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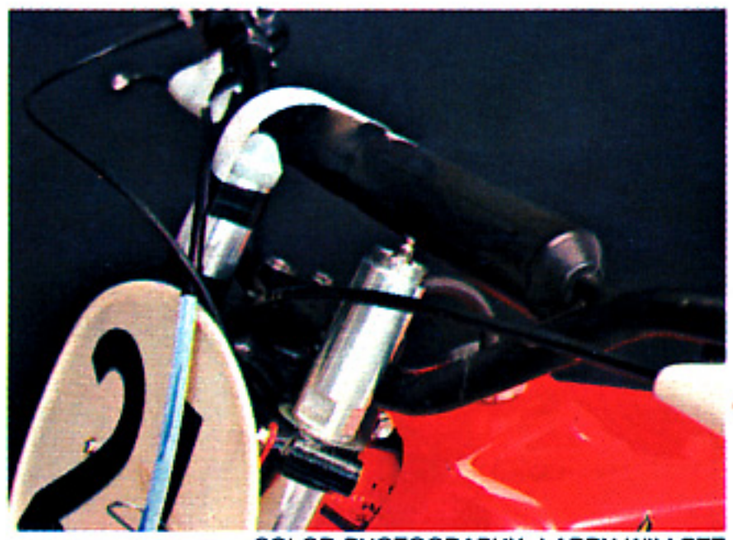
A SECRET PAINTED RED

Honda's RC 400 Factory Motocross Racer



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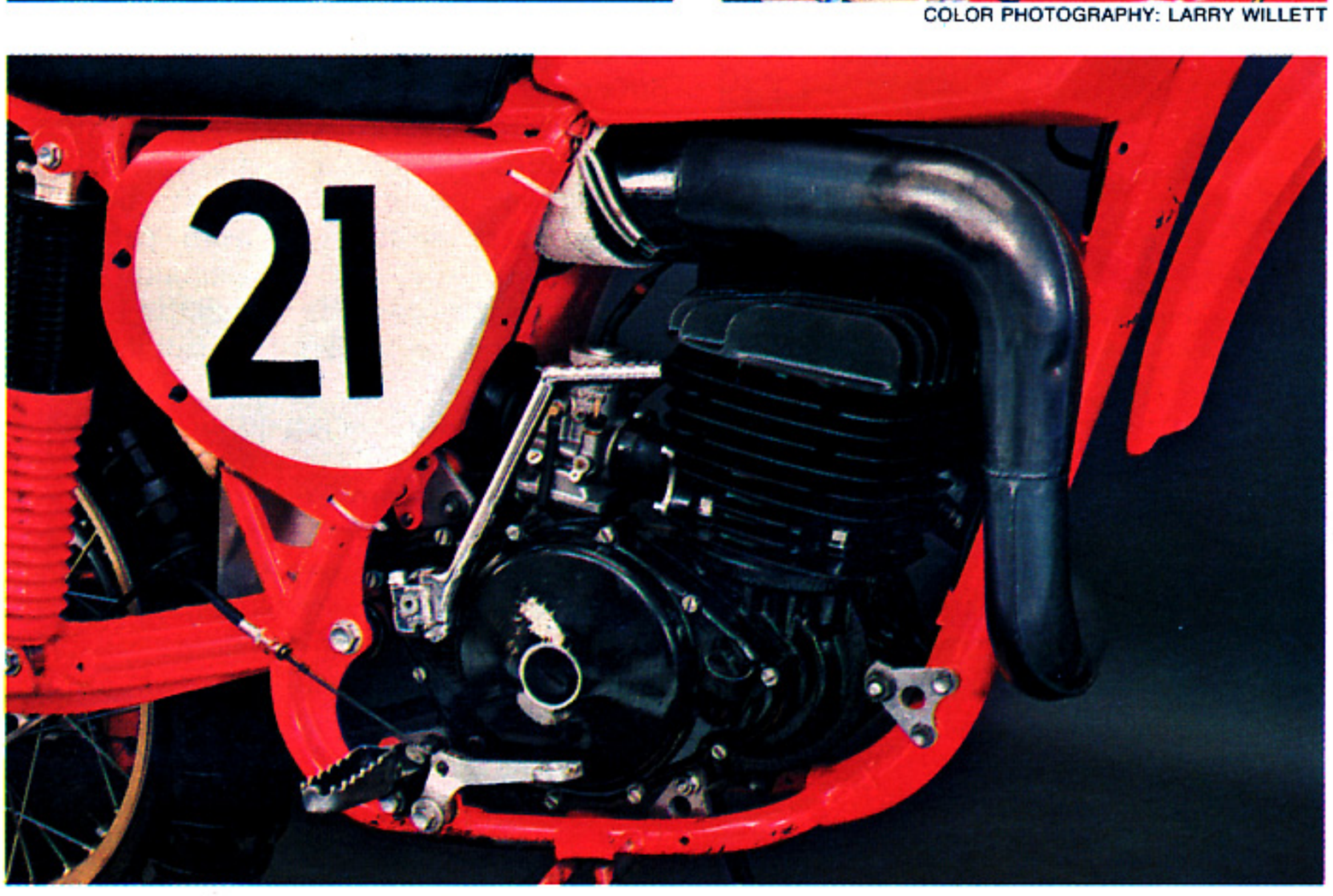

