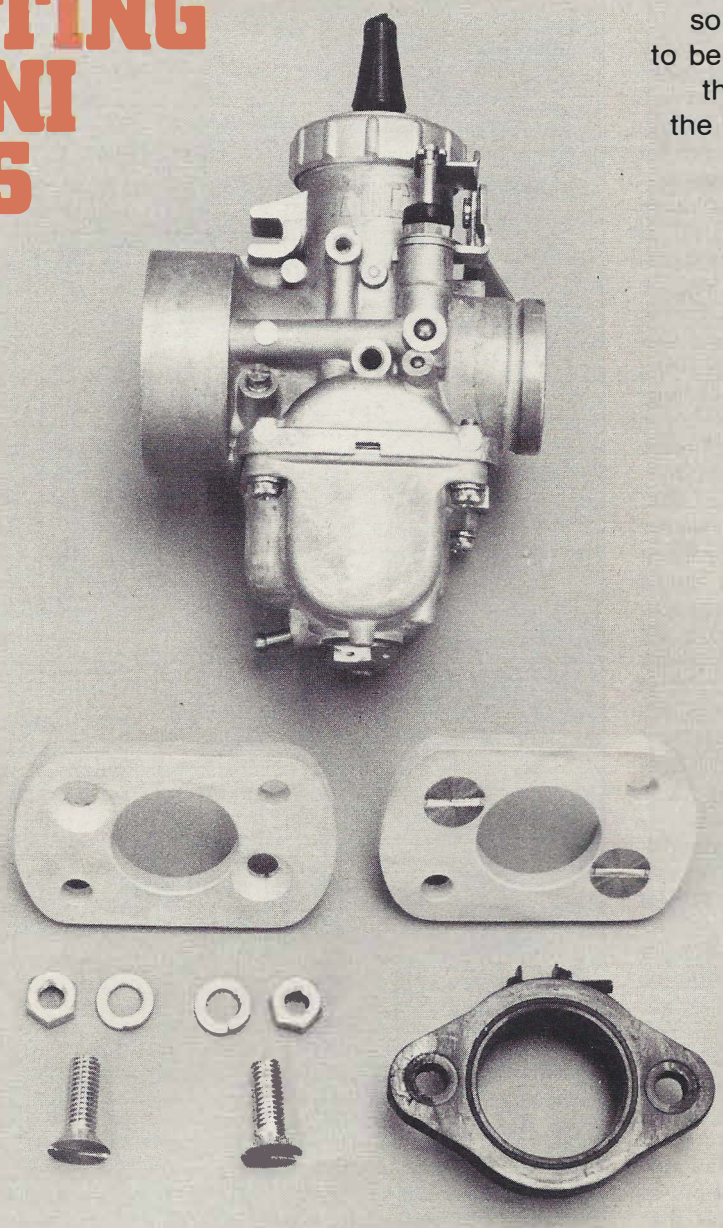
ADAPTING MIKUNI CARBS

Plenty of problems to be solved, lots of questions to be answered and results that depend entirely on the effort put into the job.

By Gordon Jennings



PHOTOGRAPHY: DALE BOLLER

● According to its reputation, the Mikuni carburetor is nothing short of magic! Just hang one on your hot European hummer, rumor promises, and the bike instantly will be transformed. Get rid of that nasty Amal, Bing, IRZ or Jikov gas-passer, the Mikuni converts passionately insist, for then you will have said a final goodbye to the fouled plugs and balky starts that make you swear, sweat, and think of abandoning motorcycles in favor of golf. And what will a Mikuni do for horsepower and mileage? You shouldn't ask, they say. Knowing would only make you feel terrible about all you've been missing.

That such extravagant claims *are* being made for the Mikuni carburetor is sufficient to arouse plenty of interest among motorcyclists, and to create a healthy degree of skepticism. Experience has shown that some of the world's air/fuel mixers yield nothing to the medieval thumbscrew in terms of sheer misery potential. On the other hand, experience also has taught most of us mistrust of anything for which magical properties are claimed—and this wary attitude is a fine defense against having one's pockets pillaged. But in the Mikuni carburetor's case we are confronted with an unusual and highly significant distinction: the claims are being made by the customer instead of the vendor. Whatever marvels may be promised by the bench racers, Mikuni's own people venture only a cautious and thoroughly qualified optimism when asked if one of their carburetors might serve as a suitable replacement for the standard item on, say, a CZ or Norton; immediately adding that much depends on the level of knowledge and skill applied in the conversion process.

