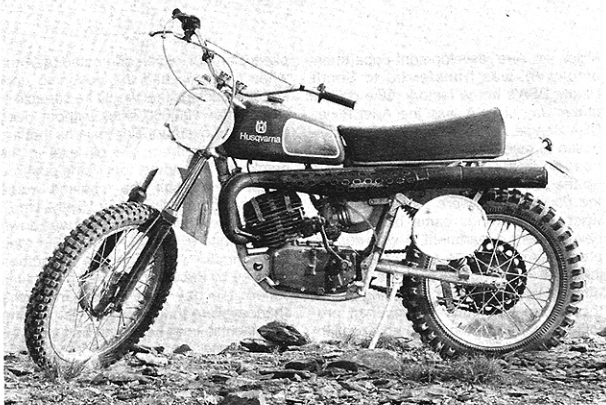


HUSQVARNA AUTOMATIC 360



Husky's automatic is unconventional, controversial and expensive. Its design is unique, the best auto in the industry. A race bike it's not; an enduro weapon it is.



PHOTOGRAPHY: JOHN ULRICH, ROBIN RIGGS

● THE SHIFTLASS-DRIVE DIRT BIKE is here, and we think it's here to stay. Dyed-in-the-wool gear slammers may argue that point but the Husky Automatic will prove them wrong. The advantage of a conventional transmission over automatics is cancelled with the advent of this motorcycle. The Husqvarna Automatic 360 is not different just to be different; it's not a gimmick. The Husky automatic works. It offers a real solution to a universal dilemma—getting from here to there regardless of the obstacles. The rougher the challenge the better the Husky works. Believe it.

It is important to point out that the Husqvarna automatic was not conceived as an enthusiast's machine. Neither was it developed as a race bike, a play bike or enduro bike. Much in the likeness of the army Jeep, the Husky was first a military vehicle. Theoretically, it was to be the ultimate go-anywhere motorcycle for the uniformed non-motorcyclist. So while the automatic's design and function are complex, its operation had to be made simple.

Husqvarna's initial involvement with the automatic drive motorcycle began in 1973. Husqvarna, Monark and Hagglund were given a long list of military requirements along with a \$100,000 check to cover each factory's development costs. The manufacturer with the best machine would acquire the Swedish army's contract for a fleet of automatics. The intricate, if not impractical, military specifications included requirements for a 100-watt quartz lighting system, an especially low operating noise level, the ability of the engine to run for a minimum of five minutes while the bike lay on its side, and complete engine/transmission replacement capabilities in the field by an untrained trooper with the bike's tool kit, and an automatic drive transmission.

It is probable that Husqvarna was less than enthusiastic about the army's automatic bike project. Development of an army vehicle to meet ultra-tough military specifications is always very costly and chancy. Commitment to a limited production "special" in addition to a long term parts and service contract with the military is quite a gamble for any company. Development of a prototype was nonetheless undertaken.

Husqvarna's nucleus for the army automatic came from existing models. Unlike Hagglund and Monark who built all-new designs, Husky went to extremes to keep their army automatic within their current known standards. Husqvarna's automatic drive was a proven and familiar concept within the Swedish company. Rather than going to outside sources for transmission development, Husky brought an engineer, Lars-Erik Gustausson, over from their chain saw division to develop an automatic drive from already proven Husqvarna products.

It is Husqvarna's unique approach to automatic transmission design that gives this Husky a functional edge over the



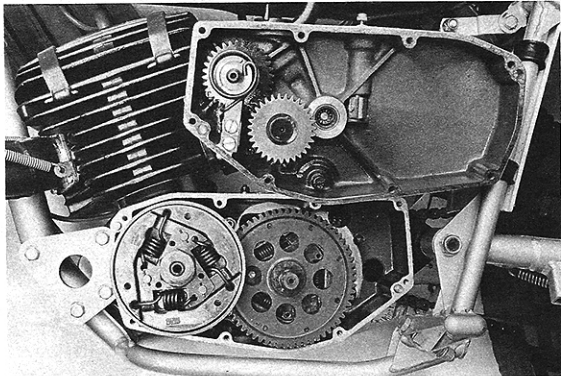
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variable-ratio V-belt arrangement employed by Rokon and the elegant fluid torque converter of the 750 Honda. Hydraulic converters use up a lot of power in the churning of oil, they tend to be bulky and heavy, and they're sharply limited in their range of torque multiplication. V-belt systems convert power into heat through belt flexing, and their efficiency—which can be as high as 90-percent—tends to decline as their bulk is reduced. Husqvarna's transmission is best described as a conventional gearbox that has been made to shift automatically. Its efficiency is thus unimpaired, and extraordinary cleverness in the design of the self-shift mechanism has made Husky's automatic light and very compact.