● When it comes to racing, Honda hates to lose. In the 1960s the Honda Motor Company went after the world roadracing championships with one, two, four, five and six cylinder machines, and Honda conquered all. After winning the 50cc, 125cc, 250cc, 350cc World Championships and the 500cc Manufacturer's title, Honda withdrew their fantastic armada from Europe and returned to Japan in 1967. The factory officially appeared at Daytona in 1970 with 750cc works bikes which disappeared after bagging the 200-miler. To this day, virtually no one knows anything about these championship motorcycles.

In racing matters the Japanese worship secrecy with genuine fervor: they closely guard *all* information concerning their factory equipment. Much of Japanese racing technology only reaches the production line years later—and sometimes not at all. After eleven world motocross titles and seven years of domination in three grand prix classes, the paying customer has been able to buy very few GP innovations from Suzuki.

Yamaha has likewise moved forward and backwards with equal mystery. Yamaha won the 1973 250cc World Championship in motocross with a bike which had conventional rear suspension; meanwhile, the production-line motocrossers were fitted with Yamaha's monoshock system. Since Kalevi Vekhonen's championship title, not a single Yamaha GP Monoshocker has made a title threat. Technical information about Yamaha's factory motocrossers, past and present, lies behind a thick wall of secrecy.

That Honda, the all-time champion of secrecy, stays lip-locked about its works motocrossers should not surprise you. But this situation is nevertheless confounding. *Cycle*'s staffers have dug deeply into the bowels of Jim Pomeroy's Bultaco, Ake Jonsson's 400 Maico, the 360cc Husky Mikkola bike, Can-Am's GP racer, and Jiri Falta's CZ replica. All factory racers have different porting configurations, carburetors, pipes, suspension units, tires and chassis; yet they can be championship bikes. In general, the European factories delight in showing journalists the close, or sometimes distant, relationship between their works equipment and production-line bikes. But not the Japanese.

Secrecy becomes understandable when victory utterly depends upon small technological margins. But a grand prix motocross victory rests on three equal parts—the rider, the preparation and the machine. Joel Robert was World Champion on a CZ before joining to Suzuki; Ake Jonsson trampled the competition in the Trans-AMA on a Maico and then switched to Yamaha; Jim Wienert was the 500cc national champion on a Kawasaki before being bought by Yamaha; and Gary Jones was three-time AMA 250 champion on three different bikes: Honda, Yamaha and Can-Am. Though the equipment is only one element in winning, the Japanese stay mum. Honda volunteers very little information about works bikes—and treats detailed questions as unneeded and undesirable prying into official factory business.

It's much easier to find out how the motocross effort fits into the Honda organization. Honda handles open class motocross quite differently than their racing offensive of the 1960s. Similar to the Baja program, the distributor (American Honda) is the official racing sponsor in motocross. This shields the Japanese factory from any embarrassing failures. But the factory connection is very real. The US racing department (the Sports Division) is strictly controlled by Honda's service director, Mr. Teruhisa Ohki.

American Honda purchases the RC 400

HONDA: THE GIANT ROARS

Honda painted the works 400 red, hired Pierre Karsmakers to win the AMA Open Motocross Championship on it, and clamped a lock on further details. So Cycle started snooping...

