

Safety At Sea Studies - 1991 Liferaft Test

West Marine Heavy Weather Liferaft Test June 22, and July 4, 1991

Life Raft Study provided by [West Marine](#),
for additional information dial (800)BOATING (800)BOATING
© West Marine Products, Inc. 1994

Sponsored by:

West Marine Products Plastimo USA, Inc.
Avon-Seagull Marine Recovery Engineering
Switlik Parachute Co. SOSpenders, Inc.
Magellan Systems Corp.

INDEX

Introduction
Objectives
Objectivity
Location
Weather
Support Vessels
Participants
Rafts Tested
Differences in Raft Construction/Equipment/Specifications
Deployment/Inflation
Boarding
Drogue Deployment
Canopies
Viewing Ports/Visibility/Ventilation
Floor Design
Familiarization
Air Holding Ability/Repairability
Survival Kits
Personal Volume/Floor Space
Water Shipped While At Sea/Bailing
Lifejackets
Seasickness
EPIRB's
GPS
Flares
Raft Pick-Up
Conclusions
Participants

INTRODUCTION

West Marine Products, of Watsonville, CA, conducted a test comparing four popular yachtsman's liferafts and one rescue platform on June 22nd, and July 4th, 1991. In addition, a variety of marine safety products were tested including flares, life jackets, VHF radios and watermakers. We intended to test the rafts in normal, windy, summer conditions in the open ocean.

Although originally planned to be part of the test on June 22nd, the Switlik Coastal Raft and Rescue Platform did not arrive in time to be used in the test. As a result, a second test date was scheduled on July 4th. The results of this test have been incorporated into the original test, noted where appropriate the differences that the weather made on any comparisons. Although the delay in testing the Switlik was regrettable, the same volunteers took part in each test and recorded their impressions similarly.

OBJECTIVES

Rather than attempt to select the best raft, we knew as we approached the test that we would have a variety of rafts that were not necessarily competing in the same market. Even if we tried to evaluate cost versus performance, we did not think it was possible to conclude that a particular brand was superior to the others, although one raft was judged better than the others. As expected, some aspects of each raft were deemed better than others, which we have documented. We also included survival gear from several manufacturers, including Recovery Engineering watermakers, Pains Wessex flares, Skyblazer flares, Magellan GPS receivers, Icom, Standard Communications and West Marine handheld VHF's, SOSpenders inflatable lifejackets and a variety of seasickness remedies.

OBJECTIVITY

Participants were cautioned ahead of time that they would be testing rafts that had different price points, different amounts of survival gear, and different design criteria. Our goal was to have them look at specific aspects of the rafts somewhat in isolation from the rest of the raft. For example, we wanted them to look at the survival packs as if their contents were spread out on a table, and not let the fact that one raft had more bilge water affect their observations.

Although a laudable goal, it appears that two aspects of the rafts affected the crews' observations about other raft attributes. One was the degree of headroom inside each raft. Rafts with increased head/leg room were described in much more positive terms. Also, the Avon Coastline, due to its single floor, was harshly judged in other areas unrelated to the floor construction. This was known in advance, and is more of a condemnation of single floor rafts in general, than the Avon Coastline in specific.

LOCATION

We conducted the test about 1-1/2 miles south of Lighthouse Point near Santa Cruz. Although technically within Monterey Bay, this area is open to the full effects of the prevailing Pacific winds and diurnal local winds. Upwind of the test site, the coastline is almost perfectly east-west, so there was little effect of being in the lee of landmasses due to the westerly winds. The water was 20 fathoms deep at the deployment site. Rafts were deployed in the vicinity of 36°55'N, 122°02'W.

On July 4th, rafts were deployed in the vicinity of the Santa Cruz Mile Buoy, about 1 mile from the first site. The buoy provided a convenient landmark by which we could observe our drift. Water

depth was 10 fathoms.

WEATHER

On June 22nd we had typical summer conditions for this area. Winds at launch time (10:00 am) were out of the west at 7 knots (force 3). During the duration of the test, winds increased to a steady 25 knots with frequent gusts above 30 knots (force 6-7). Waves were about one foot at the start (sea state 1), building to 3-5 foot chop (sea state 4) at 2:00 pm. Whitecaps began about 11:00 am and intensified until wave tops were breaking and rolling for some distance at 2:00 pm. Spray streaks were also evident on the water surface.

On July 4th, conditions were foggy, with 1/2 mile visibility. Winds were out of the southwest at about five knots (force 2). By the time that the test was concluded, winds were about 10 knots (force 3), and wavelets were appearing (sea state 2).

SUPPORT VESSELS

Three support vessels and two inflatable sportboats were used to conduct the test. Two of the support vessels were sailboats, a Santa Cruz 40 *ProMotion*, and a Morgan 32 *Suivez-Moi*. The third boat, a 22' Grady-White offshore fishing boat *Flying Fish*, was used to retrieve the rafts at the conclusion of the test.

PARTICIPANTS

A combination of West Marine associates and participants from various safety suppliers made up the liferaft teams. Representatives from each group were combined to make six teams of 3-4 individuals each. Due to attrition, teams 1 and 2 were combined towards the conclusion of testing on the first day, resulting in a single six man team. Experience levels amongst participants varied widely, ranging from those who had little sailing experience, to experienced offshore sailors with specific knowledge about liferafts. Teams were allowed to decide who was in charge, if anyone, and to spend their time getting to know the rafts and the raft's survival gear. To the degree that it was possible, raft occupants were to imagine that they were actually abandoning a ship at sea, and to act accordingly.

