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# Vanagon

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The creation of  
a Volkswagen original.

The behind-the-scenes story  
of the creation of a completely new  
van-wagon by the company  
that pioneered the  
economy transportation concept  
over 30 years ago.

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# A Volkswagen original for the '80s.

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There has never been a “me too” VW. From the Beetle, the original original, to the current generation of VW models.

In fact, since 1974 Volkswagen created and introduced one original after another to replace every VW model marketed in the United States except for the Bus.

This book is the story of how Volkswagen engineers and designers created and built Vanagon, the most recent Volkswagen original. More spacious. More comfortable. More drivable.

Volkswagen's completely new Vanagon and Vanagon Camper for the '80s carry over very little from the venerable Bus.

The proven 2-liter air cooled, fuel-injected engine is there, albeit further improved. The industry's first sliding side door has also been retained, but enlarged to accommodate a more spacious opening.

Most everything else is new.

The first VW Bus was introduced in 1950. Through thirty years of production, including a 1967 metamorphosis, the model ran up a production record of 5.5 million units.

That will be the act to follow.

To do the job, Volkswagen has invested well over a quarter of a billion dollars in developing Vanagon and putting it into production.

That the money was well spent becomes obvious as one gets to know Vanagon. The completely new seven-to-nine-passenger original for the '80s.

# A Volkswagen original takes shape.

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Volkswagen management knew what was needed. The consumers' message was clear.

Buyers had demonstrated their desire for a spacious seven-to-nine-seater vehicle. Vans do provide the space and room the active American family needs. In the areas of ride, economy, handling, and interior appointments, however, vans leave much to be desired.

True, large wagons did provide better ride and handling, with nearly adequate room—but because of poor fuel economy they have become a rare species.

The requirements for VW's van-wagon for the '80s were easy to see, though not simple to achieve: More space and greater fuel efficiency than some of the large station wagons. Better handling, greater comfort, and better finish than a Van. In essence, the best of a van combined with the best of a wagon!

## Selecting the drive train.

Before Vanagon's designers and engineers committed their first sketches to paper, they considered a dozen different vehicle concepts. These included front engine/front wheel drive, front engine/rear wheel drive, rear engine/rear wheel drive and a variety of engine locations in between.

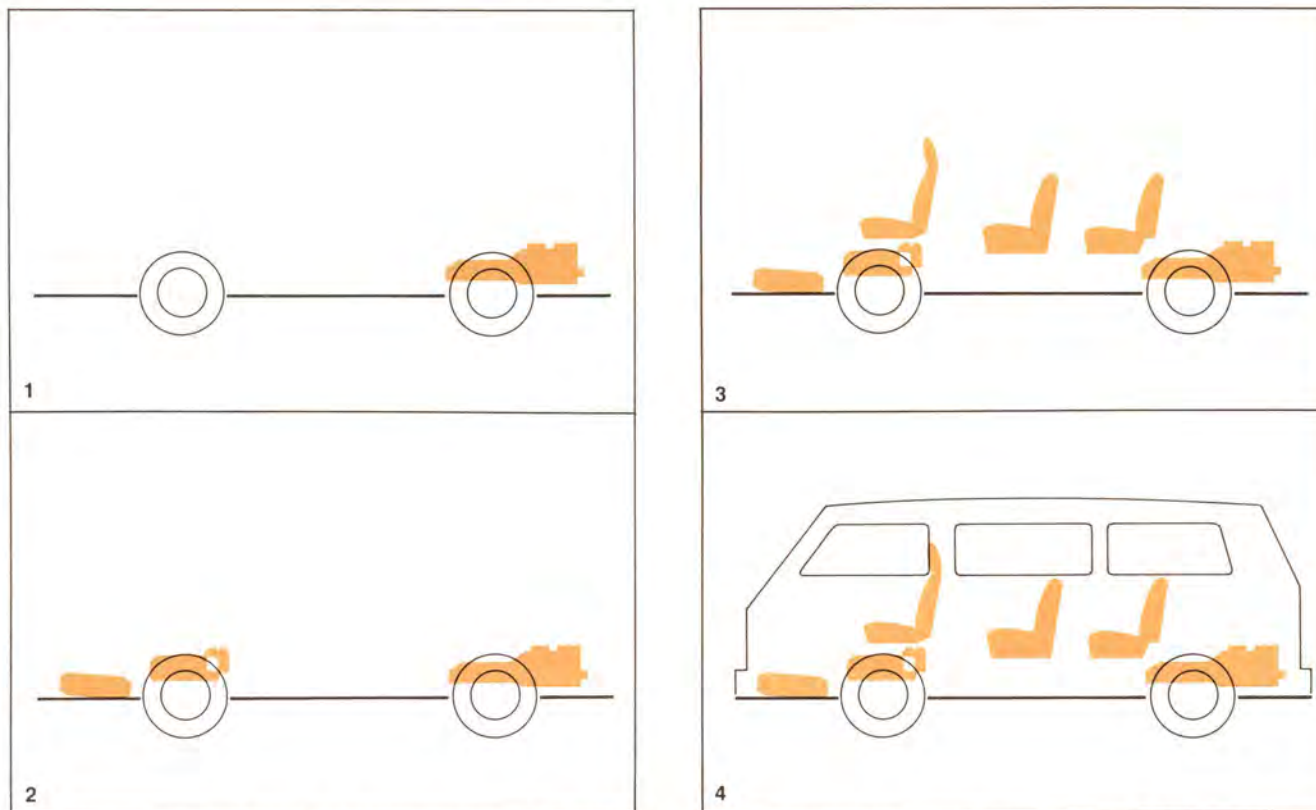
These were ranked according to 52 criteria. From performance and space utilization, to comfort, economy, and versatility.

The decision not to opt for front engine/front wheel drive, the configuration used in all other new generation VWs, was based on painstaking value analysis. Conventional front engine layouts produced clearly less favorable results for this type of vehicle. Conversely, the decision to remain with rear engine/rear wheel drive was in no way a simple adherence to the tried and trusted. In fact, the closest competition came from two modified rear engine designs.

Here are some of the key telling advantages that led to the selection of the Vanagon layout.

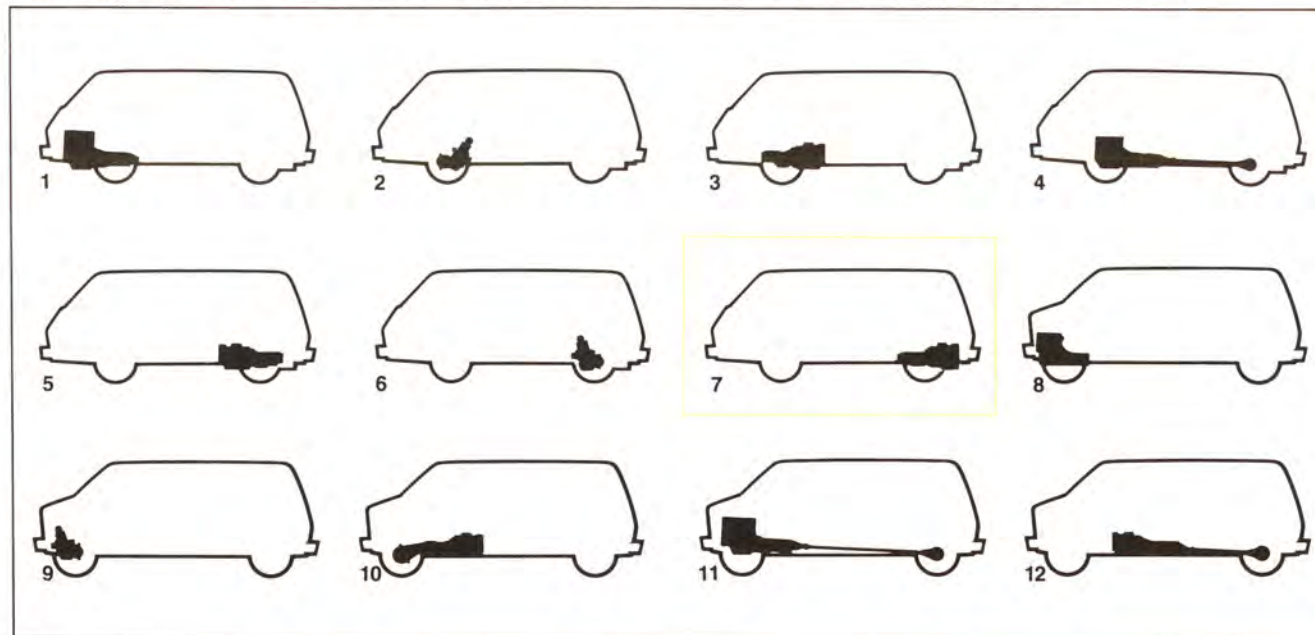
*Fully 68% of the road space occupied by Vanagon is usable interior space. This compares favorably with the 56% available with conventional short-hooded, front engine/rear drive layouts favored by domestic makers.*

