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**REPORT OF INVESTIGATION
INTO THE CAPSIZE OF
YACHT 'RAMBLER 100'
OFF THE CORK COAST
ON
15th AUGUST 2011**

**REPORT No. MCIB/206
(No.9 of 2012)**

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1. SUMMARY

- 1.1 Whilst taking part in the Rolex Fastnet Race, on the afternoon of Monday 15th August 2011, the yacht 'Rambler 100' rounded the Fastnet Rock and was sailing in a SSW direction towards the Pantaenius mark located approximately 8nm SSW of the Fastnet Rock. The yacht was on a port tack with the keel canted to windward and the weather ballast tanks full of water. 'Rambler 100' was beating at a speed of between 12 and 12.5 knots.
- 1.2 Approximately 20 minutes into the beat and having covered approximately 4nm, a loud bang was heard by all on board and the boat heeled suddenly and dramatically to leeward (starboard). She continued to heel over until the mast and sails hit the water. After momentarily slowing, the boat quickly turned turtle coming to rest in an inverted position.
- 1.3 Of the 21 crew members on board, 11 were on deck and 10 were below decks at the time of which 5 were in their bunks. 16 of the crew managed to climb onto the inverted hull, 5 remained in the water and formed a close group.
- 1.4 It soon became apparent that the keel fin had fractured and the major portion of it had become detached.
- 1.5 The Valentia Coast Guard and Baltimore lifeboat commenced search and rescue operations and all 21 crew members were picked up, the 16 on the hull by the Baltimore lifeboat and the 5 in the water by the 'Wave Chieftain', a dive boat chartered by another race competitor to take photographs as they rounded the Fastnet Rock. One crew member, Ms. Wendy Touton who had been in the water, was suffering from hypothermia and was airlifted by Coast Guard helicopter R115 and taken to Tralee General Hospital, all other crew were taken to Baltimore, Co. Cork.
- 1.6 The scope of this investigation and report does not investigate the reason for the keel failure, only the fact that it failed causing the capsizes. Further analysis is being carried out on the reason for the failure by the appropriate authorities.



'Rambler 100'
at sea

2. FACTUAL INFORMATION

2.1 Vessel description

Class of Vessel:	Canting Keel Water Ballasted Monohull Maxi Racing Yacht	
LOA:	30.5 m (100 ft)	
Beam:	7.4 m (24.7 ft)	
Draft:	5.7 m (18.7 ft)	
Displacement:	33 Tonnes (72,753 lbs)	
Mast Height:	47 m (154.2 ft), deck stepped	
Water Ballast:	Tanks on either side of the hull each capable of holding approximately 8 tonnes of water ballast	
Underwater: Appendages:	Steel deep fin canting keel with lead 'T' bulb, white in colour	
	Twin retractable daggerboards, white in colour	
	Twin rudders, white in colour	
	Retractable propeller and propeller shaft	
Hull Colour:	White	
Flag of Registry:	Cayman Islands, U.K., US Sail No. USA25555	
Owner:	Speedboat Racing Ltd Campbells/Campbell Corporate Services Limited 4th Floor, Scotia Centre, P.O. Box 884, George Town, Grand Cayman, Cayman Islands	
Skipper:	George David	
Crew:	Erle Williams	Joe Fanelli
	Peter Isler	Wendy Touton
	Stu Wilson	David Petersen
	Mick Harvey	Justin Clougher
	Aubie vanBeuren	Jerry Kirby
	Tim Dawson	Chris Higgins
	Bob Wylie	Kyle Lyman
	Mike Mottl	Duncan Maitland
	Scott Beavis	Andrew Taylor
	Nathan Hislop	Jan Dekker

- 2.2 For promotional purposes each boat taking part in the Rolex Fastnet Race, including *'Rambler 100'*, was equipped with a tracking device supplied by Yellowbrick. This device automatically updates the vessels position every 15 minutes and allows interested parties to follow the race online via a website. These trackers can suffer from time delays and occasionally fail to respond to a request for an update and can thus sometimes appear to stop for periods. This apparent stopping of a vessel on the website is not considered a cause for concern as the system is known to suffer from these problems and is not relied on to give accurate data.
- 2.3 *'Rambler 100'* was equipped with AIS.
- 2.4 *'Rambler 100'* was equipped with two canister type liferafts, each capable of accommodating 12 crew. Both liferafts were stored in a custom built carbon fibre box mounted at the rear most part of the cockpit. They were not equipped with hydrostatic release devices. They were stored in a box as previous experience had shown that when they were secured directly on deck, the constant flow of water through the cockpit when travelling at speed had caused one to become dislodged and lost overboard.
- 2.5 *'Rambler 100'* was equipped with safety equipment to comply fully with the ISAF Special Offshore Regulations category Mo2 as required by the RORC for the Rolex Fastnet Race in particular with regard to "*Section 4 - Portable Equipment and Supplies for the Yacht*", "*Section 5 - Personal Equipment*" and "*Section 6 - Training*" (Appendix 7.2). It is however noted that, although installed, Satcom C, was not turned on.
- 2.6 The training of the crew of *'Rambler 100'* exceeded that required for the Rolex Fastnet Race, which is classed as an ISAF Category 2 event in so far that 11 of the crew had completed an ISAF Offshore Personal Survival Course and prior to their Transatlantic Race in July, a professional safety trainer had been hired to conduct live Man Overboard and Abandon Ship drills whilst underway. All of their personal safety kits had also been professionally inspected and re-packed.
- 2.7 There have been a number of keel failures on one-off design yachts. Many of these have been found to have been caused by weld fractures.
- 2.8 Any reference in this report to the ISAF Offshore Special Regulations (OSR) refer to the 2010/2011 edition of the ISAF OSRs which were in place at the time of the incidents.

3. NARRATIVE

3.1 Events prior to the Incident

- 3.1.1 *'Rambler 100'* left the starting line of the Rolex Fastnet Race off the Isle of Wight, England, at 13:10 hrs on Sunday 14th August 2011. The course for the race involved leaving the Solent, rounding Land's End and continuing on to round the Fastnet Rock off the southern coast of Ireland before rounding the Pantaenius offset buoy, 8nm SSW of Fastnet and proceeding around the Isles of Scilly to finish off Plymouth, England.
- 3.1.2 *'Rambler 100'* arrived at the Fastnet Rock and rounded it, leaving it to port, at approximately 17:17 hrs on Monday 15th August. She was the first monohull to round the Rock.
- 3.1.3 Having rounded the Fastnet Rock, *'Rambler 100'* came onto the wind to beat the approximately 8nm to the Pantaenius offset buoy which she intended to leave to port before bearing away and heading in the direction of the Isles of Scilly. The navigator gave the information that they would continue for 29 minutes on port tack, then 4 minutes on starboard before rounding Pantaenius and freeing off onto a close reach. The boat was making approximately 12 to 12.5 knots of speed at this time. The keel was canted to windward and the weather ballast tanks were filled with approximately 8 tonnes of water.
- 3.1.4 Those off watch were below deck as was the navigator who was seated at the nav station. The navigator had informed the crew that they would be tacking soon so those in their bunks were preparing to move to the other side of the vessel as she tacked.
- 3.1.5 At approximately 17:40 hrs, a loud bang was heard by all on board and the boat heeled dramatically to starboard. Within 15 seconds the boat was laid on her side with her mast and sails in the water.

3.2 The Incident

- 3.2.1 Those below deck were thrown to the low side as the boat capsized. Three of the crew on deck managed to climb over the lifelines onto the hull as the boat heeled, the others, including Mr. David and Ms. Touton, were either thrown or jumped into the water and swam clear as the boat came over.
- 3.2.2 The navigator attempted to send a 'MAYDAY' call on the installed VHF; however, as the mast head was now in the water, the broadcast was not heard. He made a further attempt using a handheld VHF which was not completed before he had to make his escape from the capsized boat. Unfortunately, it was lost when he tried to hold onto the upturned hull after swimming clear.
- 3.2.3 The boat turned turtle rapidly, in less than 60 seconds. Those below deck crawled along the companionways to the hatches and swam out below the

lifelines to surface alongside the boat. They were helped on to the upturned hull by the 3 crew that were already there. Most of the crew who had been below deck were not wearing their foul weather gear and had not been able to access their PFDs as the boat turned over.

- 3.2.4 Five crew members, Mr. Joe Fanelli, Mr. Stu Wilson, Mr. Mike Mottl, Mr. George David and Ms. Wendy Touton were unable to reach the now inverted boat and were rapidly being swept away in a North-Easterly direction due to the effects of the wind and seas. They formed themselves together as a group and tied their PFDs together with the tethers fitted to the jackets.
- 3.2.5 In accordance with the RORC Prescription requiring PFDs to be worn when the mainsail is reefed, all those on deck were wearing PFDs and foul weather gear. The crew later commented that the PFD is not properly effective without the use of crotch/thigh straps.
- 3.2.6 None of the three 'grab bags' containing survival aids could be reached by the crew escaping from below. Two of the bags, stored under the navigators seats at the nav station, contained EPIRBs.
- 3.2.7 There was no time to attempt life raft launch from the deck. After the hull inverted, access to the rafts was prevented by the sides and rear of their box. Furthermore, the rafts have positive buoyancy preventing their removal from the box with the hull inverted. In addition the sea conditions impeded access efforts.
- 3.2.8 It was not possible to deploy the Horseshoe lifebelt or Lifesling from the upturned hull.
- 3.2.9 No attempt was made to reach the ship's EPIRB installed under the aft hatch as the motion of the upturned hull made it too risky to dive under.

3.3 Events following the Incident

- 3.3.1 As each member of the crew escaped from the capsized boat or managed to swim alongside or to the transom of the vessel, they were helped onto the hull by those already there. Ultimately, 16 of the 21 crewmembers managed to climb onto the upturned hull. Most of the crew who had been below deck were off watch and were without either foul weather gear or PFDs.
- 3.3.2 The 5 remaining crew could not be reached from the vessel as they were carried away by the wind and waves.
- 3.3.3 The survivors on the hull managed to obtain a line from the cockpit and it was strung from the port rudder to the starboard daggerboard to provide some security for the crew.
- 3.3.4 At approximately 17:45 hrs, two PLBs were switched on, both on top of the upturned hull.

- 3.3.5 At approximately 18:09 hrs, '*ICAP Leopard*' (another 100 ft maxi yacht and competitor in the Fastnet Race) passed within 400m to leeward. All attempts by the crew on '*Rambler 100*' to attract their attention by hailing or using the lights and whistles attached to their PFDs failed. It later transpired that those who used the whistles attached to their PFDs found them to be ineffective.
- 3.3.6 About 5 minutes later, two Volvo 70 class yachts, '*Groupama*' and '*Abu Dhabi*' and later an IMOCA 60 class yacht all sailed by to leeward. Again, all attempts to alert them failed.
- 3.3.7 At 18:29 hrs, MRSC Valentia was advised of a PLB (406 MHz) hit in the Fastnet Rock area. At this time, the information available to MRSC Valentia identified both PLBs as being registered to '*Gigi Barnard*'. At 18:51 hrs, MRSC Valentia put out a CQ (general call) broadcast by VHF. The call was initially for '*Gigi Barnard competing in the Rolex Fastnet Race*'. Also at approximately 18:50 hrs, MRSC Valentia asked the Baltimore RNLI lifeboat to reconnoitre the area where the PLB was located. The lifeboat was in the area of the Fastnet Rock on exercises at the time and also had a photographer on board who was photographing the yachts rounding the Rock.
- 3.3.8 MRSC Valentia declared 'PAN PAN' at 18:51 hrs.
- 3.3.9 At this time, there was a feeling amongst the Coast Guard and RNLI that a PLB may have fallen overboard from a yacht.
- 3.3.10 The navigator on board yacht '*ICAP Leopard*' was listening to the VHF broadcasts and realised that '*Gigi Barnard*' was the point of contact for George David, skipper and owner of the yacht '*Rambler 100*'. This information was passed on to MRSC Valentia. '*ICAP Leopard's*' navigator also gave MRSC Valentia the satellite phone number for '*Rambler 100*'. It was also noted at this point that '*Rambler 100*' was no longer visible on AIS.
- 3.3.11 At 19:30 hrs, after making several unsuccessful attempts to contact '*Rambler 100*' by VHF on Channel 16 and satellite phone, MRSC Valentia declared 'MAYDAY' and tasked Coast Guard Helicopter R115 from Shannon. The Baltimore lifeboat was also en route to a new position (51° 21.10' N, 09° 39.15' W) supplied by MRSC Valentia. They also made repeated calls to '*Rambler 100*' on Channel 16, but received no response. Visibility was down to approximately 0.5 nm in fog.
- 3.3.12 At 19:46 hrs, one of the lifeboat crew saw a light flashing through the fog. As they approached the light, they could see an upturned yacht. MRSC Valentia was immediately informed. At 20:00 hrs, the Baltimore lifeboat arrived at the yacht at position 51° 20.50' N, 09° 37.80' W to find 16 people on top of the upturned hull.
- 3.3.13 The crew on the hull immediately informed the lifeboat that 5 of their crewmates were in the water and had drifted away. They indicated the

direction that they had last seen them going. The lifeboat quickly searched in the direction indicated (North East of their position) but found nothing and returned to *'Rambler 100'* at 20:10 hrs.

