ON SCENE

The Journal of U. S. Coast Guard Search and Rescue

This Issue:

Prepare for Winter

Cold Water Survival & Ice Rescue

Fall 2006 **COMDTPUB P16100.4**

ON SCENE

The Journal of U.S. Coast Guard Search and Rescue
Fall 2006

Contents

COVER STORY

04

Ice Capabilities Center of Excellence
Ice Rescue Operations Overview

SPOTLIGHT

15

18 Year Old Wins Coast Guard's Top Prize: An Interview with Tanya Budd

01 A Note From the Chief of Search and Rescue…

02 From the Director of Enforcement & Incident Management

03 How Old Is Search and Rescue?

Breaking News…

07 Coast Guard Asks Companies to Discontinue Cellular *CG Phone Number

08 121.5 MHz ELTs The End of an Era - The New U.S. position on 406 MHz ELTs

Features…

11 Person In the Water!!

12 What Should You Do With Your Old EPIRB?

13 The Four Stages of Cold Water Immersion

14 "It Doesn't Look Like They're Drowning" - Recognize Instinctive Drowning Response

17 How Long Can You Survive?

19 Swimming: An Option for Self-Rescue In Cold Water

22 The Sinking of the Cape Falcon

24 Surviving Winter on the Great Lakes: From Search and Rescue Controllers On-Watch

25 "Let's Have a Beer Before We Start!"

System Developments…

27 U.S. Coast Guard R&D Center to Update Survivability Information

29 Survival Modeling and SAROPS

32 Update: Distress Alerting Satellite System (DASS)

34 The Process for Developing International Maritime Guidelines

Training & Education

36 Alaska Boater Education: Cold Water Immersion - "Don't Let It Be Your Last Gasp"

International

38 Around the World with Amver: – Amver Vessel Rescues Sailor

RADM David P. Pekoske
Assistant Commandant for Response

RDML Wayne Justice
Director of Enforcement and Incident Management

CAPT Scott LaRochelle
Chief, Office of Search and Rescue

CDR Steven Stilleke
Editor

ON SCENE is a semi-annual, authorized special interest publication produced by the Office of Search and Rescue for members of the U.S. Coast Guard and the SAR community. Editorial content is not to be considered authority for official action nor record material. Individual views and opinions do not necessarily reflect those of the Department of Homeland Security or the U.S. Coast Guard.

We strongly encourage readers to submit articles or letters to the editor. Though we make every effort to publish all submissions, we do reserve the right to refuse publishing articles that are not consistent with our objectives. Furthermore, we reserve the right to edit articles for length, accuracy and grammar.

If you prepare an article for publication, please submit an electronic copy either on disk (3 1/2", CD-ROM, ZIP) or via eletronic mail. Please send photos or graphics if possible. Indicate if you wish us to return your material.

Notice to librarians:
The last issue published was the Fall 2005 edition.

ISSN: 0093-2124

A Note from the Chief of Search and Rescue...

Captain Scott LaRochelle
Chief, Office of Search and Rescue

We've all heard or used the expression "drinking from a fire hose" to describe a fast-paced work environment—that fairly well sums up my first few weeks in the hot seat as Chief of Search & Rescue. It has been non-stop from the get-go. Having been an end-user of the SAR system most of my career, I had little appreciation for the full breadth and depth of the Coast Guard's SAR program—until now.

Fortunately we (the SAR community) are blessed to have an incredibly dedicated and talented professional staff on board to tackle the myriad of programmatic challenges that lie before us, while still being agile to respond to the daily fires inherent with Headquarters duty. Let me tell you up-front, this staff is first rate and has your interests at heart.

When Herb Brooks, the USA Olympic ice hockey coach in 1980 at Lake Placid, addressed his underdog team before taking the ice against the mighty Russians, he told them, "Great moments come from great opportunities. And your opportunity is now."

Your SAR program's opportunities are in play right now. Among the major issues we are working include: overseeing the full development of the Sector Command Center program, shepherding the changeover from COSPAS-SARSAT to DASS, ensuring the end-user operational requirements for Rescue 21 are satisfied, refining specific SAR policy in the CG Addendum, and aggressively reaching out to our international SAR community to reshape worldwide policy and broker bilateral agreements.

… the great moments are just around the corner. If you want to see the direction of the SAR program, take a look at the Commandant's strategic direction. We will be in-step, looking for opportunities to further advance the SAR program under Admiral Allen's overall direction.

My commitment to you is simply this: I will not lose sight of where the Coast Guard's pointy end of the spear lies. It's not here at Buzzard's Point; it's not at the Areas or the Districts. It resides firmly at the small boat stations, air stations and command centers. Our mission is to create policy and procedure to make your world of work more effective and efficient.

Briefly, a little about me. I have 10 years experience in operations ashore—three as Ops in Galveston, three as Deputy in Moriches, three as CO in Milwaukee, and most recently the past year as CO of Sector Lake Michigan. My goal is to serve you well. And I'd like to hear from you periodically to let me know if we're holding up our end of the bargain.

Semper Paratus…

From the Director of Enforcement & Incident Management

Rear Admiral Wayne Justice

Within two hours of Admiral Allen's Change of Watch, he issued an email to all-hands presenting his Commandant's Intent. His message was quite clear. The world in which we live has changed dramatically, and will continue to change. To meet the needs of our nation, the Coast Guard's first priority is Mission Execution. Towards that end, we will reshape our force into a trident of shore, maritime and deployable operations.

To coordinate those forces, Sector, District and Area Command Centers will be the linchpin in the command and control structure. Our multi-mission resources – aircraft, ships and boats – will respond to an increasingly complex myriad of Homeland and non-Homeland Security Missions.

To ensure Mission Execution in this environment, I ask you to do three things: remain proficient, vigilant, and flexible. You must be proficient in your core competencies, whether on-watch in the Command Center, at the helm of your vessel, or the controls of your aircraft. You must be vigilant of your surroundings. No amount of equipment or sensors can replace your situational awareness. Finally, you must remain flexible, prepared to quickly change from a boarding, to migrant interdiction, to search and rescue.

Proficient. Vigilant. Flexible. Only then can we be truly prepared to meet All Hazards, All Threats.

I applaud your work and professionalism. Semper Paratus!

RDML Wayne Justice

Editor's Note: The following is reprinted from the *National Maritime SAR Review*, published in the summer of 1969. In January, 1972, the *National Maritime SAR Review* changed its name to *On Scene, The National Maritime SAR Review*. In 1995, the magazine adopted its current name, *On Scene, The Journal of Coast Guard Search and Rescue*. While the name has changed over the years, the purpose has remained the same. *On Scene* provides non-directive informational articles to Search and Rescue professionals highlighting current SAR developments and lessons learned. *On Scene* is distributed free of charge to U. S. Coast Guard units and other subscribers domestically and internationally.

How Old Is Search and Rescue?

Search and Rescue is at least as old as Greek Mythology. As the Greeks of antiquity developed their pantheon of immortals, they appointed each to his allotted function in human affairs. The Greek writer Lucian relates the following concerning the half brothers Castor and Pollux, of whom only Pollux was immortal.

In Lucian's version of the story, their dwelling places are heaven and earth; when Pollux goes to one, Castor goes to the other, so that they are never with each other. One day Apollo asks Hermes:

"I say, why do we never see Castor and Pollux at the same time?"

"Well," Hermes replies, "they are so fond of each other that when fate decreed one of them must die and only one be immortal, they decided to share immortality between them."

"Not very wise, Hermes. What proper employment can they engage in that way? I foretell the future; Aesculapius cures diseases; you are a good messenger – but these two – are they to idle away their whole time?"

"No, surely. They're in Poseidon's service. Their business is to save any ship in distress."

"Ah, now you say something. I'm delighted that they are in such a good business."

Ice Capabilities Center of Excellence Ice Rescue Operations Overview

By Commander Steven Stilleke & Senior Chief Boatswains Mate Michael Pollack

In the early days, the U.S. Life Saving Service (now called the U.S. Coast Guard) issued each surfman a personal floatation device made of cork and canvas, a waxed or rubber coated canvas "storm suit", and wool long underwear. Even at the coldest, iciest stations, there was no particular training or equipment for ice rescue. Bold rescuers fought the elements and used improvised techniques to aid those in peril.

The 1960's advanced personal survival gear to the neoprene wet suit, and rescue equipment to the 14' aluminum ice skiff. Individual Search and Rescue (SAR) stations outfitted the bare bones ice skiffs as they saw fit, and the station's veterans handed down tactics and skills to new recruits in a repeating cycle of informal training.

In the early 1980's the state of Ohio's Department of Natural Resources established a school to train their Conservation Officers in basic self-rescue and ice rescue techniques, ice formations, and emergency medical procedures. Members of the U.S. Coast Guard attended some of these first formal courses and brought the knowledge back to their stations.

In the 1990's the Coast Guard witnessed the "Dive Rescue" ice rescue courses. They became the popular school of choice offering Train the Trainer opportunities and a graduation certificate. The Coast Guard attended courses at Local Fire Departments, and select Coast Guard stations, providing both the Coast Guard and local agencies the opportunity to drill together and adapt standard practices.

Over the years, significant technological developments like MARSARS, Inc's "Shuttle Board" expanded the techniques available to rescuers. The Shuttle Board offered the opportunity for a more standardized response, and a welcome option to the ice skiff. However, local units still determined the need for the Shuttle Board, and were required to purchase it with their own funds and develop their own training program.

In the winters of 2000 thru 2004, both Coast Guard and civilian instructors held a small number of "ice rescue" training sessions at Coast Guard Station Saginaw River. In 2002, the Ninth Coast Guard District drafted its first policy covering ice operations and training, in an attempt to standardize the Ice Program. It identified approved Ice Rescue training courses and allocated funding for externally contracted training, and thus the basis of current Coast Guard policies were born.

The 2004 Bi-Annual Ice Symposium, hosted by the Ninth District,

FN Tagaropoulos in the Required ICE Rescue PPE further refined the requirements for standardized ice operations techniques, standardized Personal Protective Equipment, and a central ice operations training venue.

Ice Capabilities Center of Excellence (I.C.C.E)

The Coast Guard created I.C.C.E to meet those requirements. I.C.C.E. provides training on ice policy, self-preservation techniques, response tactics, and qualifies Train the Trainers. I.C.C.E. also seeks out new ice rescue techniques, evaluates innovative equipment, and reviews policy for applicability as the program advances.

The Coast Guard held the first official I.C.C.E. training courses on the "mess deck" of Station Saginaw River in the late winter and spring of 2005. One Ready for Operations course and two Train the Trainer courses were held that year, with approximately 70 students receiving graduation certificates. The first Ice Boat course was held later that spring graduating 24 students.

In 2005, the Ninth District's Ice Program won the Captain Niels P. Thomsen Innovation award, which included a $10,000 grant and funded a state of the art I.C.C.E training facility.

The target audiences for I.C.C.E. training are the Sector Ready for Operations team and members of designated ice operations stations. Ready for Operations, or RFO, is an inspection process to review and evaluate the unit's training program and crew during ice operations drills. The RFO and Train the Trainer course curriculums are the same with the exception of focus. The RFO course stresses the inspection and grading process, while the Train the Trainer course focuses on operations and training. Upon completion of either course, the student returns to their parent unit as a qualified instructor in current policy and techniques.


2006 Train the Trainer students practicing the "Go" technique using the MARSARS shuttle board

Safety First

Whether conducting drills, training, or actual operations, personal safety is paramount. All training emphasizes the ability to rescue yourself first. Coast Guard Ice Rescue crews require a minimum of four people: a team leader, two rescuers (one must be EMT basic or First Responder qualified), and one crewmember to remain with the vehicle as a communications relay between the station and crew. To emphasize the importance of personal safety, during the first morning of training, students are required to perform a full dress out in their personal protective equipment (PPE). Instructors verify the material condition and fit of the member's PPE. Rescue PPE includes: polypropylene medium weight underwear, MSD 900 breathable marine survival suit, ice cleats, neoprene hood, neoprene diver's gloves, tinted and clear goggles, kayaker helmet with Black Diamond moonlight headlamp, rescue harness with a stainless steel D-ring to connect to the tether line or MARSARS Shuttle Board, ice awls, and a Coast Guard standard SAR vest.

Prior to any on ice drills being conducted a review of the Coast Guard's operational risk management program is performed. Each team is required to perform a risk analysis exercise and report their findings to the senior instructor. The "hard water" environment is one of the most dangerous environments in which to work. A lot can go wrong on a boat before it is no longer a safe haven, but on the ice, all a team has is the gear they carry and their teammates. Students must understand the importance of not taking their own safety for granted.

Equipment

Team Leaders evaluate each case to determine the most appropriate rescue tools. All units are equipped with handheld radios with built-in GPS, a spud bar (used to test the quality of the ice while transiting), a reach pole with shepherd's crook, and AN/PVS-14 monocular night vision devices.

The MARSARS Rescue Shuttle is the device of choice for short haul rescues (any case ½ mile or less from shore). The Rescue Shuttle minimizes patient handling and physical stress. It features a built in 4:1 ratio pulley system and can extricate victims of all sizes while keeping the rescue team a safe distance away. Teams also have a variety of lines ranging from a 75-foot floating line in a rescue throw bag, to a 550-foot line reel when extra reach is needed.

Long haul rescues (cases more than ½ mile from shore) typically require some kind of conveyance. Conveyances currently in use include: ice skiffs, the Argo ATV,

The RDC being used for recovery of conscious victim the Rapid Deployment Craft (RDC), and various ice boats.

The RDC is only 50 pounds when deflated and easy to transport. A standard SCBA bottle can inflate the RDC in minutes providing over 2000 pounds of buoyancy. The RDC is extremely durable and can easily accept an outboard motor for greater capability.

The 18' Air Ranger Ice Boat skims across the ice

There are three different iceboats currently in use (18', 20', and 23'). All of these iceboats have also been adapted for flood conditions and were successfully used after Hurricane Katrina.

Course Curriculum

Classroom instruction covers ice characteristics, recognition and correct treatment of cold related injuries, instructor techniques, required ice kit, conveyances and training site set up. On the ice, students practice self-help, and "reach, throw, and go" techniques. Students receive 10 hours of on ice instruction including a night exercise. Students often find the night exercise the most valuable. Many of them have little real ice experience, and most have no nighttime experience. Night exercises illustrate the difficulty in locating a victim with sketchy information. For the exercise, an instructor is placed in a remote location on the ice, often in the water, and the team is given only a relative bearing. The team must use all of their equipment (compass, GPS radio, and local chart), to locate and effect a rescue of the victim. The team is then evaluated on their use of the equipment, communication, and teamwork. On the last day, each member of the team is required to evaluate their teammates, just as they will be required to do back at their unit.

Train the Trainer students preparing for night operations

14' Ice Skiff

The 18' Air Ranger "Ice Boat" on duty during Hurricane Katrina operations

The Future

2006 was a transition year for the Center of Excellence. Previously, course instructors were comprised of Ninth District Ice Board members (experienced ice operations personnel from all over the district). To add continuity and permanence to the Center of Excellence, the core of future instructors will come from within Station Saginaw's crew. Starting in 2007, the I.C.C.E will perform all facets of ice training and work to expand the courses presented. As more and more conveyances come on line, the I.C.C.E will standardize training, tactics, and outfit of these unique Coast Guard assets. Expansion may also create the opportunity to train outside agencies. The Coast Guard already encourages units to drill with their local ice capable departments, and have authorized the use of those departments on its ice teams, so it is only natural to offer them a training resource as well.

The Cleveland Search and Rescue Region has a wide variety of lakes, rivers, and tributaries that develop ice cover. The public uses these "hard water" areas extensively during the winter for both commercial and recreational purposes, which drives the demand for ice SAR services. Successful ice SAR operations, perhaps more than any other class of search and rescue, depend on an interactive network of local response agencies with specific capabilities. The Ice Capabilities Center of Excellence strives to meet that need, and ensure that rescuers are "Always Ready" to answer to call.

Coast Guard Asks Companies to Discontinue Cellular *CG Phone Number

By Kathryn Manzi

*In an effort to improve Search and Rescue Response the Coast Guard has requested all wireless providers in states other then Alaska to remove the specialized keying sequence, *CG, used to reach the Coast Guard for maritime emergency assistance.*

The *CG feature was introduced by some cellular communications companies in the early 1990's, but never developed into a nationwide service. As wireless providers moved to digital systems, some didn't migrate *CG to the new system and others even lost track of whether or not they were continuing the feature. This patchwork of service is confusing for the mariners who choose to use it, and may, in fact, prevent them from making a timely call for assistance should they find themselves in an area where *CG is not available.

The Coast Guard has found through research and experience, that with the multitude of wireless systems and the misalignment of cellular coverage areas with our regions for Search and Rescue response, the use of this specialized service has resulted in misdirection of emergency calls. This has often added significant delays in the Coast Guard response to those calls for assistance.

The Coast Guard has requested that the cellular companies reroute all *CG calls to the 911 Public Safety Answering Point (PSAP) nearest to where the call originated. As an added precaution, mariners should stop using the special keying sequence *CG and begin using 911 on their cell phones to notify authorities of a distress at the onset of a maritime emergency if a cell phone is their only means of communication.

The one exception to the discontinuance of the *CG specialized keying sequence is the Alaskan cellular phone region. Cell phone companies operating in Alaska all have the *CG feature available, and because the Coast Guard has a single number for routing those emergency calls, the cellular and Coast Guard regions are fully aligned; calls are not missed and cannot be misdirected. The *CG feature will remain active in Alaskan waters.

Mariners are encouraged to invest in a VHF-FM radio as their primary means of distress alerting on the water. Communication via VHF-FM radio provides superior alerting capabilities over cellular phones.

All maritime boaters should have a VHF-FM radio onboard their vessel to assure any calls of distress are heard immediately. Cell phones should only be used as a secondary means of communication. If the cell phone is the only means of communication available then remember, as with any land based emergency, the number to call rescue personnel is 9-1-1. *CG is no longer available. Have a fun and safe boating season.

VHF-FM Radio:

Superior Service in an Emergency

When a MAYDAY is sent out via VHF-FM radio it is a broadcast, not just one party is receiving the distress call; any nearby boaters can hear the distress call and offer immediate assistance. Cellular phones are point to point; other boaters in the area can not hear the call and consequently will not be able to respond.

With the Coast Guard's Rescue 21 system improvements to the National Distress and Response System (which is monitored by Coast Guard Sector communications centers) any call, distress or otherwise, placed over a VHF-FM radio will have an associated line of bearing (LOB). This LOB significantly narrows the area in which Coast Guard or other responders must look to find the boater making the call. In many locations two or more LOB's will be associated with a call; the intersection of those LOB's will provide the position of the caller. A cell phone doesn't do this. If the distressed caller does not know his location, it is difficult and time consuming to determine a position through the wireless companies. This is often aggravated by low batteries and poor reception.

VHF-FM radios are manufactured today with Digital Selective Calling (DSC). This feature provides the mariner with an emergency feature that will send a distress with the vessel's information and Global Positioning System (GPS) location at the press of a button. It is important to note that the DSC radio must be properly registered with a Maritime Mobile Service Identification (MMSI) number through Boat U.S., and the radio must be properly interfaced with the GPS in order to send an accurate position to assist emergency responders to respond to the distress.

