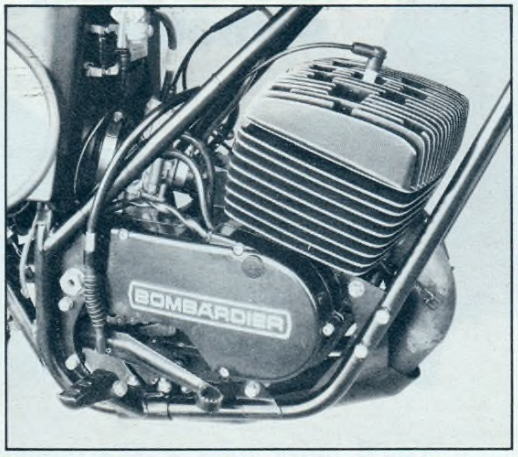
COLOR PHOTOGRAPHY: LARRY WILLETT

CAN-AM 250 T'NT ENDURO



If you get tired of trails, you can win a motocross without even removing the lights. If you tire of motocross you can win the stock 250 street class at the drag strip—knobby tires and all. After that you can do some cafe racing, and win your share again. If you get tired of riding, you can win some money instead. Just make a few bets with your friends about horsepower.

● The degree of proficiency attained determines the sophistication of the tools required. A housewife needs only an adding machine for balancing her checkbook, but a launch expert must have a complete computer to calculate rocket trajectories or balance differential equations. The Can-Am is the computer of off-road motorcycles. It's not for everyone, because its high powerband makes it harder to ride than a Yamaha Enduro. But the same powerband in the hands of a motorcycle launch expert makes the Can-Am the best enduro bike in the world, regardless of displacement.

The magnitude of such a statement is enormous considering the existence of Penton and Maico enduros, but *Cycle* is convinced the Can-Am is No. 1 (in spite of several shortcomings) simply because its performance numbers and other strong points are so overwhelming.

Can-Am's history is brief and impressive. It begins with Bombardier Ltd., a company headquartered in Valcourt, Quebec and founded in 1937 by Joseph-Armand Bombardier to build snow vehicles. Today, after rocketing into the economic stratosphere with the sale of more than 1 million Ski-Doo Snowmobiles since 1960, Bombardier controls 20 other concerns and markets motorcycles, snow vehicles, tractors, plastics, apparel and rubber goods in 32 countries through 4000 dealers. Sales last year totaled $156,000,000.

In 1970 the company determined that motorcycles would (1) provide needed diversification, (2) furnish a second major product line for some 2500 snowmobile dealers and (3) allow full utilization of assembly lines normally idle during the off-season. The Board of Directors hired an American, Gary Robison, to design and build a complete line of street and dirt motorcycles for Bombardier. Robison was a Californian who learned about motorcycles by tuning race bikes and grinding cams for Harmon & Collins. The Bombardier Directors gave him a white sheet of paper and unlimited funds and said, "report to us once a month on your progress. And by the way, add the profitability of the motorcycle division to your list of responsibilities."

Robison formed a design team (which presently numbers 65) in the motorcycle R & D department, and attributes Can-Am's success to his entire staff. Others in the company say it couldn't have happened without him.

One of Bombardier's major wholly-owned subsidiaries is Rotax, an Austrian engine-building firm with elaborate two-stroke production facilities. During 1971 Robison flew to Austria 15 times to super-


Can-am

vise the design and testing of Can-Am's incredible rotary-valve engine. Most of the following year was spent on chassis work and prototype production. Late in 1973 Bombardier released four Can-Am motorcycles to the public—a 125 MX, 125 T'NT Enduro, 175 MX and 175 T'NT Enduro. All four bikes immediately proved their worth, but easily the most impressive competition achievement was Billy Uhl's tie with Carl Cranke (250 Penton) and Jack Penton (400 Penton) for the ISDT Qualifier series championship while riding a 175 Can-Am Enduro. He was also the only rider in the series to win a Gold Medal in all six events.

