CAPP
CANADIAN ASSOCIATION
OF PETROLEUM PRODUCERS

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Topic 1: HUEBA

1.1

CANADA-NEWFOUNDLAND
OFFSHORE
PETROLEUM
BOARD

February 25, 2000

Mr. Paul Barnes
East Coast Manager
Canadian Association of Petroleum Producers
Suite 905, Scotia Centre
235 Water Street
St. John's, NF
A1C 1B6

Dear Paul:

Subject: Escape Breathing Devices for Helicopter Transportation

The results of research and experience indicate that the probability of successfully exiting an overturned helicopter in cold water is low even by passengers who have the benefit of escape training and an approved transportation suit. We understand that several companies in the North Sea have adopted the use of "Escape Breathing Devices" to improve passengers' chances of surviving a crash. While we recognize that there are risks and issues associated with the use of these devices, we believe that progress, to date, in this area represents a significant step forward in reducing the risk associated with helicopter travel offshore. Consequently, we request that you discuss this matter with your safety committee and advise us of any decisions on this issue.

Should you or the committee wish to discuss this further with us please contact Mr. Peter Noel at 778-1410.

Yours Truly,

HHPike

Howard Pike
Manager, Operations & Safety

CC A. Parker
J. O'Neill

Topic 1: HUEBA

1.2

0000 - 15 -21

Canadian Association
of Petroleum Producers

CAPP

FAXED May 15/00

COPY

May 15, 2000 Sent via facsimile and mail

Mr. Howard Pike
Manager, Operations and Safety
Canada-Newfoundland Offshore Petroleum Board
5th Floor, TD Place, 140 Water Street
St. John's, Newfoundland
A1C 6H6

RE: Escape Breathing Devices for Helicopter Transportation

Dear Mr. Pike:

Pursuant to your letter of February 25, 2000 on the above referenced subject matter, we have recently discussed this issue within our Safety Sub-committee and are proposing the following. We have gathered information from member companies on the device and have had numerous discussions at the Safety Sub-committee table on this topic. We have determined that the device is used sparsely in the North Sea with evidence that training is an issue with users. Over the next six months, we will investigate this issue further and undertake the following steps:

1. Investigate the use of these devices by member companies who have operations in the North Sea.
2. Discuss the issue with the manufacturers of the survival suits currently being used on the east coast. This discussion will focus on equipment interface with existing suits and potential opportunities for future research and development.
3. Discuss the issue with representatives of local safety training institutions to elicit their feedback/advice.
4. Discuss the issue with potential end users of the equipment.
5. Undertake a cost/benefit analysis of using the device.

Once information from this investigation is obtained, we would like to share it with the Boards and subsequently meet to further explore the topic.

Sincerely,

Michelle Williams
for R. Paul Barnes
Manager, East Coast

/mw
c.c. Andy Parker, C-NSOPB

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Topic 1: HUEBA

1.3

CAPP

CANADIAN ASSOCIATION
OF PETROLEUM PRODUCERS

June 19, 2001

Mr. Howard Pike
Manager, Operations & Safety
Canada-Newfoundland Offshore Petroleum Board
5th Floor, TD Place
140 Water Street
St. John's, NF A1C 6H6

Dear Mr. Pike:

Re: Emergency Breathing Systems (EBS) For Helicopter Transportation

The Canadian Association of Petroleum Producers (CAPP) reviewed and investigated a number of research papers and reports with respect to Emergency Breathing Systems (EBS) for helicopter transportation. CAPP also investigated the use, and any associated issues, of these devices by member companies who have operations in other offshore jurisdictions. A summary of this research is attached for your review.

Based on this investigation and our May 31, 2001 meeting with representatives from both offshore Boards, it is CAPP's position to delay making any final decisions with respect to the implementation and use of helicopter EBS on the East Coast pending the outcome, and our subsequent review, of the United Kingdom Civil Aviation Authority (UK CAA) literature review and the Norwegian Oil Industry Association (OLF) initiative on new survival suit standards / specifications. In the interim we will continue to monitor this issue and will re-visit once additional information becomes available.

If there are any concerns with this plan of action, please do not hesitate to contact me at 724-4202.

Sincerely,

R. Paul Barnes
Manager, East Coast

cc: Andy Parker, C-NSOPB

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CAPP

Helicopter Emergency Breathing Systems (EBS):

Research Summary

I. Reports Reviewed

- An Examination of Current Emergency Breathing Systems for Helicopter Escape for Use by Crew and Passengers in Canadian Offshore Oil Operations (Brooks, 2001)
- Breath-Holding Ability of Students Attending the Basic Helicopter Survival Training Course (Brooks, 2001)
- RTO AGARDograph 341: The Requirements for an Emergency Breathing System in Over-Water Helicopters and Fixed-Wing Aircraft Operators (Brooks and Tipton, 2001)
- Report on Emergency Systems Workshop, Hosted by the UK Civil Aviation Authority (October 2000)
- Surviving From Ditched Helicopters (Coleshaw, 2000)
- An Initial Investigation of Passenger Evacuation from the Super Puma Helicopter (Brooks et al, 1999) [1]
- Training Issues Relating to the Use of Emergency Underwater Breathing Apparatus by Helicopter Passengers (Coleshaw, 1998)
- Advantages and Disadvantages of Using Underwater Breathing Apparatus in Helicopters (Coleshaw, 1997)
- Numerous international articles and literature on the subject

The following is a summary of the major issues identified.

1. EBS Design

- The following factors should be considered in the design and assessment of emergency breathing apparatus:
    - Design and comfort
        i. Mouthpiece with comfortable fit, allowing good mouth seal underwater

[1] As discussed at the May 31, 2001 meeting, CAPP members are not supportive of the recommendations and conclusions stated in this report.

ii. Mouthpiece easy to grip and difficult to knock out of mouth

iii. Minimum breathing resistance

iv. Minimum use of hands for deployment

v. Nose clip desirable

- Performance
  i. Must extend time which can be spent underwater
  ii. Adequate period of use in cold water whilst exercising
  iii. Buoyancy assessment required within helicopter
- Innocuousness
  i. Minimum snagging hazards during escape
  ii. Ability to escape through smallest escape windows
  iii. Minimum medical risk during training
- Compatibility with suit, lifejacket and harness
- Information must be provided for end-users, helicopter operators and servicing companies covering usage, storage, maintenance and servicing

- Need for agreed specifications and testing procedures
- When assessing the overall benefits of emergency underwater breathing apparatus, consideration must be given to the fact that use of the breathing equipment increases the number of actions that the passengers must perform. In addition to taking a breath, releasing the harness, finding and removing the exit, the individual must also deploy the unit, fit the mouth and perhaps the nose clip. This may cause anxiety during training and impede escape during an emergency.

2. Health Considerations

- Health conditions of each individual worker that requires the use of this device must be taken into consideration.
- Certification from a physician must be received that confirms that a trainee is fit to breath compressed air:
  - What are the medical effects of training with EBS?
  - How medically fit do you need to be to train with (and eventually use) EBS?
  - Determination of "Fitness for Work"?

3. Training

- Mandatory training is recommended for all systems – rebreather, hybrid compressed air rebreather or pure compressed air units
- Wet training vs. dry training? Wet is the only option for compressed air, dry training at the hanger can be done for the rebreather system.
- As an item of diving equipment (pure compressed air systems), due consideration must be given to training in their use, taking into account that there are some medical risks associated with use even in shallow water (i.e., pulmonary barotraumas, pulmonary over-inflation, or burst lung).
- A recompression chamber is recommended should an employee suffer from a pulmonary over inflation injury. While such an injury is unlikely to occur, it is still a recommended precaution.

4. Development of Oper ator Policy

- Policy to deal with those employees that are deemed "unfit" to breath compressed air or have difficulty learning to use the device.
- Policies regarding the development of course training standards, re-certification standards and refresher training courses need to be developed.

5. Integration of EBS with Lifejacket and Survival Suits

- Requiring lifejacket manufacturers to redesign the lifejacket to include pocketry would be time consuming and costly
- Redesigned lifejackets could be subject to regulatory re-certification
- Alternative approaches, design a separate bandolier vest system or mount the EBS in the seat pocket or on the bulkhead of the helicopter, have advantages and disadvantages.

