Monaco Energy Class

Technical Rules 2021

(Issued Septembre 2020)

The Monaco Energy Class has been designed to compare the efficiency of the propulsion systems using sustainable energy. To achieve this aim, a catamaran hull, described in this document, will be provided by the Yacht Club de Monaco to each team competing.

Teams will have to build a cockpit including the propulsion system with controls & steering and fit it to the hull.

The Technical Regulations presented in this document serve as directives for the races. Situations that are not covered by the Rules will be decisively resolved at the sole discretion of the Organisation.

1. General

1.1. The Rules stipulated herein apply to the events organised in 2020. One event may be composed of one or more races.

1.2. All participants of each event are expected to have read, understood and agreed to the Technical Regulations. The Organisation will penalise all participants and teams that ignore or violate the Technical Regulations. Penalties may be given in the form of warnings up to and including disqualification and elimination from further participation.

1.3. All questions concerning the interpretation of the Technical Regulations must be submitted to the Organisation in writing.

1.4. The rules will be published on the YCM's website and are binding for all participants and teams. If deemed necessary by the Organisation, it has the right to amend these Technical Regulations.

2. Technical Condition and Safety

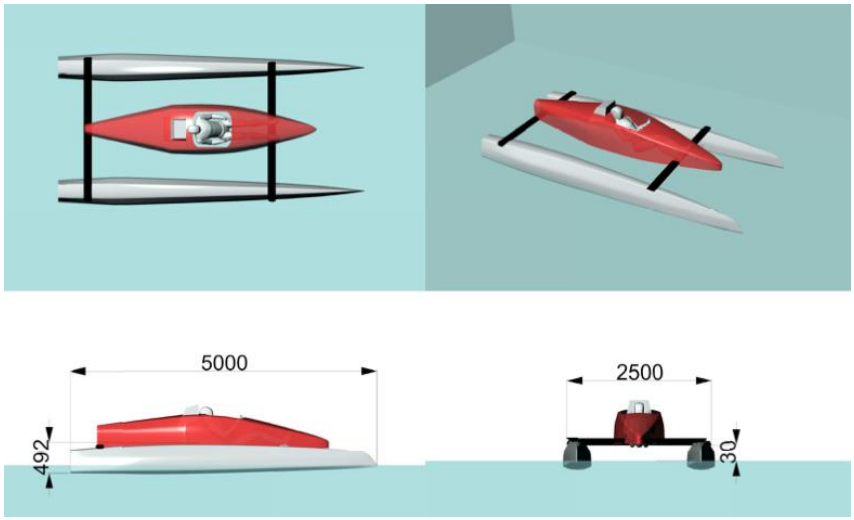
2.1. All participants are, at all times, responsible for the technical condition and safety of their boats during the event,

2.2. The design must be made such that the boat can safely participate in the race taking into account all aspects of the event (racing, storage in the paddock, etc.),

2.3. Approval of the design and approval of the boat during inspection will under no circumstances exempt the participants of their responsibility.

3. The Hull

3.1. Dimensions



Total weight of hulls + beams = 55kg

3.2. The hull is made of 2 hulls and 2 beams bolted together. The beams are round carbon fibre poles of 10cm diameter. They will be used to support and secure the cockpit.

3.3. The hull has been designed to comply with French Category C meaning that the hull has been designed to sustain winds up to 6 Beaufort and a 2-metre significant wave height.

3.4. Hulls have been constructed to be unsinkable. This is achieved by means of watertight compartments and buoyant materials integrated to the hull.

3.5. Participants are not allowed to modify or transform the hulls and beams at any time during construction or an event.

3.6. The hulls will be available four (4) days before each event and will have to be returned the day after the last race of the event.

4. The Energy Source

4.1. At any moment the maximum energy onboard is limited and measured to 5Kwh energy arriving in the engine, (whatever the type of energy) and the maximum pressure will be 700 bars.

4.2. The energy source will be controlled one (1) hour before the start of each race by the Technical Committee.

4.3. Containers of the energy source will have to conform to current transport regulations. (Décret n° 2001-386 du 3 mai 2001 modifié + Arrêté du 3 mai 2004 modifié + Arrêté du 29 mai 2009 modifié + ISO 21487:2012)

4.4. The energy source must be properly fixed/stored onboard to withstand the sea conditions defined in the French Category C weather classification. The energy container must be stored in a position isolated from the pilot seat.

