SUPERSONIC
NEW REALM OF BIG SPEED

Craig Breedlove Knocks On a Mysterious Door

BY JAMES JOSEPH

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HEADLINES HAVE a way of masking the facts, particularly when behind the news lurks sobering second thought. It happened that way at Bonneville during the 1965 speed season.

Craig Breedlove's titanic 600.601-mph 2-way average in his new Spirit of America-Sonic I had, in a single stroke, seemingly catapulted Big Speed to within a bare 80 mph of Mach I—sonic speed on land, which at Bonneville's altitude (4240 ft.) lies between 680 mph and 750 mph, depending on air temperature, humidity and atmospheric pressure.

But had it? Had Craig's great go and the not-so-far-behind 576.553-mph performance of Art Arfons in his Green Monster really carried Big Speed and its breakneck practitioners to the brink of the "barrier": Sonic speed?

Judge the land speed duel to the summit in worldwide headlines and one would think so. Having come this far, to the "unassailable" 400-mph, 500-mph and now 600-mph barriers, conquered in the span of but three unprecedented seasons of speed, the remaining 80 to 150 mph would appear hardly more than foothills en route to the summit.

Yet the speed gap that remains may prove insurmountable and even tragic.

From here on, to and through the barrier, if in fact it proves to be that, LSR seekers are dealing in unknowns.

As one Bonneville old salt, his face as somber as his words, puts it, "These next 100 mph are the ultimate . . . the black abyss . . . the far outer space of Big Speed."

Premonition, in fact, hung heavily over the Flats during the 1965 season, and well it might. For both Craig and Art came as close to sudden death, all within the space of 19 days, as the laws of averages and luck allow.

Craig's moment of truth came unexpectedly on Oct. 19, 1965, when, midway through the mile-apart timing lights, Sonic I, edging the 600-mph mark, got all but airborne. As the 4-ton car's front wheels reared off the salt, Craig chopped his power, popped his chutes and hung on. The car, virtually out of control, veered 1000 ft. off the course, ran outside the second timer light and miraculously stayed upright as Breedlove wrestled it to a stop.

"Flight," the natural aptitude of super-speed cars to fly, is but one among many hidden dangers, few of them really calculable and almost none of them detectable in wind tunnel testing, which face drivers as they edge ever closer to Mach I. And no one knows these dangers better than Breedlove.

"Speed like that," Craig was later to say, "is unforgiving. Once over the 500-mph mark, it's seldom the crash that kills, but G forces. Deceleration forces in a spin or roll are quite enough, in themselves, to rupture blood vessels and cause almost instant death."

G force represents a new and tangible land-speed hazard as speeds edge upward. No longer is it simply the crash that kills. Recognizing the near futility of crash-proofing the driver's body (as the contoured cockpit of his first Spirit had been designed to do), Craig abandoned, in his new Sonic I, even the pretense of 100% body-contact protection. It simply didn't warrant the effort when herculean G forces can squeeze the blood and life from a man.

Tire failure, certainly the second most feared man-trap on the summit road, nearly took Art Arfons out of the running (and, as narrowly, out of this world) on the second of two record breaking runs on Nov. 7, a bare few weeks after Breedlove had managed to cancel his flight to oblivion.

Art's near miss occurred, predictably, on a north-to-south run. Oddly, there never has been a serious accident or death on an opposite direction, south-to-north, Big Speed sprint.

It happened as Arfons thundered the Monster through the clocks at a blistering 577.386 mph and, with a last blast from his afterburner, saw the air speed indicator nudge 620 mph. As it did, the right rear exploded like a time bomb.

The tire detonation, echoing across the Flats, shattered the wheel, bent axle and frame, and tore out a hunk of Monster's *derriere*. Art fought for control as the car ran wild, hitting an off-course marker post which shredded a second tire (the right front) and cracked the Monster's fiberglass inlet air duct. In averting death, Art, if nothing more, proved a point: Even on the fringes of sonic speed a car can be turned. He had often wondered whether the Monster would respond to the wheel at high speed. Now he turned the machine back to the course. Simultaneously he popped both his chute (to stop) and his canopy (to rid the cockpit of blinding smoke from the burning tire). Like a sputtering Roman candle, the Monster came to rest not far short of the same brackish ditch which had drowned Breedlove's first Spirit and nearly Craig himself in October 1964.

Afterward, news pictures and TV film clips, flashed around the world, portrayed Arfons, as victorious and jovial, having set a new land speed record, 576.553 mph. He rode in triumph before the cameras on the shoulders of his elated crew, the public face of a Big Speed champion in his moment of achievement.

But this *CAR LIFE* reporter, at course's end when Art ground to a stop after that tire bomb exploded, witnessed a far more sober Arfons. For a long moment he sat there, stunned, beneath the shattered cockpit canopy, a man obviously deep in shock. It had been a close one and Art's face showed it. Visibly unnerved, he allowed himself to be helped from the cockpit.

Silently, in tension that was electric, crewman Charlie Mayenschein, who had helped design the Monster, walked the badly shaken Arfons around the salt, trying to wring the shock out of him. As cool a character and veteran a performer as Art is, it didn't take him long, no more than a few minutes, to regain his nerve and to put out of mind, if only for the moment, his closest brush with death.

Five minutes later, when photographers and TV reporters arrived, Art was his former self, grinning, and that was the portrait of triumph the world saw.

CAR LIFE's reporter, from his course-end position, had witnessed the grimmer side, perhaps the prophetic one, of the world's most savage speed duel: It was the portrait of a man etched in shock, who staggered, more than walked, away from death.

Thus, during the 1965 season, while competitors were still some 80 to 150 mph short of the barrier, two of sonic speed's long-anticipated dangers, tire failure and uncontrolled flight, came within a finger's snap of wiping out Big Speed's two greatest and nerviest challengers.

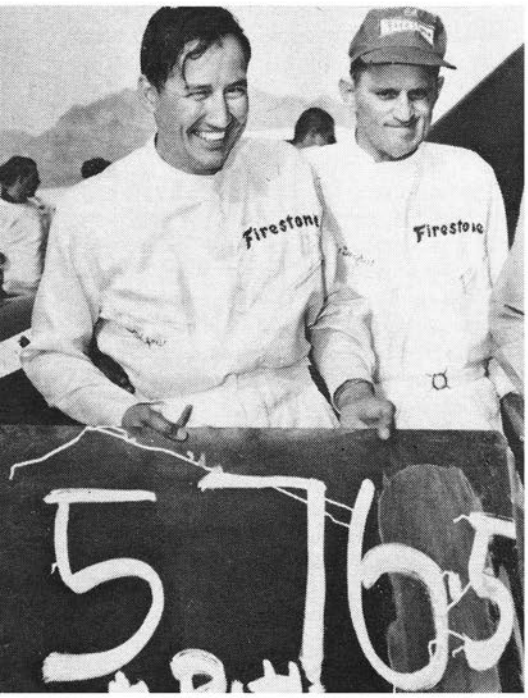
Bearing this in mind, one begins to understand why most experts look for no quick, certainly no easy, summit conquest. No less a Big Speed authority than Joe Petrali, USAC's chief Bonneville timer and the man who has clocked every major speed attempt on the Flats since 1956, told *CAR LIFE*, "I think sonic speed lies a long way ahead. In fact, I don't really expect, in my lifetime, to see a car reach the speed of sound on land."

Behind Petrali's judgment, made from the unexcelled vantage point of his timing trailer, standing only 1200 ft. back from the course, lurks the specter of an unspoken prediction: Someone is going to die before the summit is reached.

The contestants themselves, inured to premonition, are more concerned with the wherewithal of the chase.

ENGINE POWER is not the problem. Both Breedlove and Arfons, their cars nearly identically powered by J-79 15,000-lb. thrust jet engines (about 17,500 lb. of thrust with afterburners), now pack all the power needed to carry a car not only to, but well beyond, the sonic barrier. ▶

SUPERSONIC



ARFONS went from spin to grin, setting a soon-beaten record.

Breedlove has estimated his Sonic I's ultimate speed at 800 mph plus, more than enough to reach Mach I's nominal 720 mph. Arfons, as early as last year, when he first brought the Green Monster to Bonneville, his J-79 then the heftiest powerplant ever installed in a car, estimated that Monster had raw power enough to go supersonic any day.

Neither, to date, has dared use more than partial thrust. Art, for one, chockblocks his foot throttle to prevent anything so rash as a full-thrust go. Art hit his estimated 620 mph last year on what he called "half power," actually on 12,000 lb. of thrust, with fully 5000 lb. still in reserve.

"I'm no hero," he confessed bluntly, after his 576-mph go. "Things begin to happen at about 620 mph, because that's when parts come under near-sonic stress," he added soberly.

All of which sums up the stark realities of the second thoughts hanging over Bonneville: Were it merely a matter of power, both Craig and Art would by now have been to the barrier.

Much more is involved, including some grim and calculated questions. Not even the experts can answer them all:

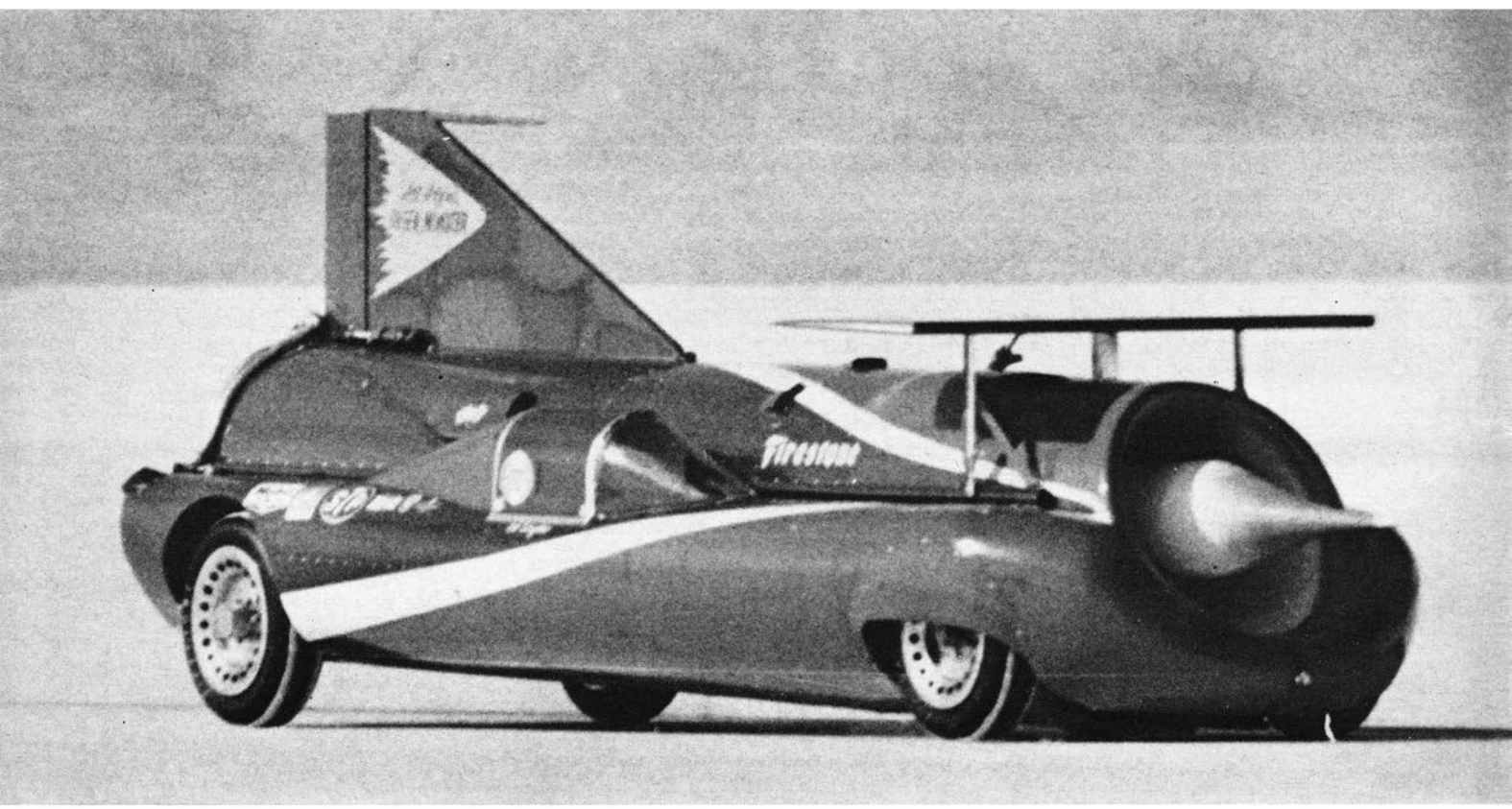
Will air itself prove a veritable stone wall to supersonic cars?

No, say aerodynamic experts, so long as sonic cars, like supersonic airplanes, are designed to knife through the air barrier.

"Air," explains one aerodynamicist, "is really a fluid. Warned that something's coming—a car, let's say—it parts, letting the vehicle through. What warns air of a vehicle's approach at subsonic speeds are compression waves. They travel out ahead of the car at the speed of sound, telling those air molecules to move aside. But once running supersonic, the vehicle literally outruns its own warning waves. The air just ahead isn't forewarned. So it doesn't part to let the car through. The car has to be designed to ram through—like a missile."

Breedlove's new quarter-million-dollar Sonic I, the first Big Speed car ever designed specifically for supersonic speeds, is built to behave like a missile, though in appearance it doesn't faintly resemble one. More correctly, the 34-ft. 7-in., long fuselage, with a 202-in. wheelbase and a height of only 4 ft. 10 in., from the top of the air duct (though its tailfin stands 10.5 ft. high), resembles a squat beetle with a long proboscis.

GREEN MONSTER was fitted with a negative lift wing to prevent flight during 1965 runs at Bonneville. Tire failure, a result of heavy torque loading at the right rear wheel, halted Art Arfons' assault on the Mach I barrier.



In design, Sonic I may, as its engineers claim, be up to the Mach I assault. Structurally, however, there seems reason for doubt. On one of its near-600-mph runs during the 1965 season, wind dented some of the car's aluminum body panels. At higher speed, Sonic I conceivably might have been all but stripped of its skin.

Arfons, apparently once confident that the simple addition of a sonic nose probe might be enough to take Green Monster to the barrier, seems to have some sober second thoughts, likely reinforced by his 1965 close call. By run time 1966, Art hopes to put on the Salt a second-generation Monster, a true sonic-era car.

Can shock waves flip a car?

Here, the experts seem sharply divided.

Bernard M. Pershing, a top aerospace engineer and an early consultant to Craig Breedlove, shrugs off the idea as improbable.

"Sure, there'll be shock waves," he concedes. "Every vehicle at supersonic speed creates a continuous shock wave much like a boat's wake. But at the Mach I land speeds, those pressure waves simply haven't the power to bowl over much of anything, certainly not a car weighing four tons or more."

But a top sonic boom researcher disagrees.

"We're dealing here," he gestures gravely, "with something new—shock waves created by a car traveling only a few inches above the ground—not 30,000 ft. in the air, as most airplanes are when they go supersonic."

A plane's shock waves are dissipated in thin air. Before they can reach earth, much less do damage, they must travel through thousands of feet, even miles, of air. The air robs them of their strength.

"But," points out this expert, "when there are only a bare few inches of air between a car and the ground, pressure waves aren't dissipated. In fact, they're reflected and even strengthened. Under the worst conditions, they may be multiplied 2-3 times their original strength. And there it is: A super-powered fist of air, jabbing upward beneath the chassis. Air as powerful as that might easily lift and flip a car."

A recent freak shock wave accident, caused when an Air Force F-104 at an altitude of only 500 ft. went supersonic, underscores this expert's concern.

Instruments showed the pressure of the boom's blast force to be a shattering 40 psi (highest ever measured). Shock waves from a sonic car inches, not feet, off the ground might conceivably be 4-6 times more powerful. Or, as much as 240 pounds of pressure per square inch.

This expert sums up grimly, "You don't have to be a math whiz to figure the effect of a wallop like that on a supersonic car."

Even a booming 40 psi pressure wave, exerting its force across Sonic I's underside, could possibly lift the 8000-lb. car off the salt with ease. Twice the pressure might hurl it high into the air.

Breedlove's experts, among them Lockheed sonic research specialist Walt Sheehan, admittedly devised Sonic I's slight "Coke-bottle" shape not only to offset possible sonic wave lift, but to damp so-called local sonic flows, the latent instability caused by shifting the center of pressure when one area of the car becomes sonic while another, adjacent, may still be subsonic.

Sheehan, for one, discounts as negligible the lift inherent in ground reflected sonic waves. But in the next breath he concedes, as must any researcher, that at near-barrier land speeds nobody can say exactly what will happen or how sonic waves, whether local flow or true booms, may behave.

Can tires be built to stand up to supersonic speed?

Less than a year ago insiders at both Goodyear and Firestone, which are as competitively locked in the race to the barrier as the drivers they sponsor, were likely to say, "No," and mean it.

For in fabricating tires to travel 550-600 mph (as they had for Breedlove and the Arfonses, Art and his brother Walt), tire engineers had seemingly run out of materials, mainly super-strength synthetics able to withstand the loads, which even at 550 mph, subjected tires to about 10,000 times the force of gravity.

In the 1965 season, at least, Goodyear proved it could put together a tire which would stay together at the top speed Breedlove dared, or cared, to go.

The performance of Craig's slicks, 8.00-25s on 25-in. diameter forged aluminum wheels on the front, 8.00-39s on similarly forged 39-in. wheels on the rear, was superb. Dynamometer tested to 850 mph and nitrogen inflated to 250 psi, the "kiss of rubber" treaded slicks, with a 5.5 in. wide footprint, breezed to speeds well above 600 mph.

There is little doubt that Craig's justifiable confidence in Goodyear's good work spurred him to try a last desperate go on Nov. 15 after Arfons had snatched back the world mark. Craig blazed to his great 600.601-mph average with all tire treads intact, though on the fastest leg he clocked 608 mph and at times nudged 620 mph.

There is no doubt, either, that Art's failure to track back after his lost record stemmed from the fact that Firestone has not yet come up with a tire that won't blow when Art goes. Art might well have rushed repairs on Green Monster, but he could hardly hope to best Breedlove's 600-mph average on bare wheels. Two seasons have shown that bare aluminum might be safer than what Firestone has up to now managed to put together. On three occasions, twice in 1964 and once this season, Art exceeded 600 mph. Each time a tire blew.

Obviously embarrassed for his sponsor, Art has steadfastly blamed his car, not Firestone. At fault, laments Art, is Green Monster's "peculiar characteristic," meaning that torque reaction to the rotation of its jet engine turbine wheels puts a tremendous load on the right rear tire. Each time it has been the right rear that has blown.

Less embarrassed apparently is Firestone which, immediately after Art's record run and blowout, took a full-page ad in the *Wall Street Journal* to proclaim how Art had up and done it again on his trusty Firestones.

One Bonneville wag was unkind enough to suggest that Firestone might have found better use for its money—such as hiring away one of Breedlove's Goodyear tire engineers.

To date, at least, Goodyear's efforts substantiate its engineers claims that, indeed, a tire can be built to supersonic specifications.

Can a car be controlled through the barrier?

Jet pilots slipping from subsonic to sonic speed often momentarily lose control, but only for a split second. On land even that might be fatal.

"Transitional control," admits a sonic expert, "is one of the Xs in the land speed equation."

Breedlove, who approaches Big Speed with a scientist's fervor, has almost given up any illusion that wind tunnel testing will provide any go or no-go answers to the control-through-the-barrier question.

If his 600+ mph record breaker is indicative, his two runs were all but flawlessly perfect, the engineers have apparently controlled local sonic flows which some had feared might cause the car to yaw or roll.

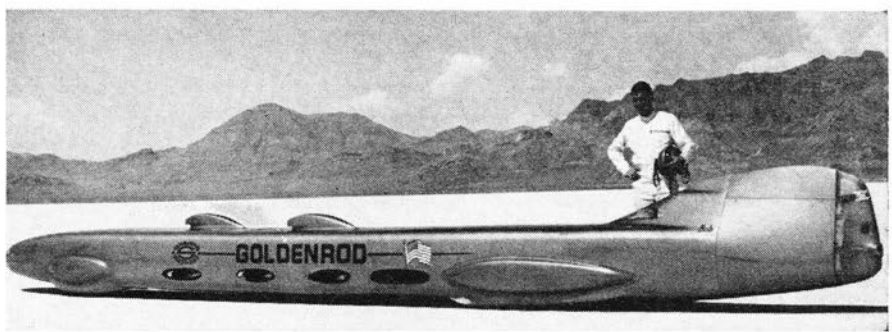
Development of negative lift, that fine balance of sonic flows and shock waves to prevent the car from flying, could obviously stand some improvement, as Craig rather quickly discovered on his first 600-mph run which narrowly missed becoming a flight. Breedlove succeeded in 1965 by adding airfoils, really miniature negatively angled wings, to Sonic I's front end. Whether they will be sufficient as speeds push toward 700 mph is a big and serious question. ▶

SUPERSONIC

WILLIAM A. MOORE

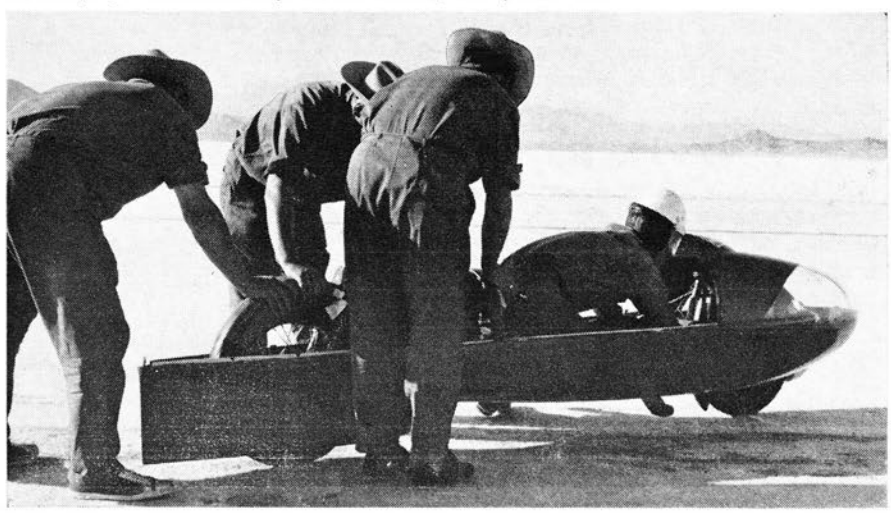
325.85 MPH, the world record for single-engined, wheel-driven cars, was set by the 460-cu. in. Chrysler-powered Herda-Knapp streamliner.

TWIN TRIUMPH motorcycle engines powered the "Gyronaut" on a one-way run of 190.4 mph, but the machine was unable to record the required return.



LSR RECORD holder for wheel-driven cars is the "Goldenrod," pushed to 409.277 mph by driver and co-builder Bob Summers of Ontario, Calif.

THE 50-CC Kreidler, ridden by Rudolf Kunz, set new records of 130 mph for the flying mile and 73.95 mph for the standing-start quarter-mile.



Arfons' Green Monster, its design far less scientifically pampered than Breedlove's, is a remarkably stable and controlled animal of speed. Much of that stability can be credited to the 6-ft. long, 30-in. wide hydraulically actuated "wing" which, poised over Monster's nose, maintains ever-increasing "negative lift," thus the same relative weight on the nose (to keep it from lifting) the faster the car goes. To keep Sonic I on the ground, Craig unblushingly borrowed Art's "negative wing" for 1965, both in principle and practice.

Still, no one can be sure whether the 620 mph "good enough" control will, at 720 mph, be good enough at all.

Finally, can any braking device really stop a supersonic car?

The answer: Beefed up parachutes of the type now used to brake space capsules in their fiery 4000-mph reentry of atmosphere can chop a car's speed from 750 mph to perhaps 200 mph, where aircraft-type disc brakes, cooled perhaps by supercold liquid nitrogen can take hold.

Breedlove, with the 1964 brakeless 300-mph plunge into a Bonneville ditch still fresh in mind, equipped Sonic I with the same 8-ft. diameter drag chutes, only much stronger. Even so, his main chute malfunctioned on one high-speed run during the 1965 season, forcing him to pop his emergency chute.

At near-sonic speed, however, a new breed of chute, "reefed" so that only a portion of the canopy is hammered by the tremendous opening shock, may be needed. Reefed against initial shock, the chute once partially opened, blooms to full diameter and full braking force. Another obvious advantage of the reefed chute is that it blunts the impact of deceleration, thus G forces on car and driver.

Eventually, Big Speeders may backstop chutes and disc brakes with small retro-rockets or rig their engines with aircraft-type thrust reversers.