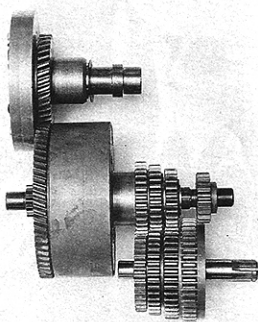
The design that Gustausson brought over from the chain-saw division is a positive engagement, multi-clutch, four-speed gearbox system. The entire assembly fits comfortably inside a standard set of Husqvarna engine transmission cases.

The Husqvarna Automatic 360 engine is basically the same as used in the CR motocrosser and WR cross country racers. It is not a detuned version of their near-40 bhp race engine. The entire top-end of the automatic is interchangeable with the CR or WR. The reed valve assembly and carburetor for all three models is also the same. All the engine cases are identical castings, with the automatic having a special clutch cover. The crankshaft flywheels are T-shaped rather than full-circle forgings. The Motoplat alloy magneto flywheel is considerably smaller than the one used on the standard transmission models. All of these parts were lightened to compensate for the added weight of the centrifugal clutch's solid brass bob weights on the crankshaft's drive side.

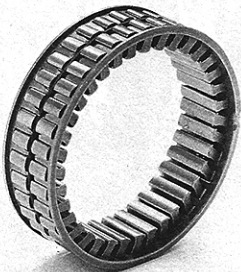
The crankshaft-mounted centrifugal clutch initiates motion by transferring power to first gear. The large brass bob weights are restrained by springs, but centrifugal force moves them out into contact with the clutch drum at approximately 2500 rpm. The drive is then passed by a pair of spur primary-drive gears to the transmission's innermost input shaft, across another pair of gears to the output cluster and from there to the drive sprocket. The important thing to know, here, is that when the transmission is in first, the drive carries through four concentric shafts, which are separated by odd little devices known as sprag clutches. A sprag clutch looks like something a roller-bearing manufacturer made as a joke: it's a ring of stubby I-section wedges inserted between inner and outer races, like bearing rollers. But round bearings will roll in two directions; the sprag clutch's wedges are tilted, when installed, to allow relative rotation in only one direction. That is to say, the wedges' tilt in-



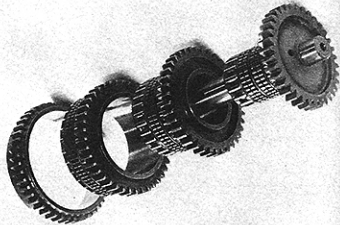
The crank-mounted centrifugal clutch engages first gear. The driven gear houses three more clutches.



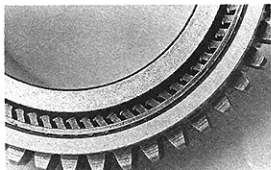
Each gear on the driven housing is integral with one of the centrifugal clutches. Small gear is in neutral.



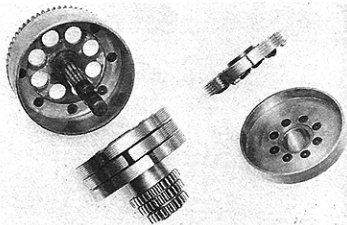
The one way action of the shoes allow gears to freewheel in one direction, lock in the other.



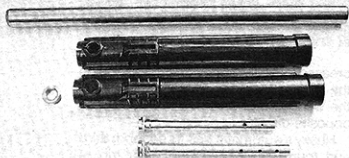
Fourth through first gears on the layshaft run on one way Sprag clutches and needle bearings.



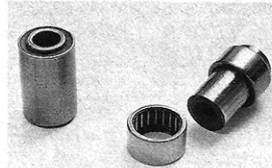
Sprag clutch shoe clusters are sandwiched between gear housings. They lock in one direction.



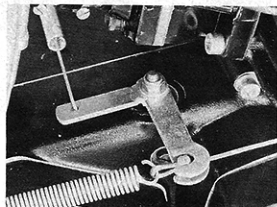
Centrifugal clutch shoes are brass. Large driven housing drives first gear directly through main shaft.



