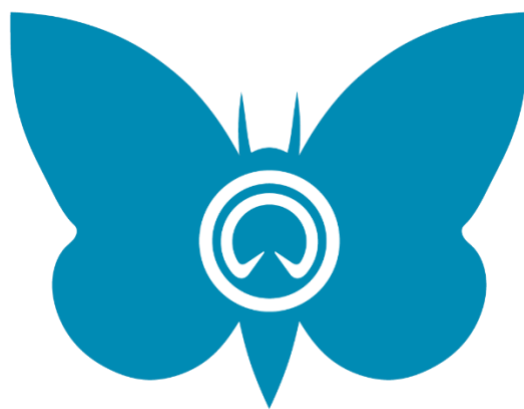




# FOILING WEEK



## Foiling SuMoth Challenge

sponsored by



2020 Rules v 2.0  
October 1<sup>st</sup> 2019



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## ABBREVIATIONS

<b>3R</b>	Reduce Reuse Recycle acronym
<b>CF</b>	Carbon fiber
<b>CFRP</b>	Carbon fiber reinforced polymer
<b>FW</b>	Foiling Week
<b>FSM</b>	Foiling SuMoth
<b>IMCA</b>	International Moth Class Association
<b>LCA</b>	Life Cycle Assessment
<b>MS360</b>	Marine Shift 360
<b>SM\$</b>	SuMoth dollars



## 1 GENERAL

### 1.1 Introduction

The *Foiling SuMoth Challenge* is a competition inspired by the need for more sustainable and efficient sailboat designs, along with coherent manufacturing methods.

The ultimate goal of this competition is to promote sustainable practices by challenging the University and higher education students in a friendly, technical, and athletic competition.

### 1.2 Concept

The constitution goals of the **Foiling Week™** are to provide the foiling experience accessible to everyone, to generate an eco-social behavior, as well as to ensure the safety of the foiling community on the water.

The Foiling SuMoth concept is in line with the three pillars of **The Foiling Week™ – accessibility, sustainability and safety.**

#### 1.2.1 Accessibility

One of the key aspects of the Foiling Week is to allow an inclusive and extensive experience to the sailing community and newcomers into the foiling world. The Foiling SuMoth challenge allows students from all over the globe to participate in an innovative, sportive and challenging competition.

To allow an inclusive and equilibrated competition between teams, a *standardized manufacturing budget* system is applied to the manufacturing of each boat.

In a man-driven sport like sailing, female sailors in the foiling community are rare. To promote female sailing, the scoring system of the Foiling SuMoth challenge is made to encourage teams to have at least one female team member.

#### 1.2.2 Sustainability

Business models in shipyards and naval industry are only oriented towards the economic benefit of the products. Companies typically choose cheap labor locations along with weak environmental regulations to generate a bigger income. Such choices result into negative social and environmental impacts.

The Foiling SuMoth challenge organization believes that a student competition is a great opportunity to have raw and creative ideas. The future naval architecture and engineering professionals will be a key factor to change the economic driven approach.

To revert such “business as usual” practices, the Foiling SuMoth aims is to look towards to the “**3R**” concept of – *Reduce Reuse Recycle* - as well as the three aspects of sustainability.

A sustainable practice can be defined as a balance between environmental, social and economic performances.



- **Environmental**

The Foiling SuMoth boats are meant to be designed and manufactured with a focus in low-carbon emission practices, where the use of bio-based materials as well as recycling and upcycling obsolete elements is encouraged.

- **Social**

The Foiling SuMoth challenges the teams to make a reflection about the social impacts along the production chain of the materials used for the design and manufacturing phases of the boats.

- **Economic**

The Foiling SuMoth must comply with the manufacturing budget and standardize costs. The manufacturing budget was created for two reasons: to limit the manufacturing spending and to have an equilibrated competition.

With these three key points in mind, the **Foiling SuMoth** concept aims to enhance the sensibility towards more sustainable innovative designs and manufacturing methods to be applied on foiling high efficiency sailboats.

