

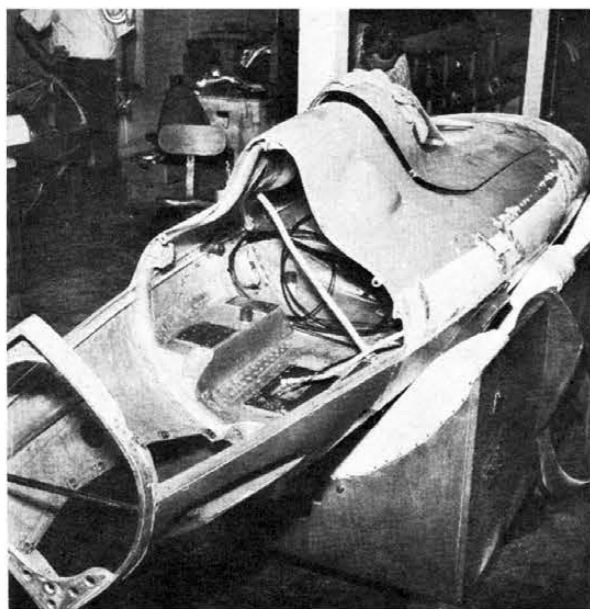
Gustav Baumm designed an air-slicing body that made engineers check their wind tunnels and allowed a high winding mite to crank 122 mph out of three tiny inches. It also gives up 252 miles to a gallon of gas at 68 mph.



TO BEAT THE WIND

Against Nevada background, Mueller begins first of record runs. Careful acceleration prevented wheelspin on wet salt.

By GRIFF BORGESON



Rear view of Baumm cross section of tail to which fin can be tacked for speeds above 135 mph. Note roll bar effect of half round interior reinforcement.

AUGUST 4, 1956, 7:20 a.m. For the first time in over two hours the wind sock at the starting line hung limply on its shaft. In the pit area the air became suddenly tense. The course steward grabbed the phone and made quick contact with the observers spotted at one-mile intervals down the fastest part of the blinding white, black-lined 14-mile straight-away.

"Mile Four?"

"Zero."

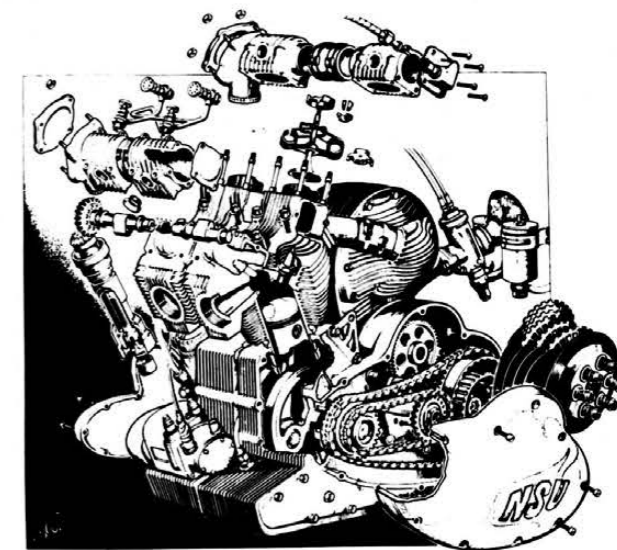
"Mile Five?"

"Zero."

