GRANT AGREEMENT

BETWEEN:

PETROLEUM RESEARCH ATLANTIC CANADA
(PRAC)

- And -

OFFSHORE SAFETY & SURVIVAL CENTRE, FISHERIES AND
MARINE INSTITUTE, MEMORIAL UNIVERSITY
(OSSC)

FINAL REPORT

Helicopter Underwater Escape Breathing Apparatus (HUEBA) Training

Grant #: **T07-03**

Principal Investigator: Mr. Robert Rutherford, Director Marine Institute Offshore Safety and Survival Centre (OSSC)

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Date of Completion Original: 31st August 2008
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Report Submitted by: Robert Rutherford, Director, Marine Institute Offshore Safety and Survival Centre (OSSC)

Helicopter Underwater Escape Breathing Apparatus Training

Project Summary

The Canadian Association of Petroleum Producers (CAPP) identified a requirement to introduce Helicopter Underwater Escape Breathing Apparatus (HUEBA) training for persons working offshore in Eastern Canada.

The purpose of this grant agreement was to provide a contribution to the expenditures required in order to make this training available in Newfoundland and Labrador. The scope of work included modification to facilities at the Marine Institute - Offshore Safety and Survival Centre (OSSC) , acquisition of equipment and training tools, acquisition of servicing equipment, provision of training to instructors and technical support personnel undertaking a risk management assessment, implementing risk mitigation protocols and developing of training materials. The project required the design and construction of a Shallow Water Escape Trainer (SWET) and included a demonstration to industry and dissemination of information to the international training community.

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Helicopter Escape Underwater Breathing Systems Training

1. Introduction

The Canadian Association of Petroleum Producers (CAPP), identified a requirement to introduce Helicopter Underwater Escape Breathing Apparatus (HUEBA) training for persons working offshore in Eastern Canada

To put this training in place necessitated modification to facilities at the Offshore Safety and Survival Centre, acquisition of equipment and training tools, provision of training to instructors and technical support personnel, undertaking a risk management assessment, implementing risk mitigation protocols and developing of training materials.

The project involved considerable discussions with operators, medical advisors and training personnel regarding the selection of the optimal emergency breathing system, integration of the system into the flight suit and managing of risk. It was determined that the optimal system was a pressurized air system but that in order to reduce risk of medical injury to "as low as reasonably practical" (ALARP) training could only be undertaken at the surface, not in the Helicopter Underwater Escape Trainer. In view of this, the MI-OSSC designed and built a Shallow Water Underwater Escape Trainer (SWET) system.

A demonstration of the training course and training method was provided to industry representatives on March 5th 2009.

2. Objective

To develop the capability in the Province of Newfoundland and Labrador, to offer Helicopter Underwater Escape Breathing Apparatus (HUEBA) training in a risk managed environment to the East Coast Canada, Offshore Petroleum Industry. The objective of this training is to improve the chance of survival of offshore personnel in the event of a helicopter ditching at sea.

3. Methodology

Background

The Canadian Association for Petroleum Producers established a task force comprised of operators, regulators and trainers to consider the implementation of emergency breathing systems (EBS) for helicopter transportation. The task force determined that the optimum system for East Coast Canada should be a pressurised air type and that it should be introduced into Basic Safety courses for all personnel offshore. The intent was that the HUEBA would be used by all personnel undertaking

Figure 1 Helicopter Underwater Escape Trainer (HUET)

Helicopter Underwater Escape Training using the standard HUET (see Figure 1).

The requirement to put this training in place involved significant expenditures in facilities, equipment and personnel training. To assist in defraying these costs the OSSC made application to Petroleum Research Atlantic Canada for a grant of $50,000. This application was accepted.

Facilities Modifications

The training, as envisaged, required there be an opportunity to familiarise the trainee with the use of the HUEBA in water prior to its use within the HUET. To accomplish this required a shallow water pool. The survival tank at the OSSC is a constant depth of 4 metres. Since the construction of a purpose designed pool was cost prohibitive, a work around solution was found through the design and installation of a training platform (see figure 2)

Figure 2 - Structure to provide shallow end to pool

To provide for refilling of the pressurised air bottles in a timely and efficient manner, as well as to ensure that all hygiene issues could be effectively addressed, it was necessary to modify the office adjacent to the survival tank to include an EBS servicing room which could be maintained in a hygienic condition, additionally this space includes a secure and self contained filling station.

