

OF FRAMES AND THINGS

Discussing, then testing, the Hossack chassis

IF ONE had to try and encapsulate the recent Road Racing Show at the Alexandra Pavilion, London, in a phrase it would be, "It's a frame up". There were, of course, all the usual goodies on show, from accessories and tuning kits like the £12,500 Honda VF 750 race kit, to complete bikes. And it was these that caught attention.

Centre-hub steering designs will never be acceptable on roadsters until they are popular on the track. Difazio and others have ploughed a lonely furrow with technically superior designs that have never sold in viable numbers; and they won't until they win races. Motorcyclists are a conservative bunch. This seems something of a contradiction, when biking is usually seen as an expression of character—even individuality. But so far, anything without idle forks—at least on a heavyweight—has yet to take the market by storm.

However the Eif is rather less of a curiosity now that it has amply demonstrated that, as severely unconventional as it appears to be, it's quite quick enough around the tracks to make all the way forward in the future. Head and Tomkinson's Needle might have made a mark, but it never made the same pace... it takes a great deal of money to develop successful racing motorcycles.

Hejira took pride of place at the show, if prominence be the criterion, with a design based upon two steel bulkheads into which all the major stresses are channelled. Like Needle and the Eif,



At the Road Racing Show, Norman Hossack, left, makes a point; on the bike, R. K. ("I'm really quite non-mechanical") looks depressed, or thoughtful, or baffled

the fuel load... heavy enough, after all... is placed where the weight can actually be beneficial, in lowering the centre of gravity of the machine—underneath the engine. But the futuristic design, depends how much you look at

it, is only just in its first stages. It is, in a sense, the skeleton for the clothes that are yet to come. When the chassis has all the potential bugs chased out, enclosure that will form part of the completed machine will follow.

Then there was Multitank with frame and chassis kits for a variety of single-cylinder engines; to say nothing of the Brooklands bike complete which I believe is discussed at length elsewhere in this issue.

Harris showed among other things a glass-fibre mock-up of an intended carbon-fibre F1 chassis. And then there was Hossack, with neither centre-hub steering nor fix that matters a steering head at all. They're all worth by now. But then, after the show, a phone call was made and another race test was arranged....

NORMAN HOSSACK is a man with a mission and a very interesting background in mechanical design. The mission is to change current thinking in motorcycle chassis design. His background is coloured not merely by his education but from having spent some seasons with the McLaren car racing team. The extensive testing programmes that were involved to prove chassis designs sparked many a thought that, to Norman at least, had application to bikes.

Here it should be said that Norman started his bike racing career in South Africa on a 250 Ducati, so his sympathies were with two wheels right from the start. However SA is rather far from the centre of things when your interests are in developing new ideas. So Europe it had to be. Various opportunities presented themselves: one was to mechanic for the Shocore team, but at the time that didn't look too much of a deal; and

MOTORCYCLES

Italian



Style

Can you imagine anything more exhilarating than watching the world flash by from the seat of an Italian thoroughbred motorcycle?

Always capable of producing high emotions, it's a relaxation step of man and machine that builds into an exhilaration of the heart that few other motorcycles can equal.

Three Cross Motorcycles has specialised in the sale and after care of these exotic Italians for a number of years. Consequently, they are well placed not only to offer the widest selection of new and used Italian super bikes in the UK but also offer some timely advice when it comes to choosing the 'Little lover' that has stolen your heart.

We usually have over 200 bikes in stock, including:



THREE CROSS

MOTORCYCLES

Laverda, Ducati, Moto Guzzi and some very exotic specials like our custom 33 Laverda which will really make you stand out in the crowd!

Why not come and see us? We'll look forward to meeting you and perhaps starting off another romance!

WELL WORTH A VISIT

Open Mon-Sat, 9-6, Sun 10-3.

NOW OPEN AT:

Bromyard...

LAVERDA · MOTO GUZZI · DUCATI · KAWASAKI · HONDA · YAMAHA · HARLEY-DAVIDSON

Three Cross Motorcycles · Woblesbridge Industrial Estate · Three Legged Grims · Wimborne · Dorset · Tel: 0202 824531

Three Cross Motorcycles · Collington · Nr Bromyard · Herefordshire · HR7 4NB · Tel: Kyr 08856 284/5

HOSSACK

then after Norman had said no, Barry got his works contract. Oh, well. . . But then came the McLaren offer, with a chance to research and test ideas in chassis design.

True enough that chassis on four wheels are hardly the same as for two, but some of the fundamental principles apply in both cases. Perhaps the first is that suspension on either tends to compensate for deficiencies in the chassis, channelled into the chassis, and therefore not doing the best possible job of keeping the wheels in contact with the road. With conventional chassis design it's a case of striking the best compromise.

You will no doubt have seen those interrupted skidmarks on motorways — as if a juggernaut had skidded down a flight of stairs. Norman explains the interruptions as the effects of the chassis actually storing the energy led into the chassis. The braking loads, and then the aforesaid "energy packets", are fed back again, giving the effect of juddering to a standstill. Think of it another way: as all that kinetic energy flowing back and forth generating stresses and strains and having the effect of locking the wheels and then releasing them momentarily.

