(With a '71 or later machine on its centre stand you could take out the front bolt on the machine itself as there is practically no weight on it so long as the head steady has not been removed). Screw this into the end of the spindle.

The first modification on Mk 11A 850s, whilst it retained the stupid ¼in locating screw for the spindle, has less bearing area because bushes and spindle are shorter and neither has it the 1/16in oil feed holes. Still worse, hardly any oil was put in at the works, the feed wicks are very tight in the spindle bore so that any oil which might be in the centre of the spindle is unlikely to reach the disc wicks which are under the core plugs and which are intended to feed oil to the outer edge of each bush.

The second modification on Mk III at long last secures the spindle in the engine plate cross tube with two cotter pins—bicycle crank type—but the other faults, tight wicks and no oil remain.

An improvement is to drill the centre of the offside core plug 13/64in, tapping size for ¼in BSF (26T) or ¼in UNF (28T). Use a pilot drill, say ⅛in, first so that the tapping drill does not drill oversize; tap the hole. By screwing in a ¼in set screw against a suitable washer and spacer you can pull the core plug out, take out the disc wick and run a drill, the 13/64in will do, down the middle of the feed wick and put a similar hole in the centre of the disc wick. With a Wesco or similar pressure oil can you can now inject oil through the right hand wick into the spindle centre where it will pass along to the nearside wicks. Replace the disc wick and refit the core plug—it will tighten in if you fit it as before, nut convex side out, and expand it with a hammer and suitable soft drift. Complete the job by fitting a short ¼in cheese head set screw and fibre washer. Then periodical oiling with a Wesco is all that is necessary. I know NVT say SAE140 or EP90 but I use engine oil if nothing else available —any is better than none at all!!

Finally, referring once again to the original set-up which has the grease nipple. Having dismantled the parts and got rid of all grease, a small Tecalemit grease gun will operate with oil but must have the grease cleared out first. Mine works well and I used it at Andover and still do at Parkroad. Care must be taken however as these will build up a high enough pressure to blow the end cap off also.

Failing this get a friend to hold the machine as far over to the left as possible—footrest rubber on ground—but not weight of machine on it!!! Remove the grease nipple and inject oil with Wesco can.>>

REAR SUSPENSION UNITS don't usually give much trouble, but many owners prefer 150lb (sidecar) spring in place of the 126lb springs fitted standard. This helps the handling in a strange way—and it also helps the dampers if you fit the Girling covers over the units at the same time. More than doubles the life of the units, or fit rubber gaiters.

The early black curved chainguard was better for the chain and in styling —it was fitted on pre-1971 Fastbacks—but if you can't find one, the later 850s had a plastic effort which slotted onto the end of the alleged chainguard to stop the oil from spraying all up your back and all over your luggage.

As a word of warning, there are two ways of breaking a Commando frame (well three, if you count the pavé at MIRA).

1. Have the rear isolastic mounting too tight—this will break the frame where the tubes from the seat knobs downwards meet the gussets for the battery carrier.
2. Put a carrier on the back without supports to the pillion footrests. If this doesn't break the rear loop it will bend it downwards, and then it will break when you try and straighten it. Watch out for carriers which foul the top of the damper unit—this can break off the damper eye with interesting consequences.

GROUP 12:— Footrest plates

FOOTREST PLATES: The most over-engineered part of the machine—not that there is much competition for the honour. They are forged from aluminium alloy and are unbreakable. Even if the plates are bent until one end touches the other they will not break. For Concours rebuilders the catalogue is not strictly accurate—as well as the spacers between the frame and the side-plates there are extra ⅜in washers on the ⅜in bolts. This was to cock the plates outwards at the rear to avoid a snarl-up of the rear brake cable and the silencer studs.

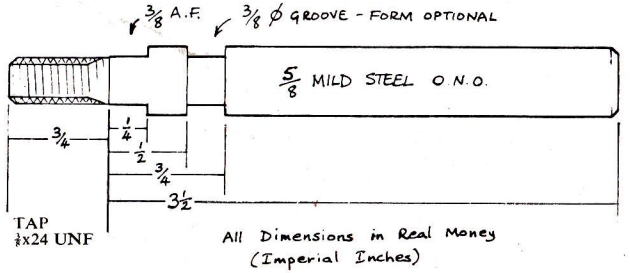
The two plates differ only in the Zener Diode hole in the right hand plate —on electric start models there are even diodes in each plate—and the only threads are those for the three footrest studs. These are 5/16 x 20 UNC in the holes, and for a brief period, instead of using studs and nuts, bolts were fitted in these holes. Much neater. The studs were UNF at the outer end—except for the right hand rear bolt—which was always a bolt, and which was deliberately made too long so the earth lead for the Zener could be attached to its inside end. The Zener earth requires a 5/16in UNC nut, the only one on the whole bike—but if you lose it a 5/16in Whitworth nut will fit. Very common on coach bolts and gutter fittings.

THE FOOTRESTS: as all of you who have ever had a Commando know, break off. Early examples are brazed into the hangers, and were messy to put right because re-brazing spoilt the chrome and buying a new one spoilt the bank balance. Later footrests were screwed in, and broke off just below the surface. The thread is 7/16in x 20 UNF but it is best to drill out the thread in the hanger completely so that in the event of a breakage you can fit the new bit at the roadside without resorting to spark erosion. You all do carry spare pegs, don't you? You can get the rubber off the broken peg using the screwdriver in the tool kit—poke the screwdriver down into the gap and dribble petrol (or washing up liquid) down inside. Then make sure no one is looking and hammer the screwdriver into the other end of the rubber. It doesn't do the screwdriver any good—but you will only destroy the end you hit, so hit the Philips end because it doesn't fit the crosshead screws all over the bike anyway. They're Posidrive.

A further idea on footpegs is a modified peg like that in Diag. 3. This has been tested in a 50 m.p.h. slide. What happens is that the peg is allowed to bend under a heavy fall. If it breaks off at the constriction completely then the stub is easily removed with a spanner. No locknut is needed as it is done up tight and the constriction also stops the rubber from falling off.

There was a spring made, but fitted as standard only on some police bikes, which would prevent the brake pedal digging in the road if the cable were to break. The cables don't break, but if you are worried and you can't find a suitable spring, cut a slice from an FSIE tube and slide it over the footrest and pedal. Best thing that could happen to an FSIE, to have its tyres removed to mend Nortons. If you remove the clevis and clip from the cable end, refit the head of the clevis on the inside so that if the clip should fail and fall off the clevis can't fall out.

Diagram 3.



GROUP 13:— The oil tank

THE OIL TANK is not over engineered. The mounting rubbers fail regularly because:

1. They are under strain due to the mudguard fouling the hoses and connections.
2. They are not oil proof.
3. They are usually fitted twisted.

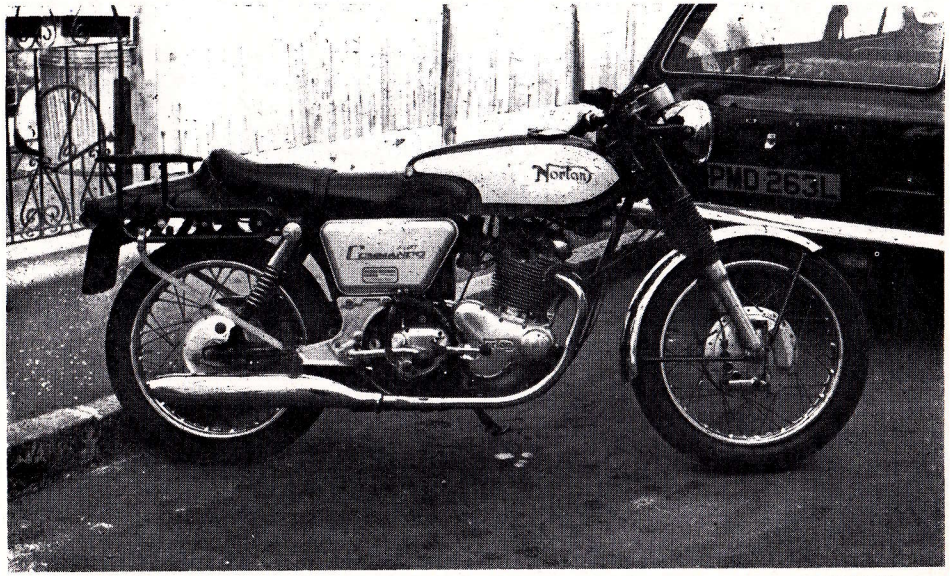
If they are left broken the oil tank can't fall out but as the tank flops about the strain falls on the bottom fixing which can split out of the tank bottom. (Then the stain falls on the garage floor.) About the chain oiler the least said the better, but I suppose it does stop one side of the carrier going rusty.

