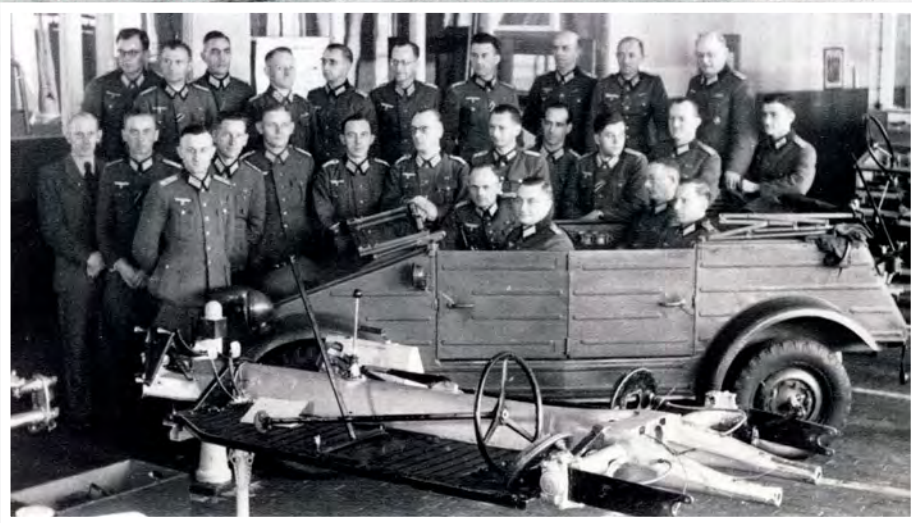


MAIN IMAGE: Although late to the party the Kübelwagen was soon to make its mark. Pictured outside the works was a swathe of the model which was designated the Wehrmacht's sole Light Uniform Passenger Vehicle by the end of 1941.

BOTTOM: Part and parcel of the launch of the Type 82 was the need to train military personnel in its servicing. A class gathered for instruction in such matters as its rear-hub gear cases, whose lubrication was often neglected



The

Acknowledged as one of World War Two's most versatile and successful light vehicles, the Type 82 'Kübelwagen' had to struggle to gain acceptance by the German military



Volkswagen Goes to War

The final design of the KdF-Wagen, later known as the Volkswagen, was completed by 1938. Although its creation was a team effort, orchestrated by chief engineer Karl Rabe, this historic car's creator was incontrovertibly Ferdinand Porsche. Inventors galore had proposed and built small air-cooled rear-engined cars but it took a Porsche to make

such a car a high-volume production reality.

Although the requirements of its low price and mass production kept the Type 60's final design from having features that specifically pointed toward military use, such as Hitler's preferred four-wheel drive, its potential for wartime service was never overlooked.

In 1935, while the Volkswagen was still under

development, Hitler introduced conscription and scrapped the name Reichswehr for his armed forces in favour of Wehrmacht, or Defence Force, of which the Heer or army became a constituent. Its Heereswaffenamt (HWA) continued to define and source its equipment.

The leaders of the new Wehrmacht proclaimed motorisation was a priority and the ►

Hühnlein kept his NSKK at arm's length to the evolving Type 60.

In fact Porsche himself rejected this criterion in a technical report about the capabilities of the vehicles used in the NSKK's winter trial of 1935. He stressed that in order to cope with off-road driving in all weather conditions, special vehicles were needed—special cars that "naturally can only have a somewhat limited civilian use." In fact Germany's car makers were obliged to produce extra-rugged machinery that could handle the NSKK's often-exaggerated cross-country trials.

New Fangled

In the event, the 30 Volkswagen prototypes were test-driven by members of an SS troop, under the supervision of Ferry Porsche. The SS men fell under the spell of this new-fangled automobile. Encouraged by reactions of these beguiled SS motorists, the Porsche/GEZUVOR test workshop under Rudolf Ringel modified a test Volkswagen to improve its off-road mobility. Special tyres were fitted and ramp angles at both front and rear were increased by shifting the spare wheel and muffler upward. Tests from December 1937 showed that this made the little car remarkably agile across country.

The modified Volkswagen was seen in action by an HWA officer, who blessed an effort to extract "as much as possible for military application from the existing vehicle." But in January 1938 he was unable to make much more of a commitment than that to Porsche, simply pointing out that a military version would need lighter-weight bodywork if it were to be able to carry four troops plus all their equipment—a desirable objective.

