FINAL REPORT[JR1]

2005 CREW OVERBOARD RESCUE SYMPOSIUM

By John Rousmaniere

June 26, 2006

The accident known as “crewoverboard,” “manoverboard,” or “person-in-the-water” presents the most demanding and agonizing challenge that any sailor or powerboater will face. It is no wonder that rescue methods and gear are in constant development. Rarely, however, are they tested side-by-side in a variety of boats.

At the Crewoverboard Rescue Symposium on San Francisco Bay, California, held August 9-12, 2005, some 400 tests were conducted of 40 items of gear and numerous rescue methods by 115 volunteers in 15 sail and powerboats of many types, including multihulls, cruisers, and racers. Conditions ranged from a light wind and flat sea to a 35-knot blow and steep chop. Out of these tests came findings of considerable practical value, including:

- New rescue techniques for several types of multihulls and powerboats
- Improved rescue techniques for keel sailboats
- New understandings of standard maneuvers, the advisability of matching them to boat types, and the need to be prepared to improvise on them
- Appreciation of differences between various emergency lights and alarms
- Identification of problems with rescue equipment, operator’s manuals, and trends in boat design and construction

Written by John Rousmaniere, this report is based on observations made by him, symposium participants, and the other members of the organizing committee (all of whom reviewed drafts and contributed Lessons Learned). Photos are by Phil Cowley and John Rousmaniere, with production assistance by Karen Prioleau, Ruth Wood and Chris Edmonston. John Rousmaniere may be reached at jrousmani@aol.com.

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The Event

The symposium was co-sponsored by West Marine (a boating equipment supplier based in Watsonville, Cal.) and Modern Sailing Academy (a sailing school and charter company in Sausalito, Cal.), which served as host. Funding totaling $26,000 was generously provided by the Bonnell Cove Foundation of the Cruising Club of America, the BoatUS Foundation for Boating Safety and Clean Water, West Marine, the Sailing Foundation of Seattle, and North Sails.

The organizing committee consisted of: John Connolly (head instructor, Modern Sailing Academy); Chuck Hawley (West Marine, safety-at-sea seminar moderator); Karen Prioleau (Newport Beach, Cal., U.S. Sailing Assn. Instructor Trainer/National Faculty, Orange Coast College instructor); John Rousmaniere (New York, N.Y., author *The Annapolis Book of Seamanship*, *Fastnet, Force 10*, etc., North U instructor); and Ruth Wood (Alexandria, Va. President, BoatUS Foundation for Boating Safety and Clean Water). All five participated as testers or observers.

A total of 15 boats took part, with as many as seven each day.

- *Keel sailboats:* Islander 30, Beneteau 33, J-105, Island Packet 38, Beneteau 393, Beneteau 42, Beneteau 43, Islander 53
- *Multihull sailboats:* Corsair F-24 trimaran, Corsair F-28 trimaran, Seawind 1000 33’ catamaran, Dragonfly 40 trimaran
- *Powerboats:* 23’ Zodiac RIB, Fortier 26 launch, Grand Banks 42 trawler

Thanks go to the following suppliers of boats, equipment, and services: the boat owners, Modern Sailing Academy (John Connolly), West Marine (Chuck Hawley, Phil Cowley, Sheila Hubbard, and Nick Degnan), the BoatUS Foundation (Ruth Wood and Joni Sralla Turken), Landfall Navigation (Captain Henry Marx), and Garmin International (among others).

The many volunteer testers endured long, hard afternoons on or in the water. Among those whose contributions verged on the heroic was Mary Swift, who arranged for three meals a day, and still went sailing. At the end of this report is a partial list of participants who are national or international leaders in boating safety.

With[JR2] nary a complaint, several volunteer in-water "victims" allowed themselves to be dragged around the bay and up the sides of boats, and later appeared at debriefings to offer lucid, first-hand analysis of their experiences. Nobody was allowed in the water without wearing buoyancy and a wet, dry, or survival suit, and without a safety boat standing by.

Goals

We set out to test familiar rescue gear and maneuvers while at the same time encouraging the creation of new ones. Our specific goals were these:

1. ***Test rescue gear and techniques***—with average sailors in a range of popular boats, following protocols established by the organizers, advised by a team of scientists.
2. ***Evaluate the tests***—
    A. quantitatively through elapsed times of rescues and other hard data entered on data sheets by testers,
    B. qualitatively through testers' notes on data sheets, daily debriefings, and other oral and written reports from observers and testers,
    C. visually by video and photographs, and by downloading GPS tracks of boats during tests.
3. ***Report findings to the public***—in articles written by participants and in this final report.

As might be expected with so ambitious an effort, there were disappointments. Sailors required a day or more to master maneuvers, GPS tracks were distorted by tidal currents, and irregularities in keelboat test protocols and data recording methods appeared during the first two days before being corrected.

One organizer, John Connolly, believes that trials of this sort can yield significant information if held under a plan designed by professional scientists, and that "The symposium did not meet this standard." The other four organizers, however, believe that a truly scientific standard is out of reach considering the many variables inherent with boats and weather. They also believe that these tests did yield significant information. There is no question that the symposium addressed real, practical needs.

Ross Stein, the skipper of the Corsair F-24 trimaran, said he was motivated to participate by two recent crewoverboard accidents in the local F-24 racing fleet (both victims were rescued). After the symposium he wrote me, "This is not an imagined risk, and we need to gain experience. You have given us this chance."

(Organizers' comments may be found in "Lessons Learned." Tables 1 and 2 cover quantitative results.)

Press Coverage

Many publications covered the symposium, some in two or more articles with follow-up extending into the summer of 2006. They include *Blue Water Sailing*, *BoatUS Magazine*, *CCA News*, *Cruising World*, *Kazi* (Japan), *Latitude 38*, *Practical Sailor*, *Sail*, *Sailing*, *Sailing World*, *Santana*, *Soundings*, and *Yachting*. A DVD showing highlights of the event is available for the cost of reproduction and shipping.