On the second day of testing, only West Marine associates participated, all of whom were veterans of the first test. We split the group into two teams of four each, and then combined them at the latter stages to test the overload capacity of the two Switlik products.

Participants wore normal boating attire, with most of them in foul weather gear, one in a wetsuit, and several in lightweight water-resistant gear like West Marine Pacific Cup outfits.

RAFTS TESTED

We wanted to test rafts that would be the most popular with our customers. Since most of our customers fall into the "coastal cruising" category, or purchase rafts so that they meet the requirements of race organizers, we requested that raft manufacturers supply us with rafts that met the minimum ORC (Offshore Racing Council) standards.

June 22nd rafts included:

1. Avon Coastline valise-pack raft with a single floor. This is a single buoyancy tube raft with a self-erecting canopy arch and minimal safety gear.
2. ProMotion's Avon Offshore raft, packed in a valise. This is the traditional Avon raft, with a integral double floor, complete "E" pack safety provisions, double buoyancy tube construction and

self-erecting canopy.

3. Plastimo Offshore + raft, packed in a hard canister. This is a double-tube raft with self-erecting canopy, fitted with an optional inflatable floor for insulation.

July 4th rafts included:

4. Switlik Coastal raft in a valise. This is an oval single tube raft, with a manual-activated, CO2 - inflated canopy arches. It was equipped with an optional inflatable floor and standard equipment package.

5. Switlik Rescue Platform packed in a valise. This is a non-canopied, single tube disk that is designed to support the crew out of the water. Though quite different from the liferafts in this test, the Rescue Platform is an alternative to a liferaft for many consumers, and we decided to test it as well.

All rafts were 6 person sizes, and the Rescue Platform was in a 10 person size. The three raft manufacturers encouraged us to test their "premium" rafts. These included Avon's Offshore raft, Switlik's Search and Rescue model and Plastimo's Trans-Oceanic model. Manufacturers repeatedly expressed concerns that their raft would not compare well to the others in the test due to the "apples and oranges" aspect of testing products. We assured them that our objective was not to select the perfect raft, but to compare features and trade-offs. The manufacturer's concerns stem from frequent evidence that *offshore boaters frequently select rafts designed for coastal cruising*, rationalizing their choice because "something is better than nothing". While we understand the limited budgets of anyone venturing offshore, our tests reinforced the importance of having the correct liferaft for the type of boating one intends to do.

DIFFERENCES IN RAFT CONSTRUCTION/EQUIPMENT/SPECS

	Avon Coastline	Avon Offshore	Plastimo Offshore +	Switlik Coastal	Switlik Rescue Platform
Price	\$2,685.00	\$4,435.00	3,345.00*	\$3,475.00	\$1,695.00
Shape	6-sided	8-sided	5-sided	Oval	8-sided
Tube Diameter	12.75"	10" X 2	9-1/2" X 2	13-1/2"	12"
Outside Dimension	8' 5"	7' 2"	7' 7" **	9' 1" X 6' 2"	9' 6" X 9' 6"
Inside Dimension	6' 3"	5' 6"	6' 0" **	6'4" X 3'11"	7' 6" X 7' 6"
Weight as Tested (lbs.)	56	86	97	60	38
Canopy Inflation	Automatic	Automatic	Automatic	Manual/CO2	None
Arch Tubes	One	One	One	Two	None
Ladders	One	One	Two	Two	None
Water	None	Pint cans	Sachets	None	None
Flares	3HH	3HH/2 para	3HH/2 para	3HH	3HH
Paddles	Yes	Yes	Yes	Yes	No
First Aid Kit	No	Yes	Yes	No	No
Flashlight	No	Yes	Yes	Yes	No
Water Activated Lights	Yes	Yes	Yes	Yes	Yes

* Plastimo raft priced as tested in canister pack; valise version is \$3,125.00.

** Plastimo raft dimensions are from one "point" to the opposite "side" due to its five sides.

DEPLOYMENT/INFLATION

Teams were instructed to pretend that their vessels had struck something and that they were taking on water rapidly. An Abandon Ship Bag was prepared in advance for each raft. Teams brought the rafts from below deck to the cockpit, made their lanyards fast, and threw the rafts into the water. They then inflated the rafts, boarded them from the cockpit area of the vessel, cut the lanyards free and set themselves adrift.

From the outset, there were marked differences in the amount of leadership/coordination of the teams. Because there was no actual danger, teams were methodical and did not forget any significant details (securing the lanyard, for example). The two larger rafts (Avon Offshore and Plastimo) were substantially more difficult to get into position to launch. The handles on the Plastimo canister were handy, allowing two testers to grasp them and toss it over the lifelines and into the water. According to the Plastimo team, it was "somewhat difficult because it was heavy - two man launch". Due to the light weight of the Rescue Platform (approximately 20 lbs. less than the other rafts) it was easy to launch. It took an average of 20 seconds to get the rafts to the vessel's gunwale, another 15 seconds to launch the rafts into the water, and 10-15 seconds for the rafts to inflate such that their canopies were erect. Boarding took about 40 seconds, and all rafts were cut free within 120 seconds of the start of the exercise. It is difficult to say whether panic would have increased or decreased the deployment time.