Considerably more enthusiasm was generated at the higher levels of the SS that same January when the leader of the V30 test cadre, Captain Albert Liese, proselytised on behalf of the Volkswagen's military utility to Lieutenant General Josef 'Sepp' Dietrich. An intimate of Hitler's, the influential Dietrich could see the merits of the Volkswagen's low profile, light weight and, particularly, potential for low cost which would facilitate a rapid conversion of



'Aero' wheels and tyres underpinned this Kübel in Tunisian service. During his invasion of France Field Marshal Rommel first appreciated the Type 82's value, which he proved decisively in his North African operations

Germany's military to more modern vehicles when the balloon went up.

A dollop of fertiliser for the flowering of this relationship was spread by Ferry Porsche in his stewardship of the prototype testing. At first, he said, he looked on the SS drivers sent to him as snoops and spies: "Every little detail, each day, had to be recorded, and at first this was intolerable and struck me as quite absurd. It was often difficult for me to contain my anger. But after a while I discovered that few of those SS men were stupid thugs. Some could be approached and spoken to. Some would listen and a few even approved of our own suggestions about testing and performance evaluation."

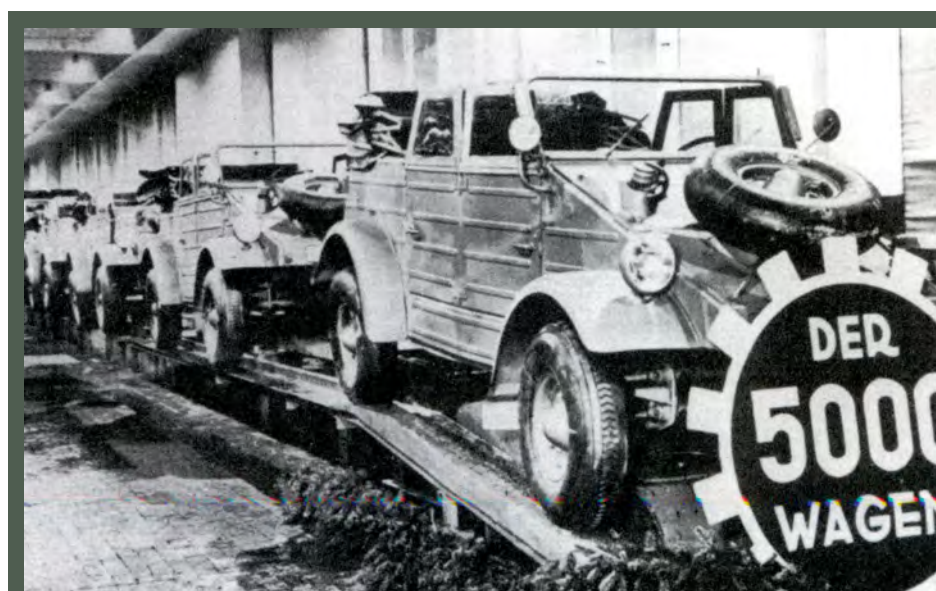
Porsche's forbearance at a crucial juncture was to be richly repaid. In addition to the rest of his work on the VW project, Ferry became closely involved with the development and testing of military versions of the Type 60.

Helped by a nod from Sepp Dietrich, the HWA gave Porsche an order to build a military version of his KdF-Wagen on January 26, 1938. March 14 saw Hitler hailed in Vienna after

Austria's annexation by Germany. For many in Austria this provided the economic integration with its powerful neighbour that had long been sought. Later that year, on October 5, Ferdinand Porsche's home town was subsumed into the Reich by Hitler's annexation of German-speaking areas of Bohemia and Moravia in Czechoslovakia.

Before receiving the official go-ahead, the SS troops and the workshop at Zuffenhausen had built a crude Kübelwagen that consisted of little more than a VW platform frame with angled-sheet fenders, three bucket seats on the floor and a mount for a massive machine gun. This resembled more a breadboard feasibility study than a serious design.

The first Porsche proposal, pictured in a Karl Rabe layout drawing of May 15, 1938 showing the Type 62, presented a distinctly 'civilian' aspect with rounded wings and engine cover and luxurious pleated-leather bench seats. A clue to the reason for this may be that project Type 62 dated from 1936, according to the Porsche type-number list. This suggests that the number was assigned quite early to what



Traditional celebrations were observed for the completion of the 1,000th and 5,000th Kübelwagens. The later milestone vehicle was equipped with the wide-section 'aero' wheels and tyres best suited to desert use

the project list calls an 'off-road vehicle.'

