

Upgrading the Suspension on the Kawasaki ER6-F/ N

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The ER6-F has a basic problem in that the suspension fitted as standard, while perfectly decent, suffers from a lack of quality on the one hand with the rear shock and an elderly design on the other with the front forks.

The Rear Shock

The rear shock has to work very hard as there are no linkages to help spread the load with the result that it gets very hot. It also doesn't cope particularly well with bumpy surfaces or pillions. Encounter both and it cab get quite scary. Because of the relative simplicity of the design and the off-set position, replacing the rear shock with a good quality unit is an easy and quick job that repays the effort handsomely. There are loads of better quality units available from a large number of manufacturers. I personally chose a Nitron unit, which has simply adjustable damping and screw-collar adjustment for preload. The only draw-back is that there isn't much room for making adjustments after any unit is fitted and there is nowhere on the bike to simply bolt any remote reservoirs, so that type of shock is not usually used. Another advantage is that the spring rate can be chosen to suit rider weight and taste.



The Nitron shock as fitted. I ended-up turning it the other way up so I could get at the pre-load more easily.

The Front Forks

This is a far more complicated procedure simply because it involves removing the forks.

The basic problem with the forks as fitted is not one of quality. In fact the forks on the ER6 are good examples of their type.

There are two main types of front fork. Damper-rod and cartridge. Damper-rod are the type on most Japanese bikes which are not of the 'super-sport' variety and suffer from the inevitable compromises that have to be made in order get the damping as close as possible to optimum. They don't usually make it as close as the OE Kayaba's as fitted to the ER6. The problem stems from the fact that the damping is controlled by the rate that the fork oil is forced through

orifices within the damper rod. Obviously, once these have been chosen and manufactured no further adjustment is possible, although some bikes have some preload adjustment. Inevitably they tend to have too little low-speed damping as when you apply the brakes, so the forks 'dive' and too much high-speed damping so that the forks 'lock' when the bike hits a bump and makes the ride feel harsh. (This can cause the very interesting phenomenon that half the riders of the ER6 swear blind that their forks are too hard and the other half think they're too soft...) Kayaba have done the best they could but the design is the problem here.

Cartridge forks have a sealed, in most cases gas-charged cartridge that sits within the fork and handles the damping with a spring either on top or below (for USD type forks). Instead of oil being pressurised through orifices the damping is provided by flexible shims that allow the oil to pass. Depending on the thickness of the shims (or shim stacks) the oil can be more carefully controlled. Low speed damping is far better as the shim resists more strongly the lower oil pressure and high-speed damping is better as the shim will get out of the way more effectively.

These cartridges will often feature adjustment for compression and rebound damping and also for preload when they are found as standard on the bike. This isn't always the case for conversion kits and these can only usually be adjusted for pre-load although they can usually have different shim-stacks fitted by a service agent or the manufacturer to taste. The spring rate can be chosen to suit as well.

Methods

So if we have damper-rod forks we are already at a disadvantage and there are various methods open to us to improve the feel and comfort of the standard forks.

Oil Change

At a really basic level, you can change the oil level or the weight of the oil. Heavier oil will give you greater compression and low-speed damping but at the expense of greater rebound and high-speed damping. The opposite is true of lighter oil, of course.

On the plus side this is a cheap option. On the negative side you are only altering the characteristics of a fluid that will change over time in any event. So be prepared to do it often. It is also a little difficult to properly remove all the oil without removing the forks, particularly on the ER6's as they have no drain plug.

Spring Change

Can, and is, often combined with the oil change. Two main avenues of thought. Either to simply choose a different rate of linear spring to be either harder or softer than OE according to rider weight and riding style or to fit a progressive rate spring, again chosen for rider weight etc. The progressive springs aim to optimise the damping by having the spring rate change by the fashion in which it is wound. There are loads of spring makers and suppliers. Hyperpro, Maxton, Race-Tech, Hagon to name but a few.

On the plus side this is a very simple and relatively cheap option particularly if you choose a single-rate spring (progressive springs run out a little more expensive). Replacing the spring is very simple to carry out and requires no removal of the forks. Negative side is that it might not work to everybody's satisfaction and you do still have, essentially the same forks as you had before. If you get it right and it suits you this is worth a try, if not, you wasted your time.