(continued on page 4)



After deciding to put the engine and transmission in back (1), Volkswagen engineers designed the Vanagon so that, at half payload for instance, it provides optimal 50/50 front to rear weight distribution (2). Seats and controls were ergonomically located (3) to minimize driver and passenger fatigue. The body shell (4) had to be both pleasing to the eye, as well as aerodynamically correct. Despite Vanagon's wider frontal area, the drag coefficient has been reduced to a mere 0.44.

Vanagon's designers and engineers investigated a total of twelve design configurations, and drive train concepts, including front engine/front wheel drive, front engine/rear wheel drive, rear engine/rear wheel drive, and numerous variations of these. Painstaking value analysis, based on a total of 52 criteria, provided the basis for selection of No. 7, rear engine/rear wheel drive.



At half payload, for instance, Vanagon provides optimal 50/50 front to rear weight distribution.

*Vanagon is at a distinct advantage compared with front engine / front or rear drive vans when climbing hills and in difficult terrain, such as slippery, muddy or snow-covered roads, because Vanagon's engine / transmission add weight over the driven rear wheels, enhancing traction.*

*In Vanagon, passengers ride fully relaxed in the comfort-zone between the front and rear axles.*

### **A suspension worthy of a sedan.**

With the drive train configuration decided upon, Volkswagen's designer team turned its attention to the suspension and chassis. Here the goal was to achieve drivability and handling beyond that of any comparable vehicle.

A measure of their success is Vanagon's capability of registering 0.70 lateral g forces on the skid pad. This figure compares favorably with many passenger sedans. Prospects coming to Vanagon from both domestic vans and station wagons will be impressed with the vehicle's responsiveness, maneuverability, ride and easy handling.

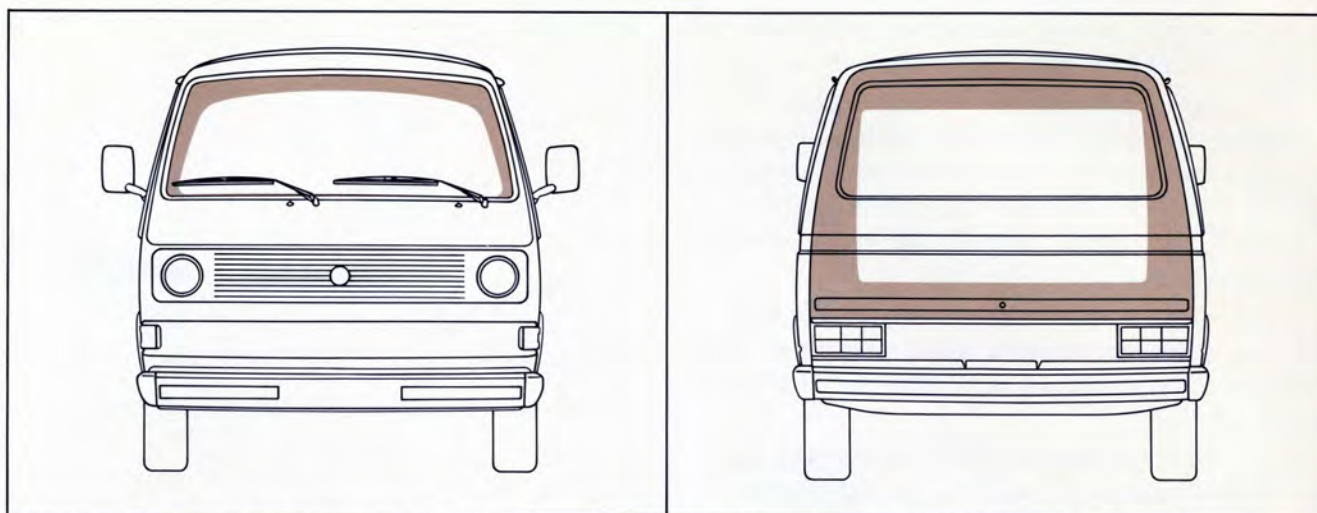
This is achieved, in part, through the use of a completely new suspension system. Unequal length control arms, progressive coil springs, telescopic shock absorbers, and an anti-roll bar control the front wheels.

In the rear, semi-trailing arms in combination with progressive coil springs and double acting hydraulic shock absorbers make up the independent wheel suspension. Indeed, looking at Vanagon's suspension system, both the expert and enthusiast are equally impressed by the sophistication and effectiveness.

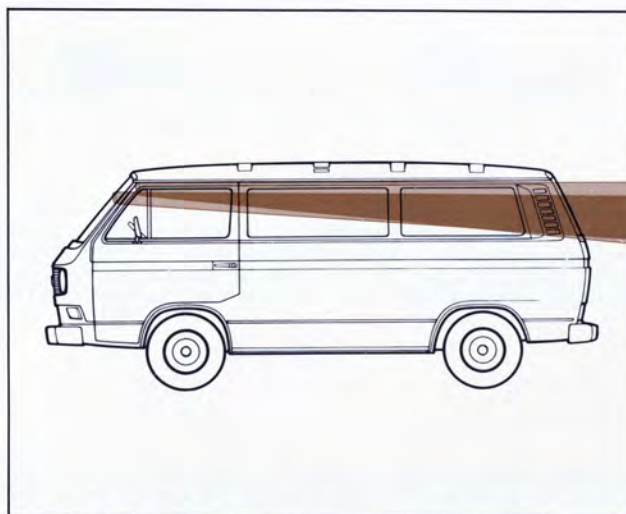
To make Vanagon as responsive as possible, a unique rack and pinion steering system has been developed.

The turning radius, wall to wall, has been shortened to 34.5 feet, not much more than that of a Rabbit. And the combination of a wider stance and longer wheelbase makes Vanagon's ride more like that of a large sedan than that of a van or wagon.

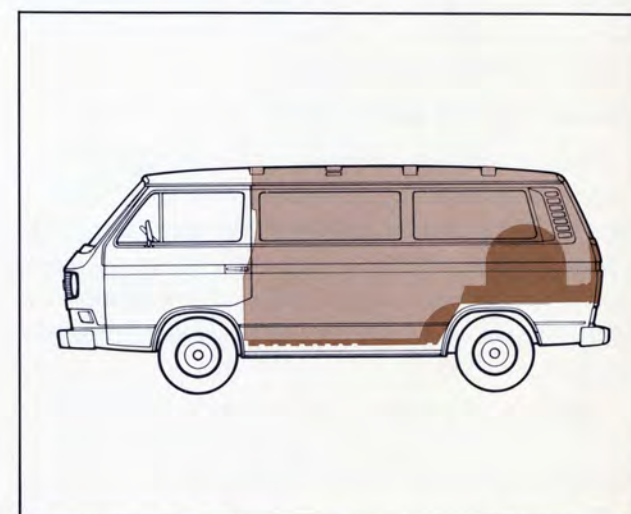
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Total glass area in the Vanagon is 22% larger than in the old VW Bus. The spacious rear hatch opening is 75% larger.



The 50% larger rear window provides a full view of the road behind.



