Life Raft Suggestions for the Zodiac Corporation

Based on Experiences of the Survivors of the Loss of the SV Concordia, February 17, 2010

The following comments were provided by the survivors and are offered in the spirit of constructive dialogue. Crew comments are in quotation marks. Suggested solutions to the problems noted are in all capital letters. We appreciate the chance to make these observations and hope that the Zodiac Corporation will be able to use them during what we are sure must be continual review and upgrading of your safety and lifesaving products.

Crew of the SV Concordia

Design

- Canopy
  - ”In regards to the liferafts, the only thing that I could recommend (as ultimately it worked perfect to save us) is that other port holes or windows might be beneficial. I know that when I had my little attack (panic, overheating, not too sure) that it was difficult to get to a porthole, and that if there were a couple others strategically placed, it might make it easier to seek fresh air.”
  - “When people needed more air, the canopy was cracked open, but it usually popped off the pontoon and came fully open. Those sitting under the opening soon complained of being chilled.”

    SUGGESTION: CONSIDER PROVIDING AIR VENTS IN THE CANOPY THAT COULD BE INDIVIDUALLY CONTROLLED BY A PERSON SITTING OR KNEELING.

  - “... the canopies would constantly come un-velcroed and pop open with the movement of the raft in the sea and the people in the raft, resulting in rainwater and waves spilling inside the raft.”
  - “The large canopy openings were invaluable when we were abandoning ship as it was possible to have two people stand side by side in the opening to pull people in the water aboard the raft. However when drifting at sea, the large openings were more problematic. Whenever someone wanted to get more air, to stand upright for a few minutes or to urinate over the side, the entire large “hatch” on one side or the other had to be opened which allowed wave tops and rain into the raft. The canopy “hatches” were difficult to close, requiring someone to lean over the side and force the covers’ lower edges over the round of the pontoon.”

- "Loops on the outside of the canopy, at the top, would be useful to tie extra lights, radar reflectors, etc to."

  SUGGESTION: LOWER EDGE OF CANOPY COULD BE ATTACHED TO THE PONTOON ALL THE WAY AROUND AND HATCHES OF DIFFERENT SIZES MIGHT BE BUILT IN WITH INDEPENDENT CLOSURES.

- Canopy support
  - "One thing that I wouldn't necessarily swap with the Beaufort raft is the canopy support system. The Beaufort one uses a thinner air-filled "frame" with four "posts" to hold up the canopy. I didn't think to test it out, but something that is very important in a liferaft is to be able to stand up outside the canopy to check a potential ship or aircraft sighting, to fire flares or even to check on, fix or replace the external strobe light/radar reflector/SART etc and a strong canopy support system is required for something to lean against to prevent falling out of the raft or falling over on top of everyone else inside the raft. The Zodiac system needs to be made more sturdy as it did still collapse when leant on, however at first glance it looks like it might be ahead of the Beaufort version."

    SUGGESTION: CANOPY ARCHES SHOULD BE AS RIGID AS POSSIBLE

- Stowage
  - "There could be pockets on top of the air chambers to keep equipment in when the bags are opened."
  - "The only suggestion I have at this point is that they put the equipment in pockets around the edge of the pontoons in clearly labeled containers. The problem I see with this is that it would make sitting against the edge a bit uncomfortable, though it would make finding things a lot easier."
  - "Accessing equipment and gear readily was a problem. The bags the emergency equipment was stowed in were not water proof; I think one bag was velcroed and another was simply tied with twine, both bags took on water (as the rafts were constantly wet.) Finding equipment or supplies in the long narrow bags was difficult and often much had to be unloaded onto the mass of bodies and legs to get at something underneath, and then it all had to be located and put back in again."
  - "Storage system for supplies and equipment in the raft: With 20 people in a raft that size it becomes very difficult to keep track of supplies and equipment when bodies are piled all over each other and no one can stand up easily to look at what they are lying on top of. LOTS of pockets attached to the canopy support bars (best) or at the very least to the insides of the top pontoon (not so good because everyone will have to be leaning on these still) are needed to make the equipment more accessible - it was literally impossible to find some of the equipment for extended lengths of time during our ordeal."
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SUGGESTION: CONSIDER INSTALLING EXPANDING POCKETS ALONG THE PONTOONS' INTERIOR PERIMETER CLEARLY MARKED WITH THE ENCLOSED GEAR (SEA ANCHOR, QUIOTS, AIRPUMP, BAILERS, MEDICAL, SIGNALING GEAR, ETC.), or…

