

ON A SCALE OF ONE TO TEN

By A.P. Brooks

Dudley Moore had it right in "10", nobody really ends up with a ten. Or with a one for that matter. The boat show season again brings the problem of rating sailboats to the minds of shoppers and aficionados alike. There are no tens, but salesmen will tell you, "This is the fastest, driest, best-built boat in the show."

Reason alone tells us that can't be true for every boat. Yet, without a study of a new boats' Performance Handicap Rating Formula (PHRF) ratings, International Measurement System (IMS) sheets or performance packages from the USYRU, it is awfully tough to make sense out of the sales claims. If you don't believe it, take a look at any listing of new boats, set out by length overall with whatever generic description the manufacturer or ad writer decided to hang on them. Veteran sailors have their own ideas about what constitutes racers or cruisers, but there is no universal agreement on how to classify sailboats.

Trying to compare sailboats by the builders' classifications is nigh onto impossible. Some boats called "cruisers" will, under IMS or PHRF, rate well above some called "racer-cruiser" and vice versa. You don't get what you think you're getting, and many new boats have yet to be rated under IMS or PHRF. For instance, one new boat is called a racer-cruiser by its manufacturer. It has a displacement of 41,200 pounds on a waterline length of 38'3" and 1,286 square feet of sail. Those translate into a Displacement/LWL ratio of 328.67 and a SA/Displacement ratio of 16.88. On my scale it rates a 1.5 and qualifies as a "lead sled."

Another sailboat rated by the manufacturer as a cruiser has a displacement of 10,000 pounds on a waterline length of 30 feet and a sail area of 712 square feet. This is DISP/LWL ratio of 165.34 and a SA/DISP ratio of 24.13. On my scale, this so-called cruiser rates a 4 and a description as a racer-cruiser.

Or take the boat the builder classified as a racer-cruiser that has a displacement of 2,750 pounds on 27'5" of waterline with 524 square feet of sail; DISP/LWL ratio of 59.57 and SA/DISP ratio of 42.18. To me, this rates as an 8.75 and an out-and-out "racing machine," but of the two given a racer-cruiser designation by the builders, one will not sail away from Granny paddling in her water wings!

Normally magazines publish lists of new boats and classify them by whatever name the manufacturers decided to call them. Sometimes that's like putting the family sedan in fancy chrome trim, a muscle car in dowdy grey, and calling the former a pace car and the latter a commute special.

So how about those funny numbers and neat categories I just tried out on you? Categories of lead sled, cruiser, racer-cruiser and racing machine with numerical ratings to help sort out the boats overall and within the categories. If you don't care about the basics, skip the next three paragraphs and go on to how to work out the "S" number on the accompanying graphs.

LOA is just an indicator of how much space there is likely to be in the boat and what its hull speed might be. Might be? You hear that it is a hard and fast 1.35 times the square root of the waterline length (LWL), but Marchaj and other elder gurus of aero/hydro-dynamics hedge and say that the potential speed performance of

sailing craft varies from 0.9 for heavy keeled yachts to 4.0 for an out-and-out racing machine.

The speed differential is a function of increased ability to carry sails, increased stability, and reduced specific resistance and DISP/LWL ratios. Lower DISP/LWL ratios generally indicate lighter boats or less weight loading per foot of length. Sail area displacement ratio (SA/DISP) is found from Sail Area divided by (Displacement/64)^{2/3}; and Displacement/Length of Water Line ratio is equal to (Displacement/2240) divided by (.01 x Length of Water Line)³. These are the real factors that determine performance, and the hardest to come by when standing on the pier trying to compare a Gee Whiz 31 to an Awesome 32.