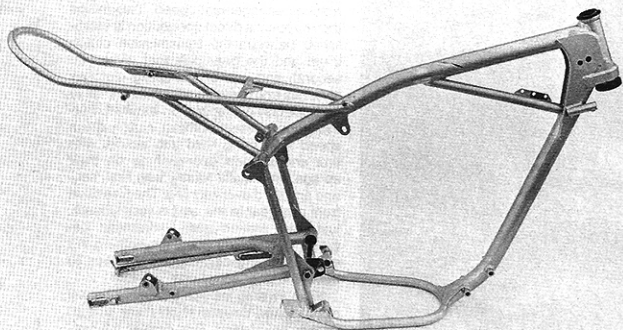
New fork uses old stanchion with longer sliders and re-designed damper rods for more oil flow.



Rubberized swing arm bushings have been replaced with needle bearings, which eliminate flexing.



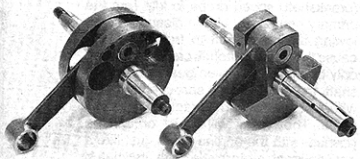
This lever slides first gear in and out of engagement. Neutral is only used to enable engine starting.



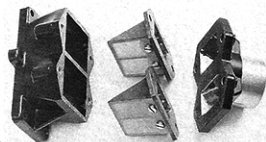
The motocross, cross country, and automatic models all use the super-light Mikkoila-type chassis.



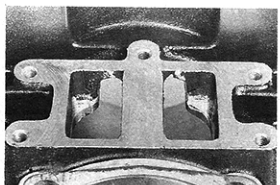
The flat-top piston is by Mahle. Slots mate with reed valve induction timing to charge crankcase.



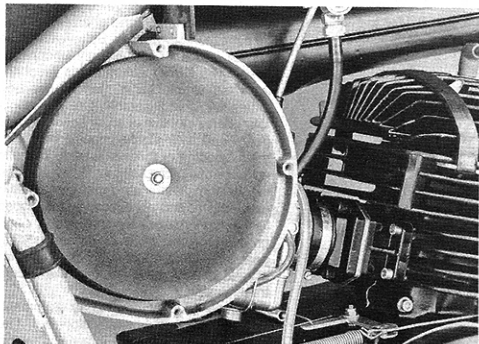
Full-circle flywheels are for race bikes. T-wheels are lightened for added weight of automatic clutch.



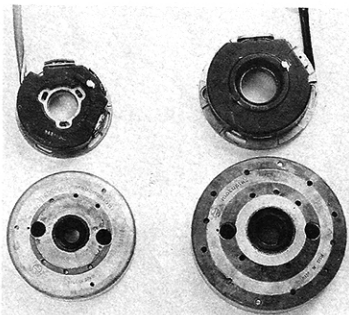
The reed valve block is small for a big engine. Reed petals are special plastic. Castings are magnesium.



This close-up view of the intake port shows their small size. Husky grinds sleeve edges off.



All Husky models use the same air cleaner system. Filter element is of the oiled-foam type.



To equalize inertia weight on the crankshaft Husky uses a small Moto-plot flywheel on the automatic. Flywheels are aluminum.

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creases and allows the shaft to turn inside the hub one way; the tilting action jams the wedges and prevents rotation in the opposite direction.

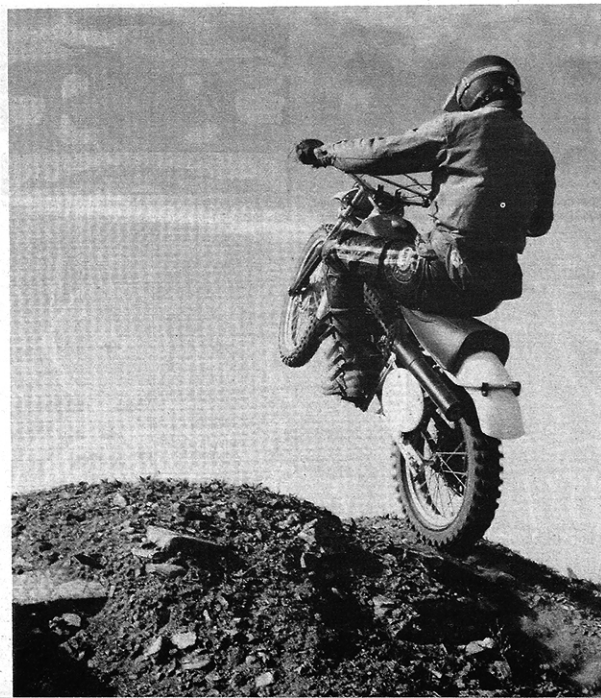
Husky's automatic has its second, third and fourth ratios engaged by a trio of centrifugal clutches inside a single drum on the transmission input shaft. When the engine reaches its peaking speed in first gear, the second-gear centrifugal clutch reaches engagement speed. Two things then happen: a direct connection is established between the transmission clutch drum and the gear pair that gives you second; and one of the sprag clutches switches from drive to slip, to let the drive gear for first overspeed on its shaft. Further increases in shifting clutch-drum speed then bring third into action, with first and second over-running on their sprags, and finally fourth, with first, second and third over-running. The transition from one gear to the next is very smooth, just like a well-adjusted Hydramatic, because the transmission uses nothing but slow-engaging centrifugal clutches to make the gear selections.

