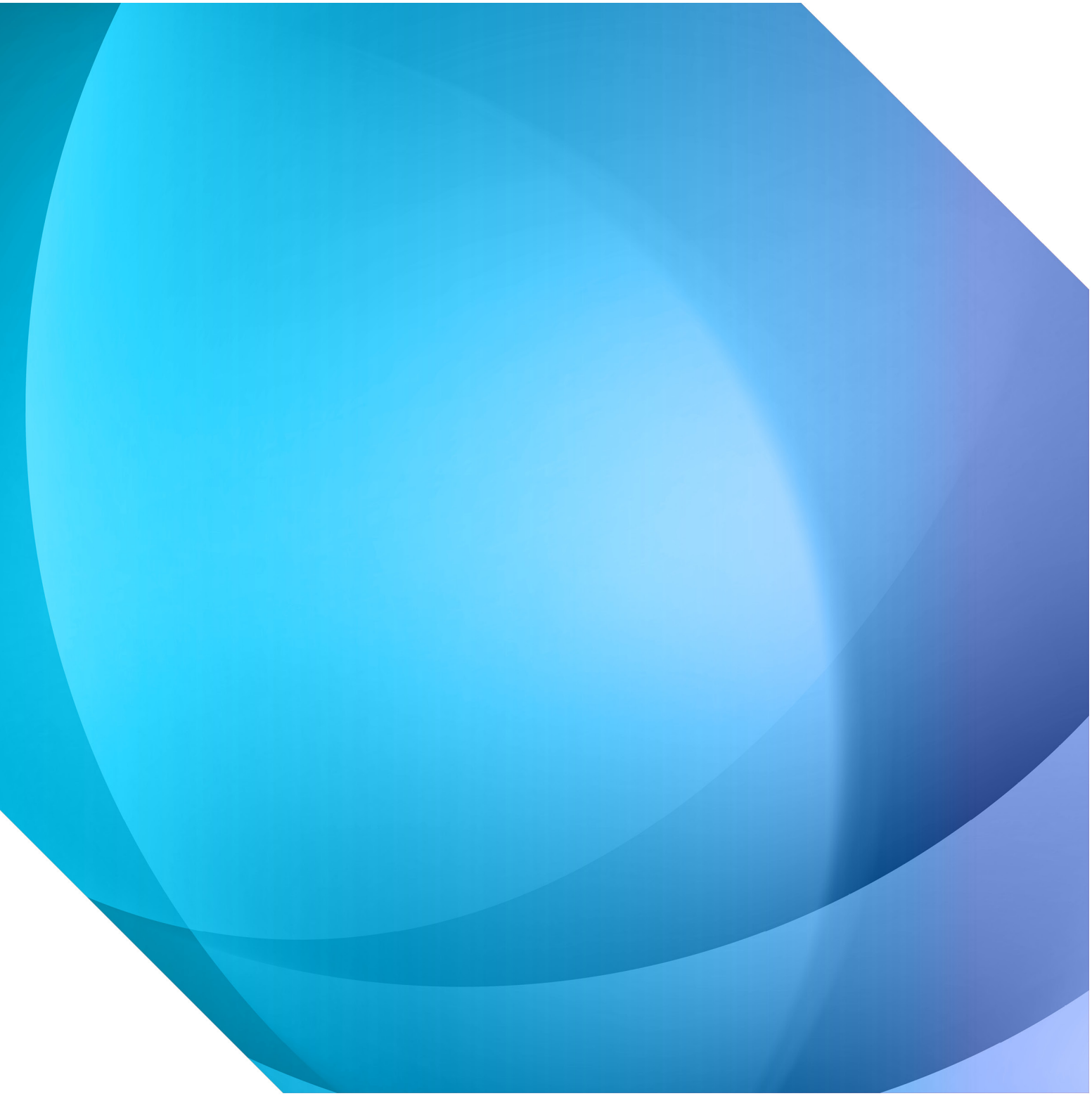
Flight Operations

Safety Review of Offshore Public Transport Helicopter Operations in Support of the Exploitation of Oil and Gas

Progress Report – 2019

CAP 1877



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Foreword

In 2016, we published a progress update on the actions and recommendations contained in the Offshore Review (CAP 1145). This review will close the CAP1145 specific activity, but other work streams remain in place to tackle ongoing issues in both the offshore and onshore environments. We are committed to continuously improving the safety of helicopters generally and the safety of those who fly offshore remains at the forefront of our minds. We have been working closely with our colleagues in the European Aviation Safety Agency, relying particularly on its authority and leadership in rulemaking and certification, to achieve many of the objectives outlined in the original Offshore Review. We have also actively collaborated with Industry through the Offshore Helicopter Safety Leadership Group to secure better safety outcomes for all those engaged in offshore flying across Europe.

The previous updates and this publication demonstrate the progress that has been achieved with the measures that were introduced to improve the survivability aspects for passengers and crew and to minimise the likelihood of an accident in the first place.

Mark Swan,

Director Safety and Airspace Regulation, United Kingdom Civil Aviation Authority

November 2019

Introduction

In February 2014, we published a safety review of offshore helicopter operations (The Offshore Review (CAP1145). The Offshore Review examined the risks to helicopter operations to support the oil and gas industry in and around the North Sea. It was conducted in conjunction with the European Aviation Safety Agency (EASA) and the Norwegian Civil Aviation Authority and was peer-reviewed by independent experts. It identified a wide range of opportunities to improve the safety of those operations and to increase the chances of passengers and crew surviving an accident.

In total, the Review listed 32 actions and 29 recommendations that would all contribute towards the end goal of improving the safety of offshore helicopter operations. Some of these would necessitate long term changes in areas such as helicopter design, and others could be implemented almost immediately and have an instant impact on survivability.

Offshore helicopter operations are extending into the support of renewable energy sources, such as wind farms. Although this activity was not specifically examined in the Offshore Review (CAP 1145), many of the actions and recommendations were considered relevant to these new areas and are being adopted for operations in this sector.

The work done within EASA rule-making task RMT.0409 to update Commission Regulation (EU) No. 965/2012 (the Air Operations Regulation) finally came to fruition when on 1 July 2018 the new requirement for a Specific Approval for Offshore Operations became applicable across Europe. This requires all commercial operators and those non-commercial operators flying large helicopters to comply with the new regulations and obtain an approval from their relevant Competent Authority. These new regulations were influenced significantly by CAP 1145 findings and present a level playing field for operations to all offshore locations including helidecks, ships and wind turbines.

About this report

We stated that we would report publicly on the progress of all actions and recommendations in the Offshore Review. Two progress reports were accordingly published:

CAP 1243: Safety review of offshore public transport helicopter operations in support of the exploitation of oil and gas – Progress Report 2015 (January 2015)

CAP 1386: Safety review of offshore public transport helicopter operations in support of the exploitation of oil and gas –Progress Report 2016 (September 2016)

The Progress Report 2016 (CAP 1386 was to be the final progress report but over the intervening period, the regulatory landscape has changed, there was a further fatal crash in Norway in April 2016 (LN-OJF) and there have been changes to the joint CAA and

Industry body, which is now called the Offshore Helicopter Safety Leadership Group. All of these factors have led us to conclude that a further progress report is warranted and so, in January 2019, we conducted a Post Implementation Review (the PIR) of the actions and recommendations detailed within The Offshore Review (CAP 1145). The review problem statement was:

"Have the Recommendations and Actions in The Offshore Review (CAP 1145) been adequately implemented and have these achieved the objective of improving the survivability of passengers and crew following an accident?"

Whilst there is further activity ongoing in both the offshore and Onshore Helicopter operating domains, this report provides a final statement regarding progress against each action and recommendation within the Offshore Review (CAP1145). Where the first-person pronoun (we/us) is used in this document, it refers to the body corporate of the Civil Aviation Authority.

Within this report we also include responses from HeliOffshore[1] and the European Aviation Safety Agency (EASA). The full response from HeliOffshore is included as an Annex to this report.

[1] HeliOffshore is the global, safety-focused association of the offshore helicopter industry. In October 2014, leading helicopter operators formed the organisation with the specific mission of enhancing safety for offshore helicopter flights.

CHAPTER 1

Passenger safety and survivability

All of the Actions relating to the safety and survivability of passengers and flight crew (A5 through A10 inclusive) have been fully implemented, improving protection in the event of an accident as follows:

- increasing the chances of a safe rescue from the sea by prohibiting operations over the sea in conditions where the significant wave height exceeds 6 metres (A5);
- reducing the risk of a capsize of a ditched helicopter by prohibiting operations over the sea in conditions exceeding the certified ditching performance of the helicopter (A6);
- reducing the likelihood of the helicopter sinking by requiring helicopter operators to ensure that the Emergency Floatation System (EFS) is armed for all overwater departures and arrivals (A7);
- increasing passenger underwater survival time, to improve the chances of escape from a capsized helicopter, through the introduction of new improved 'Category A' Emergency Breathing Systems (EBS) for all passengers (A8/A10);
- increasing the prospect of an escape from a capsized helicopter by ensuring that all passengers are seated next to an exit that is compatible with their body size (A9).

Further details are presented in the table at Annex A.

Originally mandated for UK operations only via the issue of a CAA Safety Directive, all these measures have now been underpinned through incorporation in the European Air Operating Rules[2] published by the European Aviation Safety Agency.

We are confident that these measures will improve the prospects of survival and safe rescue of passengers and flight crew in the event of a helicopter ditching or water impact. There remains scope for further improvement through progression of the recommendations and other initiatives, as described in the remainder of this section of the report.

European Aviation Safety Agency rule-making activities

Starting in December 2012, the EASA rule-making task (RMT.0120), "Helicopter Ditching and Water Impact Survivability", has undertaken a major overhaul of the helicopter Certification Specifications (CS-27 & 29) and associated Acceptable Means of Compliance

2 https://www.easa.europa.eu/document-library/general-publications/easy-access-rules-air-operations

(AMC) material, related to offshore survivability. We have been directly involved in this rule-making task which has culminated in the publication of new specifications and means of compliance in Amendment 5 to Certification Specifications CS-27 and CS-29 on 25 June 2018[3]. The key elements of the amendment include:

- emergency floatation systems are required to be resistant to damage as a result of a water impact;
- emergency floatation systems are required to automatically deploy upon contact with the water;
- if emergency floatation systems are disarmed for certain phases of flight then they should automatically be re-armed upon exiting those flight phases;
- revised ditching sea-keeping stability requirements, incorporating irregular wave testing representative of the actual sea conditions that are likely to be encountered in the event of a ditching (Note: the certified significant wave height is required to be promulgated in the RFM);
- underwater escape exits are required to be a minimum size (Type IV, equivalent to extra-broad - XBR) and be operable in the event of ditching or capsize. Underwater escape exits are also required to be easily identifiable when capsized and automatically illuminated;
- a minimum of two exits are required to be provided for each group of four passengers;
- seat rows are required to be aligned with underwater escape exits;
- to assist the location and opening of underwater escape exits when capsized, hand holds are required to be provided next to underwater escape exits;
- egress shall be possible through any underwater emergency exit with any door in the open and locked position;
- externally mounted life rafts shall be provided;
- it must be possible to release and initiate the inflation of the life raft from the flight deck, cabin and externally for all foreseeable floating attitudes, including capsized;
- it must be possible to directly board the life rafts in the event of a ditching;
- operating handles of underwater escape exits are required to be marked with black and yellow stripes to improve underwater visibility.

It should be noted that the list above is not exhaustive and some of the provisions listed above may not apply to Certification Specification CS-27 and CS-27 Category A types due to the need to consider the lower complexity of these designs and proportionality. The new certification specifications and means of compliance are only applicable to new applications for the certification of a helicopter design that are received after their adoption; however, the work of the rule-making task (RMT.0120) continues in the form of a review to consider which of the new measures, should be applied retrospectively to existing helicopters or to

[3] https://www.easa.europa.eu/regulations#regulations-initial-airworthiness

newly manufactured helicopters. Any retrospective action would be put into effect via the EASA regulation on Part 26, (additional airworthiness specifications for a given type of operation) containing the regulation and including the entry into force date, applicability criteria and top-level requirement, and Certification Specification CS-26 (Additional airworthiness specifications for operations, containing the technical means of complying with the regulation). A Notice of Proposed Amendment (NPA) detailing the proposed changes is expected to be published by EASA in Q1 2020.

Some of the changes under consideration relate to items listed in Recommendation 5, for which only some action has so far been taken by the industry. Recommendation 5 stated:

> *CAA expects that offshore helicopter operators will address the following key items from the EASA RMT.0120 (27 & 29.008) draft NPA without delay:*
>
> - *Fitment of the side-floating helicopter scheme.*
> - *Implementation of automatic arming/ disarming of Emergency Floatation Equipment.*
> - *Installation of hand holds next to all push-out window emergency exits.*
> - *Standardisation of push-out window emergency exit operation/marking/ lighting across all offshore helicopter types.*
> - *Ensure that external life rafts can be released by survivors in the sea in all foreseeable helicopter floating attitudes.*
> - *Ensure that all life jacket/immersion suit combinations are capable of self-righting*

The submission at Annex B to this report from HeliOffshore, provides some detail on the progress of industry against each element.

Survival equipment

In response to issues identified during the EASA rule-making task (RMT.0120), a suite of new survival equipment standards is being produced for publication. This work is being undertaken by ASD-STAN, an Associated Body to CEN (European Committee for Standardization) for Aerospace Standards. The new standards will be published by CEN as European Norms (EN) and then directly referenced by EASA in the form of European Technical Standard Orders (ETSOs). We are contributing to this initiative by providing the working group with its chairman and secretary, and also an independent expert to draft the new standards material for review and agreement by the working group.

Progress as at September 2019 is as follows:

- **Emergency Breathing Systems (EBS):** A new standard for EBS has been developed and published as European Norm (EN 4856:2018). EASA has committed to publishing a covering European Technical Standard Order (ETSO-2C519) by the end of 2019. The new standard is based on the draft standard (The Development of EBS Technical Standards CAP 1034[4]) used to approve the EBS deployed in service in connection with Actions A8 and A10. The main

[4] www.caa.co.uk/cap1034

differences between the new standard and the CAP 1034 requirement are that system capacity is defined by volume as opposed to duration, demonstrated by test and flight deck compatibility testing has been incorporated into the standard. We do not expect retesting/recertification of EBS that is already approved to the CAP 1034 standard.

- **Lifejackets:** Work on a new lifejacket standard is nearing completion. A key requirement being addressed is ensuring a self-righting capability for all lifejacket and immersion suit combinations in use which is ambiguous in the current standards. Self-righting becomes increasingly difficult to achieve as the level of thermal protection of the immersion suit is increased. The pre-standard European Norm (prEN 4862) is expected to be ready for submission by end-2019.
- **Immersion suits:** The new standard for immersion suits is well advanced and its primary aim is to address the issue of thermal stress on wearers, particularly flight-crew. This will be achieved through the introduction of four levels of thermal insulation (currently, only one is provided), to be matched to the prevailing sea surface temperature. It is expected that manufacturers will produce a single suit 'shell' with an associated range of thermal liners. The pre-standard European Norm (prEN 4863) is expected to be ready for submission late 2019/early 2020.
- **Life rafts:** The most significant life raft issue identified by rule-making task (RMT.0120) was the lack of any standard for helicopter externally mounted life rafts. Work on a new standard is underway to address this and other issues such as resistance to puncture, boarding facilities, survival bag/equipment design, and the length of the retaining line. The pre-standard European Norm (prEN 4886) is expected to be ready for submission by mid-2020.

We anticipate that all the new standards will be published by the end of 2021 and thereafter EASA can issue the relevant European Technical Standard Orders. It is not yet known how and when EASA proposes to give effect to the new standards. It will always be possible for the industry to voluntarily introduce equipment meeting the new standards once they have been published and, indeed, products approved to these standards are available. From a passenger protection perspective however, mandating through regulation would be more effective.