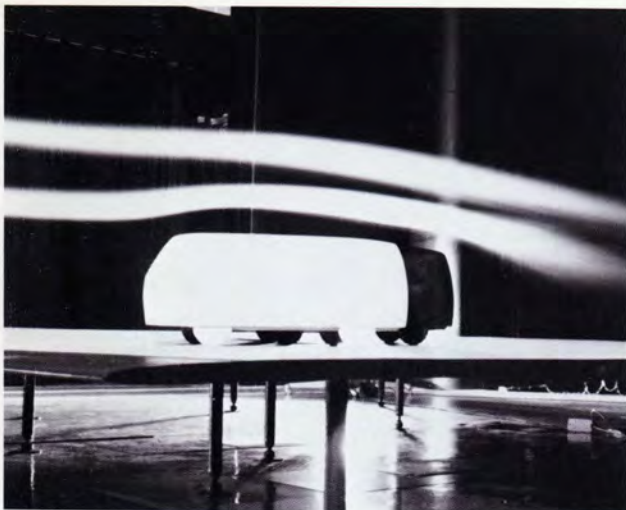
By lowering the floor and engine compartment, interior capacity has been increased by 40%.



Steering wheel angle, pedal height and seating were ergonomically designed to suit about 95% of the population.



An advanced holographic technique was used to measure stress and deformation. Shown here is Vanagon's transverse linkage.



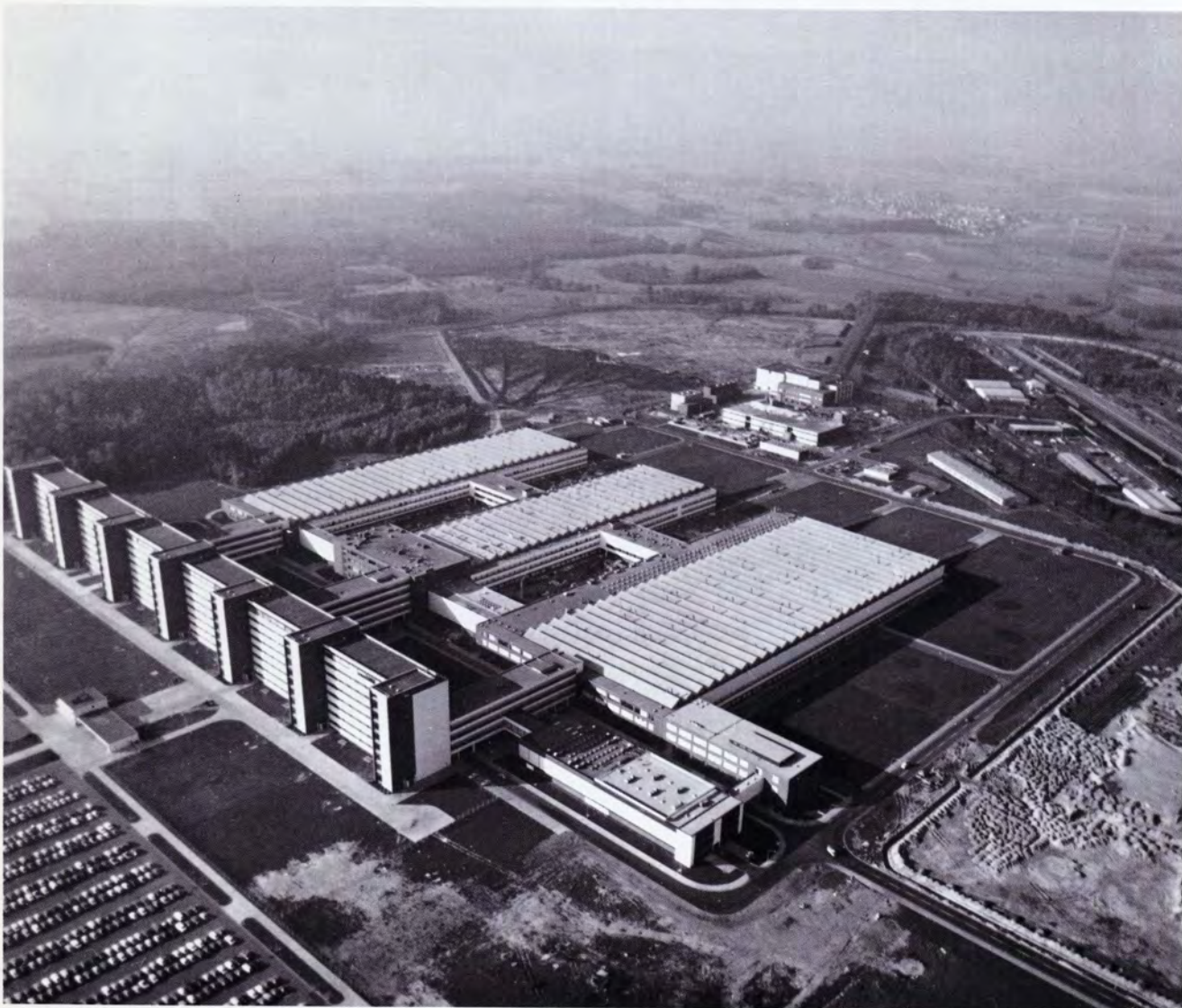
Mock-ups were tested in VW's massive climatic wind tunnel at Wolfsburg.



Thousands of heat lamps in the wind tunnel heat the air stream to 113°F, simulating climatic conditions in desert areas.



Volkswagen's styling designers spent long hours refining Vanagon's functional body design to make it as attractive as possible.



The Volkswagen Research and Development center at Wolfsburg has a staff numbering over 3,500.



In the styling studio, Vanagon's designers at work on a life-size mock-up and a reduced size scale model.



In the styling studio, technicians check dimensions on the 1:1 full-scale model.

### The interior.

Volkswagen designers also re-examined the question of driver and passenger comfort in designing Vanagon's interior.

To help minimize driver fatigue, controls, instruments, and the driver's seat have been ergonomically positioned to suit about 95% of the population. In addition, seat controls are anatomically designed.

Vanagon's trim is on a par with that of fine European sedans. Good quality materials, finished with great care, are used throughout. The headliner is hand-fitted. Color schemes have been selected to create a relaxing air within the vehicle. For added visibility in all directions, and to enhance the Vanagon's light, appealing ambience, the glass area has been greatly increased.

For all-weather comfort, Vanagon's designers created an efficient flow-thru ventilation system, capable of changing the air in the front compartment every 18 seconds at highway speeds of 55 miles per hour.

The heating system is designed to raise the interior temperature to a comfortable 68°F in just 10 minutes from a cold start, even when outside temperatures are as low as 32°F.

Vanagon's designers created a vehicle that's right for the market. The lowered floor makes for easier entry and exit, and also serves to increase the amount of usable space. To add to the vehicle's utility, there are a wide side door and rear hatch. The trunk over the engine compartment measures a huge 49.7 cubic feet and with the rear bench folded, offers an unbelievable 92.9 cubic feet.

### A body designed by computer.

The Vanagon body shell was designed with the assistance of a computer, using graphic projections that provided a high degree of certainty even before the first models were built.

All design data were fed into a second computer that controls a driving simulator. This sophisticated test instrument provided first-hand experience of Vanagon's basic handling characteristics—even before the first prototypes were built.

*(continued on page 8)*



Vanagon's sound deadening insulation was put to the test in the acoustical chamber at the Wolfsburg Research and Development facility.



The wind tunnel's flow pattern demonstrates the Vanagon's aerodynamic structural soundness.

The Wolfsburg wind tunnel's 30-foot fan, with its ten huge adjustable blades, rotates at speeds up to 175 rpm.





Volkswagen test drivers put Vanagon through thousands of miles of testing at Ehra-Lessien, Volkswagen's massive all-weather proving ground.



On the track at Ehra-Lessien: Vanagon's near 50/50 axle load distribution provides consistent, predictable handling.





Through Vanagon's development, computer simulation saved both time and money.

Aerodynamic work was carried out in Europe's largest climatic wind tunnel, the massive VW installation at Wolfsburg.

After thousands of hours of testing, changing and testing again, Vanagon's drag coefficient was reduced to a mere 0.44. This figure compares favorably with much smaller vehicles, and is below that of conventional vans. It contributes considerably to Vanagon's fuel efficiency.

A frame-like base, welded to the floor of the monocoque steel body shell, gives Vanagon outstanding torsional stiffness. It also accounts for the noticeable absence of squeaks and rattles.

### Refining a Volkswagen original.

Like all new vehicles from Volkswagen, Vanagon had to prove itself by overcoming the incredible rigors of Ehra-Lessien before going into production.

Ehra-Lessien, Volkswagen's 11,000,000 square meter proving ground is among the most demanding in the world. And equally impressive are the computer-controlled testing and measuring facilities.

But a test track and computer can only tell part of the story. So Vanagon was driven during an entire winter in Sweden and in the summer heat of the Sahara desert to test its ability to perform and survive under a wide range of environmental conditions.

In sum, Vanagon has been thoroughly tested throughout every stage of development prior to going into production.

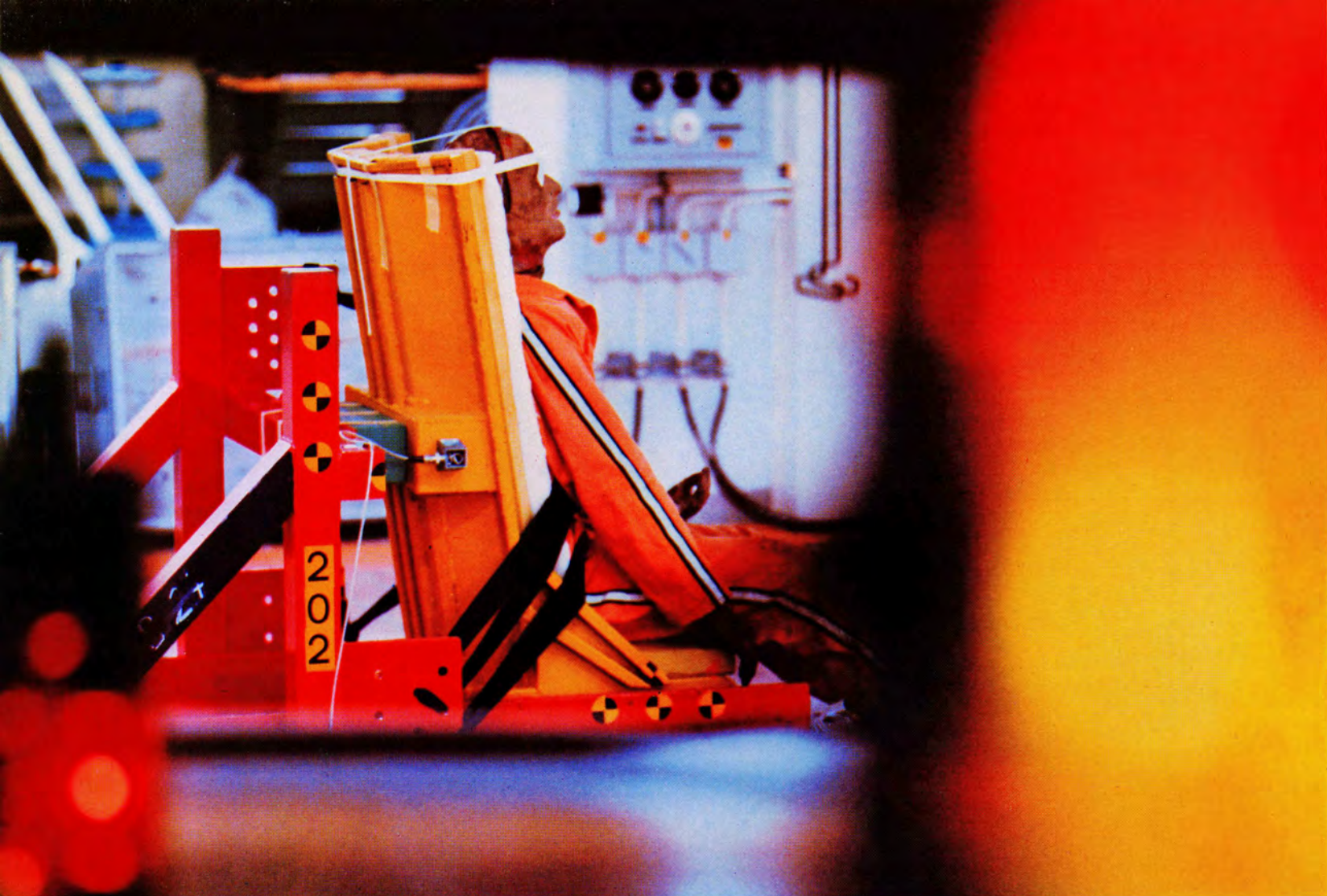


*(Right)* Vanagon prototype in Wolfsburg's wind tunnel chamber. Turning vanes in the wind tunnel redirect the wind flow through a nozzle that accelerates the stream to 112 mph.

*(Left)* Proven at Ehra-Lessien: Wider track, longer wheelbase and a well positioned center of gravity combine to give Vanagon cornering characteristics akin to some nimble sedans.



VORSICHT  
WIND



**(Left)** Crash dummies on a test sled were used to develop seat design and to test passive safety engineering of the Vanagon.



A Volkswagen engineer at work on the computer drafting machine used in designing the Vanagon body shell.



**(Left)** A dynamometer in the test bed of the climatic wind tunnel can reproduce all of the load conditions encountered in actual driving. Rolling and climbing resistance, as well as drag, are precisely regulated from the control room.

