Discussion Paper – Mainsail Widths

Introduction

1. In May 2015, the Finnish fleet introduced a proposal to reduce the mainsail widths of Six Metres sailing in the Classic division. This proposal was submitted too late for any informed discussion at the 2015 AGM. At the AGM the issue was referred to the Technical Committee for their advice. This paper is intended to summarise the comments of those members of the Technical Committee who have expressed their views, so that ISMA members can submit their own opinions before a formal proposal is put before an AGM.

History

2. For many years the mainsail cross-widths were not restricted, though in practical terms the amount of roach was limited by batten lengths of 1200mm for the middle two battens and 900mm for the top and bottom battens. Mainsail cross-width limitations were first introduced in 1982, as 70 per cent of the foot length B at the half height and 41 percent at the three-quarter height. With effect from 1 March 1990 these cross widths were reduced to 67 per cent and 39 per cent respectively, which are the values that apply today. At that the same time there was some confusion about whether the limits on batten length had changed, because of a printing error in the IYRU yearbook, but the existing limits were introduced in 1992, when the top batten became unlimited with the other battens having a maximum length of 1500mm.

3. Copies of correspondence from 1988 indicate that Angus Melrose, who had worked on the design of Twelve Metre sails as well as on the sails for Battlecry and St Kitts, was consulted in 1988 on the decision to reduce the cross widths, which was influenced by the move to introduce a full length top batten and the problems that might bring in catching on the backstay. He supported the reduction to reduce the cross-widths to 67 percent and 39 percent, but commented that he would personally prefer a further reduction to 65 percent and 38 percent.

The Finnish Fleet Proposal

4. The Finnish fleet submitted a proposal to change Class Rule 14 as follows:

"The total width of the mainsail, including the luff rope, at half and three quarter heights shall not exceed 67 % and 39 % respectively of the maximum permitted foot length B in a Modern yacht, and 60 % and 33 % in a Classic yacht, respectively."

A copy of their supporting paper is attached as Annex A.

5. The proposal was circulated to all the members of the Technical Committee at that time, noting that there were two specific points in the proposal which might be questioned:

a. The paper which sets out the proposal starts: "The spring meeting of FINSMA discussed the wind limit applied in local racing. It was commonly agreed that the same rule should be used as in international events. But it was also seen, that while modern division has no problems at 12 m/s wind, the classics are in a more difficult situation." There is an implication here that there is an agreed or required wind speed limit of 12 m/s (23 knots) in international events. But no such wind limit is specified.

b. Secondly, the paper suggests "In the old days the mainsails could be reefed and racing was possible even in higher winds. As requesting a reefing system by the Class Rule would mean significant and costly changes in the rigs and sails, a simple solution of decreasing the mainsail roach was agreed upon." But there is nothing in the Class Rule to prevent boats reefing their mainsails if they wish. It is questionable whether adding reefing eyelets to the sails would be any more expensive than cutting the roach and adjusting the batten pockets.

Comments of the Technical Committee

6. The detailed responses of those members of the Technical Committee who replied to a request for comment are set out in Annex B. Ian Howlett has also drawn attantion to a discussion paper which he wrote in 2004, which is reproduced in its entirety in Annex C. The principal points are as follows:

a. The existing limitations on mainsail cross-widths were developed with the modern boats in mind, since they comprised nearly all the active fleet when the restrictions were introduced. Although they are smaller than the first restrictions, they are still more generous than some advisers would wish to see. They make sense for sails on a bendy mast, but allow a very big roach on sails set on a straight mast. The lack of any limit above the three-quarter height measurement means there is no control to stop the top of the roach catching the backstay.

b. Although it might seem to be a good idea to limit the size of the roach (how far it extends outside the straight line from head to clew) in terms of practical measurement the only sensible way to control it is by measuring mainsail cross-widths.

c. Any proposal to set different limits for classics compared with the rest of the class presents a risk of dividing the class.

d. There is no practical way to 'grandfather' sails, so all of the boats affected would have to alter their sails to meet a new rule. In turn, this means that there must be plenty of warning before any new rule takes effect.

e. Longer battens help prolong sail life, and many classes have no limit on batten length at all. But removing any limit on batten length could allow full length battens which would change the appearance of the class.

f. There are conflicting views on whether it is sensible or practical to reef sails. *(Note: There has never been any suggestion that a reefing capability should be compulsory – merely an observation that there was nothing in the Class rule that prevents it)*

g. It is questionable whether adding reefing eyelets to the sails would be any more expensive than cutting the roach and adjusting the batten pockets.

h. If the class is to reduce the girth measurement, then there are arguments for reducing the girth measurements for modern boats as well.

i. Some would argue that there are aesthetic arguments for reducing the roach and limiting batten lengths to give a more traditional classic appearance.