Prevention

A COB accident is no small, isolated incident. It puts everybody at risk, victim and rescuer alike. The endless appearance of ever faster, ever more unstable boats accelerates the problem. These boats require the use of safety harnesses and PFDs earlier and more frequently than older, steadier craft. Here are two guidelines:

- You must have a very good reason for *not* wearing a harness or PFD.
- At least hook on when moving around on deck in unsteady conditions, and when performing two-handed jobs, such as going up or down a companionway, trimming sheets, hoisting or lowering sails, adjusting jib sheet leads, and steering. When both hands are devoted to the ship, there's no hand for yourself.

Locating the Victim

Lights

Among the 40 devices[JR3] tested were 15 lights. One night, as observers looked on from a range of 2 miles, the lights were shown first in front of bright Sausalito, then with the dark park on Angel Island as a backdrop.

Five types of lights were tested: strobes, incandescent lights, light sticks, divers' lights, and narrow-beam "focused" lights. Strobes have the advantage of being omnidirectional so they need not be aimed to attract attention, yet their visibility at 2 miles was surprisingly weak. The best performance came from three focused lights:

- *The Greatland Rescue Laser Light* emits a brilliant bar-shaped red light that seems to explode as it is swept from side to side.
- *The Sure Fire E2E Executive Elite Flashlight* is designed for law enforcement officials, who use it to blind suspects.
- *The Adventure Lights VIP Safety Light* can be clipped onto clothing and has a bright orange LED light that offers three options – steady, flashing, and S-O-S.

While a range of 2 nautical miles may be a suitable standard for fast boats (a 12-knot boat covers that distance in just 10 minutes), it may be unrealistic for ones in the 6-knot range. Future tests will be held using shorter ranges.

Lights Tested (NOTE: All prices in this report are approximate)

ACR C-Light (pen-shaped incandescent, $12)
ACR C-Strobe (pen-shaped strobe, $20)
ACR DoubleFly FireFly 2 (incandescent and strobe, $80)
ACR Firefly 3 Personal Rescue Strobe (manually operated compact strobe, $80)
ACR Firefly 3 Waterbug Personal Rescue Strobe (water-activated strobe, $90)
ACR Rapid Fire A Strobe PFD Light (compact strobe, $30)

ACR Rapid Fire B Spotlight PFD light (compact incandescent, $30)
Adventure Lights VIP Safety Light (focused LED, waterproof, long battery life, $85)
Greatland Rescue Laser Light (focused laser, waterproof, $100)
Omniglow Cyalume Personal Marker Light (light stick, affixes to PFD, $16)
Princeton-Tec Predator Pro (wide beam Halogen Headlamp, $30)
Princeton-Tec/West Marine Aqua Strobe C (compact strobe, $40)
Red Probe P (diver's beacon/personal marker light, $13)
Surefire M E2E Executive Elite Flashlight (short battery life, weatherproof, $95)
Underwater Kinetics Blue LED Mini Pocket (a diver's light, $30)

Alarms/Crew Monitoring Devices

These devices set off an audible alarm when someone wearing a transmitter or beacon goes over the side, and then provide information for locating the victim. The alarms tested were of two types: direction finder (D/F) and GPS. We tested two of each type with the boat making 5 knots and turning back after approximately 0.3 mile toward a mannequin on which the transmitters were placed. All were deemed satisfactory in performance. The price of these devices is approximately $1,000 before customizing.

D/F alarms guide the boat to the person in the water. After a water-activated radio transmitter worn by the crew is dunked, an onboard instrument homes-in on it. These systems were extremely accurate. The Sea Marshall Maritime Survivor Locating Device almost hit the mannequin, while Emerald Marine Products' Alert was about 3 meters off. One tester found the Sea Marshall's 360-degree dial especially easy to use. The Alert required a deeper dunking than the Marshall before it was activated.

GPS-based alarms guide the boat to the "splash point" where the person went in. These are automated versions of the familiar MOB button on a GPS instrument. When the MOB button is pressed, the GPS records the boat's geographical position as a waypoint to which the boat is then manually steered.

But an alarm automatically records the waypoint when its base station loses contact with a transmitter worn by a crew member. If the boat returns quickly, the victim should not be far from the splash point. The NKE Gyropilot transmitter is water-activated, and the MOBi-lert Crewsafe is set off when the personal transmitter strays outside a predetermined area. The water-activated alarm triggered faster than the proximity alarm. Both devices had good accuracy. Such instruments can be connected to wind instruments or the autopilot to automatically turn the boat into the wind or head back to the waypoint.

Making Contact

Tests and accident accounts repeatedly prove that even expert swimmers wearing clothes cannot swim more than a short distance without becoming dangerously fatigued. Contact, therefore, means bringing the boat directly alongside the victim or getting a line or buoyant object to him or her. Because the first tactic can put the victim out of the crew's line of sight, limit the helmsman's options, and cause injury, many testers preferred to leave a gap of a few meters while the crew tossed a heaving line, a Lifesling, or another device on a line.

Throw[JR4] **Rope/Heaving Line**

The throw rope heaving line consists of a small bag (or "sock") into which a 15- to 20-meter buoyant line or tape is flaked (packed without kinking). The weight of the line carries the tossed bag toward the target. The other end should be tied to the boat so when a load comes on, the thrower is not pulled overboard.

We tested three types and all worked satisfactorily. One has a small loop at the end, another has a strap, and the third (which was heavier and had the longest range) has a water-activated inflated life ring that may be used as a hoisting sling. With practice, many people were able to toss bags fairly accurately 10 or more meters, upwind or downwind. If the bag misses, it can be retrieved and used again after repacking the line or (more quickly) filling it with water to provide weight.

Throw Ropes Tested

Markus Rescue-line (70-foot line with a webbing strap to fit around body, $88)
Sporting Lives Rescue Throw Bag (70-foot line, $50)
Survival Technologies Tech-Float (75-foot line, auto-inflate life ring, $179)
West Marine Rescue Throw Bag (50-foot line, $48)
West Marine Inflatable Lifesling (125-foot line, auto-inflate life ring/sling, $150)

The[JR5] ***MOM***

If the victim is not wearing a PFD, the rescuer has two problems: provide buoyancy and find the victim. Throw bags with inflatable devices can solve the first problem, as can tossing a life ring, a lifesling, or a cockpit cushion. The second problem is always a challenge, even in flat water and bright sunshine.