121.5 MHz Beacons *The End of an Era*

The New U.S. Position on 406 MHz ELTs

By Mr. Rick Button

"We have reviewed this proposal in detail and we agree without comment."

These simple words on 10 July 2006 were the successful result of years of effort by the United States Search and Rescue (SAR) services to change our previous national position on carriage of 121.5 MHz Emergency Locator Transmitters (ELT) on aircraft. This statement is the United States' reply back to the International Civil Aviation Organization (ICAO) regarding the proposed amendment on aircraft ELT carriage requirements on international flights and general aviation. By agreeing without comment, the United States no longer favors the 121.5 MHz ELT at the expense of the 406 MHz ELT.

The new position provides a business incentive for 406 MHz ELTs to be part of any newly built aircraft which could be used for international flights. This change reflects a consensus which balanced the aviators' concern of cost to retrofit 406 MHz ELTs with the concern of SAR services about the known weaknesses of the 121.5 MHz ELT. SAR subject matter experts from the National Oceanic and Atmospheric Administration, Air Force, and Coast Guard worked with the Federal Aviation Administration to develop a consensus national position.

BACKGROUND AND SCOPE

COSPAS-SARSAT is an international satellite system whose mission is to protect life and property by providing accurate, timely and reliable distress and security alert and location information to SAR authorities. It carries out its mission in a non-discriminatory fashion consistent with national and international protocols, and has helped save and assist many thousands of lives since its inception. Search and Rescue Satellite Aided Tracking (SARSAT) relays alerts to search and rescue organizations from persons are in distress, and also delivers security alerts from ships at sea to security authorities when acts of violence such as piracy or terrorism occur onboard.

The four types of equipment that provide alerts via SARSAT are emergency position-indicating radio beacons (EPIRBs) for the maritime environment, ELTs for the aviation environment, personal locator beacons (PLBs) for use on land or in multiple environments, and ship security alerting systems (SSASs) used aboard ships and other craft at sea.

Cospas-Sarsat provides for processing emergency signals on two types of distress frequencies that support distress alerting for SAR operations:

> 406 MHz beacons specifically designed for use with the Cospas-Sarsat 406 MHz system, including the Low-Earth Orbiting Search and Rescue (LEOSAR) satellites and the Geostationary Earth-Orbiting SAR satellites of the GEOSAR system; and
>
> 121.5 MHz beacons suitable for use with the LEOSAR system only.

LEOSAR satellites process 243 MHz signals from beacons that operate on both 121.5 and 243 MHz in the same manner as they process 121.5 MHz signals (further discussion in this article about 121.5 MHz processing also applies to processing 243 MHz alerts).

There is a large variety of EPIRBs, ELTs, SSASs, and PLBs that broadcast on 121.5/243.0 MHz and 406 MHz.

Limitations of 121.5 / 243 MHz Beacons

1. Analog signal only = no digital identification code to let SARSAT system know signal is from a beacon
2. Low power output…hard for satellites to detect and process an accurate location
3. USMCC handles 250-400 "hits" per day:

- Only 1 in 8 alerts come from beacons. The rest are interference sources like ATM machines, pizza ovens, and even stadium scoreboards!
- High false alert rate makes first-alert launch unfeasible…delays SAR response to possible victims.

Due to inherent limitations of 121.5 MHz beacon signal characteristics, the 121.5 MHz system performance is limited. In particular, there are numerous false (non-distress) alerts generated that cannot be easily identified and eliminated.

This situation led to official requests to Cospas-Sarsat from the International Maritime Organization (IMO) and ICAO to establish a termination date for processing 121.5 MHz signals.

In October 1999 the Cospas-Sarsat Council decided to comply with these requests.

Cospas-Sarsat developed and is fully implementing a plan to discontinue all system processes relating to 121.5 MHz satellite alerting. The plan includes actions for Cospas-Sarsat and for responsible national administrations and international organizations to enable complete and coordinated termination.

INTERNATIONAL TERMINATION DATE: 1 FEBRUARY 2009

The Cospas-Sarsat Council, supported by the United States, ICAO and IMO, unanimously decided in October 2000 that a firm termination date should be established, which will result in discontinued use of any residual 121.5 MHz processing capability.

The announced date on which processing of 121.5 MHz alerts will be terminated by all components of the Cospas-Sarsat System is February 1, 2009.

Administrations and international organizations are continuing a coordinated global effort to prepare for the termination date on February 1, 2009.

United States

In advance of the February 1, 2009 termination date for the satellite processing of 121.5/243 MHz beacon signals, the United States SAR services, in particular the Coast Guard working with the Federal Communications Commission (FCC), took a proactive approach to set a firm termination date for 121.5 MHz EPIRBs. This approach focuses on a three-prong effort to transition the maritime community (both commercial and recreational users) from using 121.5 MHz EPIRBs: In 1999, the FCC immediately ceased the certification of any new 121.5 MHz EPIRBs. In addition, a rule was set that the manufacturing and sale of 121.5 MHz EPIRBs would cease as of February 1, 2003. The final important deadline was that operation of any 121.5 MHz EPIRB will cease after December 31, 2006. Thus, any 121.5 MHz EPIRB, in effect, becomes "illegal" to use beginning January 1, 2007.

TERMINATION RATIONALE AND ACTIONS

The following paragraphs discuss some of the justification for terminating 121.5 MHz services, and some efforts to ensure that it will happen smoothly:

Use of 121.5 Mhz EBIRBs will be illegal on January 1st, 2007

121.5 MHz BEACON USAGE

01 February 2009: International Termination of 121.5 MHz Satellite Alerting

U.S. Termination of 121.5 MHz EPIRBs = 3 Phases

1. 1999: Certification of new 121.5 EPIRBs ceased
2. 01 February 2003: Sales and manufacture of 121.5 MHz EPIRBs ceased
3. 01 January 2007: Operation/Use of 121.5 MHz EPIRBs is illegal

System Capabilities

Based on limited availability of internationally-provided LEOSAR instruments, and finite design lives of satellites and onboard equipment, the space segment will be marginally capable of processing 121.5 MHz alerts until February 1, 2009, at which time the capability will rapidly degrade. Services will end concurrently worldwide, regardless of any residual processing capability. All satellite and ground system operators will be instructed by Cospas-Sarsat to disable processing of 121.5 MHz signals effective February 1, 2009.

Space and ground elements will continue to process signals from all beacons that alert using the 406 MHz frequency band.

Beacons

Within the U.S., maritime distress beacons that alert on 121.5

MHz are no longer allowed to be manufactured or used. Use of 121.5 MHz aviation beacons is falling as the result of aggressive education on advantages of 406 MHz beacons, and about the termination date for processing 121.5 MHz alerts. Similar beacon phase-out efforts are underway in most countries.

Successful worldwide efforts have been ongoing to reduce the costs associated with 406 MHz beacons; costs are expected to continue to fall.

Information Campaign

The decision to terminate satellite processing of 121.5 MHz signals was announced in the Federal Register on July 2, 2001.

The termination date will continue to be publicized nationally and internationally to distress beacon users and SAR communities by all available means.

Cospas-Sarsat has provided clear guidance about the termination to administrations, rescue coordination centers (RCCs) and other SAR points of contact (SPOCs).

IMO and ICAO are supporting Cospas-Sarsat in informing administrations, beacon users, beacon manufacturers, and other international organizations about the termination.

Benefits

The termination will improve confidence in the Cospas-Sarsat System's capability, as the many 121.5 MHz system disadvantages will be eliminated.

Discontinuation of 121.5 MHz beacons will improve the quality of 121.5 MHz aeronautical voice distress and emergency communications by reducing noise and interference caused by distress beacons in the same frequency band.

A fixed date:

Enables standard global implementation, consistent with IMO, ICAO and International Telecommunications Union requirements;

Enables effective transition planning and management for international organizations, administrations, manufacturers, the public and associated entities;

Encourages a shorter transition to 406 MHz beacons or equivalent systems, and helps beacon users prepare with the least possible confusion about the timeline; and

Eases the burden on international RCCs which can simultaneously implement compatible and less difficult procedures for responding to alerts, and which will benefit from a large reduction in false alerts.

Termination will allow much more efficient and effective use of SAR resources, and improved services to beacon users in life-threatening situations.

121.5 MHz SAR operations are adversely impacted by unavoidable long delays inherent in the alerting process, and for resolution of ambiguity regarding the distress location. 406 MHz beacons have proven to be at least four times as effective for lifesaving.

Operating costs for Cospas-Sarsat participants will be substantially reduced due to simplified standard ground station functions, data distribution, and SAR response.

False alerts will be resolvable much more effectively with 406 MHz beacon identification and registration which is unavailable for 121.5 MHz beacons.

SARSAT Saves Lives for the boating public and maritime industry:

So far, in the year 2006 (as of August 1st) the United States using SARSAT rescued 157 people:

- **Rescues at sea:** 128 people in 37 incidents;
- **Aircraft rescues:** 4 people in 4 incidents;
- **Rescues involving distress alerts from Personal Locator Beacons:** 25 people in 13 incidents.

For the year 2005, the United States using SARSAT rescued 222 people in 93 incidents:

- **Rescues at sea:** 150 people in 54 incidents;
- **Aircraft rescues:** 38 people in 19 incidents;
- **Rescues involving distress alerts from Personal Locator Beacons:** 34 people in 20 incidents.

Worldwide: Over 20,300 people have been rescued using SARSAT since 1982.

United States: 5,286 people have been rescued using SARSAT since 1982.

About the Author: Mr. Rick Button is the Chief of the Coordination Division within the U.S. Coast Guard's Office of Search and Rescue in Washington, DC

Person In The Water !!

Station Tillamook Bay, Oregon, 20 February 1998... but just as easily today.

By Mr. Mark Dobney

At 3:17 PM on the winter afternoon of February 20th, 1998 a phone report came into the USCG Station Tillamook Bay operations center. The caller was a local resident living along the northern shore of Tillamook Bay who had observed what she thought may be a person in the water in Crab Harbor near Kincheloe Point.

The day was a brisk 41˚F and the water temperature was below 50˚F as is normal for the Oregon winters. Also typical of the winter weather were the southeasterly winds blowing at 40 knots and the overcast sky, the visibility reduced to 5 miles due to haze or occasional showers. The bay was kicking up with about a 1 foot wind chop. There was no other boating traffic out on the bay and the bar entrance to the ocean was restricted due to hazardous conditions for recreational boating traffic.

Station Tillamook Bay sounded the Search and Rescue alarm and the duty boat crew ran the 100 yards down the catwalk to the ready 47 foot Motor Lifeboat. Group Astoria Oregon was notified and diverted an HH60J helicopter from a scheduled training mission to assist (landing first at Astoria to pick up the duty rescue swimmer). By 3:27 PM the station's Motor Lifeboat was underway and arrived on scene in less than six minutes. Surfman BM2 J. Darin O'Brien and his crew immediately located one person floating in the water face down and unconscious. They also sighted two more people in the water clinging to the mostly submerged hull of a 14 foot pleasure craft with only the bow above water. The single female victim was floating away from the others with the outgoing tide. BM2 O'Brien maneuvered the lifeboat to recover the woman. By 3:37 PM the crew had her on board and had commenced CPR on the aft deck of the Motor Lifeboat. The victim was cold with no obvious pulse or respirations. At 3:41 PM a second boat crew launched to assist, with Chief Warrant Officer Dobney at the helm of the station's 30 foot surf rescue boat. By 3:43 PM, BM2 O'Brien and his crew had recovered the other two persons (both very large men) from the water. The two Motor Lifeboat crew members, not engaged in CPR or driving the boat, could only get the male victims into the side recovery port due to their size and weight. The crew quickly headed back to the station to meet an arriving ambulance. At 3:48 PM the Lifeboat moored at the station with the crew still conducting CPR and transferred the victims to EMS. The Surf Rescue Boat recovered the submerged small boat and the HH60 helicopter, piloted by LT Heitsch, arrived in the area and recovered some of the boat's gear along the nearby beach. All the victims were suffering from extreme hypothermia. EMS personnel worked on the female victim with assistance of station personnel and eventually did resuscitate the victim. Although landing areas near Station Tillamook Bay in Garibaldi, Oregon and the hospital in Tillamook, Oregon were very small and not normally used by the large HH60 Jayhawk helicopter, it was determined that the risks were worth using the helicopter for transport of the woman the 12 miles to urgent care. By 4:21 PM the 49 year old woman had been turned over to hospital personnel at the emergency room of Tillamook Hospital. The two men, 44 years old and 70 years old, had been transported by ambulance to the hospital. The female victim was in critical condition with a core temperature of approximately 80˚F. She was later transferred from the Tillamook level three trauma center to Oregon Health Sciences University (OHSU) level one trauma center in Portland Oregon after being warmed and stabilized. The two men were treated and released after a short stay at the hospital.

This incident occurred when a group of friends from West Lind, Oregon decided to go recreational crabbing on Tillamook Bay. The small 14 foot boat was being operated with an engine too large for its size (55 HP) according to the capacity plate. This coupled with the overall weight of the passengers and gear (crab rings, two coolers and a gas can) caused the boat to start taking on water over the stern. This concerned the operator so he attempted to pull his anchor and proceed back to the launch ramp at Garibaldi. The outboard engine stalled and the boat quickly filled with water (probably exaggerated when the operator added his weight at the stern to check the motor). The hull's inherent buoyancy kept it partially above water and the anchor kept it in place but the victims had no means of signaling their distress. None of the persons on board were wearing Personal Floatation Devices. The victims remained in the water for about

Coast Guard 47 foot Motor Lifeboat in the surf on the Oregon coast one hour clinging to the bow of the boat before the Coast Guard was notified. The female victim had a much smaller build than did her partners, and she finally lost consciousness, and thus her grip on the hull, just before the Motor Lifeboat arrived. The two men could do nothing to help her or themselves due to the effects of hypothermia.

I received a follow-up letter dated April 23rd, 1998 from the doctor at OHSU hospital that treated the female victim. He wanted to pass on congratulations to the Coast Guard crew for a "superb job in resuscitating this lady". He further indicated they did get a good outcome as she was transferred to a rehabilitation facility. He said she was "mentally alert and overall doing quite well. She had a stormy course in the hospital. Nevertheless, she is a survivor." The doctor stated that her survival was "in no small part due to the excellent pre-hospital care provided" by the Coast Guard personnel. He wanted to ensure we understood "just how sick she was and at the same time appreciate that when things go right in the pre-hospital setting that it makes the team effort so much more meaningful."

A bizarre twist to this story was the information that we discovered later through discussion with medical staff. The female victim had one or even two other near drowning incidents before this one. We all agreed that if we were in her shoes, it would be time to move to the desert in order not to tempt fate again.

Using the Cold Exposure Survival Model, the functional time for the 49 year old female was a little over 1 hour, with a survival time of a little over 3 hours. The functional time for the men was over 3 hours, with survival time of over 7 hours. These results are nearly reflected in the actual circumstances of this case, although it is not likely they could have survived very long without the aid of life jackets for buoyancy after losing the physical functionality of their hands.

In an instant, a day of crabbing turned into a fight for life at a level one trauma center. Thanks largely to the outstanding pre-hospital care of the Coast Guard crews and local EMS responders all of the victims survived. Survival in a cold-water environment starts with proper planning and preparation. Failing that, first responders must be trained and always ready to recongnize and properly treat cold-water injuries.

The only significant change that has been made since this case occured in 1998 is the addition of a heli-pad to the Station/Port of Tillamook property which is large enough to accommodate the Life Flight helicopters and the HH60J helicopters that serve as the primary aviation SAR resource along the coast.

The author, Mr. Mark Dobney was a Coast Guard Chief Warrant Officer, and the Commanding Officer of Station Tillamook Bay when this case occurred in 1998.

The surfman in the article, BM2 O'Brien, is now a Chief Boatswains Mate assigned to the Coast Guard Cutter Eagle.

The HH60 helicopter pilot in the article, LT Heitsch, is now a Commander assigned to Air Station Elizabeth City, NC.

What should you do with your old EPIRB?

By Public Affairs Specialist 3rd Class Jeff Pollinger

In June 2006, the Coast Guard received a distress signal from an Emergency Position Indicating Radiobeacon, or EPIRB, registered to a boat home-ported in Missoula, Montana.

No people were in trouble, but the Coast Guard didn't know that when they first received the signal. However, it wasn't long before they discovered the call was a false alert. The owner of the EPIRB had failed to unregister the device when he sold his boat to a man in Ft. Lauderdale, Fl.

EPIRBs are devices intended to save lives by transmitting a signal to rescuers with the position of troubled boaters. When they are improperly disposed of they can cost the Coast Guard valuable time and taxpayers thousands of dollars in resource costs.

The International Maritime Organization and the Coast Guard recommend that unwanted EPIRBs be disposed of by removing the battery and shipping the unit back to its manufacturer or rendering the unit inoperable by demolishing it. The EPIRB should also be unregistered with National Oceanic and Atmospheric Administration in any case when the unit has been disposed of or transferred to a new owner.

The Coast Guard routinely refers cases involving the non-distress activation of an EPIRB (either as a hoax, through gross negligence, carelessness or improper storage and handling) to the Federal Communications Commission. The FCC can prosecute cases based upon evidence provided by the Coast Guard, and will issue warning letters or notices of apparent liability or fines up to $10,000.

By following the rules for proper EPIRB disposal, boaters can save themselves and the Coast Guard a lot of difficulty. For more information on EPIRBs, please contact the National Oceanic & Atmospheric Administration (NOAA) at 1-888-212-7283 or visit their Web site at: www.sarsat.noaa.gov

The Four Stages of Cold-Water Immersion

By RADM Alan Steinman, USPHS (Ret) and Gordon Giesbrecht, Ph.D.

Falling into cold water can be life-threatening. There are four stages of cold-water survival, and each presents the survivor with a different challenge. The stages are: 1) cold-shock; 2) functional disability; 3) hypothermia; and 4) post-rescue collapse. It is important to understand the risks of each stage in order to be properly prepared to survive a cold-water emergency.

Stage 1: Cold-shock (0-2 minutes): Sudden immersion in cold water causes an immediate fall in skin temperature which triggers several body reflexes. These reflexes are collectively known as the "cold-shock" response, and they last for just the first few minutes after falling in. The cold-shock responses are: 1) instantaneous gasping for air; 2) sudden increase in breathing rate; 3) sudden increase in heart rate; 4) sudden increase in blood pressure; and 4) dramatic decrease in breath-holding time. If your head is underwater and the cold-shock reflex causes you to gasp and inhale (and simultaneously decreases your ability to hold your breath), you may breathe in water and drown. This has happened often enough in the past that the Coast Guard had a term for it: "sudden drowning syndrome." It's one reason why a personal flotation device (PFD) can be life-saving – it helps keep your head out of the water during the first few minutes the cold-shock reflexes are active.

