

Research Update for 27 May 2009 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 anomaly detection techniques has been completed. The final two interim reports covering the second in-service trial and the additional work funded by the FAA on data reasoning are expected in time for review at the next progress meeting with GE Aviation scheduled for 16 June 2009. The overall final project report will be drafted once all interim reports have been completed and agreed. The final report will include a summary of the S61 and S.Puma MRGB seeded defect testing in an appendix which will be written by the CAA.

Overall the project has been very successful. Presentations on this work were given by GE Aviation at the 10 June 2008 Oil & Gas UK ASTG Symposium and at the 11/12 June 2008 RAeS Maritime Operations of Rotorcraft conference. A paper proposing full implementation of the research was presented to the Oil & Gas UK Board on 15 October 2008 and approved. GE Aviation will be progressing implementation via OEMs for aircraft with OEM supplied HUMS. GE Aviation will deal with helicopter operators direct for 'legacy' HUMS. A one-day workshop was held in Aberdeen on 29 April to help to launch implementation and was well attended. An item has been included on the agenda for the 9 June 2009 ASTG meeting with a view to progressing implementation.

2 Side-Floating Helicopters

The contract for the helicopter type-specific design study for side-floating helicopters was let by EASA to Eurocopter and Aer Azur. The work has been completed and two drafts of the final report received and reviewed by EASA and by the CAA (D. Howson). A number of weaknesses in the final report remain, however, and it is uncertain whether these can now be addressed. Nevertheless, the study found the side-floating concept to be practical and effective. The main problem is that the report recommends a symmetric system (without any convincing justification), which leads to unduly pessimistic outcomes in terms of weight, cost and drag. Disappointingly, systems aspects such as deployment have only been superficially addressed and, in a number of areas, the study has not moved the concept forwards very far. EASA had intended to hold a workshop on the subject of ditching and water impact early in 2009 at which Eurocopter were to present their work. This has not taken place and no action has been taken to set it up. An enquiry was recently received from Canada which was directed to EASA; this may serve as a reminder.

EBS is considered to have the potential to mitigate the safety risk associated with water impact/post ditching capsize in the short to medium term pending availability of side-floating emergency flotation systems, and in the long term in the event that retrofit of the side-floating scheme is judged to be impractical. The example draft technical standard for EBS contained in CAA Paper 2003/13 is being developed into a full specification to ensure that any EBS voluntarily deployed truly represents a net

safety benefit. Dr Susan Coleshaw (the author of the study reported in CAA Paper 2003/13) has been contracted to perform this work. The loan of PSTASS equipment from the MoD via DSTL has been organised and the equipment is being prepared for the cold water trials at Portsmouth University. Subject to ethical approval, the cold water trials are expected to take place during June 2009. Ethical approval for the 'warm' water trials at Falck-Nutec has already been granted; they will be scheduled once the cold water trials have been completed. A presentation on this project was given at the 11/12 June 2008 RAeS Maritime Operations of Rotorcraft conference.

3 Operations to Moving Decks

A specification for the vessel motion sensing equipment has been developed jointly with the industry. A meeting was held with the equipment manufacturers on 24 January 2008 to conduct a detailed review of the first draft of the specification; a second draft was produced and circulated and no significant comments received. The specification is being used to define the prototype equipment necessary for the sea trials and, once validated by the sea trials, will be added to the joint UK/Norway guidance material (Norsok Standard).

The next phase of the project is to conduct sea trials to evaluate the use of the equipment by pilots and deck crew and to collect data to enable the present, conservative, MSI/WSI limits to be refined. It is hoped that two trials can be performed ideally covering:

- two vessel types;
- two helicopter operators;
- two helicopter types; and
- two motion sensing equipment systems.

The first trial is to be hosted by Maersk on their Global Producer III FPSO, equipped with a Miros motion sensing system and served by CHC Scotia S.Puma helicopters. An initial meeting of all parties involved was held on 28 April in Aberdeen, and a need to conduct the trials in an incremental fashion was identified. A further planning meeting is to be arranged to conduct a safety assessment of the trials.

