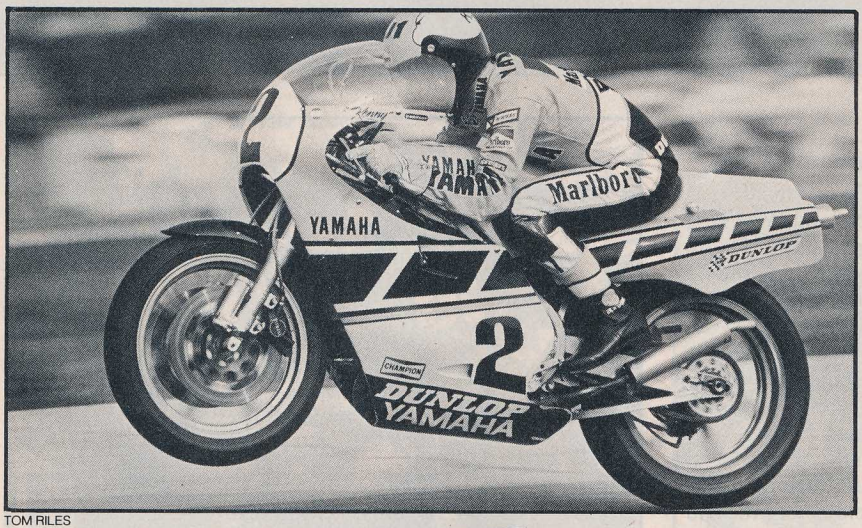
TOM RILES



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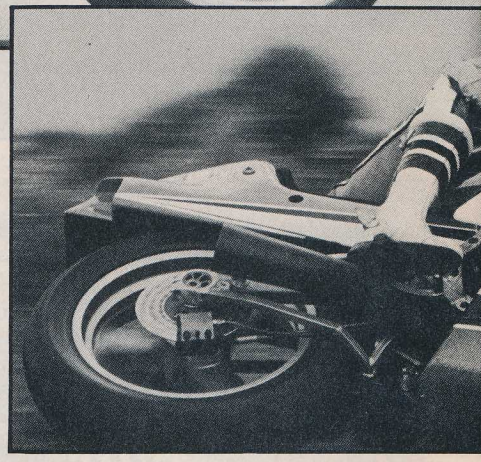


Kawasaki 750 (top) had oil cooler in fairing. Yamahas (left and far right) showed detailed attention to streamlining.

DAYTONA 83

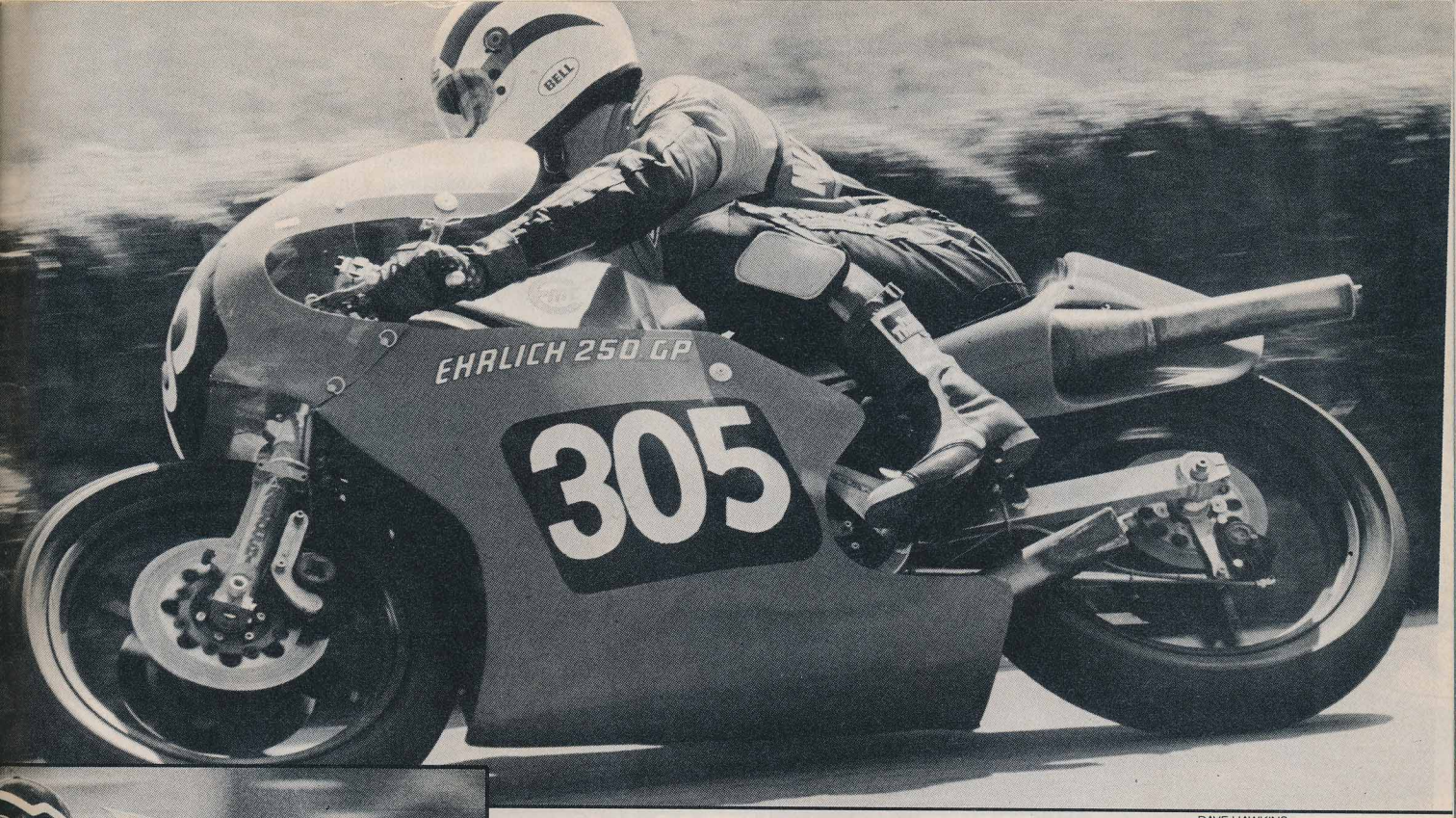
This year Daytona had variety: two-strokes, four-strokes; air-cooled, water-cooled; V-fours, square fours, transverse fours, splayed threes, tandem twins, V-twins and vertical twins.
By Kevin Cameron

