

Prop Shop

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Three parts to proper performance

Don't forget about the propeller when it comes to overall boat performance (remember... without it, you go nowhere). It's one of the three major performance components of a boat package.

Boat



Engine



Propeller



The propeller is perhaps the hardest working single piece of equipment on your boat, but it's many times taken for granted, and often overlooked when diagnosing a performance issue. For your boat to perform effectively, the prop you use must be the right one for the job and it must be kept in good condition ([see Prop Shop, Volume 2, Edition 1](#)).

What's news?

- Three parts to proper performance
- Know the effects
- Testing propellers
- Over and out?
- Reconditioned propellers

Know the effects

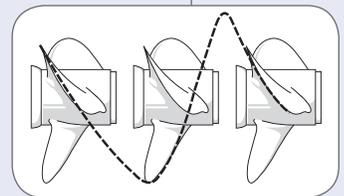
We all know a few basic propeller buzz words. But do you know what they actually mean, or what manipulating them does for boat performance? The impact can be huge. Let's take a deeper look into a few of the more common ones.



➤ pitch

definition: pitch is the distance (in inches) a particular prop would theoretically travel in one full revolution, as if traveling through a solid.

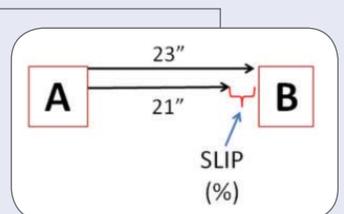
effect: a lower pitch will have quicker acceleration and "pushing power" but a lower top speed, while a higher pitch prop provides a potential for higher top speed but with slower acceleration. The correct propeller will allow your engine to reach the upper portion of the wide-open throttle (WOT) range specified by the manufacturer with a normal-to-heavy load, without exceeding it. Each inch of pitch is equal to approximately 150 +/- 50 rpm, so adjusting the pitch adjusts the WOT rpm.



➤ slip

definition: slip is the amount of "wasted" energy a particular prop generates, meaning that the actual distance traveled in one full propeller revolution is less than its pitch measurement. It is normally expressed as a "percentage of inefficiency." As an example, a 23" pitch with nearly 9% slip means the prop actually moves the boat about 21".

effect: a certain amount of slip is engineered into each line of propellers to create different performance characteristics. Slip can be beneficial, such as helping two stroke outboards quickly hit their power band at hole shot. Other props and boats perform best when slip is minimized.



(continued on next page)

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➤ Know the effects | continued



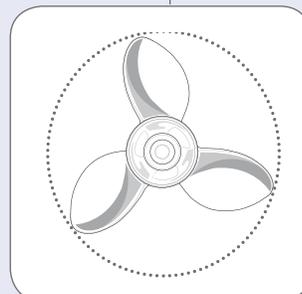
➤ diameter

definition: diameter is the total width of the “circle” at the blade tips as the propeller spins.

effect: a larger diameter pushes more water and reaches deeper into the water, so they're typically used on large, heavy boats or ones with high engine-mounting heights.

A smaller diameter is usually used on lighter-weight boats, where the prop operates lower in the water or when a gain in engine RPM is desired.

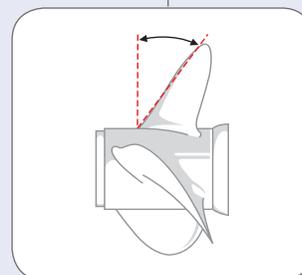
Proper diameter is determined by the propeller's design and intended application.



➤ rake

definition: rake is the angle of the blades in relation to the propeller's barrel, or center, and is expressed in degrees.

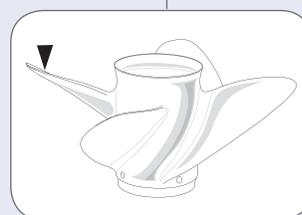
effect: a high-rake propeller is best-suited for high engine-mount applications by helping reduce ventilation and increasing bow lift. Too much rake, however, strains the engine; decreases hole shot, and generally results in poor performance. A propeller with a low rake angle will cause less strain on the engine, resulting in potentially better hole shot and higher WOT operating RPM.



➤ cup

definition: cup is the small curved lip on the blade tip and/or trailing edge.

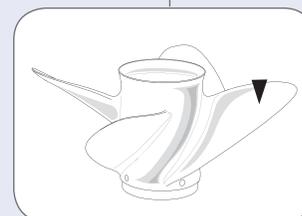
effect: used in proper amounts, cup helps reduce ventilation and propeller slip, allowing for higher mounting heights and greater bow lift. Too much cup, however, will cause excessive steering torque and bow lift and limit the engine's ability to develop and maintain proper RPM.



➤ blade surface area

definition: blade surface area refers to the total surface of the blades.

effect: the more blade surface area a prop has the more water it pushes, for better “hole shot” and increased planing efficiency. Having too much blade surface area for the application can create significantly more drag, however, potentially restricting engine RPM and causing negative boat-handling issues.



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Testing propellers

OK – so you've followed the procedure we've outlined on our website on how to pick a prop and you've narrowed the field down to two or three likely candidates. You also know that on-water testing is the way to truly decide which propeller is best, but how will you accurately compare them?

When it comes to evaluating propellers, it's important for each prop under consideration to be tested using the same criteria. To help you in this effort, Yamaha offers a simple test form which guides you through the proper testing procedure.

Known simply as the Propeller Performance Evaluation form, it requests and records test information and results, so that the data from each test can be accurately compared afterward.

This, in conjunction with your personal assessment of how the propeller 'feels' when on the water, will clearly demonstrate the winner.