Further work on the MSI/WSI operating limits will be needed on completion of the sea trials to address the modelling of helicopter control movement while on deck, and also the phasing of the maximum values of the MSI and WSI, both of which are based on arguably over-conservative assumptions in the present limits. There is a possibility that some or all of this work and more may be funded under a Joint Industry Project (JIP) led by MARIN in the Netherlands. The CAA and Atkins, the CAA's research contractor for this project, are actively involved in the development of the project scope and will participate in the project if it goes ahead.

This project remains a joint UK/Norwegian initiative; the last joint industry meeting was held on 7 December 2007. A presentation on this project was given at the 11/12 June 2008 RAeS Maritime Operations of Rotorcraft conference.

4 Helideck Lighting

The AGI Stage 2 lighting system (green perimeter lights as per Stage 1 plus replacement of floodlighting with lit aiming circle and 'H' marking) has been installed on the Perenco Thames 'A' platform in the southern North Sea and on the Centrica CPC-1 platform in Morecambe Bay.

The system on the Thames 'A' is presently only partially serviceable and negotiations are in progress with the manufacturers (AGI and Orga) to replace it with a production version. It is hoped that this can be accomplished in time for further evaluation during winter 2009/10.

A limited trial of the system on the CPC-1 was conducted during the second half of February 2009. A total of 10 flight crew questionnaires covering 14 landings were received of which seven were very positive, two positive and one neutral. The trial had to be suspended due to some of the lighting panels coming loose which was the result of the way in which the painted 'H' marking had been applied to the helideck. The system was re-installed in early May and the trial recommenced on 14 May. Demonstration flights for UK industry representatives are to be arranged as soon as possible.

The specification for the Stage 2 lighting scheme has been added as an appendix to the 6th Edition of CAP 437 by way of advance information. A meeting with the manufacturers, AGI and Orga, was held on 1 April 2009 and some refinements to the specification have been agreed.

The AAIB report on the accident to G-BLUN in Morecambe Bay (7/2008) published on 17 October 2008 notes that the new helideck lighting may have prevented that accident. AAIB have contacted the CAA regarding this work in the context of the accident near the ETAPS platform in February 2009 and, as a result, the CAA will be presenting the work to the AAIB on 25 June. It is also hoped to extend the proposed demonstration flights for the GPS guided offshore approaches (see item 6 below) to include flights to a platform equipped with the new helideck lighting to show how the two schemes combine to form an integrated solution.

A presentation on this project was given by the CAA at the 10 June 2008 Oil & Gas UK ASTG Symposium and at the 11/12 June 2008 RAeS Maritime Operations of Rotorcraft conference.

In connection with helideck status lights, all work on the testing of flashing lights has been completed and a new helideck status light specification has been published in CAA Paper 2008/01. This supersedes CAA Paper 2003/06 and will be referenced from CAP 437 in the 6th Edition. IMT have now redesigned their helideck status light; it has been independently tested (by Intertek in the USA) against CAA Paper 2008/01 and confirmed to be compliant.

5 HOMP

The remaining HOMP research is the provision of a measure of low airspeed for use in the ground-based analysis system. The original programme of work had reached a point where, in order to make progress, flight trials were needed to generate a new, more accurate database to train the neural network being used. This exercise was to be performed by Bristows but had not progressed due to logistical difficulties. At the November 2006 HMLC Bond kindly offered the use of one of their aircraft for these trials, and an initial meeting between Bond and the CAA was held on 5 June 2007 to discuss how best to take advantage of the offer and move the project forward.

At this point the CAA became aware of staff changes at Westland Helicopters which cast doubt over their ability to complete the work. Advantage was taken of this opportunity to have GE Aviation review the work completed to date. GE have raised a number of points and there is the possibility that better results may be obtainable from the existing data set. The tasks of recovering the original data from tape to CD and replaying the data have been successfully completed, and a sample of the replayed data sent to GE Aviation for review. GE subsequently submitted a costed

proposal for a small feasibility study which has been agreed and accepted, and work is now underway at GE.