The Machines

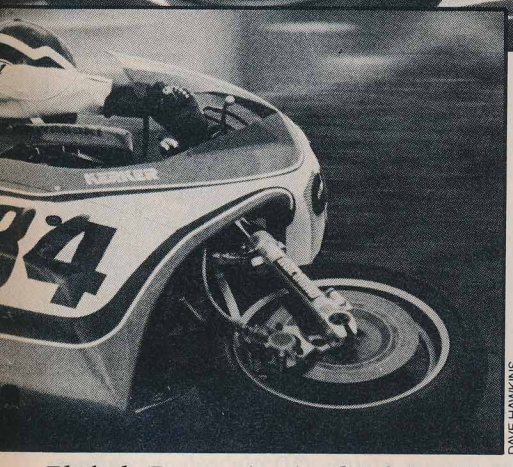
□ After the last of the great Roberts/Baker/Cecotto battles of the mid- to late-1970s, Daytona slid into racing's backwater. Yamaha's OW-31 750 two-stroke, designed specifically to win Daytona, succeeded in both its original factory form and later as the privateer TZ750D. When the FIM killed Formula 750 after 1978, the factories turned to European 500cc GP racing, and privateers held sway at the Speedway.

Though the sharp competition in 500 racing brought rapid advances in tires, suspensions and engines, these fragile machines were unsuitable for Daytona. So long as the specialized Yamaha 750 had life in it, factories had little reason to take a chance against it at the Florida track.

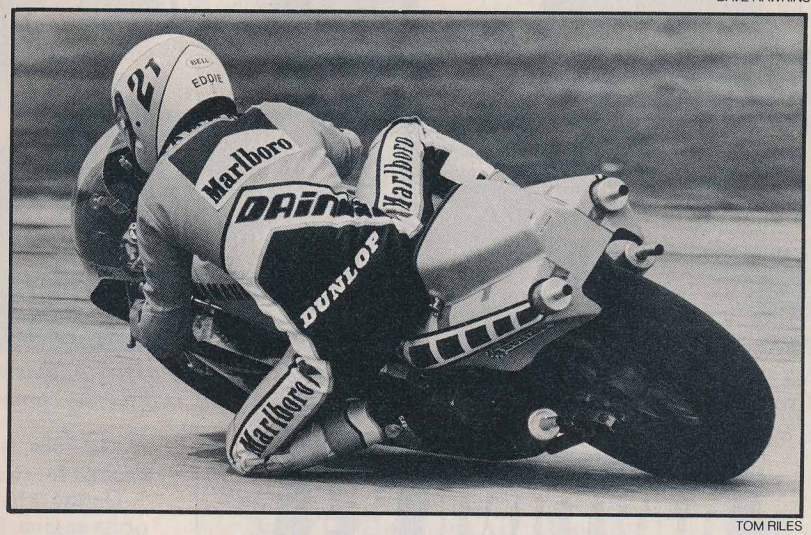
Enter Honda. Like Yamaha before them, Honda people knew the prestige value of a properly trumpeted Daytona win, and also like Yamaha they knew it would take a specialized machine to gain the crown. Result? The 1025cc four-stroke FWS. It very nearly did win the event last year, cruising effortlessly around the Speedway at 2:04s, pulling away from almost everything else at two seconds a lap.