The Man Overboard Module (MOM) is a high-tech version of the bamboo or fiberglass manoverboard pole. The MOM 8 has an inflatable 6-foot pylon with a light on top and an inflatable life ring attached by a pendant. The MOM 9 has the pylon and light plus a one-person inflatable life raft that can be hoisted aboard by a halyard or tackle. Stored in a box on the after pulpit, when triggered the MOM drops into the water and its components are inflated automatically by CO^2 cartridges. At Sausalito we observed that a MOM drifts at about the same speed as a victim in the water.

During the first test of the MOM 8, the boat's recorder noted on his data sheet that "a few minutes" passed before the pylon stood wholly erect. After this device was repacked by a factory-authorized repacking service, it was deployed again. This time the light failed to work, its wire tangled with the pylon, and the pylon did not become fully erect (though it was visible from a range of about 1 mile).

MOMs Tested

Switlik/Survival Technologies MOM 8 (inflatable pylon and life ring, $695)
Switlik/Survival Technologies MOM 9 (inflatable pylon and life raft, $1,295)

Maneuvers

The boat's approach to the victim must be both rapid and effective. Speed is important because it helps keep the victim in sight and because he or she may be disabled. The boat also must be under control, and the crew and gear must be prepared to make the rescue. *(See Table 1.)*

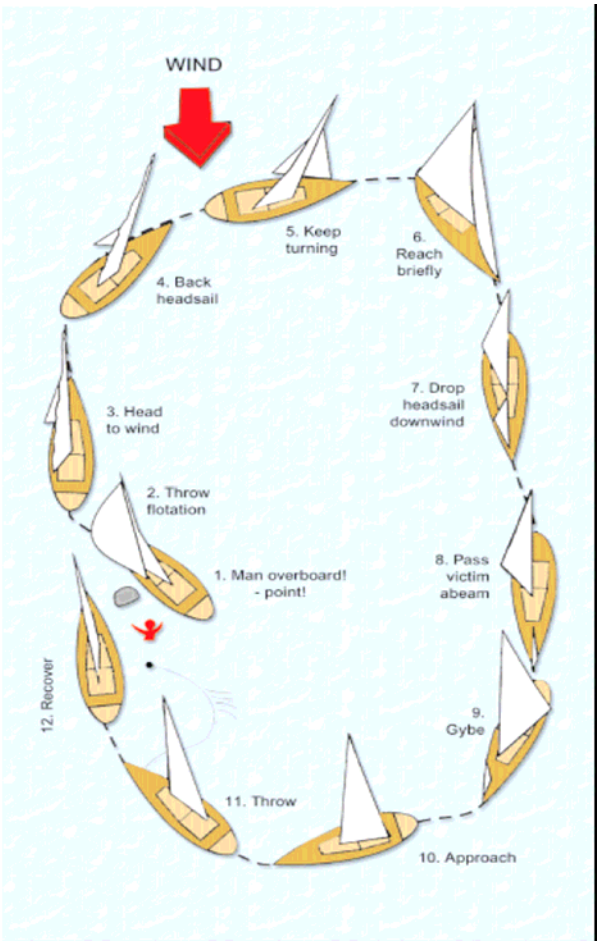
Four [JR6] ***Maneuvers***

Four maneuvers employing basic sailing skills, three of which are illustrated on the following page, have been developed. *(Illustrations Courtesy of* Soundings.*)*

- *The Quick Stop*. Luff into the wind immediately, then make one or more elliptical loops around the victim. To slow the boat and avoid distraction by sheets, trim the sails flat (with the jib left trimmed to one side), or furl the jib. When the crew and gear are ready, head to the victim on a close reach. (This maneuver is also used in Lifesling rescues.)
- *The Figure 8*. Alter course to a beam reach, and after about 5 boat lengths tack, bear off, and return on a close reach.
- *The Fast Return.* If sailing upwind, bear off, and after about 2½ boat lengths, tack, back the jib, bear off, and head up to the victim on a close reach. If sailing downwind, head up, and after about 2½ lengths, tack and head to the victim.
- *The Deep Beam Reach.* Bear off to just below a beam reach, and after 2 boat lengths tack and come back to the victim on a close reach (*not illustrated).*

Though the last two seemed to some testers to be versions of the Figure 8, John Connolly distinguishes between them and assigns the four to two groups. Point of Sail Maneuvers (Figure 8 and Deep Beam Reach) bring the boat to a specified point of sail and can carry the boat beyond the victim. Turning Maneuvers (Quick Stop and Fast Return) bring the boat through various points of sail in prescribed ways before tacking or jibing toward the victim; they may require more sailing ability.

