V2 Vector Thrust Tube

CARF-Models Mephisto

The new vector pipe for our Mephisto has been tested for an entire year and we finally have approved it for serial production. Running a 300+ N turbine on vector pipe puts an extreme load on all materials. Thus it is ultra important to make sure that it will not implode under any circumstances, and it will never mechanically lock up or fail otherwise.

With this design, which bases on the vast experience of Alfred Frank (Frank Turbines), we have been able to create a highly efficient vector pipe in terms of thrust loss and manoeuvrability.

There are 3 critical areas:

Firstly, it is not a dual pipe. A single pipe tends to be hot. So please be especially careful when installing it into the fuselage, make sure that all servos, wires and linkages have a safe distance of at least 10-15 mm from the pipe and make sure you have a good airflow through the rear fuselage. It is also important to give the engine enough air to breathe so that under no circumstances hot air from the exhaust side of the pipe is recirculated into the fuselage due to a vacuum. Please note that the entry lip as opposed to an entry cone, has considerable advantages. Firstly it will create a laminar airflow inside the pipe, keeping the cool air close to the inner pipe surface for much longer, and reducing the thrust loss avoiding the vortexes a cone would create. It has been proven that a lip over a cone, the thrust increase is up to 1 kg!

Secondly, the front end must be firmly secured to the engine, as if not perfectly centered, you lose a lot of thrust and you risk heat development inside the fuselage as there is an open gap between the engine exhaust and the lip. Speaking of which, should be 20 mm from exhaust cone rear edge and lip front edge. In normal operation the pipe gets sucked forward (towards the engine) so the cage included with the pipe has to be firmly fixed to the pipe, rest solidly against the engine's cone flange and define the distance. It also automatically grounds the pipe against the engine, so that there will be no static discharge possible, which otherwise has reportedly effected ECU and RC operation. To hold it from sliding back during the attachment of rear fuselage to front fuselage, the one tab should be either bolted to the carbon bridge, or simply bent to a hook.

Thirdly, the rear end has to be protruding into the vector so that with no movement it can lock up with any of the screw heads in the vector's mechanics. The vector itself has to be mounted in the rear former, that means that there will be no linkage length compensation necessary when the pipe gets hot, which is a huge advantage. However, it has to be actively aligned along the thrust line, so it is important that the former in which it is mounted, is strong and perpendicular to the thrust line.

With all this being said, here are the step by step installation instructions:

1. Prepare the mounting former of the vector by trial fitting the former into the fuselage. it should be placed right behind the stab tube sleeve. For upgrade of older kits, increase the diameter of the main hole so that the vector fits, then double it up on one side with 3mm plywood. This can be lightened with lightening holes but the plywood should contact the fuselage skin in a few areas, too. Then use sheet metal screws to mount the vector into the former. Please note that the former has to be aligned perpendicular to the thrust line. the stab tube is a great help to do the alignment, as well as the lower half of the rear edge of the rear fuselage.

2. Glue the former with the mounted vector into the fuselage, making sure that the plywood reinforcement is in contact with the fuselage in some areas.

3. Make sure that the control arms of the vector do not touch or bind with the fuselage. if they still make contact, you should grind a little off the metal until they fit. The vector is truly maximised for this airplane and things are tight.

4. With setting the servos and linkages to the vector you should follow the Mephisto Instruction manual. If you upgrade from a V1 pipe to the V2 pipe, you should find that the linkage length should only have to be adjusted little if any. A 35 mm long servo arm should give you sufficient deflection of the larger vector as well.

5. Make sure that when both rudder and elevator is applied, the vector doesn't bind. Set the max deflections for each axis so that functions can overlap without binding. This is VERY important.

6. We recommend to stick with the clevises. We are flying planes for an entire season with zero problems. A metal ball link for instance will have to be mounted on one side of the control arm and the screw to mount it with, will constantly be under bending load. There is a high probability of fatigue breakage over time, especially if the the ball links are restricted in movement 90 degree to their control function and throw limitation isn't watched carefully. We DO NOT RECOMMEND IT! A small cable tie will help to secure

the clevises and in all the many hundred flights we have, not a single time a clevis came off or a cable tie broke or melted.

7. You will note that it is a very good thing with the V2 pipe, now that the Vector can remain in the plane even if you want to remove the thrust tube for maintenance or access to the vector servos.

8. Now you set the length of the pipe, respecitvely the front distance to the engine. Lay the engine on the mounting rails without fixing it. Then slide the pipe into the vector. You will see that the pipe is held flexibly in the vector, so that at high deflection of the vector the pipe can follow a little the movement without locking the vector up. This is intentional.

9. Make sure you slide the pipe far enough into the vector that at FULL MOVEMENT of the vector, the rear edge of the pipe CAN UNDER NO CIRCUMSTANCES catch one of the mounting bolts of the vector to the kardanic ring. The rear edge of the thrust tube must always cover these little screw heads. Otherwise the vector could lock up in flight with catastrophic consequences!

