Competition Rules

SubRacing Series – Design Competition 2026

Issue 1.0

Welcome Message

The SubRacing Series Design Competition 2026

To all Engineers, Naval Architects, Scientists and Pioneers

You are invited to join a global movement. Over the next 8 months, you will be helping shape the foundation of a sport for the 21st century! Join us in transforming humanity's relationship with the ocean, through the excitement of sport.

The SubRacing Series was founded on a belief that innovation thrives in competition. Just as Formula One revolutionized motorsport engineering and the America's Cup pushed marine design to new limits, we believe the SubRacing Series can become the next catalyst for high-impact innovation in subsea technology and ocean understanding. More recently, SailGP has shown how a purpose-driven, technologically advanced racing series can rapidly build a global fanbase and commercial ecosystem, proving that with the right mix of innovation, narration and accessibility, a new sport like submarine racing can be both culturally impactful and commercially viable.

We have hosted two proofs-of-concept races in Gran Canaria, brought international teams together, and validated that this can be done. We invite you to help us take the next step.

Your challenge: To develop a high-performance, two-person, hybrid-powered racing submarine. Your design must balance safety, speed and control, all within the spectacular and challenging constraints of real-world subsea conditions.

James Raikes
Programme Director

Matt Silver-Vallance
Chief Business Development Officer

Nick Cunningham-Moorat
Chief Executive Officer

Changelog

Version	Date	Description
0.1	22/06/2025	Initial draft for stakeholder review
0.2	07/07/2025	Further internal changes
0.3	14/07/2025	Further internal changes
0.4	17/07/2025	Initial complete draft
1.0	20/07/2025	First release

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Figures

Tables

Abbreviations

ALARP. *As low as reasonably practicable*
DC26. *Design Competition 2026*
SDR. Submarine Design Report
SMB. *Surface Marker Buoy*
SSB. *Surface-Signalling Buoy*
SSJR. Submarine Safety Justification Report

Acknowledgements

The document authors would like to thank all those who contributed to its development whether by providing suggestions, guidance or feedback. We would also like to thank the existing competitions that provided various degrees of inspiration for this rulebook, namely European International Submarine Races (eISR), International Submarine Races (ISR), and Formula Student UK.

Introduction

Competition Overview

The SubRacing Series Design Competition 2026 (DC26) challenges participating teams to develop a design for a two-person, hybrid-powered, free-flood racing submarine. Teams will develop their design over the coming months, from early concept to detailed drawings, to be assessed and scored by the panel at the DC26 Competition Event.

Teams who achieve successful designs in DC26 will be invited to continue to the SubRacing Series Build & Race Competition, see Figure 1, culminating in the SubRacing Series Race Event where team will race head-to-head in the open water in a variety of events to test their SubRacers to the limits and achieve victory. Designs will be judged in the context of their potential for successful building and racing.

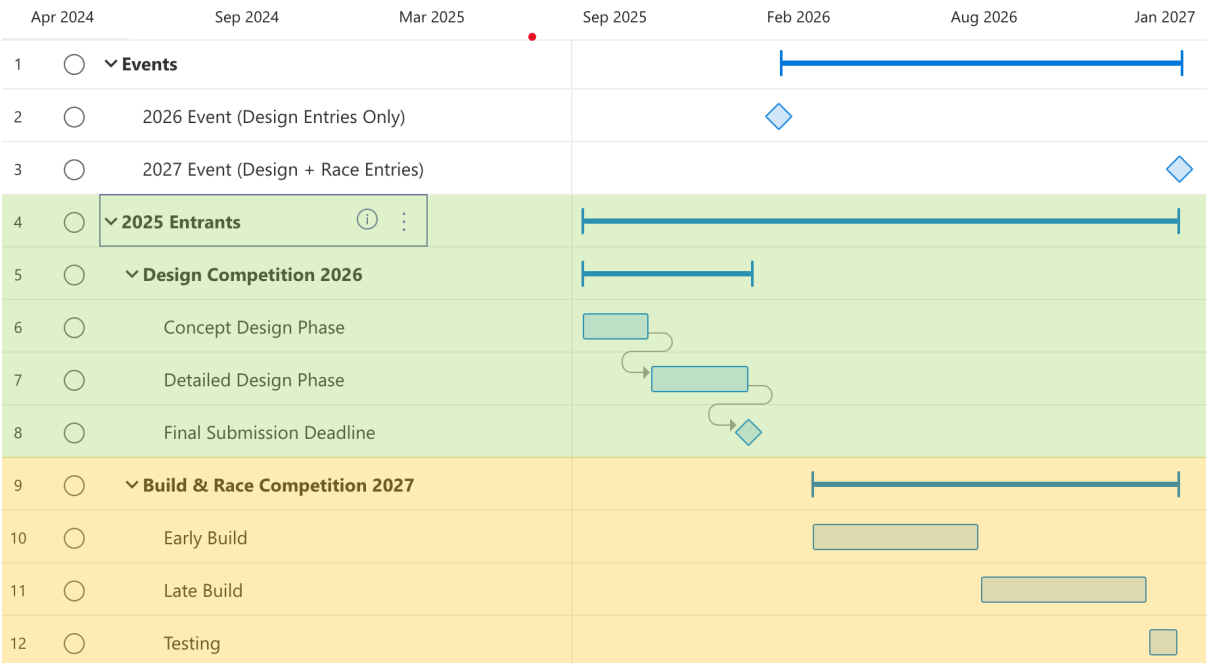

Figure 1: High-level timeline for DC26 (green). Build and Race (orange) details TBC

Specification Rationale

The intended design envelope for participating entries, and hence the design regulations established below, have been carefully considered and reviewed to balance delivery of an exciting competition for contestants, fans and recognition of the practical limitations on team resources, all underpinned by an uncompromising focus on safety.