Equipment Acquisition

In order to efficiently deliver HUEBA training to all offshore personnel, it was necessary to acquire 80 Aqualung pressurised emergency breathing system units. (See figure 3)

The proposal to PRAC envisaged a requirement to purchase 20 Helly Hansen flight suits complete with EBS pocket.

For OSSC to meet the anticipated required demand for this training, as well as, to have a variety of sizes of suits available, a decision was taken that a minimum of 75 suits would be required. It was originally intended to purchase 20 suits and lease the remainder. As we were able to get favourable lease terms for all the suits a lease agreement with Helly Hansen for supply and service of suits was put in place for 75 suits.

Figure 3 Aqualung EBS on and off suit

Training of Instructors and Technical Support Personnel

Training of Instructors

Train the trainer training (5 days) was provided to two key senior OSSC instructors at Survival Systems in Dartmouth Nova Scotia. This training facility had extensive experience training military personnel in the use of emergency breathing systems. Training for other instructors was provided "in house".

Not envisaged at time of proposal submission was that in order to meet N&L Occupational Health and Safety regulations, all instructors are required to have scuba diving certification. This was arranged though Ocean Quest, Foxtrap.

Training of maintenance technicians was provided by the Emergency Breathing System supplier/manufacturer, Aqualung.

Risk Management

A risk management assessment of HUEBA training using a pressurised air system was undertaken by the OSSC in conjunction with the HUEBA task force. The risk management assessment included medical advice regarding the possibility of barotraumas. As a result of this assessment, it was determined that the depth of water to which the individual using the breathing apparatus was subjected should be limited to one foot. For this reason HUEBA training could not be completed within the HUET as previously envisaged. See recommendation of CAPP HUEBA Task force December 2008 (Appendix 2).

Revised Approach and Equipment Requirement

As a result of the above risk assessment, the MI -OSSC conducted market research to determine if there was a suitable "shallow water escape trainer" (SWET) that could be acquired. We were not able to locate anything which would meet our requirements and therefore moved ahead to design own "fit for purpose" shallow water escape trainer.
The trainer was constructed at Memorial University fitting shops.

Figure 4 MI designed SWET chair

Training Materials

Existing training materials for delivery of all courses including helicopter escape training were modified to include HUEBA. (See Appendix 1)

Training demonstration

A demonstration of the HUEBA training system and training was provided to representatives of the offshore petroleum industry on March 6th at the Foxtrap, Survival Tank. The following industry representatives participated: Derek Mullaly, Jeremy Whittle, Chris Drover, Steve Bettles, Gertie Ryan-Kavanagh, and Glen Carroll

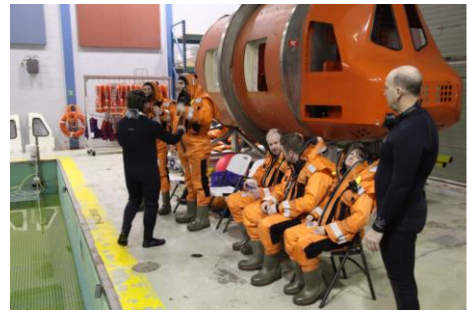

Figure 5 Demonstration of training to Industry Representatives

4. Results

The project has enabled the capability to deliver Helicopter Underwater Escape Breathing Apparatus Training to be available in Newfoundland and Labrador. This will lead to improved safety of helicopter transportation.

5. Dissemination

The results of the work will be disseminated through a report to the Canadian Association of Petroleum Producers (CAPP) Training and Qualifications Committee.

The results of the work will be disseminated to the International Community through a report to the April 2009 meeting of the International Association of Safety and Survival Training (IASST) (www.iasst.com).

