Basics

race preparation

Come on now, admit it: a lot of you who might be fresh to the sport of motorcycling already have the beginnings of a big, mangy rat growing in your souls whose name is Racing and who feeds on speed. What follows will help you spend more time on the track and less time staring at melted pistons, seizure streaks, twisted connecting rods and blown head gaskets.

BY GORDON JENNINGS

• By mid-February 1973, at least a couple of dozen new water-cooled Yamaha TZ 350s had been delivered to shops around the country and were being prepared for Daytona. You could have walked into any of those shops at any stage in the preparation process without finding substantial differences in the details of the work being done. Most of the effort expended was being devoted to engines, and most of the engine work involved nothing more elaborate than minor surgery to correct casting flaws and mismatched edges in the ports. None of it would have been unfamiliar to anyone with experience in the preparation of two-stroke engined competition bikes except the mundane business of fitting fairings—an activity filled with fiberglass dust and itching which the motocross brigade happily avoids.

But if the pre-Daytona work performed was virtually identical, the observable result of those labors was not. All of the TZ 350s were motoring around in Bill France's sandbox rather rapidly, but some were vastly more rapid than others. As expected, Kel Carruthers' Yamahas absolutely flew, giving away little in sheer speed to the best 750cc Kawasakis and Suzukis. Also expected were the grumbled complaints from the lowlier privateers, some of whom swore that the TZ 350 just naturally wasn't as fast as last year's air-cooled Yamaha 350 and all of whom seemed convinced that Carruthers' contract with Yamaha International gave him access to Trick Stuff maliciously being withheld from everyone else.

Such talk may have made the privateer tuners feel better about themselves, if not overly optimistic about their prospects for success in the contest at hand, but it almost certainly had no foundation in fact—and it was self-defeating to the extent that it obscured the truth. And in truth, the real advantage Carruthers enjoyed was in the lavish stock of spares provided by Yamaha, a first-rate team of riders, and especially in his own solid skill as a tuner.

After handcrafting a number of genuine Daytona disasters in years past, I am not much inclined to claim solid tuner's skills. Even so, the Yamaha TZ 350 I prepared for Jess Thomas here in *Cycle*'s shop was one privateer entry that gave away nothing in pure speed to Kel's semi-works Yamahas and may even have been a trifle faster: the *Cycle* TZ 350 was pulling slightly taller gearing than even Carruthers' own bike, but then he may have been giving away top end in the interest of infield acceleration. The point here is that *Cycle*'s entry was operating at horsepower parity with the Yamaha-supported stuff, and that this was done without recourse to special hardware.

Indeed, not only did we prepare the *Cycle* TZ 350 without Trick Stuff, we had no spares of any kind until the preparation process had been completed. For most privateers that would have been a handicap; for us it was a positive advantage. When you have no spares for your new zoomer and must face the possibility that they may be in short supply even after becoming nominally available, there is compelling reason for restraint in all the details of preparation. Considering the fact that simple lack of restraint has so often been my downfall in years past, it does seem likely that having it forced upon me by circumstance was, on balance, a good thing.

