CARF-Models
KOBUZ-3

Instruction Manual

The CARF-Models KOBUZ-3 is the replica of one of the most famous aerobatic gliders, built in the 60s and won numerous Glider Acro Competitions. But it is not only a “scale replica”, it also has the pedigree of an ultra high performance glider as it could not be any stronger, faster, more precise - and even in thermal conditions more efficient.

The CARF-Models KOBUZ-3 is readily built. Only RC equipment (and a turbine or EDF) must be installed in order to fly. However, a few design features are important to understand and some advises are to be followed in order to build and fly this airplane successfully.

1) The Wings

The CARF-Models Kobuz-3 wings are made from all carbon UD and bi-directional fibre. It is total area vacuum sandwiched and has the control surfaces attached by “elastic hinge”. The hinge is at the bottom of the wing, the slot at the top, and that slot has a perfectly fitted lip installed to seal the gap. Control horns are on the top, and they do have very specific angle and position to allow to use maximum Butterfly settings for landing, since we have (due to performance and safety) omitted the spoilers/speedbrakes commonly found in these gliders. The internal design consists of a multi layer main spar and 2 rear spars for flaps and ailerons. The rectangular socket for the carbon wing joiner is bedded in the main spar with lots of carbon. These wings are literally undestroyable in the air and it has been tested! Servo mounts are installed and the hatches are pre-fitted.

The wing joiner is also a full carbon design with 3 foam cores. It is literally undestroyable in the air, just like the wings.

The ailerons and flaps are set up to be used for a very powerful butterfly action during landing. Therefore geometry of horns, linkages and servo arm positions are crucial. The control horn positions are precisely set and glued to position and they are NOT identical on aileron and flap. That’s on purpose. The following are most important details for **Servo Installation:**

- Use servos which fit the side mounts well. All Servos for the Kobuz-3 are Standard Size and should have a torque of 25 kg min
- Always put a drop of silicone on the servo case before you finally mount it in the frame. That silicone is easy to remove but still keeps the servo from ever so little sliding in the mount, which could give annoying trim irregularities in flight.
- Flap servo arm **LENGTH 18 mm, ANGLE 90 degree (vertical)** to the servo for FLAP NEUTRAL position
- Ail servo arm **LENGTH 14.5mm, ANGLE 30 degree backwards from vertical** for AILERON NEUTRAL position (approx. perpendicular to the linkage)

- electronic center of the servos should offset (~30% out) at control surface neutral position so that the servo allows 2 times as much throw towards the CROW direction than opposite.
- Aileron differential with this geometry will automatically result in approx. 75% down and 100% up (25% diff).
- For Butterfly the flap down deflection should be 60-70 mm (measured at the root). Aileron up accordingly approx. 25-30 mm (measured at tip). These settings still allow full aileron movement and give you enough aileron authority during landing at full butterfly.

The angles and lengths of the servo arms are crucial because **only** when this geometry is set right, the necessary butterfly (Crow) deflections can be reached! Be warned, butterfly is VERY powerful at the settings described above, thus a proportional activation is a must (not only put on a switch).

2) The Fuselage

Also the fuselage of the CARF-Models KOBUZ-3 is manufactured from all carbon fibre. The strength and stiffness is unmatched, especially because of its large cross section all the way to the tail. Only the front area under the canopy glass is a patch of fiberglass only, that is because in this area the RC equipment is placed and we do not want the carbon to shield the RC signals.

The canopy is readily built, attached to the frame and the frame is attached to the fuselage with pins and a canopy release mechanism. It's all prefabricated and functional when you take the plane out of the box. A cockpit tub is also included.

The formers for the retractable landing gear are installed, aligned and the gear itself is soft mounted, it is to be bolted in with 2 bolts from the front, and two rubber standoffs in the rear. The retract servo is to be installed to the side of the gear frame, a simple aluminum bracket is included. Install 2 springs to pull the doors shut when the gear is retracted.

The rudder servo is to be mounted right behind the retract. The formers are glued in. A Pull Pull cable system is installed to move the rudder, the slots for the cables are already pre-drilled. Don't change any hardware, use what is provided with the kit. All included hardware has been tested and has a reason which you might not immediately recognize.

A tow release is pre-installed (except on a handful of very first kits) and if to be used, a servo can be mounted flat in the bottom of the fuselage. This tow release is simple and super reliable.

3) The Stab

The stab is all carbon fibre, too. The elevators are skin hinged as well, thy are cut in the middle because the geometry of the hinge line would not allow to leave it one piece. Still, both elevators are joined by a single ball link and the elevator servo is installed in the rear of the fuselage. The linkage can be removed when the stab is removed for transport.

Use a 35 mm long servo horn and install the linkage with a ball link, so that you can move the linkage around 3-dimensionally. This is needed to attach it to the elevator. You need to practice a little to remove and attach the elevator linkage, you can do it without removing the rudder, it just requires a little try and error and then practice. The 35 mm long servo horn is a little longer than what's required for the final deflection of the elevator but with a good modern HV servo with 25-35 kg torque you can afford to reduce the servo throws to 60% without losing more than the essential torque. You do need the longer arm to make it easier to remove and attach the linkage. We do NOT recommend to use on the elevator anything else but the included 3mm ball link mounted between the two phenolic horns.

The rudder is attached to 2 hinge posts with a 2mm steel pin, and if you use the clevises included in the hardware, it is very fast and easy to remove the rudder if need be.