6. Expenditures of Funds

Project

Total Project expenditures as submitted in proposal:

PRAC $50,000 MI Cash: $114,028 MI in Kind $12,000

Total: $176,028.00

Actual Expenditures (For details see spreadsheet Appendix 3)

PRAC $50,000 MI Cash $ 97,928.19 MI in Kind: $ 19,639.65

Total: $ 167,567.84

PRAC funds

PRAC expenditures during the project period are summarized in table below

Budget Item	**Eligible Costs During Period**	**Actual Expenditures**
Salaries and Benefits		
Equipment and Facilities	50,000	50,,000
Materials and Supplies		
Travel		
Dissemination		
Totals	**$50,000**	**$50,000**
Surplus/(Deficit)		**$0.00**

7. Employment Summary

The work undertaken in this project was completed by existing full time employees of the Marine Institute Offshore Safety and Survival Centre. The implementation of this training will require the addition of one full time technical support position. This position will be responsible for the "on site" servicing of the Emergency Breathing Systems

Appendix 1   Training Materials

BASIC SURVIVAL TRAINING

TYPE AND PURPOSE:

This is a basic course designed to provide personnel with an understanding of the hazards associated with working in an offshore environment, the knowledge and skills necessary to react effectively to offshore emergencies and to care for themselves and assist others in a survival situation.

CALENDAR ENTRY:

Hazards, Emergencies and Safety; Emergency Preparedness and Response; Firefighting; Personal Buoyancy Apparatus; Personnel Transfer Devices; Evacuation; Survival Craft and Launching Systems; Launching Systems; Survival; Signalling Devices; Search and Rescue; and Helicopter Safety and Emergency Procedures; Emergency Breathing Systems (EBS)

CERTIFICATE AWARDED:

MI Certificate of Achievement

PREREQUISITES:

Marine Institute approved medical clearance.

SCHEDULE:

Duration:	40.0 hours (5 days)
Theory:	17.5 hours
Practical:	22.5 hours

CLASS SIZE: 12

COURSE AIMS:

1) To give students a basic understanding of the hazards associated with the marine environment, offshore petroleum installations, and helicopters.
2) To provide students with the knowledge necessary to react to alarms and emergencies on board offshore petroleum installations and helicopters.
3) To provide students with the knowledge and skills required to assist in emergency, survival, and rescue scenarios.

MAJOR TOPICS:

1.0 Hazards, Emergencies and Safety
2.0 Emergency Preparedness and Response
3.0 Firefighting
4.0 Personnel Buoyancy Apparatus
5.0 Personal Transfer Devices
6.0 Evacuation
7.0 Survival Craft and Launching Systems
8.0 Survival
9.0 Signaling Devices
10.0 Search and Rescue
11.0 Helicopter Safety and Emergency Procedures
12.0 Emergency Breathing System

COURSE OUTLINE:

1.0 Hazards, Emergencies and Safety
1.1 Hazards
1.2 Emergencies
1.3 Safety

2.0 Emergency Preparedness and Response
2.1 Emergency Preparedness
2.2 Response to Emergencies

3.0 Firefighting
3.1 Fire Theory
3.2 Fire Classes
3.3 Control of Fire
3.4 Self-contained Breathing Apparatus (SCBA)
3.5 Fire Prevention
3.6 Smoke Hoods

4.0 Personnel Buoyancy Apparatus
4.1 Types and Application
4.2 Requirements
4.3 Components
4.4 Procedures

5.0 Personal Transfer Devices
5.1 General
5.2 Hazards
5.3 Procedures

6.0 Evacuation
6.1 Circumstances
6.2 Methods
6.3 Procedures

7.0 Survival Craft and Launching Systems
7.1 General
7.2 Lifeboats
7.3 Life Rafts
7.4 Launching Systems

8.0 Survival
8.1 Factors
8.2 Enemies
8.3 Strategies

9.0 Signalling Devices
9.1 Types
9.2 Applications
9.3 Procedures

10.0 Search and Rescue
10.1 Facilities and Organization
10.2 Equipment
10.3 Procedures

11.0 Helicopter Safety and Emergency Procedures
11.1 Flight Preparations
11.2 Helicopter Safety
11.3 In-Flight Emergencies
11.4 Helicopter Underwater Escape Training

12.0 Emergency Breathing System
12.1 Rationale for EBS
12.2 Hazards associated with using EBS
12.3 EBS equipment and operation
12.4 EBS Practical

LEARNING OBJECTIVES:

THE EXPECTED LEARNING OUTCOME IS THAT THE STUDENTS WILL BE ABLE TO:

1.0 Hazards, Emergencies and Safety

1.1 Hazards
- Define a "hazard".
- List the hazards to offshore petroleum installations.
- List the hazards to personnel on board offshore petroleum installations.
- Relate how hazard levels impact upon accident rates.