DAVE HAWKINS



DAVE HAWKINS



TOM RILES

Ehrlich-Rotax (top), third in F2, was sole first-10 non-Yam. Aluminum-framed Kawasaki 1025 (above) wasn't a F1 threat.

Those early laps had been hard-fought; Kenny Roberts had run right with the big Hondas on a new Yamaha OW-60 square-four 500 two-stroke, but it stopped. Yamaha had violated its own rule, running a machine not built for the job.

While tire chunking had the two special Hondas in the pits, Graeme Crosby was circulating steadily in the mid-sixes on a 1979-vintage Yamaha OW-31. This was a kind of insurance policy Yamaha took out in case KR's new-technology 500 failed to finish. Conservatism paid off—Crosby won, but the two hard-working Honda men were right behind him; hard racing all but erased their tire-stop deficits.

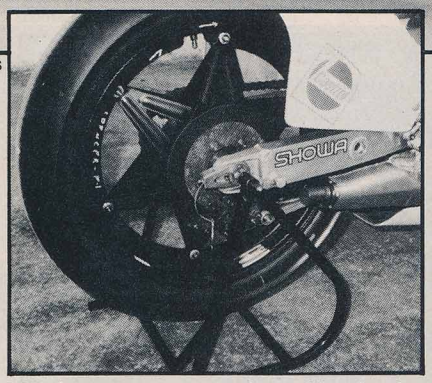
A showdown was in store for 1983. The presence of either Honda or Yamaha at the Speedway would be a challenge the other could not ignore. Honda had the established FWS, now shod with improved-technology rubber. Now Honda also had its own succesful 500cc GP racer, the NS2. This simple three-cylinder, reed-valve, two-stroke machine is the answer to an interesting question, one asked by anyone who has ever looked over the qualifying results from a GP. Odd though it seems, the times posted by fast 350s are often within a fraction of a second of the best 500 times. The question is this: What would happen if a 100-horsepower engine could be put into a light 350 chassis?

Honda engineers knew that Yamaha and Suzuki were running 500s with far more power than this (up towards the mid-140s in the power-crazed 1981 season), but the inviting possibility remained—with the right rider a "100-horsepower 350" might outrun them.

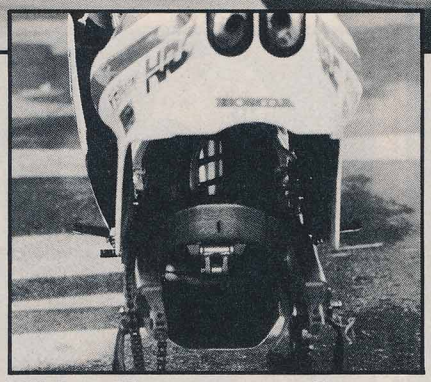
Honda built it, discovering that a three-cylinder engine vibrates enough to crack frames that ought not to break. Therefore the first Honda two-stroke GP racers were heavier than planned—with the extra metal in the chassis. A more pleasant discovery was that even overweight, coming across the scales no lighter than the 275-pound Suzukis, the little Honda was indeed competitive. Its low-horsepower engine and sophisticated suspension combined to preserve its tires, while the more power-laden opposition massaged its tires into uselessness with only 20 minutes of hard running. The Honda could be ridden harder, longer. Although it did have less power, what there was could keep working through entire races. This added up to three race-winning performances last season. Beginning with just 108 horsepower to propel 275 pounds, the Honda progressed energetically

Jimmy Adamo tried Reno Leoni's 600TT2 but raced the faster, old twin. Tony Rutter's 750TT2 was the best of the small Ducatis.

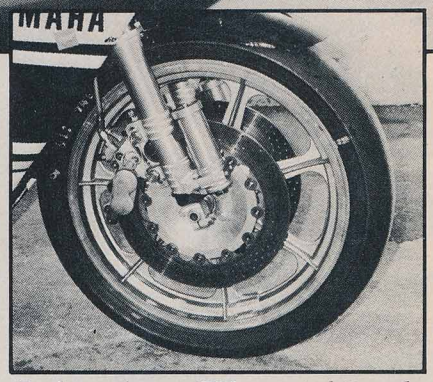
DAVE HAWKINS



NS diet program: carbon-fiber brake disc, very light composite wheels.



NS Deep Throat: massive alloy swing arm, shock and transverse chamber.



Brakes, please: OWs carried Brembo four-piston, QD pin-release calipers.

DAYTONA 83

The Machines

upward in power, downward in weight.

Back in 1982, when Roberts' 500 Yamaha stopped early in the Daytona 200, the second-guessers wondered why Kenny left the powerful and reliable old OW-31 to Crosby instead of riding it himself. Part of the answer lies with the AMA, part with KR. Back in 1977, when the OWs were certainly too fast for their tires, the AMA imposed an intake restrictor rule requiring each of the 750's four 34mm intakes to be choked down to only 23mm before entering the engine. This took enough edge off acceleration to satisfy critics. In time, a modified rule permitted engines 500cc and under to run unrestricted. With all the development Yamaha had put into its GP 500s, it was tempting to believe one might be fast enough for the 200.

