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1. Introduction

The quality of Olympic sailing equipment is an important subject as there are a number of associated threats to the sport:

- Cost implications: quality issues result in increased costs of Olympic campaigns, creating financial barriers to sailors and risking accessibility and participation.
- Sustainability implications: quality dictates the frequency of replacements and the purchasing behaviour of those seeking the best-performing equipment.
- Integrity and fairness: a level playing field requires equalised equipment (where intended), equal opportunity to access equipment as well as the means to validate production and identify equipment manipulation.

At the 2022 mid-year meeting, World Sailing's Council directed World Sailing to address concerns regarding the quality and cost of Olympic equipment.

2. Objectives

The Olympic Equipment Quality workstream aims to define actions that could be implemented at the earliest opportunity and make recommendations to inform strategy going forward.

This report aims to facilitate the discussions at World Sailing's 2022 Annual Conference and is the result of the discussions had by the Staff with members of the Equipment Committee, the Board, Athlete Commission, Manufacturers, International Measurers and representatives of other technical sports.

Throughout the discussions, World Sailing is aiming to answer the following questions:

- How to define the current state across various dimensions affected by the quality of equipment as seen by each relevant group within World Sailing?
- How to validate proposals to address the challenges?
- How to identify the priorities?
- How to rate the success of the workstream and any action implemented?

3. Background

The quality of equipment matters. As a technical sport, sailing is equipment dependent and as such, the highest level of competition is inherently linked to the optimisation of equipment performance.

Differences in the physical properties of the equipment such as weight, shape, stiffness and surface friction have a substantial effect on the performance of the athlete.

For the Olympic sailing competition, World Sailing regulations set out to select Events and Equipment that place emphasis on athlete skill rather than equipment development with the aim to limit the impact of equipment on performance.

It is therefore critical that equipment is not only designed to high standards but also that it is produced consistently. This has traditionally been addressed by World Sailing by selecting forms of "One Design" equipment for the Olympic sailing competition. There is, however, no established

definition for One Design, and the rules and frameworks aiming to provide the technical control vary in scope and effectiveness from Class to Class. The challenges and risks are different, and the issues must be addressed with an understanding of the objectives and philosophy of each specific Class.

Areas of concern include:

- The rate of breakages of equipment,
- The competitive lifespan of the equipment,
- The perceived lack of controls at production,
- The perceived lack of controls to identify equipment manipulation,
- The lack of confidence and credibility on equipment inspections,
- The increasing price of the equipment,
- The permitted tolerances in equipment governed by measurement rules permit manufacturers to produce and offer different designs,
- Where the building specifications defining the eligibility of equipment are not publicly available, there are perceived inconsistencies in the equipment produced by the different manufacturers as well as between the equipment produced by each single manufacturer,

Whether perceived or real, these risks influence the behaviour of manufacturers, athletes, event organisers and equipment inspectors. As a consequence, these risks can result in undesired behaviours;

- Manufacturers competing to produce enhanced equipment where the Class objective is for manufacturers to produce equipment as similar as possible,
- Manufacturers becoming complacent and distributing equipment built with discrepancies or within a wider range of tolerances than they are capable of achieving,
- Increased purchase behaviour influenced by an attempt to identify and assess equipment with different properties to select and reserve the best performing for competition,
- Increased purchasing behaviour due to the limited competitive lifespan of some equipment items,
- Manufacturers offering customised equipment or athletes influencing manufacturers to customise equipment,
- Athletes altering equipment justifying that they are repairing the equipment they purchased with damages,
- Athletes altering equipment justifying that it's not produced or supplied consistently when compared to other orders,
- Athletes altering equipment believing that there are no mechanisms in place to identify their alterations or to distinguish their alterations from inconsistencies from production,
- Challenges to self-regulate the sport at events and for Technical Committees to determine the eligibility of equipment,
- Urgent Class Rule changes seeking to clarify the eligibility of equipment,
- Reactive changes to building specifications that are not adequately managed,

Throughout the years, World Sailing has relied on the role of Class Associations and the development of measurements rules and other requirements listed within their Class Rules to

govern the appointment and eligibility of manufacturers and their equipment. This has permitted the sport to be self-regulated by enabling athletes and equipment inspectors’ access and visibility into the measurements and all requirements, while holding manufacturers and athletes responsible.