In 1936 the Porsche people had been thinking of making a version of their new small car that would be suitable for the off-road trials promoted by the NSKK. These popular and well-publicised events would have helped spread the word about the capabilities of the VW-to-be.

The car they built as the Type 62 looked ideally suited to that application, its body details modified to suit the final chassis design.

An alternative body was built in 1938-39 for the same chassis. This was a low, aggressive-looking vehicle whose side-mounted spare wheels fooled some commentators into

calling it a "six-wheeled" prototype. Nicknamed the Stuka after the famous dive bomber for its pugnacious looks, it was as militaristic as Porsche's Type 62 was civilian in appearance. The Stuka took part in comparison tests with the Type 62 and other vehicles.

The body of the official Type 62 was commissioned on May 17 from traditional Porsche panelling partner Reutter of Stuttgart. Its spare wheel was inset into the front deck and its sides were completely open, a few straps deployed to keep the occupants from spilling out. This prototype was ready for presentation to the HWA on November 3, 1938, showing its

kinship with the Volkswagen in the shape of its windscreen and its rounded lines. Ferdinand Porsche presented it to General Becker and others of the HWA including Lieutenant Colonel Sebastian Fichtner, head of the vehicle-test section.

The army put the Type 62 to the test at its Münsingen Troop Training Grounds that same November, pitting it against one of its Class I military vehicles, the smallest 4x4 model in its inventory. The Porsche people brought along a Volkswagen prototype for comparison purposes. The open-topped Type 62 fared well enough, although the army assessors thought it looked too "civilian" and asked for more "military elements" in its design.

While further tests were being conducted on the first Type 62 the Porsche engineers produced a more 'militarised' version. This Type 62 K1 kept the rounded wings and recessed spare tyre but had a more angular main body made of flat sheet steel ribbed for stiffness. One version resembled the first in having open sides with canvas doors; another had proper doors with side screens. The car with open sides was commandeered by the DAF's Robert Ley in October 1939 for a tour of Poland.

Tests of this new type in comparison to two of the standard army vehicles at St Johann in the Tyrol in March 1939 showed it to be promising but still lacking the ample ground clearance needed for military duty. Eighteen-inch wheels were fitted to increase the clearance but these were not the answer, especially because they raised the car's overall gear ratio when what was actually needed was lower gearing.

A different ring gear and pinion were tried in the Type 62 to give a lower axle ratio, but with a pinion that was too small this was a major and risky departure from the standard VW design. Ferry Porsche explained the problem: "You had to be able to go at about the walking speed of a soldier carrying his full backpack, so that he could keep pace with the vehicle. This was about 4km/h (2.5mph). Thus there was one serious drawback to overcome. Low gear in the regular transmission produced about 8km/h (5mph). This was adequate for civilian use but too high a speed for cross-country military purposes."

