EXperts-Yachts
Normal & Coded Photogrammetic Targets
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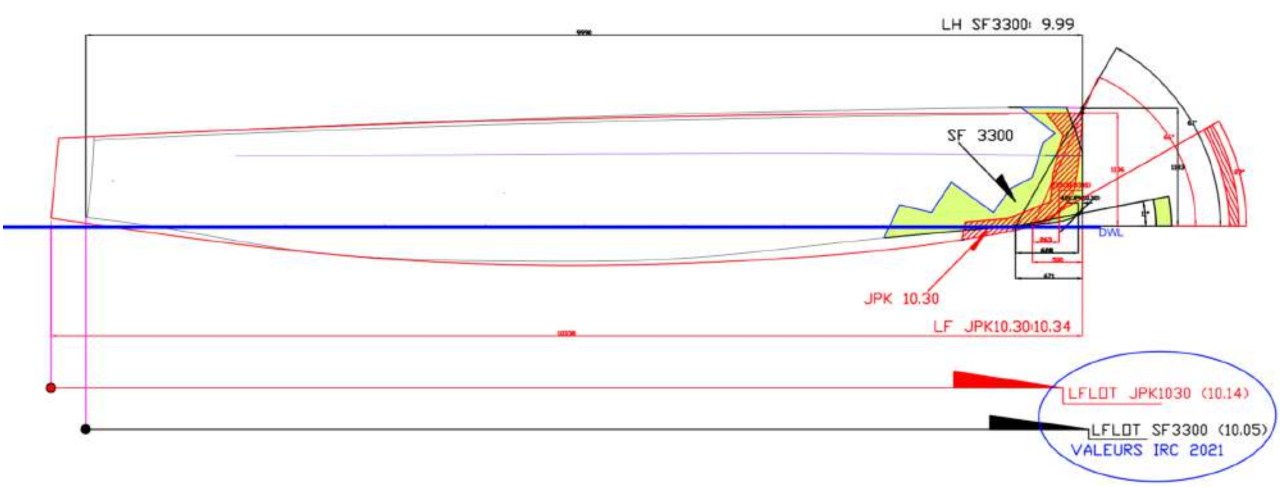
ANALYSIS of the "SCOW" EFFECT of CARENES SHAPES in IRC.

These front hull shapes are not new. The Scow Boat was born in the USA and a "Dinghy" version is still in the MELGES BOATS catalog.

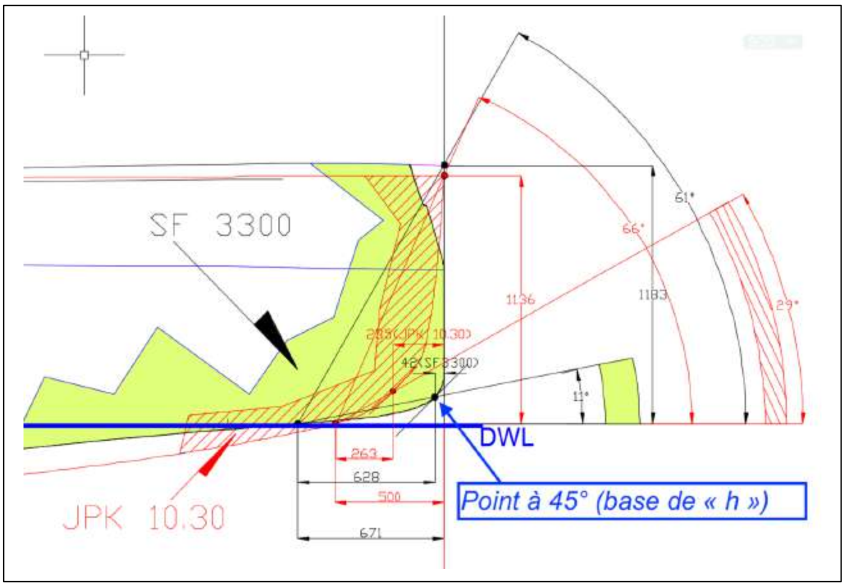
The "Fireball" is also a version quite close to a Scow Boat.