Similar feats of giant-killing were preordained for the 250 by its performance numbers. At Irwindale Raceway *Cycle's* Can-Am walloped every other 250 we have ever drag tested with a 15.040-second, 85.22-mph quarter-mile. Not even the Yamaha, Kawasaki or Suzuki street 250 Twins can threaten that figure. The enduro bike most similar to the Can-Am in concept and performance is Penton's 250, which ran 1.4 seconds and 9.02 mph slower.

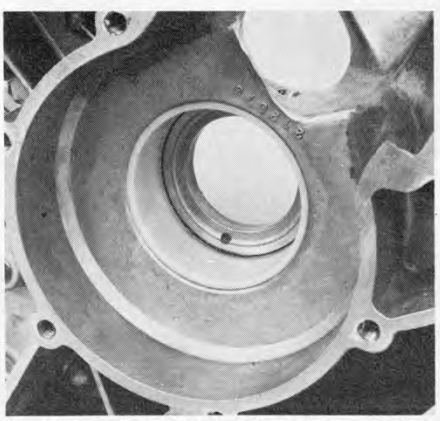
On the dynamometer the Canadian bombshell exploded for 27.73 horsepower, an amount any manufacturer would be happy to find in their motocrossers and an amount which exceeded the Penton's best by 1.17 hp. During a flash reading in which the Can-Am was revved directly to its 8000 rpm power peak, output reached an astounding 30.03 hp.

Out in the field these enormous performance figures suggest that the Can-Am should be able to set fast time in any Six Day special test section, and threaten even 400 Huskies in high-speed cross-country events such as Baja. There is enough mid-range power to bounce along at 24 mph in an enduro without constant shifting, but such high hp figures naturally steal torque from the low end. Since it's impossible to have both, Robison has opted for the screaming meemies. "Without a reputation or established dealer network to sell motorcycles, Can-Am must sell horsepower," says Robison. "Either you build it for serious riders or you build it for the Sunday cow-trailers. The Japanese have the Sunday bunch well-covered, so we build for the pro. A good rider can go faster with lots of horsepower than he can with lots of low end."

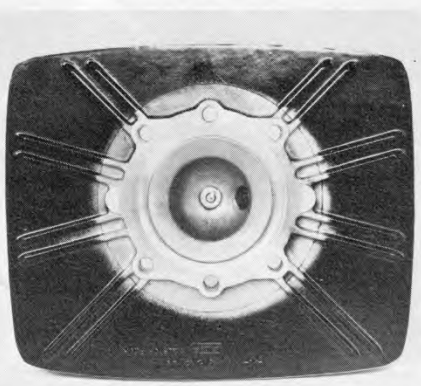
So seems to be the case in the real world. Pentons have even more radical power characteristics than the Can-Am, and of the 30 men who qualified for this year's ISDT, 14 rode Pentons—making them the cross-country bike to beat in America. When going fast really counts, America's top riders prefer the acceler-

PHOTOGRAPHY: DALE BOLLER, BILL DELANEY

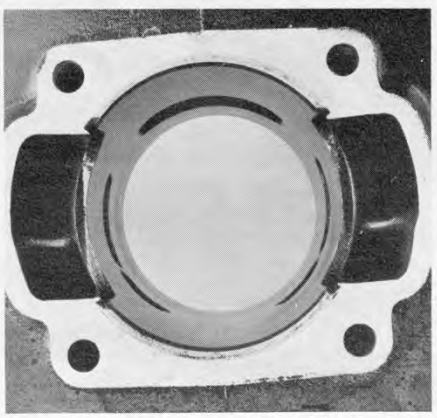
Bold tank striping and a stubby cylinder give the Can-Am a distinctive look. The number plate implies its purpose—enduros and ISDT qualifiers.



Coefficient of expansion of plastic insert equalizes expansion rates of bearing and case.



Symmetrical head requires a 30 thousandth squish band and features enormous finning.



