AAIB
Air Accidents Investigation Branch

Annual Safety Report 2013

Published October 2013

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Chief Inspector's Report

I am pleased to introduce the 2013 AAIB Annual Safety Report which includes information on our activity and progress on the status of Safety Recommendations that were published in 2012.

Throughout 2012 the AAIB deployed a field team on 47 occasions and investigated 13 fatal accidents responsible for 16 deaths. All these fatal accidents involved aircraft operating in the private category. Further detailed information on this year's activity is included in this report along with that from previous years for comparison; you will see that the figures are very similar.

Overseas, the AAIB deployed teams to assist in fatal accidents involving a Bermudan registered ATR72 in Tyumen, Russia and a Montserrat registered Britten-Norman Islander accident in Antigua. These were deployments as part of our commitment to accident investigation on behalf of the Overseas Territories. In addition, the AAIB deployed two investigators to a Dornier 228 accident in Kathmandu, Nepal where seven UK citizens were fatally injured.

In 2012, the AAIB started its own Twitter account (@aaibgovuk) to provide timely information on field deployments and accident report publications. We also became the proud recipients of the Investors in People Silver Award and hosted visits from our sister organisations in China, Australia and the United States

The introduction of the European Union (EU) Safety Recommendation Information System now means there is a central repository for all EU Member States recommendations and the European Commission's intention is to make this publicly available. With this in mind, we will review the format of the AAIB annual safety report next year to ensure that it continues to serve the needs of our stakeholders. Any feedback is most welcome!

Keith Conradi

Introduction

The Air Accidents Investigation Branch is the part of the Department for Transport responsible for the investigation of all civil aircraft accidents and serious incidents (collectively referred to as 'accidents' in this document) occurring in or over the United Kingdom, its Overseas Territories and Crown Dependencies. Its authority is enshrined in Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 and the Civil Aviation (Investigation of Air Accidents and incidents) Regulations 1996. Its purpose is 'to improve aviation safety by determining the causes of air accidents and serious incidents and making Safety Recommendations intended to prevent recurrence'. The AAIB reports directly to the Secretary of State for Transport on safety matters.

The Civil Aviation Authority (CAA) Safety and Airspace Regulation Group (SARG) is established to develop the UK's aviation safety environment, in partnership with industry, through continuous improvements in aviation safety in the UK and, in partnership with the European Aviation Safety Agency (EASA), across Europe.

The European Community established the EASA in 2003 with the legal competence to be the rulemaking and standard setting organisation for all aviation safety regulation on behalf of its member states. The EASA now actively undertakes the tasks of aircraft and product certification, and has responsibility for the rules related to the design and maintenance of aircraft products and parts, plus setting standards for those organisations involved in design, production and maintenance of these products and parts. The Agency's rulemaking role is expanding into Implementing Rules for aircraft operations and flight crew licensing. Similarly, work has begun on developing draft (high level) Essential Requirements to cover air traffic management and aerodrome activities. This is expected to be the third and final major phase of the transition to a coherent European rulemaking body for aviation safety regulation.

As a National Aviation Authority however, the CAA SARG retains a statutory duty to exercise full rulemaking and oversight responsibility for all those aspects not being adopted by EASA. Moreover, as a Competent Authority within the new European framework, CAA SARG is required to deliver safety oversight of UK industry against EASA's pan-European rules and standards. The developing European framework for the regulation of aviation safety has at its heart '2 pillars' – EASA and the National Aviation Authorities of the Community member states. Collectively, therefore, a maturing European regulatory system will continue to be focused on seeing that aircraft are properly designed, manufactured, operated and maintained; that airlines operate safely; that flight crews, air traffic controllers and aircraft maintenance engineers are suitably skilled; that licensed aerodromes are safe to use and that air traffic control services and general aviation activities meet the required safety standards.

Accident investigation and safety regulation are clearly different and the two functions are deliberately kept independent from each other. However, the evaluation of the findings of an accident investigation and the determination of the need for and the initiation of, appropriate action to maintain and enhance safety is an important part of safety regulation. Thus a good working relationship between the AAIB, the CAA and the EASA is essential, while in no way jeopardising the independence of accident investigation.

Effective liaison has been maintained between the AAIB, the CAA and the EASA, which has been particularly useful in the immediate aftermath of any accident. However, the formal procedure by which the AAIB identifies and conveys to the CAA, the EASA or other bodies, matters which it believes require action is by means of Safety Recommendations.

Safety Recommendations can be made at any stage as the AAIB investigation progresses. Both the CAA and the EASA have formal procedures for the receipt and evaluation of such recommendations and initiation of necessary action.

The CAA is informed of all AAIB Safety Recommendations and has, until recently, responded to the AAIB, in the form of a Follow-up Action on Occurrence Report (FACTOR), on all Safety Recommendations, regardless of whether they were the action addressee. The CAA now only formally respond to the AAIB with a FACTOR if a Safety Recommendation is specifically addressed

to them. They have assured the AAIB, however, that they will continue to react appropriately to any Safety Recommendation if they believe it is in the interests of UK aviation safety.

Until September 2004, responses to the Air Accidents Investigation Branch's recommendations were published by the Civil Aviation Authority in their annual Progress Report on AAIB recommendations under the cover of a Civil Aviation Publication (CAP). With the shift of responsibilities, however, it has become more appropriate for the AAIB to take responsibility for reporting on the responses to its recommendations regardless of the target authority or organisation. The first AAIB progress report was published in March 2006.

This ninth report, which is titled the AAIB's 'Annual Safety Report', contains additional information concerning accident statistics and the activities of the AAIB. The bulk of the report remains unaltered and details the responses received to AAIB Safety Recommendations made up to and including 31 December 2012.

Statistics

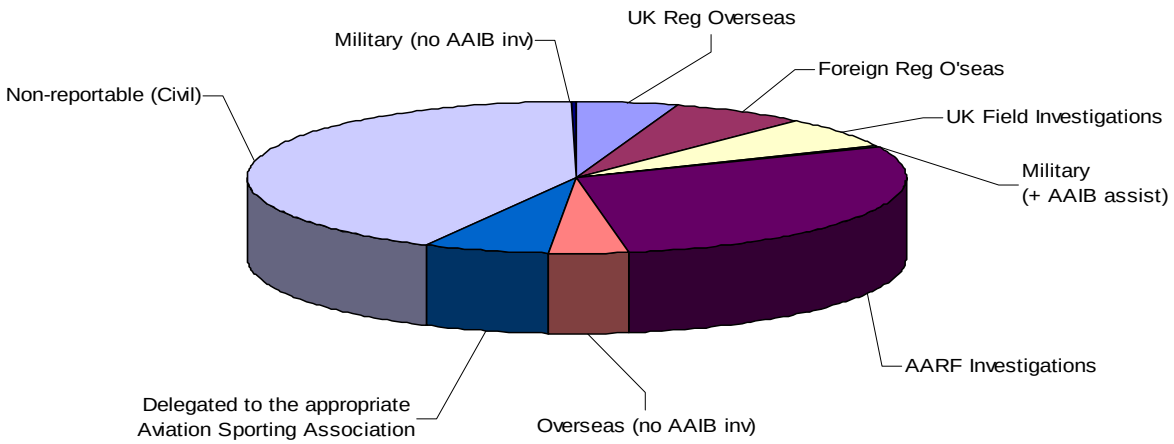
The following pages provide the statistics for 2012, 2011 and 2010, for accidents and serious incidents involving the Air Accidents Investigation Branch.

An explanation of the categories is as follows:

Category	Definition
UK Aircraft overseas	Investigations involving UK registered aircraft, or aircraft registered in one of the UK Overseas Territories or Crown Dependencies, occurring in a Foreign State where the AAIB has participated in the capacity as the Accredited Representative representing the State of Registry in accordance with ICAO Annex 13.
Foreign Aircraft overseas	Accidents and serious incident investigations to Foreign registered aircraft occurring in a Foreign State where the AAIB have participated in the capacity as the Accredited Representative
UK Field Investigations	Investigations involving the deployment of a 'Field' team within the UK or to one of the UK Overseas Territories or Crown Dependencies and those investigations where a team have not deployed but Safety Recommendations are made. Also includes investigations which have been delegated to the AAIB by another State.
Military with AAIB Assistance	Where an MoD Service Inquiry is convened following an accident / serious incident to a Military aircraft and an AAIB Inspector is appointed to assist.
AARF Investigations	Investigations conducted by correspondence only using an Aircraft Accident Report Form (AARF) completed by the aircraft commander.
Overseas (no AAIB)	Notifications to the AAIB of an overseas event which has no AAIB involvement.
Delegations to Sporting Associations	Investigations delegated to the relevant UK Sporting Associations.
Non-reportable (Civil)	Occurrences notified to the AAIB involving civil registered aircraft which do not satisfy the criteria of a reportable accident or serious incident in accordance with the Regulations.
Military (no AAIB inv)	Notifications to the AAIB concerning Military aircraft with no AAIB involvement.

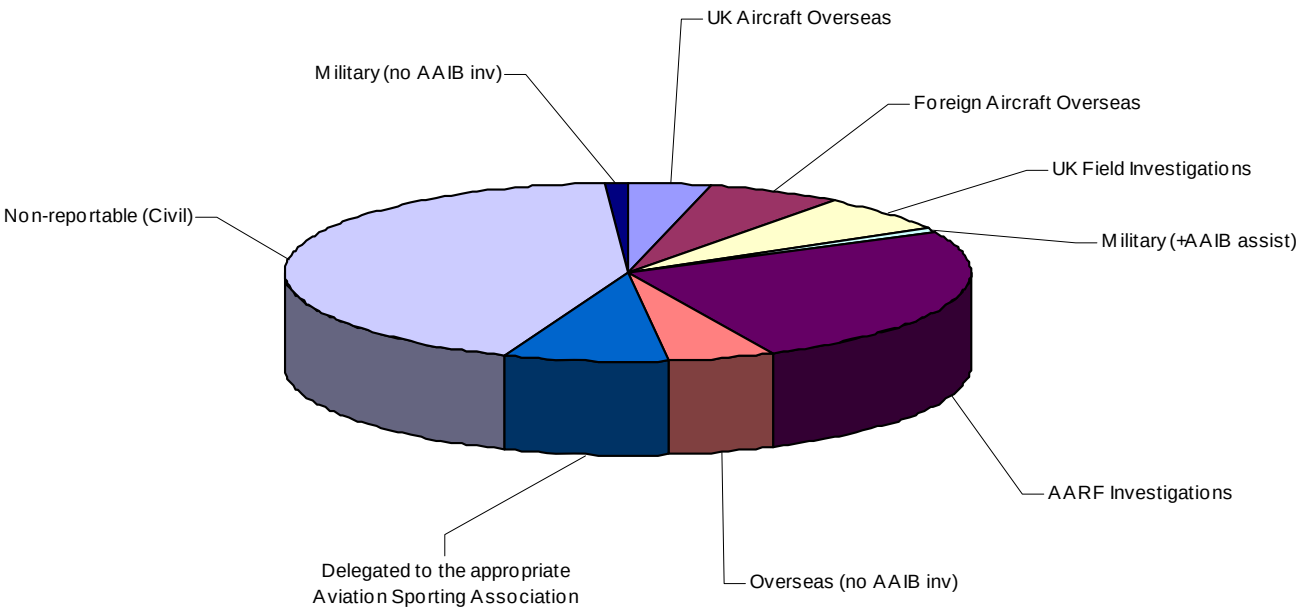
AAIB Notifications 2012

	J	F	M	A	M	J	J	A	S	O	N	D	Total
UK Aircraft Overseas	2	0	2	2	4	8	4	6	2	3	1	3	**37**
Foreign Aircraft Overseas	2	2	3	4	3	4	5	4	7	9	3	4	**50**
UK Field Investigations	3	4	5	7	5	1	6	8	3	3	1	1	**47**
Military (+ AAIB assist)	1	0	0	0	0	0	1	0	0	0	0	0	**2**
AARF Investigations	11	15	19	14	28	13	29	26	26	16	10	10	**217**
Overseas (no AAIB inv)	6	2	2	4	6	2	2	2	0	2	2	0	**30**
Delegated to the appropriate Aviation Sporting Association	3	3	2	5	6	2	6	9	2	5	1	0	**44**
Non-reportable (Civil)	23	21	35	26	39	26	40	25	30	22	19	8	**314**
Military (no AAIB inv)	1	0	0	1	0	0	0	0	0	1	0	0	**3**
Total	**52**	**47**	**68**	**63**	**91**	**56**	**93**	**80**	**70**	**61**	**37**	**26**	**744**
UK FATAL ACCIDENTS	**3**	**0**	**0**	**2**	**1**	**0**	**2**	**3**	**1**	**0**	**0**	**1**	**13**
No of DEATHS	**4**	**0**	**0**	**2**	**2**	**0**	**2**	**4**	**1**	**0**	**0**	**1**	**16**



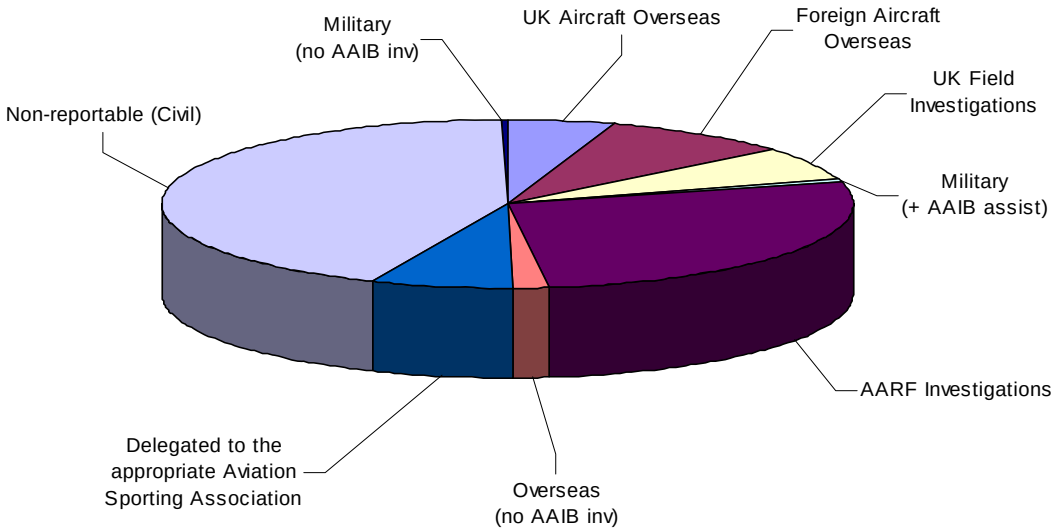
AAIB Notifications 2011

	J	F	M	A	M	J	J	A	S	O	N	D	Total
UK Aircraft Overseas	0	2	0	1	5	4	5	3	2	2	4	3	**31**
Foreign Aircraft Overseas	5	8	2	3	7	3	9	3	4	3	2	2	**51**
UK Field Investigations	6	3	5	6	4	5	10	1	4	2	3	3	**52**
Military (+ AAIB assist)	1	1	0	0	0	0	1	1	1	0	1	0	**6**
AARF Investigations	6	11	21	21	14	21	34	20	24	15	10	2	**199**
Overseas (no AAIB inv)	1	7	3	0	2	2	7	3	1	3	3	8	**40**
Delegated to the appropriate Aviation Sporting Association	2	1	2	6	7	11	8	7	7	8	1	1	**61**
Non-reportable (Civil)	13	26	22	42	33	34	38	40	24	30	23	15	**340**
Military (no AAIB inv)	0	0	0	0	0	1	0	0	1	2	4	0	**8**
Total	**34**	**59**	**55**	**79**	**72**	**81**	**112**	**78**	**68**	**65**	**51**	**34**	**788**
UK FATAL ACCIDENTS	**1**	**0**	**2**	**2**	**2**	**0**	**3**	**0**	**1**	**1**	**1**	**1**	**14**
No of DEATHS	**2**	**0**	**2**	**3**	**2**	**0**	**3**	**0**	**1**	**1**	**1**	**1**	**16**



AAIB Notifications 2010

	J	F	M	A	M	J	J	A	S	O	N	D	Total
UK Aircraft Overseas	3	2	3	1	2	6	5	5	3	1	3	3	**37**
Foreign Aircraft Overseas	8	2	7	5	8	5	3	9	5	3	6	4	**65**
UK Field Investigations	3	4	1	6	4	7	3	8	4	3	4	1	**48**
Military (+ AAIB assist)	0	0	1	0	1	1	0	0	0	0	0	0	**3**
AARF Investigations	6	8	13	25	21	34	19	17	20	16	13	8	**200**
Overseas (no AAIB inv)	3	0	0	0	1	0	2	1	2	1	1	1	**12**
Delegated to the appropriate Aviation Sporting Association	0	0	1	7	7	7	7	9	6	4	1	0	**49**
Non-reportable (Civil)	25	25	32	19	27	28	37	30	32	22	22	20	**319**
Military (no AAIB inv)	0	1	0	0	0	0	0	1	0	0	0	0	**2**
Total	**48**	**42**	**58**	**63**	**71**	**88**	**76**	**80**	**72**	**50**	**50**	**37**	**735**
UK FATAL ACCIDENTS	**2**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**9**
No of DEATHS	**3**	**0**	**0**	**2**	**1**	**1**	**2**	**1**	**2**	**3**	**0**	**0**	**15**



Safety Recommendations Report

This is the ninth annual Progress Report on Safety Recommendations submitted to the Secretary of State by the Air Accidents Investigation Branch (AAIB). It contains all the recommendations made by the AAIB in 2012 including the responses to those recommendations received up to and including 30 June 2013 and those recommendations categorised as open from previous years where significant additional information has been received.

The recommendations are grouped into eight sections:

1. Aeroplanes - 5,700kg MTWA and above
2. Aeroplanes - above 2,250kg and below 5,700kg MTWA
3. Aeroplanes - 2,500kg MTWA and below
4. Microlights
5. Rotorcraft - 5,700kg MTWA and above
6. Rotorcraft - above 2,250kg and below 5,700kg MTWA
7. Rotorcraft - 2,500kg MTWA and below
8. Others

Within each section the accidents are listed by event date in reverse chronological order. This date should be taken as the date the recommendation was made.

The Status of responses to Safety Recommendations, as determined by the AAIB, have been divided into 6 categories.

1. Accepted - CLOSED (appropriate action implemented or planned but not yet implemented)
2. Rejected - OPEN (further action required)
3. Rejected - Rejected for acceptable reasons not known at the time of publication (no further AAIB action)
4. Partially accepted - OPEN
5. Response awaited - OPEN
6. Superseded - CLOSED

Statistics

Recommendations made in 2012 and status:

Number	**Status Category**					
	1 Accepted CLOSED	2 Rejected OPEN	3 Rejected	4 Partially accepted OPEN	5 Response awaited OPEN	6 Superseded CLOSED
35	22	2	1	4	6	0
% of total	63	6	3	11	17	0

89% of recommendations receiving a response have been accepted or partially accepted.