Emulators

These consist of a gadget that sits on top of the existing damper-rod and alter the damping characteristics. There are two main types that I know of. Those by Race-Tech and Matris, both of which do essentially the same job, but do it rather differently.

Race-Tech first. These, really quite expensive items sit on top of the damper rod and are held in place by the spring. They require quite an extensive re-working of the existing fork internals. The damper-rod has to have the compression

orifices at the bottom drilled to a greater diameter or extra ones added so that they no longer affect the damping, its also necessary to block up the rebound orifices at the top. If the internals include a spring spacer (as the ER6 does), this must be shortened by the thickness of the emulator.

When all this had been done the damping is now controlled by the emulator, and this can be adjusted by a simple spring and screw. Race-Tech also manufactures springs and these can be chosen and fitted to further complete the work. On the plus side they are very well spoken of by those who have used them so they do seem to work well. They are also a middle of the road option as far as expense goes.

On the negative side the re-working of the internals can be bit of a chore, although you can get stronger replacement damper-rods (traxxon) that are manufactured specifically for this application, the problem is that the OE rods are of very thin steel construction and not really robust enough to have too many holes drilled in them. While the damping can be adjusted, you do need to fish the emulator out each time you do it and it can apparently take a bit of trial and error to get the oil weight and air-gap set up correctly.

Matris have a slightly different take on it. They supply a complete kit of springs, spacer, emulator and a fork-top with pre-load adjustment and also fork oil. They also call it a cartridge kit. It isn't. So far as I am aware, you can't get any of this stuff separately although they do it as a spring replacement kit without the emulator. The Matris emulator is of a more sophisticated design and the valve fits inside the top of the OE damper-rod, extending down the inside with some o-rings so as to block off the top damping orifices. No modification is necessary to the bottom orifices. Adjustment is for pre-load via the new fork-top and damping can be altered by changing the shim-stacks.

On the plus side this Italian-made kit is of great quality and very convenient to fit. They are very highly spoken of and generally seem to need little in the way of adjusting and setting-up. You can choose the spring rate of the springs that arrives with the kit. Not having to modify original components is a bonus. On the negative side adjustment of the emulator is not as easy, although the kit does come with a choice of shims. As with Race-Tech, you do have to fish the emulator out but as it clips more firmly inside the top of the damper-rod I imagine that this would be more difficult. What is an issue is the cost. This, at time of writing, was the most expensive option available.

To Sum Up

On the plus side both these examples seem to work well. On the negative side they are costly for what you get and you do still have essentially, the same forks at the end of it.

Cartridge Inserts

Cartridge forks have been around for a long time and in recent years manufacturers have designed replacement kits for both OE cartridge forks (as improvements) and OE damper-rod types (as conversions).

The basic method is to simply remove all the fork internals and install a damper unit which bolts to the bottom of the slider, a damping rod extends to the fork top, through the spring. The oil is usually replaced with a lighter weight as it is responsible only for lubrication and the air-gap, as damping is provided by the damper unit. For the ER6 I have found two main suppliers for this type of conversion. Maxton and Bitubo.

Bitubo

Is another Italian manufacturer with a very long pedigree in motorcycle sport. The kit they supply comes with everything you need in the box, including oil. Bitubo supply Silkolene 5w for the ER6 kit. There is no easy adjustment to the damping, the damping unit being a sealed nitrogen-type. Pre-load adjustment is provided by a new fork-top. You can choose your own spring-rate, should you require it.

On the plus side. This is a product of excellent quality and the one I chose to go for. Cost-wise it compares very favourably with all the other options and it has proved to be a highly effective solution. Fitting of the unit was very

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simple and the damping rates and spring-rate chosen by the manufacturer proved to be well suited. I now have state-of-the-art fork technology hiding inside my apparently standard forks.

On the negative side. Although the fitting was easy it did entail a complete strip-down and removal of the forks, although I did not find it necessary to replace the oil-seals. I've had to accept their damping, although I can return it to the suppliers to be altered.

Maxton

Are a British motorcycle suspension specialists. They can supply a kit or fit and set-up your forks for you. Their cartridge conversion kit has rebound damping and pre-load adjustment at the fork-top. A spring is chosen to suit your requirements.

