Appendix 2 – Safety Improvements and Initiatives

Since the early 1980s, many safety initiatives and improvements to UK Continental Shelf (UKCS) helicopter operations have been funded and fully supported by industry and the regulators. Some of the major achievements are listed below but they have not been given any order of priority or importance.

Regular Reviews and Periodic Updating of CAP 437, Offshore Helicopter Landing Areas – Guidance on Standards
This key document is founded in the International Civil Aviation Organisation's (ICAO) international standards and recommended practices, and outlines the basic requirements that the regulators and helicopter operators apply to offshore helidecks to ensure they are fit for purpose.

Health and Usage Monitoring Systems
Health and Usage Monitoring Systems (HUMS) for engines and transmissions was introduced on the UKCS in the early 1990s to reduce catastrophic component failures by detecting technical faults before they become a hazard to flight safety. From its inception, HUMS has proven its worth and is now widely acclaimed as an essential helicopter maintenance tool. It is also mandated by the Civil Aviation Authority (CAA) for all UKCS offshore helicopters. Research continues to extend its scope to rotors.

Advanced Anomaly Detection for the Health and Usage Monitoring System
A programme began in 2009 to implement advanced anomaly detection (AAD) to the HUMS data on the UKCS offshore helicopter fleet. The outcome of a successful CAA research project, AAD improves on existing HUMS data analysis using data mining techniques and enhances HUMS' sensitivity to defects without increasing the false alert rate. Since 2013, HUMS AAD has been progressively introduced for the most used helicopter types.

TCAS 2 Collision Avoidance System
The UKCS is currently introducing an airborne collision avoidance system on all offshore helicopters. This system could eliminate potential conflictions between similarly equipped offshore helicopters and reduce 'air miss' opportunities with other aircraft.

Improved Standard of Helidecks and Equipment
In the early 1990s, the CAA carried out a series of helideck surveys on behalf of the Health and Safety Executive (HSE), which identified helideck and equipment deficiencies and non-compliances with regulations and codes of practice. The outcome from these surveys led to the introduction of the British Helicopter Advisory Board (BHAB) Helideck Inspection Regime (now known as the Helideck Certification Agency) to undertake routine helideck examinations and acceptance for flight operations on behalf of the helicopter operators.

Improved Helideck Operating Standards and Guidelines

Guidelines for the Management of Offshore Helideck Operations were initially developed by industry and other stakeholders in response to the HSE/CAA offshore helideck operations inspection programme. These guidelines were first published by UKOOA (now Oil & Gas UK) in 1993. They are regularly reviewed and were last updated in April 2011 (Issue 6) and re-titled *Guidelines for the Management of Aviation Operations*. Subsequently, various sections have been updated to reflect latest best practice and the interim amendments circulated to industry. In mid-2015, Oil & Gas UK and its members embarked on a process to update the document as *Aviation Operations Management Standards and Guidelines* while harmonising the structure with the International Association of Oil & Gas Producers' *Aviation Management Guide*. When published, it will be available on Oil & Gas UK's website so that subscribers can be assured they are working with the latest version.

Offshore Flights Restricted in Poor Weather Conditions

Due to the findings of a fatal accident near Cormorant Alpha in 1992, industry introduced operating policies to improve the management of helicopter operations in adverse weather conditions. With the emergence of CAA's CAP 1145 in 2014, more stringent requirements have been introduced.

Training and Competence of Helideck Crews

The training and competence of helideck crews was challenged in the early 1990s, leading to the development of competence-based training requirements by industry and other stakeholders. The latest industry standards were issued by OPITO in early 2013 and a project commenced in early 2015 to revisit offshore helideck teams, radio operators and met observer training requirements and competence standards to ensure they remain fit for purpose. In May 2016, Oil & Gas UK *Aviation Operations Management Standards and Guidelines PART D – Personnel Training and Competence* was published following an industry-wide effort to bring the structure and content for helideck teams training and competence up-to-date. The new requirements are now being collectively progressed by industry into a revised set of OPITO standards.