- 3.3.14 In the meantime, MRSC Valentia had tasked the Waterford based Helicopter R117, and the Naval Service vessel *'L.E. Ciara'* which was in the area at the time, to join in the search for the 5 casualties missing in the water. Also asked to join the search was another vessel, the *'Wave Chieftain'*, a dive boat owned and skippered by the Baltimore lifeboat relief mechanic, Jerry Smith which was in the area taking photographs of vessels in the Rolex Fastnet Race.
- 3.3.15 At approximately 20:10 hrs, the Baltimore lifeboat started taking the survivors off the hull of *'Rambler 100'*. This was achieved by using the lifeboat's small inflatable dinghy with lines attached in order to ferry the crew off the hull and to the lifeboat one or two at a time. By 20:20 hrs, all 16 survivors were on board the lifeboat.
- 3.3.16 Once aboard the lifeboat, the navigator from *'Rambler 100'* gave his estimate of the direction the remaining 5 crew members were drifting. At the same time, approximately 20:18 hrs, MRSC Valentia predicted the drift pattern of the casualties utilising the software package, SARMAP and asked the *'Wave Chieftain'* to search on a course of 055° from the position of the upturned yacht.
- 3.3.17 At 20:31 hrs, *'Wave Chieftain'* reported sighting the remaining 5 casualties in the water and proceeded towards them.
- 3.3.18 Using the hydraulic dive platform on the transom of the boat, the 5 crew were taken out of the water and brought on board *'Wave Chieftain'*. It should be noted that the skipper, Mr. David, ensured that his crew were safely aboard before himself being hoisted on to the deck. At 20:42 hrs, all 5 casualties were on board the *'Wave Chieftain'*.
- 3.3.19 Both the Baltimore lifeboat and *'Wave Chieftain'* set course for Baltimore, Co. Cork.
- 3.3.20 On board *'Wave Chieftain'* one of the survivors, Ms. Wendy Touton was noted to be suffering from hypothermia. At 20:59 hrs, it was decided that her condition was critical and MRSC Valentia tasked Helicopter R115 to airlift her to hospital. At 21:27 hrs, R115 winched Ms. Touton aboard the helicopter and proceeded towards Tralee General Hospital, Tralee, Co. Kerry.
- 3.3.21 At 21:51 hrs, R115 reported that due to weather conditions, they were unable to land at the hospital and were proceeding to Kerry Airport.
- 3.3.22 At 22:28 hrs, R115 landed at Kerry Airport and Ms. Touton was transferred to an ambulance and taken to Tralee General Hospital where she made a full recovery.

- 3.3.23 At 21:35 hrs, the Baltimore lifeboat returned to Baltimore Harbour with 16 survivors. The *'Wave Chieftain'* arrived shortly thereafter with 4 more. All the survivors were met by ambulance staff, members of the Baltimore Sailing Club and members of the local community, amongst them some medical doctors. They were taken to the Baltimore Sailing Club where dry clothes had been collected for them.

4. ANALYSIS

- 4.1 *'Rambler 100'* capsized very quickly once the keel had fractured leaving no time for the crew to react other than to get to safety.
- 4.2 The rapidity of the total inversion of *'Rambler 100'* took all of the crew by surprise.
- 4.3 The water ballast tanks on the windward (uphill) side of the boat contained approximately 8 tonnes of water. Once the boat lay on her side, the leverage of the ballast pulled her over into an inverted position very quickly.
- 4.4 The off watch crew below decks when the incident took place were unable to access either PFDs or foul weather gear.
- 4.5 The 'MAYDAY' call broadcast by the navigator on the ships installed VHF set did not receive a response. The DSC was not used.
- 4.6 The navigator's handheld VHF set was lost whilst he was swimming out.
- 4.7 The two grab bags containing EPIRBs stored under the navigator's seats port and starboard proved inaccessible.
- 4.8 The liferafts stored in containers on the aft deck could not be accessed with the hull inverted.
- 4.9 The ship's EPIRB remained in its bracket in the aft companionway and did not trigger automatically.
- 4.10 The PLB signals were picked up by UK COSPAS-SARSAT Mission Control Centre (UKMCC) at ARCC, RAF Kinloss in Scotland and passed on to MRSC Valentia but there was confusion as to who they were registered to.
- 4.11 It later transpired that the PLB whose signal was picked up, was registered to Mr. George David, however neither the name of the vessel nor any contact details for the vessel appeared on the registration. The name *'Gigi Barnard'* was given on the second page of the registration form as both the primary and alternative 24-hour emergency contact along with 3 phone numbers.
- 4.12 Three of the crew had managed to climb over the side and onto the hull as the boat inverted. Had they not done so, the crew would have had great difficulty getting out of the water and onto the hull.
- 4.13 Each of the crew had been issued with a 'safety pack' containing a PLB and strobe light; however, they were not carried or attached to PFDs.
- 4.14 11 of the crew held current ISAF Offshore Personal Survival Course certificates.
- 4.15 The crew had undergone onboard liferaft and survival training provided by a specialist in the US prior to the transatlantic race.

5 CONCLUSIONS

- 5.1 The failure of the keel was both dramatic and catastrophic causing the rapid heeling and subsequent capsizing of the yacht '*Rambler 100*'. The reasons for the failure are not discussed in this report as the analysis of the keel stub has yet to be completed and the causes of the failure have yet to be determined.
- 5.2 For those trapped below decks when the boat inverted, the only means of escape was to make their way to one of the two companionways and swim through the cockpit and below the guard rails to surface beside the boat. By its nature, the cockpit would have contained many ropes - sheets, halyards etc - which would have created a tangled mess when tipped upside down into the water. This would have posed a significant problem for anyone trying to swim through without getting caught up in the tangle. An escape hatch, perhaps located in the transom such as those found on IMOCA 60 class yachts, would significantly aid escape from an inverted hull.
- 5.3 A grab bag containing an EPIRB, handheld VHF set and other life saving equipment located within reach of the companionway or perhaps beside the helm position would have proved easier for one of the crew to grab before leaving the boat.
- 5.4 There were two liferafts stored in a box at the after most part of the cockpit. Despite attempts to launch them, it proved impossible with the hull inverted. A method of releasing them from their storage box from the rear or side would have made it possible to launch at least one of the rafts.
- 5.5 The ship's EPIRB did not automatically deploy and remained in its bracket in the aft companionway. An EPIRB mounted in a float free bracket fixed to a secure point in the cockpit, on a wheel plinth or to the satcom antenna mast would have automatically deployed when it went underwater and transmitted a signal to the rescue services.
- 5.6 Despite the fact that each crew member had been issued with a safety pack containing a PLB and strobe light, only two were available to those on the upturned hull and the group of 5 in the water had none with them. It would have greatly aided the rescue services had each of the survivors carried their own PLB and activated it on entering the water.
- 5.7 Two PLBs were activated by crew members on the upturned hull. Despite the fact that both were correctly registered with NOAA Satellite and Information Service in the USA in the name of Mr. George David and a 24 hour emergency contact - Gigi Barnard - was supplied along with three telephone numbers, confusion reigned as to who '*Gigi Barnard*' was. This led to a delay of approximately one hour before MRSC Valentia declared 'MAYDAY'. If the PLB registration had included information such as the name of the vessel that the holder was sailing on, the vessel's call sign and satellite phone number, MRSC Valentia would have been in a position to launch a full search and rescue operation sooner.

- 5.8 The RNLI lifeboat crew found it difficult to see the upturned hull of *'Rambler 100'* until they were within a few hundred metres of the vessel due to the poor visibility at the time. Had the underwater appendages been painted with a bright colour, they would have been visible from a much greater distance.

6 SAFETY RECOMMENDATIONS

It should be noted that the following recommendations are being made primarily to the International Sailing Federation (ISAF) for inclusion in their Offshore Special Regulations (OSR) for future offshore yacht racing events.

- 6.1 Modify ISAF OSR Appendix K (Moveable and Variable Ballast) to include a requirement for emergency escape from an inverted hull and access to a liferaft and grab bag from an inverted position. Add a requirement to be able to deploy a Horseshoe lifebelt or Lifesling from an inverted position.
- 6.2 Modify ISAF OSR 4.20.3v (*Liferaft stowage on a multihull shall be such that each liferaft may be readily removed and launched whether or not the yacht is inverted*) to include monohull yachts in OSR category 0 races and for monohull yachts with canting keels in OSR Category 1 and 2 races.
- 6.3 It is recommended that a grab bag containing at least a handheld VHF and EPIRB be located in such a position when boats are inverted so that they can be readily accessed by crew in the cockpit.
- 6.4 It is recommended that ISAF OSR 3.29.1v be modified to include category Mo1,2 and that DSC be used in the event of a MAYDAY broadcast.
- 6.5 It is recommended that ISAF OSR 4.19 be modified to state that the ship's EPIRB be mounted in a float free bracket located such that it will deploy automatically in the event of a capsize and in such a position that it is accessible to the crew from the water aft of the boat with the boat in any position.
- 6.6 It is recommended that all crew carry their safety pack with them at all times and that all PLB's be registered to the individual user and that the vessel's name, call sign and satellite phone number be included on the registration (ISAF OSR 5.01 k). It is further recommended that all PLB's be entered on crew lists with the race organisers prior to commencement of the race (ISAF OSR 4.19e). OSRs currently state that PLBs should be properly registered with the appropriate authority.
- 6.7 Modify ISAF OSR 4.02.3 to include category Mo1,2 and make it a requirement that a section of hull and underwater appendages show an area of highly visible colour.
- 6.8 It is recommended that the flag State authorities should instigate an investigation as to why the keel failed and disseminate any recommendations/technical guidance following this investigation.
- 6.9 It is recommended that yachts racing under category Mo1 be required to carry their AIS antenna at mast head to facilitate stronger AIS signals.
- 6.10 It is recommended that the ISAF in conjunction with the RORC and the major yacht racing national authorities develop regulations concerning the standard of welded keel fins.

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Appendix 7.1 Glossary of Abbreviations and Terms

AIS	Automatic Identification System
Category Mo0,1,2	ISAF OSR Monohull Category 0, 1, 2
DSC	Digital Selective Calling can be used to initiate distress calls by VHF
EPIRB	Emergency Position Indicating Radio Beacon
IMOCA 60	International Monohull Open Class Association 60 (feet in length)
ISAF OSR	International Sailing Federation Offshore Special Regulations
MAYDAY	International distress call via VHF broadcast where there is a threat to life or a vessel is in imminent danger of sinking
MRSC	Marine Rescue Sub Centre
Nav Station	Navigation station on a yacht
nm	Nautical Miles
PAN PAN	International distress call via VHF broadcast where there is no threat to life or imminent danger to the vessel but a state of urgency exists
PFD	Personal Flotation Device
PLB	Personal Locator Beacon
RORC	Royal Ocean Racing Club
SARMAP	Search and Rescue Model and Response System used to predict the movement of drifting objects
Satcom	Satellite Communications
VHF	Very High Frequency radio is installed on most seagoing small craft. It is used for a wide variety of purposes, including summoning rescue services and communicating with harbours, marinas and other vessels. It is ‘open broadcast’ meaning that any VHF radio in range, set to channel 16 will pick up a distress call from a vessel in trouble. It operates in the Very High Frequency range, between 156 to 174 MHz. A VHF set can be either fixed or portable.

