addressed to IMCI for consideration in RSG Guidelines
Date: 1st May 2003

Multihull escape hatches

With reference to the RCD regulations on the exit from a capsized catamaran.

Regulation **3.8 (extract ISO 12216)** regarding safety hatches for escape from capsized multihulls is defined as:

"All habitable multihull craft over 12 metres long shall be provided with viable means of escape in the event of inversion.
All habitable craft shall be provided with viable means of escape in the event of fire."
"Each habitable area of a multihull sailing craft shall have access to an escape hatch capable of being used in the capsized position."

This paragraph does not define the actual way of exit from a capsized catamaran. However, this is being interpreted as having to have an opening hatch of a specified minimum size (450 x 320mm) in the 'INNER SIDE' of each hull, one to each hull, to be in a position (hopefully) just above the waterline of the capsized catamaran (this places it also just above the waterline of the catamaran in the upright position).

This interpretation assumes that the catamaran involved is of the large deck cabin type, joining the two hulls together into one continuous enclosed space without any dividing safety bulkheads. (Exit from such a defined catamaran in 'actual reality' is difficult. Naval officers and safety experts I have discussed this problem with, pointed out that it resembles the escape problems from the interior of a sea crashed helicopter. Because of the difficulties, helicopter crews by regulation require regular annual exit training from an upside down helicopter in training tanks!!).

Not all catamarans are designed with a large deck cabin joining the two hulls into a large volume of possible flooded space.

Some catamarans, including all our designs, are designed in two separate units: two hulls and a platform between, or designed in 3 separate units: two hulls and a separate deck pod cabin mounted between the two hulls.

The reasons for this design construction are: less windage, higher platform clearance, lower centre of gravity increasing overall craft stability, better hull sailing performance, safety in extreme weather conditions due to less windage and less major volumes to flood.

Such catamarans - two units (hulls) or three units (2 hulls and deckpod), can in our opinion use the 'Diving Bell' method of exit in a possible capsize, using the normal deck hatches or entrances into the cabins - see enclosed drawing.

The advantage of the 'Diving Bell' exit is:
1) that normal deck hull entry hatches are large enough for overweight and storm clothed people to pass through,
2) on opening, trapped air does not escape and sink the overturned catamaran lower.
3) the hull sides are not structurally weakened by escape hatches, which are usually placed in the area of most wave impact.
4) Naval and diving experts assure me that it is easy to sit on the edge of a 'Diving Bell', then push down and, if needed, be guided sideways and upwards. The diving depth of usually no more than 50 cm is not considered difficult (see drawing).

The French Catagorisation Authorities have since many years passed our designs for Catagory A, by accepting the Diving Bell principle as exit in case of capsize.

The point has been raised (by Gregoire Dolto) that one cannot exit a diving bell wearing an inflated life jacket. Neither can one exit the catamaran hull through the minimum size (450 x 320 mm) hullside escape hatch wearing an inflated lifejacket, never mind thick sailing clothes. Either way one would need to use life jackets that

are inflated by the wearer after exiting.

For our designs, which are designed with very high stability, capsizing as a danger is third in order of importance:

1) Flooding in case of Collision
2) Fire spread,
3) Capsize

We especially design our boats to have a stability that makes capsize of the larger ones (over 12m) a very, very small risk factor, a point agreed by Gregoire Dolto (I won't tempt fate by saying there is no possibility, but to date there are no known capsizes of our designs over 12m since their inception in 1955 and thousands of designs sailing the oceans - see Annex on Stability). We, as designers, have therefore focussed on safeguards for eventualities 1 and 2, which are definitely an increasing risk when sailing the oceans (more and more containers are lost at sea).

As prevention in eventualities 1 and 2 we use several watertight bulkheads in each hull, generally dividing the living area into two sections by a watertight bulkhead, as well as placing watertight collision bulkheads in the bow (generally 2) and further watertight bulkheads (1 or 2) in the stern. These watertight bulkheads also help in isolating fire for a reasonable period. Each section has a good sized entry/exit hatch of 600 x 600mm (minimum 550 x 550mm), directly to the deck. i.e. a viable means of escape in the case of fire!

