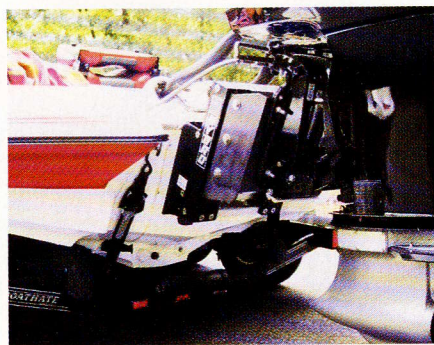


**TABLE 3**  
Pounds of Thrust at Propshaft  
For Outboard Applications

Engine HP	Calculated Maximum Pounds of Thrust
125 hp	1130
150 hp	1356
175 hp	1582
200 hp	1808
225 hp	2034
250 hp	2260

steel bolts and nuts are equal in strength and clamp-loading ability to Grade 5 fasteners. Table No. 5 lists the differences in bolt grades and thread pitch. It also shows significant differences between grades 2 through 8. At least one boat builder (Allison) is now installing the larger and much stronger stainless 9/16x18-inch-pitch fasteners in the top holes.

While Grade 8 fasteners are not available in stainless, the cadmium (gold color) coating has held up well in all of my applications. Be sure to use comparable washers and nuts of the same grade when installing any of these



▲ *Both of these rigs have had their setups fine-tuned by adding additional setback to their outboards' mounting locations. The additional setback changes the balance between the boat and outboard, allowing the optimum angle of attack and thrust application for maximum top speed. Both boats regularly post GPS speeds in excess of 90 mph with stock power.*

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**TABLE 4**  
Pounds of Force Applied to Transom Surface  
Using Maximum Calculated Thrust from 20-Inch Outboard (TABLE 3)

Propshaft Thrust	125 HP 1130 lbs.	150 HP 1356 lbs.	175 HP 1582 lbs.	200 HP 1808 lbs.	225 HP 2034 lbs.	250 HP 2260 lbs.
Setback						
0"	2420	2904	3388	3872	4356	4840
4"	2533	3040	3546	4053	4560	5066
6"	2608	3130	3652	4173	4695	5217
8"	2693	3232	3770	4309	4848	5386
10"	2787	3345	3902	4460	5017	5575
12"	2900	3616	4219	4821	5221	6027
14"	3013	3616	4219	4821	5424	6027

“high performance” fasteners. On the 1/2-inch and 9/16-inch bolts used to attach my outboard and its brackets, I like to use a torque wrench set to 50 to 55 lbs./ft. I always install self-locking nuts that are checked once a week for tightness. This inspection extends to all steering fasteners and fluids.

Table No. 1 lists the dry weights of several 1999 and 2000 model year outboards and can be used as a reference to find your engine's approximate weight.

Table No. 2 contains the calculated force on a boat's transom surface using a 400-pound outboard and several setback variations. Forces were also calculated using a 2-inch deflection (pothole or speed bump.) of the engine's position as it is carried on the trailer at speeds of both 30 and 60 miles per hour. The force of gravity would cause an unsupported object to fall (accelerate) at the rate of 32 feet per second/per second. Using this, we can calculate the amount of force an outboard weighing 400 pounds would generate when deflecting 2 inches in the distance of 2 feet at the previously mentioned speeds.

Higher speeds, stiffer springs, or larger deflections (bumps, potholes) will of course cause increased amounts of force. One rea-

son that shocks aren't installed on boat's trailers is that they would slow the trailer springs' reaction time, causing greater deflection of the boat and everything attached to it. When traveling on rough roads or at high speed, remember the outboard's weight and the effect that leverage has on the amount of force applied to the transom.

Tables No. 3 and No. 4 illustrate the calculated force on a boat's transom surface using the thrust values for several horsepower models using a 20-inch-shaft length and different setback variations. Remember these thrust calculations are approximate, propeller design and pitch do change the rpm range and amounts of thrust produced during acceleration and full throttle operation. The unfortunate striking of an underwater object or a trailering accident can impart far greater stress than those listed here. Have all hardware, brackets, steering-system components and the boat's transom area checked thoroughly before returning the boat to service if such an accident occurs.

For those owners seeking maximum speed from their boats, proper setback and setup are the secrets to one boat out performing the other when all else looks equal. Take your time, use the right hardware and have fun. **B&WB**

**TABLE 5**  
Common Outboard Mounting Bolt Strength  
SAE Grades 2, 5 and 8

Bolt Grade	Tensile Strength Minimum psi	1/2x13-Inch Pitch	1/2x20-Inch Pitch	9/16x18-Inch Pitch
		Clamp Load (lbs.)	Clamp Load (lbs.)	Clamp Load (lbs.)
2	74,000	5850	6600	8400
5	120,000	9000	10,250	13,000
8	150,000	12,750	14,375	18,250

\*Note: Stainless bolts and nuts perform to Grade 5 standards in most applications  
Grade 2 —Low Carbon Steel  
Grade 5 —Medium carbon steel, quenched and tempered  
Grade 8 —Medium carbon alloy steel, quenched and tempered