THE OIL FILTER is fitted on the return from the engine to tank, not as shown in the parts list, so that there is no tendency for a clogged filter to starve the oil supply. The element is interchangeable with elements from Citroen 2CV cars and Simca 1100s—the Simca unit is a bit longer than the Citroen job but the thread and so-on are identical. Fancy a Commando having metric threads!

STOP PRESS:

OIL: For those interested in monograde oils, SAE 40 SE or SD is preferable, if you can get it, to multigrade (20w/50) (SAE 30 SE/SD for below 0°C. SAE 50 SE/SD for above 32°C ambient.) normal multigrade would be preferable to a cheap monograde as it would be without the additives denoted by the SE or SD. Running in will take up to 1200 miles on a monograde before full 'economical' oil consumption can be expected.

PANNIER & TOP BOX WEIGHTS: The factory recommends no more than 25 lbs. in the top box. No more than 40 lbs. in panniers (evenly distributed) or 40 lbs. total to maintain factory designed handling stability (nicely put!).



A fine example of the 1971 ***Fastback, only a few of which had the two-tone*** *tank. Owned by Paul Bennett.*

GROUPS 14, 15 and 16:— Forks and front wheel, including front brake

FORKS AND FRONT WHEEL: The Norton Roadholder front fork achieved an enviable reputation in the early days of telescopic forks, due to a certain extent to a better clamping of the wheel spindle than some competitive designs, especially the forks on the first post-war Triumphs. The reputation lives on even though technology has proceeded over the last thirty years to give performance about as good as can be expected from telescopics. Designs used by B.M.W., Marzocchi, Ceriani and many others—notably not from Japan—are very well respected, but the poor old Norton fork has slipped slowly further and further back until it is debatably the most old-fashioned telescopic fork in use. There is one modern feature, in which the Commando is ahead even of the most prestigious machines—the steering bearings. Simply it is this—I have had to do with one or two Commandos in my time but never have I heard of head races which wore out. One or two damaged in accidents, yes; oh, and I am only talking of the 1971 on models—the early ones had what are best described as featherbed type yokes and cups and cones which were abysmal. The bearings themselves are quite ordinary sealed ball bearings, doing a job for which they are not really best suited, that is, taking an end load. So why do they last so well? Simple really—think for a minute why head bearings fail. There can only be three reasons, accidents excepted.

(a) They are too tight. It is difficult not to overadjust the adjustable type because one doesn't know just when to stop and this bruises the tracks.

(b) They are too loose. This can be due to settlement after fitting and puts all the load on two or three balls.

(c) The wet gets in, causing rust and fretting corrosion.

For once then, they got it right: bearings which can't be fitted too loose, or tight and which are sealed on both sides to stop the wet getting in, and, equally important, to stop the grease getting out.

The best thing to put in Norton Teles is Automatic Transmission Fluid, but if this allows too much topping then try Castrol Shockol or even the original "Castrolite". Don't use less than the recommended disposable plastic cupful in each side (160cc) or you'll get even more than your share of topping. Seals wear due to oil getting out, mixing with road grit, grinding the seal and the chrome away. It is the ultimate folly to take the gaiters off. The latest gaiters will fit all post 1970 machines and should be compulsory. Or use Montesa gaiters—slightly slimmer.

There has been a kit for use in the handling department. A steering damper made in the land of the rising sun. Kit No: 064247, but it didn't help much. One other kit that was also available was the 063412 which converted drum brake to disc. I'm afraid it's all down to one's own codging these days.

You should all know the story of the front brake position—originally fitted behind the right hand leg. For some exceedingly technical reason this caused all the bikes to pull to the left, and made most of them so bad that you couldn't steer the machine hands-off. Nortons which wouldn't steer hands-off! And no-one complained. Well, actually, about a dozen people did, but there wasn't anything that could be done about it. Anyway, later it was found that if you take the forks out of the yokes and swap them over the brake finishes up in front of the left hand leg and the machine then steers O.K. No, I can't explain it either. This is not the safest thing to do because there is a grave danger (that is, a danger which might lead to the grave) that the bearing

locking ring will unscrew if the rotation of the wheel is reversed. Do it by all means, but make up some way of securely locking the bearing ring.

There isn't much that can be done to prevent the inside pad wearing rapidly in wet weather. The factory did make a scraper effort to fit beneath the caliper but it made a vile noise and didn't work very well. Perhaps swapping the legs over cures this too. Life of 3,000 miles is to be expected, so if you are going abroad take a spare pair of pads. It can rain over there, too—we've just returned from the F.I.M. rally and we must have had a dozen thunderstorms in the month.

Don't forget to change brake seals, hoses and fluid about every three years at least, as the rubber simply does not last for ever. The drum front brake is simply not worth bothering with—there are some good ones about but there are a lot more bad ones. Ask the Lancs. Constabulary what they thought of the drum brakes on their Interpols.

STOP PRESS:

FRONT WHEEL BEARING LOCKRING: Part No. 066612 to be used as such when reversing front brake to lefthand side.

FRONT DRUM BRAKES: I could write a volume here. Some twin leading shoes did work well, mostly the early ones. I had a later one. Some mods to get it working at least reliably. The centre hole is often too large, allowing the brake plate to flop about. This can be bushed down, possibly with phosphor bronze or such. There was a service sheet at one time which gave advice on how to cut a hole in the bottom edge of the plate to let the water out!! Why let it in I ask? Even with the blanking plate in the air (water) scoop rain still hits it and goes sideways into the brake. I had the whole scoop removed and welded over; success.

Now the linings you can benefit from by fitting are, AM4 green racing, but they have to be fitted by an expert and machined exactly to the drum size. Also make sure they have the leading edge well cut back 1in or more as they do tend to grab, especially first grab in the morning due to the dampness in/on the linings/drum.

There was also a brake stiffening kit. This necessitated replacing the two cams and pivot points, a hammer, drift and vice job, but from reports I've received this was well worth it, especialy with standard linings. Wouldn't like to combine it with AM4 though, might be too much.

GROUP 17:— Rear hub, brake and sprocket

JOHN HUDSON: The other weak point which I think has not been mentioned is the one-piece double row ball bearing in the rear sprocket and brake drum on 1971 models up to the introduction of the Mk.III. This bearing is still the Hoffmann (now RHP) 117DR but it tends to be neglected, tucked away as it is in the centre of the brake drum. It does of course have to take by itself all the driving load which it cannot share with the two single row bearings in the wheel. It is retained in the brake drum boss by a circlip which is concealed by a felt washer retainer, felt washer and pen steel washer and these three have to be prised or levered out before the state of bearing and circlip can be determined. Sometimes the eyes of the circlip break off in service and sometimes the circlip itself comes out when brake shoe retaining set screws can rub on the inside of the brake drum.

When the three washers mentioned have been removed extra grease can be worked into the bearing if its condition seems O.K. otherwise. With the circlip out, drive lightly on the opposite end of the dummy spindle and all parts will come out of the brake drum including inner felt and plain steel washer.

GROUP 18:— Handlebar controls

There are many variations in these bits and pieces which may not be obvious to the naked thingy:—

THE BRAKE AND CLUTCH LEVERS: Started off with good old fashioned steel levers—but there are also two types of the later Lucas pattern. Early alloy levers were almost flat on their front surfaces. Later levers were rounded to make it easier to pull in the clutch (!) and to match the rounded hydraulic lever: they are much more comfortable. Later still (1973) the clamp brackets were altered to move the pivot away from the handlebar grip—making it for the first time possible to use clutch and dipswitch at the same time. Previously if you could reach the switch your fingers were so near the clutch pivot that you had virtually no leverage. Even later the plastic switch levers were lengthened to make operation even easier—you can't get the bits separately to update your machine, but if you are buying complete switches get the latest type; they are completely interchangeable. I shouldn't have to tell you that if you have a penchant for an indicator switch on the left hand side you can simply swap the complete units over without disconnecting anything but the 8 screws which hold them to the bars, but then you will have to get used to operating the front brake, dipswitch, horn and headlamp flasher with your right hand (and sometimes all at once). One of the horn or headlamp wires can be connected instead to the red and white (starter) connection in the other unit, but the other button separates a connection (the kill button) rather than making one. If you are a genius with a soldering iron you **can** do it. . . .