All rafts inflated right-side up without any seawater in them. Canopies were furled in the open position. The Plastimo raft had a much larger opening due to the shape of its door. The Switlik, due to its manually-activated arch inflation system, was completely open and could be boarded from any direction.

We noted afterwards from the Plastimo literature that their liferaft is packaged differently from the other rafts. Inside its protective canister, the raft is vacuum-packed inside a heavy plastic pouch, making the raft practically impervious to water damage between repacks. Since damage due to water intrusion is a common cause of premature liferaft damage, this seems like a good idea to us.

BOARDING

Teams boarded the rafts carefully, seemingly reluctant to jump in through the open canopies. We did not want to test the ease of boarding from the water, due to the low (56°F) water temperature and possibility of hypothermia. Later, when teams were exchanged amongst the rafts, several persons leapt into the openings in the canopies and found it surprisingly easy to board in this manner.

The lower freeboard afforded by a sinking boat would have made boarding much easier from a vessel.

Several participants expressed the opinion that it would be very difficult to board the rafts with foul weather gear and/or lifejackets from the water, especially if the person in the water were the first to board. Boarding ramps, which are now offered on Coast Guard rafts, would probably have made boarding from the water much easier. Due to the low inflation pressure and small tube diameter, it is easy for a person assisting from the raft to lower the freeboard to nearly water level with his weight on the tube(s).

DROGUE DEPLOYMENT

Teams deployed the drogues soon after boarding the rafts. All drogues were judged equal in effectiveness. Rafts drifted at a rate of 0.25 knots in 10 knots of wind, to a maximum of 1.5 knots in 25 knots of wind. Surprisingly, the rafts drifted apart laterally as well as downwind. This could have been due to some wind shear along the coast, or a counter-current in the test area.

The Plastimo raft had small retaining straps or tape which caused the raft to drift 90° to the intended direction until they were cut. This might have been difficult to diagnose at night. The Avon Offshore raft had an additional line which allowed the participants to rotate the raft towards the drogue so that it could be tripped and brought in. The Switlik Coastal raft has its drogue located at one of its "ends", which causes the raft to drift with its bow to the wind. This aligns the long axis of the raft with the wind, and places the waterproof "end" of its canopy towards the wind and waves.

The Rescue Platform had a drogue attached similarly to the rafts, which slowed its rate of drift. Since the Rescue Platform is a symmetrical disk, it does not have an axis or feature that aligns in any particular way with the wind.

CANOPIES

Both Avon rafts had similar canopy designs, using a triangular-shaped opening on the leeward side. This was held closed by Velcro® strips and fabric ties, although few teams felt comfortable enough to shut themselves inside. The Offshore version had a small halyard to facilitate pulling the door closed. Since the door on the Avons does not have a "sill" or "lip" at the bottom, the freeboard of the raft is not increased over the freeboard afforded by the buoyancy tubes alone.

The Plastimo raft has an opening that is about 45% as large as the canopy, on the leeward side. This is furled along the arch tube and is rolled down into place, as opposed to the Avon's which is furled along the buoyancy tube and is rolled up. The lower portion of the Plastimo's canopy runs along the top of the upper buoyancy tube, which is about 8" high and provides some additional freeboard. It has a zipper which mates with the zipper from the roll-down flap to form a reasonably tight seal. All teams reported difficulty in starting the Plastimo's canopy zipper, due to the tautness of the fabric. Most felt it would be very difficult to start the zipper and close the door at night, especially if one were unfamiliar with the method.

Most teams liked the open nature of the Plastimo's canopy, and would have left it wide open for the test had it not been for the need to test all variations in ventilation. Observer Michael Greenwald was quick to point out that in rough seas, the degree to which the canopy can be shut tight overrides one's desire for ventilation and openness.

The Switlik Coastal raft has a distinctive canopy design compared to the other rafts. It was manually inflated, using two optional inflation mechanisms located on the arch tubes. The Switlik uses two arch tubes which are semicircular in shape which are located across the narrow axis of the raft. This provides much more interior volume than the other rafts. Second, only the fabric at each end of the raft is permanently attached to the arch tubes; the other three panels are adjustable by use of zippers. This allows the canopy to be erected in a number of configurations depending on the conditions. In rough conditions, for example, the two side panels could be zipped up about a foot to increase freeboard, yet the "roof" panel could be left entirely open. Our only concern was that the side and roof panels overlap by about twelve inches, but there is no way to seal the junction between them, other than a tie tape in the center. We suspect that this gap could leak in severe conditions. The interior of the canopy was coated with a blue paint, intended to reduce the nausea that the orange color reportedly promotes. No one got seasick while inside the Switlik raft, although conditions were calmer during its test. Like the Plastimo raft,

the zipper which closes the roof panel was judged to be difficult to start at night.

West Marine Heavy Weather Liferaft Test June 22, and July 4, 1991

Life Raft Study provided by [West Marine](#),
for additional information dial (800)BOATING (800)BOATING
© West Marine Products, Inc. 1994

(continued from [previous page](#))

VIEWING PORTS/VISIBILITY/VENTILATION

The Avon rafts use a circular viewing port with a drawstring closure. Several teams allowed water to enter through the viewing port, since it is on the weather side and quite low on the canopy. Teams who secured the port with the drawstring were able to stop the influx of water almost completely. Although somewhat claustrophobic and leaving one feeling vulnerable, most teams could stick their heads through the ports for a scan of the horizon. The Plastimo raft had a straight zipper horizontally across the weather side of the canopy which was uncomfortable to stick one's head through. A curved zipper shape was suggested for greater comfort and ventilation. Neither design seemed as it would be particularly effective at catching rain water from the canopy, although the Avon design was considered better in this respect. The Switlik raft did not have a viewing port as such, but its canopy design allowed visibility by adjusting the zippered panels.