Note: 39 Safety Recommendations were allocated with recommendation numbers of which 3 were withdrawn and 1 was no longer applicable before issue

Recommendations within 2013 report by Addressee:

Addressee	Number
ASTM International	1
ATR	2
BAE SYSTEMS Regional Aircraft	4
Boeing Commercial Airplanes	3
Bombardier Aerospace	2
Civil Aviation Authority (CAA)	11
Cessna Aircraft Company	4
Diamond Aircraft Industries	3
European Aviation Safety Agency (EASA)	32
Eurocopter	3
Extra-Flugzeugbau GmbH	1
Federal Aviation Administration (FAA)	19
Flight Design GmbH	1
Flybe	1
Flybe Aviation Services	3
Honeywell Aerospace	1
International Civil Aviation Organization (ICAO)	3
Isle of Man Airport	1
Joint Aviation Authorities (JAA)	2
John A Osborne Airport, Montserrat	4
Ministry of Defence (MOD)	2
P&M Aviation	1
Sikorsky Aircraft Corporation	1
Thales Aerospace	1
Turbomeca	2

Note: Please note that a number of Safety Recommendations are made to more than one Addressee

Aeroplanes > 5,700kg MTWA or above

Boeing 757-300	London Gatwick Airport	3 October 2000	Serious Incident

AAIB Bulletin: 7/2002
FACTOR: F13/2000

Synopsis

After an uneventful flight from Ben Gurion Airport, Tel Aviv, the crew made an ILS approach to Runway 26 Left at London Gatwick Airport. The commander was 'pilot not flying' (PNF) in the right seat and another captain was the 'pilot flying' (PF) in the left seat. Prior to commencing their approach, the crew had received ATIS Information 'Delta', timed at 1920 hrs, which broadcast the following information: "Runway in use 26 Left; surface wind 180°/10 kt; visibility 10 km or more; cloud, scattered two thousand feet; temperature +16°, dew point +13°; QNH 1015, QFE 1008." There was no significant change in ATIS Information 'Echo' timed at 1950 hrs. Along with their landing clearance, the crew were advised by ATC that the surface wind was 190°/ 9 kt. The landing was made with Flap 25 and Mode 2 autobrake selected in conditions of slight drizzle.

The crew considered that a normal landing had been made, touching down at approximately 135 kt, just beyond the PAPIs and slightly left of the runway centre-line. Shortly after touchdown the commander stated that the autobrake had disconnected. The PF acknowledged and reselected Mode 2 on the autobrake. The PF had selected reverse thrust and both pilots considered that retardation was normal until 100 kt when some vibration was felt. Around this time an engineer working on an aircraft to the north of the runway heard what he described as two separate distinct "bangs", separated by some 5 to10 seconds. The PF continued to slow the aircraft and, on the instructions from ATC, cleared the runway at fast exit 'Golf Romeo'. On initial check-in with the ground controller, the PNF advised that they would be holding position as they suspected a "flat tyre". The crew had also noticed an indicated loss of some hydraulic fluid contents in both Left and Right Systems. The controller cleared the crew to hold at 'Golf 1' and advised them that the AFS were on their way to inspect the aircraft. He also declared an 'Aircraft Ground Incident' and advised the tower controller. As a precaution, the tower controller instructed the next landing aircraft to go-around and then initiated a runway inspection.

The inspection revealed tyre debris on the runway and the runway was declared closed at 1955 hrs. By now, the AFS had inspected the aircraft and informed the crew that the two right rear tyres had burst. The passengers deplaned via the normal exits and the aircraft was then towed onto stand. The runway was swept and, following a further inspection, was declared open at 2044 hrs.

SAFETY RECOMMENDATION – 2002-014

It is recommended that Airworthiness Authorities such as the JAA and FAA consider implementing the measures outlined in AAIB Safety Recommendations 99-11 and 99-12 concerning requirements for tyre pressure monitoring and warning systems.

Response

The European Aviation Safety Agency prepared a pre-Regulatory Impact Assessment (RIA) proposing the creation of a rulemaking task that would require the installation of a tyre pressure monitoring system on large aeroplanes. The pre-RIA will be used to consult with their advisory bodies representing aviation authorities and industry. The Agency will make a decision to create a rulemaking task after this consultation.

Status – Accepted – Closed

Airbus A320-231	On approach to Addis Ababa, Ethiopia	31 March 2003	Serious Incident

AAIB Bulletin: 6/2010
FACTOR: N/A

Synopsis

A British Mediterranean Airbus A320 aircraft, registration G-MEDA operating as flight number LAJ 6711 on a flight from Alexandria (Bourg-el-Arab), Egypt, to Addis Ababa, Ethiopia, carried out two approaches using the Addis Ababa VHF Omni-Directional Radio Range beacon (ADS VOR) and associated Distance Measuring Equipment (DME). On the second approach the aircraft crossed over a ridge of high ground in Instrument Meteorological Conditions (IMC) and came within 56 ft of terrain at a location 5 nm to the northeast of the airport. As the aircraft crossed the ridge the crew, alerted a few seconds earlier by a radio altimeter (RA) height callout, carried out a go-around; at the same time the Enhanced Ground Proximity Warning System (EGPWS) generated a 'TOO LOW TERRAIN' aural alert.

The investigation determined that the antenna of the ADS VOR had suffered water ingress and was not functioning correctly. The correct maintenance procedures for the ADS VOR/DME and its associated monitoring equipment were not followed.

The aircraft received erroneous information from the ADS VOR which was fed to the flight deck VOR display, the Flight Management System (FMS), the navigation displays and the EGPWS computer with its associated Terrain Awareness Display (TAD). A single common position source error thus adversely affected all these apparently independent navigation/situational awareness systems.

The existing certification standards for the aircraft navigation systems were met but were not sufficient to protect against this problem.

Six Safety Recommendations were made.

SAFETY RECOMMENDATION – 2010-022

It is recommended that the International Civil Aviation Organization review the methods by which the effectiveness of radio navigation aid ground station monitors are assured.

Response

1. The conclusions of section 3.2. of the Final Report with regard to the casual factors of the incident have been examined and deemed fully justified in light of the information provided in the body of the report. It seems that such factors include, inter alia, the incorrect bearing information provided by the VOR on which the published approach procedure was based, and the failure of the quality controls associated with the maintenance and monitoring of the facility.

2. A preliminary review of the relevant ICAO provisions on radio navigation aid ground station monitors has been conducted. In the specific case of the VOR, monitoring provisions are specified in Annex 10, Volume I, Chapter 3, 3.3.7 (similar provisions exist for other radio navigation aids):

3.3.7 Monitoring

3.3.7.1 Suitable equipment located in the radiation field shall provide signals for the operation of an automatic monitor. The monitor shall transmit a warning to a control point, and either remove the identification and navigation components from the carrier or cause radiation to cease if any one or a combination of the following deviations from established conditions arise:

a) A change in excess of 1 degree at the monitor site of the bearing information transmitted by the VOR.

b) A reduction of 15 percent in the modulation components of the radio frequency signals voltage level at the monitor of either the subcarrier, or 30 Hz amplitude modulation signals, or both.

3.3.7.2 Failure of the monitor itself shall transmit a warning to a control point and either:

a) remove the identification and navigation components from the carrier; or

b) cause radiation to cease.

3. It should be noted that, on the occasion of the incident, as stated in the report, variable VOR bearing errors of up to 30 degrees were observed. Accordingly, condition 3.3.7.1 a) (bearing changes in excess of 1 degree) had risen, and the monitor should have been triggered to perform the required action, namely "either remove the identification and navigation components from the carrier or cause radiation to cease". However, as the report itself confirms, the monitor failed to activate, either because the error condition had not been detected or because the detection did not lead to the required action being performed. This could be attributable either to a permanent condition associated with the use of unsuitable monitoring equipment, or to a temporary failure of the monitoring equipment itself. The former reason would point to non-compliance with the main provisions of 3.3.7.1; the latter would point to non-compliance with the provisions of 3.3.7.2. In either case, it is apparent that the relevant ICAO Standards were not being met by the monitoring equipment. Had they been met, the incident could have been prevented.

4. In light of the above considerations, the following conclusions are submitted:

a) one or both of the relevant ICAO Standards for VOR monitoring (3.3.7.1 and 3.3.7.2) were not being met by the monitoring equipment;

b) The existing ICAO provisions are sufficient to assure the effectiveness of VOR monitoring, provided that such provisions are by States.

5. The incident report will also be submitted to the consideration of the next meeting of the Navigations Systems Panel (NSP), to be held on 22-31 October 2008.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2010-023

It is recommended that the European Aviation Safety Agency and the Federal Aviation Administration review and revise the existing TAWS certification requirements with a view to ensuring that they protect against common mode failures that could induce a CFIT accident. Furthermore the minimum requirements for the navigational accuracy of sources used for TAWS should be tightened to reflect the needs of the system to perform its function. These revised standards should then be applied retrospectively to all aircraft required to be fitted with TAWS.

Response

On June 27 2012, the FAA published Technical Standard Order (TSO) - C151c, Terrain Awareness and Warning System, to clarify TAWS position requirements, recognising the increased capabilities and accuracies associated with the use of Global Navigation Satellite System (GNSS) position and the technological advancements of the TAWS equipment. During the TSO public comment period, the FAA addressed the issue of mandating GNSS as the navigational position source. Industry stated that the proposed mandate would come at a time when navigation sources, system integration, and position accuracies should be driven by NextGen requirements that are still in development.

Industry found that earlier TSO - C151 requirements should remain effective, providing air carriers an opportunity to decide on navigation source equipment and integration based on more certain and substantive navigation source requirements. They also commented that TAWS integrated with Flight Management System (FMS) sources may actually yield safety advantages over GNSS if the Receiver Autonomous Integrity Monitoring (RAIM) function detected insufficient integrity. Lack of GNSS position integrity provided by RAIM occurs when insufficient GNSS satellite geometry exists

at a given location. In responding to these comments, the FAA modified the TSO requirements to minimise this impact on industry.

Although TSO – C151c requires the primary horizontal position for TAWS to come from a GNSS source, TAWS equipment intended for installation in aircraft operating under 14 CFR Part 121 could be configured to operate solely on a non-GNSS position source. The FAA is not aware of other incidents caused by similar VOR errors. For this reason, the FAA has not mandated any retrofit action.

Although the FAA has only required the primary horizontal position for TAWS to come from a GNSS source, many TAWS being manufactured today use a GNSS source thereby improving the capability of the TAWS to provide an earlier warning.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2010-024

It is recommended that the European Aviation Safety Agency and the Federal Aviation Administration study the issues relating to the use of TAWS so that where data source problems are identified by the system the flight crew can be alerted.

Responses

European Aviation Safety Agence (EASA):

Terrain Awareness and Warning System (TAWS) is not part of the aircraft navigation systems and it shall not be used as mitigation means to detect navigation system or data problems. The TAWS certification policy assumes that the signal received from the ground station, VHF Omnidirectional radio Range (VOR) is correct, and ground stations shall be adequately monitored and controlled by the responsible bodies (Airport and Air Traffic Control).

Federal Aviation Administration (FAA):

The function of the TAWS is to provide the flight crew with terrain awareness, as well as aural and visual alerts on a display to help prevent an inadvertent CFIT event. Because the TAWS is not part of the aircraft navigation system it is not required to detect navigation system and data errors or alert the flight crew to such errors. The TAWS assumes the position data received is correct.

Status – Rejected – open

SAFETY RECOMMENDATION – 2010-025

It is recommended that the European Aviation Safety Agency and the Federal Aviation Administration consider whether the crew should be alerted when a FMS has identified a recurrent problem with a particular navigation aid and furthermore consider whether the subsequent use of that navigation aid for position information is desirable.

Responses

Federal Aviation Administration (FAA):

Early FMS stressed the capability to connect several way points and perform to a given accuracy. These systems are still in service today, approved under various performance standards depending on when they entered into service. Performance standards recently included Required Navigation Performance (RNP), which adds accuracy, as well as monitoring and alerting components. Systems using ground-based navigation sources for RNP operations must provide the capability for a reasonableness and integrity check. Current requirements for RNP systems which utilise ground-based navigation sources ensure position determination is within the required accuracy standard.

Status – Rejected – open

European Aviation Safety Agence (EASA):

Status – Response awaited – open

Airbus A320-211	Leeds Bradford Airport	18 May 2005	Accident

AAIB Formal: AAR 6/2007
FACTOR: F37/2007

Synopsis

While landing on Runway 14 at Leeds Bradford Airport the aircraft touched down just beyond the end of the marked touchdown zone with low autobrake selected. Manual wheel braking commenced shortly after mainwheel touchdown. At a groundspeed of around 70 kt the brakes ceased operating, for about 17 seconds. A pronounced dip in the runway surface initially prevented the pilots from seeing the runway end. When it became apparent to the commander that it would not be possible to stop before the end of the runway, he deliberately did not select alternate braking, as this would have caused loss of nosewheel steering, but instead used nosewheel steering to turn the aircraft sharply to the right. The aircraft skidded sideways and came to a halt with its nosewheels off the runway, shortly before the end of the paved surface and the start of a steep down slope.

The cause of the braking loss could not be positively established but it was consistent with the effects of excessive noise in the electrical signals from the mainwheel tachometers used to sense groundspeed. Two of the tachometer driveshafts were found bent and it was known that this encouraged a resonant condition that could cause tachometer signal errors above the groundspeed at which they would be detected by the aircraft's monitoring systems. Should the condition affect both main landing gears simultaneously, the brake control system logic could generate an erroneous aircraft reference speed, which could activate the anti-skid system and release the brakes. Fluctuation in the signal errors would prevent the system from detecting and correcting the braking loss or providing a warning to the crew.

It was found that there were a number of other known anomalies with the brake control and monitoring system that could cause either brake failure or locking of the wheels, some of which had resulted in previous incidents and accidents. The aircraft manufacturer and the Airworthiness Authority had defined and implemented corrective actions, and redesigned tachometer driveshafts and updated software intended to correct some of the faults were available, but had not been incorporated on a substantial number of aircraft, including JY-JAR. The findings raised concerns about the aircraft manufacturer's procedures intended to ensure design quality and continued airworthiness.

The investigation identified the following causal factors:

1. Excessive wheel tachometer signal noise, caused by a bent tachometer driveshaft on each main landing gear assembly, resulted in loss of braking using the Normal system.

2. Inadequate fault tolerance within the brake control system led to the sustained loss of Normal braking during the landing ground roll.

3. There was no flight deck indication of brake system malfunction, and this delayed the crew's recognition of the loss of braking.

4. There was a lack of effective action to fully rectify brake system anomalies apparent from previous incidents and accidents.

Seven Safety Recommendations were made.

SAFETY RECOMMENDATION – 2007-018

The European Aviation Safety Agency should consider requiring, for aircraft in the A320 family and other aircraft with similar combined Brakes and Steering Control systems, changes that allow manual selection of Alternate braking without consequent loss of nosewheel steering.

Response

In the case of the A320 family and other aircraft with similar combined Brakes and Steering Control systems, it is considered after review of the current design that the requested change to allow manual selection of alternate braking without loss of steering is not necessary.

It has been demonstrated that the A320 family, A330 and A340-200/300 aircraft are fully controllable by the use of differential braking during rollout and taxi.

Status – Accepted – Closed

SAFETY RECOMMENDATION – 2007-019

The European Aviation Safety Agency should require Airbus to take measures aimed at ensuring that anomalies in A318/319/320/321 aircraft braking systems that may lead to loss of Normal braking are clearly indicated to the flight crew.

Response

In the case of the A320 family aircraft braking system, it is pointed out that the involved aircraft was fitted with a Braking and Steering Control Unit (BSCU) standard 9 at the time of the event. In certain conditions the loss of braking function would not be detected due to a too long confirmation time. BSCU standard 9.1 was developed with an adjustment in the loss of braking confirmation time; this modification has since been implemented in BSCU standard 10 and subsequent.

Installation of BSCU standard 10 has been mandated (EASA Airworthiness Directive 2008-0048 issued on 28 February 2008) with a completion date set at the end of September 2009. The fleet retrofit today is completed.

EASA considers that appropriate actions address the intent of the Safety Recommendation.

Status – Accepted – Closed

Bombardier DHC-8-400	**Near Leeds, West Yorkshire**	**4 August 2005**	**Incident**

AAIB Bulletin: 4/2007
FACTOR: F20/2007

Synopsis

Shortly after initiating a descent, an oily smell was noticed on the flight deck, almost immediately followed by a smoke build-up in the flight deck and cabin. The flight crew carried out the initial part of the smoke checklist procedure, declared an emergency and carried out a diversion. The cabin crew members donned smoke hoods, which caused appreciable communication difficulties, and prepared the cabin for an emergency landing. After landing, an emergency evacuation was carried out, without injury.

The smoke was found to be the result of fatigue cracking of a compressor support member of the No 2 engine. This had led to damage to an oil seal, allowing oil to leak into the bleed air supplying one of the air conditioning units. Fleet modification action aimed at preventing fatigue cracking of the component and at improving the affected oil seal was completed on all of the operator's fleet by July 2006.

No means of rapidly ascertaining the source of the smoke was available to the crew. Carrying out the subsequent actions prescribed in the checklist would have stopped the supply of smoke but the procedure was relatively protracted and could not be completed because of a high flight crew workload associated with the diversion.

Four Safety Recommendations were made.

SAFETY RECOMMENDATION – 2007-004

It is recommended that for all large aeroplanes operating for the purposes of commercial air transport, the UK CAA and the EASA should take such steps, procedural or technical, as are necessary to improve the reliability and availability of communications between flight and cabin crews, including the reliability of communications equipment and associated power supplies in both normal and emergency configurations.

Response

It is acknowledged that some events reported some non-availabilities of the power supply to the Public Address (PA) system or interphone system.

A study funded by the Agency and dated September 2009 (Project EASA.2008.C18 - Study on CS-25 Cabin Safety Requirements) identified four such events (between 2003 and 2006) which, however, were not linked to subsequent injury.

Nevertheless the Agency agrees that CS-25 could be improved to require power supplies for PA, interphone and evacuation alert systems (required by operational rules or otherwise) to have the capability to maintain the functioning of these systems for sufficient time to allow completion of emergency procedures dependant on crew to crew and crew to passenger communications.

This item has been identified for future inclusion in the rulemaking programme but with a low priority.

Status – Accepted – Closed

Dornier 328-100	**Near Sumburgh Airport, Shetland**	**11 June 2006**	**Serious Incident**

AAIB Bulletin: 3/2007
FACTOR: F19/2007

Synopsis

During a visual approach to Sumburgh Airport, the aircraft encountered worsening weather conditions and inadvertently flew into close proximity with the terrain. The crew were alerted to the situation by on-board equipment, but the commander did not respond to the 'PULL UP' warnings it generated. The approach was continued and a safe landing made at the airport. The investigation identified a number of organisational, training and human factors issues which contributed to the crew's incorrect response to the situation. Two recommendations were made, concerning crew training and regulatory oversight of the aircraft operator.

SAFETY RECOMMENDATION – 2006-130

The Joint Aviation Authorities should review the training requirements for flights crews operating aircraft required to be equipped with a predictive terrain hazard warning function, with a view to ensuring that such crews are adequately trained in its use, interpretation and response.

Response

Commission Regulation (EU) No 1178/2011 of 3 November 2011, related to civil aviation aircrew, covers Ground Proximity Warning System training.

EASA Executive Director (ED) Decision (ED) 2012/018/R on air operations, published on 25 October 2012, contains Guidance Material (GM) on Terrain Awareness Warning Systems (TAWS).

The Joint Aviation Authorities (JAA) learning objectives, which explicitly include training on Enhanced Ground Proximity Warning Systems (EGPWS), are currently being transposed into the European regulations structure within the framework of Rulemaking tasks RMT.0188 and RMT.0189 [former FCL.002(a) and (b)].

Status – Accepted – closed

Airbus A319-111	Overhead Brest, France	15 September 2006	Serious Incident

AAIB AAR: 4/2009
FACTOR: F6/2007

Synopsis

The serious incident occurred to an Airbus A319-111 aircraft operating a scheduled passenger flight between Alicante, Spain and Bristol, UK. The aircraft had experienced a fault affecting the No 1 (left) electrical generator on the previous flight and was dispatched on the incident flight with this generator selected off and the Auxiliary Power Unit generator supplying power to the left electrical network.