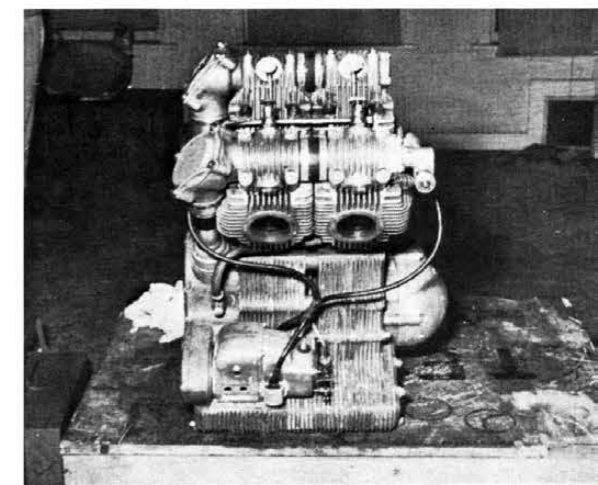
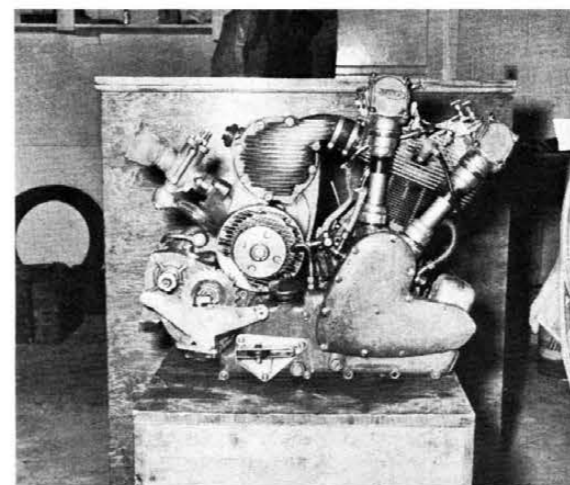
At each station the men were keeping a constant check on wind velocity with hand anemometers. And now, although the nearby mountains were in partial shadow—a usual indication of turbulent air over the salt, it was dead calm the whole length of the course. Wilhelm Herz, many times German national champion and former holder of the world's absolute motorcycle speed record, had his leathers zipped and his helmet on when the chief engineer said quietly, "Ist gut," and gave the nod that triggered a new attack on the big record.

Herz wriggled into a red, silver and blue shell that encased him as closely as a snail's, and four mechanics gave him a starting push. He made an easy warmup run, verified the calmness of the air, and came back to the pits for a change to racing spark plugs. Then, within what seemed like seconds, the streamliner was on its official way.

Diagram shows working parts of supercharged 110 bhp, 500 cc engine. Plant powered Delphin III, with Herz at bars, to over 210 mph. A new world's speed record.



The big blown twins. Both 350 and 500 cc are identical (the 500 shown here). Only five of each have been built due to FIM restriction on racing blown engines. This led to the start of the record breaking runs in '51 in order to obtain further use from mills.



Herz took off in bottom gear, feeding the throttle gently to avoid wheelspin, and popped the change into second like lightning at about 105 mph. His machine dwindled rapidly in the colossal perspective of the Salt Desert, but the roar of the engine stayed strong and you could hear him slice from second to third at about 150 mph. Then he dropped below the horizon, but the hard exhaust note still carried and the final shift into Fourth at about 185 mph sounded clean and clear.

Finally, for a few minutes, it was silent. Then a speck appeared—floating, incredibly, on a mirage just above the horizon. A moment later Herz roared back through the timing traps, the fastest man in the world on two wheels. His two-way average was just under 211 mph, a full 26 mph faster than the record he had just destroyed.

The absolute record is the one that impresses the world, but it is not necessarily the most important achievement on the salt last August. NSU, Germany's biggest manufacturer of motorcycles, proved the total versatility of its machines by methodically gobbling up every two-wheel record in the book. Beyond this, the company's engineers learned things about high-speed vehicle performance that they couldn't have found out anywhere else on earth. But probably most important, they were able to unleash and observe a wildly revolutionary new machine, a vehicle that stands somewhere between motorcycle and missile.

NSU's unorthodox bomb has a background as improbable

as its appearance. The company entered the world-record field relatively recently, and almost accidentally. NSU has supported road racing for decades, and its supercharged machines were always top contenders, until, in 1951, Germany was readmitted into the *Federation Internationale Motocycliste*, the two-wheel version of the F.I.A. The F.I.M. formula barred blown engines, and before setting out on a new racing-engine design program, NSU's brass, with Teutonic thrift, meditated on what might still be milked from their heavy, but fearfully powerful blown 350 and 500 cc engines. The answer was records. The engineers laid out a special, long-wheelbase frame and built a new streamlined shell that moved with such slick, fish-like efficiency that it was named the Delphin or Dolphin. In this machine, late in '51, Herz charged down the autobahn near Munich at an average speed of 180 mph, a new world's record.

The fact that NSU had entered the record-breaking business attracted mountains of comment, criticism and well-meaning suggestions. It also attracted a remarkable individual named Gustav Albert Baumm. He was a frail young man, a penniless refugee from the Soviet Zone, blond and bearded. He was a motorcyclist, an artist in paint, and a self-styled ne'er-do-well with no professional training. All he had, he said modestly when he came knocking on NSU's door, was extraordinary engineering talent.