6 Offshore Approaches

All work on the three-phase hazard analysis covering en-route navigation, WXR approaches and GPS enhanced WXR approaches has been completed and a final summary report has been produced for publication in the public domain as a CAA paper. The main conclusions are:

- there are no hazards/conflict scenarios worse than TOLERABLE for use of GPS for en-route navigation,
- several UNACCEPTABLE hazards/conflict scenarios remain for the unaided weather radar approach, but
- there are no hazards/conflict scenarios worse than TOLERABLE for the 'new' weather radar approach underpinned by use of existing GPS.

A presentation on the new GPS assisted weather radar approach was given at the 12 November 2008 HMLC meeting, and CAA Flight Operations has written to the helicopter operators with details of the new approach procedure which is to be implemented.

The EU 6th Framework GIANT project work was launched in November 2006 and comprised:

- data collection and analysis to establish the suitability of EGNOS for the offshore helicopter application;
- joint UK/Norway design of a 'full' GPS approach;
- hazard analysis of the 'full' GPS approach; and
- simulator trials of the 'full' GPS approach at Eurocopter.

All of this work has been completed and the project report is presently being finalised. This report will be published in the public domain as a CAA paper later in 2009.

A joint industry meeting on this research was held on 6 March 2009. Presentations on the work performed under the EU 6th Framework GIANT project were given and a draft of the final report circulated for comment by end March 2009. The next stage of the project called HEDGE, which forms part of an EU 7th Framework project, was reviewed and discussed. The work will essentially comprise the production and trials of a demonstrator system and a number of additions to the project were identified for costing. The additions presently proposed include:

- demonstration of the integration of the SOAP procedure with the enhanced helideck lighting;
- safety assessment of the visual segment;
- integration of AIS into the navigation display;
- addition of RNAV guidance to assist shuttling;
- database accuracy offshore; and
- uplinking data to helicopters.

Mainly as a result of the recommendation in the AAIB report on the G-BLUN accident in Morecambe Bay, EASA are taking a keen interest in this research and the possibility of EASA contributing funding to the project is being explored.

A presentation on this project was given by Helios at the 10 June 2008 Oil & Gas UK ASTG Symposium and at the 11/12 June 2008 RAeS Maritime Operations of Rotorcraft conference.

7 Helideck Friction

The contract for a programme of work comprising a review of the current helideck friction criterion in CAP 437 and a review of a range of friction measuring devices was let to NLR in The Netherlands in October 2007. An HCA representative is participating in the monitoring and direction of the project. The experimental work was started in April 2008, some of which was witnessed by CAA and HCA representatives, and has now been completed. The full final report has been received and reviewed, and a meeting to discuss the comments was held at NLR on 22 January 2009. A second version of the report is now being produced.

In essence, the work confirms the Finlay Irvine GripTester to be the most appropriate device for measuring helideck friction. The main problem with this device is its portability but, while the research was being conducted, a smaller more portable friction tester employing the same measurement principle as the GripTester was identified (T2GO, manufactured by ASFT in Sweden). A costed proposal has been received from NLR to add a review of this device to the study for inclusion in the final report, but cannot be progressed until sufficient funding is available.

The establishment of a new criterion for aluminium helideck surfaces forms a contract option. The programme of work for this element was reviewed at the 22 January meeting and the need for a small extension identified, essentially to include helicopter tyre footprint pressure as a variable. A costed proposal for the revised programme of work has been received and contractual proceedings are in progress to add the original work programme to the existing contract with NLR; the additional work will form a costed contract option to be taken up if and when the additional funding can be secured.

8 Turbulence Criterion

All work on the development of the turbulence criterion and the review of the present CAP 437 0.9 m/s vertical wind component criterion has been completed and reported. Following consultation with the industry, the turbulence criterion will be added to CAP 437 in the 6th Edition, and the 0.9 m/s vertical wind component criterion will be removed. The final reports on the HOMP validation of the turbulence criterion and the review of the 0.9 m/s criterion are presently being published in a single CAA paper (CAA Paper 2008/02). The helideck design guidance material published in CAA Paper 2004/02 is being updated to take account of the results of this work, and will be republished in CAA Paper 2008/03. These documents are referenced in the 6th edition of CAP 437. A presentation on this project was given at the 11/12 June 2008 RAeS Maritime Operations of Rotorcraft conference. No further research on helideck environmental issues is currently anticipated.

