

Advice provided by the C-NLOPB's Offshore Helicopter Safety Inquiry (OHSI) Implementation Team to the C-NLOPB Board

Advising Document
OHSI Phase I, Recommendation 15
Regarding pilot helmets



In November 2010, the Honourable Robert Wells, QC, submitted the Report for Phase I of the OHSI to the C-NLOPB, containing 29 recommendations for enhancing the safety of helicopter travel offshore. Each Advising Document contains the text of the recommendation for which the advice is offered.

The Team's advice for Recommendation 15 was accepted by the C-NLOPB Board at their meeting on July 20, 2011, thus allowing the Team to proceed with their proposed risk assessment

The OHSI Reports, other Advising Documents, C-NLOPB OHSI Action Plans, and more can be found on the C-NLOPB website: http://www.cnlopb.nl.ca/ohsi_main.shtml

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Recommendation

It is recommended that the wearing of pilot helmets be made compulsory.

Method

The nature of this recommendation did not lend itself to the precise use of the 14-step process that the OHSI Implementation Team normally employs to assess the OHSI recommendations. Since the OHSI's recommendation had already been accepted by the C-NLOPB, and because the Operators – in collaboration with Cougar Helicopters – have already embarked on a voluntary helmet-wearing program; it was decided that this recommendation (and the Operators' plans to implement it) needed first to be validated, so that an appropriate implementation strategy could be recommended to the C-NLOPB.

System Safety Deficiency (SSD)

Pilots are vulnerable to head injury and resulting incapacitation during a ditching.

Background

The Board accepted in principle the OHSI's recommendation for compulsory wearing of helmets by pilots in early December and a letter was sent to the Operators on December 13, 2010 stating that unless there were compelling arguments to the contrary, compulsory wearing of helmets should begin immediately. This initial position by the Board was modified in a second letter after the OHSI Implementation Team was formed and it was decided that a more thorough review of the recommendation was needed.

Falling out of the initial deliberations of the Team, a fact-finding mission was organized to visit Defence Research and Development Canada (DRDC) Toronto. This facility is renowned for its leading-edge research in the development of safety equipment and practices. The briefing by the subject matter experts on the use of helmets in the helicopter environment was extremely informative. Although there was a great deal of data available for aircrew using helmets with night vision goggles (NVGs) there was limited information on the effects of helmets without NVGs or the type of flying profiles presently being conducted in the C-NL Offshore Area by Cougar Helicopters. The Military profile (as briefed) varied significantly from the 8-hour flying days routinely being conducted by Cougar's pilots. Therefore, it was felt by the Team that a more careful Management of Change approach would be necessary to ensure that compulsory use of helmets did not introduce new hazards and risks during Offshore Operations.

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Some of the key issues and areas of concern to the Team were:

- A. The possibility of neck and back injury over the long term – research on helmet use in the military has found evidence of a correlation between length of time that a helmet is worn and incidence of neck and back related injury (albeit with NVGs);
- B. Whether a proper risk assessment of a compulsory helmet program had been conducted;
- C. Whether there are less obvious environmental factors, such as noise and vibration, that would need to be looked at from a Management of Change perspective;
- D. Whether there are equipment compatibility issues regarding the wearing of helmets that may need to be mitigated; and
- E. Whether there are systemic maintenance issues needing to be addressed before a compulsory helmet system can be instituted.

Discussion

The OHSI Report describes the important role that pilots play in the survivability of the passengers during a ditching scenario. Whether keeping the aircraft afloat for a more planned egress or providing the leadership (e.g., command and control) throughout the survival and rescue phases of an accident, the pilots are a critical component of success during any crisis. In a ditching, one or both pilots being incapacitated due to head injuries can seriously jeopardize the lives of any remaining survivors.

Initiatives to promote the use of helmet wear by aircrew are well underway at Cougar Helicopters. On a cost-shared basis between the Operators and Cougar Helicopters, an initiative to procure helmets has been implemented. It has recently been reported by Cougar Helicopters that the majority of pilots are now voluntarily wearing helmets.

Transport Canada and the Transportation Safety Board also actively promote the use of helmets for all helicopter aircrew. Transport Canada does this through its safety communiqués, and the Transportation Safety Board through the release of Safety Information and Safety Advisories. Furthermore, in its report on Flight 491, the Transportation Safety Board found that the “lack of regulation requiring pilots to wear helmets and visors places them at greater risk of incapacitation due to head injuries following a ditching or crash” (Findings as to Risk, #22).

A risk assessment (RA) by Cougar helicopters was released in early 2011, recommending compulsory helmet use. The purpose of the RA was “to identify potential hazards and evaluate risks associated with wearing and not wearing a helmet.” The RA “strictly focused on the post incident survival and egress properties directly relating to helmet usage.” Six scenarios were considered:

- a. Uncontrolled ditching
- b. Hard landing/crash on ground
- c. Helicopter dynamic rollover
- d. Severe turbulence

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- e. Wind shear
- f. Bird strike

Of the six scenarios addressed, the first scenario (uncontrolled ditching) was deemed to pose the highest risk to pilot head injury. Injuries due to wind shear or sudden deceleration were considered low. Risk of head injuries to aircrew for the remaining four scenarios was considered moderate. In all scenarios, the risk of pilot head injuries would be reduced with the introduction of helmets. However, it should be noted that the RA did not include a comprehensive analysis of human factors or ergonomics.

