

## **Research Update for 21 November 2013 HSRMC Meeting**

Note: Item numbers correspond to the joint industry HSRMC research programme.

### **1 HUMS**

All work on the advanced HUMS VHM data analysis using Advanced Anomaly Detection (AAD) techniques has been completed, and the overall final project report has been published on the CAA's website as CAA Paper 2011/01. The summary of the HSRMC-funded S61 and S.Puma MRGB seeded defect testing will be produced and published separately in due course.

Overall the project has been very successful and Oil & Gas UK are progressing implementation. AgustaWestland have licensed the GE system for the AW139 which was presented at the 11 December 2012 ASTG meeting. Eurocopter is developing its own version of AAD initially for implementation on MARMS HUMS on the EC225 and EC175; presentations were given at the ASTG meetings on 14 December 2011 and 18 September 2012. Sikorsky is developing an equivalent system for the S92 for which some information has been received. See separate ASTG agenda item for further information.

Related AAIB Safety Recommendations:

- Aircraft Accident Report 2/2011, G-REDL near Peterhead, Safety Recommendation 2011-041.

### **2 Side-Floating Helicopters**

Ditching, Water Impact and Survivability: The EASA review of the regulations and advisory material on ditching and water impact (Rule-making task ref. RMT.0120 (27&29.008)) was launched in January 2013 and has met a further two times. The last meeting was held at Helitech in London from 23 through 27 September 2013 and resulted in broad agreement of a 'straw man' for the Notice of Proposed Amendment (NPA). This will now be 'fleshed-out' for discussion and agreement at the next meeting set for 25-27 March 2014 at EASA in Cologne. The NPA is scheduled to be published mid-2014 and the final decision is due by September 2015.

The initial scoping study commissioned by C-NLOPB at Oceanic Consulting Corporation in Newfoundland has been completed and reported. The S92 wave tank trials have been commissioned. These will involve benchmarking the testing against Sikorsky results, evaluating the addition of scoops to the sponson floats, and evaluating a number of side-floating configurations and failure cases. The UK CAA will be assisting with the monitoring of this project.

EBS Specification: The development of the example draft technical standard for EBS contained in CAA Paper 2003/13 into a full specification has been completed and the overall project report, including the technical standard, has been published in CAP 1034. The standard may be used by industry on a voluntary basis to review existing EBS provision. In addition, the work has been presented to the ditching Rule Making Task and EASA may decide to develop the specification into a formal standard (ETSO).

The TSB in Canada has recommended that EBS be mandated for overwater flights in its Aviation Investigation Report (A09A0016) on the March 2009 S92 fatal accident; compressed air-type EBS has now been introduced.

Presentations on the work have been given at the 11 May 2010 HSRMC meeting, the 8 June 2011 Oil & Gas Aviation Symposium, the 5/6 December 2011 EASA ditching workshop and the 23-27 September EASA RMT.0120 meeting.

Related AAIB Safety Recommendations:

- Aircraft Accident Report 2/93, G-TIGH near the Cormorant 'A' platform, East Shetland Basin, Safety Recommendations 93-26, 30 and 31.
- Aircraft Accident Report 7/2008, G-BLUN at the North Morecambe gas platform, Safety Recommendation 2008-036.
- Aircraft Accident Report 1/2011, G-REDU at the ETAP Central Production Facility Platform, Safety Recommendation 2011-065.

### **3 Operations to Moving Decks**

The initial sea trials on the Maersk GP III commenced on 13 February 2012 and were temporarily suspended at the end of May 2012 pending review of the results with trials participants and other key industry representatives on 17 July 2012. The trials have been reported by Atkins, the research contractor, and the main issue identified was the conspicuity of the repeater lights on the helideck. Modifications to the system to address this aspect and other developments have been agreed which will be evaluated in further trials.