On the other hand, Kenny never liked the 750—its chassis *or* its engine. Since he began to race in European GPs in 1978, he has consistently preferred to ride any of Yamaha's 500 designs over the 750. Roberts often candidly characterized the 750 as an ingenious way to be permanently out of control. The old 750 was a fine design in its time, and well suited to Daytona in 1976 (its debut), but nowadays anyone who runs one in an international race in Europe is regarded as a charity case; he would surely ride something else if only he could afford it.

In time, the AMA restrictor rule became ridiculous—tires advanced rapidly while the old 750 marched in place. It began to appear that the AMA was keeping the rule only to please special interests who wanted a crutch to assist four-stroke development. After the 1982 Daytona, when it was clear that 750 privateers no longer had a chance against mature factory four-strokes, the rule was lifted. Since the unleashed 750s won no races despite being unrestricted, the AMA was inclined to let matters rest. But every factory with plans to run a two-stroke at Daytona began clamoring for clarification; they needed to know how big they could build. Decision? The original idea of 750 two-strokes versus 1025cc four-strokes would stand. No restrictors for anyone.

Yamaha and Honda laid plans. Yamaha knew from the

previous year that it would be silly to send a fragile 500 against the FWS juggernaut. They knew Kenny had no interest in riding a hopped-up (and therefore even more dangerous) OW-31, even in an updated chassis. And they needed desperately to win the event to assert themselves against arch-rival Honda. They wanted to win it good, and they had to repeat what had worked in the past: build a special motorcycle for that event only.

A year ago, the motorcycle Yamaha planned might not have worked, for precisely the reasons the FWS hadn't worked for Honda—tires. Motorcycle racing engineers must take full account of tire capabilities in everything they do. If the tire says no, it doesn't matter how many other parts say yes. Fortunately, in the time since last year's Daytona, three racing tire makers (Michelin, Goodyear and Dunlop) have advanced their art in ways none is willing to discuss. Because tire makers can't patent rubber compounds, constructions or even engineering attitudes, the only protection they have for their discoveries is secrecy. Ask all the questions you like; if you are lucky, you may get polite observations about yesterday's weather. Speculation might give something away.

What to build? Yamaha's machines have evolved in 10 years of 500 racing from reed-valve to piston-port to rotary-valve induction and power has climbed from the high eighties toward one-fifty. Three years ago, in a private conversation, a Yamaha engineer stated that a full 750, built with rotary-valve technology, would begin life at 175 horsepower. That would be impressive but for two things—tires and fuel consumption. If you have to change your shredded tires every 50 miles, you are all done. If the only way to go the full 200 miles is to use cement tires, you are still all done. To make a lot of power you must burn a lot of fuel. Normally, big machines stop twice at Daytona. A third stop would be a significant handicap, costing about 20–30 seconds that would have to be made up with yet more power, yet more chance of wrecking the tires.

The threshold for doing it in two stops with the 24-liter tank is about 12 mpg, allowing a sensible reserve for an extra lap if the rider misses the gas sign, plus a half-gallon in the tank for insurance.

Any new machine Yamaha contemplated would have to get the 12 mpg. The old 750 got good mileage (as high as 14 or more) because (1) it's not too powerful, (2) its reed intake reduces fuel spit-back when running below the powerband and (3) its moderate port sizes and downright small exhaust ports don't spend precious micro-seconds yawning open while all the fresh mixture whistles out to be wasted.

Recent 500 technology isn't moderate. Those machines carry giant fuel tanks because they have, in relation to their size, giant appetites. Though direct application of 500 technology would produce a fast Daytona engine, it would use too much fuel. Anything to be built for Daytona would have to be truly special in the fuel consumption department, not a quick modification to some handy existing hardware. Yamaha needed the two-stroke equivalent of Honda's FWS—a big engine with the smooth powerband necessary for tire life, moderate fuel consumption, and a chassis that could keep the tires in firm contact with the asphalt.

Mechanical design is tricky. Even for something as apparently simple as a self-loading gun action, the expected development period is *seven years*. In the motor racing business, such lead times would be unworkable. There must be short-cuts.

A completely new design would require every single part to be proven to the necessary level of reliability. Intolerable. Designers use items like gearboxes, clutches, drive systems and even reciprocating parts over and over in several bikes. Yamaha used the same con-rod forging in all its 54mm stroke street *and* racing engines from 1972 through 1978. All their 250/350/500 racers have used clutch plates punched in the same dies. That's sensible.