The increase in blood pressure and heart rate from sudden immersion into cold water can also be fatal. These rapid changes in the cardiovascular system can trigger irregular heart beats or even cardiac arrest in susceptible individuals. But even aside from the potential for cardiac arrest, the irregular heart beats and rapid breathing rate can be incapacitating for someone struggling to keep his head above the waves. This is yet another good reason why a PFD can be life-saving in this situation: it helps you stay afloat until your heart rate, blood pressure and breathing rate return to more normal levels when the cold-shock reflexes diminish.

Sudden immersion in cold water also drastically reduces your ability to hold your breath. For the average person who can hold his breath for 60 seconds in air, breath-holding time is reduced to 20-25 seconds or less when submerged in water colder than about 50˚F. This would obviously be a problem for someone trying to escape from a submerged automobile, vessel or aircraft. Finally, the rapid breathing that occurs during the first few minutes of cold-water immersion can lead to a drop in blood levels of carbon dioxide with subsequent mental confusion or even unconsciousness; both can significantly increase your chances of drowning, particularly if you're not wearing a PFD.

Stage 2: Functional Disability (2-30 minutes): If you survive the cold-shock reflexes after falling overboard, cold water can still affect you in other ways. It is much harder to swim in cold water than it is in warm water. Your muscles get cold, making it harder to use your arms and legs to stay afloat. And cold water is a bit more viscous than is warm water, requiring you to work harder to swim or stay afloat. Your hands get cold quickly and you lose manual dexterity and grip strength. This can affect your ability to grasp a rescue line or life ring or even to help pull yourself back aboard your vessel. Both swimming failure and loss of manual dexterity can occur during the first 30 minutes after falling into cold water. Again, a PFD would be life-saving during this period, as it would dramatically decrease your need to swim to keep your head up.

Stage 3: Hypothermia (> 30 minutes): Hypothermia is a decrease in the body's core temperature (i.e., a drop in the temperature of the body's vital organs below 95˚F) resulting from excessive heat loss to the cold water. Hypothermia is not really a threat until you have been immersed in cold water for at least 30 minutes. The body cools relatively slowly, even in extremely cold water. When the body's temperature falls to around 86-90˚F, you will lose consciousness and likely drown. But even in ice-water, this could take an hour or more to occur. In warmer water, the time to unconsciousness could be much longer, depending on your body size and weight (large and/or obese people survive much longer than small, skinny people), your clothing, your state of health, the sea-state, and particularly on whether you're wearing a PFD or some other means of flotation. But without a PFD or supplemental flotation, unconsciousness in the water usually means immediate drowning. Survival times for the average sized person wearing an insulated worksuit with inherent buoyancy (e.g., an insulated exposure coverall and medium-weight undergarments – not a survival suit) in 45˚F water, even in heavy seas, could be as long as 5-8 hours. For the same person wearing a survival suit, properly donned before entering the water, the survival time could be as long as 36 hours!

Stage 4: Post-Rescue Collapse (> 30 minutes): A survivor is still at significant risk even after removal from the water. Significant levels of hypothermia can slow the body's normal defenses against a sudden drop in blood pressure. This can occur when the survivor is removed from the water, particularly if he/she is rescued in a vertical posture and not promptly placed in a horizontal posture in the rescue vessel or aircraft. The hypothermic heart and arteries cannot adjust fast enough to the drop in blood pressure, which may cause loss of consciousness, irregular heart beats or even cardiac arrest. Furthermore, the body's core temperature continues to fall even after a survivor is removed from the water, a phenomenon known as "afterdrop." If the afterdrop lowers the heart temperature too far (e.g. below about 77˚F), cardiac arrest may occur. Finally, metabolic changes in the body caused by prolonged immersion hypothermia can contribute to potentially fatal cardiovascular effects even after a survivor is rescued. For all of the above reasons, rescuers should be particularly mindful of the ABC's of first aid, handle a hypothermic victim gently, begin gentle rewarming efforts in the rescue vehicle, and transport the survivor to a site of definitive medical care.

“It Doesn’t Look Like They’re Drowning”

How To Recognize the Instinctive Drowning Response

By Aviation Survival Technician First Class Mario Vittone and Francesco A. Pia, Ph.D

In the summer of 2002 at U.S. Coast Guard Air Station New Orleans, a young aircrewman had just returned with his crew from Lake Maurepas, west of Lake Pontchartrain. A boat with a family of five aboard had capsized during a squall, and he had deployed to assist the survivors. He began telling his story:

“We arrived on scene and all five of them were in the water; some clinging to debris, some not. As we hovered above the scene, two of the victims appeared to be looking up at us, treading water. I hurriedly changed into my wetsuit when I heard the pilot say, ‘They don’t look like they are in any immediate danger. They can wait for the boat.’

I said, ‘No Sir, they look like they are drowning!’”

Good crew resource management prevailed. The pilot put the swimmer in the water to gather all the victims together and to make sure they were all safe until the sheriff’s boat arrived. It was a successful rescue and everyone did a great job. But why was there such a difference between the two assessments? Why does one person think that there is no immediate danger, and another think that danger is imminent? Doesn’t everyone who works on (or above) the water as rescue professionals know what drowning looks like?

Most people assume that a drowning person will splash, yell, and wave for help; and why wouldn’t they? That’s what we see on television. Without training, we are conditioned first to think of drowning as a violent struggle that is noisy and physical. It is not.

Coast Guard rescue crews are less likely to see a person drowning than nearly every other water rescue professional (beach and pool lifeguards). Our relative distance to the accidents and distress calls to which we respond usually puts us on-scene well after persons who may experience problems have done so. However, if you play this game long enough you will see a victim in the water. You may even be the one directing him or her to get in the water. Extenuating factors such as increased levels of stress, secondary injuries, and environmental factors can increase the likelihood of distress and/or drowning in the victims we find. It is important that we learn to recognize the behaviors associated with aquatic distress and drowning, so we can make informed decisions during emergencies.

The *Instinctive Drowning Response* represents a person's attempts to avoid the actual or perceived suffocation in the water. The suffocation in water triggers a constellation of autonomic nervous system responses that result in external, unlearned, instinctive drowning movements that are easily recognizable by trained rescue crews.

In the case of our aircrew above, the victims outside the rotor wash, looking “up” (at the helicopter) appears from the pilot’s view to be doing fine and able to wait the five minutes for the boat to arrive. When in fact, they may be 30 seconds from going down for the last time. The splashing and waving that one expects from false training or dramatic conditioning (television) was not there.

This is not to say that a person in the water that is shouting and waving is fine and doesn’t need assistance. They are in what is known as *aquatic distress.* They are not drowning, but realize they are in trouble and still have the mental capacity (and lung capacity) to call for help.

Our rescue crews must know what drowning looks like. Recognizing panic and distress in the water is something that they must learn and train for in order to perform their jobs effectively.

Characteristics of the Instinctive Drowning Response:

1. Except in rare circumstances, drowning people **are physiologically unable to call out for help.** The respiratory system was designed for breathing. Speech is the secondary, or overlaid, function. Breathing must be fulfilled, before speech occurs.

2. Drowning people’s mouths alternately sink below and reappear above the surface of the water. The mouths of drowning people are not above the surface of the water long enough for them to exhale, inhale, and call out for help. When the drowning people’s mouths are above the surface, they exhale and inhale quickly as their mouths start to sink below the surface of the water.

3. **Drowning people cannot wave for help.** Nature instinctively forces them to extend their arms laterally and press down on the water’s surface. Pressing down on the surface of the water, permits drowning people to leverage their bodies so they can lift their mouths out of the water to breathe.

4. Throughout the Instinctive Drowning Response, drowning people cannot *voluntarily* control their arm movements. Physiologically, drowning people who are struggling on the surface of the water cannot stop drowning and perform voluntary movements such as waving for help, moving toward a rescuer, or reaching out for a piece of rescue equipment.

5. From beginning to end of the Instinctive Drowning Response people’s bodies remain upright in the water, with no evidence of a supporting kick. Unless rescued by a trained lifeguard, these drowning people can only struggle on the surface of the water from 20 to 60 seconds before submersion occurs.

18 Year Old Wins Coast Guard's Top Prize

An Interview with Tanya Budd

By Commander Steven Stilleke

Tanya, tell me about yourself, where are you from?

Hi, I'm Tanya Budd, I'm an 18 year old high school student from Berkshire, England.

Congratulations on your accomplishment. Tell me about your award? What was it like to win?

I was the proud winner of the Coast Guard's Recreational Boating Safety Award at the International Science and Engineering Fair (ISEF). It was an international competition against 1,500 other students from 47 countries, and all over the United States. The top prize was $5,000. I also received another $500 for placing 4th in the Engineering category of the ISEF Grand Awards.

This was a truly awesome occasion, and I was absolutely stunned to have won this award. I was overwhelmed when called to the stage and nearly cried.

What led you to participate in the International Science and Engineering Fair?

I was invited to this event after being named Young Engineer for Britain last September. Just prior to leaving for America, I was the winner of two Isambard Kingdom Brunel Awards in the innovation award category, and for a special commendation of engineering, presented to me by the president of the Royal Academy of Engineers. I was also lucky enough to be invited to have lunch at Buckingham palace, with His Royal Highness, the Duke of York with a number of prominent UK Engineers.

What was your winning project? How did it come about?

My winning project, Hypo Hoist, is a rapid and efficient man overboard recovery system, which I produced as my Senior High School engineering project. Hypo Hoist came about when I was sailing with some friends on the English South Coast. We were undertaking a man over board simulation and sailing back to a crewmember that we had lost overboard, (we were using a bucket & fender to simulate the crewmember). As you are probably aware, the south coast of the UK is at latitude 50 degrees north; and consequently counts as cold-water sailing. The sailing conditions tend to be quite challenging as the tidal streams are quite fierce and run at up to 6 knots around the coast. It's not infrequent to have gales,

The Intel International Science and Engineering Fair (ISEF) was held in Indianapolis, Indiana, May 9 - 12. The ISEF is the world's largest pre-college science competition. Now in its 57th year, it is the world's only science project competition for students in the ninth through twelfth grades. The Intel ISEF brings together students, teachers, corporate executives and government officials from around the world. Students compete for over $3 million in scholarships, tuition grants, scientific equipment and scientific trips. The competing students have earned the right to be there by winning top prizes at local, regional, state or national science fairs.

The Coast Guard's Boating Safety Program, through its non-profit grant program, established a Special Award for Recreational Boating Safety to recognize projects that demonstrate the best means of improving the safety of recreational boating.

The second place prize of $3,000 went to a student who developed a catalytic converter to reduce carbon monoxide emissions from gas hot water heaters. The third place award of $1,000 went to a student that developed a non-toxic and very effective method of reducing barnacle growth on boat hulls using ultrasonic waves. The fourth place prize of $500 was for a project that developed a methodology for the identification of conditions that affect the resolution of GPS signals.

even in summer, thus the ever possible risk of losing someone over the side is a real one. I realized that maneuvering the boat back to the casualty was only half of the equation, and that the most challenging part was actually how to retrieve a heavy, waterlogged person, out of the water, up the freeboard of the boat, and back onto the yacht. This problem can escalate rapidly if the causality is unconscious, and can prove impossible if you are sailing lightly crewed. By the time the boat had sailed back to the casualty in the water, with an average temperature of 5˚C (41˚F), and bearing in mind the exertion of the casualty in the water with the kinetic and thermal energy expended, the person would likely be suffering serious effects of cold shock.

It is vital to keep a casualty in a horizontal position because changing their attitude and lifting them vertically causes a rapid drop in blood pressure, which is already critically low as the pressure exerted on the patient by the body of water is removed on recovery. This results in a lack of blood flow to the brain and greatly increasing the chances of cardiac failure and neurological malfunctions.

Hypo Hoist is designed to rescue a conscious, or unconscious, person out of the water and back onto the safety of the yacht by just one crewmember, whilst minimizing risk and injury to the casualty. Hypo Hoist reduces the risk of cardiac failure, induced by the effects of immersion hypothermia, by recovering the casualty in a constant horizontal during and after recovery.

How did you come up with the design for Hypo Hoist?

Hypo Hoist is based on the original concept of rescuing a casualty using a spare headsail that is lead back to a main halyard so as to roll the person back onto the yacht. But with Hypo Hoist, the sail is replaced by a triangular polyester mesh structure which forms a cradle in which the man overboard is floated, with the aid of a boat hook. The cradle is then lifted back onboard. The top of the cradle attaches to the boat either by snap shackles located at four points on the mesh, which can be clipped to toe rails, or by a three-part aluminum pole, which has a central bungee cord joining the poles together. Using the concept of tent poles, the three sections can be assembled by sliding them into one and another using custom produced aluminum fittings. The pole slides through the top pocket in the polyester mesh structure attaching the cradle to the deck using universal rope. At the far point, a halyard (spare rope that is lead from the mast to a winch) is fastened to the cradle through a metal eye. The cradle has two functions, to either hoist and roll the man-over-board up the freeboard to a point level with the deck and back onto the yacht, or to function as a boarding ladder with handholds to allow quick and easy access back onto the yacht.

What does the future hold for the Hypo Hoist?

My device has already been snapped up by Isle of Wight manufacturer SeaSafe Systems Ltd. It was launched on the market in June at *SeaWorks* commercial boat show in Southampton. It will also be featured at the *International Southampton Boat Show*, in England this September.

And what does the future hold for you personally?

I never dreamed when I entered Young Engineer for Britain last year that it would lead to so much. I was invited to be a spokesperson by the Royal Academy of Engineers at the Brunel Bicentenary conference in June at the historic Bristol Temple Meads station. I attended a champaign reception onboard the SS Great Britain, hosted by His Royal Highness, the Duke of Gloucester. The following evening at the Gala Dinner, it was announced that I was also selected as Brunel University's Entrepreneur of the Year.

I'm so pleased that I decided to take up engineering for a career. It is so exciting, and I feel like I have an amazing opportunity with my life. I have a scholarship to study Mechanical Engineering at the world famous Brunel University (College) London. I am also returning to the Young Engineer finals this year to act as a mentor for the contestants. I have also been invited by the Institute of Civil Engineers to judge their media project. And, I was selected for an internship with Airbus, and provisional job opportunities at the end of my degree! So things are looking really good.

Do you have any advice for other young engineers or inventors?

My advice to young people with an idea is to seek expert advice, and never give up. People respect the fact that you're young and haven't studied engineering yet, so you will need guidance. Be inquisitive and challenge by asking why? Why is something like it is, and why can't we make it better?

How Long Can You Survive?

Predicting Survival Time for Cold Air Exposure and Water Immersion

By Dr. Peter Tikuisis, Allan Keefe, David Lever, and Rick L'Ecuyer

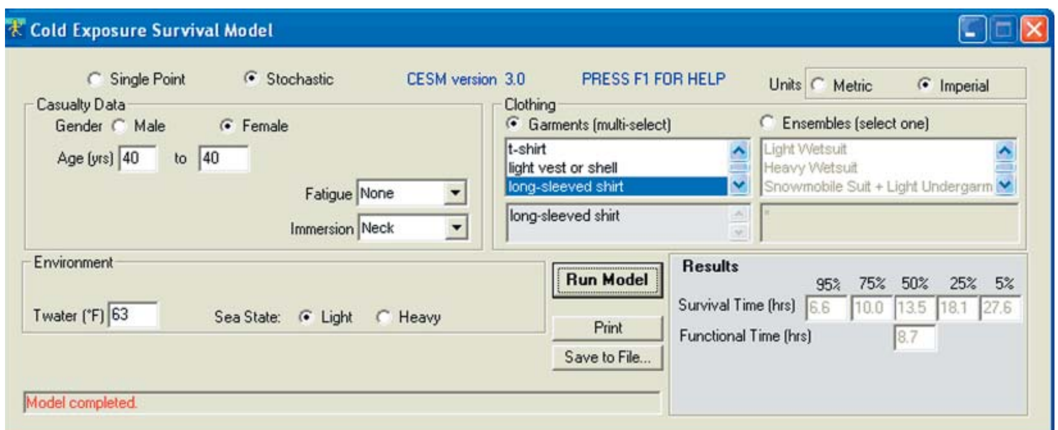
> *"It is a miracle she was found.... She was severely hypothermic.... She said she figured she had about 15 minutes left."* Canadian Coast Guard Captain Susan Pickrell, 14 July, 2005

This incident involved a 40 year old female survivor of immersion in 63°F water off the coast of British Columbia. She was successfully rescued approximately after 8 hours in a "hypothermic, but lucent" state. Survival cases such as this are often described miraculous, as the expected survival time is usually much lower. But, do such cases really defy scientific expectation? Apparently, survival times can be surprisingly long if the individual survives the initial period of cold shock.

Upon immersion, a poorly insulated individual will first experience debilitating cold shock that can lead to an involuntary inspiration of water and subsequent drowning[1]. This initial phase normally lasts 2-3 minutes and subsides when the skin temperature becomes steady just above water temperature. If death occurs during this phase, its probable cause is drowning either through an involuntary, excessive inspiration of water or heart failure. However, for the individual that survives cold shock, the risk of perishing shifts to hypothermia (deep body cooling).

Although advances in Search And Rescue (SAR) technologies allow for an accurate and rapid response, *a priori* prediction of the casualties' likelihood of surviving provides an important strategic and operational advantage. Allocation of resources and contingency planning are better served if casualty survival times can be reasonably estimated. Crude charts of survival time have recently been replaced by a computer-based model for such predictions, known as the Cold Exposure Survival Model (CESM) developed at DRDC Toronto (formerly DCIEM™)[2, 3].

CESM was constructed using principles of heat transfer combined with anatomical and physiological considerations of human response to cold[2,3]. Survival time is based on the predicted time to reach life-threatening hypothermia, assumed when the deep body temperature reaches 28°C/82.4°F. It is further assumed that all casualties begin their exposure to cold air or immersion in water capable of a normal physiological response to cold (i.e., reduced skin blood flow and shivering). Casualties are also assumed to be immobile (i.e., not walking or swimming) since the model does not assume levels of physical activity. Although activity would generate additional body heat, this potential advantage is confounded by the possibility that more heat would leave the body in very cold, well-stirred water as compared to passive immersion. Instead, the only heat assumed to be generated by the casualty is through their normal metabolism and shivering, which represents a conservative baseline condition.



Cold Exposure Survival Model version 3.0 more accuractly predicts survival times with more user defined inputs

User-defined inputs include the clothing worn by the casualty and climatic conditions (air temperature and wind, and/or water temperature and sea state). Casualty characteristics such as height and weight can be specified if known, otherwise only a range of age is required. In the latter case, a large number of possible anthropometric combinations are stochastically (randomly) applied to yield a range of survival times, which are then sorted according to probabilities of survival time[4].

In the graphic shown above, CESM was applied for the case described earlier involving a 40 year old woman and predicts survival times ranging from 6.6 (95% probability) to 27.6 hours (5% probability). The functional time prediction of 8.7 hours pertains to a deep body temperature of 34°C/93°F, the threshold for cognitive impairment indicating when the individual is likely beyond dependable self-help. This prediction concurs with the observation that the woman was lucent at the time of rescue. But note the disparity in the predicted times to lethal hypothermia and the statement that she was severely hypothermic. A deep body temperature of 34°C/93°F is associated with a mild state of hypothermia[5]. Indeed, hypothermia is not considered severe until deep body temperature reaches 28°C/82.4°F, which we adopted as the survival endpoint since death is imminent unless intervention occurs to remove the individual from further cold exposure.