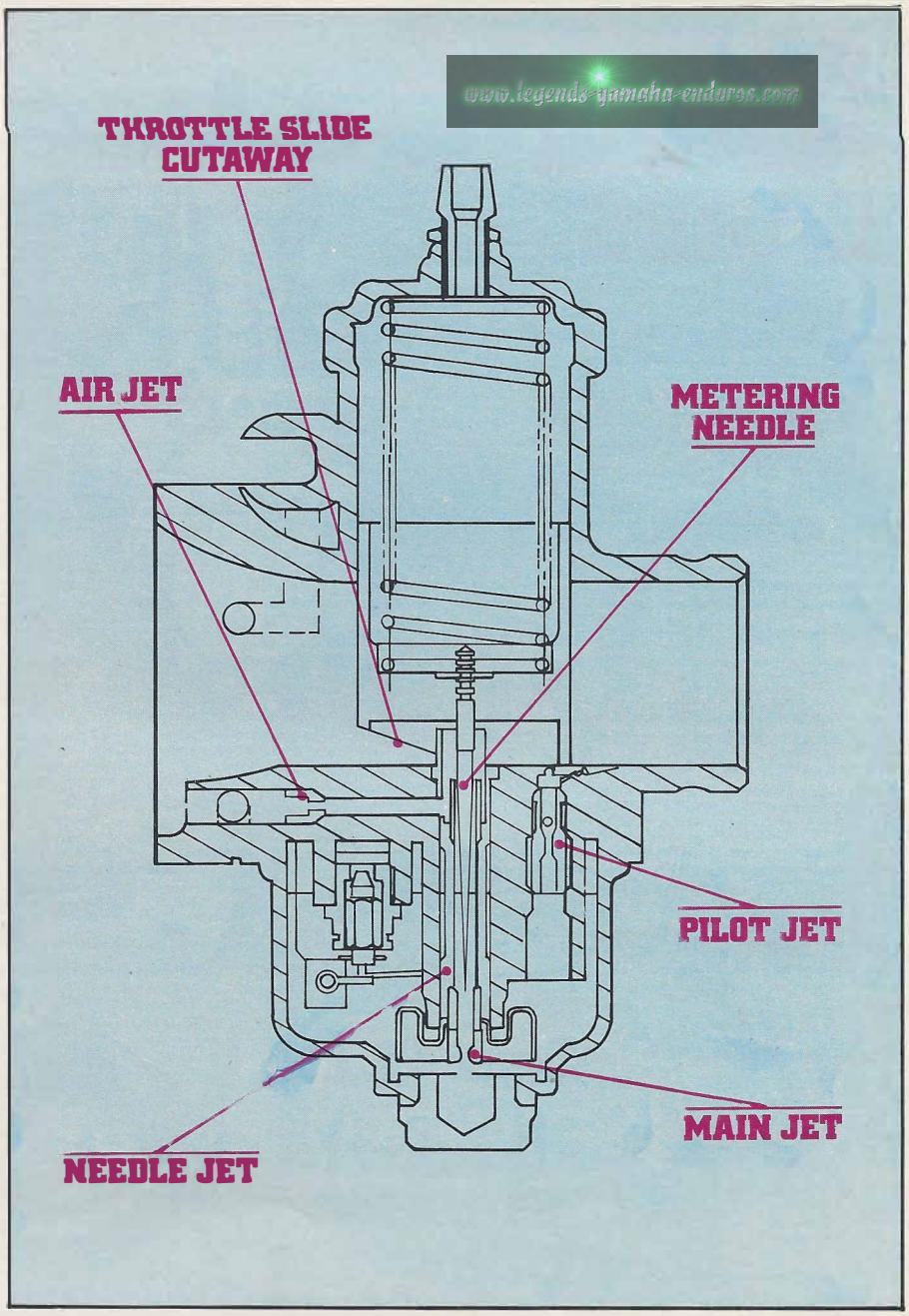
Out in the real world the knowledge/skill factor varies enormously and this is reflected in the results actually obtained with Mikuni conversions (which sometimes fall far short of reputation's promise). We know of several CZs, for example, in which the desired transformation actually occurred: these somewhat temperamental motorcycles became downright civilized after Mikuni carburetors were grafted on their cylinders. But then there's a certain Honda 750 that has been all tricked out as a cafe racer, and its perfectly satisfactory Keihin carburetors replaced with a set of oversized, badly-jetted Mikunis. The Honda's owner assures us that those big Mikunis have given his bike a big boost in power, im-

proved his pet parrot's appetite and language, cleared up a persistent case of heartbreaking psoriasis, and made him irresistible to beautiful women. What the carburetors really have done is to make his the rattiest-running Honda-based cafe racer in Southern California, a remarkable feat viewed in light of the number and quality of contenders for that title.