Porting couldn't be simpler. Two bridged transfers and a huge exhaust accent the rotary valve.

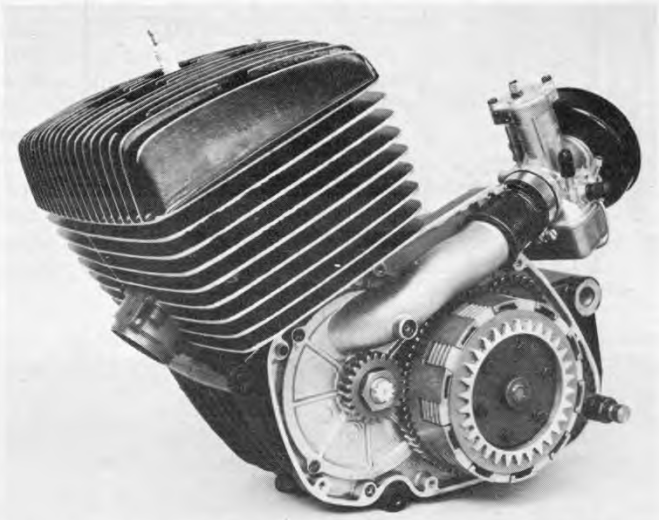
ation and top speeds provided by sheer horsepower. These riders, and several thousand others across the country, are skillful enough to maintain the ground speeds which keep a high-output engine in its powerband, to manipulate the throttle accurately enough to avoid wheelspin, and to shift as required in the midst of any kind of terrain. A novice may be intimidated by such demands, and more experienced riders simply may not like such power delivery characteristics. For them, and the novice, an Ossa or Yamaha with lots of bottom-end torque will be easire to ride, and therefore preferable. But for guys who can use it, raw horsepower is the quickest way down a trail.

The engine responsible for this power was built under ideal conditions: unfettered by previous design restrictions, existing production facilities or lean budgets. It benefited from all the mistakes in motorcycle engines before it. Enthusiasts designed it. It took shape on a drawing board with space-age technology and materials at its disposal.

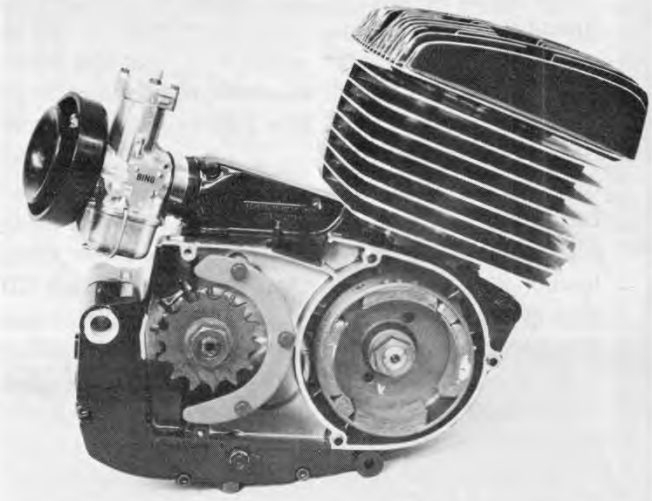
But ideal circumstances don't make horsepower. Metallurgy, rod-length-to-stroke ratio, port timing, quality control and other basics do. Bombardier uses radically over-square bore and stroke (74 x 57.5mm) dimensions along with hot port timing and a large chunk out of the rotary valve to achieve power. The cylinder and head on the enduro is the same as the motocrosser, yet it idles without a fuss and persists in starting on the first kick. Porting consists of two bridged transfers, a huge exhaust and an egg-shaped intake port opened and closed by a thin steel rotary valve geared to the crankshaft. The holes in Bombardier's steel liner match the ports in the beautifully die-cast cylinder exactly. Our only complaint is that four cylinder studs have to be removed to get the cylinder off while the engine is in the frame.