1.2 Emergencies
- Define an "emergency".
- Describe the relationship between hazard and emergencies on board offshore petroleum installations.
- List and discuss the types of emergencies that happen most frequently to offshore petroleum installations.
- List and discuss the types of emergencies that happen most frequently to personnel on board offshore petroleum installations.
- Discuss the methods of reducing accident rates on board offshore petroleum installations.

1.3 Safety
- Identify the groups responsible for safety on board offshore petroleum installations.
- Differentiate each group's responsibility in maintaining a safe working environment on board offshore petroleum installations.
- List the personal safety equipment required on board offshore petroleum installations.
- Summarize the importance of adhering to established safety rules and procedures on board offshore petroleum installations.
- Explain the recognized process for modifying existing safety rules and procedures on board offshore petroleum installations.
- Outline the methods of promoting accident prevention on board offshore petroleum installations.

2.0 Emergency Preparedness and Response

2.1 Emergency Preparedness
- Explain the orientation / familiarization process for new personnel to the offshore petroleum installation.
- Explain the purpose of a Muster List / Station Bill.
- Summarize the content of a Muster List / Station Bill.
- Explain where Muster Lists / Station Bills are required to be posted.
- Discuss the need for crew preparation and training for offshore petroleum installations.
- Compare the different methods of offshore petroleum installation crew preparation and training.

2.2 Response to Emergencies
- Indicate how personnel aboard an offshore petroleum installation should conduct themselves at emergency stations.
- Discuss correct personal conduct at offshore petroleum installation emergency stations.
- Describe the actions and procedures to follow upon hearing emergency alarms.
- React to alarms during simulated emergency exercises.

3.0 Firefighting

3.1 Fire Theory
- Define the following fire science terminology:

a.	fire	b	fire tetrahedron
c.	flash point	d.	ignition temperature
e.	auto-ignition	f.	spontaneous combustion
g.	fuel	h.	rates of combustion
i.	smoke	j.	flammable range
k.	explosion/fire	l.	products of combustion
m.	extinguish	n.	extinguishing principles

3.2 Fire Classes
– Name the classes of fire.
– Identify the graphic symbol and its color for each fire class.
– Give examples of each fire class.
3.3 Control of Fire
– Explain the principles of extinguishing fire.
– Name the different methods of extinguishing fire.
– Describe the types of portable extinguishers required on board offshore petroleum installations.
– Explain the limitations of portable extinguishers.
– Relate fire extinguisher ratings to practical applications.
– Demonstrate the operating procedures for various portable extinguishers.
– Prepare hoses and nozzles for firefighting use.
– Describe the water patterns that can be applied to a fire.
– Select the correct water patterns used to extinguish particular types of fires.
– Discuss fire control techniques.
– Perform fire control techniques.
3.4 Self-Contained Breathing Apparatus (SCBA)
– Describe the purpose of a SCBA.
– Describe the operating principles of SCBA.
– Identify the factors limiting the use of SCBA.
– Define “pressure demand” as it relates to a SCBA.
– Describe the function of the main components of a SCBA.
– Practice pre-donning checks for a SCBA.
– Perform donning and doffing procedures for a SCBA.
– Practice functional checks on a SCBA.
– Describe the procedures for dealing with SCBA malfunctions.
– Demonstrate the disassembly and assembly of a SCBA.
– Operate a SCBA in restricted visibility following the prescribed procedures.
3.5 Fire Prevention
– Diagnose the common causes of fire.
– Outline fire prevention measures.
– State the responsibilities of offshore petroleum installation personnel in relation to fire prevention.
3.6 Smoke Hoods
– Describe the purpose of smoke hoods.
– Identify the limitations of smoke hoods
– Perform pre use inspections
– Practice donning a smoke hood
– Use a smoke hood in a simulated escape exercise