"Survival cases such as this are often described miraculous, as the expected survival time is usually much lower. But, do such cases really defy scientific expectation?"

It is envisioned that CESM will continue to be applied as a versatile decision aid for SAR operations. The newly developed stochastic option can provide SAR planners with estimates of probable numbers of survivors as a function of time by simply multiplying the probability of survival with the number of casualties involved. At present, CESM predictions assume that all casualties survive the initial stage of cold shock. However, if required, information is available to estimate the number of casualties that are likely to survive the initial immersion[6] and to differentiate survival rates between those wearing and not wearing a PFD[7]. Ultimately, CESM can be merged with other models that predict the probability of finding a casualty to yield an overall 'survivability' model that predicts the probability of finding a live casualty, as recently advocated at the Survivability of Distressed Mariners Workshop held in New London, CT in March 2006.

Endnotes

1. M.J. Tipton (1989). The initial responses to cold-water immersion in man. Clin Sci 77: 581 - 588.
2. P. Tikuisis (1995). Predicting survival time for cold exposure. Int. J. Biometeorol. 39: 94-102.
3. P. Tikuisis (1997). Prediction of survival time at sea based on observed body cooling rates. Aviat. Space Environ. Med. 68:441-448.
4. P. Tikuisis and A.A. Keefe (2005). Stochastic and Life Raft Boarding Predictions in the Cold Exposure Survival Model (CESM v3.0), DRDC Technical Report 2005-097.
5. www.chems.alaska.gov (2003). Cold Injury Guidelines. Department of Health and Social Services, Division of Public Health, Section of Community Health and EMS, State of Alaska.
6. E.H. Wissler (2003). Probability of survival during accidental immersion in cold water. Aviat Space Environ Med 74:47-55.
7. E.H.N. Oakley and R.J. Pethybridge (1997). The prediction of survival during cold immersion: results from the UK national immersion incident survey, Institute of Naval Medicine, Gosport, UK, INM Report No. 97011.

The Cold Exposure Survival Model (CESM) was developed as a decision aid for Search and Rescue (SAR) to predict the survival time of individuals exposed to cold air or immersed in water. It offers the option of prediction for a specific individual or a group of individuals under the assumption that the casualties are immobile, but capable of a normal physiological response to cold. Predictions are expressed either by a specific time, if detailed information of the casualty is known, or by a range of times based on various probabilities of survival if casualty information is incomplete. CESM is available as a stand-alone application and is also imbedded in a larger suite of decision aids for SAR.

About the Authors:

Dr. Peter Tikuisis is a Defense Scientist at DRDC Toronto, Allan Keefe is a Technologist at DRDC Toronto.

David Lever is a Search & Rescue controller at RCC Halifax.

Rick L'Ecuyer is the software manager at EMS Technologies in Ottawa, Canada.

Swimming: An Option for Self-Rescue In Cold Water

By Michel B. Ducharme, Ph.D. & David S. Lounsbury, M.Sc.D.

What should a person do upon accidental immersion in cold water? For a long time, aquatic safety organizations and government agencies stated that swimming should not be attempted, even when a personal flotation device (PFD) is worn. Only recently in their 2006 drowning report did the Canadian Red Cross Society state that if rescue is unlikely, it may be preferable to swim to safety. This is supported by data from the same report showing that over 60% of survivors of cold water boating immersions swam for shore as opposed to only 30% of the survivors staying with the boat (The Canadian Red Cross Society, 2006). This significant change in the advice provided by public safety organizations came along with an increased body of evidence supporting swimming as a potential option for self-rescue during accidental immersion in cold water.

Swimming In Cold Water

Early studies have shown that exercise in water at 25°C/77°F had no effect on the body cooling rate, allowing the maintenance or even an increase of core temperature in water warmer than 25°C/77°F. But in water below 20°C/68°F, exercise increased the rate of core cooling by 37%, the corresponding increase when swimming being 50%. When compared to floating still, treading water and down proofing (two survival swimming behaviors) increased the cooling rate by 34% and 82%, respectively. The increased body heat loss during exercise in water leading to an increased body cooling rate is likely attributed to the increased blood flow to the working limb muscles significantly decreasing the protective insulative effect of the muscles normally observed at rest. Furthermore, some of the extra heat loss is attributed to the increased water convection during exercise.

Keatinge (1969) was among the first investigators to conduct studies on swimming in cold water. He observed that while good swimmers were able to swim without life jackets in 23°C/73°F water with no difficulties, the same individuals were only able to swim 7 to 12 minutes in 5°C/41°F water. The main factors identified as contributing to the swimming failure were panic, fatigue and respiratory distress. No change in core temperature was reported during the short swimming period.

In early studies on channel swimmers it was reported that only half of the competitors completed the crossing of the English Channel, this failure being attributed to hypothermia due to the cold water. Later, another study predicted that the average swimming distance before incapacitation in water near 12°C/53°F would be about 1,400 m/1500 yds based on the body cooling rate to reach a core temperature of 33°C/91°F, considered by these authors to be the lower limit for maintenance of "useful activity" such as swimming. In the above studies, the authors assumed that core cooling, as opposed to fatigue and respiratory distress, was the limiting factor during swimming in cold water.

These observations led to a general conclusion more than 30 years ago that *"people are better off if they float still in life jackets or hang on to wreckage and do not swim about to try to keep warm"*.

Today, a relevant question concerning cold water survival would be: have we focused our advice on the right priorities? What is the priority when immersed in cold water? Is it to preserve heat or to get out of the cold water? When we try to understand the basis for the general conclusion mentioned above, we find that the early studies played a key role. Can we still support this general conclusion in light of the evidence provided by more recent studies on the topic?

In the early study by Keatinge, swimming failure was attributed to panic, fatigue and respiratory distress. Today, we understand that those initial responses to cold water immersion are attributed to cold shock. The uncontrollable breathing, hyperventilation, gasp reflex, dyspnoea observed early during cold water immersion can lead to a lack of coordination between the swim stroke and respiration. In turn, these physiological responses would increase the risk of developing panic due to water inhalation and inability to swim and to hold the head above water. Thus, cold shock may explain the swimming failure observed by Keatinge early during immersion in 5°C/41°F water. This limitation can be easily overcome by ensuring that the respiratory responses have adapted and breathing pattern is under control (about 2-3 minutes) before initiating the swimming activity.

Studies between the 50's and 70's infer from their prediction that swimming failure is linked to the development of hypothermia, accentuated by the increased heat loss due to the swimming activity. Recent studies investigating swimming failure during immersion in cold water have reported however that failure to swim precedes the development of incapacitating hypothermia. Muscle fatigue attributed to arm cooling rather than systemic hypothermia is likely the primary factor responsible for the decrease of swimming ability and the cessation of the activity.

Recent evidence from the literature are showing that the early factors identified as being responsible for the development of swimming failure which led to the development of the early recommendations advising not to swim in cold water can be either easily overcome, or are not likely the primary contributors to swimming failure (Ducharme, 2005).

Distance Covered Before Swimming Failure

Recent field studies conducted in water between 10 and 14˚C/50-57˚F indicate that people can swim in cold water with a PFD for a distance ranging between about 800 m/875 yds (novice) to about 1500 m/1650 yds (expert) before being incapacitated by the cold (Wallingford et al., 2000; Kenny et al., 2001; Lounsbury and Ducharme, 2005). An interesting finding in the above field studies is the similar swimming period before incapacitation. The average swimming duration for the three studies was about 47 minutes before incapacitation, a time interval between the range of 42 to 55 minutes deemed irrelevant to the swimming ability of the subjects. This observation is supporting the assumption that the swimming failure might be primarily related to muscle fatigue of the arms, as a consequence of arm cooling rather than general hypothermia, since hypothermia does not incapacitate in such a short time interval. This observation is supported by the reported low muscle temperature of the triceps, averaging 26.9˚C/80.4˚F following a 55-minute swim in 10˚C/50˚F water (Kenny et al., 2001,2002). Doubt (1991) suggested that a reduction in muscle temperature below normal will reduce muscle perfusion for a given workload, which in turn will increase the anaerobic contribution to the work effort, and will both increase the rate of muscle fatigue and decrease the contractile force. Once muscle fatigue has developed due to local cooling, this would lead to swimming failure characterized by a decrease of the distance covered by unit of oxygen consumed (increase in inefficiency and a-synchronicity of the arm and leg action), an

When To Swim and When To Wait

1. Upon falling into cold water, focus only on keeping your head above water, and your airway clear for approximately the first 2-3 minutes, until your rate of breathing is under control. This will allow you to calm yourself before making any important survival decisions.

2. Ask yourself: "Am I likely to be rescued soon?" The definition of "soon" (before loss of consciousness due to hypothermia) depends mainly on the water temperature, your level of insulation (body fat and clothing), and the use of a PFD, but in 10˚C/50˚F water it is probably: approximately 2-3 hours if you are minimally dressed with a PFD and lean (<10% body fat); 4-5 hours if you are of average build (15 - 20% body fat); and, up to several hours if you are fat (>30% body fat) (Tikuisis, 1995). If you aren't sure whether you will be rescued soon, proceed to step 3. If you are fairly certain that you will be rescued soon, try to conserve body heat by holding the Heat Escape Lessening Posture (HELP posture; Keep your legs together, pulling your thighs to your chest if possible. Keep your armpits covered by your arms. Either place your hands and forearms across your chest, or use your hands to help hold your legs in close to your body). Once you have made your decision, hold to it, since your judgment will become impaired the longer you stay in the water.

3. Look all around you. Try to determine where the nearest source of safety is located.

4. Try to assess the distance. Don't worry about putting it into numbers. Just think about whether you could successfully swim to your goal based on your ability to swim and your level of fitness. Keep in mind that: a) you are wearing a life jacket that will help you; and, b) you are immersed in cold water, which will hinder you. You are more likely to under-estimate than over-estimate your ability. If you still are not sure at this point whether you could swim to shore, ask yourself whether you think you would be able to swim the required distance within 45 minutes (research has shown that the average person can maintain purposeful swimming for this time interval). If so, this lends further support that swimming for shore might be the best survival strategy in this case.

5. If you think the goal is attainable, your best bet is to swim. Proceed to step 6. If you do not think the goal is attainable, try to conserve body heat by holding the HELP Posture. Once you have made your decision, hold on to it, as your judgment will become impaired the longer you stay in the water.

6. Once you have made your decision, hold on to it, as your judgment will become impaired the longer you stay in the water.

7. Start swimming to your goal. It is recommended that you use head out breast-stroke because you can recover your arms underwater. Using the head out front crawl while wearing clothes is wasteful of energy.

8. Try to swim with an even and sustained pace defined by the distance to be covered and your level of fitness, as this will help you travel the furthest distance before you become exhausted or hypothermic.

increase in stroke rate, a decrease in the length of each stroke, and a more vertical swimming position (Tipton et al, 1999; Golden and Tipton, 2002). At this point, the victim without PFD will start struggling to keep his/her head above water or will not progress anymore if wearing a PFD.

Distance Perception And Making The Initial Decision

It is important for an individual to judge two issues before setting out to swim: the distance separating them from their goal, and whether one has the ability to reach that goal before incurring swimming failure.

In a recent study to simulate a survival situation in which a person floating in cold water would have to make a decision about whether to swim for shore or not, subjects were periodically presented with pictures of an Ontario shoreline and then asked questions to assess their survival strategy, survival confidence, distance perception, perceptive confidence and estimated swimming time (Lounsbury, 2004). It was observed that on average, subjects tended to over-estimate the distances to shore by a factor 3. In the same study, the subjects made also indirect estimations of their swimming speed by estimating how long it would take them to reach a given projected lakeshore destination. The mean quotients of perceived speed over actual speed were found to be very close to unity, indicating that people have a very accurate idea about how long it will take them to achieve a given swimming goal. Note that this accuracy in "estimation of time to destination" exists despite a 3-fold over-estimation of distance.

However, it is not one's ability to assign accurate numbers to distance that is relevant in a survival scenario. What is more important is having an intuitive feeling for whether or not goals are attainable. In the recent study mentioned above, the perceived distance threshold (PDT) was defined as the greatest distance that a subject would attempt to swim. The average PDT was 921.9 m/1000 yds, which compares favorably to the average swimming distance of 1123 m/1228 yds achieved by the swimmers. Therefore, PDT was either close to reality, or else conservatively low. Interestingly, 86% of the subjects questioned within 3 minutes of the beginning of the swim had swam the furthest distance that they claimed they would manage to swim. However, after 35 minutes of swimming, this proportion had decreased to 32%. This data suggest that subjects were quite astute in deciding their swimming strategy early in the immersion, but after about 30 minutes of swimming or passive cooling, their decision-making ability became impaired. It would therefore seem wise to make one's accidental immersion survival plan directly after cessation of the cold shock responses and early during the immersion.

Conclusions

Self-rescue swimming during accidental immersion in cold water is a viable option particularly if the likelihood for rescue help is low, and the victim can reach shore within 45 minutes of swimming based on his/her fitness level and swimming ability. On average, a cold water immersion victim wearing a PFD should be able to swim approximately 800 m/875 yds before incapacitation due to muscle cooling and fatigue of the arms rather than general hypothermia. This swimming distance is about 1/3 of the distance covered at warmer water temperature.

Endnotes

1. Doubt TJ. 1991. Physiology of exercise in the cold. Sports Med 11: 367-381.
2. Ducharme, MB, Self-rescue during accidental cold water immersion. In: Handbook on Drowning, Prevention, Rescue, Treatment, J.J.L.M. Bierens (Ed.), Section 5.8: Rescue techniques: Self-rescue, p. 232-235, 2005.
3. Golden F., Tipton M. 2002. Essentials of Sea Survival. Human Kinetics.
4. Keatinge WR. 1969. Survival in cold water. Oxford and Edinburg: Blackwell Scientific.
5. Kenny, GP, Reardon FD, Ducharme MB. 2001. Physiological limitation to emergency swimming in cold water. DCIEM Contract Report CR 2001-026.
6. Kenny, GP, Ducharme MB, Reardon FD, Oksa J. 2002. An evaluation of possible factors limiting cold water swimming distance. Proceedings of the 10th International Conference on Environmental Ergonomics, Sept 23-27, 2002, Fukuoka, Japan. p. 271-274.
7. Lounsbury DS. 2004. Swimming survival – Performance and judgement in cold water. M.Sc. Thesis, University of Toronto.
8. Lounsbury D.S., M.B. Ducharme. 2005. Self-rescue strategies during accidental cold water immersion: performance and thermal considerations. Proceedings of the 11th International Conference on Environmental Ergonomics, 22-26 May, 2005 Ystad, Sweden, Ingvar Holmer, Kalev Kuklane and Chuansi Gao, Editors, Lund University, p. 553-556.
9. The Canadian Red Cross Society. 2006. Drownings and Other Water-Related Injuries in Canada, 1991-2000. Module 2: Ice & Cold Water. Ottawa, ON.
10. Tikuisis, P. 1995. Predicting survival time for cold exposure. Int J Biometeorol. 39: 94-102.
11. Tipton M, Eglin C, Gennser M, and Golden F. 1999. Immersion deaths and deterioration in swimming performance in cold water. Lancet 354: 626-629.
12. Wallingford R, Ducharme MB, and Pommier E. 2000. Factors limiting cold-water swimming distance while wearing personal floatation devices. Eur J Appl Physiol. 82: 24-29.

About the Authors:

Michel B. Ducharme, Ph.D.

Dr. Ducharme received his PhD from the University of Toronto in 1990. He is a senior Defence Scientist and Head of the Human Protection and Performance Group at the Defence R&D Canada in Toronto. He is also an Adjunct Professor in the Faculty of Physical Education and Health at the University of Toronto, and in the Faculty of Health Sciences at the University of Ottawa. For the past 20 years, his research work has focused on the thermal performance, protection, and survival in extreme environments. Dr. Ducharme has conducted numerous research projects at sea and in the Arctic with the military. He has authored over 100 peer-reviewed publications and over 170 scientific presentations in the field of thermal physiology. He was recently the co-recipient of two national scientific awards for his work on the revision of the Wind Chill Index which was implemented across North America in 2001.

David S. Lounsbury, M.Sc.

Mr. Lounsbury completed his Master's Degree in 2004 at the University of Toronto under the supervision of Dr. Ducharme. He is currently completing his second year as a student at the Medical School, University of Western Ontario.

The Sinking of the Cape Falcon

By Public Affairs Specialist Second Class Shawn Eggert

The skies over Newport, Oregon contained barely a hint of clouds, and the sea was nearly transparent. It was a good day for fishing. It seemed that clear water, clear skies, and clear sailing were all the men aboard the 27-foot pleasure craft, Cape Falcon, needed to ensure a bountiful catch and a safe return to port. As it turns out, they probably could have used another place to store their catch as well.

The crew of the Cape Falcon got underway from Newport at 5:30 a.m. July 14. Bob Templin, the boat's owner, and his friends Elmer "Sandy" Killian and Steve Harrison were looking forward to a peaceful day of tuna fishing off the coast of Tillamook, Oregon. They set out for a spot 45 miles offshore where friends had said there were plenty of fish to be caught. The Cape Falcon sported a six-cylinder diesel engine capable of 340 horsepower so it didn't take them long to get there.

In addition to speed, the vessel was also equipped with most of the safety gear a responsible boat owner should have aboard a boat. Flares, life jackets, a first-aid kit, and a radio among other things were all stored in the cabin or in various other places aboard the vessel along with a Global Positioning System and a depth finder.

The fishing wasn't going so well out at the spot the men had found so they turned back toward Newport trolling for tuna as they went. Somewhere around 40 miles east of Newport and some time around noon, the men began to bring in 20-30 pound tuna. These were stored in a compartment near the engine well used for storing tuna lines and an extension cord. The compartment had been built with a limber hole so that water from within could escape into the engine well to be collected by the bilge pump. In a written report to the Coast Guard, Templin stated he noticed a small amount of water and fish blood sloshing around in the compartment. He switched the bilge pump from automatic to manual hoping it would ensure that the maximum amount of water would be removed from the vessel.

The men continued to fish—landing one tuna after another, cooling them in an ice chest, and then storing them in the compartment. However, it wasn't long before one of the men noticed that the boat was listing on the compartment side. Templin went to investigate and found that the compartment was half-full of water. The combination of the weight of the water and over 200 pounds of tuna was about to create a serious problem for the men.

Templin told one of his companions to point the bow of the Cape Falcon into the waves to keep more water from splashing into the boat while he tried to empty the compartment with a manual bilge pump. It was no use. Scant minutes later, the compartment was completely full of water, and the boat was precariously close to foundering. To make matters worse, the engine died as one of the other men made a mayday call over the radio.

The call was received shortly after 1 p.m. by both Coast Guard Sector North Bend and Sector/Air Station Astoria who responded by dispatching a total of five aircraft to search for the vessel. Meanwhile, things aboard the Cape Falcon were only getting worse.