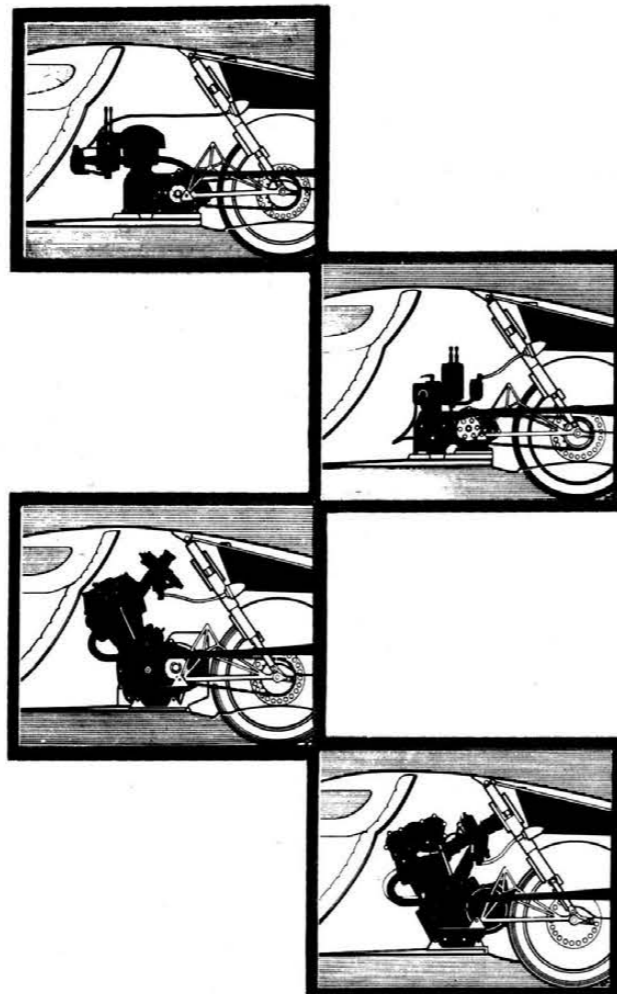
Needless to say, Baumm the Character, met a certain resistance when he tried to introduce himself and his ideas

to engineers and board chairmen. "We turned him away several times," an NSU executive admits, "but he wore us down. Just to appease him and send him on his way, one of our engineers finally agreed to give him a few minutes' time."