With globalisation and economies of scale, right-holders and their approved manufacturers have been able to develop the sport at high pace. World Sailing has seen a natural transformation into the so called ‘manufacturer-controlled Classes’ or other models that do not rely on public measurement rules.

1976	1980	1984	1988	1992	1996	2000	2004	2008	2012	2016	2020	2024
SOL	SOL	SOL	SOL	SOL	SOL	SOL	YNG	YNG	Elliott	FINN	FINN	470
TMP	STR	STR	STR	STR	STR	STR	STR	STR	STR	470	470	
FINN	FINN	FINN	FINN	FINN	FINN	FINN	FINN	FINN	FINN			
470	470	470	470	470	470	470	470	470	470			
TRN	TRN	TRN	TRN	TRN	TRN	TRN	TRN	TRN				
FD	FD	FD	FD	FD	EUR	EUR	EUR					
				EUR		49er	49er	49er	49er	N17	N17	N17
					LSR	LSR	LSR	LSR	LSR	49er	49er	49er
		Windglider	Div II	Lechner	MIS	MIS	MIS	RSX	RSX	LSR	ILCA	ILCA
										RSX	RSX	RSX
0	0	1/7	1/7	1/8	2/8	3/9	3/9	3/8	3/4	4/6	4/6	5/6
0%	0%	14%	14%	13%	25%	33%	33%	38%	60%	67%	67%	83%

Figure 1: Olympic Classes transition from measurement-controlled Classes to ‘Manufacturer Controlled’ One Design¹ models

These models have brought numerous benefits to the sport, simplifying for example the logistics behind equipment inspections at events, allowing in theory, to simply verify the manufacturer instead of requiring equipment to be measurement controlled.

World Sailing however, has not fully developed its governance structure to reflect the implications of these changes. In the past, Class Rules included measurement rules developed and tested throughout the years as well as production requirements visible to all, whereas now manufactured controlled Class Rules simply include reference to the need for equipment to comply with their confidential Building Specifications and to comply with a World Sailing approved manufacturing control system.

Although the commercial undertakings with Olympic Equipment manufacturers and right holders include contractual obligations, there is an urgent need to develop, implement and maintain the Building Specifications and an approved Manufacturing Control System essential to the concept with clear roles and responsibilities for the Class, the manufacturer, the right holder and World Sailing.

4. Benchmarking the current state and evaluating progress

Quality can be defined as consistent conformance to customer’s expectations. Reports from athletes and their representatives suggest that the quality of Olympic equipment is inconsistent and does not meet their expectations.

To facilitate the discussions, the following distinction has been proposed.

¹ The IKA-Formula Kite model, although a registration system of different designs, is arguably a registration of multiple ‘one design’s each being manufacturer controlled. Each with their ‘confidential building specification’ and with a World Sailing approved manufacturing control system which is managed by the Class.

- 1) The quality of equipment as the measure of the equipment being fit for purpose and robust, a measure of how suitable such equipment is for the designated Olympic event, an indication of its lifespan, an indication of the rate of replacements due to breakages.
- 2) The quality of equipment as the measure of the equipment being produced within consistent tolerances.

Perceived poor quality can be a result of either a mismatch between the production and the design specifications, or because the design specifications are not aligned with the expectations of the customers.

This subjective element means that different groups affected within World Sailing (Athletes, Coaches, International Measurers, Manufacturers, Class representatives, Equipment Committee members, event organisers, etc.) will have different perceptions of the current state of quality for each Class and each equipment item.