This design of generous forward volumes, which is intrinsically linked to that of the aft volumes in order to have hydrostatic support when the boat heels over, is often associated with a "spatula effect".
An effect that seems to be in fashion at the moment.

<u>THE SPATULAR EFFECT OF THE BOW</u>.
When sailing downwind, the volumes of spatulate bows are above the waterline. Their large volumes generate more lift (in the archimedean sense) than those of sailboats of the same class, which are more like "wave breakers".

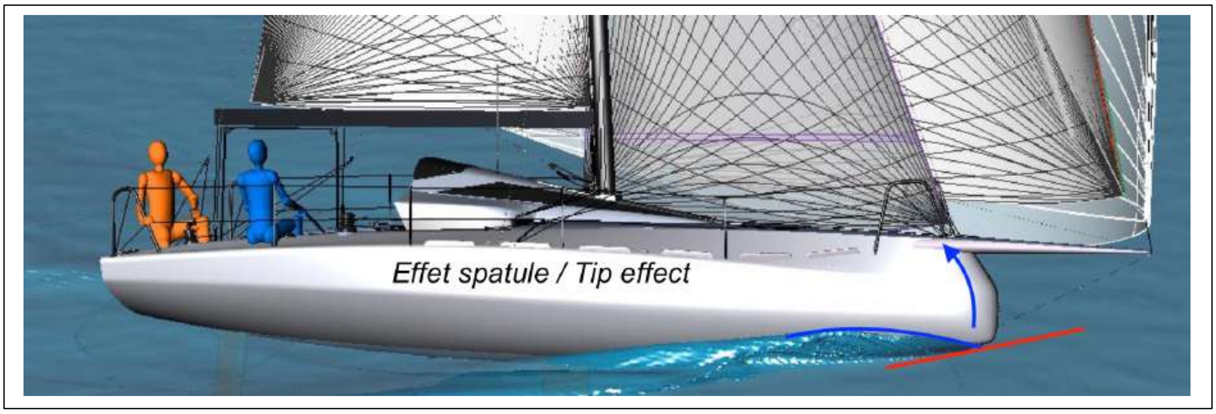


Analysis of the profile drawings shows that the architect is trying to move the 45° measurement point forward (as close as possible to the end of LH).



As a result, the height "h" decreases (height from the waterline of the 45° tangency point of the bow shape), to obtain the longitudinal generatrix of the spatula.

Finally, the underwater part of the bow behaves partly like a kiteboard. The water that is pushed to the side is supported by the generous shape and volume of the forward couples, which produces an archimedean lift, but also increases the drag