Massive finning on both the head and cylinder dissipate heat fast. Even at peak horsepower on the dyno, temperatures hovered at the safe 400-degree level. Once while prerunning the Baja 500 course in Mexico, mud covered the engine; it still didn't ping or detonate from over-heating. In addition the engine refused to cough or lose power at altitudes from sea level to 5000 feet even while running on oily low-test Mexican gas.

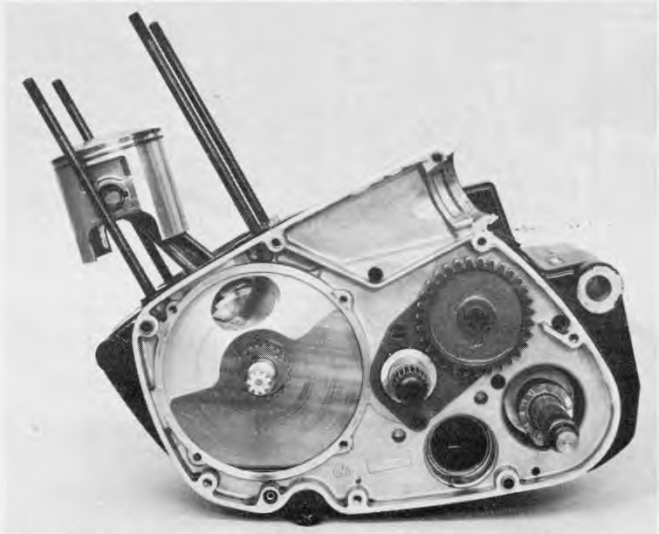
Inside the engine, a Dykes top ring and standard second ring for oil control encircle a cast aluminum piston. The rod carries needle bearings top and bottom. Nothing reflects the Can-Am's space age genesis more than the special plastic liners which support the huge ball bearing mains. The coefficient of expansion of the plastic is equal to the difference in expan-



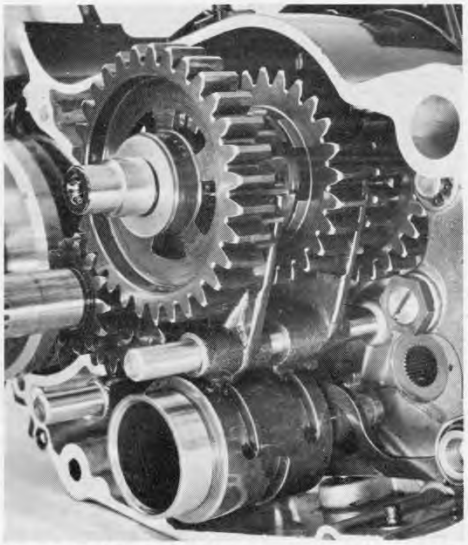
Unique ram tube locates the carburetor rearward for less engine width and contributes greatly to superior breathing. The rugged clutch runs wet.



A bell-shaped velocity stack is moulded into the carburetor air box boot. Three different chain shrouds are available to match different sprockets.



