A Report by the RORC Rating Office  
submitted by the Royal Yachting Association  

Special Regulations changes to maximum storm sail dimensions and areas following SR04-08.

1. Change

Reduction of maximum permitted storm trysail area from 17.5% to 12% of mainsail luff length * foot length, reduction of storm jib area from 5% to 3.5% of height of the foretriangle squared, and reduction of luff maximum length from 65% to 50% height of the foretriangle;

2. Stated Reasons for Change

The rationale for the change is that storm sails should be specifically designed for force 9 to 10, not for force 7 to 8. This makes an assumption of what “severe weather” is. It is also stated that reports from the 1979 Fastnet Race and the 1998 Sydney/Hobart Race showed that storm sails were too large.

3. Issues

3.1 As is noted in the original submission, designing storm sails for force 9 – 10 potentially leaves a void in a boat’s sail inventory in force 7 – 8. OSR do not (currently) define ‘severe weather’.

3.2 From information provided by sail makers to the RORC Rating Office, 95% of storm trysails and 97.5% of storm jibs will need to be replaced prior to racing in 2010. There will therefore need to be consideration of grandfathering clauses for some or all OSR categories.

3.3 The groups consulted by the submission proposer all have different views. See submission SR04-08.

3.4 OSR 4.26.1 (a) is clear that the specified storm sail areas are maxima and that smaller areas are likely to suit some yachts according to their stability and other characteristics.

3.5 The RORC Rating Office has not received any suggestions from owners, designers sailmakers or others to suggest that current OSRs are deficient in this respect. The 1979 Fastnet Race Enquiry notes that the current OSR trysail requirements were not in place at that time, and that the ORC were working on this new regulation at the time. No further recommendation was given. The Coronial report into the 1998 Sydney/Hobart Race does not include any recommendations related to storm sails.

3.6 Comment received from sailmakers, including the sailmaker consulted by the proposer of the submission, expresses the opinion that it is equally possible for storm sails to be too small.

3.7 With the very wide range of boat types now racing under OSRs, the current regulation allows latitude for boats to specify the most appropriate storm sail sizes. The amended regulation will significantly curtail that.

4. Recommendation

That a working party is formed to address the question of appropriate sizes for storm sails and that until the report of that working party is received the current (2009) OSR 4.26 remain unchanged.

Noting the grandfathering issue above and that sailmakers and others are already questioning what sizes of storm sails to manufacture, a published decision is urgent.
The rationale behind the changes to OSR are that storm sails should be specifically designed for use in storm conditions only (Beaufort force 9 to 10), whilst in reality many boats use their storm sails in force 7 to 8. The report states that on several boats in both the 1979 Fatsnet Race and the 1998 Sydney to Hobart Race the storm sails used proved to be too large for the purpose. It should be noted that yacht design is very different, and far more varied today compared to 30 years ago in 1979, and conditions in that race reached force 12, hurricane conditions, not storm conditions. The Enquiry into the 1979 Fastnet Race gives the following recommendations:

SAILS AND EQUIPMENT

00.5 a) Storm Sails. The Special Regulation relating to storm sails does not fully cover the requirement but it is doubtful if any regulation could be effective for all types of yacht. It is understood that the ORC’s new regulation which includes the provision for a trisail has emphasized the owner’s responsibility for ensuring that storm sails, adequate for the size and type of yacht, are on board, and in consequence it is unnecessary to make any further recommendations.

It should also be noted that the Coroner’s Report on the Sydney to Hobart Race 1998 gives no recommendations to review storm sail sizes, and does not consider storm sails or their use to have influenced the cases considered.

As of January 2010 the majority of storm sails will need to be immediately replaced. There is no provision within the approved changes for grandfathering of existing storm sails. It is also important to note that rigs and deck layouts may need to be adapted for the smaller sails, as strong points currently used may no longer be appropriate for the smaller sizes.

Due to the very nature of storm sail design and usage it is expected that they will last for a far longer period than any other sails, and as such they will only be replaced very rarely. This change will require the majority of boats to have new storm sails whilst the existing sails are still fully serviceable and arguably adequate for purpose.