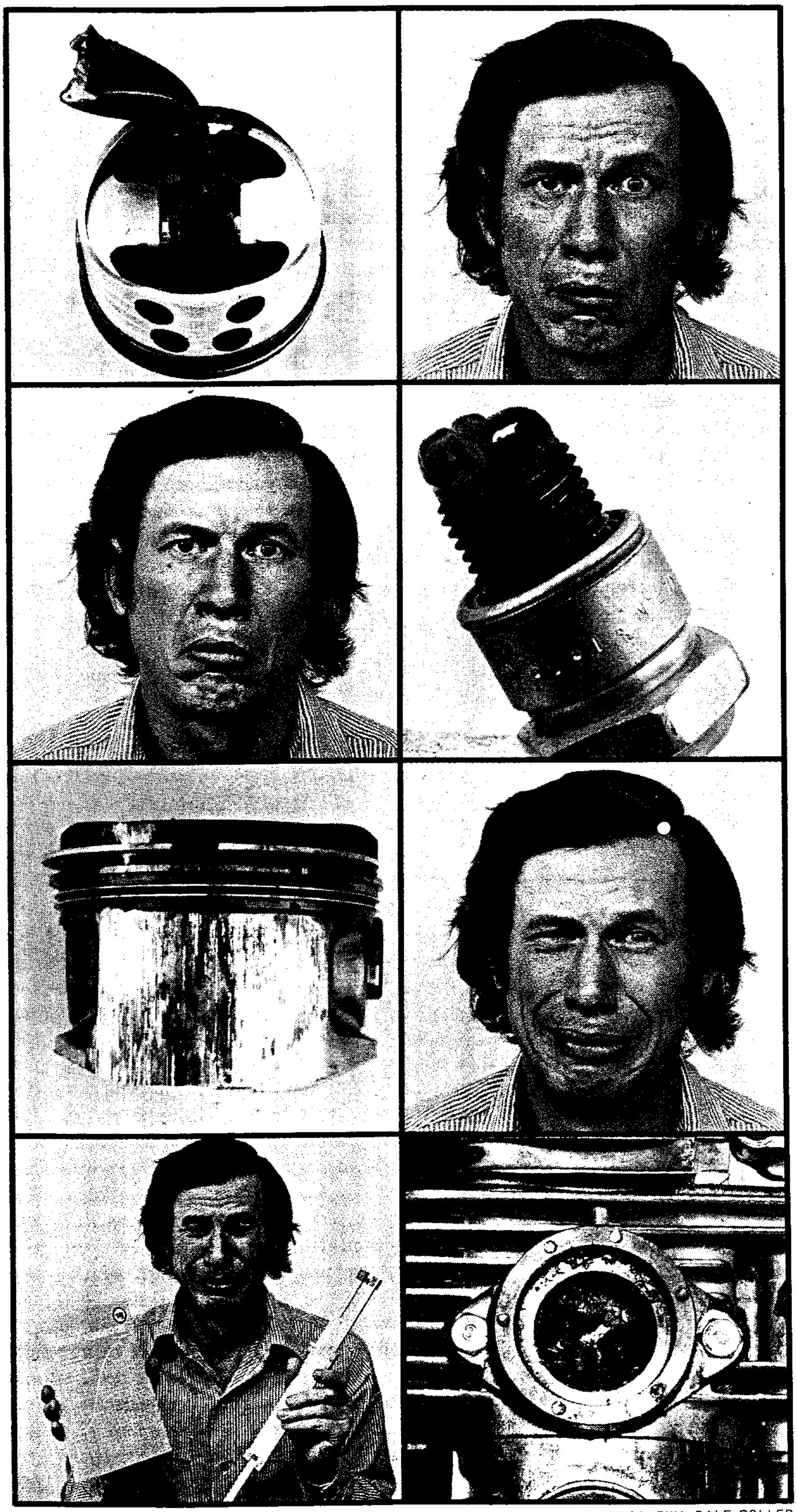
That no trick hardware was made available to us should not be taken to mean we had no advantage over other privateers. Motorcycle magazines' staffers are perfectly situated to learn something new and/or useful every day, and those of us who care about high-output two-stroke engines can easily collect a wealth of related information. Special hardware all too often does not even work in the application for which it is intended, whereas good information is applicable in every endeavor from road-racing to motocross.

If nothing else, my contacts with professional engineers have saved me a common tuner's error, which is to think that the slide rulers are either indifferent or stupid. Few are, and it is possible to improve upon their handiwork only because the scope of the engineers' activities is confined by a couple of realities. First there is the matter of manufacturing cost, which forbids the application by factories of the laborious manual matching of port/manifold joints and such. Racing parts, just like those intended for ordinary touring applications, have to be mass-manufactured to plus/minus tolerances, and it is inevitable that tolerance-stack mismatches do occur. Second, the factories' development engineers must allow for the fact that most race-bike customers aren't gifted tuners, a situation which makes the engineers disinclined to build ragged-edge engines.