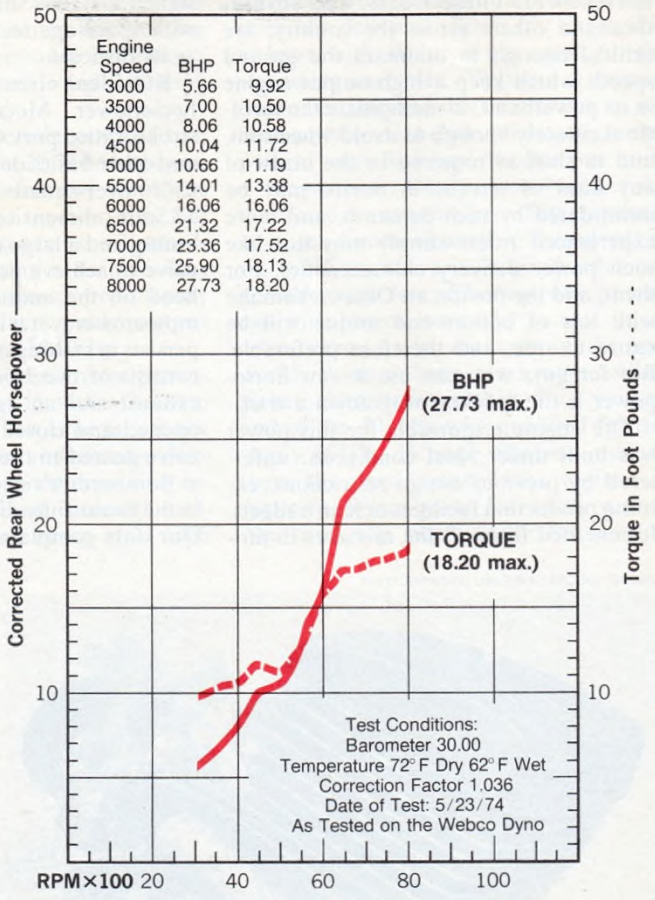
Removing the ram tube reveals a giant rotary valve and the intake port. Removeable bearing retainer plate on transmission shafts eases shimming.

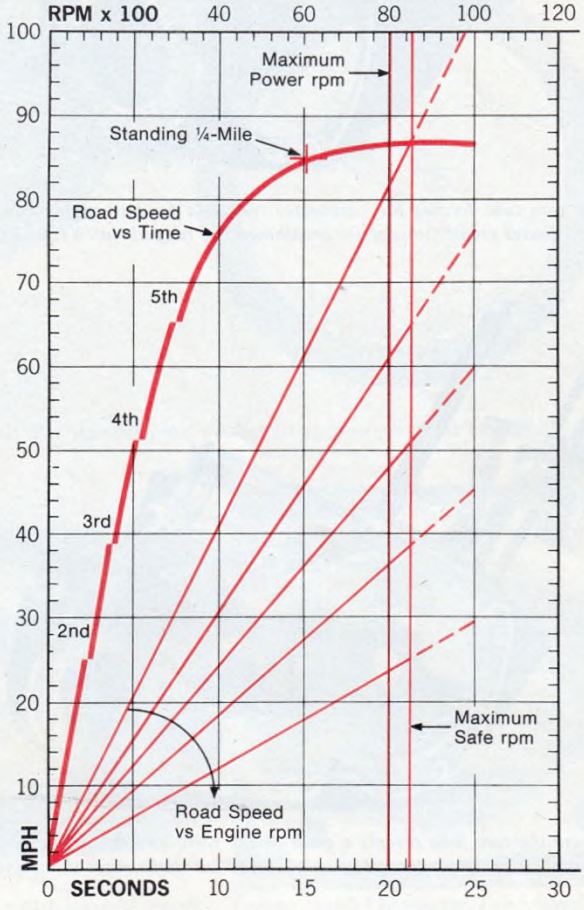


Drum and fork mechanism provides faultless shifting. Idler gears spin on needles, shafts on balls.