### 1.2.3 Safety

The SuMoth participating teams should consider the sailing environment and be aware of the importance of safety in high speed sailing. Foiling brought a new generation of sailing boats that can reach high speeds and with it the increased risk of accidents and injuries. The degree of consciousness for safety and security should be higher than ever before in the history of sailing boats.

## 1.3 Concept application

The *Foiling SuMoth* concept is applied as a competition where the teams and their boats are evaluated on three categories:

- Sailing regattas
- Engineering and design
- Sustainability

Each category will be evaluated by the corresponding Jury over a technical report and formal public presentation during the competition timeframe.



## 2 PARTICIPATING TEAMS

The Foiling SuMoth Challenge is open to all schools with the ability of designing, building and sailing their own concept safely. The registration and participation are free.

All communications between team and the Organization will be exclusively made via the [Slack Workspace](#). **It is each team responsibility to be active on the communication platform to remain informed of all news and relevant information. Access to the platform will be granted to all members once the registration is completed.**

### 2.1 Teams requirements

The teams willing to compete in the Foiling SuMoth Challenge event:

- Shall be fully composed by students, with no restriction on the career or degree
- OR could be School alumni, graduated the year before the competition.
- Shall have a competition team of up to 10 students.

### 2.2 Team roles

Teams must assign four (4) roles by the time of the registration and up to 6 skippers prior to the competition.

Each person can occupy a maximum of two (2) roles. The Team Captain can only be responsible for a single role. Please refer to APPENDIX A – Team structure example

#### 2.2.1 Team Manager

The *Team Manager* must be formally related to the institution (i.e. Teacher, Professor, Assistant, Postdoc, etc.). The *Team Manager* will be responsible for the students involved in the project during the design, manufacturing and competition phases, remaining the maximum authority towards the organization.

#### 2.2.2 Captain

The team Captain must be a student. This person will be in charge of the team, remaining the main contact with the event organization.

The Captain will be responsible to provide the Technical Report and Presentations needed to evaluate the presented concepts.

In the case of multiple Foiling SuMoth concept boats in the same team, each Concept must have one dedicated Captain with the possibility of sharing the Logistics and Communication officers as well as the skippers.

#### 2.2.3 Logistics Officer

The Logistics Officer will be in charge of the arrangements of the team prior and during the competitions (accommodation, transportation, etc.).

The person in charge will be in direct contact with the organization management.



### 2.2.4 Communication Officer

The main tasks of the Communication officer are to promote the teams' advancements and achievements during the design and manufacturing phases as well as during the competition.

### 2.2.5 Skippers

A maximum of three (3) skippers per gender are allowed during the Foiling SuMoth Challenge competition, for each Foiling SuMoth concept.

Skippers' registration is only needed prior to the competition phases.

## 3 TECHNICAL REQUIREMENTS

### 3.1 General

To participate in the **Foiling SuMoth Challenge**, boats shall meet all the technical requirements specified in this section.

### 3.2 IMCA box rule

All foiling SuMoth concepts must meet the [IMCA](#) (International Moth Class Association) "box rule" specifications, as seen on Table 1.

<b>Length</b>	3.355 m
<b>Beam</b>	2.250 m
<b>Maximum luff length</b>	5.185 m
<b>Maximum mast length</b>	6.250 m
<b>Hull weight</b>	Unrestricted
<b>Rigged weight</b>	Unrestricted
<b>Sail area</b>	8.25 m <sup>2</sup>
<b>Restrictions</b>	Multihulls/trapezes/movable seats/sailboards
<b>Advertising</b>	Category C (Unrestricted)

Table 1 IMCA box rules

### 3.3 Buoyancy

All boats shall remain unsinkable at all times and under all circumstances with greater buoyancy than its weight plus the skipper (85kg).

### 3.4 Manufacturing budget

The Foiling SuMoth must be designed and manufactured complying with the manufacturing budget, where the prices are evaluated in "SM\$" (SuMoth dollars).

This virtual currency is used to define standardize the cost of materials for all participant teams.

The manufacturing budget is **capped to 10000 SM\$**, including all boat elements and spare parts to comply with the challenge rules.