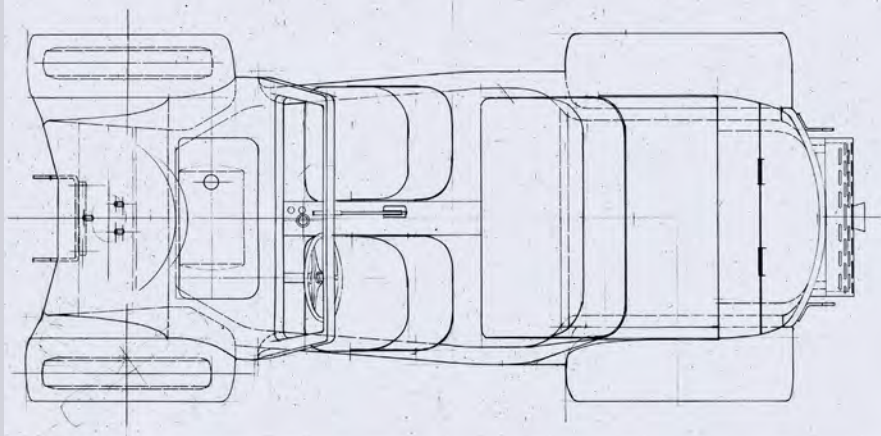
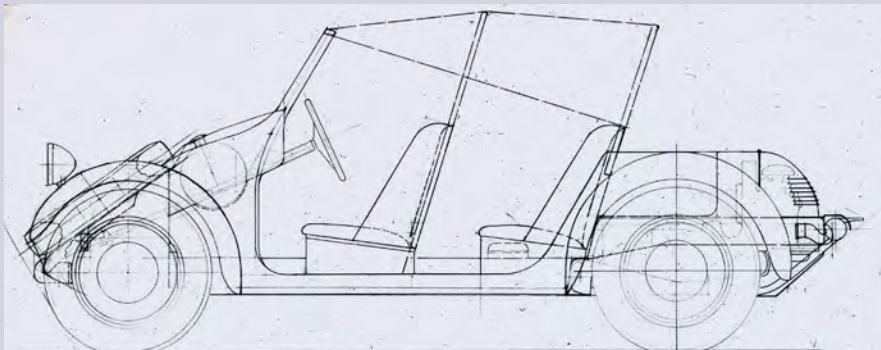
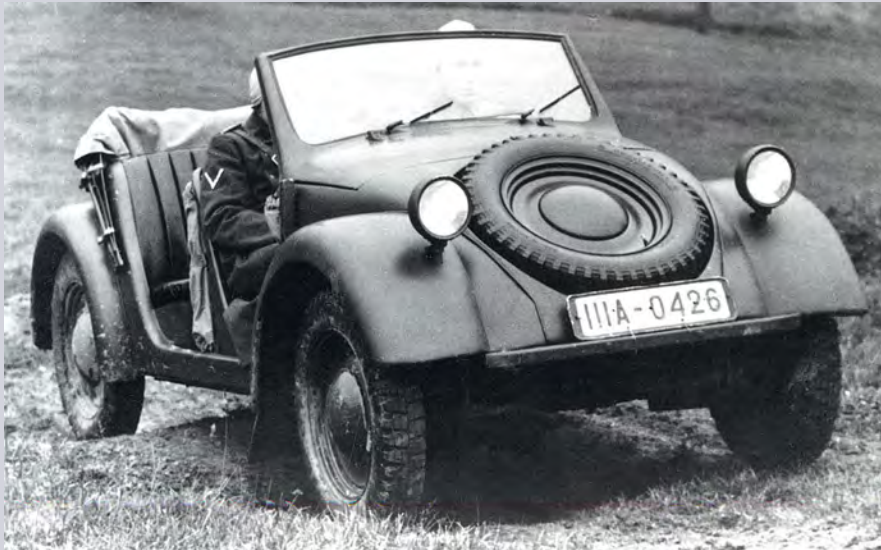
Pulling Power

Porsche's solution was typically ingenious. A pair of reduction gears was installed at each rear-wheel hub. The gearing raised the vehicle by two inches while reducing the overall gear ratio to give more pulling power at a lower road speed. The hub reduction gears had a ratio of 1.40:1, which combined with the standard final-drive ratio of 4.43:1 gave a ratio of 6.20:1. At the front the wheel-spindle carriers were modified to increase ground clearance there.

Now the Porsche engineers, well on their way toward a completely new vehicle design, awarded the VW-derived Kübel project a new number in 1939: Type 82. Another year was destined to pass after the presentation of the Type 62 before the first two samples of the Type 82 were formally accepted by the Army High Command in December 1939.

This new version reverted to 16-inch wheels for which tyres were more readily available. Now the engine was idling at 780rpm at the

Porsche's 1938 Type 62



Dating from 1936, Porsche's Type 62 project was first envisioned as a sporting car to take part in trials organized by Adolf Hühnlein's NSKK. Presented to the Army in 1938 it was found capable but not sufficiently 'military-looking'



'No doubt remained about the vehicle's military bearing'

required walking pace of four km per hour, so Ferry's goal was successfully achieved. At 3,300rpm in top gear the Type 82's maximum speed was 50 mph.

No doubt remained about the vehicle's military bearing. It had square-rigged, corrugated, high-sided coachwork built by Ambi-Budd in Berlin to Porsche's designs. Its spare wheel rested on top of the sloping front deck, simplifying the body. A serviceable hood and side screens were provided.