Templin had given up on trying to bail water from the boat with a five-gallon bucket and was heading for the cabin to retrieve a life jacket when a torrent of water flooded the vessel slamming the door shut with his friends inside. He quickly found himself underwater and fighting the down-pull of the sinking boat to avoid being taken with it into the deep and unforgiving sea. He surfaced 8-10 seconds later and saw the bow of the Cape Falcon descending below the waves like a faltering promontory taking with it over 200 pounds of tuna, a 340-horsepower engine, every piece of safety gear he'd stored for situations just like this one and, quite possibly, his friends.

Killian and Harrison were still trapped in the cabin as the Cape Falcon was overcome by the waves. Further calls for help over the radio were useless so they grabbed whatever life jackets were at hand and went for the windows of the cabin as water filled the vessel. They spent close to 20 seconds below the waves before they managed to free themselves from the cabin and swim to the surface. Finding Templin, they swam to the bow of the vessel and held on until the sound of air hissing through the double-welded aluminum alerted them that the Cape Falcon would soon be completely underwater. Fearing they may be sucked down with the boat, the men swam for the nearest piece of floating debris they could find.

Templin, Harrison and Killian managed to escape the Cape Falcon by swimming for an ice chest that had floated up from the deck. Killian was wearing a life jacket he had taken from the cabin, and he and Harrison held onto each other's arms across the top of the chest to keep it balanced in the water. A small child's life jacket Harrison took from the cabin was given to Templin who tucked it under his arm for additional buoyancy as he held onto one of the ice chest handles. The three men had drifted away from the sinking vessel and had been at the mercy of the tide for twenty minutes when they began to see fins circling them in the water. In the meantime, the Coast Guard was racing to the rescue.

The emergency call from the Cape Falcon had left the Coast Guard with very little information about the location of the vessel and the boat was not equipped with an Emergency Position Indicating Radio Beacon (EPIRB) that would have enabled the Coast Guard to home in on the vessel's location.

"Even with all the resources at our disposal, we had only a ten percent chance to locate these men based on the information we received from the emergency call," said Lt. Cmdr. Pat Smith, the Coast Guard Command Center Supervisor. "Had they spent only four or five hundred dollars to equip their vessel with an EPIRB, it's possible this search would have taken only one or two hours."

Though there was a GPS aboard, the only person who understood its use was busy trying to bail water from the boat. That left the Coast Guard with only two pieces of information about where to begin their search. The caller had stated the vessel was about 45 miles offshore and had 800 feet of water below it.

"Mariners sometimes use the word 'Mayday' when attempting to conduct radio checks on VHF channel 16. This can make it difficult for the Coast Guard to judge the authenticity of calls that have no correlating position or other important information," said Lt. Matthew Michaelis, Command Duty Officer at the District Command Center. "But everything in the tone of the caller's voice, and the fact that two other fishing vessels offshore also heard the Mayday broadcast, told us this was probably a legitimate case."

"The eight hundred-foot fathom curve off the Oregon coast is a huge area," said Lt. Lee Titus, another Command Duty Officer, at the Command Center. "Some very clever extrapolating was done to come up with a pretty accurate search area."

By determining what radio towers were closest to the call's point of origin and using charts of the Oregon coast that included depth data, the Coast Guard was able to find an area that corresponded to that description.

"Search and rescue controllers considered a number of factors including the locations of the two fishing vessels that heard the call, the locations where the depth was approximately eight hundred feet, and the "footprint" of the three Coast Guard radio towers on the Oregon coast that also heard the distress call," said Michaelis. "Instead of using a GPS position to search a relatively small area, the Coast Guard had to use a number of different aircraft and boats in order to search an initial area encompassing roughly sixteen hundred square miles."

A C-130 search plane from Air Station Sacramento joined with an HH-60 helicopter from Air Station Astoria and four HH-65 helicopters from Newport and North Bend to begin search patterns over the water 50 miles from the Oregon coast. There was little wind to stir up the waves, and crewmen aboard the aircraft were given a clear view of a large number of sharks that had come to the area. When a 47-foot response boat from Station Yaquina Bay was sent to investigate a rain slicker that was spotted floating on the water near where the sharks had been seen, the rescuers feared the worst had occurred.

The three men from the Cape Falcon had escaped drowning only to be surrounded by the circling fins of…a pod of dolphins. The dolphins had apparently come to either investigate the sinking or were after any tuna that had come free from the boat's compartment. Regardless, the men breathed a sigh of relief and held onto the hope of being rescued.

Two hours after the sinking of the Cape Falcon, the men got their first glimpse of a Coast Guard helicopter. They waved and called out to it, but were too far away and too small a spectacle to be seen by the crew as it flew past. Sighting another helicopter, Harrison produced a 9mm pistol he was carrying and attempted to get the pilot's attention by firing three rounds into the air. However, the sound of the whirling rotors from the helicopter drowned out any chance the crew would hear the gunfire.

Nearly seven hours passed before a civilian vessel that had joined the search spotted the men. The crew aboard the vessel tossed a life ring to Templin and his friends as a call was made to the Coast Guard that the men had been found. However, close to eight hours in the 65-degree water had robbed the men of any energy to reach out for the flotation device. The Coast Guard would be required to get the men out of the water.

Aviation Survival Technician Third Class Tom Marin was aboard the HH-65 helicopter from Air Station North Bend that was first to reach the scene. "I dove out of the helicopter with a small, one-man life raft and swam towards the men," said Marin. "Their hands were so cold they were actually stuck to the surface of the ice chest."

Marin gave the men the raft to hold onto and asked which of them was in the worst shape. Being so cold, Harrison and Templin could only manage to nod toward Killian who was the oldest of the three and displaying signs of hypothermia.

Marin grabbed Killian and swam with him to where a basket was lowered from the HH-60 helicopter that had just arrived. After loading Killian into the basket to be hoisted up, he returned to the raft to retrieve Templin and then Harrison. Rigid from the cold and barely able to move, each man had to be physically manipulated into the basket like a large action figure.

"I could tell they wanted to help me get them into the basket, but they were too cold and weak from exposure," said Marin. Once all of the men were inside the helicopter, they were rushed to Newport Community Hospital where all three men recovered.

"I did what I could to assure them they'd be someplace warm and dry in a just few minutes," said Marin. "It's truly amazing for them to have survived, but they had a lot going for them. Water temperatures here are usually lower, but it was a warm day, and there was very little wind. Tuna also tend to swim in warmer currents so where they sank was probably much warmer than elsewhere."

Lt. Matthew Weller of Air Station North Bend, who flew the HH-65 helicopter that arrived on scene, credits the search and rescue procedures of the Coast Guard. "We had been flying multiple search patterns over a ten square mile block for nearly six hours," said Weller. "With the small amount of information we had to go on, it's fantastic to see our training and the systems we have in place come together for a big rescue like this."

The Cape Falcon now rests at the bottom of the Pacific Ocean. According to Templin's report, its sinking is believed to have been caused by a blockage of the limber hole used to empty water from the compartment where he and his friends were storing their fish.

Surviving Winter on the Great Lakes

From Search and Rescue Controllers On-Watch

By LCDR Keith Ropella & LTJG Jon Rose

Try this: have one search & rescue controller place a hand in a bucket of ice water while another executes a practical search & rescue (SAR) problem. How long can the first controller hold that hand in the water? Can they make it through the gathering of initial information? Until a rescue unit can launch? Until a search plan is created? Until you've read this entire article? A controller will quickly realize why cold water rescues demand quick action.

We all live by the search and rescue mantra, "hit it hard, hit it fast" but these watch words take on a critical meaning in the winter months of the Coast Guard's northern district where exposure to the elements above the surface can be dangerous, and survival time in the water can be measured in minutes rather than hours.

An average healthy adult wearing appropriate cold weather attire can predictably survive for hours on the surface of the ice. The same adult immersed in freezing water, expending precious energy attempting to free himself, compounded by the shock and panic of the situation, may have only minutes of functional survival time. To see an example of this, run a Cold Exposure Survival Model (CESM) for an average person in cold weather conditions wearing typical clothing for the environment. Start with no immersion, then get him wet to see the predicted functional and survival time drop.

One Ninth District controller got to experience the mind and body numbing effects of falling through the ice—if only vicariously—in February 2005. A cell phone call from two men was transferred into the Command Center. The men and their ATVs had already fallen through the ice on Lake St. Clair. The ice had broken up around them and they were struggling to stay on their partially submerged, two inch-thick ice floe. The controller kept the two hypothermic men on the phone for 25 minutes, giving them survival instructions, using them to guide the Coast Guard helicopter to their location in the low nighttime visibility, and keeping them calm throughout the rescue even as the ice broke from under them several times. The two men survived the frozen ordeal thanks to the cool head of the SAR controller.

Conditions on the Great Lakes lend themselves to an active winter population consisting of ice fisherman, recreational vehicle users (ATVs and snowmobiles) and the use of "ice bridges" for automobile travel between the mainland and the islands and between the U. S. and Canada. These winter maritime users help make sure the Coast Guard stays active on the Great Lakes year-round.

Until a few years ago, controllers had limited resources to dispatch to those in need of assistance in ice conditions. The helicopter (HH-65s from Air Stations Detroit and Traverse City) has been, and will continue to be, the primary asset for ice rescue. It is fast, safe, and reliable in most situations. However, helicopters do have their limitations: HH-65s do not have de-icing capability, they are several hours away from many popular parts of our area of responsibility, and conditions can be un-flyable at the Air Station, at the rescue site, or anywhere in between. The only other options were a few ice skiffs scattered at stations throughout the District, or local fire departments who also had limited capabilities.

Since 2000, we in the Ninth District have committed ourselves to staying on the cutting edge of ice rescue capability. One of the main accomplishments is the establishment of the Ice Capabilities Center of Excellence (ICCE) in Station Saginaw River, Michigan. As the name suggests, the ICCE is the focal point for ice rescue capabilities. It is where the foundation for the standardization of the Ninth District ice rescue program was formed.

The ICCE is also where all ice rescue equipment and conveyances are tested, approved, and standardized. The rigorous evaluation system ensures Coast Guard personnel can safely and effectively perform their rescue mission by overcoming such unique obstacles as finding GPS and flashlight batteries that work when it is -50°F. In addition to the ice skiff (essentially a john boat with an outboard for open water and a push bar to move it across the ice), ice rescue stations have a host of new conveyances including MARSARS shuttle boards, an ARGO amphibious all-terrain vehicle, and airboats.

The airboat, or iceboat, has quickly demonstrated its overwhelming effectiveness for ice operations. In 2001, Station St. Clair Shores prototyped a 23-foot Husky airboat complete with a heated cab able to traverse snow, ice and shallow water. Since then, the Coast Guard has purchased three 18-foot and three 20-foot American Airboats. These models were specifically designed for the Coast Guard and will soon become Coast Guard standard boats. The improved response time, crew safety and comfort, and ability to rapidly deliver patients to waiting medical assistance greatly increases a victim's chance of survival in ice related rescues.

Although originally intended as an ice rescue platform, the iceboat has proven its worth elsewhere. It has become a valuable Maritime Domain Awareness and Law Enforcement platform for when our 1,500 mile open-water boarder with Canada freezes, facilitating illegal boarder crossings and smuggling. During Super Bowl LX, held in Detroit this past February, these boats proved to be the perfect asset to patrol the security zone established in the frozen Detroit River.

Altogether ice rescue has come a long way. When the ice breaks beneath your feet we are now truly able to "hit it hard, hit it fast" with confidence. (p.s. for those of you with your hand still in the bucket of ice water, go ahead and take it out.)

"Let's Have A Beer Before We Start!"

By Dr. Frank Golden

That expression may be a natural prelude to a normal day's activities on or near water. But what are the possible consequences? Will the day turn out to be like many others before, or could this one be different? Will that beer or two have an outcome that could change your life and that of your family?

In most western cultures, the use of alcohol has become an acceptable form of social behavior in all walks of life. Indeed it is often assumed to be a necessary prop to ensure an occasion goes well and is enjoyed by all. We have all, or at least most of us, had a beer or two on such occasions, to help us relax and enjoy the company, without experiencing any ill effects. Unfortunately, with repetitive consumption over time, our tolerance to the level of alcohol in our blood increases so that we need to consume more alcohol to attain the desired effect.

Sadly, alcohol is toxic to the body and while small doses may have a favorable and pleasing psychological effect, as the blood level increases it has a progressively deleterious effects. Furthermore, when consumed by someone already on prescribed medication, or taking illicit substances, there may be an adverse interaction, which will intensify the end result. But even on its own, alcohol has a depressant effect on the brain affecting: judgement, decision making, perception, coordination, vision, and balance, all to varying degrees depending on blood levels and degree of tolerance attained by the individual. While the effects of higher levels of alcohol are clearly sensed by the individuals themselves, many of the initial effects of smaller quantities of alcohol may be below the perceived threshold, creating a false sense of security, or worse still, a sense of bravado or even invincibility in some instances.

With increasing personal tolerance of alcohol, we think we can judge how much is safe to drink before engaging on a specific activity. Such judgement is usually based on previous experience of both the quantity of alcohol consumed and the difficulties associated with a specific activity. Thus, if we perceive a task to be complex, or difficult, requiring concentration or good dexterity, we tend to abstain prior to taking it on. However, for more mundane, uncomplicated, tasks with less perceived risk, we think there is less need for abstention before embarking on them.

Many might regard recreational boating, fishing, swimming, etc., as one such example. Our perception of the dangers involved, based on previous personal experience, may lead us to adopting a pretty relaxed attitude to alcohol intake, either prior to or during the activity. However, should anything out of the ordinary occur, the likelihood of being able to respond quickly enough, or in the correct manner to avert disaster, could be significantly impaired. It is for this reason that a with blood alcohol content of 0.08 (80mg%) or higher it is illegal to operate a vessel on all Federal waters in all U.S. states. Even relatively small amounts of alcohol in the blood stream can affect judgement long before the more overt physical signs of alcohol intake become apparent to yourself or others.

> *"...with a blood alcohol content of 0.08 or higher it is illegal to operate a vessel on all Federal waters in all U.S. states."*

This is one of the biggest dangers with alcohol intake: our lack of awareness of the incipient dangers on human performance of relatively low blood levels, even in people who are accustomed to drinking and have developed a degree of tolerance to alcohol.

We can all readily understand why the drunk can get into difficulty in a marine environment, and clearly never see ourselves in such a situation. What many don't appreciate however, is that for every drunk in such situations there are probably over a hundred with blood alcohol levels that show little overt signs of incapacity but whose reflex times and performance are nevertheless adversely impaired. Not surprisingly therefore are the latest Coast Guard statistics, which show that approximately one-third of all maritime fatalities involve alcohol. Furthermore, a detailed study of recreational aquatic activities has shown that a blood alcohol level above 0.10 (100mg%) is estimated to be more than 10 times likely to be associated with a fatal accident than those with no alcohol in their blood.

But it is not only those in charge of the boat that are at risk—although they are the group who are more likely to make an error of commission or omission that can result in an accident—passengers who have consumed excess alcohol may also cause problems. Passengers, who are high-spirited from alcohol consumption, should be regarded as "Man-Overboard" incidents waiting to happen. In small craft, inexperienced passengers can be a liability even when sober. When under the influence of alcohol, especially those who are unfamiliar with boats, passengers may make some sudden movement and easily upset the stability of the craft. This may result in their, and others, precipitous entry into the water, or even capsize.

Another problem with passengers, both in large and small craft, is unfamiliarity with their surroundings. The carefully structured safety briefing they will have received before leaving the dock or jetty can be easily forgotten in the mist of alcohol. In the frenetic activity of an impending disaster, they will be totally incapable of fending for themselves and will likely require one to one supervision in the use of lifesaving equipment. In small craft the probability of such supervision is extremely remote. Likewise, parents with young children on board have a difficult task on their hands in normal circumstances without increasing the risks by consuming alcohol while engaging in maritime pursuits.

The presence of alcohol in the blood of those who have been swimming is also associated with a high fatality rate. Many surveys show 50% of drowning victims have alcohol in their blood. However, it is less easy with swimming than boating to make a definite association between alcohol consumption and the activity/action that resulted in the final outcome, other than the effect of alcohol on facilitating muscle fatigue (see below).

Cold Water Immersion & Alcohol

Regardless of the well-understood effects of alcohol on judgement and behavior described above, the response of the body to a cold environment is significantly altered following the ingestion of alcohol. The age old myth that 'alcohol helps to keep out the cold', probably predates the foolish use by the Benedictine monks in Europe of dispatching St. Bernard dogs—with the miniature cask of brandy (or more probably Benedictine) slung beneath their neck—to the aid of stricken mountain climbers high in the Alps.

Many publications attribute the feeling of well being created by alcohol in the cold as being due to its vasodilatation (opening) effect on the blood vessels in the skin, creating a "warm glow". That effect only occurs in a warm environment. In the cold, the direct effect of cold on the skin is to produce a vasoconstriction (closing) of the blood vessels. So another explanation must be found for the myth about the potential benefits of alcohol in cold conditions.

The truth is more likely to relate to the decreased perception of cold, resulting from the general depressant effect of alcohol on the brain, coupled with an impairment of the shivering response in those who have consumed alcohol. Experiments have shown that when a group of fit young men, who had not recently eaten, consumed as little as two pints of standard strength beer and then engaged in some moderate exercise for 30 minutes in a cold environment (14.5°C; 58°F), their blood sugar fell to half its normal value and deep body temperature fell to hypothermic levels (35°C; 95°F) in the 30 minutes. Despite this low body temperature they did not shiver noticeably, and hence their body was unable to defend the fall in temperature. Alcohol impairs the ability of the liver to manufacture glucose required to sustain normal blood sugar levels. When blood sugar falls to about half its normal value, shivering all but ceases. (This is due to the effect on the brain that can be reversed by intravenous glucose).

Another experiment was conducted to evaluate the effect of alcohol on the initial responses to cold water ("cold shock"). A group of 15 male and 1 female volunteer subjects, wearing normal swim wear, consumed a volume of alcohol—calculated to produce a blood level of 0.12 (120mg%)—one hour before being immersed in cold water (15°C; 59°F). The magnitude of their cold shock response was not altered significantly when compared to that seen in a control, alcohol free, condition. The immersions were of insufficient duration to assess the effect on their shivering response but all the participants commented that they felt the cold less in the "alcohol immersions".

While that experiment does not prove an adverse or beneficial effect of alcohol in the initial stages of immersion, there is little doubt that raised blood alcohol levels will increase the likelihood of someone falling into the water and conducting such an experiment on themselves!

One of the more potentially dangerous effects of alcohol to people in the water, already alluded to, is probably that associated with the inhibitory effect on glucose production by the liver to replenish dwindling circulating blood levels during exercise. Swimming in cold water is much more difficult than in warmer water. Not only are you unable to swim as fast as you normally can, but the distance you can cover is significantly reduced before fatigue cuts in. There are several possible reasons for this.