On the other hand, technology would never progress

(Continued on page 125)

At A Glance

1983 Daytona 200, Top Ten Finishers

1.	Kenny Roberts	Yamaha
2.	Eddie Lawson	Yamaha
3.	Steve Wise	Honda
4.	Steve Gervais	Yamaha
5.	Dave Aldana	Yamaha
6.	Kurt Lentz	Yamaha
7.	Hap Eaton	Yamaha
8.	John Long	Yamaha
9.	Rusty Sharp	Honda
10.	Doug Brauneck	Yamaha

Winner's average speed: 110.926 mph
Race time: 1:48:51.03 Distance: 200 miles

Superbike 100, Top Ten Finishers

1.	Freddie Spencer	Honda
2.	Mike Baldwin	Honda
3.	Dave Aldana	Honda
4.	Wayne Rainey	Kawasaki
5.	John Bettencourt	Honda
6.	Joey Mills	Ducati
7.	Rick Orlando	Suzuki
8.	Lynn Miller	Honda
9.	Rueben McMurter	Kawasaki
10.	Glenn Barry	Honda

Winner's average speed: 106.090 mph
Race Time: 0:56:54.53 Distance: 100 miles

International Lightweight Race, Top Ten Finishers

1.	Antonio Jorge Neto	Yamaha
2.	Jim Filice	Yamaha
3.	Con Law	Ehrlich
4.	Rhys Howard	Yamaha
5.	Russ Paulk	Yamaha
6.	Dave Busby	Yamaha
7.	Rusty Sharp	Yamaha
8.	John Long	Yamaha
9.	Hugh Humble	Yamaha
10.	Don Greene	Yamaha

Winner's average speed: 101.923 mph
Race time: 0:59:13.981 Distance: 100 miles

Battle Of The Twins, GP Class, Top Five Finishers

1.	Jay Springsteen	Harley-Davidson
2.	Jim Adamo	Ducati
3.	Tony Rutter	Ducati
4.	Malcolm Tunstall	Ducati
5.	Jon Minonno	Triumph

Winner's average speed: 104.089 mph
Race time: 0:29:00.843 Distance: 50 miles

Supercross, Top Ten Finishers

1.	Bob Hannah	Honda
2.	Johnny O'Mara	Honda
3.	David Bailey	Honda
4.	Mark Barnett	Suzuki
5.	Broc Glover	Yamaha
6.	Rick Johnson	Yamaha
7.	Goat Breker	Honda
8.	Billy Liles	Kawasaki
9.	Ron Lechien	Yamaha
10.	Jeff Ward	Kawasaki

12-lap final, time: 0:22:18.220

The Machines *Continued from page 117*

without risky pioneering in materials and design. Engineering planners may believe that carbon-fiber parts will be extensively used in street-bikes in seven years, so they had better get busy right now learning how to use the stuff. But in a Daytona machine? Probably not. Extreme pioneering is a matter for the development shop and the private test track where unwanted photographers can be arrested. Races are said to be won with obsolete equipment and ideas, but in this case, obsolete is just a nasty way of saying "mature and proven." Privateers have to try new things in public. The factories? No way.

What could Yamaha use? The wide, heavy 750 was out. The piston-port inlines were too feeble. The hard-worked GP 500 disc-valve engines were too fragile. What then?

The race department was already hard at work on its 1983 revision of the hard-to-ride OW-61 Vee-four. Built to be what Kenny thought he needed, with the sudden, piston-port-like powerband his riding style required, it would need flywheels of more conventional weight, and that meant new cases with the room for them. In the midst of this it would be hard to make a big Daytona version of it as well.

That left the square-four OW-60, the machine KR had ridden at the Speedway in 1982. It was an interim mount between the heavy and hastily built OW-54 of the 1981 GP season and the abrupt type 61 of 1982. This engine had its four cylinders in square configuration, canted forward, above and ahead of its gearbox. How much displacement could be packed into this basic concept? How much could the cylinder bores grow before compromising transfer area and water-jacket volume?

No one knows for sure outside of Yamaha and the AMA teardown staff, but an authoritative source gives bore and stroke of the resulting bike, the OW-69, as 63.5 x 54. A new bore, but the stroke is ages-old—common with the entire TZ clan from 250 to 750. No pioneering required there at all. Reciprocating parts right off the shelf, all adding up to 684cc.

Yamaha engineers have some known preferences. They like, for example, to spin a 54mm stroke engine at about 10,700 rpm at the power peak. Let those desperate privateers reach up toward 12,000 in their search for 750 power; we are in the business of finishing races.

How sharply should the engine be tuned? Not up with the 500 GP machines, where power is narrow and fuel consumption heavy. Up there, the BMEP (Brake Mean Effective Pressure, an abstract average of the cylinder pressure acting during the power stroke) runs to over 150 psi. We can't use that level of tune. Let's run our fingers down the graph to a lower point, almost down where the motocross engines are churning out their massive torque, down to about 135 psi. Yamaha first reached that level back in 1963, and now it's easy to combine 135 psi with broad power and good mileage.