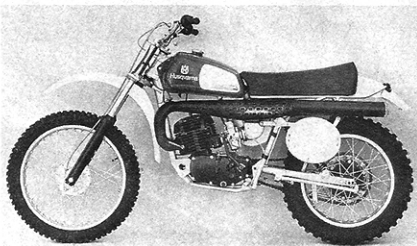
In an inverse fashion downshifting will occur when countershaft (rear wheel) speeds are slowed. This causes the secondary centrifugal clutches to close and disengage sequentially from fourth to third to second. Then when engine (crankshaft) speed drops to idle rpm the primary centrifugal clutch disengages allowing the crankshaft to freewheel. Because the sprag clutches can be engaged only by the outer driven gears on the lay shaft, the countershaft sprocket will freewheel in the forward direction of wheel travel. The Husky will coast or can be pushed, with the engine idling, just like a conventional motorcycle with its clutch lever pulled in or gearbox in neutral. By the same token, this eliminates the possibility of bump starting the engine.

All of the centrifugal and one-way clutches and gears and shafts sound to be a maze of complexity. Believe us when we tell you it isn't. It is only unconventional. The Husky automatic is mechanically as simple as a manual gearbox clutch and shift assembly. There are only four gears—not five or six or seven. These gears and their shafts require no shimming, spacing or thrust washers. There is no stack of clutch plates or clutch-release mechanism. There is no mechanical shift mechanism, and no exacting clearances to maintain. Absent are shift shafts, cam-grooved drums, shift forks and sliding gear sets. Gear dogs and ears and their crucial bevels don't exist in the Husky transmission.

Maintenance of the Husky automatic engine is incredibly straightforward. The entirety of the engine's internals, saving the crankshaft, can be removed with the

CYCLE

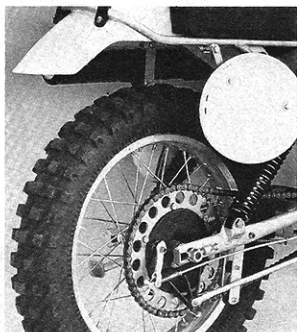




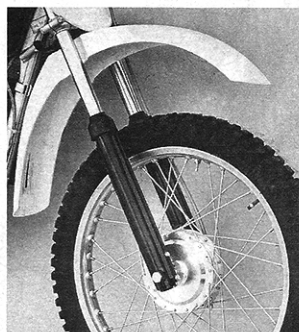
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Price, suggested retail \$1995
 Tire, front 3.00-21
 rear 4.75-18
 Brake, front 160 x 25mm (6.3 x .98 in.)
 rear 160 x 25mm (6.3 x .98 in.)
 Engine type Reed valve two-stroke
 Bore and stroke 82 x 67mm (3.23 x 2.64 in.)
 Piston displacement 354cc (21.6 cu. in.)
 Compression ratio 11.5:1
 Carburetion 1-36mm Bing 54
 Air filtration Twin Air oiled foam
 Ignition Motoplatt CDI
 Fuel capacity 11.8 liters (3.1 gal.)

Transmission oil capacity 1.0 liter (1.06 qt.)
 Electrical power A.C. Flywheel Generator 35w/6v
 Primary transmission Centrifugal Clutch/
 Spur Gear 1.703
 Secondary transmission # 520 D.I.D. 4.417
 Gear ratios, overall (1) 17.30:1 (2) 12.85:1
 (3) 10.20:1 (4) 8.49:1
 Wheelbase 1420mm (56 in.)
 Seat height 800mm (31.5 in.)
 Ground clearance 270mm (10.6 in.)
 Curb weight 112.5kg (248 lbs.)
 Test weight 185kg (408 lbs.)



