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

Advising Document
OHSI Phase I, Recommendations 10 & 16
Regarding personal protective equipment

CANADA-NEWFOUNDLAND and LABRADOR OFFSHORE PETROLEUM BOARD

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 Recommendations 10 & 16 was accepted in principle by the C-NLOPB Board at their meeting on May 30, 2011. At that time, the C-NLOPB took responsibility for developing its strategy to implement these recommendations.

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**

Recommendations

10: It is recommended that the Regulator, oil operators, helicopter operator(s), and worker representatives, with the assistance of Transport Canada if it is available, explore on-board safety and equipment issues for passengers, with a view to reaching a consensus on improvements. The Regulator should state the appropriate goals, and the oil operators be asked to respond as to how they could be met, after which there should be further discussion with the foregoing stakeholders. In the absence of consensus, the Regulator should decide the issue(s).

16: It is recommended that, before the Regulator establishes goals for the oil operators, the need for additional personal protective equipment for pilots and passengers be studied and discussed by Transport Canada (with their agreement), the Regulator, oil operators, helicopter operator(s), trainers, manufacturers and suppliers of personal protective equipment, and worker representatives.

Method

A working group of the C-NLOPB's OHSI Implementation Team reviewed Recommendations 10 and 16, as well as the information provided in the OHSI reports. A high-level hazard identification session was completed with members of the working group and representatives from the Cougar SAR Team. From the results of the session, the group identified the system safety deficiency and developed an implementation plan to address it. The working group subsequently reviewed personal protective equipment and safety equipment improvements for the following three scenarios:

1. Survive impact;
2. Egress helicopter; and
3. Survive post egress.

The working group drafted an outline for implementing the recommendation and suggested areas to be reviewed in order to improve personal protective equipment and safety equipment onboard helicopters traveling offshore. The working group presented their information to the complete OHSI Implementation Team, and this information became the basis for the Team's proposed implementation strategy for the consideration of the C-NLOPB.

System Safety Deficiency (SSD)

There is no systematic, pro-active process for identifying performance deficiencies relating to helicopter passenger and pilot personal protective equipment and onboard safety and equipment in the C-NL offshore industry.

Additionally, the team identified several deficiencies related to personal protective equipment and onboard safety equipment in the C-NL offshore. These are listed in the following section.

Background

In February 2011, the working group completed a hazard identification session on surviving a controlled ditching in an S-92A as currently configured and equipped for the C-NL offshore. The findings were separated into three scenarios and personal protective equipment and safety equipment deficiencies were identified for each.

1. Survive Impact

- Cold Water Shock
  - Cold shock response is the physiological response of organisms to sudden cold, especially cold water. Even with the protection of an immersion suit, the sudden exposure of the face to the cold water causes an aspiratory gasp (i.e., gasp reflex), hyperventilation, and involuntary water intake.
  - From the TSB Report on Flight 491, p. 33: "Research has shown that the median breath-holding time of 228 offshore oil workers immersed in 25°C water was 37 seconds. Researchers concluded that inability to breath-hold was responsible for the 15% to 50% death rate in helicopter accidents in water. As the temperature of the water decreases, so does the average breath-holding time. In near freezing water, breath-holding time drops dramatically to approximately 5 to 10 seconds."
- Breathing Devices
  - HUEBA (Passenger breathing device)
    - The Helicopter Underwater Emergency Breathing Apparatus (HUEBA) is used by passengers only. It has a small cylinder of compressed air with a mouthpiece connected by a hose, and will – under normal conditions – supply approximately 21 breaths of emergency air at 21 feet. Participants are trained in the operation of HUEBA during BST but cannot use the HUEBA during HUET training scenarios due to the risk of air embolism.
  - HEED (Pilot breathing device)
    - The Helicopter Emergency Egress Device is used by pilots only. It is a compressed air cylinder with a mouthpiece and does not have a whip and hose attachment. It requires two hands to retrieve from the pilot's vest, which may cause the pilot to lose orientation with the window exit. The HEED can also be dropped or lost easily.
- Communications from Pilots During Flight Operations

  - There are times that passengers cannot understand PA announcements. This may be due to equipment issues with the PA system or pilot inconsistency in making PA announcements.

- Pilot Helmets

  - The issue of pilot helmets is addressed in Recommendation 15 (for which a separate Advising Document is being prepared).

- Pilot Heat Stress

  - Due to the glass-enclosed cockpit and pilot flight suit, pilots could experience heat stress which could impair their ability to effectively execute an emergency landing or ditching and subsequently perform the egress procedures.