The design rules will be updated each year the competition is run to implement feedback from competitors and to reflect the development and expansion of the series.

Teams must consider ‘Design for Build’ throughout their design, and the Technical Requirements have been written to support this.

Document Scope

This is the Rulebook for DC26, covering technical and non-technical regulations applicable for the duration of the design competition and against which all DC26 entries will be assessed.

The Rulebook will also govern the 2027 Race Event for entrants to next year's Build and Race competition. The subsea arena specification and dynamic event formats have been included to establish the underpinning requirements of your design.

DC26 competitors will only compete in the static events.

Document Control

When updates to this document are required, a revision will be made and details recorded in the Changelog section above. Any rule changes will be individually listed against each revision as applicable. The latest version of the Rulebook will always be available on the SubRacing Series website.

About the Organisers

SubRacing Series Ltd

The SubRacing Series Ltd was founded with the vision of transforming how people engage with the ocean. Inspired by innovation in marine engineering, science, sport and the triumph of ingenuity in adversity. SubRacing Series Ltd aims to create the world's first global submarine racing league, combining cutting-edge engineering with real-world environmental impact. Following successful proof-of-concept events in 2023 and 2024, the series is now launching its inaugural Design Competition as a critical step toward building a new subsea sporting series.

Design Competition Team

Coming on board earlier this year to build and develop the Design Competition as the latest step in the SubRacing Series journey, the Design Competition Team comprise a small group of professionals from various parts of the submarine domain who share a passion for the SubRacing Series vision. The DC Team membership is outlined in Table 1.

Table 1: Design Competition Team

Programme Director	James Raikes
Technical Lead	Thomas Howell
Subsea Arena & UW Env	Adam Horner
Safety Advisor	Andy Dacombe
Acting Project Manager	Louise Robinson

Entrant Liability

Designers and/or associates participating in this competition may use their own designs to build a racing submarine. However, neither the designers, their associates, nor SubRacing Series Ltd bear any liability or responsibility for any third party's use, replication, or adaptation of those designs. Any such use is undertaken entirely at the risk and discretion of the parties involved and does not imply endorsement or responsibility by the original designers, their associates, or SubRacing Series Ltd.

Pilot Year Considerations

The SubRacing Series Design Competition 2026 is the pilot for what will become a growing annual event, developing and refining over time. Part of this process is identifying areas for improvement in this pilot year for the benefit of next year's competition and to ensure the greatest chance of sustaining and building this field in which we are all invested. Teams involved in this first year have a unique opportunity to have a voice in the formation and refinement of this new endeavour. As such, we would like to highlight the following points and make the following requests of all our competing teams:

Collaborative vs Competitive Attitude

We expect all teams to enter with an open-minded attitude reflective of the reality of participating in a brand-new competition developed by a small team of passionate volunteers.

Within reason, teams are requested to work with the organisers to improve the competition for all, rather than purely acting in self-interest to maintain greater competitive advantage over their opponents. The following headings provide illustrative examples.

In certain cases, organisers may offer point bonuses to teams that provide feedback and raise issues, particularly where concealing information may have provided a competitive advantage. Bonuses awarded will be entirely at the organisers' discretion.

Competitor Feedback

Feedback on any element of the competition, either technical or non-technical is welcomed at any stage. Please use the DC@subracingseries.com email address and an online forum for competitors will shortly be launched and communicated to teams that have entered.

Technical Queries

In future years, the technical query process will be further developed and formalised to ensure ingenious innovations by the querying team are not automatically revealed to their opponents, thus eroding their competitive advantage. This year, the organisers respectively reserve the right to utilise any technical query brought to their attention to provide clarification or rule alteration for all teams, particularly where a safety risk has been identified.

Rule Changes

All reasonable effort will be made by the organisers to avoid making changes to the rules once the competition period has begun. In cases where this is unfortunately unavoidable, organisers will look to make the least impactful change that will reasonably mitigate the issue that has been identified. Nonetheless, regrettably, rule changes that may require teams to rework established aspects of their design cannot be entirely ruled out and this will remain entirely at the organisers' discretion.

General & Administrative Regulations

G1. Competition Procedure

G1.1. All designs must follow all rules listed in the Technical Requirements section.

G1.2. DC26 comprises three static events as described in the Static Events section.[1]

G1.3. The maximum achievable points, before bonuses, are shown in Table 2.

G1.4. Bonus points are awardable in instances where teams work with the organisers to close potential loopholes in the rules, thus potentially forfeiting a competitive advantage should they have attempted to utilise it.

G1.5. Bonus points awarded shall be 5 points for an escalation that results in a minor amendment to the rules and 10 points for a major amendment.

Table 2: DC26 maximum achievable points

Event	Points
Engineering Design	100
Cost & Manufacturing	100
Safety	100
Total	**300**

G1.6. The official language of DC26 is English. All submissions must be in this language.