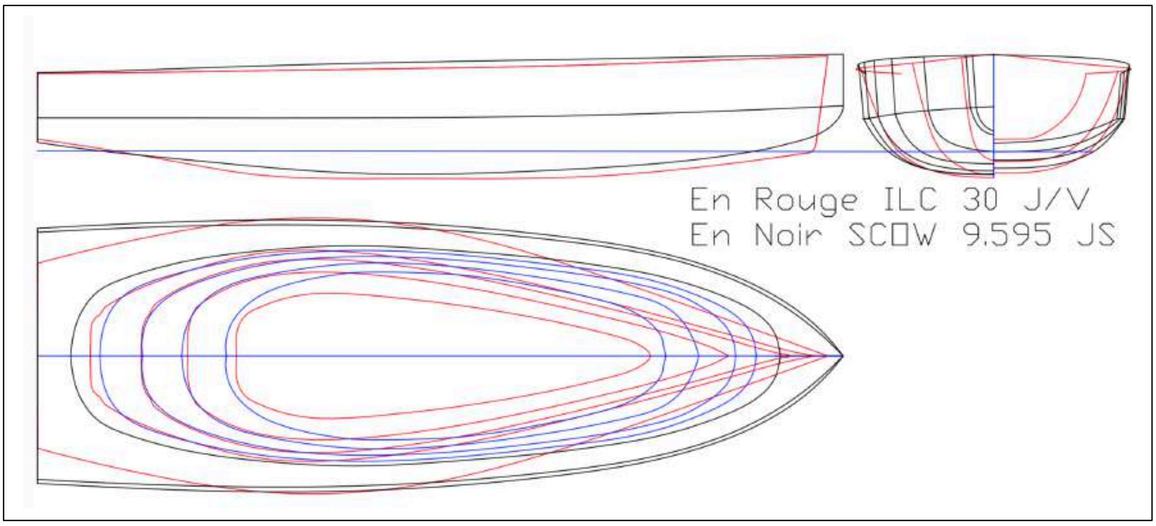


But this is only the visual effect of a scow boat and there is also a hydrodynamic effect which is more complex.

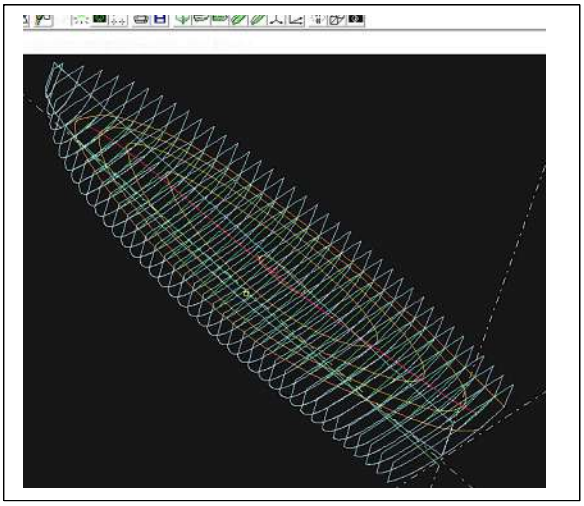
The more 'rounded' shapes of the forward sections result in waterlines with a strong elliptical tendency.
If things were to remain as they are when heeled, the Scow effect would be of no use and would even be a permanent handicap.

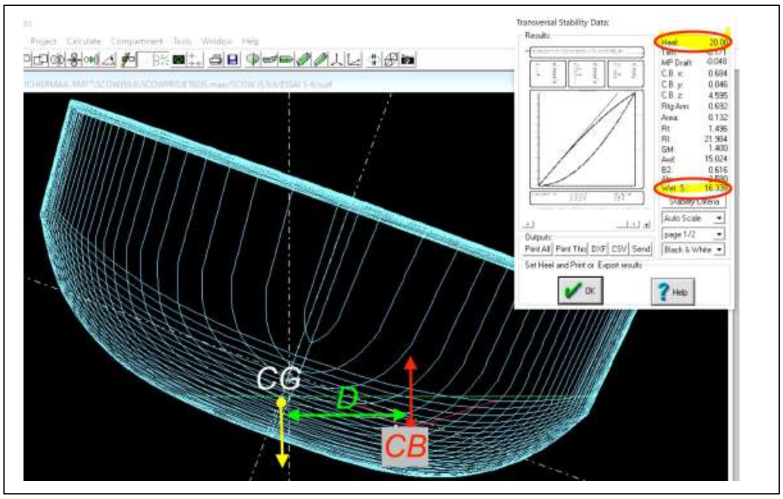
The IMOCA with a "classic" bow passes through the water without any turbulence (very light wind), the second IMOCA with a spatula bow immediately digs into the water (red arrows), which generates drag.

When a "Scow" hull is superposed on a "classic" hull, it can be seen that the water lines of the "Scow" hull are generally "elliptical", i.e. voluminous at the front, compared to the tendency of "classic" boats which are more "triangular" (in red on the drawing below).