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS

	Category
outboard engine together with permanently installed fuel supply systems and fuel tank(s) may be used as an alternative.	
3.28.2 Generator A separate generator for electricity is optional. However, when a separate generator is carried it shall be permanently installed, securely covered, and shall have permanently installed exhaust, cooling and fuel supply systems and fuel tank(s), and have adequate protection from the effects of heavy weather.	**
3.28.3 Fuel Systems	
a) Each fuel tank provided with a shutoff valve. Except for permanently installed linings or liners, a flexible tank is not permitted as a fuel tank.	MoMu0,1,2,3
b) The propulsion engine shall have a minimum amount of fuel which may be specified in the Notice of Race but if not, shall be sufficient to be able to meet charging requirements for the duration of the race and to motor at the above minimum speed for at least 8 hours	MoMu0,1,2,3
3.28.4 Battery Systems	
a) When an electric starter is the only method for starting the engine, the yacht shall have a separate battery, the primary purpose of which is to start the engine	MoMu0,1,2,3
b) All rechargeable batteries on board shall be of the sealed type from which liquid electrolyte cannot escape. Other types of battery installed on board at 1/06 may continue in use for the remainder of their service lives, although it is strongly recommended that they be changed for sealed batteries as soon as possible.	MoMu0
c) It is recommended that consideration be given to the installation of sealed batteries, noting however that a special charging device may be specified by the battery manufacturers	MoMu1,2,3
3.29 Communications Equipment, EPFS (Electronic Position-Fixing System), Radar, AIS	**
<i>Provision of GMDSS and DSC is unlikely to be mandatory for small craft during the term of the present</i>	MoMu0,1,2,3

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS	
	Category
<i>Special Regulations However it is recommended that persons in charge include these facilities when installing new equipment.</i>	
3.29.1 The following shall be provided:	**
a) A marine radio transceiver (or if stated in the Notice of Race, an installed satcom terminal), and	MoMu0,1,2,3
i an emergency antenna when the regular antenna depends upon the mast.	MoMu0,1,2,3
b) When the marine radio transceiver is VHF:	MoMu0,1,2,2
i it shall have a rated output power of 25W	MoMu0,1,2,3
ii it shall have a masthead antenna, and co-axial feeder cable with not more than 40% power loss	MoMu0,1,2,3
iii <i>the following types and lengths of co-axial feeder cable will meet the requirements of OSR 3.29.1 (b)(ii): (a) up to 15m (50ft) - type RG8X ("mini 8"); (b) 15-28m (50-90ft) - type RG8U; (c) 28-43m (90-140ft) - type 9913F (uses conventional connectors, available from US supplier Belden); (d) 43-70m 140-230ft - type LMR600 (uses special connectors, available from US supplier Times Microwave).</i>	MoMu0,1,2,3
iv <i>it should include channel 72 (an international ship-ship channel which, by common use, has become widely accepted as primary choice for ocean racing yachts anywhere in the world)</i>	MoMu0,1,2,3
v Notwithstanding OSR 3.29.1 (b) a yacht in a Category Zero race shall have a marine VHF DSC radio in accordance with OSR 3.29.1 (b) (i) and (ii) covering all international and US marine channels and meeting the class D specification of the ITU.	MoMu0
c) At least two hand-held satellite telephones, watertight or with waterproof covers and internal batteries. When not in use each to be stowed in a grab bag (see OSR 4.21)	MoMu0
d) At least two hand-held marine VHF transceivers each with min 5w output power, watertight or with waterproof covers. When not in use to be stowed in a grab bag (see OSR 4.21)	MoMu0

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	Category
e) A hand-held marine VHF transceiver, watertight or with a waterproof cover. When not in use to be stowed in a grab bag or emergency container (see OSR 4.21)	MoMu1,2,3,4
f) Independent of a main radio transceiver, a radio receiver capable of receiving weather bulletins	**
g) <i>It is strongly recommended that a hand-held watertight transceiver operating on one or more aviation frequencies including 121.5MHz should be provided. This will enable communications between the yacht and aircraft on SAR duties, not all of which have maritime VHF. When not in use to be stowed in a grab bag (see OSR 4.21.2)</i>	MoMu0
h) A D/F (direction-finding) radio receiver operating on 121.5MHz to take a bearing on a PLB or EPIRB, or an alternative device for man-overboard location when each crew member has an appropriate personal unit (see OSR 5.07);	MoMu0
i) An EPFS (Electronic Position-Fixing System) (e.g. GPS)	MoMu0,1,2,3
j) A Standard-C satellite terminal (GMDSS) shall be permanently installed and permanently powered up for the duration of the race and for which the race committee shall have polling authority.	MoMu0
k) An MF/HF marine SSB transceiver (GMDSS/DSC) with at least 125 watts transmitter power and frequency range from at least 1.6 to 29.9 MHz with permanently installed antenna and earth.	MoMu0
l) An active radar set permanently installed, with not less than 4 kW PEP with antenna mounted at least 7 metres above the water. The radar antenna unit shall have a maximum dimension not less than 533 mm. The radar shall be mounted so that the antenna unit remains essentially horizontal when the yacht is heeled. Installations in place before January 2006 shall comply as closely as possible with OSR 3.29.(L)	MoMu0
m) A class A AIS	MoMu0

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS

	Category
n) An AIS Transponder	MoMu1,2
o) <i>An AIS Transponder is recommended</i>	MoMu3
3.29.2 <i>Yachts are reminded that no reflector, active or passive, is a guarantee of detection or tracking by a vessel using radar.</i>	**
a) <i>The attention of persons in charge is drawn to legislation in force or imminent affecting the territorial seas of some countries in which the carriage of an AIS set is or will be mandatory for certain vessels including relatively small craft.</i>	**

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Category

**SECTION 4 - PORTABLE EQUIPMENT & SUPPLIES
for the yacht
(for water & fuel see OSR 3.21 and OSR 3.28)**

	Category
4.01 Sail Letters & Numbers	
4.01.1 Yachts which are not in an ISAF International Class or Recognized Class shall comply with RRS 77 and Appendix G as closely as possible, except that sail numbers allotted by a State authority are acceptable .	**
4.01.2 Sail numbers and letters of the size carried on the mainsail must be displayed by alternative means when none of the numbered sails is set.	**
4.02 Hull marking (colour blaze)	Mo0,1, Mu0,1,2,3,4
4.02.1 To assist in SAR location:-	
a) Each yacht shall show at least 4 m ² of fluorescent pink or orange or yellow colour as far as possible in a single area on the coachroof and/or deck where it can best be seen	MoMu0
<i>b) Each yacht is recommended to show at least 1 m² of fluorescent pink or orange or yellow colour as far as possible in a single area on the coachroof and/or deck where it can best be seen</i>	MoMu1
4.02.2 Multihulls shall show on the underside, where they can be seen when inverted, an solid area of highly-visible colour (e.g. Day-Glo pink, orange, or yellow) of at least 1 m ²	Mu0,1,2,3,4
<i>4.02.3 Each yacht is recommended to show on each underwater appendage an area of highly-visible colour</i>	MoMu0,1
4.03 Soft Wood Plugs	
Soft wood plugs, tapered and of the appropriate size, shall be attached or stowed adjacent to the appropriate fitting for every through-hull opening.	**
4.04 Jackstays, Clipping Points and Static Safety Lines	
4.04.1 The following shall be provided:	
a) Jackstays:-	MoMu0,1,2,3
shall be provided-	
i attached to through-bolted or welded deck plates	MoMu0,1,2,3

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	Category
or other suitable and strong anchorage fitted on deck, port and starboard of the yacht's centre line to provide secure attachments for safety harness:-	
ii comprising stainless steel 1 x 19 wire of minimum diameter 5 mm (3/16 in), or webbing of equivalent strength;	MoMu0,1,2,3
iii which, when made from stainless steel wire shall be uncoated and used without any sleeving;	MoMu0,1,2,3
iv <i>20kN (2,040 kgf or 4,500 lbf) min breaking strain webbing is recommended;</i>	MoMu0,1,2,3
v <i>at least two of which should be fitted on the underside of a multihull in case of inversion.</i>	Mu0,1,2,3
4.04.2 Clipping Points:-	
shall be provided-	
a) attached to through-bolted or welded deck plates or other suitable and strong anchorage points adjacent to stations such as the helm, sheet winches and masts, where crew members work for long periods:-	MoMu0,1,2,3
b) which, together with jackstays and static safety lines shall enable a crew member-	MoMu0,1,2,3
i to clip on before coming on deck and unclip after going below;	MoMu0,1,2,3
ii whilst continuously clipped on, to move readily between the working areas on deck and the cockpit(s) with the minimum of clipping and unclipping operations.	MoMu0,1,2,3
c) The provision of clipping points shall enable two-thirds of the crew to be simultaneously clipped on without depending on jackstays	MoMu0,1,2,3
d) In a trimaran with a rudder on the outrigger, adequate clipping points shall be provided that are not part of the deck gear or the steering mechanism, in order that the steering mechanism can be reached by a crew member whilst clipped on.	Mu0,1,2,3
e) <i>Warning - U-bolts as clipping points - see OSR 5.02.1(a)</i>	
4.05 Fire Extinguishers	

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ISAF OFFSHORE SPECIAL REGULATIONS

		Category
Shall be provided as follows:		
4.05.1	Fire extinguishers, at least two, readily accessible in suitable and different parts of the yacht	**
4.05.2	Fire Extinguishers, at least two, of minimum 2kgs each of dry powder or equivalent	MoMu0,1,2,3
4.05.3	Fire extinguishers, at least three of minimum 2 kgs each of dry powder or equivalent including at least one extinguisher or system suitable for dealing with fire in a machinery space	MoMu0
4.05.4	A fire blanket adjacent to every cooking device with an open flame	MoMu0
4.06 Anchor(s)		
4.06.1	An anchor or anchors shall be carried according to the table below:	**
TABLE 12		**
LOA	detail	race category
any	The specification of anchor, chain and rope shall be in accordance with relevant class rules or the rules of a recognised Classification Society (eg Lloyd's, DNV, etc.)	MoMu0
8.5 m (28 ft) and over	2 anchors together with a suitable combination of chain and rope, all ready for immediate use	MoMu1,2,3
under 8.5 m (28 ft)	1 anchor together with a suitable combination of chain and rope, all ready for immediate use	MoMu1,2,3
any	1 anchor, readily accessible	MoMu4
4.07 Flashlight(s)		
4.07.1	The following shall be provided:-	
a)	a watertight, high-powered flashlight or spotlight, with spare batteries and bulbs, and	MoMu0,1,2,3
b)	a watertight flashlight with spare batteries and bulb	**
c)	for Mu3,4 the watertight flashlight in OSR 4.07.1 (b) shall be stowed in the grab bag or emergency container	Mu3,4
d)	a watertight high-intensity heavy duty handlamp powered by the ships' batteries, instantly available	MoMu0

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	Category
for use on deck and in the cockpit, with spare bulbs	**
4.08 First Aid Manual and First Aid Kit	**
4.08.1 A suitable First Aid Manual shall be provided	**
<i>In the absence of a National Authority's requirement, the latest edition of one of the following is recommended:-</i>	**
<i>a) International Medical Guide for Ships, World Health Organisation, Geneva</i>	MoMu0,1
<i>b) First Aid at Sea, by Douglas Justins and Colin Berry, published by Adlard Coles Nautical, London</i>	MoMu2,3,4
<i>c) Le Guide de la medecine a distance, by Docteur J Y Chauve, published by Distance Assistance BP33 F-La Baule, cedex, France. An English translation may be available.</i>	**
4.08.2 A First Aid Kit shall be provided	**
4.08.3 <i>The contents and storage of the First Aid Kit should reflect the guidelines of the Manual carried, the likely conditions and duration of the passage, and the number of people aboard the yacht.</i>	**
4.09 Foghorn	
A foghorn shall be provided	**
4.10 Radar Reflector, AIS (Automatic Identification System)	
4.10.1 A passive Radar Reflector (that is, a Radar Reflector without any power) shall be provided	**
a) If a radar reflector is octahedral it must have a minimum diagonal measurement of 456 mm (18in), or if not octahedral must have a documented RCS (radar cross-section) of not less than 10 m ² . The minimum effective height above water is 4.0 m (13 ft).	**
<i>b) The passive and active devices referred to in these notes and in 4.10.1 and 4.10.2 above are primarily intended for use in the X (9GHz) band</i>	**
4.10.2 <i>The most effective radar response from a yacht may be provided by an RTE (Radar Target Enhancer) which may be on board in addition to the required passive reflector. An RTE should conform to Recommendation ITU-R 1176. An RTE is strongly recommended.</i>	MoMu1,2,3,4