The use of surveys has been proposed to allow to gather the opinion of each relevant group:

- 1) To define the current state of play as seen by each relevant group across the following areas;
 - a. Current oversight of equipment manipulation
 - b. Current Quality Assurance processes at production
 - c. Current Quality Controls and inspections to validate equipment after production
 - d. Current level and effectiveness of Equipment Inspections at main events
 - e. Effectiveness of the current Class Rules as the framework for technical control of the Class
- 2) To confirm and validate proposals to address the perceived challenges.
- 3) To help identify priorities and whether to direct resources and efforts to:
 - a. Implement quality controls at production
 - b. Introduce measurement rules to validate equipment
 - c. Focus on identifying equipment manipulation
 - d. Limit the permitted number of equipment items used by competitors at main events
- 4) To establish benchmarks to allow evaluation of progress around the following areas;
 - a. confidence of quality and equality of equipment among competitors
 - b. purchase rate of equipment, breakages and historical warranty claims
 - c. current state of quality assurance and quality control processes
 - d. frameworks, regulatory and contractual requirements, rules and responsibilities

The current state varies from Class to Class and for each equipment item within each Class. The quality of the equipment is largely influenced by the existing frameworks, governing structures and parties involved in each case;

- Whether there are public measurement-controlled rules or specifications considered confidential that define the agreed tolerances and corrective actions,
- Whether the design specifications documented, maintained and updated through an approved process,
- Whether the specifications or rules permit different options for manufacturers, and include all factors considered relevant to affect performance,

- Whether there are quality assurance systems in place, reporting systems to the governing authority and audits conducted to verify compliance,
- Whether there is a single manufacturer or multiple manufacturers,
- Whether equipment is being mass produced and sold through retailers or whether its custom produced and sold directly to the athlete,
- Whether there is a record of warranty claims or not,
- Whether the licensing of new manufacturers is managed by World Sailing, right holders or the Class,
- Whether there are means to inspect against the production requirements at events or not,

The proposed survey will be finalised following feedback received at the Annual Conference and distributed to all relevant Committees and the wider sailing community.

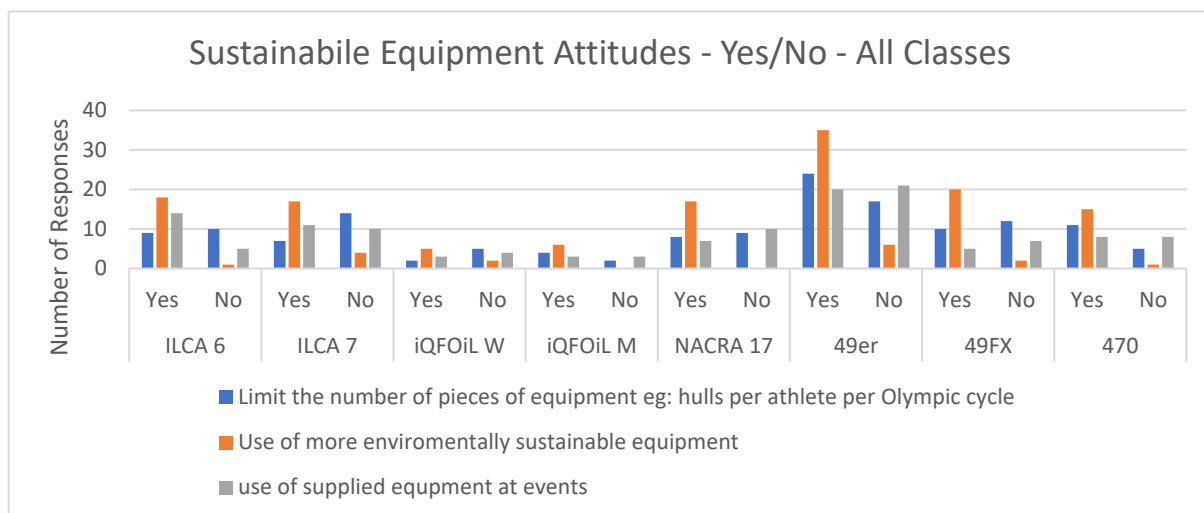
a. Sustainability

Identified in Olympic Agenda 2020+5 as a focus for the IOC, sustainability is integral to all Olympic sports and by extension, the equipment. This is also reflected in the World Sailing Sustainability Agenda 2030's recommendation: deliver Sustainability through technical standards, which highlights the need for sustainable equipment and manufacturing processes as part of the overall impact of Olympic Competition.