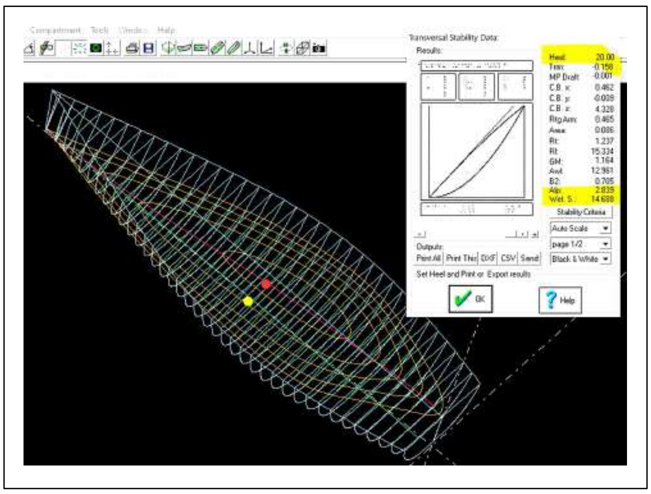


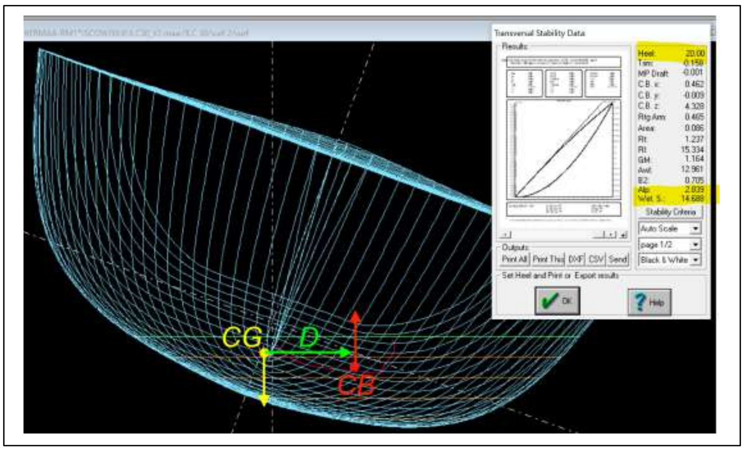
« Scow » model





« Classic » model





It can be seen that when the boats heel, the water lines do not behave geometrically in the same way on the two models:

- ✓ **<u>On the "scow" hull,</u>** as soon as the boat heels, the water lines rotate slightly, then as the heel increases (up to 20°) we see that the shape of the water lines translates downwind of the hull without too much deformation and almost parallel to the axis of symmetry of the boat.
  As the successive sections of the living works are very round, the geometry of the hydrostatic volume is preserved.
  This leeward slip shifts the hull center to leeward and away from the boat's center of gravity (the CG is fixed). This increases the arm (noted "D" on the drawing) which produces the RM (Righting Moment).
  The gain in RM increases the ability to carry a larger sail area.
  As a result, the center of buoyancy also decreases, which increases the ability to plane.

- ✓ **<u>On the "classic" hull</u>** with a heel, the lines pivot sharply around the bow beam (10 to 12°), so the hydrostatic volume is clearly angled in relation to the plane of symmetry of the boat and its sail plan.
  At 20° heel, the leeward offset of the hull center is less than for a scow hull.

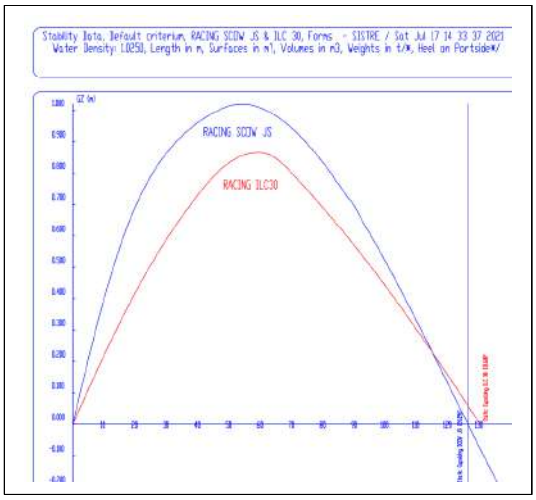
Everything seems to be going well in the best of all possible worlds... However, the reality is a little different.