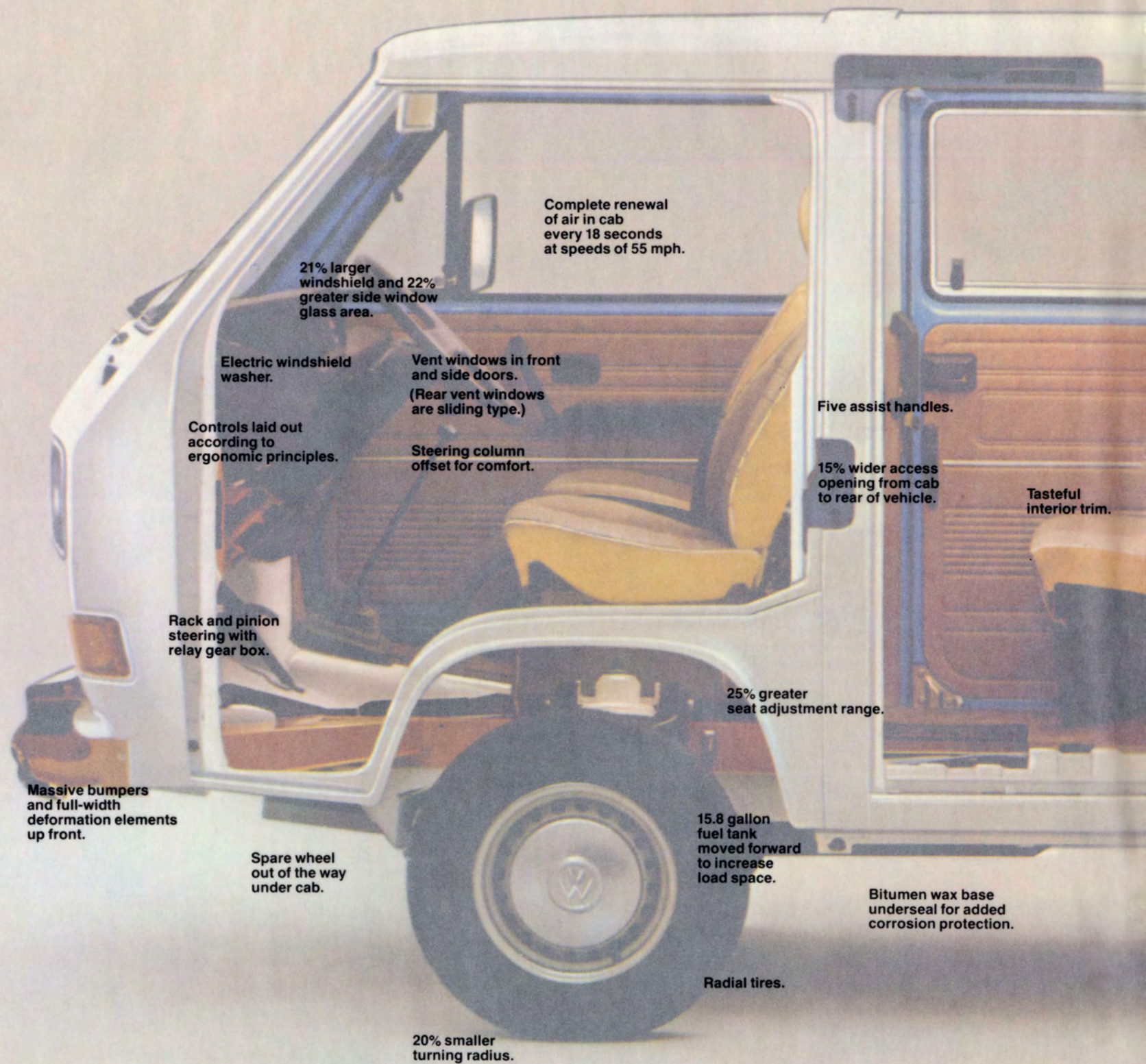


Resistance to aquaplaning is tested on a section of flooded roadway at Volkswagen's Ehra-Lessien proving ground.

A convoy arrives in the Sahara for testing Vanagon under actual conditions of severe heat. Vehicles were also driven through sub-Arctic conditions on Sweden's remote roadways.







Complete renewal  
of air in cab  
every 18 seconds  
at speeds of 55 mph.

21% larger  
windshield and 22%  
greater side window  
glass area.

Electric windshield  
washer.

Vent windows in front  
and side doors.  
(Rear vent windows  
are sliding type.)

Controls laid out  
according to  
ergonomic principles.

Steering column  
offset for comfort.

Five assist handles.

15% wider access  
opening from cab  
to rear of vehicle.

Tasteful  
interior trim.

Rack and pinion  
steering with  
relay gear box.

25% greater  
seat adjustment range.

Massive bumpers  
and full-width  
deformation elements  
up front.

15.8 gallon  
fuel tank  
moved forward  
to increase  
load space.

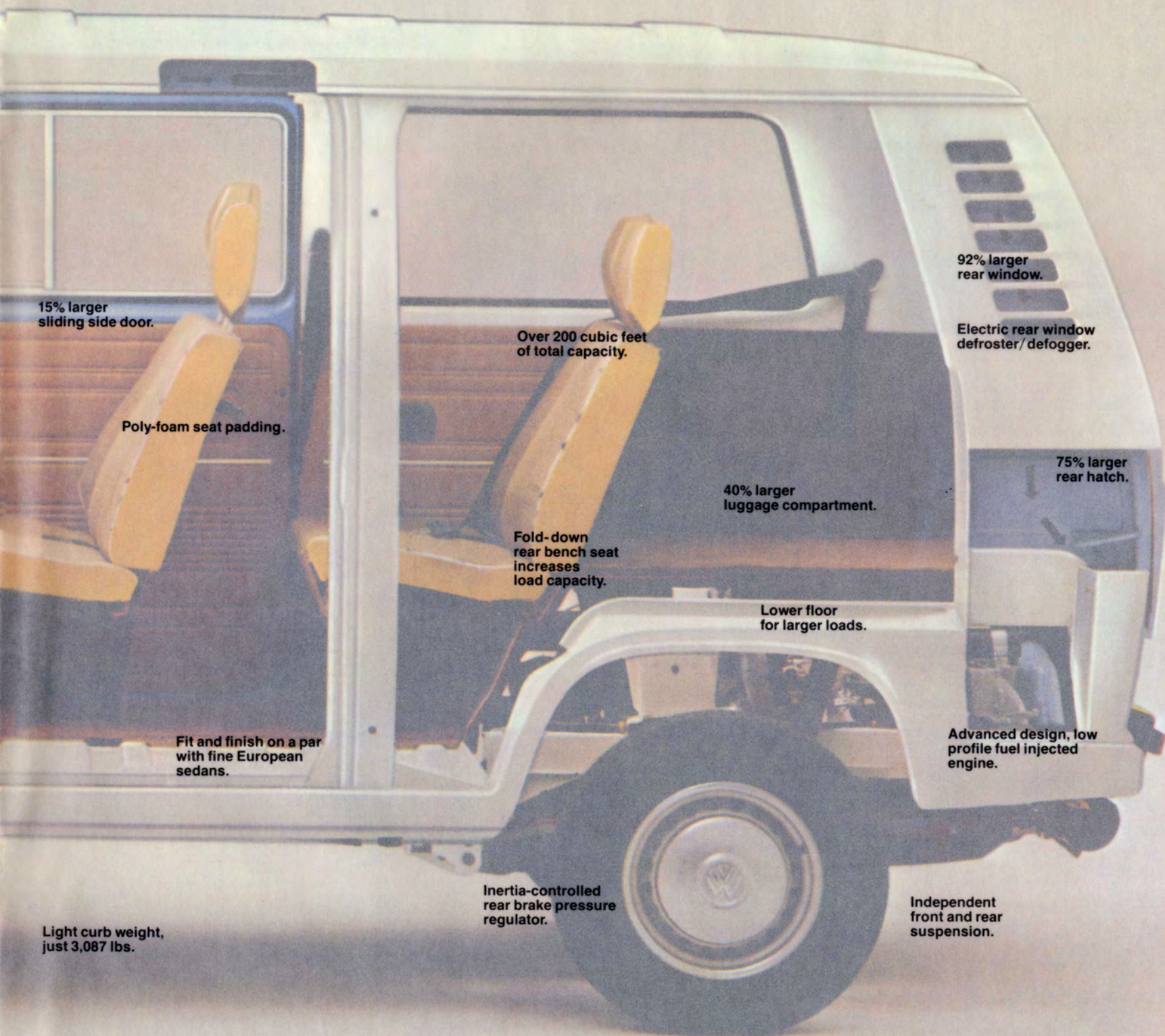
Spare wheel  
out of the way  
under cab.

Bitumen wax base  
underseal for added  
corrosion protection.

Radial tires.

20% smaller  
turning radius.





15% larger  
sliding side door.

Poly-foam seat padding.

Fit and finish on a par  
with fine European  
sedans.

Light curb weight,  
just 3,087 lbs.

Over 200 cubic feet  
of total capacity.

Fold-down  
rear bench seat  
increases  
load capacity.

Inertia-controlled  
rear brake pressure  
regulator.

40% larger  
luggage compartment.

Lower floor  
for larger loads.

92% larger  
rear window.

Electric rear window  
defroster/defogger.

75% larger  
rear hatch.

Advanced design, low  
profile fuel injected  
engine.

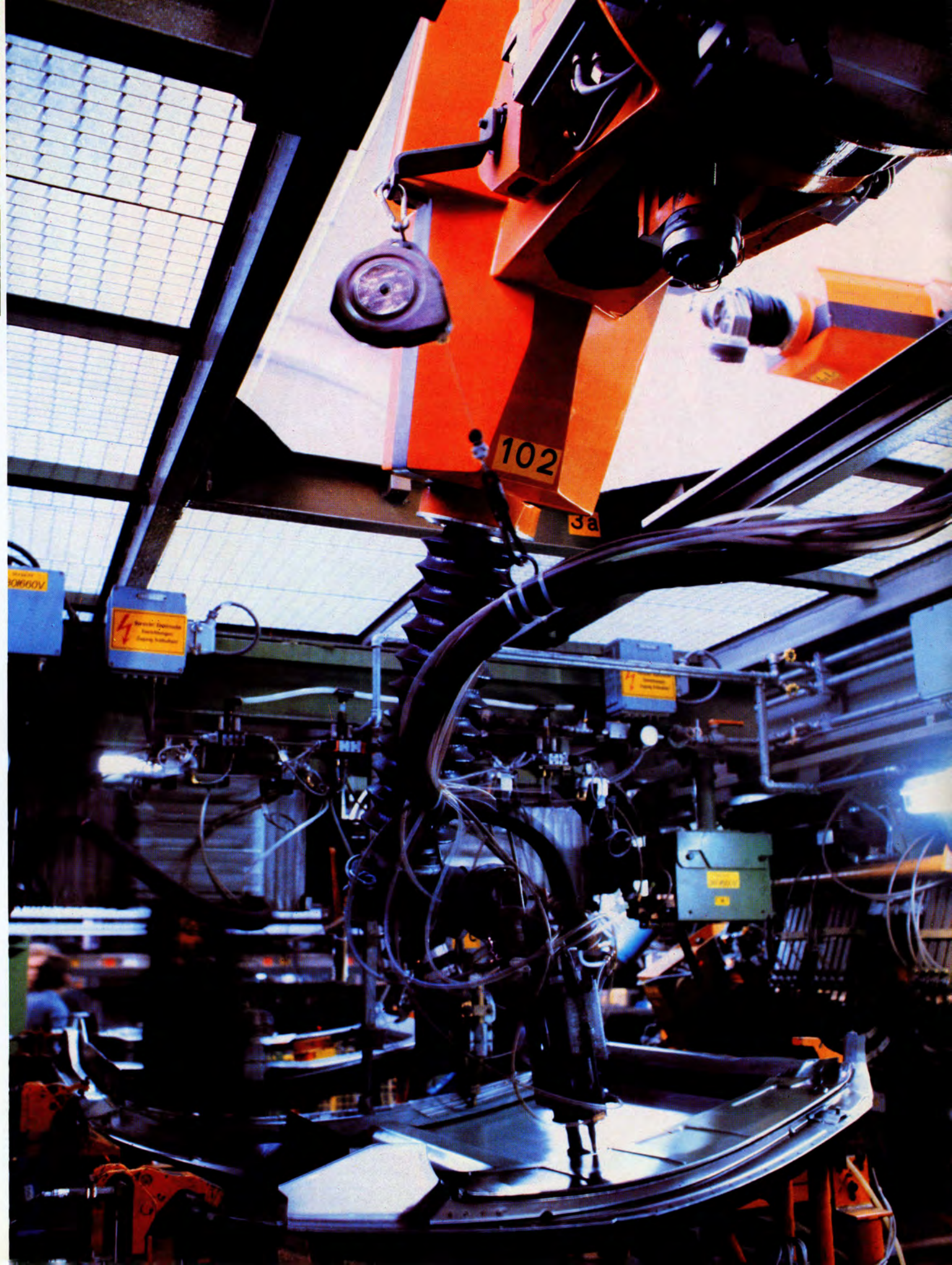
Independent  
front and rear  
suspension.

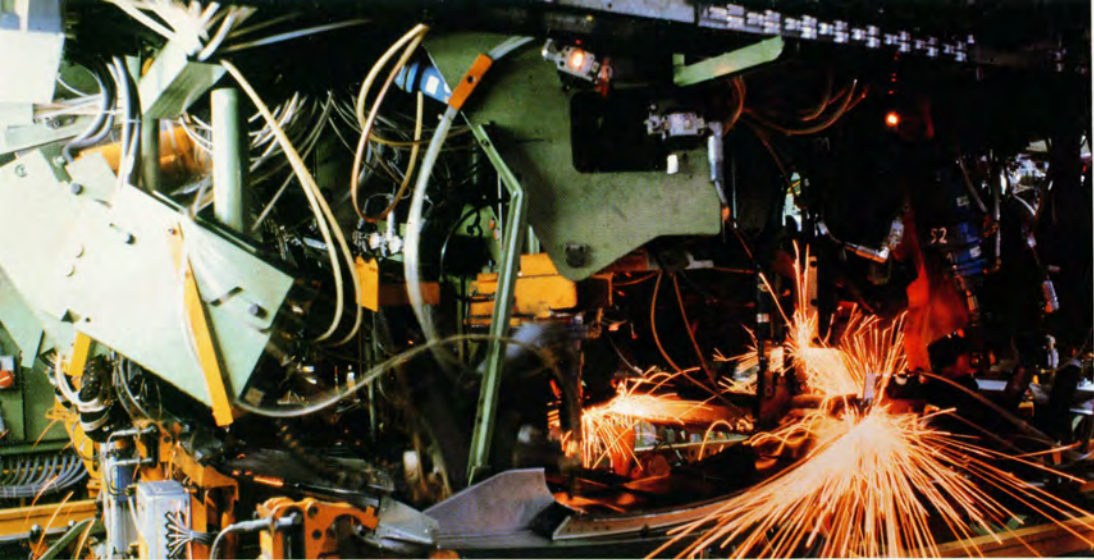




A robot assembly line at Volkswagen's Hannover plant. Computer programmed robot assembles a Vanagon body panel.

*(Right)* Close-up of Vanagon robot assembly line.





In a matter of seconds, robots accurately complete hundreds of pre-determined spot welds on the Vanagon body shell.



Hand welding and brazing completes assembly of Vanagon's body shell.



Inspectors checking the body shell finish before the vehicle enters the paint line.

Special vacuum devices draw off excess paint as workers spray the Vanagon body shell.



A paint inspector checks the finish of a Vanagon on the paint line.





*(Left, top)* Hand touch-up is used to correct minor flaws on the Vanagon's paint finish.

*(Left, bottom)* A special team checks wheel alignment on a nearly completed Vanagon.

*(Right, top to bottom)* A worker puts finishing touches on the interior trim.

Applying the Vanagon insignia on the back of a nearly finished vehicle.

Every Vanagon is run through a battery of tests on the dynamometer.

Finished Vanagons ready for shipment to the USA.



# Building a Volkswagen original.

State of the art technology is also part of Vanagon production.

Visitors to Volkswagen's Hannover plant are treated to an inside look at some of the most sophisticated and advanced automotive manufacturing techniques to be found anywhere in the world. Including industrial robots developed and built by Volkswagen.

Of the more than a quarter billion dollars invested by Volkswagen in the development of Vanagon, some \$21 million were spent on industrial robots for the Hannover plant.

Nicknamed "Robbies", these robots have taken over repetitive, often physically demanding operations.

Yet, much of the finishing and fitting is still done with human hands. It is the carefully orchestrated interplay between the precision of robots and the skill of the craftsman that guarantees a level of workmanship and finish in Vanagon that's hard to find in most other cars.

In addition to the 44 "Robbies" at the Hannover plant, there are also 14 large, high-capacity automatons nicknamed "Golies" after the biblical giant Goliath. These large robots are used to automate the Vanagon body assembly line.

## The building process begins.

A welding carousel begins the manufacturing process by turning out a Vanagon front end, complete with identification number that correlates with a specific order. Other welding carousels turn out the side panels and floor sections earmarked for this specific vehicle.

These subassemblies come together in a large fixture controlled by a process computer. Hydraulic and pneumatic power units carry out all holding, lifting, and clamping operations.

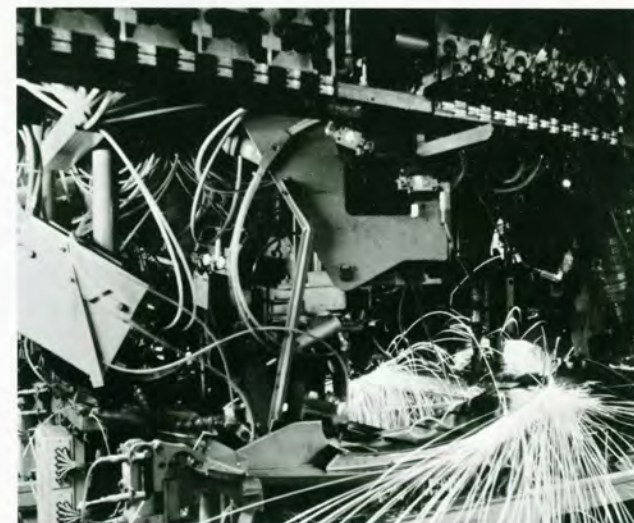
At the command of an electronic signal the welding begins. In a matter of seconds, hundreds of spot welds have been completed and the basic monocoque shell has been formed.