So it clearly is possible to get both very good and very bad results from a switch to Mikuni carburetion, which should surprise only those who have swallowed the legend whole—slide, bowl and throttle cable. The rest of us believe about half of what is promised by all the glowing reports, and conclude that even when discounted 50-percent, the Mikuni conversion would be worth doing if we could be sure our personal abilities are equal to the task. And therein lies the rub: talk is just talk; if the job is going to get done you sooner or later will find yourself standing silent beside your bike, eyeing a bare intake manifold flange and wondering where to begin. It's an intimidating situation, and one with which the writer has very recent experience, having arrived at a state of acute disgust with the (expletive repeated) "other" carburetor on my personal motorcycle; having looked at the available conversion kits without finding anything suitable for the application at hand; having gone through all the aggravation of devising and fabricating adapters; and having fought the battle of slides, needles and jetting.

Anyone who in the cold clear light of morning decides to go ahead with the Great Carburetor Swap should first address himself to the question of size. You can of course err seriously in the matter of throat size, and we will discuss that aspect in good time. But equally important, and usually ignored in the early stages of planning, is sheer overall carburetor size and shape. Carburetors of approximately equivalent throat diameters tend to have about the same height, taken from slide cover to float chamber base, but the Mikunis are comparatively wide and their shapes very blocky—meaning that you probably will find yourself fighting for the space needed to accommodate a Mikuni and provide access to its adjustments.

Accessibility may become a real problem when the engine involved has twin cylinders and intake ports crowded closely together. Off-the-shelf Mikunis have throttle-stop and idle mixture adjustment screws on opposite sides of their bodies, so in a paired installation you're going to have one of each located between the carburetors. It's bad enough to have the big, easily-adjusted throttle-stop screw hidden away like that; the smaller, recessed mixture screw is a job for triple-jointed fingers and an unflinching indifference to skin/metal contact with the hot cylinderhead. Mikunis are made with mixture screws on the same side as their throttle stops, and you can save yourself a lot of agony by combining the two types in a twin-cylinder conversion, mounting them so that both idle mixture screws are pointed outboard. Unfortunately, the same-side models are not always available in the appropriate size.

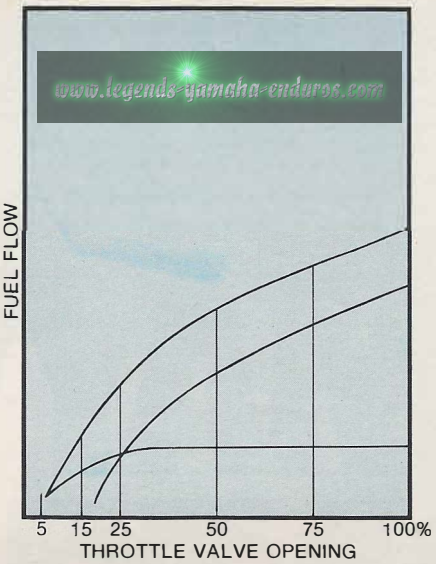


On the subject of throat size there is much to be said, but the important thing is that you do not get carried away. Never assume that bigger is automatically better, because it isn't and some of the problems of installing an oversize carburetor can make you wish you'd found some other occupation for your uncommitted evenings. The Mikuni is a sophisticated item, as motorcycle carburetors go, and it will for that reason do quite a nice job of metering fuel at through-throat air velocities lower than those required for most others. It isn't much better streamlined internally than the others, but there is an improvement in mass air flow to be had with a Mikuni carburetor a little larger than the unit it replaces. Mikuni's own tuning manual contains a chart with throat size plotted against horsepower per cylinder (on the basis of a carburetor for each cylinder) but that seems unduly conservative. My bike had 30mm carburetors; according to Mikuni's chart, reading up from its known bhp/cyl rating, it should have had carburetors with 28mm throat diameters. A set of 32mm-throat Mikunis were selected (partly on the basis of hunch; partly through calculation) and these provided not only a very noticeable improvement in performance at high revs—where it was to be expected—but also made the engine pull stronger mid-range and added about 1000 rpm at the bottom of the effective power band.