Experience may have taught factories to take a dim view of the average tuner; it has taught us to keep a close eye on the factories. However brilliantly the engineers may have done their work, it all goes for naught on a Monday morning when the guys on the assembly line suffer from hangovers. Mistakes are made and the worst of them seem to be reserved for racing bikes—perhaps because the production run is too brief to properly train the workers. You are more likely to find assembly errors in production racers than in their touring equivalents; in consequence the first stage of racing preparation is to take the machine apart for close inspection. That's how we started the process with our TZ 350.

Along with the expected nubbins and ridges inside the engine's ports, it was discovered that the transfer tunnels in the cylinder block didn't begin to match the transfer troughs cast into the upper crankcase half. The reason? Yamaha uses the same crankcase castings as in the street-going RD 350, which has separate cylinders and is somewhat pinched for transfer tunnel area between the two air-cooled cylinders. Casting the water-cooled cylinders in a single block allowed the inner transfer passages to share a single separating wall, and they could therefore be very perceptibly enlarged. Enlargement there also permitted increases in the size of the outboard transfer passages. There obviously was no direct, mechanical restriction on the size of these outer transfers. The restriction stemmed from the need for symmetrical flow patterns inside the cylinders, which required a matching symmetry in the size and shape of the transfer passages. Thus the crowded condition between the air-cooled Yamaha's cylinders dictates the form of all its transfer ports.

Those ports are larger in the water-cooled TZ 350, and have a better shape. For that reason, even though enlarging the air-cooled engine's transfers does pay



PHOTOGRAPHY: DALE BOLLER

power dividends, I confined myself to just smoothing casting flaws inside the transfer passages and trimming the crankcase transfer troughs to match. My feeling in this is that Yamaha (and most other manufacturers) can cast better port shapes than I can carve. Only when something is clearly the creature of manufacturing convenience should substantial amounts of metal be removed. One such area was an abrupt step in the exhaust port spigot where the cast surface ended and the machining began. This step appeared to be the result of expediency rather than planning, and it is generally accepted that any abrupt changes in cross sectional area in exhaust ports create sharp secondary reflections tending to spoil the power-augmenting wave activities generated by expansion chambers. Another area of reshaping was at the ribs separating the main transfer ports and the boost ports. These ribs are squared off in the machining of the cylinder base, and most of the people who prepare racing Yamahas trim the divider ribs to a knife edge. That almost certainly is the wrong approach: knife-edges are fine in super and hypersonic applications, but flow rates at the transfer passage entry are subsonic, and a rounded shape like that of a light aircraft's vertical stabilizer seemed more appropriate, so that's what I use.

Gross irregularities are easily detected, but the workers who build these racing machines are diabolically clever in hiding small, nasty mistakes. You'll become positively paranoid after preparing a few new racing engines and encountering transmissions unaccountably shimmed to give only partial gear engagement, tight and dry oil seals, piston rings installed inverted and/or with their end gaps too narrow or too wide, and sundry other such surprises. Yamaha's machines are somewhat less likely to have these built-in traps than those of most others, but even Yamaha isn't perfect. If it's perfection you want, you should be willing to give time for the complete tear-down and reassembly process.

One of the most important items in the preparation of a racing two-stroke engine is one that a factory would find almost impossible to handle in advance of delivery to the customer. Two-stroke racing engines have very wide exhaust ports and their rings bulge out into those ports every time the piston sweeps down to bottom center. The rings would be broken on the next upstroke but for the shallow chamfers ground around the port windows. These chamfers ease the rings back into their grooves and should be (but never are) completely free of snags and rough spots. Careful tuners will smooth away any sharp edges with fine-tooth tool makers' files and polish the chamfers with a very fine grade of emery cloth. Chromed-bore cylinders, like those in the TZ 350 engine, present a special problem because the chromium plating is very thin, and the cylinder will be ruined if the underlying aluminum is exposed. When working with chromed cylinders, use fine emery cloth—or, better still, round-section jewelers' stones—and just polish the chamfers. Give particular attention to the edge between the cylinder wall and the chamfer, as a sharp ridge of chromium builds up there during the electroplating process. This ridge is not entirely removed in the subsequent precision grinding operation.

