Building the Talon

John Sumner

Part 1

From this....

To this. Extraordinary!

In 2008 John Sumner used our Builder Assistance Program to build his brand new A600 TALON. John's Talon was one of the first to be built in Australia, and draws admiring comments from all who see it.

John was assisted by Kevin Lunn, Australia's most experienced RotorWay helicopter builder. In this commentary, John describes the building process from opening the boxes through to seeing it fly for the first time.

Owner Builder Pilot.

A little background first: I'm an airline pilot, recently retired from the Boeing 747-400; so I have plenty of fixed wing time but no experience in rotary winged flight. Nor have I ever built any kind of aircraft from a kit. So I have the usual home handyman skills, with good workshop tools and space at home. I live on a farm, so am used to maintaining a variety of machines but employ experts from town for anything serious.

The 2 major reasons I was attracted to the Builder Assist program are:

1. Time: Although I'm retired, I'm far from idle, with cattle and cropping taking up much of my time. A major project like this would take me many months to get done at home, with all the distractions available. There are lots of components in this kit and finding out what is what would be a task in itself.

2. Quality of Build: While I expect to become knowledgeable during the building process, I don't have the experience to build a high quality finished product the first time around. Mine will be Kevin's 9th new build (his 2nd Talon) and his input is important, if I'm to enjoy flying an excellent helicopter at completion.

So I have taken myself to North Queensland for a month, to concentrate on building my RotorWay. The kit had been delivered sometime earlier and included many boxes, with dozens of parts cards on which many small parts are shrink-wrapped and labeled, body panels, the airframe and other aircraft components.

We immediately sorted the parts cards into some we would need now; some soon and some much later. Kevin recognised all the parts, and we didn't need to refer to any of the comprehensive manuals for this process.

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The first phase of construction started with the airframe. This is constructed from chrome-molybdenum steel, covered in a greasy substance, which prevented any deterioration during transit. Unfortunately, this steel is very tough to drill but we added many components - lots of measuring and drilling! We smoothed the legs that attach to the skids and little niceties like this always save weight and add extra quality, as well as losing lots of sharp corners.

Then we added the tail boom to the rear of the airframe. This was a very tricky task of alignment, with many plumb bobs and a level surface. Horizontal stabilisers were added, measured level with a digital protractor, drilled and bolted to the boom. The boom was drilled and bolted to the airframe and when everything went together nicely, we took it all apart to send it to be sandblasted and powder coated. It should return a lot less greasy and much nicer to work with.

The airframe is missing.

The airframe was meant to be away for a week but this turned out to be 10 days -- not that it mattered, as we had plenty to do in the interim. I learnt a lot about the build process and was very pleased with the construction path that RotorWay had taken. This second phase meant a lot of grunt work on metal fabrication and fibreglass -- probably the low point of the build process for me.

On the other hand, I was delighted that the "seriously tricky gadgets" came fully assembled. This includes the elastomeric rotor assembly (the exploded diagram for which is thoroughly frightening); the engine and the tail boom. I wasn't initially sure if I would be bolting on cylinder heads to a short engine and my skills in fabricating sheet metal for a tapered tail boom would never have made the grade, I'm certain.

What is necessary is to make various metal parts out of basic sheet, using templates for accuracy. The body also requires fitting to adjacent parts at this stage, for the first time at least. The "tub"; the forward, lower part of the fuselage, needs marking and splitting. Air ducts need fibreglassing into place and a whole lot of fitting and sanding takes place. The body panels provided don't just match exactly -- they need to be made to fit properly, if you desire a nicely finished aircraft.

The panels are held together with "cleco" bolts; an expanding split pin that just holds things in place until you take it apart again. You get used to using a lot of these! We had also sent the skids to a motor bike shop to be polished. They came back just like chrome.

“I WAS DELIGHTED THAT THE SERIOUSLY TRICKY GADGETS CAME FULLY ASSEMBLED”

The rear fin; horizontal stabiliser plus its own fins needed to be shaped, fibreglassed to cover the metal/fibreglass junctions and then sanded and filled a few times. They end up looking as good as a blended wingtip -- amazing!

