

RotorWay

EXEC 162F

I must confess that I have always been deeply suspicious of kit-built helicopters. Building one's own aeroplane seems all very well; fixed wings are basically aerodynamic, so ought to be able to allow the aircraft to glide almost no matter what you do...at least in theory. But I feel highly dubious about trusting my own or anyone else's self-build skills when it comes to something with as many moving parts as a helicopter.

This, I imagine, is the view of most helicopter pilots, who tend to shake their heads at the mere mention of kit helicopters. Most of those that I know would never even consider flying a Rotorway. They are convinced that such machines are thoroughly unsafe, and that they require huge amounts of maintenance. And people shudder

EASILY ONE OF THE PRETTIEST HELICOPTERS, BUT HELEN KRASNER ISN'T JUST IMPRESSED BY ITS GOOD LOOKS.

as they describe the way that the tail rotor is attached, by something commonly perceived to be like a series of large rubber bands!

It should perhaps be emphasised that most of these people have never actually seen a Rotorway, much less been in one. But I have. I stood and admired several at the PFA Rally a couple of years ago; for the Rotorway really is an incredibly good looking

little helicopter, perhaps the prettiest rotary aircraft in the skies. I discussed them with several enthusiastic owners, and even sat in one on the ground. Indeed, despite my fears, Rotorways fascinated me, and I was secretly itching to have a go at flying one.

So I was absolutely delighted to be given the chance to test one for *Today's Pilot*...despite the fact that I

The Exec felt quite remarkably stable for such a small machine.





set off on the long drive to Essex with the words "Be careful" ringing in my ears.

Soon afterwards I was confessing all these fears, fascinations and prejudices to Jonathon Bull. We were standing in the hangar at Takeley, on the fringe of Stansted Airport, while I was waiting to fly his Exec 162F, the last version of the Rotorway, developed in 1994. Jonathon and his brother David run Southern Helicopters, which holds the Rotorway franchise for the UK, and they had given me the chance to fly G-BWUJ, along with instructor Iain King. Iain was out flying 'UJ' with a prospective customer, but the hangar held three other complete Exec 162Fs, including the one recently filmed while being built on a series on the satellite TV Discovery Channel. There were also two other partially-built examples. I began to realise that there were at least a few people who

did not share my fears. In fact, there are 28 Rotorways flying in the UK, and another 14 in the process of being built. Jonathon explained that building a Rotorway is not as complicated as it sounds. Most of the crucial components are factory built; the main shaft comes as a complete cone, and the tail boom as a complete cone. No

I FOUND THE EXEC VERY COMFORTABLE.

welding is required as it is all done at the factory, many other components are pre-assembled, and the helicopter can actually be assembled with a minimum of mechanical ability. Everything is provided, including all the instruments; all the would-be builder has to provide is paint and avionics. Your Rotorway arrives at your door in eight crates; almost 50%

assembled, with everything clearly labelled, detailed instructions and an exhaustive series of videos to guide you through the build process. You can even order the kit in four parts if you wish, paying for it as you go. No special tools are required, and according to Rotorway literature, the helicopter can be built in a one-car garage... though I suspect it is referring to the kind of garage that might accommodate a huge American car. In the UK the CAA keeps an extremely close eye on builders, with everything being carefully monitored. It is necessary to have two inspections by licensed engineers during the build, plus a number of intermediate inspections; David and Jonathon frequently do these.

Nevertheless, building a Rotorway is not really for those who run a mile at the mere mention of DIY. Although the company claims that one can be built in 300 hours, Jonathon was

ABOVE Within half an hour I was happily throwing G-BWUJ around the sky, and feeling reasonably at home in her. (ALL KEY - STEVE FLETCHER)

ABOVE The main rotor has a diameter of 7.6m.

ABOVE RIGHT The pre-flight also includes checking that an 11.3kg balance weight is attached - to the right skid if flying solo, under the tail boom if two-up.

at pains to point out that this is a gross under-estimate for the average builder; 800-900 hours is more likely. And all this work has to be done carefully and precisely; it is not for those of us who think 'nearly perfect' is good enough. So clearly, building a Rotorway is for people who enjoy tinkering with a helicopter as much as flying one. Which definitely counts me out. Jonathon assured me that I would be able to do it if I wanted to, despite having never assembled anything more complicated than Argos furniture. The plans, books and videos to help the would-be builder are extremely comprehensive and assume no previous knowledge, and Jonathon and David are only a phone call away if necessary. They emphasised that builders could phone as often as they liked, every day if necessary, and they would even visit if required.

