

Cycle

Suzuki GR650D
Reviving & Remaking
The Big Vertical Twin

Honda V45 Interceptor It's High-Tech Triumphant!

Yamaha IT490K
Newest Monocross,
Biggest Engine Yet

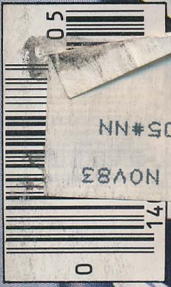


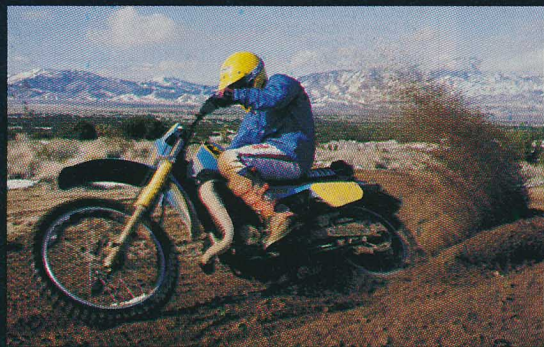
Superbike Interceptor **Technical Analysis**

The 750 Racer
Built To Win
At Any Cost

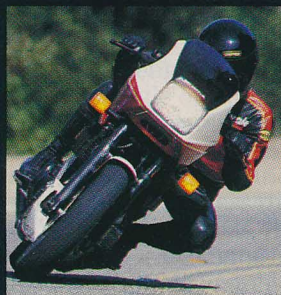


600308 KFF 1021B090 G41C NOV83
ALAN D KUFFEL
1021 BRADLEY SQ
SPARKS NV 89431
05#NN
05





pg.75



pg.40

This Month's Puzzle:
Refer to the cover photographs supplied by Dave Hawkins, observe the details and select the best bargain:

- A) Honda Interceptor (\$3498)
 - B) Honda Racer (\$GULP!)
 - C) HawkEye Hawkins
(The bill's in the mail)
 - D) Model T.W. ('Just buy me lunch') Wolff
 - F) All of the Above
- For the correct answer, see the road test on page 40.

ROAD TESTS

- 40 Honda V45 Interceptor
The future is now!
- 75 Yamaha IT490K
Born-again Monocrosser: new body, new soul, latest techno-tricks.
- 100 Suzuki GR650D Tempter
Computer-shaped vertical twin—melding past into present.

SHORTS

- 85 Harley-Davidson FLHT Electra Glide Classic
Big bike with a Big price tag.

FEATURES

- 31 Louder Than Money
Rob Muzzy: When this man talks Superbike racing, Kawasaki listens up. By Kevin Cameron
- 90 Catalytic Converters In Our Future
The Word has come down, and It is . . . By Don Phillipson
- 92 Countdown To 1984
Big Brother: Alive and well and peering down our pipes. By Don Phillipson

TECHNICAL

- 25 Full-Attack Interceptor
Honda's new V45, dressed for the Superbike Wars. By Kevin Cameron
- 48 Inside Honda's Interceptor
Track-inspired technology hits the street. By Kevin Cameron

