

Selection of Equipment – Evaluation Panel Report 2024 Men’s and Women’s One Person Dinghy Event

Table of Contents

1	<i>Preamble</i>	2
2	<i>Executive Summary</i>	2
3	<i>Equipment options summary</i>	3
3.1	RS Aero	4
3.2	Laser	5
3.3	Melges 14	6
3.1	D-Zero.....	7
4	<i>Evaluation scoring</i>	8
4.1	Evaluation scoring matrix.....	8
4.2	Evaluation considerations	9
4.3	Evaluation scoring results	10
4.4	Cost Evaluation.....	11
4.5	Design Evaluation	13
4.6	Quality Evaluation	18
5	<i>Appendix 1 - Background</i>	23
5.1	Re-evaluation	23
5.2	Evaluation Panel	24
5.3	Evaluation Principles	24
6	<i>Appendix 2 - Sea Trials</i>	26
6.1	Venue selection.....	26
6.2	MNA Sailors selection.....	26
6.3	Sea Trials activities	27
7	<i>Appendix 3 – Medical Observer Report</i>	29
8	<i>Appendix 4 - Cost report</i>	30
8.1	Retail Price Comparison	30



1 Preamble

In November 2018, the World Sailing Council took the decision to approve the Board recommendation to select equipment from the four presented options as outcome of the re-evaluation of the Men and Women’s One Person Dinghy equipment for 2024.

Following the decision from Council, the Equipment Committee nominated an Evaluation Panel to run Equipment trials (Sea Trials) under regulation 23 and to further evaluate the equipment against the criteria stated in the re-evaluation Invitation to Tender documents.

The criteria includes considerations regarding performance, athletic suitability, appeal, quality of production, standardization of the equipment, cost, distribution capacity, universality considerations and other areas further addressed later in the report affecting the suitability to the event.

The [Evaluation Panel](#) included members from the Re-evaluation Working Party, the Equipment Committee, the Events Committee, the Emerging Nations Program, the Medical Commission, Athletes Commission, World Sailing’s Technical and Offshore team and World Sailing Board members.

2 Executive Summary

The Evaluation Panel exchanged multiple emails in the past 3 months, met multiple times via web conference and spent 5 days together during the Sea Trials hosted in the Real Club Náutico de Valencia, in Spain, evaluating the equipment options.

The evaluation considers information available from the Re-evaluation tender process (which includes documentation and feedback from boat production facility visits), and information from the Sea Trials (which includes presentations from the candidates, feedback from MNA Sailors, the Coach and the Evaluation Panel members, feedback from Equipment Inspections and observations of the equipment).

This report seeks to provide the objective outcome of the evaluation to serve as guidance for the Equipment Committee in its task to make a recommendation to Council for the selection of equipment under regulation 23.

The Evaluation Panel would like to note that the evaluation of proposed models for licensing additional qualified builders and compliance with the Olympic Equipment Strategy is not included under the scope of the Evaluation Panel. This matter is being considered separately by the Executive Office in line with the Olympic Equipment Policy applying to all Olympic Classes.

**The evaluation concluded that there are two suitable items of equipment for the event:
The RS Aero equipment presented by RS Sailing and the Laser equipment presented by ILCA.**

The [Evaluation Panel](#) developed a [scoring matrix](#) against which the equipment options were scored based on the evaluation criteria for the event. The overall scores are:

RS AERO	LASER	MELGES 14	D-ZERO
80%	69%	54%	52%

3 Equipment options summary

As defined by Council, the selection of equipment will be made from amongst the D-Zero, Laser, Melges 14 and RS Aero. As required by Regulation 23.1.8(f), all four options will be available for Council to select.

The following table and descriptions give a brief overview of the presented equipment.

	RS AERO	LASER	MELGES 14	D-ZERO
				
Year launched	2014	1969	2015	2014
Length	4 m	4.23 m	4.27 m	4.20 m
Beam	1.4 m	1.37 m	1.58 m	1.42 m
Hull Weight	30 kg	58 kg	51 kg	43 kg
Sail Area Men	8.9 m ²	7.06 m ²	9.1 m ²	8.7 m ²
Sail Area Women	7.4 m ²	5.76 m ²	7.4 m ²	6.9 m ²
Sail Material Type	Woven	Woven	Laminate	Laminate
Retail Price (M) ¹	£6,041	£4,973 - 5,515	£6,718	£4,448
Retail Price (W) ²	£5,992	£4,996 - 5,516	£6,607	£4,448

Ideal weight ranges as estimated by the MNA sailors for the presented rig sizes at the Sea Trials:

Men (kg)	85 to 91	80 to 86	90 to 96	85 to 93
Women (kg)	68 to 73	67 to 71	71 to 75	70 to 75

¹ [See Appendix 4 – Big Rig](#)

² [See Appendix 4 – Small Rig](#)

3.1 RS Aero

Following three years of development by Jo Richards, Guy Whitehouse and the RS Team the Aero was launched in 2014. The Glass Fibre Reinforced Polymer (GFRP) foam sandwich hull with Carbon Fibre Reinforced Polymer (CFRP) reinforcements is built by MTAG Composites, UK. The carbon reinforced GRP foam appendages are built by DEM Foils and McConaghy Boats where Aluminium moulds are used. Spars are produced by Italica in China and the Sails by North Sails.



Presented by RS Sailing

<https://www.rsaerosailing.org>

Evaluation Panel:

The equipment is deemed suitable for Olympic competition. The boat was described as fun, fast and appealing with simple and well executed concepts which were appreciated by the MNA sailors.

The light hull (30kg) requires sensitive boat handling and was considered by the sailors as having the potential to reward higher sailing skills.

The design is simple and well thought out for shipping, saving space when stacking hulls for transport. Its light weight and its size make it attractive and suitable for the youth pathway. The hull is engineered with modern materials and production methods. All fiber is CNC cut, the quantity of material is optimized and proven to be effective and there are strict controls on the building processes monitoring the production to a high level of standardization.

Mass production is already established with a high-end quality product. Quality was recognized by the MNA sailors and considered among the highest in terms of value for money. The builder is in a satisfactory position to produce and deliver boats in a reasonable timescale.

The boat pricing information is credible, proposing an open book pricing, where the price is driven by a formula to be monitored by World Sailing accounting for all factors.

3.2 Laser

The Laser was designed by Bruce Kirby and Ian Bruce and was launched in 1969. The hull is built by three manufacturers; Laser Performance*, Performance Sailcraft Australia and Performance Sailcraft Japan. The Laser has a GRP foam sandwich Deck and a solid GRP Hull with local foam reinforcements, both built with polyester Resin. Stated suppliers for appendages are N1-Spain and Laser Sports Equipment Company-China. The Rig of the Laser is supplied to the builders by several manufacturers; Selden-UK, Technocar-HUN, CST-AUS, Southern Spars-SRI. Stated sail suppliers are Hyde Sails, North Sails and Pryde Sails.



Presented by ILCA

<https://www.laserinternational.org>

Evaluation Panel:

MNA sailors acknowledged their experience and familiarity with the boat and felt comfortable sailing it. The boat is considered reliable and all around well suited for selection. Having been the Olympic equipment for many cycles, the boat has become available around the world and is actively sailed in emerging nations. However, challenges and issues with distribution remain unresolved. The class representatives acknowledged challenges regarding warranty and supply issues in Africa and South America and communicated to the panel that with the current market situation they remain unable to resolve this.

The rig and sails are the least satisfactory parts of the boat. For the associated price, they are low in quality requiring many replacements during one season. The hull is durable beyond its competitive life making cheap boats available to many sailors. There is a pathway established from the 4.7 to the Radial and to the Standard, however the hull remains less suited for youth and light sailors.

Since 2014, ILCA has increased efforts to monitor the standardization of equipment, but the introduction of upgrades and cooperation with all builders remains a challenge.

*This report considers the evaluation of the Laser as presented during the invitation to tender phase with the reported three builders. The recent public announcements from ILCA regarding the status of Laser Performance has not been accounted for in the evaluation.

3.3 Melges 14

The Melges 14 was designed by Reichel Pugh, USA and launched in 2015. Currently there are three licensed manufacturers for the Hull; Melges Boat Works-USA, NELO-POR and Mackay Boats-NZL with Ovington recently joining the venture. The hull is built as a GRP foam sandwich construction with epoxy resin, cured under vacuum. The appendages in Europe are built in-house at NELO, Aluminum mould tools and milled foam cores are used. The spars manufacturer is Kilwell Fiber Tube, NZL. The 9.1m² and 7.4m² mylar sails are manufactured by North Sails.



Presented by Melges Boat Works
<https://www.melges14.com/class>

Evaluation Panel:

The boat is simple, easy to rig and visually appealing on land and in the water. MNA sailors considered the boat big and too powerful with both men's and women's rig better suited to larger persons. Although there is a smaller rig and sail for youth, the hull size remains too big and unsuitable for smaller rig sizes and youth. The brand has expanded beyond the original builder and has agreements in place to open production in different parts of the world. There would be some time required for new builders to begin. The building manuals are in place and transfer experience has been gained with the addition of two builders.