4.5. It is forbidden to use other batteries, except to provide power for any visualisation, communication, satellite positioning and telemetry equipment.

4.6. Solar, wind, hydraulic, thermal, pneumatic and / or kinetic energies are the only sources of energy authorised in addition to the primary source listed above. These energies must be created and used during the race. The energy created cannot be used for any other following races. They can also be installed and remove at the beginning of any race.

The energies will be limited as follow:

Solar	2,5 m2
Wind	5m2 & 3m air draft
Waste	Maximum weight of the boat ready to sail

5. The Engine, Propulsion & Steering

5.1. Each boat must be able to move and be manoeuvrable in forward and reverse gear.

5.2. The steering gear of the boat must be of a sized for adequate controllability, must operate smoothly and must be free of play both in loaded and unloaded conditions.

5.3. Each boat must be capable to sail at a speed of 3 knots.

6. The Cockpit

6.1. The cockpit must be secured using the systems described in the Hull paragraph. Any additional non-destructive securing systems may be used.

6.2. When the boat is stopped, the cockpit, excluding the engine and any system to create additional energy, must not touch the water.

6.3. The cockpit must include a seating position for the pilot that must not be enclosed. The driving position must be such as the feet of the pilot are positioned in front of his body

and be free of any potential hazards. Seats must include a headrest. The pilot must have a clear field of view and have unobstructed hearing at all times. The pilot must be able to evacuate the boat within 5 seconds without any form of outside help. This must be demonstrated by means of an evacuation test. Hatches that need to be opened before the pilot can evacuate the boat are not allowed. Safety belts are also not allowed.

6.4. The cockpit may be streamlined and must be self-draining

6.5. The weight of the cockpit must not exceed 145kg. This means that the total weight of the finished boat with pilot (full load displacement) must not exceed 270kg.

6.6. The cockpit must be coloured with high visibility colours (white or dark colours should be avoided).

7. Electrics/Electronics

7.1. Electronics must be housed in a watertight compartment and cooled. Any boat failing to comply with the IP67 standard for the on-board electronics shall not take part in the event. Exception for the fuel cells that have to use the air as input. In that case an automatic stop is required on the system and has to prove to the technical comity that the system is safe for the pilot and safety teams.

7.2. All of the electrical circuits on board the boat must be protected in order to avoid personal injury and short circuits.

7.3. Protection may take the form of limitation or interruption of the current, circuit breaker(s) or by the insertion of individual circuit fuses.

8. Dead Man Device

8.1. Each boat must be fitted with a device that is designed to cut the power supply to the engine as soon as the pilot loses control of the boat or when the pilot leaves the boat, whether voluntarily or involuntarily.

8.2. It must be clearly marked and visible. The pilot must be able to activate it whilst simultaneously evacuating the boat without it delaying the evacuation. It must remain functional at all times while the pilot is onboard.

8.3. It must be accessible by external personnel and located within 1 meter of the starboard side.

8.4. The functionality must be such that when the dead man device is removed the engine stops running and that when replaced it requires at least one more additional action to enable the engine to start running again.

9. Safety & Safety Equipment

9.1. All sharp edges of the boat must be adequately protected.

9.2. All rotating components in or on the boat must be adequately shielded to prevent unintentional contact while on and off the water. In the case of the use of a flywheel, it must be fitted into a protective housing that is capable of containing all released components in the case of disintegration of the system.

9.3. Propeller(s) used for propulsion are exempted from this rule 9.2 when the boat is on the water. When off the water, the propellers need to be adequately protected.

9.4. All boats must be fitted with the following safety equipment, that must be readily available to the pilot at all times:

9.4.1. Floating towline of at least 10 meters and a minimum diameter of 10mm with carabiner clip secured to it.

9.4.2. A paddle with a minimum overall length of 100cm, a minimum blade length of 30 cm and a minimum blade width of 13 cm

9.4.3. A boat hook with a minimum length of 100cm that may be combined with the paddle.

9.4.4. A uniformly coloured orange or red warning flag with a minimum size of 30 cm x 30 cm attached to a stick or similar structure with a minimum handle length of 100 cm. This flag must not be secured to the paddle or the boat hook.