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	Category
a) An RTE shall be provided in compliance with ITU-R 1176	MoMu0
<i>b) The display of a passive reflector or the operation of an RTE is for the person in charge to decide according to prevailing conditions.</i>	**
<i>4.10.3 A passive reflector in compliance with revised ISO8729 (revision in progress at 1/06) offers improved performance over earlier models and has a size typified by a cylinder of not more than weight 5kg, height 750mm and dia 300mm. When revised ISO 8729 is published the Special Regulations regarding radar reflectors will be reviewed and may be changed.</i>	**
<i>4.10.4 S (3GHz) band radar is often used by ships to complement X (9GHz) band radar. On S (3GHz) band a conventional reflector or RTE offers about 1/10 the response obtained on the X (9GHz) band.</i>	**
4.11 Navigation Equipment	
4.11.1 Charts Navigational charts (not solely electronic), light list and chart plotting equipment shall be provided	**
4.11.2 Reserve Navigation System <i>Navigators are recommended to carry a sextant with suitable tables and a timepiece or an adequate reserve navigation system so that total reliance is not placed on dead-reckoning and a single form of EPFS (Electronic Position-Fixing System) (see Volpe Report at www.navcen.uscg.gov/archive/2001/Oct/FinalReport-v4.6.pdf)</i>	MoMu0,1
4.12 Safety Equipment Location Chart A safety equipment location chart in durable waterproof material shall be displayed in the main accommodation where it can best be seen, clearly marked with the location of principal items of safety equipment.	**
4.13 Echo Sounder or Lead Line	
4.13.1 An echo sounder or lead line shall be provided	MoMu1,2,3,4
4.13.2 Two independent echo sounders shall be provided	MoMu0
4.14 Speedometer or Distance Measuring Instrument (log)	
A speedometer or distance measuring instrument (log) shall be provided	MoMu0,1,2,3

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ISAF OFFSHORE SPECIAL REGULATIONS	
	Category
4.15 Emergency Steering	
4.15.1 Emergency steering shall be provided as follows:	
a) except when the principal method of steering is by means of an unbreakable metal tiller, an emergency tiller capable of being fitted to the rudder stock;	MoMu0,1,2,3
b) crews must be aware of alternative methods of steering the yacht in any sea condition in the event of rudder loss. At least one method must have been proven to work on board the yacht. An inspector may require that this method be demonstrated.	MoMu0,1,2,3
4.16 Tools and Spare Parts	
Tools and spare parts, including effective means to quickly disconnect or sever the standing rigging from the hull shall be provided.	**
4.17 Yacht's name	
Yacht's name shall be on miscellaneous buoyant equipment, such as lifejackets, cushions, lifebuoys, lifelines, grab bags etc.	**
4.18 Marine grade retro-reflective material	
Marine grade retro-reflective material shall be fitted to lifebuoys, lifelines, liferafts and lifejackets. See OSRs 5.04, 5.08.	**
4.19 EPIRBs	
4.19.1 A 406 MHz EPIRB shall be provided	MoMu1,2
a) At least two 406 MHz EPIRBs shall be provided	MoMu0
<i>b) It is recommended that a 406 MHz EPIRB should include an internal GPS, and also a 121.5MHz transmitter for local homing.</i>	MoMu0,1,2
c) Every 406 MHz EPIRB shall be properly registered with the appropriate authority.	MoMu0,1,2
<i>d) EPIRBs should be tested in accordance with manufacturer's instructions when first commissioned and then at least annually.</i>	MoMu0,1,2
<i>e) A list of registration numbers of 406 EPIRBs should be notified to event organizers and kept available for immediate use.</i>	MoMu0,1,2
<i>f) Consideration should be given to the provision of a locator device (eg an "Argos" beacon) operating on</i>	MoMu0,1,2

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	Category
<i>non - SAR frequencies, to aid salvage if a yacht is abandoned.</i>	
<i>g) Beacons with only 121.5MHz are no longer recommended for distress alerting. Satellite processing of 121.5 MHz is being phased out. 121.5MHz will continue to be used for local homing by on-board D/F systems and for local homing by SAR units. Type "E" EPIRBs are no longer supported and should be replaced immediately.</i>	MoMu0,1,2
<i>h) See OSR 3.29.1(e) for on-board D/F and OSR 5.07.1(b) for personal EPIRBs (PLBs)</i>	MoMu0
4.20 Liferrafts	MoMu0,1,2
4.20.1 Liferaft Construction and Packed Equipment	
a) A sufficient number of liferafts shall be provided so that in the event of any one liferaft being lost or rendered unserviceable, sufficient aggregate capacity remains for all persons on board	MoMu0
b) Liferafts shall comply with SOLAS LSA code 1997 Chapter IV or later version except that they are acceptable with a capacity of 4 persons and may be packed in a valise. A SOLAS liferaft shall contain at least a SOLAS "A" pack.	MoMu0
4.20.2 Liferaft(s) shall be provided capable of carrying the whole crew when each liferaft shall comply with either:-	MoMu1,2
a) OSR 4.20.1 (b) (SOLAS), or	MoMu1,2
b) for liferafts manufactured prior to January 2003, OSR Appendix A part I (ORC), or	MoMu1,2
c) OSR Appendix A part II (ISAF) when, unless otherwise specified by a race organizer, the floor shall include thermal insulation, or	MoMu1,2
d) ISO 9650 Part I Type I Group A (ISO) when each liferaft shall contain at least a Pack 2 (<24h) and-	MoMu1,2
i) shall have a semi-rigid boarding ramp, and	MoMu1,2
ii) shall be so arranged that any high-pressure hose shall not impede the boarding process, and	MoMu1,2
iii) shall have a topping-up means provided for any inflatable boarding ramp, and	MoMu1,2

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	Category
iv when the liferaft is designed with a single ballast pocket this shall be accepted provided the liferaft otherwise complies with ISO 9650 and meets a suitable test of ballast pocket strength devised by the manufacturer and	MoMu1,2
v compliance with OSR 4.20.2 (d) i-iv shall be indicated on the liferaft certificate.	MoMu1,2
4.20.3 Liferaft Packing and Stowage	MoMu0,1,2
A Liferaft shall be either:-	MoMu0,1,2
a) packed in a transportable rigid container or canister and stowed on the working deck or in the cockpit, or:-	MoMu0,1,2
b) packed in a transportable rigid container or canister or in a valise and stowed in a purpose-built rigid compartment containing liferaft(s) only and opening into or adjacent to the cockpit or working deck, or through a transom, provided that:-	MoMu0,1,2
i each compartment is watertight or self-draining (self-draining compartments will be counted as part of the cockpit volume except when entirely above working deck level or when draining independently overboard from a transom stowage - see OSR 3.09) and-	MoMu0,1,2
ii the cover of each compartment is capable of being easily opened under water pressure, and-	MoMu0,1,2
iii the compartment is designed and built to allow a liferaft to be removed and launched quickly and easily, or-	MoMu0,1,2
iv in a yacht with age or series date before June 2001, a liferaft may be packed in a valise not exceeding 40kg securely stowed below deck adjacent to a companionway.	MoMu1,2
v Liferaft stowage on a multihull shall be such that each liferaft may be readily removed and launched whether or not the yacht is inverted.	Mu0,1,2
c) The end of each liferaft painter should be permanently made fast to a strong point on board the yacht.	MoMu0,1,2

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	Category
4.20.4 Liferaft Launching	MoMu0,1,2
a) Each raft shall be capable of being got to the lifelines or launched within 15 seconds.	MoMu0,1,2
b) <i>Each liferaft of more than 40kg weight should be stowed in such a way that the liferaft can be dragged or slid into the sea without significant lifting</i>	MoMu0,1,2
4.20.5 Liferaft Servicing and Inspection	MoMu0,1,2
<i>IMPORTANT NOTICE Recent evidence has shown that packaged liferafts are vulnerable to serious damage when dropped (eg from a boat onto a marina pontoon) or when subjected to the weight of a crew member or heavy object (eg an anchor). Damage can be caused internally by the weight of the heavy steel CO2 bottle abrading or splitting neighbouring layers of buoyancy tube material. ISAF has instituted an investigation into this effect and as an interim measure requires that every valise-packed liferaft shall have an annual certificate of servicing. A liferaft should be taken for servicing if there is any sign of damage or deterioration (including on the underside of the pack). Persons in charge should insist on great care in handling liferafts and apply the rules NO STEP and DO NOT DROP UNLESS LAUNCHING INTO THE SEA.</i>	MoMu0,1,2
a) Certificates or copies, of servicing and/or inspection shall be kept on board the yacht. Every SOLAS liferaft and every valise-packed liferaft shall have a valid annual certificate of new or serviced status from the manufacturer or his approved service station.	MoMu0,1,2
b) A liferaft built to OSR Appendix A part I ("ORC") packed in a rigid container or canister shall either be serviced annually or may, when the manufacturer so specifies, be inspected annually (not necessarily unpacked) provided the yacht has on board written confirmation from the manufacturer's approved service station stating that the inspection was satisfactory.	MoMu0,1,2
c) A liferaft built to OSR Appendix A part II ("ISAF") packed in a rigid container or canister shall either be serviced annually or may, when the manufacturer so specifies, have its first service no longer than 3 years after commissioning and its second service no longer	MoMu1,2

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	Category
than 2 years after the first. Subsequent services shall be at intervals of not more than 12 months.	
d) Liferaft servicing certificates shall state the specification that the liferaft was built to. See OSR 4.20.2	MoMu1,2
4.21 Grab Bags	
4.21.1 Grab Bag or Emergency Container for Multihulls Without Liferrafts	Mu3,4
a) A multihull without a liferaft shall have, readily accessible whether or not the yacht is inverted, either a watertight compartment or a grab bag with the following minimum contents. A grab bag shall have inherent flotation, at least 0.1 m ² area of fluorescent orange colour on the outside, shall be marked with the name of the yacht, and shall have a lanyard and clip.	Mu3,4
<i>b) Note: it is not intended to duplicate in a grab bag etc. items required by other OSRs to be on board the yacht - this regulation covers only the stowage of those items</i>	Mu3,4
c) a watertight hand-held marine VHF transceiver plus a spare set of batteries	Mu3,4
d) a watertight flashlight with spare batteries and bulb	Mu3,4
e) 2 red parachute and 3 red hand flares	Mu3,4
f) a watertight strobe light with spare batteries	Mu3,4
g) a knife	Mu3,4
4.21.2 Grab Bags to Accompany Liferrafts	
<i>a) A yacht is recommended to have for each liferaft, a grab bag with the following minimum contents. A grab bag should have inherent flotation, at least 0.1 m² area of fluorescent orange colour on the outside, should be marked with the name of the yacht, and should have a lanyard and clip.</i>	MoMu0,1,2
<i>b) Note: it is not intended to duplicate in a grab bag items required by other OSRs to be on board the yacht - these recommendations cover only the stowage of those items</i>	MoMu0,1,2