So far, this sounded pretty good. But

what about the maintenance, and the stories I had heard of more time being spent working on the Rotorway than flying it? In fact, the Exec 162F requires far less in the way of maintenance than earlier versions of the Rotorway. Jonathon assured me that not much tinkering is actually required, which is good news if you are the sort of pilot who likes to keep your hands clean between flights. Referring to one owner, he told me: "This chap flies about an hour and a half a week, and does virtually nothing between services." If the owner wishes, Jonathan and David can do the 25 hour and 50 hour service and sign the work off. They can also do the 100 hour service, although this must be signed off by a licenced engineer. As for safety concerns, just as in the early days of the R22, in the past low-houred pilots tended to fly Rotorways without sufficient

experience or training. Flown well, and within its limitations, Jonathon is confident that the type is as safe as any other helicopter. Of course, it has its critics, but so do most other helicopters. I may not have an engineering background, but I see no reason to doubt the experts and engineers from the CAA who have given the Exec 162F a Permit to Fly. After all, the CAA is hardly renowned for being lenient when it comes to allowing new or experimental aircraft to take to our skies.

At this point in our discussion, Iain appeared and promptly introduced me to G-BWUJ and the pre-flight checks. For the 'A' check, a few access panels have to be removed by undoing large-headed screws. This doesn't take long, and it gives a clear and unhindered view of the engine, drive train and all systems. In common with all helicopters there are witness



FAR LEFT The tail rotor is driven by three separate belts.

LEFT The Exec is the most popular kit helicopter in the world, and around 750 162Fs have been sold. Total global sales exceed 4,200.



Visibility is fantastic,
even at the sides.



marks just about everywhere to check that nothing is loose, and teletemps to check that nothing is overheating. The tail rotor is driven by three separate belts, those same belts that other pilots had so unkindly compared to rubber bands! In fact the belts are made of an extremely strong fibre, and though they have to be looked after very carefully for the first five hours of their life, checking their tension pre and post flight is all that is required. This is really little different to checking the Vee-belts that connect the engine to the main rotors of other helicopters. There is no reason why it should be inherently dangerous, and the belts also do away with the need for a tail rotor gearbox. The pre-flight also includes checking that an 11.3kg balance weight is attached - to the right skid if flying solo, under the tail boom if two-up.

The Exec is flown from the left seat, and unlike most other helicopters in the UK, the main rotors turn clockwise. Climbing in is somewhat

SHE WILL TURN ON A SIXPENCE

complicated. You put your left foot on the skid-mounted step, swivel into the seat, then lift one foot over the cyclic. It cannot be done elegantly, but it probably gets easier with practice. The seats are fixed, and the pedals can be adjusted using a screwdriver. I still needed a cushion in order to reach the pedals, but at 1.6m that's the case for me in virtually any aircraft, and it must be said that most helicopter pilots are taller than I am. If building your own Rotorway, the pedals can be adjusted during the build, as can the cyclic length and various other things. This means that (to a certain extent) you can build the helicopter to fit the pilot.

Once inside, I found that the Exec was very comfortable. There is a reasonable amount of room for a two-seat helicopter, and the conventional cyclic and collective are comfortably placed. Visibility is fantastic, even at the sides. The doors close easily with three-point fixings, and the four-point harness is quite comfortable. The weight limit per seat is 95kg, similar to other small helicopters. There is virtually no storage space, but there is an optional 'helipack'. This can be fitted underneath the cockpit and takes up to 18kg of luggage.

Gauges show voltage, oil temperature, oil pressure etc. The tachos show engine and rotor RPM in the Robinson-style (ie crossed needles). The engine is fuel injected, so there is no carb heat gauge. One thing that

ROTORWAY HISTORY

The Rotorway has quite a long history. In 1961, B J Schramm began testing a prototype, which led to the eventual development of his first production kit-built helicopter - the Scorpion - in 1967. According to Rotorway literature, this was the first kit helicopter "which actually flew". However, the Scorpion was underpowered, and suffered a number of teething problems. But using the lessons he had learned, in 1980 Schramm introduced a new two-seat kit helicopter, the Rotorway Exec. With a modern, streamlined appearance, this helicopter looked very similar to the current model. But less-than-perfect aerodynamics and a tendency to overheat meant that the Rotorway team still strove for improvements, and the next version was a larger two-seat helicopter called the Elete, created in the late 1980s.