6. Other

- Human behavioral responses (cold shock, disorientation, fear, panic, etc.)
- Helicopter cabin design (seats, harnesses, escape routes and exits)
- External environment (in-rushing water, debris, weather conditions, external sea, low visibility, and debris)
- Cleaning and maintenance of devices can be quite costly and time consuming
- Some subjects may experience light-headedness if they breath from rebreather / hybrid devices for an extended period of time before escape

II. Other Offshore Jurisdictions

1. Norwegian Oil Industry Association (OLF) initiative on new survival su it standards/specifications

- Draft specification from the SINTEF/NUTEC study is being reviewed by the OFL LFE (Aviation Committee)
- Meeting with potential manufacturers was planned April 2001
- Rebreathers, splash shields etc. are among the proposed features
- Norsk Hydro indicates a draft report will be available in July 2001

2. UK Civil Aviation Authority (CAA)

- Growing momentum from CAA to mandate the use of rebreathers but no firm timing of when rules will be implemented (or if there will be mandated rules)
- Performing a document review of past studies regarding the potential benefits and risks from the use of rebreathers to support any rules they may promulgate; no new studies are being conducted to establish the benefits and risks
- No indication of when they will announce their decision

3. UKOOA

- Accepts there are reasonable doubts about the risks and benefits of rebreathers and that it is the CAA's responsibility to provide direction on this issue
- Adopted a wait-and-see position pending the outcome of the CAA review

4. Shell and other Operators

- Shell is continuing to introduce rebreathers, supported by dry training for personnel (as are BP and Conoco). Marathon, Mobil North Sea, and Talisman are awaiting the outcome of the CAA review before deciding upon a course of action.
- In February 2001, Shell conducted additional pool trials to judge the effectiveness of training personnel in the use of rebreathers and to develop recommended procedures for the use of equipment in a helicopter emergency
- CAA plans to use the Shell research in its library review

Topic 1: HUEBA

1.4

CANADA-NEWFOUNDLAND
OFFSHORE
PETROLEUM
BOARD

February 12, 2003

Mr. Paul Barnes
East Coast Manager
Canadian Association of Petroleum Producers
Suite 905, Scotia Centre
235 Water Street
St. John's, NF
A1C 1B6

Dear Paul:

Subject: Helicopter Underwater Escape Breathing Devices

Further to our telephone conservation today I wish to formally express my disappointment that your organization has not, as yet, reached a consensus on the implementation of the subject devices. Attached for your ease of reference are Mr. Pike's February 25, 2000 letter and my correspondence of August 28, 2001. Both these documents clearly indicate the importance we place upon this issue and our desire for a prompt decision. Given the lack of an industry wide initiative I will be recommending that my superiors look at dealing with this a matter on an individual authorization basis. As you are aware from our many discussions on this issue I view Helicopter Underwater Escape Breathing Devices as a mature and tested technology and would hope that we can achieve implementation in relatively short order.

Should you wish to discuss this matter further please contact me at 778-1410.

Yours Truly,

Peter E. Noel

Peter E. Noel
Senior Safety Officer

CC H. Pike

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Topic 1: HUEBA

1.5

CAPP

CANADIAN ASSOCIATION
OF PETROLEUM PRODUCERS

March 20, 2003

this doc. attachments were emailed to both people as well prior to hard copy being sent out.

Mr. Howard Pike, Chief Safety Officer
Canada-Newfoundland Offshore Petroleum Board
5th Floor, TD Place, 140 Water Street
St. John's, NL A1C 6H6

RE: Helicopter Underwater Escape Breathing Systems (EBS)

Dear Mr. Pike:

Over the past 18 months we have been investigating the use of an EBS in other offshore jurisdictions and have noted that the current research seems to indicate that the use of an EBS, if correctly deployed, in a survivable impact on water, will allow helicopter passengers to extend their breathing capability such that the risk from drowning is reduced and their chances of survival increased.

In order for an EBS implementation to be fully supported and managed through to a successful conclusion, we believe that there are a number of critical issues that require resolution. These issues involve certain design aspects of the device, training, health and hygiene and their use in cold Atlantic Canada waters.

To facilitate a successful implementation of EBS it is paramount that an Implementation Committee be commissioned to oversee that the recommendations and findings in a Discussion Paper we have prepared on this issue (see attached) are researched, understood and resolved. This committee should be comprised of east coast operators who have helicopter contracts, a representative from CAODC, a worker representative, a safety representative from the Board, as well as other operating companies who have an interest and knowledge of EBS.

As there are a number of questions and concerns around the detail of how any EBS should be implemented, the Implementation Committee will be supported by working groups dedicated to specific tasks and activities dealing with these concerns in their area of expertise (e.g. training, health issues and design concerns).

With regard to the timing for any possible EBS implementation we envisage the Implementation Committee will develop an implementation plan with a goal of having the critical issues resolved by the end of 2003.

Please let us know if this approach addresses your concerns and if you will be willing to appoint a representative to the implementation committee.

Sincerely,

R. Paul Barnes
Manager, Atlantic Canada

c.c. Stuart Pinks, C-NSOPB

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CANADIAN ASSOCIATION
OF PETROLEUM PRODUCERS

Emergency Breathing System Discussion Paper

September 2002

The Canadian Association of Petroleum Producers (CAPP) represents 140 companies that explore for, develop and produce natural gas, natural gas liquids, crude oil, synthetic crude oil, bitumen and elemental sulphur throughout Canada. CAPP member companies produce approximately 97 per cent of Canada's natural gas and crude oil. CAPP also has 125 associate members who provide a wide range of services that support the upstream crude oil and natural gas industry. Together, these members and associate members are an important part of a $60-billion-a-year national industry that affects the livelihoods of more than half a million Canadians.

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1 Purpose

The purpose of this document is to:

- Provide members of the CAPP Safety Committee with a document that summarizes the questions and concerns surrounding the implementation of EBS.
- Make recommendations on the EBS usage decision, selection, training and implementation process for consideration by the East Coast Operators.

2 Statement of Fact

The research to date confirms that the use of EBS, if correctly deployed, in a survivable impact on water, will allow helicopter passengers to extend their breathing capability such that the risk from drowning is greatly decreased and their chances of survival increased.

3 Cautionary Note

There is no doubt that the EBS should be viewed as an enhancement to helicopter passenger safety under many foreseeable circumstances. All of the equipment currently available has advantages and disadvantages. This Discussion Paper however, makes recommendations for one particular type of EBS, the Hybrid Device. This preferred option is made based on the present state of knowledge, technology and operational and user acceptance. It is incumbent on all potential users therefore to recognize that there may be occasions when it cannot be used due to its design limitations. The Hybrid Device is designed for shallow water egress, at depths up to approximately 3m. At depths exceeding 3m, the hydrostatic pressure restricts a person's ability to breathe into the bag.

4 Summary of Recommendations

1) CAPP and the East Coast Operators should agree to implement the use of EBS as soon as feasibly possible, i.e. once the identified critical issues have been resolved.

2) An EBS Implementation Committee should be struck comprising Operators who have helicopter contracts, a representative from CAODC, a worker representative(s), as well as other operating companies who have an interest and knowledge of EBS.

3) CAODC representative on the CAPP Safety Committee to be the liaison for communicating EBS details to CAODC.

4) Operators and contractors to use the offshore JOSH committees as the communication means for EBS implementation.

5) The Hybrid Device is the recommended EBS equipment.

Note: At the present time the only Hybrid Device available is the Shark Air Pocket Plus currently being used in the UK North Sea.

6) Egress testing to be conducted to show that the Hybrid Device would not adversely affect the other safety/survival systems.

7) Testing to be conducted in order to confirm adequate sizing of the top up air supply.

8) Egress testing with an inflated Rebreather bag appropriate for east coast sea water temperatures and immersion suit system should be conducted to verify egress will not be inhibited.

9) Further research and testing should be conducted on the Hybrid Device to verify underwater deployment capability.

10) Implement the progressive training approach, using a combination of dry and wet training

11) EBS training to be a module within BST and BST-R.

12) The joint industry/government Training Qualification and Guidelines Committee (TQG) should direct the training schools to liaise with OPITO and other training agencies to ensure maximum learning are obtained from EBS training course development and delivery.

13) A "grandfathering" rule be applied to all current BST and BST-R certificates so that they remain valid until their expiry dates.

14) The Implementation Committee to confirm the acceptance criteria for EBS training involving personnel who have limited risk exposure to helicopter travel.

15) All students will be trained on the use of the EBS, including the pool side exercises, however during the actual HUET training, the use of the EBS for egress purposes is optional.

16) Further research and testing is needed in the area of when to deploy the EBS i.e. pre or post impact. This testing to be conducted with a face mask.

17) The EBS training module should focus on using the Rebreather bag only, without top up air supply for training sessions.

18) Research to be conducted to ensure that adequate sterilization techniques are available to re-use Rebreather bags during training.

19) Review feasibility of disposable Rebreather bags as a cost effective alternative.

20) The implementation of EBS remain an industry initiative.

21) CAPP to agree in principle with the philosophy of requiring all EBS Devices to meet a Canadian standard.

5 Concerns and Questions

5.1 EBS Implementation Decision

Question:

Can an informed decision be made without knowing the full cost and operational impacts?

Response:

Given the arguments provided below and some preliminary research into EBS type selection the cost of leasing and servicing the equipment would be similar to a Personnel Locator Beacon (PLB) and less than a lifejacket . Estimates are based on a Hybrid Device and servicing and leasing costs in St. John's. With regard to other operational related costs, these would mainly be associated with worker training. Certain other one off costs would also be incurred, such as the need to conduct further tests and trials, as well as the development of a Canadian technical standard. Refer to section 5.5 for more detail on training recommendations and section 5.8 on standard development.

Recommendation:

1. CAPP and the East Coast Operators should agree to implement the use of EBS as soon as feasibly possible i.e. once the identified critical issues have been resolved.

