# Annex B – Scoring

## Annex B1: The Race Scoring System

1. The race scoring system operates according to the basic principle:

"Fastest time with least faults"

2. So a Clear Run with no faults beats all runs which have faults, whatever their overall time.

3. After a day's racing each boat's best run is identified and these best runs are ranked and awarded points towards the EISR Trophy as follows:

   a. Four full days racing (Monday to Thursday):

| position | 1 | 2 | 3 | 4 | 5 | 6 | etc |
|---|---|---|---|---|---|---|---|
| points | 12 | 10 | 8 | 6 | 5 | 4 | etc |

   b. Three full days racing (Tuesday to Thursday):

| position | 1 | 2 | 3 | 4 | 5 | 6 | etc |
|---|---|---|---|---|---|---|---|
| points | 16 | 14 | 12 | 10 | 9 | 8 | etc |

### 4. 3 or 4 days' racing?

   a. Whether a full day's racing is held on the first racing scheduled day (ie Monday in this case) depends how many boats have completed all pre-race qualifications (Diver safety brief, tank familiarisation dive, Dry Inspection of boat by judges, hatch inspection by safety divers, Wet Inspection). If half or more of the teams are ready to race, the first day will be organised as a full day of racing with marks awarded as 3a. above. Otherwise the day's priority will be to get the remaining boats qualified.
   b. Even if the Day 1 priority is getting the remaining boats qualified, the course will be available and the dive coordinator will provide opportunities for qualified boats to race. The results will be ranked, as 3 above, and bonus points will be awarded as follows:

| position | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Bonus points | 8 | 6 | 4 | 3 | 2 | 1 |

c. Faults will be awarded as follows:

| Error | Faults |
|---|---|
| Every instance of any part of the submarine breaking the surface | 4 |
| Breaking the surface continuously for most of any of the 3 sections of the course (initial straight, long bend, slalom section to finish) | 8<br>per section |
| Hitting any pole in the tank | 4 |
| Dragging any pole off its plate | 8 |
| Passing the wrong side of any pole | 8 |
| Hitting the end net after the finish | 8 |

Note: If a submarine has passed a marker and then veered off the course, no additional faults will be awarded for missed, dragged, or hit markers as it re-orientates and resumes the run.

### Friday runs for the Agility Prize:

d. Boats taking part in this Prize event (which does not count towards the eISR Trophy) undertake 2 laps of the course. After passing the finish line for the first time, boats stay dived and return to (and must cross) the start line between the starting poles for the second time then complete the whole course, including the slalom section, finishing when the finish line is crossed for the second time

# Annex B2: Final Design Report Marking

| Required<br>Section of report | description to cover | Marks out of |
|---|---|---|
| TABLE OF PRINCIPAL PARAMETERS | Length overall; max beam; hull weight & contained volume; positions of CofG and Centre of Buoyancy; type of propulsion; type of propeller; desired thrust; propeller rpm; pedal cadence : propeller shaft gear ratio; type of hydroplane & rudder control | 5 |
| INTRODUCTION including AIM | Team's discretion | 10 |
| existing hulls (bodies):<br>RETAINED FEATURES/NEW FEATURES<br>----------<br>new hulls (bodies):<br>DESIGN PHILOSOPHY / DESIGN AIMS | Changes from previous design, with reasons for making the changes<br>----------<br>The underlying aims influencing the design | 10 |
| HYDRODYNAMICS & HULL FORM | Hull resistance; shapes of hull and control surfaces | 10 |
| PROPULSION SYSTEM | Drive train, transmission, propulsors, | 10 |
| TRIM, HYDROSTATICS & STABILITY | Weight estimations & volume calculations, centre of gravity, centre of buoyancy, centre of lateral resistance, trim and compensation ballast/buoyancy, ballast plan, stability with and without pilot. | 10 |
| CONTROL SYSTEMS | Pitch & depth control, control surfaces, braking/reverse thrust. | 10 |
| STRUCTURES | Materials, construction, pilot access, pilot visibility, manufacture, assembly | 10 |
| ERGONOMICS & PILOT BIOMECHANICS | Pilot biomechanics; cockpit, visibility, instrumentation, position indicators, power/thrust indicators, depth indicator | 10 |
| SAFETY & DESIGN FOR RECOVERY | Pop up buoy, release system/release preventer, recovery tow point, | 10 |
| TRIALS & TESTING | Full scale testing plans and achievements | 15 |
| GENERAL ARRANGEMENT | Drawings & pictures | 10 |
| FUTURE DEVELOPMENT | Proposals (if any) | 5 |
| SUMMARY/CONCLUSIONS | Team's discretion | 10 |
| OVERALL | Quality of the Report | 15 |
| | TOTAL | 150 |

Notes: 1. To convert Total to the percentage contribution of this element of the eISR Trophy scoring: divide total by 6.25 : 150/6.25 = 24%