The current plan is to launch an initial system in CAP 437. The scope of this system was discussed with the HCA Helideck Steering Committee at their 27 February 2013 meeting. The following elements were reviewed and agreed:

- New heave rate measure (SHR) – the modified version of this (hysteresis added) has been tested off-line on data from the Foinaven FPSO and the Alliance DSV; it should ideally be trialled in-service before being widely introduced.
- Helideck traffic lights – this addresses misreporting of deck motion which accounts for about a third of the related MORs.
- Relative wind monitoring - this addresses the West Navion accident scenario (G-BKZE, November 2001, which involved loss of vessel heading control), and the passage of line squalls while on-deck (NB: Also applicable to fixed helidecks.)
- Initial MSI/WSI advisory only limits – initial advisory limits will be produced for the S.Puma and S76; it is intended that limits for the AW139 and S92 will follow.
- New HMS display – human factors design principles have been employed to develop an improved 'standard' display and to incorporate the additional information required for the new scheme.

A further meeting with HCA Helideck Steering Committee representatives has been scheduled for 29 November 2013 to finalise details prior to issue of the ITT for the trials HMS.

The status of the other work streams is as follows:

- 1) Reporting – the project report is being updated to incorporate new work completed and will be restructured to facilitate future updates.
- 2) Definition of initial system for roll-out – the technical specification for HMS has been finalised following discussions with HCA and a tender is to be issued for

the production of equipment. Discussions with a lighting manufacturer regarding the repeater lights are ongoing and it may be necessary to tender the work for the development of the repeater lights.

- 3) GP III trials – analysis of vessel motions and helicopter FDR data collected during the trials has been analysed in detail and reported in an Atkins Technical Note.
- 4) Further development of MSI/WSI – additional tasks have been identified, agreed and costed with Atkins and have been contracted. Further work is likely to emerge under the collaboration with AgustaWestland which is being pursued.
- 5) Calculation of helicopter type-specific limits – this is currently expected to be progressed with AgustaWestland.

It is envisaged that once a validated type-specific limit is available for a helicopter and incorporated in its Flight Manual, it will then be permissible to take credit for the MSI/WSI and consider relaxing the pitch/roll/inclination/heave rate limits for touchdown (provided that the MSI/WSI is within limits). In this case, the MSI/WSI will become a red 'do not land' limit.

The HELIOS Joint Industry Project (JIP) on operations to moving decks run by MARIN in the Netherlands does not appear to be making any progress.

Presentations on this project have been given by Atkins at the Oil & Gas Aviation Seminar in September 2010, by the CAA at the EASA Rotorcraft Forum in December 2010, and by Atkins at the September 2012 European Rotorcraft Forum.

Related AAIB Safety Recommendations:

- Aircraft Accident Report 3/2004, G-BKZE at the West Navion drill ship, Safety Recommendations 2003-133 and 135.

#### **4 Helideck Lighting**

All work on the development and validation of the specification has been completed and reported in CAP 1077. The specification was added to CAP 437 in the 7<sup>th</sup> Edition issued in February 2013. Letters to industry advising the CAA's position on helideck lighting and the timescales for the introduction of the new lighting have been issued. A working group has been established by Oil & Gas UK to pool experience and expertise to address installation issues; three meetings have been held on 16 April, 5 June and 18 October in 2013 and good progress is being made. Also forming part of the research project, a second system is to be installed on the BP Miller platform; the equipment has been delivered and installation awaits certification of the attachment method.

Presentations on this project have been given by the CAA at the 10 June 2008 Oil & Gas UK Aviation Symposium, the 11/12 June 2008 RAeS Maritime Operations of Rotorcraft conference, the 22-24 March 2010 CHC Safety & Quality Summit, and the 21/22 September 2010 OGP Aviation Sub Committee.

Related AAIB Safety Recommendations:

- Aircraft Accident Report 5/88, G-BHYB near the Fulmar A oil platform, Safety Recommendation 4.4.
- Aircraft Accident Report 1/2011, G-REDU at the ETAP Central Production Facility platform, Safety Recommendation 2011-053.

## 5 HOMP

The remaining HOMP research is the provision of a measure of low airspeed for use in the ground-based analysis system. This work has been using a database of Bristow S.Puma data including low airspeed as measured by a HADS. As a result of the work completed to date, it has now been established that this data is unreliable due to the HADS sticking. Although it is now clear that flight trials will need to be performed to generate a new database, the more recent analysis performed by GE Aviation has demonstrated significant potential of the concept. The final report on the GE work has been completed and accepted.

