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Relevés de Carènes
Jauges et Expertises Maritimes
Expert Judiciaire près la Cour d'Appel de Rennes

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Le 31/01/2021

ANALYSIS of the "SCOW" EFFECT of CARENES SHAPES in IRC.

Scow hulls are not new. Scow boats originated several decades ago in the USA and a dinghy version is still in the MELGES BOATS catalogue.

The "Fireball" is also a fairly similar version of a Scow Boat.

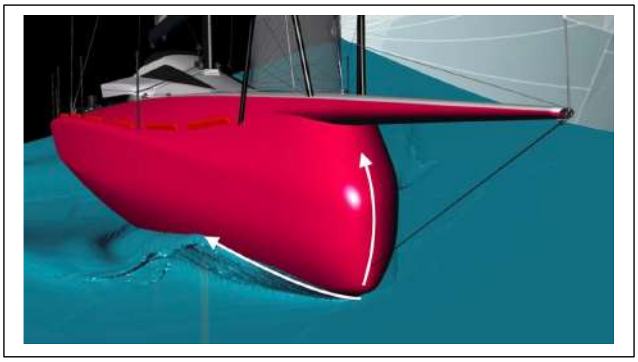
This design of generous forward volumes is intrinsically linked to that of the stern volumes in order to have a hydrostatic force when the boat pitches up, is often associated with a "spatula effect".
This effect is coming back into fashion at the moment as many races are held on ocean courses (transatlantic races in the trade winds).

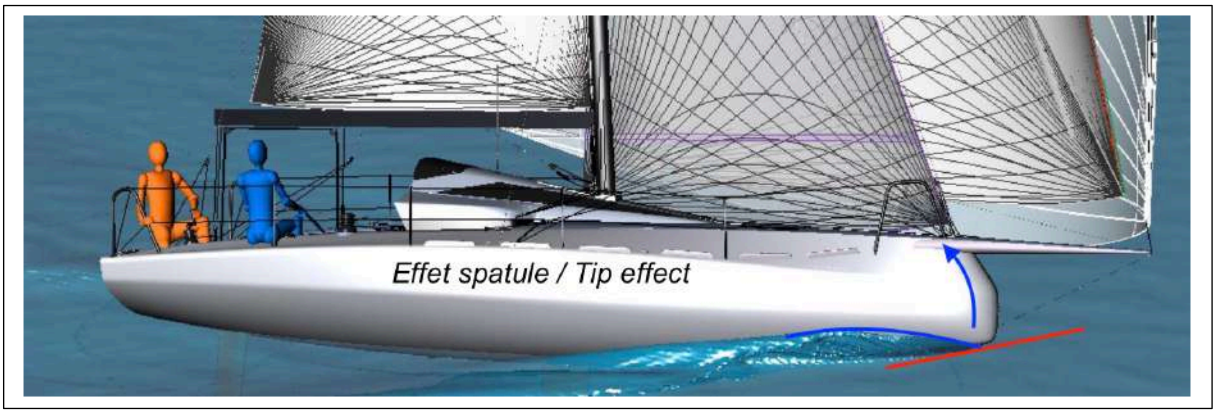
<u>The SPATULATE EFFECT</u>

When sailing downwind, the volumes of the spatulate bows are above the forward limit of the static waterline. This large volume creates more lift (in the archimedean sense) than those of sailboats of the same class, which are more of a "wave breaker".

Analysis of the profile drawings shows that the architect seeks to move the IRC measurement point forward at 45° to be as similar as possible to the front end of LHT.