DRDC research related to neck and back injury caused by prolonged use of helmets was only on helmets with NVGs (the military standard). NVGs add substantially more weight to a helmet than Cougar pilots would typically experience. Furthermore, Cougar pilots:

- Fly more missions
- Fly longer missions
- Have longer careers

Therefore, the Team is of the opinion that a compulsory helmet program for Cougar pilots would need a comprehensive RA as part of the Management of Change process. This RA, including Human Factors modeling, could reduce the possibility of additional risks or hazards being introduced to the operation as well as develop any mitigation to reduce any known hazards or risks to ALARP. An outline of the recommended process for this risk assessment can be found in Appendix A.

Conclusion

The C-NLOPB OHSI Implementation Team believes it is important that all additional risks or hazards associated with the wearing of helmets by pilots be identified and addressed before helmet use is made compulsory. The Team recommends that a RA facilitated by a Human Factors specialist be conducted as part of the Management of Change process.

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Appendix A

Management of Change Risk Assessment Process

Scope

The objective of the process will be to develop appropriate mitigation to address any possible safety-risks related to the implementation of OHSI Recommendation 15 (the compulsory use of helmets by pilots), using the S92-A.

Purpose

The procedure provides guidance for conducting Hazard Analyses. The procedure enables the identification of hazards that are rooted in human and organizational factors. It also enables consistency in terminology, application, and data archiving throughout the proposed change or activity.

Procedure

General. The following general steps are conducted sequentially during a Management of Change Hazard Analysis:

- a. A Team Leader is appointed - in this case it will be a Human Factors specialist;
- b. The terms of reference are prepared, which generally includes sections to describe the introduction, purpose, scope, method, assumptions and limitations of data (if appropriate), the schedule, and the approval page;
- c. The Hazard Analysis Team will be determined (see below);
- d. The Hazard Analysis Team identifies the risk scenarios;
- e. The hazards and safety-risks are identified against the scenarios; and
- f. Mitigation strategies are prepared and documented.

Preparation. There are a number of important steps to be completed prior to conducting a Management of Change Hazard Analysis.

1. **Baseline the current operation (without the helmet) to identify any possible hazards and SSDs:**
This will be done through a question and answer process using the participants of the Hazard Analysis Team by applying the Person-Equipment-Task-Environment (PETE) model. This model allows the Hazard Analysis Team to walk through each element systematically in order to characterize the context of piloting a helicopter for the purpose of offshore oil exploration in the North Atlantic. For example, for the Person category of the PETE model, the Hazard Analysis Team will list the critical human abilities needed to safely fly a helicopter (e.g., information processing, hearing, speech, and vision). These will then be used to assess any potential factors, such as task (e.g., ditching), environment (e.g., severe weather), or equipment (e.g., breached helicopter windshield or mechanical failure) and their impact on human performance.

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2. **Identify impact on human performance (or performance shaping factors):** performance shaping factors become critical for identifying possible human error in conjunction with the development of accident scenarios to illustrate potential outcomes.
3. **Review performance shaping factors:** Once all the performance shaping factors have been identified, they will be reviewed by the Hazard Analysis Team for commonalities indicative of SSDs and hazards.
4. **Prioritization of SSDs and Hazards:** Each hazard and SSD will then be reviewed and prioritized for their importance, exposure and urgency. As well, the Hazard Analysis Team will review any current or existing mitigations (à la Reason Model - if any) against the same criteria.
5. **Assessment of Mitigations:** The next step will be to look at assessing the appropriateness and effectiveness of a helmet to mitigate the SSDs and hazards to ALARP. For mitigations where ALARP does not exist, further mitigations will be solicited from the Hazard Analysis Team.
6. **Review collected Data:** Based on the data collected from various sources (including independent research institutes such as DRDC, CAA, etc.), the Hazard Analysis Team will look at potential hazards associated with wearing a helmet using core PETE factors of information processing and repeating steps 1-5 above.

Proposed Hazard Analysis Team

Facilitator: Mr. Remi Joly – Human Factors specialist

From the OHSI Implementation Team:

Mr. Peter McKeage – Aviation Advisor, C-NLOPB

Ms. Allison Moyle – Safety Officer, C-NLOPB

Mr. John Whalen – Radio Operator, HMDC

Mr. Evan Sturge – Pilot, Cougar Helicopters

Mr. Jeremy Whittle – Emergency Response Lead, Atlantic Region, Husky

Mr. Ray Dalton – Terra Nova FPSO EH&S Advisor, Suncor

TBD: Second Cougar pilot and further input from pilots