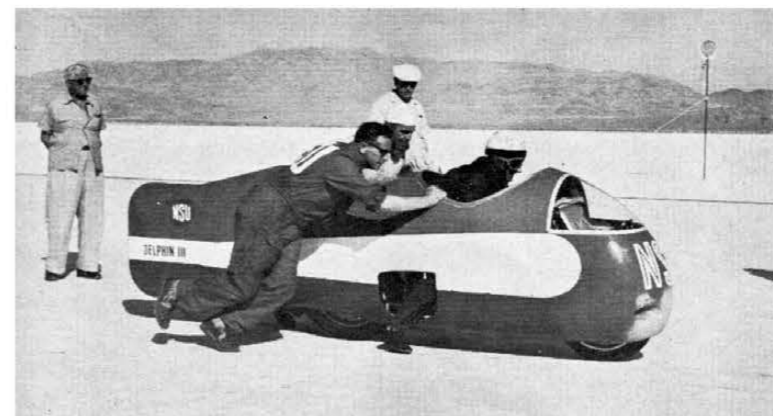
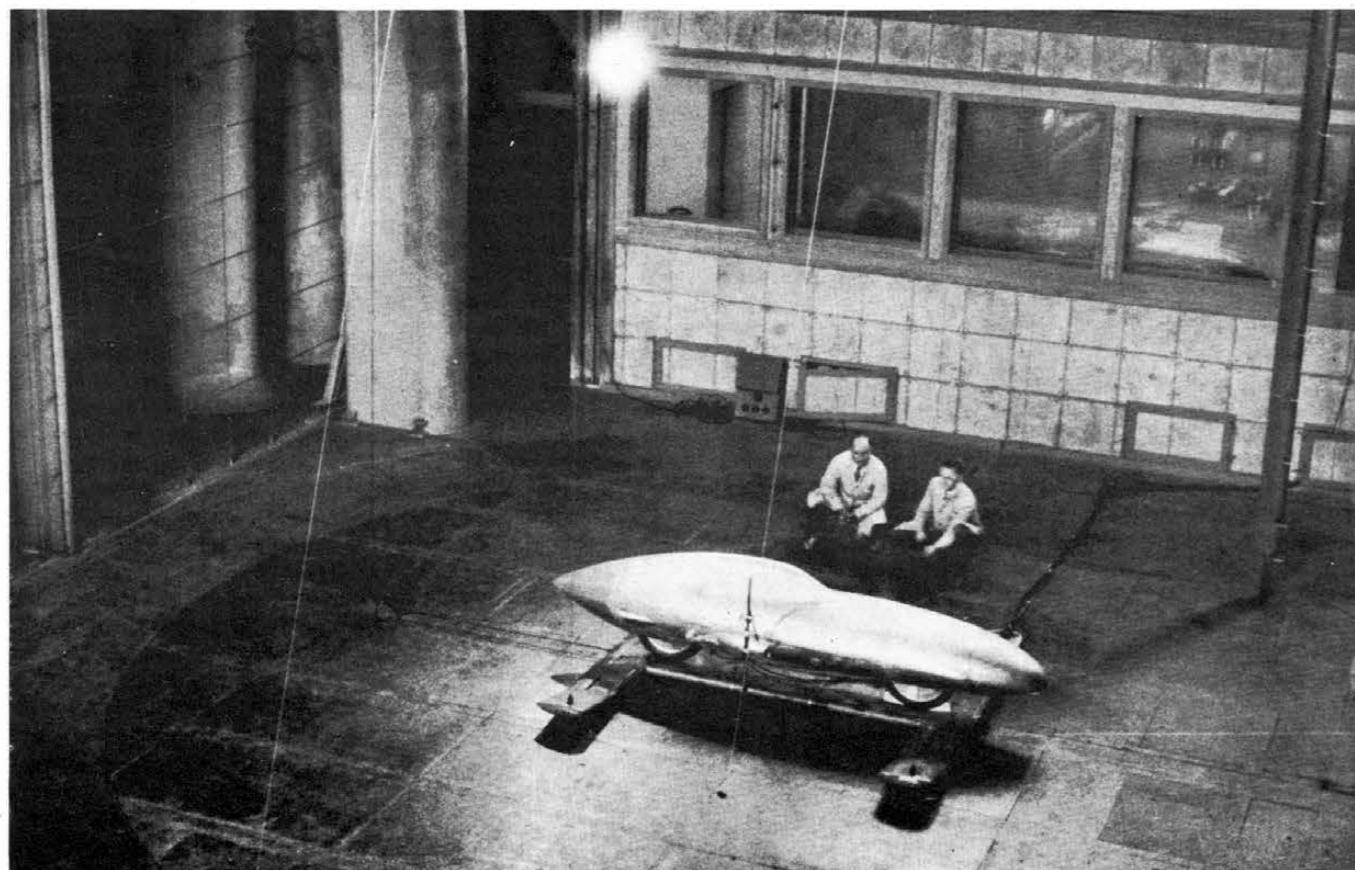
This, of course, was what Baumm had been waiting for. After two hours the engineer who'd expected to dispose of the "crank" with a pat on the head and a quick bums' rush decided he had better call in some higher-ranking brass. Baumm, expounding his ideas for a machine that would go faster than anything known to man, held them all spellbound for the whole day, and they agreed to meet with him a few days later on a nearby hill for a demonstration of some of his ideas.

Baumm had no money for building models or prototypes, but he had ingenuity. Before the demonstration, he found an old ironing board and a pair of bicycle wheels, and these he assembled into a skeleton facsimile of the two-wheel vehicle he could see in his mind—one with small wheels and a "deckchair" reclining position for the rider, to give the lowest possible frontal area, air resistance and center of gravity. When Baumm rode his ironing board down the hill none of the NSU executives laughed. The demonstration looked so good, in fact, that they gave Baumm an office next door to Walter Froede, engineer in charge of research and development, and let him loose. Baumm never wanted to be, and never was, on the regular payroll. He insisted on being his own man, free to work out his own ideas.

As the work progressed NSU's diploma engineers became increasingly intrigued by Baumm's personality. He had a brilliant mind—filled with stimulating and original opinions and theories about a dazzling variety of subjects. His feeling



NSU engineers at the wind tunnel of the Technical University of Stuttgart were amazed by low resistance Baumm design.



