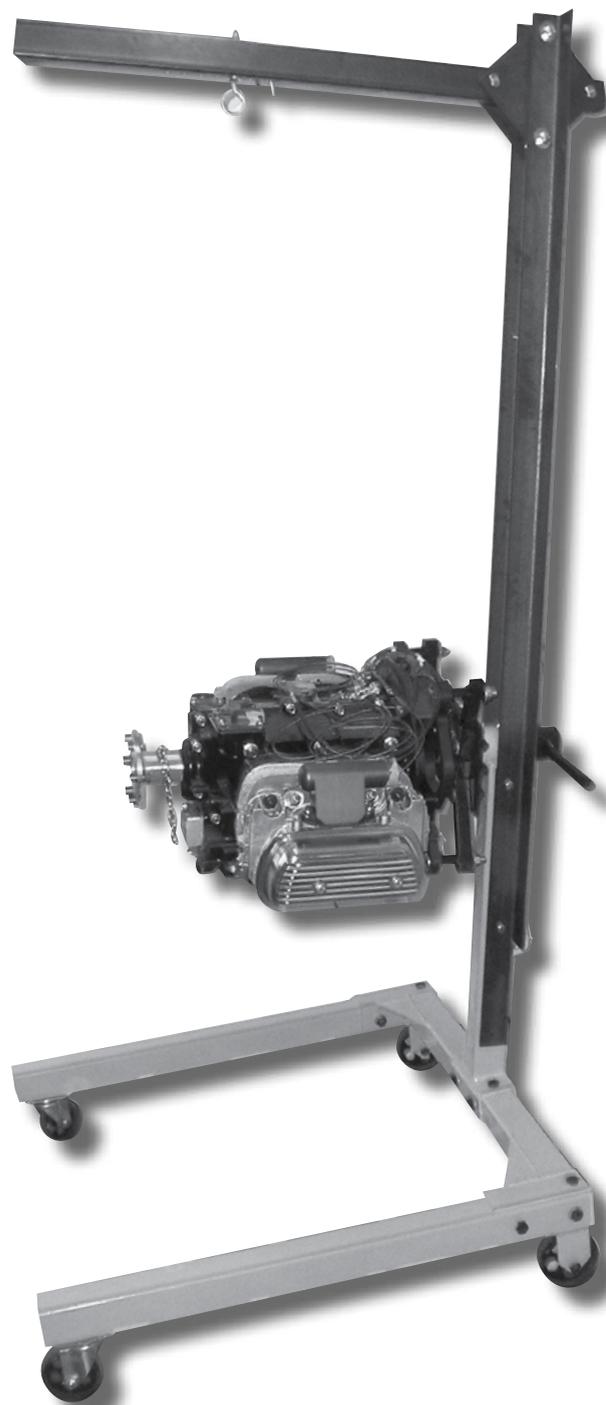


Heavy Lifting

...Well, Relatively Speaking / by Graham Luckhurst

The time had come to mount the VW engine to my Sonex. Guessing where to locate the gascolator, battery, oil cooler, oil separator etc. without the engine in place was just getting too risky. There was no option but to assemble that VW kit from all the boxes of parts. As I prepared the components, it quickly became apparent that this thing was going to get really heavy as the parts came together. Some assistance would be necessary so an engine stand was procured from a local auto outfit at a reasonable price. Progress was much better and a lot safer. Being able to flip the engine to any angle with ease is a real plus. Once the engine was complete, the next task was to install it onto the airframe. An engine hoist was the obvious answer. However, I really did not want to spend the money on another piece of equipment I would rarely use, but I did want to have available on occasion in the future. Borrowing is an option, but not necessarily reliable as 'Murphy' would dictate your friends are out of town or their hoist is in use for some indeterminate time just when it is needed. Besides, I do not like to keep hitting on my friends for a loan, especially as being a first time builder I do not have a lot to return as favours. Therefore I decided to build my own hoist using the engine stand as a base. My ability to work with steel is very limited, and I have no welding experience or the equipment. Cutting steel is a real effort, again without the right tools, but I am great at drilling holes. Fairly small holes! 3/8" holes into steel are about my limit. A steel 3/8" bolt has approximately 5500 pounds shear strength so I did not see any issue assembling the hoist with them since my engine weighs about 160 pounds. What was nice about a combined engine stand and hoist is that you can lift the engine directly