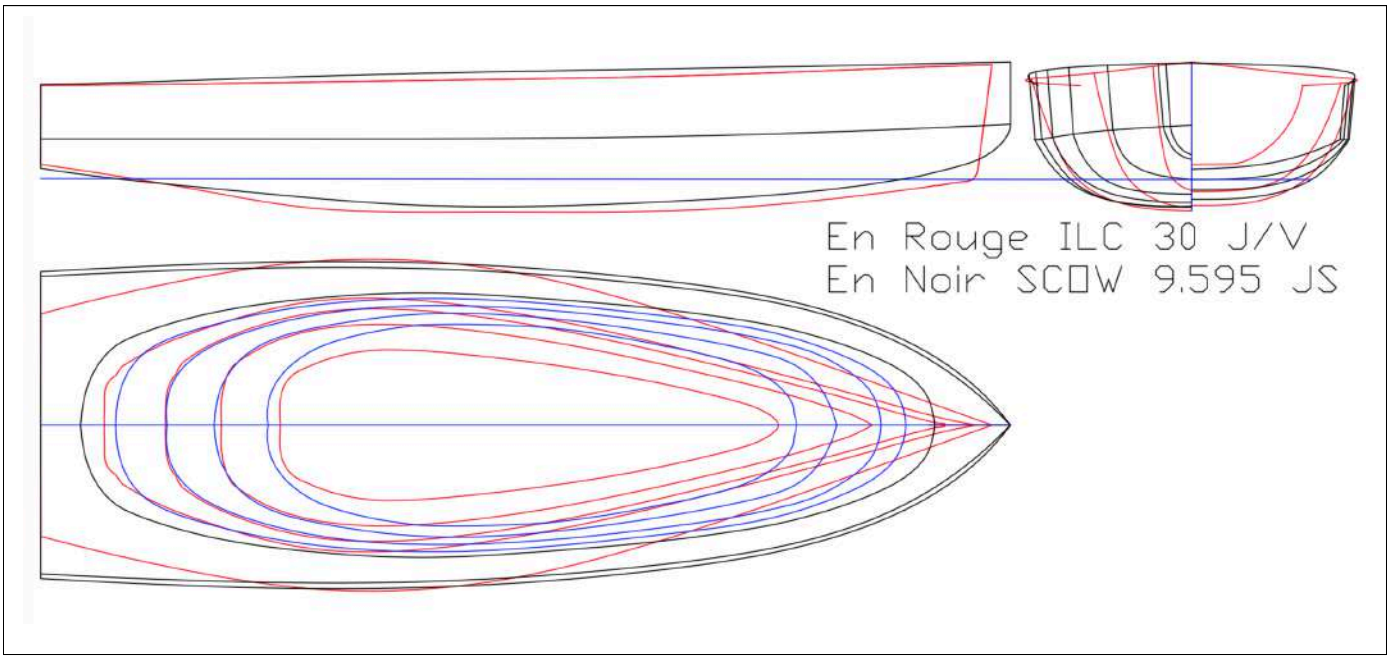
This results in a flatter longitudinal generatrix of the bow, which, combined with the development of transverse volumes, produces lift and, as soon as there is speed, raises the boat.
On the other hand, when the speed is low (less than the speed related to LWL) this bow shape pushes its own wave and generates a lot of drag.