Question:

How should EBS be implemented and what would be the timing?

Response:

The issues around implementation concern mainly:

- Availability of equipment, its selection and design;
- Training course development and readiness;
- Satisfactory completion of testing and trials program;
- Appropriate equipment approvals.

Therefore, before EBS can be successfully implemented there is a need for further work and planning. An Implementation Committee should be formed with representation from key stakeholders with support from working groups tasked with specific activities.

Recommendation:

2. ***An EBS Implementation Committee should be struck comprising Operators who have helicopter contracts, a representative from CAODC, a worker representative(s), as well as other operating companies who have an interest and knowledge of EBS.***

Issue:

If the CAPP decision is NOT to implement EBS, there is an expectation from the regulators that a comprehensive justification needs to be provided.

Response:

Based on the research and reports to date, the C-NOPB appears to be of the opinion that the use of EBS will enhance the safety and potentially reduce the risk to helicopter passengers and be consistent with individual Operators' philosophy of ALARP. However, there is also a counter argument that based purely on a statistical analysis i.e. number of passenger miles flown offshore east coast and number of ditchings or fatalities, it would be difficult to justify their introduction. Much like aircraft crashes and their associated fatalities, helicopter crashes are a very emotive subject and therefore perception is a very potent driver. Ultimately, the pros of implementing EBS outweigh the cons.

Question:

Given that the EBS initiative originated with the C-NOPB, is the C-NSOPB fully supportive or is it possible for one jurisdiction to go it alone?

Response:

The position from C-NSOPB, is that they appear to be in favour of EBS usage, however would caution Operators over how it would be implemented. They would not be in favour of making successful EBS use during training, a condition of employment for working offshore. Refer to section 5.5 on Training for suggestions to accommodate this.

Issue:

Involvement of other stakeholders in the decision making process, e.g. workforce representatives, CAODC, service companies, helicopter contractors and training schools.

Response:

Preliminary discussions have taken place with CAODC and the training schools. CAODC haven't really discussed EBS implementation, but based on limited information available would be supportive. They also recognize that the decision to implement EBS lies with the Operators, however as the largest employer of people working offshore they want to be kept in the loop and consulted on implementation plans. Given their status as a group employing a large number of offshore workers, it's important that the drilling contractors are involved in any communication to their employees on what EBS is all about and why it's being implemented.

With respect to training schools, once the decision is taken to implement EBS and type selection made, they will work with CAPP to develop the appropriate training requirements.

Recommendations:

3. ***CAODC representative on the CAPP Safety Committee to be the liaison for communicating EBS details to CAODC.***

4. ***Operators and contractors to use the offshore JOSH committees as the communication means for EBS implementation.***

5.2 EBS Selection

Question:

Are there significant advantages for one type of EBS over another?

Response:

There are three approaches to the emergency supply of air:

- A Rebreather that enables a person to inhale exhaled air from a bag;
- A compressed air supplied system using a regulator and air from a pressurized cylinder; and
- A Hybrid Device, comprising the Rebreather with additional water activated top up compressed air supply.

Each of the devices have advantages and disadvantages. However, based on current research, the types of equipment currently available and used by Operators in other jurisdictions, the preferred EBS equipment is the Hybrid Device i.e. a Rebreather with a compressed air top up cylinder.

The main advantages for this device are:

- The risk of pulmonary barotrauma during training can be removed by training on the rebreather bag only, thereby also negating the need for recompression equipment;
- Greater air supply quantity containing "purer" air, which may be necessary for the East Coast operations due to extremely low ambient seawater temperatures and the need for an extended air supply;
- The equipment is still effective even though it may not be possible to achieve a full exhalation, prior to usage;
- Less rigorous medical required as training will not involve use of compressed air; and
- Simpler device, without need for regulator or contents gauge or more detailed inspection and service, etc.

The main disadvantages of the Hybrid Device are:

- The ability to deploy the equipment successfully with one hand may be difficult to achieve and hence require extensive training;
- Potential concerns over the sterilization of rebreather bags during training; and
- There may be some concerns over the additional buoyancy contained in an inflated rebreather bag, which could hinder egress.

Recommendation:

5. The Hybrid device is the recommended EBS equipment.
<u>Note</u>: At the present time the only Hybrid device available is the Shark Air Pocket Plus currently being used in the UK North Sea.

5.3 EBS Design

Some of the parameters for the EBS design should be:

- Robust and durable;

- High degree of reliability and availability (will work when required);
- Simple to use and train on;
- Deployable with one hand;
- Compatible with use of face-mask;
- Designed and manufactured to a recognized standard;
- Compatible with existing immersion suit system safety devices;
- Not cause entanglement or inhibit egress through emergency exits; and
- Low cost.

Question:

Where should the EBS device be carried or mounted?

Response:

There are a number of options to consider, depending on the type of EBS device selected including:

- On the immersion suit;
- On the lifejacket;
- Separately mounted on the air frame, e.g. seat back; and
- A stand-alone device contained in a pouch and attached to the suit or lifejacket by a belt and clip arrangement.

The current design for the Hybrid Device employs the belt and clip arrangement, which can be unzipped from certain immersion suits and allows the EBS to become detachable, in a similar way to the lifejacket. In this way it can be re-used by personnel on an inward bound flight. The advantage of this arrangement is that it would obviate the need to seek regulatory approvals for changes to either the immersion suit or lifejacket. This arrangement would still require testing however, to show that the EBS would not adversely affect the other items of safety/survival equipment i.e. immersion suit and lifejacket and not present snagging or entanglement hazards.

Recommendation:

6. Egress testing to be conducted to show that the Hybrid Device would not adversely affect the other safety/survival systems.

Question:

What effect will the much lower seawater temperatures, present off the east coast, have on a person's breath hold capability when immersed?

Response:

The experiments conducted to date have used much higher sea water temperatures than those typically found offshore east coast, where average surface temperatures are 15 degrees Celsius in summer and 0 degrees Celsius in winter. The lower the sea water temperature, the less capability a person had to hold their breath and hence, there may be a need for a larger volume or duration of air to be provided to ensure an adequate margin for safe egress.

Recommendation:

7. Testing to be conducted in order to confirm adequate sizing of the top up air supply.

Question:

What effect would any additional buoyancy contained in the Hybrid Device bag have on a passenger's ability to egress from the helicopter?

Response:

Although some testing has been conducted by the USCG on the ability to egress using an inflated Rebreather bag, this was not conducted using the immersion suits in use on the east coast. It is also unclear at what sea water temperatures this testing was conducted. Therefore, the performance of the Hybrid Device, with the east coast immersion suits, as well as any added buoyancy due to the need for extra top up air, is unknown.

Recommendation:

8. Egress testing with an inflated Rebreather bag appropriate for east coast sea water temperatures and immersion suit systems should be conducted to verify egress will not be inhibited.

Question:

Can the EBS be deployed underwater?

Response:

The current thinking from the CAA in the UK is that the EBS device should be deployed "post impact" in a controlled ditching situation. Their information concludes that under such conditions,

there is adequate time for the EBS to be deployed in air, prior to the helicopter starting to capsize or sink. However, given the situation whereby the EBS cannot be deployed in air or quickly enough prior to impact, it should have the capability of being deployed underwater.
See also Recommendation 16 concerning deployment testing in conjunction with a face mask.

Recommendation:

9. ***Further research and testing should be conducted on the Hybrid Device to verify underwater deployment capability.***

5.4 EBS Servicing and Inspection

Question:

What are the likely costs for servicing and inspection of EBS Devices?

Response:

The indications from one company involved in the servicing of immersion suits and lifejackets are that Hybrid Devices would be treated in a similar fashion to lifejackets. One advantage of having the Air Pocket Plus, as a standalone device, clipped to lifejacket or immersion suit is that it becomes detachable from the suit and is re-used by another passenger on an inward bound flight. This reduces considerably the number of devices required to be in circulation. Inspection would be relatively simple, requiring only to ensure that the air cylinder remains fully charged and tampering has not taken place. Servicing would be carried out, based on how many flights had occurred with costs comparable with a lifejacket, in the $1.00-$1.50 range per unit per day.

5.5 Training

Question:

What type of training is recommended for EBS?

Response:

Research to date has shown that a progressive approach to EBS training using a combination of classroom theory, dry training, pool time and then EBS usage in the HUET is the preferred option.

This can also be supplemented by Hybrid demonstrations and pre-flight Orientation videos at the heliport, prior to embarkation.

Recommendation:

10. Implement the progressive training approach, using a combination of dry and wet training.

Question:

What would be an appropriate duration for the training?

Response:

The training schools should develop a training module, based on the above philosophy and include it in the BST and BST-R as an EBS module. It is anticipated that the extra EBS module will be accommodated within the 40 hour BST course, given some of the suggestions provided by CAPP, through the TQG, to the training schools for optimizing the time spent on the course. Reference should also be made to course content and lesson plans etc being developed by OPITO in the UK.

Recommendation:

11. EBS training to be a module within BST and BST-R.

12. The joint industry/government Training Qualification and Guidelines Committee (TQG) should direct the training schools to liaise with OPITO and other training agencies to ensure maximum learnings are obtained from EBS training course development and delivery.