One team suggested that a handle be placed on the outside of the arch tube to help stabilize a crewman attempting to stand in the raft's opening. Several members tried to stand in the rafts and were very unstable due to the motion and lack of hand holds.

The rafts' bright orange canopies were visible over several miles from the escort vessels. The Rescue Platform, due to its lack of a canopy and low freeboard, was much less visible. Occupants of a Rescue Platform would have to rely on the pyrotechnic devices supplied.

FLOOR DESIGN

There were four distinct types of floors represented: the Avon Coastline and Switlik Rescue Platform with their single layer floor; the Avon Offshore with its double, integral floor; the Plastimo with its removable, double floor; and the Switlik with its removable drop-stitch floor. The overwhelming consensus of our testers was that single floor rafts are very uncomfortable due to the heat loss from one's rear and legs. Although we were only in the rafts for three hours, and the water temperature was 56°F, the heat loss through the single floor was remarkable. Even with Space Blankets under the our rears, the continual feeling of cold was very uncomfortable. One participant began to shiver after only one hour in the Coastline raft. It was the group's strongly held opinion that *only those who use their boats in consistently warm waters (greater than 75°F) where there is a strong chance of a fast rescue should consider a single floor raft*. The option of taking inflatable air mattresses along in the Abandon Ship Bag was not tested, although it would have likely provided the insulation gained by the other designs.

The Avon Offshore has a tufted, integral floor that is inflated separately using the hand pump. The pump was difficult to insert into the valve, due to the lack of resistance to downward pressure. Once inflated, the floor was comfortable and provided good insulation. It was nearly as easy to bail the Avon Offshore as it was the simpler Avon Coastline.

The Plastimo raft had a separate floor that tied into the corners of the raft. It, too, is intended to be inflated using the raft's topping off pump, but the team could not figure out how to do this so they blew it up orally. Once tied in place, it provided comfort similar to the Avon's double floor. It also allowed

water to collect between the inflatable floor and the floor of the raft, making the raft difficult to bail dry. We did not try, but rather surmise that to completely bail the raft it would be necessary to untie most of the retaining straps and roll the floor against one side of the interior, while collecting the water on the other side.

Neither of the two "tufted" floor models had a pressure release valve built-in, so it was difficult to judge how much pressure to apply. One Plastimo tester said that "...floor was too soft and collected water where your tush or feet were". More pressure might have solved this, but there was no way to judge other than by guessing.

The Switlik Coastal raft had a separate floor that was tied in place like the Plastimo. This floor is made from a "drop stitch" fabric, which has two layers a material separated by hundreds of 3" threads. This allows the floor to assume a uniform 3" thickness throughout. It was inflated over a period of about 8 minutes and assumed an oval shape that matched the raft's interior dimensions perfectly. We inflated it quite hard, which gave our rears enough support to be isolated from the water below. The flat surfaces of the floor did not hold water in puddles, and it was much easier to bail as a result.

The Rescue Platform takes a completely different approach to floor design. Since there is no canopy, and since the freeboard is only about 6", water is shipped easily over the sides. The floor leaks around its entire perimeter as well, collecting in the dish-shape formed by the other tube and floor. When loaded with eight testers, the raft ended up with about a foot of water in it, which could not be bailed as fast as it came into the raft. Although intended to reduce hypothermia by supporting a vessel's crew out of the water, the water which accumulates in the floor would have the same heat-robbing effect as any other water. One tester commented that the platform appeared to be sinking! We have to conclude that the Rescue Platform is better than nothing for keeping a crew out of the water, but not as good as a quality inflatable dinghy or sportboat which would have remained drier.

We equipped each Abandon Ship Bag with several Mylar/aluminum "space blankets" to see if they would be effective in insulating the crew members from the cold floor. Several participants said that it was much more comfortable while sitting on the blankets, but others could not discern any difference. When the blankets were placed over wet legs and torsos, they seemed to work, although probably due to reduced evaporative cooling rather than insulation.

FAMILIARIZATION

Other than an occasional label saying KNIFE or TOP OFF HERE, there are precious few instructions to guide the occupants of the liferaft. To the question "Were instructions clear on the outside of the raft, the Plastimo team responded "Yes for launching, other instructions were not clear". It may seem peculiar to observers at boat shows when they see large stencils on rafts saying such apparently obvious stuff, but raft occupants need all of the basic instructions they can get. Add the complexity of multiple languages, and one could easily imagine the interiors of rafts looking like those of Egyptian tombs.

The Switlik raft and Rescue Platform did have several yellow on black and black on yellow stencils that were quite obvious. At night, of course, written instructions would have been marginally useful. The group felt that it would be helpful to have a laminated card with survival basics, located in a prominent location, similar to the instructions on the outside of the raft.

As an example of the consequences that a lack of information causes, most teams could not figure out what the rescue quoits were. These soft rubber heaving rings are designed so that raft occupants can make contact with a victim before the raft drifts away from them. Without this knowledge, the rescue quoits become useless.