4.0 Personal Buoyancy Apparatus
4.1 Types and Application
– List the personal buoyancy apparatus required by the appropriate authorities:
a. to be carried on board offshore petroleum installations
b. to be worn by passengers during over-water helicopter flights
– Outline the purpose and functions of personal buoyancy apparatus.
– Describe situations where personal buoyancy apparatus are designed to be used.
– State the limitations of personal buoyancy apparatus.
4.2 Requirements
– Summarize the basic requirements of personal buoyancy apparatus.
– Compare the effectiveness of the different personal buoyancy apparatus.
– State the quantity of each personal buoyancy apparatus required to be on board offshore

petroleum installations.
– Explain where the personal buoyancy apparatus is stored on board offshore petroleum installations.
4.3 Components
– Differentiate the main components of the personal buoyancy apparatus.
– Explain the function of the main components of various personal buoyancy apparatus.
– Identify the ancillary components of each type of personal buoyancy apparatus.
– Explain the function of the ancillary components in each type of personal buoyancy apparatus.
4.4 Procedures
– Demonstrate the correct pre and post checks for each type of personal buoyancy apparatus.
– Perform the correct donning and doffing procedures for each type of personal buoyancy apparatus.
– Manoeuvre in and out of the water wearing a personal buoyancy apparatus.
– Operate emergency response equipment wearing a personal buoyancy apparatus.
– Appraise the on board storage placement and arrangements for personal buoyancy apparatus.

5.0 Personnel Transfer Devices
5.1 General
– Discuss situations when personal transfer devices may be utilized
– Identify various personal transfer devices utilized in the offshore industry.
– Identify components of various personnel transfer devices used in offshore industry.
5.2 Hazards
– Identify potential hazards associated with using personnel transfer devices
– Discuss the importance of body position and transfer device stability
– Identify personal protective equipment to be worn during personnel transfer
5.3 Procedures
– Explain proper procedures for loading and unloading personnel and equipment in personal transfer devices
– Demonstrate proper procedures for loading and unloading personnel and equipment in personal transfer devices
– Participate in personnel transfer exercise.

6.0 Evacuation
6.1 Circumstances
– Analyze the circumstances that may lead to an offshore petroleum installation being evacuated.
– Categorize the evacuations.
6.2 Methods
– Determine the methods and associated equipment for evacuating offshore petroleum installations.
– Evaluate the hazard levels for the different evacuation methods used on board offshore petroleum installations.
– Prioritize the evacuation methods for specified circumstances.
6.3 Procedures
– Perform offshore petroleum installation pre-evacuation checks.
– Demonstrate the precautions and procedures for evacuating when using equipment located on board offshore petroleum installations.
– Participate, as a crewmember, in the evacuation of an offshore petroleum installation by any means.
– Perform post-evacuation procedures for the various evacuation methods.

7.0 Survival Craft and Launching Systems
7.1 General
– Define a “survival craft”.
– Discuss the regulations governing the carriage of survival craft on offshore petroleum installations
– List the types of survival craft required aboard offshore petroleum installations.
– Compare the various survival craft found on board offshore petroleum installations.
– State the advantages and limitations of each type of survival craft.
7.2 Lifeboats
– Discuss the general requirements of totally enclosed lifeboats

– Describe the construction, characteristics, components and markings of a totally enclosed lifeboat
– Identify the special components of a TEMPSC
– Name the required ancillary equipment carried in lifeboats
– Demonstrate the correct use of the ancillary equipment carried in lifeboats
– Conduct pre and post launch checks on a lifeboat
– Discuss the procedures for boarding a lifeboat.
– Safely board a lifeboat and prepare for launching.

7.3 Life Rafts

– Describe the stowage requirements of life rafts onboard offshore petroleum installations.
– Describe the construction, characteristics, components and markings of marine inflatable life rafts.
– Discuss the function of each of the main components of a life raft.
– Identify the differences between throw over and davit launched life rafts.
– List the items of ancillary equipment normally found in a life raft.
– Demonstrate the correct use of the ancillary equipment carried in life rafts.
– State the actions to prepare a life raft for boarding.
– State the inflation methods for life rafts.
– Demonstrate the techniques for wet and dry boarding of a life raft.
– Demonstrate the techniques for righting a capsized life raft.
– Carry out immediate actions following a launch of a life raft.
– Discuss the survival instructions following the launching of a life raft.
– Participate in practical survival exercises using marine inflatable life rafts.