While in the cruise at Flight Level (FL) 320 in day Visual Meteorological Conditions (VMC), with the autopilot and autothrust systems engaged, a failure of the electrical system occurred which caused numerous aircraft systems to become degraded or inoperative. Some of the more significant effects were that the aircraft could only be flown manually, all the aircraft's radios became inoperative and the Captain's electronic flight instrument displays blanked.

Attempts by the flight crew to reconfigure the electrical system proved ineffective and the aircraft systems remained in a significantly degraded condition for the remainder of the flight, making operation of the aircraft considerably more difficult. The flight crew were unable to contact air traffic control for the rest of the flight. The aircraft landed uneventfully at Bristol, with the radios and several other systems still inoperative.

The reasons why the electrical system could not be reconfigured by the flight crew could not be established.

The investigation identified the following causal factors in this incident:

1. An intermittent fault in the No 1 Generator Control Unit, which caused the loss of the left electrical network
2. An aircraft electrical system design which required manual reconfiguration of the electrical feed to the AC Essential busbar in the event of de-energisation of the No 1 AC busbar, leading to the loss or degradation of multiple aircraft systems, until the electrical system is reconfigured
3. The inability of the flight crew to reconfigure the electrical system, for reasons which could not be established
4. Master Minimum Equipment List provisions which allowed dispatch with a main generator inoperative without consideration of any previous history of electrical system faults on the aircraft
5. Inadequate measures for identifying Generator Control Units repeatedly rejected from service due to repetition of the same intermittent fault

Preliminary information on the progress of the investigation was published in AAIB Special Bulletin S9/2006 on 13 December 2006 and four Safety Recommendations were made. Ten additional Safety Recommendations were made in this report.

SAFETY RECOMMENDATION – 2008-090

It is recommended that the EASA require improvements to the fault monitoring logic of the type of Generator Control Unit (GCU) used on A320-series aircraft with the aim of preventing the monitoring system from incorrectly interpreting a fault within the GCU as an external system fault.

Response

The specific case of the fault monitoring logic of the Generator Control Unit (GCU) used on A320-series aircraft has led to a review with the TC holder.

As a result, a new GCU standard 5.2 (Mod 39670) has been developed and certified on October 13, 2008 to improve the robustness of the differential protection trip related to the "GLC welded" failure mode. This is the standard in production on A320 family and associated SB 24-1124 was issued on December 2, 2008.

It has been determined that there were no reason to mandate this improvement because the impact is Minor (and Major during T/O and Landing).

As a consequence it is deemed that no unsafe condition exists and no further corrective action than those already undertaken by Type Certificate Holder (TCH) are necessary.

Status – Partially Accepted – open

Jetstream 3202	**Wick Airport, Caithness**	**3 October 2006**	**Accident**

AAIB Formal: AAR 3/2008
FACTOR: N/A

Synopsis

The aircraft was on a scheduled flight from Aberdeen to Wick. It was the fourth sector of a six-sector day for the crew, during which there had been no significant delays. The crew flew the VOR/DME procedure for Runway 31, and became visual with the runway during the latter stages of the arc portion of the procedure. They configured the aircraft with the landing gear selected 'DOWN' and flaps set as required for the approach and landing. The commander, who was the Pilot Flying, flared the aircraft for touchdown at the normal height but as the aircraft continued to sink, he realised that the landing gear was not down. He carried out a go-around and, following a recycling of the landing gear, flew past the control tower. The controller confirmed that the landing gear was down and the aircraft diverted back to Aberdeen Airport where a safe landing was made. It was subsequently found that, during the go-around, the underside of the fuselage and the tips of the right propeller had contacted the runway surface.

The investigation found that contamination of the landing gear selector switch points had acted as an electrical insulator preventing current flow to the landing gear lowering system and audible warning systems. The three green landing gear indicator lights, which are independent of this circuit, had functioned correctly. The crew had not checked the indication prior to landing and were therefore unaware that the landing gear was retracted.

The investigation identified the following causal factors:

1. Mechanical wear and arcing across one of the poles in the gear selection switch resulted in a piece of cupric oxide acting as an insulator across the pole which should have energised the gear extension circuit.

2. The flight crew did not identify that the landing gear was not down and locked by visually checking the landing gear green indicator lights.

3. Due to the failures associated with the gear selection switch, the flight crew received no audible warnings of the landing gear not being in the 'DOWN' position.

SAFETY RECOMMENDATION – 2007-079

It is recommended that BAE Systems amend their SOPs for the 'Landing Checks' to include confirmation by both PF and PNF that the landing gear handle is selected down and that three green indicator lights are illuminated. They should encourage operators of the Jetstream aircraft to adopt the revised procedure.

Response

In June 2008, BAE Systems issued Flight Operations Support Information Leaflet TP-001-08, in order to highlight the incident and convey to operators the manner in which it expects the various checklist drills to be completed; i.e. the 'challenge and response' philosophy.

BAE Systems has revised its Manufacturer's Operating Manual in order to more precisely describe this philosophy and includes landing gear position as a critical item that must be cross-checked by both pilots.

The revised MOM is due to be issued by the end of June 2013.

Status – Accepted – Closed

SAFETY RECOMMENDATION – 2007-080

It is recommended that BAE Systems should review the safety analysis for the Jetstream 32 landing gear system to include cases where the gear selector lever can be moved to the 'DOWN' position with the landing gear remaining retracted and the audible warning inhibited.

Response

BAE Systems has carried out a review of the safety analysis for the Jetstream 32 landing gear system, which focussed on the following two closely related failures.

Landing with Gear not Locked DOWN but Indication Healthy. Hazardous

Whilst this failure case reflects the technical fault experienced during the Wick accident (temporary failure of the landing selector lever resulted in the gear not deploying), it assumes the crew is aware that the gear has not locked down and that the appropriate Emergency Checklist drills are followed accordingly. Consequently, BAE Systems does not consider this safety case to be applicable to the Wick accident.

Landing with Gear not Locked DOWN and Indication Faulty. Catastrophic

Therefore, BAE Systems asserts that this safety case adequately accommodates the Wick accident and points to its response to Safety Recommendation 2007-079, referred above, as the means by which the 'faulty indication' of the safety case is mitigated.This case assumes that, due to faulty indication, the crew is not aware that the gear has not locked down and, consequently, the Emergency Checklist drills are not pursued, likely resulting in an attempt to land and the potential for a catastrophic event.
Though the gear position indication at Wick was 'healthy', BAE Systems reasons that the 'faulty indication' was introduced by the crew's failure to observe the correct landing gear position indication. As the crew was unaware that the gear had not locked down, the same failure case outcome is reached.

BAE Systems intends no further action for Safety Recommendation 2007-080.

Status – Accepted – Closed

VARIOUS	**Bristol International Airport**	**VARIOUS 29 December 2006 3 January 2007**	**Serious Incident**

AAIB Formal: AAR 1/2009
FACTOR: F1/2009

Synopsis

The serious incidents involving G-BWDA and G-EMBO were notified to the Air Accidents Investigation Branch (AAIB) on 29 December 2006. An investigation into the two serious incidents began on 2 January 2007. During this investigation, the events involving G-XLAC, and others, were identified.

Resurfacing and re-profiling work was taking place on parts of the runway at BIA as part of a major project to resurface the manoeuvring area pavements, and sections of the runway surface were ungrooved 'base course' asphalt. From 14 November 2006, there were reports from flight crew of a variety of problems related to the friction characteristics of the temporary runway surface, though no serious incidents occurred until 29 December 2006. On that day, the flight crew of G-XLAC experienced poor stopping performance during landing. Later that day, the flight crew of G-BWDA experienced stopping and lateral control difficulties during landing, and the aircraft departed the runway surface and came to rest on the grass area at the side of the runway. Later still, the flight crew of G-EMBO experienced lateral control difficulties during landing, and the aircraft partially left and then regained the runway. On 3 January 2007, another flight crew, also operating G-XLAC, experienced poor stopping performance. The airport was subsequently closed whilst grooves were cut in the base course. After it re-opened there were no further incidents.

The investigation identified the following causal factors:

1. Reduced friction on the wet ungrooved base course sections of the runway caused flight crews to experience reduced braking action and reduced lateral controllability on landing in strong crosswinds.

2. The Flight Operations Department Communication (FODCOM) advice published by the CAA regarding operations on runways notified 'slippery when wet', in wet conditions, was not communicated by Operators to flight crews.

3. The passing, by ATC, of braking action reports based on Mu-meter friction assessments, gave flight crews a false confidence in the braking action available on the wet runway.

The investigation identified the following contributory factor:

G-BWDA landed in a crosswind outside the operator's published limits and the subsequent use of reverse thrust was contrary to the advice contained in the company's Operations Manual.

The AAIB made five Safety Recommendations.

SAFETY RECOMMENDATION – 2008-079

The European Aviation Safety Agency should research the technical and operational feasibility of developing equipment and procedures to measure aircraft braking friction with respect to runway position, using on-board aircraft data from landings. As part of this research the European Aviation Safety Agency should develop appropriate standards of recording and methods for sharing this information, and its tolerances, in a timely manner, with interested parties.

Response

Industry has already been evaluating technical solutions showing that a potential exists for utilising aircraft data collected during previous landings for near real-time determinations of the friction coefficient of a runway. Some field trials have been made confirming this potential. In addition, the

Federal Aviation Administration (FAA) has issued a call for research on this technology (FAA Announcement DTFACT-13-R-00009-0001). The Agency is continuing to monitor the development of this emerging technology.

However, this concept in isolation does not work for aerodromes with infrequent landings or for first landing aircraft. That is why the Agency also conducted a study to review technological improvements that are expected from continuous friction measuring equipment (CFME). Reference: EASA.2011.OP.13 "Continuous Friction Measuring Equipment - Use on Contaminated Runways".

The need to develop a standard for recording and sharing runway friction information should be first supported by a global consensus on the most appropriate runway condition reporting systems and a common runway condition reporting format. To this end, the Agency is taking part to ICAO Friction Task Force (FTF), which aims at developing Standards and Recommended Practices on runway friction reporting, as well as guidance. ICAO FTF reports to ICAO Aerodrome Operations and Services working group.

Status – Accepted – Closed

Boeing 737-3Q8	Bournemouth Airport	23 September 2007	Serious Incident

AAIB Formal: AAR 3/2009
FACTOR: N/A

Synopsis

The Boeing 737-300 was on approach to Bournemouth Airport following a routine passenger flight from Faro, Portugal. Early in the ILS approach the autothrottle disengaged with the thrust levers in the idle thrust position. The disengagement was neither commanded nor recognised by the crew and the thrust levers remained at idle throughout the approach. Because the aircraft was fully configured for landing, the air speed decayed rapidly to a value below that appropriate for the approach. The commander took control and initiated a go-around. During the go-around the aircraft pitched up excessively; flight crew attempts to reduce the aircraft's pitch were largely ineffective. The aircraft reached a maximum pitch of 44º nose-up and the indicated airspeed reduced to 82 kt. The flight crew, however, were able to recover control of the aircraft and complete a subsequent approach and landing at Bournemouth without further incident.

Although the commander reported the event to the operator the following morning, his initial Air Safety Report (ASR) contained limited information and the seriousness of the event was not appreciated until the Quick Access Recorder (QAR) data was inspected on 4 October 2007.

G-THOF was not subjected to an engineering examination to ensure its continued airworthiness and remained in service throughout this period.

The investigation identified the following causal factors:

1. The aircraft decelerated during an instrument approach, to an airspeed significantly below the commanded speed, with the engines at idle thrust. Despite the application of full thrust, the aircraft stalled, after which the appropriate recovery actions were not followed.
2. The trimmed position of the stabiliser, combined with the selection of maximum thrust, overwhelmed the available elevator authority.

The investigation identified the following contributory factors:

1. The autothrottle warning system on the Boeing 737-300, although working as designed, did not alert the crew to the disengagement of the autothrottle system.
2. The flight crew did not recognise the disengagement of the autothrottle system and allowed the airspeed to decrease 20 kt below V_{REF} before recovery was initiated.

Three Safety Recommendations were made.

SAFETY RECOMMENDATION – 2009-043

It is recommended that Boeing, in conjunction with the Federal Aviation Administration, conduct a study of the efficacy of the Boeing 737-300/400/500 autothrottle warning and if necessary take steps to improve crew alerting.

Response

In conjunction with Boeing, the FAA completed an evaluation of this and related incidents involving the B-737 autothrottle system. With the results of the evaluation, the FAA initiated rulemaking to require, through an Airworthiness Directive, improvements to the crew alerting capability of the B-737 aircraft with regard to autothrottle disconnects.

Status – Accepted – Closed

Boeing 777-236ER	London Heathrow Airport	17 January 2008	Accident

AAIB Formal: AAR 1/2010
FACTOR: N/A

Synopsis

Whilst on approach to London (Heathrow) from Beijing, China, at 720 feet agl, the right engine of G-YMMM ceased responding to autothrottle commands for increased power and instead the power reduced to 1.03 Engine Pressure Ratio (EPR). Seven seconds later the left engine power reduced to 1.02 EPR. This reduction led to a loss of airspeed and the aircraft touching down some 330 m short of the paved surface of Runway 27L at London Heathrow. The investigation identified that the reduction in thrust was due to restricted fuel flow to both engines.

It was determined that this restriction occurred on the right engine at its Fuel Oil Heat Exchanger (FOHE). For the left engine, the investigation concluded that the restriction most likely occurred at its FOHE. However, due to limitations in available recorded data, it was not possible totally to eliminate the possibility of a restriction elsewhere in the fuel system, although the testing and data mining activity carried out for this investigation suggested that this was very unlikely. Further, the likelihood of a separate restriction mechanism occurring within seven seconds of that for the right engine was determined to be very low.

The investigation identified the following probable causal factors that led to the fuel flow restrictions:

1. Accreted ice from within the fuel system released, causing a restriction to the engine fuel flow at the face of the FOHE, on both of the engines.
2. Ice had formed within the fuel system, from water that occurred naturally in the fuel, whilst the aircraft operated with low fuel flows over a long period and the localised fuel temperatures were in an area described as the ‘sticky range’.
3. The FOHE, although compliant with the applicable certification requirements, was shown to be susceptible to restriction when presented with soft ice in a high concentration, with a fuel temperature that is below -10°C and a fuel flow above flight idle.
4. Certification requirements, with which the aircraft and engine fuel systems had to comply, did not take account of this phenomenon as the risk was unrecognised at that time.

Eighteen Safety Recommendations were made.

SAFETY RECOMMENDATION – 2009-095

It is recommended that the Federal Aviation Administration amend their requirements for landing gear emergency loading conditions to include combinations of side loads.

Response

In their May 30, 2012 response, the FAA communicated their plan to revise Title 14, Code of Federal Regulations (14 CFR) section 25.721(a), based on a recommendation from the Aviation Rulemaking Advisory Committee (ARAC), to require consideration of side loads in addition to upward and aft loads. They are also planning to issue advisory material specifying that upward, aft and side loads should be considered to act in any reasonable combination. The FAA published a notice of proposed rulemaking for this change due on March 1, 2013. They anticipate the final rule to be published by December 2014.

Status – Accepted – Closed

SAFETY RECOMMENDATION – 2009-096

It is recommended that the Federal Aviation Administration, in conjunction with the European Aviation Safety Agency review the requirements for landing gear failures to include the effects of landing on different types of surface.

Response

The FAA reviewed this issue with EASA and concluded that a change to the regulatory requirements for landing gear failures to account for the effects of landing on different types of surfaces is not warranted at this time. Such a change would require significant industry support and data that is currently unavailable. At the time of their response, neither the FAA nor EASA had plans to pursue rulemaking that would address this safety recommendation. If the FAA makes a change to the applicable regulations in the future, they will consider this recommendation again, however, no such action is currently planned.

Status – Rejected

SAFETY RECOMMENDATION – 2009-097

It is recommended that the Federal Aviation Administration require that Boeing modify the design, for the Boeing 777, of the indirect ceiling light assemblies, their associated attachments, and their immediate surroundings to ensure that the fluorescent tubes, or their fragments, will be retained in a survivable impact.

Response

In 2010, the FAA initially evaluated the Boeing 777 indirect ceiling light assembly design. This cursory review led us to consider mandatory corrective action to require modification of the indirect ceiling light design to reduce the risk of fractured glass within the cabin. Though not specifically noted during the investigation, there is the potential for this glass to have an impact on emergency egress and passenger survivability.

In their initial response to FAA safety recommendation 10.039 they proposed mandatory corrective action and planned to develop and initiate an airworthiness directive (AD). After performing a detailed risk analysis however, they determined that the risk of broken glass from indirect ceiling lights causing injury serious enough to impede emergency egress would be extremely low. Therefore, the issue does not meet the criteria for issuance of an AD, although the previous indirect lighting design did not pose an unsafe condition, Boeing incorporated a design enhancement in production at line #454. The design enhancement includes a more robust chassis and stronger end-holders.

Status – Accepted – Closed

SAFETY RECOMMENDATION – 2009-098

It is recommended that the Federal Aviation Administration and the European Aviation Safety Agency, review the qualification testing requirements applied by manufacturers to cabin fittings, to allow for dynamic flexing of fuselage and cabin structure.

Response

This Safety Recommendation has been considered in collaboration with the Federal Aviation Administration (FAA). It has been determined that the risk of broken glass from indirect ceiling light assemblies causing Injury serious enough to impede emergency egress would be extremely low. This Item does not meet the unsafe condition criteria for mandatory action on the light design or the fittings in question. For the same reason, no rulemaking action is deemed necessary.

Status – Rejected

Boeing 737-73V	West of Norwich, Norfolk	12 January 2009	Serious Incident

AAIB Bulletin: 9/2010
FACTOR: N/A

Synopsis

A flight control manual reversion check was being conducted as part of a post-maintenance check flight. During the check, the aircraft pitched rapidly nose-down, descending approximately 9,000 ft before control was recovered. A number of maintenance and airworthiness check issues were identified and six Safety Recommendations were made.

SAFETY RECOMMENDATION – 2010-074

It is recommended that Boeing develop an Aircraft Maintenance Manual procedure to identify mis-rigging of the B737 elevator tab control system and amend the Aircraft Maintenance Manual tab adjustment procedure to limit the amount of trim adjustment on any one maintenance input.

Response

The reference (c) letter outlines some of the various actions taken over the years in order to mitigate a mis-rigged tab. Due to the very small amount of adjustment (typically in a 1/4" band) for the tab rigging, it is very difficult to ascertain a mis-rigged condition without accomplishing the power off flight test. This is why the requirement for the flight test exists; the aerodynamic forces over the elevator and tab surfaces cannot be duplicated any other way. As such, Boeing has placed emphasis and instructions in the AMM to identify the initial position of the tab prior to any replacement or adjustment. Boeing have clarified and simplified the methodology of communication between the flight test crew and maintenance personnel through the use of a more easily understandable Maintenance Manual chart to correlate the tab rod adjustment with the flight test results. Special tooling has also been developed in order to minimize the adjustment necessary following removal and/or replacement of the tab or tab mechanism components.

Boeing will continue to monitor and evaluate the performance of these actions and will revise procedures and techniques for elevator tab adjustment.