Safety and survival training

The frequency and fidelity of safety and survival training was highlighted as a matter for attention in The Offshore Review (CAP 1145). In relation to the mandate of such training, EASA has declared this to be "outside of the Agency's competency" (see Recommendation R6 in Annex A). Were such training to be required under aviation regulation as recommended, then we and/or EASA would be in a legal position to address the issues of frequency and fidelity directly. In the absence of such authority, it remains for the industry (the Offshore Petroleum Industry Training Organisation - OPITO) to review the training as described in Recommendation R7.

As at April 2019, the OPITO has modified the safety and survival training to include in-water training on the new Category A Emergency Breathing Systems (EBS). The mandate to introduce EBS required the manufacturers' minimum recommended training to be undertaken which comprised class room training only, and the adoption of this improvement to the training regime is welcomed. The introduction of in-water training was delayed due to concerns raised by the UK Health & Safety Executive (HSE) regarding the possibility of injury resulting from the use of compressed air breathing apparatus during training. Consequently, the training is initially limited to shallow water exercises, but we are encouraging Oil and Gas UK/OPITO to work towards extending the use of the breathing system to all exercises, including those conducted in the Helicopter Underwater Escape Trainer (HUET). Underwater escape training with compressed air breathing systems for all exercises was introduced in Canada in June 2016 with no problems or injuries reported so far.

The OPITO is also planning to review the Basic Offshore Safety Induction and Emergency Training (BOSIET) standard and has invited representation from us on the industry work group tasked with the review.

Safety and survival research

The proposed amendments to Certification Specification (CS-29) in Notice of Proposed Amendment published by EASA in March 2016 under Phase 1 of the EASA rule-making task (RMT.0120) included an objective-based provision (CS 29.801(i)) for 'post-capsize survivability features' that consider occupant breath-hold time. The associated acceptable means of compliance (AMC 29.801) stated that a design that included an 'air pocket' (where a significant portion of the helicopter remains above the water line and provides air for survivors) would be one possible means to provide such features. The intention was that after capsize (as a result of a ditching or water impact) the emergency flotation system (EFS) of the helicopter would be specifically designed to assure a capsized floating attitude with an appreciable portion of the fuselage above water. This would provide an 'air pocket' in the passenger cabin, which would allow passengers/crew who had not managed to rapidly escape the aircraft to readily find a source of breathable air while they orientate themselves and make their escape.

EASA received a number of negative comments during the consultation of the proposed amendment (NPA 2016-01) regarding the 'post-capsize survivability features'. After considerable deliberation, EASA decided that the proposed 'air pocket' design solution was insufficiently technically mature to be presented as a possible means to achieve the improvement in safety intended by the proposed Certification Specification. EASA concluded that further research should be conducted with regards to the 'air pocket' solution, focussing on the areas of concern that had been raised by the adverse comments. EASA

EASA committed to actively follow technological developments and related research into enhanced emergency flotation systems that could provide an 'air pocket' in the event of a helicopter capsize. To this end, EASA undertook to commission research to address the

concerns raised by the helicopter manufacturers. Consequently, EASA has recently launched a call for tender for a significant research task which will be initiated in early 2020.

In parallel with EASA activities, an analogous floatation system was being developed in Australia for a military aircraft, and funding was reported to have been committed to ‘civilianise’ the scheme. Unfortunately, the military programme was cancelled earlier in 2019 due to an Australian Government decision not to invest in the helicopter fleet in question. Although the cancellation of the project does not represent any criticism of the flotation system itself, it is now unlikely that the civilian programme will proceed.

CHAPTER 2

Operations

Safety Management

Operator Safety Management Systems (SMS) aim to drive a proactive approach to risk identification. They continue to develop in organisations we oversee, and we look at the output from these systems, as a primary indicator of the operator's ability to manage a safe flight operation. One of the benefits of an active SMS is the ability to identify and thereby manage potential risks that have not yet crystallised. The introduction of the requirement for a SMS into the continuing airworthiness regulations via the section known as 'Part CAMO', will reinforce this ability to identify and manage risks. Operator data from individual organisations is shared with us as part of our ongoing oversight activity and this operator specific data is then aggregated, to define generic risks across an operating sector i.e. for operators of the same aircraft type. These risks once anonymised, are shared confidentially with offshore operators for appropriate mitigating action.

Since its initial introduction, the Offshore Helicopter Safety Action Group (OHSAG) has been renamed as the Offshore Helicopter Safety Leadership Group (OHSLG) reflecting a review of its terms of reference and work streams, to act in a safety leadership role through appropriate governance to industry. Activities undertaken by this leadership group, include proactive action to identify future industry threats and safety opportunities, and the development of a generic risk log. This log is populated from both the anonymised sector risk data mentioned above and also from data sourced by the leadership group itself. The change in name therefore reflects the high level aims of the group including its sub groups who may be charged with particular tasks.

Oversight of operations

Our regulatory oversight remains highly active within the offshore sector, given the complexity of flight operations and the often-challenging operating conditions. A team of experienced inspectors with operational backgrounds as pilots, engineers and air traffic controllers conduct inspections in all aspects of offshore commercial air transport. This activity enables both us and the operator to agree on next steps in mitigating risks and resolving regulatory non-compliances.

The new European regulation for Specific Approval for Helicopter Offshore Operations (SPA.HOFO) introduced a number of regulatory requirements that embodied much of the detail and objectives in our Offshore Safety Directive 2014/01, which was established as a consequence of The Offshore Review (CAP 1145). The remaining items relating directly to helidecks are reported in Chapter 4 of this document and now appear in Safety Directive 2019/02. Within the Helicopter Offshore Operations regulation, the requirement for a Helideck Directory (HD) is met in the UK, by the use of the products of the Helideck

Certification Agency (HCA)[5]. These products, along with other helideck technical matters, are in turn governed by the Helideck Steering Committee (HSC) as advised by the Helideck Technical Committee (HTC). In the absence of a legal method for us to certify offshore oil and gas installations, we have established an inspection programme to help identify and mitigate helideck risks.

The offshore oversight team focusses on all helideck operations, including a safety compliance assessment in line with the Helideck Directory requirements, as applicable to the helicopter operator. Any findings that relate directly to the infrastructure or service provision offshore, including dangerous goods[6], are now reflected in limitations to the individual platform's directory entry

We have also augmented the existing [offshore oversight team, by mirroring current aeroplane oversight methods to influence safety in the ground handling environment focussing on such issues as cargo and baggage handling which is known as the Ground Handling Operations Safety Team (GHOST). The establishment of this offshore sub-group should encourage the sharing of best practice across both land-based and offshore helicopter operations.

Pilot training

A review of pilot training material recommended that operators engage with Original Equipment Manufacturers (OEM) to help develop their Standard Operating Procedures (SOP). Manufacturers are now producing Flight Crew Operating Manuals (FCOM) for their more complex helicopter types, alongside the introduction of Operational Suitability Data (OSD)[7]. This will enable flight operations and training departments to address syllabi for initial and recurrent training and facilitate the checking of both pilots and those providing the training and validation.

EASA has also launched the rule-making task (RMT.0724) 'Rotorcraft FCOMs' to improve the operating information provided to rotorcraft flight crew in the relevant aircrew manuals. Safety could be improved by standardising the structure and approach used to present operational information in rotorcraft manuals, thereby improving the clarity of this information. This rule-making task will consider the current approach utilised in the acceptable means of compliance to Certification Specification (CS-25), and other initiatives such as the activity undertaken by HeliOffshore. A notice of proposed amendment should be available in Q3 2020.

Original equipment manufacturers have already developed operating manuals for the EC225 and S92 in cooperation with HeliOffshore.

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5 https://www.helidecks.org/index.php

6 Dangerous goods are defined by the International Civil Aviation Organisation (ICAO) as articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the ICAO Technical Instructions or which are classified according to those Instructions

7 OSD covers pilot training, maintenance staff and simulator qualification; the master minimum equipment list (MMEL); and possibly other areas, depending on the aircraft's systems.

We introduced an Alternative Method of Compliance (Alt MOC) in 2015 to provide offshore operators with the required flexibility to meet the safety intent of the existing pilot training and checking requirements. This has allowed best use of flight simulator time available and ensures that crews are checked in those areas identified by the operator as critical to flight safety. It also establishes a foundation for the future development of training and checking regimes such as Alternative Training Qualification Programmes (ATQP) and evidence-based training for those operators who have comprehensive, well established and mature training organisations and established Flight Data Monitoring (FDM) programmes.

The helicopter industry believes that there may be benefits in adopting competency-based training, as detailed in the current aeroplane Alternative Training Qualification Programme (ATQP) requirements, already established within European regulations. This training alternative, allows the operator to focus upon the issues that affect its specific operation, derived from its own evidence-based data, rather than meeting the general regulatory requirements. The airline industry is also further developing these concepts into evidence-based Training. The International Civil Aviation Organisation (ICAO) Document 9995 Chapter 1 background at 1.3, gives current guidance and states that:

> *"evidence-based training addresses pure scenario-based training in prioritising the development and assessment of key competencies, leading to a better training outcome. The scenarios recommended in evidence-based training are simply a vehicle and a means to assess and develop competence. Mastering a finite number of competencies should allow a pilot to manage situations in flight that are unforeseen by the aviation industry and for which the pilot has not been specifically trained".*

The industry, through their collective association, HeliOffshore[8], is working to develop a helicopter-specific evidence-based training system alongside the current EASA evidence-based training rulemaking task which published Notice of Proposed Amendment (NPA 2019-08) "Update of organisation requirements – flight crew" for public comment on 14 June 2019.

These generic competency-based methodologies should enable crews to deal with technically complex aircraft in today's evolving aviation system, by honing non-technical communication skills and behavioural awareness, based on human factors principles. The focus is on how people should identify, interact and deal effectively with a complex event. Simply applying a checklist during an emergency drill is usually not enough to resolve a modern complex situation. Through competency-based training concepts, the aviation industry continues to explore and develop programmes that focus on how people interact with and best manage complex aircraft. We are working closely with the industry to assess and adopt the best available training models. Evidence-based training is an example of a modern training model; it seeks to use data from events and individuals' performance to determine priorities for training. This type of training is however, data and manpower

[8] http://helioffshore.org/about/

intensive and implementation will be a challenge for helicopter operators. While development of these training systems continues, offshore operators are making best use of human factors principles within their current training programmes.

The CAA examiner assessment form, TS10, has been developed to include a non-technical assessment alongside a performance indicator function, to assist with standardisation and personal development. The flight examiner role is critical in upholding the standards and practices established for pilot competence. This formal report identifies how the examiner applied the current requirements and standards and acts as both feedback and record of the three-yearly 'Assessment of Competence'.

The monitoring of the pilot flying the aircraft and the trajectory of the aircraft in flight is a primary obligation of both pilots. Training in how to monitor pilots is embedded within operators initial and recurrent training and checking programmes but global accident and incident data, continues to indicate that automation and flight path management are key areas for attention in both aeroplane and helicopter operations. With evermore complex types emerging, it is apparent that monitoring and aircraft management skills are fundamental in ensuring a continuing safe operation.

Flight simulators are now available for all offshore helicopter types both in the UK and within Europe. These simulators facilitate accurate pilot training in devices that replicate the aircraft as equipped for offshore operations. EASA simulator requirements demand that these devices remain fit for their operational purpose. The introduction of Performance Based Navigation (PBN) [more accurate track keeping and navigational capabilities] means that crews and aircraft must be trained and equipped to meet the new requirements which rely on Global Navigation Satellite Systems (GNSS) technology. Simulators must therefore keep pace with this demand and flight crew training/checking syllabi adapted to meet the airspace, instrument approach procedures and system changes.

CHAPTER 3

Airworthiness

When considering the airworthiness actions (8) and recommendations (12) from The Offshore Review (CAP 1145), all were assessed as complete as per the updates communicated within The Progress Report 2015 (CAP 1243) and The Progress Report 2016 (CAP 1386). Recognising that for many of these subjects there has been ongoing work, including externally by operators, the oil and gas industry and also within EASA, the following is a summary of the work that has been undertaken to enhance the safety of offshore operations.

Sharing of Safety Critical Information

We have continued our dialogue[9] with the offshore operators and EASA, with a focus on ensuring that there is clarity and alignment of the understanding of the Certification Directorate EASA with the reality of offshore operations. Meetings continue to be held in Aberdeen with the helicopter operators on a six-monthly basis, where both the initiatives relating to Action 31[10] and Action 26[11] are discussed. The sharing of information on trends in Mandatory Occurrence Reports (MOR) has benefitted from our own continuous improvement activity and development of our processes. These improvements include all airworthiness related occurrence reports which are reviewed in detail on a weekly basis, with rules set for those that require greater investigation either by the reporter and/or us. A review of helicopter related occurrence reports has focussed our attention on topics such as critical part rejections, events that may result in additional crew work load, and/or actions that might require a helicopter to land immediately. Recognising the criteria for reporting[12], it is possible that not all safety critical events are being reported. In response to this deficiency, through our dialogue with industry, we have continued to improve the better sharing of information relating to in-service difficulties, reliability issues and additional maintenance burdens placed on the operators. During 2018, EASA also attended the meetings with the offshore operators in Aberdeen and continue to receive invitations and minutes of meetings from operators. We are also working alongside HeliOffshore and are aware of their analysis on global Return to Base (RTB) events.

Through the development of our own system for identifying and monitoring industry risk, (the Regulatory Safety Management System), we have engaged with the EASA Certification Directorate twice yearly, sharing identified industry risks and occurrence reports relating to the design of rotorcraft, aircraft and engines. In 2018 a meeting specifically on rotorcraft

9 Action A23, CAP 1145 refers

10 The CAA will form an Offshore Maintenance Standards Improvement Team with the offshore helicopter operators with the objective of reviewing the findings at Annex F to the CAA Strategic Review of the Safety of Offshore Helicopter Operations and making proposals to achieve a step change in maintenance standards.

11 CAA Airworthiness will meet with offshore operators periodically to compare the trends of MORs with operator in-service difficulty / reliability data to ensure that the complete risk picture s captured, addressed and that the desired outcomes are being achieved.

12 (EU) 376/2014 and (EU) 2015/1018 refers

risks was held with the EASA Head of Rotorcraft, Product Certification Managers and subject matter experts in attendance. These meetings have permitted the better sharing of safety critical, reliability and maintenance related information, thereby enhancing EASA's engagement with Type Certificate holders especially where there is a need to make informed safety related decisions.

Future Safety Critical Parts Developments

Recognising the benefits of distributing safety critical information, there is consideration for focussing on data collection that adds value, better analysis and improved sharing of intelligence. Discussions with EASA led us to develop a proposal with offshore operators to share information relating to the early rejection of both critical parts[13] and components, the failure of which may result in increased workload or action to land immediately. We have now produced a list of those critical parts and a pilot scheme of components that would require an immediate landing for the current offshore fleet types. Operators, EASA and the Type Certificate holder should all benefit from this improved sharing of information and intelligence in Q4 2019.

Vibration Health Monitoring

The Offshore Review (CAP 1145), reviewed the use of Vibration Health Monitoring (VHM) systems and their introduction to operations. VHM systems continue to be a major source of identifying issues with critical rotor and rotor drive systems for all operators and with the introduction of Specific Approval for Helicopter Offshore Operations (SPA-HOFO), with effect from 1 January 2019, all operators are required to have systems to collect, analyse and respond to detected alerts. The specifications for VHM systems for large rotorcraft are set out in Certification Specification (CS29.1465) and there are now requirements for system performance, both during the initial system certification phase and through-life, with the requirement to monitoring in-service performance. These requirements are referred to as the Controlled Service Introduction (CSI). EASA has formally approved the VHM systems for the current offshore fleets of helicopters, including the Sikorsky S92, Leonardo AW 139, 169 and 189, and Airbus Helicopters AH 175. The process of the Controlled Service Introduction has required the support of the Type Certificate holder, EASA and the operators, with further independent resource being provided to the process from our own vibration health subject matter expert.