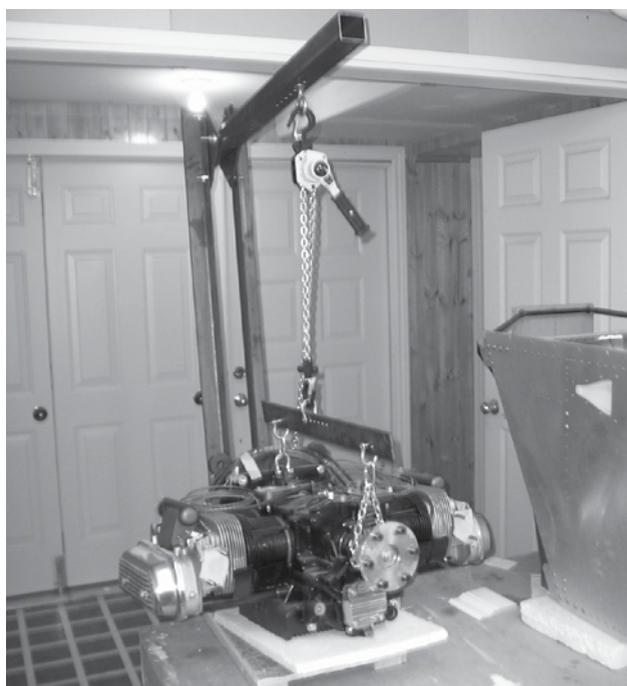
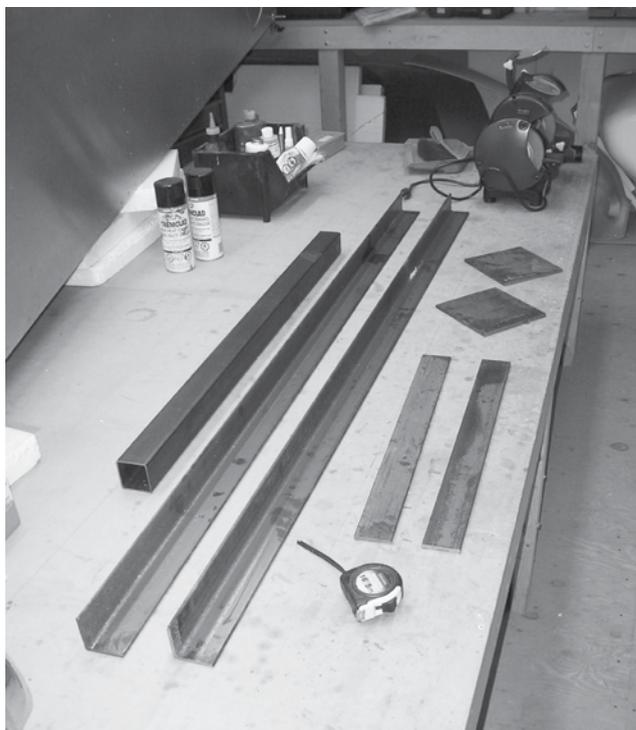
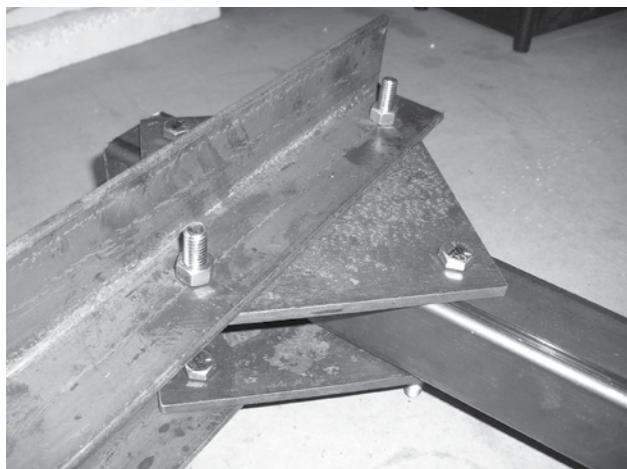


