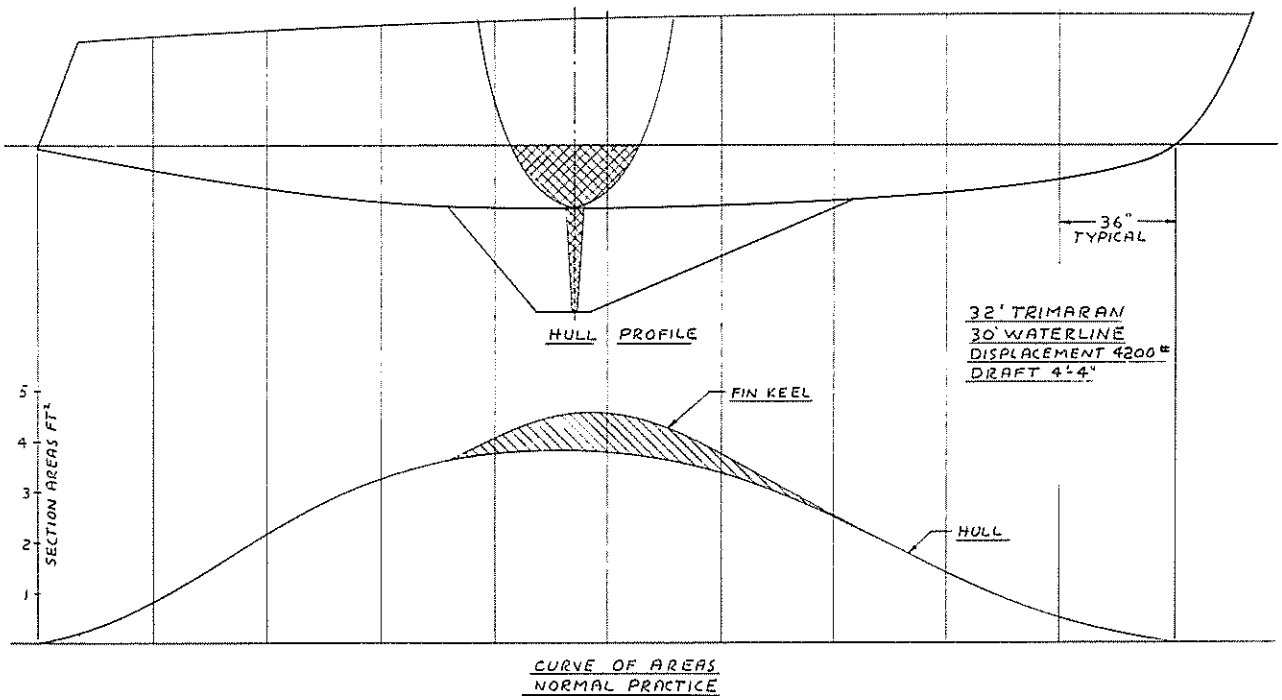

FIGURE 1 - Curve of Areas as in Normal Practice

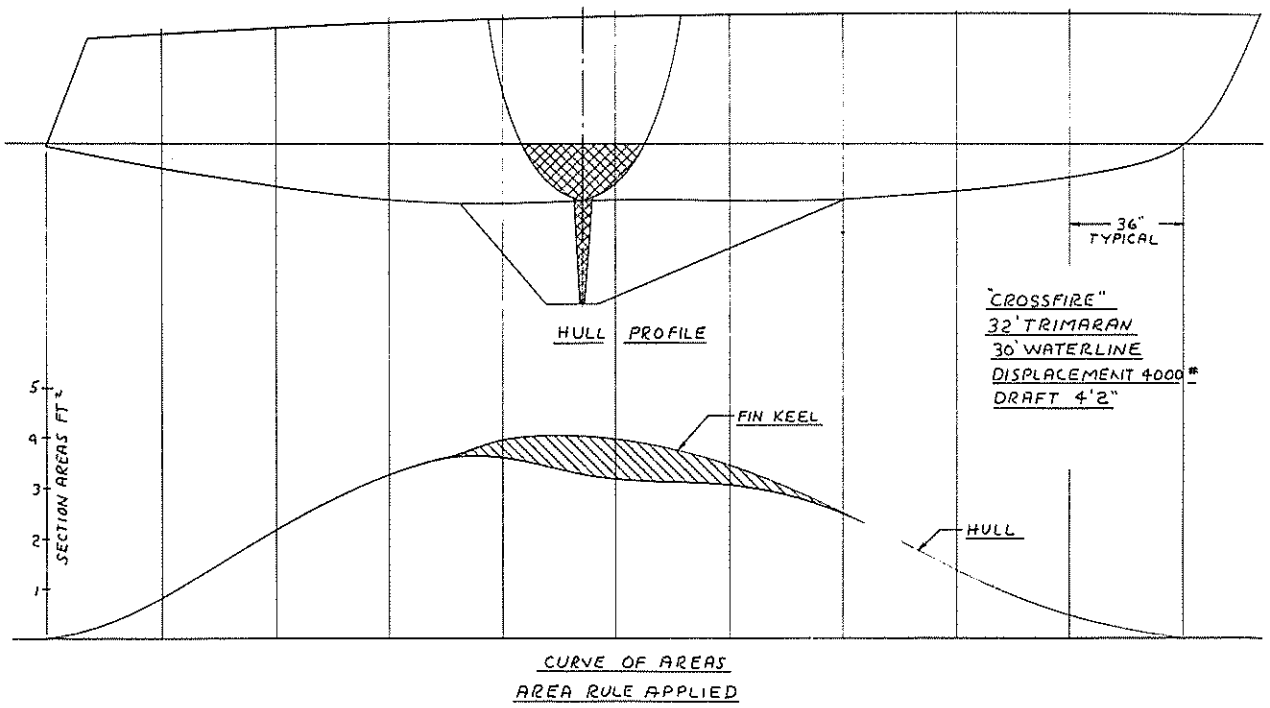

FIGURE 2 - Curve of Areas Using the Area Rule

APPLYING THE AREA RULE CONCEPT TO THE MAIN HULL OF HIGH PERFORMANCE CROSS TRIMARAN SAILBOATS.

Having worked in the engineering dept. of General Dynamics (San Diego) during the developement of the F 102 and F 106 supersonic aircraft and remembering the improvement to the performance when the area rule was incorporated, I was intrigued with the idea of trying the same concept on the hull of one of my high performance trimarans.

The area rulr was developed at N A C A in 1951 by Richard Whitcomb.

Whitcomb's concept says that basically the interference drag - the major drag component at transonic speed - depends almost entirely on the distribution of the airplane's total cross-sectional area along the direction of flight.

Applying this concept to the design of high performance (above V= L x 1.4) displacement-type sailboats, the fin keel and the hull would be considered together in the developement of the curve of areas.

My CROSS 32R racing trimaran "CROSSFIRE" was the first to be designed and built using the area rule concept.

Figure # 1 shows the curve of areas for the hull as in normal practice, with the fin keel curve added to the main hull curve. The displacement of the main hull is 4,000 lbs and the fin keel 280 lbs. The prismatic coef. for the main hull only is .56. When the fin keel and the main hull are considered together the prisc. coef. drops tp .50.

