

Here comes the Byte CII.....

the (not so) new kid on the block!

How it all began



Ian Bruce, the designer of the Byte was browsing Scuttlebutt one morning and happened to read an article by Paul Henderson, President of ISAF. In a nutshell, Paul said he was looking for an “out of the box boat” for the women’s Olympic singlehander, mentioning two or three boats, including the Byte.

Reasoning to himself that he had already launched and built one “out of the box” Olympic boat – the Laser - then, why not another? He had a platform of over 2700 Bytes worldwide but felt that a 50 year old rig concept just wouldn’t cut it in 2004. He turned to his 29er partner, Julian Bethwaite, arguably the world’s leading designer of the self-depowering skiff rig, and wondered if such a rig could really work on a cantilevered mast. “Piece of cake” said Julian!! However, there had to be more of a reason to do it than that for the boat to have a chance of being really successful. By the way, there is no magic in the name CII. It is shorthand for a “**C**arbon, **II** (two) piece mast”.



The rationale for the CII

There is one, and only one, overriding reason to even consider replacing the present Olympic equipment. It is certainly not performance and definitely not the organization of the Class, both of which are superb – it is simply COST. In a Class where money spent can, and does, equate directly to results achieved, where you can spend up to 4000 Pounds Sterling on a mast, and usually require more than one, where a new sail is required for every major regatta and where you have to travel to Europe if you want to have any chance of being in the hunt, it only stands to reason that participation is concentrated amongst the “have” countries and is almost nonexistent in the “have nots”. A recent drop-out from an Olympic campaign summed it up this way. “It’s ALL about equipment - if you do not have the right sail/mast combination for the given conditions, it’s almost a waste of time sailing. If you do, only then will your sailing skills make a difference.”

Should you have any doubt at all about just who can compete, visit the Cadiz ISAF World Championship Website and browse through the Europe results. Summarized, they are as follows:

Participants: 116

European/North American/Australian/NZ entries: 107

Remaining 9 entries all from China, Japan, Argentina and Brazil

There were NO entries from SE Asia, Africa, South Africa, Central America, Caribbean, Bermuda, India, Pakistan, the rest of South America and the rest of Asia.

There are, undoubtedly, a multitude of reasons explaining why this was so but they will all, in the end, come down to cost. Yes – there are many young women now sailing with the goal of an Olympic berth but they are at the apex of the sport. That number could be, and would be, EXPLODED if there was a Class widely available around the world at an unbeatable purchase price and an ongoing maintenance cost that was minimal. Not only would it make competing less expensive, it would spawn the growth of a huge base under an Olympic boat, provide an opportunity now unattainable by all but a few and, more importantly, fuel the growth of female sailing at the grass roots level.



Priorities for the development of the CII

Ian set the priorities for the development as follows:

1. Cost
2. Cost!
3. Absolute one-design to include spars, foils and sails with equipment supplied by the Class if Olympic.
4. World-wide manufacturing by independent builders operating at arm's length.
5. Performance to be improved over the Byte with weight range of sailor to be broadened to the maximum possible and hopefully, extended below the present weight range of the Byte.

Cost

The Byte is already the lowest priced performance singlehander available in the world in whatever territory in which it is built. Ian, learning from his Laser experience, achieved this by developing a continuous laminating procedure for the boat that is not only fast but also eliminates fatiguing in the laminates due to secondary bonds. Bytes do not soften with age. The new mast and sail will definitely add to the cost of the boat but not as much as one would expect as the one-design aspect of these items, and their sourcing, will result in huge purchasing advantages and the production of the present alloy lower mast is very labour intensive. It is expected that the maximum price for the complete boat, with sail and spars, in the Western world will remain under US\$4000 and, in the Asian, Latin, and other less affluent territories, well under that.