While the massive chassis of juggernauts are hardly to be compared to racing hardware, the basic principles still apply. A bike being braked on the limit has, relatively speaking, a lot of energy to dissipate, and it isn't all done through heating up the brake discs. The wheel is trying to stop, the forks are bending, however slightly, energy is running up the forks through the steering head and into the chassis. It's quite a long path when you look at any conventional bike. Then the wheel doesn't travel in a straight line — or rather, the rest of the bike is trying to describe an arc around the wheel. And the wheelbase varies. And if the various parts weren't made sufficiently tough to cope with all those loads, then they'd bend even more. And the effects on navigation, and "braking feel", would be even worse.

So if all that energy had much shorter paths to travel, all the bits along the way wouldn't have to be built like a tank — again, comparatively speaking. Well, these were just my impressions after talking to Norman for half an hour, trying to extract design concepts from him. To look at a Hossack, you might think that it was a meld of the old Norton John Player specialtime plus a modern version of the grider, or even the Girardolle, fork. I even heard one irreverent remark about the "Meccano set" I was to ride, from one observer. There are always slightly confused observers in the paddock when they see a Hossack.

There's more than a hint of truth in some of the comments and I sought to tease Norman somewhat by suggesting hadn't he re-invented the grider fork? "I have drawn upon some of its useful details", he said, "but bypassed its problem points". (Just to make it easier to read, and write, we'll drop the actual quotes.) He contends that wheel travel of a grider fork is more than somewhat limited; this is true. The links really are very short. And in any case it still requires a steering head, and Hossacks don't. Consequence of this is that there is still a very long path from the centre of the mass of the machine, up the wheel axle through the head and down.

Now I'm really quite non-technical, so I teased him some more. I suggested that while this was true enough on paper, the actual

Hossacks so far built house Rotax, Yamaha and Honda motors



Lightweight chassis of the Hossack



At the front . . . with ribbone type suspension

advantages on the track are imagined rather than real. After all, when you're out there where it's at, where the action takes place, does the difference really show?

That did seem to be quite a good question, but so was the answer. We were at the time looking across the paddock at a big Ducati, and Dukies steer as well as any. *As* fork worked sure enough, but Norman observed that it did have probably 30 years of development behind it, and rather like the poppet valve ways had to be found to compensate for its deficiencies, so that while the design was not fundamentally good, its current performance had become the state of the art. If, therefore, a Hossack only performed as well as current hardware, while still in an early stage, quite clearly its potential offered a way forward to far better performance.

It's the front end of a Hossack that catches your eye first. And to a modern day rider it's that semblance of a grider fork that surprises. In fact the fork is based upon the car ribbone principle, taking the form of an absolutely right triangle — or rather, two of them — the basis of which govt on the main frame and the sharp ends in the centre on the twin fabricated blades that take the place of telescopic forks. At a quick look you really have to stop and look to see how it could possibly work; then the simplicity of the design emerges. It's all done with rose joints.

First, unsprung weight is very low, anti-dive is an inherent characteristic of the design, and the consequence of all this is that spring rate of the Koni unit is very light. But to repeat — since the suspension does not have to cope with heavy

braking loads it can be tuned much more finely to cope with following-the-road undulations, therefore giving a better roadholding performance.

At the rear, the pivoted fork extends forward to provide a very short arm to bear the top of the Spax spring unit, the bottom of which is supported by tubes from behind the gearbox mounting. It's again a very light fabricated part and allows the non-gas unit to be positioned dead upright. Norman contends that the virtue of this arrangement is much more consistent damping performance. The shortness of the arms and of the link portion again contribute to a very rigid back end.

As a depression, all the inclined units, as in monocoque systems, require gas-filled units, given that they are the conventional twin-tube design, to work. This is, Hossack contends, an unnecessary complication and he, therefore, designed a suspension system that would permit the use of standard air units, as per car practice.

When starting out on this design, the objective was rigidity rather than lightness, but the achievement of the first aim has naturally resulted in a very light frame. The machine that was to be the subject of this test houses a very standard Yamaha LC 350 unit, and total weight is just 230lb. For comparison, a TZ "G" weighs in at 270lb. At the other end of the scale, the early Hossack frame carrying a 500 single Honda, and raced very successfully, comes in at 218lb. It is quite clearly possible to build a 250 right on the minimum grand prix weight limit of approximately 188 lb.

Seen at the racing show, where we came in, the frame was offered as a TZ replacement and bears a £1,200 price tag. That does of course mean using your own, or choice of, brakes and wheels. You could in fact build a very nice competitive bike for under a couple of grand. Incidentally, Hossacks have so far been built to house Rotax, Honda and Yamaha motors. It's very easy to allow for the various power units since they are suspended from the frame, basically a bridge.

At this stage, Norman Hossack has begun to consider offering complete machines but this would ideally need a tie-up with an engine manufacturer and component suppliers, but it's clearly a possibility; anybody out there listening? The final result would be a better machine because the chassis would already be set up for known wheels and brakes and not be subject to some of the DIY-ery.