Even though the exhaust port is the most likely to suffer ring snagging, this can also occur in the transfer ports, and those chamfers should also receive close attention. And you will usually find that a few small spots will have eluded your searching eyes and fingers. These invisible snags will reveal their presence in the scratch marks you'll see on the rings after the engine has been run hard a few minutes. You then will know where the port window chamfers need added attention, and although perhaps a half-dozen full cycles of running, checking and polishing may be required to get things perfect, the results are worth the effort. Do it right and the rings will retain a nice, clean sealing face many times longer than otherwise would be the case.

Racing two-stroke engines are very sensitive to ring sealing. Blow-by drops power output by diluting and heating the fresh charge down in the crankcase, and blow-by is directly responsible fo almost every instance of piston seizure. People more or less assume that seizure occurs when overheating causes a piston to expand until it is effectively larger than the bore itself, a press fit. Investigation has shown that not to be the case. Indeed, so long as the piston skirt is adequately lubricated, seizure will not occur at all, though the pressures created by thermal expansion may be so high that the whole piston may deform. Unhappily, the piston deformation often includes a vertical smearing of metal around the ring groove, and that in turn locks the ring so that it loses its ability to seal. When that happens the high-temperature combustion gases are free to blow down past the piston skirt, which scorches away the oil film, and piston seizure follows that breakdown of lubrication.

The mechanism of piston seizure being what it is, it becomes clear that the device most often employed as a countermeasure—larger piston/cylinder bore clearances—is likely to make the problem worse rather than better. A loose-fitting piston is apt to rock too much to allow the ring to seal decently, and it offers an unobstructed path for any high temperature gases that force past the ring. Piston clearances in the TZ 350 engine are only .040-.045mm, or less than .002-inch, and this Yamaha is neither as fast nor as reliable when its pistons are a looser fit. Of course, it is water-cooled and has aluminum cylinders with an expansion rate very near that of its pistons, and engines with air cooling and/or iron cylinder liners need more clearance for their pistons—though often not as much as they are given.

While on the subject of pistons, seizures and the like, I will confess to being appalled at the average two-stroke tuner's passion for economy in the amount of oil fed his engines. Nearly 10 years ago I learned from a professional engineer that his firm's power certification tests were run using a 10:1 gasoline/oil mixture, and he added that they might go to even higher percentages of oil if magnetos and spark plugs capable of firing such rich mixtures became available. He admitted that rather less oil was desirable under actual racing conditions, because of plug fouling problems with the 10:1 mix, but insisted that maximum performance was obtained with the largest percentage of oil the plugs would tolerate. Subsequent experience and further investigation have convinced me that he was absolutely correct, and it's now my practice to feed any two-stroke racing engine as much oil as its ignition system and spark plugs will handle. Any doubts I may have had about the wisdom of this approach were resolved by more recent data obtained with elaborate instrumentation: test results clearly showed that cylinder wall and piston temperatures are elevated as the percentages of oil coming in with the fuel are reduced, and the engine cools as more oil is added. Power output follows closely the temperature changes, but in inverse ratio of course.

It should be noted here that oil-test procedures, whether the samples tested vary in kind, percentages added to fuel, or both, must include carburetor adjustments to give maximum power with each individual sample. That is to say, you cannot use the same carburetor jetting to test Brand-A against Brand-B, or the merits of a 15:1 fuel/oil mixture against one mixed to 20:1 proportions, and then expect that the results will have any validity. This aspect of such testing is often overlooked in individual efforts to determine which oil, or mix ratio, represents the optimum.