9.4.5. An audible warning system, such as a ship's horn audible at reasonable distance, such as an orally operated horn, an air horn or an electrically operated horn

9.4.6. An approved fire extinguisher with a minimum capacity of 1 kg of extinguishing material suitable for extinguishing fires on board, preferably with a foam based means of extinguishing. Only fire extinguishers showing a valid approval are allowed. The approval should show the date the fire extinguisher was tested last and the date when the next test is due. The fire extinguisher must be mounted in a position such that it can be reached easily by the pilot from their normal seating position in the cockpit. It should also be prevented from being dropped into the water after taking it out of its housing attachment. In addition to the manually operated fire extinguisher an automated means of fire extinguishing may be installed.

10. Pilot Requirements and Communication

10.1. The minimum age of a pilot at the time of the race is 18 years old on the 1st day of the event and be appropriately licenced to sail pleasure craft in his country of residence.

10.2. The weight of the pilot ready to sail (with overalls, helmet, lifejacket, shoes and communication system) must be at least 70 kg. Each pilot will be weighted during the technical inspection at each event.

Ballast if used must be properly fixed to the boat, in or near the pilot's seat and accessible for inspection.

In case there is more than 1 pilot, the lightest pilot will be used to calculate the correct amount of ballast to be put on board.

10.3. All pilots on board the boat must wear an approved lifejacket of 90 Newton buoyancy capacity or equivalent. If not of the rigid type, the lifejacket must be automatically inflatable when coming into contact with water. The lifejacket must be designed such that it keeps the head of the one wearing it above water (e.g. the lifejacket must be fitted with a collar).

10.4. All pilots must wear an open face, bright colour fluorescent helmet, a bright colour fire resistant jumpsuit and non-buoyant shoes.

10.5. All pilots must be capable of communicating to one member of their on-shore team. The means of communication must have a broadcast range of at least 2 nautical miles. The means of communication must be integrated into the helmet of the pilot, waterproof and supplied with a battery of sufficient capacity to last at least one race without being recharged.

11. Appearance of the Boats

11.1. The first third of the hull forward is reserved for branding or markings provided by the Organisation aiming to promote the messages of the Yacht Club de Monaco and/or its partners. The rest of the hull and the cockpit is free for team's markings. These may not be in conflict with sound moral standards whatsoever.

11.2. The Organiser reserves the right to refuse a boat that displays marking judged contrary to the values and the messages of the Yacht Club de Monaco.

11.3. Each boat must fly, a flag of his/her organisation nationality with a minimum height of 20cm.

11.4. A boat will not be authorised to start a race if the markings have not been complied with.

11.5. All markings to the hull must be removed at the end of each event.

11.6. The Organiser reserves the right to mount a camera on each boat.

11.7. A transponder for tracking and course tracing during each race may be provided by the Organisation and must be positioned on each boat.

12. Inspections / Racing Test

12.1. The Organisation is entitled to conduct inspections of the boats at any time of its own choosing. The participants are bound to cooperate with such inspections.

12.2. The Organiser will inspect all boats for full compliance with the Technical Rules prior to racing. During the inspection the participants are required to present their boat in a race-ready condition.

12.3. During the inspections, the participants are required to demonstrate the racing performance of their boats. During this demonstration, the participants must race a prescribed circuit. The boat and the pilot will be judged on the following aspects:

- Controllability of the boat,
- Racing skills of the pilot,
- Freeboard in racing condition.

12.4. Boats that fail to comply with the applicable Technical Rules or the racing test will not be allowed to enter the race until the time they do come into full compliance and this has been confirmed by the Organisation by means of a re-inspection.

12.5. During a race the boats are not allowed to leave the paddock without permission. Leaving the paddock without the prior permission of the Organiser will lead to disqualification,

12.6. All modifications or repairs to the boat made after the inspection, will be subject to re-inspection.

13. Technical Failure / Modifications

13.1. In the case of the occurrence of a (technical) failure on board, the participants are entitled to repair and/or replace the failed or flawed components with identical ones. The Organiser must be informed of any technical failure.

13.2. Modifying the boat during a race or after the boat has been technically inspected & approved by the Organiser, is not allowed.

13.3. Modifying the boat in between races is allowed but must be reported to the Organiser before the start of the first race element after completion of the modification.

13.4. A participant will only be allowed to participate in the race after any modification has been inspected and approved by the Organiser.