

# Basic Detail Report

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## Australia II

### Vessel number

HV000074

### Date

1982

### Primary Maker

Steve Ward

### Description

The 19.5 m long, aluminium International 12 Metre Class yacht AUSTRALIA II was built by Steve Ward in Cottlesloe, WA and launched in 1982 at Fremantle. It was designed by Ben Lexcen for a syndicate headed by Alan Bond, and for both of them it was their fourth challenge for the trophy since 1974. Their previous challenger AUSTRALIA

(HV000518) had won a race in 1980 using an unusual mast, and had shown that something special was needed to beat the American defenders, so Lexcen set about trying to find that element for success. The entire project was kept under a veil of secrecy to protect details of its radical design being passed on to any other syndicates involved in the 1983 America's Cup Challenge. It was only after AUSTRALIA II had won the series that the shape of the hull and keel were revealed to the public. The principal element in AUSTRALIA II's success was the winged keel developed by Ben Lexcen. He had trialled endplates and other similar features on rudders, centreboards and keels at different times in his career, starting with a Moth class dinghy in the late 1950s, and then the break-through 18-foot skiff TAIPAN (HV000054) in 1959. The focus of his efforts was to reduce the drag and loss of efficiency from tip vortices off these appendages. These experiments met with mixed success but when he returned to the idea again in the 12 metre class, he developed the concept from a different direction. 12 metres are heavy displacement yachts, with a considerable amount of ballast. The draft restrictions and large volume of the hull result in a shallow depth keel, with a poor aspect ratio and poor efficiency. The wings on the keel helped to reduce these inefficiencies in a similar way to the endplates he had experimented with, but he was able to make another bold step in lateral thinking. Rather than just realising the improvements to drag, Lexcen could see other advantages at the same time, and this was characteristic of his ability to think around many things at once. The wings were made quite large which concentrated more of the lead ballast lower down, an improvement to stability and therefore the yacht's speed. At the same time Lexcen was looking at an inverted keel profile, so that the longest chord and greatest mass was now at the base, not where it met the hull. This upside down profile and additional weight in the wings ensured that the ballast keel's centre of gravity was now significantly lower than a conventional 12 metre design, as well as being a more efficient shape. Lexcen then optimised the hull and rig proportions around the advantages this keel offered

by choosing to design hull to the International 12 Metre Class rules with a slightly shorter waterline and greater sail area than normally used. Careful manipulation of the hull shape at the measurement points ensured it had a long waterline when heeled to take advantage of the power that was achieved with more sail and more stability than the other designs. Much of this development came from rigorous tank testing and computer analysis at a facility in the Netherlands, a move sanctioned by the cup defenders and trustees of the Deed of Gift, the New York Yacht Club. This move has to lead to controversy over the design origins and this is still debated by some of the parties involved. The principal issue is the claim that the design was actually created by the team from the Netherlands test tank and not by Ben Lexcen. This is not a true representation of the arrangement. Lexcen created the concept of the wings and the upside down profile, and the other examples from his career show that he had been trialling different ideas to combat tip vortices in many earlier designs. The test tank and the facilities it offered were used as a tool to then research and optimize these concepts initiated by Lexcen. There is a complex set of choices and compromises that have to be made in relation to the best proportions and shape of the keel and hull around the desired hull dimensions and sail plan area allowed by the rule. There are always penalties along with advantages. In this case one of the significant penalties was the greater wetted surface area and resultant drag, coming from the addition of the large wings. With the aid of the tank testing and computer simulations it was possible to trial a variety of models generated from Lexcen's basic concept, often making gradual changes as suggested by the testing. When the model with the best ratio of gains to losses was identified, the final design was then able to be drawn. AUSTRALIA II proved a breakthrough, and a handful as well (at least initially), but not because of any significant errors in the design. While one adjustment shortly after launching was to move the keel about 250mm for better balance, the major issue was simply that the proportions and shape gave AUSTRALIA II characteristics that were new to 12 metres. It was stiffer and could hold on to its sail better in fresh conditions, and was much more manoeuvrable in pre-start situations. Whilst much of this was obvious just sailing the boat, the syndicate had the advantage of an excellent yacht to trial with for comparison, a new conventional keeled design by Lexcen eventually called CHALLENGE 12. This was initially built by the Bond syndicate as a back-up in case AUSTRALIA II failed to meet expectations. However, it was soon apparent that AUSTRALIA II was going to be a success, and a Victorian syndicate took over CHALLENGE 12 as a separate Australian challenger for 1983. The story of the racing is now legend. AUSTRALIA II dominated the Louis Vuitton Cup challenger series, hardly losing a race. The mysterious keel had not been revealed, but it was evident that it was matched with superb sails and excellent crew work showing that the syndicate was well prepared in all areas. Onshore the concern of the Americans was obvious as they sought to have AUSTRALIA II banned by trying various legal moves, all of which were frustrated by both the officials running the contest, and the powerful Bond syndicate spokesman, Warren Jones. Led by skipper John Bertrand the crew's confidence was high leading into the America's Cup series, but they were well aware of the task ahead racing against LIBERTY helmed by Dennis Conner. Gear failure was a significant factor in AUSTRALIA II's first two losses, yet it was also apparent that AUSTRALIA II had enormous potential, and this showed through when it dominated the third race. Another loss in the fourth race put them on the brink of failure, but the pendulum swung back in AUSTRALIA II's favour when it responded with two comprehensive wins to level the series at 3-all. After all the earlier protests by the Americans about fair play and legal interpretations they then produced one of their own. LIBERTY had multiple rating certificates, a loophole the Australians had not explored. It meant

they could quickly optimize the ballast, trim and sail areas to suit anticipated conditions without having to request officials re-measure the hull, and as the final race approached and was then postponed, LIBERTY's crew made changes to optimize the yacht for the anticipated conditions. It almost worked. A re-invigorated LIBERTY was now able match AUSTRALIA II's speed and in the final race LIBERTY led comfortably into the final downwind leg. Rounding the top mark almost a minute behind the Australians used better tactical skills to make a bold move and find better breeze on the opposite side of the course to the Americans. In addition, AUSTRALIA II's superior spinnaker shape allowed them to sail marginally faster and 2/3rds of the way to the leeward mark AUSTRALIA II came back to the middle of the course and defiantly crossed underneath and ahead of LIBERTY, gaining the lead for the first time. This was the defining move of the race of the century. On the last upwind leg to the finish line AUSTRALIA II's ability to tack quickly and maintain speed, attributes of the winged keel, helped it to keep ahead and remain in control throughout as the LIBERTY crew attempted to wear them down with a long tacking duel. The win was one of the greatest international sporting triumphs ever, and without the extraordinary design of AUSTRALIA II, it is unlikely that such a colourful and intense event would have occurred. In 1988, in recognition of the yacht's importance it was acquired by the National Museum of Australia, and in 1991 AUSTRALIA II went on display at the Australian National Maritime Museum. Plans were then made for the vessel to be moved to the new wing of the Western Australian Maritime Museum at Fremantle, WA. AUSTRALIA II was moved from the ANMM in 2000, temporarily put back into sailing trim to take part in the 150th Anniversary of the America's Cup at Cowes in 2001, and then put on display at WAMM in Fremantle where it now remains.

### **Dimensions**

Vessel Dimensions: 19.69 m x 3.68 m x 2.65 m (64.6 ft x 12.1 ft x 8.7 ft)