It would seem sensible to introduce any such changes, if considered necessary, over a longer period, possibly applying it to Category 0 races initially, where severe storm conditions are less likely to be avoidable, and gradually introducing the changes to Category 1 & 2 races over a period of a few years, unless a race organiser specifically invokes the new sizes.

There are also several aspects of storm sail design that need to be considered, which do not appear to have been included in the report:

1. The OSR limitations are maximum sizes only, and these maxima should not be taken as correct for all boats. Designers, sailmakers and owners need to consider far more than simply maximum area when selecting storm sails, as already noted by OSR 4.26.1, which states “it is strongly recommended that persons in charge consult their designer and sailmaker to decide the most effective size for storm and heavy weather sails. The purpose of these sails is to provide safe propulsion for the yacht in severe weather – they are not intended as part of the racing inventory. The areas below are maxima. Smaller areas are likely to suit some yachts according to their stability and other characteristics.” The submission refers to the yacht AFR Midnight Rambler from the Sydney to Hobart Race in 1998, where the boat was overpowered when they were sailing with storm jib only, and that they had to abandon an effort to use the trysail. This would suggest that OSR 4.26.1 had not been properly considered in this case, as opposed to the rule being incorrect, it had not been applied appropriately.

2. The maximum sizing of storm sails for OSR is based on the rig dimensions alone, yet the area, vertical centre of effort and longitudinal centre of effort of storm sails for any boat is based on far more than the rig dimensions alone. It is also important to consider deck arrangements, with regards to strong points for sheeting and tacking of storm sails.

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3. Storm sails can be too small. This is the view in the original submission from North Sails Norway, where it is stated “The sailmaker’s view was that a 5% storm jib would be adequate for a boat with large foretriangle, but that reduced areas could lead to sails which are too small for propelling the boat in less severe conditions which are often met (Beaufort 7 or 8), and that storm sails should not be designed for wind forces that are seldom met.” Figure 1 shows two boats, one a light displacement racer and the other an older heavy displacement cruiser/racer. The rig and storm sail sizes have been scaled from actual information provided by North Sails UK of storm sails designed and built for two boats. Both are within the current OSR, however the heavy displacement boat will need to purchase new sails or heavily modify the existing ones to meet the new requirements in 2010. The question then is whether the new sails will be sufficient to allow such a design to make way, or whether they will have to keep a heavily reefed mainsail and/or heavy weather jib up longer than would be preferred. The issue with this is that an additional reef may be needed in the mainsail, with associated rig hardware, to fill any hole in the gale force conditions when the new storm sails may be too small. This not only adds to expense, but more importantly means that crew will be required to lower the mainsail and set the trysail in far worse conditions, putting the crew in more danger.

4. During the 4th Leg of the Volvo Ocean Race 2008-2009 the fleet experienced wind speeds up to 55 knots (the top end of force 10) and wave heights of up to 14 metres with wind against tide causing a very steep and confused sea state. The storm sail areas and dimensions for these boats are based on the current OSR requirements, and in this case the fleet all use storm sails to the maximum sizes, primarily so that they are effective jury rig sails if needed. It should also be noted that these are fully professional crews with considerable experience with these boats.

As chief measurer for the class and the event I have been able to discuss with the teams frankly how the storm sails performed. No concerns were raised after the leg that the storm sails were too large for these light displacement, heavily canvassed yachts. At no time did any of the crews feel they needed to try and make way under bare poles. Depending on the conditions, the boats were depowered by centring the canting keel and using a combination of the following configurations as the weather worsened:

- 3 Reefs and Heavy Weather Jib
- 3 Reefs and Storm Jib
- Trysail and Storm Jib
- Trysail only
- Storm Jib only
Several crew have noted that continuing to make way and control the boats was fundamental to negotiating the sea state safely, and that reducing the sail area in some conditions reduced the manoeuvrability and increased the concerns of damaging the structure. There is no intention of reducing the storm sail sizes for the Volvo Open 70 Rule in line with the new OSR requirements.

5. Furthermore, there is an argument that sailmakers just go straight to the maximum sizes in OSR rather than considering the individual design. In our studies this does not appear to be the case. From a fleet of 79 boats provided by North Sails UK, only 7.5% had Trysails at the maximum sizes, and the range was from 9.1% of P to 17.4% of P, where the current requirement is 17.5% of P and the new requirement is 12% of P. Table 1 below summarises this data.