3.1 D-Zero

The D-Zero was initially developed by Dan Holman and is built by Devoti Sailing in Poland since 2014. The Hull is a GRP foam sandwich construction, Vinylester Resin is used and the hull cures under vacuum. Appendages are built in-house in aluminium moulds with an expandable two component foam. The 100% carbon spars are supplied by CompoTech, Czech Republic. The laminated ply sails of both sizes (8.7m² and 6.9m²) are manufactured by North Sails.



Presented by Devoti Sailing s.r.o.

<https://www.d-zerosailing.org>

Evaluation Panel:

Presented as a measurement-controlled class with control methods under development where worldwide distribution would be achieved by local builders being licensed based on demand.

The intended plan to control quality among manufacturers to ensure standardization was evaluated, however the implications of having multiple new builders is unknown since the measurement controls are yet to be developed.

This leaves significant work to develop full quality control procedures and manuals for builders to ensure the produced equipment is the same worldwide.

With a mainsheet traveler and multiple options to adjust the mast rake the boat was considered the option where in addition to athletic superiority, success would be more related to the technical knowledge of the equipment.

4 Evaluation scoring

4.1 Evaluation scoring matrix

The Evaluation Panel developed the following groups and subgroups summarized and outlined below against which the equipment options were scored. The subgroups were assigned weights which total 100% within each group. The groups were also assigned weights that total 100%.

Assigned Weights	
Cost	25%
a) Price considerations	55%
b) Universality considerations	40%
c) Transportation considerations	5%
Design	45%
a) Athletic suitability	35%
b) Performance	25%
c) Appeal	10%
d) Universality considerations:	25%
e) Customization	5%
Quality	30%
a) Standardization of equipment	45%
b) Quality of product	30%
c) Universality considerations	15%
d) Manufacturers	5%
e) Sustainability considerations	5%

Table 1: Evaluation scoring matrix

4.2 Evaluation considerations

In its task to evaluate the equipment, the Evaluation Panel has used the following information. This information has been accepted in good faith and verified wherever possible:

- Feedback from the MNA Sailors and Coach at the Sea Trials,
- On-site inspections and observations of equipment at the Sea Trials,
- Information available from the Re-evaluation tender process (provided documentation and feedback from boat production facility visits),
- Additional information requested from Manufacturers and Class representatives including feedback statements at the Sea Trials,
- Presentations from the Manufacturers or Class representatives in evaluation areas at the trials,
- Web-search information on current distribution and costs of equipment.

In general, the evaluation results have come from debate of the Evaluation Panel at the Sea Trials in a free and open discussion atmosphere.

The evaluation scoring matrix was prepared ahead of the trials to give guidance and weight to the conclusions for the total evaluation.

Feedback from the MNA sailors was gathered via written questionnaires prepared by the panel and group discussions after sailing each day. The sailors were encouraged to speak on any topic they desired during these sessions. Careful notes were taken to capture all topics brought forward for further consumption by the panel during debate.

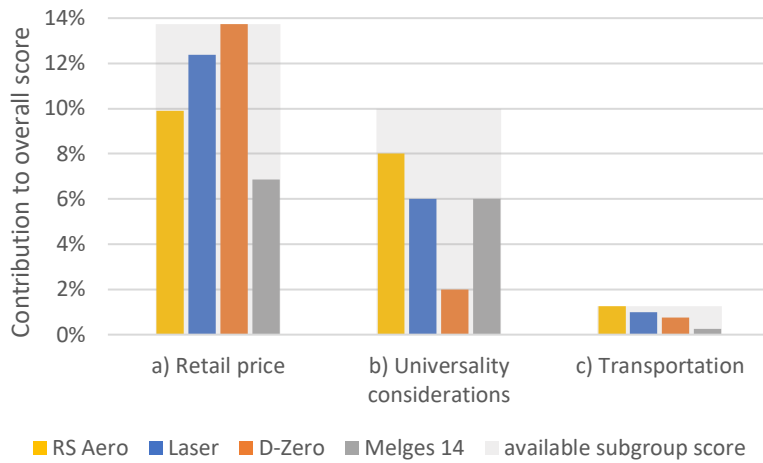
As a rule, the following was followed;

- Questions asked to the MNA sailors were assigned to the appropriate related group and subgroup. The MNA sailors feedback is accounted for in these areas.
- Feedback from discussions and presentations were discussed by the Panel and assigned to a group and subgroup. Comments that spanned more than one subgroup or one group were accounted for in each.
- Each candidate manufacturer was scored for each subgroup with a grade from 0 (lowest) to 5 (highest). The final scoring totals identified the rank of each manufacturer against the criteria of the evaluation that was used to create the scoring matrix.

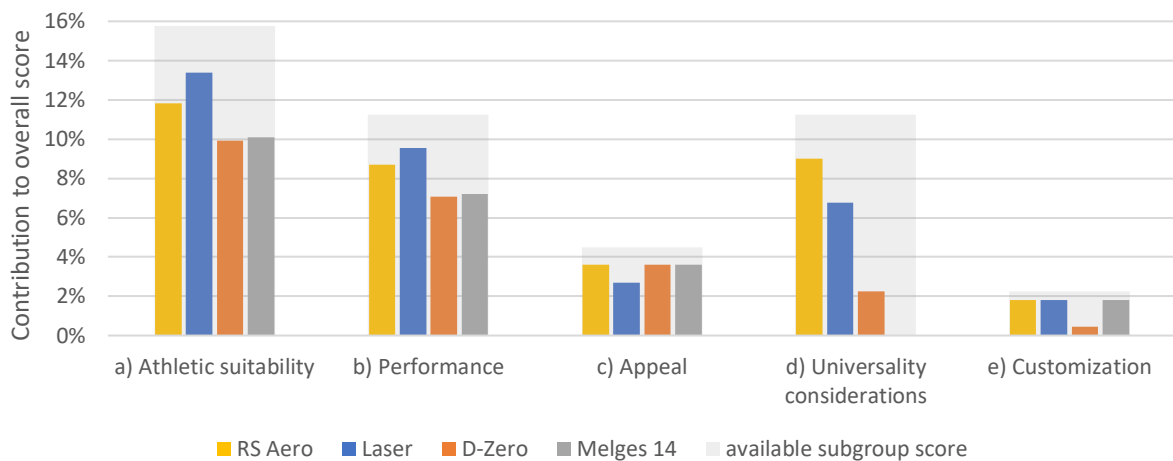
On the final morning, the panel submitted one last round of questions for open feedback from the sailors to confirm that the panel conclusions were as expected by the MNA sailors.

4.3 Evaluation scoring results

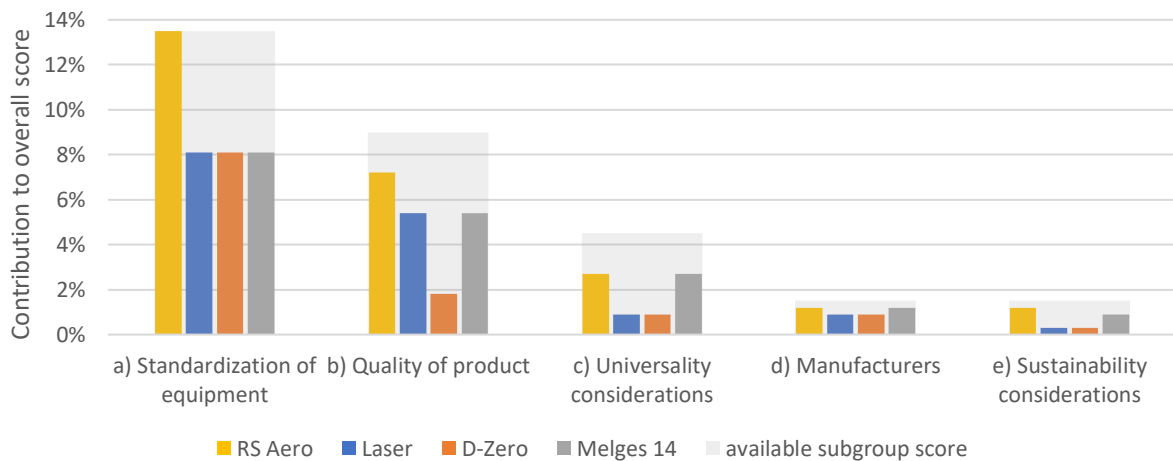
Cost



Design



Quality



4.4 Cost Evaluation

Cost subgroups	RS AERO	LASER	MELGES 14	D-ZERO
Retail price	3.6	4.5	2.5	5
Universality considerations	4	3	3	1
Transport	5	4	1	3

4.4.1 Retail price

This subgroup seeks to evaluate the price of the equipment taking into account not only the retail price of the boat but considering the price of replacements to address the life-cycle costs. [See Appendix 4.](#)

Cost subgroups	RS AERO	LASER	MELGES 14	D-ZERO
Retail price	3.6	4.5	2.5	5

In the evaluation, the retail price of the boat ready to sail accounts for 60%. The combined price of the main items of equipment excluding the hull, referred to as “spares” account for 40%.

As a result of this, the lowest combined price is awarded a maximum score of 5 and the highest combined price has been awarded a score of 2.5. The remaining scores are the result of interpolating among these.