10. This gives you the position of the intake lip, and you should then place your engine with a distance of 20 mm between the rear edge of the exhaust cone to the front edge of the intake lip.

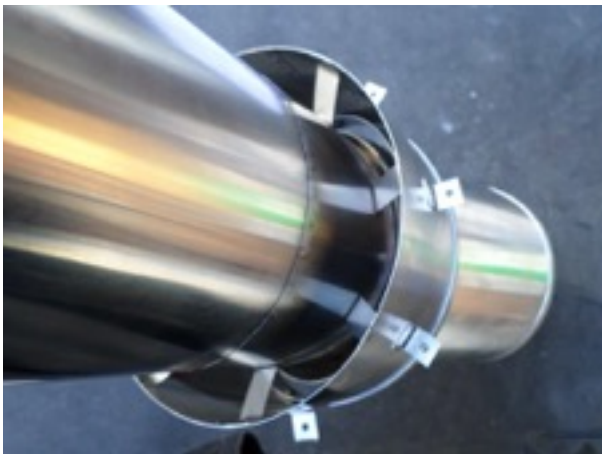
11. Remove the front cage, fit it in diameter on to your engine's exhaust cone and decide for the correct hold to mount the cone to the pipe. The holes in the cage should be good most suitable engines with cone length from 80 - 110 mm. However, if you use a FRANK TURBINE, 20-30 mm are measured from its outer cone rear edge, NOT from the inner cone tip. Most likely you will have to move the engine further back and shorten and re-drill the cage.

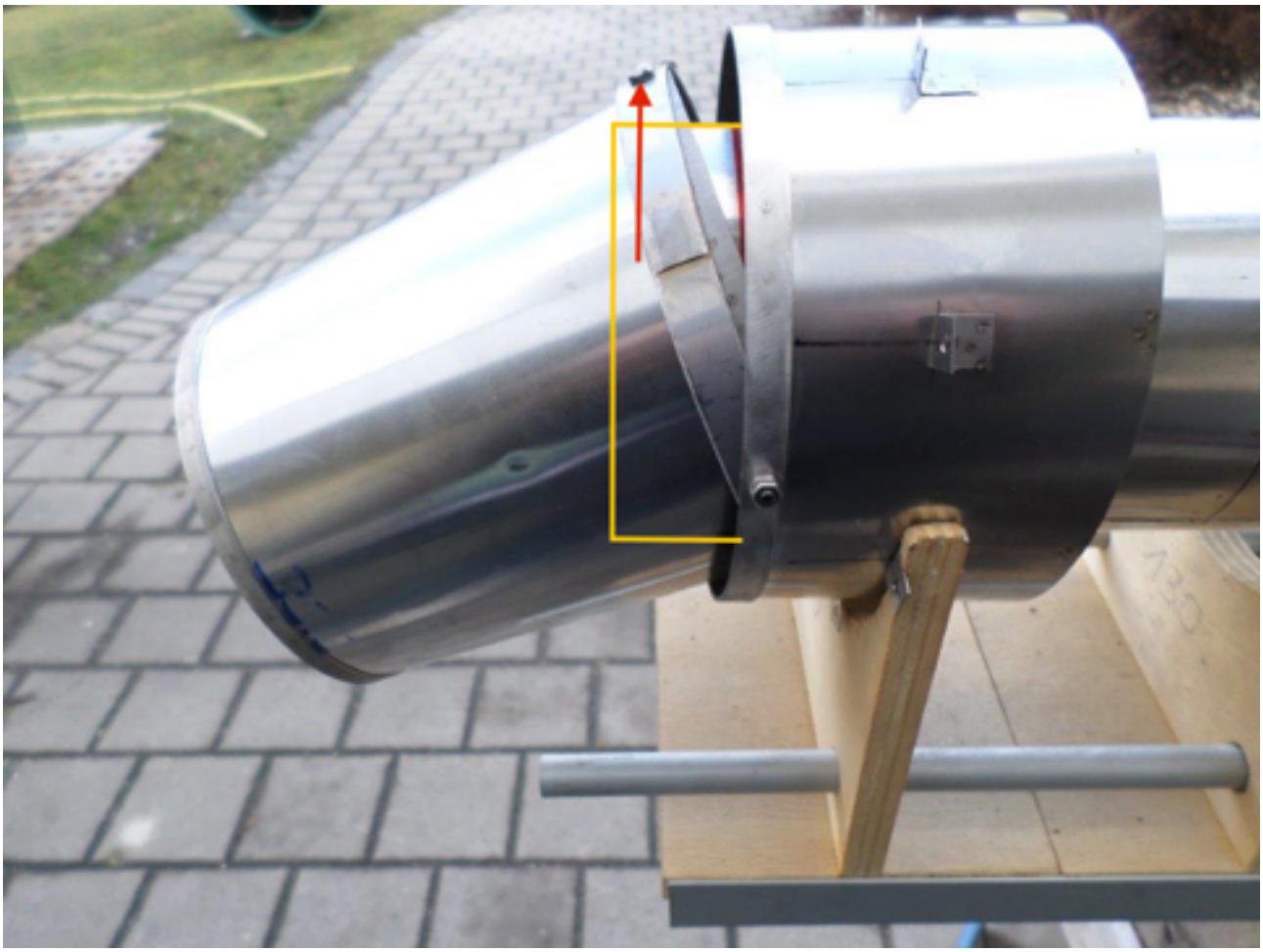
12. Once this is defined, mount your engine permanently to the wood rails of the front fuselage engine mount.

