The Hewland 'box

It seems hard to believe, but the design of the Hewland five-speed dates back to the early '60s, and was borne out of a need for a transmission better able to make the most of the 997cc Pre-Crossflow screamer engines used in Anglia 105E race cars with their ridiculously narrow power bands. Mike Hewland developed the design using the original Ford three-rail gearbox casing, and the new gearbox made its race debut in March 1962 at Snetterton in the Pre-Crossflow-powered Marcos of Dick Prior. Dick won the race, and with the new 'box naturally being deemed a success, the likes of Broadspeed, Superspeed, Alan Mann Racing and eventually the Ford Competitions Department began using them, not just in Anglias, but thanks to the gearbox's versatility, in the larger-engined Lotus Cortina, too.

Eventually, the five-speed gearbox became commercially available through Wooler. It's not known how many were built, but the relatively high-price and the fact that the 'box was only available with dog-engagement (albeit helical-cut) gears probably means that it never sold in huge numbers and now survivors are very rare indeed.

Larger alloy cover needed to house extra set of detent springs. Top cover is original Hewland item.

Looks simple doesn't it? But there's genius in the design, manufacture and assembly.

All gears used are helical cut...

THREE-RAIL FIVE-SPEED: THE LOWDOWN

Hewland 'boxes are pretty thin on the ground – how did you find one?
It's reckoned there are only about four of five left now, and as far as I know, none of them are working. I'm eternally grateful to Ginetta owner, Michael Higson who lent me his original Hewland gearbox to base my new design on.

Presumably this one didn't work either?
No, it was fatigued and slightly damaged, and I discovered fairly early on in the development that some of the parts were missing, too. I had to conduct a post-mortem to work out what was supposed to be there, and just as importantly, make it all reliable.

Why manufacture a complete new gearkit when you could have used some of the existing three-rail 'box components?
I realised early on in the development that the type of customers who would be buying this gearkit weren't going to be happy with old gears welded up in a garden shed. I had to start from scratch. The only items we reuse from the original gearbox are the selector rails, and those are modified, too.

Do you think you've been able to improve on the original Hewland design?
Yes, I think so. Development in materials and techniques means I've been able to use something much more exotic to manufacture the gears from. I can't tell you what it is, but it's used in the Formula One transmission industry, and we use the electron beam welding process, which is a big step up. The gears are helical-cut, dog change and feature caged needle roller bearings, and the helices are cut in alternate directions so that the thrust generated is halved between the front and rear bearings to reduce stress and fatigue. I've been able to improve on the feel of the gearchange, too – it's now very nice indeed.

Will this gearbox be eligible for historic racing?
Yes, but our helical-cut four-speed Bullet gears are actually the only ones in the world that fall within the FIA rules — the straight-cut gears were never homologated. These are ideal for fast road too, especially if you drive to and from an event. Correct ratios, quiet and slick.

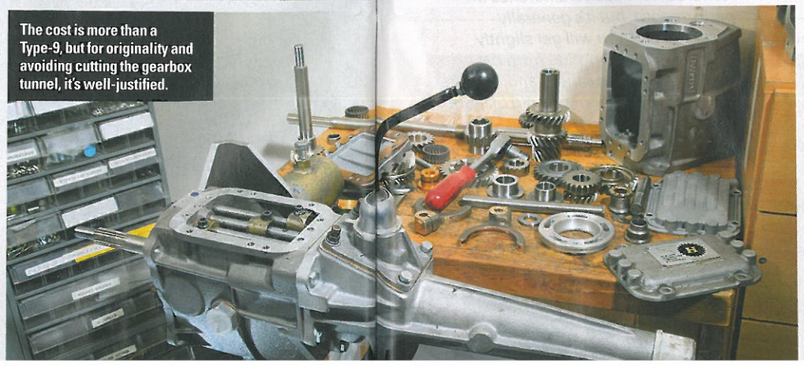
Has the 'box been used in anger yet?
Yes, it's been tested at Spa Francorchamps in a Ginetta race car, and it went very well. I got it back for a check over and it is perfect.

Is there scope to produce a synchromesh version for everyday road use?
No, there just isn't enough room inside the three-rail casing. Dog-engagement gears aren't really meant for road use, but having said that, the gearbox you've been photographing today is the one from the Ginetta test car, which the owner has been driving around the streets of Brussels.