First, the direct effect of cooling on muscles will reduce the volume of blood flow to them (through cold vasoconstriction) and with it, less oxygen will be available to meet their increased exercise demands. Consequently, the work involved in cold-water swimming will be more anaerobic. Such work uses higher levels of sugar (glucose). Second, even in normal circumstances, as the muscle's own stores of sugar are insufficient to meet the demands of heavy exercise, they are very dependant on extra glucose being delivered by the blood. The cold vasoconstriction will therefore reduce that source of additional energy and thereby facilitate the early onset of fatigue. Third, this handicap will be further enhanced if the diminished blood flow that does reach the exercising muscle is also depleted of glucose because of the inhibitory effect of alcohol on the liver glucose production. The net result will be a significant reduction in anaerobic muscle capability, leading to early fatigue and hence swim failure. Finally, those who are accidentally immersed in cold-water, usually are fully clothed, frequently in heavy outdoor clothing. When this becomes saturated, it adds a considerable burden to the work of swimming and further hastens the onset of swim failure.

Thus, if at risk of cold-water immersion, don't assume you can swim even a relatively short distance to save your life. Make sure you always wear a PFD and let others do the work in getting to you. Even then, having alcohol in you body will significantly reduce your survival time through its effect on impairing body heat production by shivering.

So think twice before having that beer before getting underway.

U.S. Coast Guard R&D Center
to Update Survivability Information

By Mr. M. J. Lewandowski and Mr. A. Chris Turner

In March 2006 the Research and Development Center began a major, multi-year project to update survivability information for use in Search and Rescue (SAR) planning.

Over-searching is costly, and not searching long enough is tragic. A better understanding of survivability factors, and more accurate models for maximum survival time and survival probability, will aid SAR controllers in their planning. An anecdotal case illustrates the potential benefits of this project:

In April 2005, two teenagers disappeared in a small sailboat offshore in South Carolina. This case was suspended due to a lack of new leads after a two-day search. The two boys were later found off the coast of North Carolina and safely returned home after 5 days on the open ocean. In this case, where water temperatures were relatively warm (68°-72° F), survival times were significantly longer, ≥120 hours, than the approximate 36 hour time provided by the current Cold Exposure Survival Model.

In late March, the Research and Development Center hosted a two-day workshop on "Survivability of Distressed Mariners". This workshop helped evaluate the state of the science of Survival Physiology, determined gaps between the knowledge of science and the knowledge of responders, examined available survival models, and determined the feasibility of integrating a survivability module into the new Search and Rescue Optimal Planning System (SAROPS).

Workshop participants included a wide range of civil and military experts from the United States and Canada. Presentation topics included reviews of cold water guidance and modeling approaches, warm water exposure issues, and psychological and physiological factors (e.g. fatigue and circadian rhythms) influencing survival. The participants also developed a "roadmap" to develop the comprehensive survival prediction model, and prioritized potential short-term solutions to the problem.

The participants agreed the highest priority was to develop a tool that will provide authoritative guidance on the probability of incapacitation and survival as a function of time for a range of sea and air temperature conditions; and incapacitation and survival probabilities as a function of body water loss for higher water temperatures. Since ultimately this information will be integrated into the SAROPS software, all of these calculations must be expressed as a set of mathematical expressions. A second tier requirement was developed to be able to define the modifying effects of other factors, including injury/trauma, blood alcohol/drugs, PFD/flotation device, and "will to survive".

Empirical data collection will be a key to this effort. In 1991, the UK found that its own case documentation was inadequate for the required data analysis, and created a voluntary survey to validate survival curves. The result was a 1500-case data set that is now the largest collection of real-life data. Workshop participants recommended that the U.S. Coast Guard create a program modeled on the United Kingdom's effort to increase the base of available real-life knowledge.

From a review of available information and input gathered at the workshop, several approaches to estimate survival are available. The first approach is mechanistic, where survival is a physiological function of the balance between heat generation processes such as metabolism and shivering, and heat loss as a function of body fat content, clothing, and water temperature. The mechanistic approach presently does not solve for probability of survival (POSv).

The second approach is essentially an empirical approach based on survival data. Existing data sets must be more thoroughly explored. The most promising single prospect is the immersion incident data set that is basis for the "UK National Immersion Incident Study" (Oakley and Pethybridge, 1997). The Maritime and Coastguard Agency (MCA) has continued to collect data since the original 1992-1997 effort. The data set now contains over 1500 cases and is ripe for exploration using multivariate regressions. The UK uses a probability of survival approach that is dependent on water temperature and use of a personal flotation device (PFD).

The mechanistic and empirical approaches have limited application. The range of temperatures at which exposure has been observed for the National Immersion Incident Study is limited to temperatures below 65°F. This approach is also constrained by the lack of control over conditions or lack of information associated with exposure cases that produce apparent inconsistencies related to the underlying data: victims with heavier build or wearing heavy clothing experience higher death rates. To meet user needs, therefore, additional data and analysis are needed to develop this approach. Other data sets including historical literature and U.S. Coast Guard data that must also be reviewed in detail. The strength of this approach is that the empirical data includes outcomes (e.g. mortality) that cannot be covered by experimental (e.g. tank) data.

A third approach (Wissler, 2003) combines the mechanistic heat balance approach to calculating core temperature with a POSv as a function of core temperature. This approach has been published, but does not appear to have been implemented and tested, which would be required to meet user needs.

Most of the survival work thus far has been confined to the effects of temperature, mainly below 20˚C. Golden and Tipton (2002) describe a number of factors that need to be considered by a comprehensive model. Survival time at low temperatures will be shortened by consideration of swim failure, drowning, or cardiac arrest. At higher temperatures (>68˚F), hypothermia is not expected to be the cause of death, and other processes influence survival, such as body water loss, metabolism, and fatigue. Information provided by subject matter experts at the March 2006 workshop indicates that research into human performance at higher temperatures, and the influences of psychological factors is ongoing. Although much of this work has been land-based, it has lately been extended into the marine environment by the U.S. Navy. The inclusion of these factors to meet stakeholder needs will require exploratory work.

A final alternative is to incorporate the existing Cold Exposure Survival Model into SAROPS. This alternative has minimal risk, but does not extend survival-based information beyond what is already known. Also, work of this nature, adapting a fully-functional independent computer model, with its own existing user interface and code into SAROPS, is more of an information systems integration issue (software re-write) than an R&D effort.

After considering the above alternatives, the R&D Center will work to develop a "product" for the U.S. Coast Guard. This "product" will estimate POSv by simulating how environmental temperatures affect important victim physiological parameters. These are expected to include core body temperature, core temperatures of limbs, water loss as a percent of body mass, and heat exhaustion. A combined empirical approach will provide multivariate expressions of POSv as a function of water temperature, personal flotation device use, user description (age, commercial fisherman vs. recreational boater), or other victim traits (alcohol use, injury).

In detail, the R&D Center will work with the U. S. Army Research Institute of Environmental Medicine (USARIEM) to develop software for a physiological based (mechanistic) model of Probability of Survival (POSv). The model will extend the Coast Guard's survival prediction capability to a wider temperature range. It will factor dehydration and heat stress effects into the POSv at higher temperatures (>68º F). This represents a reasonable simulation of physiology and is adaptable to further improvement. USARIEM also has an institutional commitment to supporting further work. The expanded temperature range, the consideration of additional physiological factors, and the probabilistic representation of survival represent significant progress for the Coast Guard. This model would be suitable for modular addition to SAROPS.

The R&D Center will also work towards a statistical-based, empirical model developed in collaboration with researchers in the United Kingdom. This model will also be capable of incorporation into SAROPS, and would calculate POSv as a function of sea and air temperature and victim attributes. This model will be based on the most comprehensive known data set. Its supporting data will also allow determination of additional information useful to Coast Guard controllers (such as the maximum survival time observed for a given temperature) to limit cold water search times.

The R&D Center will also report on additional water-survival data sets developed from actual records collected during the course of this work that would be particular useful for case studies and validation (checks) of the two above models. This will probably require more diligent record-keeping by responders, but will pay dividends by having survival information for higher water temperatures.

Finally, the R&D Center plans a report that compares and contrasts the physiological and statistical-based models developed during this work, and includes independent validation and verification using the existing data set and those collected during the course of this work. This report will make final recommendations for incorporation into operational guidance and decision tools, including SAROPS.

Participants in the "Survivability of Distressed Mariners" Workshop, 22-23 March 2006 represented a wide cross section of experts from the military, governemnt, industry, and academia.

Survival Modeling and SAROPS

By Mr. Arthur Allen, U.S. Coast Guard Office of Search and Rescue

The principle role of search planning tools is to provide guidance on optimally allocating the search resources. "Optimal" is traditionally defined in terms of maximizing the Probability of Success (POS) for finding ***search objects*** *rather than* ***survivors****. The assumption, of course, has been that the search objects will either be or contain survivors. However, the Coast Guard's present search planning tools do not account for* ***survival times*** *– victims are assumed to live forever. Neither are survival times considered in the allocation of resources. In effect, the "Probability of Survival" is set and held constant at 1.0 (100%). Under this assumption, POS is maximized by achieving the optimal balance among the size, track spacing, orientation and location of the search patterns. All with respect to the probability density distribution describing where the search object is more likely and less likely to be while SRUs are on scene searching, and within the constraints imposed by the SRUs' search speeds and on scene endurances. Optimizing in this fashion does not account for those situations where survival times may be limited to only hours or days.*

Therefore a more appropriate way to define POS for SAR is: The probability of finding ***survivors*** and the desired output of search planning methods and tools is ***optimal survivor search plans***. This is a goal for future versions of the Coast Guard's new SAR planning tool, Search and Rescue Optimal Planning System (SAROPS).

It is a well-known fact, but one that bears repeating. The water is a hostile environment for humans. The chances for continued survival for victims of a distress incident usually decrease rapidly with time. Therefore it is important to locate, rescue, stabilize to the degree necessary/possible, and deliver survivors to a place of safety (and additional medical care if/as needed) as quickly as possible. Optimal search plans, within the operational constraints imposed by resource availability, search pattern requirements, and safety requirements, endeavor to increase POS as quickly as possible in order to minimize the time required to find search objects.

FACTORS AFFECTING SURVIVAL

Humans need heat, water, available energy, and sleep to survive. A key to optimizing searches and locating victims before they perish, is to have a model of the remaining expected survival times.

HEAT: At the present time, the Coast Guard uses version 2.2 of Dr. Peter Tikuisis's Cold Exposure Survival Model (CESM) (Tikuisis 1997) of the heat-production / heat loss for a single survivor under constant conditions. The model predicts the maximum times that a specifically defined victim will remain functional and alive. This model works reasonably well under cold-water conditions (0°C (32°F) to 15°C (59°F)), but has limitations in warmer water conditions (> 15°C). Tikuisis's model is not directly part of either of the Coast Guard's present search planning tools. Plans exist to incorporate this model (or its successor) into SAROPS.

Tikuisis et al (1997) report on a workshop on survival prediction models with a special emphasis on terminology. A summary of previous studies was presented, and is reproduced here as Figure 1.

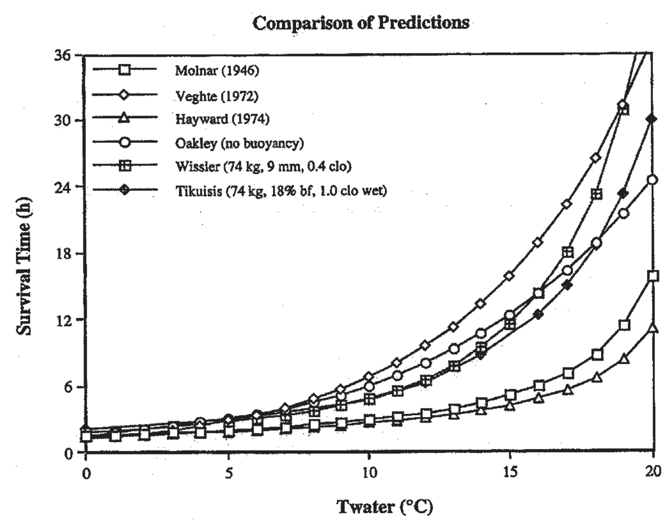
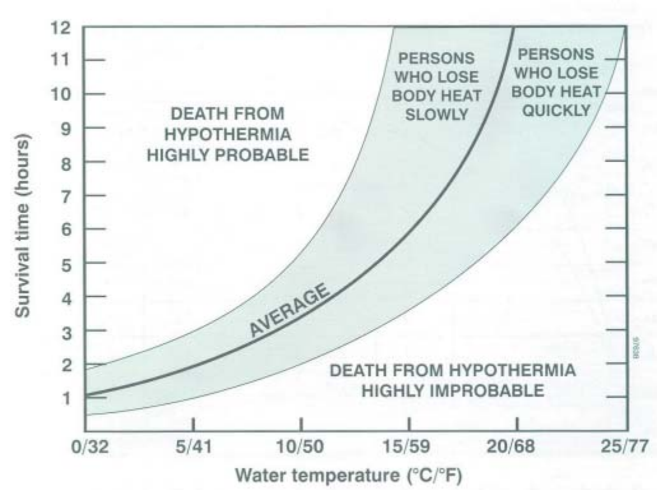


Figure 1. Summary of Hypothermia models. Tikuisis et al (1997)

This figure includes the results of early studies by Hayward (curve depicted by open triangles) which is a predecessor to his later work, currently in use as the survival curves in the IAMSAR Manual.



Survival Curves from the IAMSAR manual (Hayward (1983))

What we are left with are models, statistics, and studies that are in reasonable agreement for water colder than 10˚C (50˚F), since the principal factor influencing survivability is the effect of cold water on human physiology. Between 10˚C (50˚F) and 15˚C (59˚F) the models show a greater spread in their predictions. In this range, survivability and hypothermia models are sensitive to (1) type of survival statistics versus the hypothermia model used in the study, and (2) clothing and body factors. Survivability above 15˚C (59˚F) is influenced by additional factors that are not presently included in the hypothermia models. These additional factors include: fatigue (energy reserves), sleep deprivation, natural rhythms, dehydration, and the compounding effect of other injuries.

WATER: Dehydration is the loss of water and electrolytes (primarily potassium (K+) and sodium (Na+) from the body without being sufficiently replaced. Dehydration means the body does not have enough fluids to function at an optimal level. Dehydration is classified as mild, moderate, or severe based on the percentage of body weight lost: Depending on age,

- Mild dehydration -- a loss of 3-5% of body weight;
- Moderate dehydration -- a loss of 6-10% of body weight;
- Severe dehydration -- a loss of more than 9-15% of body weight.

Severe dehydration is a life-threatening emergency.

There are five ways a body can lose water:

(1) through the skin,
(2) through the lungs,
(3) urination,
(4) blood loss and
(5) through the gut.

A survivor at sea can become dehydrated before the incident occurred and continue to dehydrate after the incident. Water is lost through the skin by sweating. Pre-incident sweating is most likely to occur in the tropics among the recreational boaters and those who work in hot spaces. Post-incident sweating is a concern for non-immersed survivors in terms of long-term survival. Burns (sun-burn included) essentially break down the skin's ability to keep water inside the body, and therefore represent a potentially large source of both water and heat loss from the body.

Water loss through the lungs occurs because we need to humidify the in-coming air to 100%. Breathing dryer air will result in higher water loss via the lungs. Persons inside airplanes and large vessels will typically be breathing very dry air. The air that SCUBA divers breathe from their tanks is extremely dry. Dry air is only a concern prior to the distress incident, since the air just above sea level will always be well humidified.

Urination is our body's natural way to eliminate excess water and nitrogenous waste. The drinking of diuretics prior to the incident will leave the survivor dehydrated. Common diuretics consumed at sea are beer and coffee; other diuretics are tea, cola, chocolate, and food products containing caffeine. In addition, some medications are diuretic. Persons entering the water will also experience the natural shunting effect of blood from the body's extremities to its core due to hydrostatic pressure and cold. The body perceives this increased blood flow as a volume overload, and signals the kidneys to make more urine to correct it. The result is the urge to urinate when cold or immersed in water.

Blood loss can be another important source of dehydration. Menstruation is of particular importance, since some women can become slightly dehydrated during their menses. This is thought to be caused by a fluid shift from the blood vessels into the surrounding tissue rather than to actual blood loss. Trauma suffered during the incident can also contribute to fluid loss. If the trauma is significant but not lethal in and of itself,

Dehydration Levels	% of Body Weight Lost	Fluid Loss in Lbs & Liters	About How Soon Can This Happen	Effects and Symptoms
Initial Dehydration	2%	3 lbs. 1.5 liters	1 hour	Decreased athletic performance, Decreased muscular endurance
Heat Cramps	4-6%	6-9 lbs. 3-4 liters	2-3 hours	Muscle cramps, Loss of strength, Fatigue, Significantly lower endurance, Impaired coordination
Heat Exhaustion	6-8%	9-12 lbs. 4-5.5 liters	3-4 hours	Headache, Dizziness, Serious fatigue, Nausea
Heat Stroke	7-8%	11-12+ lbs 5+ liters	4+ hours	High temperature, Confusion

Figures are for a 150 pound (67.5 kg) person exercising on bike on a hot day.

the resulting fluid loss can be the cause of death.

For the survivor at sea, seasickness prior to and certainly after the incident will contribute greatly to dehydration and decrease that person's chance of survival. Seasickness causes fluid loss quickly through vomiting, diarrhea, and perspiration.

Drinking seawater also causes dehydration. The sodium concentration in seawater is several times higher than the concentration in human blood. The body has to excrete the extra salt in the urine and more water is required to get rid of the salt than was in the seawater in the first place. Therefore, a person will literally "dry up" drinking seawater because the body will be trying to maintain the proper electrolyte concentration in the blood.

Dehydration can lead to a person being incapable of surviving in warm water; in cold and cool water it will make a person more susceptible to hypothermia.

ENERGY AND SLEEP: A person can die directly due to cold-water immersion or dehydration. A person cannot die directly due to fatigue, sleep deprivation or his natural rhythms; however, these factors can significantly influence a person's ability to remain alert, make decisions and react. In the life or death situation of surviving at sea, these abilities may be the deciding factors. When the above factors combine, the cumulative effect will surpass the single effects of each of these factors.

Many accidents are caused by human events which can ultimately be attributed to any one of the factors above. Added to this is the possibility of trauma occurring as a direct result of the accident. This suggests that those surviving a maritime accident may – at the outset – already be deficient in one or more of the basic human factors required for survival.

Survival Modeling and SAR Planning:

The primary task of a search planning tool is to provide guidance on the allocation of resources to the search. The heart of SAROPS is a "Monte Carlo" simulation technique. It generates thousands of simulated search objects, draws samples from leeway, wind and current parameters to compute a separate drift trajectory for each simulated object (using a 20-minute time step). It also computes each object's probability of being detected based on the search and rescue unit's sensors, environmental conditions and search patterns. It then computes the overall POS, and the POS for each of up to four possible types of objects that could have resulted from a distress incident (e.g. PIW, raft, disabled vessel). SAROPS version 1.0 has algorithms for the optimal allocation of resources that account for the fact that the type of search object may not be precisely known, but it is known to be one of the (up to four) possible types of search objects specified by the search planner. In order for SAROPS to include a survival module and include it in the algorithms for optimal resource allocation, each simulated search object will have to have a number from 0.0 to 1.0 assigned to it at each time step indicating the probability of that search object still being "alive." We know from Frost (2002) that there are resource allocation algorithms that can use survival state information to plan searches and that these resource allocation algorithms can substantially improve our Probability of Success (POS) for a given amount of available resources.