The calculation of the manufacturing costs must be made with the help of the "Standardize cost" tables on the STANDARDIZE COSTS section.



### 3.5 Manufacturing constraints

Along with the IMCA geometrical restrictions, the main parts of the Foiling SuMoth will have a carbon fiber composite limitation, of which:

- **Hull:** Maximum of 20% CFRP (recycled/upcycled source)
- ~~Boom: 50% carbon fiber from recycled/upcycled source~~
- ~~Mast: 50% per mass of carbon fiber allowed with a maximum of 2kg~~
- **Foils and verticals:** Up to 80% per mass of carbon fiber

The CFRP limitations for the rig (Boom and Mast) has been removed for the 2020 Foiling SuMoth Challenge after a discussion with the SuMoth teams and the Organization at the FW 2019.

Used and obsolete IMCA parts can be used for the rig manufacturing and assembly.

The amounts should be calculated with an average of 55% volume fraction in the fiber composite laminate and only accounting the laminate section of the part.

### 3.6 Electronics and sailor assistance

Data acquisition and measuring systems are allowed at all times. In the case of battery powered electronics, the compartments used for this purpose must remain fully waterproof (i.e. IP67) firmly fixed and placed above the waterline of the vessel.

## 4 COMMUNICATIONS AND SOCIAL MEDIA BLOGS

During the academic year, each participating team shall create **two** blog posts of 1500 words (or 3 single spaced pages). These blog posts will be sent to the SuMoth organization via email (sumoth@foilingweek.com) on or before its due date, respectively.

These posts will be published by Foiling Week on its social media channels and website.

#### 4.1 1<sup>st</sup> Blog post (due on November 15<sup>th</sup> 2019)

- The global presentation of the team (i.e. team flag, background, etc.)
- Motivation to participate in the SuMoth Challenge
- Milestones towards the Foiling SuMoth Challenge 2020
- Objectives as a team and outcomes

#### 4.2 2<sup>nd</sup> Blog post (due on April 15<sup>th</sup> 2019)

- Ongoing work towards the Foiling SuMoth Challenge 2020
- Overall description and hints on the design
- Achieved milestones
- Readiness to competition, what does team need to complete before the Challenge begins?
- Sustainable choices applied. What is sustainable in their design and build?





#### 4.3 Regular team progress and milestones

A monthly Social Media advancement reporting is required to showcase the achievement of the teams. At least **one monthly publication**, from December 2019 to May 2020 must be done. The publications shall respect one of the following formats:

- Video: Between 1 minute and 3.30 minutes, with an interview.
- Text: format: 400 words and two images minimum

### 5 TECHNICAL REPORT AND PUBLIC PRESENTATIONS

#### 5.1 Technical Report

For the competition, each team shall provide a “Foiling SuMoth Technical Report”

The report must be sent to the organization prior to the competition in PDF format and provide one hard-copy, printed on recycled paper at the Foiling SuMoth Challenge.

The report will have a maximum of 40 pages and present the design and manufacturing specifics of the boats. Including the sustainability path, the manufacturing of the parts with three main sections:

##### 5.1.1 *Engineering and Design*

This section will provide the analysis made by the team to achieve their Foiling SuMoth concept, their calculations and results.

##### 5.1.2 *Manufacturing and cost analysis*

Within the limits of the “Manufacturing Constraints”, each team will provide a detailed analysis of their path to manufacture their concept. From first use materials to recycled ones to upcycled obsolete elements.

The cost analysis, following the “Standardize Cost” must be provided in a chart.

##### 5.1.3 *Sustainability analysis*

In this section, the team will provide a Life Cycle Assessment (LCA) of the materials and elements used in the manufacturing of their boat, made with **MarineShift360 LCA Tool**.

From the molds to the final parts, this section will justify the choices made to achieve concept with a sustainability approach.

Teams are required to attend all webinars proposed by MS360. Specific questions related to the LCA shall be posted on the **#lca** channel in the Slack workspace.