A key decision was to fit the vehicle with

doors. Doors kept the soldiers inside, meaning that tight-fitting bucket seats were no longer needed. Flat front seats and a wide bench rear seat could be used instead, offering more flexible carrying capacity. It also rendered the "Kübel" nickname completely inappropriate—but it stuck.

The Porsche men deployed several secret weapons in the design of their Type 82 that contributed to its military success. One was lightness. The original Type 60 Volkswagen of 1938 had a design weight of 1,510 pounds and ready for the road it weighed 1,545 pounds dry. Compared with the small passenger cars offered by Adler (1,810 pounds), DKW (1,720

This Kübelwagen was booty for the British Army in North Africa. It is one of the Type 82s that was sent back to the United Kingdom for detailed evaluation to gain insights into the technological threat posed by the Volkswagen

pounds) and Opel (1,700 pounds), its lightness helped the civilian VW gain a power-to-weight advantage over its rivals.

The same philosophy helped the Type 82 shine compared to the heavy Class I military vehicles. Rigorously controlling weight in every aspect of the military VW, the Porsche engineers brought this version in at the same design weight as its saloon counterpart, 1,510 pounds. At 1,600 pounds with all its skid plates and other battle gear it weighed only 3.6 percent more than the road-ready civilian car. This was an astounding accomplishment, even given the Type 82's open bodywork.

Another secret weapon in the car's design

Eight of the first pilot batch of 25 Kübelwagens produced in April of 1940 paraded in the courtyard at Zuffenhausen, where they were produced. Manufacturing at the Fallersleben factory commenced in May of 1940



was its limited-slip differential developed by the ZF company. This used a central cage to drive a ring of sliding pawls which engaged wavy-cam surfaces that drove each of the rear-wheel axle shafts. When one drive wheel started to slip and spin, friction in the unit rapidly built up and began transmitting driving torque to the wheel that was not spinning—the one that had better traction.

The Porsche office exploited its early access to this ZF invention, first in a passenger car it was designing and then, in 1936, in the Auto Union racing cars. In these they stole a march on rival Mercedes-Benz until the Stuttgart firm twigged what they were doing. It was only natural that Porsche would use the ZF limited-slip differential to help compensate for their Type 82's lack of four-wheel drive.

four-wheel drive in all four normal forward speeds. Pushing the lever forward to the second notch engaged the extra-low gear as well. Thus extra-low was only available when the Type 87 was operating in 4x4 mode.

Two Type 82s and two Type 87s were tested by the army in February 1940 in company with a wide range of other vehicles including trucks. They were driven south from the Berlin Kummersdorf test ground to the winter test site in the mountainous Tyrolean Alps at St Johann, the town reputed to be the coldest in the region.

VW historian Dr. Bernd Wiersch quoted a report of April 5, 1940 on the Tyrolean trials: The Wünsdorf Test Centre is in general very enthusiastic about our vehicles. In the prevailing slippery ground conditions in the mountains, for example, our four-wheel drive Types 86 and

Type 82 in its final form was featured at the 1940 Vienna Spring Exhibition. The HWA was thawing, albeit slowly. Pilot manufacture launched at Porsche's Stuttgart plant produced 25 units in April and thereafter 100 in May at Fallersleben. In June, when 200 were made, deliveries commenced to the army. It paid RM2,945 for each of its Type 82s.

This early production "involved mostly an assembly job," wrote historian Art Railton, "the line occupying a small portion of the huge factory. Joe Werner's shop was producing the engine-transmission, but the rest of the vehicle was shipped in from suppliers. The foundry was still not finished so castings came from a supplier in the nearby Harz Mountains."

Joseph Werner was one of a handful of German-American engineers whom Porsche had recruited in Detroit in the 1930s to help mass-produce the KdF-Wagen. An ex-Ford man, he knew the art and science of volume production, especially for engines. So his instructions on the Kübelwagen job were especially frustrating: "I was ordered to build no special tools and not to make the mistake of having any tooling left over for use in building KdF-Wagens when we finished the 'Jeep' order."

There was as yet no demand for hordes of Kübels, the thousandth not built until December 20, 1940. The war was still expected to be over soon.

Invasion of Russia

Military interest in the little vehicle began to grow after the invasion of Russia in mid-1941. The original Uniform Chassis I for light Army vehicles had been replaced by a new design in 1940, made exclusively by Stettin's Stoewer. Under the challenging conditions of the Russian Front the Stoewer vehicle exhibited "severe defects in the frame, wheel suspension, clutch, drive shaft, steering, etc."