Dennis Blanton, American Honda's Racing Coordinator, is in charge of team logistics.

works motocrossers from the factory. Each one of the open-class RC motocrossers carries a value of $30,000; that's $12,000 above the Honda works 125s, and about $5,000 less than Suzuki claims for their GP bikes. Honda has tailored the open-class RC models to North American circuit racing, including the AMA nationals, Trans-AMA series, and U.S. and Canadian Grands Prix. None of the open-class RCs are raced in Europe or Japan. The single exception has been Pierre Karsmakers' appearance at the British 500cc championship round.

Honda first jumped into the open class two years ago when Gary Jones rode a 360cc machine at the Carlsbad Grand Prix. Shortly thereafter Honda Motor Company sent over short-stroke 360cc and long-stroke 400cc bikes for testing and experimentation. With the bikes came a group of factory engineers to watch, study and work on the bikes during the 1973 Trans-AMA series while Marty Tripes and Gary Chaplin raced the machines. For the following season Honda produced more developed versions raced in the 1974 Trans-AMA by Richard Eirstadt.

In 1974 all the Honda RC works machines—125cc, 250cc and Open—debuted in a new, brilliant fire-engine red. Campaigned with the works bikes was a four-stroke motocrosser privately developed in American Honda's race department. Rex Staten rode this 400cc-plus single in numerous local and national events. The bike sparked enormous interest, and many observers thought it a genuine factory racer. It wasn't. Indeed the four-stroke would soon be pensioned off as Honda intensified their effort in the Open class with the two-stroke RCs.

Entering the 1975 season Honda had already collected two national championships. Gary Jones won the 1973 250cc title, and Marty Smith owned the 1974 125cc number-one plate. The national 500cc crown and Trans-AMA championship had nevertheless eluded Honda. To undercut Yamaha's chance at the 1975 500cc national title, Honda bought Pierre Karsmakers away from Yamaha, and this buy-off made Karsmakers the highest paid motocross star in the United States. Honda was deadly serious about winning.

Honda's factory racing department built no more than six RC 400s, and three were prepared for Karsmakers' 1975 season. While the frames were made of chrome molybdenum steel tubing, the heavily reinforced swing arms were all thick-wall aluminum tubing. Weight considerations, of course, ruled out a steel-tube swing arm, and the thick-walled aluminum proved stiff enough to resist flexing.

The chassis geometry of the RC 400 resulted from experimentation with the early CR-250s. George Etheridge of Honda's product testing department had developed a successful chassis modification for the 250 Elsinore. The CR-250 frame was cut at the head and the steering neck was moved straight back. This modification shortened the wheelbase but retained the same fork angle. By placing more weight on the front wheel, the CR's inherent cornering washout was eliminated.

The open class racers can use four different engine configurations with three different capacities. The early short-stroke 360 was joined by two other oversquare engines displacing 400cc and 450cc. This selection gave Karsmakers three short-stroke, high-revving engines—and a more gutty undersquare 400. First used in 1973 the super-powerful 450cc engine originally could use both four and five speed gearboxes; however, the engine developed too much power for either transmission and Karsmakers found the engine unacceptably powerful.

Though Karsmakers used short-stroke 360 and 400 engines early in the 1975 season, they made the bikes difficult to ride: it was impossible to get the power on the ground. Both short-stroke engines had power curves similar to the very pipey RC 250 machines. As delivered from the factory, all the open class engines reputedly produce over 40 bhp; and when the big engines hit their power peaks, the bikes lost traction.

After sampling those problems, Karsmakers moved to the long-stroke 400 with its five-speed gearbox. Although the short-stroke RC motocross engines use a crankcase reed-valve induction system, the long-stroke 400 is a basic piston-port intake design. The undrilled (no windows) 400 piston employs two conventional rings rather than a single Dykes-type found inside most works engines.

According to Honda, the design of the RC 400 engine is nearly identical to the production Elsinore 250. Materials of the RC engine are, however, much different. Crankcases and covers are sand-cast in magnesium, and the cylinders and cylinderheads are produced in die-cast aluminum. The hemispherically-shaped combustion chambers are conventional enough, but unlike the production engines the 400s use special pistons. The engines are held together by titanium case screws.

Nominal venturi size of the carburetors varies with the altitude, track and weather conditions. Keihin carburetors (made by a subsidiary company of Honda) are made to order for the RC bikes. Slower, tighter courses might require 36mm carburetors, whereas 41mm instruments would be fitted for fast high-horsepower tracks. Located behind the Keihin carburetor is a still air box with an oil-soaked foam filter. The long front fork which has more than eight inches of travel dictates an up-

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and-over expansion chamber. To meet the AMA sound regulations the RC bikes have token glass-packed silencers.