On the plus side. You can keep going back until it is right. Good quality equipment manufactured to a high standard. The rebound damping adjustment is a plus point. Nobody else seems to offer this with a conversion.

On the negative side. Expensive. This was the single most expensive solution available and could get even more expensive if you got Maxton to do it for you. There is also the received information from various users that Maxton's solutions are not always to everybody's taste.

Traxxion

Another conversion, this time from an American manufacturer. Features a cartridge converter that can be made-up to fit any bike. Details are a little sketchy and no prices appear to be available and I can't find any trace of anybody that has used them. They appear not to be a DIY option.

Final Comments

Obviously, a lot of options to consider. I finally went for what I considered to be the most DIY-friendly and effective option and fitted a Bitubo fork cartridge conversion kit. Cost wise they fitted in the middle of the two emulator solutions being a bit more than the Racetech stuff (if I included springs) and a bit less than the Matris kit. It was also the cheaper of the two or three cartridge converters.

And This is How I Did it

First I removed all the fairing panels





Using an Abby stand I jacked-up the front and removed the front wheel, mudguard and finally, the forks.



This is what came in the box.



Detail of the spring, damping rod and fork-top.



Top fork is as removed.

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Before removing the fork from the clamps on the yokes I loosened the fork top.

Before removing the fork top the fork-slider was placed in a vice and the bottom bolt loosened.....



... before finally being removed with the fork upside down. Because the springs were still in situ this gave sufficient tension on the damper-rod to prevent it from turning and allow the bolt to be removed. When I turned the fork the right-way up to remove the fork-top I did it over a container to catch the oil.



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All the OE components that will no longer be required. Left to right.
Fork-top, spacer tube, washer, spring, damper-rod. Bottom bolts get re-used.



Old and new, laid-out for comparison.



The damper unit, minus spring and fork-top, drops inside the stanchion and slider.



Then the bolt goes back in, as tight as possible, to secure it.



Top fork is done, second one awaits. Note the spring seat on the right, just below the spring. This drops over the damping rod after the oil has been added. The small locking-nut screws over the threaded part of the damping-rod next, all the way to the bottom. Spring drops in and then the fork-top screws on to the damping-rod as well, all the way down to the lock-nut which is used to secure it. At this point the stanchion is extended to the fork-top which is screwed in. Job done.

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All that remains is to secure the fork in a vice and put the final tightening on the bottom bolt, using the spring tension to hold everything still as before. I had no difficulty with getting it tight enough without this final precaution, as it happens, but you do need to get it at least tight enough to be oil-tight at the initial fitting stage.

Final tightening of the fork-top gets done when the forks are re-installed in the yokes.

Final Set Up

With the bike all back in one bit and the most vital part carried out (the stickers, of course)! I then had a bit of experimenting to do with the settings. The fork on the ER6 is comparatively short travel compared to others. It has a range of 90mm as opposed to a more usual 120mm. This means, I'm assuming, that its static sag needs to be a little less than the usual 30 to 40mm and I ended up with about 20 to 25mm. The pre-load adjuster gives 1mm of adjustment for each full turn to a limit of 15 turns and I finally settled on 8mm for a 12 stone rider. Having found the optimum (for me) adjustment for the forks I had to make some slight changes to the rear to keep things balanced. Nothing drastic, a couple of clicks of damping and one turn on the pre-load. Interestingly I ended up with almost the exact same amount of preload (in mm's) at both ends.

And finally.....

I'm well satisfied with this. The forks are an immense improvement over the OE set-up and, combined with the Nitron shock I have a machine that handles even better and sorts the bumps out very competently. The ER6 always handled well to begin with but its suspension let it down on anything but the smoothest of surfaces. Not any more. It's actually a bit off-putting at first. On roads that I know well I'm waiting for the bumps and crashes but all I get is a nicely controlled ripple and sometimes, nothing at all.

Well worth the effort and not really the most expensive thing you might do to improve a bike. The total cost was £350 for the Nitron and £300 for the Bitubo kit and if you set the cost of the bike and these items against the next machine with handling and suspension as good as this you come to a far greater total than £4650!



All there is to show for it.....



Although the people trying to keep up might beg to differ..... That's at Cadwell Park two days after the forks were done, I hadn't had time to do the stickers!

Cheers and good luck!

Geoff Comber