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	Category
4.21.3 Grab Bag Recommended Contents	
a) 2 red parachute and 2 red hand flares and cyalume-type chemical light sticks (red flares compliant with SOLAS)	MoMu1,2
b) watertight hand-held EPFS (Electronic Position-Fixing System) (eg GPS) in at least one of the grab bags carried by a yacht	MoMu1,2
c) SART (Search and Rescue Transponder) in at least one of the grab bags carried by a yacht	MoMu1,2
d) a combined 406MHz/121.5MHz or type "E" EPIRB (see OSR 4.19.1) in at least one of the grab bags carried by a yacht	MoMu1,2
e) water in re-sealable containers or a hand-operated desalinator plus containers for water	MoMu1,2
f) a watertight hand-held marine VHF transceiver plus a spare set of batteries	MoMu0,1,2
g) a watertight flashlight with spare batteries and bulb	MoMu0,1,2
h) dry suits or thermal protective aids or survival bags	
i) second sea anchor for the liferaft (not required if the liferaft has already a spare sea anchor in its pack) (recommended standard ISO 17339) with swivel and >30m line diameter >9.5 mm	MoMu0,1,2
j) two safety tin openers (if appropriate)	MoMu0,1,2
k) first-aid kit including at least 2 tubes of sunscreen. All dressings should be capable of being effectively used in wet conditions. The first-aid kit should be clearly marked and re-sealable.	MoMu0,1,2
l) signalling mirror	MoMu0,1,2
m) high-energy food (min 10 000kJ per person recommended for Cat Zero)	MoMu0,1,2
n) nylon string, polythene bags, seasickness tablets (min 6 per person recommended)	MoMu0,1,2
o) watertight hand-held aviation VHF transceiver (if race area warrants)	MoMu0,1,2
p) water in re-sealable containers and a hand-operated desalinator	MoMu0

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	Category
q) <i>hand-held satellite telephone with waterproof cover and internal batteries</i>	MoMu0
r) <i>strobe light</i>	MoMu0
s) <i>medical supplies including any for pre-existing medical conditions of any crew member</i>	MoMu0
t) <i>spare unbreakable spectacles for any crew members needing them</i>	MoMu0
u) <i>wet notebook with captive pencil</i>	MoMu0
v) <i>powerful whistle (operated by mouth)</i>	MoMu0
w) <i>6 red SOLAS compliant parachute flares, 3 white parachute flares, 2 orange SOLAS compliant smoke flares, cyalume-type light sticks</i>	MoMu0
x) <i>a watertight, high-powered torch (flashlight) with spare batteries and bulbs</i>	MoMu0
y) <i>watertight hand-held EPFS (Electronic Position-Fixing System) (eg GPS)</i>	MoMu0
z) <i>SART (Search and Rescue Transponder)</i>	MoMu0
aa) <i>406MHz or type "E" EPIRB registered to the yacht (see OSR 4.19.2)</i>	MoMu0
4.21.4 Swimmer of the Watch Bag	MoMu0
a) <i>It is recommended to keep a bag, stored ready for immediate use within reach of the main companionway hatch, to facilitate the recovery of a man overboard by a swimmer of the watch and containing-</i>	MoMu0
b) <i>50 metres of buoyant 8mm rope</i>	MoMu0
c) <i>a pair of swim fins</i>	MoMu0
d) <i>a semi-automatic life jacket</i>	MoMu0
e) <i>suitable clothing to effect a man overboard recovery in cold water</i>	MoMu0

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

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	Category
4.22 Lifebuoys	
4.22.1 The following shall be provided within reach of the helmsman and ready for instant use:	**
a) a lifebuoy with a self-igniting light and a drogue or a Lifesling with a self-igniting light and without a drogue.	**
b) In addition to a) above, one lifebuoy within reach of the helmsman and ready for instant use, equipped with:	MoMu0,1,2
i a whistle, a drogue, a self-igniting light and	MoMu0,1,2
ii a pole and flag. The pole shall be either permanently extended or be capable of being fully automatically extended (not extendable by hand) in less than 20 seconds. It shall be attached to the lifebuoy with 3 m (10 ft) of floating line and is to be of a length and so ballasted that the flag will fly at least 1.8 m (6 ft) off the water.	MoMu0,1,2
iii Each lifebuoy shall be equipped with a sachet of fluoresceine dye	MoMu0
4.22.2 When at least two lifebuoys (and/or Lifeslings) are carried, at least one of them shall depend entirely on permanent (eg foam) buoyancy.	MoMu0,1,2
4.22.3 Each inflatable lifebuoy and any automatic device (eg pole and flag extended by compressed gas) shall be tested and serviced at intervals in accordance with its manufacturer's instructions.	**
4.22.4 Each lifebuoy or lifesling shall be fitted with marine grade retro-reflective material (4.18).	**
4.23 Pyrotechnic and Light Signals	
4.23.1 Pyrotechnic signals shall be provided conforming to SOLAS LSA Code Chapter III Visual Signals and not older than the stamped expiry date (if any) or if no expiry date stamped , not older than 4 years.	**

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				Category
red parachute flares LSA III 3.1	red hand flares LSA III 3.2	orange smoke LSA III 3.3	race category	
6	4	2	MoMu0,1	
4	4	2	MoMu2,3	
	4	2	Mo4	
2	4	2	Mu4	

TABLE 13

4.23.2 The following lights shall be provided and readily available for the purpose of collision avoidance: **

a) a watertight white torch (flashlight) with spare batteries and bulb **

b) a watertight, high-powered white spotlight (searchlight) with spare batteries and bulbs **

4.24 Heaving Line **

a) a heaving line shall be provided 15 m - 25 m (50 ft - 75 ft) length readily accessible to cockpit. **

b) the "throwing sock" type is recommended - see Appendix D **

4.25 Cockpit Knife

A strong, sharp knife, sheathed and securely restrained shall be provided readily accessible from the deck or a cockpit. **

4.26 Storm & Heavy Weather Sails

4.26.1 Design

a) it is strongly recommended that persons in charge consult their designer and sailmaker to decide the most effective size for storm and heavy weather sails. The purpose of these sails is to provide safe propulsion for the yacht in severe weather -they are not intended as part of the racing inventory. The areas below are maxima. Smaller areas are likely to suit some yachts according to their stability and other characteristics. **

4.26.2 High Visibility

a) it is strongly recommended that every storm sail should either be of highly-visible coloured material **

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS

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<i>(eg dayglo pink, orange or yellow) or have a highly-visible coloured patch added on each side; and also that a rotating wing mast used in lieu of a trysail should have a highly-visible coloured patch on each side</i>	
4.26.3 Materials	
a) aromatic polyamides, carbon and similar fibres shall not be used in a trysail or storm jib but spectra/dyneema and similar materials are permitted.	**
b) <i>it is strongly recommended that a heavy-weather jib does not contain aromatic polyamides, carbon and similar fibres other than spectra/dyneema.</i>	**
4.26.4 The following shall be provided:-	
a) sheeting positions on deck for each storm and heavy-weather sail;	**
b) for each storm or heavy-weather jib, a means to attach the luff to the stay, independent of any luff-groove device. A heavy weather jib shall have the means of attachment readily available. A storm jib shall have the means of attachment permanently attached;	**
c) a storm trysail which shall be capable of being sheeted independently of the boom with area not greater than 17.5% mainsail luff length x mainsail foot length. The storm trysail shall have neither headboard nor battens, however a storm trysail is not required in a yacht with a rotating wing mast which can adequately substitute for a trysail;	MoMu 0,1,2
d) if a storm trysail is required by either OSR 4.26.4 (c) or OSR 4.26.4 (g) the yacht's sail number and letter(s) shall be placed on both sides of the trysail (or on a rotating wing mast as substitute for a trysail) in as large a size as practicable;	**
e) a storm jib of area not greater than 5% height of the foretriangle squared, with luff maximum length 65% height of the foretriangle;	MoMu0,1,2
f) a heavy-weather jib (or heavy-weather sail in a yacht with no forestay) of area not greater than 13.5% height of the foretriangle squared and without reef	**

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS	
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points;	
g) either a storm trysail as defined in OSR 4.26.4(c), or mainsail reefing to reduce the luff by at least 40%.	MoMu3,4
h) in the case of a yacht with an in-mast furling mainsail, the storm trysail must be capable of being set while the mainsail is furled.	MoMu0,1,2
<i>i) It is strongly recommended that the heavy-weather jib does not contain aromatic polyamides, carbon fibres and other high modulus fibres.</i>	**
<i>j) A trysail track should allow for the trysail to be hoisted quickly when the mainsail is lowered whether or not the mainsail is stowed on the main boom.</i>	MoMu0,1,2
4.27 Drogue, Sea Anchor	MoMu0,1
<i>4.27.1 A drogue for deployment over the stern, or alternatively a sea anchor or parachute anchor for deployment over the bow, complete with all gear needed to rig and deploy the sea anchor or drogue, is strongly recommended to withstand long periods in rough conditions (see Appendix F).</i>	MoMu1
4.27.2 A drogue for deployment over the stern, or alternatively a sea anchor or parachute anchor for deployment at the bow, shall be provided complete with all gear needed to rig and deploy the sea anchor or drogue to withstand long periods in rough conditions (see OSR Appendix F)	MoMu0
4.28 Man Overboard Alarm	MoMu0
4.28.1 Each yacht shall be equipped with a man overboard alarm including an emergency button immediately accessible to a helmsman which will sound an audible alarm in the accommodation and simultaneously send an appropriate signal to the ship's navigational software	MoMu0
<i>4.28.2 A yacht is recommended to be equipped with an EPFS (e.g. GPS) capable of immediately recording a man overboard position from each helm station</i>	MoMu 1, 2
4.28.3 A yacht shall be equipped with an EPFS (e.g. GPS) capable of immediately recording a man overboard position from each helm station (From January 2012)	MoMu 1, 2

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS

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4.29 Deck Bags	Mo0
4.29.1 OSR 4.29 shall apply only when RRS 51 moveable ballast is changed in the Notice of Race, Sailing Instructions or Class Rules to permit deck bags	Mo0
a) A deck bag or bags may be provided for the stowage of sails on deck	Mo0
b) A deck bag shall be:-	Mo0
i so constructed to ensure rapid draining of water	Mo0
ii securely fastened in such a way that the integrity of deck fittings e.g. stanchions and lifelines, is not compromised	Mo0

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS	
SECTION 5 - PERSONAL EQUIPMENT	Category
5.01 Lifejacket	
5.01.1 Each crew member shall have a lifejacket as follows:-	**
a) In accordance with ISO 12402 – 3 (Level 150) or equivalent, ISO 12402 requires Level 150 lifejackets to be fitted with a mandatory whistle and retro-reflective material. Also, when fitted with a safety harness, ISO 12402 requires that this shall be the full safety harness in accordance with ISO 12401. Any equivalent lifejacket shall have equal requirements. Note: persons of larger than average build are generally more buoyant than those of average build and so do not require a lifejacket with greater levels of flotation. Wearing a Level 275 lifejacket may hamper entry into liferafts.	**
b) fitted with either a crotch strap(s) / thigh straps or a full safety harness in accordance with ISO 12401, Crotch straps or thigh straps together with related fittings and fixtures should be strong enough to lift the wearer from the water.	**
c) fitted with a lifejacket light in accordance with SOLAS LSA code 2.2.3 (white, >0.75 candelas, >8 hours),	**
d) if inflatable have a compressed gas inflation system,	**
e) if inflatable, regularly checked for gas retention,	**
f) compatible with the wearer's safety harness,	**
g) clearly marked with the yacht's or wearer's name,	**
h) fitted with a splashguard / sprayhood in accordance with ISO 12402 – 8,	MoMu0
i) Fitted with a PLB unit (as with other types of EPIRB, should be properly registered with the appropriate authority)	MoMu0
<i>It is strongly recommended that a lifejacket has:</i>	
j) <i>a splashguard / sprayhood See ISO 12402 – 8,</i>	MoMu1,2,3,4