In short, we can use survival modules within SAROPS to make significant improvements as funding becomes available. However, this means that the Monte Carlo SAR planning tool requires a survival module to estimate the state of the survivors. Since survival time remaining is very dependent on search object type, this also implies that the search planning tool requires a state change module. The big hurdle to implementing a survival module in SAROPS is having reasonable predictors of the survivors' own state variables that impact survival (core temperature, dehydration levels, etc) and relating those to probability of survival algorithms.

While the human search planners intuitively account for survivability, they do not have empirical justification for their decisions. A new comprehensive survival model will validate the actual SAR decisions and provide both justification and documentation for the search planning process.

What About Sharks?

The chance of shark or other predator attack on survivors presently is not included in the survival model. The International Shark Attack File is a compilation of all known shark attacks that is administered by the American Elasmobranch Society and the Florida Museum of Natural History. (See http://www.flmnh.ufl.edu/fish/Sharks/ISAF/ISAF.htm) More than 3,200 individual investigations are currently housed in the File, covering the period from mid-1500's to the present.

End notes:

Frost, J.R. (2002). Elements, Modules, and Algorithms for Planning Optimal Searches: A High Level Overview, Potomac Management Group, Inc. report for U.S. Coast Guard Office of Search and Rescue.

Hayward, John S. Ph.D (1983). "The Physiology of Immersion Hypothermia" In: The Nature and Treatment of Hypothermia edited by Robert S. Pozos and Lorentz E. Wittmers, University of Minnesota Press, Minneapolis, 1983.

Tikuisis, P. (1997). Prediction of Survival Time at Sea Based on Observed Body Cooling Rates. Aviat. Space Environ. Med 68: 441-448.

Tikuisis P., A.J. Belyavin, A.C. Buxton, S.R.K. Coleshaw, C. Higgenbottam, H. Oakley, P. Redmen, A. Pasche. E. Wissler, R. Withey, and C.J. Brooks (1997) Prediction of Body Cooling DCIEM No. 97-TM-47

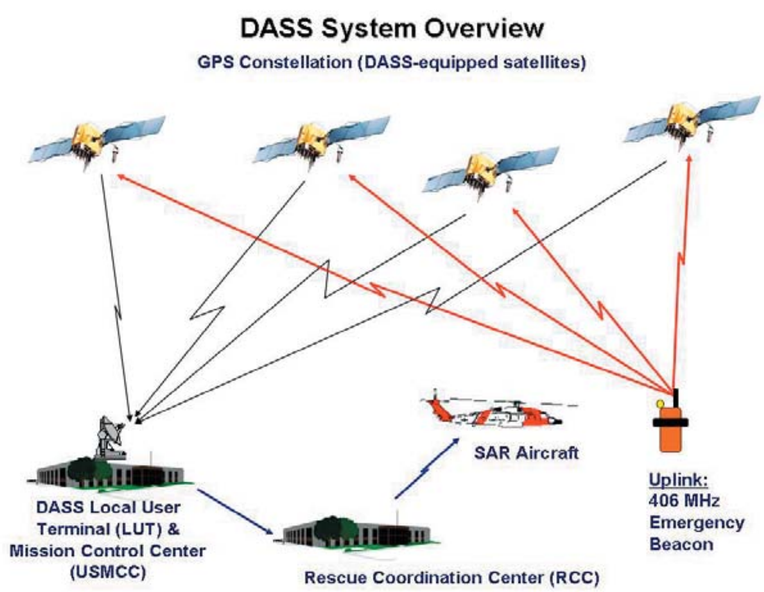
Update:
Distress Alerting Satellite System (DASS)

By Mr. Daniel Karlson

In the Spring 2003 issue of On Scene we reported on the next generation satellite search and rescue system which is to be known as the Distress Alerting Satellite System, or DASS. This system, once operational, will provide a significant enhancement for search and rescue—not unlike the tremendous advancements that Rescue21 is already beginning to hold for our nation's radio and distress communications capabilities. And since we last reported on DASS, there have been many important advancements in its implementation which the search and rescue community will no doubt find of great interest.

As a refresher, DASS will be a follow-on system to the current COSPAS-SARSAT search and rescue satellite system which has served search and rescue agencies around the world for almost 25 years now. In that time, the Cospas-Sarsat System has saved over 20,000 lives since it was first launched in 1982 including over 5,000 in the United States alone—a large majority of which were saved by the U.S. Coast Guard. In fact, the U.S. Coast Guard represents the largest user of satellite SAR data worldwide. These saves were all possible through the use of emergency beacons carried onboard vessels (carrying EPIRBs), aircraft (with ELTs installed), by individuals in distress carrying Personal Locator Beacons (PLBs), and by the newest type of beacon called a Ship Security Alerting System (SSAS). These beacons operate on either the 121.5/243 MHz analog frequency or the 406 MHz digital frequency. The 121.5/243 MHz frequency, which is being terminated and will no longer by detected by the SARSAT system after February 1, 2009 will not be detected by DASS either. Rather, it will only detect the more robust 406 MHz beacons which have and will continue to be operational for many years to come. This will ensure that the many thousands of 406 MHz beacon owners around the world will not have to upgrade to new beacon technology—they will be able to use what they have.

One of the main differences from the current Cospas-Sarsat System which uses a constellation of low-earth orbiting (LEO) satellites and geostationary orbiting (GEO) satellites, is that DASS will instead fly onboard the Global Positioning System (GPS) satellite constellation which is in a mid-earth orbit (MEO). A major advantage of flying on board the GPS constellation in a MEO orbit is the fact that there are multiple satellites in view of any given part of the earth at any given time. This redundancy allows multiple satellites to detect a distress signal transmitting from an emergency beacon. More importantly, DASS will also be able to provide highly accurate location information for the beacons by having the multiple satellites in view. Just like GPS works to provide highly accurate position information for a GPS receiver, so too will DASS work to provide a highly accurate, GPS-quality position for the location of an emergency beacon. All of this information will, within a matter of minutes, be transmitted to a Mission Control Center (MCC) and onto a Rescue Coordination Center (RCC). This represents a unique advantage over the current Cospas-Sarsat system. Unless the 406 MHz beacon has an integrated or externally connected GPS receiver connected to the beacon, RCCs must wait for the LEO satellites to pass overhead of the beacon to calculate



a position by using the Doppler effect. Depending on the beacon's location on Earth this can take as long as one hour to process. DASS is a multi-agency effort that is currently being developed by the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), the Department of Defense, the Department of Energy's Sandia National Laboratory, and by the United States Coast Guard (USCG). The U.S. and the Canadian Government are also exploring the feasibility of continuing Canada's support to satellite SAR by possibly providing the SAR Repeater equipment—a key component of the DASS payload. This equipment has been provided by the Canadian Government for the LEO satellites since the SARSAT system's inception.

As DASS comes online, the current LEO satellite constellation will be phased out over time. Those satellites are currently operated by NOAA (which flies the SARSAT satellites), by Russia which flies the COSPAS satellites, and a new LEO satellite that will be launched by the European Meteorological Satellite Organization which will be called METOP. It is anticipated that the last of the LEO satellites will be launched within the next 10 years. By then, operational DASS satellites are expected to be in orbit detecting and locating emergency beacons.

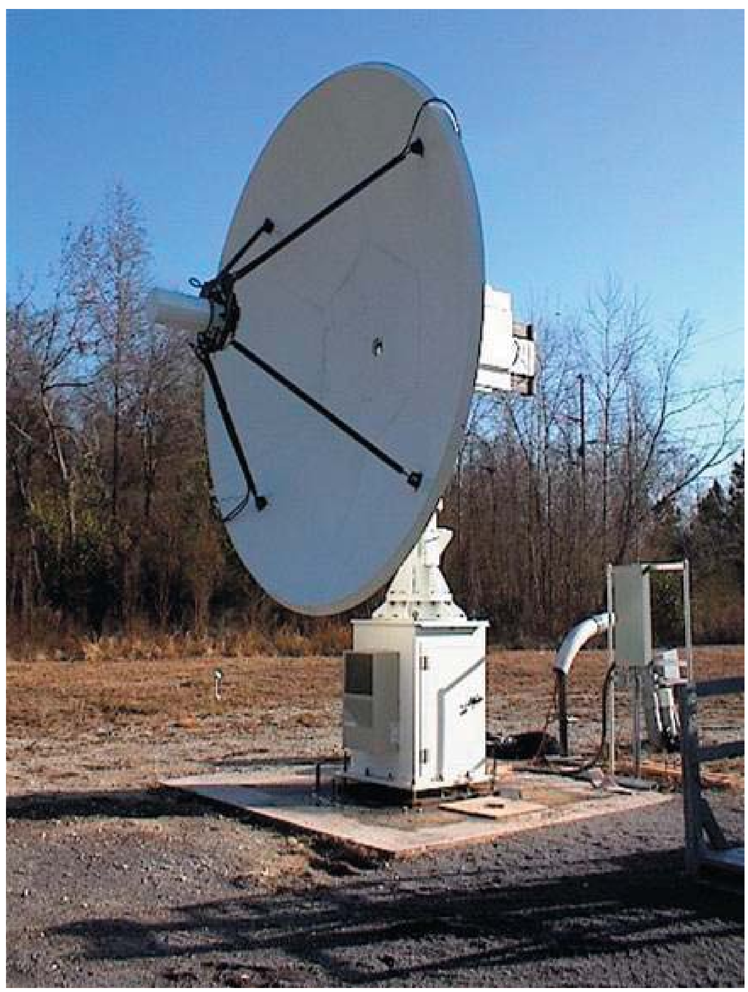
An important development with DASS, is in the proof-of-concept testing phase which is now underway. This effort is being spearheaded by NASA in conjunction with the U.S. Air Force which flies the GPS satellites and the Sandia National Laboratory. At present, there are currently six GPS satellites in orbit which are flying the DASS test equipment on board the Block II-R series. These satellites are being evaluated by NASA at the SAR Laboratory operated by NASA's SAR Mission Office at the Goddard Space Flight Center in Goddard, Maryland. At SARLAB, NASA has recently installed a DASS Development Local User Terminal (DLUT) which is able to receive and process 406 MHz signals from the GPS satellites—and the limited results that NASA is achieving is already showing much promise for the system. As more GPS satellites are launched with the proof-of-concept DASS payloads, the tests are expected to show further improvement. Another GPS satellite is expected to be launched this winter and it is envisioned that the final proof-of-concept constellation will have 9 GPS Block II-R and probably 12 GPS II-F satellites. Eventually, the operational DASS system will exist as a secondary payload aboard all GPS Block III satellites. The first operational DASS-equipped satellites are expected to be launched in 2013 with final deployment expected through 2018. The final constellation will include at least 24 satellites.

In addition to the DASS development activities which have been underway here in the United States, two additional MEO Search and Rescue (MEOSAR) constellations are planned. The European Space Agency has been working for a number of years to develop the Galileo Satellite Navigation System. Although Galileo is still in its development stages, it is being built to also include a SAR capability too. Russia is also planning to introduce a MEOSAR payload aboard its GLONASS Navigation Satellite System. Each of the SAR components for these two systems are expected to operate very similarly to DASS. In fact, the International Cospas-Sarsat Program has been hard at work to ensure that all three satellite systems will be interoperable with one another. This will ensure that MEOLUTs around the world will be able to detect and process signals from all three constellations. Not only will this save SAR services from having to install and operate three separate ground stations, but more importantly, it will provide for increased coverage with the multiple satellites in view at any given time.

DASS and the other MEOSAR satellites will represent a dramatic breakthrough in the potential to save lives and property, reduce risks to rescue personnel, and reduce rescue costs. These systems will reduce the time it takes to receive and locate distress alerts and will one day soon truly help take the "search" out of "search and rescue".

About the Author: Mr. Daniel Karlson is the U.S. Coast Guard's SARSAT Program Manager in the Office of Search and Rescue (G-RPR) at USCG Headquarters in Washington, DC.

For additional information concerning DASS, please contact Mr. Daniel Karlson at: DKarlson@comdt.uscg.mil or via telephone at: 202-267-0459



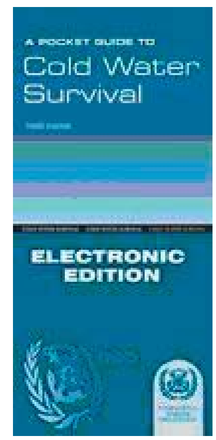
DASS Proof-of-Concept Local User Terminal at NASA's SARLAB

The Process for Developing International Maritime Guidelines:

Prettier than Making Sausage...

By Mr. Dave Edwards

The International Maritime Organization (IMO) approved and published the "Guide for Cold Water Survival" as Maritime Safety Committee Circular MSC.1/Circ.1185 dated 31 May 2006 (This circular can be downloaded from the IMO web site, www.imo.org.). IMO is a United Nations agency that is chartered to promote maritime safety and prevent pollution. To fulfill their chartered mission, IMO develops a wide range of maritime standards, practices, and guidelines. To demonstrate how international maritime guidance is developed through the IMO consensus process, the Guide for Cold Water Survival (in this article, referred to as the "Guide") will be used to demonstrate the process used that allows the impacted nations of the world to discuss and agree on a publication's rewrite.



The Process

Whether creating an original or updating an existing document, the international process is essentially the same. Someone has an idea that would be beneficial to the international maritime community and convinces an IMO member nation or other recognized organization to submit the idea as a paper for review during the annual IMO Radiocommunications and Search and Rescue Subcommittee (COMSAR). At COMSAR, the idea is reviewed and discussed by the member nations to determine whether the guidance has merit for the maritime community.

The Guide, updated in the Spring of 2006, will be used as an example. The IMO process for development of international guidance goes through the following procedure:

• Someone determined it was time to update the Guide's 1992 edition (or with another potential publication, create the first edition.)

• A paper was submitted through a national delegation to the appropriate IMO subcommittee. In this case, the Guide was submitted to IMO's COMSAR subcommittee that convenes annually each February (the U.S. Coast Guard's Office of Search and Rescue normally sends two representatives to COMSAR as part of the Department of State authorized delegation.).

• During COMSAR, the member nations determined it was a worthy goal to update the Guide (the other alternative was terminating the Guide's publication.)

• Further discussions were held. At COMSAR, there was general agreement that the Guide required updating. The originator of the proposed Guide update became the responsible party.

• Historically, a country would volunteer to write the publication for submission at the next COMSAR meeting. At COMSAR, the publication would be rigorously reviewed and discussed with many recommendations and corrections made. With a little luck, the publication could be accepted at the current COMSAR session, or carried forward to be considered at the next session.

• In the Guide's case, it was approved by COMSAR for updating. A Correspondence Group was established to complete the text for final review and acceptance at the next COMSAR. The Correspondence Group Coordinator, typically from the country who originated the idea, creates an initial draft for critique and additional input; the initial draft is then posted for international review. Other countries and experts review the initial draft and provide feedback to the Correspondence Group. For the Guide's initial draft, not only did SAR experts review and provide feedback, but other medical experts as well. In the United States, the Coast Guard Headquarters Operational Medicine and Medical Readiness Division, as well as the Guide's original author, provided invaluable feedback to the updated version.

• The Correspondence Group Coordinator served as the focus point to exchange email discussions among participants. These discussions review and articulate potential errors, what additional material needs to be added, presentation style, general exchange of assumptions, etc. The purpose of the discussions is to minimize re-work before the next COMSAR annual meeting, remove any errors, and maximize the opportunity to have the publication approved at COMSAR and forwarded to IMO's Maritime Safety Committee (MSC). The Correspondence Group must complete the re-write three months before COMSAR to ensure the publication is submitted and translated for other delegations to review prior to the next COMSAR.

• At COMSAR, the Guide was discussed in the Search and Rescue Working Group (SAR WG), a separate WG from the Communications WG (if necessary, both WGs meet in general "plenary" sessions). If the paper or topic being discussed in the SAR WG is too large or controversial, the SAR WG Chairman will establish a "Drafting Group" to resolve major concerns. The drafting group typically works after normal business hours and sometimes while the SAR WG is discussing other matters. Strong effort is made to attain unanimous agreement, or at least no disagreement.

• When the SAR WG finished the Guide's re-write, it was submitted for discussion to the COMSAR plenary session where the SAR WG's decisions can be reviewed and adjusted. Discussions within COMSAR are passionate, intense, professional, and non-bureaucratic; in particular, discussions become heated when international interpretation of the meaning and intent of many words and phrases are discussed.

• Once approved, the Guide's re-write became part of COMSAR's report to MSC for consideration and action (The Guide's re-write was approved and forwarded to MSC in twelve months from the first recommendation for the re-write's approval). While COMSAR is the recognized subject matter expert in certain aspects of maritime safety, the MSC is the COMSAR's governing body and is responsible for overall maritime safety. Fortunately, the MSC meets twice per year, and typically one of those sessions is about three months after COMSAR.

Summary

If the drafting, review, and approval of a publication by COMSAR goes well, new guidelines can be approved in 15 months. Shorter topics or simple, non-contentious changes, could be made sooner, and other topics can take much longer. However, the IMO review process, no matter how involved, provides the opportunity for member nations to provide feedback and corrections to guidance being evaluated for publication.

Involved as it may be, this process is how the impacted nations of the world comment and reach consensus.

The process to develop international guidelines may sometimes appear to be less than ideal but it is certainly better, if not prettier, than the process used to make sausage.

HOAX CALLER SENTENCED TO 18 MONTHS FEDERAL PRISON

BOSTON - A Fairhaven, Mass. fisherman was sentenced in federal court for making calls to the Coast Guard on an emergency frequency falsely claiming to be aboard a sinking commercial fishing vessel in need of immediate assistance. Responding to these calls, the Coast Guard launched search and rescue missions at sea involving a Falcon jet, Jayhawk helicopters and patrol boats.
Brian Feener, 21, was sentenced by U.S. District Judge Rya Zobel to 1 year and six months in prison, to be followed by 3 years of supervised release. Feener was also ordered to pay $82,004 in restitution to the U.S. Coast Guard. Feener pleaded guilty May 3, 2006, to two counts of communicating a false distress message and two counts of making a false statement.

At the earlier plea hearing, the prosecutor told the Court that, had the case proceeded to trial, the evidence would have proven that July 10, 2004, Feener radioed the Coast Guard on the international hailing and distress frequency from his home, claiming he was the captain of the fishing boat Why Not, which was taking on water near the entrance to Buzzards Bay. He told the Coast Guard, "If you could send a unit out to me, I'd really appreciate that." In response, the Coast Guard deployed an HU-25 Falcon jet, two HH-60 Jayhawk helicopters and three patrol boats, in a futile eight-hour search for the Why Not, a fishing vessel that later was determined not to exist, in the area where Feener claimed to be. The search cost the Coast Guard approximately $58,000 in crew and asset use.