Herz in Delphin III gets starting push from NSU crew. As soon as bike pushes under power, Herz folds legs into shell.

Diagrams of four power units NSU used to break speed records. UPPER LEFT: Smaller version of the Flying Hammock — this is a 50 cc two stroker. UPPER RIGHT: A four stroke rotary valve engine developing 12 bhp at 16000 rpm. LOWER LEFT: Larger version of Flying Hammock. This is the successful Racingfox engine which was reduced from 125 to 100 cc. LOWER RIGHT: Ensuring a record speed, this 250 cc DOHC engine puts out 42 bhp.

for aerodynamics was awe-inspiring. With a sure, intuitive hand he molded the form of his first model, every contour contributing to the basic objectives: minimum frontal area, minimum drag, optimum lateral stability, downward pressure on the body proportional to the vehicle's speed.

The shape was definitely weird. A cross-section through the nose of the projectile produced an oval with its long axis horizontal. From the front wheel to the front of the canopy the cross-section became an inverted pyramid. From the canopy aft it became an oval again but with the long axis now vertical. The reason for the vertical broadening of the rear of the body, Baumm explained, was to permit that surface to act as a stabilizing fin, which it could do successfully up to speeds of about 135 mph, beyond which point a true fin would have to be attached.

A conventional motorcycle has an air resistance, or Cw factor, of about 0.80. NSU's first Delphin streamliner had a Cw of just 0.28, obviously good. But when the time came to take Baumm's model to the Stuttgart Technical Institute's wind tunnel for testing, the existing standards of aerodynamic efficiency went down the chute. After the first air resistance readings, the technicians in charge explained with some embarrassment that evidently there had been a breakdown in the instruments and that there would be a delay until the trouble could be located. But the only trouble was that the Cw of the Baumm bolide was low beyond the experts' belief—it was a fantastic 0.11!

(Continued on page 62)



Men at one mile intervals along course checked wind velocity with hand anemometers calibrated in meters per second. Runs were attempted only when wind was at zero over entire course.



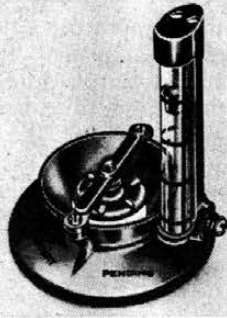
Wind velocity had to be zero over entire course area. Unfortunate fin-over-canopy flip occurred when Herz tried to correct error in course direction caused by side wind.

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Beat the Wind

(Continued from page 23)

Baumm's ideas for the purely mechanical construction of his vehicles were just as radically original as his ideas for streamlining. He specified unit construction for the somewhat cigar-shaped body; the shell and frame were one and the same. The shell material was magnesium alloy about .040-in. thick. It was reinforced with half-round stiffeners of the same metal, riveted in intersecting spiral paths to the inside of the shell. The engine mount was a simple base-plate behind the rider and on the floor of the shell. The rider reclining almost horizontally, as on a deck-chair or in a hammock. Said Baumm unequivocally, "We've been slaves to the horseback position long enough."

The handle bars, located under the seat, controlled the front wheel fork by a novel but simple system of parallelogram links. When at rest the driver could steady the machine by putting his feet on the ground, through two openings in the shell. Once under way he pulls his feet inside the shell, like an airplane retracting its landing gear, and with a lever, closes two flaps over the openings.

When the NSU crew arrived on the salt in late July, they came loaded for bear and with two firm intentions—one, to set records that would stand for a long, long time, and two, to make further cautious exploration of the Baumm design's unpredictable potential. To accomplish these ends, they brought a much refined version of the Delphin, two Baumm machines, nine mechanics, three F. I. M. timekeepers, six correspondents, representatives of the Voice of America, a battery of top-ranking company brass, about 50 packing crates and two road-racing motorcycles to serve as portable test stands. They hired the two best riders that could be had. One was lanky, blond Herz, who was slated to herd the heavier iron—the 350 cc and 500 cc Delphin, and the biggest of the Baumm machines, the 250 cc cc Baumm IV. The other small, jockey-like, 46-year-old H. P. Mueller, an ex-Auto Union driver who had been riding in motorcycle road races for a quarter of a century. Mueller had logged more miles at the controls of the little Baumm machines than any man alive, including economy tests that yielded an amazing 252 miles per gallon at 68 mph.