# Annex B3a: Dry Inspection Checklist & Marking

| HULL | | Tick box | |
|---|---|---|---|
| | One person/ 2 people | | |
| | Length < 5.5m; Width < 1.5m | | |
| | Shell surface: Glass fibre/ carbon fibre/Kevlar | | |
| | Shell core: flax/ polymer foam/ divinycell/ Styrofoam/ corecell/ syntactic foam | | |
| | Chassis/ no chassis | | |
| | Pilot vision & head visibility: whole nose cone transparent/forward & down only | | |
| | Drain hole > 233 $cm^2$[36 $in^2$] | | |
| | Hatch securing ; secured to hull when open | | |
| | Hatch opening method, from outside, from inside; clearly marked on outside | | |
| | Volts 24v max; Battery location, type, isolation NOTICE in place. | | |
| | External moving parts in hi-viz orange | | |
| | Hull Marks out of 6 | | |
| PLANES & RUDDERS | | | |
| | Cruciform/X form | | |
| | Fixed blades with flap/whole blade movement; pairs ganged/ pairs separate | | |
| | Actuator: mechanical/ electrical | | |

| | | | |
|---|---|---|---|
| **PROPULSION** | | | |
| | Pilot input: rotary bicycle/push-pull linear | | |
| | Transmission: chain/ belt | | |
| | Gearbox: bevel/ step up/ ratio: | | |
| | Shaft: single/ dual concentric | | |
| | Propulsion Marks out of 6 | | |
| **PROPULSOR** | | | |
| **propeller** | Single 2-blade/fixed pitch/ adjustable pitch/variable pitch | | |
| | Single 2-blade variable pitch actuator: mechanical/ electrical; In hub/ on shaft | | |
| | Contra-rotating : 2 x 2-blade fixed pitch/ 1 x 2-blade & 1 x 3-blade fixed pitch | | |
| | Torque correction: none required/offset CofG/ by rudders/ by planes | | |
| **Mirage oscillating fins** | Single pair/ double pair<br><br>On top/ on bottom/ top & bottom | | |
| | Propulsor Marks out of 6 | | |
| | Planes & Rudders Marks out of 6 | | |

| | | | |
|---|---|---|---|
| **CONTROL** | | | |
| | Single joystick/ separate L & R hands/handle bar | | |
| | Transmission: all mechanical/ all electric/ part electric | | |
| | If mechanical: cable/ rod/ chain/ | | |
| | Depth control: manual/ automatic | | |
| | Automatic roll control by rudders/hydroplanes/ neither | | |
| | Control Marks out of 6 | | |
| **POP-UP BUOY** | | | |
| | Brightly coloured | | |
| | Easily visible on surface of water (evidenced by video or still photo) | | |
| | Forms part of hull/ cylindrical/ conical/ spherical | | |
| | Contained by hatch/dedicated release mechanism | | |
| | Line is 10m long; highly visible; floating; >5mm diameter; secured to hull and capable of lifting flooded submarine to surface | | |
| | Line is stowed on a reel | | |
| | Line reel is part of buoy/ contained in the hull | | |
| | Between the reel and the stowed buoy the line passes through a continuous tube [to avoid getting snagged on release] | | |
| | Pop-Up Buoy Marks out of 6 | | |

| | | | |
|---|---|---|---|
| | **TOTAL** | | |

# Annex B3b: Quality of Manufacture - Summary

| | Judges' Comments & outstanding features | Marks out of 6 |
|---|---|---|
| HULL | | |
| PLANES & RUDDERS | | |
| PROPULSION | | |
| PROPELLER | | |
| CONTROL | | |
| POP-UP BUOY | | |
| | SUM (Max 36) | |
| | Divide SUM by 3 to give contribution to overall (max 12%) Score % | |

# Annex B3c: Wet Inspection/Diver Information Marking

**(To be assessed by tank staff)**

| | | Marks out of |
|---|---|---|
| Diver Information<br><br>**To be provided 4 weeks before Preparation Week** | 1. The name of the team's SLO (Rule V7)<br>2. The names of team members qualified to the minimum standard required by the team's declared agency for diving with a diver of equal qualification<br>3. Evidence that each diver has completed at least 10 dives post qualifying (not as part of qualifying)<br>[NB. scan diving logbooks to provide this evidence]<br>4. For each diver: a completed medical self- declaration form. Obtain forms from either of<br>www.bsac.com/core/core_picker/download.asp?id=10081<br>www.uksdmc.co.uk | 4 |
| Wet Inspection | 1. Visibility and Operation of Hatches (Rules D20, 21); Visibility of pilot's head & face (Rule D23). Primary air supply (Rules A1, A3); pilot independent air supply (Rules A4, A5)<br>2. Successful operation of the Pop-Up Buoy<br>3. Start procedure demonstration (paras 97, 98)<br>4. Emergency exit (Rule O3: steps a. to e. in 30 seconds) demonstration | 4 |
| | Total % | |

# Annex B4: Weighting of Elements for the eISR Trophy

| ELEMENT | WEIGHTING | ASSESSMENT OF |
|---|---|---|
| Design | 24% | Final Design Report |
| Production | 12% | Dry Inspection |
| Safety Features & Diver Information | 8% | Wet Inspection & assessment of information provided by team |
| Performance | 48% | Daily racing |
| Reliability | 8% | All runs during the racing* |

* Reliability:

Counting all days racing as a whole, for each boat individually:

***Reliability score = number of starts x number of completions*** *(regardless of faults)*

Rank the boats in descending order of reliability scores

Then:

| position | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | lower |
|---|---|---|---|---|---|---|---|---|---|
| Reliability Score % | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |