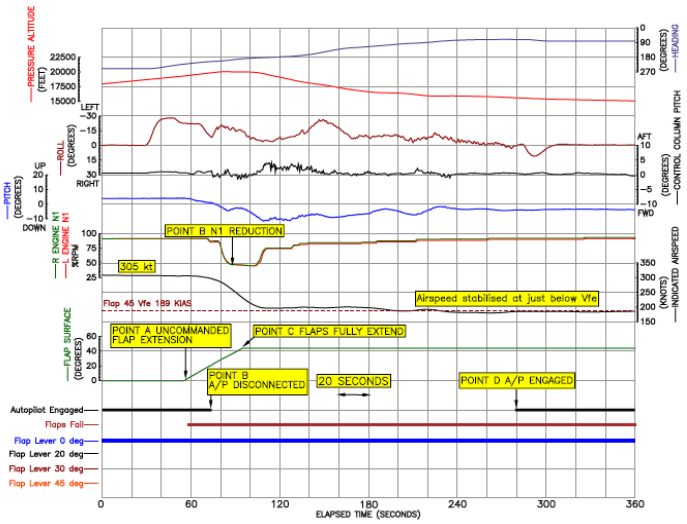
Bombardier CL-600-2B16 (604 Variant), D-AAAY

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 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.



FDR data of uncommanded flap extension

Safety Recommendation 2022-017 (Published in AAIB Special Bulletin S2/2022)

Justification

On this occasion the crew, who were actively monitoring the aircraft during climb, quickly noticed the uncommanded flap extension and were able to respond appropriately to control the aircraft and reduce its speed to below the flap limit speed. Even so, the flap overspeed reached up to about 103 kts and the speed was not reduced below the flaps 45 limit speed for some 170 seconds.

Had the aircraft been in the cruise, the crew may not have been able to recognise the uncommanded flap extension so promptly and take corrective action within the time required for the flaps to fully extend.

To ensure that operators are aware of the actions to take in the event of an uncommanded flap operation, which may occur without warning, therefore, the following Safety Recommendation was made:

> **2022-017**
>
> It is recommended that Bombardier inform operators of the Challenger 600 series of aircraft of the actions to take in the event of uncommanded flap operation in flight.

Date Safety Recommendation made: **22 September 2022**

Latest response received: **04 July 2024**

As of June 28th, 2024, all Challenger 600 series flight manuals have been revised to include procedures for in-flight uncommanded, unarrested flaps operation.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Safety Recommendation 2023-006 (Published in AAIB special Bulletin S1/2023)

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 annunciated 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:

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.

SAFETY RECOMMENDATIONS CLOSED IN 2024

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.

(AAIB closure date 12 January 2024).

SAFETY RECOMMENDATIONS CLOSED IN 2024

Mudry Cap 10B, 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.

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.

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:

> **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.

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

Latest response received: **31 May 2024**

The previous CAA update for this Safety Recommendation indicated that a new Safety Sense Leaflet (SSL) was being developed to provide GA pilots with guidance on inadvertent entry into Instrument Meteorological Conditions (IMC) to mitigate the risk of loss of control or flight into terrain occurrences.

The CAA published the 'VFR Flight into IMC' SSL on May 7th 2024. The SSL offers guidance on how to avoid a 'VFR into IMC' scenario via effective pre-flight planning and what actions to take if confronted with deteriorating weather conditions when not qualified to fly in IMC.

The CAA considers the above action satisfies the intent of the Safety Recommendation.

SAFETY RECOMMENDATIONS CLOSED IN 2024

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

SAFETY RECOMMENDATIONS CLOSED IN 2024

Leonardo AW169, G-VSKP

27 October 2018, Kings Power Stadium, Leicester

Investigation 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.

(A) Inboard row, outer race, (B) Inboard row inner race and fractured cage, (C) Inboard row inner race

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:

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

> **2023-018**
>
> It is recommended that the European Union Aviation Safety Agency amend Certification Specification 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: **28 August 2023**

Latest response received: **29 November 2024**

Pursuant to point 21.A.20 of Annex I (Part 21) to Regulation (EU) No 748/2012, the applicant for aircraft type certification is responsible for the demonstration of compliance with the type certification basis (that includes certification specifications), and to record justifications of compliance within the compliance documents as referred to in the certification programme. This implies ensuring that parts and systems reach minimum performance and reliability targets.

Therefore, the applicant is responsible for providing any information such as, but not limited to, test results to its suppliers to ensure a final airworthy design.

This principle is not specific to certain products and should not be repeated in each Certification Specification where a supplier could be affected.

The European Union Aviation Safety Agency (EASA) considers that the above-mentioned regulatory framework, including Certification Specifications, is adequate and does not envisage creating new prescriptive requirements.

EASA Status: Closed – Partial agreement

AAIB Assessment: **Not adequate**

SAFETY RECOMMENDATIONS CLOSED IN 2024

Action Status: **No planned action**

Safety Recommendation Status: **Closed**

Feedback rationale

The AAIB acknowledges the EASA has reviewed their response as a result of AAIB feedback and has not changed its position on this recommendation.

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:

> **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: **06 February 2024**

Inspections and/or retirement times are introduced in the Airworthiness Limitations Section (ALS) of the Instructions for Continued Airworthiness (ICA) based on:

1. The fatigue and damage tolerance evaluations performed when showing compliance with points CS 29.571 (Fatigue Tolerance Evaluation of Metallic Structure) and CS 29.573 (Damage Tolerance and Fatigue Evaluation of Composite Rotorcraft Structures) of Certification Specification for Large Rotorcraft (CS-29). Note: the European Union Aviation Safety Agency (EASA) considers that tail rotor bearings are part of the scope of CS 29.571/573; or

2. Certification Maintenance Requirements (CMRs) identified when showing compliance with points CS 29.1309 [or equivalent assessments performed when showing compliance with other CS-29 paragraphs such as CS 29.547(b) (Main and tail rotor structure) or CS 29.917(b) (Rotor drive system design)] to ensure that safety objectives are met when addressing

SAFETY RECOMMENDATIONS CLOSED IN 2024

significant latent failures (refer to Federal Aviation Administration (FAA) Advisory Circular 29-2C, paragraph 29.1309, which is recognised as Acceptable Means of Compliance (AMC) to CS-29; in addition, details on CMRs are provided in CS-25, AMC 25-19, the content of which is also applied by EASA to CS-29 certification projects through a Means of Compliance Certification Review Item).

Thus, EASA considers that the 'airworthiness status of life limits' of critical parts is ensured by means of demonstrating that the necessary limits are established, when required, in compliance with the Certification Specifications mentioned in points 1 and 2 above.

Following the creation of AMC1 29.571 (addressing rolling contact fatigue) as part of Amendment 11 of CS-29 (ED Decision 2023/001/R), EASA will ensure that bearings installed in rotorcraft certified by EASA comply with CS 29.571 and feature adequate life limits in the ALS, when required.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The AAIB acknowledges that EASA's response meets the intent of the Safety Recommendation.

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:

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.

SAFETY RECOMMENDATIONS CLOSED IN 2024

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

Latest response received: **29 November 2024**

In accordance with point 21.A.7 of Annex I (Part 21) to Regulation (EU) No 748/2012, the Type Certificate Holder (TCH) must provide Instructions for Continued Airworthiness (ICA) for critical parts, either structural or non-structural, and, in case of large rotorcraft, the preparation of ICA must be performed in compliance with the Certification Specification (CS) 29.1529.

The ICA applicable to critical parts may be included within the Airworthiness Limitation Section (ALS) of the ICA and/or in other appropriate Sections.

Retirement Times or Operational Time Limits provided in the ICA are necessary for the safe operation of the aircraft and they have to be implemented in the Aircraft Maintenance Programme (AMP) to obtain approval by the Competent Authority [ref. point M.A.302(d)(2) of Annex I (Part M) to Regulation (EU) No 1321/2014]. This requirement is applicable to both ALS and other Sections of the ICA.

In addition, point 21.A.3A of Annex I (Part 21) to Regulation (EU) No 748/2012 contains the necessary provisions for ensuring the collection, investigation and analysis of occurrence reports to identify the necessary mitigations in terms of changes to the design and/or to the ICA to prevent or minimize the possibility of such occurrences in the future, as necessary. This includes, as per point 21.A.3A(a)(1), the identification of adverse trends or deficiencies that cause or might cause adverse effects on the continuing airworthiness of the product. The 'analysis' is not limited to those occurrences that require the involvement of the European Union Aviation Safety Agency (EASA) under point 21.A.3A(e).

Taking into account the information above, the EASA considers that the necessary regulatory framework is already in place and, therefore, EASA does not intend to re-define or re-evaluate the airworthiness status of ICA for critical parts, either structural or non-structural, already in service.

EASA Status: Closed – Disagreement

AAIB Assessment: **Not adequate**

Action Status: **No planned actions**

Safety Recommendation Status: **Closed**

Feedback rationale

The AAIB acknowledges the EASA has reviewed their response as a result of AAIB feedback and has not changed its position on this recommendation

SAFETY RECOMMENDATIONS CLOSED IN 2024

Safety Recommendation 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 L10 life[2] and discard time calculations by flagging up potential premature degradation issues.

Therefore, the following Safety Recommendation was made:

> **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 Recommendation made: **25 August 2023**

Latest response received: **29 November 2024**

Point 21.A.3A of Annex I (Part 21) to Regulation (EU) No 748/2012 defines the obligations applicable to the Type Certificate Holders (TCHs) to establish and maintain a system for collecting, investigating and analysing occurrence reports. This includes, as per point 21.A.3A(a)(1), identification of adverse trends or deficiencies that might cause adverse effects on the continuing airworthiness of the product.

In addition, acceptable means of compliance AMC1 21.A.3A(a) clarifies that, for parts whose failure could lead to an unsafe condition (and critical parts are candidates as they could have catastrophic effect upon the rotorcraft), the 'analysis' function of the system should ensure that reports and information sent, or available, to the Design Approval Holder (DAH) are fully investigated so that the exact nature of any event and its effect on continuing airworthiness is understood. This may then result in changes to the design and/or to the Instructions for Continued Airworthiness (ICA), and/or in establishing a mitigation plan to prevent or minimize the possibility of such occurrences in the future, as necessary. The 'analysis' is not limited to those occurrences that require the involvement of the European Union Aviation Safety Agency (EASA) under point 21.A.3A(e).

Footnote

[2] The life is referred to as the L10 life, because it is a statistical prediction that gives a 90% reliability that similar bearings will achieve the same number of revolutions given the same operating conditions.

EASA considers that obligations outlined in 21.A.3A already indicate that the TCH shall collect, investigate and analyse reports and information [including the early rejection of parts from service as mentioned in guidance material GM1 21.A.3A(a) and 21.A.3A(b) Reporting system] that might question the certification assumptions for critical parts and when necessary, define design changes and implement mitigation plans.

Therefore, EASA considers that the necessary regulatory framework is already in place to address the intent of this Safety Recommendation (SR) and, therefore, there is no need to retrospectively implement a comprehensive post removal from service assessment programme for critical parts already in service.

EASA Status: Closed – Disagreement

AAIB Assessment: **Not adequate**

Action Status: **No planned actions**

Safety Recommendation Status: **Closed**

Feedback rationale

The AAIB acknowledges the EASA has reviewed their response as a result of AAIB feedback and has not changed its position on this recommendation

Safety Recommendation 2023-025

Justification

Amend Certification Specification 29 to ensure that where catastrophic failure modes are identified, practical mitigation methods within the wider system should be reviewed in order to mitigate the severity of the outcome as well as the likelihood of occurrence.

Therefore, the following Safety Recommendation was made:

2024-025

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: **19 July 2024**

SAFETY RECOMMENDATIONS CLOSED IN 2024

The European Union Aviation Safety Agency (EASA) considers that practical mitigation options such as early warning systems and failure tolerant designs are relevant means to achieve adequate safety levels in rotorcraft designs.

According to CS-29 Amdt 11 (Certification Specifications, Acceptable Means of Compliance (AMC) and Guidance Material for Large Rotorcraft), CS 29.571 (Fatigue tolerance evaluation of metallic structure) and AMC1 29.571 (dealing with rolling contact fatigue (RCF)) address the need to take into account the impact of RCF and minimise the risk of crack initiation resulting from RCF on Principal Structural Elements (PSEs). In addition, AMC1 29.571 states that 'as it is difficult to totally preclude cracking initiated by RCF, a fail-safe approach is recommended wherever possible, such that cracking of the affected structural element(s) is detected prior to its residual strength capability falling below the required levels prescribed in CS 29.571(f)'. Hence AMC1 29.571 clearly introduces the notion of fail-safe designs and of means of detection to fulfil the objective of preventing failure as a result of RCF. This regulatory material was relatively new at the date of publication of the accident investigation report and it appeared, in EASA's view, not to have been considered.

Nevertheless, additional CS-29 provisions help to meet the intent of this Safety Recommendation:

(1) The design assessments specified by CS 29.547(b) (Strength requirements - Main and tail rotor structure) and CS 29.917(b) (Powerplant – Rotor Drive System - Design) require the identification of all failures in rotors and rotor drive systems that will prevent continued safe flight or safe landing, as well as the means to minimise the likelihood of their occurrence. As per Federal Aviation Administration (FAA) Advisory Circular.

(AC) 29-2C Change 7 (recognised as AMC to CS-29) sections 29.547 and 29.917, 'a design assessment […] should be carried out in order to substantiate that the system is of a safe design and that compensating provisions are made available to prevent failures classified as hazardous and catastrophic[…]'. The listed compensating provisions include design features (such as redundancies and safety factors) and the use of safety devices or vibration health monitoring systems, which cover the means proposed by the AAIB in this Safety Recommendation. Other compensating provisions such as inspections or checks, as well as preventive maintenance are also listed.

(2) Since some years[*sic*] EASA has recognised the need to clearly identify those continuing airworthiness tasks which are listed as compensating provisions in the aforementioned design assessments and are also considered key to ensuring that the hazardous and catastrophic failures of the design are either adequately mitigated or their probability of occurrence has been adequately minimised. EASA considers that these continuing airworthiness tasks should be:

(i) considered as candidates for Certification Maintenance Requirements (CMRs) in accordance with AMC 25-19 of CS-25 (Certification Specifications and Acceptable Means of Compliance for Large Aeroplanes). EASA currently addresses the application of the CS-25 CMR concept to support the demonstration of compliance with large rotorcraft certification specifications requiring safety assessment and design assessment, including CS 29.547(b) and CS 29.917(b), through a Means of Compliance Certification Review Item. Therein applicants are requested to detail the criteria and methods to demonstrate the adequacy of these CMRs.

SAFETY RECOMMENDATIONS CLOSED IN 2024

(ii) evaluated for the need of dedicated certification testing to demonstrate adequate performance and suitable intervals. EASA is currently considering the possibility of introducing new AMC to CS 29.927(a) (Additional tests) to address this aspect. This would clarify the need to support inspection intervals and retirement times with appropriate directly applicable data.

In conclusion, while the relevance of a full assessment of the design and a detailed evaluation of the failure scenarios is agreed and already present in CS-29, EASA considers that mandating design measures to systematically mitigate the outcome of catastrophic failures could be counterproductive. This could lead to impractical and overly complex solutions, that negatively impact the reliability of rotors and rotor drive systems.

Based on the above, EASA considers that the necessary elements are in place to ensure that hazardous and catastrophic failures are adequately addressed during certification, by adequately mitigating such failures and/or minimising their probability of occurrence, thus, ensuring adequate safety levels.

AAIB Assessment: **Not adequate**

Action Status: **No planned actions**

Safety Recommendation Status: **Closed**

Feedback rationale

The changes to CS 29.571 were introduced to address issues within Principal Structural Elements (PSE). The rotor control system is not a PSE and is not certified to CS 29.571. This is stated in the AAIB report and the preamble to this Safety Recommendation.

The Acceptable Means of Compliance (AMC) for CS 29.547 do not quote FAA AC 29-2C. FAA AC 29-2C is considered explicitly as part of the AMC for other regulations. This has not changed with the publication of change 7 to AC 29-2C amendment 11 of CS-29 being issued in 2023. As such, there is nothing to direct manufacturers to consider it for compliance with this regulation.

CS 29.917 does not have a bearing on this Safety Recommendation as it relates to the rotor drive system not the rotor control system.

As stated in the report there were no Certification Maintenance Requirements (CMR) on the tail rotor control system, even though this process was in place at the time of certification of the AW169 and AC 25-19 was published in 2011.

There is no change to the requirement for dedicated testing of the tail rotor control system since the accident, which is still only considered by the regulations as part of the overall helicopter operation.

As stated in the AAIB's report, once a failure mode is considered catastrophic no further assessment is required. The response to this Safety Recommendation does not change that position.

SAFETY RECOMMENDATIONS CLOSED IN 2024

Schleicher ASW 20 L, G-CFRW

24 September 2022, Nera 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 on-site inspection of the aircraft revealed that the elevator was not connected to the elevator control rod. Two Safety Recommendations have been made; the first to mandate Positive Control Checks and the second to amend the Flight and Operations Manual 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 is made:

> **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: **23 July 2024**

As discussed, BGA Operational Regulation 38 was updated, approved at the AGM and published at BGA Operational Regulations - Pilot & Club Info (gliding.co.uk) as:

38. Inspection Before Flight. All gliders operated from a BGA club site shall be inspected before flying on each day by a pilot who has been approved to carry out a daily inspection, who must sign to confirm that they have completed the daily inspection including positive control check and that the glider is serviceable. (Updated 21 Feb 2024).

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Sikorsky S-92A, G-MCGY

4 March 2022, Derriford Hospital, Plymouth, Devon

Investigation synopsis

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.

Safety Recommendation 2023-028

Justification

Civil Air Publication (CAP) 1264, Standards for Helicopter Landing Areas at Hospitals, contains references to CAP 738. The CAP 738, Safeguarding of Aerodromes, introductory text indicates that the guidance is applicable to certificated and licensed aerodromes, but it also states that non-licensed aerodromes, heliports and Helicopter Landing Sites (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:

> **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: **25 March 2024**

CAP1264 Version 2 was published on 11 March 2024 with a new Section 2 – Heliport Operations, which now includes a consolidated chapter concerning the mitigation of helicopter downwash.

As such, the CAA consider that Recommendation 2023-28 is now closed.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Safety Recommendation 2023-029

Justification

For the HLS 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:

> **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: **30 April 2024**

The Heliport Operations Manual

CAP1264 Version 3 was published on 29 April 2024 with the addition of Annex A – The Heliport Operations Manual (HOM).

The HOM was produced, with input from UK CAA SMEs, Onshore Safety Leadership Team (OnSLG) and Blue Light Air Safety Team (BLAST), to aid those NHS Trusts with responsibility for Hospital Helicopter Landing Sites (HHLS) in producing their own overarching HHLS reference document. Its aim was to provide guidance in all areas of HHLS operations and designed in the form of a 'template', thus allowing Trusts to incorporate their own exiting policies and share best practice. Modelled on a typical AOC holder's Operation's Manual, it covers the following sections, each with guidance and relevant links to other publications or UK regulation:

Part A: General

1. Administration and Control of Manual
2. Organisation and Responsibilities
3. Safety Management Systems
4. Qualification Requirements

SAFETY RECOMMENDATIONS CLOSED IN 2024

5. Dangerous Goods
6. Handling and Notification of Accidents / Incidents

Part B: Site Specific Procedures

1. Normal HHLS Procedures
2. Emergency HHLS Procedures
3. HHLS Maintenance

Part C: Change Management

1. HHLS Change Notification
2. HHLS Safeguarding Procedures
3. HHS Operations Contact Details

Part D: Training

1. HHLS Awareness Courses
2. Training Records

The BLAST Landing Site Team (BLAST LST) has recently been stood up to provide a direct link between the Hospital Trusts, the work of OnSLG / BLAST and HEMS/SAR Operators. With CAP1264 v3 now published, BLAST LST will initially be working in conjunction with Derriford Hospital to populate and complete its own HOM. Advice and guidance from that process will be utilised by OnSLG to, where necessary, aid further NHS Trusts in completion of their own HOM.

Hospital Helipad – Aviation Awareness Course

The CAA International (CAAi) has designed and now successfully delivered a number of HHLS Awareness Courses, providing guidance and training to persons with responsibility for HHLS, including NHS Trust HHLS Accountable Managers and Responsible Persons (as designated in CAP1264). This course includes the following topics:

- Overview of UK Emergency Services Aviation
- Introduction to UK Aviation Regulation
- Principles of Rotary Flight
- Helicopter Operations
- Managing Emergencies
- Maintaining a Safe Operating Environment

Further details can be found here:

Hospital Helipad – Aviation Awareness | Training Course by the UK CAA

SAFETY RECOMMENDATIONS CLOSED IN 2024

With the above workstreams now complete, the CAA consider Recommendation 2023-29 now closed.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

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:

> **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: **03 March 2024**

The DfT accepts this recommendation, and will fulfil it through co-chairing a dedicated HHLS sub-committee of the Onshore Safety Leadership Group. This group will oversee work to improve safety across the network of hospital landing sites, including the development of an HLS database.

SAFETY RECOMMENDATIONS CLOSED IN 2024

Members of this committee include the Department for Transport, UK Civil Aviation Authority, CAAi, the Health and Safety Executive, NHS England Estates, NHS Wales Shared Services Partnership, NHS Scotland Assure, Department of Health Northern Ireland, AAIB, BHA Emergency Services Committee, BLAST and Air Ambulances UK.

This approach, which is already underway, will avoid duplication, ensure sufficient authority, representation, resourcing and expertise, and ensure the recommendation is completed successfully.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

SAFETY RECOMMENDATIONS CLOSED IN 2024

Pegasus Quik, G-CCPC

01 June 2022, East Lothian 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.

As a result of reported instances of the engine on the Pegasus Quik suddenly increasing to maximum rpm during engine start, in 2003 the manufacturer introduced optional modification M112, which prevents the engine starting if the hand throttle is not in the off position.

Safety Recommendation 2022-037

Justification

Following this accident, the aircraft manufacturer prepared Service Bulletin (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:

> **2022-037**
>
> 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: **19 December 2024**

The CAA has now issued a Mandatory Permit Directive MPD 2024-003: Pegasus Sport Aviation Ltd Quik, QuikR, Quik GTR, GT450 and Quantum microlights: Engine Ignition – Starter Inhibitor Switch – Modification on 18th December 2024 which requires all electric start Pegasus Quik, QuikR, Quik GTR, GT450, and Quantum aircraft to comply with the updated Pegasus Sport Aviation Ltd Service Bulletin (SB) 159.

MPD compliance is required no later than 25 hours or 6 months from the effective date of the MPD, whichever occurs first.

The CAA action above fulfils the intent of our original response to this Safety Recommendation.

AAIB Assessment: **Adequate**

Action Status: **Planned action completed**

Safety Recommendation Status: **Closed**

Feedback rationale

The publication of MPD 2024-003 is considered a closing action for this Safety Recommendation.

SAFETY RECOMMENDATIONS CLOSED IN 2024

Safety Actions from investigations reported on in 2024

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 where possible encourage proactive action whilst the investigation is ongoing.

The published report details the safety issues and the Safety Action that has taken place. (By convention Safety Action taken are published in the reports with a green highlighted box). When pre-emptive safety action is taken, there is usually no need to raise a Safety Recommendation as the safety issue has been addressed.

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

During 2024, 103 Safety Actions directly resulted from AAIB investigations. These arose from 19 Field Investigations and 16 Correspondence Investigations .

Index of Safety Actions Recorded in Field and Correspondence Investigations

(Listed by category, aircraft weight, manufacturer and type)

SAFETY ACTIONS OVERVIEW

SAFETY ACTIONS OVERVIEW

Boeing 787-9, G-VDIA and Airbus A350-1041 and G-XWBC

6 April 2023, London Heathrow Airport

Synopsis

During a pushback operation to reposition G-VDIA, the aircraft's left wingtip struck the right horizontal stabiliser of G-XWBC. Both aircraft were damaged but there were no injuries. The operator of G-VDIA found that the pushback tug turned too soon, so the pushback did not follow the correct angle. Contrary to their company airport operating manual, the pushback was conducted without wing walkers; a wing walker on the left side of the aircraft would probably have seen the impending collision and could have stopped the pushback operation.

Safety action taken by aircraft operator

- The operator of G-VDIA issued a safety alert to highlight their requirement for wing walkers during aircraft pushbacks and towing operations.

Safety action taken by the airport operator

- The airport operator issued an Aerodrome Safety Alert outlining factors that should be considered during aircraft pushback or towing operations.
- The airport operator advised they were reviewing non-standard[1] pushback operations and the associated Operations Safety Instruction.

SAFETY ACTIONS

Footnote

[1] The airport operator described non-standard pushbacks to be 'those that are not pushed at 90 degrees to the taxiway centreline'.

Airbus 321-253NX, G-OATW

4 October 2023, London Stanstead Airport

Synopsis

A cabin window was seen to be loose shortly after takeoff and several windowpanes were missing after the aircraft landed. The windowpanes fell out because they had been damaged by infrared energy emitted by high-intensity lights during a filming event the previous day.

The investigation found four previous occurrences on other airframes, but knowledge of them was not widespread in the aviation community. The report considers the cause of the damage and how the filming was risk assessed and supervised.

In response to this accident the aircraft manufacturer published two articles to highlight the damage that can be caused by high-intensity lights. The aircraft operator highlighted the need for a suitable aviation-focused risk assessment when carrying out this type of activity with an aircraft.

Safety action taken by the operator

- The operator reminded the department responsible for the filming of the need to use the risk assessment process for activities like this.

Safety action taken by the manufacturer

- The manufacturer published an In Service Information document to highlight the potential adverse effects of using high-intensity lighting near an aircraft.
- The manufacturer published a Safety First article highlighting the possible adverse effects of using high-intensity lighting near an aircraft.