In addition, MNA sailors commented on the prices and value for money. This was their reported overall averaged scores:

MNA sailors' impressions	RS AERO	LASER	MELGES 14	D-ZERO
Value for money - Overall boat	3.8	4.1	2.5	3.6
Value for money - Sails	3.8	3.2	3.3	2.8

4.4.2 Universality Considerations

Considers access to the equipment, distribution networks, availability of charter equipment, mid & long-term distribution scenarios and durability.

Cost subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Universality considerations	4	3	3	1

RS Aero

The boat has been designed for freight efficiency, saving space when stacking the hulls for transport. RS Sailing sells over 3000 boats per year and has an existing distribution network that covers most of the world and could grow in the medium term. They have experience organizing events with charter equipment using 40ft containers which fit 30 hulls.

Laser

Having been the Olympic equipment for many cycles, the boat has become available around the world and is actively sailed in emerging nations. However, challenges and issues with distribution remain unresolved in many nations affecting many items of equipment and not only hulls.



Melges 14

Existing network through other Melges boats dealers however this is not very extensive in emerging nations. Two business hubs in North America and Europe. Expansion plans include Mackay in New Zealand and Ovington in UK.

D Zero

Plans to distribute through builders only which would potentially be a challenge in countries and continents where too few boats are sold to make it viable to invest in the required tooling. This will mean that for these countries, warranties, purchases and spares will be handled from Devoti Sailing in Poland.

4.4.3 Transport

Evaluation of transport considerations such as shipping and road transport. The scores have been assigned based on the capacity to stack boats, amount of boats that fit into containers, size and weight:

Cost subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Transport	5	4	1	3

4.5 Design Evaluation

Design subgroups	RS AERO	LASER	MELGES 14	D-ZERO
Athletic suitability	4.0	4.5	2.5	3.7
Performance	3.9	4.0	2.3	3.0
Appeal	4	3	4	4
Universality considerations	4	3	0	1
Customization	4	4	4	1

4.5.1 Athletic suitability

Refers to the evaluation of the athletic suitability of the equipment considering the ergonomics and if success is more related to athletic superiority and tactical understanding than technical knowledge of the specific equipment.

For this subgroup, the presented result of the evaluation was directly obtained as the outcome of the MNA sailors score on the overall subject.

Design subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Athletic suitability	4.0	4.5	2.5	3.7

RS Aero

The boat was considered similar to what the MNA sailors are used to. Although considered uncomfortable initially during the downwind, the MNA sailors saw their initial comments resolved with the experience gained throughout the week.

The light hull requiring sensitivity in boat handling, was considered by MNA sailors as rewarding higher sailing skills and tactical knowledge. The simplicity of the design and of the systems promotes success more related to athletic superiority and tactical understanding than technical knowledge of the specific equipment.

Laser

MNA sailors acknowledged their experience and familiarity with the boat and felt comfortable being able to lock the body in the cockpit and transfer the body movements to the boat.

Success is more related to athletic superiority and tactical understanding than technical knowledge of the specific equipment and the design was considered reliable and all around well suited for selection.

Melges 14

The increased width and low cockpit in combination with a low hiking strap was found uncomfortable by the MNA sailors. Sailors were clearly not used to the width of the cockpit and felt unable to “lock in”. The lack of comfort in position affected the sailors assessment of the ergonomics.

D-Zero

The strengths of the boat were dependent on the wind and sea state conditions. The reduced bow volume was found by the MNA sailors to provide insufficient buoyancy making it challenging to sail with waves and stronger winds, negatively affecting the body position and boat handling.



4.5.2 Performance

Refers to the evaluation of the performance of the equipment considering all equipment items including the design of the hull, appendages, sail and running rigging. It includes considerations regarding maneuverability, responsiveness of the boat and the effectiveness of the outfitting of the systems. Suitability of the presented equipment sizes is also considered in this section.

For this subgroup, the presented result of the evaluation was directly obtained as the outcome of the MNA sailors score on the subject.

Design subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Performance	3.9	4.0	2.3	3.0

RS Aero

MNA sailors considered the hull size suitable for multiple rig sizes and perfectly suited for pathway and youth. Described as quick and aggressive in its maneuvers and easy to trim appropriately with all controls comfortably routed and efficient with simple and well thought out concepts which were appreciated by the sailors. The mainsheet system lead to the center of the boom was considered a positive feature by MNA sailors allowing for direct transmission of power to the sail. Although the rigging system offers flexibility for de-powering, the presented sail areas were considered better suited for higher crew ranges.

Laser

MNA sailors acknowledged that the design is old but performs well all-around. The rig and sails are considered the downside part of the boat and of poor quality for the associated price. In particular it is noted that for a universal event, the women’s rig promotes a larger weight and height than desirable for worldwide average women.

Melges 14

The MNA sailors considered the boat too powerful with both men’s and women’s rig. Although the sail size could be reduced to resolve the power, the hull size remains too large making the boat unsuitable for smaller rig sizes.

D Zero

With its narrow, low volume bow, the MNA sailors considered it a boat better suited for inland sailing in flat waters. The arrangement of the control lines was found to be inconveniently located with respect to the fore and aft body position required to keep the bow above the water. Although considered by the Panel as a solvable change to the outfitting, it generated much frustration among the sailors.

The MNA sailors liked the lifting rudder installation and acknowledged the effects in performance of the high-quality rig and sail design combination. The presented sail area was considered better suited for higher weight ranges.

4.5.3 Appeal

This section includes the evaluation of areas related to the appeal of the equipment including attractiveness to sailors and to audience, comfort in the boat, the reward of speed for physical effort, ease of capsize recovery and other safety considerations.

Design subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Appeal	4	3	4	4

RS Aero

The boat was described as fun, fast and appealing on land and in the water. Fitness and strength rewarded. The boat is light and easy to move around on land for launch and for transport. Easily righted after capsizing. Although the sails design is modern with a large head and full top battens, the Dacron material results in a less modern appearance.

Laser

The design looks dated compared to rest of the trialed equipment. Fitness and strength rewarded. The boat is heavy and requires more strength to move around and transport. The capsize recovery is not a problem for elite sailors but there are known problems in the youth pathway.

Melges 14

Visually appealing on land and in the water. Fitness and strength rewarded. The boat is not much lighter than current equipment and is long and wide for transport. Smaller women commented on capsize recovery difficulty with wide hull which would potentially be an issue in the youth pathway.

D-Zero

Visually appealing for media coverage on land and in the water. Fitness and strength rewarded. Sailors negative comments on bow submergence. Coaches comment on lack of hand hold with no gunwale affecting recovery after capsizing and boat handling afloat.

4.5.4 **Universality considerations**

Refers to the evaluation of the universality considerations related to the design of the boat. These include the evaluation of the simplicity of the systems, the pathway classes and the suitability to serve as youth equipment. It includes the evaluation of sailor’s weight and height range, ease of launch, retrieval and towing and ease of assembly.

Design subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Universality considerations	4	3	0	1

RS Aero

The design is simple and well designed for distribution. The Dacron sail has two full battens at the top of the sail. Dacron sails do not remain competitive for a long time but can be and are used in emerging nations for many years.

Sail controls are led to both sides of the cockpit making them easier to reach especially for people who are shorter and lighter.

Its light weight makes it attractive and suitable for the youth pathway and to be sailed by a larger range of people encouraging class development. The boat is easy to handle, move around, launch and recover preventing shoreside injuries in places where slipways are not good or do not exist.

Laser

The Laser has become the most dispersed fleet of boats in the world among the proposed. It is simple to rig and sail and rewards tactical abilities and fitness.

There is a pathway established from the 4.7 to the Radial and to the Standard, however in many cases it is not suitable for elite competition by the average height and weight of sailors in emerging



nations.

The sleeved sails eliminate halyards but also makes for more wear on sails. The Dacron sails do not remain competitive for a long time, but the sails can be and are used in emerging nations for many years.

Several parts on the boat are Laser specific and can only be purchased from an authorized dealer. There is an extensive dealer network around the world, but supply has been limited over the past 5 years resulting in the use of boats not compliant with class rules in emerging nations and around the world due to the lack of replacements.

Melges 14

The boat is simple and easy to rig and considered a powerful boat better suited to larger persons. Although there is a smaller rig and sail for youth the hull size was deemed to be unsuitable.

The Mylar sails and the full battens hold their shape and keep the sail competitive longer but when their lifespan ends, they fall apart. Dacron sails even though stretched, can be used for many years which is often the case in emerging nations.

The mast sleeved sail has an improvement over the current equipment with a plastic fitting in the top of the sail to protect it from the top of the mast.

The floor of the cockpit is covered with a soft deck material which will eventually wear out and will need to be replaced. This will result in additional costs and the material may not be available in emerging nations.

D Zero

With a mainsheet traveler and options to adjust the mast rake the boat was considered the option with the most complicated arrangements and with the potential for competition for technical knowledge.

The use of chocks at the deck to achieve different mast rakes would allow the boat to serve a wider weight range but would increase the boat specific tuning knowledge required to be competitive.