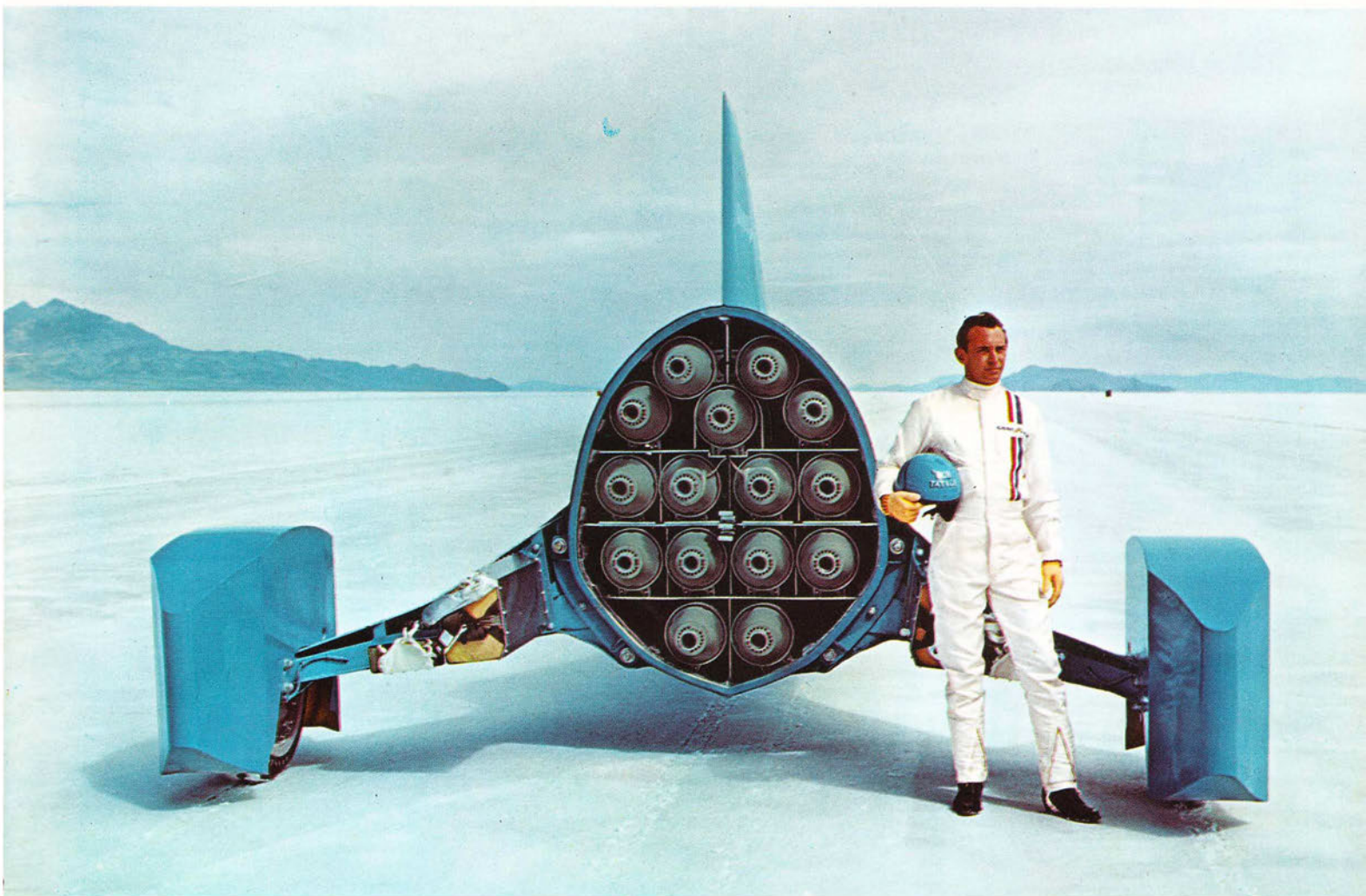
WHILE THERE's no doubt that the stop can kill (and less doubt that not stopping can kill even more quickly), the 1965 season, unlike the 1964 series, was marked by no big crises in braking. Beefed-up chutes seem to hold promise of stopping a car as effectively at 720 mph as, in 1965, they got them stopped from 620 mph.

Remaining, of course, is Big Speed's most tantalizing question—can man crack the sonic barrier on land and survive?

The question, grimly debated at Bonneville, is summed up by a sonic expert: "We won't have the answer to that one until the first car busts through the barrier. Then, we'll know pretty quick." ■

WILLIAM A. MOORE PHOTOS

CRAIG BREEDLOVE'S latest jet was built in only 10 months, performed surprisingly well for such a new design. Four wheels support this one and a huge turbo-jet engine propels it. Vertical fin only stabilizes the car, is not used for steering.



ROCKET CAR built by Walt Arfons was driven by Bob Tatroe (above) on its few spectacular charges across the salt flats (below). Preliminary runs with 15 rockets weren't fast enough so more were added later.

WAYNE THOMS PHOTOS