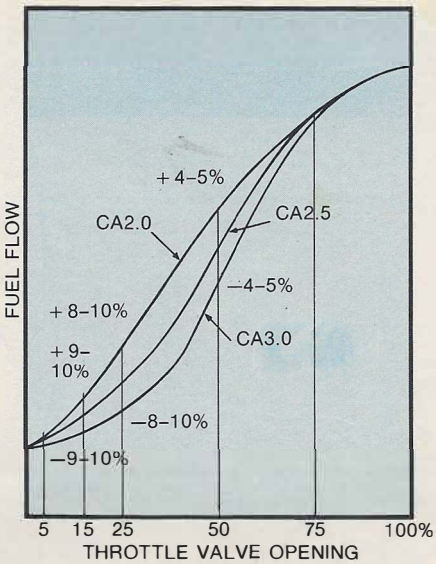
During the deliberations that led up to the choice of throat size numerous people expressed confidence that 34mm or even 36mm carburetors would be "just perfect." Perhaps, but there are compelling reasons for holding fairly closely to stock throat size in all except racing-only conversions. In four-stroke engines valve timing is arranged to suit a particular level of gas velocity in the intake tract, which implies that we should not too greatly alter port and manifold diameters unless we are prepared to embark on a complete engine redesign. And if the port and manifold diameters are to remain the same, then there hardly is any reason for fitting overly-large carburetors. You can expect that the flow capacity of the former will be greater, size for size, than the relatively "dirty" carburetor bore, and chose a throat diameter representing about 115-percent of port area, but that would seem to be a reasonable maximum. It is worth considering, too, that the process of determining suitable jetting, etc., will be much more difficult as throat size gets larger and air speed declines.

Two-stroke engines also respond badly to oversize carburetors, but for slightly different reasons. The problem here is that the window-valve wonders are extremely sensitive to any change in intake tract dimensions. They rely very heavily on inertia-ram and sonic wave effects to prevent back flowing during the period between TDC and intake-closing, and these effects are altered by changes in either diameter or length. You don't have to make big changes to find a difference: as little as 5mm in length, or 2mm in diameter, will sometimes do terrible things to intake tract tuning, and to performance. So if you have decided that you want a red-hot two-stroker and fitted a big, big Mikuni you'll need to re-tune the intake system. That job requires removing the engine's exhaust system—to eliminate exhaust-side pulsations that might otherwise confuse the picture—and trying different port window/manifold flange spacings until you find one that gives the best results. A rule-of-thumb to be followed in this is to make the intake tract longer by an amount equal to the square of throat size increases.

Entirely apart from the tuning difficulties, too-drastic increases in carburetor sizes bring with them some considerable practical problems. One of these is the matter of physical size, which already has been mentioned. Another involves the motorcycle's throttle actuating mechanism: throttle cables and their related fittings are far from being standardized, but the throttle-slide ends of Amal cables will hook up to Mikuni carburetors without difficulty. It's a quick, no-modifications linking of parts—unless there's a real disparity in original/replacement carburetor throat size. You really can't expect a throttle mechanism arranged to lift the slide above a 30mm throat to handle a 40mm lift. Peeling back the cable housing may provide enough slack to let the slide close; you still may have a problem with the twist-grip itself, if the drum that winds-in cable is too small in diameter and/or won't rotate far enough. Usually the problem is confined to drum diameter, and it manifests itself as a mournfully slow



PILOT FUEL SYSTEM



SLIDE CUTAWAY

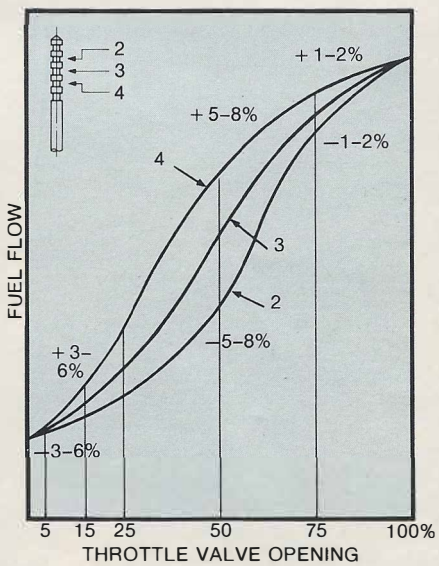
In general it may be said that the Mikuni carburetor's main jet size controls mixture strength when the throttle is fully opened. But an air jet is required to stabilize the air/fuel ratio over the broad range of engine speeds and there is the pilot jet adding its mite to the total fuel delivery. At anything less than full throttle other elements in the carburetor's two fuel metering systems become important and the overlapping influences of these elements confuse the tuning process. To clarify matters we present here a cross-section drawing of the Mikuni, and charts to show the fuel flow/throttle opening relationships for the carburetor's metering elements.