While improvements in production methods and end of life solutions are needed, minimising the need to purchase and therefore produce excess equipment is vital to the sustainability of the sport. To achieve this, equipment needs to have a long competitive lifespan and athletes need confidence that there are no potential performance gains by purchasing and testing equipment from different manufacturers or even the same items from the same manufacturer.

To gain a better understanding of Olympic athlete purchase trends, a survey was distributed at Kiel Week 2022 to athletes in Olympic Classes. The survey has also been distributed at the recent 2022 Formula Kite Worlds, and the results will be analysed shortly. The survey looked at the quantities of equipment items purchased, the reason for the purchase, athletes' attitudes towards possible sustainability measures, what athletes currently do with equipment they no longer have use for and the impact of Class Rule changes on purchasing.

In addition to the quantities purchased of key items in each Class, the results identified variations in purchasing behaviours between Classes. The survey results also reinforced the directive from the Athlete’s Commission at the mid-year meeting for a more sustainable approach to Olympic



competition with 89% of respondents reported that they would like more sustainable equipment. It also highlighted variances in attitudes towards measures such as the increased use of supplied equipment or equipment limits which differed between Classes.

The results of the survey and the wider topic of equipment quality are also key in understanding the other Athlete’s Commission directive regarding the cost of Olympic campaigns. Using the results of the survey estimation on the quantity of equipment used across the campaign can be made and the associated financial costs.

By reducing the need for athletes to purchase excess equipment, both the environmental and financial impacts can be minimised. The survey will be repeated on a regular basis to monitor changes in purchasing behaviour in addition to changes in sustainability attitudes and practices.

b. Cost

Quality and cost are directly associated. An increase in quality can see an unintended increase in cost of equipment. This could, however, still signify a reduction in the cost of a campaign if the increased quality translates into less replacements or a reduction of purchases seeking to obtain better quality equipment.

The relation is hard to quantify, and the desire is for no increase in price of equipment. Athletes in the past have noted that they are experiencing increases in price with no improvement in quality and therefore suggested that they would understand an increased prices if it translated to an increase in quality. The current perception is however that there is a wide mismatch between prices and quality.

To get clearer understanding of the costs of equipment in Olympic Classes, the office is gathering information around the costs associated with key equipment items. This is including contacting manufacturers and suppliers across all the Olympic Class. In addition to the cost of the equipment

items, the research project will also look into the Class specific costs and fees associated with official marks/stickers (in addition to the World Sailing plaque) as required by Class Rules. The objective is to have a transparent understanding of the financial aspect of the equipment and the associated parties including Class Associations, builders and right holders.

With the current global inflationary pressures, transparency around increases to Olympic Equipment is vital to retaining athletes' confidence as well as impacting other stakeholders in the Olympic competition. This project has already identified many complexities in collecting and tracking this information. This includes the different restrictions some Olympic Classes place on who can manufacture various equipment items, and the lack of engagement from some manufacturers to provide price lists. It has also identified complexities in pricing as many suppliers have different price lists depending on who is purchasing the equipment item, for example athletes or MNAs. It also highlights the complexity of some distribution systems. Some suppliers are restricted to only sell to certain geographical areas, thus potentially creating monopolies in Classes where there are multiple builders.

5. Recommendations

Driven by our core value of Integrity, World Sailing must achieve full confidence and credibility monitoring compliance with the technical requirements and ensuring fairness in the sport.

The objective is to reduce the cost associated with quality issues, reducing the frequency of replacements and the associated sustainability implications to ensure a level playing field for all competitors.

World Sailing's Technical Specialists have access to the builder manuals and technical specifications, and through the contractual requirements with the Olympic Classes, the manufacturers and right holders, World Sailing has access and visibility into the production.

Throughout the experience gained from maintaining Class Rules, performing site visits, evaluating the existing documentation, and through the interviews conducted with the different groups discussing the current frameworks, the following recommendations are proposed for consideration by the relevant Committees.

It is proposed that following the discussions at the Annual Conference, such recommendations are developed to clarify the ownership of responsibilities and further define specific, measurable, achievable, relevant, and time-bound objectives.