One-design

Mast

The concept calls for a two-piece mast with the bottom carbon fibre and the top a hybrid of carbon/glass, but mostly glass. The reason for the glass is that the self-depowering rig requires a flexibility in the upper mast that cannot be achieved with pure carbon as it produces too stiff a section. The mast will come from a single source and all builders around the world will be supplied from this source. They will all be of a uniform diameter, wall thickness and stiffness. The question of differing weights of crews is discussed in the Design Parameters section.



Ian MacDiarmid works on the prototype in Northbridge AUS.

Sail

The sail will be a fully battened mylar laminate and is being developed by Ian MacDiarmid in Australia, working with Julian. Ian has been in the business of developing and producing skiff sails longer than most people have sailed their Byte and, together with Neil Pryde, developed and now produce the 49er sails. The first sails were made from a 3 mil laminate (49er material) that Ian felt was overkill and he has since had a 2 mil laminate produced especially for this project. The sails will be built by Neil Pryde in China and will be computer cut on a Gerber cutter. They will be absolutely one-design. The rest

of the boat, foils, fittings, control systems and boom will remain standard Byte with no changes of any sort required when upgrading the rig.

Manufacturing

There are existing licensed builders of the Byte in Canada, UK, Italy and Singapore and new licenses have recently been negotiated with builders in Poland, Brazil, Argentina and Australia. A further



Bytes at the National Sailing Centre, Singapore. Between the Ministry of Education, NSC and private ownership, there are over 150 Bytes on the site. The key has been price.

builder is being sought in the Caribbean. With nine builders worldwide the Byte will be the most widely built racing dinghy in the world with the exception of the Optimist. All builders are independent businesses without any ties to each other. They all produce their boats from tooling that originates in Canada and is produced by the Copyright Holder from the master plugs. This ensures that there are none of the subtle differences that creep into the so-called one-design classes where builders are free to manufacture their own master tooling. A common construction manual specifying laminates, materials, foils and fittings is supplied to all manufacturers as part of the initial tooling purchase. The Brazilian moulds are presently being produced in Canada.

Performance

Although Ian is probably best known for his role in starting and developing the worldwide Laser phenomenon, he has also led a competitive life in sailing, winning two world championships in the International 14, representing Canada on two Olympic teams in the Finn and the Star and holds some dozen National and Continental titles. So, when involved in a development project it would be difficult not to be totally performance oriented were it not for the fact that he has also built 13 International or Recognized ISAF dinghy Classes and is completely familiar with the costs involved. Therefore, as pointed out earlier, the cost and not the actual performance of the CII has had to remain the real issue with the performance secondary. That said, his design brief called for trying to create a rig that could be **MORE POWERFUL THAN THE BYTE IN LIGHT AIR** where the Byte's small sail plan puts it at a real disadvantage, particularly in mixed fleets. However, even though it would be more powerful in light air, the rig should also be **EASIER TO HOLD UP IN HEAVY AIR** to lower the weight of sailor who could handle the boat in a breeze. This would be particularly important to Asia and SE Asia. It sounded at the outset like a contradiction – after all, it can be argued that no boat can be all things to all people - but the goal was there to try for that - but at a cost that would keep the boat affordable.

The Design Development

Ever since starting the project the argument has been heard that Europe sailors have to have a special mast/sail combination to suit their individual weight unlike the Laser Class where that option is not available. If that option **were** available to the Laser sailor, you would elicit exactly the same argument!

The reason is straightforward. ALL the present singlehanders – Finn, Laser, Laser Radial, Europe and the Byte itself, have what a sailmaker refers to as a “triangular” sail as typified in the photo below. There is very little roach, they do not use full-length battens and the sails are all set on relatively stiff masts. **None of them, Byte included, is self-de-powering.** Any necessary bending of the mast to reduce the camber and to de-power the sail is accomplished with tension applied from the end of the boom to the mast tip via the leech. The broad parameters of the mast bend, matching luff curve and camber of the sails for that Class soon become well established and the resulting dynamics of the



leech then determines the weight of sailor that can hold up the rig and **that narrow weight range becomes the required weight for that Class.** In a Class like the Laser, Radial or Byte where the sail is one-design and the mast bend predetermined, the weight range of the sailor capable of sailing that boat **is further narrowed down.**

If the sails are not true one-design but measured to a rule and if the mast flexibility is changeable, then tweaking these variables **will** change the rig response for differing weights but all still within the broad parameters of that Class. This has become the rule in the Europe – if you do not have the right combination of spar and sail for your weight in the given conditions, you are simply not in the race, regardless of your sailing skills. And what is the cost to find that magic combination?!