Outside the cylinder bores, the engine will like a fairly high-viscosity oil. Rolling-element bearings employed in these engines are relatively indifferent to the amounts of oil they receive, but they are sensitive to oil viscosity. Bearings of this kind last longer when fed a trickle of 50-weight oil than when deluged with 20-weight. Sadly, in this regard, the bearings and piston rings are in fundamental disagreement. Heavy oils extend

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bearing life; they also tend to form ring-sticking gums and varnishes. My own inclination in this matter is to use the thickest oil possible consistent with the absolute necessity for keeping the rings free in their grooves. For roadracing engines, in which frequent replacement of pistons and rings is necessary no matter what oil one selects, I favor 40-weight Castrol racing oil. This castor-based lubricant is relatively clean, provides excellent protection against piston scuffing and bearing failures, and seems to form a seal between the piston and cylinder bore that blocks the passage of any gases leaking past the ring. Its only drawback is that it mixes with gasoline only reluctantly and will promptly separate from this fuel if the mixture is cooled below about 50°F.

In applications other than roadracing, where temperatures and pressures are likely to be less extreme, there is much to be said for thinner, more thoroughly degummed castor-based oils (Blendzall being one of my favorites). The degumming process used for all castors intended as motor oils tends to make them less effective as lubricants, but also burn cleaner. Sometimes the cleanliness of triple-degummed castor is more important than its *in extremis* lubricating properties. An important fact to remember about all castor oils is that they oxidize very rapidly when they are exposed to air, and cannot be relied upon to stay in solution in gasoline for prolonged periods. Therefore the gas/oil mix in your bike's tank becomes more unreliable in its intended purpose with each passing day and should be drained and discarded after no more than 48 hours. Petroleum-based oils mix perfectly, stay mixed, retain their lubricating properties over very long periods, and for those reasons are an excellent choice for the average Weekend Warrior.

Among the several small items a tuner should check and adjust (but few do) is the piston crown/cylinderhead clearance in any engine with a squish-band combustion chamber configuration. The purpose of the squish band is to confine the mixture in the combustion chamber to a small pocket right under the spark plug. When this is done higher compression ratios than would otherwise be possible may be used because: a) the charge around the edges of the cylinder bore are spread too thinly to be detonated by the advancing flame front; and b) the piston crown area directly exposed to the combustion process is reduced, yielding a reduction in the amount of heat forced into the piston. On the other hand, that portion of the charge hidden away in the squish band is substantially wasted, which is the squish head's single drawback and a compelling reason for making the squish clearance as small as possible. Clearances as close as .015 have been employed experimentally but something nearer .040-inch is less likely to bring the piston crown and cylinderhead into direct contact at high revs. More clearance is seldom necessary, as it simply wastes more of the trapped charge, and squish bands cease to function as such when the piston/head clearance is much above .060-inch.

The TZ 350's squish clearances were a mighty .080-inch, or about twice what my expert advisers consider desirable. A call to Yamaha International's racing department yielded only the information that this condition was typical, others having discovered the same thing, but that there was no explanation from Japan. Typical as it may have been, I didn't think it was right, and finally concluded that the whole thing was a Yamaha effort to save the customer from himself. The clincher in reaching this conclusion was that an SAE paper authored by Yamaha's ranking engineers gave a compression ratio of 8:1 (taken from exhaust-closing) as suitable for this kind of water-cooled racing engine. Calculation showed that if the combustion chamber had been milled just a millimeter shallower, giving the right squish clearance of .040-inch, then the compression ratio would have been almost exactly 8:1.

All this seemed to be too much for mere coincidence, so I finally decided that while shaving a millimeter off the underside of our engine's cylinderhead might not be as good as having the combustion chambers machined less deep in the first instance, it was better than having a compression ratio of less than 6.5:1 and squish clearances so deep as to present virtually a wide-open combustion chamber. The extra-deep chamber just seemed entirely too much like something Yamaha might have decided upon at the last minute as a safety detune in engines destined for customers who might not give close attention to such humdrum matters as jetting and ignition settings. Frankly, I have made my share of mistakes in this kind of work—and rarely have missed an opportunity to lunge forward and grab an extra helping of stupidity when it was available. But now that I'm not riding I have fewer distractions at the track and have time to gather good advice. This time my sources said the modification under consideration was going to work, but that I'd better not miss much with mixture or timing or there would be pieces of engine all over the track.