PILOT FUEL SYSTEM: *An adjustable air screw and throttle-slide-bypass hole brake fuel flow up through the pilot jet at idle, but there is a rapid rise in pilot system fuel delivery until ¼-throttle is reached. Fuel flowing up through the pilot jet combines with that from the main fuel system at larger throttle settings and changes in pilot jet size thus require an adjustment in the sizes of all the other metering elements—including the main jet.*

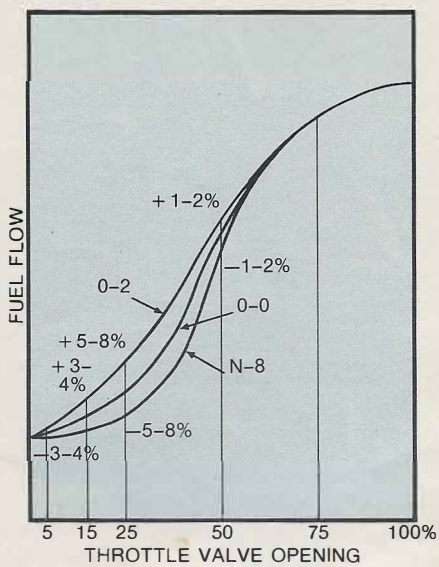
SLIDE CUTAWAY: *The chart shows the effects of 2.0, 2.5 and 3.0 throttle slide cutaways on total fuel flow with all other factors remaining the same. The cutaway's influence is slight above ¾-throttle; strongest around ⅓-throttle.*

NEEDLE POSITION: *This is what happens when you raise or lower the tapered metering needle relative to slide position. The effect extends over the full range of throttle settings with the strongest response at the halfway point. There would be a shifting, higher or lower, of the whole fuel-flow envelope with multiple-taper needles.*

NEEDLE JET: *Of significance is the fact that virtually all the change in fuel flow is confined to the area below half-throttle, and that the needle jet numbers shown indicate a size spread of only 0.02mm in jet diameters.*



NEEDLE POSITION



NEEDLE JET

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throttle action—with up to ¾-turn at the grip required to completely lift the slides. Stick close to stock throat size when you're doing that Mikuni conversion and you'll avoid at least this one set of problems.

Mikuni carburetors are available with either of two mountings: you can get them with the traditional two-bolt flange; they also come in spigot-type models. For the latter you'll have to pay an extra few dollars to get the matching molded neoprene stub-manifold. You'll find applications in which the flange-mount Mikuni is virtually a bolt-on replacement for an existing carburetor, and in such instances there will be an overpowering urge to go for the cheap-and-easy. Don't do it. Half the problems we have with all motorcycle carburetors can be traced to the effects of engine vibration, which causes rapid wearing of slides and needle jets, wandering idle settings, and sometimes severe frothing in the carburetors' float chambers. In fact, there's a fair chance you could approximate the good results you expect to get with a Mikuni simply by providing a little flexibility in mounting your bike's standard carburetor.

One of the "other reasons" for insisting on spigot-type carburetors will become obvious once you have begun the process of sorting out jetting, slide cutaway, etc. There may or may not be room in a four-stroke engine installation for dropping the float bowls and removing throttle slides; two-stroke engines usually carry their carburetors low, right down against the transmission housing, and there's just no hope of removing anything but the slide without first separating the Mikuni from the cylinder. If the carburetor is flange-mounted you have to take off two bolts, disturb—and perhaps tear—a manifold gasket, and worry about distorting the carburetor body if, in haste, you should overtighten the flange nuts. With the spigot-type Mikuni you loosen one Phillips-head screw to relax the neoprene sleeve's circular clamp, and presto! You're holding the carburetor in your hand, with only the throttle cable and fuel line to prevent carrying the thing right over to your work bench.

There is, unfortunately, a small problem (apart from slightly increased expense) that comes in the box with that spigot-mount Mikuni: you have to find room for the neoprene sleeve, which needs more space in every direction than a flange-mount carburetor. First, the construction of the neoprene mounting sleeve is such that the two bolts holding it in place have to be farther apart than the studs provided for most flange mountings. Second, not only do you have to provide for the neoprene stub's length, there is more distance created by the spigot extending back from the carburetor body. In some instances it will be possible to reposition the stock mounting studs; most

installations will require some kind of adapter, and that will add even more distance between carburetor and engine. Entirely apart from any bad effects this intake tract lengthening may have on performance, you may find yourself in difficulties because moving the carburetor back has brought it into contact with a frame member, the air box, the fuel tank's underside, or some other component that cannot easily be relocated. Such difficulties are made all the more likely by the Mikuni carburetor's size, and by the need to mount it very close to level—even if that means having its intake stuffed straight into the side of a battery. You can tilt the Mikuni a little, up or down, but if its throat is angled more than about 15-degrees from the horizontal all bets are off. We know from experience that this much will not too seriously upset the Mikuni's low-speed metering; anything more is *terra incognita* for us and what happens at 20-degrees is anybody's guess?