Question:

Once EBS training is in place, will there be a need to re-certify all BST and BST-R certificate holders?

Response:

It is not envisaged that EBS training be retroactive. Given the large numbers of personnel involved in BST type training, the ability of the training schools to accommodate extra training and the ability to offer EBS dry training and orientation at the heliport, the use of a "grandfathering" rule is proposed. Therefore, all current BST and BST-R certificates would remain valid until their expiry date. The Implementation Committee would be responsible for determining the start-up timing for EBS training.

Recommendation:

13. A "grandfathering" rule be applied to all current BST and BST-R certificates so that they remain valid until their expiry dates.

Question:

How would the EBS training requirement for persons with limited risk exposure be addressed? For example:

- Short duration work conducted by non-Canadian personnel, e.g. seismic or construction vessel crews; and
- Short duration visitors, e.g. those persons taking the Offshore Survival Introduction (OSI) training.

Response:

Given the low frequency of helicopter travel and hence limited risk exposure for these persons full EBS training should not be provided, but dry EBS orientation training would be provided at the heliport.

Recommendation:

14. The Implementation Committee to confirm the acceptance criteria for EBS training involving personnel who have limited risk exposure to helicopter travel.

Question:

Should EBS training be mandatory or optional?

Response:

By adopting the progressive approach to the training it should be possible for all students to understand the benefits of EBS and for them to become confident in its usage. This approach should allay concerns over the students' ability to use the Hybrid Device and breathe underwater, both upright and inverted. There will however be a small percentage of students, who will not be comfortable with its use, either in the pool or in the HUET. For those people, it is important to provide them with an assurance that if they can't use the EBS, they will still be permitted to work offshore i.e. that successfully using EBS is not a condition of employment.

Recommendation:

15. All students will be trained on the use of the EBS, including the pool side exercises, however during the actual HUET training, the use of the EBS for egress purposes is optional.

Question:

Should EBS training promote EBS deployment pre or post impact?

Response:

There are two schools of thought around the deployment timing. When Shell and Shark (the developers of the Air Pocket) first promoted the use of EBS, their training instructions were for the device to be deployed, pre impact. However, subsequent reports and policy statements from the CAA would suggest that post impact deployment is the preferred method. This stance is mainly due to the belief that facial injuries may result from the inserted mouthpiece because of impact forces with the water. There are some contrary views to this position, which would argue that, if time permits, the EBS should be deployed pre impact. In this mode the passenger would feel more confident and comfortable knowing that they would have an adequate amount of air available in which to complete their egress, irrespective of breath hold capability.

Another factor to consider, is that the Super Puma helicopters, currently in use off Newfoundland, are fitted with 4 point harnesses, as opposed to simple lap belts, and therefore will tend to hold passengers more firmly in position on and after impact and reduce the likelihood of injury.

Recommendation:

16. Further research and testing is needed in the area of when to deploy the EBS i.e. pre or post impact. This testing to be conducted with a face mask.

5.6 Medical/Health Considerations

Question:

How medically fit do you need to be to train with (and eventually use) EBS?

Response:

A major advantage of using the Hybrid Device over the compressed air system is that in-water training can be conducted using only the Rebreather portion of the equipment i.e. the top up cylinder is removed during training. This should allow the training schools to accept the same medical requirements currently existing for BST. In addition, it also removes the risk to students of a pulmonary barotrauma caused by incorrect breathing techniques underwater and precludes the need for a recompression chamber to be available.

Recommendation:

17. The EBS training module should focus on using the Rebreather bag only, without top up air supply for training sessions

Question:

What additional psychological stressors would be added to workers because of EBS training?

Response:

Research to date (UK North Sea) shows that HUET training is known to cause high levels of anxiety amongst the offshore workforce. This would be in addition to one of the most stressful parts of their job i.e. the actual helicopter flight offshore. There is some concern therefore that by increasing the complexity of training some additional anxiety will result. This however, is offset by the fact that personnel who have been satisfactorily trained on EBS have stated that their confidence levels have improved significantly and their anxiety levels reduced, knowing that they have a much greater breathing capability in order to successfully egress the helicopter. Long-term health benefits can therefore be gained from reducing anxiety due to training and to flying offshore.

Question:

How will training schools ensure that the Rebreather bags used for training purposes are adequately sterilized between users?

Response:

The issue of preventing infectious diseases is one, which is receiving much more attention these days. There are medical concerns over the ability of "conventional" sterilization techniques to effectively remove all germs from devices such as air bags into which people have been inhaling and exhaling. Further research into this area will be required in order to assure all persons participating in Hybrid training exercises that there is no risk from infectious diseases. Alternatively, further work

should be done with the equipment manufacturers to explore the possibility of disposable Rebreather bags for training purposes.

Recommendation:

18. Research to be conducted to ensure that adequate sterilization techniques are available to re-use Rebreather bags during training.

19. Review feasibility of disposable Rebreather bags as a cost effective alternative.

5.7 Regulatory Jurisdiction

Question:

Does EBS equipment require approval from a regulatory agency or any type of Canadian approval?

Response:

In the UK North Sea any emergency or survival equipment carried on a helicopter and required by legislation, has to meet certain technical standards specified by the CAA. Where any additional equipment is provided, over and above the regulatory requirements, the supplier of that equipment, e.g. the Operator, has to demonstrate that the equipment will not adversely affect the operation of any mandated equipment. The CAA, on successful demonstration, would then issue a limited approval termed, "no hazard, no credit." The Hybrid Device has been given such a limited approval.

In Canada, the situation is similar, whereby the safety/survival equipment required by regulation i.e. lifejackets, immersion suits and liferafts all meet a Canadian standard. In discussions with the Aircraft Certification Branch of the Department of Transport (DOT), it is apparent that their preference is for the offshore Operators to implement EBS usage through commercial or contractual arrangements, rather than have the DOT mandate the carriage by regulation. There are a number of advantages to this approach, including retaining more control over where and how the devices are to be used, as well as showing regulators and external and internal stakeholders the Operators' commitment to enhancing all aspects of worker safety.

Recommendation:

20. The implementation of EBS remain an industry initiative.

5.8 EBS Technical Standard

Question:

Is there a need for a technical standard for design and performance?

Response:

The CAA paper, prepared by Coleshaw, included an example of a draft technical standard and in a subsequent paper presented by Hodge, UKOOA have given indication that they will not be developing a CAA technical standard based on the document. Rather they believe that the combination of the draft example technical standard and the various testing and research reports generated would enable Operators to "discharge their responsibilities with respect to the design and use of EBS and satisfy a duty of care to passengers."

There is no indication at the present time whether UKOOA will proceed with developing an EBS technical standard.

In Canada there are precedents of where the oil and gas industry have taken the initiative when it comes establishing technical standards for safety and/or survival equipment as well as, other examples for Canadian standards for PPE or safety equipment. These include:

- Helicopter Passenger Immersion Suit standard, CGSB;
- Fire Retardant Workwear standard CGSB;
- Marine Abandonment Suits CSA;
- Life Jackets and Life Vests CSA;
- Eye Protection CSA;
- Hearing Protection CSA;
- Respiratory Protection CSA; and
- Fall Protection CSA.

The advantages and disadvantages of developing a Canadian standard versus not having a standard mainly relate to liability and regulatory issues, as well as the time and costs that would be involved by the Operators in ensuring that Manufacturers and Suppliers were delivering the specified product. Also, a review of the CAA example draft standard indicates that it would be an excellent starting point for the development of a Canadian standard.

The DOT has also stated that they would be willing to participate in any standards development work.

A review of the CAA example draft standard indicates that it would be an excellent starting point for the development of a Canadian standard.

Recommendation:

21. CAPP to agree in principle with the philosophy of requiring all EBS Devices to meet a Canadian standard.

6 List of Persons Consulted

Contact	Affiliation	Phone #
Peter Noel	C-NOPB, Senior Safety Officer	709-778-1410
Dave Scratch	C-NSOPB, Chief Inspector	902-429-2130
David Howson	CAA, Research Project Manager	44-1293-573350
Robert Nolan	Shark Air Products	44-1670-760365
Steve Frenette	IMP	709-722-4221
Chris Brooks	Survival Systems, R&D Director	902-465-3888
Bob Rutherford	OSSC, Director	709-834-2076
Rick Burt	Cougar Helicopters, Base Team Leader	709-758-4801
Byron Halbleib	Global Santa Fe, Operations Manager	709-724-6600
Ross McKay	DOT Air Administration Regional Superintendent, Helicopter Operations	506-851-7249
John Ereaux	Regional Manager, Aircraft Certification	506-851-7411
Chris Twyman	Shell Expro, Chair UKOOA, Aircraft Committee	011-44-1224-882616
Richard Verbiski	CGSB, Standards Officer	819-956-0854

7 Research Summary Updated 19 August 2002

Helicopter Emergency Breathing Systems (EBS):

Reports Reviewed:

- CAA paper on EBS – An Operational View from the Regulator, given at the Offshore Emergencies conference in Aberdeen, by Brian Hodge, June 2002
- CAA preliminary study of the Implementation and Use of Emergency Breathing Systems SC 123 (Coleshaw May 2002)
- An Examination of Current Emergency Breathing Systems for Helicopter Escape for Use by Crew and Passengers in Canadian Offshore Oil Operations (Brooks, 2001)
- Breath-Holding Ability of Students Attending the Basic Helicopter Survival Training Course (Brooks, 2001)
- RTO AGARDograph 341: The Requirements for an Emergency Breathing System in Over-Water Helicopters and Fixed-Wing Aircraft Operators (Brooks and Tipton, 2001)
- Report on Emergency Systems Workshop, Hosted by the UK Civil Aviation Authority (October 2000)
- Surviving From Ditched Helicopters (Coleshaw, 2000)
- An Initial Investigation of Passenger Evacuation from the Super Puma Helicopter (Brooks et al, 1999) [1]
- Training Issues Relating to the Use of Emergency Underwater Breathing Apparatus by Helicopter Passengers (Coleshaw, 1998)
- Advantages and Disadvantages of Using Underwater Breathing Apparatus in Helicopters (Coleshaw, 1997)
- Numerous international articles and literature on the subject

[1] As discussed at the May 31, 2001 meeting, CAPP members are not supportive of the recommendations and conclusions stated in this report.