Flood lighting on the left side of the aircraft

Safety action taken by the regulator

- EASA published a Safety Information Bulletin highlighting the risk of damage when using high-intensity lighting near an aircraft

SAFETY ACTIONS

Boeing 737 8200, EI-HET

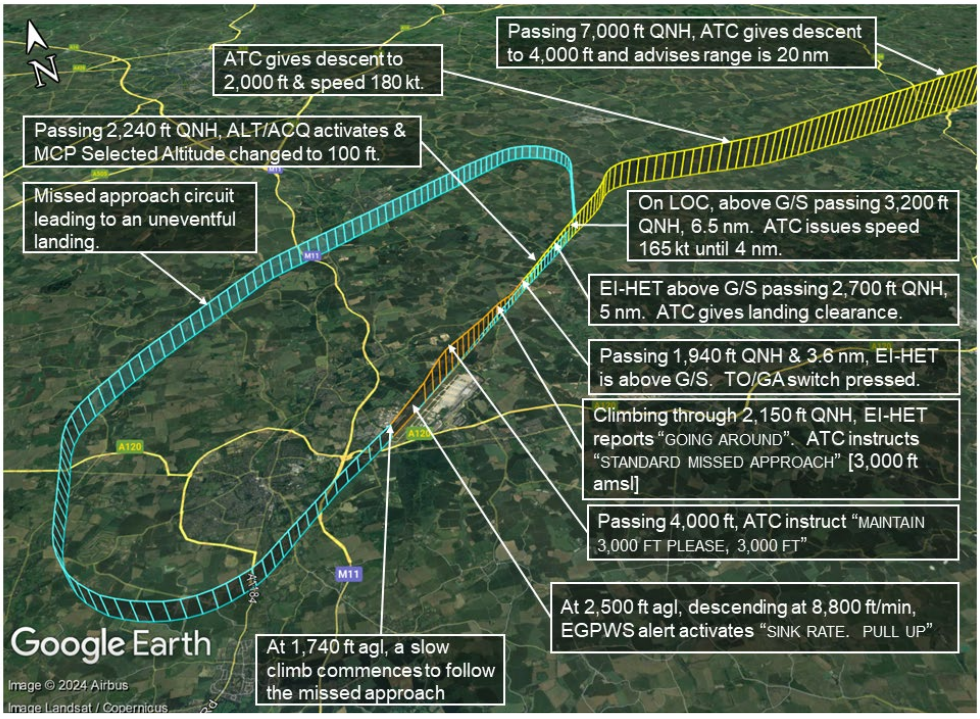
4 December 2023, London Stansted Airport

Synopsis

After an unstable ILS approach, a manually flown go-around (GA) was initiated at 1,940 ft amsl and 3.6 nm from touchdown. During the approach the mode control panel altitude display was set to 100 ft, but not reset to the missed approach altitude (MAA), prior to the GA being commenced. In the GA the aircraft committed a level bust as it climbed through the MAA of 3,000 ft amsl. Upon recognising this the PF pitched the aircraft down and entered a descent, having reached a maximum altitude 4,030 ft amsl. During the descent the aircraft reached a nose-down attitude of 17.7° and 295 KIAS, with Flaps 5 extended before a recovery and climb was initiated, during which its lowest recorded height was 1,740 ft agl. After the recovery was commenced the EGPWS warning sounded. The entire event occurred with the aircraft in IMC.

Prior to the GA the MAA was not checked by either pilot and during the GA the PF was fixated on the flight directors and expected them to command the aircraft to level off.

There have been several serious incidents which occurred during go-arounds with similar factors to that found in this investigation involving EI-HET. Although EI-HET is a Boeing 737-8200 [MAX], the incident could have occurred in any variant of the Boeing 737, or any other type of aircraft with similar autopilot and flight director systems.



EI-HET's radar flightpath as it approached Stansted (yellow), the GA, level bust and descent (orange), and second approach and landing (blue). © 2024 Google Earth, image © Airbus

SAFETY ACTIONS

Safety actions taken by the operator

- Re-emphasised to all pilots the correct go-around procedure via a mandatory learning module.
- Introduced a training package covering high energy approaches and all engines go arounds, demonstrating non-standard or unexpected go-around conditions, in their 'summer 2024' recurrent training package.
- Introduced a 'Discontinued Approach Procedure' in June 2024 that can be used when an approach is ceased prior to glideslope capture or if the approach gate requirements in its operations manual cannot be achieved. This was backed up with a Chief Pilot Alert to all pilots, via their portable electronic devices, highlighting this serious incident and the new procedure.

SAFETY ACTIONS

Boeing 737-4K5, G-JMCZ

26 April 2024, En route to Edinburgh Airport

Synopsis

At the start of the descent for Edinburgh Airport the cargo shifted in the main deck and came into contact with the forward bulkhead. The aircraft landed safely at Edinburgh without further incident. The aircraft was loaded with items in Bays B to L, leaving Bay A empty. This is described as a void bay. The crew were notified of the movement after the cargo had already been unloaded so it was not possible to ascertain whether the locks had not been engaged or had malfunctioned in some way.

Safety actions taken by the operator

- Issued a notice to crew aimed at crew awareness and mitigation of load shift during flight, specifically relating to void bay awareness and management.
- Issued guidance to move a single void bay in the B737-400 from Bay A to Bay B as it was assessed to be lower risk and gave the crew some opportunity to check the security of Bay A from the bulkhead door.
- Convened a Safety Action Group to specifically look at the risk exposure and assess barrier strengths in cargo loading and security.
- Issued a new load instruction form which made the obligations of each party clear for load security and included a box requiring the signature of all parties for the locks in void bays should there be any on the flight.
- Engaged with the CAA safety forum, leading on the risks of void bays.

Safety action taken by the CAA

- Established a medium-size-operator Flight Operations Liaison Group which captures the larger cargo operators to share events, risks and best practice.

SAFETY ACTIONS

Boeing 737-301, G-JMCU

6 March 2023, Aberdeen Airport

Synopsis

The aircraft departed Aberdeen Airport with FLAP 1 set instead of the planned FLAP 5 used in the takeoff performance calculations. The crew noticed the incorrect flap setting after takeoff, whilst attempting to retract the flaps in the normal sequence. Calculations performed afterwards indicated that on this occasion the aircraft's performance on takeoff was adequate with FLAP 1 set. However, it is not safe to takeoff without confirming that flap is set correctly, because the aircraft may not achieve the required performance.

An incorrect flap selection was made and not detected before takeoff. A combination of poor weather conditions and time pressure may have influenced the pilot's performance. It is necessary to check the actual flap position set, because the green configuration light indicates only that flap more than zero is set.

Safety action taken by the Operator

- In response to this event, the operator amended the 'Before Takeoff' checklist to include the planned and indicating flap setting to be verbalised. They issued a 'Flying Staff Notice' to highlight the potential risk of flap mis-selections. The notice drew particular attention to those recently converted from the ATR (another aircraft type) of the risk of 'reverting to type' and moving the lever to the first gate (FLAP 1), rather than the second or third as required for FLAP 5 and FLAP 15 departures.

SAFETY ACTIONS

Boeing 737-8K5, G-FDZS

4 March 2024, On takeoff from Bristol Airport

Synopsis

When the crew began their takeoff, the autothrottle (A/T) disconnected when the Takeoff/ Go-Around switch (TOGA) was selected. As a result, neither thrust lever advanced automatically towards the calculated (low pressure compressor speed) N1 takeoff setting. Despite attempting to re-engage it, the A/T remained in an inactive mode. The takeoff was conducted with 84.5% N1 instead of 92.8% N1, with the associated reduction in aircraft performance. The rotation occurred close to the end of the runway and the aircraft climb rate was initially very slow. The crew increased power on the engines towards the takeoff setting from 450 ft aal. The rest of the flight to Las Palmas was completed without incident although the A/T remained unavailable. The uncommanded disconnect was likely the result of the voltage being supplied to the autothrottle servo motor (ASM) being too low which was a known problem with the B737 A/T and the older revision of the ASM part fitted to G-FDZS.

The operator has taken a number of safety actions to address both the actions to be taken in the event of an uncommanded disconnection of the A/T at takeoff, and their monitoring of events through flight data monitoring.

SAFETY ACTIONS

Safety actions taken by the operator

- Event trigger created for A/T disconnection during takeoff. The event allows an understanding of the historical and current level of nuisance A/T disconnects being experienced.
- Further refinement of the slow acceleration trigger using the statistical analysis.
- Event trigger created for a N1 Reference and actual takeoff thrust delta. This is part of a layered approach to give visibility of potential events which do not meet the required takeoff thrust. This event compliments the slow acceleration flight data monitoring (FDM) trigger.
- A safety alert was published immediately after the event to raise awareness. The alert has been reissued to give clear guidance that A/T disconnect is a system failure and meets the definition for rejected takeoff (RTO).

Boeing 737-8AS, EI-EGD

4 October 2023, London Stansted Airport

Synopsis

A ground vehicle collided with EI-EGD when it was turning onto stand across the back-of-stand road the vehicle was travelling on. A Bulmor SideBull OMNI 135 vehicle collided with EI-EGD because the vehicle driver did not see the aircraft or did not anticipate it would turn onto stand. The driver may have experienced inattentional blindness and his performance may have been reduced by the fast operating tempo, high workload and task related fatigue. The stand and road layout in the area created the potential for conflict between vehicles and aircraft to arise from any direction.

Safety action taken by the vehicle operator and the airport authority

- Following this event, the vehicle operator and airport authority both issued safety notices to airport drivers regarding safe driving practices. The airport's safety notice drew attention to clues that drivers can use to recognise that an aircraft would soon be turning on to stand, such as the presence of personnel and equipment at the head of stand and the activation of the stand guidance system.

Example Bulmor SideBull OMNI 135 vehicle

SAFETY ACTIONS

SAFETY ACTIONS

ATR 72-212A 600, EI-GPN

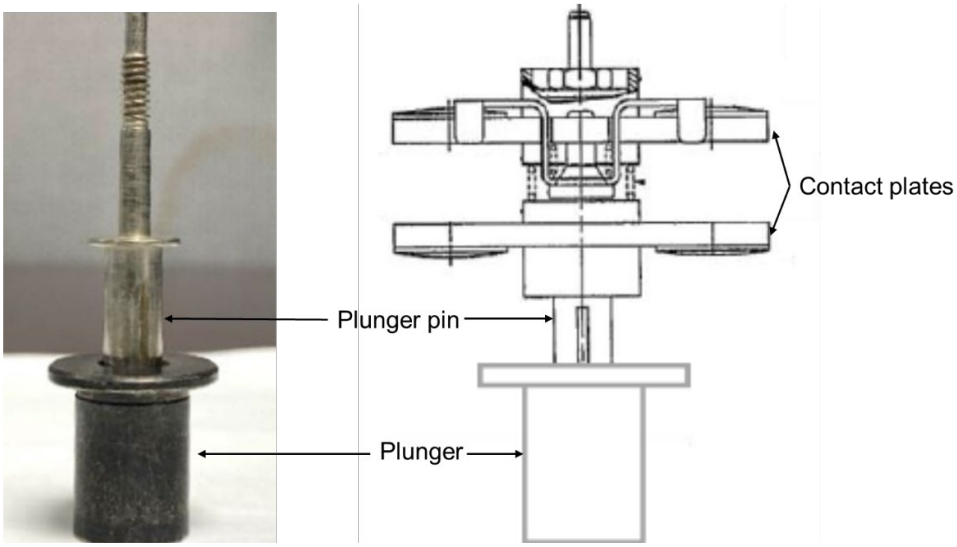
19 September 2022, Belfast City Airport

Synopsis

During the aircraft's approach to Belfast City Airport, a number of aircraft systems dropped off-line including some necessary for landing. The flight crew, experiencing natural effects of startle and surprise, and without a specified procedure to follow, continued with the approach, restoring systems by turning off the Transformer Rectifier Unit (TRU). The aircraft was operating under an Operations Engineering Bulletin[1] (OEB) which required the TRU to be continually powered. Following the failure of an electrical contactor, this disconnected the DC output from the TRU to the Standby and Emergency bus bars, thereby removing electrical power to several aircraft systems.

Technical cause of the contactor failure

The failure of this contactor, designated as 95PA in the circuit, fitted in EI-GPN was caused by a slippage between the plunger and pin assembly operating under increased cycles. The slippage resulted in poor connection, localised arcing and subsequent loss of continuity across its A1 and A2 terminals. A definitive cause of the pin and plunger slippage with the 95PA contactor fitted to EI-GPN and several other contactors manufactured during 2015, could not be fully determined.



Plunger and pin assembly (the plunger and pin photograph shows both components prior to insertion)

Footnote

[1] Initiated by EASA Emergency Airworthiness Directive E-AD 2021-0120-E.

Safety actions taken by the aircraft manufacture

- ATR have published Airworthiness Operator Messages (AOM 2021/05 issues 4 to 5) to give advice and direction to operators on the actions to be taken should non-normal TRU events occur whilst operating under AD 2021-0120-E. In particular Issue 5, which provided operators with Operations Engineering Bulletin (OEB) 56/3. This OEB made recommendations to operators on mitigating actions to be taken in the event of the temporary loss of all cockpit display systems and recommendations in case of electrical failure during the flight while the TRU is on.
- They have also addressed the technical issues that required the introduction of the AD 2021-0120-E by taking the following safety action.
- An AOM 2021/05 issue 6 was issued on 7 March 2023 to publish Service Bulletins (SB) ATR42-24-0062 and ATR72-24-1032. These SB introduce a modification to the battery toggle switch (FIN 7PA) circuit integration. As per EASA AD 2023- 0078R1 published on 20 April 2023, the embodiment of these SB removes the requirement to operate with TRU on.

Safety action taken by the operator

- The operator stated its intent to maximise learning from this incident, adopting a rule-based structure to proactively assist crews with managing startle and rebuilding situation awareness.

SAFETY ACTIONS

ATR 72-202, G-NPTF

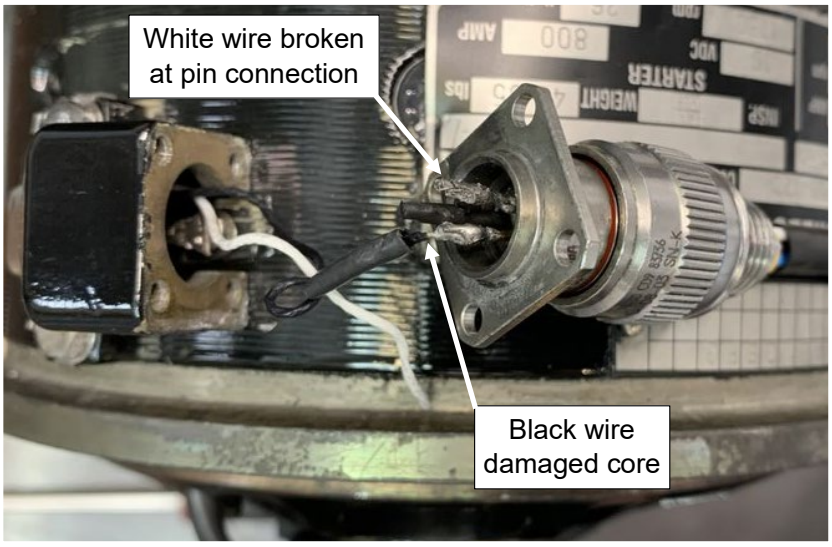
17 January 2023, East Midlands Airport

Synopsis

During the latter stages of a CAT II automatic approach to East Midlands Airport, the aircraft suffered a significant electrical malfunction. This caused the loss of the co-pilot's flight instrument displays and triggered a number of warnings and cautions. The crew executed a go-around and diverted to Birmingham International Airport. A wiring defect, probably caused by incorrect use of mechanical wire stripping tools at a third-party organisation, was the cause of the electrical malfunction. Action has been proposed by the equipment manufacturer and has been taken by the third-party maintenance organisation to promote the use of alternative tooling to prevent a reoccurrence.