2. **Egress Helicopter**

- Exits

  - On the S-92A there are four emergency exits and 8 window exits. Window exits are not considered emergency exits by definitions contained in FAR 29, the Federal Aviation Regulation under which the aircraft is certified. Although the window exits are not considered “emergency exits”, they are positioned in the helicopter in such a manner that anyone sitting next to one would presumably try to utilize it as a primary escape route in the event of an emergency. This is what workers are trained to do in BST training. There is no process in place to ensure that passengers can physically fit through the window exit.

- Placement of Auxiliary Fuel Tank

  - The auxiliary fuel tank has been installed in S-92As to increase their flying range. The S-92A can have up to two auxiliary tanks installed. Due to its size and location, the auxiliary fuel tank can hinder a passenger’s ability to escape a ditched helicopter. No training standard takes into account egress from an S-92A with the auxiliary tank installed.

- Double Seating

  - The helicopter seating layout includes double seating (one passenger by a window and one by the aisle). Passengers in the aisle seats have to wait for passengers in the window seats to egress the helicopter before they can attempt their escape. There is no training standard that takes into account double seating.

- Pilot Command and Control

  - In BST training, passengers are typically told that post-ditching, pilots will be in charge. However, pilots have no training for leadership post-ditching.

- Liferaft Positioning Outside of the Helicopter

  - In training, students are instructed to step from the helicopter into the liferaft if the helicopter remains upright after ditching. However, the liferafts will be inflated next to the exit that is located between the sponson and the forward flotation bag, which – when deployed – has a diameter of 55 inches, and the sponson has a width of 32.5 inches. This may prevent the liferaft from floating close enough to the helicopter to allow passengers to step easily into the raft.

- Surface Obstructions

  - If a controlled ditching occurs and the helicopter inverts, passengers must escape through an emergency exit or a window exit and ascend to the surface. Personnel are not trained for the possibility of an obstruction on the water's surface, such as flotation bags or other debris that could hinder their ability to reach the surface.

- Visibility Under Water

  - All passenger seats are supplied with scuba masks (goggles). The masks are intended to aid passengers in underwater egress. A passenger's ability to escape a submerged helicopter could be compromised if the masks are damaged, fill up with water, or do not fit.,.

- Stroking Seats

  - Team experience indicates that training does not take into account foot position in the brace position. Improper foot position may lead to lower body injury or entrapment when stroking seats reach their maximum extent in an impact.

  - A seat in the fully stroked position will be substantially lower than a seat in its normal position. This will influence the person's ability to release the seatbelt, locate/activate the window exit, and egress the helicopter in an emergency. There is no training standard that takes into account stroked seats.

3. Survival Post Egress

- Pilot Suits

  - There is no requirement for pilot suits to meet thermal, buoyancy or visibility standards. Cougar pilots wear blue Viking pilot suits (Viking Life-Saving Equipment; model number PS4177). The Viking PS4177 is a dry-suit with neoprene wrist seals, a waterproof zip fastener and a neoprene collar and hood. There is no inherent buoyancy provided by the Viking PS4177, nor does it provide thermal protection. Buoyancy is provided by a separate flotation vest and thermal protection by undergarments.

- By contrast, requirements for passenger flight suits are as follows:
    - Thermal protection no less than 0.75 clo;
    - Minimum flotation buoyancy of not less than 156 Newton (N);
    - Maximum escape (inherent) buoyancy no greater than 175N; and
    - Visibility requirement for passenger flight suits: international orange, yellow or an equivalent high visibility color.

- Passenger Suits
    - The passenger flight suit and undergarments are considered a system and must be considered together when assessing thermal protection and buoyancy. There is no standard regarding what undergarments passengers should wear.
- PLBs
    - All passengers traveling in the C-NL offshore are issued a Sea Marshall model ISPLB8X Personal locator beacon (PLB). These PLBs are not required by Transport Canada or C-NLOPB regulation. The PLBs are designed to operate for 20 to 30 hours on 121.5 MHz. Signals from these PLBs are by line of sight, and can be homed by surface ships or aircraft. The signal cannot be received by the COSPAS-SARSAT satellite system because it only detects signals broadcasting on 406 MHz.
    - The PLB design is such that over-tightening of the antenna can, with very little resistance, cause the antenna connector to turn. This may prevent the PLB from remaining watertight. Excessive turning of the antenna connector can cause the wire to break, which makes the PLB incapable of transmitting.
- Blue Sky / ELTs
    - Each liferaft is equipped with an A 500-12Y voice-capable emergency locator transmitter (ELT). There is currently no standard to ensure helicopter passengers are familiar with the operation of this ELT.
    - Aircraft ELTs are required to have a 50 second delay before a signal is transmitted. If the helicopter crashes in water, there is a strong possibility that the fixed ELT antenna will be below the surface of the water before the 50-second delay has elapsed. In this case, the ELT signal may be badly attenuated, and the signal may not be detected by the COSPAS-SARSAT satellite system.