<table>
<thead>
<tr>
<th>Trysails</th>
<th>Storm Jibs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current as a % of max</td>
<td>Current as a % of max</td>
</tr>
<tr>
<td>50%-60%</td>
<td>2</td>
</tr>
<tr>
<td>60%-70%</td>
<td>2</td>
</tr>
<tr>
<td>70%-80%</td>
<td>4</td>
</tr>
<tr>
<td>80%-90%</td>
<td>22</td>
</tr>
<tr>
<td>90%-100%</td>
<td>49</td>
</tr>
</tbody>
</table>

This demonstrates that the concern that sailmakers are using the OSR values as the default values appears incorrect.

**Below is a comment from Butch Ulmer of UK Halsey:**

*This is an overreaction to the problems encountered by light displacement, fractional rig boats with huge mainsails.*

*Given the preamble in bold print, I would make the storm sails the proper size for the boat in question regardless of areas specified.*

**Further comments from Des McWilliam of McWilliams Sails:**

*I have raced in multiple Fastnets (including 1979), Hobart, Middle Sea (including 2007), Ton Cups using sails designed and made in this loft. I know the sizes of the storm sails made here. I have strong recollection of the conditions in which they were used. And I know how they worked on a wide range of IOR to IRC, heavy to light, tender to stiff yacht designs.*

*I fear that the change may be driven by experience limited to modern, light displacement, non-overlapping, big mainsail yacht designs. Older designs could be rendered unsafe by this change.*

1. I submit that older, heavier designs (often with high aspect ratio mainsails and large overlap headsails) often needed sails at or close to the old maximum sizes in order to get off lee shores.

2. The previous rule defined maximum sizes for Storm Jibs and Trysails. We varied the sizes as required in consultation with the yacht designer and owner, bearing in mind the likely sailing area for the yacht.

*Therefore I cannot see the need for a reduced area limit.*

3. The new limit may, or may not, be introduced after January 2010. What do I do with orders on the books already for the 2009 season? What do I tell the owners? Will they think that the sport is well regulated?

*I wonder what thoughts were behind the perceived need to reduce the sail area limits by decree rather than by case? Has someone been making light weight sails that can be used as staysails etc? That already happened in the early 1980s and was covered by the construction rules.*

*From the point of view of efficacy of use as genuine storm sails I cannot see why the current maxima are not maintained so that we can design safe sails for each yacht.*

**Grant Spanhake of North’s Design Group commented:**

1. I have only used a trys’l twice in my life. Once in 60 knots at the bottom of the south island (NZ) on Lion New Zealand. It was an exercise Peter Blake put us through. On a large heavy 80’ maxi the size seem correct for that boat, but I can see that it may be too large for a lighter displacement boat.
2. I have just designed a set of sails for a Bill Tripp 75' that is been built in Italy. I reduced the trys'1 size on this boat simply because I wanted the head of the trys'1 to be at a spreader position on the rig. The tack was above the mainsail stack on a pennant. And the clew is designed to be above people's heads (So it doesn't kill people when hoisting the sail. The sail was designed to sheet to the spin sheet blocks. With these practical parameters in place I found that the trys'1 was under sized. So a reduction in area once again seems correct.

Andrew Lechte of North's Design Group commented:

The things important to a useful storm sail set-up is how the balance of the boat can be maintained through the changes from heavy-weather jib to storm jib and from three-reefs to trysail with those combinations. As the trysail is fixed to the mast as a reefed mainsail is, the CE position of the trysail is not dissimilar to a 3-reefed mainsail. Ideally, the trysail should sit as low as possible on the back of the mast. With some boats, the trysail is designed to sit above the car stack of a dropped mainsail (if the boat has a slide-luff system). For this system, a shorter luff is recommended to keep the CE low.

The storm jib is a difficult one. If this sail is connected to the headstay, a smaller than maximum sail is needed to reduce yaw moment. If on the forestay, most of the time, the sail is sheeted to the jib turning block which usually results in a clew that is a long way off the deck. This raises the CE and makes it difficult to get to the clew if additional sheets need to be attached.