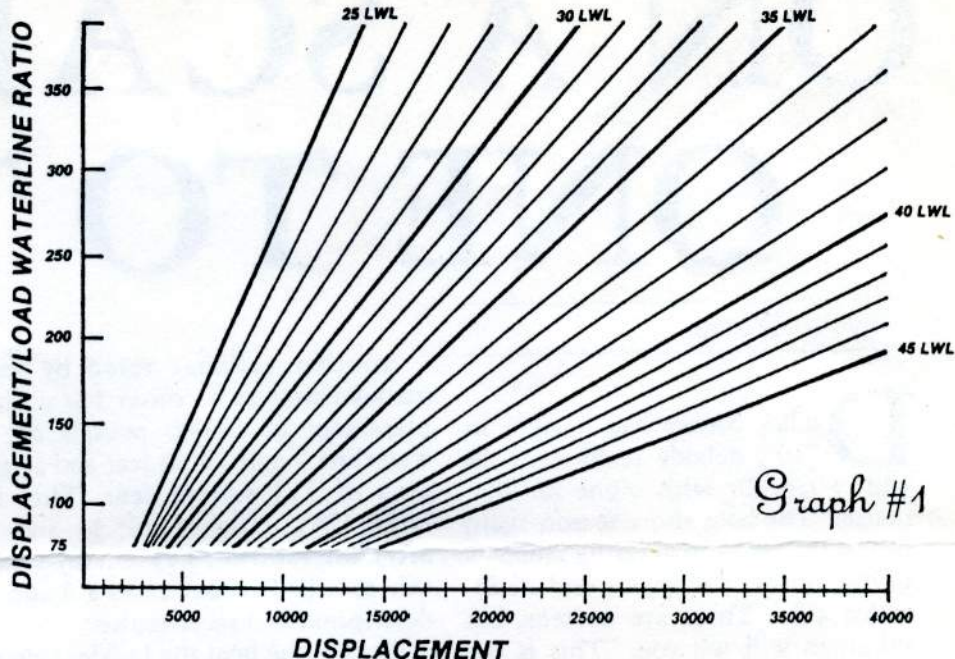
Sales literature generally gives you some numbers, solid ones such as length of water line (LWL) and the displacement (DISP). So if you carry a calculator and understand basic algebra, you tap out the displacement in pounds, divide by 2240 and have the answer in long tons. That you divide by the result of LWL times 0.1 raised to the third power. Or, if you want to skip the calculator, use the accompanying Graph I. It will approximate the DISP/LWL ratio for you with enough accuracy to give you the first of the guides to the comparisons mentioned in the opening paragraphs.

More myths have been created around the DISP/LWL ratio than almost any other. "Heavy is better... Lighter is faster... Moderate is cruiser... Don't go to sea in anything under 400... ULDB's come apart after six races." As with all black and white statements, one can argue either side on any given day.

Face it, you are the one who is going

to use the boat. If you want one with a high DISP/LWL ratio because you're nostalgic for heavy cruisers, will never go out in anything over fifteen knots of breeze and are willing to sail at four knots max, it's your money, your time and your boat. Critics can stick it in their ear for all you care. But stay out of the ULDB's because they *will* accelerate, *will* go fast in fifteen knots of breeze and *will* tend to be a handful in the middle of the Gulf of Mexico in a line squall. But you don't ever leave Galveston Bay and are tired of four knots? Then maybe you want a faster boat to beat the crowd to Redfish on Friday night. Hey, there are trade-offs.

That is what makes any one measure of a boat so difficult, there are other factors as set out above. So how do you rate those two great-looking boats? The Gee Whiz 31 has a displacement of 11,000 pounds and LWL of 24'2"; Graph I gives a DISP/LWL of about 346. The Awesome 32 dis-