Safety actions taken by the overhaul facility

- An analysis of standard practice manuals to check the method of wire stripping specified, followed by an update of the relevant Technical Instruction to bring it in line with the standard practices.
- Clarified that tool choice is performed in the following order for each task: CMM, Standard Practice, Technical Instruction.
- The Method Department technicians have been informed of the issue and, where a method is not specified, they will assist the technician in assessing the best way to strip the wire.
- Wire stripping has been declared as an industrial process and training is to be performed.
- Technicians have been informed that the preferred method of wire stripping is to use thermal wire strippers.



Speed sensor connector with heat-shrink sleeve removed from wires

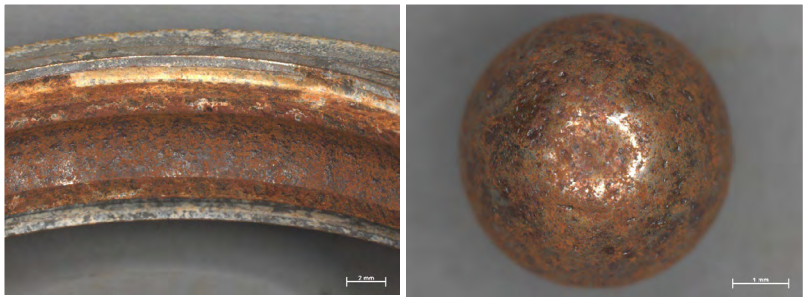
SAFETY ACTIONS

ATR 72-202, G-NPTF

7 March 2023, Bristol Airport

Synopsis

During the flare to landing at Belfast International Airport the co-pilot, who was PF, discovered that the rudder was extremely difficult to move. The commander immediately took control of the aircraft and used the nosewheel steering for directional control on the runway. Examination of the aircraft on the following day showed that the rudder was almost immoveable from either set of rudder pedals in the cockpit or by physically pressing on the rudder outside the aircraft.



Bearing No 2 corrosion and pitting (outer race shown, inner similar)

A number of faults with the rudder control system were uncovered during the investigation but the major cause of the extreme rudder stiffness was the degradation of the steel rudder rear quadrant support bearings due to corrosion. The sealed nature of the bearings and their installed location precluded visual inspection of their condition. Moisture ingress in the vicinity of the bearings had likely contributed to their degraded condition. The installation of the rudder damper may also have contributed to the rudder stiffness, albeit to a lesser extent.

A Service Bulletin which recommended replacement of all flight control bearings with corrosion-resistant stainless steel bearings had not been embodied on the aircraft.

Safety actions taken by the manufacturer

- ATR has amended the figure referenced in the AMM tasks for removal/ installation of the rudder damper, to include an orientation arrow. This change was incorporated in the AMM in January 2024.
- ATR took steps to ease the installation of some post-mod flight control bearings, including the rudder rear quadrant bearings, so that they can be replaced on an on-condition/opportunity basis, without the need to embody the entire SB 72- 27-1020. This change took effect in January 2024.

Safety actions taken by the operator

- Resealed all gaps and areas of degraded sealant on G-NPTF's vertical stabiliser.
- The operator's CAMO issued instructions to specify Aeroshell 33 as the only grease to be used for lubrication of the flight control pivot points to ensure a consistent lubrication philosophy and avoid mixing different products. It took steps to ensure this change was implemented during maintenance planning, by the organisation it subcontracts to provide partial CAMO services.

SAFETY ACTIONS

Bombardier CL-600-2B16, D-AAAY

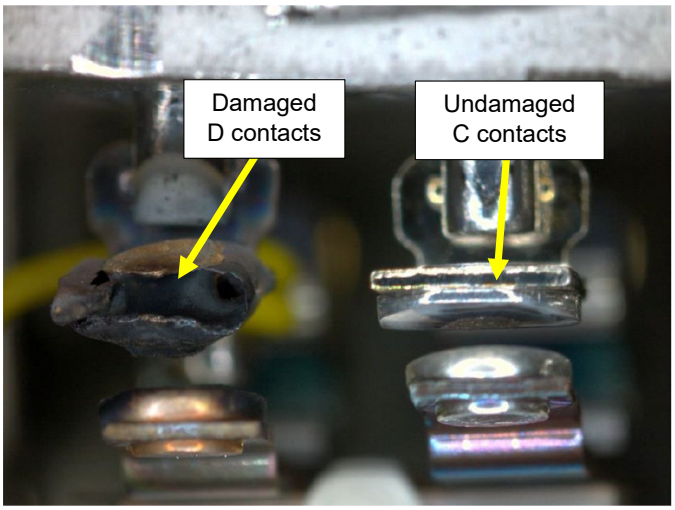
10 August 2022, Farnborough, Hampshire

Synopsis

In the climb, after departing Farnborough Airport, D-AAAY had an uncommanded[1] 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.

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.



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

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 actions taken by the manufacturer

- On 26 September 2022, Advisory Wire AW600-27-2631 was issued to advise operators of the event on D-AAAY.
- On 29 December 2022, five Service Bulletins were issued for operators to check the operation of the flap system on the Challenger 600 series of aircraft.

Footnote

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

SAFETY ACTIONS

Safety action taken by the regulator, Transport Canada

- On 16 February 2023, Airworthiness Directive CF-2023-07 was issued and became effective on 24 February 2023 to mandate Bombardier Aviation's Service Bulletins to check the operation of the flap system on the Challenger 600 series of aircraft.

SAFETY ACTIONS

Leonardo AW189, G-MCGT

26 July 2021, Ballintoy Harbour, County Antrim

Synopsis

The Search and Rescue helicopter was on its third approach, in poor visibility, to collect a casualty from a site adjacent to high ground. The Pilot Flying (PF) selected a mode of the Automatic Flight Control System (AFCS) which would bring the helicopter to a hover. As he did so, the helicopter unexpectedly yawed towards the high ground. When a further selection was made on the AFCS to effect a go-around, the helicopter accelerated towards the terrain while maintaining height. The Helicopter Terrain Awareness Warning System (HTAWS) triggered a visual and aural caution terrain alert. The crew immediately made a climbing turn onto their planned escape heading during which a warning terrain alert triggered. The helicopter recovered to a safe height and returned to its home base.

The unexpected yaw was caused by a mismatch between the previously selected AFCS heading reference and the heading flown by the PF. While the helicopter and the flight control system were found to be serviceable and performed as designed, the crew did not have a complete understanding of the functionality of all the AFCS modes. Other factors included:

- Overriding the engaged modes by manually flying the helicopter.
- A lack of clarity between the role of PF and Pilot Monitoring (PM).
- Ineffective communication and co-ordination between the pilots.
- Imprecise application of Standard Operating Procedures (SOPs).

Safety actions taken by the Operator

- The operator has briefed all crews on the behaviour of the AFCS reference datum on selection of hover (HOV) mode and reinforced it during recurrent simulator training.
- Issued further guidance to their crews on managing the threat of a Degraded Visual Environment (DVE)
- Added additional guidance in the Operations Manual (OM) including:

  If (DVE) conditions are likely to occur, Search and Rescue (SAR) crews should consider planning for an Instrument Flying profile, i.e., Instrument Let Down, Radar /Forward Looking Infrared Approach (RFA). Even if the route is visually flown the overlay of an RFA type approach will aid planning and allow a rapid conversion to IF techniques.

SAFETY ACTIONS

Increased communications within the crew are vital to determine the actual environmental conditions, it is likely that one side of the aircraft could have significantly better visibility than the other, particularly in the mountains or coastal environment. In this case, communications within the crew are vital to provide a shared mental model of the situation and the best way to proceed.

- Amended their OM to:
  - Clarify when mixed mode flying might be appropriate.
  - Emphasise the importance of good communications and Crew Resource Management (CRM) within the whole crew in the use of automation.

SAFETY ACTIONS

Leonardo AW169, G-KSSC

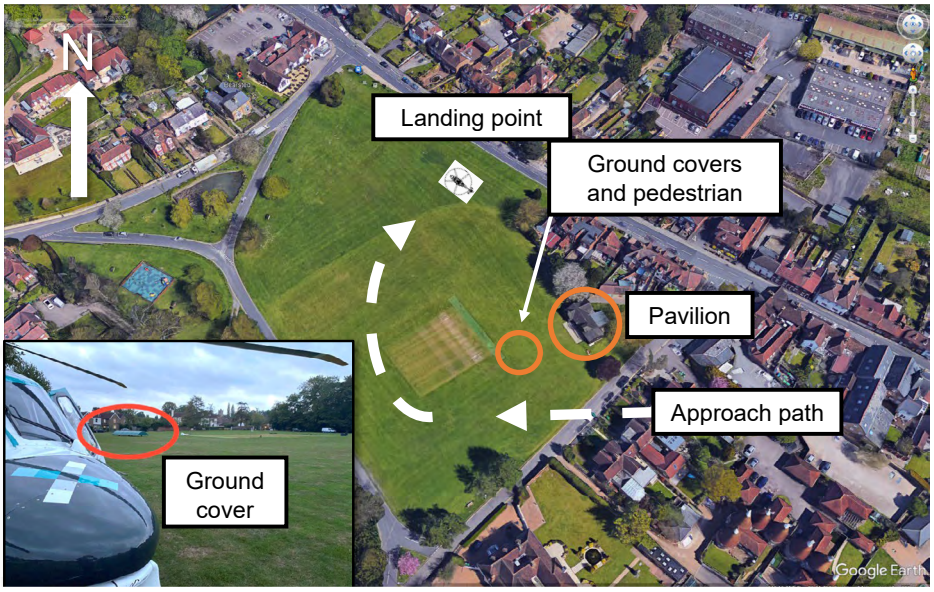
11 October 2023, Bearsted Common, Maidstone

Synopsis

During the final approach to a Helicopter Emergency Medical Service (HEMS) landing site, the rotor downwash from the helicopter moved an unsecured ground cover on a cricket pitch. The cover struck a bystander on the leg causing a minor injury.

Safety action taken by the operator

- The operator published a Flying Staff Instruction (FSI) to provide enhanced guidance to pilots on the awareness of downwash and links to industry guidance material and resources for additional study. The FSI was incorporated into the Operations Manual.



The cricket pitch and surrounding field

SAFETY ACTIONS

AW139, 5N-BOX

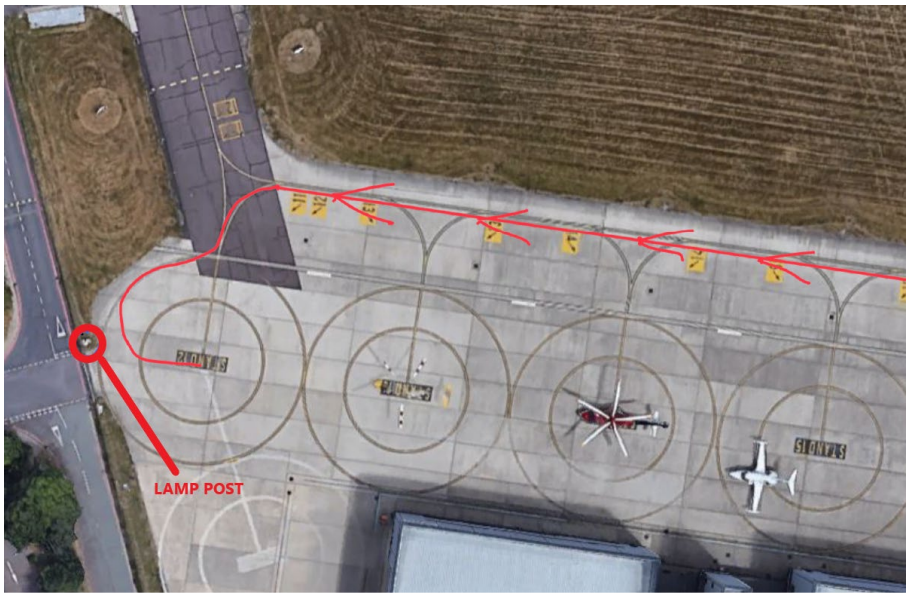
13 November 2023, Norwich Airport

Synopsis

The helicopter was ground taxiing to the parking area on return from an air test flight. As the commander manoeuvred the helicopter to align with other helicopters on adjacent parking spots the main rotor blades struck a lamp post on the airport perimeter. All five main rotor blades were damaged. The helicopter was shut down and no personnel were injured. The handling agent took safety action to require the use of marshallers for crew unfamiliar with or visiting the airport and to replace the stand markings in early 2024.

Safety actions taken by the handling agent

- A local procedure was established so that crews not based at Norwich would be directed to their parking positions by an aircraft marshaller.
- The stands would be resized for different helicopters in the early part of 2024 and the stand markings would be erased and replaced with new painted surface markings.