In fact, this hydrostatic balance only exists for the Scow model in very restricted sailing conditions, i.e. downwind and at very targeted and limited wind angles (25 to 35°) associated with a real wind speed of at least 15 knots.

For the rest of the sailing angles, the Scow model appears quite complex to manage.

Indeed, the wetted surface of a real Scow hull is much larger, due to its elliptical shape. On the two models studied, ILC 30 and SCOW 9.595JS (LHT 9.6, BMAX and displacement identical), the difference in wetted area at 20° heel is $2m^2$, i.e. 15% more. When sailing in light winds, especially beyond 60°/70° from the wind, this extra wetted area will represent a real handicap that even an increase in sail area (which also increases the TCC) will not make up for. The more you sail downwind, the more the handicap will increase.

The other effect will be the passage through the short waves of the forward shapes of the Scow hulls at close hulled and close reaching. The control of this type of sailing will appear very complicated because of the poor performance of the boat.
In reality, Scow hulls with elliptical tendencies are not polyvalent.
It is true that the "classic" hulls also have their " imperfections ", but overall, these hulls produce a very high level of performance, homogeneous and with transitions that are well linked, and this on all the possible angles of navigation from the true wind.



<u>What is the result and how can this effect be assessed in IRC?</u>

The IRC is a system that rates boats according to the basic characteristics of the hull, appendages and sails. Some features are performance enhancing, others are considered to be hindrances.

Since its inception the IRC has not included hull shape in the calculation of the TCC. In other words, the IRC does not use VPP.

But it should be remembered that the IRC is not the "Master of the Clocks" during the course of a regatta (Offshore or Inshore).

This role is left to the meteorological environment (wind direction and strength) and the sea state encountered during the regatta course imposed in the Notice of Race.

For example, it is possible to sail 300 miles to and from the race course without using the spinnaker. However, we do not criticize the rules of measurement which tax the spinnaker.

Thus the following questions arise:

From the IRC parameters taken into account for the calculation of the TCC:

- The waterline length LWL "boat with a 0° list
- BMAX
- Hollow
- Overhangs with a 0° heel
- Empty displacement.
- Draft, profile and type of keel
- Sail area

Is it possible to objectively tax a "scow" type boat shape or any other shape for that matter?

Second question: a spinnaker, by its surface, by its shape brings an additional speed. A spinnaker can be used in an angular range from 60/70° (Code 0) to 180° of the true wind. This means that there is a high probability that the equipment can be used in regattas and that it will be of benefit.

For Scows it is much more complex because the effects of the Scow shape on boat speed are much more random, in the sense that they can be very positive, in extremely particular conditions (wind, angle from true wind, sea state), but outside these conditions, can be very negative.

In fact, when the use of the spinnaker no longer brings any performance gain, the crew returns to the basic configuration (mainsail + jib) and the "classic" boat regains a minimum of performance.

With a scow-type hull, this is much more difficult, if not impossible.

Should we then abandon the IRC philosophy which leaves all freedom of design of the hull to the architect, in order to take into account the "Scow" hull shape?

<u>The answers to both questions are negative.</u>

Indeed, introducing a measurement system that would allow the forward hull shapes to be assessed for the possibility of a Scow effect would lead the IRC to insidiously change its paradigm. Indeed, the IRC should not only look at the "Scow" shapes, but also examine the aft shapes of the hulls, the widths on deck, the height of the freeboards, etc., etc., and end up with an analysis of the resulting speeds of each hull shape... a sort of phantom VPP!

In other words, the Scow shape or any other shape of forward volume is not an appendage or equipment that is supposed to bring a permanent performance gain.

A Scow shape is a very particular architectural choice influenced by the course and statistically probable sea and wind conditions the boat will encounter, e.g. “Alizés” winds.
For example, in the case of the VENDEE GLOBE. If the Notice of Race reverses the course and imposes the Antarctic on the port side, there is no need to change the measurement rule, yet the hull shapes will immediately be totally different and "exit" the "Scow" or "Spatula" shape.