Choices for the Future

7. So far, no clear arguments have emerged to make a firm recommendation to the Class. The Class has an opportunity to decide what changes, if any, it wishes to make to the Class Rule. Any such proposals would be subject to the approval of World Sailing, and could not be introduced without a suitable delay to allow all the boats to comply.

8. There are a number of points for the Class to consider:

a. Is a limitation necessary? There is nothing in the Class rule to prevent owners specifying sails with less roach than the maximum, or which prevents fitting reefing systems to flatten the mainsail or reduce its area.

b. Should the class reduce girth measurements for all boats, or just for part of the class (the Classic division).

c. Is there an aesthetic reason to limit the size of sails throughout the class to produce a more 'traditional' appearance? There is already a prize specifically for classic boats which use wooden spars and traditional 'white' sailcloth.

The Questions to Answer

9. In due course the Class will need to decide on a number of questions:

a. Do owners want to alter the girth measurements on mainsails?

b. If so, should the limits for classics be different to the rest of the class?

c. What should the new limits be, for classics and for the rest of the class?

10. Comments on the points in paragraph 8 and the questions in paragraph 9 will help to decide how the whole issue is presented to the Class for a formal decision at the next Annual General Meeting. ISMA members are invited to send their comments to the Executive Secretary at tim@timrussell.freeserve.co.uk

Tim Russell
Executive Secretary
11 May 2016

Annexes:

A. The Finnish Fleet Proposal – Proposal for a Change in the Sail Rule of the Classic 6-Metre Yachts.

B. Comments from Members of the Technical Committee.

C. Ian Howlett's Discussion Paper written in 2004.

The Finnish Fleet Proposal

PROPOSAL FOR A CHANGE IN SAIL RULE OF THE CLASSIC 6-METRE YACHTS

1. **Introduction**
   The spring meeting of FINSMA discussed the wind limit applied in local racing. It was commonly agreed that the same rule should be used as in international events. But it was also seen, that while modern division has no problems at 12 m/s wind, the classics are in a more difficult situation. In the old days the mainsails could be reefed and racing was possible even in higher winds. As requesting a reefing system by the Class Rule would mean significant and costly changes in the rigs and sails, a simple solution of decreasing the mainsail roach was agreed upon.

2. **Proposed rule**
   §14, delete sentence starting "the total width of the mainsail…" and replace by:
   "The total width of the mainsail, including the luff rope, at half and three quarter heights shall not exceed 67 % and 39 % respectively of the maximum permitted foot length B in a Modern yacht, and 60 % and 33 % in a Classic yacht, respectively."

3. **Justification**
   A Classic in its original condition would not tolerate the loads of modern rigs and sails. Practically all Classics, at least all actively raced yachts have been more or less rebuilt and strengthened to conform to the higher loads. Nevertheless, limiting the tensions at the upper end of the wind scale would save the ageing wooden structures. A relatively small decrease in the mainsail area does not deteriorate the sailing characteristics of a Classic yacht. As seen in the example in the Appendix, mainsail would be downsized for about 7 %.

   Economically cutting out a little from the leech and replacing the batten pockets in the existing sails is a very minor expense in the maintenance costs of a Classic. On the other hand the usable age of the sail would be extended. Normally the first mark of wear in a mainsail is a creep along the inside ends of the battens. Experience from the sailmakers tells that even longer battens do not correct this or extend the life of a new sail. Also the wear from chafing against and tangling with the backstay would disappear. Of course the price of new sails would be slightly lower. Also sails used in Moderns could still be re-used in Classics after a very moderate modification.