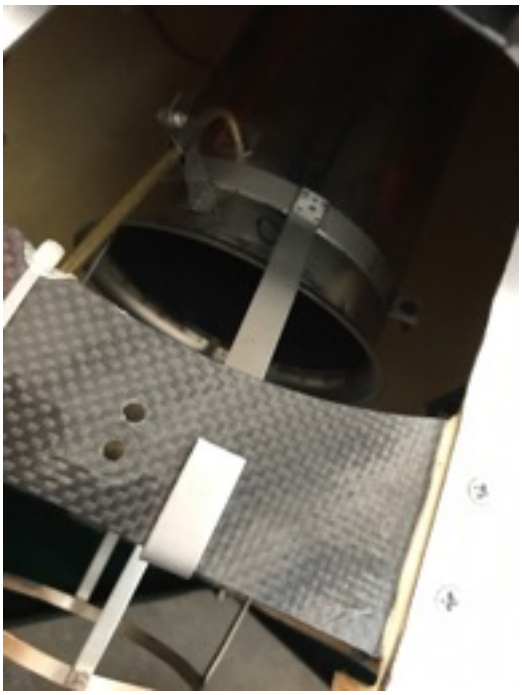
13. Now take the single tab, which is welded to the pipe and bend it, so that it can be connected to the carbon bridge in the rear fuselage. Then either drill and bolt it to the bridge, or bend the tab around it to form a hook. This is absolutely sufficient and functional.

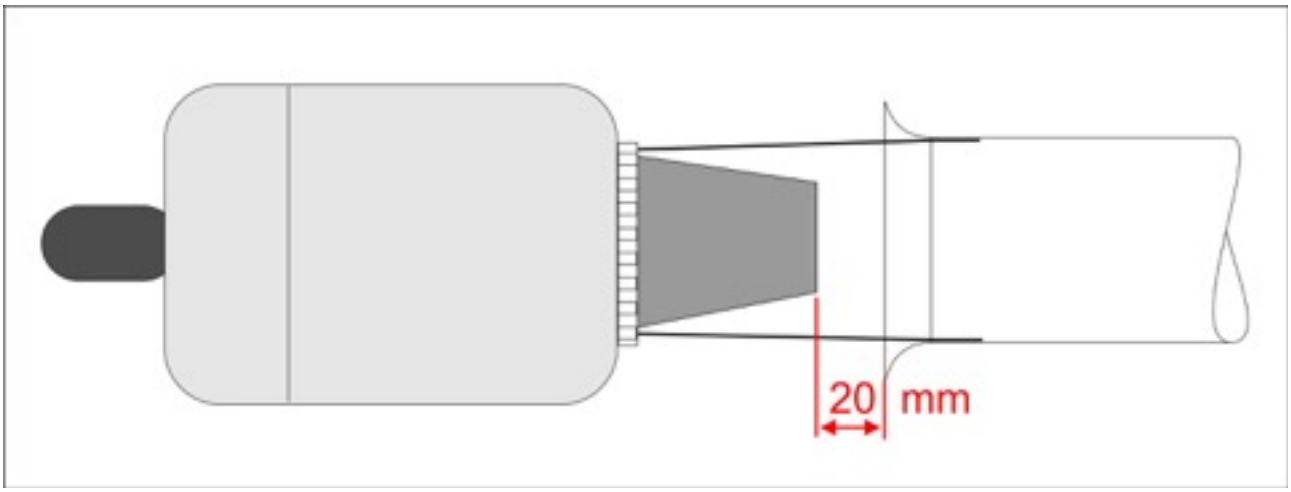
14. The pipe has a smoke tube holder attached to it. Take a 4mm brass tube, bend it as needed and install it, then tighten the clamp. It always has proven to be sufficient to use a single injector probe. The advantage is that no smoke probes protrude the engine's exhaust cone, which if mounted on the engine side, would be exposed when the rear fuselage is removed, and be constantly bent or broken during transport.
15. Removing the rear fuselage is still very easy, because nothing connects permanently to the engine. Bend the ring of the cage so that it fits loosely to the engine cone, still c centring the intake lip nicely.

This new vector pipe is more efficient than any other type, in terms of thrust, maneouverability and strength/safety. Hover low and slow… We wish you a lot of fun with that extra kilo of thrust you gained :-)





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