Ideally, the storm sail would be hoisted on an inner forestay to keep the yaw balance neutral but this may cause issues with strength of the inner forestay attachments. These would need to be spec'd to handle storm jib loads. But the resulting storm jib geometry is much better with a lower CE due to a lower clew point and less yaw moment making steering easier in a range of angles.

With Canting keel boats, you have to expect the worst conditions which means keel on center or maybe even stuck on the wrong side. I would recommend being much smaller than the maximum in this case and would highly recommend an inner forestay for the storm jib as this increases the tack angle and enables the boats to use the jib sheeting position and keep a relatively low clew with low yaw moment.

Basically common sense in the design of the storm sails is the key. Owners that intend to do offshore events should ensure that their storm sails are designed for this rather than settling for the cheapest option available to pass the safety regs.

6. As 97.5% of the fleet would need to invest in new storm sails, of a significantly smaller size, is it intended that either current sails would be grandfathered for a period? This has not been discussed.

7. There is also the question of what conditions storm sails should be designed to best cope with. Whilst the name storm sails suggests beaufort 9 to 10 (as submission SR04-08 concludes), what sail sets should be used in force 7 to 8? If the trysail and storm jib are too small to be efficient in gale force conditions then sailors will be forced to use a heavily reefed mainsail and heavy weather jib in conditions they might otherwise use the storm sails, just so that they can maintain control of the yacht. Again attention is drawn to OSR 4.26.1 which states “The purpose of these sails is to provide safe propulsion of the yacht in severe weather”. It is far more preferable for sailors to feel comfortable to change to the storm sails sooner rather than later. This may also allow them to avoid meeting the storm force conditions the sails are designed for by taking shelter in a timely manner. It is also possible to set just the trysail or just the storm jib, depending on the balance of the yacht and the conditions met. There is also the consideration of which conditions it might be better to go bare poled and set drogues. Equally, in today’s world with better weather forecasting and communications it is far easier to avoid such conditions than previously. An example is the recent Vendee Globe, where 3 competitors were informed by the race director that severe weather was approaching them, and they were advised to seek shelter rather than set storm sails and ride it out. Such options were not available a few years ago.

In May 1999 the RORC Technical Committee formed a working party, consisting of Simon Rogers (Chairman), Peter Kay, Andy Claughton and Neil Mackley to investigate this very question following the 1998 Sydney/Hobart Race. The working party concluded that the current requirements were sufficient, but that more emphasis should be placed on knowledge of rigging storm sails and their general use.
The choice of appropriate storm sail sizes for individual boats should take the OSR sizes as a starting point, but each design should be reviewed by the designer, owner and sail maker to determine the best option. OSR should be a guide to a sensible starting point, it should not restrict boats from carrying the appropriate sails for the conditions. It is very important that the transition from a 3 reefed mainsail and heavy weather jib to trysail and storm jib does not leave any gaps in the inventory as the conditions worsen. The revised limits have the potential of leaving a large proportion of the existing fleet needing to carry their mainsails in more severe conditions that they currently do. This will result in crew needing to lower the mainsail and set the trysail in the conditions that they would previously have been safely in the cockpit or down below.

Conclusions

- IF it is accepted that the current storm sail sizes need to be reconsidered, a fully detailed review should be carried out. A working party should be formed and tasked with first establishing whether the current requirements are adequate for purpose. If it is considered that they are not then this working party should carry out a detailed study as to the correct sizes and appropriate parameters for establishing storm sail characteristics, and an appropriate time scale for implementation.
- Until such time as this working party has drawn its conclusions and reported back to the ISAF Offshore Special Regulations Committee no changes should be rushed into.
ADDENDUM  18th February 2009

Further comments have been received following the circulation of this document. These along with further research, and comments from the author of the original submission are considered below:

Firstly, the author of the original submission has responded in paper “Comments to the RORC note on storm sails”. In this it is repeatedly stated that the requirement for smaller storm sails is driven by 2 principle concerns:

A: The conclusion that storm sails proved too large during the 1979 Fastnet Race and the 1998 Sydney to Hobart Race. Throughout the author quotes from various books published on the races, but not on either of the official reports. The RORC comments are limited to the official reports, both of which suggest that wind speeds up to Hurricane force were experienced in these races. As such, it is expected that storm sails may well have been too large, as they were being used in more extreme conditions than they are designed for. It therefore appears that the author feels that boats should carry not only storm sails, but also a set of hurricane sails.