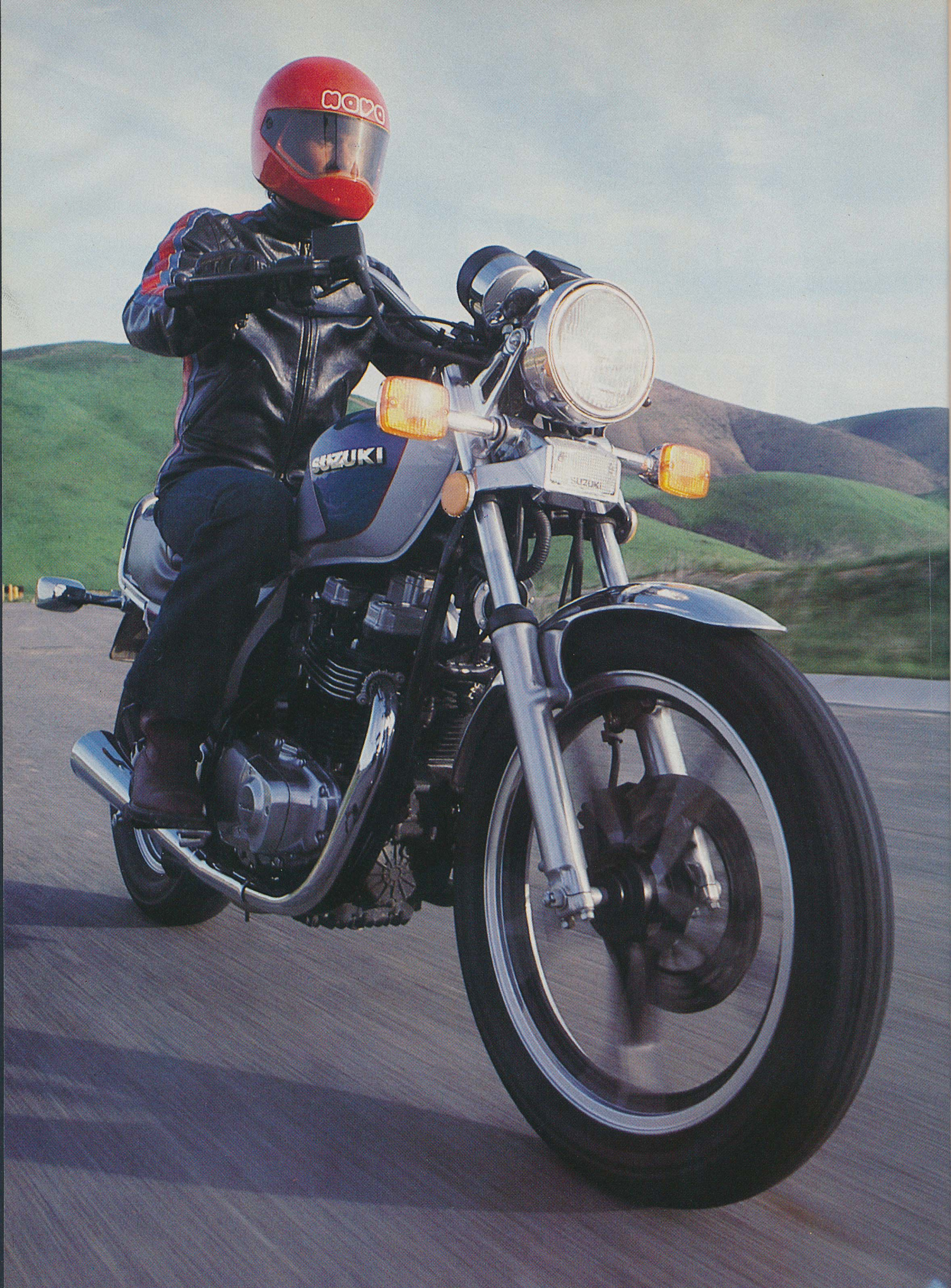
DEPARTMENTS

- 8 Editorial/III Wind/Phil Schilling
- 10 The Duct Tapes/The Last Straw/Ed Hertfelder
- 14 TDC/Price And Production/Kevin Cameron
- 17 Letters/Understanding
- 20 Bits/Gashopper/Ken Lee
- 22 Pipeline/GP Program/Jim Greening

P Thomas Sargent, *Publisher*
Phil Schilling, *Editor*
Don Phillipson, *Executive Editor*
Thomas J. Saputo, *Art Director*
Allyn Allaire Fleming, *Managing Editor*
Ken Lee, *Food Editor*
Mark Homchick, *Associate Editor*
Buzz Buzzelli, *Associate Editor*
Mark G. Lindemann, *Copy Editor*
Gayle P. Longbotham, *Editorial Secretary*

Irwin Germaine, *Production Manager*

Cook Neilson, *Mud Maker*
Kevin Cameron, *Contributing Editor*
Dave Hawkins, *Contributing Editor*
Jim Greening, *Contributing Editor*
Ed Hertfelder, *Contributing Editor*



□ The 650 vertical twin should be dead and long forgotten. It's not. Suzuki engineers have lifted the concept from the history books, marched the configuration through computers, given it a variable-mass crankshaft, a counterbalancer, an air-swirl induction system and oil-jet cooling, and mounted the entire package in a single-shock chassis. Applying new technology to an "old" configuration has produced a freshly minted motorcycle with contemporary performance. Without this reapplication of new engineering, old concepts stay old. New tech revived V-engines, and now Suzuki has remade the 650 vertical twin.

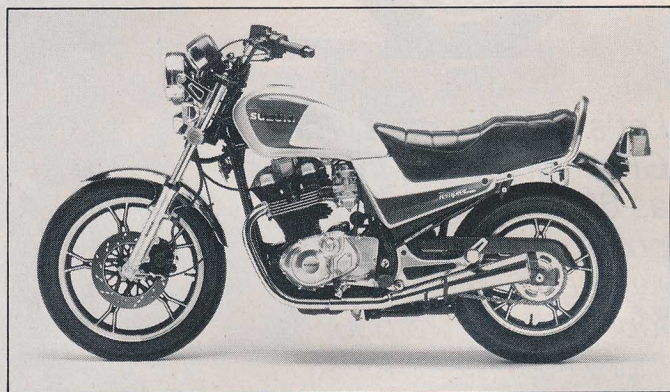
When you look at the GR650D's engine you'll understand how ideas and technology produce compact, efficient powerhouses—a 650 engine that's 450-small. The Tempter's central crankcase castings, for example, are 35mm shorter and eight millimeters narrower than the GS450's; even the GR's cylinder head is just seven millimeters wider. The GR's overall sump-to-cambox height is only two inches more than the GS650 transverse four engine, yet the GR has a cylinder head with half the moving parts and a much-condensed lower end. Suzuki engineers pressed and compressed the 650 engine into the smallest, tightest package manageable.

Central to the machine's nimble handling is the GR's compact engine. Suzuki's Full Floater suspension positions the single shock absorber directly between the engine and the rear wheel. Carrying the hefty shock unit and its accompanying linkage low, near the swing-arm pivot, drops the bike's center of gravity. The GR's short 56.3-inch wheelbase (the same as the GS550ED's and shorter than many other 550s' and 650s') is in part responsible for the GR's quick, light handling; that short wheelspan would be impossible with a long engine block. In motion, the bike steers like a 550; at a stop, it feels even smaller—like a 450.

