



Serial Number

Break-In and Running Instructions for GPH/OBR Helicopter Edition Engines

Congratulations on your purchase of this O'Neill Brothers Racing modified Zenoah power plant!

This engine has been modified to provide higher power and lower vibration than a stock engine can provide. The end result is an engine that operates smoothly and has a much wider power band at the peak horsepower range.

This engine has been modified to operate at peak performance in the following RPM ranges:

GPH/OBR310HE	12,500-13,500 RPM, with 13,000 being the optimum performance rpm
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Use your drive ratio to calculate the head speed on your model that sets engine speed within its optimum performance range

These engines will give literally hundreds of hours of trouble-free service. In order for the engine to achieve this though, proper running and break in procedures **MUST** be utilized. Proper needle settings, oil and oil ratio must be followed.

Fuel Requirements

- This engine is designed to be operated on low octane fuels. High-octane fuels are not required or recommended.
- It is common to use alternative fuels such as VP Racing Small Engine Fuel or "camper" fuel marked under names such as Coleman, Ozark, and Crown. These fuels burn much cleaner than gasoline, have virtually no odor, provide the same power as gasoline and have long shelf lives. Needle settings are identical to those used with traditional gasoline fuel.

Break- In Oil

- Use the included break-in oil mixed at 32:1 ratio. This will be one bottle per gallon of fuel.
- The break in period on this oil will be for approximately one gallon.

Initial Needle Settings

The engine will be delivered with a Walbro WT-990 series carburetor. For initial break-in, use these mixture settings

Low Speed Needle: 1-3/8 turns open from full closed.

High Speed Needle: 1-3/4 turns open from full closed.

Fuel Filter / Filtering

Use a felt fuel clunk in the fuel tank. This will provide adequate filtering, no other filter is required.

Muffler Choice

The recommended exhaust system for this engine is the MStudio GS260 muffler. In all testing, the best performance was achieved using this muffler

Air Filter

The engine is delivered with a high flow air filter. Do not run the engine without a filter. The MA XCell air filter has also tested with good results.

Break-In Procedures

Please take the time to follow these break-in procedures for the first few hours of operation. Failure to do so may result in engine damage from overheating and/or lean operation. These are very rugged engines and will provide the best power and longevity when properly broken-in.

First Flights

- Create a low throttle curve for normal mode and avoid using idle-up. The throttle curve will most likely be very low. Example settings are 5, 15, 25, 40, 100. It is very important to keep the engine RPM low for the first tank or two.
- Start the engine and let it idle for a minute or so. Then lift the model into a low rpm hover. Make sure that the engine RPM does not exceed about 10,000 RPM. If the engine races at all, land and reset the needles (both) to a richer setting and/or reduce the throttle curve for lower settings. Remember! Keep the RPM down, this is critical.
- Fly the model for a minute or so, the goal is to get the engine hot. Land, shut down the engine and allow it to cool for at least 45 minutes. Repeat this a second time.
- Now you can fly out the rest of the tank, following the break-in procedure.

Break-in Procedure

- All settings listed are for use with the WT-990 carburetor
- Needles are not adjusted unless necessary until end of gallon 2
- As Head Speed is increased, it naturally leans the fuel/air mixture and slowly increases heat. Adjust throttle trim as necessary for proper idle.

Richen the needles a bit when switching to the fully synthetic oil fuel on the second gallon. The engine may run a bit rough while it gets used to the new fuel, don't worry! The next tank of fuel will again run smooth. This is the process of the engine "pickling" with the new oil and doing a small break-in adjustment.

Suggested Break-in Process		
1st Gallon	Settings	Flight Style
After First Flights	Max 10,000 Engine RPM	ONLY easy upright flight
25-48 oz	75% 10,000 RPM, 25% 11,200 RPM	ONLY easy upright flight
48-72 oz	50% 10,000 RPM, 50% 11,200 RPM	Very gentle loops and rolls
72-96 oz	75% 10,000 RPM, 25% 12,600 RPM	Full collective for 10 seconds at a time is OK
96-128 oz	50% 10,000 RPM, 50% 12,600 RPM	Full collective for 10 seconds at a time is OK
2nd Gallon - Switch to Synthetic oil	Low needle at 1 3/16, Hi at 1 3/4	Cool at lower RPM if engine power ever decreases at higher RPM
0-64 oz	50% 11,200 RPM, 50% 12,600 RPM	Slowly increase time at full collective
64-96 oz	25% 11,200 RPM, 75% 12,600 RPM	Slowly increase time at full collective
96-128 oz	10% 11,200 RPM, 90% 12,600 RPM	Easy tic-tocs, easy hurricanes, etc. No sustained full collective
3rd Gallon	Low needle at 1 1/8, Hi 1 1/2-1 5/8)	Work into max RPM and longer times at full collective, cool at lower RPM
	Cycle between max desired RPM, cool at 11,200 RPM	
	Increase % time at max RPM	
	Adjust hi needle after 32 oz	

Oil Recommendations

Recommended Oils are:

- Amsoil – Saber 100
- Redline 2T
- Motul 800 2T

Other Tested Oils

- Stihl Ultra
- Klotz with Techniplate (two-cycle pre-mix (no castor!))
- Yamalube 2R
- Honda HP2 two-cycle pre-mix

NEVER use oil intended for injection systems. These oils will damage the engine in short order! Suggested mix ratio is 36:1. Avoid oils intended for marine or outboard use. These oils tend to result in a higher exhaust residue which can clog the exhaust system

Normal Running

After the break in process is complete the setting may be leaner for proper running for peak power and smoothness.

- Most Gear ratios will hover on the low needle depending on the head speed. The high needle will be used more for wide-open throttle on these gear ratios.
- Always run both needles as rich as possible for satisfactory results. Always error to the rich side on both needles as being slightly too rich will not damage the engine, being too lean can cause engine damage.

Remember! Keep the needles on the rich side and keep adding load to the engine each flight. It is now time to try some aerobatics and listen to the engine for any complaints! If at any time you hear what sounds like a boom support rattling or a low buzzing sound, land and richen the needles immediately! This is detonation and the engine is getting hot.

You will find that both performance and vibration levels will improve for as much as 3-5 gallons of fuel.

Power Delivery

Use this graph to help you setup your throttle and pitch curves on your helicopter. There is a fairly broad range within which you will get good performance results. Typically you want to set your maximum RPM just slightly higher than where peak power is produced so that the engine will load into max power.

