Lambert Microturbines T32 Kolibri
Important User Information and Check List

The Lambert Microturebines T32 Kolibri is a true micro gas turbine engine designed for recreational use in model aircraft. Despite its small size, it is a high precision device that can be harmful if not operated properly. Inside this engine, rotational speeds in excess of 240,000 rpm are present. This equals circumferential verlocities at the tips of the turbine and compressor blades of almost 1500km/h (930mph). So please observe these instructions carefully.

Preparing for a start

- Please make sure you've got installed the supplied fine wire mesh fuel filter between the fuel pump and the turbine.
- The fuel for the Kolibri turbine is Kerosene or Jet A1, blended with 5% of turbine oil (Aeroshell 500 / 550 / 560 or Exxon 2380).
- Please always store both the oil and the fuel in closed containers since they are hygroscopic.
- When filling the fuel tank in the aircraft, always use a gasoline filter (with a fine paper filter element – the type used for lawn mowers or the like) between the transfer pump and the tank. This prevents dirt from entering the fuel system in the aircraft which is essential for the longevity of the turbine bearings.
- As a fuel tank, you can either use a PE bottle with a felt tank clunk for bubble-free delivery, or a plasma bag. The latter requires very careful filling in order to remove any trapped air. Don't use PVC bags or bottles since they will degrade and fail very quickly. PE (polyethylene) is the right material. Also, don't use silicone rubber tubing in conjunction with turbine fuel. Polyurethane or Tygon tubing suits very well.
- Make sure all batteries are charged and your LPG container (either Rothenberger no. 3.5504 or CFH no. 52107 or similar propaner/butane blend) has at least one third of its charge left.
- Connect the starter blower to a 12V power source (either 10 cell NiCd, 12V lead-gel of at least 6Ah, or the cigarette lighter socket of a car) and check it is working properly.
- Make sure your radio is properly matched with the turbine ATCU by switching on the radio, adjusting both throttle and throttle trim to minimum and switching on the receiver in your aircraft. The data terminal should display "Trim Low" and the blue light at the ATCU should stay off. If you find a different behaviour, it may be necessary to teach your radio to the ATCU. For details on this procedure please consult the ATCU manual. Now move the throttle trim tab to the maximum position. The blue light at the ATCU should be lit and the terminal (if connected) should display "Ready". In this position, your engine is ready for starting.
- If you start your engine for the first time or you have made changes to the fuel system, it may be required to prime the fuel pump. It is essential that you are using transparent fuel tubes (i.e. clear polyurethane) from the pump to the filter and further on to the turbine so you can actually see the fuel in the tubes. If there isn't any fuel in the tubes,

please prime the pump as follows: With both receiver and turbine battery connected to the ATCU or switched on, set both throttle and trim to maximum and wait approx. four seconds. After that delay, the fuel pump will be activated at 50% power for a few seconds. You can always cut the pump by lowering throttle and trim. Only leave the pump on until fuel is visible in the tube after the pump. If you left on the pump too long, the turbine may be flooded with fuel. In this case hold the aircraft with the turbine in a vertical position so the fuel can drain from the turbine through the exhaust. If the pump wasn't activated long enough to prime properly, you will need to cycle the receiver power and then repeat the above steps. For safety reasons, the priming process can only be executed once each time the ATCU is powered up.

Starting the engine

Firstly, a few things to keep in mind. During the startup cycle, **you are not in a hurry**. Especially during the first few starts, until you get familiar with the procedure, it may come in handy to have another person available to "free your hands" a little. Please **always have a CO2 fire extinguisher available** during any start attempt. For your own safety, you and your "helping hand" should **wear ear defenders** since the enigne will be very noisy at close proximity. Also keep in mind that it may be required to **cool down the engine** with the start air blower after a failed start attempt. For the first starts until you have familiarized yourself with the Kolibi, it is also required to have the data terminal connected to the ATCU. After several starts, after you feel comfortable with the procedure, you can leave it off to save weight in your aircraft.

Please follow this sequence:

- Switch on your radio with throttle/trim set to minimum, then switch on the receiver and connect the turbine pump battery (if you haven't done this before).
- Connect the tube from the LPG can to the check valve on your turbine.
- Set the **throttle trim tab to maximum**, leaving the **throttle lever at minimum**. The blue light at the ATCU will be lit and the data terminal will display "Ready"
- Direct the starting air blower to the intake of your turbine and switch it on. The turbine will start spinning and there will be an RPM reading on the data terminal.
- Now raise the throttle lever to maximum and return it to idle. This will initiate the automatic startup sequence. You can always terminate this sequence by **lowering the throttle trim**.
- With the blower still active, open the valve at the LPG can. Now **momentarily switch off the blower** and listen carefully. Eventually you should hear the noise of the gas igniting, accompanied by an increase of the EGT reading on the data terminal. **Immediately switch on again the starting air blower and leave it directly at the engine intake.** If the LPG won't ignite immediately, don't allow the turbine rotor to come to a rest completely. Switch on the blower **for a short time** and then off again until you get ignition. Once the ATCU starts the fuel pump, the RPM of the engine should quickly increase. This is indicated by the light at the ATCU starting to flicker.

- After the engine has reached 40,000 RPM you can **slowly close the valve** at the LPG can.

- The engine will self sustain at approx. 55,000 RPM but it is advisable to **leave the blower at the intake until the engine reaches 70,000 RPM** to assist acceleration ad keep the start cool. After that, slowly remove the blower from the intake and then switch it off. **Never switch off the blower at this time while it is still located at the turbine intake.**

- The engine will continue to accelerate and you can already remove the LPG tube from the check valve. **Always leave the check valve at the engine** since it prevents hot, compressed air and possibly fuel from draining out of this port.

- When the engine has accelerated to idle RPM, the data terminal will display "Running" and the light at the ATCU will turn off. The throttle control is handed to the pilot and the engine will follow your throttle setting. The data terminal can now be plugged off of the ATCU.

Shutting down the engine

- In order to shut down the engine, just move **both throttle stick and trim to minimum**.

- It is not crucial, but for the longevity of the bearings, it is advisable to **cool down the engine with the starting blower** after shutdown. If the engine is shut down during a flight, the ram air will effectively cool down the engine, so in this case it is not necessary to use the blower.

- If you encounter an unexpected shutdown on the ground or a failed or terminated start attempt, and the engine is still hot, it is mandatory to **cool it with the blower**. The turbine section is still very hot (approx. 500°C) after the engine is shut down and this heat will creep through the shaft to the rear bearing and will cause degradation. When the engine is shut down from full operation, the inertia of the rotor will help to cool down the turbine to approx. 350°C. Further cooling will either be effected by the ram air or by the blower.

Have lots of fun with your Kolibri Turbine and always Happy Landings!

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