In 2017 we introduced a detailed checklist for the completion of vibration health audits to check compliance with operator procedure manuals. The VHM audit is now scheduled as part of our oversight and focuses on how operators manage the day to day operational aspects of vibration health. In addition, it examines how the Continuing Airworthiness[14] aspect of the process, including the interaction with the Type Certificate Holder, is conducted.

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13 CS-E and CS29.602

14 Continuing airworthiness' means all of the processes ensuring that, at any time in its operating life, the aircraft complies with the airworthiness requirements in force and is in a condition for safe operation

We have continued to develop our knowledge of vibration health with the development of our own staff training programme to cover both the methodology of such monitoring systems and their operational use. A total of 7 staff are now trained and competent to provide oversight of operators using VHM as part of their operational approval, further staff are progressing through our training programme.

In February 2018 we provided further updates to the document, Helicopter Vibration Health Monitoring (CAP 753)[15] to reflect Safety Directives, EASA Certification Memorandums and the publication of HeliOffshore's HUMS[16] Best Practice Guidance[17]. The latter of these is a further initiative adopted following the publication of The Offshore Review (CAP 1145).

Independent review of operators use of Vibration Health Monitoring - 2019

As stated previously in this report, continued effort is considered necessary to strengthen the measures currently in place to reduce the offshore helicopter accident rate. Airworthiness related accidents still account for a major proportion of all fatal accidents and of these, rotor and rotor drive systems continue to present a significant risk, influenced by the large number of critical parts utilised in these designs. The tragic fatal accident to LN-OJF in April 2016 provides continued evidence of this risk.

Vibration health monitoring systems are a major source of prognostic capability and provide advance detection of issues with critical elements of rotor and rotor drive systems for all offshore operators. The performance of VHM and its contribution to safety was considered in The Offshore Review (CAP 1145) resulting in two actions and two recommendations being made. Though the specific topics of these actions and recommendations have been addressed, it is recognised that there are still significant advances which can be made to further improve the prognostic capability and usability of VHM. At the same time, the current level of maintenance effort required to operate some of the existing VHM systems (VHMS), presents not only a significant additional operating cost, but increases the effort needed to identify 'real' issues, relating to mechanical problems of the rotor and rotor drive system, from the many false alerts generated.

We have performed a review of VHMS performance and operator procedures. This review identified a number of significant areas for improvement which have taken place since the first issue of The Offshore Review (CAP 1145) in 2014 and also some aspects of VHM which warrant additional effort for improvement. A summary of findings from this review are detailed below;

- **SPA HOFO:** The requirement for "Specific Approval for Helicopter Offshore Operations" (SPA-HOFO) became effective on 1 July 2018 with HOFO.155 requiring VHM for the current UK offshore fleet by 1 January 2019. This requirement states that all operators are required to have VHM systems to

[15] www.caa.co.uk/cap753
[16] Health and Usage Monitoring System
[17] CAP 1145 Recommendation R26 refers to the development of VHM best practice.

collect, analyse and respond to detected alerts. The specifications used to assess VHMS design for compliance with HOFO.155 is Certification Specification (CS29.1465). A significant feature of this requirement is that this places requirements for system performance on the helicopter type certificate holder (or VHMS STC holder), both for certification and continued airworthiness throughout the life of the helicopter. At the end of 2018, EASA formally approved the VHMS for the current offshore helicopter types, including the Sikorsky S92, Leonardo AW 139, 169 and 189, and Airbus Helicopters AH 175. Having achieved initial certification in accordance with Certification Specification (CS29.1465) the next step is to complete the Controlled Service Introduction (CSI) phase, during which the VHMS performance in service will be monitored and evaluated. Final acceptance of compliance with (CS29.1465) post service introduction, will involve the Type Certificate holder, EASA, operators and a local National Aviation Authority[18].

- **Technology and Performance:** During the last 4 years a number of new ground station systems have been introduced to existing helicopter VHM platforms along with a number of new VHM systems launched associated with recently certificated (last 10 years) helicopter types. These newer systems can now acquire significantly more indicator readings per flight, which provides greater resolution for understanding the significance of individual outlying data points (i.e. normal scatter or a real indication) over a much shorter time period. Improved avionic capability also allows capture of more raw data which can be analysed as necessary on the ground. The proportion of successfully completed downloads and improved threshold setting are also valuable improvements. Another potential step change is the introduction of automated trend monitoring which can increase the duration of advance warning. Unfortunately, introduction of new technology can sometimes lead to an initial increase in the number of false alerts which has been evident with recently introduced systems. Improvements have already been introduced to recover the alert rate back to a normal level.

Looking to the future, improved avionic capability, data analysis tools, real-time HUMS and artificial intelligence should all provide the next generation of VHMS significant scope for improvement.

Remaining Challenges:

There are three main findings of our review of VHM. These findings were the need to increase VHM prognostic capability, i.e. the period of advance warning available, the reliability of VHMS with respect to the rate of false alerts, which has historically been poor, and the proportionality of cost and effort consumed by VHM in comparison to other viable means of health monitoring. Though these findings will appear obvious to anyone familiar with VHM, these continue to be critical such monitoring to realise its potential for avoiding

[18] National Aviation Authority is the term used by EASA to denote the competent authority for aviation in a particular state.

future accidents whilst in parallel developing into a ‘normal’, reliable means of condition monitoring. These issues are addressed individually below;

- **Prognostic Capability:** There are several rotor drive system and rotor pitch control failures that have resulted in accidents over the past 10 years. These failures fall into 3 categories which are addressed below;

  - Main Gear Box (MGB) epicyclic module degradation / planet gear failure. VHM gear and shaft indicators have traditionally been targeted at components that rotate around an axis which remains fixed in relation to the location of the vibration sensor and for which a method of signal averaging is used to reduce scatter. As there are multiple planet gears that are continually moving in relation to the sensor, this presents a far greater challenge for effective VHM. By employing more accelerometers, monitoring individual planet gears, directing signal averaging to individual planet gears, developing new indicator algorithms and refining methods of threshold setting there is the potential to significantly improve epicyclic module health monitoring.

  - MGB internal shaft failure. Though there are already the means to monitor this type of failure condition, the failures experienced reinforce the knowledge that the timescale for development of some MGB internal mechanical failure modes may only be a few tens of hours. Accordingly, it is necessary to drive improvement of the prognostic capability of VHM, maybe by better location of sensors, and routinely downloading VHM data at each available opportunity, in order to maximise the likelihood of indicators providing a timely warning.

  - Rotor pitch control. Rotors present a different set of challenges to VHM as different modes of degradation often result in similar changes in VHM signal, i.e. energy at blade passing or once per revolution frequencies. Pitch control mechanisms, which typically contain a number of critical parts, will have some non-rotating and some rotating elements. Where VHM can be used to monitor these critical components, consideration should be given to extending the scope of VHM to cover these parts. Of particular concern are tail rotor pitch control bearings, which have exhibited reliability issues across platforms of several helicopter manufacturers.

- **Reliability / False Alert Rates:** Typically, the rate of false alarms for traditional means of condition monitoring, such as oil debris monitoring, or information provided to the cockpit, should generally be better than 10% of the actual event rate being monitored. The rate experienced on the current North Sea fleet over recent years has varied around 0.01 to 2 per flight hour, depending on helicopter type. In practice around 95% of the current Health and Usage monitoring System (HUMS) alerts can be considered as spurious, resulting in checks to the helicopter with no mechanical fault found. Generally, most of these ‘false’ alerts

are either due to a lack of optimized threshold settings or are 'real' alerts but resulting from reliability problems with the HUMS itself.

When this alert rate is compared with the actual failure rate of the components being monitored (extremely remote), it is clear that much more needs to be done to reduce the false alert rate and align with the rates set out in the document Helicopter Vibration Health Monitoring (CAP 753). Factors which can influence the false alert rate, and which account for the vast difference alert rates experienced across existing types, include sensor and wiring reliability, methods of data point smoothing (e.g. only indicate if 3 points out of 5 exceed the threshold), methods chosen for threshold setting and very significantly the use of multiple Condition Indicators (CI) from different sensor locations to generate alerts based on Health Indicators.

Each of these factors can present a balance or compromise between the confidence of optimising the point of early warning and the risk of increasing the likelihood of false alerts. Improving detection capability helps to separate the failure and normal CI values and thus reduces the need for compromise when setting thresholds. Further effort should be made to evaluate the potential to reduce false alert rates by monitoring potential failure conditions from multiple sources. A decision to increase the number of sensors to achieve this objective, should only follow demonstration of acceptable sensor and associated wiring failure rates. We also consider that there is scope to develop Key Performance Indicators (KPI) in order to better evaluate and compare different types of VHM false alarm prior to benchmarking acceptable performance targets.

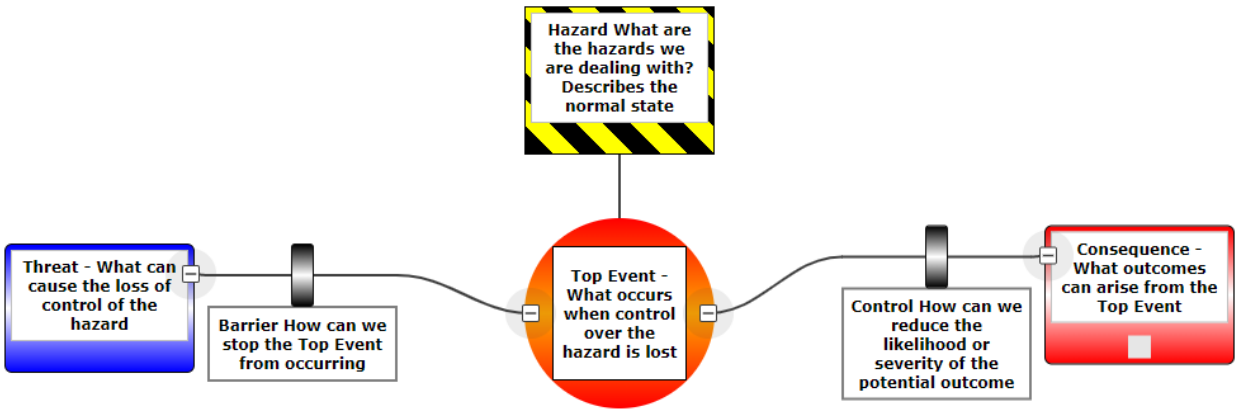
- **Proportionality of cost and effort consumed by VHM:** Provision of VHM equipment is expensive in comparison to other means of condition monitoring. In addition, the operating costs can be high, due to the extent of maintenance required following frequent alerts or analysis of atypical vibration data. Though experience has shown that the cost of VHM is considered to be generally worthwhile, the industry should endeavour to implement and optimise different means of health monitoring whichever is most appropriate for the failure condition being monitored. This situation is continually changing as new opportunities for health monitoring become available due to advances in technology. Of particular note is that many gearbox failure modes result in debris being released into the lubricating oil system. For failure conditions which can be detected earlier using oil debris monitoring (ODM) consideration should be given to improving ODM capability alongside improvements in VHM.

Future Vibration Health Monitoring Developments

As part of our long-term strategy for VHM, we are developing a Bowtie[19] risk model, looking at the threats that may make a risk apparent and the effectiveness of any controls in place

[19] https://www.caa.co.uk/Safety-Initiatives-and-Resources/Working-with-industry/Bowtie/

that reduce the likelihood or impact of a risk. Our intent is to share the finalised version of this work, along with several other Bowties, with offshore operators in order that this may aid their internal risk management programmes. This work is in line with many other industry bow tie models we have developed which can be found on our website and a simple generic explanatory diagram is included below.



Recognising the requirement to continuously improve and add resilience to our knowledge, oversight and staff training of vibration health, we will be developing our training programmes, audit programme and CAA Publications (CAP) to reflect this work.

EASA has also launched the rule-making task (RMT.0711) 'Vibration health monitoring Systems' with the objective to drive and enable improvements in the fidelity of VHM systems and also to foster the modernisation of these systems which would provide additional safety benefits when compared to the existing legacy systems. The use of VHM to detect imminent failures of critical rotor and rotor drive components has been shown to greatly improve the level of safety of rotorcraft particularly for offshore operations. There is however, a need to improve the current Certification Specifications to reflect the evolution of modern VHM systems in order to gain the associated benefits. We intend to share feedback from the 2019 independent review of operators VHM through active participation in rule-making task (RMT.0711).

A Notice of Proposed Amendment (NPA) is expected around Q2 2020.

Maintenance Standards Improvement Teams

Since the publication of The Offshore Review (CAP 1145), we have further expanded on action A31[20], relating to the improvement of maintenance standards. Extending the initiative beyond the offshore helicopter working group, we have now established eight further working groups with representation from over fifty UK organisations. These groups

[20] The CAA will form an Offshore Maintenance Standards Improvement Team with the offshore helicopter operators with the objective of reviewing the findings at Annex F to the CAA Strategic Review of the Safety of Offshore Helicopter Operations and making proposals to achieve a step change in maintenance standards.

have continued to discuss the challenges and opportunities for industry to improve, developing guidance material to assess the competency of staff, continuation training and a doctrine for writing a procedure. The guidance documents have been developed with our support, by industry-led subject matter experts. These documents have been published for wider industry to access through our own website and communicated via the Skywise[21] application. Where we identify areas of problems within organisations, our surveyors are now advising organisations to consult these documents for the purposes of continuous improvement.

Future Maintenance Standards Developments

Whilst three pieces of guidance material have thus far been produced, there is recognition of the need for further areas of improvement across the wider industry. Guidance, relating to contracted maintenance and the role of organisations, the assessment of Continuing Airworthiness Management Organisations (CAMO[22]) competencies and to support the trailblazer programme for apprenticeship schemes, are all being progressed by the relevant working groups. We continue to work alongside the Offshore Working Group to identify themes which could provide greater guidance and standardisation to the sector. One such theme highlighted by the group has been the performance of the modern engineer and how they interact within an organisation and its operating environment. This theme is being reviewed and future work will look to develop some of the initiatives undertaken by HeliOffshore relating to the human hazard analysis of maintenance tasks being conducted.

21 https://www.caa.co.uk/Our-work/CAA-SkyWise/

22 For EU operators and others to whom EASA regulations apply, a Continuing Airworthiness Management Organisation (CAMO) must be in place. This is an approved organisation responsible for implementation of continuing airworthiness management tasks.

CHAPTER 4

Improving knowledge and facilitating change

The CAA's helicopter safety research projects were addressed in Chapter 27 of The Offshore Review (CAP 1145) and several them were highlighted in Action A32 for attention as follows:

The CAA will:

- *Promote and support the implementation of the results of the research on helideck lighting, operations to moving helidecks, Differential GPS-guided offshore approaches and Helicopter Terrain Awareness Warning Systems (HTAWS).*
- *Seek to ensure funding for the research on operations to moving helidecks, Differential GPS-guided offshore approaches and HTAWS to allow timely progress to completion and, once completed, promote and support the implementation of the results.*

CAA-led research projects have delivered practical and cost-effective solutions in several risk areas which have either been implemented or are being implemented as described in the remainder of this section of the report.

Operations to moving helidecks

With reference to section 3.3 in Annex G to The Offshore Review (CAP 1145), based on CAA-led research a new Helideck Monitoring System (HMS) standard has been developed with the industry and published by the Helideck Certification Agency (HCA). The new standard introduces the following features:

- Improved measure of heave rate, Significant Heave Rate (SHR);
- Helideck 'traffic lights' to indicate the HMS status directly to the helicopter flight crew;
- Relative wind monitoring function to warn against changes in vessel and/or wind heading after landing;
- Motion Severity Index (MSI) and Wind Severity Index (WSI) advisory caution to address loss of stability (tipping and/or sliding) on-deck after landing;
- Improved HMS displays with increased standardisation.