The testing and research on the use of the different settings would result in a disadvantage for teams with less resources. These small pieces could be lost during transport or on the water and may be difficult to replace in some areas of the world increasing cost. The required proposed measurement controls at events would be unlikely in emerging nations. The sail is made from Mylar film which holds the shape and keeps the sail competitive longer but when their lifespan ends, they fall apart and are inconvenient for second life use that is often the case in emerging nations.

4.5.5 Customization

Customization is defined by the criteria that equipment for this universal event shall be simple, standardized and no option be given for development, optimization or customization.

Design subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Customization	4	4	4	1

RS Aero

The boat was described by the MNA sailors as having all controls comfortably routed and working efficiently with simple and well thought-out concepts. The production method and quality controls seek to ensure standardization with no option for customization.

Laser

The simplicity of the boat and the design in conjunction with the established closed class rules limit the options for development and customization to a strict minimum.

Melges 14

Well controlled with standard fittings and limited options for customization.

D Zero

Presented as a measurement-controlled class with control methods under development.

Although there is a clear strict plan envisioned for measurement and quality control, the system does not exist yet and can potentially lead to customization or differences among different manufacturers as seen with other measurement-controlled classes.

The additional trimming options make it the least simple among the presented boats.

4.6 Quality Evaluation

As part of the re-evaluation tender process tenderers provided detailed information regarding construction methods, technical specifications, quality control methods and construction capacity. In addition, the re-evaluation Working Party performed inspections at the main hull manufacturers of each tenderer and witnessed the stages of production, the quality control methods and evaluated the installations and working practices. The information has been reported and evaluated by the Evaluation Panel but is deemed confidential.

The following subgroups were evaluated under the “Quality” group:

Quality subgroups	RS AERO	LASER	MELGES 14	D-ZERO
Standardization of equipment	5	3	3	3
Quality of production	4	3	3	1
Universality considerations	3	1	3	1
Manufacturers	4	3	4	3
Sustainability considerations	4	1	3	1

4.6.1 Standardization of equipment

For this section standardization refers to the evaluation of the standardization among produced equipment, accounting for existing quality controls worldwide, measurement procedures at events, building specifications, and the evaluation of Class Rules towards achieving equal equipment including the control of fittings permitted.

Quality subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Standardization of equipment	5	3	3	3

RS Aero

RS Aero’s finished product exceeded all others in terms of quality and durability. The hardware and systems are well designed to function easily for the sailor and are proven in international competition. The spars are built to a specification and quality control standard that is producing consistent equipment for this international class. The lightweight hull is engineered with modern materials and modern composite building expertise bringing consistency of manufacture that is performing in the current marketplace. These have yet to experience Olympic competition however their World Championships were held in 2018 in high winds and waves at the London 2012 Olympic Venue with no breakage reported. The class has single source of supply for all parts. The hull production is single source in a high technology composite facility which is not exclusively building boats.

Laser

The equipment presented at the Sea Trials was used equipment from the 2018 World Sailing World Championships in Aarhus. The Class representatives described their current quality control methods and tolerances to demonstrate standardization, however the values shown represented the values obtained at only one of the current class builders.

Since 2014, ILCA has increased efforts to monitor the standardization of equipment, but the introduction of upgrades and cooperation with all builders remains a challenge. The class presented



results, although compliant with their construction manuals and quality controls, the presented tolerances were considered by the Evaluation Panel as too high. The supply of equipment for Olympic events and other major events mitigates the poor standardization, however tighter tolerances and higher controls are deemed required.

Melges 14

The Melges 14 trials boats were supplied by their European builder. The brand has expanded beyond the original builder and there are agreements in place to open production in different parts of the world. There would be some time required for new builders to begin. The building manuals are in place and transfer experience has been gained by the expansion to their European builder. Single source manufacturer of spars and sails. The mast construction process was found to have a flaw resulting in small difference in curvatures of the presented equipment.

D Zero

The samples of the D-Zero seen at the trials were nicely finished and inspections revealed that there were only very minor differences between presented parts considered acceptable by the Evaluation Panel. Currently with a single source manufacturer of spars and sails.

The implications in standardization of having new multiple different builders is unknown since the measurement controls are yet to be developed. The intended plan to control quality among manufacturers and ensure standardization was evaluated, however there is much work required to develop full construction manuals for builders to adhere to and quality control procedures to ensure standard equipment production.

4.6.2 Quality of production

Quality is a critical characteristic in all Olympic equipment and together with standardization should be highly valued for universal equipment that must serve all the nations in our sport equally. The quality of the boats was investigated in depth before and during the trials.

This subgroup refers to the evaluation of the manufacturing methods, the consistency of equipment in terms of weight and finishing of the product, the materials, tolerances, durability, and stage of development (proven vs experimental).

Quality subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Quality of production	4	3	3	1

RS Aero

RS Sailing provided good building specification and demonstrated the quality control procedures they have in place with the hull manufacturer for a number of their products.

The manufacturer has strict control on the building processes and monitors the production to a high level of standardization. All fiber is CNC cut, the quantity of material is optimized and proven to be effective. There is a record of all the materials used and an effective approval process in place. Mass production is already established with a high end quality product well recognized by the MNA sailors.

Laser

The hull has proven to be durable beyond its competitive life making cheap boats available to many sailors, however there has been a long history of variations among different builders which has led

to the supply of equipment at major events.

Melges 14

The inspections revealed some details affecting the consistency of production. This was evident in the mast assembly at the trials where differences in the curvature of the assembled two-part mast were noticed. It was observed that this was the result of a solvable assembly issue. The production method includes quality controls for the existing manufacturers to adhere to with a clear production process. Although in place, the implementation requires further time to see the quality of the product at the highest level.

D Zero

The only current manufacturer has a proven record of quality products that have proven durable; however, some areas of the current manufacturing process were considered to lack quality controls presenting risks to ensure consistency if applied to mass production.

The intended quality control method for the proposed market model involving multiple manufacturers seeks to ensure equality of performance rather than to enforce consistency of production methods. This has the potential to control quality among manufacturers, however it has yet to be developed.

The presented boats showed some areas with wear and there was concern among MNA sailors regarding the structural integrity of the raised deck support for the upper rudder fitting following observations during the Sea Trials with high winds.

4.6.3 Universality considerations

Evaluating the warranty and repair services, source of materials and tooling.

Quality subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Universality considerations	3	1	3	1

RS Aero

There are several parts on the boat that are RS specific and can only be purchased from an authorized dealer making it hard to keep boats class legal in emerging nations. There is already an extensive dealer network around the world based on other RS Sailing classes where distribution and customer service meet expectations.

Laser

The class representatives have acknowledged challenges regarding warranty and supply issues in Africa and South America and have communicated to the panel that with the current market situation they remained unable to resolve this.

The class approved carbon top section has not been readily available in emerging nations which presents a disadvantage.

Melges 14

The methodology to produce boats at different manufacturing sites with different builders has already been implemented. The boat uses fittings and parts available worldwide.

Melges, Nelo, Mackay and Ovington provide a proven dealer network capable of providing supply and customer service worldwide.

D Zero

Multiple plans were described to meet the potential demand and required services. From adopting



existing class association networks to licensing any interested party or shipping containers to serve as construction facilities with all required materials and tooling for construction on site. Warranties, spares and other services would be supported through local builders. Customer service in countries and continents where too few boats are sold to make it viable to invest in the required tooling would require an approach to Devoti Sailing in Poland through online services.

4.6.4 Manufacturers

This subgroup seeks to evaluate the qualifications and experience, the current and future capacity and the impact of becoming “Olympic” (increased demand).

Quality subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Manufacturers	4	3	4	3

RS Aero

The RS hull production is single sourced in a high technology composite facility. The current manufacturer has a production capacity of 30 boats/week equating to 1500 boats a year and is capable of increasing capacity in the short term up to 2000. RS Sailing has multiple international classes with a distribution and service network that provide good warranty and customer service.

Laser

With over 217000 boats built since production started and having served as supplier of the Olympic equipment for many cycles, the qualification and experience is proven. The reported current production capacities are: Performance Sailcraft Australia 30 boats/week, Performance Sailcraft Japan of 5 boats/week, Laser Performance 50 boats/week. Issues regarding supply of equipment to some areas of the world remain unresolved.

Melges 14

The brand has expanded beyond the original builder and has agreements in place to open more production in different parts of the world. The building manuals are in place for manufacturers to adhere to.

Over 230 boats built since production started. (Europe: 60, North America: 157, Africa: 6, Asia: 3, South America: 1, Oceania: 6) The current production capacity is 2.5 boats/week at both Melges Performance Sailboats and NELO with the capacity to expand production. The addition of Mackay in NZL and Ovington in the UK brings a proven distribution network and increased capacity to meet demand.

D-Zero

Over 220 boats build since production started. With a current production capacity of 2.5 boats/week Devoti Sailing has the possibility to increase production in the short term to 20 boats/week amounting to 1000 boats a year. The only current manufacturer has a proven record of quality products proven durable, but systems need to be developed to achieve mass production. Worldwide demand would be met by licensing interested builders which would require time before new builders could be qualified and new production begun.