Now let's put the numbers together. A 684cc engine, turning 10,700 rpm, with a 135-psi BMEP works out to just over 150 horsepower. That would look good to the Yamaha men, who knew how that horsepower level acted in test OW-31s. Current tires could be expected to live reasonably with 150 horsepower, and the race could be run with only two stops. Build it.

During the series OW-54, 60, 61, Yamaha was playing catch-up with their suspension. The 54 was old technology, the 60 a feeler into the new, and the 61 pioneering. The new Type 69 would represent more mature technology than any of these.

At the Speedway, they ran as though they did have 150 horsepower, or maybe a bit less; their straightaway speeds were no higher than the best 750s'. Exactly 180.00 mph was where the eye caught Roberts on Tuesday of race-week, with Lawson hardly slower at 179 plus. The machines reached those speeds far sooner, however, for lap-times dropped

(Continued on page 126)

The Machines *Continued from page 125*

sensationally. A year ago, Roberts on the OW-60 was on the pole with a 2:01.84; in 1983, with more acceleration, he was back with identical top speed but at 1:59.75. If a two-second slice doesn't seem like much, get down there and try it yourself.

Five-hundred brakes weren't expected to stop this thing, so on the 18-inch front wheels were Brembo drilled iron discs and the latest of four-piston Brembo calipers. A Japanese company rarely uses out-of-house products, but time was short. The brakes were said to be marginal but consistent, and Yamaha was nervous: at least one of the four bikes in the Yamaha garage carried its calipers on quick-disconnect mounts, as though it might suddenly need a complete system change in the race.

While Michelin and Goodyear press development of 16-inch front tires, Kenny and Dunlop continue to be wary of them. Due to the shorter distance between the front tire's contact patch and the axle, simply using a 16 on the front reduces the rider's braking effort by 12 percent, and this may be part of Yamaha's momentary brake dilemma.

The chassis, made of square-section aluminum members, was pioneered by Yamaha in 1980 at the beginning of the battle against weight. As with all GP 500s, the steering head is supported by two triangular yokes whose apexes join to the rear, above the gearbox. Indicative of coming changes, these yokes are completely sheeted-in at the sides for stiffness. Much more of this and people will begin talking about semi-monocoque again.

The swing arm has its bracing underneath (possible now because only two pipes pass beneath the engine) and operates the rising-rate, over-center toggle linkage via a pair of pushrods; the single shock is in Yamaha's traditional location.

The front fork, Yamaha's anti-chatter design, achieves complete separation of the damper oil from the clearance gas with low-pressure accumulators on the front of the sliders.

Such was Yamaha's Daytona weapon, and it worked as planned, save for Roberts' unscheduled stop. At the end, KR and his Yamaha OW-69 had 114 seconds on the closest Honda, Steve Wise's FWS.

Considering how Honda has trimmed its European troops, it was a safe bet that the company's Daytona effort would be smaller-scale than Yamaha's. The FWS four-strokes were not scrapped in favor of an all-two-stroke assault, partly at Mike Baldwin's urging. They were instead to play the tortoise to everyone else's hare, circulating at their highly respectable 2:04s while attrition took care of the others.

Daytona tests months ago had shown that though the NS two-stroke wasn't the most powerful machine, neither was it slow. Spencer got through the timer on Tuesday at 176.47, a figure any 750 tuner would be glad to see. And that was on a 500. There must be something to all this business about light weight and low frontal area. Physics must be true.

Honda's exploitation of the no-restrictor decision went no further than enlarging the bore to produce 540cc, but the big cylinders distorted enough to lose gas seal. The 500 parts produced better acceleration and better lap times by a second.

Spencer qualified third at 2:00.2, working his little scooter hard, standing it up on the brakes into turns, sliding grandly through them, and shooting away, just as Roberts had done on his fast lap. Tucked down under his machine in turn two, the horseshoe, Spencer looked so smooth and safe that the descriptive word "cozy" came to mind. New suspensions permit the expert rider to slide smoothly and a lot, rather as cars do. In the old days of twisty frames and cart springs, sliding produced jerky breakaways that soon merged into complete loss of control. Modern machines present their tires to the road very compliantly in their plane of rotation, but very stiffly in any other plane, so a new style of riding is evolving to exploit the sliding now possible By comparison, privateers on 750s struggling to get under 2:10 looked awkward and uncomfortable.

Spencer, too, made an early stop to correct faceshield trouble, and he, like Roberts, was back at the front soon. His duel with KR and Eddie Lawson lasted only six laps, ending as Spencer's shift drum tightened up as he was exiting turn two. Haslam's NS Honda ran as high as second until it broke a crankpin, dragging its back tire as mechanics tried to restart it after the first gas stop.

Baldwin on the FWS tortoise sprang into the lead off the start grid with his four-stroke acceleration, but Lawson's speed pulled him down. Baldwin lasted until lap 42, never far from the front but never again in contention; then a bad clutch unit put him out. And Wise on the other FWS? He was out of brakes after lap 36.