Appendix: The roach

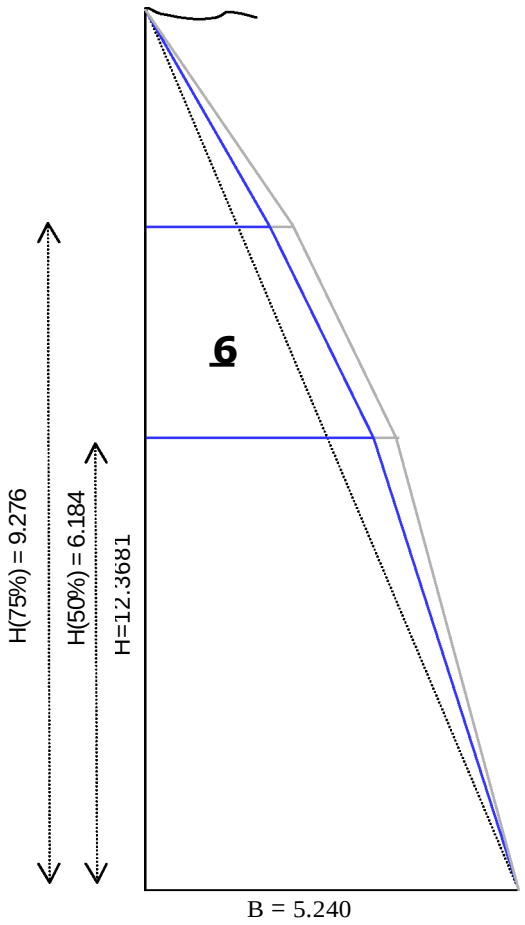
The effect of the proposal on the roach of a main sail.

Example FIN-61 (T.Holm 1950) with a boom length B = 5.240 m and a luff length H = 12.368 m

H	H at 50%	H at 75%		Sail Area (m2)
12.368	6.184	9.276		
B	b_at_50%	b_at 75%		
5.240	3.51	2.04	67/39%-rule (1999-)	38.8
5.240	3.14	1.73	60/33%-rule (-1999)	36.1

Blue = proposal

Grey = present



Annex B to Mainsail Widths
Discussion Paper
Dated 11 May 2016

Comments from Members of the Technical Committee

Hank Thayer's Comments

While I do not have a firm opinion on whether to limit the classic mainsail roach, I would like to reiterate some history that I sent out last year especially since I was involved along with Scot Rohrer in deciding on the original girths. I believe that the issue with classics originates from the fact that we based the girth percentages on modern boom measurements from the time (mid '80s) of 14.5 to 15 feet (4.420m – 4.572m). This resulted in roach profiles very similar to that on the previous generation of mains with about 14" (355mm) of positive roach at the second batten from the top. At the same time we increased the batten lengths from 39 and 47 inches to the current lengths. The longer booms of the classics create positive roach beyond what was intended and would indeed lead to shorter mainsail life and proportionately larger mains than in the moderns. To make consistent leech profiles across the two groups the rule should measure positive roach rather than girths, but this would be a bit more time consuming. I hope this aids the discussion.

David Chivers' Comments

Measuring roach is fraught with problems and interpretations. It depends on how the sail is flaked and how the "loose" cloth is distributed. Over the length of a Six Metre's luff I suspect I could get several different measurements. However It is almost impossible to measure a cross height incorrectly and so this is a much safer way of ensuring consistent measurement results.

I am always concerned about classes setting wind limits. In my experience it rarely achieves what they want and usually leads to disagreements or endless "personal" interpretations. Frequently it is sea state rather than wind speed which will be a deciding factor. I see no reason to pursue this.

There is nothing in the class rules to prevent reefing and there must be a myriad of systems on the market which could be fitted if required and would cover both modern and classic boats. The costs to sails would be no different and probably less than re-cutting.

I am concerned that reducing the size of sails in the classics further divides the class. I think that to assume that new sails would be cheaper because of a 7% area reduction is hopeful to say the least. There is still just as much input in design and manufacture so a little less cloth is going to be negligible.

I appreciate the desire and need to look after the classics and perhaps to have a "Classic silhouette", but I think the ramifications of this change could cause no end of problems. The sails could not be grandfathered so we are forcing a massive sail re-cutting programme on the fleet and the need to ensure that every boat has complied. Easier said than done! All owners may be happy with this or I suspect many will not!

I believe that more work needs to be done on this and reefing systems investigated before we make a change which could have unintended consequences.

Greg Stewart's Comments

On battens**:**

- I do think longer battens help the life of Classic Six Metre mainsails.
- I have a full upper batten and have found it really helps being able to twist off, float, the mainsail in heavy breeze. I have added longer lower battens to my mainsails on other boats to help prolong their life.
- Most other rules have removed batten limits since the girths control the size of the mainsail.