7.4 Launching Systems

– Categorize the common survival craft launching systems found on board offshore petroleum installations.
– Explain the principles of the common offshore petroleum installation survival craft launching systems.
– List the major components of the common offshore petroleum installation survival craft launching systems.
– Perform pre-launch checks for an offshore petroleum installation survival craft.
– Observe the operation the launching system during the launch of an offshore petroleum installation survival craft.
– Participate in the launching of various survival craft.

8.0 Survival

8.1 Factors

– List the physical and environmental factors affecting survival in a temperate climate.
– Compare the effects of the physical and environmental factors of survival in a temperate climate.

8.2 Enemies

– List the prominent physiological and psychological enemies of survival in temperate climates.
– Describe the effect physiological and psychological enemies will have on personnel in survival scenarios.
– Identify the physiological and psychological enemies by their signs and symptoms.
– Practice minimizing the effects of the physiological and psychological enemies during open water survival scenarios.

8.3 Strategies

– Define a “survival plan”.
– Discuss short and long term survival strategies for offshore petroleum installations.
– Discuss the importance of leadership and team effort in survival scenarios.
– Apply leadership and team effort concepts in open water survival scenarios.
– Perform essential tasks during simulated survival scenarios.
– Outline how priorities are given to essential tasks during simulated survival scenarios.

9.0 Signaling Devices

9.1 Types

– Define a "signaling device".
– Categorize signaling devices into three "type" groups.
– List the signaling devices required on board offshore petroleum installations and associated survival craft.
9.2 Applications
– Describe the limitations of signaling devices.
– Compare the effectiveness of the different signaling devices.
9.3 Procedures
– Determine the procedures for attaining maximum efficiency from signaling devices.
– Activate signaling devices following the precautions and operating procedures prescribed.

10.0 Search and Rescue
10.1 Facilities and Organization
– Examine government and company responsibilities for rescue facilities and organization.
10.2 Equipment
– Describe the applications for the various rescue equipment carried on board SAR helicopter and standby vessels.
10.3 Procedures
– Prepare various survival craft and their crew for rescue.
– Examine the importance of correctly wearing personal protective clothing during rescue operations.
– Examine the importance of establishing communications with the rescuers.
– Use the various pieces of rescue equipment carried on board SAR helicopter and standby vessels.
– Participate in simulated rescue operations following prescribed precautions and procedures.

11.0 Helicopter Safety and Emergency Procedures
11.1 Flight Preparations
– Discuss the personal preparations to be conducted prior to arrival at a heliport.
– Describe heliport check-in and helicopter pre-boarding procedures.
– Examine the characteristics of the helicopter passenger transportation suit systems to be worn by passengers during over-water helicopter flights
– Demonstrate the correct pre and post checks for the flight suit
– Perform the correct donning and doffing procedures for the flight suit
11.2 Helicopter Safety
– Identify the danger zones for passengers approaching a helicopter.
– Explain the precautions to be taken when approaching a helicopter's danger zones.
– Discuss the recommended personal conduct during a helicopter flight.
– List the safety equipment carried aboard helicopters
– Use the safety card to identify and locate emergency exits
– Discuss the purpose and proper use of helicopter safety equipment.
11.3 In-flight Emergencies
– Categorize helicopter in-flight emergencies.
– Analyze helicopter in-flight emergencies.
– Name the three phases of helicopter in-flight emergencies.
– Identify escape routes from the helicopter
11.4 Helicopter Underwater Escape Training
– Participate in an introductory safety briefing
– Respond to alarm phase of a simulated emergency
– Open emergency exits at an appropriate time
– Use emergency exits at an appropriate time
– Participate, as a passenger, in simulated in-flight emergencies.
– Exit the HUET on the surface of the water
– Exit the HUET when partially submerged
– Exit the HUET when capsized
– Launch a helicopter life raft
– Use the helicopter life raft in a simulated survival situation

12.0 Emergency Breathing System
12.1 Rationale for EBS
Egress time vs breath-hold time

- Examine factors affecting individual breath-hold time
- Identify time required to egress a capsized helicopter
- Discuss the need for EBS