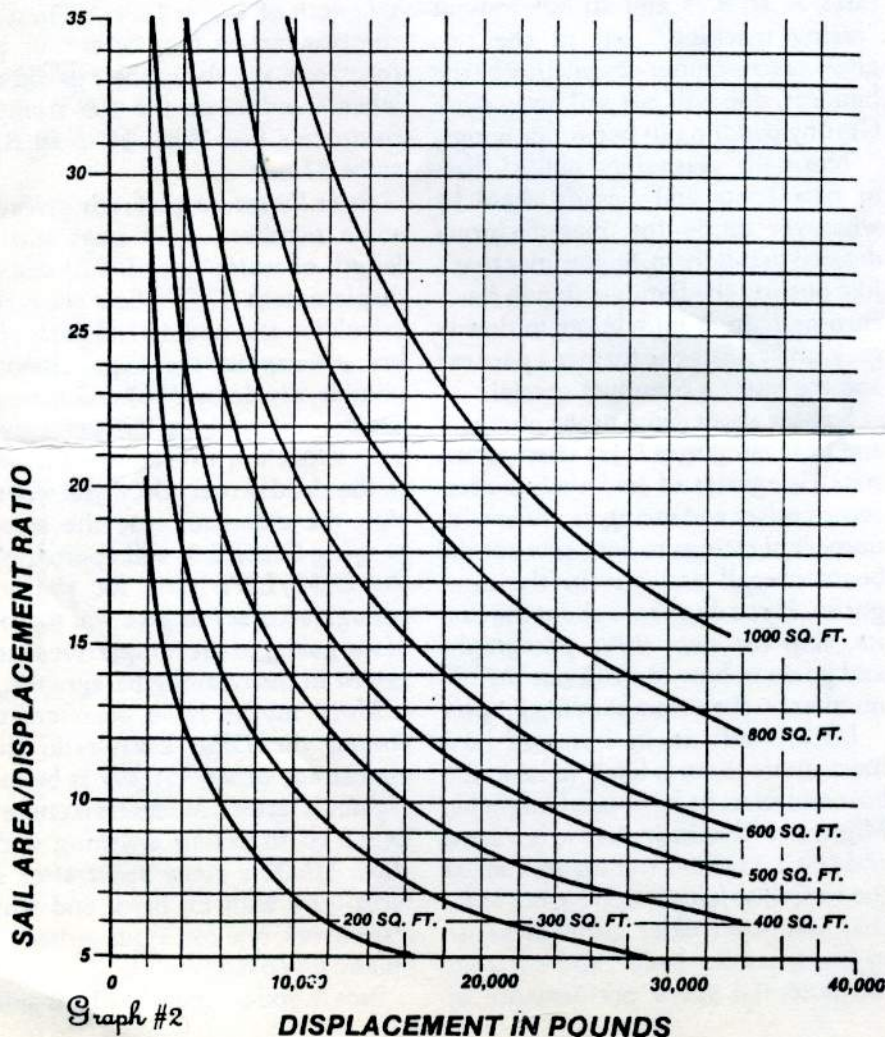
places 9,800 pounds on water line of 25' 10" and Graph I gives her about 256 for a DISP/LWL ratio. Nice numbers, but what about that compar-

ison?

Well, first we need to look at that other ratio, and that's where Graph II comes into play. With the displacement and the sail area we can find the SA/DISP ratio. One word of caution here is to use the 100 percent fore triangle, not that monster 150 or larger genoa the salesmen want us to buy with the boat. We're looking for constants in comparisons, not sails to put on the boat.

The Gee Whiz 31 has 485 square feet of sail and the Awesome 32 has 496. Plugging those numbers into Graph II, read up from displacement on the bottom scale to the line corresponding to sail area, then across to read the ratio from the lefthand scale. About 15 for the Gee Whiz and 17 for the Awesome. But they both have about the same amount of sail, so why the difference? Because of the DISP/LWL ratios, one boat is easier to drive than the other; the Awesome, with almost the same amount of sail, will be quicker off the mark and run easier in a given amount of wind than her heavier sister. The bigger the engine in the dragster of the same weight, the faster; with the same engine, the lighter the faster.

But we are still not comparing the boats with an ten scale, right? Well, now, with those two ratios we can. If you have about the same size boat, in terms of length, this scale will give you several answers in one handy



number. When comparing boats of different lengths, the scale will only give you the category and a rough idea of where it will be in relation to the other boat. For boats of the same length, generally the higher the "S" number, the lower the PHRF or IMS rating. That means for two boats of equal length, the one with the higher "S" number will take less time to cover a given distance or to travel over a given set of courses and distances.

Read the DISP/LWL ratio on the top scale of Graph III, the SA/DISP ratio on the bottom, connect the two lines and the number on the scale in the middle where the line crosses is your "S" number. Gee Whiz is about a 1.3 and the Awesome is a 2. In practical terms, the Gee Whiz is a lead sled and the Awesome is on the bottom edge of the performance envelope for cruisers, which range from 2 to 3. If a boat falls around 4 it is in the racer-cruiser category, and anything from a 5 on up is good for going as fast as possible on a clear day.

The "S" number classification scale is as follows:

< 2 — Lead Sled; 2 to 3 — Cruiser;

3 to 5 — Racer-Cruiser; > 5 — Racing Machine.

