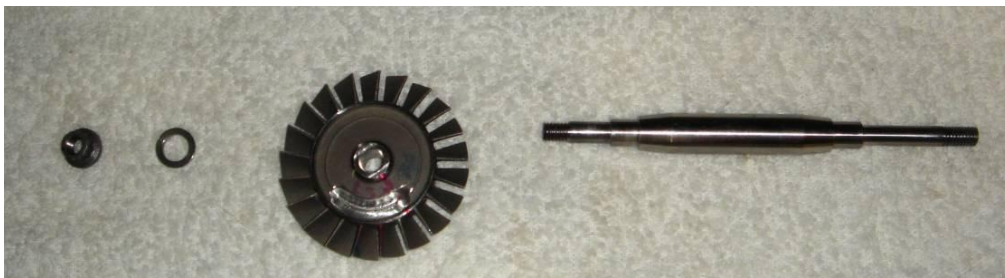


Turbine kit assembly manual

1. Lay out the diffuser the LYB bearing (the one not in the GRW package). Ensure that the “V” etched into the bearing points out away for the engine. It is a good idea to put a light drop of light machine (3&1) oil onto the bearing before assembly. Use blue semi-permanent Loctite for the 6 counter sunk bolts.



2. Assemble the shaft; first the bearing, then the v shaped spacer (narrow end of spacer interfaces with the bearing) last the turbine and then the nut. Use the GRW packaged bearing and once again the “V” on the bearing should point outward away from the motor. The nut is left handed. The machined balancing groove on the turbine should be placed toward the long part of the shaft. Do not use Loctite. Ensure that the alignment marks on the shaft and on the turbine line up.



Your assembly should look like this.



3. Carefully, slip on the combustion chamber. Align the fuel and propane line through the front diffuser there are 2 specific holes for this and they can be identified by looking at the back of the diffuser. Next, put the NGV ring into back of combustion chamber and shaft tunnel (the NGV is already in place in photo below). Then, slip the preload tube into rear of shaft tunnel. Next, slip the rotor shaft assembly into the shaft tunnel moving to the front of the motor. Move to the front of the turbine and place the "T" shaped washer on to shaft so that the narrow part is recessed down into the front diffuser.

Last, observe the alignment marks a slide the compressor onto shaft. While maintaining correct alignment and orientation of the shaft, turbine and compressor, finger tighten the compressor nut.



4. The completed assembly should like this. Next, tighten the rear nut and the compressor nut using a 12 mm socket and an 8 mm wrench (12 point, 8mm box wrench for the rear). Do not over tighten! Just tight. Double check that the marks are still closely aligned.



4. Assemble front cover with the fuel fittings provided. Notice, the front cover has 3 specific holes that the plumbing goes into, align according. The fuel/gas pipe holes will be slightly larger than the others.



5. Place the 6 black screws into the front cover. Notice the screw pattern yours should be similar to leave room for the hall-effect sensor. Use 8 black screws if your turbine is not to be fitted with hall-effect sensor. The rotor should spin freely. Press firmly forward and backwards on the shaft to ensure that the rotor is seated and as is free turn. The compressor should turn with a strong puff of air from your lungs. The rotor will free up even more after its first run. I recommend a manual start with air for the first time so that the automatic starter does not overload and the ECU. Damage to the ECU may occur if there is too much starter motor resistance. Use an external air source such as leaf blower or air compressor. After, initial running, the heat, and fuel will cause the rotor bearings to seat themselves and the turbine will be freer. Then it will be ready for full auto function if desired.



6. Locate the tail cone, and case. You may need a little lubricant to slip the case over the “O” ring. (Note: It is a good idea to use two or three neat wraps of Teflon plumbers tape put under the large front O ring when sliding the case on over the aluminum inlet cover. The use of the Teflon tape will ensure the best possible seal.) Ensure the 8 holes are aligned and put in 8 screws around the periphery. Slip on the tail cone on and orient the thermocouple hole on the exhaust nozzle to your discretion. Align the glow plug holes on the case and on the turbine itself. Bolt on the tail cone using 8 stainless steel screws. Do not use Loctite for putting on the tail cone. Loctite will make the tail cone almost impossible to remove.



7. Be sure to pull out 2-3 coils out (2-3mm) of the glow plug this will aid start gas ignition. Notice the glow plug hole may not be perfectly line up with the case. This is not of concern. Use an Allen key or hex wrench to push the combustion chamber over and insert the glow plug, be careful not to damage element.

