SERVICE BULLETIN

MERCURY OUTBOARDS

Number: 78-7
Date : 11/23/77

CIRCULATE TO:	SERVICE MGR.	PARTS MGR.	MECHANICS	Place in Your "Service Bulletins" Binder

ENGINE PERFORMANCE

(Attach Service Bulletin Sticker to P. 1A-8 of Your Service Manual.)

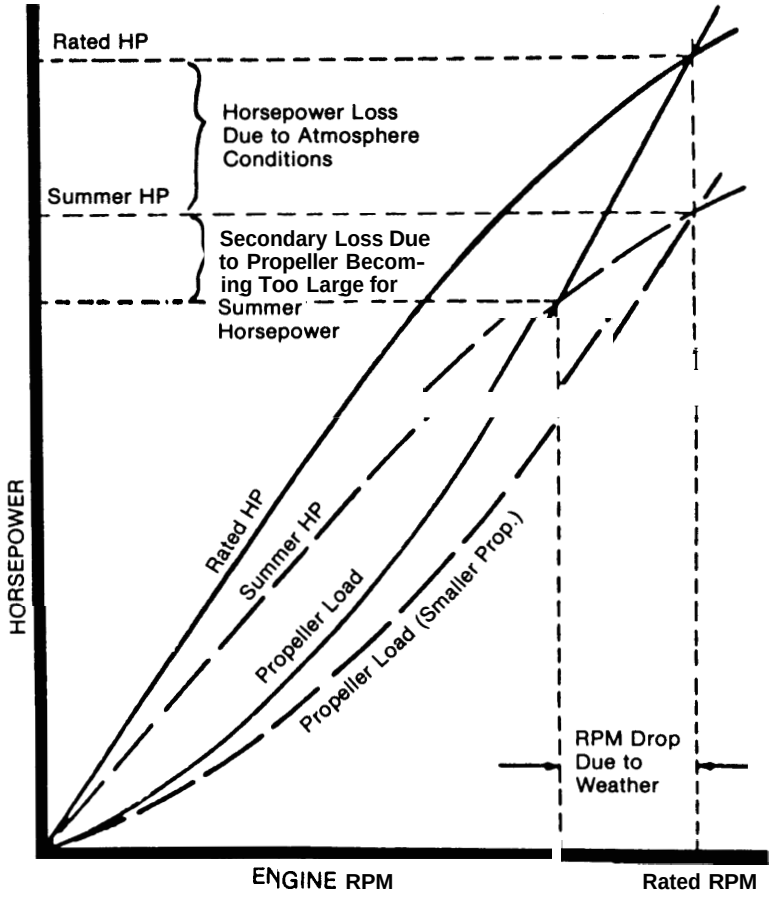
How Weather Affects Engine Performance

It is a known fact that weather conditions exert a profound effect on power output of internal combustion engines. Therefore, established horsepower ratings refer to the power that the engine will produce at its rated RPM under a specific combination of weather conditions.

The Engine Test Code of the Society of Automotive Engineers (SAE) standardizes the computation of horsepower from data obtained on the dynamometer, correcting all values to the power that the engine will produce at sea level in dry air at 60°F (16°C) temperature and a barometric pressure of 29.92 inches of mercury.

Summer conditions of high temperature, low barometric pressure and high humidity all combine to reduce the engine power. This, in turn, is reflected in decreased boat speeds--as much as 2 or 3 miles-per-hour in some cases. (Refer to chart, below.) Nothing will regain this speed for the boater, but the coming of cool, dry weather.

In pointing out the practical consequences of weather effects, an engine--running on a hot, humid summer day--may encounter a loss of as much as 14% of the horsepower it would produce on a dry, brisk spring or fall day. The horsepower, that any internal combustion engine produces, depends upon the density of the air which it consumes and, in turn, this density is dependent upon the temperature of the air, its barometric pressure and water vapor (or humidity) content.



Accompanying this weather-inspired loss of power is a second but more subtle loss. At rigging time in early spring, the engine was equipped with a propeller that allowed the engine to turn within its recommended RPM range at full throttle. With the coming of the summer weather and the consequent drop in available horsepower, this propeller will, in effect, become too large. Consequently, the engine operates at less than its recommended RPM.

Due to the horsepower/RPM characteristics of an engine, this will result in further loss of horsepower at the propeller with another decrease in boat speed. This secondary loss, however, can be regained by switching to a smaller pitch propeller that allows the engine to again run at recommended RPM.

For boaters to realize optimum engine performance under changing weather conditions, it is essential that the engine be propped to allow it to operate at or near the top end of the recommended maximum RPM range at wide-open-throttle.

Not only does this allow the engine to develop full power, but equally important is the fact that the engine also will be operating in an RPM range that discourages damaging detonation. This, of course, enhances overall reliability and durability of the engine.

Detonation: Causes and Prevention

Detonation in a 2-cycle engine somewhat resembles the "pinging" heard in an automobile engine. It can be otherwise described as a tin-like "rattling" or "plinking" sound.

Detonation generally is thought of as spontaneous ignition, but it is best described as a noisy explosion in an unburned portion of the fuel/air charge after the spark plug has fired. Detonation creates severe, untimely shock waves in the engine, and these shock waves often find or create a weakness: The dome of a piston - the cylinder head gasket - piston rings or piston ring lands.

While there are many causes for detonation in a 2-cycle engine, emphasis is placed on those causes which are most common in marine 2-cycle application. A few, which are not commonly understood, are:

1. **Over-advanced ignition timing.**
2. **Use of low octane gasoline.**
3. **Propeller pitch too high (engine RPM below recommended maximum range).**
4. **Lean fuel mixture at or near wide-open-throttle.**
5. **Spark plugs (heat range too hot - incorrect reach - cross-firing).**
6. **Inadequate engine cooling (deteriorated cooling system).**
7. **Combustion chamber/piston deposits (result in higher compression ratio).**

If an impression exists, that 2-cycle engines are very complicated and complex, NOT SO. Two-cycle marine engines are, pound-for-pound, still one of the most dependable and easiest-to-service power packages. Generally, when they are operated on the correct diet of fuel and oil, with specified ignition timing and setup to turn at the recommended RPM at wide-open-throttle, they will provide countless hours of trouble-free operation.

Detonation usually can be prevented, provided that 1) the engine is correctly set up and 2) diligent maintenance is applied to combat the detonation causes, listed, preceding. The following information (Tune-up Specification Chart - Gasoline Recommendations - Propeller Selection) is intended as a quick reference to aid in proper setup and maintenance.