Figure # 2 shows the curve of areas of the main hull and fin keel with the area rule concept applied. It will be noted that only 75% of the fin keels area was removed from the main hull areas so that the modification to the main hull curves would not be too severe.

As a result of the design change, the pris. coef. was increased from .50 to .55 and the maximum cross section area was reduced by 12%.

The fin keel configuration was developed to have a smooth and gradual curve of areas of its own. This would allow it to be used with the minimum amount of modification to the main hull lines. The main hull will have some what of a "coke bottle" shape in the area of the fin keel.

It was hoped that by using the area rule concept on the main hull of "CROSSFIRE" that the "hump" speed effects normally noticed in other displacement hulls would be reduced. Also that the trimaran would be able to accelerate through the basic hull speed (V= L x 1.4) with the minimun amount of resistance. V= L x 1.4 being 7.7 knots.

When "CROSSFIRE" is sailed, the acceleration is very smoothin speeds up to 12 and 13 knots. No "hump" speed effects have been noticed. Speeds up to 18 knots have been attained. There is very little depression in the water flow at the mid-hull section at 7.7 knots, such as is normally observed in displacement mono hulls.

The area rule concept was used in the design of Mike Kane's CROSS 52R racing trimaran "CRUSADER". CRUSADER"S RECORD SPEES FOR ITSELF !

The area rule is being utilized in the design of all CROSS racing trimarans.

"CROSSFIRE" has a displacement length ratio of 66.