The engine's compactness adds other benefits. A narrow engine can settle lower in its chassis without limiting ground clearance, in turn lowering the bike's center of gravity and center of mass. A compact, light engine allows lighter superstructures: the frame, swing arm and connecting hardware all reflect this. Diet engineering pays off: The GR650 weighs 438 pounds with a full fuel tank, moving the Tempter closer to the 450 twins than the 650 in-line fours. It's even lighter than bikes from that champion marque of engineered weight savings; fully gassed, the GR presses its rubber against pavement some 13 pounds less than BMW's lithe R65LS. The final result is a motorcycle with 450 feel and 650-twin punch.

The 650's engine internals also ran through the engineering weight-reduction salon. The camshafts are hollow-bored, according to Suzuki sources a first for the company. Power from the crankshaft drives the clutch via helical-cut gears, runs through the five-speed gearbox, then goes directly to the rear wheel by a #530 roller chain. The 650's drive train contains no heavy, power-wasting jackshafts, transfer boxes or drive shafts. The cam-chain tensioner, a simple coil-spring unit, is similar to DR and SP types. Suzuki engineers used computer analysis to delete excess material from the crankcase castings.

SUZUKI GR650D TEMPTER



Take an old favorite, the 40-inch vertical twin. Add 1983 technology. Presto! You've got single-shock rear suspension and a brilliant computer-shaped counterbalanced engine, and—what's this?—a crankshaft that adjusts its own mass! Now that's new.

SUZUKI GR650D TEMPTER

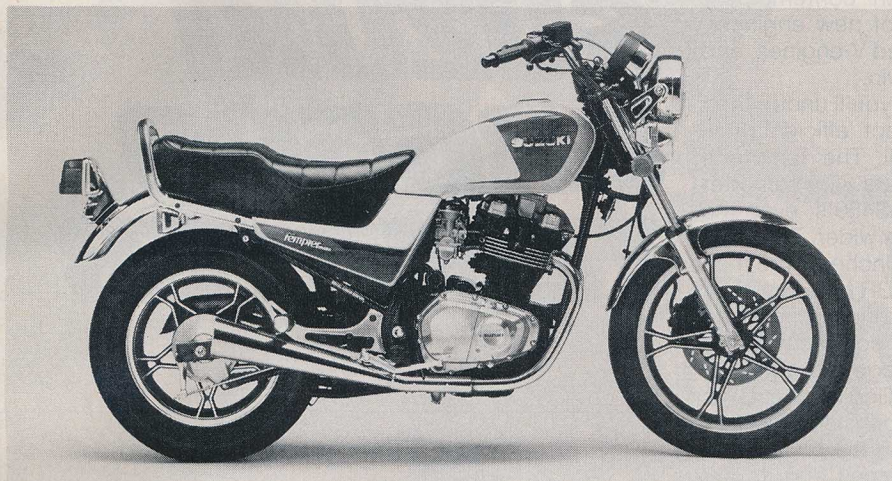
The GR's engine layout, like the GS450's, uses a 180-degree crankshaft with a single gear-driven counterbalancer; upstairs, twin overhead camshafts operate directly on shim-and-bucket followers, opening two valves in each combustion chamber, but there the 650/450 kinship ends.

And the new-tech begins. A centrifugal clutch attached to the crankshaft's left end engages a 2.78-pound (44-ounce) auxiliary flywheel. This clutch, operating conversely of conventional go-kart types, disengages at higher

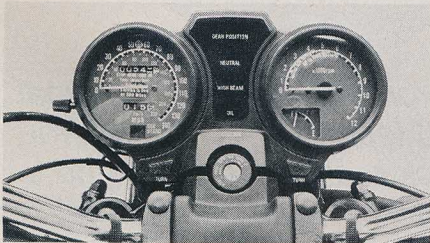
uneven 180-/540-degree firing pulses of the 180-degree crank. You might not notice the long rollover in a smaller displacement 180-degree twin, but it would certainly be apparent in a 650. At low speeds, a light flywheel would tend to stop, stalling the engine—on the other hand, at high speeds a reduction of flywheel mass enhances acceleration and also aids engine braking.

This variable-mass system required another engineering first for Suzuki. The extra width of the clutch and flywheel mechanism at the crank's end would have required a lengthy starter-

parts—the check valves prevent oil from flowing through the jets. As engine speed and oil pressure increase, the check valves pop off their seats, allowing the jets to spray oil onto the underside of the pistons. Common in diesel engines, the system cools the underside of the pistons, a rather obvious stratagem when dealing with the heat created by diesel and/or turbocharging. In normally aspirated en-