250 CAN-AM T'NT ENDURO

Price, suggested retail	$1465
Tire, front	3.00 x 21 Yokohama Trials
rear	4.00 x 18 Yokohama Trials
Brake, front	5.90 x 1 in. (150 x 25.4 mm)
rear	5.90 x 1 in. (150 x 25.4 mm)
Brake swept area	37 sq. in. (239 sq. cm)
Specific brake loading	11:5 lbs./sq. in. at test weight
Engine type	Two-stroke rotary-valve single
Bore and stroke	2.91 x 2.26 in. (74 x 57.5 mm)
Piston displacement	247cc
Compression ratio	13:1
Carburetion	1; 32mm; Bing
Air filtration	Filtron foam
Ignition	Bosch CDI
Bhp @ rpm	27.73 @ 8000; actual
Torque @ rpm	18.20 @ 8000; actual
Rake/Trail	Adjustable: 25°–32°/4–6 in.
Mph/1000 rpm, top gear	9.7 mph
Fuel capacity	2.5 gal. (9.5 liter)
Oil capacity	2 qts. (1.89 liter)
Transmission oil capacity	1.2 qt. (1.14 liter)
Electrical power	55 watts @ 6000 rpm
Battery	12V, 5AH
Gear ratios, overall	(1) 25.4 (2) 16.24 (3) 12.13 (4) 9.56 (5) 7.99
Primary transmission	Spur gear 2.91:1
Secondary transmission	⅝ x ¼ Renold chain 14/42 3:1
Wheelbase	55 in. (140 cm)
Seat height	31 in. (50 cm)
Ground clearance	6 in. (9.65 cm)
Curb weight	267 lbs. (12 kg), with full tank of gas
Test weight	427 lbs. (194 kg)
Instruments	Seiko speedo, odo, trip mileage 2-way by 10ths
Sound level (California Standard)	90 dB(A)
Standing start ¼-mile	15.040 sec.; 85.22 mph
Top speed	85.22 mph (137 kph)
Average fuel consumption	25–30 mpg
Speedometer error	30 mph actual 29.85 60 mph actual 62.89





sion rates of the aluminum crankcase and steel bearing race. Thus the bearing/crankcase fit is uniform hot or cold, and there is no crankshaft whip to accelerate wear or promote excessive vibration.

No component is more critical than the clutch in controlling high-horsepower engines in tricky traction situations. It must be able to supply partial amounts of power smoothly while the engine spins at six or seven thousand rpm. Such slippage can warp and swell a flimsy clutch in seconds, but the Can-Am plates handle teriffic abuse without losing their wide engagement point and progressive action. Twelve alternate steel and friction plates are held tight in an oil bath by six springs controlled by a nylon-lined cable. Straight-cut teeth on the clutch hub mesh with the crankshaft gear to form the primary drive. Pull in the clutch and the bike will start in any gear.

Early 125 and 175 Can-Ams had problems with stiff shifting and elusive neutrals, but the 250's rotary drum and fork arrangement works perfectly with or without the clutch. All five transmission ratios are well spaced for fast cross-country riding.

Mikuni supplies an oil injection pump driven by a nylon gear on the crankshaft end. The pump lives in a sealed compartment in the primary cover, which butts against O-ring-sealed oil galleries cast into the intake ram tube and lower crankcase. From this lower gallery oil flows into the main bearings and out through the drilled flywheel to the big-end needles.

Can-Am 250's top fork nut permits air to escape on compression so no hydraulic air lock can occur.

Can-Am piston rod (right) directs oil onto side of stanchion rather than up and onto fork springs.

Bombardier has developed a sticky green injection oil which seems to be everything a good oil should be. Besides minimal smoking and consumption, the oil burns so clean that after 800 miles no carbon had collected around the exhaust port and only a thin carbon skin coated the piston crown. Both rings were completely free. Once the two-quart oil tank is full, you won't have to worry about replenishment for at least 600 miles. A pinhole leak in the oil tank of *Cycle's* test bike remained undetected until injectolube spread all over the battery box and ignition system. Apparantly the flaw was so small that Bombardier's routine pressure check didn't detect it. A spot of epoxy stopped the dribble.

Germany supplies carburetion to Bombardier in the form of a 32mm Bing, which remains accurate in all types of terrain. Part of the tuned intake system includes a rubber velocity stack molded into the boot connecting the carburetor and air box. Fiber mesh traps water and large objects at the air intake under the seat; a small Filtron handles the final cleaning. For dusty competition, a larger air cleaner would be desireable because our Filtron was almost totally clogged after half a day

Once you change to knobbies the Can-Am will perform every dirt trick in the book. Slides are easiest with steering head eccentrics at 32 degrees.

in this year's Greenhorn Enduro.