All that compression was sure to have a powerful effect on engine output, and did, but it also had its effect on the amount of time spent twirling wrenches. When you are tuning two-stroke engines you spend nearly as much time peering at pistons as at spark plugs. The plugs tell you about mixture strength; the undersides of the piston crowns are an excellent indicator of impending trouble. When you see the cooked-oil varnish inside the piston beginning to char, the piston crown itself is dangerously near melting. But if the varnish inside the piston retains its gloss and the skirt is smooth and clean, then you know temperatures are within limits, the ring is sealing properly, and all is right with the world. Because we were dealing with an unknown (the high compression) at Daytona, much time was spent sending Jess out to do a few laps and then dismantling the engine's top-end to check the condition of the piston. This was very time consuming, but necessary. By taking this approach it was possible to catch problems in the incipient stage, before they could develop into an expensive explosion, and it gave me a chance to work the last, invisible rough spots off the port window chamfers.

One of the things that was revealed in these inspection tours through the engine was that the spark advance specified in the TZ 350 owner's manual was too much for the high-compression version to tolerate. Theory predicted that this would be the case, due to the increases in flame propagation speed produced both by the higher combustion chamber pressures and the enhanced turbulence stemming from the reduced squish clearances, and this was confirmed by the appearance of the spark plugs and pistons. Pulling back the ignition advance to 1.9mm BTC (from 2.0mm) changed the spark lead by no more than three degrees, but that was enough to eliminate all signs of overheating. At that point the varnish up inside the piston was jet black, but not charred, at its center and faded out into the characteristic shades of chocolate and tan at the edges. I might add here that the color of this varnish is virtually an absolute gauge of compression ratios. You can raise an engine's compression ratio until the varnish in the middle of the piston crown's underside turns as black as a race official's heart, and if you've done everything else right, you won't have to worry about reliability unless the varnish begins to char. That's the danger point.

Obviously, doing everything else right is a trick not everyone manages—especially as regards mixture strength. You already know my feelings about feeding a racing engine slathers of oil. Our TZ 350's tank was filled with a 14:1 blend of Castrol 4OR and gas, which most tuners would consider totally absurd. Most tuners would, and as many would have been staggered by the jetting I chose: most of the TZ 350 Yamahas at Daytona were running #320 (or thereabouts) jets; *Cycle*'s Yamaha was sucking fuel past a pair of #360 Mikuni main jets. Kawasaki's Mr. Yoshida may not think much of ultra-rich mixtures (see Kevin Cameron's Loudon race report, in *Cycle*'s September, 1973 issue), but my experience has been that leaning "down, down" much below the point of chuffing soot results in power increases—but only in misapplied dyno-testing. There is no doubt that the engine will cold-flash higher readings on the dynamometer with leaner mixtures; rich mixtures provide enough internal cooling to improve sustained power output, and it is sustained power that counts on the race track.

Ultra-rich air/fuel mixtures, with the fuel carrying high percentages of oil, do require a first rate ignition system—like the TZ 350's pointless CD magneto—and the right spark plugs. And here again I'll say that the recessed-gap racing plugs made for four-stroke engines are a bad choice for two-stroke engines. Champion now has an extended nose racing plug that is far less foul-prone than those of the traditional racing pattern, and I found at Daytona that the Champion E-55 was an absolute marvel. Even with the dense fog of fuel and oil our TZ 350 was getting in its cylinders, we could use the Champion E-55 plugs for both warmup and racing without the slightest trace of loading or fouling. Subsequent experience showed that slightly better results were obtainable on shorter courses with the marginally warmer Champion N-214, but at Daytona the E-55s were by some considerable margin the best plugs we tried. It is my practice to always use the hottest plug, richest mixture and most oil an engine will stand, and Champion's latest racing plugs have permitted a quantum leap in that direction.