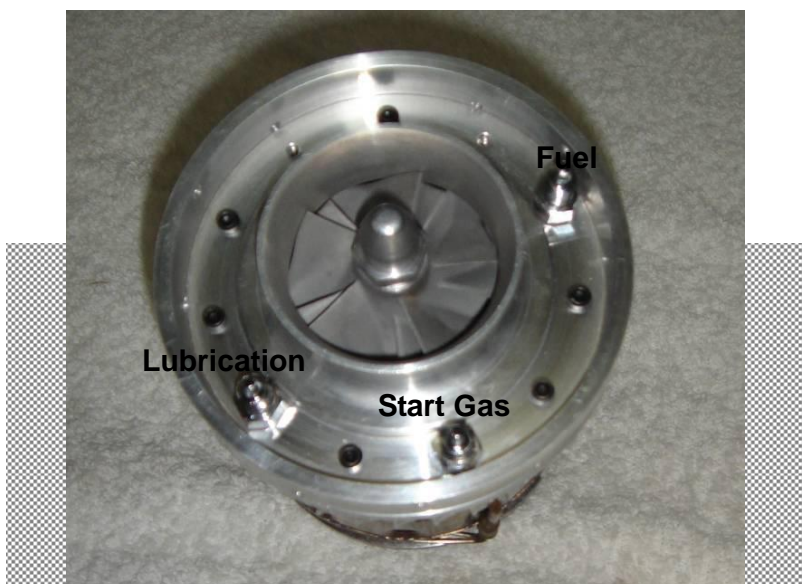


8. Hook up the plumbing: Use the clear tubing for fuel and lubrication lines. Use Orange turbine for the Start Gas line. The lubrication line and fuel line connect together under the cowl. Take the lube line and fuel line and connect them together by the “Y” shaped Push-Fit connection, the incoming fuel and oil for this connection will enter into the base of the “Y” shape. The top of the “Y” will go to the lubrication fitting and the fuel fitting on the turbine. Ensure that you use enough tubing under cowl to prevent kinks. Using a little extra tubing

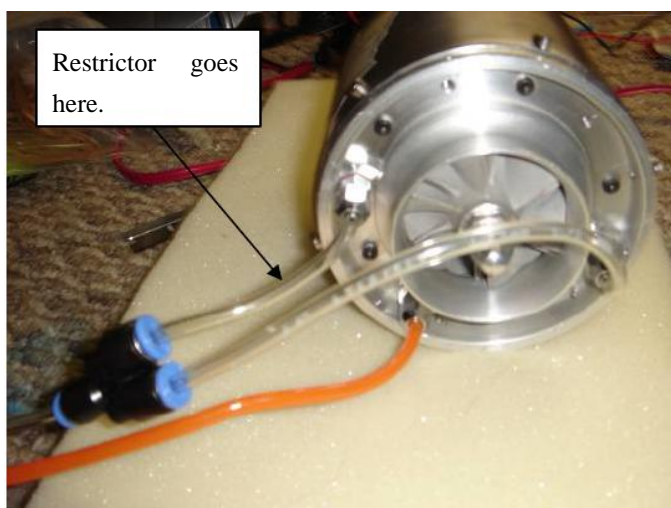
under the cowl will create gentle curves where the plumbing enters the chrome fittings on to the turbines intake. It is a good idea after assembly is complete to go back remove the three the cowl bolts and sneak a peak underneath the cowl to ensure that there aren't any kinks with any of the plumbing. A kink in a lubrication line can be

catastrophic to the turbine's bearings.

How to release a push fit connector. Push the tubing in and hold down the blue flange, continue to hold the blue flange a pull the tubing out of the push fit connector. I can be difficult. Also use very cuts when you trim the tubing.



Note: Included with your turbine is a small section of hypodermic needle. This is to meter the lubrication to the bearings. This lube line restrictor needs to be inserted in between the pushfit “Y” connector and the lubrication port of the turbine. Use picture above to locate “**Lubrication**” port. The restrictor needs to be placed inside the clear tubing before the port.





If you notice it gets busy under the cowl.

9. If you are using a hall-effect sensor omit two of the black intake cover bolts to accommodate its installation as shown below. One of the left over screws is good for holding the thermocouple down later.