Together, the new functionality addresses all the issues evident in the Mandatory Occurrence Reports (MORs) relating to operations to moving helidecks.

By agreement with the industry, vessels not equipped with a HMS meeting the new standard, will be limited to stable deck conditions from 01 April 2021. This is reflected in Amendment 1 to the document, Standards for Offshore Helicopter Landing Areas (CAP

437)[23]. Following in-service trials on the Chevron 'Captain' and 'Alba Floating Storage Unit (FSU)' vessels, some minor changes to the standard have been identified which will be introduced in an update by end 2019.

Super Puma 'roll-over' accident on the West Navion drillship in November 2001 - the new Helideck Monitoring System *standard addresses this and other scenarios*

Helideck lighting

Referring to section 3.4 in Annex G to The Offshore Review (CAP 1145), the new helideck lighting scheme developed from CAA-led research and specified in the Standards for Offshore Helicopter Landing Areas (CAP 437), was mandated for UK offshore operations at night, from 01 April 2018 under Safety Directive SD-2016/005. This has now been superseded by SD-2019/002 which was issued to update the content of the earlier directive following the introduction of the new European air operating rules from 01 July 2018.

The new lighting is installed on most installations operating on the UK continental shelf (UKCS). Some durability issues with one or two of the systems that have been approved by CAA International[24] were initially encountered, but most have now been resolved. All feedback received from helicopter flight crews on the benefits of the scheme has been positive.

The specification is now considered mature and is being adapted for elevated onshore helipads at hospitals for incorporation into Standards for Helicopter Landing Areas at Hospitals (CAP 1264).

[23] www.caa.co.uk/CAP437

[24] As offshore helidecks are currently not licensed, the CAA has no mandate to approve any associated equipment. CAA approval was requested by the lighting equipment manufacturers, however, and this was performed on a full cost recovery basis via CAA's commercial subsidiary, CAA International.

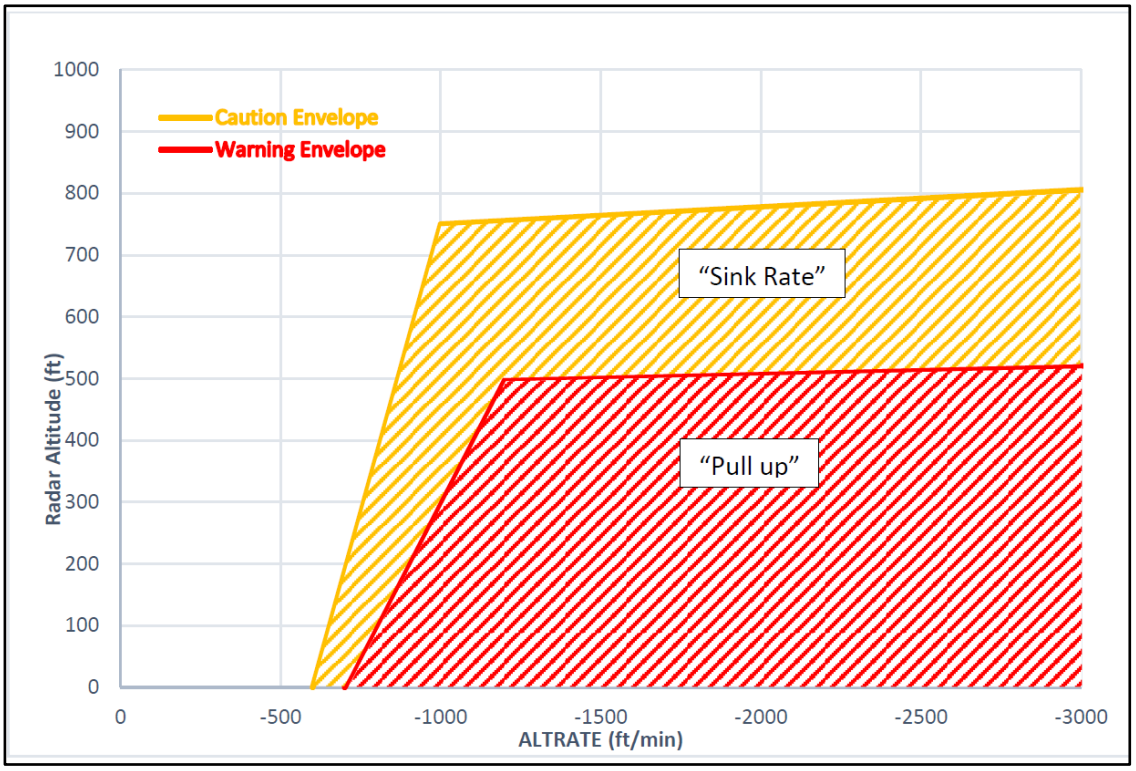
New CAP 437 helideck lighting scheme on the Spirit Energy CPC-1 helideck in Morecambe Bay

Helicopter Terrain Awareness & Warning Systems

As described in section 3.10 in Annex G to The Offshore Review (CAP 1145), starting in spring 2010, we led a joint industry research project aimed at improving the performance of Helicopter Terrain Awareness and Warning Systems (HTAWS) in terms of reducing the 'nuisance' alert rate, increasing warning times and improving the detectability of alerts by flight crews. All research has been successfully completed, resulting in the following publications:

- Offshore Helicopter Terrain Awareness Warning System Alert Envelopes, July 2017 (CAP 1519);
- Class A Terrain Awareness Warning System (TAWS) for Offshore Helicopter Operations, April 2017 (CAP 1538);
- Class A HTAWS Warning Annunciation, November 2018 (CAP 1747).

The performance improvements demonstrated by the research have resulted in a major industry-led initiative to implement most of the alert envelopes within CAP 1519, in the current offshore helicopter fleet. Roll-out of the HTAWS software modifications is expected to commence in 2019 with the Leonardo AW189. The new Mode 1 alert envelopes are presented in the figure below for illustration; there are several other modes and sub-modes.



HTAWS alert Mode 1

In addition, a joint EUROCAE/RTCA[25] working group (WG-110/SC-237) was launched in December 2018 with the aim of developing a formal international minimum operational performance standard (MOPS) for HTAWS for offshore helicopters. The starting point for the new standard was the alert envelopes published in CAP 1519, and the results of the warning annunciation research (CAP 1747) is being considered for incorporation. It is anticipated that the new standard will be published around the end of 2020.

The new standard is expected to be adopted by EASA to support the mandate for HTAWS for offshore helicopter operations which applies to helicopters used in commercial air transport operations with a maximum take of mass greater than 3,175 kg or having more than nine seats and first issued with an individual certificate of airworthiness after 31 December 2018.

Triggered lightning forecasting system

With reference to section 3.11 in Annex G to The Offshore Review (CAP 1145) and Recommendation 28[26], the triggered lightning forecasting system developed by the Meteorological Office under a CAA-led research project was implemented in OHWeb[27] during the winter of 2011/12 on a trial basis and was declared fully operational from the winter of 2015/16.

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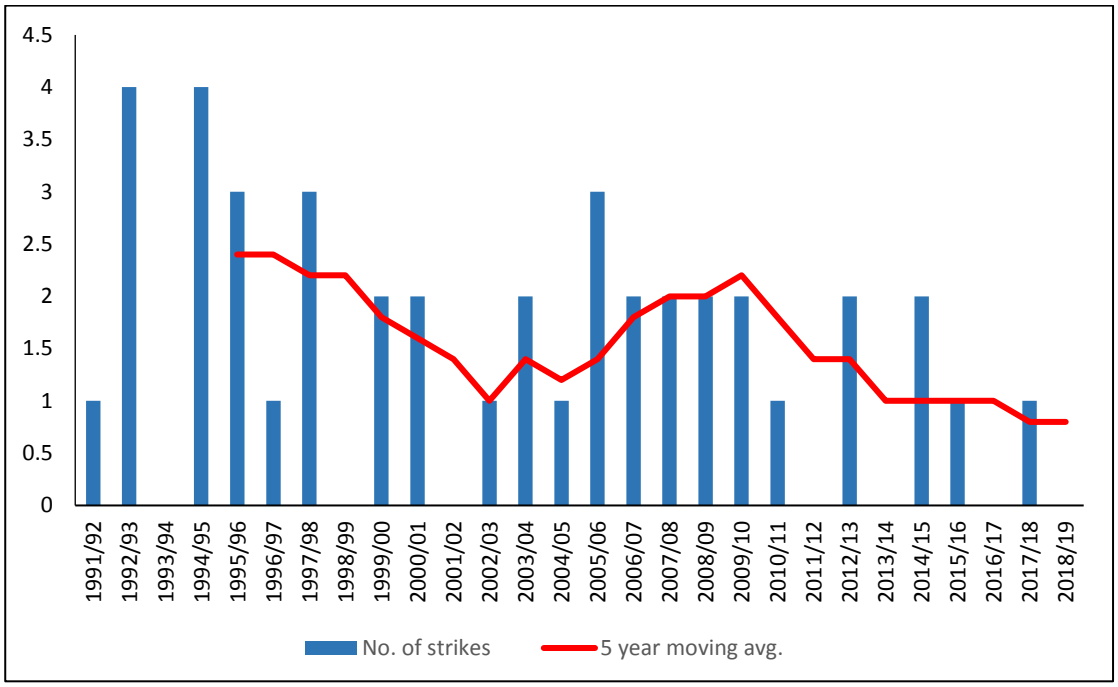
25 EUROCAE (https://eurocae.net/) and RTCA (https://www.rtca.org/) are respectively the European and North American industry bodies responsible for producing standards for avionics equipment for civil aircraft.

26 It is recommended that the UK Met Office and the helicopter operators fully implement the triggered lightning forecasting system, subject to satisfactory performance during the present in-service trials.

27 OHWeb is the offshore helicopter meteorological information service used by the operators.

During the period from 1991/92 to 2010/11, prior to the introduction of the system, the average lightning strike rate was 1.8 strikes per year. The figure for the period from 2011/12 to 2018/19 while the system has been in use is 0.75 strikes per year, i.e. the strike rate has more than halved. The statistics, based on occurrence reports, are presented in the chart below.



Offshore helicopter lightning strike statistics

Although there have been winter seasons with no lightning risk due to warmer than usual temperatures during the post implementation period, it is possible that risk free winter seasons also occurred during the pre-implementation period, e.g. 1993/94, 1998/99, 2001/02. In addition, improvements to the system have been introduced based on lessons learned from the strikes that have occurred post implementation, i.e. strikes in similar circumstances would be expected to be avoided in future. Overall, therefore, it is considered that the introduction of the system has delivered a worthwhile reduction in the lightning strike rate.

Use of the system does involve some disruption to services and inconvenience, and this is particularly difficult when the lightning risk is widespread and volatile. Further development of the presentation of the lightning risk areas to flight crews is in progress to reduce display volatility and thereby aid flight planning and minimise disruption.

ANNEX A

Progress at a glance

Action	Description	Delivery date (as set in the Review)	Previous progress update	Current status	Details
A01	The CAA will establish and lead a new offshore operations safety forum to work for a substantial improvement in the safety of helicopter operations on the UK continental shelf.	Q3/2014	OHSAG established – see CAP 1243, page 21.	COMPLETE	Performance Based Regulation (PBR) has now been fully implemented and a risk picture for offshore helicopter operations has been established. Offshore helicopter operators are now regularly presented with sector and risk information through the Performance Based Oversight process that enables them to see their own performance picture in comparison to other operators within the same sector. As part of the implementation of PBR, the PBR Industry Group was established and now meets every 6 months. Offshore helicopter operators are represented on this group.
A02	The CAA will accelerate its work with industry to develop and apply Safety Performance Indicators to improve the effectiveness of helicopter	Q3/2014	Expanded scope to improve safety performance monitoring capability of helicopter operators' SMS – see CAP 1386, page 12.	COMPLETE	

	operators' Flight Data Monitoring programmes.		Initial action complete; revised delivery date for expanded scope Q2/2015.		
A03	The CAA will analyse lower risk occurrences (i.e. serious incidents and incidents) for the main areas of risk, technical and external cause occurrences in particular, in order to increase the 'resolution' of the analysis. This analysis will take the form of a rolling annual review of the last five years of occurrence reports.	Q3/2014	Detailed analysis presented at SMS Symposium, July 2014 – see CAP 1386, page 12.	COMPLETE	See A01.
A04	The CAA will work with the helicopter operators via the newly established Helicopter Flight Data Monitoring (FDM) User Group to obtain further objective information on operations issues from the FDM programme.	Q4/2014	Revised scope to first identify opportunities to improve helicopter operators' FDM programmes, before being able to use them to obtain information on operational issues. See CAP 1386, page 21. Initial action complete; revised delivery date for expanded scope Q3/2015.	ONGOING	A joint industry working group was established to progress improvements to helicopter operators' FDM programmes. The issue of monitoring approaches was prioritised and a European Operators FDM (EOFDM) Working Group A exercise was performed to identify how approaches should ideally be monitored and what FDM parameters would be required. The next step in the process would normally be to undertake an EOFDM Working Group B exercise. This represents a significant undertaking and it has been determined that, in the short-term, a more general approach is to be taken. The first step will be to produce improved Guidance Material (GM) for incorporation in EASA air operating rules (SPA.HOFO.145).

A05	With effect from 01 June 2014, the CAA will prohibit helicopter operators from conducting offshore flights, except in response to an offshore emergency, if the sea state at the offshore location that the helicopter is operating to/from exceeds sea state 6 in order to ensure a good prospect of recovery of survivors.	01 June 2014	Prohibition in force – see CAP 1386, page 11.	COMPLETE	Prohibition introduced by Safety Directive SD-2015/005, now superseded by EASA air operating rules (see SPA.HOFO.110(b) (10)), and AMDT 10/2018 to the UK AIP (see GEN 1.6, para. 3.6).
A06	With effect from September 2014, the CAA will prohibit helicopter operators from conducting offshore flights, except in response to an offshore emergency, if the sea state at the offshore location that the helicopter is operating to/from exceeds the certified ditching performance of the helicopter.	01 Sept 2014	Prohibition in force – see CAP 1386, page 10.	COMPLETE	Prohibition introduced by Safety Directive SD-2015/005, now superseded by EASA air operating rules (see SPA.HOFO.110(b) (10)). and AMDT 10/2018 to the UK AIP (see GEN 1.6, para. 3.6).
A07	With effect from 01 June 2014, the CAA will require helicopter operators to amend their operational procedures to ensure that Emergency Floatation Systems are armed for all	01 June 2014	Requirement in effect – see CAP 1386, page 8.	COMPLETE	Prohibition introduced by Safety Directive SD-2015/005, now superseded by EASA air operating rules (see SPA.HOFO.110(b)(9)).

	overwater departures and arrivals.				
A08	With effect from 01 September 2014, the CAA will prohibit the occupation of passenger seats not adjacent to push-out window emergency exits during offshore helicopter operations, except in response to an offshore emergency, unless the consequences of capsize are mitigated by at least one of the following: a) All passengers on offshore flights wearing Emergency Breathing Systems that meet Category 'A' of the specification detailed in CAP 1034 in order to increase underwater survival time. b) Fitment of the side-floating helicopter scheme in order to remove the time pressure to escape.	01 Sept 2014	Action complete, but effectively superseded by progress on A10 – see CAP 1386, pages 8-9.	COMPLETE	Prohibition introduced by Safety Directive SD-2015/005, now superseded by EASA air operating rules (see SPA.HOFO.165(c) and AMC1 SPA.HOFO.165(c)).