#### 5.2 Public Presentations

During the FSM challenge, the participating Teams will provide two public presentations.

##### 5.2.1 *Foiling Week Forum Sessions*

A 15 minutes presentation, synthesizing the concepts key elements, during the Foiling Week™ forum sessions. Presentations drafts will be requested two weeks in advance.



### 5.2.2 Foiling SuMoth Challenge Presentations

Each team will provide a 30-45 minutes presentation in front of the Foiling SuMoth Jury and contestants. With the goal to share their innovation and experience within the community.

## 6 STANDARDIZE COSTS

The standardized cost tables define the price in “SU\$” (SuMoth dollars) that the materials used for the manufacturing will cost for the competition evaluation.

Where the eco-friendliest materials are “cheap”, the ones who will have a higher impact, hence less sustainable, will have a greater price for the calculation.

All bio materials, such as natural woods (i.e. Balsa Wood), have a cost of 0 SU\$.

### 6.1 Manufacturing raw materials and processes

The materials and processes types and related standardize costs can be found on the [Google Sheets document on this Link](#).

If a material is not present in the document, the team shall contact the organization via the Slack workspace to assign a cost and add it to the document.

### 6.2 Blocks, tacks and pulleys

The cost of these elements in SM\$ will be considered equivalent to the standard commercial costs in US\$. The value of each element needs to be provided in the *Technical Report* as per manufacturing standard prices.

### 6.3 Recycled elements and materials

#### 6.3.1 *Obsolete artifacts and boats*

The use of recycled elements from old obsolete or broken artefacts (i.e. Lowrider IMCA, recycled boats or parts, etc.) is allowed and will have a **0 SM\$** cost in the budget calculation.

Every single element coming from an obsolete artefact must be itemized with the origin description and the transformation involved.

The materials used to turn an obsolete part into a Foiling SuMoth part must be itemized in the manufacturing budget calculations.

If a “classic” IMCA boat (or other class) hull or part is used, the team shall make sure that this part does not belong to the history of such class and, as such, has historical value.

#### 6.3.2 *Recycled materials*

##### Industrial excess

The use of materials coming from industry excess is allowed and encouraged. The budget cost of such material will have a 25% reduction in the cost calculation.

##### Out of shelf life

In the case of using out of shelf life materials (i.e. prepreg, epoxy, etc.) these materials will have a reduction of 50% in the cost calculation.



### Upcycled elements and materials

Any element that is used as is or transformed to be used for the Foiling SuMoth concept has no SM\$ impact on the cost analysis.

#### 6.3.3 *Used parts*

Used IMCA boat parts are allowed as long as they are made before 2014.

## 7 QUALIFICATIONS, MEASUREMENTS AND SAFETY

Prior to the competition, each boat shall be measured upon the box rules on Table 1 to comply with the IMCA.

Once measured and complying with IMCA rules, the Foiling SuMoth boats will be allowed to race in the IMCA regattas.

A structural and buoyancy examination will be made on each Foiling SuMoth concept boat to ensure safety for all participants.

## 8 COMPETITION

The competition is composed by a **Dynamic stage** where the sailors will compete on a fleet and individual race on the water and a **Static stage** where the judges will evaluate the technical attributes of each development.

### 8.1 Dynamic stage

#### 8.1.1 *Fleet racing*

The fleet racing regatta will be governed by the international rules of sailing and courses will be held as per IMCA racing rules and course diagrams, with open and female divisions.

#### 8.1.2 *Speed test*

The Speed Test regatta is composed by a two-leg course, starting with a downwind slalom course followed by an upwind leg, with individual open and female divisions.

### 8.2 Static stage

#### 8.2.1 *Cost, Design, Manufacturing and Sustainability*

The cost, design, manufacturing and sustainability technical reports of each team will be evaluated by the Jury individually, followed by a public presentation and a committee review of each teams' boat.