10. Optional, bullet starter. If you choose to mount a starter motor here is a technique that may be useful.
- With the cowl mounted on turbine place on the turbine. Apply three pieces of masking tape onto cowl and place the starter onto the cowl.
 - With the starter clutch extended and aligned with the compressor nut.
 - Use a pencil to mark around the legs in a circle and cross hairs.

d) Next, if available use a spring loaded punch to dimple an approximate hole center. Drill the three marked holes with a 1/8" (3mm) drill bit and attach bullet starter to cowl.

e) Put cowl back on the turbine and re-check starter alignment. Use your 7.2v battery to spool the turbine. This engagement and disengagement must be smooth. Observe whether there is unnecessary load on the starter. If the engagement is not smooth damage to the full-auto ECU may occur (if full-auto is used). If the engagement is not smooth carefully eyeball the engagement and figure out which way the starter clutch needs to go. You can

manipulate the alignment with a small plastic/rubber mallet. Tap on the reinforced machined area on the bullet starter housing itself. The cowl is made of relatively soft aluminum and small corrections can be made to

concentric location of the starter ensuring the smooth engagement and disengagement of the clutch. During this process the depth of the starter inside the bullet may need to be adjusted. Remove the cap off the bullet assembly, slide the motor toward / away relative to the turbine to achieve the optimum location and then put bullet cap back on. The clutch needs to be able extend out to grab the nut and then retreat smoothly and easily. The bullet housing acts as a collet on the starter motor. A small square piece of electrical tape placed on the starter motors body will add extra friction to the starter motor to prevent it from moving inside the bullet.



11. Turbine mounting straps: Use a smooth jawed vice or large pair of pliers to bend the mount straps. Notice the 1/8 inch gap (2-3 mm) where the strap meets the vise, this is a good general area to make the first bend. Bend each strap to about 90 degrees on each end. Curve the straps around the turbine body and insert the strap bolts, generally the strap bolts stick up so that they do not interfere with the turbine mount.



12. Installing the thermocouple (temperature probe): The nylon probe hold down will usually line up with the one of cowl or case screws. (I prefer to use one of the longer black left over screws to hole the nylon probe clamp) The probe should stick down into the exhaust through a small hole in the tail cone to a depth of about 1/8 to 1/4 inch (3-6mm). Do not cut the probe under any circumstances. Curve the probe without sharp bends into this hole in tail cone. A piece of silicon tubing can be used to slip onto probe and fit between nylon probe clamp

and temperature probe.



Full-Auto configuration ready to go!
(Temp probe not shown)

Safety Notes

Take note that this engine is not a toy. This is a no kidding turbojet engine. This engine should be handled with the utmost respect and care. Contained inside this engine during operation is a lot of energy both in heat and mechanical form that is capable of extreme personal and property injury and damage. Do not operate this engine under the influence of alcohol!

The following guidelines should be read carefully followed.

1. Always keep a CO2 or similar fire extinguisher close when starting and operating the engine
2. Use proper personal protective equipment to include ear and eye protection!
3. Keep loose clothing and loose material away from the intake of the turbine and away from the rear of the turbine.
4. Always operate your engine in open air away from confined spaces as the engine exhaust contains gases which can cause asphyxiation.
5. Do not touch the engine while it is running. Turbines rotate at a very high rpm and the engine casing and exhaust can reach very high temperatures. Ensure anything affected by heat is kept well clear of the engine and exhaust during operation.
6. Never use the engine near to sources of flammable gases, liquids or materials.
7. Keep spectators, children and animals well away from the starting area at least 25 feet away.
8. Ensure proper use and disposal of fuels for they are hazardous to the environment and they are flammable. Use proper and correctly marked containers for all flammable substance used for the turbines operation. It is a good idea to use fuel proof gloves when handling fuels.

Turbine Engine Specifications

Outer Diameter 90mm; Length: 165mm less starter

Weight: 850grams less starter

Approximate thrust: **14** lbs at 160,000 RPM

Idle RPM: 43,000

Min Sustain RPM: 30,000

EGT @ max rpm: Approximately 68^o C

Consumption: @ max RPM about 6-7 oz per min

Fuel/ oil: Kerosene / J-A1 + 4-5% oil (synthetic 2T TCW3 spec motorcycle oil or turbine oil)