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS	
	Category
<i>k) a PLB unit (as with other types of EPIRB, should be properly registered with the appropriate authority)</i>	MoMu1,2,3,4
<i>l) if of a gas inflatable type, a spare cylinder and if appropriate a spare activation head</i>	MoMu1,2,3,4
5.01.2 For every gas inflatable lifejacket a spare cylinder and if appropriate a spare activation head shall be carried.	MoMu0
5.01.3 Each yacht shall carry a spare lifejacket or lifejacket(s) as required in OSR 5.01.1 sufficient for at least 10% of the total number of persons on board (minimum one spare lifejacket). At least one of the required spare lifejacket(s) shall be a semi - automatic for use in man overboard recovery.	MoMu0
5.01.4 The person in charge shall personally check each lifejacket at least once annually.	**
5.02 Safety Harness and Safety Lines (Tethers)	MoMu0,1,2,3
5.02.1 Each crew member shall have a harness and safety line that complies with ISO 12401 or equivalent with a safety line not more than 2m in length. <i>Harnesses and safety lines manufactured prior to Jan 2010 shall comply with either ISO 12401 or EN 1095.</i> <i>Harnesses and safety lines manufactured prior to Jan 2001 are not permitted.</i>	MoMu0,1,2,3
<i>a) Warning it is possible for a plain snaphook to disengage from a U bolt if the hook is rotated under load at right-angles to the axis of the U-bolt. For this reason the use of snaphooks with positive locking devices is strongly recommended.</i>	MoMu0,1,2,3
5.02.2 At least 30% of the crew shall each, in addition to the above be provided with either:-	MoMu0,1,2,3
a) a safety line not more than 1m long, or	MoMu0,1,2,3
b) a mid-point snaphook on a 2m safety line	MoMu0,1,2,3
c) Each yacht shall carry spare harness and safety line units as required in OSR 5.02.1 above sufficient for at least 10% of the total number of persons on board (minimum one unit).	Mo0
5.02.3 A safety line purchased in January 2001 or later shall have a coloured flag embedded in the stitching, to	MoMu0,1,2,3

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS	
	Category
indicate an overload. A line which has been overloaded shall be replaced as a matter of urgency.	
5.02.4 A crew member's lifejacket and harness shall be compatible	MoMu0,1,2,3
5.02.5 <i>It is strongly recommended that:-</i>	MoMu0,1,2,3
a) <i>static safety lines should be securely fastened at work stations;</i>	MoMu0,1,2,3
b) <i>A harness should be fitted with a crotch strap or thigh straps. Crotch straps or thigh straps together with related fittings and fixtures should be strong enough to lift the wearer from the water.</i>	MoMu0,1,2,3
Note: <i>Before the end of 03/10 ISAF will publish recommended minimum breaking strains which for equipment purchased on or after 01/11 will be mandatory. Effective January 2011, a harness shall be fitted with crotch or thigh straps.</i>	MoMu0,1,2,3
c) <i>to draw attention to wear and damage, stitching on harness and safety lines should be of a colour contrasting strongly with the surrounding material;</i>	MoMu0,1,2,3
d) <i>snaphooks should be of a type which will not self-release from a U-bolt (see OSR 5.02.1(a)) and which can be easily released under load (crew members are reminded that a personal knife may free them from a safety line in emergency);</i>	MoMu0,1,2,3
e) <i>a crew member before a race should adjust a harness to fit then retain that harness for the duration of the race.</i>	MoMu0,1,2,3
5.02.6 <i>Warning - a safety harness is not designed to tow a person in the water and it is important that a harness is used to minimise or eliminate the risk of a person's torso becoming immersed in water outside the boat. The diligent use of a properly adjusted safety harness is regarded as by far the most effective way of preventing man overboard incidents.</i>	**
5.03 Personal Location Lights	MoMu0
a) <i>two packs of miniflares or two personal location lights (either SOLAS or strobe) shall be provided for each crew member: one should be attached to, or carried on, the person when on deck at night.</i>	MoMu0
5.04 Foul Weather Suits	

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS		Category
	a) a foul weather suit with hood shall be supplied to each crew member .	MoMu0
	<i>b) it is recommended that a foul weather suit should be fitted with marine-grade retro-reflective material, and should have high-visibility colours on its upper parts and sleeve cuffs. See OSR 4.18</i>	**
5.05	Knife	MoMu0
	A knife, one shall be supplied to each crew member to be worn on the person at all times	MoMu0
5.06	Watertight flashlight	MoMu0
	A buoyant watertight flashlight, one shall be supplied to each crew member.	MoMu0
5.07	Survival Equipment	MoMu0
5.07.1	One set of Survival Equipment shall be supplied to each crew member to include:-	MoMu0
	a) an immersion suit (attention is drawn to EN ISO 15027-1 constant wear suits, and EN ISO 15027-2 abandonment suits and the LSA Code Chapter II, 2,3);	MoMu0
	b) a PLB (Personal Locator Beacon) equipped with 406MHz and 121.5Mhz;	MoMu0
	c) a personal unit in addition to the PLB in OSR 4.07.1(b) if the location device carried by the yacht in accordance with OSR 3.29.1(h) requires it;	MoMu0
	<i>d) Attention is drawn to the value of keeping on the person a combined 406MHz/121.5MHz PLB when on deck: this may aid location in a man overboard incident independent of the equipment carried by the parent vessel</i>	MoMu0,1,2
	<i>e) All PLB units, as with other types of EPIRB, should be properly registered with the appropriate authority</i>	MoMu0,1,2
5.07.2	<i>It is strongly recommended that an immersion suit should be supplied to each crew member in a multihull in conditions where there is a potential for hypothermia</i>	Mu1,2,3,4
5.08	Diving Equipment	
5.08.1	A yacht shall carry at least two diving suits each to cover the entire body and including gloves, fins and portable air supplies.	MoMu0

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS	
	Category
SECTION 6 – TRAINING	
6.01 At least 30% but not fewer than two members of a crew, including the skipper shall have undertaken training within the five years before the start of the race in both 6.02 topics for theoretical sessions, and 6.03 topics which include practical, hands-on sessions.	MoMu1,2
6.01.2 Every member of a crew including the skipper shall have undertaken training as in OSR 6.01	MoMu0
<i>6.01.3 It is strongly recommended that all crew members should undertake training as in OSR 6.01 at least once every five years</i>	MoMu1,2
6.01.4 Except as otherwise provided in the Notice of Race, an in-date certificate gained at an ISAF Approved Offshore Personal Survival Training course shall be accepted by a race organizing authority as evidence of compliance with Special Regulation 6.01. See Appendix G - Model Training Course, for further details.	MoMu0,1,2
6.02 Training Topics for Theoretical Sessions	
6.02.1 care and maintenance of safety equipment	MoMu0,1,2
6.02.2 storm sails	MoMu0,1,2
6.02.3 damage control and repair	MoMu0,1,2
6.02.4 heavy weather - crew routines, boat handling, drogues	MoMu0,1,2
6.02.5 man overboard prevention and recovery	MoMu0,1,2
6.02.6 giving assistance to other craft	MoMu0,1,2
6.02.7 hypothermia	MoMu0,1,2
6.02.8 SAR organisation and methods	MoMu0,1,2
6.02.9 weather forecasting	MoMu0,1,2
6.03 Training Topics for Practical, Hands-On Sessions	MoMu0,1,2
6.03.1 liferafts and lifejackets	MoMu0,1,2
6.03.2 fire precautions and use of fire extinguishers	MoMu0,1,2
6.03.3 communications equipment (VHF, GMDSS, satcomms, etc.)	MoMu0,1,2
6.03.4 pyrotechnics and EPIRBs	MoMu0,1,2

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

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6.04 Routine Training On-Board	**
<i>6.04.1 It is recommended that crews should practice safety routines at reasonable intervals including the drill for man-overboard recovery</i>	**
6.05 Medical Training	MoMu0
6.05.1 At least two members of the crew shall be able to apply simple strapping and plaster casts, undertake skin suturing, insert intravenous cannulae and give intravenous fluids, give both intra-muscular and intravenous injections and apply a temporary dental filling	MoMu0
6.05.2 At least two members of the crew At least one member of the crew shall hold a current Senior First Aid Certificate or equivalent and should be familiar with the management of medical emergencies that may occur at sea including Hypothermia, and radio communications operations for obtaining medical advice by radio. Each of these crew members shall also have undertaken the training required by OSR 6.01.	MoMu1 MoMu2
6.05.3 At least one member of the crew shall be familiar with First Aid procedures, hypothermia and relevant communications systems (see OSR 6.02.7, 6.03.4)	MoMu3,4
6.06 Diving Training	MoMu0
6.06.1 At least 30% of the crew shall have received appropriate diving training to enable them to carry out basic repairs underwater and to provide assistance if necessary in recovery of a man overboard	MoMu0

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS Appendix K

APPENDIX K
Moveable and Variable Ballast

Notwithstanding the maximum length limit of 24m in the standard, this Appendix invokes International Standard ISO 12217-2, Small craft – Stability and buoyancy assessment and categorization – Part 2: Sailing boats of hull length greater than or equal to 6m. The functions KFR (Knockdown Recovery Factor) and FIR (Inversion Recovery Factor) are defined in ISO 12217-2, except as modified by this Appendix.

This Appendix applies to Monohull Yachts only. Unless specifically stated, a requirement applies to Special Regulations Categories 0, 1, 2, 3 and 4. This Appendix does not apply to boats racing under Category 5.

1 Stability

1.1 Boat Condition

In the calculation of stability data:

- (a) Deck and other enclosed volume above the sheerline and cockpit volume shall be taken into account.
- (b) Mass shall be taken as Minimum Operating Mass as defined by ISO 12217-2, paragraph 3.5.3.

1.2 General Standards

In the assessment of ISO category for yachts fitted with moveable and/or variable ballast, ISO 12217-2, paragraph 6.1.4 b) shall not apply. Boats shall comply with paragraphs 6.2.3, 6.3.1 and 6.4. Calculations shall be for the ballast condition that results in the most adverse result when considering each individual stability requirement. ISO 12217-2 Annex C, paragraph C.3.3, first sentence, the word 'may' is replaced with 'shall'. ISO 12217-2 Annex C, paragraph C.3.4 shall not be used in the calculation of righting lever.

1.3 Knockdown Recovery

Boats with moveable/variable ballast shall comply with the following minimum values of Knockdown Recovery Factor (FKR) calculated in accordance with ISO 12217-2 paragraph 6.4.4 with the modification that the reference to ISO 8666 paragraph 5.5.2 changed to incorporate actual mainsail area and centre of effort. The lesser of FKR_{90} and FKR_{90} shall be used:

SR Category	0	1, 2	3	4
FKR	1.0	0.9	0.8	0.7

Appendix 7.2 Extract from ISAF OSR sections 3, 4, 5 and 6 and Appendix K.

ISAF OFFSHORE SPECIAL REGULATIONS Appendix K

Boats with age date prior to 11/04 may seek dispensation from this section 1.3 by application to ISAF.

1.4 Capsize Recovery

For boats racing under Special Regulations Category 0, Regulation 3.04.1 is modified to read:

- 3.04.1 Either with, or without, reasonable intervention from the crew, a yacht shall be capable of self-righting from an inverted position. Self righting shall be achievable whether or not the rig is intact. Boats with moveable/variable ballast shall comply with this requirement in flat water using manual power only and shall demonstrate that any equipment to be used in re-righting the boat is ready for use at all times and will function and is useable by the crew with the boat inverted. Re-righting the boat shall not require flooding any part of the boat.

Boats with moveable/variable ballast shall comply with the following minimum values of Inversion Recovery Factor (FIR) calculated in accordance with ISO 12217-2:

SR Category	0
FIR	0.9

Boats with age date prior to 11/04 may seek dispensation from this section 1.4 by application to ISAF.

Appendix 7.3 Met Eireann Weather Report.



MET ÉIREANN
The Irish Meteorological Service

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Ms Eve Reddin
Marine Casualty Investigation Board
Leeson Lane
Dublin 2

18/8/2011

Our Ref. WS3018/2C_14240
Your Ref. MCIB 206

Re: Estimate of weather conditions in the sea area near Fastnet Rock, at position 51° 20.9'N 9°38.9'W, on the 15th August 2011, between 12 hours and 24 hours

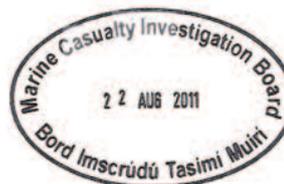
Dear Ms Reddin,

Please find enclosed the above report. Also enclosed are the Irish Weather Buoy reports from M3 and M5 our closest buoy observations. [The buoy observations have not yet been fully quality controlled]

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'Evelyn Murphy'.

Evelyn Murphy B.Sc. M.Sc. Meteorologist
(Research & Applications Div)
Ph 01- 8064290 Fax 01 - 8064247
Email: evelyn.murphy@met.ie



Appendix 7.3 Met Éireann Weather Report.