The Plastimo team noted that they could not find the knife because it was partially hidden by the canopy. The Switlik team could not find the drogue for several minutes because the canopy, in its furled configuration, covered the drogue instructions.

AIR HOLDING ABILITY/REPAIRABILITY

All rafts were inflated hard by their inflation cylinders, and were not observed to leak during the short duration of the test (5 hours). One manufacturer suggested that we puncture the rafts with a rigging knife so that we could test the ease of repairability, but we declined. All five rafts had two inflation chambers, but there were several differences in how they separated the air chambers.

The Rescue Platform and the Avon Coastline use a single tube that is separated into two chambers by vertical baffles. If one side is damaged, the other half remains inflated until a repair can be made. In the case of the Coastline, the enclosed configuration should allow the occupants to remain fairly dry, although the Rescue Platform occupants would have a hard time staying aboard in our opinion.

The Avon Offshore and Plastimo rafts have dual buoyancy tubes stacked on top of one another. These are capable of supporting the entire load if one tube is damaged. The circular shape of the tubes provides a symmetrical enclosure even with one tube irreparably damaged.

The Switlik Coastal takes a different approach entirely. Although it has a single buoyancy tube, the baffles separating the inflation chambers are extremely long and will inflate to fill the void left by air escaping from a damaged tube. The baffles end up acting like inner tubes in the damaged half of the raft, allowing the raft to retain its original shape after being re-inflated.

Both of the Avons and the Switliks use a single skin construction like an inflatable dinghy. The Plastimo raft is different, however, in that it uses an inner bladder to retain the air, surrounded by a fabric shell to protect it. This construction makes it easy for a liferaft repacker to repair the raft because he can simply unzip the outer cover and replace the "inner tube". This construction also makes it difficult to discover the locations of leaks, if the raft is not unzipped, since the leaking air can migrate far from the source of the leak before escaping. If the clamp-type leak repair device (below) were used on both of the skins simultaneously, it might be possible to slow the leakage, but we doubt it would seal as effectively as if used on a single-skin raft.

The Switlik rafts were the only ones to include clamp-type repair devices. These are oval-shaped metal and rubber devices which are pushed into a hole and then tightened into place with a wing nut. This design seems to be much more effective than the traditional glue and patch method (whose instructions start with "Make sure the surface is clean and dry") and the spiral plug style supplied with the Avons.

SURVIVAL KITS

Survival kits, as has been documented in numerous articles on survival in the past, are meager in their contents. Depending on the degree of completeness supplied by the manufacturer, and purchased by the customer, liferafts may or may not contain water, flares, fishing kits, first aid kits, repair kits, etc. Suffice to say that at the checkout counter, liferaft buyers are extremely resistant to paying for more complete kits; however at sea, they believe that every kit is woefully inadequate.

Our overall comment regarding survival kits is that since they vary from manufacturer to manufacturer, and from model to model, every liferaft owner should know what his/her raft contains. If unknown, then it should be documented at the raft's next repack. No one, in our opinion, should rely solely on the equipment supplied in even the highest specification liferaft, but should rather augment it with a separate kit.

This separate kit, often referred to as an Abandon Ship Bag, should contain an EPIRB, a watermaker, and additional SOLAS-grade flares at a minimum. Although these items can be packed within the raft, there are numerous stories of needing these items without having launched the raft. Therefore, we believe that they should be in the raft only if two of each are carried on board.

Instead of documenting every item in each kit, our testers made some generally observations about their contents and packaging.

1. The Avon survival packs used cardboard as an enclosure which immediately became soggy and began to float in the bilge water of the rafts. It was felt that they should change to plastic immediately.
2. The contents of the kits quickly got "lost" under thighs, inflatable floors, space blankets, etc. The addition of pockets along the interior of the raft's tubes would facilitate storing the goods in an organized fashion after they were unpacked from their enclosure. The numerous accounts of survival kit contents being lost due to raft capsize leads us to believe that such pockets should have secure closures.
3. Water was stored in sachets (small plastic pockets with several ounces of water each) and in cans (Avon Offshore). The sachets were difficult to open without spilling some of their precious contents, and were practically useless when partially full due to the ease with which they spilled. The cans held about one pint apiece, and came with lids to allow them to be sealed when partially consumed. Water was easier to ration in the sachets due to the numerous, individual containers. The Switlik and Avon Coastline rafts did not contain any water.
4. Paddles were included in all kits, although it was not obvious what one was supposed to do with them. A small fishing rod would make more sense. Due to the substantial ballasting of the rafts, it would be very difficult to paddle the rafts for any distance. We believe that the inclusion of paddle comes from the desire to paddle away from a burning boat which, in calm conditions, might be a nice ability to have.
5. First aid kits were small, and of undetermined value. The Plastimo kit, although tightly sealed, was impossible to re-seal after the tape had been removed even though contained in a "Tupperware-like" container. The Avon kit was stored in a cardboard box, encased in a zip-lock bag. The Switlik and Avon Coastline rafts had no kit, other than seasickness pills.
6. The Plastimo survival kit came in a large, milky plastic bag with Velcro® closures at one end. This made it easy to inventory the contents, and to store them. The Switlik kits came in International Orange cases with drawstrings that were useful as signaling devices, bailers, etc. Almost all of the contents of the Switlik kits had thin lanyards on them to secure them to the raft.
7. The Avon survival instructions, including such critical information such as how to cut the painter and how to deploy the drogue, were packed inside the equipment package where they were found much later than these operation needed to be accomplished. The paper was flimsy, and deteriorated noticeably in the wet liferaft interiors. If any of the information was actually critical to the survival of the occupants, it would have been discovered after the fact.
8. The Switlik Coastal included a copy of its brochure in the survival package. This was laminated in plastic for waterproofness, and it covers many of the design details that might be unnoticed by the rafts occupants otherwise.
9. Fishing kits were extremely marginal, and we did not take the opportunity to try catch the salmon that boats in the test vicinity were quite successfully doing. One Avon team reported "no fishing!!! (for an offshore!)". In fact, there was a fishing kit, but it was so small that it was overlooked in the kit.