I am now going to say something which seems fairly obvious. If the throttle cable breaks, stop at once. This is because the ferrule between the cable and the clamp can fall out in the road and then you really are stuck. This can even happen if the throttle just sticks—especially if the single cable freezes in the outer—so it's best to tape the ferrule to the end of the cable. This also helps to stop the rain getting in. *A twin pull twist grip with two cables all the way without midway adjusters is very much recommended. Stops all breakages and is easier to adjust i.e. one adjuster on carb. top.*

CLUTCH CABLE: Was originally a plain cable—with the new alloy levers the free length was changed slightly, the inner was lined with the cheapest possible nylon, and the nipple was changed to a brass rather than a separate steel component. This was the old story, good news and bad news, again. The nylon was an improvement, but tends to bunch up under the ferrule at the handlebar end, making the action stiffer and stiffer. Pull off the ferrule, cut about $\frac{1}{4}$in (oh all right, 6mm) off the nylon and push the ferrule on again. Don't try it with wire cutters or you'll nick the cable, use the bread knife. You can't do much about the brass nipple—but beware, as soon as the solder is worn off the surface the brass will grate on the aluminium, and this flexing will soon break off the cable flush with the nipple. Only cure is a steel nipple, but no-one makes them because steel is much more difficult to solder, so you must find a brass nipple like the one on the other end of the clutch cable and make a loose nipple to take it. Or use the bits off a pre 1971 Commando, or even a proper Norton.

Warning to all featherbed riders who try to use a Commando front brake cable because it's got a switch in or any other reason. The threads for the adjusters are different—used to be 5/16 CE1 (cycle=26 tpi) changed to 5/16 UNF (24 tpi) just to catch you out. Silly.

If you find the master cylinder won't fit with your style of handlebars, you might get some relief by swapping the stop switch and hose over—or miss the switch out altogether and block the spare hole with a $\frac{3}{8}$in UNF set screw. (If overcome by patriotism you'll have to use an oil tank drain plug part no: 060668.)

GROUPS 19, 21-24, and 28:— Handlebars, side panels, front mudguard, seats, rear mudguard, tank and instruments

All straight forward, no comments.

GROUP 20:— Exhaust systems

Not much to say about exhaust systems—I have already had a go about port threads. Don't use mutes in the straight through silencer ends, if they are brazed in file them out again even if it takes all weekend. They will put flat spots in the carburation and make the whole plot nasty to ride. From a silencer point of view the long-cone-and-short-reverse-cone type of silencer is just the same as the shortish-cone-and-longish-reverse-cone type, but the cylindrical type with a black end is much quieter and DOES NOT REDUCE THE POWER. Officially, you need different pipes for each type of silencer, but with a bit of initiative it's surprising what can be done.

I won't say anything about side covers and their fittings because they are, to use an expression used only under extreme provocation by our President, rather pisspotical.

Mudguards and tanks all straightforward.

GROUPS 25, 26, and 27:— Electrics

As string does not conduct electricity, change the H.T. leads for proper ones made of real metal. Chop the ends of the metal battery strap off to stop it from poking a hole in the capacitor. If you are tired of messing about with points and auto advances, fit a RITA ignition kit—from John Carpenter, Mistral Engineering, 63A Turner Road, London E17, an excellent bit of kit.

The harness has got three spare wires in it so that Interplods can flatten their batteries more quickly than us ordinary mortals, and on ordinary machines they are not connected at either end. They go from the headlamp to just behind the head steady, and are coloured purple and green, brown and black, and brown and purple. If you need a spare bit of wire at the roadside you can use these—but it means unwinding the harness tape to get at them.

Be careful that the negative battery terminal MUST NOT touch earth anywhere, because this will short out without going through the fuse, and will melt the earth wires (the red ones) throughout the whole wiring harness. Makes a mess and a smell. You can get Halogen bulbs part no. 457 to fit in the old style headlamp lens, but it's a bit antisocial as the cut off on dip isn't good enough. Better to go all the way and get the complete unit—Lucas part 54526114, or any 7in Quartz unit from a reputable maker. Wipac Quad Optic, an excellent cheap unit. Cibié Z beam is another good choice.

GROUP 29:— The tool kit

There is one useful modification that you ought to make, to the Allen key. It won't fit the screws which are most likely to come undone—the ones holding the manifolds to the head. You must shorten the short end to just before the bend, and if you can, bend the long bit away slightly in the middle—so the result is a slightly S-shaped Allen key. Then not only will the short end go into the heads of the screws, but the long end will miss the nut holding the inlet rocker cover on.

If you find yourself with a spare weekend and a grindstone, here are one or two other useful modifications. Round off all the corners of the tappet adjusting spanner, so that it won't mark the edges of the hole. Grind metal off the sides and outer edges of the 9/16 A.F. spanner so it will fit into the clip holding the chainguard. Finally thin down the points of the ½in A.F. so that it will only take you an hour to adjust your primary chain.

COMMANDO SERVICE NOTES — MK III ADDENDUM

These additional notes cover all models and the Mk III and have been put together by me from the experiences of the club members, so are perhaps not as exhaustive or full as the previous notes written by TRS. Some more facts on the SS camshaft have come to light from Colin Braddick who used to race Commandos in the days of the Production racer and these have been added. Thanks this time must go to a few club members who have managed to note any problems and a few answers, and Les Emery, John Switzman, John Hudson and Tim R. Stevens for their help in various ways. **Al. Osborn.**

COMMANDO MODIFICATION LIST

(COURTESY OF USNOA)

Engine No.	Modifications
128646	New type sleeve gear and layshaft pinion tooth form.
129897	Rear wheel security bolt and MK2 type frame.
130979	'APEX' oil control ring (3 bits not 5).
132576	Fibre clutch friction plates, (not cork postage stamps).
133488	3rd gears in stronger material.
134108	First engine built in Wolverhampton works, all engines with suffix 'P' built at Plumstead Matchless London factory.
134738	'Hylomar' (Rolls Royce) sealing compound, (they still leaked—not R.R. machining).
136618	Starter motor blanking plate fitted (for original starter to fit in old magneto recess).
140061	Plastic rocker feed pipe.
141783	1st—'71 model—non-adjustable steering head bearings.
146584	New type "S.E." oil control ring.
147730	Rear brake drums screwed and riveted.
147846	Toughened kickstart pawl.
148895	Modified inlet valve guide (for oil seals).
149670	Oil seal fitted to inlet guide.
150120	Oil pump paper gasket fitted.
151175	Increased chamfer on cam followers to increase oil drain from head.
152000	Rear drum strengthening webs.
152499	Replaceable foot rest pegs.
153150	Riveted clutch back plate.
153324	Tachometer housing gasket.
153362	Chaincase outer incorporating cap 'O' rings, not leather washers.
200000	Revised shape handlebar levers (Tomaselli). D shape not flat.
200000	Commando (std) cylinder head with increased inlet guide support (deleting two NM23392 heat insulating washers). Oil feed return pipes 162200 commonized for spares (17in).
200708	Cam follower locating plate modified to accommodate 1972 combat camshaft.
200976	First Combat engine (interim pistons with oil slots).
201778	Clutch plate "scrolled" groove.
202116	Master switch replaces 39565 (now 4 terminal) with associated headlamp and main harness. Stops headlamp working when parked.
202341	Valve spring bottom seat washer thinned to accommodate cylinder head variations (up to 202666), stops coil bound springs.
202666	Cylinder head amended to accommodate std NMT2073 heat insulating washers (ie reverted to 060966 (1971), cancelling above mod engine 200000).
202760	Revised front brake lever (disc-master cylinder).
203136	Front drum brake support plate introduced.
203200	Steel petrol tank (Roadster) and side covers, not GRP.
203884	Copper sealing washers introduced under rocker spindle plate bolts, and not before time.