G2. Competition Conduct

Organiser Authority

G2.1. The organisers reserve the right to revise any scheduled Key Dates. Changes will be communicated to all teams if they occur.

G2.2. The organisers reserve the right to modify the competition rules at any time and in any manner that is required to ensure the safety of the competition in their sole judgement. The organisers' interpretation of a rule is the final one.

G2.3. Official announcements throughout the course of DC26 will be considered part of the rules.

[1] Dynamic Events are those intended for the 2027 race event. They will not form part of DC26 but should be used to drive the requirements of all entrants' designs.

G2.4. Any future clarifications or amendments published during DC26 will be considered part of the rules. These will be implemented directly into the next revision of the Rulebook for the following year.

G2.5. The Key Dates document will be considered part of the rules.

G2.6. Disrespectful behaviour towards the organisers or other teams will not be considered acceptable and may, in the case of repeated instances, result ultimately in disqualification of the offending team from the competition.

G2.7. Violation of the intent of a rule will be considered as a violation of the rule itself.

Technical Queries

G2.8. Queries about the rules may be asked of the organisers at any point.

G2.9. Before submitting a query, the DC26 FAQ section of the website must be checked.

G2.10. Queries already answered will not be answered again unless it can be demonstrated that a new interpretation is required or context applies.

G2.11. Queries must be submitted to the email address DC@subracingseries.com with a subject line beginning “DC26 Query:”

G2.12. Rule amendments will be published on the SubRacing Series website and communicated to teams via forum/mailing list. Teams are expected to stay up to date and ignorance of the amendment will not be considered a valid reason for failing to follow an amended rule.

G2.13. Organiser clarifications are valid only for the year in which they are provided. After this, they will either be incorporated into the next rulebook edition or if not will require a new query to be submitted in the following year.

Protests

G2.14. Should any rule amendment, interpretation, clarification, judge verdict, event score or other official action cause some actual, non-trivial harm to a team’s performance in the competition, this should be raised in the first instance informally to the event organisers for resolution.

G2.15. A formal protest process may be implemented in future should one be determined to be required.

G2.16. Any escalation made by a team must be made promptly. Escalations made significantly after the event in question for strategic benefit will not be considered.

G3. Team & Participant Requirements

G3.1. There may be only one design entry per competition team.

G3.2. Team members may only participate for one team and not be shared between multiple teams.

G3.3. All entrants must be at least 18 years of age.

Team Make-Up

G3.4. It is up to teams to determine their organisational structures, but certain roles are required to be present in all competing teams:

- **Team Lead.** Responsible for managing the team's participation in the competition and point of contact with the organisers for queries and submissions.
- **Safety Officer.** Responsible for assuring the safety of the design

G3.5. Should a team lose any members during the course of the competition, to the point that their ability to compete is at risk, this should be escalated to the organisers at the earliest opportunity for possible courses of action to be discussed.

Registration

G3.6. DC26 can only support a certain number of teams and so a reserve list will be utilised should this number be reached.

G3.7. Full details on how to register will be published and updated on the SubRacing Series website.

G3.8. Team Leads must ensure the names of all team members are provided to the organisers and any changes are communicated as they occur.

G3.9. Requirements for registration for the Competition Event will be communicated closer to the event.

G4. Documentation & Deadlines

Submissions

G4.1. Several documents are required as part of a team's submission in advance of the Competition event. Full details regarding the required documents, deadlines, submission format, and late penalties will be provided in the **Key Dates** document, which will be available separately on the SubRacing Series Website.

G4.2. Any submissions that cannot be opened or viewed by the organisers due to technical issues (file corruption, upload fault, etc) will be considered unsubmitted.

G4.3. Team Leads are responsible for submissions and should request confirmation of receipt once submitted. Early submission is recommended to mitigate risk.

Technical Requirements

T1. General

T1.1. The submarine must be designed to be operated by two people. Roles are at teams' discretion, but 'Pilot' and 'Navigator' is recommended.

T2. Hull Design

T2.1. The submarine must fully encapsulate all crew members.

T2.2. The submarine must be free flood.

T2.3. The submarine must have a free flood/drain holes sited on the underside of the vessel. Hatches can be used to speed up flooding/draining iterations.

T2.4. Submarine length must not exceed 6 m (excluding appendages). Note also T10.1.

T2.5. Submarine width must not exceed 2 m (excluding appendages).

T2.6. Submarine height must not exceed 2 m (excluding appendages).

T2.7. The hull must support 95th percentile males. Dimensions are provided in Appendix A.

T2.8. The hull must be painted or wrapped such that it is bright when viewed from above and dark when viewed from below.

T2.9. Drag reducing coatings on the hull are permitted.

T2.10. The hull must be designed so that it is neutrally buoyant at 5 m depth. The buoyant material must withstand implosion at a depth of 20 m.

T2.11. All internal/external handles and release mechanisms used to exit the submarine must be marked with a high visibility paint.

T2.12. Release handles for rescue crews must be indicated with the word "Rescue" (Black text with 10 cm^2 orange background).

T2.13. All hatches must be secured to the hull by means of hinges, straps, or other similar mechanisms.

T2.14. The mechanism permanently securing the main hatch to the hull must not restrict in any way the crew's ability to exit the submarine.