While at Daytona, we learned that Kel Carruthers probably was using the same high-compression setup we found so effective. Kel got a shipment of heads from Japan early that week, and those heads did have squish bands about a millimeter shallower than the standard TZ 350 heads. Kel denies that these cylinderheads were machined to give a higher compression ratio, claiming that only the squish clearances had been altered. An informant inside Yamaha told us that Kel's special shipment definitely was high compression in intent, and that we had been exactly right with our early guess. Who knows? For sure Kel was sufficiently intrigued by our Yamaha's speed to drop by our garage to see what kind of gearing the bike had—and actually counted the sprocket teeth to make sure we hadn't stamped the cog with the wrong number.

Others have heard about our bike, and have tried it themselves but with very bad results. The speed is there, only not for very long before checked by a holed piston or seizure. We don't know for certain, but it does seem that other people's problems result from their not doing everything we did, and our engine was running near enough to the ragged edge to be intolerant of leaner mixtures and reduced amounts of oil. There also are some little tricks to get good sealing between the cylinderhead and block; anyone who needs this special-interest information can contact *Cycle*'s West Coast editorial offices.

"So," you're probably thinking, "if the *Cycle* TZ 350 was such a rocketship how come it didn't figure prominently in the race results?" As a matter of fact, that it didn't is my fault: in getting the bike's engine honed to a fine edge I kept the Yamaha garaged far too much and as a result Jess got far too little practice. His priorities, like my own, are of necessity heavily weighted in favor of time at the typewriter and away from the track, and he hadn't been on *any* racing motorcycle for months. Our TZ 350 was a hair-trigger bullet, and Jess wasn't comfortable on it at all. But he was out there soldiering around and figuring to see it through until Brelsford and Darr did their great, flaming catastrophe. Jess saw that through the rivulets of sweat in his eyes and just figured it wasn't a good day to be working at not having a bit of fun. He pulled in and we went off to have a cold drink.

The only real question about the TZ 350 left unanswered by our Daytona experience was, would it last? We settled that by running the bike at a local race and at the dragstrip, and by following its progress after it was sold. And our TZ 350 did more than enough miles to have finished at Daytona without repairs, and without any problem beyond a tachometer bracket failure. The bike's new owner is, we hear, delighted with it, and I have passed that information along to people I know who really know what they're doing and who told me to do exactly what I did. ◉

ART *Continued from page 50*

painting is essentially decorative—that's the main thing. Custom painters are decorating their motorcycles. Now decoration and art are mutually exclusive most of the time—not always, but they tend to go in opposite directions. And that was one of the things that drove me nuts doing this bike. I kept trying to make it look great, but at the same time that was almost working against me."

On the message: "I wanted to make a statement about machines. I think machines are fascinating; I've been interested in them ever since I was a child. But to me over-involvement in mechanical things gets kind of fetishistic and nauseating. I've had this ambivalent feeling all my life about machines, and I wanted to express that in this painting. I wanted to simultaneously celebrate the whole business of machines and sort of poke fun at it. So I did this tongue-in-cheek religious thing. I had this program of celebrating the worship of machinery—and yet I wanted to keep it a little amusing—and I thought the painting was appropriate within the context of custom painting which has always had a tradition of the bizarre. And I wanted to combine my attitude about this worship of machinery with the general classic attitude about the Triumph. So combining those two, I came up with a classical surrealist kind of artwork.