4.6.5 Sustainability

Includes the materials used, relevant quality and environmental international standards, third party audits and certifications, alignment to WS sustainability agenda, alignment to IOCs Supplier Code and the IOC’s responsible sourcing guidelines.

Quality subgroup	RS AERO	LASER	MELGES 14	D-ZERO
Sustainability considerations	4	1	3	1

RS Aero

Some of their activities align with World Sailing’s Sustainability Agenda. ISO 9001 Quality Management System certified and Working to TS16949 automotive system standards demonstrates a professional approach.

Initiatives such as the use of reusable vacuum bags and tracking of waste represent a commitment to improving known environmental impacts with quantitative improvements.

Full life cycle assessment should be conducted to also assist with a sustainability improvement schedule and consideration of ISO 14001 certification should be made in addition to a more detailed alignment with World Sailing’s Sustainability Agenda 2030.

Laser

Laser Performance manufacturing facility has processes to meet rules and regulations defined by the UK government regarding the environment and worker safety. Although the boats are built to a defined manufacturing method with a very high standard of control, practices could be adopted to quantify environmental measurables. The “LaserPerformance Handprint™” shows commitment and there is some good narrative but there is a lack of detail regarding current activities whilst demonstrating how they align themselves with World Sailing’s Sustainability Agenda 2030. PSA and PSJ yards where not visited during the re-evaluation, however their tender documentation lacked information regarding sustainability considerations and control practices.

Melges 14

Nelo is the largest canoe manufacturer in the world and is required to pass an external audit of finance and working conditions to ensure quality as a supplier to the IOC. Their control systems in place, the track of waste and presented initiatives demonstrate a professional approach and represent a commitment to improving known environmental impacts with quantitative improvements. Environmental measurables should be quantified to give more detail regarding current activities whilst demonstrating how they align themselves with World Sailing’s Sustainability agenda.

D Zero

Devoti Sailing yard has processes in order to meet rules and regulations defined by the Polish government and has a “Quality System Certificate” awarded by Ekologis, a Polish company which provides formal and legal services in the area of environmental protection. There is some narrative to research the use of more sustainable resins for fibers and coatings and it is encouraging to read that there are commitments and initiatives to identify, develop and promote sustainable solutions for the composite industry through GS4C. Environmental measurables should be quantified to give more detail regarding current activities whilst demonstrating how they align themselves with World Sailing’s Sustainability agenda 2030.

5 Appendix 1 - Background

5.1 Re-evaluation

In November 2017, the World Sailing Council approved World Sailing's procedures for re-evaluating the equipment used for Olympic Events.

In January 2018, the World Sailing Board commenced a re-evaluation of the equipment for the Men and Women's One Person Dinghy for the 2024 Olympic Games. An invitation to tender was published and the Board appointed a Working Party to evaluate all tenders received.

5.1.1 Re-evaluation phase 1

Phase 1 of the review focused on criteria such as suitability to the event, class rules, manufacturing capabilities, price and customer service. Following a report from the working party, the Board agreed to shortlist four tenders for the second phase of the process.

5.1.2 Re-evaluation phase 2

World Sailing undertook site visits to the manufacturers to confirm the credibility of the submitted information, after which an improved bid was requested from each of them. This addressed the supply of equipment to major events, the accessibility to the market by new builders and the standardization of equipment amongst different builders.

The Re-evaluation Working Party reviewed the bids and recommended to the Board that World Sailing should proceed in selecting new equipment, with the additional recommendation that the existing equipment (Laser) be included as a full option in this process. The Board approved the Working Party recommendation to proceed to evaluation and trials for these four tenders.

5.1.3 Re-evaluation outcome

In November 2018, the World Sailing Council took the decision to approve the Board recommendation as outcome of the re-evaluation for the Men and Women's One Person Dinghy equipment:

"To Select New Equipment with an additional recommendation that the existing equipment (Laser) is included as a full option in this process. The selection of equipment will be made from amongst the D-Zero, Laser, Melges 14 and RS Aero following equipment trials (Sea Trials) to be scheduled at the earliest opportunity with evaluation against the criteria stated in the invitation to tender."

5.2 Evaluation Panel

The Evaluation Panel brings together different backgrounds including members from the Re-evaluation Working Party [RWP], the Equipment Committee, the Events Committee, Emerging Nations program, the Medical Commission, World Sailing’s Technical and Offshore team and Board members.

Dina Kowalyshyn	USA	Equipment Committee Chair, and Evaluation Chairman.
Jurgen Cluytmans	BEL	Equipment Committee member, IMSC Chairman, ERSC Chairman
Stefan Rahm	SWE	Event Committee member
Yann Rocherieux	FRA	Board member, Athletes Commission Chairman
Nadine Stegenwalner	GER	Board member, World Sailing VP
Torben Grael	BRA	Board member, World Sailing VP (Not present during Sea Trials)
Jo Aleh	NZL	Equipment Committee member (Not present during Sea Trials)
Bernard Destrube	FRA	Medical Commission member
Rob Holden	RSA	WS Training Delivery Manager
Hendrik Plate	GER	WS Technical Specialist
Jaime Navarro	ESP	WS Head of Technical and Offshore
Simon Forbes	GBR	WS Offshore Technical Manager

In addition, the Evaluation Panel was assisted by a coach nominated by the Coaches Commission, Alp Alpagut, at the Sea-trials.

5.3 Evaluation Principles

As defined by Council, the evaluation of the equipment shall be against the criteria stated in the Invitation to Tender document which includes reference to:

- Regulation 23,
- the Equipment Committee Criteria used for the re-evaluation of equipment under Regulation 23.6,
- Additional considerations affecting the event as stated in the document.

5.3.1 Regulation 23

Regulation 23.1.2, used in choosing Olympic events and equipment states that, World Sailing shall seek to ensure that the Olympic equipment taken together shall meet the requirements and objectives of the IOC and to:

- a) demonstrate the diversity of skills required to race various types of boats, and minimize the overlap between Events;
- b) place an emphasis on athlete skill rather than equipment development, and limit the impact of equipment on performance;
- c) demand a high level of athletic ability as well as excellent sailing skills;
- d) be attractive and accessible to young athletes from all continents, and of different size and weight, with a clear pathway from World Sailing Youth to Olympic Events and Equipment;
- e) maximize the participation of the world’s best sailors and showcase the diversity of the sport;
- f) provide an effective platform for promotion of the sport, and elite sailors, between Olympics;

- g) progress towards an equal number of Events for men and women to participate in;
- h) avoid unnecessary or excessive equipment costs, development costs, measurement costs, coaching costs, race organization and race official costs, and television and other media costs;
- i) offer continuity of Events and evolution of Equipment to give MNAs and sailors a dependable pathway into Olympic competition with continuity of investment;
- j) provide suitable Events and Equipment for Regional Games and other regattas;
- k) minimize environmental impact.

5.3.2 Universality

The One-Person Dinghy event has been identified by the Events Committee as being Universal. The portion of the description of a Universal Event that adds criteria to the equipment selection process, is as follows;

- Equipment is widely accessible around the world;
- Success is more related to athletic superiority and tactical understanding than technical knowledge of the specific equipment;
- Equipment is simple, standardized and no option is given for development, optimization or customization under its Class Rules.

5.3.3 Additional considerations

In addition, the stated documents include as criteria the technical and professional qualification of the tenderer and the capacity to comply as an Olympic equipment manufacturer and/or an Olympic Class organization. The overall considerations include the evaluation of cost, durability, suitability to serve the Olympic level and on the pathway for youth, the functionality of the equipment, the construction methods, and the class documents.

6 Appendix 2 - Sea Trials

6.1 Venue selection

World Sailing invited Member National Authorities to submit proposals with proven experience and recognized sailing venues to serve as host and assist World Sailing with the administration and logistic organization.

Due to the challenges of equipment transport, logistics and climate considerations, Southern European venues were preferred to host the Sea-trials.

The invitation requested bids to include proposed dates, sailing condition description and imagery for World Sailing's decision on the venue.

The following expressed interest endorsed by their MNAs:

- Real Club Nautico de Valencia, Spain
- Real Club Nautico de Gran Canaria, Spain
- Barcelona International Sailing Center, Spain
- Clube de Vela de Viana do Castelo, Portugal
- Malta Sailing Federation, Mgarr Harbour, Malta
- Genoa, Italy
- Yacht Club de Monaco, Monaco (later withdrawn)
- Singapore (later withdrawn)
- Poland (later withdrawn)

The Real Club Náutico de Valencia (RCNV) was selected to host the Sea Trials from the 11th to the 15th of March.

The RCNV generously provided all the facilities that were needed, free of charge, including the use of their offices and classroom space, the changing facilities, the boat park which including a large tent with sufficient space for rigging and storing all of the boats, ribs as required and volunteers to assist with the boat rotations in the water.

The Evaluation Panel and World Sailing wishes to express gratitude to the RCNV for their welcome and assistance over the week.

6.2 MNA Sailors selection

Following the selection of the venue and the dates, World Sailing invited Member National Authorities to put forward one-person dinghy sailors, providing career highlights, requesting male sailors with a weight range of 75kg to 90kg and female sailors in the 55kg to 70kg weight range. Funding was available to support emerging MNAs and other requests were considered where available.