The CII's higher area distribution is supported on a mast with a very flexible top that bends more in the upper section than in the lower. This is a completely different dynamic from the “triangular sails” which must be hung on masts with a uniform bend to set properly.

The self de-powering rig



The statement made above that a one-design sail and spar narrow down the weight range even further would seem to be a very good argument for not having an “out of the box” one-design. However, introduce an automatic-response rig and **the dynamics change completely**.

The sail area of the self de-powering CII rig is actually greater than the Byte (same as the Europe) and its centre of effort is positioned higher off the water due to the large upper roach. Yet the flexibility in the upper section of the CII, combined with the full-length battens, results in a sail that will open up in a gust faster than a sailor can respond by easing the mainsheet and will de-power **dramatically** in response to the Cunningham, which becomes the accelerator pedal. With a pre-bend always present in the mast, tensioning of the Cunningham transmits a load directly to the mast tip and the mast bends in response, opening the leech. Add to this the fact that the battens are always trying to straighten themselves out and this force against the mast track augments the bending action.



Note the closed leech on the standard Byte on the right. In the light conditions pictured, there is nothing the sailor can do to open that leech - and it is slow.

Testing

Light to moderate air testing

The additional area of the CII, and its distribution, results in a boat that is about 4-5 boat lengths per minute faster than the Byte in light air. When sailed against the Europe and the Radial in winds under 8 kts the CII is markedly faster and the advantage appears to be more pronounced off the wind as the height of the CII rig comes into its own, particularly when the boat is heeled to weather, as it should be. None of this was really surprising. The question was rather whether or not this extra area could be managed by the existing weight range of the Class. If it could not, we would be defeating our purpose and particularly so in Asia and SE Asia. If it could, we were on to something!



In the 8 -12 kt range, the CII is about 3-4 boat lengths per minute faster than the standard Byte and appears to be about even with the Europe upwind and downwind with no testing having been done crosswind. The speed against the Radial is also about the same but the CII points noticeably higher. What did become apparent very early on is that, due to the height of the boom (“very civilised” some of the sailors from other Classes said!), weather sheeting **MUST** be used to bring the boom in over the quarter without having to use too much main-sheet tension. To this end, fairleads were fitted over the existing Ronstan traveller cam cleats to keep the traveller to hand and to enable uncleating the leeward cleat. At left, Stephe Taylor, Canadian Byte Class President, former Byte Canadian Youth Champion and Europe sailor who is now heavily into coaching, carries the traveller about 6-7 inches to weather in 8 kts to power up the rig.

Heavy air testing

In the upper wind range of 16-24 kts, all the testing so far has been Byte on Byte. Original rig strength testing was done in Australia and testing of varying mast stiffnesses has been done on two matched Bytes in Canada. Tests against the Europe and Radial will only be carried out once the new production mast mandrels have been completed and the final mast is available.

The really pleasant surprise, (to all except Julian!), has been the unanimous feedback, from ALL the sailors who tested the boat, that it was much easier going to windward, easier to hold flat and more fun to sail in a breeze than the standard Byte! The “more fun” part was sometimes difficult for them to verbalize but it was most often described as a “freedom on the water”. This is the result of the boat not heeling in a gust but rather accelerating forward as the rig automatically de-powers. With the acceleration comes an ease of steering since the boat is not “stuck” in the water, as it normally would be in a gust, until it is headed up and finally flattened by steering..