SUGGESTION: STOW GEAR IN A MULTI-COMPARTMENT BAG TIED DOWN IN THE MIDDLE OF THE RAFT, WITH EACH COMPARTMENT INDIVIDUALLY ACCESSED AND CLEARLY MARKED

- Rain Collection System
  - "The valve inside to plug the collecting hole was deformed with age or heat so that it no longer sealed... " "
  - Creating a semi-sealed "tank" in the canopy to store a quantity of rainwater rather than having to find containers to store it in would be most useful."
  - "We had difficulty sealing off the water lines from the canopy collectors when not in use. "

SUGGESTION: PROVIDE POSITIVE CLOSING WATER CATCHMENT VALVES; PROVIDE A PLUMBED IN WATER CATCHMENT BAG

Construction

- Floor
- Pontoon
  - "On the afternoon of the second day, the lower pontoon of our raft suddenly blew out a seam and deflated. The split seam was below the waterline and although we dove on it to effect a repair, this could not be done with available equipment. Perhaps this pontoon was damaged while we were trying to get clear of the ship or lines securing the rafts together put extra stress on the seam. The loss of this pontoon and its attendant floatation forced evacuation of several people from the raft (into the 8-man raft and extras into the Captain's raft.)"

  SUGGESTION: PERHAPS THE PONTOON COULD HAVE MORE INDEPENDENT COMPARTMENTS SO THAT DAMAGE TO ONE SECTION WOULD NOT DEFLATE AN ENTIRE PONTOON. INSTALL ONE WAY VALVES IN INTERNAL PONTOON BULKHEADS?

- Canopy arch
  - "The inflatable canopy arch leaked air and had to be pumped up several times. Because the valve was in the middle of the arch, the individual working the pump had to try to stand and balance against the pitching of the raft in order to reach the valve. At times this was almost impossible to do, even with other people acting as props."
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SUGGESTION: CONSIDER LOCATING CANOPY VALVES ON BOTH OF THE ARCH COLUMNS CLOSER TO THE PONTOON

- Towing and securing points
    - "The towing points on the rafts were difficult to access as they were located too far from the canopy openings to easily reach. As a result, the lifeline around the periphery and the web boarding ladder were used to secure the lines holding the rafts together. These were not strong enough and required constant attention to avoid being ripped from the pontoons. When we were alongside the freighters in heavy swells and rough seas (4-6 meters) we found we could not secure the lines sent down to us by the merchant vessel crew without tearing the webbing apart. We resorted to holding the lines by hand, which was incredibly difficult to do as the forces generated would pull the lines from our hands."
    - "The towing points could have lanyards on them to make them more accessible. It was impossible to get to our towing point. It was just too far underwater."
    - "Attachment points and grab-strap systems needs to be drastically improved as these ripped out FAR too easily on the Zodiacs."

SUGGESTION: PROVIDE SEVERAL VERY STRONG SECURING POINTS ON TOP OF THE PONTOONS AT EACH HATCH OR OPENING THROUGH THE CANOPY EASILY ACCESSIBLE TO THE CREW. STRAPS WITH 'D' RINGS?

- Lighting
    - "The interior lighting worked the first night. The switch mechanism was discovered and turned off whenever the lighting was not needed and throughout the day to save battery power. However, the interior dome light did not work the second night. The light was used for about 30-45 minutes the first night."
    - "The exterior strobe lights worked both nights."
    - "Lighting capacity could be more."
    - "The strobe light on the canopy of (RAFT 3) which was un-occupied the first night but tied to the captain's and mate's rafts, was deactivated the first night to conserve power."
    - "The internal canopy light and external strobe light were terrible quality and both failed very quickly."