EASA have tendered a research project to develop a low airspeed sensor for helicopters which, if successful, could negate the need for this work. Unfortunately no bids for the project were received.

On a more positive note, a side meeting for helicopter operators was held at the FDM Forum on 29 November 2012. It was agreed that a helicopter operator user group be established. The first meeting is scheduled to be held on 2 December 2013.

## 6 Offshore Approaches

Work completed and reported to date comprises:

- Trials of Differential GPS (DGPS) guided offshore approaches – see CAA Paper 2000/05.
- Follow-on studies to DGPS trials - see CAA Paper 2003/02.
- Effect of helicopter rotors on GPS reception; data collection trials and analysis – see CAA Paper 2003/07.
- Three-phase hazard analysis covering en-route navigation, WXR approaches and GPS enhanced WXR approaches - see CAA Paper 2009/06.
- The EU 6<sup>th</sup> Framework GIANT work including the design, hazard analysis and simulator trials of the SBAS Offshore Approach Procedure (SOAP), and EGNOS reception trials – see CAA Paper 2010/01.

The current stage of the project, called HEDGE, forms part of an EU 7<sup>th</sup> Framework project. The work essentially comprises the production and trials of a demonstrator SOAP system and the following additions to the project have been identified:

- integration of AIS into the navigation display;
- demonstration of the integration of SOAP with the enhanced helideck lighting;
- safety assessment of the visual segment; and
- addition of RNAV guidance to assist shuttling.

The AIS work package (first bullet above) and the demonstration of the integration of SOAP with the enhanced helideck lighting (second bullet above) have both been contracted. Some work on the safety assessment of the visual segment (third bullet above) was performed by a PhD student at Imperial College; a presentation on Felipe Nascimento's work was given at the 11 May 2010 HSRMC meeting.

The first set of flight trials were performed over the weekend of 29/30 January 2011; the CAA was briefed on the results on 7 March 2011. Of particular note, the AIS was well received by the pilots and found to be very helpful in improving situational awareness. Some refinements to the trials system were identified and implemented for the second set of daylight trials which took place over the weekend of 12/13 November 2011. A report on the evaluation of AIS and an interim report

covering the second set of daylight trials has been produced and accepted. The report on the first set of daylight trials has been produced for the EU and will be incorporated in the final report for this project. Night trials will be considered when a helideck fitted with the new lighting system (see item 4 above) is available in the North Sea, currently expected to be the BP Miller platform.

In the meantime, Helios Technology have been awarded further EU Framework project called HEDGE NEXT. This will involve simulator trials to further develop the approach procedure focussing, in particular, on the visual segment and interfacing the procedure to low level RNAV routes. A workshop was held at Helios on 3 December 2012 to discuss this work and some operational concepts in need of investigation were identified for further consideration.

Discussions with Eurocopter were held on 26 October 2011 concerning the design of an interim approach guidance system. This scheme included many features of SOAP and would pave the way for the future implementation of SOAP. Sikorsky have developed a system similar to SOAP for the S92 which has been certificated by the FAA and which was announced at the 4 June 2013 Oil & Gas UK Aviation Seminar.

Presentations on this project have been given by Helios at the 10 June 2008 Oil & Gas UK ASTG Seminar and at the 11/12 June 2008 RAeS Maritime Operations of Rotorcraft conference, and by the CAA at the 2-3 December 2009 EASA Rotorcraft Symposium and the 22-24 March 2010 CHC Safety & Quality Summit.

Related AAIB Safety Recommendations:

- Aircraft Accident Report 5/88, G-BHYB near the Fulmar A oil platform, Safety Recommendation 4.4.
- Aircraft Accident Report 7/2008, G-BLUN at the North Morecambe gas platform, Safety Recommendation 2008-033.

## **7 Helideck Friction**

The programme of work comprising a review of the current helideck friction measuring techniques has been completed by NLR. In essence, the work confirms that devices like the Finlay Irvine GripTester are the most appropriate type of device for measuring helideck friction. (NB: HCA have acquired one of the new Micro GripTesters which has been repackaged in a helicopter transportable form.) The final report was circulated with a CAA foreword for industry comment/consultation and all responses have been answered. The report will be published as a CAA paper together with the ongoing work on aluminium decks and helideck nets when this has been completed (see below).

