

ADDENDUM TO INSTRUCTIONS FOR ZENOAH KG-22 GASOLINE ENGINES USED IN HELICOPTERS

I cannot stress strongly enough how important proper set-up of your helicopter is to achieving maximum performance from your modified engine. The throttle must *always* lead the collective inputs. Set up the mechanical linkage as follows, and then fine tune with your radio's throttle and pitch curves.

Use a *long* servo arm on your throttle servo and a *short* arm on the carburetor throttle shaft. This will ensure that any movement of the throttle servo results in an amplified movement of the throttle plate opening. This is necessary because these gasoline engines do not accelerate as fast as glow motors; partially because of gasoline being the fuel and partially because the massive flywheel used on the Zenoahs has a lot of inertia, i.e. it offers lot of resistance to speed changes.

Some more notes on Break-in: Zenoah has recently changed the metallurgy of their piston rings and/or cylinder plating materials. The result is it takes even longer for the piston rings to seat (break-in) than before. *To speed up the break-in process*, run a higher than normal head speed at a lower than normal pitch. This results in high engine speeds with low loading.

Don't be afraid to rev these motors! Their power curves peak at between 10000 rpms and 12000 rpms.

Cooling: These engines need adequate cooling to perform properly. Whatever brand of helicopter you have, ensure that the fan shroud is as close to the *top* of the fan blades as possible.

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360 6990

This engine has been expertly blueprinted and modified. The modifications performed on this engine produce considerable power gains along with increased reliability and longevity over a stock unit. To maximize the performance of your engine, please follow these few simple suggestions:

BREAK-IN:

Please remember, this is still a new engine which will need to be broken-in properly. Break-in can be considered the final step in blueprinting your engine; a step which only you control and a step that if performed slowly and carefully, will further enhance the performance of your engine.

Important: As an aid to break-in, for the first gallon of gas/oil mix only: Add five (5) ounces of oil to one (1) gallon of gasoline for approximately a 25:1 ratio.

* Perform the break-in slowly...resist the urge to lean the mixture for peak power prematurely. Be patient!

Note: All used engines that have had new piston rings installed will need to be re-broken-in.

* The Zenoah engines take a **very long time to break-in**. After about two gallons of gas has been burned, the engine can be considered broken-in. During the consumption of these first two gallons, you will notice a steady increase in both power and smoothness.

The long break-in period is due to the type of engine construction employed by Zenoah. Cast iron piston rings are utilized which ride on a chrome plated cylinder bore...very durable!

INSTALLATION:

Install the engine in the helicopter as per the kit manufacturers instructions. Following are specific instructions for installing the carburetor/insulator/air filter, muffler, and electronic ignition module.

Carburetor Insulator: Very carefully clean the gasket sealing surfaces of the engine intake port and the insulator block of any oil or grease using acetone or alcohol. Also, clean the insulator retaining screws. Spread a very thin coating of red high temperature silicone RTV sealer on the sealing surfaces of both the intake port and the corresponding surface of the insulator block. VERY IMPORTANT...ensure that the small bypass hole in the insulator block gasket will not be blocked with excess RTV when the insulator block is attached to the engine. Now attach the block with its screws using RED loctite on the threads. Tighten the screws securely, but not excessively. Over tightening these screws will cause the insulator to warp when hot, thus creating an air leak.

Carburetor/Air filter: Clean the sealing surfaces of the carburetor of any oil or grease. As above, spread the RTV on both the carburetor and insulator sealing surfaces. Again, be very careful that no excess sealer will block the small bypass hole in the gasket. This time use only BLUE loctite on the screws.

The above steps are necessary to minimize the chance of these components loosening, which creates an air leak in the intake system that can cause your engine to run erratically or stop suddenly.

Muffler: Again, clean all sealing surfaces and fasteners. Use a generous amount of RTV on a new gasket and RED loctite on the retaining bolts. Note: Sometimes, even with using red loctite, these muffler bolts will vibrate loose continually. If this happens with your engine, use 5mm nuts on the backside of the exhaust port to retain the bolts.

Electronic Ignition Module: I have installed electronic ignition on your engine. This type of ignition system is far superior to the originally equipped breaker points. Electronic ignition produces a much hotter, more consistent, and more reliable spark than breaker points. In addition, this electronic ignition advances the spark timing as the engine speed increases.

Mount the electronic module in the position shown on the included diagram. This position allows cooling air to reach the module. The module will get warm during operation. The unconnected wire, with the ring type connector, attached to the module should be grounded by bolting it to the engine cylinder head. This is best accomplished by attaching it to the frame brace that is bolted between the main frames and then is bolted to the engine cylinder head. Just put the ring connector on the bolt before screwing it through the brace and into the cylinder head. Ensure that this ground wire is making a good connection to the cylinder head as it is critical to the performance of the electronic ignition.

FUEL AND OIL RECOMMENDATIONS:

Fuel: Use any quality 93 octane unleaded gasoline. Do not use aviation gas as it will actually degrade the performance of your engine. Av gas is not blended to burn in such small, high compression engines.

Oil: Use only Lawnboy Ashless two-cycle lawnmower oil or Duralube two cycle oil for air cooled engines.