Topic 1: HUEBA

1.6

CANADA-NEWFOUNDLAND
OFFSHORE
PETROLEUM
BOARD

FAXED
April 8/03
DATE

April 8, 2003

600-15-21

RECEIVED
APR 0 9 2003
Canadian Association
of Petroleum Producers

Mr. Paul Barnes
East Coast Manager
Canadian Association of Petroleum Producers
Suite 905, Scotia Centre
235 Water Street
St. John's, NF
A1C 1B6

Dear Paul:

Subject: Helicopter Underwater Escape Breathing Devices

Please be advised that we support your approach to the implementation of these devices as outlined in your letter of March 20, 2003. In this regard we appoint Mr. Peter Noel to act as the Board's representative on your proposed implementation committee. We request that this committee develop a draft terms of reference document such that we may seek the formal approval from our Board for our participation.

Should you wish to discuss this matter further please contact Mr. Noel at 778-1410.

Yours Truly,

Howard L. Pike
Manager of Operations & Chief Safety Officer

CC S. Pinks
P. Noel

Fifth Floor, TD Place, 140 Water Street, St. John's, Newfoundland, Canada A1C 6H6
Telephone (709) 778-1400 Telecopier (709) 778-1473

Topic 1: HUEBA

1.7

CANADIAN ASSOCIATION
OF PETROLEUM PRODUCERS

HELICOPTER EMERGENCY BREATHING SYSTEM (EBS)

RISK ASSESSMENT

2	03/22/05	Re-issued for information	[redacted]	[redacted]	P. Barnes
1	02/28/05	Issued for Information	[redacted]	[redacted]	P. Barnes
Rev	Date	Description	Originator	Checked By	Approval

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A Worksheet Report
B Facilitator Presentation
C Reference Documents

List of Acronyms

ALARP	As Low As Reasonably Practicable
BST	Basic Survival Training
BST-R	Basic Survival Training - Recurrent
CAPP	Canadian Association of Petroleum Producers
EBS	Emergency Breathing System
EHS&S	Environment , Health, Safety & Security
HUET	Helicopter Underwater Escape Trainer
MI	Marine Institute
OHS	Occupational Health & Safety
PHA	Process Hazard Analysis

Summary

This report summarizes the findings of a Process Hazard Analysis (PHA) risk assessment study examining issues and concerns around EBS training, along with the proposed implementation of the training. Training is assumed to be contained within BST and BST-R, along with incorporation into the heliport departure video.

The scope of this PHA did not include the pros/cons of using EBS in helicopter travel, or the best type of EBS to use.

The PHA was performed to identify realistic hazardous scenarios associated with the training in EBS usage. Safeguards were assessed and recommendations were generated to mitigate the risks of those hazards not satisfactorily addressed by existing controls.

The purpose of the review was to ensure that standards set for the safe conduct of the activities would be met and, in particular, that all potential exposures to personnel would be ALARP. The PHA study was carried out in accordance with the Petro-Canada document OD-PE-SA03-X00-005 Revision M1 Process Hazard Analysis (PHA) Process.

The study took place on February 22, 2005, at Petro-Canada offices in St. John's. [redacted] (Risk & Safety Engineer, Petro-Canada) facilitated the PHA session. Refer to Appendix A for attendee list and worksheet report.

A total of 14 recommendations were recorded during the session. All actions will need to be addressed by those assigned to them in the PHA session. Two of the main points/concerns raised were to do with wet-training and the risks and liability of having all BST & BST-R participants do the EBS wet-training along with if the medical standard will be raised to a higher level based on the requirements for EBS training.

APPENDIX A:

Worksheet Report

Team Members

First Name	Last Name	Company	Comment
[redacted]	[redacted]	Petro-Canada EHS&S	
[redacted]	[redacted]	Petro-Canada EHS&S	
[redacted]	[redacted]	Petro-Canada EHS&S	
[redacted]	[redacted]	CAPP	
[redacted]	[redacted]	Petro-Canada Logistics	
[redacted]	[redacted]	Husky QHSE	
[redacted]	[redacted]	ExxonMobil SHE	
[redacted]	[redacted]	Atlantic Offshore Medical Services	
[redacted]	[redacted]	Atlantic Offshore Medical Services	
[redacted]	[redacted]	Marine Institute	
[redacted]	[redacted]	Marine Institute	
[redacted]	[redacted]	Survival Systems Training Ltd	
[redacted]	[redacted]	C-NOPB Safety Officer	
[redacted]	[redacted]	Husky Operations	
[redacted]	[redacted]	Encana Drilling	Via telephone
[redacted]	[redacted]	C-NSOPB Safety Officer	Via telephone
[redacted]	[redacted]	Safety First Industry	Via telephone

Recommendations

Recommendations	Place(s) Used	Responsibility	Max RR
1. Ensure East Coast medical standard addresses EBS training	What ifs: 1.1.1, 1.1.2, 1.1.3	CAPP	Priority 1 (Unacceptable)
2. Verify training qualifications for instructors	What ifs: 1.1.4	CAPP	Priority 2 (High)
3. Ensure NF instructors complete train the trainer program and receive necessary diving certification	What ifs: 1.1.4	CAPP	Priority 2 (High)
4. Ensure training video is completed and available for use at both heliports and all offshore installations (Ensure video includes details of EBS usage for visitors who are not subject to BST or BST-R)	What ifs: 1.2.1	CAPP	Priority 2 (High)
5. Consider stating in training video that EBS usage is optional and that usage without training could be dangerous/hazardous	What ifs: 1.2.1	CAPP	Priority 2 (High)
6. Determine if standard for medical fitness needs to be raised for EBS training	What ifs: 1.1.1, 1.1.3	CAPP	Priority 1 (Unacceptable)
7. Confirm with appropriate regulatory body if there are requirement for students to have extra medical clearance	What ifs: 1.1.1, 1.1.3	CAPP/Bob Rutherford	Priority 1 (Unacceptable)
8. Reconsider wet training plan based on risks (NS incident) (Optional?)	What ifs: 1.1.1, 1.1.3	CAPP/Training Institutes	Priority 1 (Unacceptable)
9. Consider having other training in lieu of wet training (current method).	What ifs: 1.1.1, 1.1.3	CAPP	Priority 1 (Unacceptable)
10. Ensure added steps adequately integrated into training	What ifs: 1.1.5	Training Institutes	Priority 4 (Low)
11. Consider stand alone EBS training	What ifs: 1.2.1	CAPP	Priority 2 (High)
12. Review training requirements with manufacturer to ensure alignment with program	What ifs: 1.2.1	CAPP	Priority 2 (High)
13. Confirm with applicable regulatory bodies that no wet training is acceptable and that video training is acceptable in interim	What ifs: 1.1.3, 1.2.1	CAPP	Priority 1 (Unacceptable)
14. Develop communication plan for EBS implementation	What ifs: 1.2.1	CAPP	Priority 2 (High)

Worksheet

System: 1. Proposed Training (Video at Heliport and BST, BST-R over 3 year period)

Subsystem: 1. Risks of training

What ifs	Consequences	Risk Matrix S	Safeguards	Risk Matrix P	Risk Matrix RR	Recommendations	Responsibility	Remarks
1. Personnel medically unfit for pool training and participate in training	1. Personnel injury	Severity Level 2 (High)	1. East coast medical clearance	Occasional	Priority 2 (High)	1. Ensure East Coast medical standard addresses EBS training	CAPP	1. CAPP position is that failure to use EBS in pool training will not result in BST, BST-R failure
	2. Liability (training institute, Oil company, etc)	Severity Level 2 (High)	2. Medical questionnaire to address change in health status (MI?)	Occasional	Priority 2 (High)	6. Determine if standard for medical fitness needs to be raised for EBS training	CAPP	2. NL provincial OHS may require instructors to have dive medical
			3. Educational/classroom training provided (shallow water training)			7. Confirm with appropriate regulatory body if there are requirement for students to have extra medical clearance	CAPP/Bob Rutherford	3. North Sea experience is only for dry training for EBS rebreather
			4. Hyperbaric medical facilities accessible			8. Reconsider wet training plan based on risks (NS incident) (Optional?)	CAPP/Training Institutes	
						9. Consider having other training in lieu of wet training (current method).	CAPP	