The contract with NLR was extended to add the work on establishing a new test criterion for aluminium helideck surfaces. This involved full scale testing of five different types of aluminium deck surface using actual S61 and S76 wheels mounted on a test rig. All variables expected to be relevant were exercised. The work has been completed and the report delivered, accepted and circulated to the five aluminium deck manufacturers known to the CAA for comment by end November 2012. No significant comments were received. The results indicate that none of the aluminium decks tested met the minimum  $\mu$  value of 0.65 stipulated in CAP 437, despite evidence of acceptable GripTester results. The full scale test results were found to vary significantly with tyre contact pressure and it is suspected that this may explain the favourable GripTester results which may need to be scaled to be representative. The final report will be circulated for wider industry comment/consultation in due course.

Current practice in the event of a helideck not meeting the minimum CAP 437  $\mu$  value of 0.65 is to fit a helideck net. However, the effectiveness of helideck nets has never been confirmed experimentally and has been further called into question following the move from the 'standard' 20 mm sisal rope nets to the low profile FricTape nets following the introduction of the 25 mm obstacle height limit by ICAO. NLR was consequently tasked with conducting an initial, limited programme of full scale tests on helideck nets. These were performed with a single net (FricTape), and single helicopter wheel (S61) and a plain/smooth aluminium dummy deck panel (to 'isolate' the effect of the net). The testing has been completed and the results show that the net produces peak  $\mu$  values of around 0.65; the netted surface should ideally produce an average  $\mu$  value of at least 0.65. The CAA and NLR are collaborating with FricTape, the net manufacturer, who have also conducted their own tests. The NLR and FricTape results are quite similar and, interestingly, FricTape obtained better results at lighter helicopter wheel loads. Lighter wheel loads are associated with higher winds which cause the helicopter main rotor to generate more lift, helpfully coinciding with the need for friction to resist the sliding forces due to wind drag which also increase with wind speed. NLR have been tasked with performing further net testing to:

- repeat the baseline testing with a smaller (S76) wheel;
- repeat the baseline testing at lighter wheel loads corresponding to 15, 35 and 50 kt side winds applied to an S76 main rotor at MPOG; and
- investigate the effect on contact pressure on friction with 'normal' friction surfaces.

Related AAIB Safety Recommendations:

- Although there are no AAIB Safety Recommendations that correspond directly, this work is closely related to the work on operations to moving decks.

## 8 Helideck Environmental Research

All research has been completed and reported and, where applicable, incorporated in CAP 437. Attention is presently being focussed on the use of helicopter FDM to map and monitor the environments around offshore platforms.

### Turbulence:

The final report on the validation of the turbulence criterion (CAA Paper 2008/02) recommends that helicopter FDM data be routinely collected and analysed to monitor the turbulence environments around offshore platforms, providing quantitative feedback for improvement and refinement of the HLL and, possibly, further tuning of the criterion. A presentation to HCA and the helicopter operators to promote this use of HOMP data was given in Aberdeen on 7 November 2006 and was well received. All information necessary to implement the algorithm in HOMP has been provided to the helicopter operators and their HOMP system suppliers. A further presentation was given at the 16 April 2008 HMLC meeting, and this was repeated at an ad-hoc CAA/CHC meeting held on 7 November 2008.

Disappointingly, virtually no progress in implementing this scheme has been made by the helicopter operators, despite its value and importance being emphasised by the findings of an audit of HCA by the CAA. It appears that few flow studies are being commissioned by the industry and no flow study results are being received by HCA, and this situation is being exacerbated by poor reporting by flight crews; very few turbulence report forms are ever received.

### Turbine Exhaust Plumes:

The final report on the visualisation of offshore gas turbine exhaust plumes (CAA Paper 2007/02) recommends that helicopter FDM data be routinely collected and analysed to identify 'problem' platforms for consideration for installation of a plume visualisation system. The importance of this hazard was highlighted by the issue of Sikorsky Safety Advisory SSA-S92-10-002 in April 2010 concerning flight through high temperature exhaust plumes.

More recently, some issues regarding the modelling of turbine exhaust plumes have been raised by Peutz bv in The Netherlands. In essence, the suitability of CFD for these exercises has been called into question.