ENGINE

MAIN BEARINGS: What again I hear you groan? A small point, quite often with the super-blend, the inner race, especially on the timing side, comes loose on the crankshaft; this does not seem to be detrimental in any way, so do not worry about it. The next time things are apart down there a blob of Retainer Loctite is recommended. Clean both surfaces with Carbon tetrachloride or similar (Evostick Cleaner) degreasant (not petrol, it leaves a faint oily film) and use Loctite 601 green Retainer fit, this is some four times stronger than the 641 yellow Bearing fit. Bearing fit 641 is for use up to four thou. gaps, 601 for use up to six thou gaps. While the ultimate is Studlock 270, stronger than 601 but it needs a minimum gap of two thou. and will fill up to 10 thou. This pulled the hooks off of Les Emery's bearing puller. Tee Hee!

J.H. Surely it does not matter if the inner race on the timing side is a free fit on the shaft as it is secured endwise by the oil pump driving worm when this is properly tightened. >>

Yes, but carrying out modifications to slacken timing gear (as per page 4 last para), and having bearing inner loose has caused odd faults when the oil pump worm nut has loosened, odd ticking noises and even an apparently seized engine when the timing gear came loose and jammed on the oil pump. All up tight as original would be preferable here. Al Oz.

TIMING CHAIN TENSIONER: Do not overtighten chain as this can rip up the rubber surface of the tensioner, the metal underneath is not hardened ! ! !

CAMSHAFTS: Have still been known to be of an inferior hardness, check followers or replace them when replacing camshaft.

REV. COUNTER DRIVE: Leaking! Possibly changing to a 750 unit can cure it. A 750cc housing with an 850cc drive spindle gives 'O' ring seal.

EXHAUST VALVES: It's not unknown for these to get bent, one cure suggested is to fit racing NIMONIC 80A, once available from Gus Kuhn. This can also be caused by keeping oil level up to maximum level—the oil is then sucked through the air filters and cokes valve stems up causing exhaust valves especially to stick in the guides.

PUSHRODS: On Combat engines or any engine which has had a significant amount machined off the head (my 750 racer had over $\frac{1}{8}$in off) the pushrods must be shortened by the same amount and both ends of the rod may need attention, otherwise, you could find the end cap contacts the radius on the reduced diameter of the rod. On the head make sure the head gasket does not protrude into the pushrod tunnel, or the pushrods will wear away. Some Mark III models have a casting 'Flash' which protrudes into the pushrod tunnel, causes rubbing of push-rods, and ultimately failure of the camshaft. When the head is removed it is well worth clearing out the push-rod tunnels with a large round file, this only takes five minutes since the alloy is easy to remove, and should restore sensible camshaft life.

PRIMARY CHAIN CASE: A rattle in here at low revs, especially after the bike has been standing for some time, maybe on its side stand, is usually due to the Primary Chain hydraulic tensioner not having enough range to cope with a partially worn Primary Chain, so it thrashes around and hits the case. The only cure is a new chain even though it may have only done 20,000 miles or so. On Les Emery's racer they use "much stronger" tensioner springs to cure this problem.

J.H. I never heard that the hydraulic tensioner 'did not have enough range'? It loses its 'prime' if left standing and will often re-prime itself when the machine is next run. If not, remove outer half of case and squirt some more oil in collecting trough and push piston up and down by hand. We did this with new bikes after standing for long periods and it always worked. >>

CLUTCH SLIP: Apart from the "cures" already noted, this can be corrected by machining away the centre $\frac{1}{4}$in from the phosphor bronze surface of the plates, (both sides) so giving greater pressure on the remaining surface and

slightly larger mean radius. This may increase wear marginally but in any case the bronze plates wear immeasurably so the life will now drop to only a few million miles . . . My fibre clutch plates have done 100,000 miles and are not noticeably worn. Thick oil and antifriction additives promote clutch slip, so if any one is still using engine oil in the Primary Chain case then they should read page 12 again. So use SAE 20 or even ATF if clutch slip is a problem. Castrol GP 10-40 4-stroke oil can be useful if that is all that is available but do not use it in your engine, it is too thin, only meant for Castrol's profits and electric start Hondas.

CLUTCH DRAG: Yet another cause is for gearbox oil to travel down the push-rod tube by virtue of the clutch push-rod acting as a pump, when it bends under load. Cure, cut a $\frac{1}{4}$ inch out of centre of the push-rod and fit a $\frac{1}{4}$ inch ball bearing.

A notched clutch centre can be partially cured by installing two bronze or fibre plates together, thus using the un-worn part of the clutch centre, this will make the clutch operation much lighter, but could also aggravate clutch slip, but well worth a try if you've a spare plate.

ALTERNATORS: The rotor/stator gap of 8 thou. minimum is harder to achieve on the Mk III but it is essential or the rotor will rub and the over-heating will cause stator to burn out and disintegrate, this applies to all models in fact. If lacking gap use a half round file and carefully file away moulding compound and iron laminations of stator until an eight thou. feeler gauge will travel *all* the way round between rotor and stator. While considering alternators the Mk III is fitted with a high output 180W RM23 stator that needs two Zener diodes, this can be fitted to earlier models if desired or even the RM24 (even higher output at low speed) 180W 3-phase alternator will fit both models, but the 3-phase will need a different rectifier and a new pair of matched Zener diodes fitted. Full details from Al Osborn or Les Emery.

J.H. Alternator; on Mark III the rotor stator clearance can be affected by the chaincase/engine plate stud which, unlike the other models, has an adjuster nut which can be used to push the chaincase in or out and affect the fore and aft clearance between rotor and stator. That is at the 3 o'clock and 9 o'clock positions. If the rotor/stator are too close top and bottom then this will not affect it, but I have never had to resort to the filing you mention.

To gain clearance at 9 o'clock slacken the $\frac{3}{8}$in Nyloc nut (9/16in AF spanner) in the chaincase and screw up the plain $\frac{3}{8}$in nut behind the inner case to push the case outwards slightly and re-tighten the Nyloc. Reverse the procedure for more clearance at 3 o'clock. >>

(Note from T.R.S.—have it your own way if you will, but this won't give you such a smooth tickover or even plod.)

ELECTRIC START: In most cases about one of the biggest space wasters ever. A cheap supply of brushes is Lucas set 251108 (4 brush set) a bit of cutting is needed, but at today's prices it is worth it. There has been a four brush conversion set available from the United States but rather expensive at $75 from Cycle Sports (summer 1979). The new electric start Triumph Bonneville already has this mod.

Parts are thus for a straight swop type modification: —

1. Frame field, 58-241, MGL2101A is the motor body.
2. Brush plate, 36-863, MGL1033B replaces the 2-brush plate.
3. Spring set, 50-335, MGD18SS.

Cycle Sports, 2355 El Camino Real, Santa Clara, California or pester a Prestolite Dealer that these parts do exist, or questions to Robert Marshall, 1924 Kentucky Street, Redwood City, California 94061, USA. The kill button is often overlooked when in a non-running situation, as it is often hardly ever used it soon corrodes and becomes intermittent. Suggestion is to by-pass the reconnection under the tank. This is especially so for the 750s and early Lucas H/Bar switches.

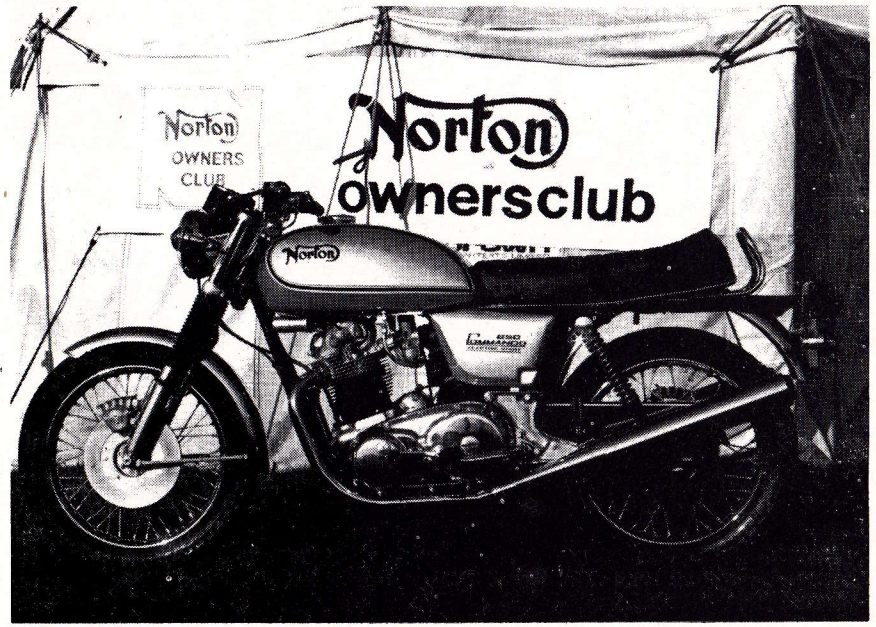
Sprag clutch, inside engine sprocket and boss on large drive gear surfaces could do with fine emery (all Emerys are fine! — a spare joke) or "wet 'n dry" grade 600 to break up polish and give some grip.