You can expect to have some problems in trying to devise a suitable adapter. The passageway in Mikuni's molded neoprene carburetor mounting is substantially larger in diameter than the throttle bore, and it probably will verge on overlapping the carburetor mounting studs on your engine. So you cannot simply bolt a plate to the existing studs and then mount the neoprene sleeve on the plate, as the studs and their nuts would have to be recessed into the plate to keep them from fouling the sleeve, and doing that would mean that air could leak inward past the sleeve flange, using the recesses as passages. An alternative is to make up an adapter that is a short piece of tubing with a flange at each end. One flange would fit the existing studs; the other would match the Mikuni sleeve. This last approach can work very well in four-stroke engine applications, where an extra couple of inches in intake tract length probably would serve only to move the power peak downward slightly and improve midrange performance. But two-stroke engines won't like the extra length at all, and there may not be room within the frame even if the engine has no objections.

All things considered, probably the best solution to the adapter problem is to use quarter-inch aluminum plate and countersunk screws. If the countersinking is done carefully the screw heads will be flush with the plate surfaces, with only the screwdriver slots to interfere with an air-tight seal. A liberal application of Permatex takes care of that last problem. You may have some trouble finding countersunk screws with threads matching those of the engine's original carburetor mounting studs, but this may be overcome by either re-tapping the stud holes or making a special set of countersunk screws. That will take care of fixing the adapter to the engine. You can then use a pair of allen-head screws to secure the neoprene sleeve's flange to the adapter plate, run-

ning them into threaded holes in the aluminum. However, you must take care that the screws are exactly the right length, because if they're too short they may pull the threads out of the aluminum—which is too thin to offer more than minimal support even when used to maximum advantage—and if the screws are too long they'll bottom against the metal behind the adapter.

A few engines have intake manifolds separate from their cylinder or cylinder-head castings, and this arrangement eases the adapter difficulty enormously. If the manifold is made of steel you saw away the existing carburetor flange and weld on a replacement with a hole pattern to match the Mikuni mounting sleeve. Heli-arc welding equipment is required to do the same thing to an aluminum manifold, and that kind of service may not be available everywhere. Where only ordinary gas-welding can be done you can effectively reproduce the aluminum manifold in steel, with the appropriate hole pattern in the outer manifold flange.

If all this fabricating and modifying seems intimidating, here's a piece of information that will lend confidence: apart from the matter of getting those countersunk screw heads flush with the adapter plate, nothing has to be done with much precision. All the bolt holes can be a bit sloppy and the adapter plate surfaces none-too-smooth, and a good slathering of Permatex will fix everything. It isn't even necessary to get the port/carburetor/adapter alignment especially close. There's a big change in passage cross-section where the carburetor plugs into the neoprene sleeve, and you can't do much to correct that. Just make the hole through the adapter smaller than the hole through the sleeve, larger than the port apperture, and don't worry about alignment. Air will flow past the close-spaced, abrupt reductions in diameter just like they were covered with a streamlined bell, and if the reductions are displaced laterally a sixteenth-inch or so you merely will have created a slightly bent bell. There really is no point in expending a lot of time and energy smoothing the sleeve/adapter/port transition when you have, say, a 32mm throttle bore plugged into a 38mm-inside sleeve diameter. That abrupt discontinuity will set up a turbulence that is certain to persist clear past the intake valve.

We have already noted that Mikuni carburetors are bulky, compared with others of the same throat diameter. They also have a comparatively enormous intake bell, or to be more precise an enormous ring around the intake bell. This ring is so large, in fact, that when the hose connecting carburetor and air cleaner is kept reasonably short the intake tract, from the standpoint of tuned length, ends at the carburetor mouth. With a smaller connection the hose would act as an extension to the intake tract, and carry the strong intake pulsations forward to envelop the

carburetor's fuel delivery orifices. The pulses have ample strength to seriously compromise fuel metering—to the extent of halting all fuel flow when conditions produce a standing positive wave over the spray nozzle. The Mikuni's oversize entry ring forces the use of air cleaner hose of such diameter that it cannot act as a part of the intake tract. Also the hose's cross-sectional area is so great that it won't develop secondary resonances of any appreciable amplitude unless you make the unlikely mistake of providing it with considerable length. As long as the carburetor/air cleaner connection hose's length is no more than six of its diameters, any sonic wave activity in the hose should be so high in frequency and low in amplitude that no problems will arise.