Sept. 24, 2004, Feener called the Coast Guard a second time from his home on the same emergency frequency, claiming to be the captain of the fishing boat Determined, an actual New Bedford-based fishing vessel on which Feener had once been a crew member. The Determined was actually in port at the time of the call. During the call, Feener stated that the vessel was sinking twenty miles south of Nantucket and that he "needed one of them Coast Guard cutters to pull up." Feener concluded his transmission by stating, "I'm out. I'm going down. I got crew savers in the water. Fishing vessel Determined, out."

In response to this call, the Coast Guard launched a three-hour search and rescue mission involving a Jayhawk helicopter and a patrol boat, an effort that cost the Coast Guard about $24,000.

Hoax distress calls are a persistent problem for the Coast Guard and the boating public. According to Coast Guard statistics, in the First Coast Guard District alone, an area that encompasses the New Jersey and New England coasts, there have been 69 confirmed search and rescue (SAR) hoaxes and 387 suspected hoax calls in the last five years. During the same period, hoax calls cost the Coast Guard $13,982,960 in operating funds nationwide. Each time the Coast Guard launches a SAR mission, its personnel are placed in harm's way. During the last five years, for instance, 85 Coast Guardsmen have been injured in SAR missions. Hoax calls also heighten the risk to boaters, including commercial fisherman, in that emergency assistance may be unavailable when rescue personnel are responding to hoaxes.

Alaska Boater Education

Cold Water Immersion

"Don't Let It Be Your Last Gasp"

By Joseph McCullough
Alaska Department of Natural Resources

Cold water immersion is the number one threat to Alaska's boaters. With a boating accident fatality rate that consistently ranks among the highest in the nation, Alaska's Office of Boating Safety recognized the need for an effort to counter that dubious distinction. A new educational video, Cold Water Immersion, Don't Let It Be Your Last Gasp, aimed at helping boaters identify, prevent, and prepare for the risks of a possible cold water emergency, is the result.

Expirments in Homer, Alaska showed the best way to escape from a submerged car is to exit as soon as possible, don't wait for the car to fill with water.

Staff from the Office of Boating Safety began planning for the video in winter 2004. Research included the works of Frank Golden, Michael Tipton, Gordon Giesbrecht and Transport Canada. In the spring of 2005, Dr. Giesbrecht, from the University of Manitoba volunteered to assist with the production of the video. Dr. Giesbrecht, one of the world's leading authorities on the effects of cold on the human body, is a firm believer in personally experiencing the effects of cold. "I'm the scientist who does things for real," he says, to make sure I really know what I'm talking about." The Office of Boating Safety then assembled a team of international experts with broad skills and knowledge. In addition to Dr. Giesbrecht, the team included Al Steinman (Retired U.S. Coast Guard Rear Admiral), Ted Rankine (Canadian Power Squadron) Art Allen and Paul Webb (U. S. Coast Guard), Bob Ayres and David Griffiths (Canadian Coast Guard) and Ron Durheim (Mat-Su Dive Rescue Team). Also assisting were members of the U.S. Coast Guard Air Station Kodiak, the cutters *Hickory* and *Roanoke Island,* Homer Coast Guard Auxiliary, Alaska State Parks, United States Air Force Para-Jumper Rescue Team and several community volunteers from Homer and Big Lake.

Coast Guard Cutter Roanoke Island

Filming for the video began in Homer's Kachemak Bay on August 3 and then moved to Big Lake in the Matanuska-Susitna Valley. Challenges ranged from transporting the crew, to malfunctioning or unavailable boats. But the cold water crew's biggest problem came from an unexpected source: the water simply wasn't cold enough. The warm sunny days that had delighted Alaska's summer visitors since May had raised Kachemak Bay's temperature to the point where the gasp reflex and swimming failure were more of a concept than a reality. The situation improved slightly when the cast moved out in front of Grewingk Glacier where Renee Allen, Mali Abramson and Chris Tawney volunteered for a swim. The footage from the three provided great examples of how fast the water can take your breath away and diminish swimming ability.

There were falls overboard, capsizes, jet skis, canoes, a duck hunter practicing re-entering his boat, Coast Guard rescues, and even a submerged car. But the

Participants capsized a canoe in Big Lake, Alaska during filming to test Cold Water Shock.

most amazing moments won't be part of the video; these took place behind the scenes when the assembled minds planned the next shoot. Each morning with various colored markers in hand, Dr. Giesbrecht mapped out the days' action coordinating people in the water, boats and a helicopter. At the end of the session the diagrams on the board looked more like a colorful battle plan than directions for a video shoot. The creativity was not confined to a conference room—ideas continued to be generated out on the water, driving along the Sterling Highway, over meals and even during a concert by Homer's own Three-Legged Mule.

Dr. Giesbrecht's "battle plan" for Friday's film shoot

In order to make the scenes as realistic as possible there were times when people actually placed themselves at risk. And there were moments of concern as the crew balanced role playing by professional rescuers in the frigid waters against using neophytes (so that the on-camera reactions were natural). The safety plan remained the top priority, and everyone's total attention stayed fixed on the volunteers whenever they were in the water.

Dr. Giesbrecht tests how long a victim can swim until "failure" in 52° water

The video's core message is the importance of wearing a life jacket when boating, especially in cold water. A properly fitted life jacket increases survival time when immersed in cold water from mere minutes to possibly hours—but only if the life jacket is worn. The video will soon be available to boating safety professionals across the continent. "We're hoping that viewers everywhere will take the message seriously," said Joe McCullough, Alaska's Education Coordinator. "We want boaters to understand a little more about the phenomenon of cold water immersion. Once they understand, we believe they'll employ safe practices whenever they go out on the water… and save a few lives as a result."

Cold Water Boot Camp

By Ted Rankine

Building on the positive experience of Alaska's program *Don't Let It Be Your Last Gasp,* a new cold-water education program is on the horizon. The U.S. Coast Guard's Office of Boating Safety, in conjunction with the United States Power Squadrons®, will start work on *Cold Water Boot Camp* later this year. Capitalizing on the popularity of the "reality" television, *Cold Water Boot Camp* will combine the high-impact format of the NBC series *Fear factor,* with the wacky information delivery of the Discovery Channel's *MYTHBUSTERS.* The program's goal is to educate boaters about the potentially fatal risks associated with a fall into cold water without a life jacket. The program is produced under a grant from the Aquatic Resources (Wallop – Breaux) Trust Fund, administered by the U.S. Coast Guard. *Cold Water Boot Camp* will be created as a broadcast program, a long format program for classroom and educational use, and a shorter version program suitable for sport and boat shows.

Ted Rankine is the creator, host and producer of PowerBoat Television. With a stong personal dedication to safe and responsible boating, Ted has produced and brought to air many television specials including the United States Power Squadrons' National Safe Boating Test, Be a Better Boater, True Boating Experiences and Saved by the Jacket. Ted spends his "down time" volunteering with the United States Power Squadrons and the Canadian Safe Boating Council.

Around the World with:

By Benjamin Strong

Amver Vessel Rescues Sailor

On April 5, 2006 the Atlantic Area Rescue Coordination Center (RCC) received a report from RCC Gris Nez, France, that S/V WATK 2 was disabled and de-masted with one person aboard, 545 nautical miles east of Bermuda. The report was made by the French S/V LAZZI 60 that passed the S/V WATK 2 and stopped to render assistance. The 60 year old male onboard stated he departed New York City on December 22, 2005 and he had not had food or water in the past three weeks. The Amver vessel M/V MIHO PRACAT responded to the request to divert and met the S/V LAZZI 60 to embark the survivor. The MIHO PRACAT successfully transferred the 60 year old male aboard. The patient was treated for dehydration and stayed on board MIHO PRACAT until he was disembarked in Port Albert, Canada.

The Amver participating M/V MIHO PRACAT. Photo courtesy of Atlantska Plovidba Shipping.

U.S. Ambassador to Greece Meets with Amver

Amver's Benjamin Strong welcomes the Honorable Charles P. Ries, United States Ambassador to Greece, to the Amver exhibit during the opening ceremonies of the Greek Shipping Exhibition Posidonia in Athens, Greece.

The Greek Shipping Exhibition Posidonia was held this year at the Hellenikon Exhibition Center (site of the former international airport) from June 4 through the 9th. It proved to be a successful and exciting time for Amver. The spirit of Amver, and mariners helping mariners was alive and well in Athens.

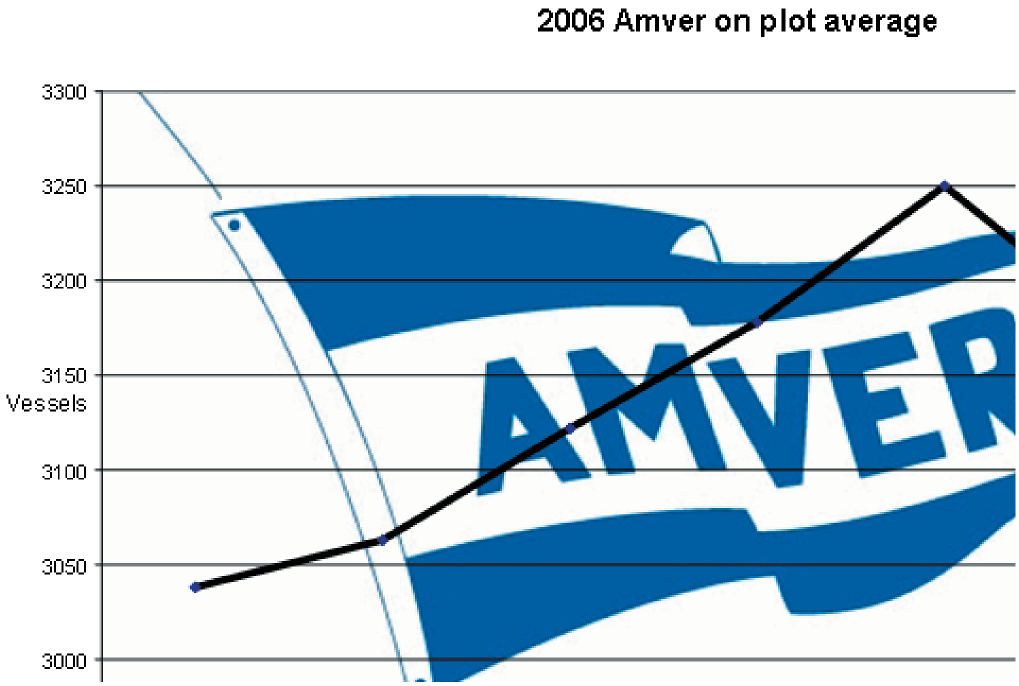
The U.S. Ambassador to Greece, the Honorable Charles P. Ries, kicked off the exhibition on Monday June 4th and the show kept Amver busy until the very closing moments.

Hundreds of people came by the Amver booth to shake hands, see what was new with Amver, or learn about the search and rescue capabilities Amver has to offer. Many Greek masters and ship owners came by to tell tales of sending Amver messages over the years. Interestingly, many young ship owners and operators came by to learn more about Amver and enroll their new ships. If anyone thinks that Amver is of a bygone era, they only needed to see the out-pouring of support at Posidonia to realize Amver's proud, rich history, and bright future.

The Amver staff networked with several commercial ship reporting and fleet management companies, and paved the way for those companies to forward their ship position reports directly to Amver. Amver also coordinated with several ship registries to encourage them to promote Amver enrollment when new vessels are seeking to fly the registries flag.

Greek hospitality, being what it is, made the trip pleasant and successful. The Amver staff looks forward to being a part of a great United States Coast Guard presence in 2008.

Amver On Track for Record 2006



On plot statistics continue to break records in 2006. This year is well on its way to becoming the best year for Amver on-plot averages. May 13th saw an all-time daily record of 3,348 vessels on-plot; the plot average for 2006 remains above 3,100.

Besides increased on-plot averages, Amver is seeing an increase in most other areas as well. The Amver Web site is averaging over 19,000 hits per month. The Amver center in West Virginia, where Amver position reports are processed, received a record 6,472 messages on July 26, 2006! As of July 28, 2006, Amver vessels have rescued 286 people and assisted another 124. The number of Amver participating vessels has also grown by 529 vessels so far this year. This is truly an incredible year for Amver and its importance is underscored by the increased number of lives saved.

Additional information, news clips, photographs of recent rescues and newly updated video clips are available on the Amver Web site, www.amver.com. Coast Guard members are encouraged to visit the site, promote Amver as a valuable life saving tool, and alerting the Amver staff in New York when rescues occur in their District.

Is Your RCC Getting Message Traffic Meant for Amver?

The Amver office in New York was notified by PACAREA that several vessels are continuing to send messages to RCCs. If you are receiving Amver sail plans, position reports, or other Amver related message traffic please forward it to benjamin.m.strong@uscg.mil so the shipping company can be notified and provided the correct address for Amver messages.

U. S. COAST GUARD SAR PROGRAM INFORMATION

SAR PROGRAM POINTS OF CONTACT

USCG Headquarters Room 3106
Phone: 202-267-1943 / Fax: 202-267-4418
www.uscg.mil/hq/g-o/g-opr/sar.htm

CAPT Scott LaRochelle 202-267-1943
Chief, Office of Search and Rescue

Mrs. Diane Armstrong 202-267-1943
Office Administration .... Diane.T.Armstrong@uscg.mil

Mr. Ted White 202-267-1559
Chief, Policy Division .... Theodore.G.White@uscg.mil

CDR Steven Stilleke 202-267-1559
Chief, Budget, Standards and Performance Branch .... Steven.D.Stilleke@uscg.mil

CDR Brad Clark 202-267-2275
Chief, Command Center Program Branch .... Bradford.Clark@uscg.mil

LT Earnest Rawles 202-267-0420
Command Center Programs .... Earnest.Rawles@uscg.mil

LT Louvenia McMillan 202-267-1586
SAR Awards, SAR Watch Newsletter, FOIA .... Louvenia.A.McMillan@uscg.mil

Mr. Conrad Theroux 202-267-6952
Command Center Programs .... Conrad.R.Theroux2@uscg.mil

Mr. Rich Schaefer 202-267-1089
Chief, Policy and Programs Branch .... Richard.R.Schaefer@uscg.mil

Mr. Jack Frost 202-267-6702
SAR Planning Tools, SAR Planning, R&D requirements/oversight .... John.R.Frost@uscg.mil

Mrs. Kathryn Manzi 202-267-0810
RESCUE21 Project Specialist, Communications .... Kathryn.A.Manzi@uscg.mil

Mr. Art Allen 860-441-2747
SAR Environtmental Data, SAR Planning Tools, Oceanographic Liaison .... Art.A.Allen@uscg.mil

Mr. Rick Button 202-267-1582
Chief, Coordination Division .... Richard.A.Button@uscg.mil
National Search And Rescue Committee (NSARC) Secretariat

Mr. Dave Edwards 202-267-1552
Amver, U.S. National SAR Supplement .... David.L.Edwards@uscg.mil

LT Kathy Niles 202-267-4936
Cospas-Sarsat Program, DASS, NSARC R&D .... Katherine.M.Niles@uscg.mil

Mr. Dann Karlson 202-267-0459
Mass Rescue Operations .... Daniel.K.Karlson@uscg.mil

Ms. Willie Foster 202-267-1580
Program Analyst and NSARC Liaison .... Willie.M.Foster@uscg.mil

Mr. Ben Strong 212-668-7764
Amver Maritime Relations - New York, NY .... Benjamin.M.Strong@uscg.mil

Ms. Beverly Howard 212-668-7764
Amver Maritime Relations - New York, NY .... Beverly.A.Howard@uscg.mil

Search and Rescue Publications Available on the Internet

SAR Watch - Office of Search and Rescue Newsletter (monthly)

SAR Watch is a monthly newsletter designed to provide accurate, up-to-date highlights about important SAR program initiatives, along with other news and announcements of interest to our community of SAR professionals. From time to time, the newsletter will also include practical material for use by field SAR personnel. The SAR Watch compliments On Scene by providing a means to pass time sensitive information in a less formal format. SAR Watch is accessible via the SAR home page via a link on the left side navigation bar.

SAR Publications:

SAR publications currently available via the SAR Program's web site include:

U.S. National SAR Plan (NSP) - The federal plan for coordinating civil search and rescue services to meet domestic needs and international commitments.

U.S. National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual - Provides guidance to federal agencies concerning implementation of the NSP and builds on the baseline established by the IAMSAR Manual. The NSS provides guidance to all federal forces, military and civilian, that support civil search and rescue operations.

U.S. Coast Guard Addendum (CGADD) to the U.S. National SAR Supplement - Establishes policy, guidelines, procedures and general information for Coast Guard use in search and rescue operations. The CGADD both compliments and supplements the NSS and IAMSAR.

SHARE YOUR ON SCENE

When you have finished reading your copy of On Scene, please take the opportunity to share it with someone interested in Search and Rescue. ***o/s***

Send articles or photographs for publication in ON SCENE to:

Editor, ON SCENE Magazine
Commandant (G-RPR)
2100 Second Street SW
Washington, DC 20593-0001

Phone: (202) 267-1559
Facsimile: (202) 267-4418
Email: Steven.D.Stilleke@uscg.mil
http://www.uscg.mil/hq/g-o/g-opr/sar.htm

DISTRIBUTION -SDL No. 144

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A	3	3	3	3	3	3	1	2	2	2		1	3	2	1	1	1		1		3					
B		5	25	1	25	10	10	10	3	2	2	10	5	25	5	5		20	1		5	5		1	5	2
C	5	5			2	1	1	1	5	1	3	1	1	8	1	3	1			1	1	1	1	1	1	6
D		1	1	8	1			10		1	1	1	1						1		1		2			1
E	3				1	1	1		1	10	10	10	1	1				1	3	1						
F																										
G			3	2	2																					
H																										

NON-STANDARD DISTRIBUTION: CG-39

M/V COUGAR ACE LISTING TO PORT

On 24 July, Coast Guard Rescue Coordination Center Juneau received a request for assistance from the 654-foot Singapore flagged, automobile carrier COUGAR ACE. The vessel was located approximately 240 nautical miles South of Adak, Alaska and was listing approximately 80 degrees to port with 23 persons aboard. A Coast Guard Air Station Kodiak HC-130 "Hercules" Long Range Surveillance aircraft was dispatched and dropped additional survival suits and rafts to the crew members making preparations to abandon ship on the starboard bridge wing should the ship sink. Unfortunately, due to the heavy list and the bridge wing's height above the water, COUGAR ACE's life boats could not be deployed and the crew could not voluntarily abandon ship. Three Amver (Automated Mutual-assistance Vessel Rescue System) vessels IKAN JUARA, BAUHNIA BRIDGE, and BUSAN EXPRESS responded to the distress call. Motor vessels, BAUHNIA BRIDGE and BUSAN EXPRESS were subsequently released. Due to the crew's inability to abandon ship and great distance off shore, a U.S. Coast Guard HH-60 helicopter and C-130, and a U.S. Air Force Para-rescue Jumper team consisting of two C-130 aircraft and two HH-60 helicopters were dispatched to rescue the stranded crew. Upon arrival, the aircraft transferred the first crewmembers to the Amver Motor Vessel IKAN JUARA and the remaining crewmembers were flown to Adak. (Official Coast Guard photo courtesy of Coast Guard cutter Rush)