On Reefing**:**

- I do not think you will ever see a Six Metre reef the mainsail while racing. The potential damage incurred while reefing is very high and not something racers will do. Going head to wind and flowing sail, potentially snagging the runners on the leech etc. Rather I think racers would use an old mainsail if they knew it was going to be very windy.
- I strongly suggest not adding any requirement that mainsails be required to have reefing capability *(Note: There has never been any suggestion that a reefing capability should be compulsory – merely an observation that there was nothing in the Class rule that prevents it)*

On Girths

(Note: in his comments Greg has used the sail measurement terms from IMS, where the foot of the mainsail is 'E', the half-height girth is MGM, the three-quarter height girth is MGU and MGT is a girth at seven-eighths height)

- An owner has the option to specify his mainsail to have less than the maximum girth.
- On my classic with a wooden mast I specified smaller than maximum girths since I did not want to have such a round leech and have to bend the mast excessively.
- Other rules like the ORR and IRC have slightly smaller girth limits. For example
    - MGU/B (the three-quarter height girth) = 0.39 for 6m vs 0.38 for ORR & IRC (would reduce the girth 53mm on a 5.25m "E")
    - MGM/B (the half-height girth) = 0.67 for 6m vs 0.65 for ORR & IRC (would reduce the girth 105mm on a 5.25m "E")
- The flicker issue arises since the Six Metre rule only has MGU and MGM and no MGT (a seven-eighths height measurement) like most other Rules. The lack of a MGT limit allows the top of the mainsail to be poked out and gain extra unrated upper area that overlaps the backstay. The limit in other rules is MGT/E = 0.22.
- If the class wants to reduce the girth limits I suggest at least a 2 year notice period before making it take effect.

Ian Howlett's Comments

Girths

I am **very** much in favour of the mainsail girths for Classic Sixes being reduced and if the FISMA numbers approximate to the fine (Alameda) North Dacron sails of 1981-ish those are the numbers that I would

choose.

I would also favour the reduction of girths for the Moderns to the numbers suggested by Angus Melrose - 38% and 65%. *(Note: Angus Melrose, writing in 1988, supported the idea of a reduction to 39% and 67% but stated a personal preference for a reduction to 38% and 65%).* It is nonsense to have a batten catch on the backstay and the current max numbers create an inappropriate leach profile. If 38% is not readily supported by a top batten that is not full length then I would advocate further reducing the same.

Battens

Once sensible girths are chosen batten lengths become uncritical to performance - but longer battens will greatly increase longevity so should not be discouraged.

Aesthetically the original Rule batten lengths are very pleasing to my eye, but on a practical level I see no reason to restrict batten lengths at all. This would mean that mainsails made of Dacron would again be fully competitive.

Annex C to Mainsail Widths
Discussion Paper
Dated 11 May 2016

Ian Howlett's Discussion Paper written in 2004

Thoughts on Possible Sail Rules for Classics

There has been considerable discussion on the idea of reducing the costs of sails by only allowing woven Dacron (polyester – Terylene in the UK) of certain defined characteristics to be used for Classic sails.

I should point out that I am not a sailmaker but have experience of a number of different Classes so hopefully these, which are my own personal thoughts, will be useful to those who have to decide such things.

My view is that the way to tackle the problem is to look at the underlying issues. Once these are identified and a strategy developed to achieve the intended objectives, a dacron mainsail might become just as desirable (fast) a sail as one made of so called exotics – so owners could have free choice of materials.

"Kirlo" in 1982 (Europeans in Helsinki) was probably the last modern to use an 8oz dacron main (1982 North Alameda) as her primary mainsail with good effect so I do have some experience of this type. This is still a fine sail after a rest but begins to fade if the wind is up, as a Regatta goes on. This means presumably that it is over-girth for its material and would be a more serviceable sail with
the roach reduced . Interestingly it is feels a better sail than its 1981 equivalent - and this is likely to be a difference in the material – and this would surely be a big problem for a "dacron only" rule.