A) Benchmarking and assessing current state

- ➔ **Recommendation 1: Establish benchmarks to determine the level of quality as perceived by each relevant group and report to Council annually through the Equipment Committee and the Board.**

Reasons: To define success, World Sailing must first understand the current state across the various dimensions affected by the quality of equipment. The different groups affected by the subject will have different levels of visibility into the matter and may have different

interests and perceptions. Not only must World Sailing strive to have effective frameworks in place but also care about the perception and credibility of the systems adopted.

The use of surveys is proposed to allow for an initial assessment that would permit to evaluate the current situation and facilitate benchmarking progress and identifying priorities as well as validating the workstream.

➔ **Recommendation 2: To implement a Hotline (whistle blower system) for reporting manipulation of Olympic equipment.**

Reasons: To provide a reporting mechanism which is a fundamental provision of the Olympic Movement Code on the Prevention of the Manipulation of Competitions. The Olympic Agenda 2020 + 5, encourages International Federations to have clear and transparent rules and regulations on technological manipulation and the consequences of their infringement. The IOC refers to the issue of using “performance enhancing technology” to gain a competitive advantage. The Hotline would allow to report suspicious approaches or activities related to equipment manipulation, or the use or development of performance enhancing equipment not regulated or permitted by the rules in Olympic Classes.

➔ **Recommendation 3: Require the relevant authority (Olympic Classes, right-holders, or their manufacturers) to periodically report warranty claims.**

Reasons: To allow to use the information to further assess and benchmark quality.

➔ **Recommendation 4: To require right-holders, Classes and manufacturers transparency on equipment price breakdown including any associated fees and royalties.**

Reasons: The cost of Olympic equipment cannot only be attributed to the production cost of equipment. To inform policy decisions moving forward World Sailing must understand the different contributors and factors that affect the price of the equipment. The existence of fees for existing internal quality control systems, royalty fees, fees for equipment registration, etc.

➔ **Recommendation 5: Require the relevant authority (Olympic Classes, right-holders, or their manufacturers) to develop internal Quality Assurance systems for World Sailing approval and to report the results periodically to monitor performance.**

Reasons: Currently some Classes, right holders or manufacturers implement their own QA systems, these are however not necessarily reported to World Sailing or standardised across manufacturers of a given Class.

Through the evaluation of the reported information World Sailing could assess production performance and use the information for auditing purposes.

B) Developing and implementing the World Sailings approved manufacturing control system and the technical specifications

- ➔ **Recommendation 6: where equipment is subject to confidential Building Specifications and subject to a World Sailing approved manufacturing control system; Develop and implement an audit plan for all Olympic Equipment manufacturers.**

Reasons: The current frameworks and contractual requirements rely on manufacturers building in accordance with to the technical specifications. World Sailing must implement a control system allowing to evaluate;

- the quality management systems in place,
- if the agreed technical specifications are sufficiently detailed and cover all the relevant areas required to define the equipment to the intended level,
- if manufacturers are producing in accordance with the requirements,
- if manufacturers are producing consistently and whether if there are different interpretations of the requirements being implemented,

The audit plan should include periodical inspections as well as surprise inspections. The audit plans could be organised similarly to those conducted within World Sailing's In-House Certification programme, requiring manufacturers to maintain a formalised system that documents processes, procedures and responsibilities for achieving quality policies and objectives.

In recent years the Covid-19 pandemic limited the ability of World Sailing technical staff, Class Associations and right holders to travel and inspect manufacturers sites. However, with restrictions easing in most countries, audits have restarted and will increase in 2023 and 2024. Given the number of the manufacturers and the spread of their facilities a priority list is being developed to maximise the benefits of available resources, which are budget dependant. Recent audits have also highlighted the need to define and establish a standardised reporting system for manufacturers. This system could also help with the prioritisation of future audits.

- ➔ **Recommendation 7: Require the relevant authority (Olympic Classes, right-holders, or their manufacturers) to develop for World Sailing's approval the technical building specifications which shall define the requirements for assessing and validating production.**

Reasons: the current state of technical specifications varies across Olympic Classes and equipment items. The purpose of these technical specifications is not to define how equipment is produced, but rather define the production process and requirements the product must satisfy to be considered to comply with World Sailings approved manufacturing control system.