### Related AAIB Safety Recommendations:

- AAIB Bulletin 3/96, G-AYOM at the Claymore Accommodation Platform, Safety Recommendation 96-1.

## **9 Extension of HUMS to Rotors**

The initial study on extending HUMS to rotors comprised a review of all relevant work (including the earlier HSRMC-funded studies) in order to form a consolidated view of the state of the art of the application of VHM techniques to the detection of rotor system Potentially Catastrophic Failures (PCFs). The study has been completed and was published in CAA Paper 2008/05.

Further work entailing the application of the AAD techniques developed on the transmission HUMS research (see item 1 above) to in-service tail rotor HUMS data was contracted to GE Aviation and has been completed. The slightly mixed results of this work were presented at the 7 December 2009 HSRMC meeting. Whereas it seems possible to detect faults prior to the start of the last flight (provided that both axial and radial vibration data are available), on-board analysis would be required to provide timely warnings. The main problems are the 'noisy' nature of the data and, in the case of the S.Puma study, the lack of axial vibration data. The final report on this work has been completed and accepted, and has been published as CAA Paper 2012/01.

As regards main rotor health monitoring and further work on tail rotors, following extensive negotiations the CAA and AgustaWestland (AW) have agreed a Non-Disclosure Agreement (NDA) which has enabled the CAA to participate in the AW Rotorcraft Technology Validation Programme (RTVP). This major programme includes significant work on rotor HUMS. The initial meeting between the CAA and AgustaWestland was held on 1 February 2012 at which GE Aviation presented the work on the application on AAD to tail rotor VHM data. A progress meeting with AW was held on 20 June 2012 and further meetings will be scheduled at appropriate points in the programme. AW have provided the CAA with presentations to brief the 16 May and 20 November 2012 HSRMC meetings, and provided a brief at the 11 December 2012 ASTG meeting. It is hoped that EASA will be able to participate but that seems unlikely at present due to lack of resources.

### Related AAIB Safety Recommendations:

- Aircraft Accident Report 1/2005, G-BJVX near the Leman F platform in the North Sea, Safety Recommendation 2004-040.
- Aircraft Accident Report 7/2010, G-PUMI at Aberdeen Airport, Safety Recommendation 2010-027.

## 10 Tail Rotor Strike Warning

A feasibility study on the provision of a tail rotor strike warning system is included in the joint industry HSRMC work programme, but insufficient funding is available to proceed at present.

## 11 TCAS

All work including dedicated and in-service trials have been completed outside of the HSRMC research programme by Bristow Helicopters. Bristow has EASA TCAS II STCs for the AS332L, S92 and S76 and has applied for an FAA STC for the S92 with the FAA doing a demo flight probably in December 2012. All UK Bristow S92s have TCAS II and the S76C++ fleet is being equipped. Eurocopter has a TCAS II system certified for the EC225 which will be an option on the EC175. AgustaWestland is to offer TCAS II on the AW189. Sikorsky has no TCAS II systems yet but has plans. Bristows are retrofitting their fleet; the other operators have been slower on the uptake.

A presentation of the work at Bristows was given to the 54<sup>th</sup> HSRMC meeting on 30 January 2008, at the 16-19 September 2008 European Rotorcraft Forum in Liverpool, and at the 2-3 December 2009 EASA Rotorcraft Symposium.

## 12 EGPWS Warning Envelopes

This project comprises the development of improved 'Classic Mode' EGPWS warning envelopes for offshore helicopter operations, and effectively addresses a number of AAIB Safety Recommendations made in the report on the accident to G-REDU in February 2009 near the ETAP platform.

Eurocopter EC225 flight data from Bristow Helicopters' Flight Data Monitoring (FDM) programme has been used to establish the limits of normal operations. This has enabled the Classic Mode warning envelopes and their associated input parameters to be refined, and has also allowed new warning envelopes to be developed. The revised and new warning envelopes have been tested using the available data from four accidents and have demonstrated a worthwhile improvement in performance in terms of warning time with a 'nuisance' alert rate of better than 1:100 flights. An interim report covering that work was produced and circulated to relevant industry contacts on 20 February 2012.