At the end of the line, a team of inspectors examines welds and fit. A random selection of bodies is checked on an alignment master gauge to measure the shell at carefully chosen points against the actual design drawings.

*(continued on page 18)*



The 44 computer-programmed "Robbies" at the Hannover plant have taken over many of the repetitive and physically demanding welding operations.



Hundreds of spot welds are completed automatically in a matter of seconds by VW's robots.



Hand welding and brazing further reinforces the Vanagon's body shell.

After the addition of doors and hatch cover, plus hand welding and brazing to further reinforce the shell, a team of body finishers takes over. Wearing thin gloves, this team of skilled workers searches for irregularities and makes the necessary corrections.

### Painting the Vanagon.

The body shell moves on to the paint shop where it receives a steaming hot detergent shower to remove grease, fine dirt and metal filings. From here it moves on to the phosphatizing unit where it receives a matte grey protective coating. This is followed by two thorough wash-downs and a final shower in water that has been desalinated to prevent even the tiniest crystalline residue from affecting the final coats of paint.

The initial painting is done by an electrocoating process in use for only a few years. The entire shell is dipped into a tank containing a solution of 10% paint, 90% water.

The paint is deposited on the body by an electric current. Tiny particles of paint are accelerated by the electric current and precipitated out of the thin dispersion into every cavity of the body to form a dense, homogeneous layer. This provides reliable protection against rust, and ensures that an even layer of paint is applied to even the remotest areas of the body shell.

After further finishing, the body shell is ready for final spray painting in its chosen color.

Skilled painters spray the interior first, along with other difficult to reach areas. As the conveyor moves along, the Vanagon breaks a photo-electric beam and the automatic spraying equipment begins its work. From here, the body moves through the drier tunnel and the final coat of paint is baked at a temperature of 140° C.

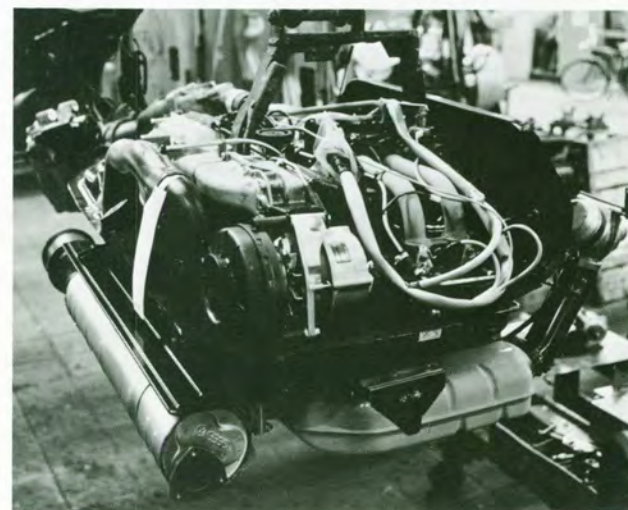
After final inspection, the finished body is ready to move on to the final assembly lines.



Hand spraying is still an important part of Vanagon's modernized paint line.



A worker masks the body prior to application of the second color of a two-color Vanagon.



The new flatter Vanagon "pancake" engine ready for installation.



A battery of tests including engine output and brakes are checked on the dynamometer.



Every Vanagon is given a final check on a lift after assembly has been completed.

### Final assembly.

Finished body shells, with all cavities sealed with a wax-based preservative to guard against corrosion, arrive at the final assembly line. Here they are transformed into finished Vanagons and semi-finished Vanagon Campers that will be shipped to Westfalia for final assembly.

During this process, a combination of automated equipment and skilled hand labor turns out vehicles complete with oil and fuel, ready to be driven off the end of the assembly line and to be taken through a wax spray booth.

The engine compartment is sprayed to resist corrosion, and an additional thick coat of bituminized wax is applied to the underside. This provides protection against flying stones and winter salts.

Completed Vanagons are now ready for shipment while Vanagon Campers, now only in a semi-finished state, will move on to Westfalia where camping gear will be installed.



Finished Vanagons ready for shipment to the U.S. from Volkswagen's Hannover assembly plant.

## A Volkswagen original becomes a camper.

Nearly thirty years ago, when Volkswagen decided to make its first camper, it was natural to turn to Westfalia-Werke to do the outfitting.

Widely known for its trailers, this century old firm made its first horse drawn carriage in 1876. And today, it is still owned and managed by members of the founding family.

A tradition of hand craftsmanship and quality still pervades everything the firm does. Paneling for Vanagon Camper is made in the firm's workshops, along with much of the trim and hardware used throughout the vehicle.

Basic Vanagons arrive at Westfalia with the front seats, dashboard and engine in place.

These skilled craftsmen transform it into a commodious camper.

As it moves down the assembly line, its flooring, electrical wiring and plumbing, paneling, cabinetry, kitchen equipment, and convertible sleepers are added.

At the final station, a VW quality control inspector carefully checks the entire unit. Only when he is satisfied will Volkswagen accept delivery of the vehicle.



Camper body shells from Hannover arrive on special cars at Wiedenbrück railroad siding.



Camper shell vehicles begin the trip through the Westfalia assembly line on their way to being turned into campers.



A worker attaching the famous pop-top roof.



Sound proofing and insulation material being fitted.



Installation of custom paneling.



Water storage tank being fitted into the Vanagon Camper.



A completed Vanagon Camper. In the background, additional Camper body shells arrive at the Wiedenbrück plant.



A Westfalia inspector checks every Vanagon Camper before delivery back to Volkswagen.



An installer hand-fitting plumbing under a Vanagon Camper.



Installation of custom paneling.



A tradition of hand cabinet making is still carried on at Westfalia.



Vanagon Campers completed and ready for delivery.



# Marketing a Volkswagen original.

Vanagon and Vanagon Camper are completely new VWs. Not face lifts. Not warm-overs.

Yet, people on the move still need room and luggage capacity, two features that led to sales of over 5.5 million units of the original Bus. And that is Vanagon's opportunity.

The vehicle will draw buyers away from full size and intermediate station wagons. It will attract van owners who no longer want to settle for a truck ride, truck handling, and truck-like operating costs.

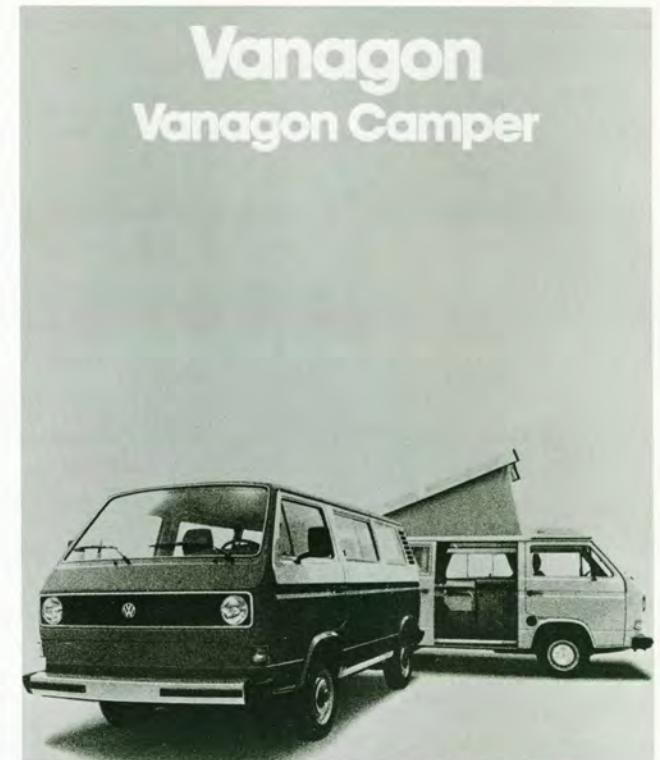
The 1980 Vanagon will fill a market niche with its unique combination of size, versatility, economy, performance, comfort, and handling. It will be competing in a marketplace where traditional product offerings are being phased out.