In conclusion, we were reminded of Michael Greenwald's comment that "Flares are like blessings; you can't have too many of them." Most rafts had three...

PERSONAL VOLUME/FLOOR SPACE

Except on three occasions, all rafts were crewed by three or four persons. The liferafts were all six person rafts. It was felt that it would be undesirable to put any more than four persons in any but the Switlik raft, with three being more comfortable. One team commented that comfort and volume of the Avon Offshore were "adequate - small for four adults - impossible for 6 persons". In rafts containing four crew members, they afforded enough room to barely stretch one's legs out 90°. Most occupants sat in a slightly crouched position with their knees bent. The Plastimo and Switlik rafts seemed to have the most floor area of the four rafts tested. In them, four large men could sit with legs extended without overlapping one another. All participants thought it would be difficult to sleep on board.

The dual-opening design of the Switlik made it feel like there was more room than any of the other rafts. With one person in each end, and other team members near the doors, it was actually possible to have six people in relative comfort. When loaded with eight, the Coastal still had freeboard, although occupant's legs were overlapping and cramped.

Headroom was at a premium in the single arch tube rafts, but the Plastimo raft had substantially more than either of the two Avons. It was actually possible to sit erect under the canopy in the Plastimo, without hunching over. This seemed to help with the nausea felt by crew, who preferred to sit more upright. The increased headroom was largely due to a taller arch tube, positioned on top of the double buoyancy tubes. This probably gave the raft more windage as well.

The Avon Coastline raft, due to its single tube construction, was very cramped on the windward (non-door) side. Its arch tube seemed to have more vertical sides, but to use that headroom you had to practically lean against the arch tube. The worst area was by the observation port on the weather side of the raft, where the canopy reduces headroom like the sides of a pup tent. Positions by the door of the raft became in high demand due to the extra overhead room.

The Switlik Coastal, with its two arch tubes, did not have the same "A-frame Cabin" feeling that the other rafts had. Except at the far each ends of the raft, it was possible to sit erect almost anywhere within the raft. It was the most comfortable, in our opinion.

WATER SHIPPED WHILE AT SEA/BAILING

None of the rafts leaked water in through their floors or tube seams, except for the Rescue Platform as previously mentioned. That water which did get inside came in primarily through the doors while crew members were entering or exiting the rafts. Crew members who were seasick also pushed the gunwale down to the point that it allowed water in. The seams in the canopy of the Avon Coastline were not taped, and let a steady drip into the interior. The Avon observation ports, as noted before, also let in water unless they were carefully tied.

Rafts were bailed almost exclusively with sponges, which were effective down to the last drop. One crew member would stand in the center of the floor, while two spongers mopped up the water around his feet. As the different teams visited each raft, each would begin a different routine depending on the condition of the crew members. Teams that did not suffer from seasickness generally spent more time inside the canopies, working on bailing, operating the electronics and general housekeeping.

The rafts with pillow-style floors tended to collect water in the numerous pockets, while the drop-stitch floor of the Switlik tended to shed the water to the perimeter and leave the sitting surface dry.

One team resorted to using a deck shoe as a bailer when they could not find the bailer in the raft.

Several teams decided that it was too difficult or uncomfortable to bail the rafts, and put up with a few inches of water in the bottom. Other teams actually compressed their canopies and sat on top of them to avoid the water inside the rafts, and to enjoy the fresh air outside. None of the teams used the designated bailing devices included in the survival kits: a yarmulke-looking scoop in the Avons, and a small dinghy scoop in the Plastimo.

The Rescue Platform shipped and leaked gallons of water, in fairly calm seas, which collected in the center of the floor. It might make more sense to have a large hole in the bottom of the floor to actually let the water out. Although this sounds like a Three Stooges solution, the buoyancy of the inflation tube may actually have been holding the water inside at a higher level than that on the outside.

West Marine Heavy Weather Liferaft Test June 22, and July 4, 1991

Life Raft Study provided by [West Marine](#),
for additional information dial (800)BOATING (800)BOATING
© West Marine Products, Inc. 1994

(continued from [previous page](#))

WATERMAKERS

Recovery Engineering supplied several watermakers for testing, and we included a Survivor 06 and Survivor 35 in each raft. Although the value of these devices has been well documented in recent liferaft survival stories, the critical nature of water on long-term survival may have been under-appreciated by the testers. None the less, each team made a modest amount of water and everyone consumed the water produced.

Several participants complained about the slightly salty taste of the water, while others thought it was tasteless. According to Sarah Black, from Recovery Engineering, the slightly salty taste disappears after two minutes, although it is not harmful in the meantime. Testers who consumed water after longer periods of operation did not object to the taste. Also, most "tasters" put the plastic output tube directly into their mouths, which had a taste of its own.