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18/8/2011

Our Ref. WS3018/2C_14240
Your Ref. MCIB 206

**Estimate of weather conditions in the sea area, at position 51° 20.9'N
9°38.9'W, near Fastnet Rock, on the 15th August 2011,
between 12 hours and 24 hours**

General Situation

A depression of centre 1004 hPa moved eastwards from the Atlantic over Ireland. Associated frontal troughs moved eastwards over the Fastnet area during the period.

Details:

12 hours -18 hours

Winds: south to south-west, Force 4 to 6
Weather: spells of heavy rain, drizzle and fog
Visibility: mostly moderate to poor
Temperatures: air and sea temperatures were between 15 and 16°C throughout.
Sea State: Moderate, with swell waves from the west crossing seas from the south-south-west.

18 hours -24 hours

Winds: south-south-west Force 5 to 6, veered south-west to west Force 5 at about 22 hours
Weather: spells of rain, drizzle and fog with good clear breaks also
Visibility: mostly moderate to poor
Temperatures: air and sea temperatures were between 15 and 16°C throughout.
Sea State: Moderate to Rough, mainly from the south-west

Evelyn Murphy B.Sc. M.Sc. Meteorologist
Research & Applications Division
Met Éireann



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Buoy	Date and Time (UTC/GMT)	latitude	longitude	Wind Direction (degrees from North)	Wind speed (knots)	Highest wind gust (knots)	Wave period (seconds)	Significant Wave height (metres)
M5	15-aug-2011 12:00:00	51.7° N	6.7° W	220	10	15	5	0.9
M5	15-aug-2011 13:00:00	51.7° N	6.7° W	220	9	13	4	0.9
M5	15-aug-2011 14:00:00	51.7° N	6.7° W	220	13	21	4	1
M5	15-aug-2011 15:00:00	51.7° N	6.7° W	220	13	18	4	1.1
M5	15-aug-2011 16:00:00	51.7° N	6.7° W	210	13	16	4	1.2
M5	15-aug-2011 17:00:00	51.7° N	6.7° W	220	19	28	4	1.2
M5	15-aug-2011 18:00:00	51.7° N	6.7° W	210	16	25	4	1.2
M5	15-aug-2011 19:00:00	51.7° N	6.7° W	200	18	29	4	1.4
M5	15-aug-2011 20:00:00	51.7° N	6.7° W	210	21	28	4	1.5
M5	15-aug-2011 21:00:00	51.7° N	6.7° W	200	18	28	5	1.7
M5	15-aug-2011 22:00:00	51.7° N	6.7° W	200	23	31	5	1.9
M5	15-aug-2011 23:00:00	51.7° N	6.7° W	200	22	30	5	2.2
M5	16-aug-2011 00:00:00	51.7° N	6.7° W	210	19	29	5	2.5
Buoy	Date and Time (UTC/GMT)	latitude	longitude	Wind Direction (degrees from North)	Wind speed (knots)	Highest wind gust (knots)	Wave period (seconds)	Significant Wave height (metres)
M3	15-aug-2011 12:00:00	51.2° N	10.6° W	170	17	23	6	1.8
M3	15-aug-2011 13:00:00	51.2° N	10.6° W	180	18	28	5	1.7
M3	15-aug-2011 14:00:00	51.2° N	10.6° W	190	19	29	5	1.8
M3	15-aug-2011 15:00:00	51.2° N	10.6° W	180	22	30	5	2.1
M3	15-aug-2011 16:00:00	51.2° N	10.6° W	170	22	34	5	2.4
M3	15-aug-2011 17:00:00	51.2° N	10.6° W	180	23	33	5	2.4
M3	15-aug-2011 18:00:00	51.2° N	10.6° W	210	20	31	6	2.8
M3	15-aug-2011 19:00:00	51.2° N	10.6° W	210	21	33	6	2.7
M3	15-aug-2011 20:00:00	51.2° N	10.6° W	220	19	28	6	2.6
M3	15-aug-2011 21:00:00	51.2° N	10.6° W	240	20	29	7	3.2
M3	15-aug-2011 22:00:00	51.2° N	10.6° W	250	18	29	6	2.9
M3	15-aug-2011 23:00:00	51.2° N	10.6° W	250	17	25	6	2.7
M3	16-aug-2011 00:00:00	51.2° N	10.6° W	250	15	22	6	2.7



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Beaufort Scale of Wind					
Force	Description	Speed* knots	km/hr	Specification -sea	Wave height** (metres)
0	Calm	<1	<1	Sea like mirror	
1	Light air	1-3	1-5	Ripples	0.1 (0.1)
2	Light breeze	4-6	6-11	Small wavelets	0.2 (0.3)
3	Gentle breeze	7-10	12-19	Large wavelets, crests begin to break	0.6 (1)
4	Moderate breeze	11-16	20-28	Small waves becoming longer, frequent white horses	1 (1.5)
5	Fresh breeze	17-21	29-38	Moderate waves, many white horses, chance of spray	2 (2.5)
6	Strong breeze	22-27	39-49	Large waves, white foam crests, probably some spray	3 (4)
7	Near gale	28-33	50-61	Sea heaps up, streaks of white foam	4 (5.5)
8	Gale	34-40	62-74	Moderately high waves of greater length spray may reduce visibility	5.5 (7.5)
9	Strong gale	41-47	75-88	Very high waves, long overhanging crests, visibility affected	7 (10)
10	Storm	48-55	89-102	Exceptionally high waves, long white foam patches cover sea	9 (12.5)
11	Violent storm	56-63	103-117	Air filled with foam and spray, sea completely white	11.5 (16)
12	Hurricane	64+	117 & over		14 (-)

*Speed = mean speed at a standard height of 10 metres.
**Wave height is only intended as a guide to what may be expected in the open sea.
Bracketed figures indicate the probable maximum wave height.

Wave Heights / State of Sea

The wave height is the vertical distance between the crest and the preceding or following trough. The table below gives a description of the wave system associated with a range of significant wave heights. The Significant wave height is defined as the average height of the highest one-third of the waves. (It is very close to the value of wave height given when making visual observations of wave height.)

Sea State (Descriptive)	Significant Wave height in meters
Calm	0 – 0.1
Smooth (Wavelets)	0.1 – 0.5
Slight	0.5 – 1.25
Moderate	1.25 – 2.5
Rough	2.5 – 4
Very rough	4 – 6
High	6 – 9
Very high	9 – 14
Phenomenal	Over 14

Individual waves in the wave train will have heights in excess of the significant height. The highest wave of all will have a height about twice the significant height

Visibility Descriptions of visibility mean the following:

Visibility (Descriptive)	Visibility in nautical miles (kilometres)
Good	More than 5 nm (> 9 km)
Moderate	2 – 5 nm (4 – 9 km)
Poor	0.5 – 2 nm (1 – 4 km)
Fog	Less than 0.5 nm (< 1km)

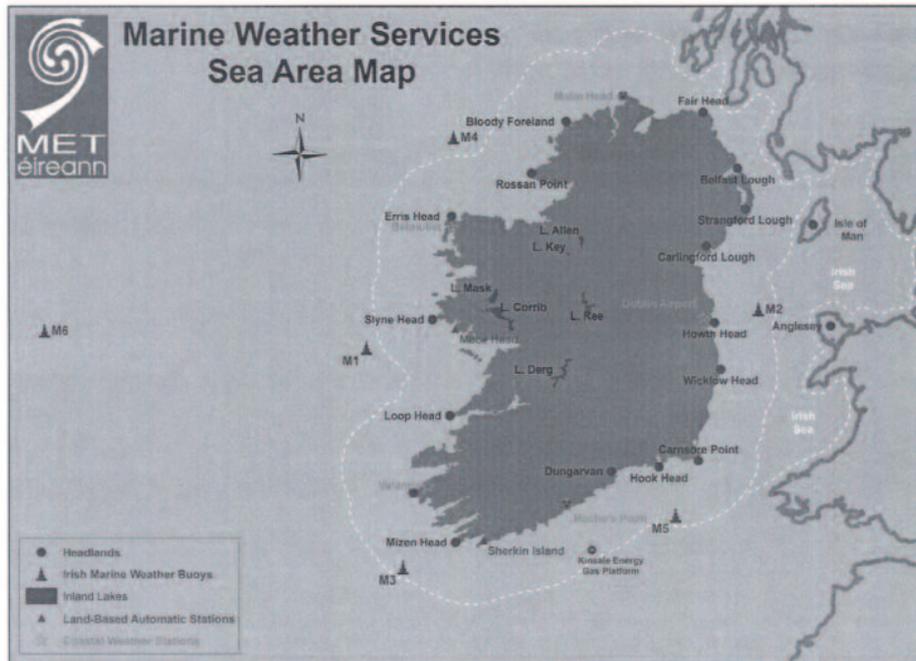
Appendix 7.3 Met Eireann Weather Report.



MET ÉIREANN
The Irish Meteorological Service

Glasnevin Hill, Dublin 9, Ireland. Cnoc Ghlas Naíon Baile Átha Cliath 9, Éire. www.met.ie
Tel: +353-1-806 4200 Fax: +353-1-806 4247 E-mail: met.eireann@met.ie

Map of Ireland with Headlands, coastal stations and offshore weather buoys



http://www.met.ie/marine/marine_map.asp



APPENDIX 7.4

Appendix 7.4 Photos of 'Rambler 100' Inverted showing Failed Keel Stub.



Appendix 7.4 Photos of 'Rambler 100' Inverted showing Failed Keel Stub.



Appendix 7.4 Photos of 'Rambler 100' Inverted showing Failed Keel Stub.



Appendix 7.5 Photos of 'Rambler 100' in Baltimore Harbour following Rescue.



Appendix 7.5 Photos of 'Rambler 100' in Baltimore Harbour following Rescue.



Appendix 7.5 Photos of 'Rambler 100' in Baltimore Harbour following Rescue.



Appendix 7.5 Photos of 'Rambler 100' in Baltimore Harbour following Rescue.



Appendix 7.6 Photos of 'Rambler 100' Inverted following Capsize.



8. CORRESPONDENCE RECEIVED

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Note: The address and contact details of the individual respondents have been obscured for privacy reasons.

17 August 2012

John O'Donnell,
Marine Casualty Investigation Board,
Leeson Lane,
Dublin 2,
Ireland

Sent by email to: info@mcib.ie



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Dear John,

Draft Report of Investigation into capsizing of yacht Rambler 100

Thank you for sending copies of the Draft Report regarding the capsizing of yacht Rambler 100 to myself and my colleague Jason Smithwick.

We have also seen a copy of a letter from Mike Urwin at Royal Ocean Racing Club Rating Office to you dated 9th August. Jason and I support the comments made in Mike's letter.

In Appendix 7.2, the report reproduces extracts from the ISAF Offshore Special Regulations 2010-11, which were relevant at the time of the incident. Effective 1 January 2012 a new edition of the OSR was published '2012-13', and I consider it would avoid confusion if the report was amended to make it clear that the references to OSR throughout the report relate to the 2010-11 edition.

The only additional comment I make, is that I presume there is a typo on page 3, in the summary, 1.6, first line where it reads:

"The scope of this investigation and report **does** investigate the reason for the keel failure..."

Presumably it was intended to say: "...does not...".

Yours sincerely

A handwritten signature in black ink that reads "Simon Forbes".

Simon Forbes
Manager, Technical and Offshore
ISAF

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limited by guarantee and
registered in England under
Number 3255744

MCIB RESPONSE

The MCIB notes the contents of this correspondence and has made the necessary amendments.

Peter Isler comments/corrections to MCIB Draft Report – Rambler100 capsized

1.3 Less than 17 crew were on deck at the time of capsizing. Based on the written reports of the crew, I believe that 13 or 14 were on deck at the time of the keel failure and 7 or 8 were down below. 3 or 4 crew off watch crew were in bunks... the rest of the crew below deck had their foul weather gear and at least a few had life jackets on.

2.5 Category 2 races do not require Satcom/Std C units to be on board a vessel. Rambler100's unit was installed for the Category 0 Transatlantic Race (July 2011) and it was used by the race committee for position reports in that race. No such system was in place for the Fastnet Race (for good reason because Yellowbrick and AIS provide more cost effective means of comms/position tracking in coastal racing.

3.1.5 Rambler100's last Yellowbrick "ping" was at 1740. At that time, Yellowbrick was polling Rambler100's unit every five minutes... so the keel fracture must have occurred after 1740 and before 1745.