Oddly enough, the rig itself will tell you if it is going to be easy to sail or require a sizable crew. Count the winches and look at their ratings. The more winches, the bigger they are, the more people you need to run the boat. With a low "S" number, lots of big winches and triple spreaders with a hydraulic back stay, get as many people as you can in the crew and be prepared to spend the day clearing the channel. With a 2 to 3 "S" number, two small winches and a simple rig, you and the family will probably be returning in the cruiser when the lead sled is half-way out. If you see a good

middle-ground "S" number, a plain rig and a single winch, you are probably looking at the latest design in composite construction with a practical set up.

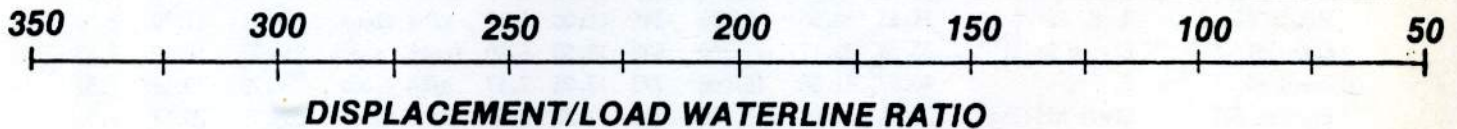
Alone in that type of racer-cruiser you'll beat the socks off the lead sled. The family types in the cruiser may give you some sport if the kids are fast and agile. With an 8 or higher "S" number, see you in Corpus Christi for the *big one* in May!

A.P. Brooks started sailing and racing in 1948. He began writing articles, fiction and technical texts under various pseudonyms in 1954 and, since early retirement from Shell Oil Company, has been a business consultant. He lives in Port Arthur and sails out of the Pleasure Island Marina.

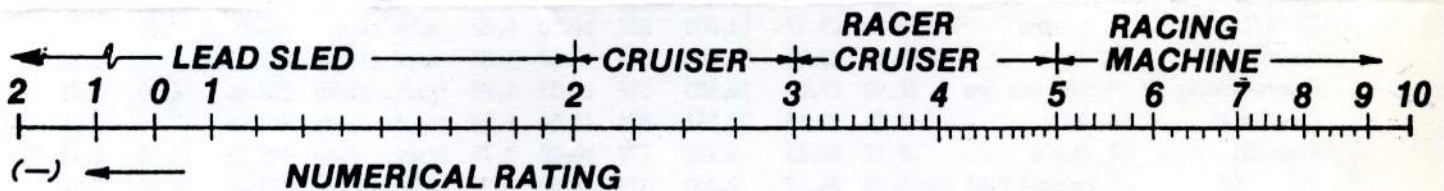
After reviewing this article, Dr. Fred Young, dean of the College of Engineering at Lamar University, advised that the "S" number may be found with a hand-held calculator by use of the following formula: $S \# = 3.972 \times 10$ to the power of $[-D/526 + .691 (1n_{10} S - 1)^{.8}]$ Where $D = \text{Displ}/\text{LWL}$ ratio and $S = \text{SA}/\text{Displ}$ ratio.

Both Dr. Young and the author stress that the "S" number is not a handicapping or rating system, but a guide to probable boat performance vs. other boats of comparable size.

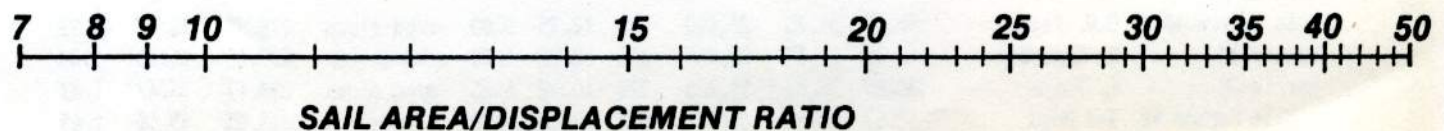
Dr. Young is also a consultant to Bethlehem Steel on offshore structures' stability. His interest in marine vessels extends to sailboats and he is currently working on modeling sailboat stability and flotation characteristics.