Test details

- prop information
- boat information
- test conditions/variables

Test results

- upwind/up current
- downwind/down current
- WOT data*
- minimum planing data
- ventilation record

*WOT refers to testing at wide-open throttle with the engine(s) trimmed out for maximum speed.

CUSTOMER INFORMATION		DEALER INFORMATION					
NAME		DEALER COMPANY					
ADDRESS		DEALER NAME					
CITY	STATE ZIP	ADDRESS					
PHONE		CITY	STATE ZIP				
E-MAIL		PHONE	E-MAIL				
TEST INFORMATION							
DATE	PROP TESTED	DIAMETER	PITCH				
CRAFT		CONSIDERATIONS		CONDITIONS			
BOAT BRAND:		# OF PERSONS ABOARD:		TEST LOCATION:			
BOAT MODEL:		ESTIMATED WEIGHT:		AIR TEMP:			
BOAT LENGTH/BEAM:		PERSONS: CARRIED GEAR:		WIND SPEED:			
BOAT WEIGHT (PUBLISHED):		ENGINE MOUNTING HOLE: 1 2 3 4		CURRENT SPEED:			
# OF ENGL: 1 2 3 4	ENG. BRAND:	% FULL OF FUEL:		WATER CONDITIONS: (CIRCLE ONE) SLICK RIPPLED MODERATE CHOP ROUGH/WHITE CAPPED			
ENG. MODEL/HP:		# OF BATTERIES: 1 2 3 4	GROUP #:	WAVE HEIGHT:			
MAX HP:	FUEL CAP:	T-TOP: Y / N	GENERATOR: Y / N	A/C: Y / N			
TEST RESULTS							
UPWIND/AGAINST CURRENT			AVERAGE		DOWNWIND/WITH CURRENT		
RPM	MPH	GPH	MPH	GPH	RPM	MPH	GPH
3500					3500		
4000					4000		
4500					4500		
5000					5000		
5500					5500		
WOT _____ rpm					WOT _____ rpm		
ACCELERATION TESTS (CHOOSE TWO) Seconds to Plane / 0-20 mph / 0-30 mph				WIDE OPEN THROTTLE DATA		MINIMUM PLANING DATA	
RUN #	UPWIND/AGAINST CURRENT	RUN #	DOWNWIND/WITH CURRENT	RPM		RPM	
1	/	2	/	MPH		MPH	
3	/	4	/	GPH		GPH	
5	/	6	/				
AVERAGE	/	AVERAGE	/				
VENTILATION							
Possible Responses: (CIRCLE ONE) None Light Moderate Severe							
TRIM IN				TRIM OUT			
ACCELERATION	N L M S	CRUISE	N L M S	ACCELERATION	N L M S	CRUISE	N L M S
WIDE OPEN	N L M S	URNS	N L M S	WIDE OPEN	N L M S	URNS	N L M S
YAMAHA DEALER USE							
PROPELLER SLIP %:		MOUNTING CENTERS (MEASURED):		TOE SETTING		<input type="checkbox"/> IN <input type="checkbox"/> OUT	
COMMENTS:							
PROPELLER RECOMMENDATIONS:							
NEXT ACTION:							

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Over and out?



If your boating season is winding down, and/or you're about ready to lay up your boat for a while, now is the ideal time to evaluate your propeller and make any necessary changes or upgrades.

Perform a thorough evaluation of your prop's condition. If there's any damage, such as nicks, cuts, or bent blades, have the propeller evaluated for possible repair. If necessary, replace it.

Also, take the time to evaluate the engine's lower unit and its seals for any damage. If found, now's the time to get it repaired or replaced.

Not comfortable with doing these inspections yourself? Perhaps you need a new Yamaha propeller for next season, or your current one repaired? What about a spare prop? Your Yamaha Marine dealer can help. Locate one convenient to you at yamahaoutboards.com, or on our Yamaha mobile app.

You'll also find more helpful information here:

<http://yamahaoutboards.com/care-and-maintenance/maintenance-matters>.

The time to think about your prop is now, not when you're ready to go boating next spring!

> Reconditioned propellers

When a propeller is worn out or damaged, particularly an expensive one, having it reconditioned by a reputable propeller repair shop may represent a cost effective option. Obviously, the amount of work required to do that (and the cost) is in direct relation to the amount of the damage.



In some cases, though, despite the level of skill of the repair shop or the technician, the level of performance obtained from a re-conditioned prop may not be what it once was. This can either be immediately apparent, or it may develop over time.

But don't despair, there's a silver lining here.

A smart boater always carries a spare propeller. If you have a reconditioned prop that doesn't quite measure up performance-wise, carry it as a spare. It's the get-home capability you'll wish you had if, and when, you need it and don't have it. Then, see your Yamaha Marine dealer for a new Yamaha prop that's just right for your particular situation.

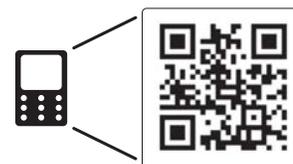
With a new prop installed and a fully-reconditioned spare on board, you'll have both peak propeller performance and peace of mind.

That's smart boating.



If you'd like more information about which Yamaha propeller is right for your needs, contact your local authorized Yamaha Marine Dealer at yamaha-motor.com/outboard/dealers/dealerhome/home.aspx

For short videos on Yamaha propellers; including proper installation, maintenance, and more; scan this symbol using your smart phone or tablet.



Message and data rates may apply.
May not be available on all devices.

Also, please join us on Facebook at facebook.com/yamahaoutboards
We'll be happy to help you get pointed in the right direction.

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