The selected sailors were:

Anna Munch	DEN	Female, age 20, 171cm, 69kg
Fatima Reyes	ESP	Female, age 31, 167cm, 67kg
Mafalda Pires de Lima	POR	Female, age 20, 162cm, 62kg
Sarah McGovern	GBR	Female, age 30, 174cm, 63kg

Tania Elias Calles	MEX	Female, age 39, 164cm, 58kg
Ash Brunning	AUS	Male, age 33, 188cm, 88kg
Ben Childerley	GBR	Male, age 18, 181cm, 85kg
Christian G. Rost	DEN	Male, age 23, 181cm, 84kg
Guillaume Boisard	FRA	Male, age 21, 193cm, 90kg
Pavlos Kontides	CYP	Male, age 28, 183cm, 82.5kg
Stepan Novotny	CZE	Male, age 24, 174cm, 78kg

The application form required sailors to declare conflicts of interest and to agree to act impartially, participating in a fair and unbiased way in the Sea Trials.

The application forbid formal or informal meetings with class representatives or manufacturers being evaluated without the approval of World Sailing and the requirement to keep the content of the discussions and shared technical information confidential.

6.3 Sea Trials activities

The pre-trials activities involved selection of the venue, assembly of the evaluation panel, assembly of detailed evaluation method by group and subgroup, evaluation of the tender documentation, selection of MNA sailors, preparation of evaluation questionnaires and the creation of a detailed schedule for each day of the trials event.

6.3.1 Equipment inspection:

The inspections of the presented equipment at the Sea Trials were conducted by Jurgen Cluytmans, IM (IMSC Chairman, ERSC Chairman, EQ member) and Dina Kowalyshyn, IM (EQ Chairman) to evaluate consistency, finish quality, and hardware installations.

With focus on the hull, spars and appendages the dimensional similitude of rudders and daggerboards were checked, as were the assembly of masts and booms. Particular attention was paid to the hardware used in assembling the boats and the detail of attachments with respect to durability. The inspection noted if components were custom parts or off the shelf to evaluate the availability of spare parts around the world.

The hull, rudders, daggerboards and mast sections were measured and weighed in accordance with the Equipment Rules of Sailing. The mast rake was checked by measuring the distance from the aft edge of the top of lower mast section and a location in the transom of the hulls.

Due to the small sample size, the narrow range found during the Sea Trials do not guarantee a small standard deviation for the entire production population as manufacturers would have selected equipment taking into account these considerations.

The observations were reported to the Evaluation Panel and taken into account in the evaluation of the equipment.

6.3.2 On the water activities:

Each candidate was requested to present four hulls with the option to set up the boats with either the men's or the women's rig.



Rotations of equipment among the sailors were predetermined to ensure each piece of equipment was exposed to the MNA sailor an approximately equal amount of time in similar conditions.

Sailing was divided in two fleets, each one with four boats of a kind. The MNA sailors would launch the first two type of boats. Volunteers provided by the RCNV would assist delivering the next type of boats into the sailing area for rotations on the water.

Each fleet had a coach assigned to manage the activities and the Evaluation Panel would observe and evaluate the activities from Ribs interacting when appropriate with the sailors.

Each candidate team was given the opportunity to assign a representative to coach and advise the MNA sailors to achieve the maximum potential of each boat type.

The fourth day saw up to 18kts of wind. Since all sailors had extensive experience with the Laser the Evaluation Panel after consulting with the Laser representatives decided to further evaluate the D-Zero, Melges 14 and the RS Aero. All candidates prepared two boats with the men's rig and two boats with the women's rig and the sailors rotated among the boats and rigs sailing against each other.

On the last day, the evaluation panel had further feedback sessions with the sailors and closing statements from the class and manufacturer's representatives.

7 Appendix 3 – Medical Observer Report

The Evaluation Panel had a member nominated by the Medical Commission to assist in the evaluation at the Sea Trials. The feedback throughout the week was discussed and evaluated where considered relevant. The following report is presented for consideration:

The four boats tested present notable similarities – planing hull, self-supported mast, one sail, a shallow cockpit. The deck layout and type of fixtures used on each boat are not prone to causing notable injury to the sailors, with the exception of sharp rivets under the Aero gunwale that could injure a sailor’s foot as he rights after capsize. However this is expected to be easily remedied by the builder.

The Laser, D-Zero and RS Aero are all approximately 140 cm wide, have one hiking strap and provide similar hiking positions, the gunwale being 70 cm from the centre line. The Melges is 20 cm wider, but provides two hiking straps to maintain approximately the same distance to the gunwale from the hiking strap. In upwind sailing, the different deck configurations will induce slight differences in muscle solicitation depending on the boat, but this should not cause a health issue. Ankle, knee, and back strain are expected to be similar in the four boats while hiking upwind, as already observed with the Laser.

In downwind sailing, the different cockpit layouts will dictate different sailor positions. The Laser has a relatively narrow and slightly deeper cockpit than the three other boats, and sailors are able to remain seated on the deck, possibly keeping their weight centred by leaning to the opposite side. The wider cockpits of the Aero, D-Zero and especially Melges may allow the sailor to sit on the deck if there is sufficient wind, but may often oblige the sailor to be positioned closer to the centerline of the boat. Several positions are adopted, but all call for maximum flexion of one or both knees, and maximum flexion or extension of the ankle joint. Moving within the cockpit in these conditions will notably solicit the knee joint and quadriceps muscles. One can anticipate possible knee strain or injury due to these positions in sailors that spend much time training.

The Laser, Melges, and D-Zero have sheets looping from a rear mounted traveller system to approximately the end of the boom. In gybes, the particularly long sheets are liable to hook the sailor (for example by the neck) and possibly toss him in the water. This is not the case for the Aero, whose sheets are much shorter, affixed mid-boom ahead of the sailor.

Many sailing injuries actually occur on land, while manoeuvring the boats or loading onto trailers. At respectively 57 and 54 kilos, the Laser and Melges present a heavy burden for two persons, and a much more significant injury risk, compared to the 30 kilo Aero hull or 43 kilo D-Zero.

In conclusion, none of the four boats appears to present a vital health or injury hazard. In downwind conditions, the Laser allows for a more comfortable position than the three other boats, where the crouched posture induced by the wide cockpit configuration may facilitate knee strain. On shore handling of the Aero and D-Zero should be considerably safer than the Melges and especially the heavy Laser.

*Respectfully submitted,
Dr Bernard Destrubé, World Sailing Medical Commission*

8 Appendix 4 - Cost report

8.1 Retail Price Comparison

The following chapter shows retail prices and suppliers data requested in the second evaluation phase. The data was requested during Week 10,2019. The tables show the declared retail prices excluding tax and shipping costs as well as the supplier for each item. Applied exchange rates are stated in the first row of each table. All manufacturers also provided cost (except PSA) and retail prices which are confidential and consequently not shown in this report.

8.1.1 Retail Prices

8.1.1.1 D-Zero

Excluding Tax and Shipping (Applied Exchange Rate 1PLN=0.2GBP, 1CZK=0.033GBP, 1EUR=0.88GBP)		
	Supplier	Retail Price
Complete Boat (<i>Improved with "Deck Extenders"</i>)	Devoti Sailing	£ 4,448.29
Hull (finished with deck)	Devoti Sailing	£ 734.58
Deck Extenders (new accessory)	Devoti Sailing	£ 154.00
Mast Top	Compotech	£ 462.00
Mast Bottom "Grey rig"	Compotech	£ 654.50
Mast Botttom "Blue rig"	Compotech	£ 500.50
Sail "Grey rig"	North Sails	£ 766.15
Sail "Blue rig"	North Sails	£ 739.20
Boom without Blocks	Compotech	£ 346.50
Daggerboard	Devoti Sailing	£ 331.10
Rudder Blade	Devoti Sailing	£ 223.30
Rudder Casette kit		
<i>Liftable Casette</i>	Vella	£ 138.60
<i>Carbon tiller extension</i>	Compotech	£ 61.60
<i>Fitting for Rudder Casette</i>	Vella	£ 38.50
Deckgear		
<i>Toe strap</i>	Ripper	£ 34.65
<i>Fittings</i>	Harken	£ 970.20
Running Rigging		
<i>Complete set of ropes</i>	Stary s.r.o.	£ 140.55
<i>Mast/boom quick release system</i>	Vella	£ 34.65