A09	With effect from 01 April 2015, the CAA will prohibit helicopter operators from carrying passengers on offshore flights, except in response to an offshore emergency, whose body size, including required safety and survival equipment, is incompatible with push-out window emergency exit size.	01 April 2015	New rules agreed with industry; workforce to be measured – see CAP 1386, pages 9-10.	COMPLETE	Prohibition introduced by Safety Directive SD-2015/005, now superseded by EASA air operating rules (see AMC1 SPA.HOFO.165(h)).
A10	With effect from January 2015, the CAA will prohibit helicopter operators from conducting offshore helicopter operations, except in response to an offshore emergency, unless all occupants wear Emergency Breathing Systems that meet Category 'A' of the specification detailed in CAP 1034 in order to increase underwater survival time. This restriction will not apply when the helicopter is equipped with the side-floating helicopter scheme.	01 Jan 2015 for passengers 01 April 2016 for flight crew	All passengers now wear EBS – see CAP 1386, pages 8-9. Action on track for flight crew.	COMPLETE	Prohibition introduced by Safety Directive SD-2015/005, now superseded by EASA air operating rules (see SPA.HOFO.165(c) and AMC1 SPA.HOFO.165(c)).
A11	The CAA will organise and chair an operator symposium on Safety management to identify generic hazards, mitigations and	Q2/2014	Symposium took place 2 July 2014 – see CAP 1386, page 12.	COMPLETE	As per the Progress Report 2016 (CAP 1386) update.

	Safety Performance Indicators for offshore operations.				
A12	The CAA will review whether operations should continue at helidecks where the overall dimensions and/or loading values as notified for the helideck are insufficient to accommodate the helicopter types in use and take the necessary action.	Q3/2014	Review completed – the Progress Report 2016 (CAP 1386), page 14.	COMPLETE	A Sub-1D risk assessment was introduced into CAP 437 Appendix H in December 2016, providing detailed methodology of how to address requests for sub-1D operations (i.e. where the overall length of the helicopter exceeds the dimension of the helideck). CAP 437 Edition 8 included the sub-1D risk assessment, which was subsequently refined and updated for Edition 8, Amendment 1 (published September 2018). ICAO Heliport Manual (Offshore – Part I) now includes a version of the UK risk assessment process; published on ICAONet, in December 2018. Note: (For alternative loading criteria acceptance criteria was already established - see chapter 3, para. 3.19).
A13	The CAA intends to assume responsibility for the certification of UK helidecks and will consult with industry to achieve this.	Q1/2015	The consultation (CAP 1295) was published on the CAA website in May 2015. Responses received to the end of July 2015 reviewed and scheme developed and proposed to the OHSAG. Pending	ONGOING	To enable the CAA to formally licence the helidecks, the CAA is working with the Helideck Certification Agency (HCA) and the helicopter operators to identify alternative ways of improving helideck standards. This has already involved CAA taking over the running of the Helideck Technical Committee meetings, and more CAA staff have been trained to oversee HCA activities.

			changes to the legislation. See page 13.		
A14	The CAA will review the conditions applicable to the issue of offshore 'exposure' approvals with a view to making them appropriate to the intended types of operation.	Q3/2014	Response subject to the output from the Cranfield University study addressing fire-fighting provision on NUIs which is due to deliver a final report on 9 January 2015 – see the Progress Report 2016 (CAP 1386), page 14. Revised delivery pending review output – Q1/2015.	COMPLETE	Current processes have been reviewed and updated using the knowledge gained from the NUI fire-fighting work. Approvals are now issued on a case by case basis instead.
A15	The CAA will commission a report to review offshore communication, handling and flight monitoring procedures from an air traffic control perspective and act on its outcomes.	Q4/2014	The report to review offshore communication has been commissioned through a meeting during December 2014, however the complexities of the actions required has resulted in a short delay. The report will be delivered in January 2015.	ONGOING	The report to review offshore communication was delivered in February 2015. Complexities of the actions required are being addressed to assess next steps and will be progressed during 2016.
A16	The CAA will, with industry, review the instrument flying training element for all EFIS-equipped offshore helicopter type	Q4/2014	Review underway: draft findings presented to EASA in April 2015. EASA rulemaking activity to	COMPLETE	Reviewed with industry (also through Joint Operators Review (JOR) / HeliOffshore) by formal inspection of operator's training requirements.

	rating courses to be satisfied that candidates have a firm understanding of the displays and techniques required for basic instrument flight. The CAA will propose to EASA any necessary improvements to the syllabus requirements.		commence in 2015. See the Progress Report 2016 (CAP 1386), pages 15-16.		The CAA, in conjunction with HeliOffshore and other industry support, has formed the Automation Workgroup which has taken this on by reviewing current automation training requirements and licensing requirements.
A17	The CAA will review all helicopter AOC recurrent training programmes to ensure that basic instrument flight skills are maintained so that crews can readily deal with manual flight if required.	Q2/2014	Review of recurrent training programmes complete; findings shared with helicopter operators, who are continuing to review their programmes. See the Progress Report 2016 (CAP 1386), pages 15-16.	COMPLETE	
A18	The CAA will review the requirement for instructor tutor training and, if appropriate, make proposals to EASA to incorporate within part-Aircrew.	Q4/2014	Proposals made to EASA – see the Progress Report 2016 (CAP 1386), pages 15-16.	COMPLETE	RMT 0599 EBT sub task now includes instructor training as part of EBT for helicopters.
A19	The CAA will examine the output of its review into the safety of large UK commercial air transport aeroplane operations for relevance and applicability to	Q4/2014	This is progressing through the CAA's Loss of Control Working Group. Revised delivery Q3/2015.	COMPLETE	To ensure that common issues affecting both fixed and rotary wing are dealt with in a joined-up way, the CAA has integrated the workstream looking at standards documents, and the subsequent workstreams.

	ensure that any appropriate safety initiatives have been extended to the offshore helicopter environment.				Large transport aeroplanes have, for some time, been moving towards Evidence Based Training (EBT) (part of the review) and this is now a joint fixed wing and rotary wing project with EASA that CAA is supporting.
A20	The CAA will amend its examiner assessment protocols (CAA Standards Document 24) to require specific 'de-identified' candidate performance indicators so that any trends in common failings are visible for proactive attention.	Q4/2014	Proposals shared and under discussion. See the Progress Report 2016 (CAP 1386), pages 15-16. Revised delivery Q1/2015.	COMPLETE	Standards Document 69 now includes specific competencies so that examiners of examiners can identify such trends using company management systems.
A21	The CAA will review the pilot recency requirements for helideck operations that have been incorporated into the draft requirements for EASA Ops Specific Approval for Offshore Helicopter Operations and require operators to implement them to an agreed schedule.	Q3/2014	Review in progress with helicopter operators. Some have already implemented the requirements. Revised delivery Q1/2015.	COMPLETE	Material proposed to EASA by the CAA has been included in EASA Opinion 4/2015 and will be included in SPA.HOFO.170 Crew requirements
A22	The CAA will review helicopter operators' safety cases for night operations to bow decks to assess operator procedures and mitigations and determine	Q2/2014	Night operations to helidecks on small vessels are now prohibited. An additional Bowtie study group, to include the wider issue of night operations in	COMPLETE	The night prohibition has been extended to include all vessels with poor visual references, whether bow mounted or stern mounted helidecks operating with the helideck upwind. (MODUs and vessels such as FPSOs with good visual references are permitted to operate at night).

	whether such operations should continue.		general, is expected to convene in January 2015. See CAP 1243, page 15.		
A23	The CAA will continue to develop it working relationship with EASA, in particular in the areas of sharing airworthiness information and the management of operator in-service issues. This will be achieved by periodic meetings and reviews with the appropriate EASA and CAA technical staff.	Ongoing	Following an initial meeting to discuss actions and recommendations of the review, regular meetings have continued around specific topics, as illustrated throughout the Progress Report 2016 (CAP 1386). EASA also supports OHSAG.	COMPLETE ONGOING CONTINUOUS IMPROVEMENT PLAN IN PLACE	The relationship with EASA continues to develop with closer engagement on the CAA's AW industry risks. The CAA has met, twice annually, with EASA Certification Directorate since 2017 to discuss risks and has further developed this collaboration with focussed meetings with the Rotorcraft team. There is a focus to 'close the gap' between UK operators, both onshore and offshore, and EASA and provide actionable intelligence on the significant safety issues effecting the types operated in the UK.
A24	The CAA will review CAA Paper 2003/1 (Helicopter Tail Rotor Failures) to determine how well the recommendations have been taken forward and to assess if further action is necessary. The conclusions of this review will be discussed with EASA.	Q3/2014	Review in progress: currently in correspondence with manufacturers and helicopter operators to establish the status and effectiveness of actions taken. Some submissions will not be completed before end of 2014. Revised delivery Q1/2015.	COMPLETE ONGOING CONTINUOUS IMPROVEMENT PLAN IN PLACE	Review completed, report has 7 recommendations to EASA. EASA has passed the report to the European Helicopter Safety Team (EHEST) for consideration, in order for discussions to commence regarding their acceptance or otherwise.
A25	The CAA will review the human performance aspects of flight crew responses to engine bay	Q3/2014	Review completed. Discussions with manufacturers and	COMPLETE	

	fire warnings, specifically within the offshore operations environment.		helicopter operators underway – see CAP 1243, page 18.		
A26	CAA Airworthiness will meet with offshore operators periodically to compare the trends of MORs with operator in-service difficulty / reliability data to ensure that the complete risk picture s captured, addressed and that the desired outcomes are being achieved.	Q2/2014	Initial meetings with helicopter operators held; regular meetings now scheduled. See the Progress Report 2016 (CAP 1386), page 21.	COMPLETE ONGOING CONTINUOUS IMPROVEMENT PLAN IN PLACE	The CAA has continued to work with the offshore operators to collect data relating to MORs / In-Service Difficulties / and Reliability. A request for data has been made to the operators but there has been no formal agreement reached between the operators. At a meeting in December 2018 it was discussed whether the request be revised to collect data relating to the early rejection of Critical Parts (CPs) and Land Immediately component system safety performance. The revised proposal will be formalised in Q2 2019 with the intention of linking this to EASA Rotorcraft safety roadmap workstream on data collection.
A27	The CAA will focus on Vibration Health Monitoring (VHM) download procedures, system/component reliability, the handing of VHM alerts and defects during audits of UK offshore operators.	Q2/2014	VHM audits have been carried out and specific improvements are being taken forward. See the Progress Report 2016 (CAP 1386), page 19.	COMPLETE ONGOING CONTINUOUS IMPROVEMENT PLAN IN PLACE	
A28	The CAA will review Guidelines for Health & Usage Monitoring Systems (CAP 753) to clarify alert generation and management, to ensure it is	Q4/2014	Review complete; EASA have raised a draft Certification Memorandum to address R27, which is linked to this item. This will	COMPLETE	Guidelines for Health & Usage Monitoring Systems (CAP 753) Amendment 2017/01 to Edition 1 published February 2018.

	consistent and a system of amber/red warning thresholds is established to allow maintenance staff to identify the severity of the alert.		be reviewed and the Guidelines for Health & Usage Monitoring Systems (CAP 753) will be updated as required. See the Progress Report 2016 (CAP 1386), page 19. Revised delivery Q1/2015.		
A29	The CAA will work with operators and their contracted engine and component maintainers to review processes that define when strip reports are required and determine necessary improvements to assure these are provided and thus ensure that potential safety information is not lost.	Q2/2014	Progress has been delayed as the Original Equipment Manufacturers are reviewing their procedures and then discussions will be held, leading to a revised target date. See the Progress Report 2016 (CAP 1386), page 20. Revised delivery Q1/2015.	COMPLETE ONGOING CONTINUOUS IMPROVEMENT PLAN IN PLACE	The CAA understands that the provision of strip reports remains an area of weakness and one that is subject to commercial terms of the contracts between the operators and their respective Power By Hour (PBH) providers. The development of the workstream on Critical Parts early rejections and Land Immediately component system performance should consider the feasibility for the provision of strip reports for all components within this data set. This will be set out in the proposal to operators for data collection.
A30	The CAA will carry out a further review of Human Factors Maintenance Error data referred to in this report and publish the results to seek improvements in this important area.	Q4/2014	Review of data completed – report being drafted and will be circulated during January 2015. Revised delivery Q1/2015.	COMPLETE	CAP 1367 issued in response. 3 recommendations made to CAA and an overarching requirement placed on industry to inform their staff of the findings. No further action on Human Factors is currently required.

A31	The CAA will form an Offshore Maintenance Standards Improvement Team with the offshore helicopter operators with the objective of reviewing the findings at Annex F to the CAA Strategic Review of the Safety of Offshore Helicopter Operations and making proposals to achieve a step change in maintenance standards.	Q3/2014, reporting Q1/2015	The Scope and Terms of Reference for the Improvement Team has been defined and initial group meetings have been held. The four working groups, formed of operators and the CAA, have all held and arranged further meetings. A review meeting will take place in January 2015 to review progress. See the Progress Report 2016 (CAP 1386), page 19.	COMPLETE ONGOING CONTINUOUS IMPROVEMENT PLAN IN PLACE	8 working groups to address this action have now been established and are supporting a number of workstreams. The groups have developed guidance on assessing competency, continuation training, and drafting procedures. Further guidance is expected in 2019 on assessing CAMO competency and apprenticeships.
A32	The CAA will: • Promote and support the implementation of the results of the research on helideck lighting, operations to moving helidecks, Differential GPS-guided offshore approaches and Helicopter Terrain Awareness Warning Systems (HTAWS).	Ongoing	Retrofit of new helideck lighting in progress with a compliance date of 31 March 2018. Contract let for prototype deck motion monitoring system for validation trials. Discussions in progress with helicopter operators on moving forwards with in-service trials of DGPS-	ONGOING	The new helideck lighting was mandated for all night operations from 01 April 2018 under Safety Directive SD-2016/005 (superseded by SD-2019/002). Action completed. The new Helideck Monitoring System (HMS) standard has been published by the Helideck Certification Agency and referenced in CAP 437. Operations to moving helidecks not fitted with HMS meeting the new standard will be restricted to stable deck conditions from 01 April 2021. Action completed.