Status – Rejected

Bombardier DHC-8-102	Bristol International Airport	24 April 2010	Serious Incident

AAIB Bulletin: 6/2011
FACTOR: F4/2011

Synopsis

After a base maintenance check at Exeter the aircraft was flown uneventfully to East Midlands to be re-painted. During the return flight to Exeter the right engine suffered a significant oil leak and lost oil pressure, so the flight crew shut it down. Subsequently, the crew noticed the left engine also leaking oil, with a fluctuating oil pressure, so they initiated a diversion to Bristol, where they landed safely. The oil leaks were traced to damaged O-ring seals within the oil cooler fittings on both engines. Both oil coolers had been removed and refitted during the base maintenance check at Exeter. It was probably during re-installation that the O-ring seals were damaged. A number of factors led to this damage and to missed oil leak checks. Six Safety Recommendations are made.

SAFETY RECOMMENDATION – 2011-014

It is recommended that Flybe Aviation Services revise their practices and procedures to ensure that their repair instructions are adequately detailed and specify the necessary access and removal requirements.

Response

Flybe accepts this safety recommendation. Since the recommendation was made, Flybe has amended Company Procedure PRO PP6 – Issue and Control of Workpacks, and PRO PP12 – Process Sheet ADM 1336 in order to address the issues identified by this recommendation.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-015

It is recommended that Bombardier Inc. amend the Aircraft Maintenance Manual for the DHC-8-100 series to emphasise the correct procedure for securing the inlet and outlet pipes to the engine oil coolers, including the method for tightening the associated knurled nuts.

Response

Bombardier has amended the Aircraft Maintenance Manual for the DHC 8 100 series aircraft to emphasise the correct procedure for securing the inlet and outlet pipes to the engine oil coolers, including the method for tightening the associated knurled nuts.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-016

It is recommended that Flybe Aviation Services review their defect rectification processes to ensure that important safety checks, such as oil leak checks, are not omitted.

Response

Flybe accepts this Safety Recommendation. Since the recommendation was made, Flybe has amended Company Procedure PRO P20 – Rectification of Defects During Base Maintenance, and procedure PRO P2 – Control of Aircraft Maintenance Checks, in order to address the issues identified by this recommendation.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-017

It is recommended that Flybe Aviation Services remind all staff of the importance of investigating the source of every engine oil leak.

Response

Flybe accepts this safety recommendation. Since this recommendation was made, Flybe has produced 3 Safety DVD's which have been shown to all Flybe Engineers, highlighting a number of incidents and the lessons to be learnt from each. These feature eye witness accounts of what happened and how it could have been prevented. A 4th Safety DVD is currently (Dec 2012) in production which is based around the SX-BIO incident. As an interim measure, while this film is in production, a Safety Notice has been produced and issued in the Engineers Read & Sign system, to highlight the importance of correctly investigating the source of every engine oil leak identified during ground runs. The Safety Notice was issued on the 11 December.

Status – Accepted – closed

DHC-8-402	**Exeter Airport, Devon**	**11 September 2010**	**Incident**

AAIB Bulletin: 6/2012
FACTOR: N/A

Synopsis

During approach the aircraft experienced a failure of the number 1 Input Output Processor (IOP 1). In dealing with this failure the flight crew became distracted and were unaware that the altitude select mode of the flight director had become disengaged and that the aircraft had descended below its cleared altitude. Descent continued until, alerted by an EPGWS warning, the pilots climbed the aircraft and re-established it on the appropriate glidepath. The investigation found that the IOP 1 failure was caused by intermittent electrical contact arising from cracked solders on two pins of a transformer on the IOP power supply module. It was further determined that there was a lack of appropriate operational guidance available to flight crews to deal with such avionics failures. Three safety recommendations have been made.

SAFETY RECOMMENDATION – 2012-017

It is recommended that Bombardier Aerospace publish information in the Quick Reference Handbook section of the Dash 8 Q400 Aeroplane Operating Manual describing the effects of single Input Output Processor failures on the operation of the aircraft.

Response

The manufacturer has incorporated relevant information in Revision 32 of the QRH, issued on 9 May 2013.

Status – Accepted – Closed

SAFETY RECOMMENDATION – 2012-018

It is recommended that Flybe amend their Operations Manual to provide appropriate guidance for the handling of serious incidents and ensure timely notification to the Air Accidents Investigation Branch.

Response

Part A now includes guidance on the reporting of serious incidents as well as accidents. Flybe has also included guidance on what constitutes a serious incident.

Training was conducted during the Annual Recurrent Training programme during 2011/12. This included the importance of submitting ASR's with the correct main titles. This was delivered to all pilots and is now included on the new pilot induction flight safety presentations.

Central safety now completes on a daily basis a summary of all ASRs filed within the previous 24hr period. This summary is sent to all Safety areas as well as all post holders for each area. This enables a quick check to be made of reports being sent to other areas as well as specific post holding areas.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-019

It is recommended that Thales Aerospace review the Input Output Processor test procedures to improve the detection of intermittent failures of the ERACLE power supply module in order to reduce the number of faulty units being returned to service.

Response

Thales edited a Temporary Revision of the IOP CMM (Ref: 31-41-06/ TR n°1), available by the end of September 2012. This CMM TR will impose specific vibration test to address ERACLE component issues on every IOP returns for repair as requested by AAIB recommendation.

As soon as this document will be available it will be addressed to AAIB through BEA.

Note that Thales already set up this procedure for IOP NFF repeater modules since the end of 2010.

Status – Accepted – closed

Cessna 680	**During climb after departure from London Luton**	**30 September 2010**	**Serious Incident**

AAIB Bulletin: 8/2011
FACTOR: F6/2011

Synopsis

The crew experienced an uncommanded transfer of fuel from the right to the left fuel tank after following the checklist procedures for a left main electrical bus fault indication. The aircraft subsequently became left wing heavy and exceeded the lateral imbalance limits. It returned to Luton Airport where a flapless landing was completed without further incident. As a result of this incident, Special Bulletin S1/2010 was published on 8 October 2010, containing two Safety Recommendations. The investigation established that the isolation of the left main bus had caused a false fuel cross-feed command which resulted in the uncommanded fuel transfer. The aircraft manufacturer has published a temporary flight crew procedure to mitigate the effects of a recurrence and has also issued a service bulletin to incorporate a design solution.

Eight further Safety Recommendations were made in this bulletin, relating to aircraft certification processes and flight recorder documentation.

SAFETY RECOMMENDATION – 2011-026

It is recommended that the European Aviation Safety Agency ensures that design organisations under their jurisdiction responsible for approvals affecting Flight Data Recorder (FDR) installations, hold the documentation required for decoding the FDR data, and that the documentation is to a suitable standard and available to operators.

Response

EASA addressed, on 8 June 2012, a letter to holders of Design Organisation Approval (DOA) or Alternative Procedures to DO, which highlights that they are responsible for producing the documentation needed for the serviceability and the operation of the Flight Data Recorders (FDR) when part of their design activities, including the FDR decoding documentation.

The letter reminds those organisations that they must ensure that the FDR decoding documentation is provided in a suitable format as part of the aircraft delivery or modification, and that they must keep the most recent version of the FDR decoding documentation they produced.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-030

It is recommended that Cessna Aircraft Company issue controlled documents, applicable to Cessna aircraft equipped with flight data recorders, that satisfy the EU-OPS 1.160 (a) (4) (ii) requirement, and make them available to all operators of the applicable aircraft. Furthermore, it is recommended that the documentation issued should follow the guidance given in Federal Aviation Administration document AC 20-141B and UK Civil Aviation Authority document CAP 731.

Response

Cessna has issued controlled documents AES-680-177 for the model 680 and AES-750-161 for the model 750 which fully define the Flight Data Recorder parameters. These documents support compliance with EU-OPS 1.160(a)(4)(ii) and will be provided, at no charge, to any operator requesting them. Going forward, Cessna will include complete parameter information with each FDRs Instructions for Continued Airworthiness (ICA) for each model. A full set of ICA documents is provided to every operator at the time of delivery and any updates to ICA are made available through our online source Cesview IIi. Guidance provided in FAA AC 20-141B and UK CAA CAP 731 will be used to aid in defining format and content.

Status – Accepted – closed

Boeing 767-324	Bristol Airport	3 October 2010	Accident

AAIB Bulletin: 5/2012
FACTOR: F6/2012

Synopsis

The aircraft landed heavily on Runway 09 at Bristol Airport, having encountered rain, reduced visibility and turbulence during the approach. The de-rotation was rapid and damage occurred as a result of the force with which the nose landing gear met the runway. The investigation found that a high rate of heavy landings on that runway had not been identified through flight data monitoring, and that training material produced by the manufacturer in response to previous, similar, events had not been presented to the flight crew. The cockpit voice recorder was not disabled after the accident and thus the recording was not available to investigators. A momentary longitudinal deceleration at touchdown was reported by the flight crew and recorded by the flight data recorder. Two safety recommendations were made.

SAFETY RECOMMENDATION – 2012-013

It is recommended that the European Aviation Safety Agency publishes guidance information that assists operators and National Aviation Authorities in the production and auditing of procedures to prevent the loss of Cockpit Voice Recorder recordings in accordance with the requirements of EU-OPS 1.160 and EU-OPS 1.085.

Response

The previous European Union provisions for commercial air transport (CAT) operations by aeroplanes, Regulation (EC) 859/2008 (so-called EU-OPS) have been transposed as the basis for Commission Regulation (EU) No 965/2012 which was published on 25 October 2012. These provisions require the aircraft commander and the aircraft operator to preserve original recorded data following an accident or an incident subject to mandatory reporting [refer to CAT.GEN.MPA.l05 and CAT.GEN.MPA.195 in Annex IV (Part-CAT) of the Commission Regulation].

However, the Agency has not yet published guidance for the operators on procedures to prevent the loss of cockpit voice recorder (CVR) recordings following an accident or an incident subject to mandatory reporting.

This is being considered within the framework of rulemaking tasks RMT.0400 and RMT.0401, which were launched on 26 September 2012 with the publication of the associated Terms of Reference. In addition, an assessment is being made on whether guidance is needed to assist competent authorities in auditing the operators' prevention of loss of CVR recordings.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-014

It is recommended that the Civil Aviation Authority should advise operators of the benefits of analysing recorded flight data relating to landings not only by airport, but also by runway.

Response

The CAA accepts this Recommendation and will include advice on runway specific event rates in the autumn 2012 update of CAP739: Flight Data Monitoring – A Guide to Good Practice.

The CAA will publish, by September 2012, a Safety Notice highlighting both the issue in this Recommendation and that contained in Recommendation 2012-015.

CAA will also take every opportunity to make UK Operators running FDM programmes aware of the issue. Specifically:-

The CAA will brief the membership of the UK FDM Operators Meeting Fixed Wing Operators. This process has already started and will be expanded to include all UK AOC holders required to have FDM programmes. This action will be complete by 31 July 2012.

This aspect has been included in the work on FDM Based Precursors project which also recommends the use of landing runway specific event rates.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-015

It is recommended that the Civil Aviation Authority should advise operators of the benefits of establishing, in conjunction with aircraft manufacturers, acceptable maximum rates within their flight data monitoring schemes for events such as hard landings, beyond which action should be taken to reduce the rate.

Response

The CAA accepts this Recommendation and will include advice on "the benefits of establishing, in conjunction with aircraft manufacturers, acceptable maximum rates within their flight data monitoring schemes for events such as hard landings, beyond which action should be taken to reduce the rate" in the autumn 2012 update of CAP739: Flight Data Monitoring – A Guide to Good Practice.

The CAA will publish, by September 2012, a Safety Notice highlighting both the issue in this Recommendation and that contained in Recommendation 2012-014.

CAA will also take every opportunity to make UK Operators running FDM programmes aware of the issue. Specifically:-

The CAA will brief the membership of the UK FDM Operators Meeting Fixed Wing Operators. This process has already started and will be expanded to include all UK AOC holders required to have FDM programmes. This action will be complete by 31 July 2012.

This aspect has been included in the work on FDM Based Precursors project which also recommends the use of landing runway specific event rates.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-016

It is recommended that Boeing Commercial Airplanes review archived training and safety information, to ensure that relevant safety information is promulgated, and continues to be promulgated, to operators.

Response

Boeing has reviewed their current guidance relative to hard nose gear touchdowns and determined it still appropriate and relevant. The Boeing training video titled "Airplane Derotation: A Matter of Seconds" serves as a refresher for flight crews and to increase flight crew awareness of the potential for both nose gear and airframe damage as a consequence of over-de-rotation.

The nine-minute video was sent to all Boeing airline customers and continues to be available at any time via the Boeing website (My Boeing Fleet) for all operators.

Status – Rejected – open

Boeing 737-8K5	Newcastle Airport	25 November 2010	Incident

AAIB Bulletin: 2/2012
FACTOR: F3/2012

Synopsis

The aircraft made a normal landing on Runway 07 at Newcastle. Initially the deceleration appeared normal but, in the latter stages of the landing run, the deceleration rate reduced despite the application of full manual braking and the aircraft came to a halt with the nosewheel 10 ft beyond the red runway end lights. The runway at Newcastle had been swept and inspected shortly before the incident. There was no reported damage to the aircraft and there were no injuries to its occupants.

SAFETY RECOMMENDATION – 2011-087

It is recommended that the CAA publishes a single definition of Contaminated Runways.

Response

The CAA accepts this recommendation and will publish in its documents, by March 2013, a single definition for a contaminated runway, in line with the definition in EU-OPS 1.480.

Across the aviation industry, there is no common taxonomy regarding runway contamination, and the requirements published by ICAO and EASA (in EU-OPS) are different. EU-OPS 1.480 contains a definition of, amongst other things, a contaminated runway. This definition is linked to the definitions of runway surface contaminants contained in EASA CS 25 Certification Specifications for Large Aeroplanes. The material contained across CAA documentation relating to contaminated runway operations is targeted at different audiences and therefore there are necessary differences in style and content. The CAA will review its publications and update references to contaminated runways to reflect the definition in EU-OPS 1.480.

Nevertheless, whilst the concept of a single definition of a contaminated runway is understood, it must be acknowledged that there are different definitions published by EASA and ICAO, thereby creating a conflict not only for the CAA but other National Authorities. The CAA has elected to adopt the EASA definition in its publications for the foreseeable future but the CAA will also continue to work with the ICAO Friction Task Force (FTF) on a common taxonomy for contaminated runways.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-088

It is recommended that the CAA develops a system of contaminant depth measurement that provides accurate and timely runway contamination information to enable pilots to determine the landing distance required.

Response

The CAA accepts the Recommendation insofar as the CAA is committed to working with the industry to identify a reliable means of providing accurate and timely runway contamination information, to enable pilots to determine the landing distance required.

During winter 2010-11, the CAA led a limited trial at four UK aerodromes, using a new matrix to attempt to correlate runway contamination readings with aircraft braking performance. Subsequently, a wider trial involving seventeen UK aerodromes is underway this winter. This trial involves the adoption of an enhanced runway contamination matrix which uses standard phraseology to describe estimated runway friction. This is obtained by assessing the runway state against a reference table using the type of contaminant and its depth. The trial also assesses whether aircrew understand the phraseology and whether the reports add value to the runway state report.

The trial will help to improve the picture of the relationship between contaminant depth and landing distance required, but the correlation will also need to involve improved contaminant depth information and involve technologies that can translate this into aircraft performance systems. This cannot be done by the CAA in isolation as it needs input from aircraft manufacturers. Although the CAA is currently working with Airbus and Boeing, it is clear that there is a large amount of further work required to make the links between contaminant depth and landing distance required. EASA has commissioned research into systems/equipment that seeks to link these two elements, but this is a project that will build on work originally commissioned by the CAA in partnership with specialist industry stakeholders. The research will need input from data gathered from a modified Continuous Friction Measuring Equipment (CFME) and validation of the mathematical model upon which the trial sits in order to succeed.

Similarly, the FAA, through its Take-off And Landing Performance Assessment Rulemaking Committee (TALPA-ARC) trials, has been working to develop a system which does enable runway contamination information to be used to help to determine landing distance required. As in the UK, this remains a work in progress and the CAA is not aware of the timescale for this work to be complete.

The ICAO FTF, TALPA-ARC and EASA work is rapidly changing the wisdom and state of the art in terms of the relationships between runway contamination and aircraft braking action. The CAA is working with these organisations, along with aircraft manufacturers and the UK industry (aerodromes, air traffic service providers and airlines) to coordinate the approach.

In summary, the CAA cannot, on its own, develop a system of contaminant depth measurement that provides accurate and timely runway contamination information to enable pilots to determine the

landing distance required. The CAA will continue to promote a worldwide coordinated approach and work with its industry and international partners to try to resolve what is a highly complex issue. In the meantime, work already completed and set out in NOTAL 2010/09 has gone some way to improving the quality and timeliness of contaminant depth pilots can expect from aerodromes during contaminated runway operations.

By September 2012, the CAA will analyse the results of the 2011/2012 UK winter operations trial and make recommendations for further work to move towards the objective sought by this recommendation, recognising the international and aviation industry-wide context of this issue.

Status – Accepted – closed

Cessna 750 Citation X	**Doncaster Airport**	**9 December 2010**	**Accident**

AAIB Bulletin: 10/2011
FACTOR: N/A

Synopsis

The aircraft was positioning to Doncaster Airport for minor maintenance. Shortly after a normal touchdown, the right main landing gear trailing link failed and both mainwheels on that side detached. The aircraft slid to a halt just off the right side of the paved surface. The link failed due to a long stress corrosion crack and a Safety Recommendation is made for frequent visual inspection of the links for the presence of such cracks.

SAFETY RECOMMENDATION – 2011-072

It is recommended that the Cessna Aircraft Company amends the Maintenance Schedule for the Model 750 Citation X aircraft to include a suitably frequent external visual inspection of the MLG trailing link upper surface for cracks.

Response

In February 2012, Cessna reduced the time interval for the inspection of the 750 landing gear trailing link assembly. Task 32-10-00-290 of the 750 Maintenance Manual now requires a visual inspection of the internal bore of the trailing link for signs of corrosion, cracks, or other evidence of damage every 12 calendar months.

Status – Accepted – closed

Boeing 737-8F2	**London Stansted Airport**	**13 March 2011**	**Serious Incident**

AAIB Bulletin: 2/2012
FACTOR: F4/2012

Synopsis

Shortly after take-off from Stansted, the aircraft pitched nose down and levelled at 450 ft agl, which equated to 800 ft aal, before flying a level left turn at this height. The aircraft commenced a climb only after the pilots received instructions from ATC. The pilots caused the aircraft to level incorrectly at 800 ft aal because they misinterpreted the information written in the general information section of the departure chart. This information originated from the departure procedure shown in the UK AIP. The pilots' misinterpretation of the information was reinforced by the difference in wording printed on the chart for the procedure flown and the previous experience of the crew.

SAFETY RECOMMENDATION – 2011-089

It is recommended that the Civil Aviation Authority should ensure that the vertical profile information included within the general information section of all SIDs published in the UK AIP is unambiguous and that the wording used is consistent across all UK SIDs.

Response

The CAA accepts this recommendation and will undertake a review of the vertical information displayed in the general information section of UK AIP SID charts. This will be commensurate with recommendation 2011-89. Where any differences are found the Aerodrome concerned will be requested to update the information published to ensure that any vertical profile information included in UK AIP SID charts shall be unambiguous and that the wording is consistent across all UK SIDs. The CAA is already in the process of devising the appropriate guidance for charts and when finalised an AIC clarifying SID vertical profile information will be issued. This will provide medium term mitigation allowing the 250 SID charts to be updated as NATS AIS works through them.

However, to provide immediate mitigation a permanent NOTAM will be agreed with CAA Flight Ops and issued making operators and air navigation service providers quickly aware of the issue. The NOTAM will be issued by the end of March 2012.