Sketch of taxi path provided by commander

SAFETY ACTIONS

Fan Jet Falcon Series D, G-FRAK

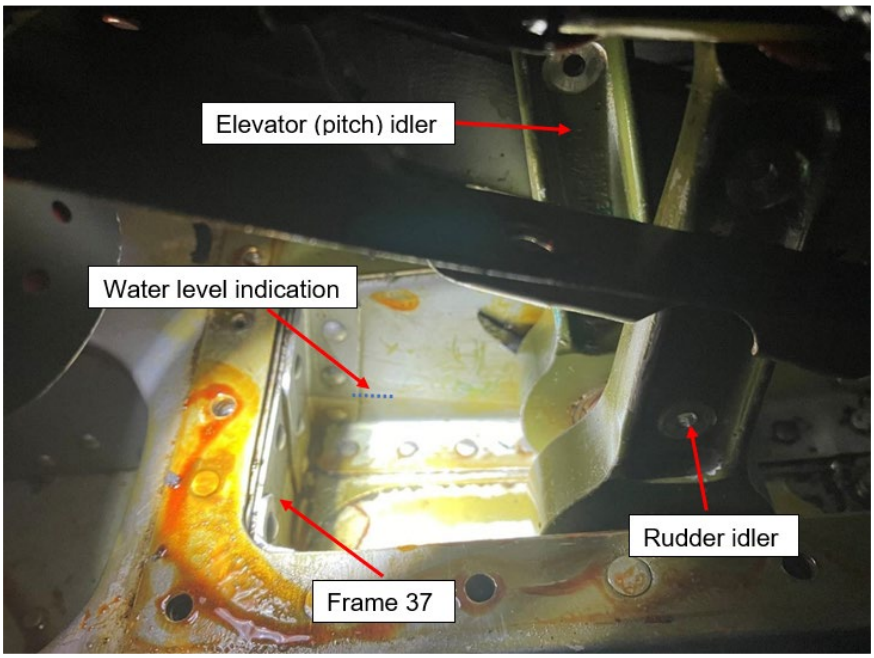
14 November 2023, In-flight over South-West England

Synopsis

The pitch control became restricted whilst operating at FL190. A MAYDAY was declared, and the aircraft diverted to the nearest suitable airfield. During the approach, the restriction cleared with a "thud" and the aircraft landed without further incident.

Subsequent investigation determined that the restriction was caused by rainwater collecting in a compartment under the pitch control idler link and then freezing at high altitude.

To prevent a recurrence, two safety actions have been taken; a modification by the operator to reduce the possibility of rainwater ingress and a modification by the aircraft manufacturer to increase drainage of the affected compartment.



Control box area in rear fuselage (Image used with permission)

Safety action taken by the operator

- To reduce rainwater ingress, a 'gutter rail' has been incorporated above the APU exhaust to direct rainwater away from it.

Safety action taken by the manufacturer

- A modification has been developed to increase drainage in the compartment under the pitch control idler at frame 37, in the rear fuselage. This will be introduced as a service bulletin due to be published in September 2024.

SAFETY ACTIONS

De Havilland Canada DHC-6-300 Twin Otter, VP-FBC

23 January 2023, E322, Mount Lymburner field location at the north-west end of the Ellsworth Mountains, Antarctica

Synopsis

On departure from an unprepared landing site the nose landing gear of the aircraft struck a small ice ridge. Once airborne, the commander noticed that attitude information was misaligned and there was some minor disruption within the cockpit near the rudder pedals. He diverted to an unmanned landing site nearby where he assessed the damage. Considering that the aircraft was safe to fly he flew the aircraft to a field station, two hours flight time to the north.

On landing at the field station, further damage was found to have occurred to the nose fairing around the landing gear and the lower bulkhead forward of the cockpit.

The accident occurred during the ground roll of the takeoff run as a result of the aircraft diverging from the skiway at a new unmanned site. The reason for the aircraft diverging from the cleared skiway could not be determined. However, the environmental conditions may have contributed to a loss of visual acuity by the commander.

The commander found himself in a situation with a genuine concern for risk to personnel. Drawing upon his engineering and technical knowledge of the aircraft, he assessed it was safe to fly, and decided to fly to a field site where there was better environmental protection and support for both personnel and the aircraft.

He considered that involving others, who were remote from the situation, in the decision-making process, may have resulted in a less optimum outcome. However, the decision not to communicate with management about the situation missed the opportunity to discuss the situation with others including the potential threat of further damage occurring during the cruise phase of the subsequent flight.

Damage to aircraft skin around the nose gear

SAFETY ACTIONS

The operator recognised that there could be rare occasions where safety would take priority over airworthiness compliance, and it may occasionally be appropriate to fly a damaged aircraft if this minimised the risk to personnel and assets, or if it was required to meet international obligations for the protection of the Antarctic environment.

Safety actions taken by the operator

The operator has,

- Adopted the use of low orbit commercial satellites for communications, which improved quality and reliability.
- Developed a 'field checklist' to guide the decision-making process when recovering damaged or unserviceable aircraft from remote locations. It would only be used in circumstances where the non-routine protection of life, assets or the environment conflicted with defined and well-established airworthiness and engineering requirements.
- Reviewed existing processes and training for new sites and established that they were 'sufficient and satisfactory'.
- During the annual review of operations for 2023, it held discussions with pilots on remote decision-making, levels of autonomy for commanders and the confidence they had to raise safety concerns. These discussions would be repeated in the annual review of operations in 2024.

SAFETY ACTIONS

Spitfire IXT, G-LFIX

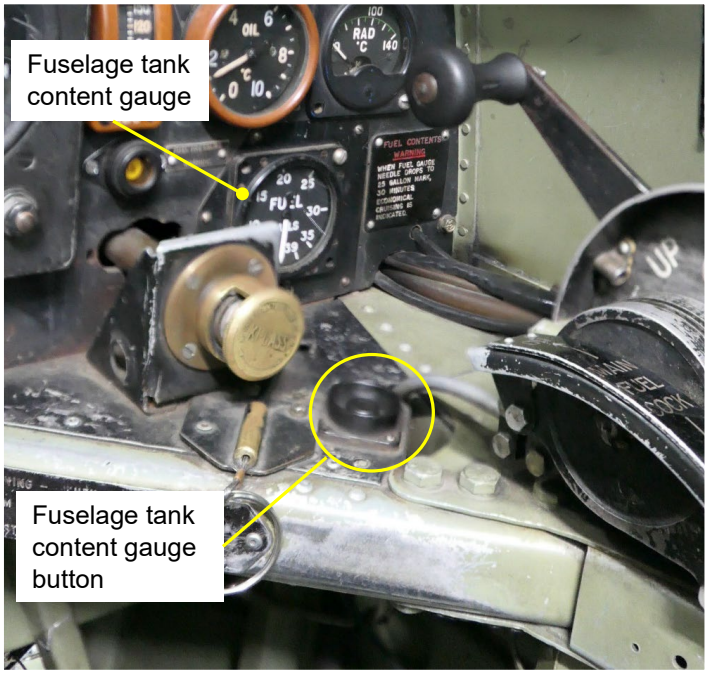
6 May 2024, Pitsford Airfield, Near Sywell, Northants

Synopsis

The engine cut out due to fuel starvation shortly after the pilot had transferred fuel supply from the wing tanks to the fuselage tank in preparation for landing. This resulted in a forced landing at Pitsford Airfield, a private grass airstrip, to the west of Sywell. During the landing the aircraft pitched onto its nose, damaging the propeller and left wing.

On a previous flight the pilot had inadvertently left the engine being supplied from the fuselage tank for the whole flight, rather than changing to the wing tanks once airborne, unknowingly reducing the fuel level in that tank.

As a result of the event the operator has implemented changes to the operating procedures to minimise the possibility of a reoccurrence.



Spitfire G-LFIX fuselage fuel tank content indication gauge

Safety action taken by the operator

- As a result of this event, the operator has introduced a requirement in their operating procedures for pilots to confirm the contents of the fuselage tank before changing to it.

SAFETY ACTIONS

SAFETY ACTIONS

Diamond DA 40 NG, G-LDGB

16 May 2023, 3 nm north-west of Oxford Airport

Synopsis

Whilst conducting an instrument flying training lesson the rear door detached from the aircraft. The passenger door detached from the aircraft because the primary locking mechanism for the door was inadvertently disengaged by the instructor whilst demonstrating to the student pilot how to respond to potential door warnings in flight. The reason why the secondary mechanism that was designed to help prevent door opening in-flight did not retain the door could not be positively determined. The aircraft landed safely and there were no injuries.

Safety actions taken by the Operator

- Providing clear guidance to crews on the use of the rear door and latches.
- Amendments to the pre-flight check list to include additional testing of the secondary latch during pre-flight checks and a reminder of the importance of reporting any faulty secondary latches as a defect.

Rear passenger door handle configuration (image used with permission)

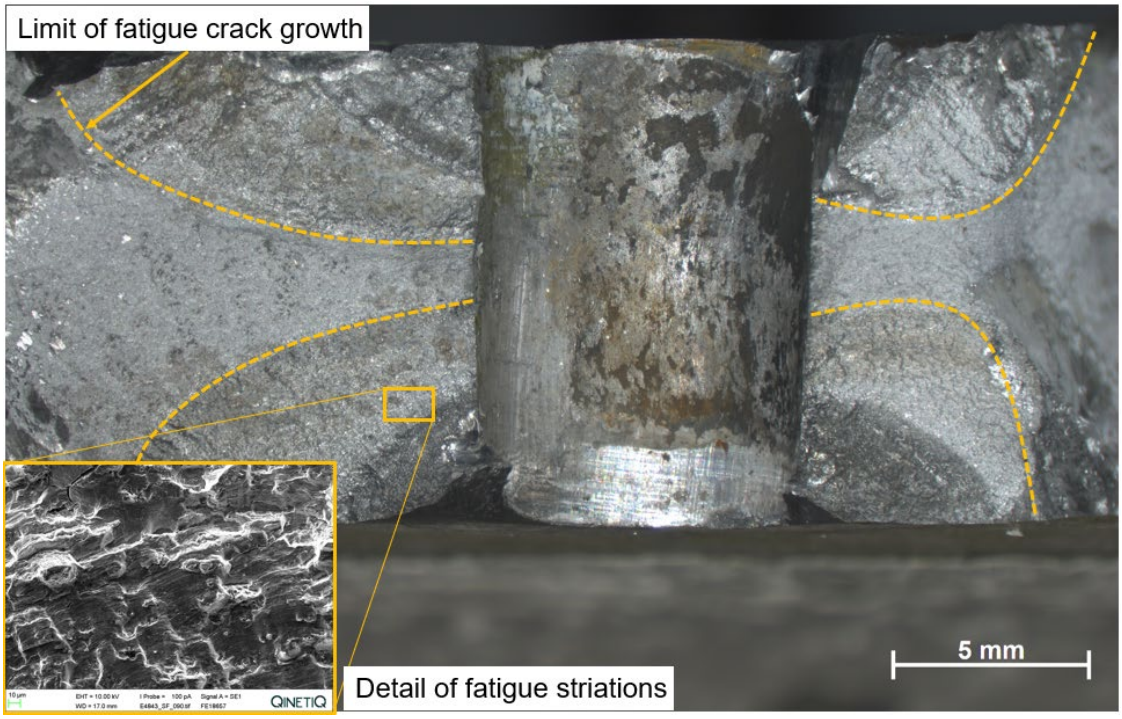
SAFETY ACTIONS

Piper PA-28-181, G-CCAV

3 May 2023, London Biggin Hill Airport

Synopsis

The nose landing gear wheel fork fractured during taxiing causing the nosewheel to detach and the propeller to strike the runway. The cause of the fracture was multiple fatigue cracks from corroded bolt holes in the fork assembly. This was due to fatigue cracks from the four attachment bolt holes which had initiated from corrosion damage. There are no mandated corrosion inspections of the landing gear other than if the aircraft is operated in salty or high humidity environments.



Detail of typical bolt hole showing limits of fatigue crack growth

Safety action taken by the CAA

- The CAA intend to issue a Safety Notice to advise operators and maintenance organisations on the inspection of the fork assembly at the interface between the fork and attachment block as part of their routine maintenance programme. The visual inspection is to find corrosion or cracking in the fork and report any findings to the CAA.

SAFETY ACTIONS

Piper PA-28-180, G-AYUH

21 August 2024, Near Stanley Hall, Halstead Hall, Essex

Synopsis

Whilst approaching Earls Colne Airfield, the pilot of G-AYUH encountered weather that was not compatible with flight under visual flight rules (VFR). The airfield was in fog, but this was not relayed to the pilot when he requested airfield details. Following an attempted track reversal manoeuvre and climb, the aircraft departed from controlled flight and struck trees and terrain, fatally injuring the pilot.

When the pilot requested the airfield details, the radio operators at Earls Colne did not inform him that the airfield was in fog. They had formed a collective view that in providing an Air-ground communication service (AGCS), the privileges of the Radio Operator's Certificate of Competence (ROCC) did not permit them to pass meteorological information to an aircraft in flight unless it had first been relayed to them from another aircraft.

The investigation identified an inconsistency in Civil Air Publication (CAP) 452 which permitted providers of an Operational Control Communications Service, which does not require radio operators to hold a ROCC, to pass 'Meteorological advice of immediate concern to an aircraft in flight or about to depart'. This contrasted with operators of an AGCS who were not explicitly empowered to provide pilots with such information for the purpose of alerting them to hazards and avoiding immediate danger.