The project was extended to cover the Sikorsky S76A+ to investigate whether a single set of HTAWS 'classic mode' warning envelopes could be produced to cover both helicopter types that maintained a 'nuisance' alert rate of no worse than 1 in 100 flights and still provided significantly enhanced warning times. This has been successfully achieved which is especially encouraging as it is believed that, as well as covering the spectrum of helicopter technological standards, a broad range of types of operation has also been addressed. The Bristow S76A+ fleet used for this study are operated in the southern North Sea which involves a lot of manual flying and low level shuttling, which is quite distinct from the EC225 style of operation in the northern North Sea.

The next step in the project will be to examine the form and format of the associated warnings. Simulator trials are then envisaged both for flight crew evaluation of the complete system and also to generate further 'accident' examples for testing the envelopes. A specification for this work has been produced and agreed; it is expected that the work will be tendered before end 2013 following receipt of initial funding from the Oil & Gas UK. This project was proposed by Bristow Helicopters and Shell Aircraft and is being jointly funded by Bristow Helicopters, OGP, Shell Aircraft, Oil & Gas UK and BP.

Presentations on the work to date were given to the 28/29 September 2011 OGP Aviation Safety Committee, the 8 November 2011 HSRMC meeting and the 7/8 December 2011 EASA Rotorcraft Symposium.

Related AAIB Safety Recommendations:

- Aircraft Accident Report 1/2011, G-REDU at the ETAP Central Production Facility platform, Safety Recommendations 2011-060, 061, 062 and 063.

### **13 Triggered Lightning Strike Forecasting**

A programme of work to investigate and demonstrate the feasibility of forecasting/predicting triggered lightning strikes to helicopters has been undertaken in response to requests from industry. The work is being performed by the UK Met Office and is funded by Oil & Gas UK, CAA Norway, CHC and seven individual oil/gas companies.

The Met Office helicopter triggered lightning product has been evaluated through in-service trials on the OHWeb weather information service during winter 2012/13 'lightning season' by all three Aberdeen-based helicopter operators. Overall, the trials are considered to have been successful and it has been agreed that the system remain operational on OHWeb going forwards. Some improvements were made during the trial that, although showing good promise, have yet to be fully evaluated. In addition, following a review of the trials results some further enhancements have been identified for incorporation in the product. Although the product is considered to be relatively mature, it is therefore proposed that it remain under the review and direction of the project team for a further 'season' covering the winter 2013/14 period.

A project review meeting took place on 16 September 2013 at which agreement of the configuration of the system and agreement to proceed with a further operational trial was obtained from all parties; the winter 2013/14 trial commenced on 1 October 2013. The project report will be updated following completion of the current trial in spring 2014 and published by the CAA in the form of a CAP.

Presentations on this work have been given at the 8 June 2011 and 13 June 2012 Oil & Gas UK Aviation Seminars.

Related AAIB Safety Recommendations:

- Aircraft Accident Report 2/97, G-TIGK North Sea 6 NM south-west of the Brae A oil platform, Safety Recommendation 95-45.

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## Nomenclature

AAD	Advanced Anomaly Detection
AAIB	Air Accidents Investigation Branch (of the UK DfT)
AIS	Automatic Identification System
CAA	Civil Aviation Authority (UK)
CAP	Civil Aviation Publication (UK CAA)
CFD	Computational Fluid Dynamics
C-NLOPB	Canadian Newfoundland and Labrador Offshore Petroleum Board
DGPS	Differential GPS
EASA	European Aviation Safety Agency
EBS	Emergency Breathing System
EGPWS	Enhanced Ground Proximity Warning System
EHEST	European Helicopter Safety Team
ETSO	European Technical Standards Order
EU	European Union
FDM	Flight Data Monitoring
FDR	Flight Data Recorder
FPSO	Floating Production Storage & Offloading
GE	General Electric
GIANT	GNSS in Aviation
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
HADS	Helicopter Air Data System
HCA	Helideck Certification Agency
HEDGE	Helicopters Deploy GNSS in Europe
HLL	Helideck Limitations List
HMS	Helideck Monitoring System
HOMP	Helicopter Operations Monitoring Programme
HSE	Health & Safety Executive (UK)
HSRMC	Helicopter Safety Research Management Committee
H-TAWS	Helicopter TAWS
HUMS	Health & Usage Monitoring System
ICAO	International Civil Aviation Organization
JIP	Joint Industry Project
MOR	Mandatory Occurrence Report
MRGB	Main Rotor Gear Box
MSI	Motion Severity Index
NDA	Non-Disclosure Agreement
NPA	Notice of Proposed Amendment
OGP	International Oil & Gas Producers Association
OGUK	Oil & Gas UK
OHWeb	Offshore Helicopter Website (weather information)
PCF	Potentially Catastrophic Failure