In tests conducted after the on-the-water test, no one objected to the taste of the water after three minutes if consumed from a separate container. Both the Survivor 06 and 35 met their design outputs of 6 and 35 gallons per day in our tests.

The larger Survivor 35 was judged easier to use, due to its long handles and high output. The Survivor 06, although much more practical for liferaft use due to its compact dimensions, was not nearly as comfortable to use. One tester commented that it was "difficult, not exhaustive". Its short handle stroke and uncomfortable handle were cited as reasons.

Watermakers like the Survivor 06, like EPIRBs, were deemed mandatory for inclusion in Abandon Ship Bags. As one observer pointed out about water that was supplied in the liferafts, "with water, when it's gone, it's gone".

LIFEJACKETS

All participants were required to wear lifejackets at all times, and most of them elected to wear inflatables made by SOSpenders or other high-buoyancy inflatable designs. The compact nature of the SOSpenders lifejackets when deflated gave the occupants of the rafts much more room, and allowed them to move about more easily. It was hard to imagine how the teams could have fit in the rafts had they been wearing Type I devices or Navy-type 35 lb. PFDs. Despite the frequent waves and splashes that the windy conditions brought on, no automatically inflating SOSpenders inflated accidentally. The tester's

experiences with the inflatable lifejackets further strengthens our opinion that modern, high-quality inflatable lifejackets like those from SOSpenders are ideal for offshore boating.

One the second day of testing, all participants inflated their vests to see if they could still fit in the Switlik Coastal. In fact, they could, although with little room to spare. We were surprised at how much our visibility was blocked in a downward direction by the large inflation chambers.

SEASICKNESS

Four participants got sufficiently seasick to vomit. About half of the other suffered lesser symptoms, including the usual dry mouth, thick tongue and "wishing they were dead" attitudes. The quick, undulating motion of the liferafts, combined with limited ventilation and a stuffy, humid environment all contributed to the motion sickness. Those who actually closed the liferaft doors were quick to reopen them - 10 minutes in the closed position was the record. Rafts with more visibility, and larger openings, seemed to help the occupants to control their nausea.

VHF RADIOS

We did not test VHF handheld radios as such, but included them so that we could maintain communications with the support vessels in case of emergency. The radios worked well although the use of waterproof bags made their operation difficult. Several users removed their radios from the waterproof cases, which inevitably resulted in wet radios. Several radios had belt clips on them which users used to hang the radios on the inner lifelines of the rafts. This worked well, because it kept the radios dry, yet placed close by where they could be heard.

The ACR SOLAS radio was used in our very wet inflatable support boats and worked perfectly. This is a specialty radio with extremely long storage life batteries, designed to be packed in a liferaft or lifeboat for emergency communications. Its construction is similar to the ACR RLB-21 EPIRB, with a fully sealed exterior. The microphone, for example, is behind a plastic membrane, and is sealed completely. The only drawback with this product is that it must be returned to the factory for battery replacement, a process that is required every five years assuming that the radio is not used in the meantime. Battery life is stated as 8 hours using the industry standard 5% transmit, 5% receive, 90% standby mode.

EPIRBs

It was our intention to test a 406 MHz EPIRB during the test, using what is known as a "test protocol" version of the EPIRB. Since 406 EPIRBs have a serialized code in their transmit message, this code can indicate that there is not a real emergency so that SAR resources are not summoned. We worked with the Mission Control Center in Suitland, MD over a period of time, trying to figure out how we could simulate an emergency without wasting Coast Guard, NOAA and other resources during the test. The Chief at the MCC was concerned about our drawing conclusions about the system responsiveness based on a single incident, due to the random nature of satellite passes over any one spot on the globe. Although helpful, he did not give us permission to set of the EPIRB.

Alden Electronics was very supportive in this area, however, by supplying us a normal as well as a test protocol 406 MHz EPIRB. We could not judge Alden Satfind's effectiveness, but we remain convinced by the numerous reports of rapid rescues that the 406 MHz EPIRB must be considered mandatory safety equipment for offshore boats. Its combination of a precise signal, unique ID code and worldwide coverage make it a very cost-effective piece of safety gear.

GPS

Magellan GPS receivers were used to track the drift of the liferafts, and they worked perfectly. With horizon to horizon visibility, all available satellites were found. The slow drift rate of the rafts made the velocity calculations marginally useful, but the position reports accurately tracked the liferafts as they drifted with the wind.

The waterproof construction of the Magellans was especially critical in the rafts because everything, no matter how carefully segregated, got wet. Users were so confident in their construction that they actually let them lie on the wet floors, due to the lack of pockets in the interior of the rafts.

FLARES

After gaining permission from the Coast Guard, we set off several flares while en route from our test site. The first flare fired was a SOLAS-grade Pains-Wessex Red hand flare. Its ignition system is very simple, and can be done with cold hands. The flare is extremely bright, such that observers in bright daylight could not stare at it. The smoke and flame had the annoying tendency to run along the backside of the flare tube, resulting in singed hand hair. This problem was eliminated when the hot end of the flare was held within 30° of downwind. A protective glove would have been nice. The flare continued to burn when under water.