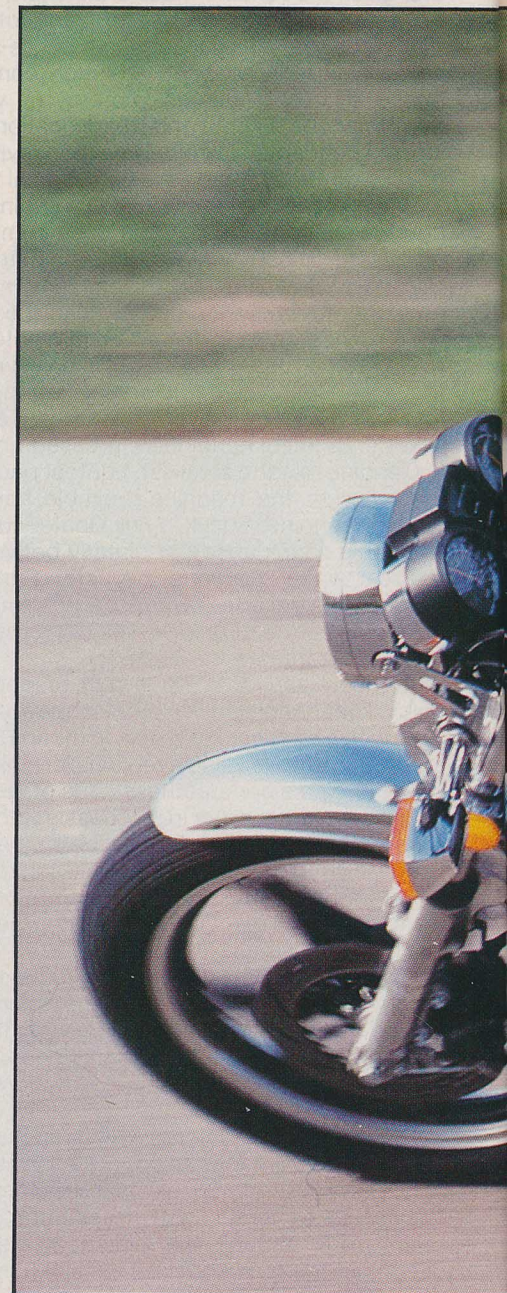
Let's talk progress. The GR weighs about the same as 650s of old. That's 60 pounds less than today's average 650 transverse four and only 20 pounds more than most 450s.



speeds. Its gripping "feet" face inward, clamping against the flywheel's inner boss rather than its outer flange as on normal centrifugal clutches. As the engine accelerates, centrifugal force throws the clutch feet outward, the clutch disengaging completely around 3000 rpm. Thus, the auxiliary flywheel freewheels at high speeds, independent of the crankshaft, and in effect reduces the crankshaft's rotating mass, while at low speeds, the clutch engages and carries the flywheel around with the crankshaft. The extra mass adds inertia, helping smooth the

motor shaft. To keep this shaft as short as possible, Suzuki fitted the pinion with a sprag-type clutch and moved the gear, clutch, and engagement drive to a separate shaft between the crank and starter motor.

In the crankcase, alongside the central web supporting the crankshaft's two inner bearings, two small oil jets aim up at the underside of the pistons. These jets, which look like a carburetor's, contain small check valves. At low speeds—when minimal oil pressure means all the oil pumped through the system must lubricate moving



gines, the oil-jet spray allows higher compression or lighter pistons or both. This system first appeared on the XN85 Turbo, and Suzuki's 750 and 650 four-cylinder engines also carry it.

The transmission incorporates another oil-system jet, the purpose here to streamline manufacturing by eliminating the need to drill small, precise passages in the engine cases. Large

passages are more easily and reliably drilled, and jets fitted at the ends of the passages can regulate flow to the specified level.

To keep the Tempter's pistons flat (thus reducing heat transfer into the piston's crown) and to maximize combustion efficiency, Suzuki designers incorporated the Twin Dome Combustion Chamber shape which first appeared on the 1981 GS650. This

upstream of the valve head. (The Yamaha system stores excess fuel/air charges in small plenum chambers not connected to the carburetors.) At the opposite side of the air jet's orifice, the port's roof is quite flat and its area necked down considerably less than at the carburetor flange. According to Suzuki, this shape, determined by computer analysis, produces the flattest power curve practical and concen-

most engines come alive—when cams and carburetors and ports and pipes harmonize to produce a burst of power—the GR just fades away. Suzuki designers have forsaken high-speed power for broad-spectrum tractability. Speed buffs won't like Suzuki's approach, but those whose riding demands down-low pulling power at sedate engine speeds will.

Considering the 650's overall middle-



configuration gives a very compact fuel-burning area. The GR650's slightly domed 77mm pistons rise only a couple of millimeters, yet yield an 8.7:1 compression ratio.

To further improve combustion at lean fuel/air mixtures, Suzuki engineers used an air-swirl induction system that draws air from the oval-venturi carburetors and delivers the jet-charge just

trates power at the bottom end of the rpm scale.