Soon after this, the company was purchased by a former customer, John Netherwood, a businessman from England. In 1990 Netherwood moved to Arizona and formed Rotorway International, rehiring most of Schramm's employees. With their help he set out to extensively redesign the helicopter, developing the Rotorway Exec 90. This had many advantages over its predecessor, including extended life limits on many of the components, more work being done at the factory, and a new method of packing and organising the kit.

In 1994, the company made a further leap forward with the introduction of the Exec 162F. The carburetted engine in the Exec 90 was replaced with a fuel injection system with electronic control, and computer monitoring - the FADEC system - was added. There were also numerous smaller enhancements. To conform to American - and British - regulations for kit aircraft, the Exec 162F had to be less than 50% complete, but the factory-built 49% included all the really difficult and critical work.

In 1996 Netherwood opted to retire and return to England. The employees bought Rotorway International through an Employee Stock Ownership Plan, and improvements continue to take place, with one of the most recent being the addition of the ACIS - Altitude Compensation Induction System - which allows the helicopter to maintain sea-level performance at high-density altitudes.

B J Schramm died in 2004, but the company he started continues to grow, develop and produce kit-built helicopters.



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ROTORWAY EXEC 162F

DIMENSIONS

LENGTH	6.7m	28ft 8ins
HEIGHT	2.4m	8ft
MAIN ROTOR DIAMETER	7.6m	25ft

WEIGHTS AND LOADINGS

EMPTY WEIGHT	442kg	975lb
MAX AUW	680kg	1,500lb
USEFUL LOAD	238kg	525lb
POWER LOADING	6kg/kW	10lb/hp
FUEL CAPACITY	64 lit	14 Imp gal

PERFORMANCE

VNE	100kts	185km/h
CRUISE	83kts	154km/h
HOVER CEILING IGE	7,000ft	2,133m
HOVER CEILING OGE	5,000ft	1,524m
RATE OF CLIMB	1,000ft/min	5m/sec

ENGINE

Rotorway International RI 162F water-cooled fuel-injected flat-four, producing 150hp (111.8kW) at 4,200rpm

MANUFACTURER

RotorWay International, Chandler, Arizona USA

UK Dealer, Southern Helicopters Ltd, Tel: 01279 870211

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was completely new to me was the FADEC. This 'Fully Automated Digital Electronic Control' is a new development on the Exec 162F. It monitors the engine's vital functions, including manifold pressure, ambient air pressure, RPM, system voltage, fuel flow, ignition timing, injection and water systems. It automatically provides the engine with the correct fuel, air and ignition ratios for best performance, and presents information on a digital cockpit display. It also has multiple back-up systems, which automatically engage in the event of failure of any system. It was interesting to play with, but can be left well alone if you prefer.

The FADEC system also allows the owner to 'plug' the helicopter directly into the Rotorway computer at the factory in Chandler, Arizona, via a computer and modem. Rotorway literature tells of a customer who was operating an Exec 162F in Nigeria, who was able to have his engine adjusted by the factory in the US to keep it running smoothly, using the FADEC system and a PC connection. The fact that the Rotorway can run on Mogas - in fact, it prefers it - was also useful for this customer, as indeed it could be for many owners in the UK who keep their helicopters at home.

Having studied all this carefully, Iain showed me the start-up procedure. The master switch is in the roof panel, along with switches for the instruments, FADECs, fuel pump and ignition. All were within easy reach for me. The clutch is engaged by pushing

ABOVE LEFT The Exec is flown from the left seat, and unlike most other helicopters in the UK, the main rotors turn clockwise.

LEFT There is virtually no storage space, but there is an optional 'helipack'. This can be fitted underneath the cockpit and takes up to 18kg of luggage.

LEFT The Exec is powered by a water-cooled flat-four, equipped with FADEC. The exhaust is located directly below the fuselage.



in a T-handle located on the back wall on the pilot's right; Iain did this quite neatly with his elbow, and I think I could have managed it with practice. Each FADEC system is then checked separately; the primary system being turned off to check that the back-up will kick in if required.

G-BWUJ lifted into the hover relatively easily - though remembering to use the right pedal when raising the collective could require a bit of practise for pilots trained on helicopters with anti-clockwise rotating rotors. She appeared to hover right skid low, which would be expected with clockwise turning rotors, but Iain said that this was mainly due to the difference in weight between the two of us.