Graph #3



(-) ← NUMERICAL RATING



	DESIGNER	LOA	LWL	DISP	SAIL A	BEAM	DRAFT	RIG	DISP/LWL	SA/DISP	"S" #
RACING MACHINES											
Condor 30	M. Price	30.00	27.42	2,750	524	24.00	1.25	fract. sloop	59.57	42.18	9.00
Sea Wind 31	C. Williams	31.00	28.42	5,200	591	23.00	1.67	fract. sloop	101.17	31.05	6.20
AVERAGE RACING MACHINE		30.50	27.92	3,975	558	23.50	1.46		80.37	36.61	7.60
RACER CRUISERS											
X-99	N. Jeppesen	32.83	27.92	6,280	563	9.83	5.75	fract. sloop	128.85	26.06	4.90
SeaPearl 28	R. Johnson	28.00	25.75	2,742	227	8.00	1.00	cat ketch	71.69	18.31	4.90
Sovrel 39	M. Sovrel	38.42	34.75	11,783	760	12.50	7.67	fract. sloop	125.36	23.08	4.75
Sparhawk 36	R. Black	36.00	30.67	9,600	716	11.17	6.67	cat ketch	148.60	24.94	4.50
Sparhawk 42	R. Black	42.25	37.00	16,000	975	13.00	7.67	cat ketch	141.02	24.12	4.45
Herreshoff 28	H. C. Herreshoff	27.83	25.00	4,500	358	9.33	3.92	cat ketch	128.57	20.72	4.17
J33	R. Johnstone	33.50	28.00	7,500	560	10.33	6.08	m/hd sloop	152.52	23.02	4.12
J34c	R. Johnstone	34.50	30.00	10,000	712	11.08	4.92	m/hd sloop	165.34	24.13	4.01
Herreshoff 40	H. C. Herreshoff	39.83	35.50	13,000	618	12.50	4.50	cat ketch	129.72	17.57	3.79
Herreshoff 33	H. C. Herreshoff	33.00	29.42	9,086	577	10.83	4.00	cat ketch	159.35	20.85	3.74
Sundream 28	Tony Castro	29.50	24.58	5,956	475	10.33	5.42	m/hd sloop	178.97	22.78	3.62
X-372 Sport	N. Jeppesen	36.33	29.50	10,800	746	11.75	6.60	fract. sloop	187.81	24.02	3.61
Reliance 12	S. Killing	39.33	29.50	8,900	488	8.33	6.00	fract. sloop	154.77	17.88	3.41
X452	N. Jeppesen	44.25	35.33	19,730	1,009	13.92	6.17	m/hd sloop	199.68	21.69	3.14
X-372 Prestige	N. Jeppesen	36.33	29.50	11,243	647	11.75	6.50	m/hd sloop	195.51	20.27	3.09
Jeanneau 40	G. Ribadeau-Dumas	40.58	33.42	17,160	874	13.33	5.42	m/hd sloop	205.30	20.63	3.01
AVERAGE RACER CRUISER		35.78	30.36	10,268	644	11.12	5.52		154.57	21.88	3.95
CRUISERS											
Laguna 33	S. Turner	32.92	27.50	9,590	577	10.67	4.00	fract. sloop	205.86	20.11	2.96
Elite 426	Ed Dubois	42.25	33.50	19,800	1,118	13.75	5.08	m/hd sloop	235.12	23.98	2.94
LM Mermaid 380	B. Andersen	37.00	31.83	14,330	678	11.92	5.58	m/hd sloop	198.31	18.06	2.91
Moorings 432	P. Briand	42.83	37.00	19,800	730	13.83	5.33	m/hd sloop	174.51	15.66	2.81
Elite 286	G. Vaton	29.33	23.42	5,511	350	10.00	5.50	m/hd sloop	191.61	17.68	2.79
Mirage 38	P. Harle	38.00	32.83	15,000	662	12.42	6.17	m/hd sloop	189.19	17.10	2.78
Newport 31	Capital Yachts	31.17	27.00	8,500	446	10.75	5.17	m/hd sloop	192.79	16.86	2.71
Com-Pac 27	B. Johnson	29.58	24.25	6,000	328	9.50	3.50	m/hd sloop	187.83	15.66	2.68
South Pacific 42	R. H. Perry	41.92	34.17	18,500	785	13.25	5.67	m/hd cutter	207.07	17.62	2.62