Suzuki engineers certainly delivered on that objective. The GR's torque peak occurs at a low, low 3500 rpm. It remains virtually flat, generating 29 to 31 pounds-feet all the way to 7000 rpm, where the engine's peak horsepower occurs. As revs build, the engine accelerates hard, and at the point when

road character, the shape of the power curve is a fair trade. In the real world of street tooting, the rider can lug the engine down to an idle and the GR will accelerate willingly. A small amount of driveline snatch occurs up to 1500–2000 rpm, depending on load. It's unnecessary to touch the 8500-rpm red-line, and short-shifting at 7000 keeps the engine in its most useful power

SUZUKI GR650D TEMPTER

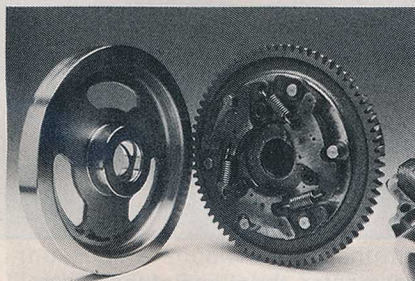
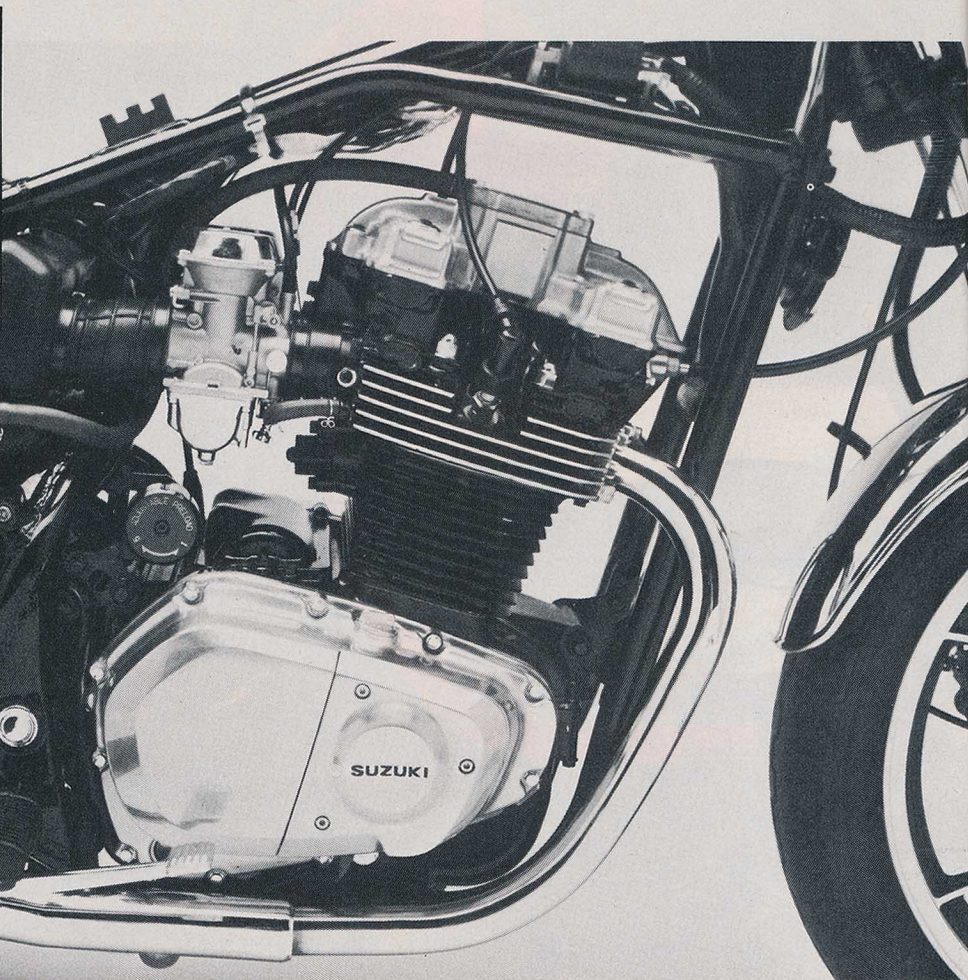
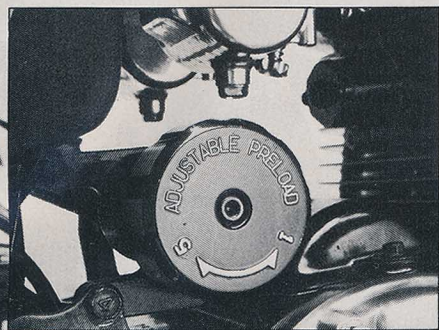
range. The GR is in its prime bumping around town among the roving obstacles and mobile chicanes of city streets. Its quick, light steering and responsive low-end power make it a perfect urban trawler. The machine's good balance aids feet-up slaloming in stop-and-go traffic and maneuvering in tight quarters.