T2.15. All crew members restraints within the submarine (e.g. toe clips or shoulder straps) must have the release mechanisms clearly identified with high visibility orange material.

T2.16. Full crew-member evacuation (no part of body remaining within hull) for both responsive and unresponsive crew must be achievable within 30 seconds.

T2.16.1. **Scenario 1**: For a conscious crew member, evacuation must be independent of external rescue.

T2.16.2. **Scenario 2**: For an unconscious/unresponsive crewmember, the evacuation must be via the other crewmember or rescue team. Time limit begins on rescuer contact with external handle.

T2.17. The crew members' faces must be visible from outside the submarine when in racing positions and all hatches closed.

T2.18. Crew members must have a means of contact with one another sufficient for one to determine whether the other is in distress (visual, verbal, dead-man switch, etc)

T2.19. The pilot must be able to see unimpeded in a 180° arc in the horizontal plane and from 45° vertically downward to 45° above horizontal in the sagittal plane. The visual field may be achieved directly or indirectly.

T2.19.1. **Indirectly**: The use of camera and screen systems. The operator must be able to access different camera views within a 1 s interval (changing camera view on one display or viewing multiple screens in the cockpit).

T2.20. The submarine must be equipped with a high visibility pop-up surface signalling buoy (SSB) which is connected to the submarine by 20 m of floating highly visible line (rated to 250 kg breaking strain).

T2.21. The mechanism to deploy the SSB must be accessible by all crew members.

T2.22. The SSB must have a net buoyancy of at least 1.5 kg and must be stowed such that during deployment it does not tangle on the crew or submarine fittings when released.

T2.23. On release of the of the SSB the submarine must automatically deploy a drop anchor designed to prevent the submarine from drifting during an emergency.

T2.24. An anchor point with a minimum internal diameter of 25 mm must be mounted to the submarine, accessible by surface vessel, to facilitate surface towing by support vessel.

T2.25. The hull must have a mounting point for a surface marker buoy (SMB). This will consist of a minimum volume 10 litres and a minimum buoyancy of 10 kg. This will be connected to the submarine by a 15 m line.

T3. Propulsion

T3.1. The **target** speed for SubRacing Series DC26 is 10 knots (5.14 m/s). The submarine must be capable of achieving this speed for a sustained period.

T3.2. The submarine must have a hybrid power system, combining electrical and human powered drive chain.

T3.3. The propulsion system must be directly coupled with the crew and the use of systems such as clutches is prohibited.

T3.4. The maximum combined power output of any motor(s) used must not exceed 1700 W.

T3.5. The drive train must always be operated in human-power mode only. The electrical primary propulsion system must not be used without human power input.

T3.6. Small motors are permitted for manoeuvring e.g. bow thrusters. These can be operated by pure electrical drive and are excluded from the motor output allowance specified in T3.4.

T3.7. Energy storage methods are not limited to batteries.

T3.8. Submarine propulsion must be water coupled.

T3.9. Only water-resistant grease may be used to lubricate boxed gearing.

T3.10. Tips of propulsion devices (e.g. propellers, propulsor, biometric fins) must be painted high-visibility orange.

T3.11. The type of battery, the battery location and how the battery can be isolated must be detailed close to where batteries are fitted.

T3.12. An emergency pushbutton kill switch to isolate power must be fitted inside the submarine easily accessible to both crew members.

T3.13. An emergency pushbutton kill switch must be placed on the outside of the hull, isolating all power to the submarine. The kill switch must be surrounded by a white and orange striped patch no smaller than 20 cm x 20 cm, with the words "stop" in black in letters minimum 4 cm high.

T3.14. Battery housed in fireproof and waterproofed enclosure.

T3.15. Electrical systems must not exceed a rating of 24V DC.

T4. Manoeuvring and Control

T4.1. Control systems can be electrically or mechanically driven.

T4.2. Electrical control systems must have mechanical redundancy in the event of electrical system failure. Engagement of the mechanical system must be conducted by a member of the crew and take place internal to submarine without the need to remove hatches.

T4.3. Tips of control surfaces must be painted with highly visible paint

T4.4. Trim and compensation systems are permitted to maintain neutral buoyancy throughout the race.

T5. Instrumentation

T5.1. The Submarine must be equipped with depth gauge and a compass for each crew member.

T5.2. The use of commercially available Sonar or Fish finder systems is permitted

T5.3. Equipment must operate within the ultra-sonic frequency (>20 kHz)

T5.4. Sonar faces must be external to the submarines hull.

T5.5. Materials used for mounting must prevent high frequency sound transmission into the hull.

T5.6. The sonar system must be equipped with a crew-operated on-off switch which enables the transducer to be switched off when support divers are present near the sonar face.

T5.7. An emergency pushbutton kill switch must be placed on the outside of the submarine to isolate power to transducer(s). This function can be integrated into the kill switch outlined in T3.13.

T6. Life Support

T6.1. All breathing air must be supplied using open-circuit SCUBA systems and use compressed normal atmospheric air. Special gas mixes, e.g. nitrox, are prohibited.

T6.2. Rebreather systems are prohibited.

T6.3. The submarine must be fitted with a minimum of 3600 litres of primary air supply for each crew member. In standard operating conditions the pressure cylinder must not fall below 50 bar (600 litres). This reserve of air must only be used in an emergency.