	• Seek to ensure funding for the research on operations to moving helidecks, Differential GPS-guided offshore approaches and HTAWS to allow timely progress to completion and, once completed, promote and support the implementation of the results.		guided offshore approaches. Work on developing new HTAWS warning envelope progressing well.		The helicopter manufacturers GPS approach systems have been reviewed and a number of issues identified. An 'enabling' project to enhance aircraft navigation data bases has been proposed to industry for funding. Action ongoing. Research into HTAWS warning envelopes completed and published in CAP 1538; research into warning form/format completed and published in CAP 1747; specification for HTAWS upgrade for retrofit published in CAP 1519; retrofit progressing - first fleets (AW139 & AW189) expected during 2019; EUROCAE WG-110 / RTCA SC-237 established to produce formal MOPS for HTAWS for offshore helicopter operations - expected to complete end 2020. Action ongoing

FULL PROGRESS REPORT – RECOMMENDATIONS

Action	Description	Delivery date (as per CAP 1145)	Previous progress update	Current status	Details
R01	It is recommended that EASA leads the development of a management system that provides a structured review of all accident and serious incident reports and recommendations of helicopters operating offshore or events which could have led to a		EASA has established the Helicopter Accident Data Collaboration and Analysis Group (HADCAG), which takes its membership from relevant national authorities, operators, manufacturers and other	COMPLETE	**EASA:** The next CAG meeting was planned on 09 Sept. 2019 with one UKCAA participant (topic this time will be SPO).

	ditching if the helicopter had been over water. This should be done in collaboration with other North Sea NAAs and the CAA to ensure a cohesive assessment of both accident causes (looking for trends) and remedies (looking for suitability and effectiveness) in order to prevent the segregated nature of accident reviews and ensure there is continuity to the safety reviews.		associations. The tasks of the HADCAG include reviewing the analysis of all safety data (including the causes and contributory factors from accidents and serious incidents) to support the strategic risk assessments that form the basis of the risk portfolios.		
R02	It is recommended that EASA involve NAAs annually in a forum to agree and exchange information on the performance of safety actions taken in line with accident and serious incident investigation recommendations and potential other improvements that could be adopted, where appropriate.		Two forum events held to date (April 2014, November 2014). Further meetings scheduled. We will request EASA to look again at the content and frequency of these events to accelerate progress.	COMPLETE	**EASA**:The Air OPS Technical Body (TeB) decided to establish a helicopter group, bringing together EASA and Member State helicopter expertise. The purpose of the Helicopter Expert Group (HEG) is to facilitate the sharing of helicopter expertise at NAA level in support of the efficient implementation of EASA regulations and requirements. The HEG should also provide regulatory feedback and assist EASA and the Air OPS TeB in identifying work priorities in helicopter air operations and air crew training and coordinate, to the best extent possible, common approaches at international level
R03	It is recommended that EASA introduces procedures to monitor and		EASA published two Certification Memorandums (CM-S-007 and	COMPLETE	**EASA**: the CM-S-007 topic is now continued with LN-OJF Safety Recommendation

	track the efficiency and reliability of maintenance interventions when these are used during the certification activity to assure the safety target of the rotorcraft.		CM-RTS-002) introducing post certification actions to verify the continued integrity of critical parts and guidance for development of time between overhaul for rotorcraft gearboxes.		**NORW-2018-008** (see EASA interim response). The CM to be transferred in CS27/29. EASA is considering the most efficient means to incorporate the contents of CM-S-007 into CS-29 to ensure that critical parts are appropriately controlled throughout their service life. This could be through a dedicated RMT (subject to a Best Invention Strategy assessment) or through the regular update to CS-29.
R04	It is recommended that EASA ensures that the Type Certificate Holder completes a design review following a failure of malfunction of a component or system on any other similar feature on that aircraft type or any other type in their product line and defines appropriate corrective actions as deemed necessary.		EASA considers that this is adequately addressed under existing continuing airworthiness processes and procedures and, as such, does not propose any further changes. NOTE: CAA has requested that EASA review the effectiveness of this decision by sampling as part of their auditing to confirm their assumptions.	COMPLETE	**EASA**: EASA is of the opinion that adequate CAW processes and procedures already exist (OEMs like AH and LH consider systematically design similarity when analyzing in-service occurrences). EASA will propose to amend the Acceptable Means of Compliance (AMC) and Guidance Material (GM) to point 21.A.3A of Annex I (Part-21) to Commission Regulation (EU) No 748/2012, in order to clarify the obligations of Type Certificate Holders to ensure compliance with the requirement of "collecting, investigating and analysing reports of and information related to failures, malfunctions, defects or other occurrences which cause or might cause adverse effects on the continuing airworthiness of the product(…)".

					This will be performed within the frame of the regular update of AMC/GM to Part-21 rulemaking task RMT.0031. The next NPA is planned to be published 3Q 2019.
R05	CAA expects that offshore helicopter operators will address the following key items from EASA RMT.0120 (27 & 29.008) draft NPA without delay: • Fitment of the side-floating helicopter scheme. • Implementation of automatic arming/ disarming of Emergency Floatation Equipment. • Installation of hand holds next to all push-out window emergency exits. • Standardisation of push-out window emergency exit operation/marking/ lighting across all offshore helicopter types. • Ensure that external life rafts can be released by survivors in the sea in all foreseeable helicopter floating attitudes. • Ensure that all life jacket/immersion suit		Currently no specific activity in this area at HeliOffshore, Oil & Gas UK or Step Change in Safety - See longer term improvements, the Progress Report 2016 (CAP 1386) page 11. We encourage operators to assess the need for taking up some or all of these measures as part of their SMS, and the oil & gas industry to consider introducing them by contractual requirement.	ONGOING	Currently no specific industry activity in this area, however: • Life raft release addressed for new helicopter designs in Amendment 5 to CS 27/29 published in June 2018. EASA Rule Making Task RMT.0120 presently considering retrospective application via Part 26 / CS 26. • New lifejacket and immersion suit standards presently being produced by ASD-STAN D12 WG2 for adoption by EASA in ETSOs. These standards will address the issue of self-righting, but it is uncertain whether the new standards will be mandated.

	combinations are capable of self-righting.				
R06	It is recommended that EASA Helicopter Ditching and Survivability RMT.0120 consider making safety and survival training for offshore passengers a requirement.		Under consideration, pending discussion with industry and participating authorities.	COMPLETE	**EASA**: During the evaluation of the various means to improve offshore helicopter safety within the scope of RMT.0120 EASA established the following position relating to passenger survivability training: *"While the Agency has a role in ensuring passenger briefings are given prior to flight, it is not at all clear that the issue of passenger training, in relation to their experience and ability to operate safety equipment, falls within the Agency's remit. Furthermore, putting the obligation of training passengers on the operators would appear to be an undue burden.* *If passenger training is a concern, it could be seen as the responsibility of the employer (the oil and gas industry in the case of most North Sea operations) to train their employees appropriately against all hazards that they are likely to face as part of their employment, including flying if this is an essential part of the job.* *Basic Offshore Safety Induction and Emergency Training (BOSIET) or equivalent, which includes use of EBS, sea survival and helicopter underwater escape training, is mandated by employers for most offshore employees. The Agency should not be*

					directly involved. *No recommendation is made."*
R07	The CAA expects that OPITO will review and enhance is safety and survival training standards with regard to the fidelity and frequency of training provided.		OPITO working group formed autumn 2014 to perform review of industry training standard. Initial focus has been training for the new Category A EBS. The remainder of the syllabus has yet to be addressed.	ONGOING	Safety and survival training updated to include in-water training for Category A EBS. OPITO is planning a review of the BOSIET standard and has invited CAA to participate. No start date or schedule has been set.
R08	The CAA expects the oil and gas industry to incorporate the fire-fighting provisions detailed in CAP 437 (Standards for Offshore Helicopter Landing Areas) for Normally Unattended Installations without further delay.		Proposals offering an alternative means of mitigating the risk have been put to OHSAG and agreed in principle. See the Progress Report 2016 (CAP 1386), page 13.	COMPLETE	New scheme limiting operations to helidecks on Normally Unattended Installations agreed with industry, added to CAP 437 in December 2016 and in operation.
R09	The CAA expects the offshore helicopter operators to apply the risk-reduction methodology detailed in CAP 437 (Standards for Offshore Helicopter Landing Areas) for operations to Normally Unattended Installations to ensure that the foreseeable event of a crash with fire is appropriately mitigated.		Proposals offering an alternative means of mitigating the risk have been put to OHSAG and agreed in principle. See the Progress Report 2016 (CAP 1386), page 13.	COMPLETE	New scheme limiting operations to helidecks on Normally Unattended Installations agreed with industry, added to CAP 437 in December 2016 and in operation.

R10	It is recommended that offshore helicopter operators identify a set of 'best practice' standard procedures and engage with their customers to agree how these may be incorporated into contractual requirements.		Oil & Gas UK is leading on this, supported by OGP ASC, HeliOffshore (the organisation formed following the outcomes of the JOR) and the CAA.	ONGOING	Update provided by HeliOffshore at Annex B
R11	The CAA expects that the oil and gas industry will review its audit and inspections practices to harmonise and pool audit schemes to reduce the impact on helicopter operators following the principles described in the Oil & Gas UK Guidelines for the Management of Aviation Operations.		Oil & Gas UK is leading on this. An initial toolbox has been delivered and is being used. See the Progress Report 2016 (CAP 1386), page 13.	ONGOING	
R12	It is recommended that EASA require helicopter manufacturers, in conjunction with the major operators of the type and NAAs, to review their recommended training material so that pilots are better prepared for operating modern highly complex helicopters.		EASA consider that this is covered within the Operational Suitability Data (OSD), which was introduced in February 2014 – see Raising the Standards of Pilot Training, (CAP 1243).	COMPLETE	**EASA**: RMT.0724 for Rotorcraft FCOM is ongoing Regulatory Impact Assessment: 2020 Q2 ToR for 2020/Q3; NPA 2020/Q3; Decision 2021/Q1 Update provided by HeliOffshore at Annex B
R13	It is recommended that Approved Training Organisations and helicopter AOC holders adopt the aircraft manufacturers' operating philosophies and recommended practices, where available, within their type syllabi and		Manufacturers and helicopter operators are working together on this. Airbus Helicopters has now produced a Flight Crew Operating Manual (FCOM) for the EC225 and other manufacturers have	ONGOING	Update provided by HeliOffshore at Annex B

	current training and checking programmes with particular emphasis on automation. This information should also be reflected in instructor guidance so that specific learning points for the automated systems are addressed in a standard manner.		plans to introduce FCOMs starting with newer models – see Raising the Standards of Pilot Training, (CAP 1243).		
R14	It is recommended that Approved Training Organisations and helicopter AOC holders review their type rating syllabi and recurrent training programmes to ensure that Standard Operating Procedures and monitoring pilot techniques are included at all appropriate stages of the type rating course, operator conversion courses and recurrent training/checking.		ATOs and AOC holders have reviewed their syllabi and are making any necessary changes – see Raising the Standards of Pilot Training, (CAP 1243).	ONGOING	Special Objective Check 12 Pilot Monitoring conducted across all Multi Pilot Operators including offshore operators who have integrated AOC/ATOs as part of annual audit cycle for 2016. Update provided by HeliOffshore at Annex B
R15	It is recommended that Approved Training Organisations and helicopter AOC holders review their training syllabi to ensure that the correct use and emphasis upon Standard Operating Procedures is impressed upon crews throughout all stages of flight and simulator training.		ATOs and AOC holders have reviewed their syllabi and are making any necessary changes – see Raising the Standards of Pilot Training, (CAP 1243).	ONGOING	Special Objective Check 12 Pilot Monitoring conducted across all Multi Pilot Operators including Offshore operators who have integrated AOC/ATOs as part of annual audit cycle for 2016. Update provided by HeliOffshore at Annex B
R16	It is recommended that Approved Training Organisations and helicopter		Manufacturers and helicopter operators are working together on	ONGOING	Update provided by HeliOffshore at Annex B

	AOC holders address with aircraft manufacturers any shortfall in the Operational Suitability Data training syllabi for those destined to operate the type offshore.		this and will continue to do so under the new OSD requirements - see Raising the Standards of Pilot Training, (CAP 1243).		
R17	It is recommended that AOC holders, in conjunction with the CAA, develop an Alternative Means of Compliance to introduce the option of Alternative Training and Qualification Programme, as permitted for aeroplanes in accordance with ORO.FCL.A.245.		This is now being undertaken by EASA, in accordance with the 4-year rulemaking programme.	COMPLETE	Now covered within the TOR of EASA RMT.0599 The specific objectives of this rulemaking task are, therefore: (a) to maintain the high aviation safety level by: (1) ensuring that initial and recurrent pilot training and checking is adequate to provide a pilot with the necessary knowledge, skills and attitude to be competent — pursuant to this objective, the Agency intends to: (i) implement EBT as a first step towards the full implementation of CBT across Subpart FC of Part-ORO; (ii) implement an alternative training and qualification programme (ATQP) taking into account experience gained in CAT aeroplane operations and extend its implementation to CAT helicopter operations (for the latter, former RMT.0386/0387); and (iii) evaluate new training methods, such as distance learning.
R18	If is recommended that Approved Training Organisations work with AOC holders to ensure that their Synthetic Flying Instructors have current		Helicopter operators have confirmed that this is already standard procedure – see Raising	COMPLETE	

	operational knowledge of the type(s) on which they instruct.		the Standards of Pilot Training, (CAP 1243).		
R19	It is recommended that Approved Training Organisations and helicopter AOC holders establish a requirement for training record narratives.		This is in development with ATOs and AOCs.	ONGOING	Update provided by HeliOffshore at Annex B
R20	It is recommended that EASA / Type Certificate Holder confirm the number of false engine fire warnings on offshore helicopters, investigate the reasons for them and determine what actions to take to address this important safety issue.		EASA has published a number of service bulletins to ensure actions are taken to reduce the number of false engine fire warnings.	COMPLETE	Also see R21 regarding review of the land immediately events. **EASA**: the R20 recommendation was for one specific safety issue only. It has been addressed and closed.
R21	It is recommended that the helicopter Type Certificate Holder identify all major components or systems that lead to a land immediately condition to ensure themselves that the actual reliability data available from the operators is validating the assumptions made at the time of certification. This review should be overseen by the regulator for the State of Design.		We have provided clarification to the Type Certificate Holders (Airbus Helicopters, Agusta Westland and Sikorsky) on the background to this recommendation. To address this recommendation, the Type Certificate Holders need to contact the relevant regulator for the state of design (EASA and FAA as necessary). CAA discussed this issue at a meeting with EASA in February 2016. EASA had not been contacted by any of the Type	ONGOING	A review has been carried out of the H175 and AW 189 to identify land immediately requirements. It is the intent to now look at the components that may result in a land immediately requirement to request that these components are specifically monitored by operators, and where failures are noted that these are reported to EASA and the TCH. See R20. Area for development but would be aided with the support of the TCH to provide definitive lists of the components that could lead to land immediately. UK CAA is including an example of components, that it understands would result in a land immediately requirement, in its request

			Certificate Holders to discuss this recommendation. It was intended that this item would link in to EASA recommendation R25 which has been closed by EASA. The CAA feel that there is a benefit in identifying the systems that lead to a 'Land Immediately'. These systems could then have the improved system reliability elements and reliability target monitoring from the ETOPS requirements.		to UK operators for data collection. A copy of the proposal will be forwarded to EASA. **EASA**: see R25 below - The "ETOPS" topic is now reconsidered in frame of LN-OJF SR **NORW-2018-006** (see EASA interim response)
R22	It is recommended that EASA initiate a rulemaking task to adopt the critical parts life monitoring and assessment requirements of Certification Specifications for Engines (CS-E) for large transport rotorcraft, currently subject to CS-29, including retrospective application. This should cover at least for the following areas: i. Residual stress assessments ii. Vibratory stress measurements iii. Manufacturing plan		EASA has reviewed CS-29 and CS-E to cover the areas recommended. EASA review has established that the existing rules ensure that critical parts are monitored and controlled throughout their service life and there is no requirement for the initiation of a Rulemaking Task. The CAA has recommended that EASA carry out an independent review of Critical Parts, assessing	COMPLETE	The CAA has continued to investigate the monitoring of Critical Parts and has identified and held initial discussion with EASA's Rotorcraft certification department regarding future improvements. These specifically consider the following: 1: Definition and the identification of Critical Parts within the regulations (EASA). 2: Variation in the identification of Critical Parts (TCH's). 3: Requirement to report and the number of reports relating to the rejection of Critical Parts.

	iv. Laboratory examination of time expired part		the design, manufacture and maintenance aspects by looking closely at current industry practice, comparing this with the minimum certification standards, CS-E, and assess differences and identify any areas for improvement and or standardisation.		4: Operator management of Critical Parts. **EASA:** The UK CAA suggestion in CAP1386 for "an independent review" is already completed, as such EASA review occurred and its outcomes were detailed in the reply to R24
R23	It is recommended that EASA revise CS-29.602 for large transport rotorcraft intended to operate over hostile sea conditions for extended periods of time, to ensure the failure mode effects and criticality analysis process used to identify critical parts recognises that a safe ditching may not always be possible.		EASA consider that the recommendation would not yield a measurable increase in safety based on the accidents and incidents considered in the report. Nonetheless, in the wider context of offshore operations, EASA will continue to evaluate whether additional airworthiness requirements may be of benefit. See R25.	COMPLETE	**EASA**: see R25 below - The "ETOPS" topic is now reconsidered in frame of LN-OJF SR **NORW-2018-006** (see EASA interim response)
R24	It is recommended that EASA provide additional guidance material to improve standardisation in approach to the classification of critical parts to minimise inconsistencies in the instructions for continuing airworthiness and where appropriate to require revisions to existing		EASA reviewed the current guidance material, which did not highlight any standardisation issue, and have issued new guidance through certification memo CM-S-007. The CAA has recommended that EASA carry out an independent review of Critical Parts, assessing the design,	ONGOING	CAA has continued to develop its knowledge regarding the rejection of Critical Parts. As part of the process it identified variations in the classification and control of Critical Parts through Manufacturers Instruction for Continued Airworthiness. The CAA is current engaged in pilot scheme to further understand the extent of Critical Part classification and rejections. The date from this scheme will be