What had happened? Honda had figured the importance of this race to Yamaha incorrectly, but its 500 had been brilliant. The FWS simply wasn't fast enough any more. With no development in a year, the only way to run them faster was to brake harder and rev higher. Brakes were marginal before Daytona 1982, and the problem had been fended off with a change of pad material. Perhaps there was just too much weight for the brakes.

If you want to win Daytona, don't try to do it with your left hand.

Kawasaki has no strategy for Formula One—all that company's efforts were being eaten up by trouble with the Superbikes. Their idea was to combine the proven reliability of the old 1025cc Superbike engine with a really light chassis and Kawasaki's usual good handling and excellent brakes. The chassis was contracted to that jack-of-all-trades Moriwaki, who produced a beautiful aluminum-tube vehicle with Pro-Link-type rear suspension. It had Kawasaki's peculiar mechanical anti-dive at the front, which uses articulated jacks powered by brake caliper torque reaction to hold the front of the machine off the bottom stops under hard braking. At the bottom of each fork slider was an eccentric to adjust trail in the field. In early practice, despite front-end chatter, Cooley thought the machine encouraging. Remember that at Loudon, Lawson on a 417-pound Kawasaki Superbike with this same engine had hounded Baldwin on the FWS every foot of the way. In a light chassis, might not that same engine work wonders? It was worth a try.

Kawasaki people have come to expect nothing from Daytona, and that is what they got in F1. Cooley's reliable old engine chuffed on lap one, sneezing out a clot of particles and oil that disturbed several people, possibly including Roberts, a lap later.

At this stage, Superbike racing hardly merits much comment. Honda was the only going concern at Daytona, for Yoshimura was absent and Kawasaki was locked into a battle with its new 750's oiling system that left little strength for much racing. If looks could win races, the Kawasakis would be on top for their wonderful detailing. The change from the roller crank of the old 1025 engine to the plain shells of the new 750 produced spun bearings in early tests. At Daytona practice, the shells were still smearing despite massive efforts to locate the problem. Like Honda back in 1980, the Kawasaki men were never far from their engine-building stands, and practice for riders Rainey and Cooley was one long break-in procedure, followed by part of a quick lap, or whatever it took to prove that the latest fix wasn't quite right yet. When they ran (Rainey's machine *did* finish 4th after all this) they were reasonably fast, approximately equal to the Honda support-team bikes in acceleration.

The engines looked racy with their exposed dry clutches and ignition parts, and the chassis looked the part, too. Made-for-the-work swing arms and single-shock suspension linkage decorated the rear, and attached to the extremely tall steering head were crowns equipped with eccentric adjusters to permit geometry experiments. Front brake calipers, like recent race-car designs from Lockheed, had multiple pistons set into a vault-like main casting, stiffened against spreading by pairs of steel C-plates.

Plain-bearing engines can't stand oil flow interruptions. Contrast that with military jet engines, whose roller and ball bearings are *required* to be capable of running 30 minutes after the entire oil system has been shot away. On the other hand, plain-bearing cranks are light, stiff and durable. Almost every racing-car engine uses them, and they will soon be universal in bike engines, too. Kawasaki, downhearted at the moment, will get to the bottom of their oiling troubles.

Four of the seven official Honda entries finished first, second, third, fifth. In qualifying, Baldwin discovered a combination worth a full second over Spencer's best, using Goodyears against Spencer's Michelins. In the race, a good performance ended when Baldwin's refueling valve failed to close completely, leaving him struggling to close it, ride the motorcycle, and worry about whether he would fall in his own leaked gas or sputter to a stop because he had already lost too much of it. With plenty of clearance between himself and third place, he limped home second while Spencer cruised. In qualifying, the machines displayed a startling combination of lap times in the 2:08–:09 range with low, low top speeds of the order of 151. They do get through that infield well.

Some of the support-team Hondas, running steel valves instead of the titanium of the works machines, were said to have trouble with keeper-groove wear and seat-hammering. These engines use rocker arms to move their valves, and that means bending loads. The heavier the valve, the more the rocker is deflected during valve acceleration. The actual velocity of the valve will not therefore be exactly what you would predict from examining the cam contour. Instead, it will have a small extra velocity added or subtracted, arising from this bending and oscillation of the rocker arm. Cams have been ground to compensate for such valve-train flexibility, but such contours work only in a narrow speed range and for a given weight of valve. Possibly the heavier steel valves of the support-team bikes are stirring up the rocker arms, and as a result are hitting their seats, not at the designed seating velocity, but at a much higher one.

The crank-mounted one-way clutches used to prevent rear-wheel hop under heavy braking were being confused by high engine rpm (14,000!). Should the sprags stay locked up, as engine torque told them to do? Or should they fly outward, partially unlocking the drive, as centrifugal effects bid them? They compromised by slipping just enough to slowly destroy the clutch units. Spencer, famous for ignoring the tach most of the time, ran without the sprag unit.