B: The author repeatedly refers to modern yachts, and how storm sail sizes should be based on the requirements of modern yachts alone. Looking at the list of boats that held IRC certificates through the RORC Rating Office in 2008 (4599 boats), an assessment is made on what percentage of the fleet are “modern yachts”. This assessment takes into account that the majority of yachts designed and launched prior to 1990 were designed based on IOR or earlier rules. Added to these are designs with a Displacement to Length Ratio (DLR) or 250 or greater. DLR is often used by event organisers to divide the fleet based on their racing or cruising characteristics. The RORC Rating Office recommend to event organisers that a value of 150 to 200 denotes a modern cruiser/racer, with values below that being more race orientated (Volvo 70s have a DLR or 43). This is a conservative value, but 1739 boats, or 38% of the fleet falls into this group. It is not known how many of these boats compete in offshore racing, but it is known that a good number do on a regular basis. As such this group must not be ignored, and the values must not be based on the modern designs alone.

The response also comments on the structural issues experienced during the current Volvo Ocean Race and Vendee Globe. This is not relevant to the storm sail sizes. It should however be noted that sea state and wind direction need to be considered by the skipper when selecting the appropriate sails to hoist. There is no substitute for good seamanship.

Further to this we have received the following comments:

Jean Sans, Technical Manager, IMOCA, UNCL:
IMOCA GIB < 20 m2 (no carbon fibres, but Spectra permitted)
No requirement for a trysail

Otherwise, I find your work excellent and I am in agreement with all your analyses and proposals.

With this in mind we have reviewed several IMOCA yachts for which we have rig dimensions. Below is a table showing the comparisons of sizes boats would need for OSR both now and next year:

<table>
<thead>
<tr>
<th>Design</th>
<th>Class limit</th>
<th>OSR '09</th>
<th>OSR'10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hugo Boss '99</td>
<td>'99 Finot</td>
<td>20m2</td>
<td>26.9m2</td>
</tr>
<tr>
<td>BT '07 Farr</td>
<td>20m2</td>
<td>21.96m2</td>
<td>15.37m2</td>
</tr>
<tr>
<td>Pindar '07 JYD</td>
<td>20m2</td>
<td>17.67m2</td>
<td>12.38m2</td>
</tr>
</tbody>
</table>

A reduction of up to 38% would be required for the new OSR values for this well tested fleet.

Dan Nolan, Offshore Director, US Sailing:
Below is my email to interested parties and the response I received from Bill Langan.
I concur with Bill.

Bill Langan, Technical Chairman, Newport to Bermuda Race:
I read through the submission and basically agree with Mike and James that a change of the maximum size storm sails needs very careful consideration. In most cases, the storm sails built by responsible sailmakers with guidance from the crew, designer and builder are generally smaller than the maximum criteria for the more modern boats. Remember that this criteria was developed based on experience with IOR style boats with high aspect mainsails and mostly masthead jibs.
with (by today’s standards) moderate to heavy displacement. Today’s boats with large sail plans, light displacement and high stability require a different approach which most sailmakers understand so why does the maxima need to be shifted when smaller sails are already being built?

For the long term, I agree that a working group should be formed to study the problem in more detail. I personally think the storm sail size should be based on displacement, not rig dimensions. You could throw in modifiers such as righting moment and rig dimensions but that would make the check of sizing somewhat difficult. It would be a worthwhile exercise to make a complete survey of the major sailmakers to check the storm sail sizes and match that to the displacements and rig dimensions. Would be interesting to see what the state of the art is at the moment.

Grandfathering is a must if any changes are made. Storm sails are built once in the lifetime of the boat so this would be a major change for every owner. Add to this the new requirements for crew training, first aid, AIS, etc. and people will throw their hands up at the rapid escalation of expense.

Phil Watson, Watson Sails, Ireland:
What a "can of worms" to find ourselves in!