In contrast KdF Kübels, just becoming available in Russia, performed much better. On November 1, 1941 an army report stated, "All special designs of the Wehrmacht in the realm of wheeled motor vehicles were weeded out (some of them are still being concluded) and, specifically, special designs for the Light Uniform Passenger Vehicle were replaced by the VW (two- and four-wheel drive)."

Before this decision could be reached the army set one more exam for the military Volkswagen, one they were confident it would fail. They sent two samples to the North African desert, where the HWA and the Uniform Chassis builders were certain the VWs would simply sink into the sand and never be seen again.

"If they proved right," Ferry Porsche reflected, "this ordeal would do us serious damage and cause Hitler's men to lose confidence in our capabilities. Our detractors were to be deeply disappointed, however. The military version of the Volkswagen performed without giving the least trouble, despite the desert heat, the sand and the brutally rough strains imposed on them. On the contrary they seemed to thrive on this kind of treatment!"

The ascendancy of the Type 82 was affirmed on March 19, 1942 by an Adolf Hitler decree that gave Fallersleben a monopoly on the production of light military vehicles. The Type 82's merits had finally triumphed. In his table



With its complement of five soldiers this striking image of the Type 82 Kübelwagen showed the benefit of adopting bench rear seating. The use of doors was considered a radical departure for this class of vehicle

As a form of protection for the project's future, four-wheel drive was also explored. This was done under Porsche's Type 87 designation, work on which continued into 1941. A drive shaft was taken forward from the front end of the secondary or output shaft of the gearbox to axle gears between the front wheels.

The front-axle gearing was given a drive ratio of 6.20:1 in order to match the gearing at the front to the double-reduction ratio at the rear wheels. In a clever design tweak, Porsche used hypoid gearing for its ring and pinion. This allowed the pinion to be offset upward from the centre of the ring gear, helping to improve ground clearance at the front. Some Type 87 versions had self-locking front differentials and some did not.

Also added to the Type 87 was an extra-low gear for off-road use. A supplementary lever controlled both functions. Normally the front-wheel drive was not selected. Pushing the extra lever one notch forward engaged it, allowing

87 cars without snow chains were vastly superior to the Army Uniform Personnel Car.

One of the most frustrated car makers, in view of the proven performance excellence of his light and low-cost military vehicle, was Ferry Porsche. Tests had shown the clear advantage of the Type 82 over the heavy Class I Uniform Chassis but no decisions were being made on the basis of this unambiguous evidence. He wrote: "Weeks went by in this way, and I finally became so annoyed that I openly proposed we take a VW Kübelwagen and run it hard for several more weeks, under all conditions, against the 'Jeep' designed by the Military Supply Office [HWA]."

The offer was accepted. Far from weakening our case, the test decisively broke the deadlock in our favour. The Kübelwagen under many conditions came off better than the military version. But still the military held back giving us clearance to manufacture..."