### 8.2.2 Scoring

A total of 1000 points will be possible, of which:

#### **Dynamic (300 points)**

##### Fleet racing - 150 points

- Female fleet racing - 75 pts
- Open fleet racing - 75 pts

##### Speed test – 150 points

- Female speed test - 75 pts
- Open speed test - 75 pts

#### **Static (700 points)**

##### Design, manufacturing and sustainability – 700 points

- Report - 50 pts
- Public presentation - 50 pts
- Methods - 100 pts
- Eco-Design – 200
- Eng. Design - 100 pts
- Innovation - 200 pts

### 8.3 Venue

The venue will be held at:

Fraglia Vela Malcesine (FVM)  
 Via Gardesana 205  
 Frazione Navene – 37018  
 Malcesine, Italy

### 8.4 Schedule

The event will be held during 6 days

Day 1	Measurements and Qualifications start
Day 2	Measurements and Qualifications, Speed Test Day 1
Day 3	Speed Test Day 2 and Fleet Race Day 1
Day 4	Fleet Race Day 2
Day 5	Speed Test and Fleet race finals
Day 6	Prize giving ceremony

## 9 GRANT ALLOCATIONS

The purpose of the Grant allocation is to help the teams needing financial support to achieve the goal of competing in the Foiling SuMoth Challenge. With the financial support of 11th Hour Racing we are able to provide a grant allocation per country and based on two criteria.

The first one is based on the GDP<sup>1</sup> (Gross Domestic Product). The countries are divided in groups, where the grant amount is inverse proportional to the GDP. The second criteria is based on the geolocation, where the distance from event and connections to mainland Europe from around the world are considered. The details can be found on the [“Grant Allocation Scheme” document](#).

<sup>1</sup> [https://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_GDP\\_\(PPP\)\\_per\\_capita](https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(PPP)_per_capita)



Grants are optional, participating teams can decide to refuse the financial support if their program is funded by other means. In the case of a refusal of the grant, the allocation will be distributed to the teams in need of support.

The Grants will be rewarded to the teams after their presence at the Foiling SuMoth Challenge who have proven to comply with all the requirements and amendments defined in the Rules.

## **10 BOATS TRANSPORTATION TO FOILING SUMOTH CHALLENGE EVENT**

GAC Pindar is the Foiling Week official logistic provider. For the SuMoth competition all teams will receive the most competitive quote which can include options for greener shipping solutions and carbon offsetting. Please contact the operations team at [pindar@gac.com](mailto:pindar@gac.com).

## **11 EVENT**

### **11.1 Event organization**

The Foiling SuMoth event will be held within and during the Foiling Week. The **1<sup>st</sup> Foiling SuMoth Challenge** will be held during Foiling Week Garda 2020.

### **11.2 Organizer**

Foiling Week  
C.so di Porta Romana 63  
20122 Milano, Italy

#### **Contacts**

Event manager: [bruno.giuntoli@foilingweek.com](mailto:bruno.giuntoli@foilingweek.com)  
Logistics and communication: [sumoth@foilingweek.com](mailto:sumoth@foilingweek.com)

## **12 INSURANCE**

Each participating boat shall be insured with valid third-party liability insurance with a minimum cover of €1.500.000 per incident or the equivalent in other currencies.

## **13 AWARDS AND PRIZES**

During the Foiling SuMoth Challenge, the following prizes will be awarded

- **Foiling SuMoth Sustainability Award**

The Sustainability award will be given to the team who has proven to have developed the concept with the least impact in the ecological, economic and social aspects of sustainability. The award requires to have a clear explanation of the approach enabling to generate, give priority to and take preventive action throughout the whole of a product's life cycle in order to minimize the environmental impact of the boat whilst maximizing its performance.



- **Foiling SuMoth Innovation Prize**

Will be awarded to the Team which has applied the best technological improvements and the most visionary and relevant innovations, if they can be adapted to the industrial world and have real economic impact.

- **Foiling SuMoth Design Prize**

Will be awarded to the Team whose boat will feature the most original and consistent design in terms of aesthetics, ergonomics, building and finishing quality.

- **Foiling SuMoth Dynamic staged Open/Female Prize**

Will be awarded to each gender overall results on both fleet racing and speed competitions.