SOLAS-grade Pains-Wessex Red Parachute flares were also tested. No one was prepared for the incredible speed with which these flares shot skyward, nor with how high they reached. Their paths were almost perfectly vertical, showing little effect from the wind. Their brilliance, due to the bright sunshine, was not very impressive, although observers from the other support boat said that the flare appeared to be an "intense red dot" at substantial altitude. They were about one mile from the site at the time of launch. Despite the propulsion of the rocket motor, and the proximity of one's hands to the flare, no discomfort was felt by the person launching either of the two parachute flares.

A SOLAS-grade smoke canister was also deployed. This produced a thick stream of bright orange smoke, which traveled downwind very quickly in the 25 knot winds. Observers judged that it was effective, although it would be more so on a day with less wind and/or from an airplane's vantage point.

Finally, a Skyblazer USCG-approved meteor flare was launched. This left the person who launched the flare's hand with powder burns from the launch charge. The flare was completely missed by all observers on the two nearby boats, while only a few members of the other support vessel could see the flare at 2/3 of a mile. It was hard to understand how to hold the flare tube so that it could be held securely, yet not get one's hands close to the muzzle of the device.

A protective glove constructed of leather or similar fire-resistant material, would have provided protection to the person launching the flares, and is highly recommended.

RAFT PICK-UP

After five hours on the water, and with sea conditions becoming more threatening, we elected to pick-up the teams and rafts and take them to shore. Teams retrieved their drogues to reduce the chance of getting the tethers in the propeller.

After retrieving the liferaft teams, the rafts were hauled aboard the Grady-White fishing boat. This was challenging, due to the heavy ballast pockets which were filled with water. As the closest edge of the raft was lifted, someone would reach under the raft and compress the ballast bag to spill the water. The rafts' stability was quite evident, due to the struggle to get them on board. It was also challenging to figure out how to deflate the rafts, with the Avon Offshore and Switliks having the only clearly-marked deflation valves.

The rafts drifted approximately four miles over the duration of the test. The trip back to shore, in 25 knots of wind and 5 foot breaking seas, was lengthy and rough.

CONCLUSIONS

Nearly all boaters who travel out of sight of land should have some sort of survival raft in our opinion. The numerous documented cases of vessels sinking, due to known causes or unknown, and the short

time that a person can survive without protection makes liferafts a necessary part of offshore survival gear. We would feel relatively secure with any of the four liferafts tested, when augmented by an EPIRB and a Survivor 06 watermaker.

The Rescue Platform is preferable to treading water, but we are concerned by its tendency to fill with water. The hypothermia protection it provides its occupants, as well as greater visibility that it provides rescuers, are valuable, but we would strongly recommend a canopied raft for ocean use - even in sheltered waters.

The other four rafts would provide substantial protection from the elements for a small crew. In all cases, we think that an inflatable floor is mandatory, even in warm waters. Unless you experience the chill of a single floor raft for several hours, you cannot appreciate the additional comfort that an inflatable floor provides.

The Plastimo raft stood out for its higher headroom and large single door. The survival kit was also packed in a very useful way, with a resealable bag to contain the components. Its construction was unique, and leads us to believe that patching may be very difficult.

The Avon Coastline was the least expensive liferaft in the test, and was similar in quality to other Avon products. It suffered from having the least amount of headroom, low freeboard, and a poorly packaged survival kit.

The Avon Offshore was a robust, comfortable raft. Its tufted floor was reasonably comfortable, and the reserve buoyancy provided by twin independent tubes provided a feeling of security. The small opening, and somewhat flimsy closure, make the canopy design seem outdated in comparison with the Plastimo and Switlik rafts.

Although there were aspects of each raft that West Marine associates particularly liked, it was our unanimous opinion that the Switlik Coastal liferaft was a superior product. In particular, we liked the floor design, the headroom and adjustability of its canopy, the way its safety products were packaged, its baffle design, and its rugged valise. It appears to be a modern, very high quality innovative design that had no weak spots in its implementation. Although priced slightly higher than the Avon Coastline, we believe it is a superior product, and in most ways superior to the more expensive offshore rafts. We would caution buyers to augment its survival kit, but we would give the same advice to anyone buying a liferaft.

PARTICIPANTS:

ProMotion:

Dave Pease, Mail Room
Peter Costello, Catalog Marketing (both days)
Geoff Eisenberg

Suivez-Moi

Mike Greenwald

Team One

Brian Bos, Catalog Marketing (both days)
Kevin King, Plastimo
Sue Bowman, Customer Service (both days)

Team Two

Brian Braine, Plastimo
Evan Baxter, Repair Center (both days)
Rob Ingram, Store Planning
Larry W. Curtis, Avon-Seagull Marine

Team Three

Chris Smith, Catalog Sales (both days)
Jerome Steed, Store 024
Sarah Black, Recovery Engineering

Team Four

Bruce Brown, Switlik
Gary Williamson, Purchasing (both days)
Mary Sarratt, Admin. Services (both days)

Team Five

Dave Kanard, Formerly of Store 001
Chuck Hawley, Marketing (both days)
Mike Mullin, Plastimo
Scott Swanby, SOSpenders

Team Six

Elaine White, Customer Service (both days)
Mike Cunningham, Catalog Sales
Paul Bannister, Plastimo
Howard Wright, Port Supply

Inflatable Operators

Bill Wald, Merchandising
Dave Ungerecht, Purchasing
Steve Miller, Purchasing