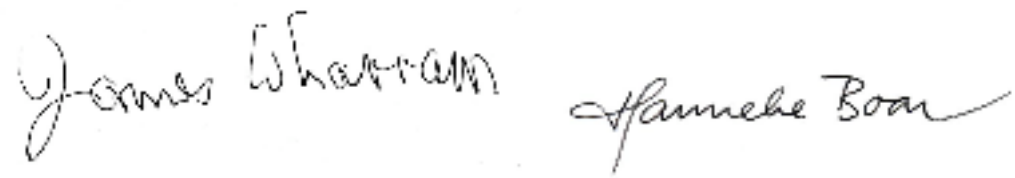
To conform to the ‘escape hatch in the hull side’ approach, necessary on the catamaran with large deckcabin (see drawing), we would need to cut holes in the structural safety/watertight bulkheads (to reach the escape hatch), thereby reducing safety in fire and flooding **and** cut holes (for escape hatches) in the side of the boat in an area where waves hit the hardest. Doing all this for concern No.3) "Capsize", is bad design practice and illogical, as the risk of capsize for **our** designs is far, far

smaller than the other two risks. The diving bell hatch approach to egress in the very unlikely event of capsize has the benefit of a large hatch area for storm-clothed people to easily pass through.

After a discussion with Gregoire Dolto, we also discussed this problem with Andrew Blyth (convener of the ISO stability work group) by phone. He gave the suggestion that instead of an escape hatch, there could be a designated area of hull side which can be hacked through with an axe (fixed nearby for that purpose), in the unlikely event of capsize. This is a suggestion we would find acceptable if the diving bell approach is considered unacceptable, as it doesn't compromise the hullside the way an escape hatch will. There could be such a designated area in every separate living space.

One final point. There have been accidents at sea due to windows in the hullsides having been left open, both on monohulls and multihulls. We feel that having an escape hatch in the hullside close to the waterline, which we notice often gets used as a ventilation hatch in harbour, invites the possibility of it not being shut properly at sea, risking the flooding and demise of the ship.

We hope that this proposal will be considered by the appropriate committees and our alternative suggestion of the diving bell principle can be accepted in Regulation 3.8 *" .....as a **viable means** of escape in the event of inversion"* when applied to Wharram Catamarans.



James Wharram and Hanneke Boon

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Annex on Stability:

We must not loose the point by thinking we can design safe exits out of capsized catamarans and thereby solve the problems of capsize.

We must think of why **some** cruising catamaran types capsize in the first place. At the moment I have my critical eye on some recent “fast cruising catamarans”.

I can authoratively write that the majority of the world’s production cruising catamarans have a high safe stability factor. However, though ISO regulations specify maximum heel angle for power boats and STYX formula limits for bal lasted keel boats there have been no stability limits set for cruising multihulls. So the market is open for new designers/manufacturers wishing to make ‘speed’ a sales point, resulting in low stability, easy capsizing catamarans.

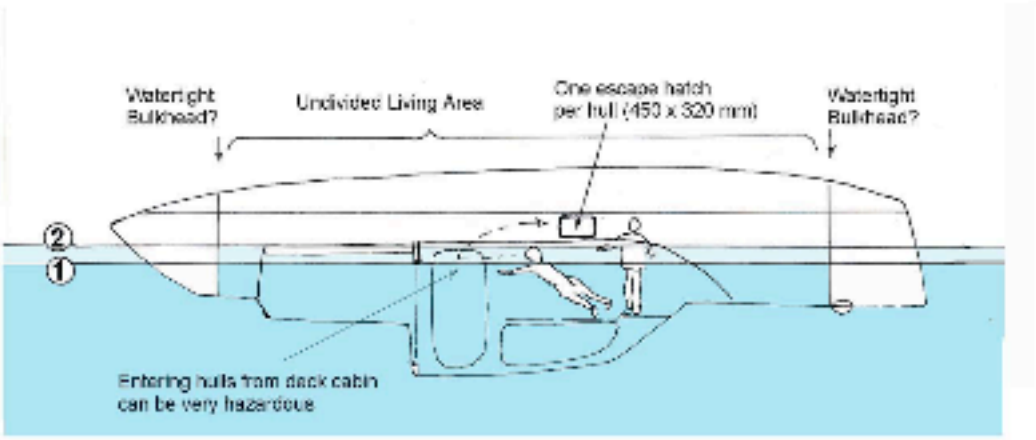
Our statistics gathered over 37 years is that catamarans with stabilities over 18 knots as calculated using the formula in **ISO/FDIS 12217-2, Annex G.1** DO NOT CAPSIZE. It is the cruising catamarans with a stability of less than 18 knots (16 knots when calculated with ‘our’ formula[1], which has a larger safety margin), which have a record of capsizing in gustsin a pleasant force 4, before the owner realises he should reef.

There are records of a number of catamarans with a stability of less than 18 knots Dynamic that have had capsize incidents. This is a fact for all sizes of catamaran, even those of 12m and over. We keep a file of catamaran stability calculations and have found that **any** catamaran with a calculated stability under 18knots has a statistical chance of capsize. This fact has been born out again by two well known ‘high performance’ cruising catamaran designs of over 12m capsizing recently (reported in Yacht Magazines[2]).