SAFETY ACTIONS

SAFETY ACTIONS

Safety actions taken by the airfield operator

- Request any pilot who PPR`s[1] in advance of the date they intend to arrive to call on the day of the flight to verify that the weather conditions are suitable for them.
- If an aircraft is due to arrive at Earls Colne and the weather has deteriorated at the airfield, and if there are any pilot reports from other aircraft on the state of the weather, this information will be passed to the pilot inbound.
- If the weather has deteriorated at the airfield and there are no pilot reports available, then the inbound pilot will be provided with some key pointers using the following standards:
    - *Horizontal visibility at midpoint of runway and end of runway.*
    - *'Unofficial' weather observations of prevailing conditions at the airfield.*
    - *The frequency of Stansted Airport's ATIS.*

Footnote

[1] Prior Permission Required (PPR): is a requirement at many airfields where visiting pilots give notice of their intention to arrive and land on a specific day and time. This is commonly achieved by a telephone call, email or notification on the airfield's website.

Safety actions taken by the CAA

- Published Safety Notice SN-2024/001, ROCC 'Flight Safety Messages' Requirement.
- Published a Supplementary Amendment to CAP 452, Aeronautical Radio Station Operator's Guide, No. 2024/01 (Version 1) which provides further information regarding the ROCC 'Flight Safety Message' requirements.
- Published Skywise alert SW2024/037 to highlight Safety Notice SN- 2024/001 and the Supplementary Amendment.

SAFETY ACTIONS

Extra NG, G-MIIL

2 April 2022, upper Heyford, Oxfordshire

Synopsis

Whilst the aircraft was in straight and level flight at 184 KIAS, the canopy broke up without warning. The pilot, the only occupant of the aircraft, sustained serious injuries and was unable to continue flying the aircraft. He was wearing a parachute and bailed out, the aircraft entering a descent and colliding with an unoccupied block of flats.

The investigation identified a lack of appropriate bonding between the inner and outer canopy frame around the front of the canopy. This caused localised and increased stresses within the transparency which under flight loads promoted fatigue crack development. When these cracks reached a critical length, catastrophic failure resulted.

Although not causal to the accident, discussion with the manufacturer highlighted concerns regarding the canopy closing and locking instructions in the POH which did not make it clear that the locking handle must be manually pulled fully rearwards to ensure that the shoot bolts are in the fully locked condition.

Canopy handle partly locked position when under spring pressure alone

Shoot bolt handles (canopy in the closed and locked position)

Safety action taken by the manufacturer

- The manufacturer introduced the following amendment to the POH:

  'To lock the canopy:

  Pull together the interior locking handles.

  Close the canopy. Verify the canopy reaches the closed position.

  Release locking handles.
  Pull the aft locking handle fully rearward to the end stop. Verify handle is in the LOCK position (green marking).'

SAFETY ACTIONS

Spitfire Mk 26B, G-CLHJ

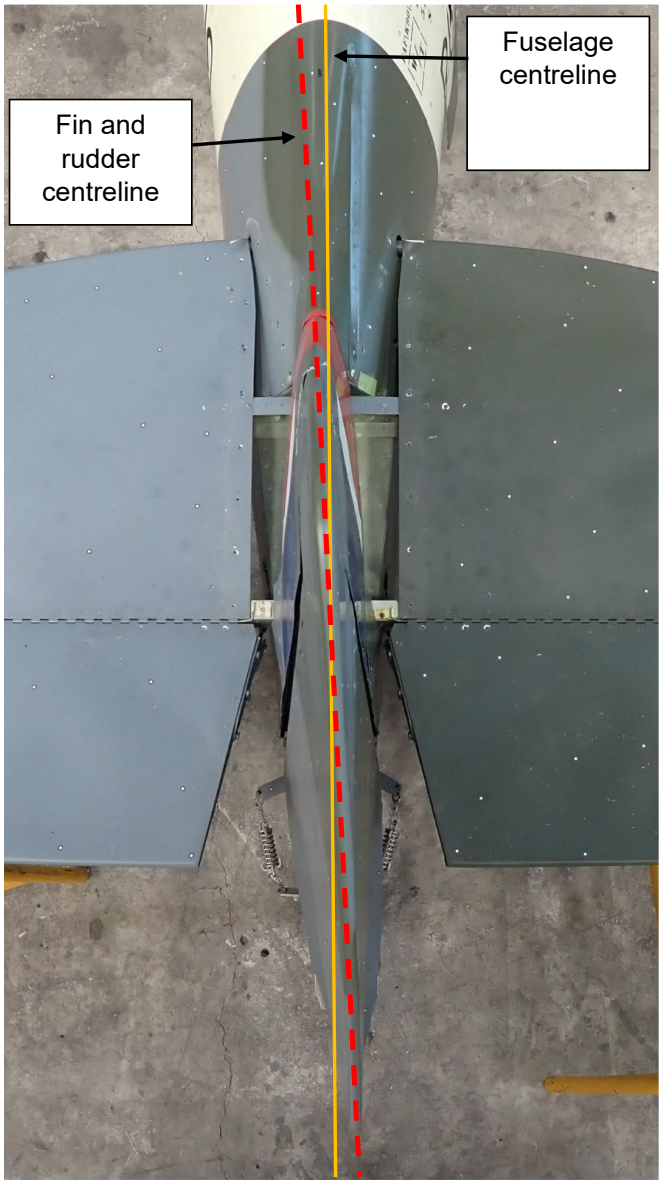
22 August 2023, Near Enstone, Oxfordshire

Synopsis

During a test flight towards obtaining a Permit to Fly, control of the aircraft was lost. The flight was testing the effects of leading edge stall strips as part of the Light Aircraft Association (LAA) approved test programme. The pilot was fatally injured when the aircraft struck the ground.

The aircraft was found to have been built with a misaligned fin and rudder. This misalignment made a wing drop at the stall more likely, but it did not prevent or restrict the ability of the pilot to recover from the stall nor any subsequent spin or spiral dive that might develop. Although the pilot's medical history indicated the possibility of an incapacitation this could not be confirmed or dismissed by the pathologist. The possibility of a control restriction preventing recovery could also not be excluded due to the extensive fire damage to the aircraft.

The LAA is responsible for inspection and approval of this aircraft type. An LAA examination of the aircraft after the accident lead to the consideration of additional potential difficulties in constructing the Spitfire Mk 26 series aircraft. With several ongoing projects in the UK, the LAA took action by issuing an MTD:



Fin and rudder misalignment from above with the rudder horn aligned with the fin leading edge

Safety action taken by the LAA

- The LAA issued Mandatory Technical Directive MTD-01-2024 on 13 February 2024 applicable to all Spitfire Mk 26 and Mk 26B aircraft. The MTD required geometry and symmetry checks to be carried out to ensure correct alignment of fin assembly and rigging of rudder with comprehensive illustrated instructions how to achieve the checks.

SAFETY ACTIONS

Piper PA-18-150, G-CLYI

13 May 2023, Sleap Aerodrome, Shropshire

Synopsis

The aircraft pitched over onto its back while making a short field landing at the end of a short takeoff and landing event. This was probably as a result of braking while landing with a tailwind. The aerodrome has identified actions to improve the safety management of flying events

Safety actions taken by the aerodrome operator

- The Safety Management System (SMS) has been updated to include risk management in event planning.
- The airfield manager has gained a Tier 1 Flying Display Director accreditation.

Video screenshot of G-CLYI after landing

SAFETY ACTIONS

Vans RV-6A, G-RVSH

3 September 2023, Truro Airfield, Cornwall

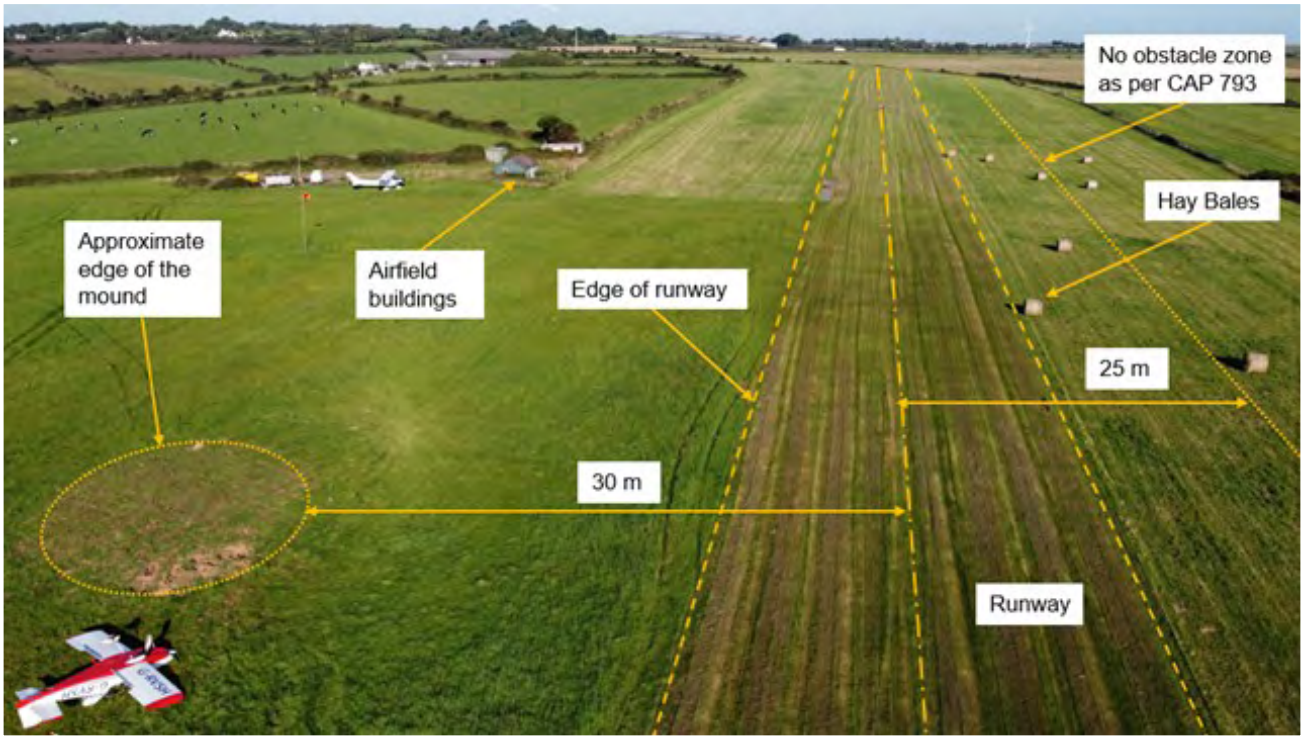
Synopsis

The pilot of G-RVSH came into land on Runway 14 at Truro airfield but touched down off the side of the runway. The nose wheel was not held off, the nose wheel dug in, and the landing gear strut deformed resulting in the aircraft coming to rest inverted.

The aircraft landed deep and 20 m to the right side of Runway 14, and the evidence indicated that it touched down on all three wheels. As a consequence, the nose wheel dug in, the strut deformed, and the aircraft rolled over onto its canopy.

The investigation did not determine why the aircraft landed deep and off the runway to the right. There were a number of factors that led to the aircraft's energy being sufficient for the aircraft to nose over, and the canopy being significantly deformed.

The guidance from the aircraft manufacturer was that the nosewheel should be held *'off as long as possible'*. The Light Aircraft Association (LAA) provided similar guidance. A combination of the aircraft energy and dynamics of the roll over may have contributed to the pilot sustaining a fatal neck injury.



Truro airfield viewed in direction of Runway 32 showing hay bales and the mound

SAFETY ACTIONS

Safety actions taken by the airfield owner

- The airfield owner has instructed the farmers to remove the hay from the airfield as soon as it is baled and not to store it on the airfield.
- The airfield owner has provided additional guidance in the Pooley's Plate on which runway to use depending upon the wind conditions.
- The airfield owner has removed the training mound.

SAFETY ACTIONS

Icarus C42 FB80 Bravo, G-CICF

8 December 2022, Headcorn Aerodrome, Kent

Synopsis

The aircraft's lithium-ion main battery caught fire shortly after takeoff, creating significant quantities of smoke and hazardous gases within the aircraft cabin that affected the ability of the pilot to safely control the aircraft. A passenger, sitting in the right seat, was able to open the cabin door in flight, which reduced the level of smoke in the cabin and the aircraft landed safely.

The investigation did not identify the cause of the battery fire. The location of the battery within the aircraft's cabin exposed the occupants to significant hazards when the battery caught fire, as the battery box did not contain the combustion products or heat from the fire. A similar airborne battery fire to the same aircraft type and lithium-ion battery type was found to have occurred in Germany, resulting in destruction of the aircraft.

Safety action taken by the manufacturer

- As a result of this serious incident and the previous similar fire that occurred in Germany, the C42 aircraft manufacturer no longer installs lithium-ion main aircraft batteries in new aircraft, having replaced these with lead-acid batteries.

SAFETY ACTIONS

Jabiru UL450, G-CDFK

4 April 2023, Damyns Hall Aerodrome, Upminster, Essex

Synopsis

During the climb after what was thought to be a normal takeoff the aircraft did not climb as expected. When at 300 ft, the pilot identified that the engine was not developing full power. With insufficient height or speed to return to the runway, and no suitable landing sites immediately available, the pilot attempted to remain airborne. The engine then stopped, the aircraft stalled and entered a spin before striking the ground.

The loss of engine power was probably caused by an age-related split in the rubber coupling attaching the carburettor to the engine's plenum chamber. No issues with the engine were identified during a 100-hour engine service or the subsequent check flight, carried out in January 2023. The location of the coupling and its mounting clips made inspection problematic. The engine manufacturer's manual for the engine stated that the coupling had a 1,000 hour, or five-year life but there was no evidence that the coupling had been replaced since the aircraft had been built in 2006.

Safety actions taken by the Light Aircraft Association (LAA)

- The LAA has revised the Permit to Fly revalidation process to require declarations of the maintenance programme and that all mandatory life limited components have been properly identified and recorded and have not exceeded their approved service life limit and have improved their guidance regarding the appropriate treatment of life-limited components specified by the manufacturer, but not mandated by the LAA or CAA. This is designed to improve the ability of LAA owners and Inspectors to identify components needing replacement before they become unairworthy.
- The LAA is revising the Type Acceptance Data Sheet to remove any conflicting statements and clarify the circumstances in which it is mandatory to maintain the engine in accordance with the manufacturer's advice regarding limited-life components when the engine is operating in an LAA-supervised aircraft.