With the saloon and a display chassis, the

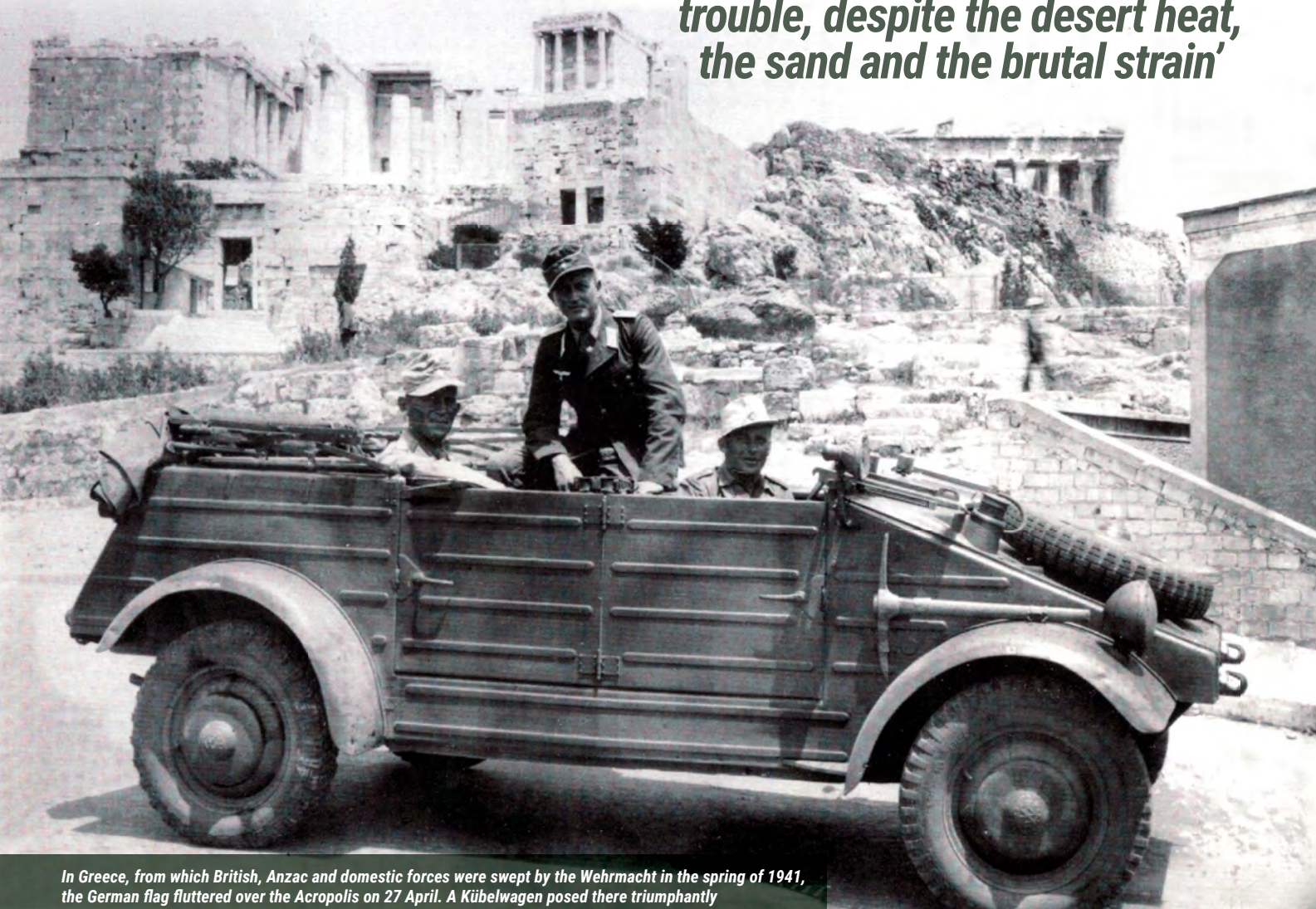
conversation among friends on April 9, Hitler elaborated on his thinking: "After the war we must, for military reasons, limit the German motor industry to the production of a dozen models, and the primary objective of the industry should be the simplification of the engine. Higher power must be achieved by increasing the number of standard cylinders rather than by the introduction of a variety of new cylinders. But the most important task will be the design of one single engine which can be used just as well for a field kitchen as for an ambulance, a reconnaissance car, road-haulage or a heavy artillery tractor. The 28bhp engine of the Volkswagen should be able to meet all these military requirements. The ideal standard engine which I envisage must have two characteristics: (a) it must be air-cooled; (b) it must be easy and swift to dismantle and change. The latter characteristic is particularly important because, as this war has shown, it is more difficult to get spare parts than to get a complete engine unit."

Production shifted up a gear; in 1942 delivery of the 5,000th Kübel could be celebrated. At that time its price to the army was RM3,457. Production, which had been flat through most of 1941, began to rise late in the year and kept climbing well into 1944. Tropical battle zones opened up to the versatile Kübel after proving trials were conducted successfully in occupied Afghanistan and Greece.

Observed by horse-drawn troops, the driver of a Type 82 peered around his door to find a way forward through muddy terrain that plagued the Russian front. Its lightness was a huge asset to the Kübelwagen in such conditions



'The military version of the VW performed without giving the least trouble, despite the desert heat, the sand and the brutal strain'



In Greece, from which British, Anzac and domestic forces were swept by the Wehrmacht in the spring of 1941, the German flag fluttered over the Acropolis on 27 April. A Kübelwagen posed there triumphantly



A military version of Porsche's front-engined Wanderer chassis well illustrated the origin of the term Kübelwagen as used for most German military people-carriers with their Kübel or bucket seating.