T6.4. The primary air supply must be securely fixed to the hull.

T6.5. Each crew member must carry an additional emergency 3 litre cylinder (minimum 200 bar) that shall be used as an independent air supply in the event of a 'bail out' that the crew can leave the submarine with[2]. The pressure in this cylinder must not drop below 50 bar.

T6.6. The secondary air supply must be fixed to the crewmembers and not fitted to the submarine.

T6.7. All regulators fitted to the submarine must conform to NorsoK U-101 standard (deliver 64.5 litre/min without free flow and with minimal effort of breathing.)

T6.8. Repeater gauges should be fitted to each air supply and mounted so that support divers can easily read tank pressures of all crew members inside.

[2] Support divers will provide additional breathing gas during the entry and exit of the submarine.

T6.9. It is forbidden to use an individual crewmember's onboard air supply (primary and backup) for any other use than life support.

T7. Environmental and Sustainability

T7.1. The submarine must not contaminate the environment that it is operating in. For example, drag reduction coatings must not slough off the submarine into the environment.

T7.2. All fluids used throughout the submarine must be biodegradable and non-toxic.

T7.3. The submarines must have an upper noise limit of 80 db (decibels), measure at a static point 1 m to the side of the vehicle, with the vehicle at 100% power output.

T8. Submarine and Broadcasting Interface

T8.1. The submarine must house, at a minimum free distance of 30 cm, specified video recording and transmission equipment facing the crew (e.g. action camera similar to an Insta360)[3]

T8.2. The submarine must include a physical interface for power/communication. **The details of this interface will be specified in due course.**

T9. Submarine Launch and Recovery

T9.1. The submarine should have an appropriate launch and recovery cradle/trolley which can be towed/pushed using a tractor (tow bar arrangement).

T9.2. The trolley must be negatively buoyant in order to prevent it from floating during launch and recovery operations.

T9.3. One end of the trolley must be fitted with a steering assembly to aid in manoeuvring.

T9.4. The trolley must be fitted with a method of securing the submarine (e.g. strops, shackles) to allow for safe operation up/down angled surfaces such as slipways.

T9.5. The submarine should be designed to include dedicated lifting points for movements on and off the launch trolley.

T9.6. The trolley must use at least 4 wheels with a diameter of not less than 30 cm.

T9.7. The trolley wheels must have rubber tyres to retain grip.

[3] Assume any broadcasting and camera equipment will be independently powered thus not draw supply from submarine.

T10. Submarine Transport and Logistics

T10.1. Submarines must be transportable in a standard 20 ft container. The internal length of this is 5.9m.

Competition Events

Static Events

S1. Overview

S1.1. SubRacing Series Design Competition 2026 comprises three static events whose scores will be combined to determine the overall champion.

S1.2. DC26 shall be scored per the following calculation:

$$\begin{aligned}\text{Overall Score} = &(\text{Eng. Design Score} - \text{Penalties}) \\ &+ (\text{Cost \& Manu. Score} - \text{Penalties}) \\ &+ (\text{Safety Score} - \text{Penalties}) \\ &+ \text{Bonus Points}\end{aligned}$$

S2. Engineering Design Event

Objective

S2.1. The objective of the engineering design event is for teams to demonstrate the goodness of their designs and the process they followed to achieve it.

S2.2. While the SubRacing Series DC takes inspiration from existing student design competitions, the emphasis is not on the academic development of the participants, rather on the quality of their outputs, and so the judging methodology will reflect this. It is assumed competing teams have a baseline engineering knowledge and experience.

Procedure

S2.3. Prior to the competition event, teams will submit a Submarine Design Report (SDR) and Design Specification Sheet. These must be submitted by the deadline specified in the Key Dates document.

S2.4. During the competition event, teams will deliver a Submarine Design Presentation after which there will be a Design Review in which the judges will ask follow-up questions and interrogate the teams' design and documentation.

S2.5. It is understood that not all elements of the design may be fully mature at this stage, in anticipation of further development post-Design Competition. However, the greater detail and quality present at this stage will demonstrate greater likelihood of success at the future Race Event and will therefore earn higher scores.

S2.6. No manufacturing is expected or required for the Engineering Design Event, or any static event, but teams may consider including scale models, prototype parts, 3D prints, etc, to support their presentation and articulate their design to the judges.

Submarine Design Report

S2.7. The SDR should contain a brief description of the overall vehicle including a review and derivation of the team's design objectives as well as any information on features, concepts, methods or objectives as required to express the value and performance of the vehicle.

S2.7.1. Areas to describe may include the hull design; system architecture; hydrostatics and stability; manoeuvring and control; human factors; etc.

S2.8. The SDR must not exceed eight pages, consisting of not more than five pages of content (text, which may include pictures and graphs) and three pages of drawings.

S2.9. The three SDR drawings must show the vehicle from the front, the top and the side. Each drawing must appear on a separate page.

Design Specification Sheet

S2.10. The design specification sheet should include the following information as a minimum:

a) name of the submarine,

b) length overall,

c) maximum beam,

d) hull weight and contained volume,

e) positions of Centre of Gravity and Centre of Buoyancy,

f) type of propulsion,

g) method and type of propulsion,

h) propulsion rpm / cadence,

i) pedal cadence, including shaft gear ratio, and

j) type of control of hydroplanes & rudders.