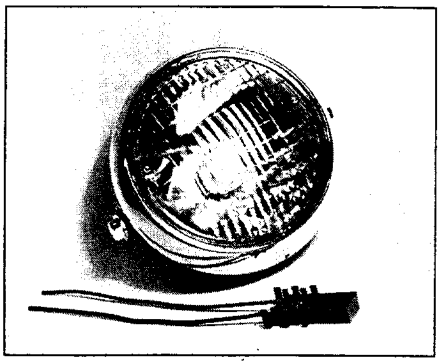
"If you take the main figure on the top of the tank, in that figure is probably the whole spectrum—simultaneously serious-looking and ridiculous." ◉

NEWSLINE *Continued from page 78*

Cycle Carrier: Desert Dynamics' new motorcycle carrier is designed to carry one or two motorcycles and bolts securely in your truck. The carrier also provides room for two G.I. gas cans. Your cycles can be padlocked in place to prevent theft. The list price is $39.95.

Contact Desert Dynamics, 6230 Maywood Avenue, Bell, California 90201.

CIRCLE NO. 5 ON READER SERVICE PAGE



Automatic Headlights: In response to California's new safety bill which states that: "Every motorcycle manufactured and first registered after January 1, 1975 shall be equipped with at least one and not more than two headlamps which automatically turn on when the engine of the motorcycle is started and which remain lighted as long as the engine is running," Keen Research and Development Corporation has a new device to accommodate the bill.

Known as the Keen "Luminator," the device will automatically turn on motorcycle lights 20 to 30 seconds after the ignition switch is turned on.

According to Stan Mutnick, a company official, "The advantage of the time delay function is that the rider has time to start his machine without the drain of his headlight on the electrical system. After starting, he is assured that he will be riding with his headlight on."

Easily installed, the Luminator will work with either 6-volt or 12-volt systems. For more information on the Luminator, write to the Keen Research and Development Corporation, 5382 Sterling Center Drive, Westlake Village, California 91361, or call 213/889-6671.

CIRCLE NO. 6 ON READER SERVICE PAGE

Cycle Saver: Prevent your bike from being ripped-off with Suitcase Cycle's theft deterrent. Suitcase Cycle says the Cycle Saver is the only theft deterrent which prevents the cycle from being ridden off.

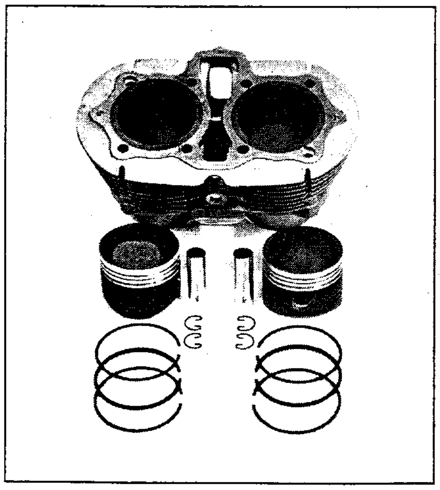
Cycle Saver allows the owner to disconnect the handlebars and lock them to the front forks, leaving no means to steer the cycle, and thus preventing it from being ridden away. The Cycle Saver Kit contains quick disconnect brackets, so that the handlebars can be locked to the front forks. Disconnecting the throttle and clutch cables is unnecessary.

In addition, a built-in lock allows two helmets to be locked to the bike, preventing their being stolen.

The unique Cycle Saver modification can be performed on most Honda, Suzuki and Yamaha motorcycles in less than an hour. No special tools are required.

For further information contact the manufacturer, Suitcase Cycle, at 3013 Airport Avenue, Santa Monica, California 90405 or call 213/390-4421.

CIRCLE NO. 7 ON READER SERVICE PAGE



Piston Kit: Convert your Yamaha 650 to a 750 with a new kit from Rand Company. Included in the kit are two 10:1 compression pistons with valve cut-outs deep enough to take a .450 lift cam, wrist pins, clips, rings and instructions. The kit is unique in that it needs only a bore job on the stock cylinder to install it. Oversize pistons are also available. A 15 to 20 per cent increase in your Yamaha's performance is claimed by Rand.

It costs $79.95 or send in your cylinder and $99.95 and Rand will bore and precision fit the kit to your cylinder and have it back to you in two to three days. Write the

(Continued on page 100)