	Instructions for Continued Airworthiness.		manufacture and maintenance aspects by looking closely at current industry practice, comparing this with the minimum certification standards, CS-E, and assess differences and identify any areas for improvement and or standardisation. To raise the awareness and knowledge of this at the operator / maintainer level, the CAA has issued IN2016/026 Rotorcraft – Critical Parts Awareness and Training, which has been directed at the continuing airworthiness organisations within the UK.		shared with EASA and fed into the BIS. **EASA CT.3**: Re-opened. This "ICA" topic is now also continued in frame of LN-OJF SRs **NORW-2018-002** and **NORW-2018-008** (see EASA interim response) EASA is considering the most efficient means to incorporate the contents of CM-S-007 into CS-29 to ensure that critical parts are appropriately controlled throughout their service life. This could be through a dedicated RMT (subject to a Best Invention Strategy assessment) or through the regular update to CS-29.
R25	It is recommended that EASA consider developing requirements that could be applied to helicopters which carry out offshore operations in hazardous environments in a similar fashion to those used for aeroplane Extended Operations and All-Weather Operations.		EASA evaluated the potential benefits of developing requirements that could be applied to helicopters carrying out offshore operations in hostile environments, similarly to those used for aeroplane Extended Operations and All-Weather Operations, concluding that Extended-range Twin-engine Operation Performance Standards (ETOPS) could be applied to helicopter	ONGOING	The UK CAA has provided feedback to EASA on the development of ETOPS for helicopters and continues to engage and support on any future initiatives in this regard. **EASA**: This "ETOPS" topic is now reconsidered in frame of LN-OJF SR **NORW-2018-006** (see EASA interim response). EASA is reviewing the initial White Paper done in 2015 that was shared with UKCAA in Sept.2015.

			design. However, EASA considers that a review of service experience does not justify a rulemaking task at this time. The evaluation was sent to the UK CAA in September 2015.		
R26	It is recommended that EASA establish a forum for discussion for best practice and developments on Vibration Health Monitoring (VHM). This forum should include NAAs, operators and VHM manufacturers. The CAA expects that this could be achieved by the end of 2014.		EASA consider that several groups already exist to address this, such as the Society of Automotive Engineers (SAE), HM-1 Integrated Vehicle Health Management Committee in which EASA is involved, and other initiatives by Type Certificate Holders. EASA believes that any new forum would be best sponsored by the manufacturers, helicopter operators and in association with the EHEST, and major highlights could be presented for a wider audience during EASA Rotorcraft Symposium.	ONGOING	The CAA has conducted a further review of UK operators and its own internal process for overseeing VHM processes. A summary of this is included within the main report. The full report with be shared with EASA for their information. **EASA**: EASA can only encourage the operator community to use the HeliOffshore guidance but it does not influence compliance demonstration with CS29.1465 related to the airworthiness and certification aspects. Reference to this document in AMC 29.1465 would have no value added as the AMC material is addressing airworthiness of the product used at TCH level. Current AMC 1465 already includes some links to the operational world which created difficulties and confusions when certifying VHM systems at the end of last year. We had to develop CRI AMC to clarify its content and we should be careful to not mix operational needs within certification guidance material.

					RMT.0711 for CS29.1465 improvement is ongoing; ToR 2019/Q2; NPA 2020/Q1; decision 2020/Q3 Regarding introduction of HOFO, EASA approvals against CS29.1465 are already granted at the end of 2018 for S92, AW139, 169, 189, EC175 and BK117 have been covered. For AH & LH products, CSI (controlled in-service introduction) are now on-going and should be running for a minimum of two years period.
R27	It is recommended that EASA review AMC 29.1465 to clarify alert generation and management, to ensure it is consistent and a system of amber/red warning thresholds is established to allow maintenance staff to identify the severity of the alert.		An EASA Certification Memorandum (CM) has been published to address this, drawing on input from helicopter operators at a meeting in August 2014. The CM provides guidance regarding prioritisation of alerts and allows standardisation of the use of colours in relation to urgency and importance of subsequent investigation and associated maintenance action.	COMPLETE	**EASA CT.3**: see R26 above
R28	It is recommended that the UK Met Office and the helicopter operators fully implement the triggered lightning forecasting system, subject to		The Met Office triggered lightning forecasting system effectively fully implemented; “trial” caveat removed from displays from September 2015. Further	COMPLETE	The Met Office triggered lightning forecasting system effectively fully implemented from September 2015. Lighting strike rate has approximately halved since introduction. Further developments in progress to enhance usability.

	satisfactory performance during the present in-service trials.		refinements introduced for winter 2015/16 'season' aimed at reducing/minimising operational impact as follows: • Rainfall rate threshold for high strike risk areas reduced from 10mm/hr to 6mm/hr to increase stability of forecasts. • Daily cold air breakout forecasts added to provide advance notification of high-risk episodes. • Lightning risk forecast updates to be synchronised with wave height forecasts to reduce impact on operations. • Operational guidance modified to allow down grading of RED areas to AMBER provided overflight at OAT ≤ - 10°C is possible/acceptable.		
R29	It is recommended that the offshore oil and gas industry, helicopter operators, helicopter manufacturers and regulators: • Continue to support the helicopter safety research programme		Ongoing as part of normal HSRMC meetings. Good support continues from all parties for the Helicopter Safety Research Management Committee	ONGOING	Support for the helicopter safety research programme remains satisfactory, but funding remains 'ad-hoc'. No progress has been made in relation to establishing a process for implementing successful

	• Establish a less labour intensive, more regularised arrangement between participating organisations for the funding of research projects • Establish, via Oil & Gas UK, a faster and more focussed approach to implementation of successful research projects. This should be in addition to and in advance of the enhancement of the aviation rules and guidance material.		(HSRMC). Funding and implementation remain challenging.		research projects in advance of and/or in addition to regulatory action.

ANNEX B

HeliOffshore Update Summary for UK Civil Aviation Authority's CAP1145 Progress Report

HeliOffshore Update Summary for UK Civil Aviation Authority's CAP1145 Progress Report

v1.0 July 2019

Overview

HeliOffshore is the global, safety-focused association of the offshore helicopter industry. In October 2014, leading helicopter operators formed the organisation with the specific mission of enhancing safety for offshore helicopter flights. Today, our 122 members are engaged in a collaborative effort to develop and implement safety programmes identified as having the most potential to save lives. The collaborative work involves aircraft operators, aircraft manufacturers, regulators, oil and gas companies, and a wide array of the industry's support and technology companies.

HeliOffshore has a clearly defined strategy based on data. This has resulted in the development of the HeliOffshore Safety Performance Model, which has been accepted across the industry and adapted into the European Aviation Safety Plan. The Safety Performance Model has helped us to define the main categories of accident events. For each of these we have identified a series of accident prevention goals that need to be achieved in order to avoid the accident. Our strategy identifies the main areas of safety risk for offshore helicopter flights and how the industry needs to collaboratively apply its resources to mitigate these risks. You will find a summary of the HeliOffshore Safety Strategy at this link.

The focus of much of our current work is on how to avoid the main accident events in the following areas:

- **Surface/Obstacle Conflicts** Aircraft manufacturers, regulators and aircraft operators have worked together to agree an implementation plan that will see the latest upgrades to Helicopter Terrain Awareness and Warning Systems (HTAWS) installed on the most common types of aircraft used offshore, starting this year.

- **Aircraft Upset** Our members have jointly developed best practice guidelines for Flight Path Management. They also are helping to ensure that pilots are

able to harness all the safety benefits of modern automation technology through Flight Crew Operating Manuals, as demonstrated in this video.

- **System Failure** Our main focus has been on ensuring the early diagnosis of potential failures using Helicopter Health & Usage Monitoring Systems, as described in these best practice guidelines. We are also using shared operational data to identify the main areas of potential system failures, and their associated causal factors, so that solutions to these can be identified and implemented.

To facilitate this work, HeliOffshore has created a dedicated collaboration space within the controlled-access HeliOffshore Space portal to:

- share safety issues, events, and information,
- consult with colleagues, and,
- discuss and develop potential solutions to issues identified.

Over the past five years, the offshore helicopter industry has faced unprecedented commercial pressures caused by a combination of weak oil prices and over- supply in the offshore transport market. The potential for these challenging trading conditions to undermine efforts to maintain and enhance safety performance, and the need to mitigate this risk, has been acknowledged by both Oil & Gas UK and the International Association of Oil & Gas Producers (IOGP).

Data produced by Oil & Gas UK shows that, since 2014, margins in the transport and logistics sector of the North Sea supply chain (including helicopter services) have fallen by up to one third from just over +10 percent to -20 percent. In response, Oil & Gas UK has drawn up a set of principles that it is urging its member companies to use in dealings with suppliers, with the intention of sustaining suppliers who can safely provide the required services. These principles include the following: that contracts should allow for investment; that contract cancellation should not occur without good reason; and that customers should discourage "low ball" bidding.

Oil & Gas UK outlined its perspective on the supply chain in a presentation at the 2019 HeliOffshore Conference & AGM. You can view the presentation here.

IOGP's response to the challenging business environment includes a current exercise by the Aviation Subcommittee of its Safety Committee to update and simplify its R590 Aviation Management Guidelines document with a view to removing particular requirements and differences that can have the unintended consequence of making it harder for operators to strengthen safety performance (see Recommendation R10 below). This can also have the benefit of helping to standardise audits.

At the same time, IOGP's Aviation Safety Committee is close to finalising plans for a new Joint Industry Project (JIP) to support shared industry investment in strengthening safety performance as part of the association's wider Project Zero campaign (called Safira) to eliminate fatal accidents across the oil and gas industry.

Through IOGP's partnership with HeliOffshore, the new JIP will provide an initial investment of £600,000 in the first year and provides a framework for further investment after that. This will support several HeliOffshore safety programmes, including the following:

- HeliOffshore Safety Intelligence Programme (HSIP);
- Human Hazard Analysis training and support work being advanced by the association's System Reliability & Resilience workstream.
- Operational Effectiveness workstream projects such as evidence-based training, pilot eye-tracking research and a new weather and rig location trial.

Here are some examples of what these projects deliver:

- HSIP, which is collecting data from HeliOffshore member operators who between them account for more than 80 percent of the offshore fleet, supports data-driven decisions on how to advance key safety programmes, as well as verifying that these are having the desired effect once implemented.
- Human Hazard Analysis is a platform for collaborative work between aircraft designers, maintenance engineers and human factors experts to systematically look at the potential for human error and develop ways to address these through changes in design and maintenance procedures.
- Evidence-Based Training supports efforts to develop a targeted approach to pilot and mechanic training that addresses those areas identified as having the greatest potential to avoid accidents.

IOGP explained its plans for the new JIP in a presentation at the 2019 HeliOffshore Conference & AGM. You can view the presentation here.

Actions A2/A4/A23

As part of its ongoing workstreams, the HeliOffshore Safety Intelligence Programme (HSIP) has been established with a dedicated programme manager. To support the programme, HeliOffshore has developed a Memorandum of Understanding (MOU) and a governance process to give operators confidence that they can share information safely and anonymously. To date, 34 HeliOffshore operator members have signed the MOU.

As part of the HSIP, HeliOffshore has been gathering hours, sector, fleet and accident information to understand the global risk picture and to measure the industry accident rate. Based on HSIP data gathered to date, HeliOffshore has produced an industry report (due for release in July) summarising some of this data. This offers an excellent opportunity for local evaluation of safety performance against a global benchmark. HeliOffshore is also starting to collect information from operators on 'High Potential' events, through its InfoShare scheme, which it is hoped will start to provide some leading indicators to changes in the risk profile.

HeliOffshore has created a Flight Data Monitoring Working Group that has started sharing and aggregating data for analysis. Currently focussing on offshore approaches, the group has recently moved to sharing continuous flight data, a development that is unprecedented in this industry.

The UK Civil Aviation Authority is working with HeliOffshore to see how best to collaborate to provide the most benefit to the industry while maintaining reporting confidentiality.

Action A13

The HeliOffshore Helideck Workgroup has completed a preliminary study using helideck-related occurrence reporting data to identify target areas for improvement initiatives. The group has

collaborated with IOGP and BP on the development of a Helideck Awareness Video for helideck teams on offshore platforms.

The HeliOffshore Helideck Workgroup is in the process of harmonising the work that has been done by various bodies including civil aviation authorities in the UK and Norway and the Gulf of Mexico's Helicopter Safety Advisory Committee (HSAC) to establish international standards for helidecks and helideck landing officer training standards. The group is also developing a global helideck information sharing network through HeliOffshore's HeliOffshore Safety Intelligence Programme (HSIP). The intention here is to save events into the system and collaborate with IOGP on the development of enhanced standards and address critical areas for enhancement.

The collaboration will also lead to the group making proposals to HeliOffshore for future activities as part of our wider work programme. The workgroup priority areas are:

1. Helideck equipment serviceability/maintenance
2. Helicopter fueling/fuel control
3. Passenger/baggage handling
4. Communications (offshore facility to helicopter)
5. Helideck team training and competence

Action 16

Operational Effectiveness: This is a large subject that holistically addresses the second highest area of fatalities in our industry when it comes to Loss of Control and Controlled Flight into Terrain/Surface. HeliOffshore has several ongoing pieces of work to address these risks, including the following: Flight Crew Operating Manuals (FCOMs), eye tracking research, enhanced Helicopter Terrain Awareness Warning Systems (HTAWS—see below), Flight Path Management g guidance

materials, effective use of automation training videos, Evidence Based Training. They all support the performance goal of addressing CFIT and Loss of Control

Helicopter Terrain Avoidance Warning Systems (HTAWS)

Phase 1 - enhanced envelope protection

- increasing warning times on existing Modes
- developing new Mode 7 (low speed / low power)

Phase 2 - enhanced HMI (increasing impact of warnings)

Status update

- Enhancements to existing Modes 1-6 agreed (60% of expected safety benefit)
- Development of new Mode 7 not agreed and moved to the EUROCAE WG/RTCA SC for further work and air testing before certification
- EUROCAE WG established – April 2019 – to define HTAWS standards
- HMI report issued – published as CAP 1747

Action A19

HeliOffshore continues to request that regulators increase the extent to which helicopter certification standards include more of the human factors requirements that are included in fixed wing certification. It is believed that this would help to ensure frontline human performance is considered as part of the design process, and this would have a significant benefit to overall safety performance. In the meantime, HeliOffshore has been working on several initiatives that help manufacturers and helicopter operators work together to better support frontline tasks. For example, the Human Hazard Analysis project has brought frontline engineers and designers together to systematically consider those tasks that could have safety significant consequences and how design, training, and procedures might better support the tasks. In addition, Flight Crew Operations Manuals have been produced to help ensure the designer's intent about how to use the technology is translated into procedures for the pilots. We continue to encourage regulators to adopt standards closer to those in fixed wing to ensure that human factors are addressed as part of the design and certification process.