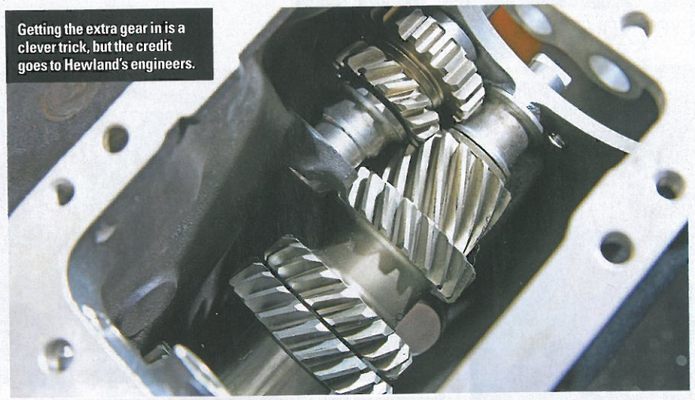
Could you also repair an original Hewland 'box?
Yes, indeed, and it would be great just to see one.

Now that the five-speed is done, what's next?
I've decided to concentrate a lot more on classic Ford gearboxes, so not only do I make the alloy and magnesium cases for them all to be assembled into, but with the hot wash, acid dip and expertise gained over the years, I can rebuild and improve on all three-rail, Type E and Type-9 'boxes. A range of next-generation gearkits are being developed — the Type-9 and helical Bullet kits are already done."

... with dog-change and needle roller bearings.



The cost is more than a Type-9, but for originality and avoiding cutting the gearbox tunnel, it's well-justified.



Getting the extra gear in is a clever trick, but the credit goes to Hewland's engineers.

The science bit

How do you squeeze an extra cog into the three-rail's relatively tiny casing? Over to Mark:

"Hewland came up with a very clever design indeed. The casing is machined so that a combined first and reverse dog ring now sits in the neutral position between reverse and first gears. First gear is in constant mesh and when you select first the dog gears engage to give you drive. When you select reverse, the outside of the dog ring, which has straight-cut gears on it, then engages with straight-cut gears on the reverse idler gear which is also in constant mesh with the helical part of the gear mated to the first gear layshaft.

"I'd love to be able to take the credit for it, but I can't," he says.

Selector fork sits over the first and reverse dog ring.

Machining the casing is the key to getting the new gearset in to the enclosed space of the three-rail 'box.

All-important magnetic sump plug keeps any filings away from the gears.

FIVE-SPEED GEAR RATIOS

Unlike the Type-9 five-speed, for example, the MKF 'box doesn't feature an overdriven fifth gear, but instead is direct 1:1, just as fourth gear is on the original four-speed 'boxes.

The ratios available are as follows:

1st	3.042:1 (optional 2.94:1)
2nd	1.78:1
3rd	1.47:1
4th	1.21:1
5th	1:1

The shift pattern is also different (see diagram), with first and reverse gears on a dog-leg. This way, first gear is now used just to get the car moving away from standstill (ideal for gradient clutch starts), with second to fifth becoming four racing ratios in the four-speed's usual H-pattern.

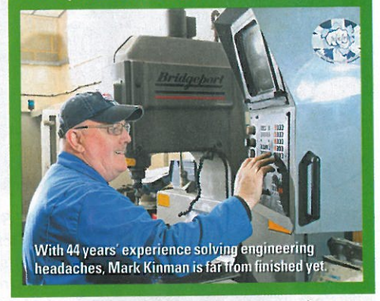
ABOUT MKF ENGINEERING

Longtime Ford enthusiasts may remember Mark from the mid-90s when he was one half of Flowtech Racing — at the time making aftermarket alloy bellhousings and diff casings for Ford transmissions, as well as getting the Type-9-based six-speed gearbox for Caterham from a box of welded up bits through to production.

But Mark's engineering background goes back much further — 44 years, to be exact. After serving his apprenticeship in the Navy, he started working in the automotive industry, including a spell with VW in South Africa and then the German motor trade in the '80s.

"I've done hundreds of BMW M3 and M1 cylinder heads — pallet-fulls," Mark recalls, "as well as the V12 engine blocks for the M1. After Flowtech, I moved to Holland for a quiet life, but after a decade I was teased back into it. I came back to the UK around two years ago to set up MKF Engineering."

"I'm a problem solver, really. People come to me with a problem, and I'll find a way around it, whether it's the rule book or a rare part. Most of my work is for the trade, but individuals and racers alike find me. I love doing what I do — I get a real buzz from the development and getting the part to the production stage."



With 44 years' experience solving engineering headaches, Mark Kinman is far from finished yet.

Luckily Mark was able to borrow an example of the ultra-rare Hewland 'box to help with his new design.

HOW MUCH?

The five-speed kit is available now for £2750 plus VAT. If you want Mark to build one up into your supplied casing, he charges £200 for the machining required and the build. New, three-rail casings in alloy are available from MKF for £400.