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RAeS	Royal Aeronautical Society (UK)
RNAV	Area Navigation
RTVP	Rotorcraft Technology Validation Programme
SBAS	Space-Based Augmentation System
SHR	Significant Heave Rate
SOAP	SBAS Offshore Approach Procedure
TAWS	Terrain Awareness Warning System
TCAS	Traffic Alert & Collision Avoidance System
VHM	Vibration Health Monitoring
WSI	Wind Severity Index
WXR	Weather Radar

**Proposed HSRMC Research Programme – Funding Status as at  
21 November 2013**

Item	CAA Project Code	Title	Funding Status
<b>1. ONGOING WORK</b>			
1	5.1	HUMS - advanced analysis of HUMS data.	Study completed. Final report published in CAA Paper 2011/01.
2	5.3	Ditching/Water Impact - side floating helicopter design study.	Study completed by Eurocopter/Aer Azur under contract to EASA. Final report published on EASA's website.
		Ditching/Water Impact - EBS specification.	Study completed. Final report being published as CAP 1034.
		EASA Rule Making Task RMT.0120 (27&29.008).	Sufficient funding available to complete all work currently identified.
3	5.10	Operations to Moving Helidecks – generation of MSI / WSI operating limits and in-service trials.	Sufficient funding available to complete all work currently identified.
4	8.2	Helideck Lighting - in-service trials of new scheme (circle & 'H' lighting).	Sufficient funding available to complete all work currently identified.
5	14.3	HOMP - extension to low airspeed regime.	Project on hold.
<b>2. EXTENSIONS TO EXISTING PROGRAMMES</b>			
6	5.7	Offshore Approaches (GIANT) – development and simulator evaluation of 'full' GPS approach + EGNOS reception study.	Study completed. Final report published in CAA Paper 2010/01.
		Offshore Approaches (HEDGE) – <ul style="list-style-type: none"> <li>demonstration of the integration of the SOAP procedure with the enhanced helideck lighting;</li> <li>safety assessment of the visual segment;</li> <li>integration of AIS into the navigation display; and</li> <li>addition of RNAV guidance to assist shuttling.</li> </ul>	Sufficient funding available for AIS receiver integration and flight demonstration of integration with helideck lighting only.
7	8.1	Helideck Friction - review of measuring techniques.	Study completed. Final report to be published as a CAA paper.
		Helideck Friction – testing of aluminium decks and development of pass/fail criterion.	Study completed. Final report to be published as a CAA paper.
		Helideck Friction – effect on resistance to sliding of landing nets.	Sufficient funding available to complete all work currently identified.
8	8.5	Helideck Environment - review of CAP 437 vertical wind component criterion.	Study completed. Final reports published in CAA Papers 2008/02 and 2008/03.

Item	CAA Project Code	Title	Funding Status
<b>3. NEW PROJECTS</b>			
9	-	HUMS – preliminary study on extension to rotor systems.	Study completed. Final report published in CAA Paper 2008/05.
		HUMS - application of advanced data analysis techniques to HUMS tail rotor data.	Study completed. Final report published in CAA Paper 2012/01.
		HUMS – AgustaWestland’s Rotorcraft Technology Validation Programme (RTVP).	No funding required at this time.
10	5.16	Tail Rotor Strike Warning.	Insufficient funding to proceed at present.
11	-	TCAS - in-service trials.	Trials completed and implementation in progress.
12	-	EGPWS Warning Envelopes.	Initial funding for next phase of work on warning form and format received allowing tendering to proceed.
13	-	Triggered Lightning Strike Forecasting.	Sufficient funding committed to complete all work currently identified.