Starter Sprag Unit, problems encountered by one member are that this unit will function for weeks or pack up first time the starter is used and even if the starter is not used, in that the sprags in the unit jam in the outer ring, this causes the retaining ring spring to bend. The unit can be stripped and spring straightened when it might break or even a new spring might do the same again. Fitting new sprag units and even new engine sprocket do not help. Les Emery seems to think the spur wheel might be worn.

GEARBOX: The layshaft ball bearing has a self destruct mode in the order of 10,000 miles mainly due to higher torque through gearbox, caused primarily by the 22T gearbox sprocket giving too high a ratio. So as well as the roller bearing replacement NJ203C3 it is advisable to lower the gearing to 21T or even a 20T gearbox sprocket (see page 16 for further details). If old ball bearing is worn or has collapsed you *must* replace layshaft bush in kickstart. Sometime in its later Commando life the 3rd gear and 4th gears were changed not in ratio but in teeth pitch and profile, and supposedly in strength. These gears must be kept in pairs and will not singularly interchange with earlier gears; you cannot get it too wrong as they will not actually go into the gearbox. The only external difference is by measurement, the later ones being 10 thou bigger.

KICKSTART PAWL: Seems to be made of very soft material on some models, so if poking into gearbox, have a new pawl to hand with an "M" stamped on it. New kick-start pawls should be checked for hardness, ie a file should *not* make any impression. In one rare (hopefully) case the kick start pawl jammed in its closed position so that kicking down gave no connection to gearbox or engine at all. Again, a file would not relieve this situation, a grinder is needed.

INTERSTATE TANK: For the silver paint Opel silver 135 is a good match.

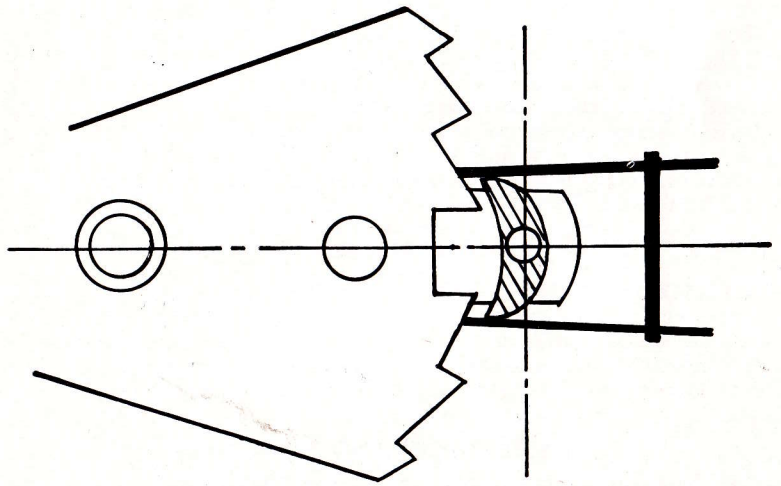


The Mk III Interstate in traditional silver with black and red linings.

THE PAWL SPRING: This is the first item to suspect if you attempt to change gear and the lever has no effect or apparent connection into the box. The spring quite often wears and breaks (carry a spare one) and when you replace it with a new one you will more than likely have to 'set' the spring as follows to ensure a good gear change; with the outer gearbox cover in your hand and the lever mechanism and ratchet assembled, the pawl spring must sit on its rest plate (part of gear lever stop plate) it must then either just touch or just clear the pawl, with its double cranked leg downwards. Most important, with the pawl central in the pawl spring an imaginary line through the centre of the pawl must be at right angles to the centre of its operating arm. This only has to be a fraction out for a poor gear change, either up or down to result.

To check you have got it right, replace gearbox cover and lever. Put machine on its centre stand and a block so that the rear wheel is off the ground, then rotate the wheel until a position of the gears can be found when you can change through most of the gears with the rear wheel and gears stationary. Now, starting at 1st gear, select 2nd carefully and as the gear lever returns to its neutral position a click should be heard (pawl selecting next ratchet). Repeat this through the gears although no click will be heard from third to fourth as there is no gear after fourth. Repeat this changing down, a click will be heard each time a change is made and there is another gear to follow.

If you get this result one way only then you have a bias on the pawl spring and it will have to be set slightly the other way.



GO-FASTER MODS, SILENCERS AND AIRBOXES

As previously mentioned the black cap annular discharge silencers do not significantly reduce power, but they must be kept with the balanced exhaust pipes. If you want to fit earlier separate pipes then you must fit the earlier reverse cone silencers. The reverse cones can be fitted onto the balanced pipes but with a slight loss in power .What did restrict performance was the black plastic air box, remove this for a 750 type one to gain performance.

Another lower performance factory modification was the restriction in the inlet valve throat, often down to 29mm, re-open to 32mm all through.

750 single pipes can be made to tuck in better.

WHEELS AND BRAKES

WHEELS: Rust from front disc tends to fly off on to the chrome rim and stick there. Clean it off before it imbeds itself. Single row wheel bearing retainer is said in manual to have a left-hand thread—not always true! Rear wheel bearings tend to disintegrate, suggestion is for an improved roller bearing, as the original are not sealed type. Rear axle material appears inadequate in most cases. (I broke one once at 80—quite fun TRS.) Some rear bearings are the sealed type.

REAR DISC CALIPER: Needs yearly dismantling and cleaning out, (not a bad idea for all hydraulics). Disc pads, especially rear, could benefit by a dab of silicone grease on their rear (non friction surface). The front brake can be improved by refitting in the back of fork leg as in Mk I and Mk II. Master cylinder on handle bar, if there is fluid leak due to the poor seals, do replace them as it has been known for fluid to get the wrong side of piston and LOCK front brake on! (I cannot see how this could possibly happen even though I worked for Lockheed for four years TRS). On dismantling the rear master cylinder and unscrewing the two body halves which have a right-hand thread, there is a locking allen grub screw below the surface of the body, lost in the muck to be removed first. Some rear wheel retainers have a right-hand thread. This has worked loose a few times, allowing the cush drive back plate to rattle. The last time it started rattling I tried to tighten it up but found it was already tight. The problem seems to be that the steel bearing retainer has worn into the alloy cush drive centre. This is because the retainer is screwed up solid but the cush drive centre moves in its rubbers.

On re-assembly of master cylinder take care, as you screw the two halves together, a fraction too far and the push-rod begins to operate the master cylinder, whose first move is to block up the return hole for brake fluid, when in use heat expands brake fluid which cannot return to reservoir, therefore pressure builds up in the system, which applies the brake! It can be very embarrasing stuck in the middle of the road with a locked back brake, I know!

TWIN LEADING SHOE FRONT BRAKE: The effectiveness of this brake can further be increased by the manufacture of a longer operating arm, i.e. the one with the cable connection. If this is done without the brake stiffening kit, the flexing of the brake cams in the bushes hinders any advantage, so add 1¼ inches to the brake operating lever after fitting the brake stiffening kit.

FRAME PARTS AND HANDLING

HANDLING: An improvement is to fit the Norvil head steady, it will fit under the Interstate tank, but a bit of juggling is needed to fit it under the Roadster tank. Norvil head steadys are rare and complex though. The Norvil head-steady, whilst improving handling will, when shimmed up correctly, cause more vibration to be trasmitted through the frame. A "half-measure" is to reduce the shimming of the unit, but the Mark III head-steady is adequate for normal road use.