The final report on the validation of the turbulence criterion recommends that helicopter operational monitoring (HOMP) 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.

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 the overall results are:

- the review of accidents and incidents shows a steady decline in the occurrence rates from the early 1990s; the majority of occurrences are related to the main rotor and the majority of these are related to hub (rather than blade) defects;
- there is no evidence that Vibration Health Monitoring (VHM) would be effective in providing adequate advance warning of main rotor faults; there is some evidence that VHM could help with tail rotor faults; other health monitoring technologies (e.g. strain gauges) might offer benefits;
- the direction of the earlier research is not considered optimal in the context of current knowledge and experience.

The final report has been reviewed and accepted, and has been published in the public domain as CAA Paper 2008/05.

Further work entailing the application of the anomaly modelling techniques developed on the transmission HUMS research (see item 1 above) to in-service tail rotor HUMS data has been contracted to GE Aviation and is under way. Preliminary results are expected to be presented at the next progress meeting scheduled for 16 June 2009.

As regards main rotor health monitoring, a scope of work had been produced for a three-year PhD-based theoretical study of how main rotor defects should manifest themselves and how and where this could be measured. A proposal was discussed at the 18 December 2008 HSRMC meeting and, following input from DSTL, it was agreed to have the proposal reviewed by AgustaWestland. Following consultation with AgustaWestland it has been concluded that the proposal probably does not represent the best way forward, but a meeting with AgustaWestland has been arranged for 20 May to discuss main rotor health monitoring in general with a view to identifying opportunities for collaborative work that HSRMC might consider funding.

10 Tail Rotor Failures

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. It is understood that some work is being performed in this area by Sikorsky in the USA.

11 TCAS

A programme of work has been proposed comprising in-service trials of TCAS II equipment on a North Sea helicopter to establish the feasibility and likely benefits of fleet-wide implementation. A separate trial is already being progressed by Bristow Helicopters.

Bristow Helicopters have completed dedicated flight trials utilising a BAE 146 'intruder' aircraft, and have agreed to provide the CAA with a copy of the associated data and documentation. A presentation of the work at Bristows was given to the 54th HSRMC meeting on 30 January 2008, and at the 16-19 September 2008 European Rotorcraft Forum in Liverpool. The in-service trials commenced in April 2008. It is understood that Bristow Helicopters have committed to fleet wide implementation of TCAS II.

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Proposed HSRMC Research Programme – Funding Status as at 27 May 2009 HSRMC Meeting

Item	CAA Project Code	Title	Funding Status
1. ONGOING WORK			
1	5.1	HUMS - advanced analysis of HUMS data.	Sufficient funding available to complete all work currently identified.
2	5.3	Ditching/Water Impact - side floating helicopter design study.	Contract let to Eurocopter / Aer Azur by EASA.
		Ditching/Water Impact - EBS specification.	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.	Sufficient funding available to complete all work currently identified.
2. EXTENSIONS TO EXISTING PROGRAMMES			
6	5.7	Offshore Approaches – development and simulator evaluation of 'full' GPS approach + EGNOS reception study.	Sufficient funding available to complete work underway. Future funding will be required for prototype equipment development and demonstrator trials.
7	8.1	Helideck Friction - review of CAP 437 criterion and test/monitoring techniques.	Additional funding required if industry wishes to pursue the provision of a more portable friction tester.
		Helideck Friction - development of new criterion for aluminium decks.	Additional funding required to investigate the effect of helicopter tyre footprint pressure.
8	8.5	Helideck Environment - review of CAP 437 vertical wind component criterion.	Study completed.
3. NEW PROJECTS			
9	-	HUMS – preliminary study on extension to rotor systems.	Study completed.
		HUMS - application of advanced data analysis techniques to HUMS tail rotor data.	Sufficient funding available to complete all work currently identified.
10	5.16	Tail Rotor Strike Warning.	Insufficient funding to proceed at present.
11	-	TCAS - in-service trials.	Trials presently progressing outwith HSRMC at Bristow Helicopters.