The trend effect (in the sense of "fashion")

Today there is a lot of talk about Offshore and Double-handed races. The term Offshore lacks precision, the Fastnet is considered an Offshore regatta, the Armen Race is rather a big Inshore Race. The borderline remains blurred.

It does not matter which designation is given to the regatta. What is important is the general trend of wind and sea conditions in relation to the course.

Today, the Transatlantic races are in the ascendancy for the IRC fleets in the 9.5 / 12 meter segment.

It is certain that between Madeira and the Caribbean Arc, the scow shapes will be rather favorable. However, this is less certain in the first part of the route from Europe. This makes the positive outcome of the scow effect uncertain.

It should be added that the number of possible transatlantic races in a year is very limited by the weather conditions and by the cost for each crew.

A transatlantic race represents a "personal challenge" for amateur skippers.

Will the new generation perpetuate this taste and enthusiasm for double-handed Europe / Caribbean Arc transatlantic races, it is possible, but let's be realistic, a transatlantic race is 60 to 80 boats of 9.5 to 12 meters?

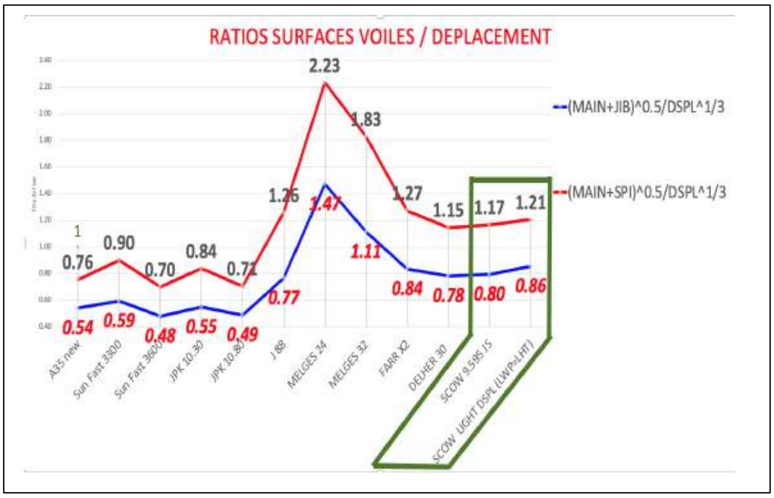
Therefore, designing, conceiving, and producing very specific boats, including the "Scows", appears to be a very small "niche" for the shipyards.

Skippers and crews, after their Atlantic escapades, will then return to more usual double-handed (or crewed) regattas with highly variable and random sailing conditions, which will require extremely multipurpose boats.

The fact that the boats concerned by these changes in hull shape are one-designs with restrictions (Box-Rule) such as CLASS 40s, IMOCAs and MINI 6.50s distorts the perception of the influence, in terms of performance, of this type of architecture.

Indeed, these boats sail in real time, without any competition from other boats of different architectures, on courses which are favourable (in principle) to their architectural tendencies.

At worst, if they have to face sailing conditions that are not adapted to their architectural lines, this does not appear since they are relatively identical architecturally speaking and there is no competition, so they all suffer the same problems.



One must be wary of the ratios that can be calculated from the sail area upwind and downwind. These ratios are very favorable to Scow models, as they have more sail area due to the large wetted area, especially as they do not have too many problems supporting this excess sail area (their righting moment at the angles of sailing in regattas is greater than classic hull designs).

Let's not forget that the IRC is based on architectural competition, not on uniformity of design. Look at the results of the DUO CATAMANIA 2021: 55 boats, a week of Inshore races, fairly steady weather but also light and moderate winds, Winner a J 120 (year 2006), ahead of a fleet of JPK, SUN FAST, etc.

In the end, during each IRC regatta (Offshore, Inshore), the external environment redistributes the cards in a random way.

As I close this paper, no competitor can imagine the weather conditions they will encounter during the next FASTNET, so choosing an architecture, even if the possibility existed, is even more utopian. The winner will be the one with the best crew and the most multipurpose boat for the weather and sea conditions experienced.

J. SANS le 22/07/2021