System: 1. Proposed Training (Video at Heliport and BST, BST-R over 3 year period)

Subsystem: 1. Risks of training

What Ifs	Consequences	Risk Matrix S	Safeguards	Risk Matrix P	Risk Matrix RR	Recommendations	Responsibility	Remarks
2. Personnel medically unfit for pool training and do not participate in training	1. Unable to train with device (not comfortable using device)	Severity Level 4 (Minor)	1. EBS is only an enhancement	Probable	Priority 4 (Low)	1. Ensure East Coast medical standard addresses EBS training	CAPP	1. CAPP position is that failure to use EBS in pool training will not result in BST, BST-R failure
	2. Personnel decide to leave industry	Severity Level 3 (Moderate)	2. Status quo BST training (including HUET).	Probable	Priority 3 (Medium)			
3. Barotrauma during HUET training with EBS	1. Personnel injury	Severity Level 2 (High)	1. East coast medical clearance	Occasional	Priority 2 (High)	1. Ensure East Coast medical standard addresses EBS training	CAPP	1. CAPP position is that failure to use EBS in pool training will not result in BST, BST-R failure
	2. Liability (training institute, Oil company,	Severity Level 2	2. Medical questionnaire to address change in health status (MI?)	Occasional	Priority 2 (High)	6. Determine if standard for medical fitness needs to be raised for EBS training	CAPP	2. NL provincial OHS may require instructors to have dive medical

System: 1. Proposed Training (Video at Heliport and BST, BST-R over 3 year period)

Subsystem: 1. Risks of training

What ifs	Consequences	Risk Matrix S	Safeguards	Risk Matrix P	Risk Matrix RR	Recommendations	Responsibility	Remarks
	etc)	(High)	3. Educational/classroom training provided (shallow water training)			7. Confirm with appropriate regulatory body if there are requirement for students to have extra medical clearance	CAPP/Bob Rutherford	3. North Sea experience is only for dry training for EBS rebreather
			4. Hyperbaric medical facilities accessible			8. Reconsider wet training plan based on risks (NS incident) (Optional?)	CAPP/Training Institutes	4. Performing wet training with the EBS will not increase the number of HUET uses in the BST & BST-R
			5. Water depth less than 10 feet			9. Consider having other training in lieu of wet training (current method).	CAPP	
						13. Confirm with applicable regulatory bodies that no wet training is acceptable and that video training is acceptable in interim	CAPP	
4. Training not sufficient (at training institute)	1. Personnel injury	Severity Level 2 (High)	1. NS instructors are experienced based on Canadian Navy work	Remote	Priority 3 (Medium)	2. Verify training qualifications for instructors	CAPP	

System: 1. Proposed Training (Video at Heliport and BST, BST-R over 3 year period)

Subsystem: 1. Risks of training

What Ifs	Consequences	Risk Matrix S	Safeguards	Risk Matrix P	Risk Matrix RR	Recommendations	Responsibility	Remarks
	2. Lack of confidence in EBS by user	Severity Level 4 (Minor)	2. Train the trainer program for NF instructors 3. Vendor recommended training is exceeded 4. Written exam at end of training	Remote	Priority 4 (Low)	3. Ensure NF instructors complete train the trainer program and receive necessary diving certification	CAPP	
5. EBS adds added steps to escape process	1. Potential confusion and egress delay	Severity Level 4 (Minor)	1. Training of personnel in BST and heliport video 2. Easy access on suit	Occasional	Priority 4 (Low)	10. Ensure added steps adequately integrated into training	Training Institutes	

System: 1. Proposed Training (Video at Heliport and BST, BST-R over 3 year period)

Subsystem: 2. EBS Implementation

What ifs	Consequences	Risk Matrix S	Safeguards	Risk Matrix P	Risk Matrix RR	Recommendations	Responsibility	Remarks
1. EBS wet training not yet completed	1. Personnel injury	Severity Level 2 (High)	1. Video at Heliport outlines EBS usage and safeguards	Remote	Priority 3 (Medium)	4. Ensure training video is completed and available for use at both heliports and all offshore installations (Ensure video includes details of EBS usage for visitors who are not subject to BST or BST-R)	CAPP	1. One manufacturer recommends wet training before usage. "Before using the SEA it is important in-water survival training which simulates emergency egress situation. You must also learn basic principles and techniques for breathing compressed air under water. Use of the SEA without proper training is dangerous and can result in serious injury, or death."
	2. Lack of confidence in EBS by user	Severity Level 4 (Minor)	2. EBS is only an enhancement (and communicated in training)	Occasional	Priority 4 (Low)	5. Consider stating in training video that EBS usage is optional and that usage without training could be dangerous/hazardous	CAPP	
	3. Potential regulatory deviation	Severity Level 3 (Moderate)		Frequent	Priority 2 (High)	11. Consider stand alone EBS training	CAPP	
						12. Review training requirements with manufacturer to ensure alignment with program	CAPP	
						13. Confirm with applicable regulatory bodies that no wet training is acceptable and that video training is acceptable in interim	CAPP	

System: 1. Proposed Training (Video at Heliport and BST, BST-R over 3 year period)

Subsystem: 2. EBS Implementation

What ifs	Consequences	Risk Matrix	Safeguards	Risk Matrix		Recommendations	Responsibility	Remarks
		S		P	RR			
						14. Develop communication plan for EBS implementation	CAPP	

APPENDIX B:

Facilitator Presentation

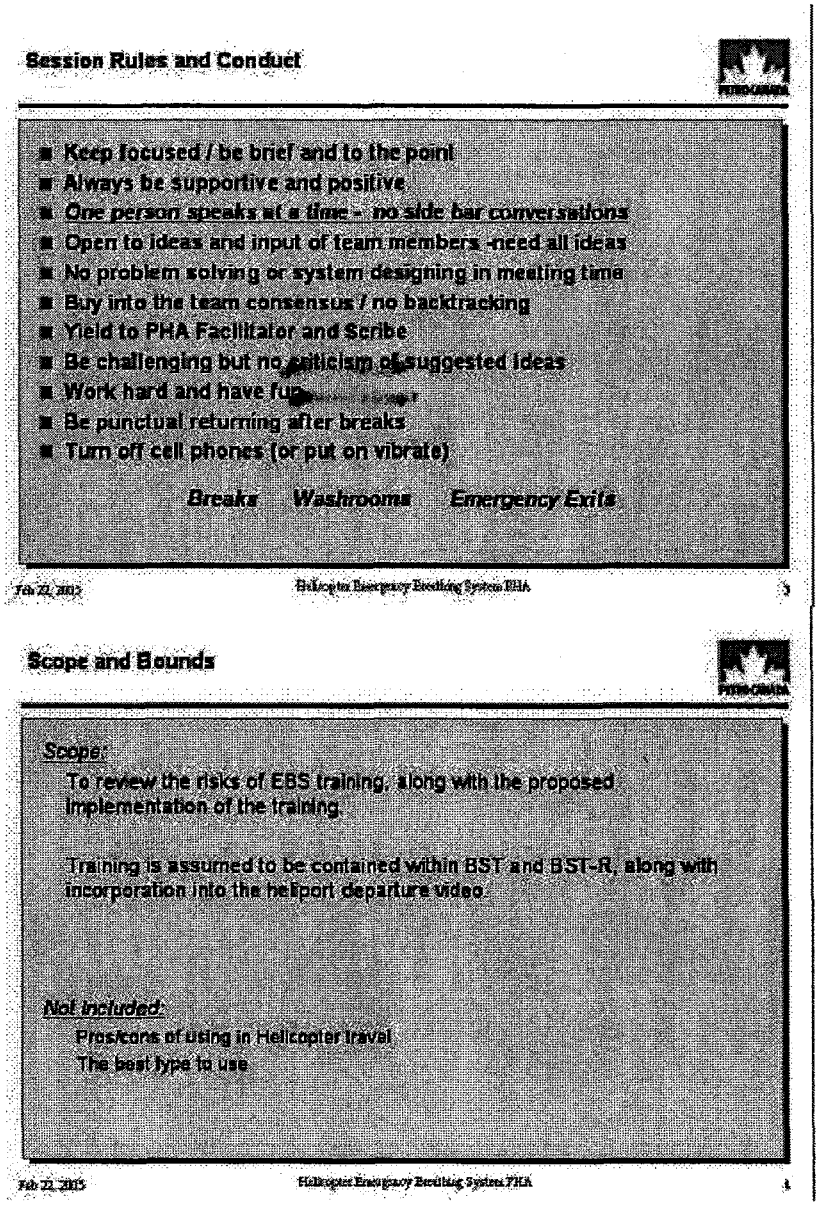
Helicopter Emergency Breathing System PHA