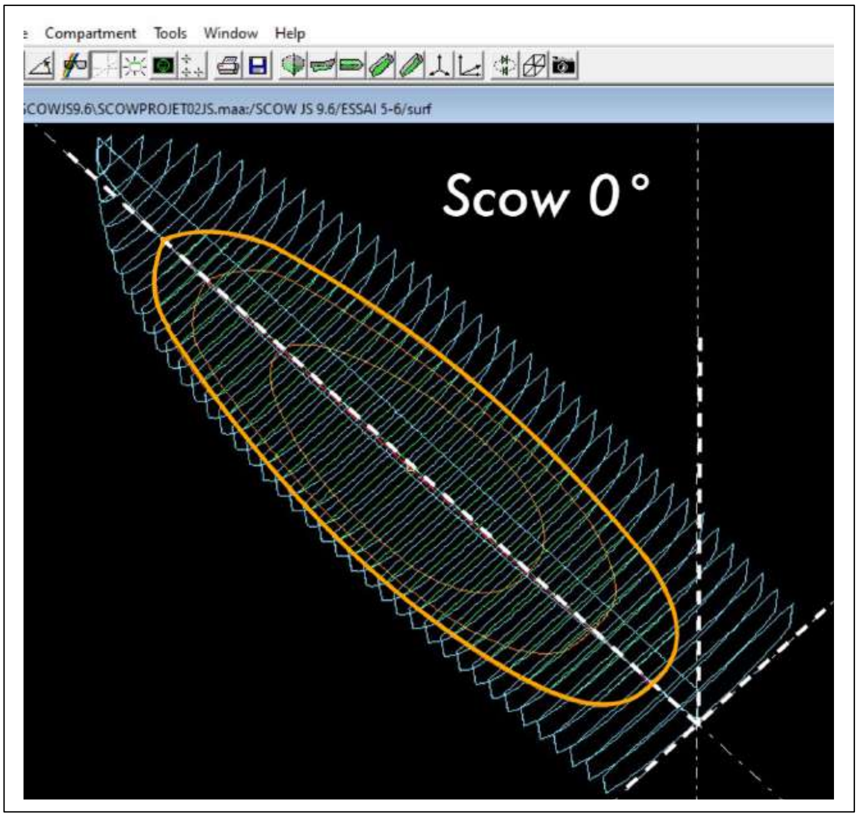




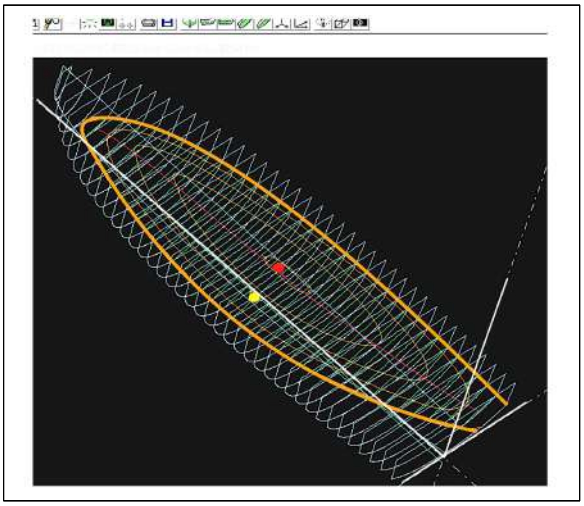
But this is only part of the hydrodynamic behaviour. The reality is that the Scow forward shapes lead the architect to design waterlines with a strong elliptical tendency.

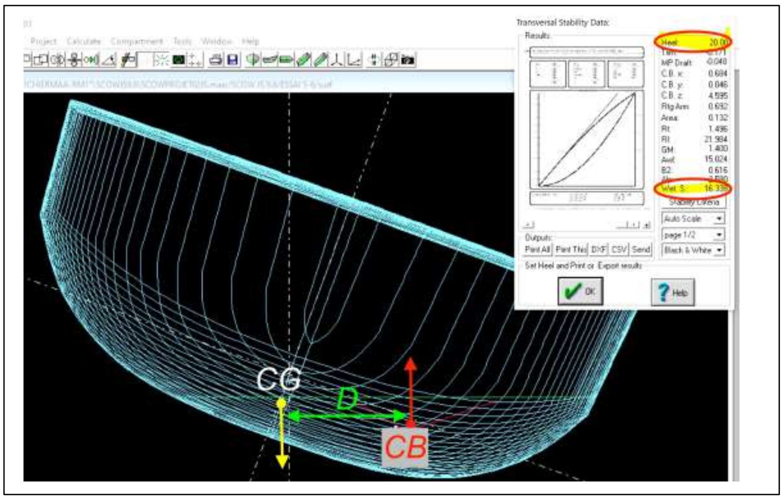
This is particularly noticeable when a Scow hull is superimposed on a 'classic' hull, the Scow hull is almost symmetrical both longitudinally and transversely.