ISOLASTICS: The front Mk III units can be fitted to any/all of the earlier models but the centre tube has to be shortened so that both ends are the same length, preferably by machining (as opposed to hack saw) to keep the ends square. The rear Mk III unit is not really worth the effort and expense of fitting. The adjuster rods for the isolastics have been known to rust up so a check-strip and grease would be advisable.

SWINGING ARM LUBRICATION: The "sealing for life" of these units is not adequate so modification can be made to allow lubrication: — Remove right-hand end cap, remove spindle and all wicks except far left wick. Drill right-hand end cover and tap ¼ UNF to take a grease nipple. Right-hand disc wick needs ¼ hole through middle as well. Drill two ⅛in holes diagonally right through spindle ½in from each end. Replace spindle disc wick with hole, and end cap with nipple and fill assembly with light oil (Castrolite) from grease gun. Lubricate regularly. Castrolite is not always available, in which case a useable alternative, especially in primary chaincases, is Castrol 4 stroke oil (made for Hondas) GP 10-40.

SERVICE RELEASE No. N3/13: Camshaft Interchangeability on 1970 and 1971 Commando (all models). (Camshaft/Crankcases/Cylinder heads and valves are affected.)

Following the introduction of new crankcases with modified breathing, together with the introduction of the Combat "SS" type crankshaft, there are now several possible combinations of crankcases and camshafts. In addition, where it is desired to fit the high performance "SS" type crankshaft to a pre-1972 engine there are problems with cam lobe clearance at the crankcase oil fling shroud. In addition, problems can arise due to valve head diameter, valve stem and spring length discrepancies, particularly where an early "non-Combat" cylinder head is fitted.

It is also essential to fit tappet locating plates 063092 to accommodate the increased lift on both "SS" and "SSS" camshafts.

The part numbers and applications of the various components are tabled below:

Cam Part Number	Identification Stamped on	Journal Type	Use Part Number	Comments
061084	S	Scrolled	061084	Standard 1971 plain bushes
062608	S	Plain	061084	Standard 1972 scrolled bushes
062673	SS	Plain	063536‡	Combat 1972 scrolled bushes
062807	SS	Scrolled	063536‡	Cobat 1972 plain bushes
063536*	SS	Scrolled	063536‡	Combat 1972 plain bushes
063537*	SS	Plain	063536‡	Combat 1972 scrolled bushes
TX0302	SSS	Scrolled	063761†	Original NVPS camshaft, plain bushes
063453*	SSS	Plain	063761†	Variant TX0302 scrolled bushes
063761*	SSS	063537	063761†	Variant TX0302 plain bushes

Use scrolled journal camshafts prior to Engine Number 204048 with plain bushes NMT2036 & NMT2037.

Use plain or scrolled journal camshafts subsequent to Engine Number 204049 with scrolled bushes 062600.

Note: Scrolled condition camshafts only will be supplied against order for the above camshafts.

*Surface treatment

‡Conversion from standard cams to Combat condition requires the following:

a) Cylinder head 063327 to provide 10:1 compression ratio.

b) Solid skirt Combat pistons (063348 LH, 063349 RH, Std.) — See Service Release N.2/4 for oversizes.

c) Combat valves — inlet 063283, exhaust 063282.

d) Standard valve springs NM22838 outer, NM22839 inner using spring seat and spacers to provide 0.050 in. (1.27mm) clearance at full lift.

†e) Conversion to "SSS" specification — as Combat from standard — no further action required for Combat.

SOME TUNING TIPS FROM C. BRADDICK

"DOUBLE S" CAMSHAFT: This was definitely the most troublesome cam produced but probably the most powerful on sale to the public. The problem associated with it were: —

1. Overlap—this was so large that with the lightest over-revving (missed gear usually the cause) the valves touched each other and bent. Singular remedy is to reduce the overall diameter of the valve heads.
2. Coil bound spring, ie, due to cam lift—using standard springs, collars, cups and insulating washers and springs do get coil bound. On NO ACCOUNT remove the heat insulating washers as heat anneals springs. Coil-bound springs break very quickly and this can go undetected for a long time save for a misfire at 4,500 plus. The proper way to overcome this problem is to re-machine the collett recess in the valve further up the stem by about 1/16th of an inch (1.5mm), this has another advantage, it reduced the spring preload of the valve on the valve seat. This gives the whole valve train a much easier life and makes things run much easier. A high preload is totally unnecessary. The only way to get the BEST results from a "double S" cam is to have the head re-machined full sphere with re-angled inlet valves (as originally done by Paul Dunstall and now by Mick Hemmings). The valves still need re-machining though.

HIGH-SPEED WEAVING: Worn rear tyres also have the effect of producing high speed weaving. Do not ask why, but it was consistent in racing that the rear tyre had to be kept with plenty of tread on it otherwise the bike shook its head. Worn rear tyre affects handling at *all* speeds and fitting a new one restores handling instantly. Fit 3.60x19 on front, *not* 4.10x19.

REAR SUSPENSION UNITS: If you have got a good-handling bike and never carry a passenger then use 100 lb springs on the hardest setting, absolutely essential! Girling gas shocks definitely improve handling and are worth considering when replacement is due.

FOOTNOTES

OIL-TANK: On my production racing Commando the handling was so good that on left-hand corners I could lean the bike so far that the oil ran out of the oil tank breather tube, down the rubber tube and onto the back tyre—alleviated by changing the oil tank breathing system.
(Cannot understand this—centrifugal force affects oil as well as bikes so solo cornering has no effect on level. Perhaps your new system was just better? T.R.S.)

If the oil tank is over filled it will pump out oil through the air filter.

CLUTCH: Check for buckled driving plates—causes slip. (Solid steel ones) and that, when using solid Ferodo driven plates, the thick pressure plate is used. If the thin one from the 850 bronze clutch is used—clutch slip. Instead of a 750 type pressure plate you can try doubling up one of the plain or friction plates, depending on how worn your clutch is and therefore how much extra room there is.

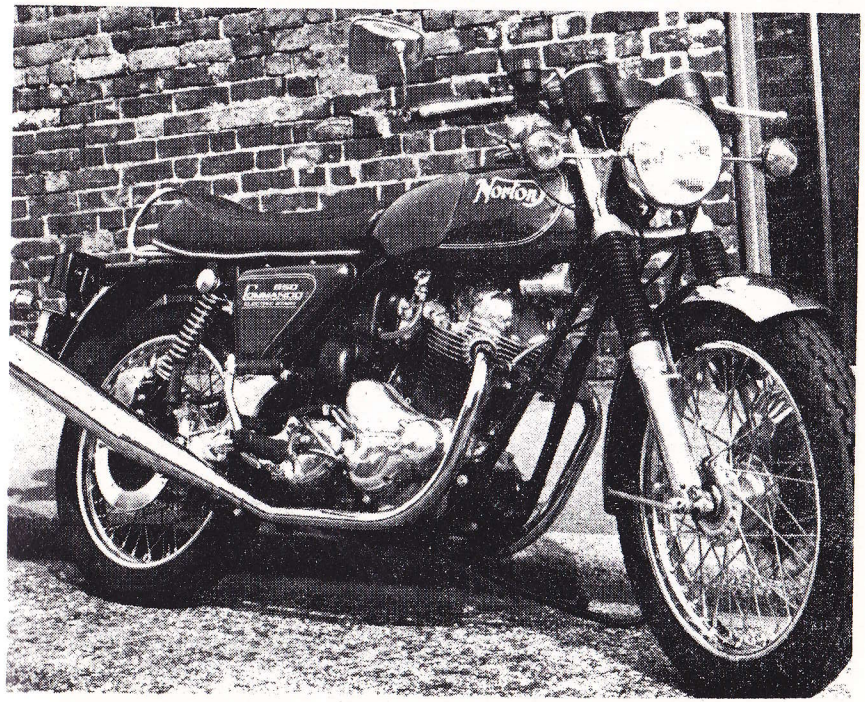
ROCKERS: Take the springs out and replace with phosphor bronze or steel spacers and by adjusting the spacer and shims get the rocker end dead central on the valve. This is a tedious process but essential for efficient running, i.e. for racer and wang artist.