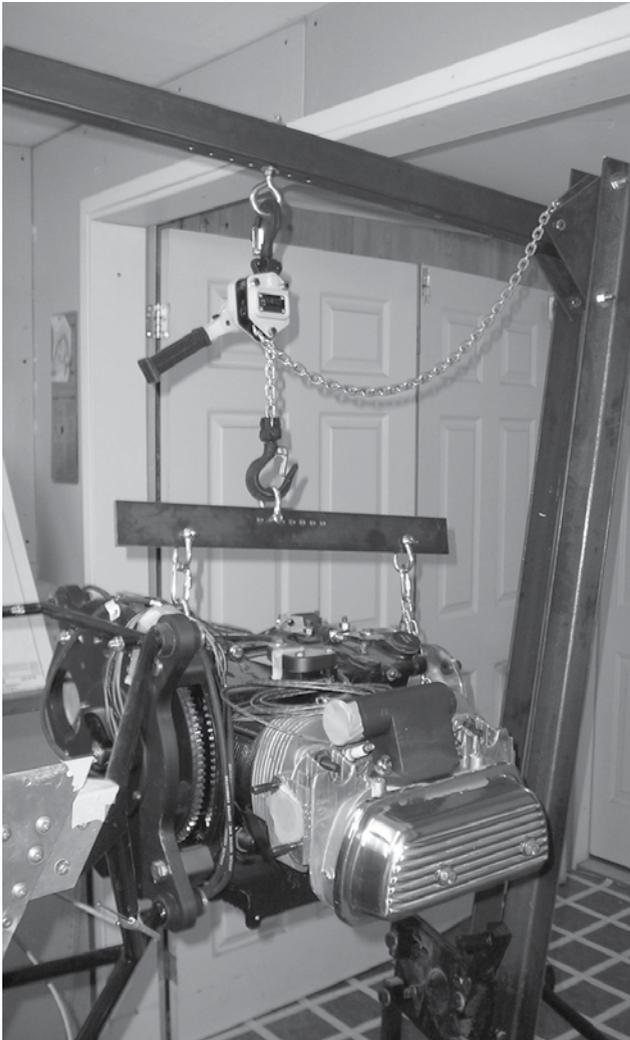
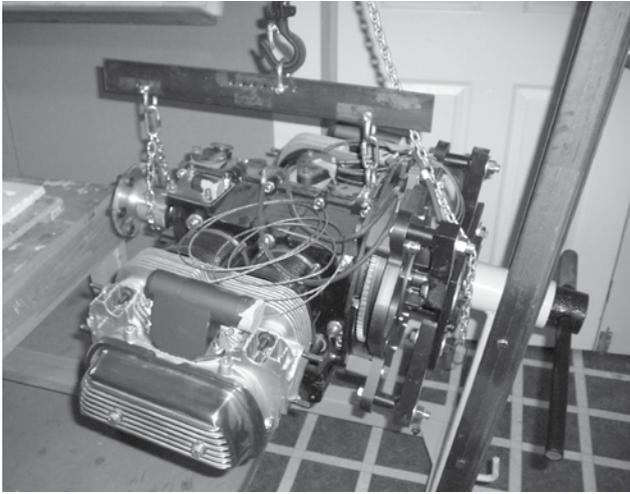
from the engine stand's fittings to the airframe, which minimizes the amount of manoeuvring, a definitely a plus in my small workshop.

The hoist framework was fabricated from two 60"x2"x2"x1/8" angles for the vertical support, a 36"x2"x2"x0.090" square tube for the horizontal support and two 6"x6"x1/4" plates to brace the horizontal support to the vertical supports. Two 20"x2"x1/4" plates were required as spacers, so the vertical supports would clear the engine stand rotational bearing tube. Using stock material and having the steel supplier cut it to the desired length saved the heavy work of sawing to size at home. All that remained was to clean up the edges and drill the holes. How the pieces go together is best shown in the pictures.

Lifting is provided by a 1/4 ton lever hoist which was plenty for what I needed. This can also be used around the garage or garden for other tasks so its cost, though very reasonable, was easily justified. A small length of chain, anchor shackles and quick links were procured from a local hardware store at minimal cost.

Below: the hoist components; top right, brackets supporting the vertical and horizontal supports. Right, using the hoist to secure the engine to the airframe.





The pictures show one more item, a 20"x2"x1/4" bar used between the engine and lever hoist. This 'balance bar' was used to locate the lifting point close to the center of gravity of the engine. It also ensured that minimal forces were applied to the hub which, the only reasonable lifting point at the front of the engine. I checked with the engine manufacturer and they indicated that it would be a safe lifting point. A simple moment calculation once I had the engine level indicated that there was only 60 pound lifting force on the hub. You will also see there are quite a few holes drilled at the horizontal support and balance bar where the lever hoist is attached. These proved valuable when trying to locate the engine close to the engine stand mount and also getting the engine level. The engine CG was much further back than I estimated.

I did ask Don, a local RAA chapter member and good friend, to come around and help mount the engine, but if pressed this could have been safely achieved with one person. With wheels yet to go on the plane, the hoist will be used to move the fuselage/engine combination around the shop as necessary. When transporting the plane, I will also use the hoist to support the engine weight. I have been warned that transporting the engine on the airframe without this precaution can result in the aircraft engine mount being overstressed or even breaking as hitting speed bumps, pot holes, or curbs can exert G forces well beyond design limits. 

Top: some of the connecting hardware; securing the engine to the engine stand; and left, lifting the engine off the bench.