Quick Stop Method



Fast Return Method

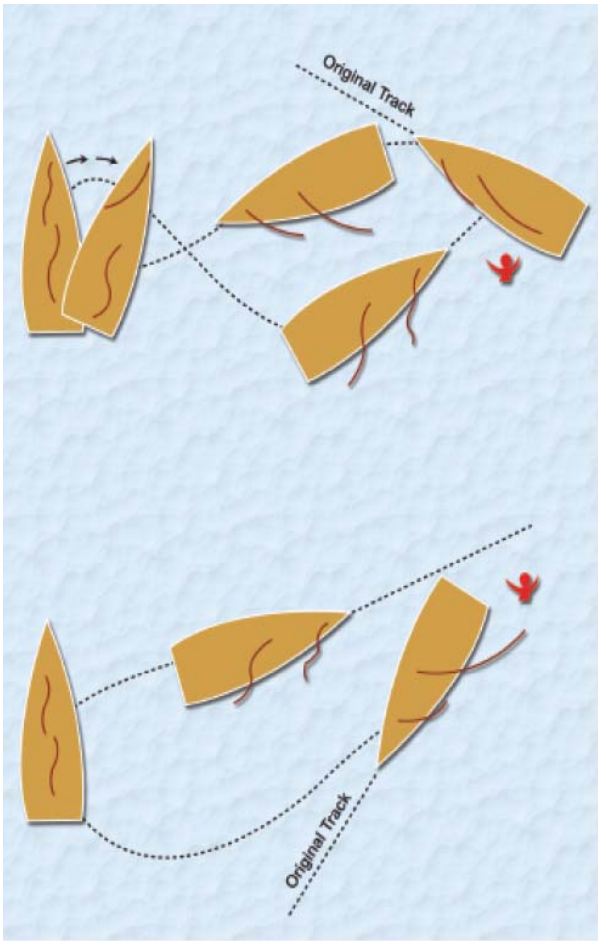
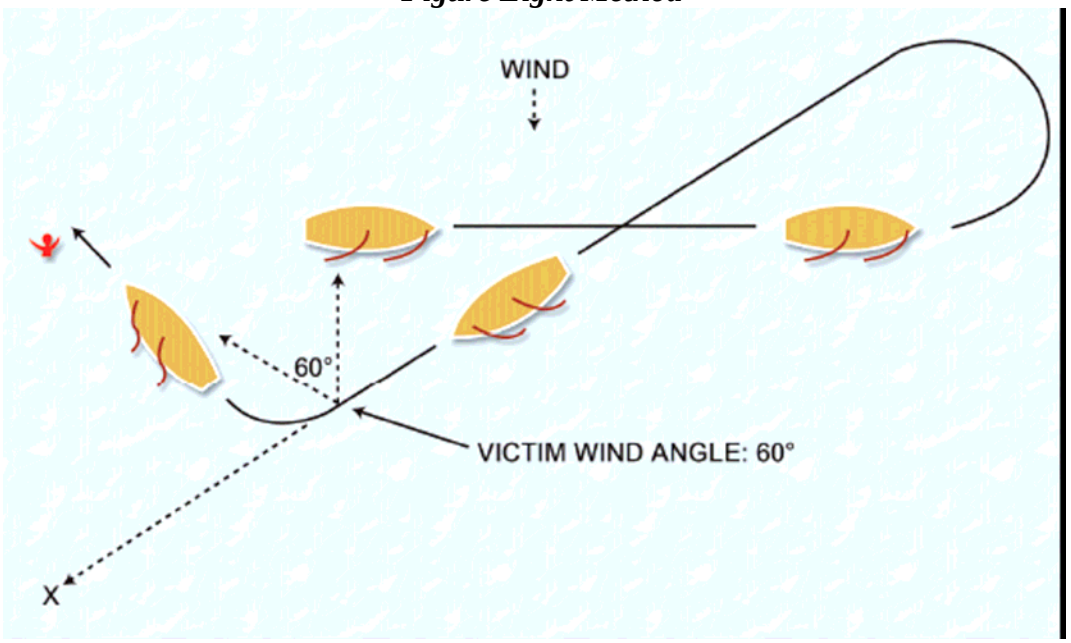


Figure Eight Method



The Final Approach

Sailing maneuvers should usually end the same way – (1) on a close reach (2) with the boat to windward of the victim and (3) with the boat at low speed.

1. *When sailing on a close reach,* a sailboat can be slowed or sped up with small adjustments of the helm and sheets.
2. *Positioning*[JR7] *the boat to windward* was the near-unanimous preference of victims in sailboat tests (powerboat rescues involve other considerations). Because boats drift downwind faster than people, a victim to windward may be quickly separated from rescuers. In very rough weather, however, the boat may blow down violently onto the victim. Victims were adamant that jibs be doused or furled so flailing sheets do not threaten injury.
3. *Boat*[JR8] *speed* must be controlled and low, but not so low that the boat loses steerageway. Some boats approached so fast that they sailed by victims or pulled them under water at the ends of lines. Other boats approached at moderate speed, then were hove-to (almost stopped with the jib backed to dward) just upwind of the victim before a throw rope was tossed.

Optimum speed was the subject of debate through the symposium. While one victim was comfortable with 3 knots, others set a 2-knot upper limit and Ralph Naranjo, of the U.S. Naval Academy's ing program, said that even with his extremely fit midshipmen, the rule at Annapolis is 1 knot. Fast or slow, victims who were in Lifeslings or holding onto lines learned to turn their backs to keep their faces clear of the water.

Although speed readings are helpful, the bottom line is whether the victim and rescuers can do their jobs without undue risk. The helmsman's eyes, therefore, belong on the rescue, not the knotmeter. A persuasive test of this principle was provided by our 160-pound mannequin "Bob," simulating an unconscious victim. When boats were moving at even modest speeds, many rescuers could not get a grip on "Bob."

The Need to Practice

Table 1 shows that contact with victims was made within 4 minutes in 87 percent of sailboat tests. Note that these crews were in a competitive state of mind, knew they were being closely observed, and had *practiced*. If average sailors and powerboaters with just some experience can approximate those times, they are doing very well.

It is demanding work. Turning without losing steerageway, slowing or accelerating on short notice, assigning a spotter to keep track of the victim – these and other skills are not normal for most boaters. People experienced with racing or sailing in tight quarters have an advantage, but even they must not assume that a rescue will be successful without practice.

Consider this comment from a J-105 crew: "This boat is extremely responsive and accelerates and decelerates quickly. There was little difficulty in returning quickly to the dummy. However, because of inexperienced helmsmen, pickup was a problem and often required several attempts."

As Henry Marx said, "The primary lesson I learned was, unless you have drilled with the equipment and know how to handle your boat, things are not going to go well in an emergency."

Evaluating Maneuvers by Boat Type

Monohull Keel Sailboats

Heavy displacement cruisers may not be able to make sharp turns without stopping dead, but a Quick Stop is often effective.

Moderate displacement cruisers managed well with all maneuvers. The Deep Beam Reach found favor once crews had practiced it.

Performance boats like a J-105 are highly maneuverable and, with practice, should be able to get back quickly using any maneuver. Because the large sails may make a jibe an adventure, the Quick Stop may not be ideal when the wind is high.

Multihull Sailboats

"There really is a bigger gulf between monohull sailing and multihull sailing than I thought," Stan Lander, the skipper of the Seawind 1000 cruising catamaran, stated at the first day's debriefing. At the start of the symposium, most people had no idea how to make a quick rescue in a catamaran or trimaran. By the end, there were new maneuvers that stood monohull doctrine on its head.

Some multihulls tack slowly and may be caught in irons, but can be jibed in a big wind because their high downwind speed reduces the apparent wind. Early on, the Corsair F-28 trimaran tried a standard Figure 8 with a tack and proceeded to miss the victim four times in succession. After the crew replaced the tack with a jibe, all went well.