Action A28

The Best Practice Guidelines for Health & Usage Monitoring Systems (HUMS) referenced in CAP753 were developed through collaborative work by HeliOffshore operator members. Following their initial publication in 2015, the guidelines have been updated with further annexes. HeliOffshore's HUMS Working Group, as part of

the association's System Reliability & Resilience workstream, is now supporting implementation of the guidelines by operators around the world. The guidelines also are referenced in the R590 Aviation Management Guidelines of the International Association of Oil & Gas Producers (IOGP).

You can view HeliOffshore's HUMS Best Practice Guidelines here.

HUMS continues to play an important role in diagnosing potentially catastrophic equipment failures, and therefore, any work to ensure reliability, effectiveness, and ease of use as part of the certification process would be desirable.

Actions A30/A31

To bring focus and enable collaboration around the System Reliability & Resilience (SR&R) workstream, HeliOffshore has created the Technical Steering Group (TSG). The TSG comprises technical and safety leaders from the HeliOffshore member operators, OEMs and oil and gas companies. The TSG has elected a chairperson whose role is to provide leadership for the group and represent it in all other HeliOffshore forums. HeliOffshore has provided a dedicated project manager for the SR&R workstream to support its efforts.

The TSG's primary role is to direct and bring focus and resources to initiatives that will improve the safety of the industry within by addressing the safety priorities identified in the SR&R workstream.

An example of one of the initiatives supported by the TSG is the Human Hazard Analysis project. Human Hazard Analysis offers a new way to bring operator maintenance personnel together with the OEM design and maintainability teams in a workshop over three to four days. For each aircraft type, a joint analysis of the human and machine interaction is conducted on safety critical systems/components and their associated maintenance tasks. The objective is to bring to the surface any areas where the human and machine interaction creates a high likelihood of maintenance error and to categorise the potential impact of any errors. This information then leads to the development of corrective actions that, when applied to the human machine system, will result in a reduction in the likelihood and/or severity of the errors occurring. Unlike current human factors in maintenance approaches, the Human Hazard Analysis is forward-looking and brings the experience of the maintenance experts to the forefront and shares this with designers.

HeliOffshore and the UK CAA continue to share information on the work of its A31 Maintenance Standard Improvement Teams. The CAA is aware of the Human Hazard Analysis project, through the offshore operators working group, and it is encouraging operators to support the production of guidance for licenced engineers on the privileges of their licence and their performance in the modern engineering world

Action A32

As a result of HeliOffshore's collaborative efforts involving aircraft manufacturers, operators, oil companies and regulators, plans have been formulated to implement upgrades to Helicopter Terrain Awareness and Warning Systems (HTAWS). These have been demonstrated to give pilots between 6 and 30 seconds of additional warning of a potential collision with an obstacle, terrain or water.

The HeliOffshore HTAWS Work Group recently reached agreement for aircraft manufacturers to focus on implementing Modes 1 through 6 of the enhanced HTAWS software, which between them will deliver an estimated 60 percent of the safety benefits from the proposed upgrade.

It was further agreed that Mode 7, which would deliver the remaining 40 percent of benefits, will be implemented later after further flight trials are complete.

Leonardo Helicopters has committed to implementing the first phase of the upgrade during 2019 for its AW139 and AW189 fleets. Mode 7 is set to be added after further flight testing.

Sikorsky has agreed to introduce Modes 1-6 in Revision 11 of its Avionics Management System (AMS-11) for the S-92. In the meantime, it will continue to flight test Mode 7 and hopes to be able to add this to the upgrade at the same time.

Airbus Helicopters is also continuing to test all the modes and intends to implement the upgrade of mode 1 through 6 for the H175 models in 2021 and on the H160 in the same year. The Mode 7 upgrade requires additional design work and flight testing before implementation in the HTAWS or flight control system.

Bell has agreed to implement enhanced capabilities in its new Bell 525 aircraft. The manufacturer is considering implementation options including embedding these functions within the aircraft's avionics suite or fly-by-wire flight control system.

The plans agreed through HeliOffshore's HTAWS Work Group call for equipment to be enhanced by modifying alert envelopes on existing aircraft types, beginning with those equipped with Honeywell's EGPWS MK XXII HTAWS. This will give earlier notifications that increase the time available for pilots to recognise the unsafe condition and respond.

Simulator trials conducted in late 2017 with Honeywell and offshore operators CHC Helicopter and Bristow Group demonstrated the use of the UK Civil Aviation Authority's CAP 1519 protection envelopes and how these can reduce the risk of controlled fight into terrain/surface accidents. The protection envelopes defined in CAP 1519 have resulted from several years of work led by the UK CAA. The CAA research was initially sponsored by IOGP, Shell, Bristow Group and BP, and also has been supported by HeliOffshore and Oil & Gas UK. The work has used Flight Data Monitoring (FDM) data and simulator trials to provide the evidence to establish the enhanced envelopes.

Recommendation R5

HeliOffshore responded to the recommendations as follows:

The CAA expects that offshore helicopter operators will address the following key items from EASA RMT.0120 (27 & 29.008) draft NPA without delay:

The draft Notice of Proposed Amendment has been superseded by the final Comment Response Document and publication of CS 27 and 29 Revision 5, which incorporated the changes included.

Fitment of the side-floating helicopter scheme:

The One Atmosphere program has stopped because the AUS government cancelled the project for the Tiger helicopter. Side floating was removed from the RMT 0120 final proposal because EASA Director decided the concept was not sufficiently mature; however, EASA has found some funding for a research program and this is now out to tender. The allocation was due to be made this summer, but we have no visibility of timescales or who will / has bid (although Airbus have done previous research on this).

Implementation of automatic arming/disarming of Emergency Floatation Equipment.

This is still in process. CS29 Rev 5 mandated auto deployment (29.801.c.2) and mentions auto arm in AMC 29.801.b.6 but it is not yet mandated due to potential technical difficulties regarding the integrity of the solution. Discussions continue within EASA.

Installation of hand holds next to all push-out window emergency exits.

Hand holds were added in CS 29 Rev 5 (29.809.j.2) but the RMT believes it is not practicable to require retrofit on existing types for structural reasons (they would have to be fixed to primary structure not the trim).

Standardisation of push-out window emergency exit operation/marking/ lighting across all offshore helicopter types.

Standard black and yellow marking was introduced by CS 29 Rev 5 (29.811.h.2) and will be mandated for retrofit by the update to Part / CS 26. The same applies to Helicopter Emergency Egress Lighting or similar exit lighting. Standardisation of the method of operation is not and will not be mandated (not practicable) although they are required to be easily operable. SPA.HOFO.165 also requires emergency exit marking.

Ensure that external life rafts can be released by survivors in the sea in all foreseeable helicopter floating attitudes.

The requirement was introduced in CS 29 Rev 5 (29.1415.b) and will be mandated for Part 29 aircraft by the update to Part CS 26.

Ensure that all life jacket/immersion suit combinations are capable of self- righting.

This is not part of the RMT 0120 task. This is however addressed by Appendix 2 to European Technical Standard Orders 2C502 (Helicopter crew and passenger integrated immersion suits), 2C503 (Helicopter crew and passenger integrated immersion suits for operations in hostile sea areas) and 2C504 (Helicopter constant wear lifejackets for operations in hostile sea areas).

Recommendation 9

Further SSG input is requested on the following CAA recommendation:

The CAA expects the offshore helicopter operators to apply the risk-reduction methodology detailed in CAP 437 (Standards for Offshore Helicopter Landing Areas) for operations to Normally Unattended Installations to ensure that the foreseeable event of a crash with fire is appropriately mitigated. (Delivery Q3/2014)

Recommendation 10

The IOGP Safety Committee's Aviation Sub-Committee (the ASC) is currently updating and simplifying its R590 Aviation Management Guidelines document with a view to removing particular requirements and differences that can have the unintended consequence of making it harder for operators to strengthen safety performance. The update process will also add new safety programmes in the guidelines, including Helicopter Terrain Awareness & Warning Systems and Flight Crew Operations Manuals. The ASC is aiming to get all IOGP member companies to confirm their support for the new guidelines as part of efforts to achieve a higher degree of standardisation.

IOGP's work to revise the Aviation Management Guidelines was explained in a presentation at HeliOffshore's 2019 Conference & AGM. You can view the presentation here.

Recommendations R12/R13

Evidence based training (EBT) rule making is still ongoing and was delayed by an EASA proposal. Following industry consultation, EASA has since elected to continue the rule making. In order to prepare the industry for the impending rulemaking HeliOffshore has held several workshops which goes through, what it is, and how to consider implementing it in your organisation.

Next Steps:

- Enrol support for Phase 3 – building the EBT Baseline Programme
- Deliver further EBT workshops
- Publish an EBT Briefing Sheet
- Use HSIP to monitor performance and inform EBT Data Report(s)
- Operators to review use of IATA Competency framework

Flight Crew Operating Manuals are being addressed on the following levels.

- Helicopter operator implementation: working to get the operators to at least start with a gap analysis and start with partial implementation
- Oil companies: working through IOGP to educate the oil companies on the level of maturity of the FCOM and get them to work with their aviation suppliers to implement the FCOM rather than demanding that they implement the full FCOM in its current state as it is still work in progress.
- The OEMs have now created a HeliOffshore FCOM steering committee that includes operator representation. They have made good progress on standardizing structure and terminology across fleets in the areas that are not type specific. This will help to facilitate easier implementation for the pilot work force.

Recommendations R14 to R19

Further SSG input is requested on the following CAA recommendations:

R14: It is recommended that Approved Training Organisations and helicopter AOC holders review their type rating syllabi and recurrent training programmes to ensure that Standard Operating Procedures and monitoring pilot techniques are included at all appropriate stages of the type rating course, operator conversion courses and recurrent training/checking. (Delivery Q3/2014)

R15: It is recommended that Approved Training Organisations and helicopter AOC holders review their training syllabi to ensure that the correct use and emphasis upon Standard Operating Procedures is impressed upon crews throughout all stages of flight and simulator training. (Delivery Q4/2014)

R16: It is recommended that Approved Training Organisations and helicopter AOC holders address with aircraft manufacturers any shortfall in the Operational Suitability Data training syllabi for those destined to operate the type offshore. (Delivery Q1/2015)

R17: It is recommended that AOC holders, in conjunction with the CAA, develop an Alternative Means of Compliance to introduce the option of Alternative Training and Qualification Programme, as permitted for aeroplanes in accordance with ORO.FC.A.245. (Delivery Q1/2015)

R18: It is recommended that Approved Training Organisations work with AOC holders to ensure that their Synthetic Flying Instructors have current operational knowledge of the type(s) on which they instruct. (Delivery Q4/2014)

R19: It is recommended that Approved Training Organisations and helicopter AOC holders establish a requirement for training record narratives. (Delivery Q3/2014)

ANNEX C

Glossary

ADELT	Automatically Deployable Emergency Locator Transmitter
AFDS	Automatic Float Deployment System
AM	Accountable Manager
AMC	Acceptable Means of Compliance
ANO	Air Navigation Order
AOC	Air Operator's Certificate
AP	Auto Pilot
APU	Auxiliary Power Unit
ARA	Airborne Radar Approach
ASL	Above Sea Level
ATC	Air Traffic Control
ATO	Air Training Organisations
ATQP	Alternative Training and Qualification Programme
BCAR	UK BCAR is the British Civil Airworthiness Requirements. These were the UK requirements used prior to the introduction of Joint Airworthiness and subsequently EASA requirements.
BOSIET	Basic Offshore Safety Instruction Emergency Training
CAA	Civil Aviation Authority (UK)
CAMO	Continuing Airworthiness Management Organization
CAP	Civil Aviation Publication (UK CAA)
CAP 437	Standards for Offshore Helicopter Landing Areas
Certification	Certification is the process of designing and ensuring the helicopter meets all of the applicable standards.
Certification Basis	The Certification Basis for an aircraft is the standards which are applied during Certification.
CFMU	Central Flow Management Unit
CICTT	CAST/ICAO Common Taxonomy Team

Class G	Class G airspace is uncontrolled in that any aircraft may use the airspace under the Rules of the Air and although an air traffic service may be available it is not mandated.
CS-29	Certification Specification 29 (CS-29) is EASA Requirements for certification of the design for large helicopters.
DGPS	Differential GPS
EFIS	Electronic Flight Instrument System
EFPS	Electronic Flight Planning System
ELT	Emergency Transmitter Locator
FAA	The Federal Aviation Administration (FAA) is the national aviation authority of the United States of America.
FAR	FAA Regulations
FDM	Flight Data Monitoring
FFS	Full Flight Simulator
FIR	Flight Information Region
FMEA	Failure Mode and Effects Analysis
FMS	Fixed Monitor System
FMS	Flight Management System
FODCOM	Flight Operations Division Communications
FSTDs	Flight Simulator Training Devices
GM	Guidance Material
HCA	Helideck Certification Agency
HEMS	Helicopter Emergency Services
HLL	Helideck Limitations List
HOMP	Helicopter Operations Monitoring Programme
Hostile Environment	[Reference; EASA Ops Annex 1] (a) an environment in which: (i) a safe forced landing cannot be accomplished because the surface is inadequate; (ii) the helicopter occupants cannot be adequately protected from the elements;

	(iii) search and rescue response/capability is not provided consistent with anticipated exposure; or (iv) there is an unacceptable risk of endangering persons or property on the ground. (b) in any case, the following areas: (i) for overwater operations, the open sea areas north of 45N and south of 45S designated by the authority of the State concerned; (ii) those parts of a congested area without adequate safe forced landing areas;
HSE	Health & Safety Executive (UK)
HUMS	Heath & Usage Monitoring System
IFPS	Initial Flight Plan processing System
IFR	Instrument Flight Rules
IRI	Instrument Rating Instructor
JAA	Joint Aviation Authorities
JAR	Joint Aviation Requirement
JAR-29	The Joint Airworthiness Requirements for certification of the design for large helicopters.
JAR-OPS 3	Joint Aviation Requirement for the operation of commercial air transport helicopters.
LI	Land Immediately
MAP	Missed Approach Point
MAUW	Maximum All Up Weight
MGB	Main Gear Box
MOC	Minimum Obstacle Clearance
MOR	Mandatory Occurrence Report
MRGB	Main Rotor Gear Box
MSA	Minimum Safe Altitude

NAA	National Aviation Authority
NATS	National Air Traffic Services
NPA	Notice of Proposed Amendments: is the method of circulating draft amendments for comment.
NUI	Normally Unattended Installation
OEI	One Engine Inoperative
OEM	Original Equipment Manufacturer
OGP	International Oil & Gas Producers Association
OPITO	Offshore Petroleum Industry Training Organisation. This is the Oil & Gas industry's focal point for skills, training and workforce development.
OSD	Operational Suitability Data
Part-145	The requirement for approval for organisations that carryout maintenance of aircraft and components used for commercial air transport.
Part-M	The requirements for approval of organisations that manage the continuing airworthiness of aircraft. This includes establishing the maintenance tasks to be carried out based on the manufacturer's instructions.
PCA	Primary Certifying Authority
PLB	Personal Locator Beacon
PPE	Personal Protective Equipment
RFM	Rotorcraft Flight Manual
SAR	Search and Rescue
Sea State	The general condition of the free surface of a large body of water with respect to wind waves and swell.
SFI	Synthetic Flying Instructor
SMS	Safety Management System
SNS	Southern North Sea
SOP	Standard Operating Procedure
SPI	Safety Performance Indicator
SPA.HOFO	Specific Approval for Helicopter Offshore Operations

TCDS	Type Certificate Data Sheet
TCH	Type Certificate Holder
TRE	Type Rating Examiner
TRI	Type Rating Instructor
UKAIP	UK Aeronautical Information Publication
UKCS	UK Continental Shelf (Geographical area)
UTR	Upper Torso Restraint
Validation	or Validating is process of certifying a type which is a non-European type and there is a bilateral agreement or working arrangement in place with that foreign State.
VHM	Vibration Health Monitoring
VMC	Visual Meteorological Conditions