Whatever troubles they may have had, Honda has Superbike in hand at the mo-

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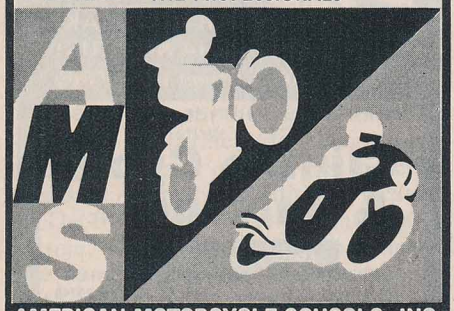

The Machines *Continued from page 127*

ment. For the continued credibility of the contest, Kawasaki must run true to past form and come back strongly in later races.

The Battle of the Twins is changing too. At the top was Harley dirt-track star Jay Springsteen, pushing the twins' lap times down into the low-13s on an official H-D entry. Here was a tuned version of the new XR-1000 engine (which consists of hand-worked dirt-tracker heads on a giant Sportster) in a resurrected chassis, equipped with modern shocks, fork, brakes and swing arm. Technology can safely be discussed at H-D these days. MIT graduates on the payroll mess about with actual computers and vehicle dynamics programs. In years past, the policy was literally this: hire no college grads; they might try to change something. No more. Be sure of this—American knowhow isn't dead.

It looked good to see those American-built pushrods rattling around the Speedway ahead of all that desmo complication. Engines make power by pumping air and burning fuel, and air and fuel don't particularly care what the machinery looks like.

Springer's machine used Harley's patented anti-dive brake system, which operates by changing the volume of air the forks must compress as they move. In normal running, both legs connect to an external accumulator, or pressure chamber, whose large air volume is easy to compress; therefore the forks compress easily. When the brakes go on, a switch triggers a solenoid valve, closing off the accumulator. Now each fork leg compresses only the small volume inside itself—much stiffer. This increased resistance prevents the machine from bottoming under braking. Springsteen at Daytona is symbolic of many changes at H-D.

Fifteen years ago lightweight streetbikes were popular and lightweight racing had real economic significance. The coming of the 1000cc street rockets put an end to both. Lightweight racing today continues without direct factory support as a sort of beginner's class and a haven for those who don't want to go broke with the big-bikes. Of all the brands that once populated the class, only Yamaha remains available. Its machine, a poor relation to factory 500 racing, uses technology discarded from the front line a year or two before.

Special projects come and go. The French Pernod disc-valve, the Morbi/Ad Maiora 250, and the Bartol engines all show promise. But aside from the production Yamaha, the only machines that can claim anything like production status are those powered by Rotax engines.

When a few races are won in England by a Rotax-engineered special, the press there announces a new world-beater. When the same equipment gets over to Daytona, it turns out to be about as fast as a Yamaha prepped by serious amateurs on a limited budget. To win Daytona you need more than a nice design (the Rotax is that) and a couple of encouraging dyno curves (it has those, too). You also need grimly expensive and crankcase-shattering hours of full-throttle tests passed successfully. You need the sheaves of test-rider reports and you need all the engineering changes that result from both. Riders do try the alternatives because of their real attractions (I agree that a real race engine should have rotary-valve induction), but in the end, they usually come creeping back to their Yamahas.

The first two finishers were Yamahas and the third was a Rotax-based special. It bore the honored EMC emblem that was last seen in the 1960s when Dr. Joe Ehrlich's special creations were part of the original two-stroke revolution. His cylinders, heads and pipes distinguished the third-place machine from standard Rotax, but for all the advance notice, it was not clearly superior.

Where has all that fabled rotary-valve acceleration gone? Bargained away to obtain satisfactory top speed. And why is top speed poor? The first 90 percent of the potential in any design is the easy part, and it gets harder from there.

Yamaha has refined its design again this year in ways that bolster its weakest area—acceleration. More bottom-end power and lighter weight are the goals. Increased compression and spark lead produced the rash of failures you might expect. It takes time to learn to live with the new modifications. To keep top-end in step, Yamaha increased the zero-cutaway Mikuni carbs from 36 to 38mm, and trimmed the intake length marginally. And again, new pipes.

Seven pounds have been pared by using magnesium instead of aluminum for the gearbox sump plate, clutch cover, and Power Valve governor body. Up front, the old 1974 cast-iron brake caliper that weighed four and a half pounds is gone, replaced by the Lockheed-type bridge caliper from the 500 GP program.

Lightweight lap times have stagnated since the departure of factory interest in the class. It will take a shocking new rider to bring them down to a level that represents the true capabilities of the machines. They are expensive if viewed as beginners' rides, cheap if seen as GP racers. Costs mean fewer people racing, and that means fewer good people. Those who have the money don't often have the talent, and vice versa. Spondon aluminum chassis, Zanzani aluminum brake discs, and titanium bolt and pivot kits adorn the machines of those who feel they have exhausted other means of going faster. But is it professional racing when the price of the equipment exceeds all the prize money you could possibly win with it in a year? ■