A second major engine component from Germany is the Bosch electronic ignition. Magnetic pick-ups in the alternator trigger a magic box and coil located under the tank/seat junction; there are no points. Timing should never slip, but if it does, a strobe light and screwdriver can get it back to spec in 5 minutes. The alternator also charges the battery, which drives all the accoutrements of street legality.

Bombardier has two problems with the Can-Am engine in its 250cc form. The low pipe has to go. It reduces ground clearance to a paltry 6 inches, and requires a heavy skid plate which gets gouged and gashed in the first rocky section you encounter. It must be removed to drain the transmission oil. It prevents you from propping up the bike on a flat surface to adjust the chain or remove a wheel. The smaller Can-Ams have high pipes; why not the 250? Gary Robison says a high pipe steals too much area from the air box, looks bad and produces about one horsepower less than the low one. Still, nine out of ten enduro riders would take the high version if given the choice.

Suspension gives you enough confidence to leap chasms without fear of compressing your back.

Another problem less easily remedied is engine vibration at high rpm. Up to 5500 revs the Can-Am is smooth, but it buzzes progressively worse as greater power outputs are reached. At peak revs vibration intrudes on the rider's concentration and begins to shake things off. While prerunning Baja with some fast characters on bigger bikes, our Can-Am spent several hours in the upper reaches of its rev range. The left turnsignal fractured and fell off. The horn bracket broke. The steering head cap nut disappeared. The ignition switch tumbler shook loose. The taillight lens was lost. The cross piece on the handlebars cracked. A bolt from the taillight bracket turned up missing, and the rear muffler mount fractured. Robison is aware of the vibration and is at work on a cure. In the meantime a few of the more vulnerable plastic pieces are being reinforced, along with the horn and muffler bracket. Luckily most of the fasteners on the bike are top-quality self-locking nylon-lined nuts, which successfully resist the shakes.

A powerful motor is only part of going fast. Can-Am's handling contributes as much to its overall excellence as its horsepower. The exclusive adjustable rake system employs three sets of eccentrics which drop into the top and bottom of the steering head in 49 combinations to provide a fork-stem rake of 25 to 32 degrees. Torrington needle bearings support the fork stem inside each eccentric. Changing the eccentrics, and thus the rake and trail, takes about half an hour. Thus you can tailor the bike's steering characteristics to your pleasure—if you have the sensitivity to tell the difference between half-a-degree one way or the other. As delivered the Can-Am has 30 degrees of rake and just over 5 inches of trail, a combination that gives it excellent steering. If you intend to experiment with forward-mount shocks, the eccentrics will enable you to change the front end proportionately.

Other specifics included in the geometry category are 55-inches of wheelbase, a swing arm about an inch longer than average, a low center of gravity and weight distribution more heavily biased towards the front than most bikes. With a rider aboard, however, bias returns to a more average percentage. The extra front-end weight minimizes unwanted wheelies and helps maintain a more horizontal attitude on long jumps. The double-loop cradle frame is made of high tensile steel and features a large backbone tube which doubles as the oil injection reservoir.

Suspension joins accurate geometry as a co-partner in the off-road handling mix. After extensive testing of various brands, Bombardier selected S & W shocks with

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CAN-AM *Continued from page 34*

75-pound springs and located them 5 inches in front of the rear axle. This combination provides the finest rear wheel control of any enduro bike we have ever ridden. Little bumps melt in the wake of increased travel, so you can remain seated through terrain that would normally shorten your backbone. The shocks don't go away after a few hours, and they bottom only rarely with the spring preload adjuster in its middle position. Perhaps the most miraculous back-end characteristic is that the 250 Can-Am stays straight while bouncing high off of consecutive whoop-dee-doos.