3.2.7 The attempt to launch the liferaft was made in the 30 seconds or so while the yacht was still floating on its side before it overturned completely and such effort would be impractical.

3.2.8 The three crew who climbed onto the overturned hull without going in the water were able to throw several lines into the water aft of the hull that greatly facilitated getting the 13 swimmers back to the hull and ultimately up on the hull. Throw ropes accessible near the transom (floating and thick enough to hold under load) are an invaluable safety device.

3.3.6 thru 3.3.10 I believe that this section could use some further tightening up to make more accurate and more clear. Based on my study (Valentia report, Icap Leopard report, Phaedo report and my observations) I believe that some of the time line events are either incorrect, or out of place. For example, a few minutes after being rescued, I was informed by the communications officer on the Baltimore Lifeboat that the Coast Guard was not aware the Fastnet Race was underway until the Lifeboat informed Valentia of this fact (when responding to the first call). Also when first contacted by VHF radio, ICAP Leopard added to the confusion by saying that R100 was okay, still ahead of them on the course. However, after monitoring further CG comms, ICAP Leopard initiated a diligent effort to contact the RORC (which was completely out of communications for a long period) that resulted in the discovery that Gigi Barnard was the contact person for R100.

The timing of PAN PAN and MAYDAY and identification of R100 as the "victim" could be more tightened up. For example, upon being rescued, the Baltimore Lifeboat crew said they did not know R100 was the victim until they visually spotted the hull.... Appx 1930. It would be very informative to obtain any recordings (if available) of the VHF transmissions during this period.

3.3.15 Why was Wave Chieftain on hand and standing by during the rescue of the 16 crew members on the hull of Rambler100 (see photos taken by Wave Chieftain photographer) when the information that there were 5 crew/victims in the water had been available for approximately quite some time? Was

there some disconnect in the rescue management at this time. Although the event had a “happy ending” - every minute counts in a rescue. The Lifeboat had been informed verbally of the five swimmers and their direction at its first pass –.. before even beginning the rescue process. There was a trail of debris blowing downwind/downcurrent from R100 that could have provide excellent tracking. Was the search for the 5 swimmers initiated as quickly as possible?

4.5 The boat’s VHF DSC was not activated because the lack of response from the Mayday broadcast meant that the submerged antennae was not sending any signal. Time was short, so I immediately tried calling out on the handheld VHF ... and got about ¼ of my Mayday call (“Mayday, boat name etc) out on the handheld. before the boat turned turtle. Clearly that was not received either as there is no mention of an unidentified Mayday call in the Valentia transcript. Most likely had the Std C been turned on, it would not have been able to transmit either because its antennae was in the water... there is some prior evidence that the Std C signal does not pass through carbon fibre of an overturned hull.

4.7 Just to make clear.. there was precious little time to get anything except one’s body out of the hull. No matter how accessible the grab bags had been... they would not have been “grabbed” by anyone exiting the hull because to take that extra time might have been life threatening. A “mini” grab bag should always be on deck where the most awake and aware crew can react.

6.1 Fixed keel racing vessels are just as prone to keel failure (which is of course, very, very rare for any kind of keel boat) and there is no reason to direct any extra safety attention only to moveable keel boats... any safety conclusions that are “good enough” for a moveable ballast boat should also be employed for fixed ballast boat.

6.4 Another suggestion is that racing yachts be required to carry their AIS antennae at masthead (as they are for their VHF antennae).. Presently most racing boats have their AIS antennae mounted low on the transom which causes a weak signal that is further blocked by the carbon fibre sails used by these boats. Strong AIS signals would facilitate rescue tracking by shoreside locations... even in the case of catastrophe like R100’s... since the signal would “disappear” at the point of catastrophe. It should be mentioned that there is technology that allows the replaying of AIS positions.

MCIB RESPONSE

The MCIB notes the contents of this correspondence and has made amendments which the Board feel are necessary.



Royal Ocean Racing Club Rating Office

John O'Donnell
Chairman, Marine Casualty Investigation Board
Leeson Lane
Dublin 2
IRELAND

Ref: MCIB 120809

9 August 2012

Dear Sirs,

Re: Draft Report of the Investigation into the capsize of yacht RAMBLER 100.

I have the confidential copy of the above report sent to me under cover of your letter dated 10 July 2012. The opinions and comments below are mine and mine alone.

While this report does not address the reasons for the keel failure, I consider this to be the most important issue to understand. Fundamentally, if the keel on a yacht remains intact, inversion of the yacht is unlikely except in the most extreme conditions. As evidenced by both the 1979 Fastnet Race and the 1998 Sydney to Hobart Race, in those conditions there is sufficient energy in the prevailing sea that yachts are invariably rolled back upright, albeit in some cases after significant periods inverted.

In the above respect, while plainly ISAF OSRs must contemplate the situation of an inverted yacht, I consider that the single most important safety recommendation in the draft report is recommendation 6.9. Further, I understand that at the behest of RAMBLER 100's owners and insurers, investigations have been carried out in UK. I consider that it is of high importance that the outcome of these investigations is made publically available. I encourage MCIB to use whatever powers are available to them to further this aim, including requesting MAIB in UK to require disclosure of the work done.

My own personal observations of inversion incidents over the last few years involving loss of a yacht's keel suggests that there is a strong link with fabricated (ie welded keel fins). Of 10 incidents that I am immediately aware of, in 2 cases there were failures in internal structure, in 1 case the keel cant mechanism failed, in 1 case the cause is not publically known. In all the remaining 6 cases, the keel fin itself failed. In all 6 of these cases, including therefore RAMBLER 100, the fin was a welded structure.

I have discussed the above with the ISAF Technical Office with a view to, at the least, including in ISAF OSRs cautionary text in respect of welded keel fins.

I comment on the MCIB's proposed safety recommendations in respect of ISAF Offshore Special Regulations as follows.

6.1 Agree.

6.2 Agree in principle.

It must however be noted that occurrences of boats capsizing and remaining inverted are very rare, particularly for boats with fixed keels.

I also note that for any existing yacht with an enclosed cockpit, launching a liferaft with the boat inverted is effectively impossible. Yachts of this configuration, which includes the majority of eminently seaworthy production cruiser/racers, would thus be precluded from competing in events such as the Fastnet race or the Sydney to Hobart Race.

I would therefore only support this recommendation for all monohull yachts in OSR Category 0 races and additionally for monohull yachts with canting keels in OSR Category 1 and 2 races.

Seahorse Rating Limited, Seahorse Building, Bath Road, Lymington, Hampshire SO41 3SE, UK
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Registered Cardiff. Reg. No. 2041269. Registered Office as above address



6.3 Agree.

I suggest however that the Regulation should be phrased to require the grab bag to be accessible by the crew with the boat in an inverted position. Satisfying that will naturally satisfy the requirement that it be accessible from the cockpit.

6.4 Agree that the requirement for DSC should be extended to cover also OSR Categories 1 and 2.

I disagree however that it should be a mandatory requirement that MAYDAY calls be made via DSC. In extremis, sailors should be able to use whatever means is best available to them.

6.5 Agree.

I suggest however that the Regulation should be phrased to permit either a float free mounting, or that the EPIRB be mounted in such a position that it is accessible to the crew from the water aft of the boat with the boat in any position.

6.6 OSRs only require a set of survival equipment for Category 0 races. OSR 5.07.1 d) however already draws attention to the value of carrying a PLB when on deck.

OSRs currently state that PLBs *should* be properly registered with the appropriate authority. I agree that OSRs should be amended replacing *should* with *shall*.

OSRs do not currently require boats to carry satellite phones.

If a PLB is properly registered, I am unsure what further benefit would be gained by including PLB details in race organisers' crew lists. There are also wider issues relating to what information should be included in the registration of a Personal Locator Beacon. Further advice from appropriately qualified sources should be sought on this point.

6.7 It is already an OSR recommendation for Categories 0 and 1 that boats have a coloured underwater area. Noting that inversion incidents for fixed keel boats are very rare, I consider that making this a requirement for these boats on Mo0,1,2 is unnecessary. However, I agree that OSR Appendix K should be modified to make OSR 4.02.3 mandatory for canting keel boats in Category Mo0,1,2 races.

6.8 I consider that recommendation 6.8 is unnecessary.

OSR 5.01.4 already requires that all PFDs are annually checked by the person in charge. Many individual crew members would not be qualified to carry out their own checks. Any such requirement would thus be largely meaningless. Additionally, the new for 2012 OSR 5.01.1 already includes the recommendation that before a race a crew member should adjust a PFD and then retain that PFD for the duration of the race.

I should also note that I am in direct contact with the ISAF Technical Office in respect of the above with the aim of assisting ISAF to be proactive in addressing the issues raised by this incident.

Finally, I am happy for all of the above to be included in the MCIB's final report.

Yours Sincerely

Mike Urwin
RORC Rating Office Technical Director

cc: ISAF Technical Office.

MCIB RESPONSE

The MCIB notes the contents of this correspondence and have made the necessary amendments.

CONWAY Helen

From: Justin Clougher
Sent: 25 July 2012 13:15
To: CONWAY Helen
Cc: Marine Casualty Investigation Board
Subject: small details

Helen, regarding RAMBLER capsized report.
Point 1.3 on page 3
There was MORE than 4 down below at the time of capsized.
For sure, Jerry, Jan were in Galley area, Justin in the leeward tunnel over the keel ram, and by my estimation Mick, Aubie, Tim were in bunks, Peter in Nav and perhaps Duncan also was down below, so that makes 7-8.

Regards
Justin

MCIB RESPONSE

The MCIB notes the contents of this correspondence and has made the necessary amendments.

DOWD Assumpta

From: Erle Williams
Sent: 27 July 2012 05:00
To: Marine Casualty Investigation Board
Subject: Rambler report

Dear Ms Helen Conway,

I would like to inform you that I have read the report on the Rambler capsized and I am happy with it.

Best regards,

Erle Williams.

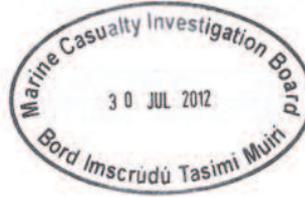


MCIB RESPONSE

The Board notes the contents of this correspondence.



Óglaigh
na hÉireann
DEFENCE FORCES IRELAND



Ceannceathrú Chabhlaigh
Naval Service Headquarters

NHQ/A/OPS/4

25 Jul 2012

Ms Helen Conway,
Secretariat,
Marine Casualty Investigation Board,
Leeson Lane,
Dublin 2.

Helen,

**DRAFT REPORT OF THE INVESTIGATION INTO THE CAPSIZE OF
RAMBLER 100 OFF THE CORK COAST ON 15TH AUGUST 2011**

1. The Naval Service does not have any observations or comments on this draft report.
2. Submitted as requested.


G. MCLOUGHLIN
SUB LIEUTENANT
PSO FOCNS



Ceannceathrú Chabhlaigh, Bunáit Chabhlaigh, Inis Sionnach, Co. Chorcaí
Naval Service Headquarters, Naval Base, Haulbowline, Cobh, Co Cork
t: +353 (0) 21 486 4801
www.military.ie

MCIB RESPONSE

The Board notes the contents of this correspondence.



Irish Coast Guard
GARDA CÒSTA na hÉIREANN

Your ref MCIB/12/206

1st August 2012

Mr. John G. O'Donnell, B.L.,
Chairman
Marine Casualty Investigation Board
Leeson Lane
Dublin 2



**Draft Report of Investigation into the capsizing of yacht 'Rambler 100' off the
Cork coast 15th August 2011**

Dear Mr. O'Donnell,

The draft report in relation to this incident has been reviewed. The Coast Guard has no observations.

Yours sincerely,

Chris Reynolds
Director

Director's Office, Irish Coast Guard, Department of Transport, Leeson Lane, Dublin 2, Ireland.
Oifig an Stiúrthóra, Garda Còsta na hÉireann, An Roinn Iompair, Lána Chill Mochargán, Baile Átha Cliath 2, Éire.
Tel: + 353 1 6783440, Fax: + 353 1 6620930, email: chrisreynolds@transport.ie

MCIB RESPONSE

The Board notes the contents of this correspondence.