Engine bearings are all standard caged roller and needle assemblies, and replacement bearings come from Honda's OEM stocks. Straight-cut primary gears drive the clutch which is supposed to be a standard 250 Elsinore unit. The special close-ratio transmissions are comprised of hand-tooled gears.

The wheel hubs and brake backing plates are cast-magnesium pieces which carry special non-fade shoes and linings. Gold anodized D.I.D. rims lace up with Honda spokes, and naturally tires vary with the track conditions.

Ignition units are standard Kokusan-Denki items. But, like tires, gearing and carburetion, different set-ups compensate for varying conditions. Three different-weight flywheel rotors can be used to control wheelspin and the rate of engine acceleration.

Like the RC 125 and RC 250 works bikes, the 400s come with two matching cylinders—one with a chrome bore and the other with an iron liner. Early testing with the RCs revealed the chrome-bore cylinders delivered more consistent performance during 40-minute motos. Though they dissipated heat quicker than their iron-liner counterparts, the chromed cylinders proved unacceptable for racing.

Any foreign object sucked into the engine would trash the cylinders by peeling the chrome off the aluminum casting. A broken ring would instantly destroy the chrome bore. But the most serious problems were chrome-bore seizures when the bikes were pressed to their maximum. The seizures were eventually identified as clearance problems.

According to Honda, the narrow piston-to-cylinder clearances traced backed to test procedures. Conditions varied widely between the factory racing department and the American motocross environment. The factory did all engine testing and development on the dynomometer; a quick field check finalized designs. (Conversely, Honda spokesmen insist that no RC engine has ever been placed on a dynomometer at American Honda; that's an almost unbelievable situation.)

Moreover, the factory ran the engines on Shell SM castor (vegetable) oil while the RCs were raced on Bel-Ray synthetic—different oils mixed with different gasolines at different ratios.

Factory testing, under controlled conditions certainly was less severe than the punishment of stateside racing. For a time the Japanese factory technicians couldn't figure out how the American team was destroying the engines. And American Honda's "alley testing" and racing was not backed by dyno checking which could have solved the clearance problems. Consequently, the chrome-bore cylinders were set aside by the American team, and the factory now uses Bel-Ray oil for their development work.

Karsmaker's biggest single problem was the 400s suspension. Initially the Japanese balked at changing suspension units. Showa, like Keihin, is also a manufacturing subsidiary of Honda Motor Company. Pierre's complete frustration with the Showa suspension units drove him to an unusual step. Although Honda resisted any change and although he rarely uses non-factory products without contract agreements, Karsmaker turned to S&W after destroying Bilsteins, Konis, and Boges as well as Showas.

S&W first gave Karsmaker some special aluminum-bodied, large diameter shocks to replace the air/oil (springless) Showas. The S&Ws were non-pressurized air/oil dampers with 100ppi springs.

The first S&W units lasted longer than other shocks but still faded 30 minutes into a moto. The damping was reduced slightly and 117 ppi springs were installed. These changes produced dampers which would finish a complete 45 minute moto, but the same units would fade in the following moto. S&W developed another anti-foam oil which delayed but did not stop the fading. Then Karsmaker tested more than 20 different valve designs. At last a freon gas cell was inserted in the damper to isolate the oil from air.

Perfecting the rear suspension uncovered the weaknesses of the Showa air/oil (springless) fork. The stock pressurized fork was less than dependable: bad seals caused air leaks, and peeling chromeplate would puncture sealing surfaces. Again S&W came to the rescue. The Showa units were reconstructed without the air-pressure spring and damping functions. S&W installed a pair of 25ppi springs and special oil-damper kits. Like the shocks, the S&W-modified fork worked perfectly.

Honda's chance of winning the national open class championship was severely damaged early in the season. Karsmaker crashed at Carlsbad when an experimental non-factory swing arm broke; he sustained a broken leg which sidelined him during a number of AMA points races. Although the AMA open class championship remains undecided, Pierre believes a trouble-free season would give him the 500 crown.

Honda has spent three long years racing the RC 360, 400(s) and 450. After a half-dozen riders, four engine swaps, numerous chassis changes and suspension problems, major personnel changes and rider injuries, Honda is close to the AMA Open title—so close that an eventual triumph now seems inevitable.

And when victory at last comes, no one at Honda will make a secret of that. ◉