4) Engine Choices, if any

We offer the service to pre-cut and pre-install the mounting formers for either a retractable turbine mount or a retractable EDF. Unfortunately both units mount very differently and require also a different shape of cutout, so we cannot provide a universal prefabrication here. The extra service has to be extra ordered, after you have decided which type of propulsion you would like to install. However, it is not too complicated to cut the opening yourself and install the formers. There is no glass work needed and no additional reinforcement to be done. The fuselage has all the strengthening for the large opening already in its layup. Cutting templates for both style openings are included in the kit, as well as all the pre-cut formers to choose from. And for the turbine version we offer a conformal fuel tank with 2 l volume, this set also includes a small header tank.

- cut the openings with a thin diamond disk in a dremel tool. The EDF hatch stays one piece, the turbine hatch must be split in the middle into a right and left door. The turbine doors get hinged to the fuselage with either offset hinges or steel pin hinges, similar to a jet gear door. They are spring loaded in the rear. The engine opens the doors when it slides through, and two small carbon tabs on the side of the mechanics will create a support where the spring loaded doors rest against while the engine is extended. The EDF hatch gets glued on top of the outer duct frame in alignment with the fuselage contour, while the EDF is retracted.
- The EDF mounts to a former in the rear of the opening. The turbine mechanics mount to a former in front of the opening. The included former could be reinforced with a horizontal board approx 30 mm wide, glued from the front against this former in the wing saddle area, to create more stiffness if a heavy and very powerful turbine is used.
- The fuel tank mounts in front of this former, above the wing joiner. 1-2 wooden sticks or small carbon tubes across the fuselage below the tank will support and hold it sufficiently. The header tank should be mounted on th bottom of the fuselage, in front of the retract former.

5) General Setting

The CG of the Kobuz is at 110-115 mm behind the leading edge at root. That is approx. 10-15 mm behind the front edge of the wing joiner to start with. It can be moved 5 mm further back gradually after a few flights, as you feel comfortable.

The Kobuz-3 will require approx. 1 kg of lead in the nose. Only if an EDF is installed, this lead can be laminated and replaced by large battery packs.

A note for the first flight: If a turbine or EDF is used to take off from a runway, or even from grass, you will notice that the plane tends to dive with its nose into the runway when throttling up suddenly. Therefore you hold full elevator up and open the throttle to 50-60%, then accelerate until you feel that you have elevator authority. Only then you should open th throttle 100% and lift off.

We recommend to use 3 flight modes, if a turbine or EDF is installed.
1. powered flight (engine active)
2. gliding (engine inactive)
3. landing (crow/butterfly active)

The above 3 flight modes allow to have both engine and butterfly on your throttle stick, whereas in the 2nd mode (gliding) the throttle stick is inhibited. You can also program the retractable engine mount to be permanently retracted in this flight mode. For EDF, this can happen immediately, for turbine, you should program a time delay of 20-30 seconds before the engine retracts for sufficient cooling (or activate a sequence in your TX). Crow/ Butterfly is only active in the landing mode, so you can make sure your throttle stick is fully forward before you switch to the landing mode (crow off). From there, you can pull the throttle stick back for more crow to be applied.

That way you only have to operate one 3 pos flight mode switch and have everything taken care of.

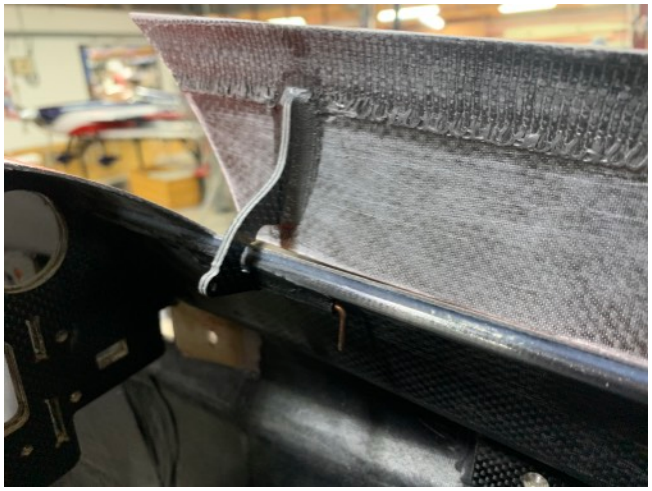
Your retractable landing gear is switched separately.

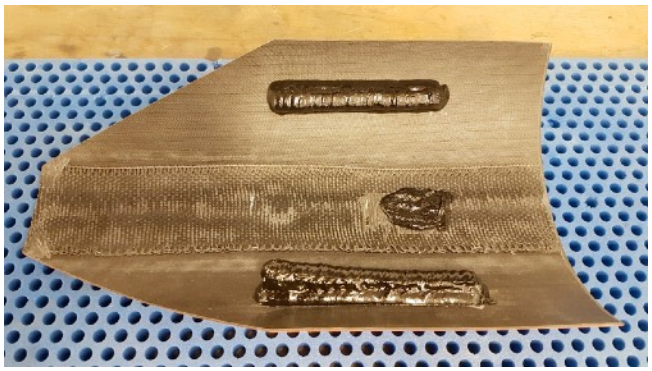
You might add a 2% mix of up elevator in the “powered flight” mode to your throttle stick position, because the plane tends to push on its nose ever so slightly at full throttle, whereas when the engine is switched off or at idle, this effect isn’t felt anymore. Thus a little mix from throttle to up elev makes sense, but only in flight mode 1 (powered flight)

Now we wish you a lot of fun with this powerhouse of an aerobatic glider.

Your CARF-Team!

PS: See photo pages attached to this manual. Some of the photos might be taken from prototype construction and could be confusing. So, please use common sense and some level of freedom to follow the suggestions in the photos. We will replace or add photos as new ones become available.



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