Due to the number of SID charts to be reviewed and amended, the target completion date is March 2013.

Status – Accepted – closed

ATR72-202	Edinburgh Airport	15 March 2011	Serious Incident

AAIB Bulletin: 7/2012
FACTOR: N/A

Synopsis

On the first flight following a maintenance check, the aircraft experienced an uncommanded yaw resulting in a roll to the left as it accelerated through 185 kt. Directional control was regained and subsequent cockpit indications identified a fault with the rudder Travel Limitation Unit (TLU). The aircraft returned to Edinburgh Airport, where it landed safely. The investigation into this serious incident was conducted in conjunction with the Air Accident Investigation Unit (AAIU) of Ireland and the 'Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile' (BEA) of France. The investigation established that a cam on the rudder TLU mechanism had been removed and incorrectly refitted during the maintenance check. As a result of this incident AAIB Special Bulletin S1/2011, containing three Safety Recommendations, was published on 15 April 2011. Since this incident the aircraft manufacturer and the engineering organisation have taken safety actions to minimise the possibility of a similar event recurring. Two further Safety Recommendations are made in this final report.

SAFETY RECOMMENDATION – 2011-010

It is recommended that ATR immediately informs all operators of ATR aircraft equipped with a Travel Limitation Unit that it is possible to install the cams on the rear rudder quadrant shaft in the incorrect orientation.

Response

ATR issued 'All Operators Message Subject: TLU mechanism mis-installation' on 19 April 2011.

Status – Accepted – Closed

SAFETY RECOMMENDATION – 2012-002

It is recommended that the European Aviation Safety Agency require ATR to modify the cams on the rudder Travel Limitation Unit on all applicable aircraft, to reduce the risk of incorrect assembly.

Response

After reviewing the system design / architecture as well as the technical documentation, updated following this incident, and the associated functional tests, it is EASA opinion that the current Rudder Travel Limitation Unit (TLU) cams design is compliant with the applicable requirement [joint Authority Requirements (JAR) 25.671b, change 11].

Considering the worst potential Impact of such event and the history of similar event occurrence (unique case), EASA will not require any modification of the current cam design.

Status – Rejected – open

SAFETY RECOMMENDATION – 2012-003

It is recommended that ATR amend the ATR 72 QRH section 2.22 A to state that the green LO SPD light should illuminate after 30 seconds, when the rudder Travel Limitation Unit switch is manually selected to the LO SPD position.

Response

The manufacturer intends to amend the Airplane Flight Manual TLU Fault procedure (subject to EASA approval) to highlight to flight crew that it may take up to 30 seconds for the TLU green light to illuminate. The ATR 72 FCOM and QRH will also be amended.

Status – Accepted – closed

Britten Norman BN2A-26 Islander	**Montserrat Airport**	**22 May 2011**	**Serious Incident**

AAIB Bulletin: 5/2012
FACTOR: N/A

Synopsis

The aircraft skidded after the pilot applied the brakes while landing on Runway 28 at Montserrat. As a result the pilot performed a touch-and-go and positioned for another approach to Runway 28. On landing after the second approach the aircraft skidded again when brakes were applied, and the pilot continued with the landing roll. However, believing there was insufficient runway remaining in which to stop the aircraft the pilot steered it onto a grass verge in an attempt to stop it before the end of the prepared surface. The aircraft came to rest beside the runway 46 m from its end. There were no injuries to the passengers and no damage to the aircraft. This was the pilot's first landing on Runway 28. No faults with the aircraft's brakes or braking system were found and there was no evidence that the aircraft had hydroplaned. An accurate runway friction assessment could not be obtained, but there had not been any pilot reports of poor friction prior to or after the incident. It was probable that a tailwind and/or a high touchdown airspeed caused the runway excursion. Issues identified by the investigation were pilot training, wind measurements, the aerodrome's weather limits, the APAPI approach angle, obstructions on the approach and the runway environment.

The AAIB published Special Bulletin (S2-2011) on 21 July 2011 concerning the VP-MON incident in which three Safety Recommendations were made. Three further Safety Recommendations are made in this final report.

SAFETY RECOMMENDATION – 2011-079

The operator of John A Osborne Airport, Montserrat should ensure that a runway friction assessment is carried out at the earliest opportunity by a qualified person using suitable equipment.

Response

The operator of John A Osborne Airport, Montserrat, advised the AAIB on 10 May 2013 that it had conducted a runway friction assessment using suitable equipment, indicating that the friction characteristics of the surface are near the design objective of a new runway.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-010

It is recommended that the operator of John A Osborne Airport, Montserrat, carry out a risk assessment of the hazards associated with runway excursions and implement any necessary mitigating action.

Response

Risk assessment has not yet been done. The preparations have commenced insofar as identifying a suitable organisation to conduct the assessment and obtaining the funding to support this exercise are concerned. It is expected that this will be done by the 31st March 2013.

Status – Partially Accepted – open

SAFETY RECOMMENDATION – 2012-011

It is recommended that the operator of John A Osborne Airport, Montserrat, remove the obstacles that infringe the ICAO Annex 14 'Aerodrome Design and Operations' takeoff and approach surfaces.

Response

Corrective action has not yet been completed. The removal of the obstacles is to be done by the 30th September 2012 with the publication of the Aeronautical Maps and Charts by the 31st December 2012. These wil involve Obstacle Type A Charts.

Status – Partially Accepted – open

SAFETY RECOMMENDATION – 2012-012

It is recommended that the operator of John A Osborne Airport, Montserrat, review the Runway 28 APAPI position and angle setting to improve obstacle clearance on the approach.

Response

Corrective action has been partly taken with the adjustment in the angle setting of the APAPI. Further review will be done by the approved Flight Checking Agency during the next exercise. This is expected to be conducted by the 31st December 2012.

Status – Partially Accepted – open

Airbus A300	**Near RAF Brize Norton Aerodrome, Oxfordshire**	**18 November 2011**	**Serious Incident**

AAIB Bulletin: 7/2012
FACTOR: N/A

Synopsis

The crew of the A300 were cleared to depart from RAF Brize Norton on a Malby Standard Instrument Departure (SID), which required them to climb to FL 080. The departure clearance was issued on the ground radio frequency. When the crew changed to the tower frequency a Climb-out Restriction (COR) of 2,200 ft on the airfield QNH was imposed by ATC, to provide vertical separation from a military Chinook helicopter in the holding pattern above the airfield. The COR instruction, which was not standard RT phraseology, was misinterpreted by the A300 crew. The A300 aircraft did not level off at 2,200 ft after departure and climbed through the level of the Chinook. The returns from the two aircraft were seen to merge on the ATC radar display. The A300 crew received a TCAS Resolution Advisory (RA), which they followed.

According to TCAS data from the A300, the minimum lateral separation between the A300 and the Chinook was 0.11 nm and the minimum vertical separation was 496 ft. Two Safety Recommendations are made with the intention of preventing similar incidents in the future.

SAFETY RECOMMENDATION – 2012-006

It is recommended that the Ministry of Defence review the practice of selecting Mode C on aircraft transponder equipment when Mode S, which allows enhanced TCAS performance, is available.

Response

On 28 September 2012, as the MOD's Air Policy lead, the Assistant Chief of the Air Staff wrote to all the Operational Delivery Holders in the Royal Navy, Army and Royal Air Force requesting that they direct all personnel under their command involved with operating and controlling aircraft to adhere to the following policy:

- Aircrew operating aircraft equipped with Mode S transponder are to ensure that Mode S is selected during all stages of flight, unless there is a specific operational need to do otherwise, thereby achieving compliance with the UK AIP.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-007

It is recommended that the Ministry of Defence ensure that standardised phraseology is used in accordance with the Civil Aviation Publication (CAP) 413: Radiotelephony Manual.

Response

On 28 September 2012, as the MOD's Air Policy lead, the Assistant Chief of the Air Staff wrote to all the Operational Delivery Holders in the Royal Navy, Army and Royal Air Force requesting that they direct all personnel under their command involved with operating and controlling aircraft to adhere to the following policy:

- All air operators and controllers are to comply with CAP 413.

Status – Accepted – closed

Airbus A321-231	Near London Heathrow Airport	20 December 2011	Incident

AAIB Bulletin: 10/2012
FACTOR: N/A

Synopsis

During the climb out from Heathrow Airport, both pilots experienced symptoms of dizziness and light-headedness. The pilots donned their oxygen masks and returned to Heathrow, where the aircraft landed without further incident.

No fault was found with the aircraft and no-one else on the aircraft experienced adverse symptoms. The incident uncovered a previously unknown fault with the cockpit voice recorder.

One Safety Recommendation was made.

SAFETY RECOMMENDATION – 2012-029

It is recommended that Honeywell Aerospace notify all relevant operators and repair organisations of the symptoms that may be observed when the data packer integrated circuit (Honeywell part number 718-1239-007), fitted to Cockpit Voice Recorder (CVR) part number 980-6022-001 and similar models, malfunctions. Honeywell should draw attention to the fact that such a malfunction may only be detectable by conducting a full readout of the CVR.

Response

A Honeywell Service Information Letter (SIL) is being prepared for circulation to all Solid State Cockpit Voice Recorder (part number 980-6020-xxx and 980-6022-xxx) customers. Further to this, a similar SIL will be issued to operators of the AR-Series SSCVR (part number 980-6023-xxx) units which utilize similar recording hardware and operation. The SIL will provide the background and detection/analysis instructions using the Honeywell developed software program (998-3420-501) to scan SSCVR download files (xxx.dlu) for presence of the repeating test pattern, to verify the integrity of the SSCVR record function. The expected release date of these SILs is 26 April 2013 and a copy will be available to the AAIB once published.

Status – Accepted – closed

Airbus A340-300	London Heathrow Airport	5 February 2012	Incident

AAIB Bulletin: 12/2012
FACTOR: N/A

Synopsis

The crew were departing from London Heathrow and were requested to takeoff from a runway intersection. The crew did not have a regulated takeoff weight (RTOW) chart for this intersection so they carried out the performance calculation using a chart for a different runway. In using this method, the takeoff performance data may not have been accurate as the obstacle data for the runway used would not have been included in the calculation. Although the aircraft appears to have become airborne later than expected, it is possible that the extra distance used will have been due to variations in piloting technique rather than an incorrect takeoff calculation. The takeoff data used by the crew was not recorded and the crew could not recall it therefore it was impossible for the investigation to corroborate the validity of the data used.

SAFETY RECOMMENDATION – 2012-030

It is recommended that the European Aviation Safety Agency introduce a requirement for fixed wing operators holding an Air Operator Certificate to record takeoff speeds and, where they are variable, thrust and configuration settings used for takeoff and retain this information with the Operational flight plan.

Response

The Agency has conducted a review of relevant accident and incident data. While the results indicate that improper use of takeoff data was a causal factor in a number of occurrences, the recording in the operational flight plan (OFP) does not seem to be the appropriate solution.

However, the Agency took note of the other Safety Recommendation made in the investigation report: "It is recommended that the International Civil Aviation Organization introduce a standard or recommended practice for fixed wing aeroplanes to record the flight management system takeoff performance data entries on the flight data recorder during the takeoff phase. The data should be retained in the operator's flight data analysis programme." The Agency is a member of ICAO Flight Recorder Panel and it will follow up the response of ICAO to this other Safety Recommendation. Depending on the outcome, the Agency may consider adding to Rulemaking task RMT.0308 the recording of the takeoff performance data entries of the flight management system.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-031

It is recommended that the International Civil Aviation Organization introduce a standard or recommended practice for fixed wing aeroplanes to record the flight management system takeoff performance data entries on the flight data recorder during the takeoff phase. The data should be retained in the operator's flight data analysis programme.

Response

Safety Recommendation 2012-031 calls for ICAO to introduce a Standard or a Recommended Practice for fixed wing aeroplanes to record the flight management system take-off performance data entries on the flight data recorder during the take-off phase. The data should be retained in the operator's flight data analysis programme.

Following discussions on this subject in the past weeks, it was acknowledged that the issue would need to be referred to the ICAO Flight Recorder Panel of experts for their deliberations during the next meeting of the Working Group of the Whole (WG/WHLl6), planned for September 2013.

Status – Accepted – closed

Jetstream 3102	**Runway 26, Isle of Man Airport**	**8 March 2012**	**Accident**

AAIB Bulletin: 10/2012
FACTOR: N/A

Synopsis

The aircraft's right main landing gear failed as it landed on Runway 26 at Isle of Man Airport. The right main landing gear detached, the aircraft slid along the runway on its remaining landing gear, right wingtip and luggage pannier before coming to rest on the grass adjacent to the runway. The passengers and crew vacated the aircraft without injury.

The right landing gear failed as a result of intergranular corrosion / stress corrosion cracking of the forward yoke pintle. Four Safety Recommendations were made.

SAFETY RECOMMENDATION – 2012-008

It is recommended that the European Aviation Safety Agency review the effectiveness of Airworthiness Directive G-003-01-86 in identifying cracks in the yoke pintle housing on landing gears fitted to Jetstream 31 aircraft.

Response

European Aviation Safety Agency (EASA)

EASA, together with the Type Certificate Holder, is reviewing the effectiveness of the Airworthiness Directive G-003-01-86, and hence the service bulletin, in identifying cracks in the yoke pintle housing. It is agreed that the current service bulletin is not adequate and it is under the process of revision. A revised service bulletin will be produced which will be mandated by an Airworthiness Directive.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-024

It is recommended that BAE Systems Regional Aircraft consider the introduction of a routine inspection on the main landing gear fitted to Jetstream 31 aircraft to detect and monitor the presence of intergranular corrosion in the bores of the yoke pintles.

Response

BAE Systems is developing a Non-Destructive Test inspection of the yolk pintle bore for intergranular corrosion cracking, which will be incorporated into the APPH Main Landing Gear Component Maintenance Manual. It is intended for the inspection to be carried out at each overhaul of the Main Landing Gear.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-025

It is recommended that BAE Systems Regional Aircraft review the functional checks of the feather lever detailed in the Flight Manual and Maintenance Manuals for Jetstream 31 and Jetstream 32 aircraft to ensure that a routine check on the positive locking of the lever in the detent is conducted.

Response

Notice To Aircrew Refs. J31 007-1 and J32 007-1 were issued in May 2012 to provide detailed instructions for operation of the feather lever. These instructions are included in the pre-flight checks being incorporated into the new Manufacturer's Operations Manual for the Jetstream 31 and 32 aircraft types, which replace the current Crew Manuals and are scheduled to be issued in early 2013.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-026

It is recommended that the Isle of Man Airport provide a feedback system to allow the Air Traffic Control Officer to be certain that the Airport Fire and Rescue Service have received and are responding to a crash alarm from the tower.

Response

On activation of the crash alarm the AFRS will inform ATC by UHF that the crash alarm has been activated. The airport intends to have this implemented by 11 January 2013.

In addition to the radio call the airport is exploring options to provide an audible/visual indication to the duty ATCO. No firm date for closing this review has been set.

Partially Accepted – open

Boeing 737-33A	Chambery Airport, France	14 April 2012	Accident

AAIB Bulletin: 4/2013
FACTOR: F2/2013

Synopsis

An onboard hand-held Electronic Flight Bag (EFB) computer was used to calculate the aircraft's takeoff performance. The commander omitted to enter the aircraft's takeoff weight into the performance calculation software, which defaulted to the previous flight's takeoff weight. The crew did not cross-check the data and incorrect speeds and thrust were calculated and subsequently used for the takeoff. As a consequence, the airspeed at rotation was too low and the pitch angle was sufficient to strike the tail on the runway. A broken spring within the aircraft's elevator feel and centering unit caused reduced resistance in the flight controls in pitch, contributing to the excessive pitch attitude achieved during rotation. The investigation also revealed wider issues relating to the general design and use of EFB computers to calculate performance data. Two Safety Recommendations are made.

SAFETY RECOMMENDATION – 2012-035

It is recommended that the Civil Aviation Authority update their criteria for the operational approval of Electronic Flight Bags (EFBs) to ensure operators have procedures in place for the use of any 'standby modes' and on-screen keyboards, and to prevent the inadvertent use of outdated EFB performance data.

Response

The CAA accepts this Recommendation and has amended the Operators Electronic Flight Bags (EFB) Checklist which is submitted as part of the Operational Approval Process. Operators will, therefore, be required to ensure that they have appropriate procedures in place such that calculation results and any outdated input field will be deleted when:

- modifications are entered;
- the EFB is shut down or the performance application is closed; or
- the EFB or the performance application has been in a standby or "background" mode for a period of time to be agreed with the operator.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-036

It is recommended that the European Aviation Safety Agency establish a set of detailed guidelines for the operational evaluation and approval of Electronic Flight Bags. These should be more specific than the proposed Acceptable Means of Compliance (AMC) 20-25 and include information such as provided in the Federal Aviation Authority document 'Electronic Flight Bag Authorization for Use' and Joint Aviation Authorities Safety Information Communication No 7.

Status – Response Awaited – open

Aeroplanes <> 2,250kg and 5,700kg MTWA

Cessna Citation 500	**2nm NNE of Biggin Hill Airport**	**30 March 2008**	**Accident**

AAIB Formal: AAR 3/2010
FACTOR: N/A

Synopsis

The aircraft departed Biggin Hill for a private flight to Pau, France but shortly after takeoff initiated a return to Biggin Hill after reporting engine vibration. During the downwind leg for Runway 21, the aircraft descended. The flight crew reported a major power problem just before it struck the side of a house. An intense fire developed. None of the two flight crew and three passengers survived.

The following contributory factors were identified:

1. It is probable that a mechanical failure within the air cycle machine caused the vibration which led to the crew attempting to return to the departure airfield.

2. A missing rivet head on the left engine fuel shut-off lever may have led to an inadvertent shutdown of that engine.

3. Approximately 70 seconds prior to impact, neither engine was producing any thrust.

4. A relight attempt on the second engine was probably started before the relit first engine had reached idle speed, resulting in insufficient time for enough thrust to be developed to arrest the aircraft's rate of descent before ground impact.

Three Safety Recommendations were made.

SAFETY RECOMMENDATION – 2010-015

It is recommended that the Federal Aviation Administration require Cessna Aircraft Inc to amend the 'EMERGENCY RESTART –TWO ENGINE' checklist to emphasise the significance of only restarting one engine at a time.

Response

The FAA completed their assessment and found the existing AFM procedures for emergency engine restart acceptable as written. It does not constitute an unsafe condition.

The FAA worked with Cessna Aircraft Company, reviewed the affected flight manuals stating 'Either Start Button - Press Momentarily' clearly directs the crew to attempt the start of just one engine at a time. This is reinforced through type rating training covering abnormal start procedures as well as the normal start procedure for starting engines on the ground. The Cessna flight manual is consistent in the use of the word 'Either' during both normal and emergency engine starting procedures to indicate each engine should be started individually. While it is plausible that the accident crew attempted to start the second engine before the first start attempt was completed, the data presented in the accident report does not definitively support this action by the crew. It is unclear that the double engine relight performance presented from an engine test cell directly correlates to the restart performance of a windmilling engine.

The FAA reviewed the AFM procedures for other models in the same category and age as the Cessna 500. For those AFMs with double engine relight procedures, none specifically discuss potential starter cutout if both are selected at the same time. The FAA review of the service history on these aircraft does not indicate a safety concern. Based on the lack of additional details form the accident aircraft, the FAA concluded that there is not adequate evidence to justify mandatory modification of the Cessna 500 AFM as proposed.