8.1.1.2 Laser

Item	LP Supplier	Retail Price ³	PSA Supplier	Retail Price ⁴	PSJ Supplier	Retail Price ⁵
Boat Radial Rig	LP	£ 4,995.83	PSA	£ 5,515.37	PSJ	£ 4,973.44
Boat Standard Rig	LP	£ 4,995.83	PSA	£ 5,515.37	PSJ	£ 5,034.90
Hull	Laser Sailboats	N/A		£ 3,141.82	PSJ	£ 2,844.76
Mast Top Composite	CST, Selden, Harken*	£ 438.00		£ 441.82	CST	£ 434.00
Mast Bottom Radial	Selden, Technocar	£ 155.34		£ 216.49	LP	£ 192.50
Mast Bottom Standard	Selden, Technocar	£ 163.04		£ 231.96	LP	£ 185.50
Boom (with Blocks ¹ , without blocks ²)	Selden, Technocar	£ 186.58 ¹		£ 195.87 ²	LP	£ 156.80 ²
Sail Radial	Hyde, North	£ 474.84		£ 425.76	Hyde	£ 367.64
Sail Standard	Hyde, North, Neil Pryde	£ 489.29		£ 538.67	Hyde	£ 436.10
Rudder Blade	N1 Foil, Tuna China	£ 223.00		£ 273.19	LP	£ 245.00
Daggerboard	N1 Foil, Tuna China	£ 372.00		£ 463.91	LP	£ 339.50
Rudder Casette (Including highest spec tiller and extension)	Harken	£ 329.80		£ 146.91	Nautos, Fareast	£ 294.00
Deckgear	Harken / Selden	£ 513.74		£ -	Harken	£ 105.42
Running Rigging	Harken / Selden	£ 106.88		£ -	Various	£ 365.61

³ LP: Excluding Tax and Shipping g (Applied Exchange Rate 1USD=0.77GBP)

⁴ PSA: Excluding Tax and Shipping g (Applied Exchange Rate 1AUD=0.54GBP)

⁵ Excluding Tax and Shipping g (Applied Exchange Rate 1YEN=0.007GBP)

8.1.1.3 Melges 14

Item	Melges ⁶		Mackay ⁷		NELO ⁸		Ovington ⁹	
	Supplier	Retail Price	Supplier	Retail Price	Supplier	Retail Price	Supplier	Retail Price
Boat Gold Rig	Melges	£ 6,853.00	Mackay	£ 6,812.00	NELO	£ 6,556.00	Ovington	£ 6,650.00
Boat Blue Rig	Melges	£ 6,772.15	Mackay	£ 6,734.00	NELO	£ 6,410.80	Ovington	£ 6,512.00
Hull, with deck gear and straps	Melges	£ 4,885.65	Mackay	£ 4,854.20	NELO	£ 4,398.24	Ovington	£ 4,365.00
Mast Top Gold	Kilwell tube	£ 396.55	Kilwell tube	£ 390.00	Kilwell tube	£ 396.00	Kilwell tube	£ 386.00
Mast Top Blue	Kilwell tube	£ 265.65	Kilwell tube	£ 260.00	Kilwell tube	£ 268.40	Kilwell tube	£ 261.00
Mast Bottom	Kilwell tube	£ 458.15	Kilwell tube	£ 455.00	Kilwell tube	£ 462.00	Kilwell tube	£ 451.00
Boom without Blocks	Kiwell tube	£ 445.06	Kiwell tube	£ 442.00	Kiwell tube	£ 448.80	Kiwell tube	£ 438.00
Sail Gold	North	£ 565.95	North	£ 561.60	North	£ 572.00	North	£ 558.00
Sail Blue	North	£ 488.95	North	£ 483.60	North	£ 492.80	North	£ 480.00
Rudder Blade	Nelo	£ 342.65	Mackay	£ 340.60	Nelo	£ 343.20	Ovington	£ 335.00
Daggerboard	Nelo	£ 481.25	Mackay	£ 478.40	Nelo	£ 486.64	Ovington	£ 475.00
Rudder Casette, Tiller, Extension	Melges	£ 211.75	Mackay	£ 207.48	NELO	£ 234.08		£ 210.00
Deckgear	Melges	£ 654.50	Mackay	£ 650.52	NELO	£ 860.64	Harken	£ 840.00
Running Rigging	Melges	£ 67.76	Mackay	£ 67.60	NELO	£ 55.44		£ 54.00
Running Rigging Olympic	Melges	£ 346.50	Mackay	£ 343.20	NELO	£ 374.00		£ 365.00

⁶ Excluding Tax and Shipping (Applied Exchange Rate 1NZD=0.52GBP)

⁷ Excluding Tax and Shipping (Applied Exchange Rate 1USD=0.77GBP)

⁸ Excluding Tax and Shipping (Applied Exchange Rate 1EUR=0.88GBP)

⁹ Local Currency, excluding Tax and Shipping

8.1.1.4 *RS Aero*

Local Currency, excluding Tax and Shipping		
Item	Supplier	Retail Price
Boat 9 Rig		£ 6,040.55
Boat 7 Rig		£ 5,991.67
Hull	MTAG	£ 3,709.32
Mast Top	Italica	£ 342.50
Mast Bottom 9	Italica	£ 393.75
Mast Bottom 7	Italica	£ 393.75
Boom without Blocks	Italica	£ 331.25
Sail 9	North Sails	£ 437.85
Sail 7	North Sails	£ 366.45
Rudder Blade	MTAG	£ 275.68
Daggerboard	MTAG	£ 331.89
Rudder Casette, Tiller, extension	Selden	£ 173.33
Deckgear	Harken - Selden	£ 489.00
Running Rigging	Kingfisher	£ 86.00

8.1.2 Retail Price Comparison

Prices in GBP, Exchange Rates applied as above, excluding Tax and Shipping									
	D-0	LP	PSA	PSJ	M14 NZL	M14 USA	M14 POR	M14 GBR	RS
Big Rig	4448.3	4995.8	5515.4	4973.4	6812.0	6853.0	6556.0	6650.0	6040.6
Small Rig	4448.3	4995.8	5515.4	5034.9	6734.0	6772.2	6410.8	6512.0	5991.7
Hull	734.6	-	3141.8	2844.8	4854.2	4885.7	4398.2	4365.0	3709.3
Mast Top	462.0	438.0	441.8	434.0	390.0	396.6	396.0	386.0	342.5
Mast Top Small	-	-	-	-	260.0	265.7	268.4	261.0	-
Mast Bottom	654.5	163.0	232.0	185.5	455.0	458.2	462.0	451.0	393.8
Mast Bottom Small	500.5	155.3	216.5	192.5	-	-	-	-	393.8
Boom without Blocks	346.5	186.6	195.9	156.8	442.0	445.1	448.8	438.0	331.3
Sail Big	766.2	489.3	538.7	436.1	561.6	566.0	572.0	558.0	437.9
Sail Small	739.2	474.8	425.8	367.6	483.6	489.0	492.8	480.0	366.5
Rudder Blade	223.3	223.0	273.2	245.0	340.6	342.7	343.2	335.0	275.7
Daggerboard	331.1	372.0	463.9	339.5	478.4	481.3	486.6	475.0	331.9
Rudder Casette, tiller, extension	238.7	329.8	146.9	294.0	207.5	211.8	234.1	210.0	173.3
Deckgear	1004.9	513.7	-	105.4 ¹	650.5	654.5	860.6	840.0	489.0
Running Rigging	175.2	106.9	-	365.6 ²	343.2	346.5	374.0	365.0	86.0

Colour Code applied per row.

¹ Reported including Running Gear costs

² Reported including Deckgear

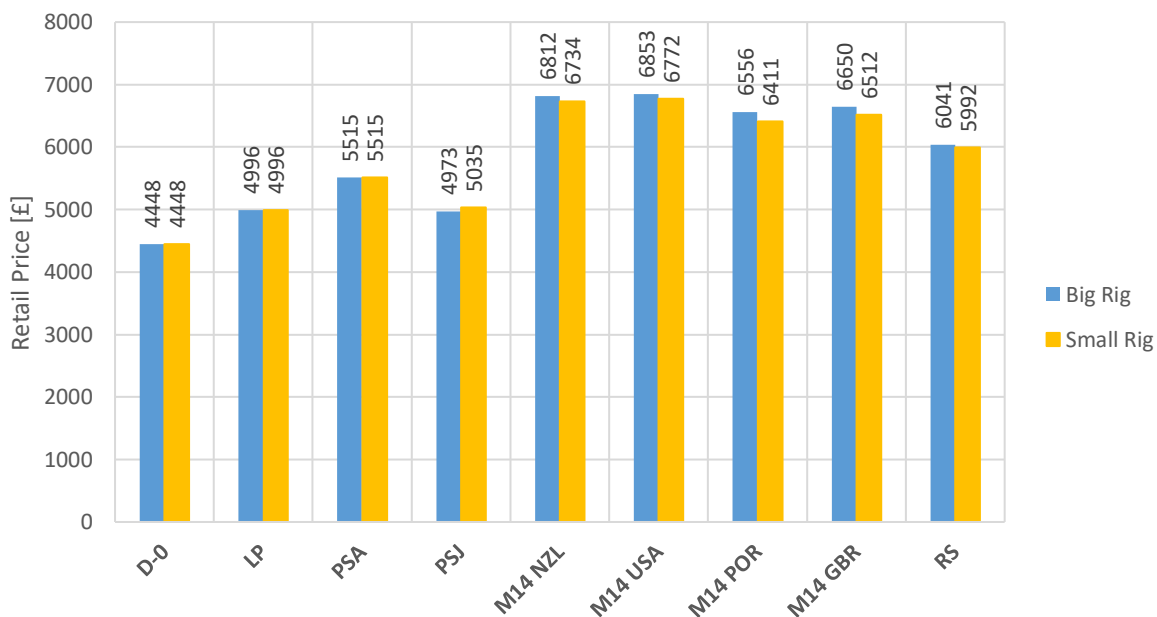


Figure 1: Boat Retail Price Comparison

Since the spare part prices for the Melges 14 are similar, the average price of the four manufacturers is used in the following chapters of the report.