Stan[JR9] Lander's crew in the cruising catamaran brainstormed the following routine: (1) Do a Figure 8 with a jibe, (2) close reach to a point about 6 meters to windward of the victim, (3) heave-to, (4) throw a line. Here is another multihull maneuver described on a data sheet by Leslie Waters: "Go to beam reach, jibe instead of tack, head back on beam reach, then when 45 degrees from victim, head directly to victim."

If the medium-size multihulls preferred to jibe, the largest and the smallest ones, the big Dragonfly trimaran and the racing Corsair F-24 tri, tacked reliably. Ross Stein in the F-24 ended a normal Lifesling rescue by heaving-to. Standing on the windward ama with the tiller extension under his arm, he hauled in the line until he had the victim on deck within a few minutes.

Powerboats

As with multihulls, each powerboat improvised maneuvers that best suited its type and size. "Two boats, two approaches," commented Joni Sralla Turken.

Heavy displacement powerboats. After the victim went off the stern of the Grand Banks 42 trawler[JR10], the helmsman turned to starboard – the side the steering wheel is on – while shutting down the starboard engine.

Owner Jerry Ramsey explained the maneuver this way in a debriefing: “The main thing is to use the mass of the boat to slow down. It gives you a chance to figure out what’s going on, to sight the victim, to organize the crew, and to go back. Sit back, let your heartbeat slow down, and let the boat do the work.” As it slowed, the boat was looped around the victim and stopped with the victim to starboard and the port engine nudging the bow up. Using this tactic and a throw rope, a Lifesling, or the swim platform, this little ship regularly had the victim on board within 6 minutes.

Moderate-displacement powerboats. The Fortier 26 is a lobster-boat type similar to many race committee boats and slows much faster than the trawler. Instead of making a long arc to gradually reduce speed, Phil Crowley cut back to idle and swung the boat around in a circle, usually ending up within 2 boat lengths and easy throw rope (or tossed Lifesling) distance of the victim. As with the trawler, the direction of the turn and position of the victim were determined by the location of the steering station. The helmsman wanted an unobstructed view of the swimmer. Once contact was made with a line, the bow was put into the wind and held there with throttle bursts until the victim was near, at which point the engine was shut down.

RIBs[JR11] *and other light-displacement powerboats.* With their shallow hulls, Whaler-type outboards and rigid inflatable boats (RIBs) are blown downwind unless they are kept moving. The RIB crew learned to come alongside the victim at a distance of 3 to 5 meters with the bow in the eye of the wind. A heaving line or Lifesling was tossed to the victim, who was brought alongside as the engine was switched off.

Notes on Maneuvers

- *Learn at least one proven maneuver.* Most of the symposium organizers believe the Quick Stop is the best sailboat maneuver for most accidents. It keeps the boat near the victim, controls boat speed, and provides time for the crew to organize themselves for the rescue. John Connolly prefers the Deep Beam Reach and Fast Return, in part because they do not require a jibe.

- *Still, there is no universal ideal maneuver*. "Be conscious when you find 'the perfect method' that it may apply only to your boat," Chuck Hawley said at a debriefing. Experience and practice are the best teachers.
- *Be prepared to improvise.* Sailors and powerboaters being practical and imaginative people, our testers kept honing maneuvers (as the test protocols encouraged them to do). As one sailor put it, "If a textbook recovery didn't work, we decided, 'Let's do *this*.' And we would try it. And it always worked."
- *You can always turn on the engine.* Rescues have been made by sailboats under power in calms and gales. Of course, check that lines are clear of the propeller.
- *Communicate clearly and often.* "You've got to talk through every step," said Matt Pedersen of the Sailing Foundation of Seattle. Include the victim in the conversation. "The victims want to have a sense of security that someone's looking at them and talking to them," said Rudi Millard, Chairman of the Cruising Club of America's Safety at Sea Committee. Hand signals will be needed in noisy conditions, say when under power or in rough weather.
- *Be aware of your environment.* Dan Rugg, a senior Naval Academy instructor, said, "If someone has a rescue method committed to memory and doesn't know what direction the wind is from, you can't do a rescue. You must have wind awareness."

Retrieval Devices

A freeboard of just 1 meter might as well be a mile to a victim and a rescuer. Still, the easiest way to get someone on board is with two or more strong arms on the scruff of the neck. The crew of the 40-foot trimaran in our tests reported they were able to haul a victim over the low, sloping stern of an ama "like a giant tuna." But a ladder or a hoisting device is usually necessary. *(See Table 2.)*

Platforms, Scoops, and Ladders

A transom swim platform is an obvious candidate to aid in a rescue. When the boat is steady, it can offer a stable platform a few inches above the water. But when the boat is rolling, as Page Reed reported from the Grand Banks 42, a swim platform is an intimidating hammer.

Sailboats[JR12]' scoop-shaped transoms are not so dangerous because they are at or below water level, yet some transom grab rails were too high to be easily reached from the water, even by exceptionally fit victims. Because there are times when the boat is rolling too wildly to deploy a metal ladder over the stern, these grab rails are important for self-rescue.

Collapsible[JR13] fabric ladders and other "soft" ladder-like devices are appealing, in part because they often have an arrangement of Velcro and a trip line that allows them to be deployed by a swimmer. Stiff fingers and feet did not always feel secure on the typical small rung however, and the bottom rung and legs often slid under round-bottom hulls.

The wide Markus Scramble-net offered good support. (It puts our safety concerns in perspective to know that the Markus line is named for a man who introduced survival suits and other safety equipment to Icelandic fishing villages.)

Hoists

We tested several hoisting methods, almost all of them involving a halyard or, in the case of the trawler, a dinghy davit. The simplest arrangement is to hook a halyard or davit line to the victim's safety harness or PFD (though uncomfortable, it works). We did not try the boom as a hoist because the organizers – each of whom has been working in boating safety for more than 20 years – know that most booms cannot raise the victim over the lifelines, and that all booms swing around wildly.

The[JR14] *elevator method*, which was tested on all boats, does not require a halyard or any special equipment but is improvised from any long, large diameter line (like a jib sheet, docking line, or the tail of a halyard). One end is secured to a bow cleat or another fitting forward, and the free end is taken far aft and led through a block to a winch. The victim stands, kneels, or sits on the line, which is then winched up the topsides, lifting the victim. Good balance and upper body strength are helpful. The elevator is a backup well worth practicing.