After a quick radio call to Stansted, we transitioned away. The helicopter climbed reasonably well, though it must be said that this is definitely not a powerful machine. With a fuel burn of around 30 litres an hour, the Exec can carry full fuel and two people of approximately 76kg each for around two hours. I could see this being a bit of a problem if you had two fairly heavy people; you couldn't really expect to fly any great distance.

The Exec has no governor, but I found that the correlator worked fairly well. It is far better than the correlator on the Bell 47, but not as good as the Schweizer 300 CBI's excellent throttle correlation. In any event, little throttle adjustment is required for normal flight manoeuvres, though I found that I always had to keep one eye on the RPM gauges,

and limitations during normal flight are 96-104%.

The twist-grip throttle seemed to be somewhat stiff, and it took me a while to be able to adjust the rotor RPM easily, but this is to be expected when learning to fly a new type. There is no low rotor RPM warning horn, and

I'D BUY ONE TOMORROW

I felt the low rotor RPM light is quite difficult to see, so could easily be missed. Although the audio cues are quite good, and it is relatively easy to hear if the rotor RPM is low, I would be disinclined to rely on this if it were my helicopter. A horn can be fitted as an option, and it seemed to me that this would be a good idea if I were to own one...for I was already thinking this way.



Apart from these few minor niggles, the Exec was an absolute joy to fly. It is as flexible and responsive as an R22, yet in some ways feels like a much bigger helicopter. You can take your hand off the cyclic, and the helicopter will fly straight and level for a few seconds. She felt quite remarkably stable for such a small machine. I noticed that the collective tended to creep down if released, but a slight adjustment was probably all that was required. The helicopter cruised comfortably at 78 knots (note that the ASI is actually marked in mph rather than knots). We managed 87 knots, but it would be hard to keep it up for any length of time. She will turn on a sixpence, with steep turns requiring very little extra power. My over-riding feeling was that the Exec was just tremendous fun to fly.

Autorotations are surprisingly benign for such a small helicopter. To demonstrate this, Iain chopped the throttle, then waited...and waited. As an R22 pilot I was almost about to panic by the time he lowered the lever. But it was reassuring to know that there really would be plenty of time in a genuine emergency. I suspect that most pilots will find it difficult to break old habits and will try to use a boot-full of right pedal rather than left on entry to auto-rotation, as I did, but these things can be easily learned. The 57-knot autorotation speed feels natural and is easy to hold; in fact, you can again take your hands off the controls for a few seconds. Descent feels comfortably slow, and recovery



is uneventful – open the throttle, then raise the lever.

Within half an hour I was happily throwing G-BWUJ around the sky, and feeling reasonably at home in her. Being so responsive, she is the sort of aircraft that quickly becomes a part of you, and the job of rotor RPM control actually makes for even greater involvement for those of us who like hands-on flying...and I suspect that includes anyone who's ever flown a helicopter. I was by now acquiring the well-known helicopter-induced ear-to-ear stupid grin on my face. In short, I loved her! I wanted an Exec 162F of my very own.

The trip back was interesting, delivering the closest aerial view of Stansted I have ever had. The approach into Southern Helicopters' field was rela-

tively uneventful, though again I had under-estimated the amount of right pedal required when coming to the hover. But these are small things, and every new helicopter takes a bit of getting used to. Overall, I was impressed. I found it quite hard to believe that this stable, responsive, lovable little machine was a kit-built helicopter, and one that I had distrusted for so long.

So don't let those who've never seen an Exec, never mind flown one, put you off. The Rotorway really is a lovely little machine. Costing just under £40,000 at current rates of exchange, it is a bargain in helicopter terms. Spares are relatively cheap, and although the life of the airframe is only 2,000 hours, a rebuild would be relatively inexpensive, since some of

the parts could be re-used. You can save money by doing your own maintenance if you're that way inclined, but this isn't a necessity.

The relatively low payload and endurance mean it might not be ideal for continental touring, but it would be great fun for local hops...and you can park it in the back garden. Optional extras include the ACIS (Altitude Compensation Induction System) to enhance performance at high altitudes. And personally I wouldn't be surprised if the next development of the Rotorway included a rotor RPM governor, though that's pure speculation on my part.

To summarise, I'd buy one myself tomorrow. That is, I would if I had £40,000 to spare. And if I didn't have to build it myself first.

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