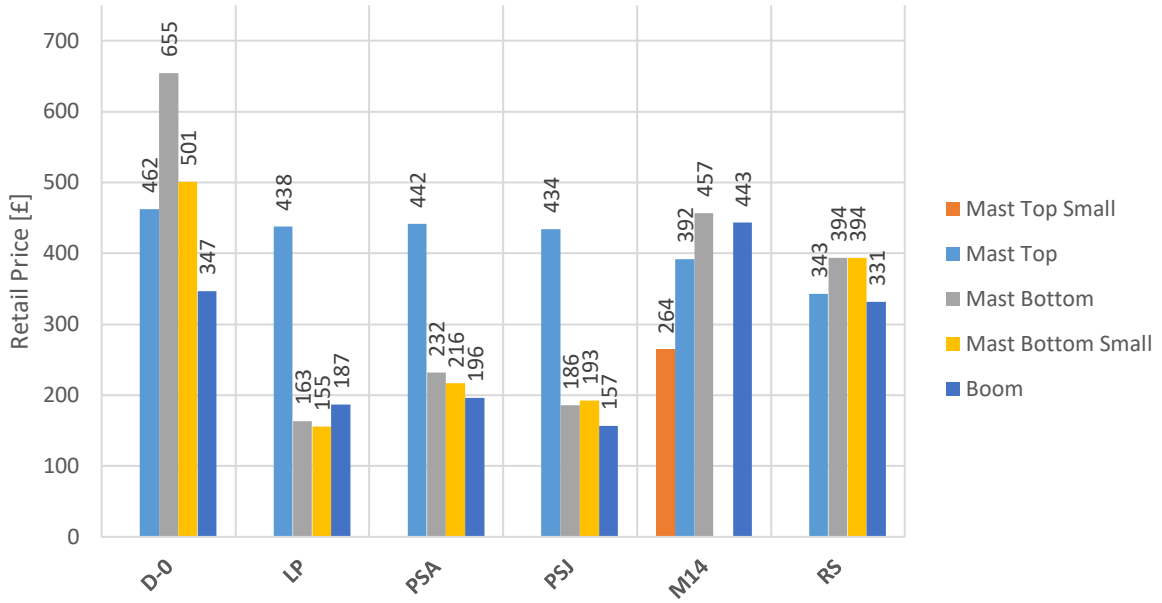


Figure 2: Retail Price Comparison - Spars

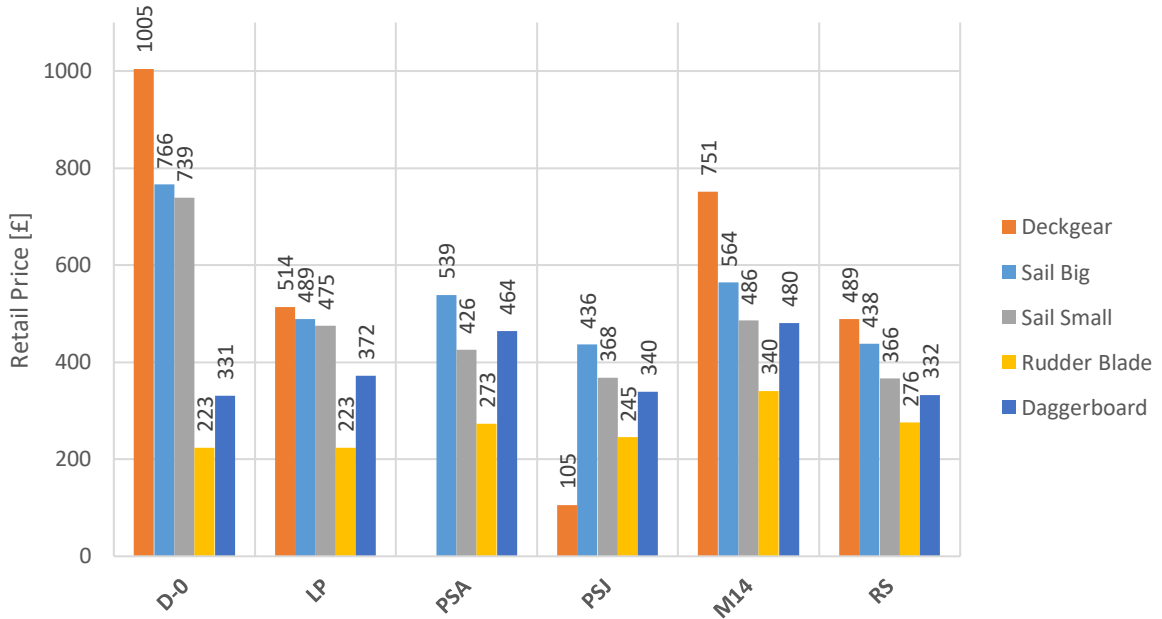


Figure 3: Retail Price Comparison – Deckgear, Sails and Appendages

8.1.3 Season Show Case

In order to compare the running costs of each boat the following tables generate show cases for all boats. The “Season show case” includes the boat ready to sail and a set of spares (which include a new mast top, one new sail and a set of appendages). The lifespan for each part of equipment has been considered constant independent of the manufacturer.

8.1.3.1 Small Rig

Prices in GBP, Exchange Rates applied as above, excluding Tax and Shipping						
Item	D-0	LP	PSA	PSJ	M14	RS
Boat Small Rig	4448.29	4995.83	5515.37	5034.90	6607.24	5991.67
Mast Top	462.00	438.00	441.82	434.00	263.76	342.50
Boom	346.50	186.58	195.87	156.80	443.47	331.25
Sail Small	739.20	474.84	425.76	367.64	486.34	366.45
Rudder Blade	223.30	223.00	273.19	245.00	340.36	275.68
Daggerboard	331.10	372.00	463.91	339.50	480.32	331.89
Sum	6550.39	6690.25	7315.92	6577.84	8621.49	7639.44
Spares Sum	2102.10	1694.42	1800.55	1542.94	2014.25	1647.77

8.1.3.2 Big Rig

Prices in GBP, Exchange Rates applied as above, excluding Tax and Shipping						
Item	D-0	LP	PSA	PSJ	M14	RS
Boat Big Rig	4448.29	4995.83	5515.37	4973.44	6717.75	6040.55
Mast Top	462.00	438.00	441.82	434.00	392.14	342.50
Boom	346.50	186.58	195.87	156.80	443.47	331.25
Sail Big	766.15	489.29	538.67	436.10	564.39	437.85
Rudder Blade	223.30	223.00	273.19	245.00	340.36	275.68
Daggerboard	331.10	372.00	463.91	339.50	480.32	331.89
Sum	6577.34	6704.70	7428.83	6584.84	8938.43	7759.72
Spares Sum	2129.05	1708.87	1913.46	1611.40	2220.68	1719.17

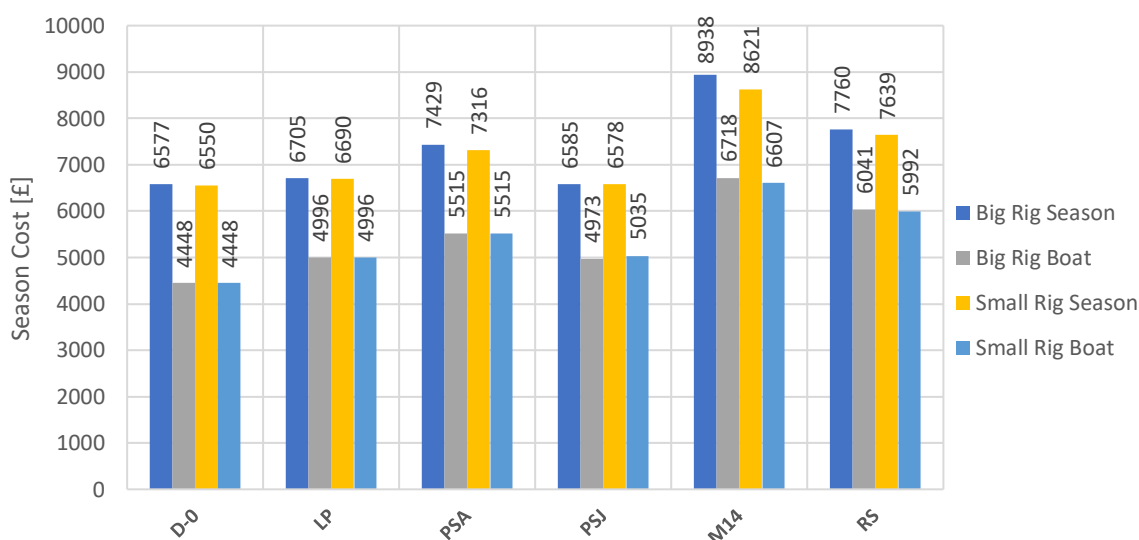


Figure 4: Boat Price - Running Cost Comparison

END OF REPORT.