Scoring

S2.11. The engineering design event will be scored per Table 3.

Table 3: Engineering Design Event Scoring Table

Category	Points
Document & Presentation *Quality, clarity, structure and presentation of the Engineering Design Report and Engineering Design Presentation*	10
Overall Concept *High level decisions, underpinning rationale, innovation and design integration.*	20
Structural Design *Hull design, manoeuvring and control, human factors*	20
Powertrain Concept *Explanation of choices, sizing, human factors*	20
Team Management & Planning *Plan to procure, build and test design for next year; team org structure and resource management*	10
Design for Manufacture *Demonstration of manufacturing understanding driving design consideration inc. materials, layout and assembly strategy*	10
Environment & Sustainability *Sustainable design from cradle to grave, environmental consideration during submarine operation*	10
Total	**100**

S3. Cost & Manufacturing Event

Objective

S3.1. The objective of the cost and manufacturing event is for teams to demonstrate their understanding of how they will manufacture their SubRacer and how much it will cost to do so. Teams should be able to demonstrate how they have traded off between performance and cost and how they have decided to make or buy particular systems or components in their design.

S3.2. As participants in an 'on-paper' design competition, this event ensures teams have considered the producibility of their design in anticipation of future attendance at the SubRacing Series Race Event.

Procedure

S3.3. Prior to the competition event, teams will submit their Cost Report. This must be submitted by the deadline specified in the Key Dates document.

S3.4. During the competition event, teams will be required to present and then field questions by from the judges to review the contents of their reports and provide further clarity and explanation where required. Each of the following engagements is currently expected to be 30min in duration.

Cost Report

S3.5. The Cost Report must include:

- **The Bill of Materials (BOM) for the design.** This is a list of all components, assemblies, materials, processes and associated costs.
- **BOM Supporting Material.** This is to include any additional information to help the judges understand the BOM, such as drawings, exploded views or renders of the design or individual elements of the design.
- **Cost Explanation.** This is to include additional information to explain how the costs have been calculated. It should state what cost model has been used, what types of costs are included, what assumptions were made, etc.

S3.6. The Cost Report must be submitted in advance of the competition by the communicated deadline and must also be brought to the event in hard copy. The Cost Report may not be changed after the online submission.

S3.7. Costs should not include R&D, capital expenditure or other Non-Recurring Expenditure (NRE).

S3.8. Costs must be given in GBP. When converting from other currencies, the exchange rate used must be provided.

S3.9. There is no maximum cost and no receipts are required.

Scoring

S3.10. The cost and manufacturing event will be judged per Table 4:

Table 4: Cost and Manufacturing Event Scoring Table

Category	Points
BOM Detail	40
Cost Realism	40
Presentation	20
Total	**100**

S4. Safety Event

Objective

S4.1. Safety is a key focus for SubRacing Series as we venture into new territories of open water racing. Therefore, DC26 will be looking for teams to

produce inherently safe designs that ensure the safety of all personnel during racing conditions.

S4.2. The objective of the safety event is for teams to demonstrate how their designs keep the risk of harm 'as low as reasonably practicable' (ALARP).

S4.3. Teams must explain the safety principles of their design, their identified hazards and the methodology used, the safety measures (whether preventative, protective or mitigating) they have put in place to minimise the risk and their justification for the measures chosen.

Procedure

S4.4. Prior to the competition event, teams will submit a Submarine Safety Justification Report (SSJR), demonstrating that risks have been identified, assessed, and managed before construction and testing begins.

S4.5. During the competition event, teams will be required to present their report after which there will be a Safety Review in which the panel will interrogate the team on the contents of their reports to gain further clarity and explanation where required.

SSJR Structure

S4.6. It is for teams to decide the best way to structure their SSJR and the key elements of their approach to safety to include. Nonetheless, the following suggestions may be used as a starting point:

S4.6.1. Suggested structure:

a) Project Overview
b) Design Safety Philosophy
c) Hazard Identification and Risk Assessment
d) Crew Safety and Emergency Scenarios
e) Build & Logistics Safety
f) Testing & Validation
g) Organisational Responsibilities
h) Appendices [as required]

S4.6.2. Suggested safety themes to include:

- **Battery safety.** Consider all areas of risk including operation as well as build, transport and charging
- **Submarine egress.** Rule T2.16 provides the upper limit but you should underpin your design with a full analysis of the hazards and how these are mitigated in your design choices.

S4.7. The SSJR should comprise between 10-20 pages.

Scoring

S4.8. The safety event will be judged per Table 5.

Table 5: Safety Event Scoring Table

Category	Points
Design Safety *How safe is the submarine?*	40
Case Structure *How well-demonstrated is this safety?*	30
Racing context *How have you reduced conservatism in your safety approach to ensure no unnecessary impact to racing performance?*	20
Presentation	10
Total	**100**

S5. Static Event Penalties

Late Submission

S5.1. A penalty of 10 points per day up to a maximum of 50 points (per event) shall be applied for late submission of required documents for that event.

S5.2. Part days will round up to the nearest whole day.

S5.3. Requests to make alterations to submitted documents may be considered but will be subject to the same lateness penalty if after the submission deadline.