Barum 4.75 ISDT tire has a huge foot print and gives superb traction. Both rims are new-type Akront.



The late version Husky fork delivers supple ride with new damping system and 8 1/4-inches travel.

motor in the frame. Given only the wrenches from the Husky's tool kit the top end, electrical system and complete transmission assembly can be removed and replaced in the field or in your garage. The simplicity of the transmission allows it to be replaced without any special measuring or micro-millimeter adjustments.

The chassis, suspension and wheels are standard Husqvarna production items. The frame and swing arm are the same Mikkola-type chrome-moly compo-

nents used on all the race bikes. While the fork is also standard it has been modified this year with extended sliders and damper rods. Husky has eliminated most of the low-speed stiction that hampered the action of the old fork, and increased travel from 190mm (7.5in.) to 210mm (8.25in.). To further smooth the ride the damping hole sizes and locations have been changed to increase oil flow. The magnesium rear hub is from the CR series and the aluminum front comes from the

WR models. Girling nitrogen-charged shocks with 110 lbs./in. springs are used at the rear.

In mid-1976 Husqvarna was startled to learn that they had been awarded the army contract. Hagglund was unable to make their production belt-driven automatics perform up to military specifications in the Sweden's harsh winter climate. With 22.5-million dollars assured Husqvarna, the automatic project be-

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HUSQVARNA..... Continued from page 35 came a civilian-market reality. The contract covered tooling and development costs and allowed the retail price to drop over \$500 from the original \$2500 tag. Prior testing and evaluating enabled Husqvarna to fix an exact position for the automatic in the market place.

Husqvarna makes no claim that the Automatic 360 is a high-speed motocross or cross country desert racer. It isn't. Officially they like to refer to the automatic as an enduro or dedicated trail riders machine. That it is. Though different in concept than conventional enduro bikes, the Husqvarna requires no special knowledge or training to operate. To start the bike the rider need only pull in the neutral lever on the handlebar, tickle the Bing carburetor and kick. Generally it will start first kick—three at the most. As soon as the engine warms and will idle the neutral lever is disengaged and the rider has only to twist open the throttle.

The double-wall pipe and silencer/spark arrestor unit keeps the Husky's noise to an acceptable level. It is comparable with most other big-bore enduro-type machines. At an idle there is a slight amount of piston and gear clattering, which disappears as soon as the throttle is cracked open enough to initiate transmission engagement. With the engine and transmission loaded only the exhaust pattern is apparent.

Rolling the throttle open progressively makes the automatic accelerate at a smooth, even pace. Once under way the rider can easily feel the sequence of shifts as the transmission moves through all four gears. Engagement is positive and shifting predictable. The throttle can be fixed in a partial-open position and the transmission will shift from first to fourth progressively. Unlike torque convertor systems, the throttle doesn't have to be cracked full open to accelerate to a desired speed and then backed off.

Most riders that first rode the Husky envisioned a great deal of slippage (or "Monkey Motion" as they liked to word it) in the automatic's drive system. We soon learned to caution new riders not to give the Husky full throttle when starting off. The centrifugal clutch is so positive and quick that the bike will readily stand on end from a stop under full throttle. In first and second gears at slow speeds, the Husky is very willing to loft the front wheel. In the upper two gears throttle response is noticeably more sluggish.

The automatic rides in a flat trajectory fashion as compared with strong running manual gearbox bikes. At speeds above 15 to 20 mph the rider cannot easily lift the front wheel by manually shifting down a gear or two and blipping the throttle wide open. When the Husky has moved into top gear it won't shift down (as an automobile will) by giving it full throttle. Down shifting will only occur when speed is reduced.

Fortunately the bike's suspension ab-

sorbs small and medium size bumps with exceptional suppleness. Comfort given the rider by Husky's improved suspension is markedly better than a Penton, Yamaha IT or Honda MR. The seating position is very Yamaha-like and is exceptionally comfortable for long rides. At slow speeds in rough terrain the Husky rolls and crawls effortlessly over obstacles without delivering the pounding and jouncing other enduro bikes produce.

In open terrain or on fire roads the automatic seems slow and sluggish. However it accelerates just about evenly with most good running 250 motocrossers, and that really isn't slow. The transmission is reluctant to down-shift and let the engine rev higher. This deceives the rider into thinking he is not running nearly as fast as he believes. We found the refusal of the transmission to shift down annoying if not frustrating when accelerating from sharp corners, climbing hills or rushing over fast, rough ground. Engine performance is there, but the automatic upshifting keeps it out of its peak power range much of the time.