It is interesting to speculate upon, say, a hot Elitich motor and all the expensive lightweight accessories — to see an almost thoroughly British bike up front in the grands prix. But while the Brit bike idea is really little more than a dream at the moment, it is at least a twinkle in Norman's eye.

Like many a good engineer with a good product to sell, Hossack freely admits that though the product stands up, the marketing behind it falls diamally. He has been toying with it for five years now, while still earning bread and butter elsewhere, and getting some really good machine results, but little publicity or outside interest. At club-level the bikes have won championships, and Vernon Gushier in particular makes a lot of hay in the single-cylinder class with the Honda-powered version. Hossack needs the resources to buy-in expertise and set up something of a publicity campaign; or he has to making just the right contact in the racing world to get a really powerful motor to prove the chassis, with an



R. K. ... impressed with the Yamaha-engineer Hosack

established rider to get it up front on the national scene. But watch this space as they say.

The current chassis is two years old and in any case is only made from very ordinary 16 oz steel. It would be easy he says, to produce a much lighter chassis by upping quality and using thinner material. Another development on the drawing board is for a riveted-alum monocoque, not that there is anything new in that concept. But with the Hosack aim of first reducing chassis loads, and in any case preventing them from actually amplifying the loads fed into them, Norman feels that he has experience already that could produce a more successful model employing this principle than has yet been seen around the tracks. Essentially it would mean distributing the loads over a much greater area than hitherto, and this is in any case the essence of the current design even though it employs square tubing.

But before getting down to riding impressions a word about the motive power. It is a pretty ordinary Yamaha, plus racing exhaust system, and the only real modification is one millimetre off the exhaust port. It's certainly no mind-blower, in power terms. In its 352 cc guise it was entered in the open 500 cc race.

Practice was a bit wet and dry and Yamaha power was a new event in itself for me, so it was very gingerly does it initially. At slow speeds the bike felt a little awkward, but as the track dried a little things got better the faster it went. However unconventional the frame, it has to be a tribute to it that I found myself more occupied with keeping the motor on the boil than wondering what the bike was going to do. It wasn't doing anything other than taking me where I wanted to without any surprises.

When I was beginning to get at it in the closing stages, it became apparent that the front end was indeed particularly stable when planting on the anchors and I was soon able to creep up behind the CB100 RB of Graham Marchant, who had started out to run in a new tyre, and we were both going gradually faster. It was slightly disconcerting, when coming back in, to be asked for impressions by Norman to realize that it had all gone rather well, and that I'd started to enjoy myself and really hadn't been able to find faults.

Angaries for the first actual race were good; front row for four laps of the Brands Hatch grand prix circuit, a Bessie Club meeting, and with 34 other types intending to be first in the chequered flag. Hosacks are small; well certainly low. When the light went to red I could stand astride the rear of the racing seat hump and heave mightily on the bars and, then on the

green, paddle away.

One hump and a quick dip on the clutch lever with the throttle set at about an eighth, and the front wheel reached for the sky. It was *stupid* off the line for yards and yards. I actually *made* the top of Paddock Hill in fourth spot. There were two RG 500 Suzuki fours there and in some ways I suppose they should have been there, bearing in mind what they are.

The following few laps were enormous fun. I scratched harder each lap, braked later and got the power on earlier each time. The fact that the LC was able to stay at least within striking distance of the 500s along the straights was a testimony to the excellent power-to-weight ratio provided by the Hosack frame. Towards the end I found that I was readily able to get the rear wheel sliding in a controllable manner, which speaks volumes for the rigidity of the frame; there was plenty of feedback.

I did get passed by one RG, and passed another, and the score at the end of the race was an excellent fourth place, in among the pens first time out on a machine so far removed from the 1,000 cc heavyweights to which I'm accustomed. That too speaks volumes for the ease of handling of the bike. In spite of it being tailored for riders of shorter stature than me, even the rather cramped accommodation was no bar to getting on with it.

Stability is the particular attribute of the bike that sticks in my mind. After the second race, I couldn't remember a weave or shimmy or so much as an unscheduled nod of its head over any of the Brands undulations. Roadholding is of a very high order.

The second race meant starting from the rear of the grid in the middle and that gave me a lot more work to do. A less meteoric start than in the first race involved traffic work, chopping and changing lines and braking into corners with the competition. All with ease. It also meant riding harder and served to re-inforce the impressions from the first event ... in short, very good.

Hosack is like several frame makers on the market ... small concerns dragged up by their bootstraps, with talented engineers with lots of ideas they need to refine and develop. There really are some exciting projects around these days. Several of them other ways forward in chassis design that will in due course reach our readers. But first they need the resources to reach the commercial stage. That can follow if racing success can attract backers. And that could be in the lap of the gods.

A quick motor and rider to extend the Hosack ... and then who knows? I'd say the potential would seem to be there.

R.K.

We also stock
Helly Hansen
waterproofs
for the real
connoisseur

RUUKA "METALLIC"
UNLINED ONE-PIECE



SPRING OFFER



Order now! Write / phone
SPORTING APPAREL
28 Granville Drive
Chilton, Co. Durham.
Tel: Bishop Auckland
(0388) 721312

JUST £40 POST
FREE

We can supply
any item from
the Ruuka range