CRANKCASES: When bolting crankcases together it is essential that there are no 'tight' spots when the crank is rotated. I have seen this and it is caused by: (a) bearing mis-alignment—a piece of aluminium or grit trapped behind the bearing outer race is all that is required to throw it off line; (b) mis-aligned crank cases caused by burrs, grit etc on the mating faces. Essential to check this on new cases.

CARBURETTORS: The twin carb tuning does not go far enough! To ensure both sides lift together at precisely the same time use a mirror placed against the air filter, in place of the rubber unions. Then by looking back from near the handlebars you can clearly see the sides. Yet another way to ensure that the slides lift together, once you have each carb set to give even tickover, is to remove the float bowls and main jets and watch the needles rise and fall. A much better tuning sequence is: — (I used this on all my racers and it is 100 per cent effective):

1. As per booklet.
2. Ensure that both slides totally disappear into the carb body at exactly the same time. This ensures that "full-bore" is truly what it means. (It is possibly to do the tuning as on page 21 and yet for one slide to lag behind the other.)
3. Close throttle and ensure that both slides lift off their stops at exactly the same time. Adjust using the throttle stop screws. Ensure that there is cable slack at the twist grip. We now have the situation where the sliders are in exact unison.
4. Go for a ride and warm up the engine.
5. Adjust the air screws to get an even tickover irrespective of the rpm.
6. If the rmp is too high, lower both throttle stop screws the same amount, a little at a time until the correct rpm is achieved. If the rpm is too low—reverse the process.
7. Go for another ride to cool off the engine (it would have got hotter whilst making the adjustments) and recheck.

I adjusted my carbs by removing the float bowls and watching the needles and later had them checked with vacuum gauges and they were dead right—so it is accurate.



The prize winning Mk III Roadster of Bob Slater, featured at club rally and record cover

CARBURATION

The 'Technical Advice' questions on carburation, at times, seem endless, along with the strange ideas some people have on the subject. A few basic facts, based on the Mk I Concentric; the main jet size is not that important and does not wear out! It starts to have an effect from 90mph plus, so if you don't cruise above 80mph (which is illegal anyway) then an error of 10 per cent, or possibly more, will not be noticed. The 220 or ex-works setting can be left alone. If you must fiddle then err on the larger, richer side. Now the needle jet and needle. This is about the most important on a Norton, especially as the needle jet has a very short life for accurate carburation, often less than 10,000 miles. Starting point is 106 with the needle position as ex-works settings, to be checked 60-70 mph with the engine pulling, i.e. slightly uphill for at least ½ mile then engine killed and plugs checked. Sooty, richness, lower needle, or replace needle jet and start again, white, hot, weakness, raise needle. The slide does not seem to wear so as to affect the mixture greatly, usually just rattles, but can cause erratic running just above tick-over. Slide to be checked at 40mph with engine pulling for ½ mile as above. Richness, fit a higher number slide (½ sizes): weakness, lower number to richen it. Pilot air screw for tick-over mixture only, and possibly pick up too. Unfortunately the N7Y plug (suitable for all riding, up to hard racing) tends to look reasonably correct even if the carburation is a bit out. Other symptoms to look for; 1, Good acceleration in a particular band but rough cruising, which clears the instant the throttle is opened — Richness, finally leads to fouled plugs. 2, Poor acceleration, spitting back, pinking (sounds like small ball bearings rushing around on top of piston) and overheating — weakness. Soon melts plugs and holes pistons. Do check ignition timing, if points, and correct it before checking carburation. Removal of air filter will weaken mixture, also noisier silencers can weaken it. The Viton tipped brass float needles do wear out, causing intermittent flooding, also caused by a damaged float-bowl-to-body gasket. Every third needle jet replace the needles as well. If you must remove the chokes do plug up the hole in the carb top, there is a screw available, this falls out and gets lost, chewing gum, electrical tape over a piece of wood, plasting padding, but a nut and bolt might drop into the carb and engine, ! ?? urgh.

AMAL CONCENTRIC SETTINGS FOR NORTON COMMANDOS, EX-WORKS

Year	*Model*	*Carb. No.*	*Main jet*	*Slide*	*Needle pos'n.*	*Needle jet*
1969	Commando	930/30-31	220	3	2	106
1970	Commando	930/46-47	180	3	2	106
1971/72	Commando	930/68-69	220	3	2	106
1973	Combat	932/26-27	230	3	1	106
1973	Commando	930/82-83	220	3	2	106
1973	Combat	932/26-27	230	3	1	106
1973	Roadster	932/29-30	260	3½	1	106
1973	Interstate	932/31-32	230	3½	2 or 3	106
1974	850 Mk 1	932/29-30	260	3½	1	106
1974	Mk 1A	932/31-32	230	3½	2 or 3	106
1974	Mk 2	932/29-30	260	3½	1	106
1974	Mk 2	932/35-36	260	3½	3	106
1974	Mk 2A	932/31-32	230	3½	2 or 3	106
1974	Mk 2A	932/33-34	220	3½	2	106
1975	Mk 3	932/33-34	230	3½	1 or 2	106

OIL

Further notes and explanations to the notes on page 28. When the Norton twin cylinder engine came about in 1949 we had monograde oils only, therefore the design took this into account, the oil lubricated the parts and helped with the cooling, especially the cylinder head. The dirt from combustion would usually end up in the oil tank as sludge, to be re-circulated in varying degrees. Not a marvellous state to be in. In winter we used an SAE 30 and in summer, 40.

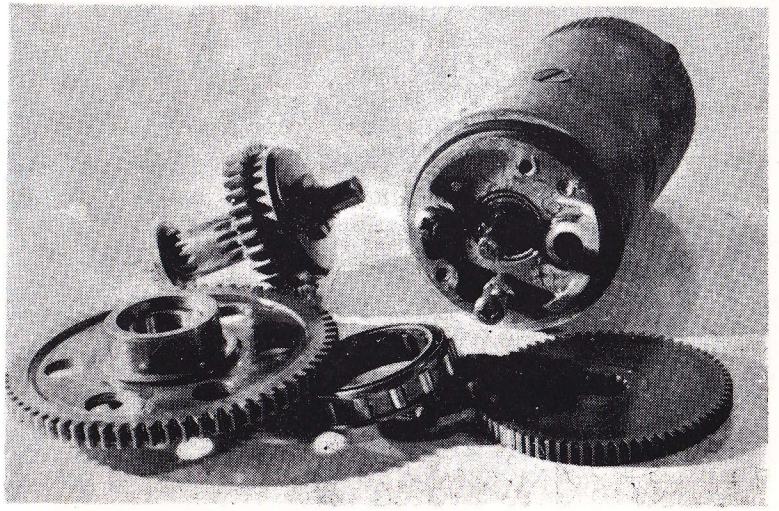
In time the oil companies came up with 'Multigrades' by adding viscosity improvers, ie we had a 20 grade oil at 0°C which has additives which stop it becoming thinner than a 50 grade at 100°F also we have further additives such as detergents. The advantages here are not quite what they seem. The detergents hold the dirt in suspension, ie it continues to circulate and do it's 'thing', the only real advantage here is that at least most of he contaminants and rubbish come out with the next oil change. The real advantage that can be gained is by fitting an oil filter, as on the Interstates in 1973. This allows some extension of oil change periods, but not too far because of the viscosity improvers. When these break down after a few thousand miles we are left with a 20 grade base oil, not clever stuff. Not at 110 at 110 anyway. (° and mph, that is.)

Also, as the multigrade is based for cars with a lower BHP/litre ratios and water cooled motors, the temperatures are reasonable with the additives lasting up to 100°C, but air cooled, high BHP/litre engines can easily generate 130°C in the oil tanks while big ends can be 50°C higher. What value our multigrade now? Some of the additives are also highly volatile! Another point is high piston and ring speeds, these tend to shear these additives also.