Equipped with large-section (200 x 12) 'aero' tyres on special Kronprinz wheels that let them take full advantage of their light weight, the Type 82s proved their merit by skimming over the desert sands of North Africa. And if one did get stuck in a ditch it was easy enough for a few soldiers to heave its light chassis out and send it buzzing onward.

It would be an exaggeration to say that the Kübels in North Africa were trouble-free. Said one German workshop report from the front, "At first this vehicle gave very good performance, but after 5,000 to 6,000 km every possible type of trouble appeared." One weak spot was the rear-hub reduction gears, a design feature which was unique and, as a result, tended to escape the routine maintenance so essential to its reliability.

Engineers from Porsche were quickly on the scene to diagnose such problems. They suggested field expedients and recommended changes to the production cars. Porsche's people considered it vital to build a cooperative relationship with the army vehicle-service personnel; generally they succeeded.

They realised that it was essential that the military version of the KdF-Wagen gained an excellent reputation among the soldiers and their families they were counting on to keep saving to buy the civilian edition. To this same end the technical manuals produced for the Type 82 carried the civilian KdF-Wagen service emblem

on their covers. This, soldiers were to understand, was the wartime version of the same car they would be driving after their victory.

Invasion of France

Field Marshal Erwin Rommel first made use of a handful of the fast-moving Kübels in the invasion of France. Later, saying that they could follow wherever a camel could go, the bold and brilliant Rommel exploited their capabilities to the full in his African campaigns. "With its black, white and red command flag on its fender," wrote historian David Irving, Rommel's "own Volkswagen Kübel car was clearly visible. From it, he set the angle and tempo of the attack. If his car was shot up or ran over a mine, he simply commandeered another."

"You saved my life," Rommel told an astonished Ferdinand Porsche when they met during the war. "I was using one of your Kübelwagens," the Field Marshal explained, "which went through a mine field without setting it off. The big Horch that was following me, with all our luggage, went sky-high!"

"It was a great car," Rommel's technical advisor John Eschenlohr told Art Railton. "Everybody drove them, officers and men. You could trust it because you knew you would get back if you went in a Kübelwagen." If they received cars without the big "aero" tyres that coped easily with the sand dunes, they installed their own from aircraft supplies.

Kübels were ubiquitous in all German theatres. They were personnel carriers, munitions carriers, fuel carriers, ambulances, siren cars, cannon tractors, engineer vehicles and communications cars. Able though they were, however, the Type 82s could do little without fuel. Lack of fuel, especially in the Wehrmacht's more extended and remote fronts, meant that many serviceable vehicles of all kinds, including Kübels, were abandoned in the field.

In North Africa many Kübels were left behind with only vapour in their fuel tanks when the rest of Rommel's army withdrew after the British counter-attacked successfully late in 1942. A decade later 350 wartime Volkswagens were still being driven happily by the local population in Libya and other Northern African nations. The situation was no better on the Russian front, said Hans-Georg Mayer-Stein: "Since the German troops in the east were more and more involved in losing battles, at least since 1943, there was scarcely time for vehicle maintenance. In the front-line repair shops, only makeshift repairs were made, or damaged vehicles were cannibalized, in order to keep their time out of action short.

As a rule the life span of a vehicle lasted only three weeks. The German military vehicles of 1944-1945 thus made a miserable impression: bashed and bent body panels, missing parts, wrong wheels and tyres, etc. Many a Volkswagen was simply left by the roadside as the German troops retreated."

Many examples, captured intact, were commandeered for use by the allied forces, who valued their mobility. In the Sahara, their saying was that one Kübel was worth two Jeeps. Several were liberated for study back home in Coventry and Detroit. The allies were deeply curious about the design of these agile German vehicles, based as they were on Hitler's famous yet mysterious and indeed notorious people's car. In years to come they would see many more of the civilian version on the roads of the world. ◀

*This article on the Volkswagen Type 82 has been adapted for CMV by Karl Ludvigsen from his book entitled, **Professor Porsche's Wars**, reviewed in the May/June 2015 issue.*



In 1938 enthusiastic SS troops connived with mechanics at Porsche's Zuffenhausen workshop to make this "breadboard" sample of a possible military version of the Volkswagen. A sectioned V30 prototype was in the background