Submission to Presentation Discrepancy

S5.4. A penalty of 5 points shall be applied for any substantive differences between the design as presented in the submitted reports and as presented during the event.

Incorrect/Incomplete Submission

S5.5. Submissions that fail to meet any of the structural requirements (missing section or artifact) outlined above will be subject to a 20-point penalty.

Presentation No-Show

S5.6. Teams who do not attend the competition event will be subject to a 50-point penalty (in addition to opportunity cost of not presenting their submitted designs). Teams are encouraged to attend in person, if this is not possible, online facilities will be provided.

S5.7. A nominal score will nonetheless still be given based on submitted documents.

S5.8. This penalty may be waived when officials are notified by the time and date specified in the Key Dates document or in extenuating circumstances.

S5.9. Verdict and definition of ‘extenuating circumstances’ are at the organisers’ discretion.

Dynamic Events

D1. Overview

D1.1. The dynamic events will take place in the SubRacing Series Arena, designed to support several racing formats, as shown on the diagram in Appendix B.

D1.2. Each event is equally weighted and so submarines must be optimised for success in each, able to achieve both straight line speed and controlled manoeuvring.

Course Layout

D1.3. The course will be approximately 600 m long and will comprise four sections: a 200 m slalom, a 200 m metre straight and a long turn and short turn connecting the two side of the circuit together.

D1.4. The course will be marked with vertical poles establishing a track width of 10 m with a rope or tape to split the track into two 5 m wide lanes.

D1.5. The minimum radius for a turn at the ends of the circuit will be 20 m.

D1.6. The racing depth will be set around 5 m. Therefore, in some areas of the course there will be an under-keel clearance of less than 4 m – it is expected that the shallower water will be around the start lines.

D1.7. Submarine designs must maintain a level flight and consideration of ballast will also be key.

D1.8. The exact position of the course in the bay remains to be finalised and will be decided once bathymetric and current surveys of the bay have been completed in order to achieve the maximum safety for race support divers and crew.

D1.9. All finish lines for races will be at the seaward end of the track to ensure that SubRacers have clear water beyond the finish line to slow and come to rest.

Course Environment

D1.10. The design competition arena will be set within the bay of Arinaga in Gran Canaria, as shown in Figure 2.

D1.11. The topology of the bay means that the maximum course depth will be 9 m and the minimum 0.5 m (at the launch area).

D1.12. The salinity of the water is approximately 1.025 kg/m3 with optimal racing condition providing 10 m of underwater visibility.

D1.13. The bottom of the bay is sand with some dispersed hard structures (rocks, anchors and mooring block).

D1.14. While the course is located within a secluded bay, the competitors will be subject to ocean currents with racing conditions restricted to a maximum of 0.5 m/s (1 knot).

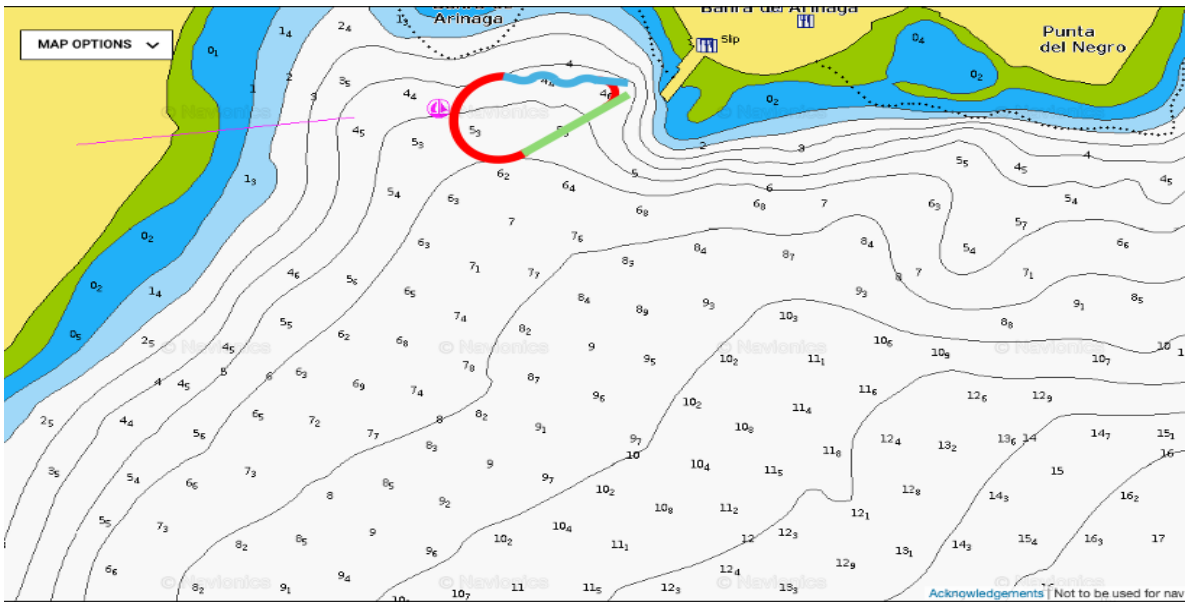

Figure 2: The indicative location of the Arena in Arinaga Bay

D2. Head-to-Head Sprint

Event Layout

D2.1. The head-to-head sprint takes place on the 200 m straight length of the SubRacing Series Arena.