- Blue Sky, which is a GPS-based tracking system, is currently being used in the C-NL offshore as a primary method of tracking helicopters. This system tracks all helicopter traffic as well as all supply vessels contracted to the Operators. The system is maintained locally by the Cougar Dispatch office in St John's. Access to the offshore is provided via the Internet.

- Liferaft
  - Cougar uses a RFD brand liferaft that is JAR OPS 3 compliant (the standard required for the S-92). They are octagon shaped with two boarding ramps, a sea anchor and canopy. The capacity of the rafts is 14 persons with an approved overload capacity of 7, for a total of 21 persons. The liferaft is fully reversible and therefore will always be launched right side up. This has two additional advantages in that it will allow rapid boarding of the raft and the canopy will not get entangled with the rotor blades. The canopy has to be raised manually. The disadvantage is it will delay getting passengers protected from the elements.
  - These liferafts are located in the sponsons on either side of the helicopter. The liferafts can be released from the cockpit or they can be manually released by activating the handle at the sponson. If the helicopter rolls to the inverted position before the rafts are launched, the handle may not be accessible from the surface and the buoyancy in the flight suits may prevent the passengers from accessing the release handle.

Discussion

The information above clearly illustrates numerous deficiencies related to onboard safety equipment, PPE, and egress and survival training. There is neither a process to identify and prioritize such deficiencies, nor to systematically facilitate continuous improvement.

The Team believe the deficiencies noted above can be addressed by the establishment of performance goals. The aim of the performance goals is to state objectives for onboard safety equipment and passenger PPE, so the achievement of the necessary performance can be monitored and, when necessary, improved. In this way, the risks to which helicopter passengers and pilots are exposed will be reduced to a level as low as reasonably practicable.

The Operator will be responsible for demonstrating to the Regulator that the performance goals are being achieved. Performance goals will also establish requirements for new stakeholders to the C-NL offshore, whether they are from the exploration and production sectors, the aviation industry, or a training institute. In this way, all passengers being transported by helicopters in the C-NL offshore will be afforded the same level of safety.

Conclusion

The Team identified several deficiencies relating to personal protective equipment and onboard safety equipment in the C-NL offshore. Furthermore, there is a lack of a process to ensure that a continuous review of helicopter personal protective equipment and safety equipment is undertaken. The Team concluded there is a need to examine the deficiencies with experts in these areas so that goals can be established to address them. The areas requiring further analysis are listed below with recommended courses of action.

The Team recommends that the development of Performance Goals for Onboard Equipment and Passenger Safety be included as part of the mandate of the Helicopter Operations and Safety Committee (HOSC) (as outlined in the Advising Document for Recommendation 20), and should be developed by the HOSC in conjunction with Subject matter Experts.

Additionally, the Team recommends that the C-NLOPB oversee the performance of the HOSC to ensure that the appropriate performance goals are developed, evaluated and achieved.

Issues requiring further attention:

Breathing apparatus

- Determine the reasons that HUEBA is not currently employed in the HUET, after which develop a risk mitigation strategy that will enable HUEBA training in the HUET.
- Determine if there is a more suitable breathing device available for pilots.

Communications

- Review the communication system between pilot and passengers to ensure consistent clear communications.
- Determine if a newer model PLB should be introduced with the capability of operating on 406 MHz as well as the existing 121.5 MHz.
- Examine the use of a Global Maritime Distress Safety System (GMDSS) to improve communications in an emergency. The radios could be placed near emergency exits in the helicopter, and additionally in the liferaft’s emergency pack.

PPE

- Research the effects of heat stress on pilots so that if necessary, mitigating measures can be put in place.
- Improve the fit of masks for passengers, either by identifying masks that better fit individual passengers, or require fit-testing instead of the present process where one size is expected to fit all persons.

- Determine if a pilot suit with thermal protection and high conspicuity would be more appropriate for use by pilots in C-NL offshore flight operations.
- Determine the best undergarment to be worn to ensure the flight suit unit will give a passenger the highest chance of survivability the case of a ditching.

Helicopter egress

- Develop a process to identify whether a passenger can fit through the "non-emergency" window exit, and put a plan in place to deal with such a circumstance.
- Determine if the auxiliary fuel tank is placed in the best possible position to minimize adverse effects on individuals escaping a ditched helicopter.
- Evaluate the likelihood of dry evacuation from a ditched helicopter into the liferaft, given the positioning of the flotation and sponson.

<u>Issues for Basic Survival Training</u>

- Deficiencies related to equipment that is used during training are addressed in the Advising Document for Recommendation 13.