As I see it the main issues are:

- Longevity
- Cost - which is linked to longevity
- Aesthetics

Question - Could it be that it is a mistake to use the same Rules for Modern and Classic Boats? These appear to be the obvious For and Against points:

For the same Rules

- Sails can be handed on or swapped between boats of different fleets
  So how common is this practice now that the Classics have appeared to become rather affluent?
- Current sails do not have to be grandfathered .

Against

- Sails with the current batten lengths and girths just do not look traditional . To me this is best evidenced by many of the 12m sails in the Mediterranean - over roached they look foolish and are probably not even particularly fast. If aesthetics is a large part of sailing a Classic then surely they should look like boats of their era not just at the dock but on the racecourse?
- To maximise the currently permitted Rule girths, sails are generally made of more expensive material than if the girths were reduced to suit dacron.
- The helm balance of our boats is also fundamental to performance and increasing the roach adds weather helm which will certainly not add speed in a breeze.

Classic Mainsails

The current sail girth restrictions (39% and 67%) were based , I seem to recall , on values that were recommended as being sensible for kevlar/mylar constructions by Angus Melrose in 1989 - then designer with North.

The intention was to make sure that the roaches so produced did not work the materials so hard that they gave reasonable working life to these sails with the batten lengths then allowed.

Such certainly appears to have been the case for though well used, the Battlecry 1988 light/./medium mainsail is still a beautiful sail (now in the Kirlo wardrobe - thank you John !)

For these proportions to work (roach not be too large) such sails need a certain amount of mast pre-bend so that a significant percentage of the girth is taken up by the luff curve. In England, Classic yachts have tended to set up their rigs with less tension and pre-bend than the moderns and thus if girths are to be maximum under the Rule the roaches have become very large - which presumably reduces their longevity and ability to go up and down the wind range. I estimate that a maxed-out Classic roach might have as much as 200mm added to the roach profile - which must be very hard to handle and may well compromise the twisting characteristics of the sail.

At a later stage the permitted traditional batten lengths were modified allowing a full length top batten and a bottom batten of the same length as the mid battens . This was I believe done to make the sails look more modern (we are and want to be seen as a development Class) and also to increase longevity . In my view this has been done at the expense of tradition, aesthetics and also operational convenience . Tacking the permanent backstay round the roach on a regular basis does seem a rather pointless activity.

There are various other points that should be made based on both experience with the boats and the wind tunnel:

- In 1988/9 the St Kitts sisters tested a dacron main against a Kevlar mylar and found only an almost immeasurable difference in performance. Our experience with "Kirlo" would support this result'
- In the Southampton wind tunnel we found that upwind 12m rigs were not very sensitive to upper girths - a gaff mainsail on a wishbone did not outperform a modern roached mainsail .

Classic Genoas

In my mind a mylar (sheet dacron) backed material is a much better choice for genoas that a woven dacron. In 1981/2 we used a light medium of 2.6oz mylar dacron - crosscut. This did not seem to get hurt in 15 knots true so a tri-radial in the same material would go up the range even further . Our heavy genoa at that time was a 2.9 oz crosscut with a double ply in the leach - and was more than strong enough for all winds.

It thus occurs to me that many of the modern genoas may be over-engineered. However, what the modern materials do provide is bulletproof sails that stow very easily and probably keep their racing life much longer than woven dacron also.

In the dinghies one of the best materials is thought to be 3.8 oz Polycote (hard finish) and even when this is well aged it still seems to outperform softer finished woven dacrons , Performance aside such a sail would however be a nightmare to stow/fold on the foredeck of a Six - quite unsuitable.

Looking at my old records, I see that my 1980 America's Cup Twelve Metre " Lionheart " had a light genoa of 3.4 oz mylar/dacron and a medium of two ply 3.8ox woven dacron. Loads on a Twelve will be some six times (based on weight) that on a Six so it easy to imagine the possibility of making Six Metre sails much stronger than they need to be .

Future Availability of Racing Dacron

The Olympic and other high profile Classes whose rules insist on woven dacron sail materials experience major problems of supply of top performing material and as dacron becomes increasingly little used, except for cruising, this problem must increase.

My Conclusion

By keeping material options open the Classics would surely not fall into any future pitfall on such matters Instead expense and increase longevity could be controlled via girth restrictions. I would estimate that 34% (reduction of some 240mm) might be a good starting point for the Classic 3/4 height girth if of course that was the direction in which the Classics would like to move.

What do the sailmakers to the Class think?

Ian Howlett 2004
Oxford