D2.2. The start line is located at the narrow end of the circuit.

Procedure

D2.3. This event provides classic head-to-head racing with two submarines competing over the 200 m straight stretch to cross the finish line first.

D2.4. Precise scoring strategy for this event remains to be finalised but may either be elimination or round robin and so multiple runs should be assumed.

D3. Head-to-Head Slalom

Event Layout

D3.1. The head-to-head slalom takes place on the opposing side of the arena, containing the four slalom turns.

D3.2. The distance between the start and finish lines is 200 m (effective track length is longer due to the slalom).

Procedure

D3.3. This event builds on the straight-line excitement of the head-to-head sprint with the addition of the slalom turns.

D3.4. The slalom is designed to have an equal number of left and right turns to ensure neither submarine is at a disadvantage.

D3.5. Precise scoring strategy for this event remains to be finalised but may either be elimination or round robin and so multiple runs should be assumed.

D4. Circuit Race

Event Layout

D4.1. The circuit race uses the full course and requires the completion of a single lap plus an additional final straight.

D4.2. The event starts at the sprint track start line and finishes at the sprint track finish line after completing a full lap.

Procedure

D4.3. Submarines must stay in their lanes throughout the race.

D4.4. Starting positions will be staggered to compensate for the increased distances in the outer lanes.

D4.5. Precise scoring strategy for this event remains to be finalised but if multiple heats are required then the intent would be to compare times across all heats, to avoid submarines doing multiple runs.

D5. Endurance

Event Layout

D5.1. The endurance event uses the whole course layout with the slalom section straightened, creating two straight lengths between the wide and narrow corners.

D5.2. The objective of the event will be to complete the furthest distance in 30 minutes.

Procedure

D5.3. Submarines will be started progressively with a gap of 8-9 minutes between each start.

D5.4. After 30 minutes have elapsed the submarine will move off the track to clear it for remaining racers.

D5.5. Completed distance will be calculated in terms of whole laps plus remaining fraction of the final lap.

D5.6. The distance will be calculated assuming a racing line 2 m wider than the internal radius of the course.

D5.7. In the event that a crew reaches their reserve air during the race, they must stop at this point, whether or not 30 minutes have been reached.

D5.8. Time elapsed for each submarine will be tracked by race coordinators who will signal when time has elapsed.

Appendices

A. 95th Percentile Male Dimensions

Table 6: 95th percentile male dimensions

Metric	Measurement (cm)
Height	Up to 195
Shoulder Width (Biacromial Breadth)	Up to 50
Sitting Height (if recumbent)	Up to 102
Arm Length (Shoulder to Wrist)	Up to 70
Leg Length (Hip to Floor)	Up to 104
Chest Circumference	Up to 115
Hand Length (Wrist to Fingertip)	Up to 22
Foot Length	Up to 30
Head Circumference	Approx. 58-60

B. SubRacing Series Arena inc. Event Tracks

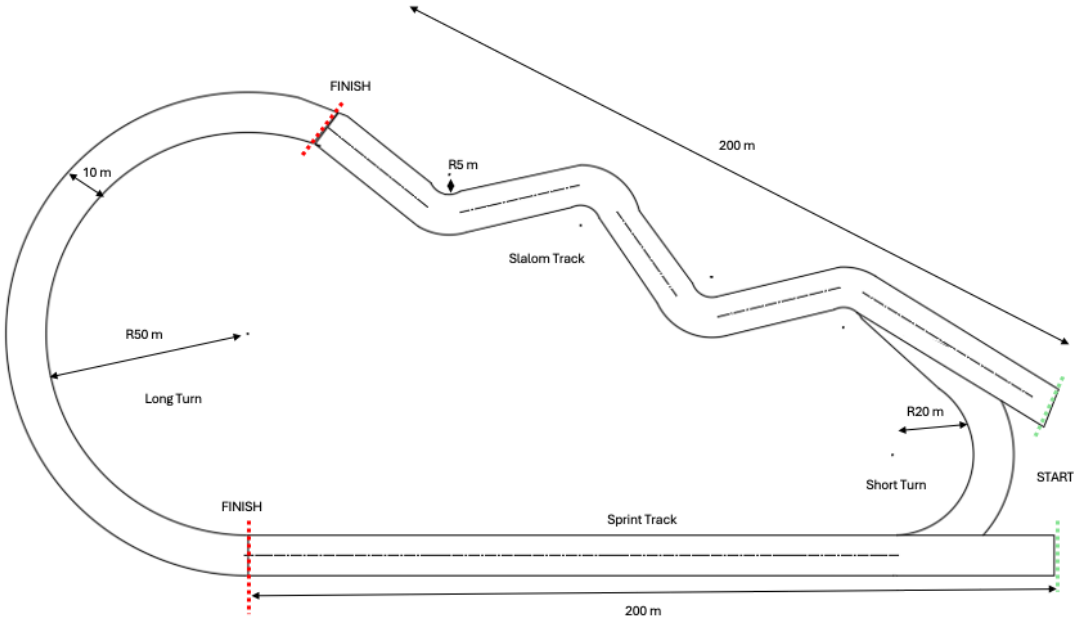

Figure 3: SubRacing Series Arena diagram

C. Bathymetry Detail

NB: Course geometry not fully representative