        - IMPROVE QUALITY OF SIGNALLING AND ILLUMINATION LIGHTING SYSTEMS
        - GLUE A PLACARD/LABEL AT LIGHTING SWITCHES WITH SIMPLE INSTRUCTIONS

Equipment

- Seasickness Pills
  - "The seasickness pills need to be changed to a different type - the taste was so horrific it made many people sick - including myself. Being sick from the taste of the pills was a bigger problem for me than actual seasickness (and I was violently seasick at times)."
- Food & Water
  - "The energy meals were tasty, a bit dry, but good with water"
  - "The packets of water seem to be a good solution for individual servings. We also had several 10 liter bottles of emergency water three of which made it aboard the rafts."
- First Aid
  - We did not actually use any of the first aid supplies as we had managed to retrieve the ship's emergency first-aid bag while abandoning ship
- Flashlights
  - "All of the flashlights in my raft leaked and quickly became filled with seawater and were rendered inoperable. One of my crew had a waterproof LED light on him and we used this. Because we did not have adequate night time lighting and finding anything after dark was nearly impossible, even with the LED, we tried to locate important equipment before dusk and assigned individuals to hold the equipment."

SUGGESTION: IMPROVE QUALITY OF WATERPROOF FLASHLIGHTS PLEASE!

- Bailers
  - "The bailers could be made of stronger stuff"
  - "Our raft was constantly taking on water but we could not locate the source. We bailed more or less continually. The heavier people tended to attract a pool of water in which they had to lie. It was difficult to get the scoops down around feet, legs and bottoms to get at the water. The sponges worked well for this but were slow. We bailed into empty exposure suit bags we took into the rafts and used these to ferry the bilge water to the canopy openings to dump over the side."
  - "This "feature" (self bailing tube) caused nothing but trouble for us. With 20 people inside a raft that size there is no way to completely prevent bodies accidentally leaning on the tube and causing it to flood the raft."

SUGGESTION: PROVIDE AT LEAST ONE TUBULAR PISTON DEWATERING PUMP LONG ENOUGH TO REACH OVER THE PONTOONS WITH 2 METER LONG DISCHARGE LINE

SUGGESTION: REVIEW THE DESIGN/CONSTRUCTION/NEED FOR THE BUILT-IN SELF-BAILING TUBE

- Air pump
    - "We used the air pump several times. In the crowded press of bodies, with people changing places regularly for lookout or to get to the openings, the pump was often misplaced or stowed in a new and inventive way, i.e. somebody would be lying on it and it could not be found. "

      SUGGESTION: PROVIDE A WELL LABELED, DEDICATED STOWAGE POUCH FOR THE AIR PUMP OR STOW THE AIR PUMP ON THE CANOPY ARCH.

- Lines
    - "The painters should float to keep them accessible and to prevent them from snarling in the ballast bags."
    - "One of the most dangerous stages of the abandon ship procedure was getting the launched rafts disentangled from the ship. The painters fouled and caught on everything. Other lines (lifelines along perimeter) and gear on the rafts caught on protrusions, hatches, railings etc. The knives were absolutely essential—can't have enough of them handy!

      SUGGESTION: LINES OF BOUYANT BRIGHTLY COLORED MATERIAL MIGHT AID THE CREW WHILE CLEARING AWAY FROM THE SHIP

- Equipment bags
    - "A number of the bags did not appear to be closed or packed in a waterproof manner and they took on bilge water from the floor of the rafts. The deep, narrow, tubular shape hampered finding things; everything had to be hauled out to get at gear in the bottom of the bags. Once out in the raft, equipment easily became lost among the crowded bodies"

      SUGGESTION: IF PROVIDING A LONG BAG, ZIPPER IT FROM ONE END TO THE OTHER, WITH SEPARATE COMPARTMENTS TO HELP KEEP GEAR ORGANIZED, or…

      SUGGESTION: PROVIDE A CIRCULAR MULTI-COMPARTMENT BAG IN THE MIDDLE OF THE RAFT. ALL COMPARTMENTS SHOULD BE CLEARLY LABELED.

General Comments:

"These are minor details of course. The rafts performed well in adverse conditions at maximum capacity. Remarkable given that one raft had less than half its floatation intact."

"I am very grateful for all the functions of the Zodiac rafts that performed well. The rafts inflated easily alongside the ship. All the rafts inflated right side up. The rafts were quite easily boarded, both from the

ship and from the water. A couple of the rafts took quite a pounding alongside the ship and survived remarkably well (although one pontoon failed later.) 64 people survived nearly two days in the rafts and this might not have been the case if anything major had gone wrong with them."

" An EPIRB and a portable VHF radio should be standard equipment - NOT optional extras!!!!!!!!! A SART would also be a welcome addition to raft equipment. A handheld GPS with a basic chart plotting function would also give ENORMOUS (or not - depending on the situation) peace of mind to be able to know, and especially to report, a position over VHF."