Safety action taken by the CAA

- On 13 December 2023 the CAA hosted a workshop to discuss what to do in the event of an engine failure after takeoff and provide some guidance on staying safe.

SAFETY ACTIONS

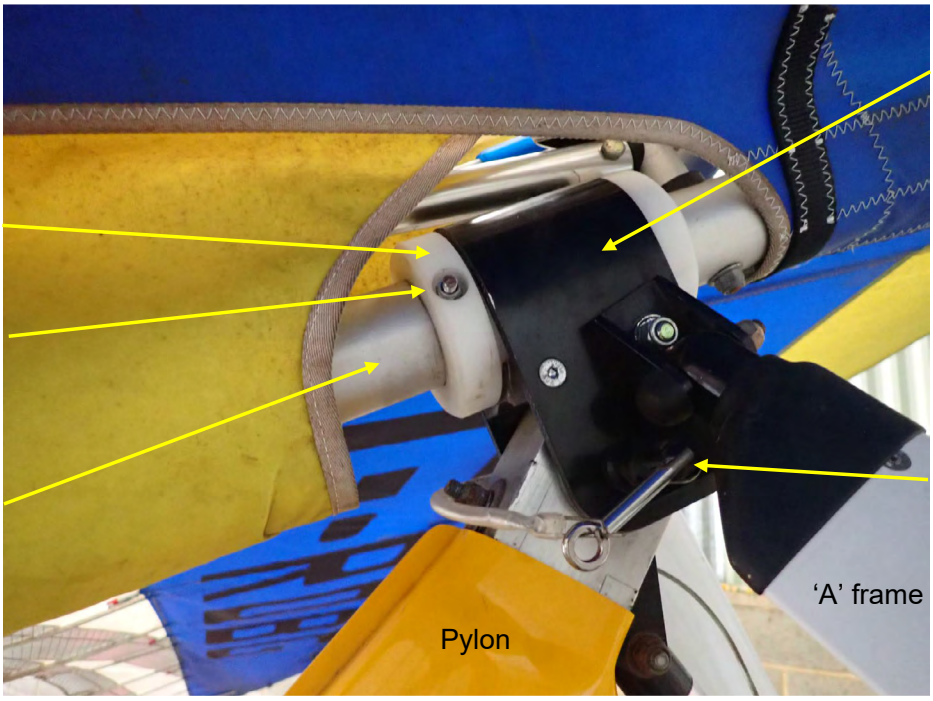
Quik GT450, G-CEVW

17 May 2023, Lundy Island Airfield, Bristol Channel

Synopsis

The pilot encountered significant control difficulties soon after takeoff. He was able to manoeuvre to return to Lundy Island but had great difficulty in controlling the aircraft, particularly in pitch. Control was lost close to the ground and the aircraft was extensively damaged in the touchdown. The pilot was taken to hospital by air ambulance but was discharged the same day having sustained only minor injuries.

The loss of a securing bolt had caused the roll bearing to move aft along the wing keel. This altered the trim of the aircraft inducing a significant nose-up pitch that was only marginally controllable.



GT450 wing keel and hang bracket viewed from the right

Safety actions taken by the manufacturer

- The manufacturer issued Service Bulletin (SB) 160 with the as follows:

  'INTRODUCTION
  An accident to a GT450 was caused by the 6mm keel roll bearing CG cap head bolt coming out, allowing the roll bearing, hang bracket and control frame top to move back causing a severe pitch up.

SAFETY ACTIONS

ACTION
An additional daily inspection check item has been introduced to specifically inspect that the bolt is present and secure before flight.

The roll bracket assembly must be inspected to ensure it moves freely on the roll bearing and that the bearing is not loose on the keel. Nylon roll bearings (dark colour) can swell with moisture over the years, causing friction which puts more stress on the CG bolt and keel hole.

Genuine replacement roll bearings are made from Acetal (bright white colour) which is not so affected.

If not already fitted, it is strongly recommended to fit the longer bolt, item 13, part no. FCM6-80 with securing M6 T type Nylok nut, item 10, part no. FNM6-NT.'

- The manufacturer also introduced, via SB 160, a clamp that is fitted to the wing keel aft of the roll bearing to prevent its rearward movement in the event of a roll bearing bolt failure or loss.

SAFETY ACTIONS

Pegasus Quik, G-CCPC

1 June 2022, East fortune Airfield, East Lothian

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.

Safety Actions were taken by the Microlight Panel of Examiners[1] the British Microlight Aircraft Association (BMAA) and the pilot's flying club.

Safety action taken by the Microlight Panel of Examiners

- The Microlight Panel of Examiners published the following guidance in their Instructor and Examiner Bulletin (01/2022), dated December 2022.

  - **'2. USE OF DIAGONAL RESTRAINTS IN FLEXWINGS**

    There is a worrying trend developing of pilots not wearing diagonal restraints when fitted to flexwing aircraft. This may be because students see instructors not wearing them and therefore consider them not important. A reminder that any restraints fitted to an aircraft must be worn by a pilot in accordance with the requirements in the aircraft Pilot's Operating Handbook (POH) and whatever restraints are fitted must be used. Instructors do not have to wear the diagonal harness if they assess it will interfere with their ability to remain safely and effectively in control.

    Student's must be left in no doubt that this is an exception purely for instructors whilst conducting flying training, and examiners whilst conducting general skills tests GSTs.

    Whilst conducting GSTs the candidate must demonstrate to the examiner the correct use of these restraints, even if the examiner is not wearing them for safety considerations.'

SAFETY ACTIONS

Footnote

[1] The Microlight Panel of Examiners are appointed and overseen by the CAA. The Panel, in turn, appoint flight examiners.

- Microlight instructors and examiners will include the following content in flying training and testing:
  - Preparation for unexpected situations and emergencies.
  - Conduct of aircraft checks.
  - Student response to unintentional mishaps and emergencies while on the ground and in flight.
  - Preventative actions which must be incorporated into daily checks and routines, including aircraft daily inspections, advice on the positioning of the base bar, and aircraft starting

Safety Actions taken by the BMAA

- The guidance published in the Microlight Panel of Examiners' bulletin on the use of diagonal restraints in flexwings will be incorporated into the 'Instructor and Examiner Guide' published by the BMAA at the next appropriate amendment.
- A 'Belt-Up' safety campaign was launched in May 2023 promoting the safe use of safety harnesses in microlight aircraft, including a campaign poster, an article in the membership magazine. A video demonstrating correct inspection and fitting techniques is planned to be released in early 2024.

Safety actions taken by the flying club

- Published a 'Procedures Reminder' to club members, emphasising the following:
  - The importance of the engine start checks to ensure the aircraft is configured correctly.
  - Keeping fingers on the ignition switches during start to ensure the engine can be stopped immediately if it runs away.
  - The importance of checking the hand and foot throttles during the daily inspection to ensure correct function.
- Require, prior to first solo, students to complete the following training:
  - Simulate an engine runaway during startup. To be conducted on the runway requiring the student to switch off the ignition switches to shut down the engine.
  - Simulate a stuck throttle and a brake failure. Both scenarios to be conducted independently on either the runway or taxiway and require the student to steer the aircraft in a safe direction before switching off the ignition switches to shut down the engine.
- Require the engine runaway, stuck throttle and brake failure, exercises to be included in biennial training flights for licence renewal.

SAFETY ACTIONS

Ventus-2CT, G-KADS and E1 Antares, G-CLXG

17 August 2023, Melton Mowbray, Leicestershire

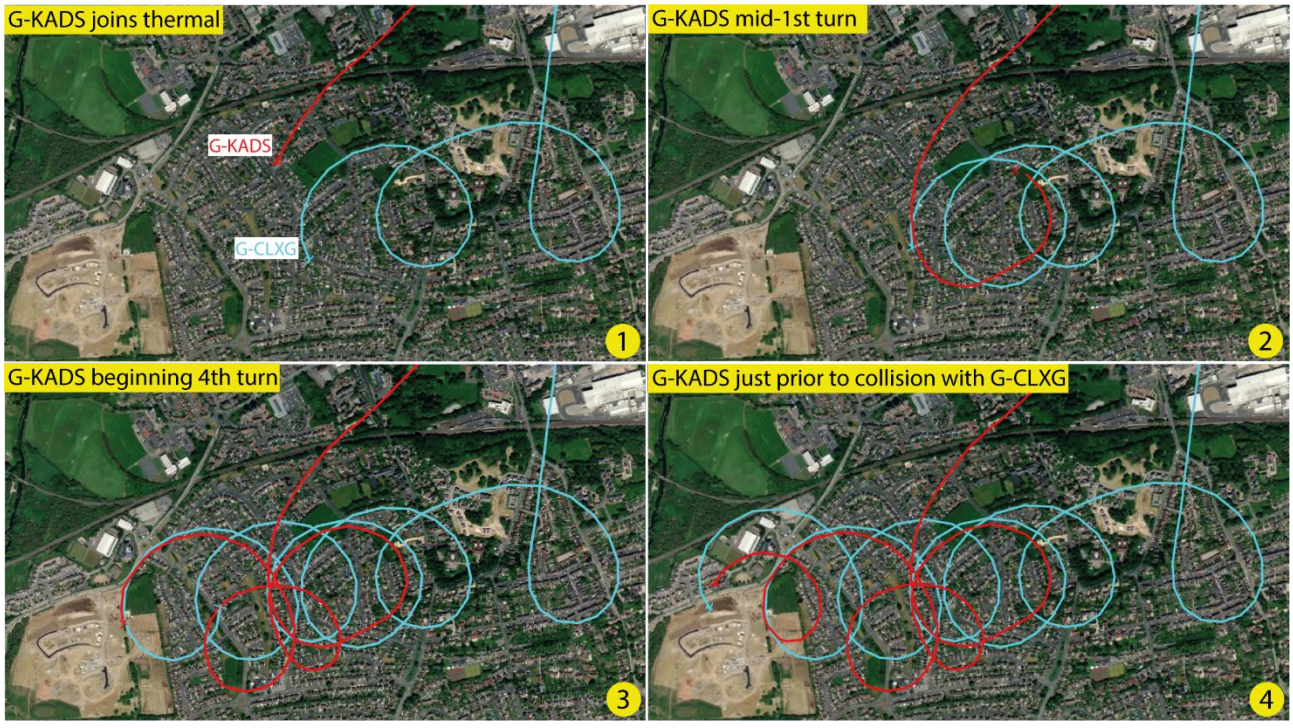
Synopsis

During a gliding competition flight, both gliders entered a thermal just to the south of Melton Mowbray at a similar height. Although the gliders were initially on opposite sides of the thermal, changes in the angle of bank of both gliders brought their flight paths into conflict and they collided. The pilot of G-CLXG was able to land his glider safely and was uninjured but the tail of G-KADS was severed in the collision and the glider descended out of control. The pilot was fatally injured.

Safety actions taken by the BGA

- The BGA has updated the 'Managing Flying Risk – Flying in Gliding Competitions' section of their website.
- The BGA is to deliver a midair collision safety campaign, in the spring of 2024, aimed at pilots taking part in gliding competitions.
- The BGA is monitoring an initiative from FAI8 International Gliding Commission which is evaluating a 'proximity monitoring tool' for evaluation of logger traces to identify unusually close proximity between gliders, as an aid to post-flight safety debriefs. If the tool proves to be useful, the BGA plans to adopt it for UK gliding competitions.

SAFETY ACTIONS



Flightpaths of G-KADS and G-CLXG in a thermal prior to the collision
© 2022 SeeYou software by Naviter

JS-MD 3, G-JSMD

15 June 2023, Nympsfield Airfield, Gloucestershire

Synopsis

During a winch launch, the aircraft was seen to pitch up into a steep climb. The left wing then dropped, and the aircraft lost control and struck the ground. The pilot recalled little after the launch but believed he may have slid backwards in the seat during the launch.

Safety action taken by the British Gliding Association (BGA)

- The BGA have written to all gliding clubs highlighting the following:

  A reminder to pilots of the hazard of being forced rearwards during acceleration on a winch launch and highlighting the need for the pilot to be adequately restrained during this phase of flight.

  A reminder of their 'Safe Launching Initiative' with guidance on their website for both winch launches and aerotows.

SAFETY ACTIONS

AW109SP, G-RAYN

1 November 2022, Nantclwyd Lodge, near Llanelidan, Denbighshire

Synopsis

While climbing away from an unlit field landing site, at a height of approximately 40 ft agl, G-RAYN's main rotor blades struck trees and sustained catastrophic damage. The helicopter fell to the ground, coming to rest on its right side. The fuel tanks maintained their integrity and there was no fire. The pilot was able to shut down both engines and, with the assistance of onlookers, helped the passengers to escape from the cabin. One of the passengers was seriously injured in the accident. Of the five passengers, at least four had not fastened their seatbelts prior to departure.

No causal or contributory technical factors were identified with the helicopter during the investigation. The investigation found that the accident resulted from the unintended rearward transition of the helicopter into a stand of trees during a planned vertical departure at night from an unlit field landing site. The flight had been scheduled as a day departure but the takeoff became delayed until after nightfall.

The investigation found several operational barriers which might have prevented this accident but were either breached or not present. These included a misunderstanding of the applicable operator-level restrictions for the non-revenue flight being undertaken and opportunities missed during the planning process to anticipate and mitigate for flight delays.

Distraction and time pressure led to the pilot not completing auditable weight and balance (WB) calculations before leaving Biggin Hill, this potentially contributed to the helicopter being overweight when it took off on the accident flight. While the pilot had assessed the available lighting as sufficient for the intended takeoff profile, the visual cues available to him on the night proved inadequate for the detection of the subsequent unintentional rearward drift toward the trees behind the helicopter.