All of this begged the question, **“If it is so easy for a light person to manage the boat in heavy air what will happen to the heavier sailor trying to power up the boat in light air?”**

The short answer is that the rig takes care of that automatically. In lighter air, without any Cunningham tension, with only moderate mainsheet tension sheeted to weather and with a slacker outhaul, the leech **can** be made to stand up to develop all the power a heavyweight needs. See the two photos below of a lightweight in heavy air and a heavyweight in light air.



Lightweight Frederique Gagnon, 114 lbs (51.8 kgs), a member of the Royal St. Lawrence YC 29er team who sailed the Byte competitively for two years, takes the CII upwind in 18 to 20 kts true. She is at the bottom end of the Byte competitive weigh scale and would be unable to sail a standard rig in these conditions.



Heavyweight Kelly Hand, 154 lbs (70 kgs), Canadian National Team Coach and former Radial World Women's Champion powers up the CII in 8-10 knots true. She is at the heavy end of the Byte competitive weight scale and would not be able to get this much power out of the standard Byte rig.



In early, heavy air strength testing, Tai Lanson puts the CII through its paces on Northbridge Harbour in Sydney, Australia, in strong gusty 22 knot winds. The rig configuration seen in this picture simply does not exist on any of today's unstayed singlehanders.

Mast stiffness and deflection testing

Prototype masts of three varying stiffnesses were tested – two from Australia cobbled up from existing Windsurfer and 49er mandrels and one from the UK off existing OK Dinghy tooling. Once again, the feedback from the sailors was unanimous. The more flexible the mast, the nicer the boat was to sail and, again, the sailor was often unable to quantify what constituted “nice”! But there was another side to the actual results on the water. The mast of intermediate stiffness was a little faster than the softest mast but it, in turn, was not as fast as the stiffest mast. Once again, this was not unexpected but, speed alone is not everything. It was only faster when sailed by much heavier sailors. The lighter sailors all discounted the stiffest mast as they could not hold the boat flat and it developed a very narrow “groove” and lost its freedom on the surface. Perhaps of more importance, the stiffest mast was 30% more expensive.

The two Australian masts still have the same fore and aft luff curve but an intermediate stiffness was produced in Canada by adding, bit by bit, to one of the masts, local athwartships c/f reinforcement in

the lower third of the mast as excessive sidebend lower down in the flexible masts, was the difference in performance. This patch work was taken as far as it could be taken but, in the end, diameter has more effect on bend than anything else and the Australian mandrels were simply too slim to get the desired result. What is now happening is a new set of mandrels are being machined in Australia specifically for the CII and the laminate designed to maintain the fore and aft luff curve, which is where it is designed to be, but to additionally stiffen the sideways bend lower down to give the boat back its height.



Marc-André Littée and brother Pat do boat for boat testing in 16-18 kts. Pat to weather has one of the Australian flexible masts and Marc-André has the UK mast. Notice that the boat is not as flat - both brothers are identical weight. White lines are overlaid on the photographs and were scaled after testing to accurately assess mast bend.



The most flexible of the masts showed excessive side bend in the lower third.

It was also been decided, in the final stages, to give away a little of the performance of the CII by lowering the CE of the sail about 100 cms (4") and this will make the boat easier to handle off the wind where it is proving to be extraordinarily fast.



Forward schedule

Two things lie ahead in the program. Firstly, the mandrels, now machined, must be polished and prototype masts again made to achieve the optimum feel and performance with the sails being tweaked to perfectly match the chosen mast. Secondly, members of the Class will be poled on the direction in which they wish to move, or not move, with the new development.

Final design development

The first masts off the new mandrels are expected to be available by the end of October and, with them, final costings on the finished product. Budget costs of the spars have looked very attractive and final costings on the sails, which we now have, are very satisfactory. There is no decision yet on start of production as the Class' decision will have a large bearing.

At the ISAF Conference from Nov 7-15 in Barcelona, existing Olympic Classes and possible new Olympic Classes have been invited to exhibit their boats in the Convention Centre where the meetings will take place. The Byte has a reserved space and the C11 rig will be seen by the sailing world for the first time. Ian Bruce, the Byte's designer, will be at the meetings representing the Byte Class International Association on the International Classes Committee and will also be on hand to answer any requests for further information on the rig.