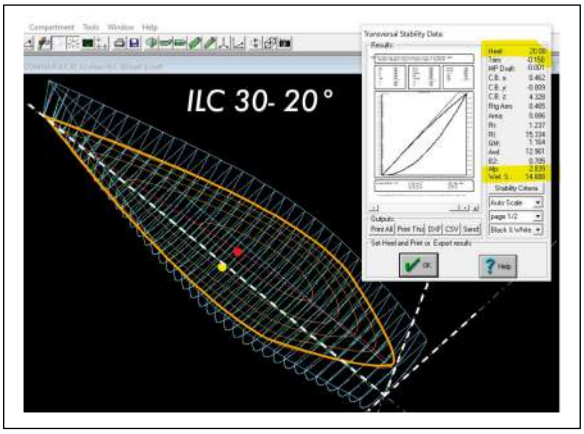


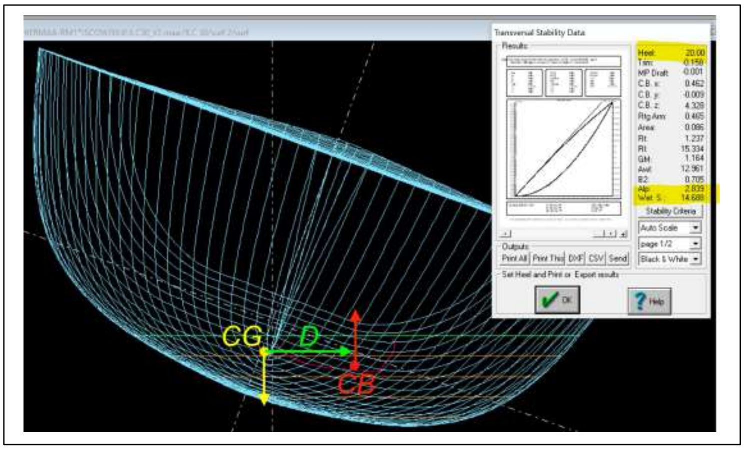
« Scow » Model





« Classic » Model





It can be seen that when the boats heel (0 to 20°), the set of water lines does not behave geometrically in the same way in the two models:

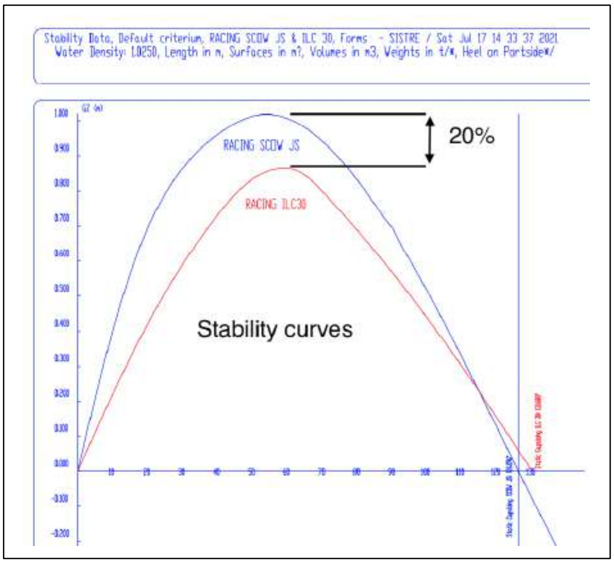
- **<u>On the scow hull,</u>** as soon as the boat heels, the water lines rotate slightly, then as the heel increases (up to 20°), all the water lines translate to leeward of the hull without too much deformation and almost parallel to the longitudinal axis of the boat.
  This leeward shift shifts the centre of buoyancy (CB) to leeward and away from the boat's centre of gravity (the CG is fixed). This increases the arm of leverage (noted "D" on the drawing) which produces the RM (Righting Moment).
  The gain in RM allows a larger sail area to be carried.
  As a result, the centre of gravity 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 longitudinal plane of the boat and its sail plan.
  At 20° heel, the leeward offset of the hull centre is less than for a scow hull.

Everything seems to be fine in the best of worlds... The reality is however different.

In fact, the hydrostatic performance of the Scow model is only of interest in very limited sailing conditions, i.e. downwind and at very targeted and limited wind angles (120° to 145°) associated with a true wind speed of at least 15 knots.

For the rest of the sailing angles in relation to the true wind, these voluminous shapes are complicated to manage because of the excessive wetted surface they generate. 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 2m2, i.e. 15% more. When sailing in light winds, or even upwind, this extra wetted area is a real handicap that even an increase in sail area (which also increases the TCC) will not overcome.



The other effect will be a very difficult passage in the short waves of the front shapes of Scow hulls (close hulled and close reaching).

It therefore appears that in reality, hull shapes with elliptical Scow tendencies are not all-purpose.

It is true that the "classic" hulls also have their "faults", but overall these hulls produce a very high level of performance, homogeneous, which allows transitions that are well linked, and this on all the possible angles of navigation from the true wind.

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

The IRC is a system that taxes boats according to the basic characteristics of the hull, appendages and sails.

In the calculation of the TCC, the parameters (measurements and equipment) that favour speed are symbolically in the "Numerator", those that generate drag in the "Denominator".

Since its creation, the IRC does not include the shape of hulls in the calculation of the TCC. In other words, the IRC does not use VPP. Hull designs are a creative work. Two boats can have identical parameters, and therefore the same TCC, and still perform differently. The IRC does not judge the "intelligence" of the boat, nor the experience of the crews, it is only a handicap system.

But it should not be forgotten 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 by the Organiser.

Thus, the following questions appear:

- ✓ **Are we able to objectively tax a "scow" type of boat shape or any other shape for that matter?**
- ✓ **Should we then abandon the IRC philosophy which leaves all freedom of hull design to the architect, in order to take account of the "Scow" hull shape?**

The answer to both questions is NO.