I agree with everything the sailmakers have said (then I would, wouldn’t I?) and I have nothing to add.

All I can do is explain the situation to prospective customers who will probably just order the new 30% smaller (cheaper!) ones, expecting to never use them!

Sebastian Edmonds, RYA Technical Co-ordinator (Racing):
Whilst the paper presented by the Norwegian Sailing Federation concerning Storm Sail areas (SR04-08) was very detailed in its theoretical analysis of wind speed / force, it did not use any practical tests or examples of where storm sails were considered too large after use.

No practical tests have been carried out showing the deficiency of the current regulation.

There has been no reported loss of life or injury due to storm sails being too large.

We would welcome the recommendation from the RORC to form a WP to look at the Storm sails issue in more detail but also to take into account practicalities that may arise from any change to the regulation.

Malcolm Runnalls, YA Chief IRC Measurer, IRC Policy Steering Group:
I have spoken with the safety committee people here in WA [Western Australia] and they agree with me that the ISAF SR committee decision to reduce the maximum sizes of storm sails is somewhat absurd, particularly in light of OSR 4.26.1.

Glen Stanaway, Sport Service Manager, Yachting Australia:
There is a view in AUS that the sizes required from 1/1/10 should be adopted in Australia for all NEW sails or with some other form of grandfathering put in place. Unfortunately I am not able to provide a strong indication whether Yachting Australia would support the view in your paper or the ISAF amendment. It will take quite a bit more time before I’ll know which way this goes.

Nicola Sironi, Chief Measurer, ORC:
For what is worth, I can say that if we would focus more on emergency sails handling, which often unfortunately result a nuisance in the emergency situation all sailors meet sooner or later, but never anticipate enough, would certainly contribute to lifesaving more than a simplistic reduction of the area.

Bouwe Bekking, Skipper, Telefonica Blue, Volvo Open 70:
I totally agree with you. Reducing the area will have negative effect both up and down wind. Upwind we have showed several times, that sailing with a storm jib is effective, but mainly if a three reefed main or try-sail is hoisted. If only a storm jib up, it is hard to sail upwind, you can see that already now, as the boat is falling sideways on the waves, meaning big breakers can fall over the boat, instead of taking them head on. Reduction in size will worsen this. As well if sailing with try–sail a smaller storm jib will unbalance the boat.

Down wind in a storm, you need a bit of area to keep the pace up, otherwise you will get overtaken by “monsterwaves”, speed is your only friend.
I have sailed several times in big breeze (50+) and ended up always either hoisting two storm jibs, or even combo storm jib with a genoa staysail, to keep control over the boat.

**Tony Mutter, Helmsman, Ericsson 4, Volvo Open 70:**

After now sailing these boats (VO70’s) I am of the opinion that the current storm jib size is ok if not on the small size. Most boats on leg 4 used there Genoa staysails as the small jib, sometimes by itself. The boats sailed well like this. However we all set them on inner Forstays, which goes well with increasing the sheeting angle and keeping the balance of the boat as you reduce sail aft. Keeping the Centre of efforts of each sail for and aft closer to the centre of lateral resistance of the boat, makes the boat easy to steer over waves. Faster and safer. So I guess the storm area is ok for us.

However on an IRC type boat you might find that they don’t set aft of the forestay and use the forestay itself. When you do this with reduced sail aft i.e. deep reefed main or trysail you separate the Centre of efforts which makes a boat much harder to steer over waves. The amount of rudder angle goes up dramatically and you get the bow blowing off at wave peaks going upwind. This increases speed when you are trying to lose it and you find that you are slamming hard. This increases the risk of hull damage from going over a wave wrong. Reducing storm jib area may help for this type of configuration just by reducing the moment about the CLR. But it is where the storm sail is tacked for and aft that will have the bigger influence on keeping a boat easier/safer to sail in high wind speed in my opinion.

**Trysails.**

On the VO 70 we are already are under max because with a 3rd reef in it was going to be to smaller step to the max area of the try. If you are caught out and need to go to the try on these boats you are pretty much just going to sail with the main down. This goes back to the above where balance of the front sail being tacked aft is the winner. On IRC type boats maybe this is to radical a change and possibly deep reefs in existing mains is smarter.