Up front, Bombardier has made two important changes in Betor forks which make them superior. Can-Am Betors have a two-way valve in the top stanchion nut which controls air pressure inside the forks. Excess compression pressure bleeds to atmosphere, thus preventing hydraulic air lock (which robs travel and results in a stiff ride). Air re-enters the stanchion as the slider pulls a vacuum on descent. The breather valve ensures free, consistent action which is uneffected by the amount or temperature of trapped air inside the forks. A second change involves a splash shield atop the piston rod which directs the geyser of oil generated by compression onto the stanchion wall, from whence it drains unhindered into the slider for instant reuse in the valving system. The oil in standard Betors shoots straight up when the forks compress and is slowed considerably in its return to the slider by the fork spring and a longer trip down the stanchion wall. In a series of quick bumps, enough oil can be slowed enroute back to the slider to cause a shortage—which will effect damping.

While redesigning the piston rod, Bombardier added a deep slot in the rod's top to greatly simplify slider removal, and relocated the drain plug to facilitate oil changing. The forks on our test bike were much too stiff with the 10-30 multigrade oil supplied, so we switched to ATF and got perfect action. In more than 800 miles of testing over every conceivable kind of terrain, the forks never topped, and only bottomed 10 or 12 times.

The tires which come stock on the T'NT are unacceptable, because both the engine and chassis far surpass a universal tire's capability in dirt. But since the Can-Am is street-legal in every state, and Federal law requires street bikes to be equipped with tires that the manufacturer is willing to certify as safe for street use, Bombardier lawyers will not allow Can-Ams to be sold with knobbies for reasons connected with product liability. We switched to a 3.50 x 21 Cheng Shin knobby up front and a Trelleborg 4.00 x 18 in back and got excellent results—at an added cost of $38.

Brakes, like the tires, are likewise not up to par. On our test bike no amount

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CAN-AM *Continued from page 103*

of force would lock the front brake, and only great pressure would lock the rear. This soft braking provides adequate control in most dirt situations, but there's a large bush at the end of a straightaway in Baja that would argue the point. Gary Robison says nobody else has been critical of braking, so perhaps the cables or shoes on *Cycle's* test bike were defective or somehow maladjusted. Water penetrates both hubs easily, but burns off quickly. Clatter from the rear brake on rough downhills is surprisingly minor despite a non-fully-floating design. The wheels surrounding these brakes consist of steel rims laced to conical alloy hubs with 40 spokes in a cross-three pattern front and rear. Spokes are retained in the hub flange by rubber buttons, so they can't fall out if the rim gets dinged. Nor can they work free and puncture a tire should they loosen. Security bolts clamp the tire to the rim front and rear.

Other running gear items include unbreakable plastic fenders, a 2.5-gallon plastic tank (with a leaking cap), non-slip leatherette upholstery on a supple seat, Bombardier's own levers and grips, a kill button, an accurate speedometer with resettable odometer and a built-in spark arrester. Finish and execution match the best of Can-Am's competitors. Certain ideas are incredibly novel, such as the gas-cap breathing system consisting of a slitted rubber diaphragm, and the rear turnsignal mounts, which simply suspend the flashers on rubber so they bend away in a fall without breaking.

But in the end all the tricks and good looks are gravy compared to the bike's brilliance in tough riding situations. Power and handling are so good that speed, more often than conservatism, is the best approach to riding over tacky terrain. If there's a bump, use the throttle to lighten the front wheel and the suspension will handle it. If there's a long, cobby hill, hit the bottom all strung out in third gear and pound it out. If a sharp turn suddenly appears, don't grab the brakes and pray—gas the back end around and go. You'll be in trouble using the speed approach to off-road riding on almost every other enduro made. That's why the Can-Am is good. That's why it's worth its price tag of $1465 (which is still $245 *cheaper* than a Penton 250 Enduro). That's also why it's better suited to superior riders than average riders. If it isn't ridden fast, there won't be enough in its low-speed performance to offset the irritations of a low pipe, noisy exhaust, vibration, soft brakes, parts hassles, improper tires and mediocre bottom end.

But for the good rider, these or a dozen other problems won't dampen his excitement over the Can-Am's steering, suspension and power. If you're up to it, the 250 T'NT will make you the best trail rider you are ever going to be. ◉