After a half-day of riding over old enduro and ISDT qualifier courses we accidentally found a way of cheating or tricking the transmission into down shifting. While running hard down a fast trail we encountered a blind ditch. We did one of those full-lock up panic stops and attempted to jump over the ditch at the last moment. The Husky lofted the front wheel unexpectedly as the engine suddenly revved up to maximum power speed and shot over the ditch. Only a rear wheel dab on the washout's far side was the outcome.

After scratching our heads for a few minutes the cause of the downshifting and power surge became apparent—and simple. When the rear wheel was stopped (as the back brake locked up) the transmission downshifted automatically to low. The following day we spent most of the daylight hours attacking every up hill, boulder garden, down hill, ledge, step-laden canyon and push-your-motorcycle-over obstacle we could find. We could not find anything that we could walk over that the Husky would not ride over—easily.

On a fast trail where there were a lot of

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slow turns we would lock up the rear wheel just prior to exiting and come out of the corner twice as quickly as before. While the Husky was never stopped by any up hill we attacked it would sometimes climb sluggishly. We found that we could actually jab the rear brake peddle quickly while climbing, forcing the automatic into a lower gear, and rocket over the top.

In those dog-paddle, pick your way, lift the front end, push the motorcycle enduro sections the Husqvarna automatic is magic. Through slow bowling-ball strewn rock sections we found a junior-level rider on the Husky could literally run away from a top expert on a conventional gearbox two-stroke. On narrow trails with ledges, rocks or tree stumps the Husky can be slowed or stopped just inches in front of an obstacle, the throttle blipped open and the bike and rider would simply bounce over on the rear tire.

At a few spots where it was not possible to stay aboard the Husky (or any other bike) further advantages of the automatic came to light. By getting off the Husky and aiming and pushing over a normally near-impossible ledge the rider has full control of the engine speed and driving force with one hand. There is no necessity to have to be on the left side of the bike in order to fan the clutch and retain balance of the bike simultaneously. With the automatic

the rider can be on either side of the bike and drive forward by just rolling the throttle off and on. There is no concern about killing the engine, melting the clutch or falling off balance.

We could go on and on with dozens of little tricks the rider learns on the Husqvarna which cannot be easily (if at all) done with clutch-and-gearbox bikes. Every time we rode the automatic we picked up on more tricks. After three days of testing and learning on the Husky we came to fear none of the things that normally concern us with manual shift machines. And at the end of this period we had completely destroyed the clutch in our follow-up machine, in addition to bending its shift lever a half dozen times and flattening its rear tire.

The automatic offers the advantage of never having its engine die or bog. In panic stops or on long, steep down hills the engine just remains at an idle. Unfortunately the Bing carburetor isn't willing to permit extended idling speeds without starving or flooding the engine. The Husky's brakes work quite well and are almost fade proof. However, the rear brake has the unique habit of moving the pedal adjustment up rather than down as the binder gets hot. The Husky hub cools so well that it expands less than the brake shoes. On downhills or winding roads the rider won't have to worry about the brake pedal and his foot inching their way down-

ward and precariously close to rocks.

As a fast cross country race bike or high-speed fire roader the Husqvarna automatic performs adequately but not as well as most big-bore racers. On fast whoop-de-do trails the chassis has a habit of wanting to stand or set up straight in G-force dips and the suspension is too soft to avoid excessive bottoming. In acceleration, the automatic cannot keep up with manual-shift big bikes on high-speed roads because the rider is not able to hold the transmission in a specific gear and let the engine spin.

We were disappointed that the Husky automatic did not come fully enduro equipped. Lacking are an ISDT head and taillight, speedometer and tool box. A speedometer kit is available from Husqvarna and Preston Petty lights and fenders fit easily on the bike. These items and a tool bag are going to be an additional expense for enduro riders.

The Husqvarna Automatic 360 is everything the manufacturer claims. It's an appealingly honest and incredibly efficient trail and enduro bike. The automatic excels in comfort, simplicity and ease of maneuverability. The tougher the terrain gets, the better the Husky performs. As an enduro or back-woods bike the Automatic 360 will go places other machines won't without a top expert's technique, a weightlifter's strength and a bandolier of clutch plates. ●