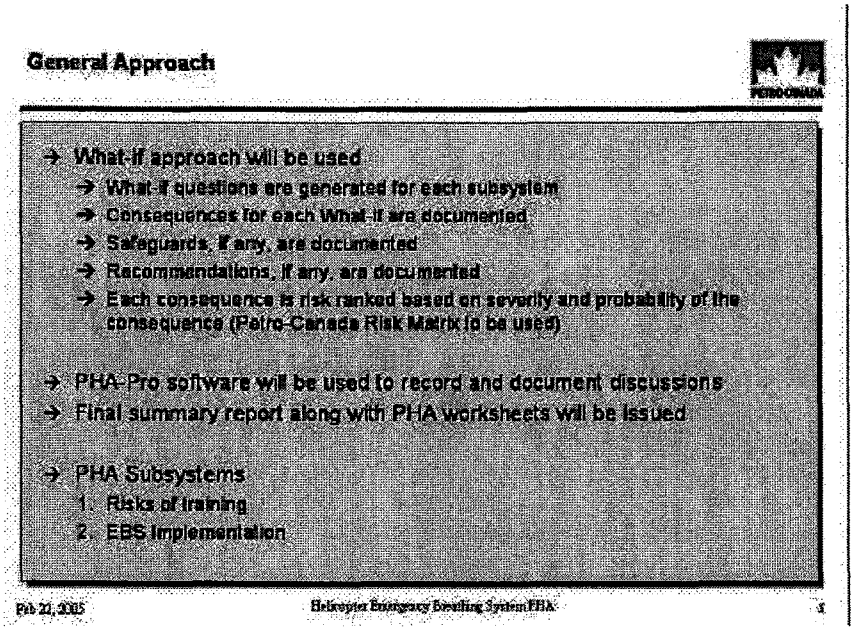
Feb 22, 2005
Facilitator: [redacted]
Scribe: [redacted]

Getting the Session Started

- Review of Issue
- Sign attendance sheet
- Review meeting rules and conduct
- Define scope for the study
- Agree on general approach
- PHA Worksheets

Feb 22, 2005 Helicopter Emergency Breathing System PHA 2


Session Rules and Conduct
Keep focused / be brief and to the point
Always be supportive and positive
One person speaks at a time - no side bar conversations
Open to ideas and input of team members -need all ideas
No problem solving or system designing in meeting time
Buy into the team consensus / no backtracking
Yield to PHA Facilitator and Scribe
Be challenging but no criticism of suggested ideas
Work hard and have fun
Be punctual returning after breaks
Turn off cell phones (or put on vibrate)
Breaks Washrooms Emergency Exits
Feb 22, 2012
Helicopter Emergency Breathing System PHA
3
Scope and Bounds
Scope:
To review the risks of EBS training, along with the proposed implementation of the training.
Training is assumed to be contained within BST and BST-R, along with incorporation into the heliport departure video.
Not included:
Pros/cons of using in Helicopter travel
The best type to use
Feb 22, 2012
Helicopter Emergency Breathing System PHA
4


General Approach
→ What-if approach will be used
→ What-if questions are generated for each subsystem
→ Consequences for each What-if are documented
→ Safeguards, if any, are documented
→ Recommendations, if any, are documented
→ Each consequence is risk ranked based on severity and probability of the consequence (Petro-Canada Risk Matrix to be used)
→ PHA-Pro software will be used to record and document discussions
→ Final summary report along with PHA worksheets will be issued
→ PHA Subsystems
1. Risks of training
2. EBS Implementation
Feb 21, 2005
Helicopter Emergency Breathing System PHA
5

APPENDIX C:

Reference Documents

Canadian Association of Petroleum Producers (CAPP)
Atlantic Canada – Safety Sub-Committee
EBS Task Group

Terms of Reference
Process Hazards Analysis (PHA) / Risk Assessment
Helicopter Underwater Escape Breathing Apparatus
Training and Implementation Plan

Scope:
To review the hazards associated with the proposed CAPP EBS training and implementation plan for possible EBS use during offshore helicopter travel. Training is assumed to be contained within BST and BST-R, along with incorporation into a heliport departure video.

Background:
The CAPP presentation entitled "Helicopter Underwater Escape Breathing Apparatus – Decision on appropriate devise for east coast operations" will be used as the basis for background information.

Schedule:
The Process Hazards Analysis (PHA) is scheduled for February 22nd, 2005 from 2 to 5 pm in Petro-Canada's offices in Scotia Center. The session will start with introductions, overview of a PHA, technical overview of the EBS system and training and then the PHA itself.

Attendees:
- Geoff Redfern, PC (Facilitator), Jonathon Babb, PC (Scribe)
- Operator Representatives from CAPP EBS task group
- CAODC representative
- Training Institutes representatives
- Helicopter contractors
- Operator Logistics representatives
- Offshore Medical Advisor (Dr. C. O'Shea will attend on behalf of PC)
- C-NOPB / C-NSOPB representatives

Approach:
What-if approach will be used :

- ➔ What-if questions are generated for each subsystem
- ➔ Consequences for each What-if are documented
- ➔ Safeguards, if any, are documented
- ➔ Recommendations, if any, are documented
- ➔ Each consequence is risk ranked based on severity and probability of the consequence (Petro-Canada Risk Matrix to be used)

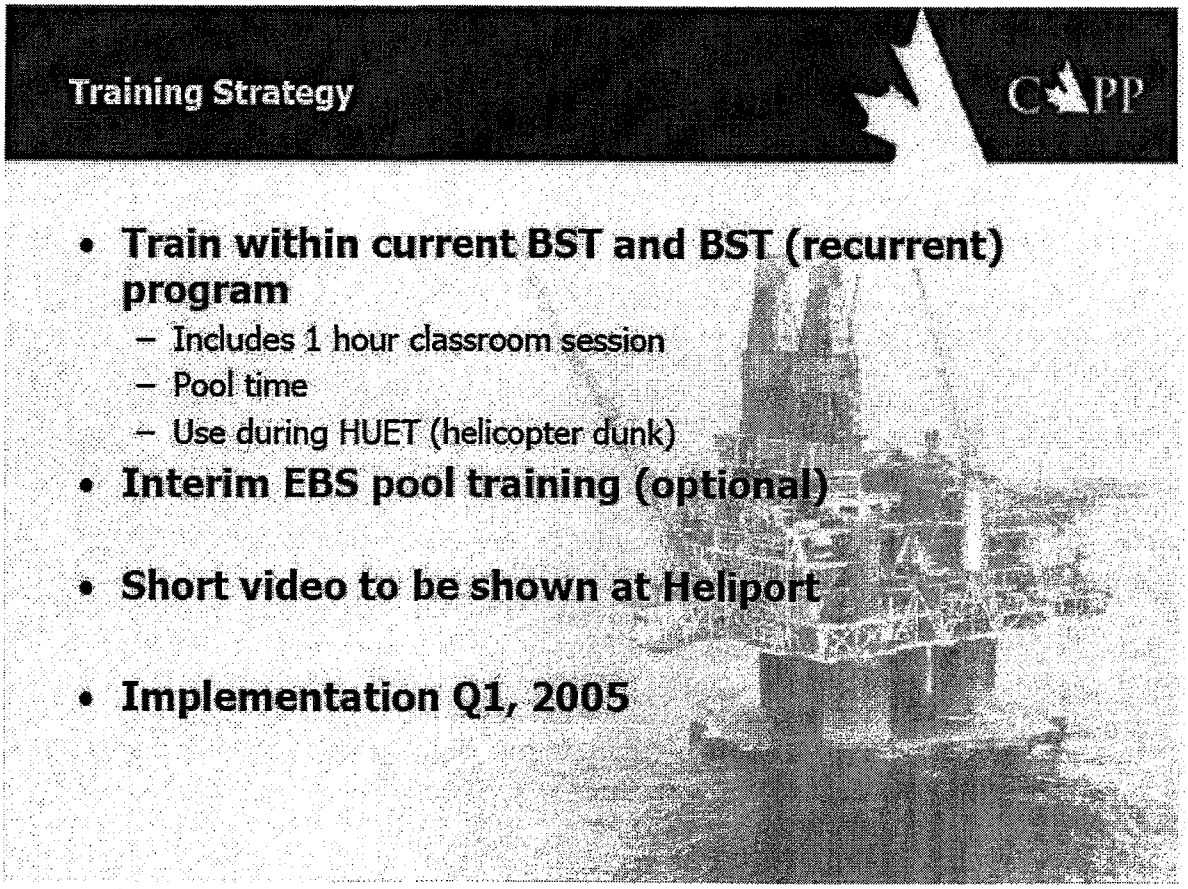
PHA-Pro software will be used to record and document discussions. A final summary report along with PHA worksheets will be issued.