- **Foiling SuMoth Communication Prize**

Will be awarded to the Team whose communication campaign is the most striking and efficient in the promotion of its participation in the Foiling SuMoth Challenge.

- **Foiling SuMoth Spirit and values Prize**

Will be awarded to the Team whose actions, according to the Jury, have best demonstrated the spirit and the values of the Foiling SuMoth Challenge.

- **Foiling SuMoth Overall Winners Prize**

The top 3 teams obtaining the most points from the Static and Dynamic stages.

### 13.1 Prize Money

Foiling SuMoth Sustainability Prize – €1000

Foiling SuMoth Innovation Prize – €500

Foiling SuMoth Design Prize – €500

Foiling SuMoth Dynamic stages Open Prize - €500

Foiling SuMoth Dynamic stages Female Prize - €500

Foiling SuMoth Communication Prize - €500

Foiling SuMoth Spirit and values prize – €500

Foiling SuMoth Overall Winners (top 3) – €500 / €300 / €200

## 14 CALCULATION EXAMPLE

The following example is an estimate calculation of a potential Foiling SuMoth, considering the “Standardize cost” tables. The calculation considers the real amounts used to produce the part, including scraps.

Consumables are not considered in the calculations of the manufacturing for this case.



## 14.1 Hull

The hull will be manufactured in a positive geometry using wood stringers and bulkheads with fiberglass/epoxy lamination and recycled PET core reinforcements, of which:

Item	Qty.	Cost in SM\$
Wood	8 kg	0
E-Glass	5kg	120
Bio-based Epoxy	6 kg	90
PET core	2 kg	30
<b>Total</b>		<b>270</b>

## 14.2 Appendages

### 14.2.1 Main foil and vertical

Item	Qty.	Cost in SM\$
Tooling board	20 kg	400
CNC machining	20 h	800
Dry fabric CF HM	2 kg	500
Bio-based Epoxy	2 kg	30
PET core	1 kg	15
Stainless accessories	0.5 kg	15
<b>Total</b>		<b>1760</b>

### 14.2.2 Rudder and vertical (same mold from main)

Item	Qty.	Cost in SM\$
Tooling board	10 kg	200
CNC machining	10 h	400
Dry fabric CF HM	2 kg	500
Bio-based Epoxy	2 kg	30
PET core	1 kg	15
Stainless accessories	0.5 kg	15
<b>Total</b>		<b>1160</b>

### 14.2.3 Trampoline

Item	Qty.	Cost in SM\$
Bamboo	10 m	0
Flax tow	40m	0
Std Mach2 tramp.	2	300 (USD)
Stainless accessories	2 kg	60
<b>Total</b>		<b>360</b>



## 14.3 Rig

### 14.3.1 Sail

Item	Qty.	Cost in SM\$
Used Mach 2 sail	1	500 (USD)
<b>Total</b>		<b>500</b>

### 14.3.2 Mast

Item	Qty.	Cost in SM\$
Alu conical mandrel	8 kg	80
Dry T800 CF	2 kg	400
Bio-based Epoxy	2 kg	30
<b>Total</b>		<b>510</b>

### 14.3.3 Boom

Item	Qty.	Cost in SM\$
PET core	1 kg	80
Dry T700 CF	1 kg	150
Bio-based Epoxy	2 kg	30
<b>Total</b>		<b>260</b>

### 14.3.4 Shrouds/stays/adjusters

Item	Qty.	Cost in SM\$
Stay	1	100 (USD)
Shrouds	2	200 (USD)
Adjusters	3	100 (USD)
<b>Total</b>		<b>400</b>

## 14.4 Control systems

Item	Qty.	Cost in SM\$
Blocks	-	500
Tiller ext	1	100
Ropes/lines	-	200
Wand + ctrl. sys.	1	100
<b>Total</b>		<b>900</b>





#### 14.5 TOTAL

<b>Item</b>	<b>Cost in SM\$</b>
Hull	270
Appendages	3280
Rig	1760
Control systems	900
<b><i>Total</i></b>	<b>6210</b>

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16 APPENDIX A – Team structure example