- ➔ **Recommendation 8: Require the relevant authority (Olympic Classes, right holders, or their manufacturers) to develop Quality Control systems (measurements, tests and processes) that would allow World Sailing to verify and validate production compliance with the building specifications.**

Reasons: World Sailing must be able to perform quality controls on the end product to evaluate compliance with the agreed technical specifications rather than relying solely on compliance with the production process as the means to validate equipment.

In some cases there is no assessment of weight distribution, geometry or other physical properties considered critical given the perception that these properties are controlled by the requirement to use the specified moulds, materials and defined production processes.

➔ **Recommendation 9: Develop requirements for evaluating, approving and implementing changes to building specifications.**

Reasons: In order to properly manage any evolution or changes to the Class Rules or Technical Specifications, World Sailing shall only give its approval to such evolution or changes where it is satisfied that the new equipment will be robust, fit for purpose, have adequate longevity of use and be available for purchase within a reasonable time.

For Olympic Classes such approval should therefore be able to be delayed or subject to conditions as World Sailing may see fit to impose. The approval may initially be only for prototype equipment for a period of time to ensure the new equipment is fit for use. In the event of an evolution or change of the Equipment, the party responsible for the change may be required to agree to comply with any upgrade package distribution, any order of distribution or distribution timetable issued by World Sailing.

C) Empowering World Sailing's Technical Specialists and appointed delegates

➔ **Recommendation 10: To require event organisers of Olympic qualifiers, World Championships, Continentals, and World Cup Series events to permit World Sailing Technical Specialists and appointed technical experts to inspect equipment at events.**

Reasons: With confidential Building Specifications, equipment inspectors are in most cases unable to check compliance against some critical requirements other than through the comparison between the equipment at the event. Allowing ad-hoc inspections from a group of specialists who have access to the confidential specifications who would report directly to World Sailing, rather than to the Event Organiser or the Class representative, would permit World Sailing to directly assess the situation, complement the inspection and overall increase the credibility to identify manipulation of equipment.

➔ **Recommendation 12: To develop the frameworks that would allow World Sailing Technical Specialists and appointed technical experts to provide the Technical Committee at Events with their assessment of equipment compliance against the technical specifications.**

Reasons: Given the lack of visibility into the building specifications, Equipment Inspectors have limited resources to verify if equipment complies with the building specifications. World Sailing's Technical Specialists and appointed delegates could support the Technical Committee at events.

➔ **Recommendation 11: Permit World Sailing to require the relevant authority to define further specifications to define areas not covered by the existing technical specifications.**

Reasons: The existing documents defining the building specifications vary in scope and detail. In some cases, there are no restrictions for areas that could be defined and would affect the quality of the product.

World Sailing's Technical Specialists have access to the building specifications and could perform assessments of the equipment at events against requirements that are not explicitly defined in the Class Rules and therefore not assessed by Equipment Inspectors at events. World Sailing could consider establishing a specialised group of professional individuals that would report to World Sailing rather than to the Class or the event organisers that would serve to assess the current state and assess manipulation of equipment or non-compliances from manufacturers. The current rules and regulations would require allowing however that such group is endorsed to performs such inspections.

➔ **Recommendation 13: Define consequences for manufacturers at fault and develop frameworks allowing for their implementation.**

Reasons: To develop a clear mechanism to sanction manufacturers that would encourage further focus on quality. When non-compliances or malpractices are discovered either at manufacturing audits or at events, when it is determined that the equipment is not meeting the specifications and has not been modified by the athletes.

➔ **Recommendation 14: Invest in technical R&D and in the use of modernised measurement tooling for inspections and quality control purposes.**

Reasons: The level of precision required to inspect foils requires the development of new inspection procedures, the use of technology capable achieving the intended observations, and the training of specialists to perform the tasks.