Nordic 34	R. H. Perry	34.33	28.00	10,656	545	11.00	6.17	m/hd sloop	216.71	17.70	2.56
Finn 381	Elvind Still	38.00	31.17	14,700	692	12.50	6.60	fract. sloop	216.77	18.12	2.55
Frers 40	G. Frers	40.67	31.58	16,000	773	13.08	7.17	m/hd sloop	226.72	19.12	2.51
Express 35T	Steve Killing	35.08	29.00	13,100	713	11.50	6.67	m/hd sloop	239.79	20.17	2.51
Nordic 40SE	R. H. Perry	39.75	32.50	18,000	756	12.42	5.50	m/hd sloop	234.09	17.28	2.48
Tartan 31	T. Jackett	31.33	26.00	9,030	506	10.92	6.00	m/hd sloop	229.36	18.36	2.46
O'Day 40 MK II	R. H. Perry	39.58	33.50	18,500	701	12.67	4.92	m/hd sloop	219.68	15.73	2.45
Nonsuch 33	M. Ellis Design	33.42	31.42	15,350	669	12.50	5.33	catboat	220.92	17.02	2.45
Endeavour 34	T. Castro	33.58	27.50	11,000	540	11.50	4.50	m/hd sloop	236.13	17.17	2.45
Cardinal 46 MkII	A. Warnick	46.42	38.08	27,478	961	13.17	6.00	m/hd sloop	222.09	16.55	2.44
CS Merlin 36	T. Castro	36.25	29.17	13,000	605	11.50	6.25	m/hd sloop	233.90	17.20	2.37
Contest 46	D. Zaal	46.42	38.92	29,540	930	13.67	5.58	m/hd sloop	223.75	15.26	2.31
Free-standing 32	Hunter Des Grp	32.00	27.00	10,400	512	11.33	4.25	fract. sloop	235.88	16.90	2.31
Freedom 42	G. Mull	42.50	34.42	22,563	874	13.50	6.50	fract. sloop	247.08	17.17	2.21
Etap 28i	P. Harle	28.17	23.83	5,732	272	10.25	3.75	fract. sloop	189.02	13.39	2.19
O'Day 302	C. Raymond Hunt Asc	29.58	24.17	7,200	374	10.00	3.92	m/hd sloop	227.64	15.80	2.18
Sabre 40	Sabre Des. Team	38.67	31.42	16,900	714	12.33	6.50	m/hd sloop	243.31	17.03	2.17
Ericson 32-200	B. King	32.50	25.83	9,800	496	10.83	4.33	fract. sloop	253.77	17.04	2.14
Cal 39	C.R. Hunt Assoc	39.00	31.67	18,000	750	12.58	7.00	m/hd sloop	253.06	17.15	2.11
Taswell 43	D. Pedrick	43.42	34.00	23,000	937	13.00	6.00	m/hd sloop	261.24	18.18	2.09
Tayana 47	R.H. Perry	47.00	40.25	35,000	995	14.50	6.00	m/hd cutter	239.62	14.57	2.01
Caliber 38	M. McCreay	38.00	32.00	18,500	700	12.67	4.50	m/hd sloop	252.04	15.71	2.00
AVERAGE CRUISER		37.11	30.74	15,499	667	12.05	5.47		222.74	17.27	2.46
LEAD SLEDS											
Able Custom 40 Mk	C.W. Paine	40.17	31.75	20,000	773	12.75	5.00	m/hd sloop	278.97	16.47	1.92
Kanter 42	D. Empacher	42.00	34.17	25,000	828	12.92	4.50	m/hd cutter	279.82	15.19	1.89
Morris 32	C. Paine	32.25	25.83	11,225	525	10.42	4.25	m/hd sloop	290.67	16.47	1.87
Little Harbor 42	Ted Hood	42.67	34.42	28,450	895	13.08	4.58	m/hd sloop	311.55	15.06	1.69
Saturna 33	W. Garden	33.00	26.75	13,500	547	10.33	5.00	m/hd sloop	314.86	15.16	1.68
Sequin 49	Ted Hood	49.00	38.25	41,200	1,286	15.50	3.83	m/hd cutter	328.67	16.88	1.63
Nauticat 35	Sitala Ychts OY	34.92	29.67	16,500	575	11.33	5.58	m/hd cutter	282.14	13.93	1.49