The Noodlevator is an improvisation on the swimming pool "noodle" type life ring (a length of rope inside a foam cover). Its inventor hoped that by securing the tail of the rope to the main boom topping lift and then swinging the victim toward the bow or stern, the victim would land on deck. It did not work that way, but a halyard made the hoist.

The MOM 9 (discussed earlier under contact devices) has a life raft that the victim crawls into. A halyard is hooked onto the device's lifting strap to hoist the raft and victim on deck. Although the raft took on water and tilted, it got the victim on deck.

The[JR15] *Lifesling* is a buoyant yoke dragged astern at the end of a line, with the boat maneuvering in a way that puts the line or sling into the victim's hands. This is usually accomplished by doing a Quick Stop. (Turns must be elliptical. The Island Packet 38 made several perfect circles around a victim without the Lifesling's getting any closer to him. Once the sailors stretched out the circle, the rescue was effected.) The victim grabs the line or sling, the boat is stopped, the victim is pulled to the boat, and a halyard or tack hoists the sling with the victim in it on deck.

The[JR16] *Inflatable Lifesling* is a throw bag that also works on the same principle as the standard Lifesling when inflated. After it hits the water, an automatic system inflates it to make a combination life ring/hoisting device.

(When several of these devices did not inflate, testers were reminded that it is the crew's obligation to check for CO^2 cartridges.)

The inflated sling sometimes skated on the water and did not always follow the boat through turns, so other delivery tactics had to be used (such as letting the device drift downwind to the victim). Some divers said the buckle system's black-on-black color scheme was confusing.

Testers liked both Lifeslings; one data recorder noted, "Inflatable Lifesling rated overall best single piece of equipment." The main problem with both devices was that crews sometimes failed to set up the hoisting tackle properly. Either the parts were tangled, or the top block was too close to the deck to pull victim over the lifelines. Practice with the tackle is as important as practice with the sling itself.

Owner's Manuals

Several testers commented that a few owner's manuals were confusing or addressed only one type of boat. For example, while the manuals for Lifeslings, MOM 9s, and other hoist systems call for a halyard, there was no free halyard on test boats with a roller-furling mainsail and jib (an arrangement typical of modern charter fleets). Lowering a roller-furled sail in order to free up a halyard is difficult and time-consuming. When Karen Prioleau invented a "creative boarding" test, Dan Rugg found that the main boom topping lift supported a hoisting tackle.

The Unconscious Victim

With an unconscious or otherwise helpless victim, the best that might be done is to put a second person (on a tether to the boat) into the water to fit a Lifesling over her or his body – no easy task. Or the crew could pull the victim to the boat with a boathook and then lift the head clear of the water while calling for assistance. We tested four retrieval devices that address the problem of the helpless victim. Results were mixed.

The[JR17] *parbuckle* is by far the most compact and simple of the four. It is a large triangular cloth, with one edge connected to the rail and the third corner extended out in the water at the end of a halyard. Once the victim is maneuvered into the bunt of the cloth with a boathook, the crew pulls on the halyard to roll the victim up to the rail. Parbuckles have a good track record with boats that have low freeboard, but with a high-sided boat the cloth can kite above the water. Sailboats present the additional challenge of maneuvering the victim between lifeline stanchions. Parbuckles can also trap water that victims may inhale at risk of drowning. The mesh fabric in the prototype Morlift parbuckle we tested allowed water to drain, but due to an insufficient number of attachments along the rail, the Morlift had a tendency to spill the victim out.

The BOB Sling is a ladder-like system of webbing and stainless steel rungs that is extended from the boat on a halyard and works on the principle of the parbuckle. It requires special deck fittings and a dedicated block aloft, and is typically set up on only one side of the boat.

The Markus-net is a deep bag-shaped assembly of straps in which the victim sits as it is hoisted with a halyard. Getting the victim into the net is not easy, but once inside, people were secure.

The[JR18] *Lifescoop*, a full-size stainless steel stretcher with a long handle, was designed to retrieve a victim at a short distance from the boat without having to put another person in the water. Using the handle, the crew on deck maneuvers the stretcher out from the boat and under the victim, pulls it and the victim to the boat, and hoists them on deck with the jib sheet and a tackle suspended from the boom.

Retrieval Equipment Tested

Elevator method (improvised from gear on hand)
Lifescoop (prototype, John Connolly, Modern Sailing Academy)
Markus Safety-ladder (soft ladder, $142)
Markus-net (a large net, price NA)
Markus Scramble-net (a wide soft ladder, $877)
Morlift (prototype parbuckle)
Noodlevator (prototype)
Ocean Marine Systems BOB Sling (looks like a ladder, works like a parbuckle, $695).
Plastimo Quick Launch Safety Ladder (soft ladder, $90)
West Marine Hoisting Tackle (3:1 tackle, $130)
West Marine Inflatable Lifesling (inflatable life ring/sling in a throw bag, $150)
West Marine Lifesling (life ring/sling with fixed buoyancy, starts at $100)

Here we end our survey of gear and maneuvers and move to the lessons learned by the event organizers[JR19]**.**

Lessons Learned by Symposium Organizers

Ruth Wood

Sailor, President, BoatUS Foundation for Boating Safety and Clean Water.

1. ***Use a safety harness*** so you don't fall off the boat in the first place.

2. ***Know your gear.*** Everyone on board should know where the rescue equipment is and how it works. This includes the hoisting tackle and how and where to rig it.

3. ***Surprise practice sessions will keep it real.*** Even when crew members know it is just a drill, they still make mistakes. Learn weaknesses before the real event.

4. ***Stopping a sailboat or even slowing down is harder than you think.***

5. ***Swim platforms in rough weather can be lethal***. Have an alternate plan for getting a person back on board.

6. ***Communication during a crisis can be chaotic.*** Pre-planned COB assignments are critical. Have a plan before you leave the dock.

7. ***Persons being towed back to the boat can drown.*** Direct the COB to face away from the stern of the boat.

8. ***The traditional COB strobe light*** that we all pin to ourselves is more or less useless at 2 miles.

9. ***Buy a throw rope.*** It is worth its weight in gold.

10. ***Knowing a maneuver is valuable, but being flexible is also important.*** Improvise when necessary. Realize that certain maneuvers works best on certain boats, while others work better on others. Practice on your own boat to find out what works.

John Rousmaniere

Sailor, author *The Annapolis Book of Seamanship, Fastnet, Force 10, A Berth to Bermuda*, and other books; North U instructor.

1. ***A COB accident puts everybody at risk.*** Even in our controlled drills, rescuers sometimes teetered on becoming victims.

2. ***Test standards.*** A rigid scientific testing regime might have discouraged participants from the experiments that proved so fruitful. While quantitative data are helpful, the best indications of a method's success are what testers say about it and do with it.

3. ***Arbitrary or unrealistic instructions.*** While an instruction to turn back after a set number of boat lengths may be easy to diagram, can the average sailor be counted on to accurately estimate a boat length in a moment of stress? I prefer a time interval – say 20 seconds. An instruction to make the final approach at a set speed like 2 knots can distract people from the main concern, which is watching the victim. And an elapsed-time measure of success can turn a rescue into a race. Getting back 1 or 2 minutes faster means nothing if the boat is out of control and the crew isn't prepared for the rescue.

4. ***The Quick Stop.*** While not perfect for every boat and occasion (no maneuver is), the Quick Stop should be familiar to all crews. It has a long record of success. Unlike methods that bring the boat back directly, it keeps the boat near the victim while the crew prepares gear. And it allows the helmsman to choose the best time to make the final approach.

5. ***Keep it simple.*** While the ingenuity behind the equipment we tested is impressive, some large, complicated devices seem better suited for professional rescuers and commercial vessels than for pleasure boaters in normal-size family boats.

6. ***The Lifesling.*** The foam Lifesling is my choice for a rescue device. It's simple (no inflation system), it's flexible (buoyancy, contact, and a hoist), it's easily pulled on deck

with standard equipment (a halyard or tackle), and it can be reused. Its track record is excellent. It does require some practice.

7. ***Consider the owner's manual as a general guide.*** As Sheila McCurdy has said, following directions explicitly can lead to "death by diagram."

8. ***Murphy is your shipmate.*** Sailors always need second chances. Maneuvers and gear have to be simple to use and reuse.

9. ***The throw bag.*** It works quickly, is versatile, and can be reused. Like all gear, it requires practice.

10. ***Effective leadership is essential.*** The maneuver may be perfect and the gear ideal, but a rescue can be doomed by a poorly led, chaotic crew.

Karen Prioleau

Sailor, U.S. Sailing Assn. Instructor Trainer/National Faculty, Orange Coast College instructor.

1. ***To my eye, orange is more visible than yellow when searching for a victim.***

2. ***On ultra fast boats,*** there is a potential for the helm to be caught and the boat to take off quickly. This could be dangerous if someone were to be dragged behind the boat in a sling or with a throw line wrapped around a wrist. It's a good idea to have a knife close by. The F-24's owner had a serrated knife in a holster bolted to the cockpit seat and accessible to the skipper or crew at all times.

3. ***Multihulls behave differently.*** The multihull crews came to different conclusions on what worked best. The big 40-foot tri did not want to jibe, while other boats seemed more comfortable jibing than tacking.

4. ***Large catamarans stop immediately*** when they head into the wind or heave-to next to the victim. The bows did blow down like a monohull bow, thus the boat was stable.

5. ***Because most GPS units are below deck,*** pushing the "MOB" function requires a set of eyes below for initialization and to track a return. I found this unsettling because it split up the crew and impaired communications.

6. ***Signal mirrors*** are easy to use and very effective at attracting attention.

7. ***An Inflatable Lifesling*** put on over an inflatable life vest is uncomfortable and even annoying for an active victim, even though the two buoyancy aids are very helpful to a passive one.

8. ***The rate of drift of inflatables*** – both the RIB powerboat and the Inflatable Lifesling – was much faster than I expected, and much faster than I could swim when I was a victim.

9. ***Off-centerline steering stations*** on large cats and powerboats make pickups on the steering side more important than wind angle (when the helmsman is inexperienced).

10. ***Charter boats.*** When sailing a charter boat with a roller-furling mainsail, be sure to consider how a lifting tackle or other hoisting system can be rigged. Use of a topping lift to support the tackle may not be an option if the boat does not have a rigid boom vang.

Chuck Hawley

Sailor, vice-president West Marine, safety-at-sea seminar moderator.

1. ***Improvising.*** Captains generally resorted to inventive, practical, and comfortable maneuvers and techniques, which resulted in relatively good results but which made comparisons difficult.

2. ***The hurrier I do, the behinder I get.*** Since crews knew that they were being timed for each of the recoveries, this led some to "race" through their recoveries rather than take a slower, more methodical approach.

3. ***Approach on a close reach.*** Rescues under sail had the greatest chance of success when the skipper approached the victim on a close reach, which allowed him or her to control boat speed and distance to the victim with ease.

4. ***It's hard work.*** Crews may have had unrealistic views of the difficulty of certain maneuvers due to the number of "willing hands" on each boat. True singlehanded recoveries were relatively rare. Maneuvers requiring tacking were (paradoxically) not seen as being more difficult than maneuvers with less sail handling.

5. ***Hoisting tackles are tricky.*** The Lifesling Lifting Tackle proved hard to use by many crews. Even after instruction, they failed to rig the tackle correctly, and commonly allowed the upper block to be much too low for effective hoisting.

6. ***Keep it simple (and affordable).*** Many of the products tested were too expensive, too complicated, or too bulky, or did too little to be effective on normal recreational vessels. This may have been overlooked by the volunteers who were keen to "give it a good try."

7. ***Different strokes for different boats.*** Different crews elected to use widely varying techniques based on the handling characteristics of the boat. No one technique worked in

all cases, or at least the crews elected to use different methods. The oft-repeated advice to experiment using one's boat is exceptionally germane.

8. ***Attachment is crucial.*** Untethered throwable devices cannot be relied upon to reach the victim or provide flotation. In the flat (windy) waters of our test, a high percentage of thrown devices simply missed their targets.

9. ***Leave towing to wakeboarders.*** When towing a floating rescue device like the Lifesling, it's important to control the boat's speed as the victim gets the device so that the device does not get pulled from the victim's hands and so the victim does not get towed at a high rate of speed through the water.

10. ***Three essentials.*** To be effective, a rescue device must (A) provide flotation, (B) connect the victim to the vessel, and (C) assist in reboarding the victim.

John Connolly

Sailor, head instructor, Modern Sailing Academy.

1. ***A scientific comparison of maneuvers*** is eminently achievable by following an independently managed plan designed by professional statisticians and/or scientists.

2. ***Maneuvers.*** The August tests were the first time in 20 years that the Quick Stop was tested against a similar "turning maneuver," and the data clearly indicated that it was significantly slower. The Fast Return was more likely to produce contact within 2 minutes without a jibe, while the Quick Stop regularly led to contact within 4 minutes and often required a jibe.

3. ***Multihulls*** perform so differently from one another that unlike monohulls, no standardized crew overboard maneuver for multihulls can be expected.

4. ***Devices.*** Watching the many safety products used to retrieve victims from the water in the August 2005 tests compelled me to contrast these results with the 1993 to 1996 tests, where several strategies were tried that used no special equipment, just normal gear typically found on a sailboat. While there were some devices like the Lifesling that combine different functions, the majority of these single function devices were not substantially better than using no special gear. Thus, one lesson for sailors to recognize is: learn the many ways to retrieve a victim with no special equipment.

5. ***Retrieving unconscious or injured victims*** is a sufficiently important and difficult task that a further test focusing on this challenge still needs to be accomplished.

6. ***The motor.*** One old lesson reared its head many times during the recent tests. Given the vastly different skill levels of participants and the reality that these tests were conducted without ocean waves, a very important safety tool on inboard engine cruising sailboats is the engine. Of course, all the normal safety precautions need to be taken into account before the engine is used around a person in the water, but there are times in large seas when the engine is crucial.

Joni Sralla Turken

Sailor, formerly of the BoatUS Foundation and now at the Chesapeake Bay Foundation, was on board the trawler.

1. ***Have a crew overboard plan and practice it.*** Make sure you and your crew understand your COB retrieval equipment. I spent years with a Lifesling box bolted to my boat's stern rail. This testing was the first time I'd ever seen what was in the box! (Shame on me.)

2. ***Swim platforms can be dangerous in certain conditions.*** Your plan should include a means of getting a person back on board without using the swim platform, if that should become necessary.

3. ***Visibility is crucial.*** It is very hard to see someone in the wake of a boat, and hard for the helmsman to see someone in the water, period. Assign a spotter, but also assign the spotter a place to stand based on your boat's layout. If the captain can't see the person pointing, or that person is blocking the captain's view, even more confusion will result.

4. ***The boat must make almost a complete stop*** next to a victim in order get any control over the situation. However, stopping a boat in wind, chop and current is tough! It takes practice.

5. ***Tactics.*** Boats behave differently. No one technique will work for all boats, but experimenting will help you find what works for your boat.

6. ***Pick-up side, power boats.*** Always work to pick the victim up on the side of the boat with the steering station, where visibility is best for the captain.

7. ***Smooth water.*** The Grand Banks trawler was able to turn around very quickly, but doing so created a lot of chop when it came back around to get the victim. Slowing the boat down for the turn was just as fast and less choppy.

8. ***Two engines are good.*** A double screw powerboat is pretty maneuverable (plus, you can cut the engine closest to the victim and still maintain power) and does not have the same weaknesses as a sailboat during rescues.

9. ***Electricity helps.*** The electric davit on the Grand Banks greatly simplified the use of a Lifesling, compared to using a sailboat halyard and/or lifting tackle. But someone on board must know how to operate the davit.

10. ***Keep cool.*** Even though our rescues were for practice, in the excitement of a "Man Overboard" yell I still found myself getting nervous and making mistakes. I found I was clumsy with tossing anything and was more likely to get the line to a throw bag wrapped around a stanchion during the toss than getting it anywhere near the victim. Practicing using these items first would have helped, and also would have helped me keep my cool.

Table 1: Maneuver Contact Times, Sailboats

This four-part table provides the elapsed times between the victim's going into the water and the moment when contact was made with a rope or Lifesling, or by coming alongside. Of these 179 maneuvers, 155 (87 percent) succeeded in regaining contact with the victim within 4 minutes.

Moderate Displacement Sail Cruiser/Racer

Islander 30, Beneteau 33, Beneteau 39, Beneteau 42, Beneteau 43

Maneuver	**0-2 min.**	**2-4 min.**	**4-6 min.**	**6-10 min.**
Deep Beam Reach	5	4	4	
Fast Return	16	6	1	
Figure 8	18	7	1	3
Quick Stop	17	16	1	

Heavy Displacement Sail Cruiser

Island Packet 38, Islander 53

Maneuver	**0-2 min.**	**2-4 min.**	**4-6 min.**	**6-10 min.**
Deep Beam Reach		4		
Fast Return	5	3	1	
Figure 8	2	8	3	1
Quick Stop	1	6	1	6

High-Performance Sail Monohull

J/105

Maneuver	0-2 min.	2-4 min.	4-6 min.	6-10 min.
Deep Beam Reach	1			
Fast Return	1	2	1	
Figure 8	1	1		
Quick Stop	1			

Sail Multihull

Corsair F-24 and F-28 trimarans, Seawind 1000 catamaran, Dragonfly 40 trimaran

Maneuver	0-2 min.	2-4 min.	4-6 min.	6-12 min.
Deep Beam Reach	2	1		
Fast Return	7			
Figure 8	1	1		
Modified Figure 8 (jibe)	9	2	1	
Quick Stop	4	2		

Table 2: Retrieval Times, All Boats

Device	0-2 min.	2-4 min.	4-6 min.	6-10 min.	10-14 min.
BOB		1		1	
Elevator		6	1	1	
Inflatable PFD	2				
Lifescoop				1	1
Lifesling (Inflatable)	2	6	3	3	
Lifesling		12	6	1	1
Markus Safety-ladder		1	1		
Markus Scramble-net	1	5	3	1	
MOM 9		1	1		
Morlift Parbuckle		2		1	
Noodlevator	1	1	3		
Plastimo ladder	6				
Swim platform or stern ladder	23	6			1

Some Participants

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Chip Barber, Chairman, New York YC Seamanship Committee

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