The Byte Class membership

Performance Sailcraft 2000 Inc., the Canadian builder, has spearheaded the development on the C11 with the support of the existing builders. This was done so that, when it came time to decide on the fate of the rig, there would be a concrete design proposal and some real testing results to offer up to the Class. The response in Canada has been "awesome" and not only among Byte sailors but also from kids who have moved on from the Byte in search of the next "cool" level of performance in a singlehander but are still of a weight that suits them perfectly to the Byte. It appears that there would be a wholesale return to the Byte by this group as the rig is definitely "cool"!



The UK has had a test rig for about a month and will continue testing in October. Maggie Fitcher, writing on the Class chat page had the following to say:
"I am one of those Byte sailors in the UK who has been lucky enough to be able to try the C11 rig. I was dead against the proposal when I first heard about it as I did not believe that it would be easier for light weights to sail than the present rig. I weigh 124 lbs and am in my late 50s, having taken up sailing at the age of 40.

Well Ian, I take it all back, I loved the rig. I took it out for the regular handicapped race at Weston sailing club in a fair blow on Southampton Water. It felt easier to handle than the current rig and I went for the gybe with no hesitation at all!

Unfortunately, the rig that Maggie was testing was the stiffest one and would have been a bit hard for her. She is in for a real surprise when she tries the more

flexible rig. From Spain the rig will go to Italy and, by then, new rigs should be available for the US, Singapore, Argentina, Brazil and Poland.

There are really four roads down which the Class can go:

1. Reject the CII rig and exclude it from any Byte Class events. In such a case, the Copyright Holder and the Manufacturers would then have to decide whether or not it is worth creating an entirely new boat with a new name and new Class structure.
2. Elect to set up the CII as a completely separate Class (like the Radial) with its own Rules and Constitution but under the Byte Class International Association.
3. Modify the Class rules to allow the CII to sail in Byte events with a separate start for the CII Division.
4. Same as Item 3 but set a time limit during which any National Class Association must decide to change over to the CII rig entirely, stay with the mixed events as in Item 3 or stay with the present rig entirely.

Although No. 1 is an option, from the response thus far, this does not seem likely..

No.2 is certainly an option - there is enough precedent in ISAF to justify it – but ISAF is not particularly keen on the proliferation of models within a Class and, with it, the proliferation of so called “World Champions” within that Class.

No.3 offers a response to the above and it is a much simpler mechanism. It involves only a change to the Class Rules and not a completely new application to ISAF for Recognised or International status. It has the disadvantage of leaving any potential buyer up in the air about whether or not to purchase the boat with a new rig or an old rig depending on what sort of activity is likely to develop in the CII Division.

No.4 would seem to be the most likely road to success and the only real argument against an eventual total conversion to the CII is one of cost and the manufacturers have come up with what they believe is a solution to that one.

With the assistance of the mast and sail suppliers in the costing of their initial supply of raw mast sections and sails, the manufacturers will take these savings, plus their own costs of finishing the masts, and pass on the whole lot to any existing, paid up, Class Member AT COST. There will obviously have to be a time limit on the membership enrolment. It is the goal, and the intention, to have all conversion rigs available to paid up members for the retail cost, today, of a new Dacron Byte sail, again with some time limit on the conversion. This policy will also mean that there should be no hesitation in buying a new boat without the CII rig as the cost of a new boat with the new rig is likely to increase by approximately the cost of a Byte sail today. This means that any new owners buying the boat with the existing rig, and then updating it later, if members, would be no further behind than had they waited to purchase the boat with the new rig!

The eventual figures for the above pricing will have to be confirmed once the final costings come out of the mast development.

Polling of the Class will be done by email, or post if necessary, to all owners and will be done before the end of October, the goal being to have a response by the ISAF meetings starting on November 7th. In the meantime, intelligent comments are always welcomed on the chat page.