This flat power curve has a few hiccups, all related to carburetion. Our Tempter's constant-vacuum units hesi-

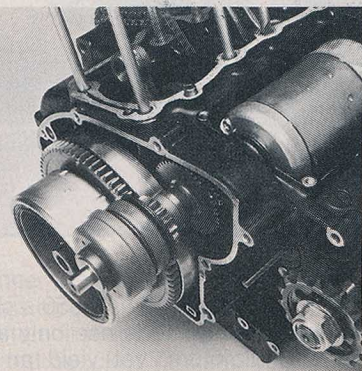
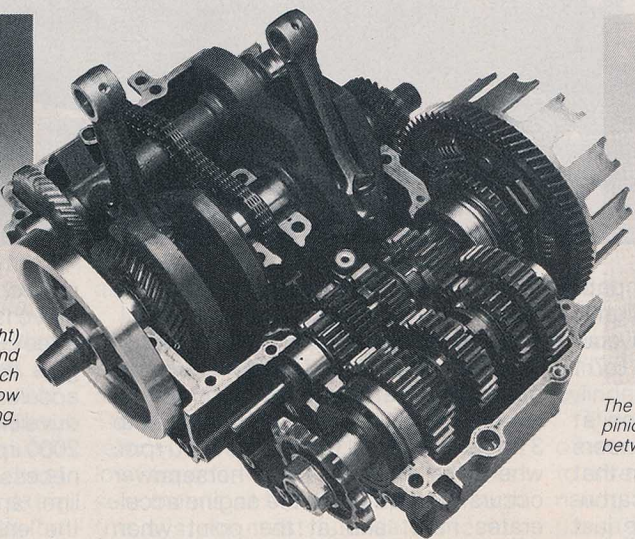
tated during on/off throttling, most frequently during gear shifting. Practice teaches the rider to minimize the stagger by making quick, snappy shifts and subtle throttle adjustments. Snapping the throttles open at low engine speeds causes the engine to balk. Around 5500 rpm another flat spot appears during subtle throttle variations. However, regardless of temperature, the engine starts quickly, and you can ride away with the engine cold. You'll feel no jerky quirks during those first

few cold-running minutes, and the convenient thumb-operated choke lever on the handlebar facilitates adjustments.

The GR's frametube layout breaks from Suzuki tradition. Most Suzuki street machines use a single backbone intercepting the two smaller top members that run from the steering head as they curve down to meet the swing-arm pivot. In contrast, the GR's backbone bends down behind the cylinder, meeting two pivot/engine-mount tubes just above the swing-arm spindle. Two top



A centrifugal crankshaft-mounted clutch (right) varies the crank's mass by engaging a 2.78-pound flywheel (left). Above 3000 rpm, when the clutch releases, the crank's inertia is reduced; below 3000, increased crank mass helps smooth running.



The GR carries its electric starter's engagement pinion and sprag clutch on an auxiliary shaft between the crankshaft and the electric motor.

tubes extend rearward from the steering head, briefly paralleling the backbone (standard practice), then jut rearward, forming the seat platform. Even the single-shock XN85 Turbo doesn't employ a layout like this, but the XN pumps out a frame-testing 71 horsepower; the GR ekes out 38.

The box-section swing arm incorporates Suzuki's Full Floater suspension system. Two short uprights transfer the arm's motion to one end of a rocker; the shock's top-end connects to the

rocker's other end, and the shock bottom mounts to an extension below the swing arm. A remote preload adjuster sits just under the right carburetor, but the shock has no provision for damping adjustment or an air assist.

The screw-type adjuster controls hydraulic pressure to a piston above the shock's spring. Screwing the knob clockwise raises pressure, and the piston bears down against the spring and increases spring preload. It's a fine-thread adjustment: changing from full-

soft to full-hard takes 20 turns. The knob's proximity to the crankcase means it must be turned in ninety-degree increments and, as the springing gets stiffer, the knob-twisting gets harder. We would prefer a quicker method of preload adjustment.

The GR's springing is biased toward sport riding, though the ride is less stiff-legged than some strictly sport machines. Fork compliance is good over most surfaces, firm only in the last few inches of travel. The rear suspension is quite firm over its full range—small-bump compliance is mediocre even at low preload settings. Medium bumps, the kind encountered on an average highway, produce a choppy ride, and large bumps (such as potholes and ledges) jolt the rider. The suspension is well suited for carrying a load; a passenger's weight smooths the ride.

The stiff springing does benefit ground clearance though. Soft springing usually handicaps a rider cornering hard on a light machine. On the GR, even aggressive riders will frighten themselves before touching any hard parts, while more sedate riders will find excellent ground clearance even with the suspension on full-soft settings.