As noted in their previous safety recommendation response to this recommendation, the FAA reviewed service data for any similar occurrences and found no incidents, accidents, or reports of such an event. They believe they have effectively addressed FAA Recommendation 10.135 and consider their actions complete.

Status – Rejected

Aeroplanes = or < 2,250 kg MTWA

Extra EA 300/L	**Hastingleigh, near Ashford, Kent**	**26 May 2008**	**Accident**

AAIB Bulletin: 8/2009
FACTOR: N/A

Synopsis

The aircraft was en-route from a flying display at Southend Airport, to its home base at Shoreham. Due to inclement weather, with a low cloudbase and poor visibility, the pilot planned to fly around the Kent coast, but having encountered better weather than expected when airborne, he set off across the county. Unfortunately the visibility deteriorated and the cloudbase lowered so he decided to abandon his route and re-trace his path. Instead of reversing his course, however, he turned through approximately 270°, and found he was flying up a valley. He elected to carry out a precautionary landing into a field, but lost control of the aircraft on final approach. The aircraft struck the ground at low speed while rolling and banked to the right. Although the airframe remained relatively intact and no ground fire occurred, both occupants were injured, one seriously. Three Safety Recommendations are made.

SAFETY RECOMMENDATION – 2009-013

It is recommended that aircraft manufacturer, Extra-Flugzeugbau GmbH, develop modifications for the Extra 300/L, and other models of similar configuration, to substantially improve the cockpit environments by the addition, for example, of energy absorption provisions for seats and relevant areas of the cockpit, with the aim of reducing the likelihood and severity of occupant injury during an accident.

Response

The EA 300/L is EASA and FAA type certificated on the basis of FAR 23 Amdt. 34 which came into effect on February 17th, 1987 (14 CFR eff. Feb. 1, 1965, including Amdt. 23-1 through 23-34). This amendment does not include the requirements for emergency landing dynamic conditions (§23.562). This requirement was introduced with FAR 23 Amdt. 36 as well as in JAR 23 later on. Formally, there is no retroactive requirement in force to include special features with respect to the prevention of occupant injury during an accident in the type design.

The type design includes aerobatic-type harness systems which consist of a military style shoulder harness, dual military style seat belts, a crotch strap and a four piece pad set. In addition, a stainless steel ratchet tightener is used on one of the lap belts to remedy probable seat belt loosening problems experienced in acrobatic manoeuvres. Such a ratchet on the lap belt will, when tightened, incapacitate probable energy-absorbing foams or other seat padding. And if the ratchet would only be slightly tightened the lap belts would not provide desired restraint due to compression of those foams or paddings during acrobatic manoeuvres within the capability of the airplane (positive acceleration +10g in combination with side loads).

The effect of an energy-absorbing element is questionable because it was reported that the body mass of the passenger in the front seat was comparatively low (relatively small stature). An energy-absorbing foam or padding would be designed to protect an occupant with a nominal mass of 77kg (ref. §23.562). The effectiveness of those provisions for protecting occupants of different masses is considerably reduced.

Finally, to Extra-Flugzeugbau's knowledge there is no acrobatic-type harness available with integrated air bags on the shoulder harness belts.

Based on this, they feel that there is no need to take measures to implement the Safety Recommendation 2009-013 in the EA 300/L type design.

Status – Rejected

Cessna F177RG Cardinal RG	**Popham Airfield, Hampshire**	**29 March 2009**	**Accident**

AAIB Bulletin: 8/2010
FACTOR: N/A

Synopsis

The pilot selected the gear for landing, observed that the single DOWN AND LOCKED light illuminated and visually checked that the landing gear was extended. On touchdown, the main landing gear folded rearwards and the aircraft came to rest with the nose landing gear extended. The green DOWN AND LOCKED light remained illuminated. An engineering examination found that both main landing gear DOWN AND LOCKED magnetic proximity switches were 'stuck' in their DOWN AND LOCKED positions due to a lack of lubrication and weak return springs. Two Safety Recommendations were made.

SAFETY RECOMMENDATION – 2010-050

It is recommended that the Cessna Aircraft Company introduce a specific maintenance requirement for F177RG aircraft to lubricate the main landing gear downlock proximity switch pivot (part number MS20392-3C15).

Response

Cessna has reviewed the associated documentation and does not agree the proximity switch pivot should be lubricated. Cessna believes the application of a lubricant on the MS20392-3C15 Clevis Pin will lead to the accumulation of dust and dirt and thereby accelerate wear of the pin or the switch. Considering the infrequent and relatively small movement of the switch pivot, the Wichita ACO agrees that lubrication is not warranted.

Status – Rejected

SAFETY RECOMMENDATION – 2010- 051

It is recommended that the Cessna Aircraft Company specify a calendar life for the main landing gear downlock proximity switch return spring (part number 2041064) fitted to F177RG aircraft.

Response

Cessna has reviewed the associated documentation and has pointed out the requirement in Section 2 ("Ground Handling, Servicing, Cleaning, Lubrication, and Inspection") of the maintenance manual for the condition of all springs in the landing gear system to be checked every 100 hours (item 10, page 2-27). When the springs are worn out, the mechanic will not be able to rig the main landing gear downlock system as described in Section 5 of the maintenance manual (paragraph 5-50 through 5-52).

Status – Rejected

Mooney M20F	**Wellesbourne Mountford Airfield, Warwickshire**	**8 August 2009**	**Accident**

AAIB Bulletin: 8/2010
FACTOR: N/A

Synopsis

The flight was for the pilot/owner to verify the satisfactory operation of the landing gear system following the replacement and subsequent adjustment of a landing gear limit switch. After a successful test flight, during which the landing gear was cycled three times, the pilot returned to the departure airfield. A final landing check was carried out during which the pilot confirmed that the landing gear was DOWN AND LOCKED. A normal flare and touchdown on the mainwheels was carried out and the nosewheel gently lowered onto the runway. After a short period (a second or two) the propeller struck the runway, stopping the engine. The pilot noticed that neither the green landing gear DOWN AND LOCKED nor the amber IN TRANSIT lights were illuminated. The aircraft slid along the runway centreline on its lower fuselage for about 100 metres before swinging through 90º to the left and coming to rest.

Examination of the aircraft revealed that the retention link, part number 53001-013, an item in the landing gear downlock system, had been fitted upside down.

SAFETY RECOMMENDATION – 2010-044

It is recommended that the Federal Aviation Administration require the aircraft manufacturer, Mooney Airplane Company, to publish guidance material on the correct orientation of the nose landing gear Retraction Link part number 530003-013.

Response

The Fort Worth Airplane Certification Office, (ASW-150), has contacted the manufacturer, Mooney Airplane Company, and informed them of this concern. Mooney Airplane Company has responded by issuing Service Instruction M20-117, dated September 8, 2010. This service instruction provides guidance on the correct orientation of the Nose Gear Retraction Link, P/N 530003-013. Attached is a copy of Service Instruction M20-117.

Based on the information provided above, ASW-150 and the Small Airplane Directorate request this recommendation be classified as "Closed, Acceptable Action."

Status – Accepted – closed

DA42	**Stapleford Airfield, Essex**	**3 June 2010**	**Accident**

AAIB Bulletin: 11/2010
FACTOR: N/A

Synopsis

Despite cycling the landing gear several times, the right main gear remained in the retracted position and the pilot landed the aircraft on the nose and left main landing gear. The pilot and passenger were uninjured, but the aircraft was extensively damaged. The investigation established that the right landing gear jammed in the wheel well as a result of the failure of a trunnion, which connected the landing gear damper to the wheel trailing arm. The failure was caused by stress corrosion cracking. Three safety recommendations were made to the aircraft manufacturer.

SAFETY RECOMMENDATION – 2010-066

It is recommended that Diamond Aircraft Industries consider issuing a Mandatory Service Bulletin for the trunnions (Part No D60-3217-23-51) on the main landing gear fitted to DA42 and DA42M aircraft to be removed, disassembled and inspected for corrosion and cracking.

Response

Safety Recommendation 2010-066 has already been covered by MSB 42-088/1, dated 5-Jul-2010 prescribing removal of the MLG joint prior to the recurring inspections in order to improve inspectability of the MLG joints.

EASA has issued Airworthiness Directive 2010-0155, dated 29-Jul-2010 mandating MSB 42-088/1

Status – Accepted – closed

SAFETY RECOMMENDATION – 2010-067

It is recommended that Diamond Aircraft Industries review their instructions for the inspection and lubrication of the trunnions (Part No D60-3217-23-51) on the main landing gear fitted to DA42 and DA42M aircraft with a view to reducing their susceptibility to corrosion and stress corrosion cracking.

Response

The DA42 airplane maintenance manual prescribes the inspection of the MLG leg and the MLG trailing arm with respect to cracks, deformation, corrosion, and damaged surface protection during every 100 hour inspection.

Furthermore Diamond Aircraft Industries have issued AMM-TR-MAM 42-447/b & 452/a, dated 24-Jan-2011, describing the removal and installation of the MLG joint emphasizing verification of smooth and easy movement of the MLG joint in order to prevent strained installation favouring stress corrosion cracking.

Both the copper based PAF sliding bushing of the former design and the steel bushings with self lubricating liner of the new design do not need further lubrication in addition to their self lubrication properties. Therefore additional lubrication during maintenance is not necessary.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2010-068

It is recommended that Diamond Aircraft Industries review the design of the trunnions (Part No D60 3217 23 51) on the main landing gear fitted to DA42 and DA42M aircraft with a view to making the components less susceptible to stress corrosion cracking.

Response

Diamond Aircraft Industries have approved MAM 42-452 introducing the MLG joint of the DA 42 NG to the serial production of the DA 42 /M. The DA 42 NG MLG joint is made of corrosion resisting steel alloy. The surface is passivated and coated with an epoxy based primer and a PUR based top coat.

In order to prevent galvanic corrosion between bushing and MLG joint the copper based PAF sliding bushings have been replaced by steel gliding bushings with self lubricating liner on its slide surfaces.

Further corrosion preventing measures have been incorporated to the improved MLG joint design such as wet installation of the bushes with corrosion Inhibiting compound and application of sealing compound to the bushes.

In order to implement the DA 42 NG MLG joint to DA 42 /M aircraft in field Diamond Aircraft Industries have issued MSB 42-088/2, dated 3-Feb-2011 prescribing replacement of the MLG joint with the improved design as a terminating action of the recurring inspection.

EASA has issued Airworthiness Directive 2011-0020, dated 7-Feb-2011 mandating installation of the improved MLG joint design in reference to MSB 42-088/2.

Status – Accepted – closed

Breezer B600	**Membury Airfield, Berkshire**	**25 June 2011**	**Accident**

AAIB Bulletin: 5/2012
FACTOR: N/A

Synopsis

Shortly after takeoff the engine stopped due to a loss of fuel pressure and the pilot made a forced landing which resulted in a heavy touchdown. The engine stoppage was probably caused by a fuel restriction when a placard blocked the fuel tank outlet. The fuel tank outlet was not fitted with a strainer or filter as none was required by the regulations for a 'Light Sport Aeroplane' (LSA). The aircraft manufacturer has taken safety action to install a fuel strainer at the fuel tank outlet of all new aircraft and is offering the same modification for retrofit. Two Safety Recommendations are made.

SAFETY RECOMMENDATION – 2012-020

It is recommended that the European Aviation Safety Agency (EASA) amend 'Certification Specifications for Light Sport Aeroplanes' (CS-LSA) to require the installation of a strainer at the fuel tank outlet, to reduce the risk of foreign objects in the fuel tank restricting the fuel supply.

Response

Further to this accident and the issuance of this safety recommendation, the ASTM International Committee F37 on Light Sport Aircraft has agreed to prepare a change to the standard ASTM F2245 "Standard Specification for Design and Performance of a Light Sport Airplane" (refer to work item ASTM WK38179, published on ASTM Website).

The Agency plans to adopt the revision of this standard through an amendment of CS-LSA (which itself requires compliance with this standard). This activity will be performed under EASA rulemaking task RMT.0003. The Terms of Reference, dated 29 August 2012, has been published on the EASA Website.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2012-021

It is recommended that ASTM International amend the 'Standard Specification for Design and Performance of a Light Sport Airplane' (ASTM F2245) to require the installation of a strainer at the fuel tank outlet, to reduce the risk of foreign objects in the fuel tank restricting the fuel supply.

Status – Response Awaited – open

Socata TB10	Coventry Airport	27 July 2011	Serious Incident

AAIB Bulletin: 8/2012
FACTOR: N/A

Synopsis

The occupants were on a local flight at 2,500 ft when they noticed smoke entering the cabin around the base of the windscreen. The aircraft diverted into Coventry Airport, with the intensity of the smoke increasing and affecting visibility, and made a safe landing. The smoke was caused by an internal failure in the alternator regulator and one Safety Recommendation is made to the EASA, to review this installation.

SAFETY RECOMMENDATION – 2012-022

It is recommended that the European Aviation Safety Agency review the alternator regulator installation of the SOCATA TB series of single-engine aircraft, with a view to reducing the risk to the operation of the aircraft as a result of smoke/fire arising from a failure of this component.

Response

EASA has reviewed the design of the electrical system and concluded that it is compliant to the requirements at the time when the aircraft was certificated. A Pilot Operating Handbook emergency procedure is available to enable the pilot to reduce the consequences of a fire and allow for a safe continuation of flight and landing. The service experience gained on the SOCATA TB series aircraft shows that the design solution provides an adequate level of safety.

Status – Rejected

Aeronca 7ACA	Farm airstrip, Wisborough Green, West Sussex	01 September 2011	Accident

AAIB Bulletin: 10/2012
FACTOR: F7/2012

Synopsis

The aircraft landed heavily having encountered downdrafts on approach to a farm strip. One Safety Recommendation was made concerning the use of energy absorbing foam cushions.

SAFETY RECOMMENDATION – 2012-028

It is recommended that the Civil Aviation Authority promote, on an ongoing basis, the benefits of fitting seat cushions made from energy absorbing foam in light aircraft.

Response

The CAA accepts this recommendation and will continue to promote the benefits of fitting seat cushions made from energy absorbing material in light aircraft where it is technically feasible to do so. The information will be made available through safety publications regularly produced by the CAA, including GASIL 11 of 2012.

Status – Accepted – closed

Microlights

Flight Design CTSW	**Caird Park Golf Course, Dundee**	**12 August 2009**	**Accident**

AAIB Bulletin: 8/2010
FACTOR: N/A

Synopsis

The pilot made a forced landing in a tree after the engine stopped near Dundee. The investigation identified flight planning as a contributory factor.

SAFETY RECOMMENDATION – 2010-045

It is recommended that Flight Design GmbH, together with P&M Aviation, revise their assessment of the unusable fuel in the CTSW aircraft.

Response

As a consequence of the investigation and recommendation, P&M Aviation (formal holder of the Type Certificate within UK) issued Service Bulletin 131 dated 18 June 2012.

The bulletin provides clear instruction on fuel management and requires pilots to land at the latest when fuel is no longer visible in either of the sight gauges. This results in noticeably higher fuel reserves, to avoid similar occurrences in the future.

Status – Accepted – closed

Pegasus Quik	**100 ft below summit of Ben More, Stirlingshire**	**12 May 2012**	**Accident**

AAIB Bulletin: 01/2013
FACTOR: F1/2013

Synopsis

The aircraft was being flown by an experienced microlight pilot accompanied by the owner, who was a passenger, occupying the rear seat. They were transiting from Perth to Glenforsa, on the Isle of Mull, at about 6,000 ft, above scattered cloud. Approximately 2 nm east of Ben More mountain, in Stirlingshire, the aircraft descended in good visibility, remaining clear of the cloud. The descent and flight up to one second before impact was recorded on a video camera attached to the aircraft. The aircraft levelled off below the cloud base and approximately 100 ft above the summit of the mountain. It continued towards the mountain and encountered severe turbulence in the lee of the summit. This appeared to cause the pilot to lose control of the aircraft, which impacted the south side of the summit, fatally injuring both occupants.

SAFETY RECOMMENDATION – 2012-037

It is recommended that the Civil Aviation Authority produce a Safety Sense Leaflet, or other guidance material, covering the activity of mountain flying for the UK general aviation community.

Response

The CAA accepts this Recommendation insofar as it will continue to support the ongoing development and publication of a safety leaflet concerning flight over and near hills and mountains. This is being produced by the European General Aviation Safety Team (EGAST) for wide dissemination and is expected in the second quarter of 2013.

Status – Accepted – closed

Rotorcraft > 5,700kg MTWA or above

AS332L2 Super Puma	**Aberdeen Airport**	**20 November 2007**	**Incident**

AAIB Bulletin: 2/2009
FACTOR: N/A

Synopsis

A Training Captain was conducting an Operational Proficiency Check (OPC); the pilot under training was required to demonstrate a clear area rejected takeoff. The helicopter was equipped with a Training Idle System (TIS) which was in use to simulate a failure of the left engine. The helicopter took off along Runway 16 at Aberdeen; at about 28 kt the commander simulated a failure of the left engine and the takeoff was rejected. The pilot flared the helicopter to reduce speed and descended towards the runway. As the collective control lever was raised to reduce the rate of descent, the overspeed protection system shut down the right engine. Main rotor rpm (N1) decayed rapidly and the helicopter touched down firmly before rrpm could be restored.

The right engine freewheel unit had failed causing that engine to overspeed; this was contained by the overspeed protection system shutting down the engine. Four Safety Recommendations were made.

SAFETY RECOMMENDATION – 2009-004

It is recommended that the European Aviation Safety Agency should review the accuracy of Flight Manual information covering Training Idle Systems fitted to all helicopter types or models. They should ensure that the information on the system, the behaviour of the helicopter and the correct pilot technique to be employed in the event of the operating engine failing are correctly documented.

Response

EASA recognise that the Rotorcraft Flight Manual (RFM) Supplement addressing the Training Idle System in the AS332L2 could be improved and have agreed the necessary changes with the manufacturer, which have led to the issuance of EASA approval ref. 10033666 for the Normal Revision RNS of AS332L2 RFM SUP.3, OEI (One Engine Inoperative) flight training procedures. The training mode systems in other contemporary helicopters have been approved at the time of certification or validation and in the absence of any reports of service difficulties, EASA cannot justify the substantial effort required to conduct a systematic review of all such systems, nor to impose all Type Certificate Holders to undertake reconsideration of their RFMs.

EASA do, however, agree to take into account the lessons learned from this accident Investigation should a training mode RFM Supplement be revised and offered for approval.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2009-005

It is recommended that the European Aviation Safety Agency should require that when a helicopter is fitted with a Training Idle System, or similar system, the effects of a failure of the operating engine are determined during the flight test and certification process.

Response

A Category A helicopter has the demonstrated capability to cope with the consequences of an engine failure at any point in the flight envelope. In the event of an engine failure in normal operations, the remaining engine has to accelerate from the All Engines Operating (AEO) condition to the full One Engine Inoperative (OEI) power level. However, when this helicopter is being operated with training mode engaged, an engine failure has already been simulated, with both engines artificially limited to a reduced power level. An actual engine failure in this condition means

that the remaining engine has to accelerate from the restricted power state of Training which can be idle in the case of the AS332L2, or approximately 50% of OEI maximum power in the case of other types. More time will inevitably be required for full OEI power to be available in the training case and, hence, a completely safe landing or flyaway cannot be guaranteed throughout the flight envelope.

There will be windows of exposure where the outcome could be severe. Attempts to explore these areas of exposure during flight test carry an unacceptably high risk factor and are, instead, considered analytically.