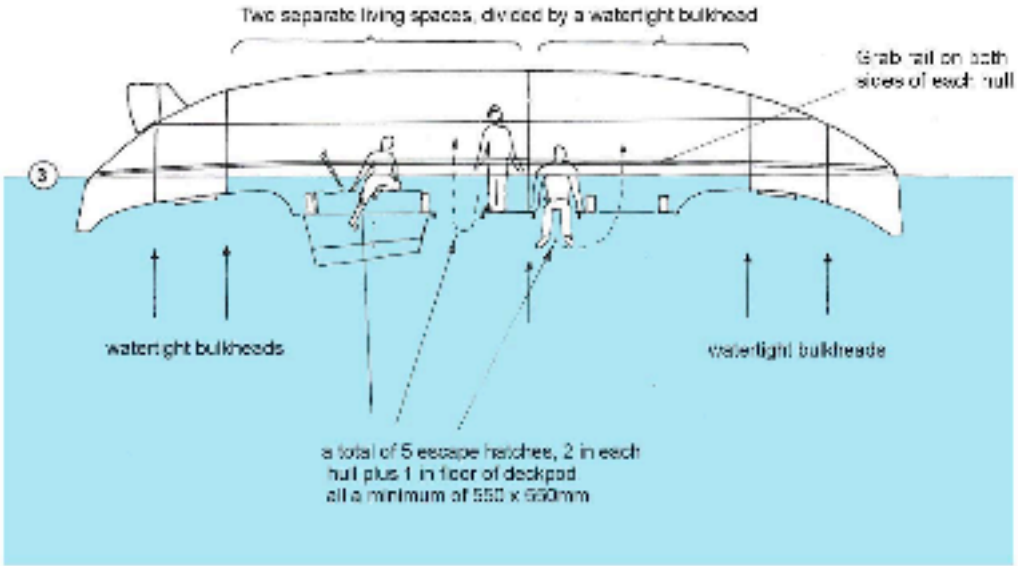
[1] See our article “Catamaran Stability” in Practical Boat Owner, August 1991. This article features a stability formula with an inbuilt dynamic factor allowing for wind gusts, that we were the first to develop in 1976. The ISO formula follows exactly the same method as ours including a dynamic factor (though slightly smaller) for gusts.
[2] Multihull International, July 2001, page 201; Yachting World, April 2003, page 63.

Drawing 1.

1. Approx. Waterline of Capsized Deckcabin Cat
   Level with, or above sill of saloon doorway (as these type of doors are rarely fully watertight, or closed at time of capsize).
2. Water level will rise when escape hatch is opened.



3. Approx. waterline of capsized Wharram Catamaran.
   She will float quite high due to the large watertight compartments in bow and stern and all hatches placed at upper decklevel.



Drawing 2.

1. Approx. Waterline of Capsized Deckcabin Cat
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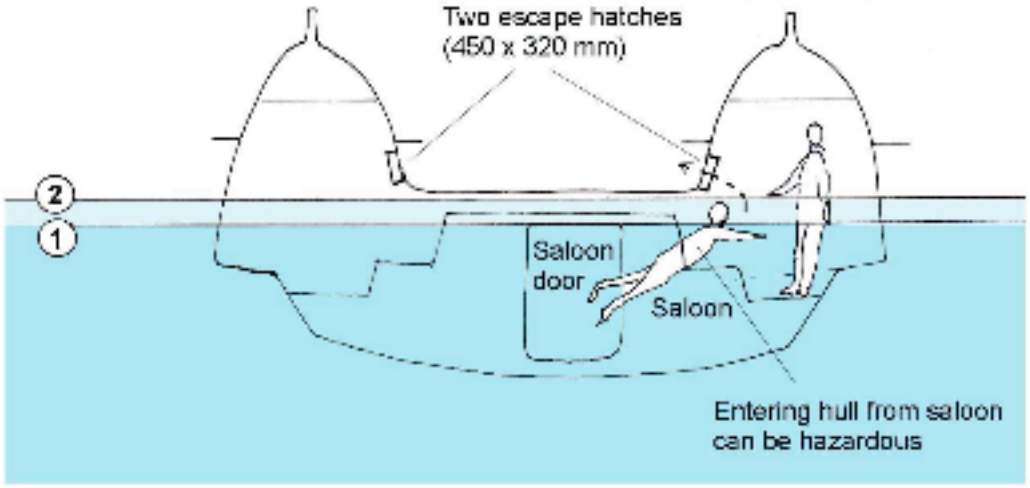
2. Water level will rise when escape hatch is opened.



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