Whatever you do with the connecting hose, do not fail to provide a good air cleaner. There's a lot of grit whipped up by traffic along paved roads, and the off-road motorcycle lives in clouds of dust—which means *all* bikes require an air filtration system. You may be lucky, and find that you can use the stock air cleaner on your bike; more often than not the system will have to be modified, in ways ranging from a simple rearranging of the carburetor/air cleaner connection right out to total replacement. If replacement looks like the only solution, you're going to spend a little money, but escape doing any real work. There are lots of suitable air filters available: the plastic foam socks have to be oiled, and that makes them messy, but they fit almost anywhere, flow plenty of air, and are inexpensive; have a look, too, at the neat air filters in the K&N catalogue.

You'll have to do something about fuel filtering when making the conversion to Mikuni. All Japanese-made motorcycles have sediment traps built into their fuel valves, so Mikuni has not bothered to provide what they probably see as redundant filtering in the carburetors. Happily, there are in-line fuel filters, modest in both size and price, to be found at almost any automotive supplies store.

Before you get past the final stage of converting over to a Mikuni carburetor, you'll have a fine opportunity to discover exactly how much fortitude in the face of unspeakable frustration you really possess. The final stage also may turn out to be a testing of your bank account, because after you have the carburetor firmly in place, fuel lines connected, air filtration provided, throttle working and all the rest, then you'll begin the really important work—which is to find a combination of jets, slide and needle that actually produces that wonderful performance and mileage legend promises.

Where do you begin? Most people begin with a mistake: to think that carburetor tuning is a matter of finding the right main jet, and that notion is just awesomely wrong. You really begin with the carburetor's pilot jet, and you may have to return

to that one a number of times as the tuning process advances. According to most literature on the subject, all the motorcycle carburetor's functions are neatly divided: the pilot jet takes care of the idle mixture, and then ceases to make any difference after the throttle is more than ⅛ open; then the throttle slide cutaway is supposed to take over, determining how much fuel gets pulled up from the spray nozzle from ⅛ to ¼ throttle openings; from ¼ to ¾ throttle, fuel metering is said to be handled by the tapered needle that partially blocks the needle jet; and from ¾ to full throttle we theoretically rely on the main jet alone. In reality, as the various fuel flow/throttle opening charts provided with this text will show, there is a considerable and confusing overlapping of effects: the pilot jet quickly reaches maximum flow as the throttle is cracked open, but its flow is superimposed on all the others and a change will be felt throughout the range; the effects of slide cutaway extend from idle almost to full throttle; the needle jet will, if its size is right, strongly influence the mixture strength from idle to half-throttle, and have some effect up to the 75-percent point; the tapered jet needle works all the way; and changes in main jet will change fuel flow from a little less than half to wide-open throttle. It's a very subtle blending of functions, and it is distinctly possible to have more than one combination producing nearly identical results.

We have observed that Mikuni carburetors are sold with standard jetting, etc., to suit an average situation, and people who do not depart too drastically from the average can get away with simply bolting their new carburetor in place and fiddling with main jets until the engine runs satisfactorily. That is to say, holding to that near-standard throat size so often recommended here will pretty nearly guarantee acceptable results. Acceptable, but not outstanding. If you want really sharp running you'll have to experiment, and you begin with that pilot jet mentioned earlier.

How do you know when the pilot jet is right? That's easy: if, when you have adjusted the idle mixture and throttle-stop screws to give the best idle with the least throttle opening, you have the mixture screw turned out from its seat about 1½ turns, then the pilot jet is perfect. The range is from one turn to three turns. If you get the best idle at less than a turn the pilot jet is too small; more than three turns and it's too large.

Past ⅛-throttle the pilot jet is doing all it will, and you then have to start juggling needles, needle jets and slide cutaways. In this, the fuel flow charts are invaluable, as are your own powers of observation. It sometimes is very difficult to know whether a slight raggedness in the engine's running is the result of a too-lean mixture, or one that is overly rich. However, in general it may be said that the difference

is revealed in the engine's response to a little more throttle, quickly applied. If the condition is made worse for an instant, the engine stumbling, then the mixture is too lean. But if the raggedness is most pronounced during steady-state cruising and improves with the application of more throttle, you then need to get rid of a too-rich condition.