This fact is recognised in current EASA certification policy which is to require the provision of adequate safety devices to minimise the consequences of an actual engine failure with training mode selected, and is also reflected in typical operational practice which is to require that such training flights are conducted with minimum crew, in carefully briefed exercises.

Status – Accepted – closed

EC225 LP	**ETAP Central Production Facility Platform in the North Sea**	**18 February 2009**	**Accident**

AAIB Formal: AAR 1/2011
FACTOR: F9/2009

Synopsis

The Helicopter departed Aberdeen Airport at 1742 hrs on a scheduled flight to the Eastern Trough Area Project (ETAP). The flight consisted of three sectors with the first landing being made, at night, on the ETAP Central Production Facility platform. Weather conditions at the platform deteriorated after the aircraft departed Aberdeen; the visibility and cloud base were estimated as being 0.5 nm and 500 ft respectively. At 1835 hrs the flight crew made a visual approach to the platform during which the helicopter descended and impacted the surface of the sea. The helicopter remained upright, supported by its flotation equipment which had inflated automatically. All those onboard were able to evacuate the helicopter into its life rafts. Both air and maritime Search and Rescue (SAR) assets were used to recover the survivors.

The investigation identified the following causal factors:

1. The crew's perception of the relative position and orientation of the helicopter to the platform during the final approach was erroneous. Neither crew member was aware that the helicopter was descending towards the surface of the sea. This was probably due to the effects of oculogravic and somatogravic illusions combined with both pilots being focussed on the platform and not monitoring the flight instruments.

2. The visual picture was possibly confused by a reflection of the platform in the sea.

3. The two radio altimeter based height alert warnings did not activate. The fixed 100 ft alert failed to activate due to a malfunction of the Terrain Awareness and Warning System (TAWS) and the selectable 150 ft alert would also have failed to activate for the same reason, had it not already been suspended by the crew. The pilots were not aware of the TAWS malfunction.

4. There was no specified night visual approach profile on which the crew could base their approach and minimum heights, and stabilised approach criteria were not specified.

SAFETY RECOMMENDATION – 2011-057

It is recommended that the International Civil Aviation Organisation introduces a Standard for crash protected recordings of the operational status of Airborne Collision Avoidance System (ACAS) and Terrain Awareness and Warning System (TAWS) equipment, where fitted, on helicopters required to carry a flight data recorder.

Response

The Flight Recorder Panel (FLIRECP), as indicated in ICAO's letter, proposed a relevant amendment to Annex 6, Part III, to address UK AAIB Safety Recommendation 2011-057.

Accordingly, the Air Navigation Commission (ANC) carried out the preliminary review of the proposal on 11 June 2013 and agreed that it should go back to the FLIRECP for further work. The next meeting of the FLIRECP is scheduled for September 2013.

The FLIRECP's future recommendations on this subject should be reviewed by the ANC in mid-2014.

Status – Partially Accepted – open

SAFETY RECOMMENDATION – 2011-059

It is recommended that the European Aviation Safety Agency reviews the acceptability of crew operated ON/OFF controls which can disable mandatory helicopter audio voice warnings.

Response

In the course of certification and approval of aircraft and/or installed systems, the proposed normal operation of each system is assessed against the applicable airworthiness requirements or certification specifications (CS 29.1309). Additionally, failures and emergencies directly and indirectly related to the use of the system are evaluated. This includes the acceptability of a means to disable a mandatory system, if proposed.

As a general principle, it is acceptable to have a means of deselecting such a system, but only if the pilot is at all times aware of the degraded status of the aircraft and there is mitigation to ensure that the aircraft continues to meet an acceptable airworthiness standard. There are many examples of the satisfactory application of this principle.

Status – Partially Accepted – open

SAFETY RECOMMENDATION – 2011-062

It is recommended that the European Aviation Safety Agency reviews the frequency of nuisance warnings generated by Terrain Awareness and Warning System equipment in offshore helicopter operations and takes appropriate action to improve the integrity of the system.

Response

A project 'Class A Terrain Awareness Warning System (TAWS) for Off-Shore Helicopter Operations' has been launched as part of the UK CAA-run joint Industry Helicopter Safety Research Management Committee (HSRMC) research programme and has been supported by the International Association of Oil & Gas Producers, Bristow Helicopters, Shell Aircraft Ltd and BP.

Flight trials were run with two helicopter types a S76A+ and a Eurocopter EC225. It appears that it has been possible to produce a single set of HTAWS 'classic mode' warning envelopes covering both helicopter types while maintaining a 'nuisance' alert rate of no worse than 1 in 100 flights and still provide significantly enhanced warning times.

The next step in the project will be to examine the form and format of the associated warnings. Simulator trials are then envisaged both for flight crew evaluation of the complete system and also to generate further 'accident' examples for testing the envelopes. Progress on these areas will be subject to availability of resource/funding. EASA monitors the project progress as member of the HSRMC. The final report will be published.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-064

It is recommended that the European Aviation Safety Agency establishes the feasibility of recording, in crash-protected memory, status indications from each avionic system on an aircraft.

Response

It is acknowledged that non-volatile memories have delivered important information in a number of investigations. However, non-volatile memories are not designed to survive accident conditions (such as crash impact forces, fire, water ingestion etc.) because avionics systems are intended to perform other functions than recording data. Instead, the crash-protected flight data recorder is specifically designed to record flight parameters, including those coming from avionic systems. In addition, adding flight parameters to the mandatory parameter list has always been done on a case by case basis. This is because establishing a set of well-defined flight parameters corresponding to specific aircraft functions has been deemed a better tool for the accident investigation authorities to identify their needs and for the industry to provide a satisfactory solution than relying on generic requirements. EUROCAE Document 112 (ED-112) already specifies that the status of some essential avionic systems of a helicopter should be recorded (see flight parameters 14, 46 and 47 of table II-A.2 "Parameters to be recorded - helicopters"). ED-112 is referenced in Annex to EASA Executive Director (ED) Decision 2012/018/R (Acceptable means of compliance and guidance material to Air Operation Rules, Part Commercial Air Transport). In addition, EUROCAE Working Group 90 is revising ED-112, and EASA has proposed to this group to add the technical status of the Terrain Awareness Warning System (TAWS) and of the Anti Collision Aircraft System (ACAS) to ED-112 table II-A.2. Rulemaking tasks RMT.0308 and RMT.0309 are in the Agency's Rulemaklng Programme and they will address the update of the flight parameters list, taking into account the latest ED-112 revision.

Status – Rejected

SAFETY RECOMMENDATION – 2011-066

It is recommended that the European Aviation Safety Agency modifies European Technical Standard Order (ETSO) 2C70a and ETSO 2C505 to include a requirement for multi-seat life rafts, that do not automatically deploy their Sea Anchor, to include a label, visible from within the inflated life raft, reminding the occupants when to deploy the Sea Anchor.

Response

According to the outcome of the SAE S-9A Safety Equipment and Survival Systems Committee work, the potential safety benefit from additional life raft markings, taking into consideration the operational aspects as well as the related necessary improvement in crew training, was not deemed to justify the associated burden and costs.

Following the publication of SAE standards AS1356, the Agency intends to harmonise ETSO 2C70b with the FAA, and this will be done in the frame of rulemaking task RMT.0206 (which will start in 2013). This ETSO update will not include the recommended action

No revision is currently planned for ETSO 2C505.

Status – Rejected

SAFETY RECOMMENDATION – 2011-067

It is recommended that the Federal Aviation Administration modifies Technical Standard Order (TSO) C70a to include a requirement for multi-seat life rafts, that do not automatically deploy their Sea Anchor, to include a label, visible from within the inflated raft, reminding the occupants when to deploy the Sea Anchor.

Response

FAA Response. We are currently in the process of revising the standard requirements for TSO-C70a. We have worked with the SAE S9 - Cabin Safety Provisions Committee on the development of a new standard, Aerospace Standard (AS) 1356, Life Rafts, that will likely be used by the FAA in the next revision of TSO-C70a. AS1356 contains the following new requirement in paragraph 8.3.8:

> *A Sea Anchor that is not automatically deployed shall be stowed in a readily accessible location that is clearly marked and visible from within the inflated life raft, including instructions for Sea Anchor use. Comprehensibility of these instructions shall be demonstrated in accordance with 2.3: Comprehensible.*

We plan to publish the revision of TSO-C70a later this year.

Status – Accepted – closed

AS332L2	**11 nm NE of Peterhead, Scotland**	**1 April 2009**	**Accident**

AAIB Formal: AAR 2/2011
FACTOR: F9/2011

Synopsis

The helicopter was operating a return scheduled passenger flight from Aberdeen to the Miller Oil Platform, situated in the North Sea approximately 145 nm north-east of Aberdeen. When it arrived from its previous flight to the Bruce Platform, approximately 190 nm north-east of Aberdeen, a 'rotors running' crew change was carried out. The helicopter was serviceable except for a deferred defect affecting a part of its ice detection system. The daily in-flight checks had already been completed satisfactorily by the off-going crew. The helicopter was refuelled, the passengers boarded, and it lifted off at 1040 hrs. The helicopter landed on the Miller platform, after an uneventful flight, at 1149 hrs, where it was refuelled again with the rotors-running. When the refuelling was complete, fourteen passengers boarded the helicopter for the return flight to Aberdeen. The weather conditions were benign with light south to south-easterly winds, good visibility with generally clear skies but with occasional broken cloud at 5,000 to 6,000 ft. Flying conditions were reported as smooth and the sea was calm.

The helicopter lifted from the Miller Platform at 1203 hrs and climbed to 2,000 ft, tracking inbound towards Aberdeen. Recorded information on the combined Cockpit Voice and Flight Data Recorder (CVFDR) shows that the crew were engaged in routine cockpit activities and there were no operational abnormalities. At 1254 hrs the co-pilot made a routine call on the company operating frequency stating that the helicopter was serviceable and the ETA was 1314 hrs. Twelve seconds later, one of the pilots made a brief MAYDAY call on the ATC frequency. This was followed by a similar call that included some position information, from the other pilot. The radar controller at Aberdeen acknowledged the MAYDAY call and tried unsuccessfully to contact the crew. He then asked the crew of another helicopter, outbound on a similar routing, to examine the sea in the area of the last radar position.

Recorded radar information showed the helicopter flying inbound towards Aberdeen at 2,000 ft, climbing momentarily to 2,200 ft and then turning right and descending rapidly. Surface visibility was good and an eye witness, working on a supply vessel approximately 2 nm from the accident site, heard the helicopter and saw it descend rapidly before it hit the surface of the sea. Immediately after impact he saw the four main rotor blades, still connected at their hub, strike the water. Around this time, he also heard two bangs close together. He immediately raised the alarm and the ship turned towards the accident site, which by now was marked by a rising column of grey then black smoke. The ship launched a fast rescue boat whilst making way towards the scene. The crew of this boat and the helicopter arrived promptly on the scene to discover an area of disturbed water, roughly 150 m in diameter containing debris from the helicopter. Other search and rescue vessels, aircraft and helicopters arrived on scene within 40 minutes. All persons on board were fatally injured.

SAFETY RECOMMENDATION – 2009-048

It is recommended that Eurocopter issue an Alert Service Bulletin to require all operators of AS332L2 helicopters to implement a regime of additional inspections and enhanced monitoring to ensure the continued airworthiness of the main rotor gearbox epicyclic module.

Response

See response to Safety Recommendation 2009-051. AD 2009-0099-E supersedes two previous AD's released as a result of this recommendation and 2009-048 and 2009-049.

Status – Superceded – closed

SAFETY RECOMMENDATION – 2009-050

It is recommended that Eurocopter improve the gearbox monitoring and warning systems on the AS332L2 helicopter so as to identify degradation and provide adequate alerts.

Response

See response to Safety Recommendation 2009-051. AD 2009-0099-E supersedes two previous AD's released as a result of this recommendation and 2009-048 and 2009-049.

Status – Superseded – closed

Note - Safety Recommendations 2009-048 and 2009-050 were addressed by the safety actions that took place in response to Safety Recommendation 2009-051 and were therefore regarded as being superseded and closed.

SAFETY RECOMMENDATION – 2009-051

It is recommended that Eurocopter, with the European Aviation Safety Agency (EASA), develop and implement an inspection of the internal components of the main rotor gearbox epicyclic module for all AS332L2 and EC225LP helicopters as a matter of urgency to ensure the continued airworthiness of the main rotor gearbox. This inspection is in addition to that specified in EASA Emergency Airworthiness Directive 2009-0087-E, and should be made mandatory with immediate effect by an additional EASA Emergency Airworthiness Directive.

Response

EASA have issued three Airworthiness Directives (AD) for the AS232 L2 and EC225 helicopters. The first two have been superseded by AD 2009-0099-E, which now requires inspection of the main gearbox epicyclic module for metal particles and embodiment of a modification to improve the likelihood of chip detection. EASA believe that these actions are appropriate to address the conditions which have so far been identified by the accident investigation. Should the investigation identify additional information regarding the cause of this accident, EASA will evaluate the need to take further mandatory action.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-034

It is recommended that the European Aviation Safety Agency (EASA) review helicopter Type Certificate Holder's procedures for evaluating defective parts to ensure that they satisfy the continued airworthiness requirements of EASA Part 21.A.3.

Response

The Agency carried out in April 2010 an audit of Eurocopter on the design Organisation Approval (DOA) side as part of the defined annual Standardisation Audit Plan. The scope of this audit included the review of the actions taken by the Type Certificate Holder on occurrences.

EASA's audit confirmed that the manufacturer was able to demonstrate that its procedures for compliance with the requirements of Part 21.A.3 are comprehensive and appropriately used.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-036

It is recommended that the European Aviation Safety Agency (EASA) re-evaluate the continued airworthiness of the main rotor gearbox fitted to the AS332 L2 and EC225 helicopters to ensure that it satisfies the requirements of Certification Specification (CS) 29.571 and EASA Notice of Proposed Amendment 2010-06.

Response

EASA have requested Eurocopter to complete their current fatigue justification file of the Main Rotor Gear Box (MGB). Since the root cause of the accident is highly suspected to originate from spalling degradation, EASA have requested that Eurocopter provide a complementary assessment aiming to take into consideration MGB fatigue tolerance evaluation for "environmental effects, intrinsic/discrete flaws, or accidental damage" [see Certification Specifications (CS) 29.571 and Notice of Proposed Amendment (NPA) 2010-06]. The methodology for such fatigue re-evaluation is based on the following:

- to review Super-Puma AS332 and EC225 MGB overhaul and incident records in order to determine the list of credible flaws (threat) likely to occur on MGB power gears;
- to analyse the impact of those defects, as determined by the review of in-service records, in terms of fatigue behaviour and crack propagation;
- to provide an updated justification of the status of the available MGB monitoring means (e.g. chips detectors efficiency, overhaul checks);
- to perform complementary computations to assess the behaviour of MGB components with catastrophic failure modes (PSE).

Furthermore, Eurocopter have launched an 18 months duration test program for MGB actual spalling testing. It aims to gather more information about any potential MGB component degradation modes, in particular spalling degradation phenomenon and its growth speed. EASA is following the testing and depending on the results, the current MGB monitoring strategies might be reconsidered.

The gear fracture mechanisms investigated after the G-REDL accident have shown that the relevant degradation phase is relatively quick in comparison with other MGB degradation modes like spalling and fatigue. Therefore progressing Eurocopter's MGB testing up to components fracture is not foreseen, but should the test provide fruitful information about fatigue and fracture mechanisms, those will be used for the complementary fatigue assessment mentioned before.

In addition to the above activities, EASA consider that the safety of the fleet relies primarily on the capability of the MGB magnetic plugs to ensure early detection of spalling.

In order to increase the likelihood of detecting any particles, EASA has issued Airworthiness Directive (AD) 2012-0129-E, dated 13 July 2012. This new AD retains the requirement for the accomplishment of MOD 0752522 (i.e. modification of the chip collector inside the MGB) of previous AD 2009-0099-E, which is superseded, and requires, for all models of the Super-Puma helicopter family, more stringent repetitive visual checks of all electrical and non-electrical chip detectors installed on MGB, and Intermediate Gear Box and Tail Gear Box as well.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-041

It is recommended that the European Aviation Safety Agency research methods for improving the detection of component degradation in helicopter epicyclic planet gear bearings.

Response

The EASA research project 'Vibration Health Monitoring and Alternative Technologies' (Tender number EASA.2012.0P.13) has been launched to address the Safety Recommendation. Reported results will published on the EASA website.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-042

It is recommended that the Civil Aviation Authority update CAP 753 to include a process where operators receive detailed component condition reports in a timely manner to allow effective feedback as to the operation of the Vibration Health Monitoring system.

Response

During follow-up discussions with AAIB concerning CAA's response to 2011-042, CAA explained that although it was at liberty to update the guidance material in CAP 753 in line with the recommendation, its status as guidance material would be strictly limited without appropriate changes to the requirements in CS-29, Part M, Part 145 and Part 21 for the regulation of initial and continued airworthiness, which are now the responsibility of EASA.

Until such EASA rulemaking tasks have been completed, it is recognised that CAP 753 is the only means at CAA's disposal to support the CAA's own requirements for the UK fleet in this area, even though this would not affect other European VHM operators. Therefore CAA has decided to revise its response to 2011-042 as follows:

CAA will, by 31 December 2012, update the guidance material in CAP 753 to include a process where operators receive detailed component condition reports in a timely manner to allow effective feedback as to the operation of the Vibration Health Monitoring System.

Status – Accepted – closed

EC225 LP	**20m E of Aberdeen**	**10 May 2012**	**Accident**
EC225 LP	**Approx 32nm SW of Sumburgh, Shetland Islands**	**22 October 2012**	**Accident**

AAIB Special Bulletin: S2/2013
FACTOR: N/A

Synopsis

Both EC225 LP Super Puma helicopters, G-REDW on 12 May 2012 and G-CHCN on 22 October 2012, had indications of a failure of the main gearbox (MGB) lubrication system and, subsequently, a warning indicating failure of the emergency lubrication system. This resulted in the crews of each helicopter carrying out a controlled ditching.

The Chief Inspector of Air Accidents ordered that the investigations into the accident to G-REDW on 10 May 2012 and to G-CHCN on 22 October 2012 be combined, and to publish an Inspector's Investigation Report.

SAFETY RECOMMENDATION – 2012-034

It is recommended that the European Aviation Safety Agency requires Eurocopter to review the design of the main gearbox emergency lubrication system on the EC225 LP Super Puma to ensure that the system will provide the crew with an accurate indication of its status when activated.

Response

The root cause of the in-flight Emergency Lubrication (EMLUB) false alarm has been identified. For both helicopters (registered G-REDW and G-CHCN) events, it has been caused by wiring discrepancies found between the electrical outputs of the Air & Glycol pressure-switches of the EMLUB system and the helicopter wiring harness connecting the switches to the EMLUB electronic card. This design non-conformity only exists on helicopters equipped with pressure-switches manufactured by the sensor supplier Industria. The corrective actions have consisted in the following: Eurocopter have developed, through design change MOD 07.53028, a fix at aircraft wiring harness level for helicopters equipped with Industria pressure-switches. The retrofit of the fleet with this EASA approved design change is handled with Eurocopter's Alert Service Bulletin No.05A032, which EASA mandated with Airworthiness Directive (AD) 2013-0037.

From the extensive design review of the EMLUB system, components examinations, system testing and analysis completed during the investigation, it has been furthermore determined that the actual average engine bleed air pressures for the EMLUB air circuit are lower than the certified design specifications, and indirectly it may also affect the pressures normally expected in the Glycol circuit of the EMLUB system. This brings the potential of triggering the thresholds of the Air and Glycol pressure-switches in some marginal flight conditions. To address this additional EMLUB system issue, Eurocopter are currently designing new pressure-switches with redefined lower pressure thresholds. After their approval, EASA will require Installation of these redesigned pressure-switches for the fleet by another AD.