Other recommendations considered throughout the discussions included:

1. To consider publishing the measurements and permitted tolerances for equipment items subject to 'manufacturer-control' allowing for customers to self-assess and hold manufacturers responsible with warranty claims.
2. To evaluate limiting the permitted number of equipment items used by competitors at main events. Athletes could for example, be allowed to register the serial number of a limited quantity of sails. At main events athletes would only be permitted to use one of their registered sails. This could potentially reduce the purchase rate of equipment with limited lifespan.
3. To consider the requirement to use supplied equipment at main events.
4. To facilitate a "One-Design charter" encouraging manufacturers and Classes to implement best practices and recognizing those honoring the charter.
5. To require a qualified third party to endorse and approve any proposed changes to building specifications before requesting World Sailing approval.
6. To permit World Sailing to review production performance and set the permitted tolerances.
7. To review the role and rights of copyright holders.

8. To recognize and endorse Olympic equipment manufacturers that satisfy World Sailing’s standards with a role within a ‘manufacturers commission’ that would allow to discuss best practices around supply of equipment, quality, and sustainability among other areas.

6. Study case - the challenge of foils

The use of supplied equipment at events has been proposed as a mechanism to address the risks identified with the introduction of ‘manufacturer-controlled’ equipment. For foils, however, the discussions are not straight forward as manufacturers have yet to prove that their production can be reliable and consistent.

Use of supplied equipment:

Strengths	Weakness
<ul style="list-style-type: none"> - Perceived equalized equipment across all teams. - Reduced inspections at event. - (If done right) Fairness. 	<ul style="list-style-type: none"> - For equipment where performance is so susceptible to small variations the equalisation of ‘new equipment’ must be proven.
Advantages	Threats
<ul style="list-style-type: none"> - World Sailing can determine the selection criteria - World Sailing can require tighter tolerances or increased requirements for selected events. 	<ul style="list-style-type: none"> - Liability if equipment breaks - Liability if equipment is proven different

Use of “bring your own” equipment:

Strengths	Weakness
<ul style="list-style-type: none"> - Avoids liability of breakages - Tested equipment - Use of best equipment 	<ul style="list-style-type: none"> - Subjective evaluations of surface finishing and compliance with building specs - Requires extensive inspections at events - Might not distinguish between alterations by athletes or purchased condition
Advantages	Threats
<ul style="list-style-type: none"> - Equipment is currently available and sailors can train with what they will use - You can bring your own replacements 	<ul style="list-style-type: none"> - Potentially different equipment across fleet - Risks of equipment manipulation on areas not covered by the measurements - Risk of equipment manipulation that still meets measurement requirements

Use of equipment from a specific production batch built to higher standards approved and tested by the Class athlete representatives:

Strengths	Weakness
<ul style="list-style-type: none"> - As defined for both alternatives 	<ul style="list-style-type: none"> - Requires the purchase of new equipment - No corrective or maintenance actions permitted

	- Availability of equipment requires managing distribution plans
Advantages	Threats
- Simplifies inspection - Removes uncertainty and subjectivity of surface finish and shape assessment	- Potentially different equipment and therefore unfair if “higher standards” are not considered sufficient to achieve equalised equipment. - Risks of equipment manipulation on areas not covered by the measurements. - Risk of equipment manipulation that still meets measurement requirements.

Variations in weight, torsional deflection, stiffness, shape or dimensions as well as the finishing appearance will result in critical changes to performance. The main challenge currently lies with the assessment of the foil shapes and finishing appearance when the production method relies on operators sanding the moulded parts at the final stages of production.

The internal quality assurance and quality control systems currently rely on subjective checks with jigs or measurement tools which are not appropriate or sufficient for the precision required.

The use of reliable new technology such as 3D scanners is considered a requirement for the desired level of precision.

World Sailing is exploring the use of scanners that would allow to automatically compare the scanned item against a reference file. The technology being considered allows to perform scans with an immediate comparison on screen against the reference model within a minute. The software highlights the areas that are outside the specified tolerances allowing for a visual inspection of a foil in less than a minute.

The system being considered would evolve around the following concept:

- 1) Manufacturers would scan foils at production. This would allow to compare the produced foils against the design specifications. The scanned files would be shared with World Sailing or stored on a cloud-based system with reference to their serial number.
- 2) The exercise would allow to define the expected tolerances. World Sailing could determine what tolerances are acceptable and the permitted corrective measures for non-compliant products.
- 3) At audits, World Sailing delegates could scan foils at production and compare against the specified tolerances.
- 4) At events, World Sailing delegates could scan athlete equipment and compare it against the original scan taken at production, or against a wider range of tolerances to account for maintenance and wear.