Greater Focus on Safe Helidecks and Helicopter Operations

An offshore helideck is a collection of systems, some of which are safety-critical. Duty holders must identify such systems and have them independently verified as required by The Offshore Installations (Offshore Safety Directive) (Safety Case etc) Regulations 2015.

The Introduction of Crew Resource Management

Helicopter operators, in conjunction with the CAA, developed and introduced systems to improve crew resource management (CRM). The CRM training provides crews with skills for more efficient flight management. Progressively, since the late 1980s, multi-crewing and pilots rated for instrument flying have been introduced for UK offshore flights.

Extension of VHF Communications Coverage and Introduction of Multilateration Flight Surveillance for the North Sea

In 2004, the UKOOA (now Oil & Gas UK) Aviation Safety Technical Group (ASTG) initiated a joint project with National Air Traffic Service (NATS) to assess the efficiency and coverage of offshore helicopter VHF aeronautical communications and fight surveillance provided on the UKCS. The outcome led to wholescale modernisation of offshore VHF aeronautical communications and the development and installation of a new multilateration flight surveillance system. This significant investment has greatly enhanced air traffic control on the UKCS. The new systems became operational in 2010 and the wide area multilateration (a world-first over such a large area of sea) has been welcomed by air traffic controllers as a surveillance tool that is the equivalent of radar.

The East Shetland Basin, however, continued to rely on the radar situated on the Gullfaks platform for its flight surveillance. However, this system is being retired from service having reached its projected end of life. The Norwegian Air Traffic Control now use the alternative ADS-B system. A NATS project is now under way to extend the UK multilateration system into this offshore region.

Helimet Meteorological Project

In 2009, in response to a new CAA requirement, Oil & Gas UK led a project to provide a UKCS-wide automatic, meteorological recording and reporting network to improve the accuracy of weather information for offshore helicopter flight crews. The Helimet project entailed installing specialist meteorological equipment and software on designated hub installations and providing training to offshore personnel in its use. The system became fully operational in 2012 and continues to develop through software updates and improved management processes, with work in 2015 to improve operator response time to equipment outages and to improve met reporter training. To date, more than 1,000 offshore personnel have received training in providing flight crews with real time met data. The system is regarded by flight crews as an excellent flight planning tool.

Civil Aviation Authority Research Projects

Some of the above initiatives have been part of the extensive research into improving offshore helicopter flight safety that has been on-going since the *Helicopter Airworthiness Review Panel (HARP) Report* was published by the CAA in 1984 (CAP 491) and, subsequently, the *Review of Helicopter Offshore Safety and Survival (RHOSS) Report*, which was published in 1995 (CAP 641). Areas of CAA research also relate directly to AAIB Safety Recommendations arising from offshore accidents.

Research projects that have already significantly contributed to improving offshore helicopter flight safety and those currently in progress are listed below:

- **Helideck Motions on Floating Platforms and Vessels**

  A significant amount of research has been carried out into the effects of the motion of helidecks on floating platforms and vessels on helicopters. New, scientifically derived, operating limits (motion and wind severity indices (MSI and WSI)) have been developed and directly relate to the risk of the helicopter tipping or sliding while landed on a moving deck. Establishment of the MSI/WSI-based helicopter operating limits scheme is nearing completion.

- **Environmental Hazards Around Offshore Platforms**

  According to pilot opinion (referred to in CAA Paper 97009), turbulence represents the greatest safety hazard and largest source of flight deck workload for crews landing on offshore helidecks. A research project, funded jointly by HSE and CAA and reported in CAA Paper 99004, investigated the nature and extent of environmental hazards around offshore helidecks, installations and vessels. Follow-on work to establish better aerodynamic criteria for validating helideck designs has also been completed and new guidance material issued[1].

- **Helideck Lighting**

  Green perimeter lighting was adopted as an international standard on offshore helidecks following the CAA's research on lighting systems to enhance visual cues for landing at night. Green perimeter lighting has been in use on the UKCS for the last four years in conjunction with improved floodlighting.