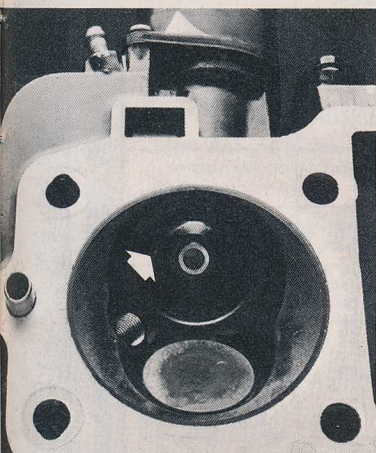
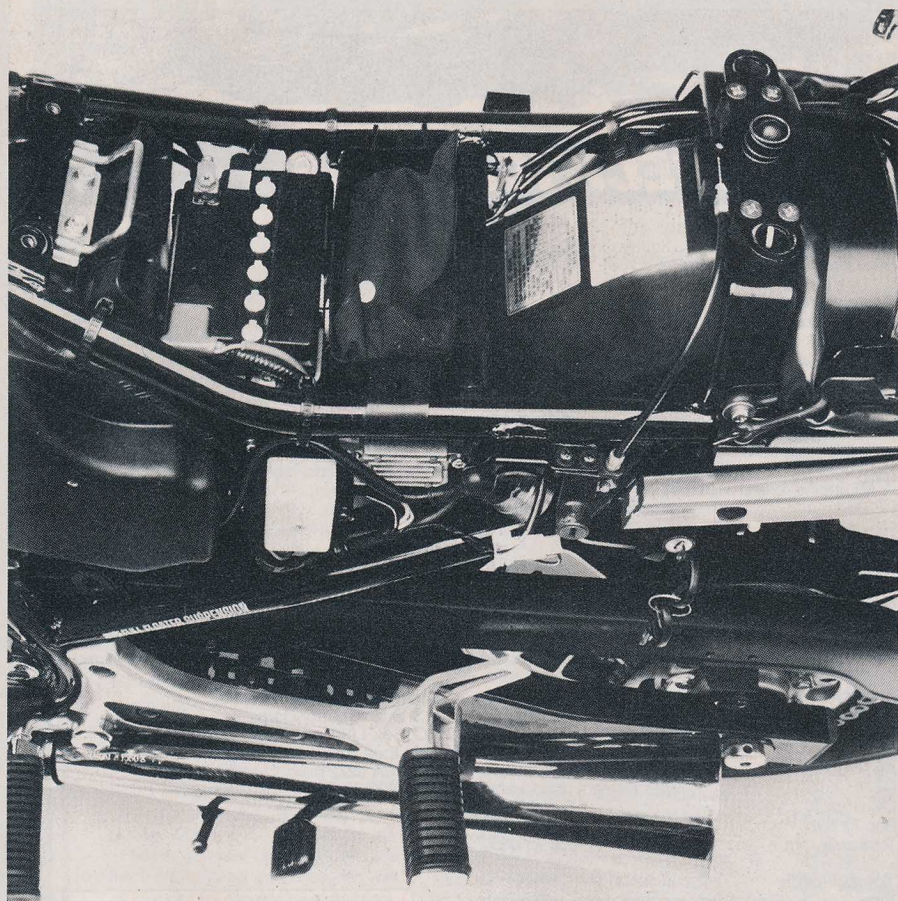
The GR's precise steering lets the rider hustle the nimble Tempter in and out of a series of corners with ease; left to right switchbacks require less effort than with most in-line fours. Even as the rider brakes hard into a corner's apex, the bike turns without trying to stand up. Mid-corner bumps cause a momentary rear-end pogo that never develops into a wobble.

The GR's brakes have no trouble stopping the 650. The single front disc is strong, with good feedback. The well-controlled rear drum has no tendencies toward lockup. During one session of countless zero-60-zero-mph sorties on a downhill road, the brakes never faded.

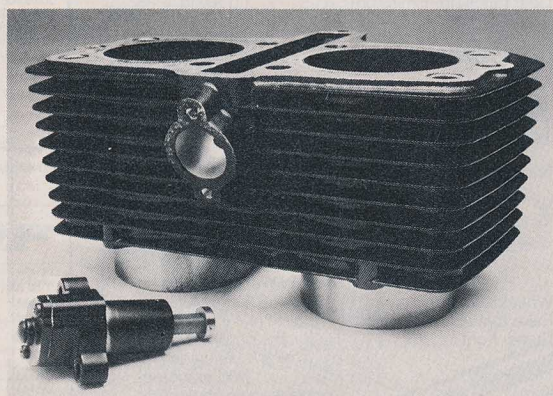
Although closer to 450 size, the 650 has more room for its rider than the average small bike. The seat composition feels softer than most other Suzukis', and the small seat step is located sufficiently rearward to avoid fouling the backsides of our largest staffers. The seat narrows toward the front so shorter riders can slide forward to reach the pavement at stops. Both handlebar and footrests are well positioned for short and tall riders.

Rubber-mounted bar and pegs control vibration to about 4500-4600 rpm. Certainly this 650 feels like an average four. At 4700 rpm, 62 mph in high gear, vibration seeps through the handlebar, seat and pegs. Though less intense than some twins', the GR's will make the rider's hands tingle after a while. Don't exceed 62 mph, and you can cruise comfortably.

Although some vibration greeted our



An induction nozzle in the inlet port draws air from the carburetor venturi and injects an air-swirl into the cylinder, improving combustion efficiency.



The Tempter's compact cylinder block has an automatic cam-chain tensioner similar to SP and DR units. The cam chain passes between the cylinders.

SUZUKI GR650D TEMPTER

passengers through the footrests, seat and handrail, the comfortably placed passenger pegs and rail found favor for their positioning. Above 4700 rpm, however, vibration renders the rail useless. Because the passenger seat area is relatively short, the grabrail hits the passenger in the tailbone.

The GR650 is most likely capable of higher mileage figures than our overall average indicates. Our test bike arrived showing only 170 miles on the odometer, and during its stay the mileage improved. The first few tankfuls netted averages in the mid-40s; the last fill-ups produced figures in the low 50s. Our lowest ever was 43.3, and our highest, 55.3, included some drag-strip runs. A two-up highway trip netted 54.8 mpg. Don't worry about straining your bladder between topping off: the 2.5-gallon main fuel supply allows a range of about 120 miles.