Mixture: Mix four (4) ounces of oil to each gallon of gasoline for a 32:1 gas to oil ratio. Note: As an aid to break-in, for the first gallon of fuel only, add five (5) ounces of oil.

Note: Pump gasoline is very dirty! It contains lots of minute particles that can easily foul up the jets in the Walbro carburetors. Therefore, I highly recommend that you install in your fuel storage can, (not the heli's fuel tank), on your fuel pumps pick up line, a felt type chainsaw filter/klunk assembly. These filters are readily available at any chainsaw/lawnmower repair shop. When used, you can be sure that you are always pumping clean fuel into your helicopter's fuel tank.

STARTING YOUR ENGINE:

These engines can be easily flooded, which can cause lots of starting headaches. To prevent flooding, the best technique to start a cold engine is as follows: With the throttle set at the idle position:

1. Close the choke completely
2. Pull the recoil starter twice
3. Open choke
4. Pull starter rapidly until engine starts

A hot/warm engine will not need any initial choking.

Always allow engine to warm-up for 30 seconds or more before attempting takeoff.

CARBURETOR ADJUSTMENT:

I have initially set both high and low speed needles. These settings will be very close to ideal, and may even be ideal. However, as the engine breaks-in, you may need to tweak both needles slightly. The needles on the Walbro carburetors are extremely sensitive compared to those of a glow engine carburetor. Therefore make any adjustments in increments of 1/32 to 1/16 of a turn. Also, only make carburetor adjustments after the engine has warmed up to normal operating temperature.

Note: Kalt uses the Walbro #167 carburetor on the GS Alphas and **Miniature Aircraft Gas Xcells** use the Walbro #197 carburetor. The needle settings will always be within the following ranges:

Carburetor #167 (with primer pump):

Low needle: one turn plus or minus 1/16 of a turn
High needle: one and 1/8 turn plus or minus 1/8 turn

Carburetor #197:

Low needle: one turn plus or minus 1/8 of a turn
High needle: between 7/8 turn and one plus 3/4 of a turn

The high speed needle setting on either carburetor can only be optimized via flight testing...here's how:

In a steady hover, the engine should sound steady with no "bubbling" or "four stroking". If you notice that the tail occasionally "kicks" like the engine is missing, then the high speed needle is too rich and needs to be leaned in small increments until the "kicking" in the tail rotor stops occurring. Once you have reached that point do not adjust the high speed needle any leaner...you've already found the ideal mixture. If you have any questions about carburetor adjustment, please call me.

SPARK PLUG:

I highly recommend that only the NGK-BMR-7A or NGK-BMR-6A resistor plugs be used in the modified engines. The stock Champion RCJ-8 does not perform well and tends to produce radio interference. If you need additional NGK plugs, call me as they are almost impossible to find in the U.S..

I suggest you replace the plug after every two gallons of fuel are burned. Replacing a spark plug is cheap insurance against a flame out. Even using ashless oil, any spark plug used in a two cycle engine is prone to eventual fouling.

Never remove a spark plug when the engine is hot! The spark plug is made from steel and the cylinder head is made of aluminum. Removing the plug while hot runs the risk of the two dissimilar metals "galling" thereby destroying the threads in the cylinder head. Wait until the engine has cooled before you remove the plug.

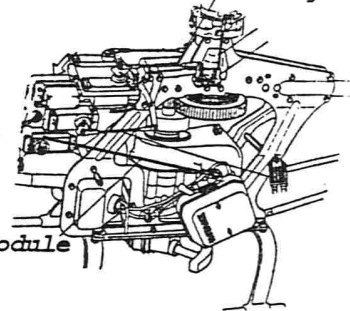
If you have some anti-seize lubricant, it's a good idea to apply a little on the spark plug threads before installation. New spark plugs should be gaped to 0.025 inches.

THROTTLE/PITCH SET-UP:

Ensure that your throttle curve definitely leads the pitch curve. This is very important because a gasoline engine transitions much slower than a glow engine. Therefore the power must "come on" before the load (pitch).

HELP

If you have any questions, feel free to call me at (703) 799-9643 any weeknight between 7 and 9:30 p.m. EST or anytime on the weekends. I have engraved a serial number on the engine crankcase just below the carburetor, please reference this number when calling as I keep records on all work performed on these engines.



Typical Mounting Location for Electronic Ignition Module

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Carburetor/Air filter: Clean the sealing surfaces of the carburetor of any oil or grease. As above, spread the RTV or sealer on both the carburetor and insulator sealing surfaces. Again, be very careful that no excess sealer will block the small bypass hole in the gasket. Use **RED** loctite on the screws.

The above steps are necessary to minimize the chance of these components loosening, which creates an air leak in the intake system that can cause your engine to run erratically or stop suddenly.

Muffler: Again, clean all sealing surfaces and fasteners. Use a generous amount of RTV on a new gasket and **RED** loctite on the retaining bolts.

Note: Sometimes, even with using red locktite, these muffler bolts will vibrate loose continually. If this happens with your engine, use 5mm nuts on the backside of the exhaust port to retain the bolts, or you may choose to drill and safety wire the bolt heads.

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