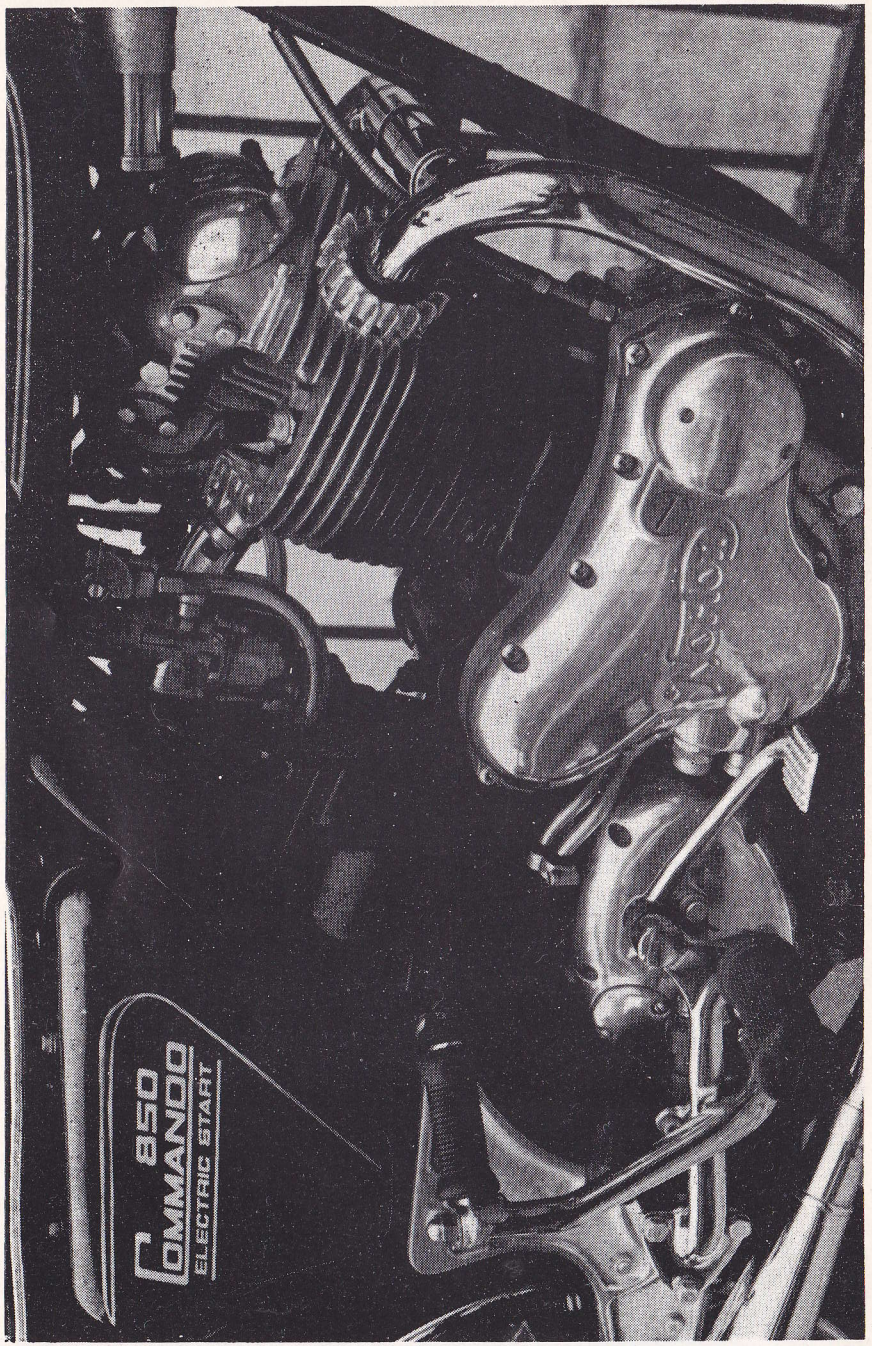
What can you do? Use a heavy duty monograde 30 in winter, 50 summer as page 28, fit an oil filter and keep to regular oil changes, certainly don't lengthen the oil change periods. The camshaft apexes have most pressure exerted on them and these are usually the first signs of trouble with oil, when premature wear sets in outside the normal soft camshaft wear on especially the Mark III.

Finally a 20/50 or 15/50 multigrade is preferable to a cheap non-HD monograde (keep to 2,000 mile oil changes), also *not* recommended is the Castrol 4 stroke Motor Cycle oil known as GP. This is a 10/40W especially for Hondas, ie engine oil has to circulate around the clutch and they have electric starters and monetarywise are more important than Nortons in the motor cycle world.

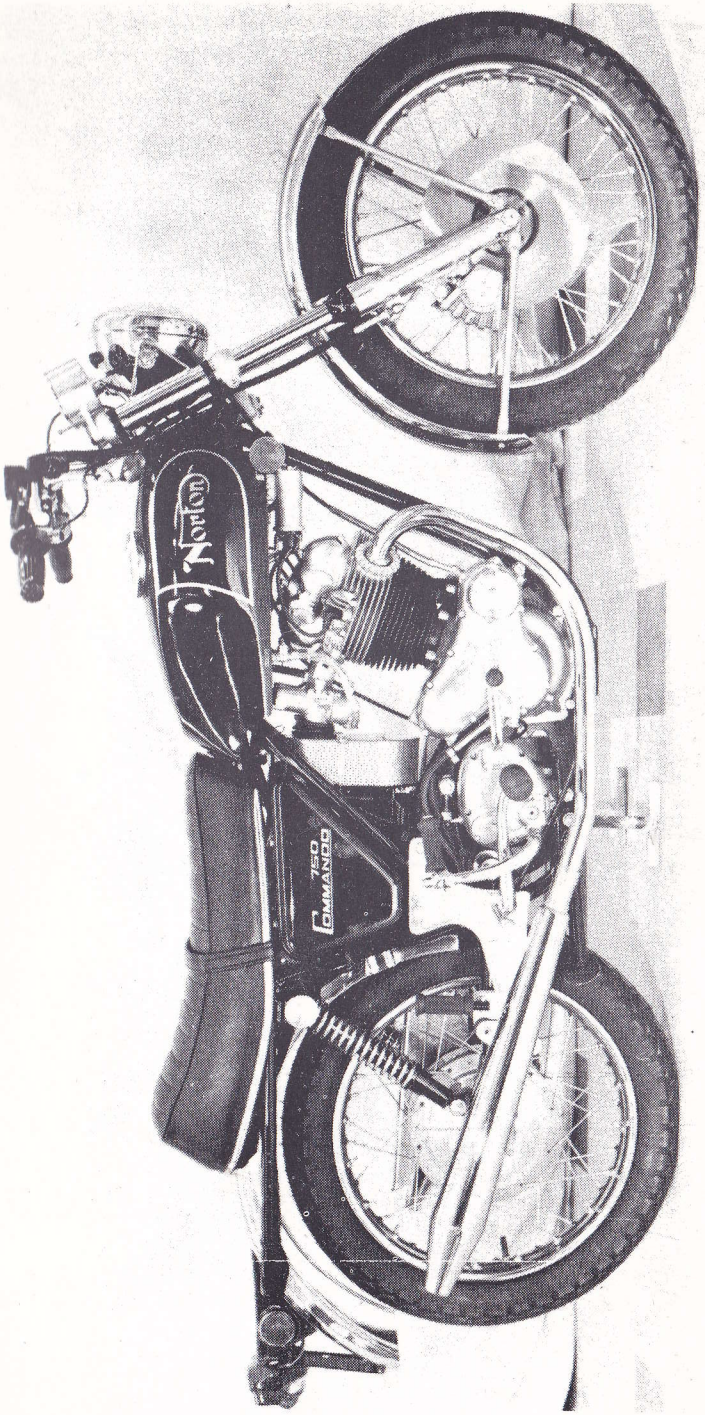
Most engines seem to survive on the multigrade despite the above, multigrade does more with regard to durability and quick-warm-ups.



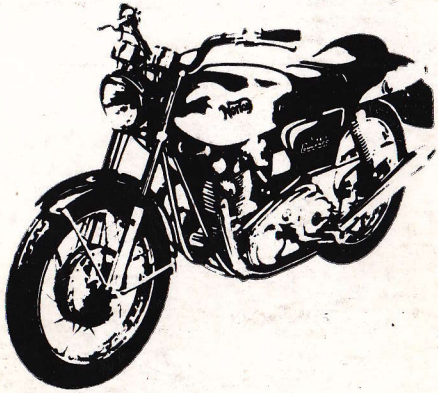
Well it fills a space!



Keep polishing.



The 72 Roadstar again fitted with Combat motor. Interesting to compare this with the 'S' type of 1970. (Page 23). Photo credit: Motor Cycle.



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