PHA Subsystems:

1. Risks of training personnel in use of EBS
2. EBS Implementation

S. Strong
Feb 2005

Training Strategy



- **Train within current BST and BST (recurrent) program**
  - Includes 1 hour classroom session
  - Pool time
  - Use during HUET (helicopter dunk)
- **Interim EBS pool training (optional)**
- **Short video to be shown at Heliport**
- **Implementation Q1, 2005**

Emergency Breathing System Video (Pixelyard) – Draft Video Script

Intro.

This video contains information on emergency breathing equipment (EBS), which is provided for your use in the event of an emergency over water. It is very important that you try to make your escape using the training you have already received and only use the EBS if you are unable to escape and have to resort to the EBS. It is important that you listen to this information so that if you are required to use this system you can do so quickly and efficiently. There are many different makes of this equipment however the type we are going to learn about is the Survival Egress Air – LV2. Aqua-Lung America produces this system. (This information you are about to receive will give you general knowledge on the system, which can be related to other systems.)

What is an EBS and how does it work.

EBS stands for emergency breathing system. It is designed to provide the user enough compressed air so he or she can effect an escape from a partially or totally submerged helicopter. This system is based on the same design as a self-contained underwater breathing apparatus known as SCUBA. Some of you may already know how to operate a SCUBA set and this safety equipment operates in exactly the same way. (The 1st stage regulator, which is situated on the top of the high-pressure cylinder, steps down the pressure from 3000 pounds per square inch to approximately 130 pounds per square inch. This air is then delivered via a low-pressure hose to

the 2nd stage regulator, which goes in the users mouth and it also steps down the pressure to the ambient pressure, which is the same pressure as the surrounding water.)

What does an EBS do.

An EBS if used correctly will give the user confidence by supplying extra air when needed. We all understand the meaning of cold shock and how our breath holding time is cut drastically often less than 10 seconds particularly in water of 15 degrees Celsius and below. It is therefore vitally important that you use this device correctly as it can give you up to 21 breaths at 21 feet. The main benefit is to give the user extra time to perfect their escape by being able to demand air from the equipment in a very stressful situation where air and breathing is crucial to your survival and is often in short supply. (The endurance of the system can vary from person to person due to the persons stress level and breathing rate. The depth the system is being used at also affects the endurance. This will be covered further in this general precautions and warnings.)

General Precautions and Warnings.

1) This device is intended for use as an emergency device to assist a crewmember or passenger making an emergency egress from a submerged helicopter. Due to it's limited air volume it is not intended for use underwater below 45 feet or 13.5 metres.
2) Before using this device it is important to receive in-water survival training which simulates an emergency egress situation. The Principals and techniques for breathing compressed air

underwater must be learnt to minimize the hazards , which could result in serious injury or death. These principals and techniques will be shown to you in the practical training phase.

3) The unit is filled with compressed air and therefore you are subject to the rules of diving using compressed air. **The number one rule is to breathe out on the way to the surface.** The reason for this rule is as follows: As you descend beneath the water the **pressure increases** and the **volume of gas** (Compressed Air) **decreases** and inversely as you return to the surface the **pressure decreases** and the **volume of gas increases** (Boyles Law). If you hold your breath at any stage on return to the surface due to the pressure decrease and the volume increase it is possible to damage your lungs and cause you to **suffer some form of air embolism.** This type of injury requires specialist treatment and is easily prevented by breathing out on the way to the surface. **It can be a life threatening injury**.

4) **The symptoms of an air embolism are usually sudden and dramatic. They may occur prior to or within minutes of surfacing. The person may have a feeling of discomfort or pain in the chest and may also have bloody froth in the mouth. These symptoms are obvious. However, the person may experience signs of embolism such as weakness, dizziness, paralysis and blurring of the vision. All these symptoms are caused by air bubbles, which have entered the blood stream or nervous system and are now causing major damage as the bubbles move through the body. This can be fatal and a person must be treated in a recompression/hyperbaric chamber.**

5) The endurance of the system is effected by pressure caused by depth. As you go deeper the endurance of the system decreases therefore you have less time breathing air from the

equipment this is due to Boyles Law. Once returning to the surface the pressure decreases and the volume of air increases therefore if the system runs out on the way to the surface keep the 2nd stage in your mouth as the residual air may expand and give you another breath. It will also remind you to breathe out.

6) This device is filled with normal air (21% Oxygen and 79% Nitrogen) compressed to a pressure of 3000 pounds per square inch or 206 bars. It is not a toy and under no circumstances be tampered with. Failure to observe this warning may result in serious injury or death

Pre-Flight Check.

Before each flight, the unit must be given a thorough visual inspection and functional test. Never use a unit, which shows signs of damage, leakage, or substandard performance.

1. (Photo required) Carefully inspect the low-pressure hose to ensure it is securely connected into it's respective port on the first- stage and the second-stage. Inspect the hose low-pressure hose for any blisters, cuts, or damage. If a hose protector is present, slide it back to expose the hose fitting and inspect for any signs of corrosion. We may be able to remove this, as the unit to my knowledge does not have a hose protector. I will check with SSL
2. (Photo Required)Visually inspect the entire system for any external damage, such as dents, gouges, or severe corrosion.

3. Check mouthpiece for security to the second-stage and to see if there is any damage to the mouthpiece.
4. (Photo Required) While the pressure valve is completely shut and the system is depressurized, inspect the pressure indicator assembly to ensure that it is securely fastened to the first- stage. Closely examine the pressure indicator to ensure it reads zero. **Caution: If the pressure indicator does not read zero when the valve is shut and the system is depressurized, DO NOT attempt to use the system until a qualified technician has inspected and serviced the unit. Caution: DO NOT attempt to open the pressure valve without first checking to ensure that the low pressure hose and pressure indicator assembly are securely fastened to the first-stage.**
5. (Photo Required) Closely examine the pressure indicator dial to determine whether the needle is within the green zone, indicating the unit is full. If the needle is not in the green zone the unit needs to be filled to 3000 pounds per square inch or 206 bars.
6. (Photo Required) With the pressure valve fully open check for leaks. If there are no leaks briefly depress the purge button to ensure that sufficient airflow is provided to clear the second stage of water.
7. Immediately after releasing the purge button, listen closely to ensure that the second-stage does not continue to flow air.

Provided that these preflight inspection requirements have all been met, the unit is now ready for use and must be stowed correctly in its stowage on your suit.

How to use an EBS.

The use of an EBS (UNDERWATER) is as follows.

It is very important that you try to make your escape using the training you have already received and only use the EBS if you are unable to escape and have to resort to the EBS.

1. (Photo Required) Grasp the second stage with either one hand or two and pull it clear of its dust cover.
2. (Photo Required)Place the second stage mouthpiece in your mouth and form a seal using you lips on the outside of the mouthpiece. Support the second stage in the mouth by using a light grip with your teeth following the areas on the inside of the mouthpiece designed to be gripped with your teeth. Do not bite down hard with your teeth as you may damage the mouthpiece.
3. (Photo Required)Blow forcefully through the mouthpiece this will clear the water from the mouthpiece. It is now possible to demand air from the unit. If you are unable to clear the water with a forceful breath you can use the purge button on the front of the second stage to complete this task. (Photo required). You can also place your tongue in the mouthpiece orifice to make this task easier. The use of the purge button should be kept to a minimum as it **decreases the endurance of the unit.**
4. Once you have cleared the unit you can demand air from the system while completing your escape. You must try to control your breathing remembering that you can only breath in and out through your mouth.

5. **Once breathing from any EBS it is vitally important that you do not hold your breath as injury and possible death may occur.**
6. On arrival at the surface keep the unit in your mouth until you are sure you are not surrounded by aviation fuel. If you are swim clear of the fuel then commence your survival routine.
7. If the unit runs out on the way to the surface keep the mouthpiece in your mouth. It will remind you to breathe out on the way to the surface and you may receive an extra breath of air as the pressure decreases and the residual air increases in volume.

When to use an Emergency Breathing System.

The individual must decide when to use an emergency breathing system however there are a few important factors to take into account. It has already been discussed and demonstrated how to prepare for a ditching in a helicopter therefore it is vitally important that you carry out the procedures you have been taught. These procedures are designed to minimize the possibility of being injured in the impact phase and should not be compromised by you trying to operate your emergency breathing system. **Remain in the brace position during the impact phase.** If you are sitting in the helicopter next to an emergency exit and it capsizes rapidly after contact with the water take a breath and once the violent motion slows down locate your **emergency exit and jettison it. Relocate the window frame undo your seatbelt and pull yourself through the exit.** Then **if required** locate your **emergency breathing system and place it in your mouth** then commence with the operating procedures and complete your escape. If you are seated more than one arms length from an emergency exit and are unable to escape due to lack of air

place your emergency breathing system in your mouth and commence with the operating procedures then follow out your escape plan. The only other time you could use it would be during flight if the cabin filled up with smoke or a toxic atmosphere and you were unable to breathe. You must however realize that it is not designed for that purpose and the aircraft may ditch as a result of the smoke or toxic atmosphere and you may need that air for underwater escape. It is important that you understand the procedures for using an emergency breathing system as the decision when to use it will ultimately rest with you. This equipment is an aid to your survival but it does not guarantee it however with the training both theoretical and practical and your own survival plan your chances of succeeding drastically increase.