In a decade, when many manufacturers will offer the public less for more, Volkswagen creates another Original—Vanagon.

Volkswagen does it again.



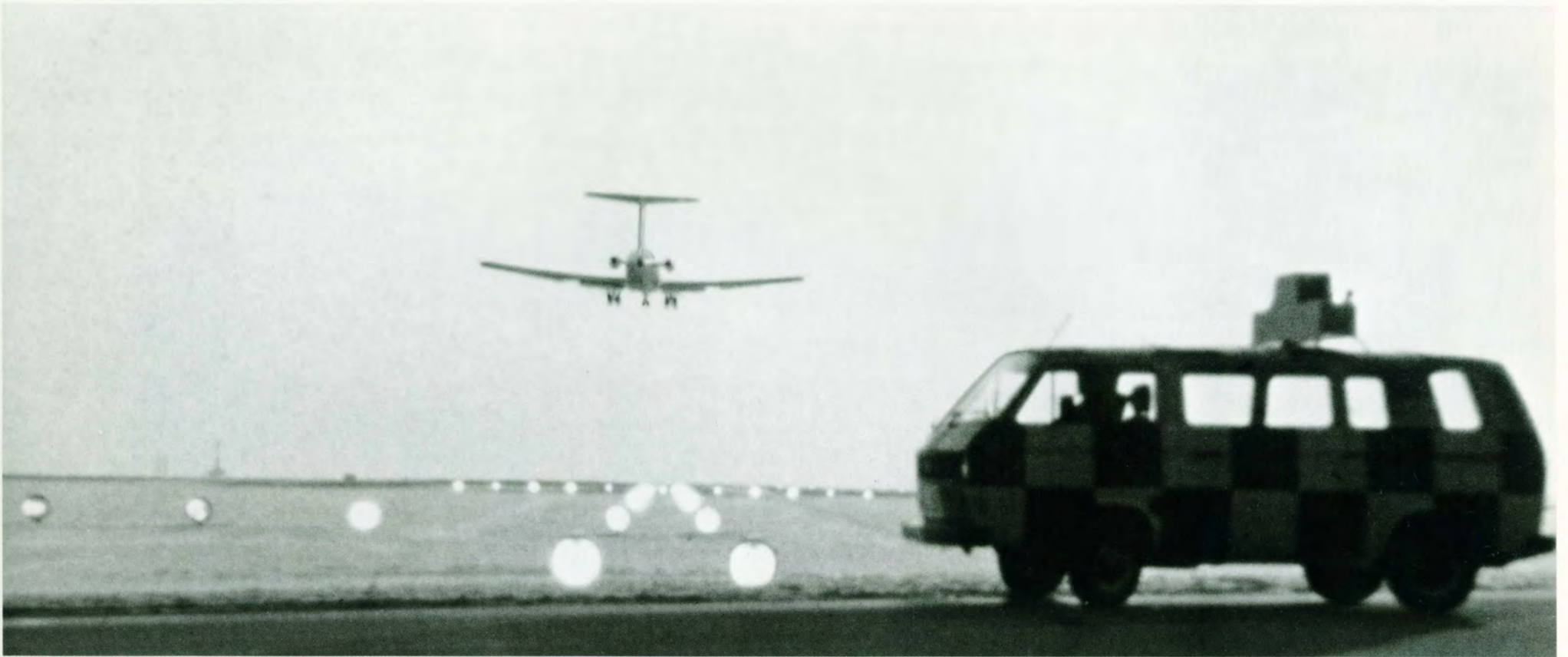
Introductory advertising for Vanagon and Vanagon Camper.



The 1980 Vanagon and Vanagon Camper VW catalog.



TV commercials used to introduce Vanagon in selected markets.



Specially equipped Vanagons are used as control and utility vehicles at many European Airports.

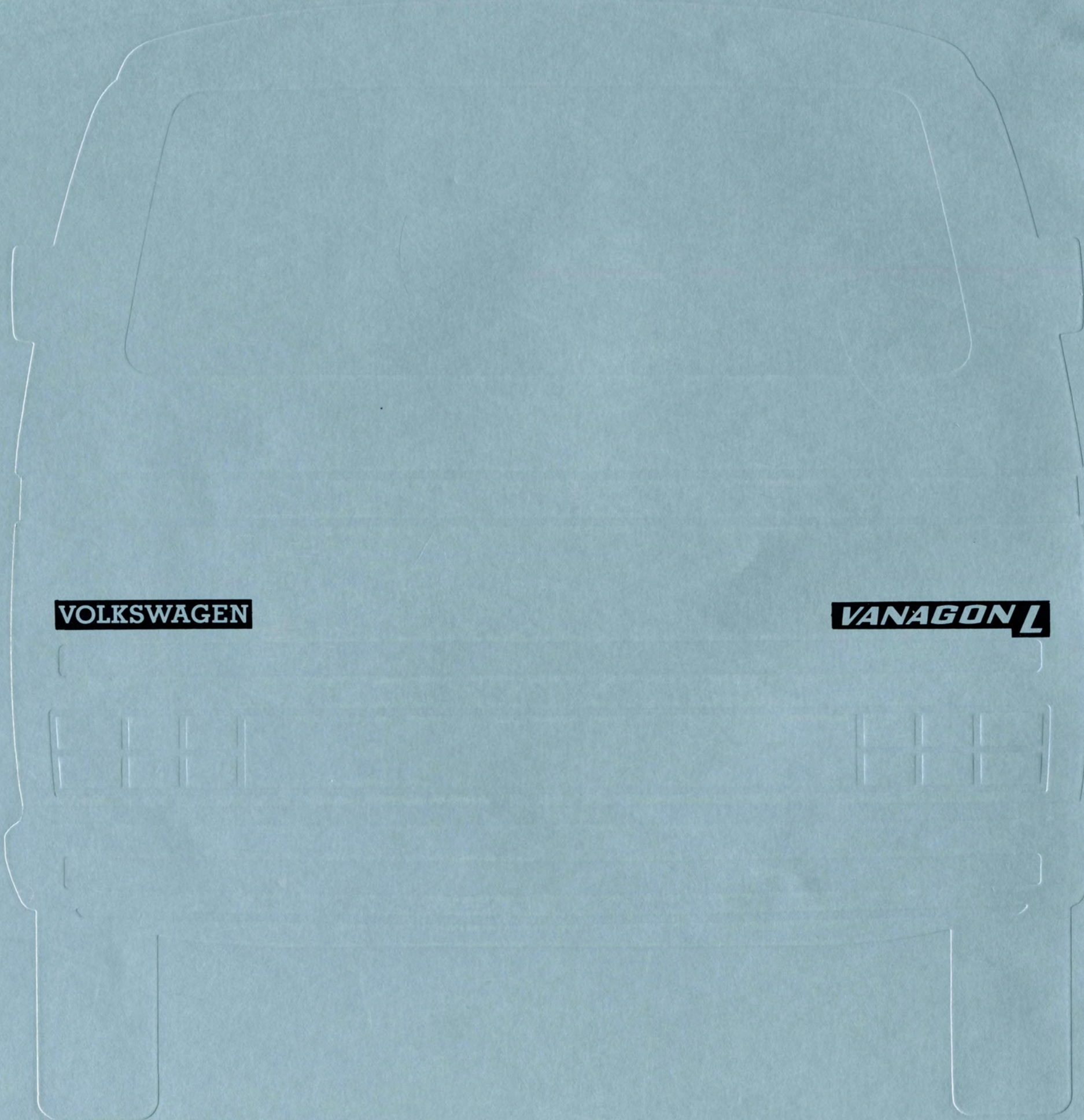
Vanagon at one of the many regional auto shows.





A Vanagon with its new owner. Vanagon will fill a market niche with its unique combination of size, versatility, economy, performance, comfort and handling.





**VOLKSWAGEN**

**VANAGON L**