Now we await the return of the airframe.

The airframe returns.

It was certainly enjoyable to bolt my nice, clean, painted airframe together; knowing that we had previously fitted and drilled all the parts. All nuts that were permanent were torque sealed at the time, so that any future movement could be monitored.

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I should mention that, as this is an American helicopter; all measures are in Imperial units. Suits me fine, as I grew up under that system and can tell the difference between a 3/16" and 1/4" drill much more easily than I can with millimetres!

The rotor head is installed at this time and then we start the fitting of body panels. All of them are curved but there is a logical sequence to it. We start with the seat back, and then move forward via the floor, tub, windscreen, and door posts; moving back to the doghouse on top and the rear panels. Some panels need cutting and all is held together with cleco bolts.

There is some sanding and filling to get the shape right and Kevin's workshop nous is always at the fore. He uses cotton flocks in the epoxy for anything that needs strength and automotive type body filler for simpler jobs, as it dries quickly and is easy to sand. During this process, the tail boom is added and the whole machine starts to look like a helicopter.

It was certainly rewarding to sit in what resembled the shell of a helicopter, in the knowledge that one day soon, it would evolve into the real thing. Then we took it all apart again, to begin installing the machinery.

During this building period, I have started my flying training with Helibiz, here at the local airport. I don't have a helicopter license, so am enjoying learning to fly the Robinson R22 Beta 2; similar to the RotorWay but not as forgiving in many ways, which makes it an ideal trainer.

It's a lot of fun learning to fly -- a helicopter is just so much more exciting than the fixed wing aircraft at my aero club. A helicopter can do a bewildering number of manoeuvres -- quick stops, hovering in tailwind and all sorts of things that are impossible for fixed wing aircraft.

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Time for machinery

This is definitely a very rewarding time of construction. We decided to get the doors out of the way first. I had heard that the doors were quite difficult to fit but again there is a process, which is really more painstaking than difficult. They fit into a frame, are riveted, sanded, filled, sanded and so on. You mark out where the paint finishes and fit them to the aircraft, drill and fit the hinges. Then the doors are ready for the paint shop: you can put them aside and go ahead with the fun stuff!

The secondary drive is fitted. This needs careful aligning, with its nearly parallel shaft actually offset from the rotor mast by 0.1 degree to the rear and 0.1 degree to the left, again with the digital protractor, which can measure that accurately. RotorWay have carefully designed the assembly process so that this kind of accuracy is possible with the mechanical adjustments available; which I think is quite an achievement. Although it's called a secondary drive; it's driven by the engine and then drives everything else -- main rotor, tail rotor, radiator fan, alternator, etc.

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The engine is installed next. This is dragged under the airframe, still in the remnants of its box and hoisted into position with two straps. With two of us, it was easy. The main weight is taken on the bottom engine bearing, the engine being vertically mounted and a torque link stabilises the upper engine. The exhaust is bolted on, which we painted black, after lagging the stainless steel with a thick, heat resistant tape.

Unusually, this engine is liquid cooled and the fan housing is made up separately by cutting, sanding and riveting fibreglass parts. The fan and large radiator are installed and the unit is then mounted to the airframe. Drive shaft, 2 pulleys and 2 belts are fitted. The alternator, electric water pump, oil tank and coolant tank come next, along with another belt and fluid lines. All components are of an obviously high standard. An American built alternator is rarely seen! The welded oil tank (which incorporates an internal cooling radiator) is a beautiful piece of metalwork.

Fitting the 2 main fuel tanks and brackets comes next, although they will be removed to allow better access to the machinery, until final assembly. A long range fuel tank will also be fitted later, under the pilot's seat. That's the left seat in this helicopter, as the rotor rotates in the European direction (part of the engine heritage), rather than in the American direction. I prefer this, as the collective is better placed and I'm more used to flying from the left seat anyway.

In the next part, we will fit the body again, to ensure it does fit around all the metalwork, with the appropriate clearances.

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