A single lock—ignition-key-activated—releases the removable seat. We welcome this change from the lock-and-twin-latch affairs which hamper the GS1100's seat. Underseat, you'll find access to the bike's battery, tool kit and locking security chain with its nifty magnetic lock. The left sidecover gives access to the air cleaner and fuses. Maintenance is pretty simple. Valve clearance is shim-adjusted, but there are only four valves—good news. The oil filter cartridge lies front-and-center; camshaft chain and ignition timing require no adjustment.

Suzuki's GR comes in another version: the economy GR650XD. Differences? The economy version has single-tone paint, no auxiliary running light under the headlamp, no fork air fittings, and spoke wheels with tube-type tires and aluminum alloy rims. Oh, one more difference—it sells for \$250 less than the D-model. In its XD form, the Tempter may be motorcycling's Most-Bike-Per-Dollar buy.

You can look at this 650 and conclude that it's the world's biggest bored-out 450. Or you can see it as we do—a technological advancement of the 650-vertical-twin concept. It's smaller and lighter than the world's last new 40-incher, Yamaha's XS650. That bike outweighs the GR by 60 pounds. Suzuki compressed the 650-twin theme into a package with 1983 features.

The Tempter is a good alternative for riders considering a 450. For all its "small bike" handling, it has more punch and more touring comfort than smaller twins, promising to amuse its rider for longer stretches. For those riders who don't need or want four-cylinder power and would gladly trade firepower for accuracy, the Tempter fits the bill *and* saves cash. One thing's for sure: Suzuki just brought the 40-inch vertical-twin concept into the 1980s. ■



TEST SPECIFICATIONS

Make and model Suzuki GR650D Tempter
Price, suggested retail (as of 2/25/83) \$2399

Performance

Standing start ¼ mile 13.75 sec. @ 93.45 mph
Engine rpm @ 60 mph, top gear 4622
Average fuel consumption rate 47.7 mpg
(20.3 km/l)
Cruising range (main/reserve) 119/33 mi.
(192/53 km)

Load capacity
(GVWR less curb weight) 487 lbs. (221 kg)
Maximum speed in gears
@ engine redline (1) 39 (2) 61
(3) 80 (4) 97 (5) 110

Engine

Type Four-stroke, vertical twin;
air-cooled with two chain-driven overhead
camshafts; two valves per cylinder
Bore and stroke 77.0 x 70.0mm
(3.03 x 2.76 in.)
Piston displacement 652cc (39.8 cu. in.)
Compression ratio 8.7:1
Carburetion (2) Mikuni constant-vacuum
Exhaust system Two-into-two
Ignition Battery-powered, inductive,
magnetically triggered
Air filtration Paper element, disposable
Oil filtration Paper element, disposable
Oil capacity 2.5 qts. (2.4 l)
Bhp @ rpm 38.59 @ 7000
Torque @ rpm 34.56 @ 3500

Transmission

Type Five-speed, constant-mesh, wet-clutch
Primary drive Helical-cut gear;
72/32; 2.25
Final drive #530 chain; 15/38 sprockets; 2.53
Gear ratios (transmission) (1) 37/13, 2.85
(2) 29/16, 1.81 (3) 26/19, 1.37
(4) 24/21, 1.14 (5) 22/22, 1.00
Gear ratios (overall) (1) 16.22 (2) 10.30
(3) 7.80 (4) 6.49 (5) 5.69

Chassis

Type Double-downtube, full-cradle frame;
box-section steel swing arm
Suspension,
front Center-axle, air-assisted fork
with 35mm tubes and 5.2 in.
(132mm) of travel
rear (1) shock absorber, adjustable for
spring preload, producing 2.9 in.
(74mm) of rear-wheel travel
Wheelbase 56.3 in. (1430mm)
Rake/trail 29.5°/4.4 in. (111mm)
Brake, front Hydraulic, single-disc with
single-piston caliper
rear Rod actuated,
single-leading-shoe drum
Wheel, front Cast, 1.85 x 19
rear Cast, 2.50 x 16
Tire, front 100/90 19 57H IRC
Grand High Speed GS-16
rear 130/90-16 67H IRC
Grand High Speed GS-16

Seat height 31.6 in. (803mm)
Ground clearance 5.3 in. (135mm)
Fuel capacity (main/reserve) 2.5/0.7 gals.
(9.5/2.6 l)
Curb weight, full tank 438.0 lbs. (198.7 kg)
Test weight 588.0 lbs. (226.7 kg)

Electrical

Power source Three-phase alternator,
230 watts
Charge control Solid-state voltage
regulator/rectifier
Headlight beams, high/low 60/55 watts
Tail/stoptlights 8/23 watts
Battery 12V 18AH

Instruments

Includes Speedometer, odometer, tripmeter,
tachometer with 8500-rpm redline.
Fuel gauge; indicators for gear
position, neutral, high-beam,
low oil pressure, sidestand
and turn signals

Customer Service Contact

U.S. Suzuki Motor Corp.
P.O. Box 1100
3251 East Imperial Highway
Brea, CA 92721
(714) 996-7040