NSU had made every conceivable preparation for the assault. The speed

potential of each shell with each engine was calculated within close limits. The record runs were simulated on test bench and in wind tunnel. But the laboratory isn't the salt, and in spite of the careful planning, the runs started badly.

For one thing, the engineers had over-estimated the smoothness of the salt. They found that the regular road-racing suspension on the record machines was too hard for high speeds. Then it began to rain—the price of coming early in the season. The salt stayed damp, slippery and impossible for days.

Worst of all, there was the gusty, unpredictable desert wind. A motorcycle's lateral adhesion is a precarious thing—much more so than that of a car, with its four big patches of tire tread gripping the road. A two-wheeler's vertical stability is no less tricky, and the lower the center of gravity the more suddenly and violently it reacts to side forces. NSU got a painful demonstration of this fact during the first of the record attempts. Herz took off on the Baumm IV, accelerated smoothly and powerfully toward the timing traps and *pow*—a sudden blast of side wind cocked the projectile on its course. Herz corrected, too much. At about 185 mph he re-corrected and the bike went into a crazy wobble. Then it crashed over on its side, flipped over many times, took a final end-over-end flip and skidded to rest.

Miraculously, Herz crawled out of the machine neither scratched nor bruised, and only slightly shaken—a living testimonial to the tremendous ruggedness of the Baumm monocoque design. The only damage to the machine was a bent front fork and a dent or two in the shell; both could have been easily repaired if the alignment templates had been closer than Germany.

The next day Herz was ready to go again—this time on the Delphin. He straddled the blown 350 cc engine, put his chin on the sponge-rubber pad on the fuel tank, tore off down the salt—and again a gust of wind thrust him off course. His recent educational experience on the Baumm machine had taught him one of the laws of the salt: never make a major steering correction at high speed. Herz heeded the lesson and let the Delphin follow its nose—smack into a timing light and tripod. The timing device was destroyed by the 180 mph blow but Herz kept the machine upright. The next day, calm as ever, Herz was ready again.

In the meantime, though, Mueller, with a single warm-up run by way of practice, was re-writing the record book with the smaller Baumm machine. One of the engines he used was a 50 cc two-stroke with a new kind of scavenging blower—almost as big as the engine itself—designed to pull exhaust gases out

of the cylinder. Except for this new, top-secret development, the engines Mueller used with the Baumm 11 were scaled-down versions of NSU's fine but conventional 125 cc racing power plants, with vee-inclined valves and dual overhead camshafts driven by a shaft and bevel gears, and with roller bearings in all the high-revving friction areas.

But nothing else about the machines was unconventional. Asked how it felt to ride it, Mueller said, "It's a lot like the old Auto Union. With that car your ability to gauge by feel and vision what the car was about to do was reduced by about 50 percent. In this respect the Baumm is similar—as in the 3-liter Auto Union you sit at the mid-point of the vehicle. And it has other quirks all its own. The steering, with your hands very low, beside your hips, is hard to get used to. The machine always wants to go straight, but because of the small wheels and the low center of gravity, it's terribly sensitive to the slightest side wind. When you close the throttle it seems as if the machine will never slow down. Its wind resistance is so low that you think it will go on rolling at top speed forever. The oddest thing about the Baumm is that when you close the leg flaps you're all alone, completely cut off from the outside world.

Evidently Herz had a similar feeling about riding the Delphin with an enclosed canopy. Even though the new Delphin had a wind drag factor of 0.15 with the canopy and 0.19 without it, Herz couldn't adjust to the idea of being totally encapsulated at high speed. When he left the pits on the morning of August 4 for the successful world's record run, he was crouched on the Delphin equipped with an eccentric-vane-blown 500 cc engine — but with no canopy.

From the point of view of the record book, it obviously didn't matter. NSU's new record is a healthy improvement over the old one, and chances are it will stand for a long time. If other manufacturers begin to challenge it, though, NSU still has a fistfull of aces in the hole. One of them is the canopy; a less claustrophobic rider than Herz could undoubtedly wring many more mph from the Delphin, even with, as for this run, the heavy, 17-year-old 500 cc engine.

By far the most impressive of NSU's hole cards, though, is the Baumm design. Tests have proved that any engine, taken out of the excellently-streamlined (by ordinary standards) Delphin and installed in the Baumm, would be good for a 50 percent improvement in top speed. What this means, not only to NSU record attempts, but to the field of aerodynamic techniques in general, time is bound to tell.

Griff Borgeson



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