12.2 Hazards associated with using EBS

Basic dive physics
- Examine Boyles Law and the relationship between pressure and volume

Basic dive physiology
- Examine the basic components, function and purpose of the respiratory system
- Examine the basic components, function and purpose of the circulatory system

Medical aspects
- Discuss the direct effects of pressure on the human body
- Describe the mechanism of lung over-pressurization
- Identify the cause, symptoms, signs, treatment and prevention of:
  a. arterial gas embolism
  b. mediastinal emphysema
  c. subcutaneous emphysema
  d. pneumothorax

12.3 EBS equipment and operation

Principles of EBS operation
- Describe the purpose of EBS
- Identify the three major types of EBS
- Describe the operating principles of EBS
- Identify the main components of EBS
- Describe the function of the main components of EBS
- Describe procedure for deploying EBS

EBS limitations
- Identify the limitations of EBS

Breathing routine
- Describe EBS clearing procedure
- Identify importance of breathing normally
- Identify importance of "never hold your breath"

EBS malfunctions
- Identify EBS malfunctions including:

a. free flow
b. flooded

- Describe actions to take in the event of a malfunction

Pre-flight inspection
- Discuss pre-flight inspection procedure

12.4 EBS Practical

Deployment and operation of EBS equipment
- Perform preflight checks on EBS
- Practice deploying EBS
- Practice carrying out breathing actions using EBS equipment at atmospheric pressure in dry conditions
- Perform donning a transit type survival suit with EBS equipment
- Perform breathing actions in a pool environment including:

a. breathe underwater using an EBS
b. clear an EBS while underwater
c. breathe while inverted underwater using a EBS
d. clear an EBS while inverted underwater

EVALUATION:

1. Demonstrate ability to complete exercises as identified in course competency checklists.
   Achieve at least 60% on a written, multiple-choice examination

Appendix 2 HUEBA Task Force Recommendation to CAPP

HELICOPTER UNDERWATER ESCAPE BREATHING APPARATUS (HUEBA) USE IN ATLANTIC CANADA

HUEBA Review Team – Recommendation to CAPP

December 2008

RECOMMENDATION

- **Implement, as soon as proper procedures are in place, a compressed air unit as the chosen emergency breathing apparatus for offshore petroleum industry helicopter travel**

- **Implement this consistently across all petroleum industry operations in both the Nova Scotia and Newfoundland & Labrador offshore jurisdictions**

- **Incorporate the compressed air unit as a component of the required safety training[1] to include dry familiarization and in-pool training at surface**

BACKGROUND

The Atlantic Canadian offshore petroleum industry identified the necessity to include a device within the standard safety gear carried by all offshore workforce personnel that would aid in the ability to egress a ditched helicopter by providing additional air for the escape. In 2006 a compressed air unit was identified as the best available technology. The compressed air unit allows an individual additional time, via providing air while submerged, and could be deployed prior to submersion or underwater.

In 2007 it was proposed that the compressed air device be integrated into the basic safety training though not used within the HUET[2]. While this recommendation addressed the inability to quantify the precise level of medical risk (i.e. low risk of air embolism), there were concerns that training with compressed air at surface only and not including in-HUET application may not provide the most effective training. Therefore, prior to implementing the device, a thorough review of all options and key learnings from other cold-water basins was undertaken. The HUEBA Review Team (Review Team), consisting of representatives of CAPP, the Offshore Petroleum Boards and industry operators[3] was established and tasked with completing this review. The Review Team was also asked to identify to what degree the device ought to be incorporated into basic safety training.

DISCUSSION

The Review Team offers its recommendation, described above, as the solution that provides the *lowest overall risk* for personnel traveling offshore in Atlantic Canada based upon information known to date. The Review Team recommends that the emergency

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[1] The following courses will include HUEBA training: Basic Survival Training, Basic Survival Training-Recurrent, Offshore Survival Introduction and Offshore Helicopter Safety

[2] Helicopter Underwater Escape Training

[3] HUEBA Review Team members: Aurora Reid, CAPP; David Scratch, CNSOPB; Peter Noel, C-NLOPB; Clinton Cariou, Exxon Mobil; Steve Bettles, Husky; David Riffe, EnCana; Michele Farrell, Petro-Canada

breathing apparatus be implemented as soon as possible. The following is provided as the basis for the Review Team's recommendation:

- A compressed air unit is the best available technology for the purpose (CAPP 2006 workshop)
- A compressed air unit can be deployed in a greater variety of accident scenarios (i.e. prior to submersion or underwater) than alternative technology[4] available at present
- There may be an increased risk of a helicopter roll immediately after ditching in the Atlantic Canada offshore environment (as compared to other cold-water basins visited by the Review Team) when sea states (parameters such as and flying parameters associated with Atlantic Canada conditions are considered
- Compared with alternate technology, there are fewer steps required to deploy the compressed air unit and these steps can be undertaken with one hand
- The compressed air unit allows for a greater duration of time underwater than alternative technology
- The risk of respiratory infection from training on the compressed air unit is the lowest of the available technology[5]
- Pursuant to expert medical advice, training in water with compressed air at surface (i.e. depths of less than a meter) would require no change to the current CAPP medical requirements (CAPP Fitness to Work Guide)
- The helicopter flight suit currently in use in Atlantic Canada is approved by Transport Canada for the compressed air device, thus the unit, relative to alternate technology, will not have an impact on the suit or implementation
- The suit currently in use in Atlantic Canada is at the maximum buoyancy value permitted by the CGSB Suit Standards, the compressed air unit will not increase that value since it is near neutrally buoyant
- Competency in using the device can be achieved by training at surface while still enabling a student to learn how to use the device in a real helicopter ditching scenario
- All available technologies carry a degree of risk of air embolism
- The low risk of air embolism from the use of the compressed air device can be virtually eliminated by training with the device at the surface[6]; alternative devices necessitate in–HUET training to ensure proper deployment is executed, thus training procedures are employed to minimize the risk of air embolism to the individual

[4] 'Alternative technology' reviewed includes the Shark Air Pocket (re-breather), Shark Air Pocket Plus (hybrid-re-breather) and Helly Hansen re-breather (as integrated into a survival suit)
[5] The incident rate of infection is near zero, there has been one case in the UK that may have been attributable to using a re-breather system though there was no formal connection; the risk of infection from compressed air use in training is less than a re-breather system and therefore considered As Low As Reasonably Practicable (ALARP)
[6] The small risk of air embolism is difficult to quantify and virtually impossible to rule out, on any device, at any depth; according to medical expertise, this risk can exist with no device employed for some individuals. Two incidents of air embolism have been recorded in HUET training in the North Sea. These incidents are documented and neither resulted in significant or lasting impairment. Relative to the numbers of individuals trained on a compressed air device to date the incident rate has been near zero and can qualify as ALARP risk.

Appendix 3 Project Expenditures

HUEBA Expenditures

Item Description	MI in kind	Price (Taxes Included)	Total
EBS System		$61,748.67	
Supply and Install 4 Aluminim Grates		$41,068.61	
Three divers one day @ $244.93/day		$734.79	
Servicing room/station		$2,385.03	
Serice room outfit (bench/storage sink etc)		$5,582.00	
construct and outfit service room	1076.04		
construct and outfit service room	838.88		
SWET chair		$5,500.00	
Instructor 5 days@455	2275		
Sub total Equipment	**2275**	**$117,019.10**	**$119,294.10**
OWSD course Dan Donnelly		$455.99	
OWSD course Joe Shanahan		$454.86	
OWSD course 3 people		$1,354.58	
Instructor training Harvey and Lacour		$21,517.50	
Travel Dartmouth one week		$1,590.06	
Travel Dartmouth one week		$2,372.10	
Tech training		$3,164.00	
Instructor 20 days@455	9100		
TA 6 days @ 350	2100		
sub total training	**11200**	**$30,909.09**	**$42,109.09**
one manager @ 655 - 5 days	3275		
sub total risk management	**3275**		**$3,275.00**
Two instructors one day	910		
One Technical assistant one day	350		
Three divers 4 hrs			
7 suits one day @29.95/day	209.65		
sub total demonstration	**1469.65**		**1469.65**
one snr manager @ 710/day 2 days	1420		
Sub total reporting	**1420**		**1420**
	19,639.65	**147,928.19**	**167567.84**

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