  The CAA's research also identified the significant benefits of lighting the aiming circle and 'H' marking. Following successful trials during winter 2012-13, these new lighting systems are now being installed, with a requirement for them to be fitted on all UKCS offshore helidecks by mid-2018. Step Change in Safety is monitoring implementation and working with industry to meet this deadline.

- **Helicopter Emergency Flotation**

  This project is directed at achieving practical improvements in the crashworthiness of flotation equipment to enhance survivability post impact with water and to provide a fall-back, side-floating, attitude in the event of capsize following a ditching. Hydrodynamic model tests of potential systems have been carried out and are reported in CAA Paper 97010. Escape trials from a side-floating helicopter have been successfully performed using a helicopter underwater escape trainer (HUET) and are reported in CAA Paper 2001/10. This research is now being reviewed for incorporation in the European Aviation Safety Agency's (EASA) regulations for new helicopters and will also be considered for application to existing aircraft.

  The introduction of Category A Emergency Breathing System following the publication of CAA's CAP 1145 will also make it easier and safer for survivors to escape from helicopters after a ditching or impact with water.

- **Preparation of Comprehensive Offshore Helideck Design Guidelines**

  Detailed offshore helideck design guidelines have been developed in response to one of the recommendations in CAA Paper 99004 (see above), which identified that some offshore helideck and installation operations can create problems that potentially affect flight safety. Problems may be caused by helideck layout and equipment deficiencies, structure-induced turbulence, hot gas plumes generated by turbines and flares, or the effects of wave-induced motions on helidecks on floating structures and vessels. These aspects often result in operating limits being imposed by helicopter operators. The guidelines were published in June 2004 in CAA Paper 2004/02 and have since been updated and re-issued in CAA Paper 2008/03, which is referenced from CAP 437.

[1] See http://publicapps.caa.co.uk/docs/33/2008_03.pdf

- **Helicopter Operations Monitoring Programme**
  Independent and continuous monitoring of flight operations allows helicopter operators to identify and address operational weaknesses (such as shortfalls in airmanship, training or procedures) and obtain better information on operational difficulties caused by environmental factors, such as weather, and thereby minimise risks. Trials of the Helicopter Operations Monitoring Programme (HOMP) commenced in 2000 and were so successful that, in 2002, the industry committed to full-scale implementation within a short time frame. The original in-service trials of HOMP are reported in CAA Paper 2002/02 and extension of the trials to a second helicopter operator and a second helicopter type are covered in CAA Paper 2004/12.

- **Forecasting / Predicting Triggered Lightning Strikes**
  Responding to requests from industry, the CAA collaborated with the UK Met Office to investigate and demonstrate the feasibility of forecasting/predicting triggered lightning strikes on helicopters. Oil & Gas UK, CAA Norway, CHC Helicopter and seven individual oil and gas companies have funded the project and the initial work was completed in June 2011. In-service trials continued throughout the winters of 2011-12 and 2012-13 and, following further refinements in 2015, the system was considered sufficiently mature to be made available to the helicopter operators who can now access forecast lightning data on the Met Office OHWeb weather information system.

- **Helicopter Terrain Awareness Warning Systems**
  This project entails modifying existing equipment to increase warning times available to pilots in the event of an impending impact with the sea, and to also reduce the 'nuisance' alerts prevalent in current systems. Significant improvements have been developed and tested on helicopter flight data from both routine operations and from accidents. The next stage will look at the design of warnings to be presented to flight crews and test the complete new scheme in flight simulator trials.

- **GPS-Based Instrument Guidance for Offshore Approaches**
  In this initiative, new equipment and procedures are being developed and demonstrated that will improve the safety of offshore operations in conditions of low visibility and at night by delivering the helicopter in a stable condition at a point from which it can be safely flown to the helideck by the pilot. A significant amount of work, including flight trials, has already been completed and is reported in CAA Papers 2000/05, 3003/02, 2003/07, 2009/06 and 2010/01. One more flight trial, to be conducted at night, is required followed by in-service trials.