The charts are a big help, but only if you actually know the exact throttle opening. One conceivably might leave off the air cleaners and actually peer inside the carburetor throats; that probably isn't practical in the real world of roadside posts, oncoming traffic and the like. A better method is to rig a drum and pointer at the throttle twist grip, with the drum indexed for slide position (the marking should be in eighth-throttle increments) and the pointer placed to give readings free of parallax error. And if you have a big-displacement motorcycle you'll be amazed at the amount of time you spend riding at no more than ¼ throttle. My own bike, a 750, will run right past the legal speed limit with a little less than quarter throttle, and cranking up another quarter takes it over 90 mph. All of this means that the pilot jet, needle jet, needle and slide cutaway really are much more important than the main jet.

Ordering alternative parts for Mikunis requires that you know the numbering system, which is in most respects uncomplicated. Slide cutaway is higher when the number is higher: a 3.5 slide has a higher cutaway than one carrying a 3.0 marking; higher cutaways produce a leaner mixture. Main and pilot jets' numbers get higher as the jet orifices get bigger, for a richer mixture. The air jet in the small passage leading to the needle jet also is bigger at the higher numbers, but the effect is reversed: bigger air jets lean the mixture—especially at high engine speeds. You shouldn't have to change this compensating air jet unless you're trying to correct for a high speed leanness and can't do it with main jetting without creating a mid-range, wide open throttle richness. The needle jet code is a combination of letters and numbers indicating orifice diameter, all of which is explained by the appropriate chart presented here.

Needle Jet Inside Diameter				
0	1	2	3	9
N 2.550	2.555	2.560	2.565	— 2.595
O 2.600	2.605	2.610	2.615	— 2.645
P 2.650	2.655	2.660	2.665	— 2.695
Q 2.700	2.705	2.710	2.715	— 2.745

That leaves the tapered metering needle, which works with the needle jet to form a variable area orifice controlling fuel flow up from the main jet. The needles are stamped with a number/letter designation like, "6DH4", which—starting at the beginning and working through—means the following: the number 6 is the code for needle length, in this case telling

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us it is for a 60mm reach; the letters are for the needle's tapers, and there is 0.25-degree per letter as you progress through the alphabet so this hypothetical needle has a first, upper taper of 1.0-degree and a second, lower taper of 2.0-degrees. Then we come to the last number, and it's the one that will drive you quietly crazy because it is assigned arbitrarily. What it signifies is the fact that not all the tapers begin at the same place along the needle's length, and that some needles have a slight reduction in diameter just above the first taper. But the number serves only to keep Mikuni's engineering records straight; it does not indicate any orderly progression.

Neither does the information provided here insure that the carburetor tuning you eventually may do will follow an orderly progression. All we can do is to supply guidance, in the most general way. In the end it is a matter of trial and error, with plenty of error. My own experience included the discovery of one needle jet and needle combination that made my bike's engine absolutely refuse to run. It would start and idle, but cough and expire at the slightest opening of the throttle. But in fairness to Mikuni it must be said that this impasse was reached more or less deliberately in the course of investigative experiment. The Mikuni carburetors I used actually worked pretty well, right off the shelf. The performance gain was unmistakable, the engine ran cleanly at nearly all throttle openings—with just a little over-rich surging between ⅛ and ¼ throttle, which was easily corrected by changing the pilot jet, needle jet, needle and slide cutaway about twenty times. As matters now stand the bike runs without any overt rich/lean symptoms, but I know it's still too rich right off idle because it runs a little too willingly when cold, and the plugs tell me the mid-range mixture is a trifle lean. So the tuning process goes on, and seems certain to continue for maybe the next six months—at which time the collection of carburetor internals that didn't work quite right will be worth probably twice the cost of the carburetors themselves.

One of your expenses should be the Mikuni VM Carburetor Super Tuning Manual, which is available from the Mikuni K. America Corporation, 7923 Gloria Avenue, Van Nuys, California 91406. The manual will be a big help when you're right down there in all the jets and stuff, wondering what to do, and if you get stuck call (213) 781-5060, or 873-7880 to pester the Mikuni people personally. Don't tell them we told you where to call, because they probably are going to have their phones ringing themselves off the hook. After the first hundred replies to callers who want to know which one of those funny-looking pieces of brass is the pilot jet the Mikuni guys may wish they'd never heard of *Cycle*. And don't call us because we don't know a thing that isn't in the Mikuni manual or this text. ◉