Overhead view of G-RAYN accident site

SAFETY ACTIONS

The passengers did not exert any pressure on the pilot to delay beyond the planned departure time, and the pilot did not consider that a night departure would pose an unacceptable risk. The investigation thought it likely that, had all passengers been secured by their seat harnesses, the level of injuries sustained could have been less severe. For frequent flyer passengers, or those focused on time pressures, it might be tempting to see safety briefings and seatbelts as an unnecessary encumbrance. In helicopters with seating and cabin configurations like G-RAYN's, once pilots are in their seats, it is not possible for them to visually check the security of their passengers' seatbelts/harnesses. Nonetheless, it is important for all parties to understand that an aircraft commander is under a legal obligation to ensure passengers are appropriately briefed and have their harnesses secure for all takeoffs and landings.

While the pilot carried out a strategic pre-flight risk assessment, a more effective and targeted tactical Threat and Error Management (TEM) approach to each phase of the operation could have provided an additional safety barrier for the flights being undertaken. Following the accident, safety action has been taken by the operator to improve its night flying procedures, ground equipment and training.

Safety actions taken by the operator

- An Amendment has been made to their Operations Manual (OM), flight documentation, and aircraft technical log sector record pages, to provide greater clarity on who, operator or owner, holds the duty of care and regulatory compliance oversight responsibility for the flight, or series of flights, being undertaken.

The operator has also;

- Issued additional instructions to their pilots regarding the process for updating company landing site directory entries and are working with the planning tool developer to align the directory management protocols and templates to their requirements.
- Reminded pilots that, irrespective of a passenger's previous flying experience or status, safety briefings and a check of seatbelt/harness security must be carried out for every flight as per the Operations Manual.
- Issued an internal Flying Staff Instruction to remind all pilots that the load sheet section of the technical log sector record page must be completed for every sector on all flights including NCO. They also amended the default WB configuration in the pilot's software planning application and undertook a review of representative fuel burn rates to be used for flight planning purposes.
- Amended the default weight and balance configuration in the pilot's software planning application and undertook a review of representative fuel burn rates to be used for flight planning purposes.
- Developed a new Integrated Management System to improve operator processes for the management of hazards. This included a new risk assessment for off-airfield night operations that explicitly covered both night landings and night takeoffs.

SAFETY ACTIONS

- Issued a Flying Staff Instruction in November 2022 to re-iterate the requirements for night off-airfield operations.
- Procured deployable lighting sets for use on flights where there was an identifiable risk of an unscheduled night takeoff resulting from a delay to the planned programme.
- Instigated an annual night flying training programme for all its onshore charter pilots (employees and contractors). The programme's syllabus specifies theoretical training on night procedures and site surveys as well as a flying element to include night takeoffs and landings using a NATO-T lighting array. The first iteration of this training programme was conducted in November 2022.
- Added landing site risk as an additional criterion in the OM pre-flight risk assessment tool, with night off-airfield operations attracting the highest risk factor loading.

SAFETY ACTIONS

Rotorway Executive 162F Modified, G-ZHWH

10 September 2023, in-flight over Hampshire

Synopsis

The helicopter took off with its ground handling wheels attached. This was discovered after landing as one was still attached and one was missing, having fallen off in flight. There were no known injuries or damage.

The kit-built helicopter was designed in the USA. There is a UK distributor of the kits, which is also a maintenance organisation for those helicopters registered in the UK. It also provides type rating conversions.

At the time of publication of this report, the design company had ceased trading and could not be contacted. Therefore, the UK based maintenance organisation has taken safety action to amend the pilot's operating handbook. The CAA supported this action.

Safety action taken by the maintenance organisation

- Introduced an amended the '*START UP, RUN UP AND TAKE OFF*' checklist by adding *'VERIFY THAT BOTH GROUND HANDLING WHEELS HAVE BEEN REMOVED BEFORE FLIGHT'.* Other helicopters' POH would be amended when undergoing an annual check. This would also be done on all other variants maintained by the Maintenance organisation.

G-ZHWH with ground handling wheel fitted

SAFETY ACTIONS

VA-1X, G-EVTL

9 August 2023, Cotswold Airport (Kemble), Gloucestershire

Synopsis

G-EVTL is an Electric Vertical Takeoff and Landing (eVTOL) prototype with a carbon fibre composite structure, fixed tricycle landing gear, V-tail and a high wing. In its configuration for this test the aircraft had a maximum takeoff mass of 3,737 kg and could be flown with a pilot onboard or remotely.

The aircraft is fitted with eight electric propulsion units (EPUs), each driving a propeller, with four on the wing leading edge and four on the trailing edge. The forward EPUs are numbered 1 to 4, from left to right, and the rear EPUs are numbered 5 to 8, also from left to right. The leading edge EPUs drive five-bladed, fixed pitch 'Generation 1' carbon composite propellers and each has a tilt mechanism allowing a variation of propeller angle between 0° and 100°, where 0° is straight ahead and 90° is vertically upwards. The forward EPU propeller blades comprise an external sheath that is adhesively bonded, with an expanding adhesive film, to a carbon fibre spar fixed to the propeller hub.

Released propeller blade including failed spar-to-sheath adhesive bond (lower three images, viewed in direction 'A')
(courtesy of manufacturer)

SAFETY ACTIONS

The aircraft was being flown by a remote pilot on a test flight at 30 ft agl when a propeller blade detached from the electric propulsion unit 3 forward motor due to a failure of the adhesive bond between the propeller blade sheath and spar. Large out-of-balance loads generated by the blade release caused structural failure of the right inboard pylon, resulting in damage to the aircraft's wiring harnesses. This caused a loss of thrust from motors 4 and 7. Whilst the aircraft's flight control system was able to maintain a level attitude, the high rate of descent caused by the loss of vertical thrust resulted in substantial damage to the aircraft when it struck the ground.

The aircraft manufacturer was, at the time of the accident, in the process of introducing a blade design that, amongst other things, eliminated the bonding failure mode that caused the blade release. The manufacturer's investigation identified 36 product and process improvements resulting from findings of the investigation.

Safety actions taken by the manufacturer

- The remaining 'Generation 1' propeller blades were withdrawn from use and, subject to a satisfactory inspection, will only be used for ground testing.
- The manufacturer was in the process of introducing a new 'Generation 2' propeller blade when the accident occurred that, amongst other things, eliminated the bonding failure mode that caused the blade release.
- Having completed its internal accident investigation, the manufacturer identified 36 product and process improvements. These include improvements in quality control, supplier qualification, design and verification processes, flight control laws, controlled area network (CAN) bus architecture and the routing of wiring harnesses.

SAFETY ACTIONS

UAS Prion Mk3

6 March 2023, West Wales Airport

Synopsis

The aircraft was operating at West Wales Airport when the remote pilot observed the engine had stopped. The aircraft had lost all electrical power but continued to fly briefly before disappearing behind a hedge. The aircraft landed a short distance beyond the south-western edge of the airfield. It sustained minor damage; there was no damage to property or injuries to people.

The aircraft suffered the total loss of electrical power as a result of the malfunction of the alternator generator to maintain the charge of the emergency battery and deliver power to the systems. This was the consequence of an incorrect wiring connection. The means to provide warning to the field crew of an alternator generator malfunction was not selected in the flight telemetry system. Further, the pre-flight check of the charge status of the emergency battery was not an effective means of establishing the alternator generator system was functioning properly.

Safety actions taken by the operator

- The operator has standardised the wiring and schematics across the fleet.
- The operator has amended their after-flight check list to establish the charge status of the emergency battery, prior to the connecting of ground power to the aircraft, as a means to verify the functionality of the power generation and charging system.
- The operator has included voltage indication of the emergency battery in the engine monitoring graphical interface to indicate alternator generator system performance.

SAFETY ACTIONS

UAS DJI Mavic 2 Enterprise Advanced

9 February 2024, Weybridge, Surrey

Synopsis

The UA lost power whilst being flown in an area that excluded the general public. This was likely due to the battery becoming detached in flight and it is possible that the battery was not fully latched in place. The same model of battery has been known to swell when it starts to deteriorate which can compromise its secure retention within the UA. Such swelling can be detected before flight by checking that the battery can sit firmly on a flat surface without rocking, and the operator has highlighted the need for such a check to its pilots.

Safety action taken by the operator

- The operator has issued guidance to its pilots on how to check for secure battery installation and the action to take if a swollen battery is identified.

Battery without swelling with a flat underside (left) compared with one with swelling evident (right). (Used with permission)

SAFETY ACTIONS

Appendix 1
Commercial Aviation Safety Team (CAST) / ICAO Common Taxonomy Team (CICTT) Occurrence Categories

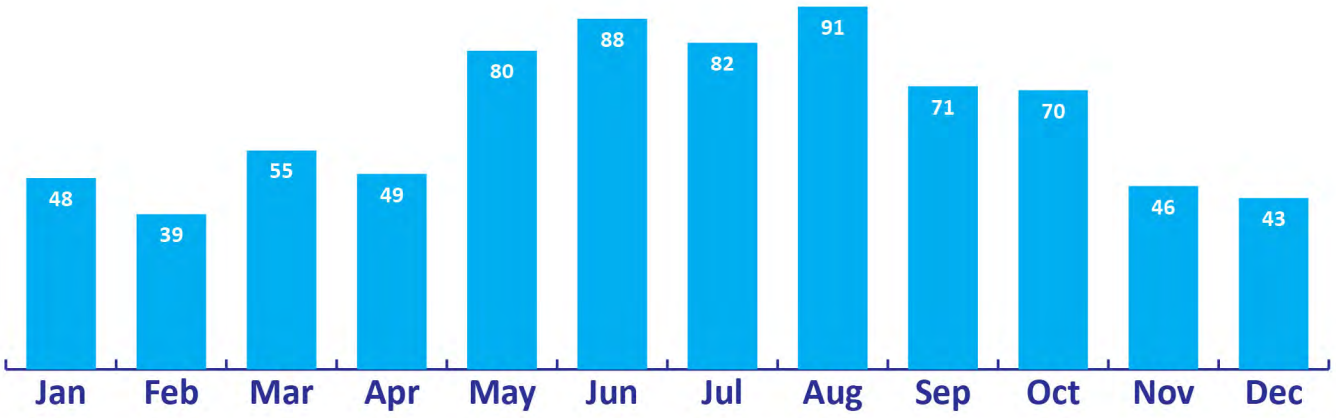
CODE	DESCRIPTION
ARC	ABNORMAL RUNWAY CONTACT
AMAN	ABRUPT MANEUVER
ADRM	AERODROME
MAC	AIRPROX/TCAS ALERT/LOSS OF SEPARATION/NEAR MIDAIR COLLISIONS/MIDAIR COLLISIONS
ATM/CNS	AIR TRAFFIC MANAGEMENT/COMMUNICATIONS NAVIGATION OR SURVEILLANCE
BIRD	BIRD
CABIN	CABIN SAFETY EVENTS
CTOL	COLLISION WITH OBSTACLE(S) 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

APPENDIX 1

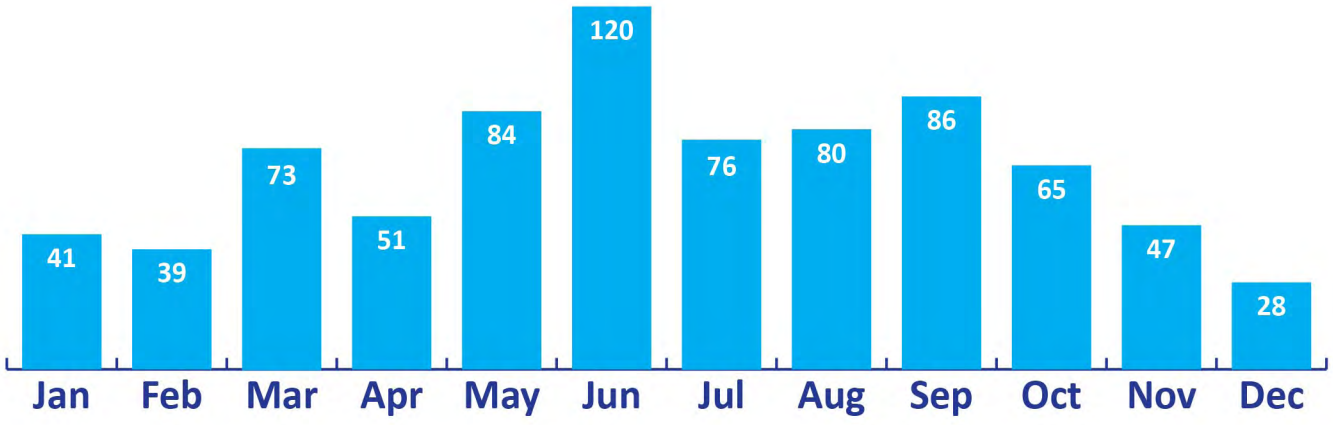
Appendix 2
Number of Notifications Received By Month

Throughout the year the AAIB notifications follow a pattern which is usually based on the flying conditions at the particular time of year. Experience has shown the underlying CAT notifications are less affected than private General Aviation of which incidents and accidents rise during more favourable flying conditions. These charts are included just for comparison.

2024



2023



APPENDIX 2

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)

GLOSSARY

Glossary of Abbreviations used in AAIB Reports cont

KCAS	knots calibrated airspeed
KIAS	knots indicated airspeed
KTAS	knots true airspeed
km	kilometre(s)
kt	knot(s)
lb	pound(s)
LP	low pressure
LAA	Light Aircraft Association
LDA	Landing Distance Available
LPC	Licence Proficiency
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

GLOSSARY

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