The use of such scanners is recommended to upgrade the inspection methods of World Sailing, allowing to assess manufacturers and confidently evaluate athlete equipment.

The rules and consequences for non-compliances would require further discussion and further development noting the errors resulting from the use of such tools as well as the assumptions and simplifications implemented at each stage of the process.

Further details of the scanner and the proposed financial model to resource such approach will be presented at the Annual Conference.

7. Conclusion

There is an urgency for World Sailing to increase its focus on the quality of Olympic equipment. This has critical consequences to the sport and the current state in some cases is considered unsustainable.

The challenges and risks are different across Classes, and the issues must be addressed with an understanding of the objectives and philosophy of each specific Class.

The focus of the discussions had to date have served to better understand where World Sailing is today across various areas, exploring what has been successful or unsuccessful and proposing some 'Big Bets' and 'No Regrets moves' on how to improve moving forward.

A number of recommendations are proposed for discussion at the Annual Conference on the following areas:

- A) Benchmarking and assessing current state
- B) Developing and implementing the World Sailings approved manufacturing control system and the technical specifications
- C) Empowering World Sailing's Technical Specialists and appointed delegates

It is proposed that following further discussions at the Annual Conference, World Sailing engages further with relevant groups to define the priorities, the course of actions and timelines for each objective.

Appendix 1: List of Olympic Equipment manufacturers

The following list includes Olympic Equipment Manufacturers that produce equipment subject to ‘confidential building specifications’. These manufacturers should be considered to comply with an approved WS manufacturing control system.

	Equipment	Manufacturer	Country
<i>Nacra 17</i>	assembly / HQ	Nacra Sailing	The Netherlands
<i>Nacra 17</i>	sails	Performance Sails	The Netherlands
<i>ILCA & Nacra 17</i>	hulls and appendages	Element 6 Evolution	Thailand
<i>ILCA</i>	hulls	Rio Tecna	Argentina
<i>ILCA</i>	hulls	Performance Sailcraft Australia	Australia
<i>ILCA</i>	hulls	Qingdao Zou Inter Marine	China
<i>ILCA</i>	hulls	Nautivela	Italy
<i>ILCA</i>	hulls	Devoti Sailing	Poland
<i>ILCA</i>	sails	New Performance	China
<i>ILCA</i>	hulls	Performance Sailcraft Japan	Japan
<i>ILCA</i>	appendages	N1foils	Spain
<i>ILCA</i>	moulds	Project By Design	UK
<i>ILCA</i>	moulds		Thailand
<i>ILCA</i>	spars	Selden Mast	UK
<i>ILCA</i>	spars	Technocar	Hungary
<i>49er & ILCA</i>	spars	CST	Australia
<i>49er & ILCA</i>	hulls and appendages	Ovington Boats	UK
<i>49er & ILCA</i>	sails	North Sails	Sri Lanka
<i>49er</i>	hulls and appendages	Mackay Boats	NZL
<i>IKA</i>	foils	Levitaz	Austria
<i>IKA</i>	foils	Chubanga	Italy
<i>IKA</i>	kites	Flysurfer	Vietnam
<i>IKA</i>	kites	Ozone Kites	Vietnam
<i>IKA</i>	foils	Moses/SABFoil	Italy
<i>IKA</i>	kites	Flymaax	China
<i>IKA</i>	kites	F-One	Vietnam
<i>IKA</i>	foils	Flying Sardine	Portugal
<i>IKA</i>	foils	Airush/Starboard	Thailand
<i>IKA</i>	foils	Taaroa	Thailand
<i>IKA</i>	foils	KFA/Kitefoil Australia	UAE
<i>iQFOiL</i>	sails	Severne Sails	China
<i>iQFOiL</i>	foils	Sonic	China
<i>iQFOiL</i>	spars	Italica	China
<i>iQFOiL</i>	board	Cobra	Thailand