Status – Accepted – closed

Rotorcraft <> 2,250kg and 5,700kg MTWA

Sikorsky S76	**Near the Leman 49/26 Foxtrot Platform, North Sea**	**16 July 2002**	**Accident**

AAIB AAR: 1/2005
FACTOR: F8/2005

Synopsis

The aircraft operator's base at Norwich operates S-76 helicopters in support of offshore oil and gas operations in the southern North Sea. On the evening of the accident the aircraft departed Norwich to complete a scheduled flight consisting of six sectors in the southern North Sea offshore gas fields. The first four sectors were completed without incident but whilst en-route between the Clipper, an offshore production platform, and the Global Santa Fe Monarch, a drilling rig, the aircraft suffered a catastrophic structural failure. The helicopter's main rotor assembly separated almost immediately and the fuselage fell to the surface about 0.8nm northwest of the Global Santa Fe Monarch which at the time was attached to the Leman 49/26 Foxtrot platform, a normally unmanned installation. Witnesses reported hearing a single or double muffled bang or boom, and seeing the aircraft fall into the sea. The fuselage disintegrated on impact and the majority of the structure sank. Fast rescue craft launched from the Putford Achilles, a multipurpose standby vessel, arrived at the scene of the accident within a few minutes. There were no survivors amongst the nine passengers and two crew.

SAFETY RECOMMENDATION – 2004-040

It was recommended to the European Aviation Safety Agency and to the US Federal Aviation Administration that their Airworthiness Requirements for helicopters should ensure that any future design of main rotor blade that incorporates a hollow metal spar should be designed from the outset to incorporate an automatic onboard crack detection system covering spar areas which cannot readily be inspected and are not damage tolerant.

Response

The Agency is aimed at providing objective safety standards and it would be inappropriate for the Agency to prescribe a specific design solution for a specific component and material type. Industry currently use a variety of fatigue tolerance evaluation methodologies, all of which have some merits and shortfalls, and current rulemaking efforts are targeted at providing greater flexibility in their use and to focus on the end effects (ie how inspection intervals, retirement times, or equivalent means are set to avoid catastrophic failure). The safety benefits of on-board crack detection systems are well understood by industry and have been used in the past on production helicopters.

They remain an option for future designs.

Status – Rejected

Aerospatiale SA365N	**Approx 450 metres SSE of the North Morecambe gas platform, Morecambe Bay, Irish Sea**	**27 December 2006**	**Accident**

AAIB Formal: AAR 7/2008
FACTOR: F12/2008

Synopsis

The helicopter departed Blackpool at 1800 hrs on a scheduled flight consisting of eight sectors within the Morecambe Bay gas field. The first two sectors were completed without incident but, when preparing to land on the North Morecambe platform, in the dark, the helicopter flew past the platform and struck the surface of the sea. The fuselage disintegrated on impact and the majority of the structure sank. Two fast response craft from a multipurpose standby vessel, which was on position close to the platform, arrived at the scene of the accident 16 minutes later. There were no survivors amongst the five passengers or two crew.

The investigation identified the following contributory factors:

1 The co-pilot was flying an approach to the North Morecambe platform at night, in poor weather conditions, when he lost control of the helicopter and requested assistance from the commander. The transfer of control was not precise and the commander did not take control until approximately four seconds after the initial request for help. The commander's initial actions to recover the helicopter were correct but the helicopter subsequently descended into the sea.

2 The approach profile flown by the co-pilot suggests a problem in assessing the correct approach descent angle, probably, as identified in trials by the CAA, because of the limited visual cues available to him.

3 An appropriate synthetic training device for the SA365N was available but it was not used; the extensive benefits of conducting training and checking in such an environment were therefore missed.

Six Safety Recommendations were made.

SAFETY RECOMMENDATION – 2008-033

It is recommended that the European Aviation Safety Agency ensure that research into instrument landing systems that would assist helicopter crews to monitor their approaches to oil and gas platforms in poor visual flying conditions and at night is completed without delay.

Response

EASA is collaborating with the UK Civil Aviation Authority on the "Offshore Approaches" project, which is an add-on to the FP7 research project HEDGE and HEDGE Next (Helicopters Deploy GNSS in Europe). The main tasks of this project are integration of AIS (Automatic Identification System) into the navigation display, and the following additions to the project have been identified addressing the Safety Recommendation:

- demonstration of the integration of SOAP (SBAS Offshore Approach Procedure) with the enhanced helideck lighting,
- safety assessment of the visual segment,
- addition of RNAV (aRea NAVigation) guidance to assist shuttling.

Upon completion the final report will be will be published.

Status – Partially Accepted – open

AS365N3	Norwich Airport	18 April 2011	Serious Incident

AAIB Bulletin: 4/2012
FACTOR: N/A

Synopsis

Following a normal despatch and engine start for a routine offshore flight, the ground engineer monitoring the helicopter's departure noticed flames emanating from the No 1 engine. As there was no dedicated means for ground staff to inform ATC of the incident, in order to alert the crew, the ground engineer chased the helicopter along the taxiway to attract the crew's attention and communicate with them using hand signals. The crew shutdown the helicopter and the passengers were evacuated. The ground engineer extinguished a small oil-fed fire in the engine bay with a handheld fire extinguisher from the cockpit.

SAFETY RECOMMENDATION – 2011-095

It is recommended that Turbomeca add a caution to the Arriel 2C Maintenance Manual to highlight the consequences of rotating the gas-generator rear-bearing oil ducts during removal or refitting of the flanged unions and to publish suitable technical advice to operators to raise awareness of this risk.

Response

Turbomeca understand and agree with this recommendation that deals with the root cause of the oil leak that occurred on Arriel 2C engine s/n 24514 at the copper seal level due to the rotation anti-clockwise of the rear bearing oil supply duct during the previous periodic maintenance intervention that lowered the torque on the duct and reduced the contact pressure on the copper seal.

In order to comply with this recommendation, Turbomeca has updated the rear bearing replacement and the flanged union replacement procedures of its Maintenance Manual (maintenance task references 72-43-10-900-801-A1 and 72-43-00-900-806-A1) to include a warning that raises the awareness of the operator or of the maintenance organisation when performing those maintenance operations by indicating that a non adherence to the procedure can cause an oil leakage in operation and can lead to an engine fire.

Additionally, Turbomeca will highlight these updates to the operators and maintenance organisations with the issue of Service Letter LS 2833/11/Arriel 2, to be released shortly.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-096

It is recommended that Turbomeca amend the approved maintenance program for Arriel 2C engines, to ensure that the concurrent replacing of the O-rings on the gas-generator rear-bearing oil ducts is not performed on both engines of a helicopter, in order to reduce the risk of an oil loss on both engines during a flight.

Response

With regard to this recommendation, Turbomeca would like to point out that, in Turbomeca scope, it is not required for Turbomeca to define an approved maintenance programme specifying the sequence of maintenance tasks to be applied to both engines of a same aircraft.

Any modification to the approved maintenance schedule of an engine impacts Chapter 5 of the Engine Maintenance Manual. The Engine Maintenance Manual's contents must be compliant with the appropriate Certification requirements, namely (for the most recently certified engines) the Certification Specification for Engines : CS-E. As part of the CS-E, the Acceptable Means of Compliance AMC E510 (3) (h) refers to maintenance operations on multiple engines and Turbomeca

complies with this requirement, after consulting EASA, with the following warning in the Engine Maintenance Manual:

> "Turbomeca recommends the operator and maintenance organisation to define a strategy minimising the likelihood of maintenance errors which could be generated following concurrent maintenance performed on multiple engines with a potential impact on flight safety"

Although this requirement should only apply to engines certified in accordance with the CS-E, Turbomeca decided to extend the addition of the above-mentioned warning to the Engine Maintenance Manuals of all its engines used in twin-engine configurations and certified in accordance with previous Certification regulations. This action will be performed during the next normal revision of the concerned maintenance manuals.

The updates in the Engine Maintenance Manuals regarding the O-ring replacement operation and the potential consequences of not complying with the procedures (see response to Safety Recommendation 2011-095) will ensure that the operator and the maintenance organisations take this operation into consideration for their multiple engine maintenance strategy.

Status – Accepted – closed

MD 900	**Leeds Bradford Airport**	**29 July 2011**	**Accident**

AAIB Bulletin: 5/2012
FACTOR: N/A

Synopsis

Approximately one minute after landing, and whilst stationary on the ground, the forward cross tube of the helicopter's skid landing gear fractured, damaging the helicopter but not causing any injuries to the crew onboard. The forward cross tube had failed due to a fatigue crack beneath the right side stop clamp. It was determined that although the clamp had not been removed from the cross tube during scheduled maintenance, as required by the Rotorcraft Maintenance Manual, the maintenance instructions were ambiguous regarding the requirement to inspect of the area of the forward cross tube beneath the side stop clamps. Two Safety Recommendations have been made.

SAFETY RECOMMENDATION – 2012-004

It is recommended that the Federal Aviation Administration require MD Helicopters to determine a suitable inspection method and interval for periodic detailed examination of the landing gear cross tubes on the MD900 helicopter.

Status – Response Awaited – open

SAFETY RECOMMENDATION – 2012-005

It is recommended that the Federal Aviation Administration require that MD Helicopters amend the MD900 Rotorcraft Maintenance Manual to require visual examination of the area of forward and aft cross tube, exposed when the forward and aft side stop clamps are removed, as part of the periodic maintenance schedule.

Status – Response Awaited – open

Sikorsky S-76C	Private site, Lydd, Kent	3 May 2012	Serious Incident

AAIB Special Bulletin: S4/2012
FACTOR: N/A

Synopsis

Following an event in which high torque was used, flight data was analysed on behalf of the operator using incorrect conversion information relevant to earlier variants of the helicopter. The operator was therefore unaware that total torque had exceeded a level at which maintenance action was required. The investigation revealed the existence of the correct information and one Safety Recommendation is made to publish it in a single document.

SAFETY RECOMMENDATION – 2012-033

It is recommended that the Sikorsky Aircraft Corporation issues, in a single document, correct flight data recorder engineering unit conversion information for S-76C++ helicopters equipped with a Teledyne Control Flight Data Acquisition Unit part number 2231230-10-A 1. This document should follow the guidance given in Federal Aviation Administration Advisory Circular 20 141B and UK Civil Aviation Publication 731.

Response

Sikorsky Aircraft intends to comply with the AAIB's Recommendation to fully document the S-76 FDR data interpretation in a single document. This document will be in the form of a Sikorsky Engineering Report (SER). Sikorsky Aircraft will advise when the publication is finalised and the report is approved for release.

Status – Accepted – closed

Rotorcraft = or < 2,250kg MTWA

Hughes 369E	Glastonbury, Somerset	19 June 2011	Accident

AAIB Bulletin: 2/2012
FACTOR: N/A

Synopsis

While flying in the cruise at an altitude of 2,200 ft amsl, it is probable that the helicopter sustained a mechanical failure that resulted in the loss of pitch control to one of the tail rotor blades. During the subsequent attempt to land in a field, the airspeed reduced to the point where directional control of the helicopter seems to have been insufficient to maintain heading. At a height of approximately 50 ft, the helicopter yawed rapidly to the right before the rotation ceased and it developed a high rate of descent. The helicopter struck the ground heavily and was destroyed. The pilot survived but sustained serious injuries. There was no fire.

The investigation established the presence of fatigue cracks emanating from corrosion pits on the tail rotor blade pitch horn on one blade, which led to its failure. Also, the associated tail rotor pitch link had failed. The sequence of the two failures could not be established but either could explain the helicopter's behaviour before it crashed. Neither the failed section of this tail rotor blade pitch horn nor the associated pitch link were recovered from the accident site.

Four Safety Recommendations are made.

SAFETY RECOMMENDATION – 2011-100

It is recommended that the Federal Aviation Administration review Helicopter Technology Company's service life and approved maintenance programme, with regards to the inspection for corrosion, for tail rotor blades fitted to the MD 369 series of helicopters that have a pocket in the pitch horn (Part number 500P3100-101), to ensure their continued airworthiness.

Response

The McDonnell Douglas Helicopter Inc., (MDHI) and Helicopter Technology Company (HTC) approved maintenance programs have determined that there are no existing specific inspections for corrosion other than a general check in the area. The FAA has also determined that the pitch arm of affected tail rotor blades is susceptible to failure if even a small amount of corrosion is present in the area around the pocket in the pitch arm. Both MDHI and HTC have developed service information to call for initial inspections of the pitch arm with annual inspections for corrosion. The FAA has initiated a notice of proposed rulemaking airworthiness directive (AD) that would mandate these inspections on the affected tail rotor blades.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-101

It is recommended that the Federal Aviation Administration requires that Helicopter Technology Company ensures that there is an effective layer of shot peening on the pitch horns of in service tail rotor blades (Part number 500P3100-101) fitted to MD 369 helicopters.

Response

The service information developed by the Supplemental Type Certificate (STC) holder, HTC, specifies inspections to determine if the shot peen layer in the area of the pocket in the pitch arm has been compromised. If there is any evidence that the shot peen is not adequate, the service information specifies removing the tail rotor blade from service. Annual inspections follow up the

initial inspection to ensure that the shot peen area remains intact. The FAA has initiated an NPRM AD that would mandate these inspections on the affected tail rotor blades.

Status – Accepted – closed

SAFETY RECOMMENDATION – 2011-102

It is recommended that the Federal Aviation Administration requires that MD Helicopters ensures that an effective layer of shot peening is maintained on the pitch links fitted to MD 369 helicopters.

Response

The service information developed by the Type Certificate (TC) holder, MDHI, also specifies inspections to determine if the shot peen layer in the area of the pocket in the pitch arm has been compromised, and if there is any evidence that the shot peen is not adequate, the service information specifies removing the tail rotor blade. Annual inspections follow up the initial inspection to assure that the shot peen area remains intact. The FAA has initiated an NPRM AD that would mandate these inspections on the affected tail rotor blades.

Status – Accepted – closed

Robinson R44 II	**Furz Farm, Murhamchurch, Bude, Cornwall**	**24 July 2011**	**Accident**

AAIB Bulletin: 5/2012
FACTOR: F5/2012

Synopsis

While on a flight to visit friends near Padstow, Cornwall, the pilot unintentionally entered IMC and climbed to about 4,000 ft amsl. The pilot subsequently lost control of the helicopter and, after a very high rate of descent, crashed. There was a post impact fire and the pilot was fatally injured.

As a result of the investigation some contaminants, that were not contributory to the accident, were found in the helicopter's fuel supply, consequently one Safety Recommendation is made.

SAFETY RECOMMENDATION – 2012-009

It is recommended that the Civil Aviation Authority publish guidance to General Aviation pilots regarding the quality and storage of fuel for use in aircraft.

Response

The CAA accepts this Recommendation. General Aviation Safety Information Leaflet (GASIL) 02/1012 was published in March 2012 with interim guidance on fuel quality and fuel storage conditions. In view of the temporary nature of the GASIL compendium, the CAA will publish further guidance in the form of a Safety Sense Leaflet (SSL) (either an amendment to SSL 04 'Use of MOGAS' or a separate SSL) by the end of November 2012.

Status – Accepted – closed

Robinson R22 Beta	Ely, Cambridgeshire	6 January 2012	Accident

AAIB Bulletin: 2/2013
FACTOR: N/A

Synopsis

The Robinson R22 helicopter was flying from Manston to Fenland. Near Ely, witnesses on the ground saw it pitch and roll rapidly, the two main rotor blades separated from the rotor head and the aircraft fell to the ground. The pilot was fatally injured.

SAFETY RECOMMENDATION – 2012-038

The European Aviation Safety Agency should amend the requirements in Certification Specification Part 27 to reduce the risk of 'loss of main rotor control' accidents in future light helicopter designs.

Response

EASA acknowledges receipt of this Safety Recommendation. Please be advised that it is under consideration and that the outcome will be communicated in due course.

Status – Response Awaited – open

SAFETY RECOMMENDATION – 2012-039

The Federal Aviation Administration should amend the requirements in Federal Aviation Regulation Part 27 to reduce the risk of 'loss of main rotor control' accidents in future light helicopter designs.

Status – Response Awaited – open

Others

No Safety Recommendations were made in this section.

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GLOSSARY OF ABBREVIATIONS

aal	above airfield level
ACAS	Airborne Collision Avoidance System
ACARS	Automatic Communications And Reporting System
ADF	Automatic Direction Finding equipment
AFIS(O)	Aerodrome Flight Information Service (Officer)
agl	above ground level
AIC	Aeronautical Information Circular
amsl	above mean sea level
AOM	Aerodrome Operating Minima
APU	Auxiliary Power Unit
ASI	airspeed indicator
ATC(C)(O)	Air Traffic Control (Centre)(Officer)
ATIS	Automatic Terminal Information System
ATPL	Airline Transport Pilot's Licence
BMAA	British Microlight Aircraft Association
BGA	British Gliding Association
BBAC	British Balloon and Airship Club
BHPA	British Hang Gliding & Paragliding Association
CAA	Civil Aviation Authority
CAVOK	Ceiling And Visibility OK (for VFR flight)
CAS	calibrated airspeed
cc	cubic centimetres
CG	Centre of Gravity
cm	centimetre(s)
CPL	Commercial Pilot's Licence
°C,F,M,T	Celsius, Fahrenheit, magnetic, true
CVR	Cockpit Voice Recorder
DFDR	Digital Flight Data Recorder
DME	Distance Measuring Equipment
EAS	equivalent airspeed
EASA	European Aviation Safety Agency
ECAM	Electronic Centralised Aircraft Monitoring
EGPWS	Enhanced GPWS
EGT	Exhaust Gas Temperature
EICAS	Engine Indication and Crew Alerting System
EPR	Engine Pressure Ratio
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
FAA	Federal Aviation Administration (USA)
FIR	Flight Information Region
FL	Flight Level
ft	feet
ft/min	feet per minute
g	acceleration due to Earth's gravity
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
hrs	hours (clock time as in 1200 hrs)
HP	high pressure
hPa	hectopascal (equivalent unit to mb)
IAS	indicated airspeed
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IP	Intermediate Pressure
IR	Instrument Rating
ISA	International Standard Atmosphere
kg	kilogram(s)
KCAS	knots calibrated airspeed
KIAS	knots indicated airspeed
KTAS	knots true airspeed
km	kilometre(s)
kt	knot(s)
lb	pound(s)
LP	low pressure
LAA	Light Aircraft Association
LDA	Landing Distance Available
LPC	Licence Proficiency Check
m	metre(s)
mb	millibar(s)
MDA	Minimum Descent Altitude
METAR	a timed aerodrome meteorological report
min	minutes
mm	millimetre(s)
mph	miles per hour
MTWA	Maximum Total Weight Authorised
N	Newtons
N_R	Main rotor rotation speed (rotorcraft)
N_g	Gas generator rotation speed (rotorcraft)
N_1	engine fan or LP compressor speed
NDB	Non-Directional radio Beacon
nm	nautical mile(s)
NOTAM	Notice to Airmen
OAT	Outside Air Temperature
OPC	Operator Proficiency Check
PAPI	Precision Approach Path Indicator
PF	Pilot Flying
PIC	Pilot in Command
PNF	Pilot Not Flying
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
TGT	Turbine Gas Temperature
TODA	Takeoff Distance Available
UHF	Ultra High Frequency
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

Annual Safety Report 2013

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