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 flare of the transverse profile, the height of the freeboards, etc., etc., and result in an analysis of the resulting speeds of each hull shape... a sort of phantom VPP!

A Scow shape is a very particular architectural choice influenced by the course and statistically likely sea and wind conditions the boat will encounter, e.g. trade winds.

<u>The Fashion Effect</u>

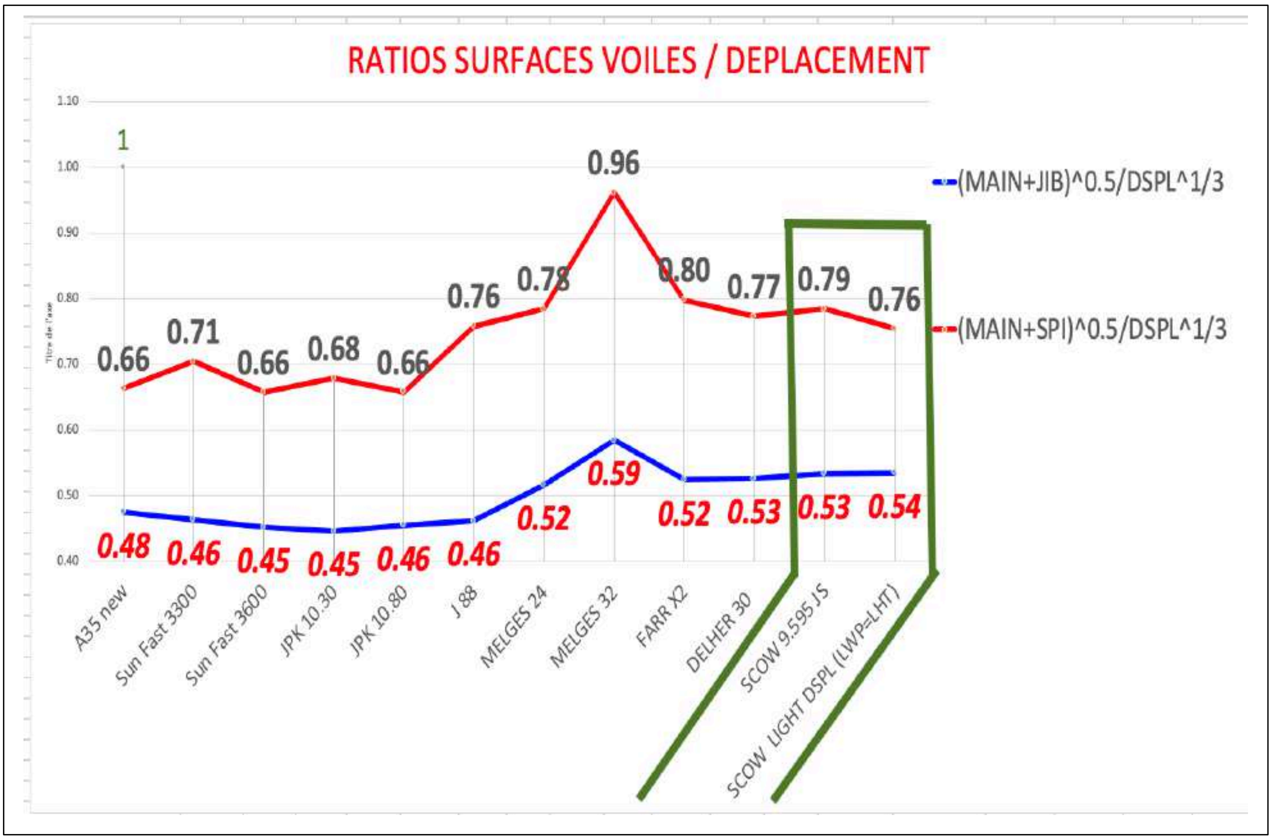
Today the Transatlantic Races are quite popular for the IRC fleets, both crewed and double-handed.

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 may make the "Scow effect" balance uncertain.

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

Indeed, these boats sail in real time, without any competition from other boats of different architectures, on courses which are favorable (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 difficulties.



Beware of the ratios that can be calculated from the upwind and downwind sail areas. These ratios are favorable to the Scow models, as their sail areas are larger (as is the TCC) due to the increase in Righting Moment.

J. SANS le 31/01/2021