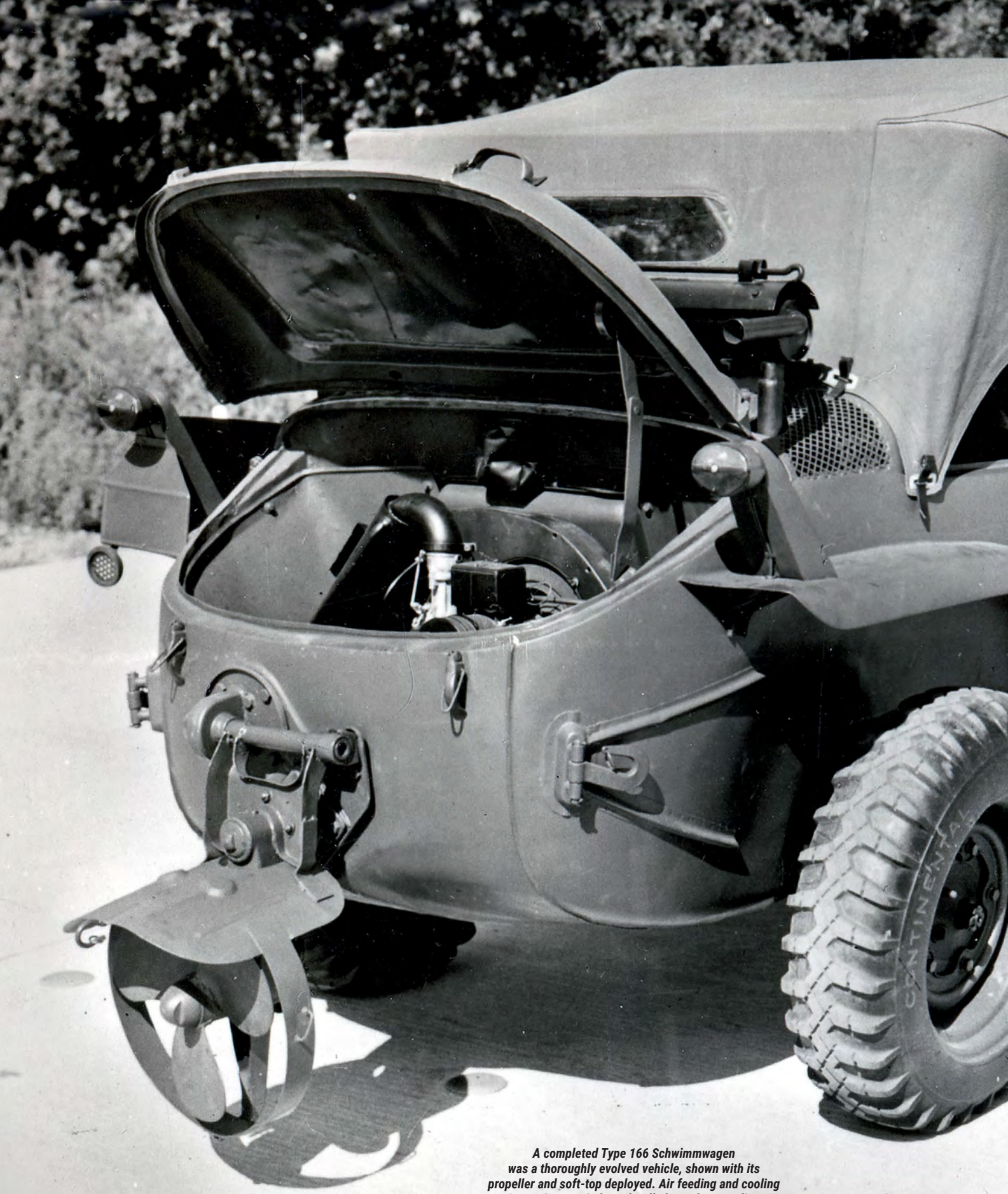


A completed Type 166 Schwimmwagen was a thoroughly evolved vehicle, shown with its propeller and soft-top deployed. Air feeding and cooling its engine was inducted well above the waterline

'The Porsche engineers would have been gratified by this assessment of their work by the enemy industry'

words Karl Ludvigsen pictures archive

Porsche's Masterpiece

During World War Two the Porsche team was given its head to create a purpose-designed amphibious military vehicle, the result was the Schwimmwagen

While relaxing on the holiday liner Robert Ley in the summer of 1940, Ferdinand Porsche reflected on yet another commission for his engineering team in Stuttgart. On July 1, 1940 the Army Weapons Office (HWA) asked him to design and build an amphibian version of his military four-wheel-drive Type 87, the Kübelwagen.

Here, Porsche well knew, was a clear sign of future maritime missions for the Wehrmacht. On the day he received the commission German troops disembarked at the Channel Islands and Porsche thought an invasion of the main British Isles could not be long in coming.Amphibian vehicles, he decided, would be just the job.

A preliminary request prepared on June 18 said that such a vehicle was urgently needed by the army's engineers. The HWA's contract made RM200,000 available for the project. Led by Porsche's son Ferry, the Stuttgart designers adapted the 4x4 Type 87 platform to this new application with remarkable speed.

After tests with a modified Type 87 they created a new design, on the same wheelbase, named the Type 128. Completed on September 21,1940, at the end of that month the first Type 128 plunged into Stuttgart's Max Eyth Reservoir in a bend of the Neckar River east of the Porsche offices in Zuffenhausen with Ferry Porsche at the wheel and four colleagues checking for leaks.

Described and pictured by Piotr Mariusz Radomski in CMV number 176, the Type 128 was built in a pre-series of 30 units for evaluation by the HWA in comparison with other designs. In August of 1941 three of the pre-series cars traipsed 1,600 miles through the Alps. Fifteen per cent of the running was under 'poor and poorest' off-road conditions and 20 per cent

over rough mountain tracks.

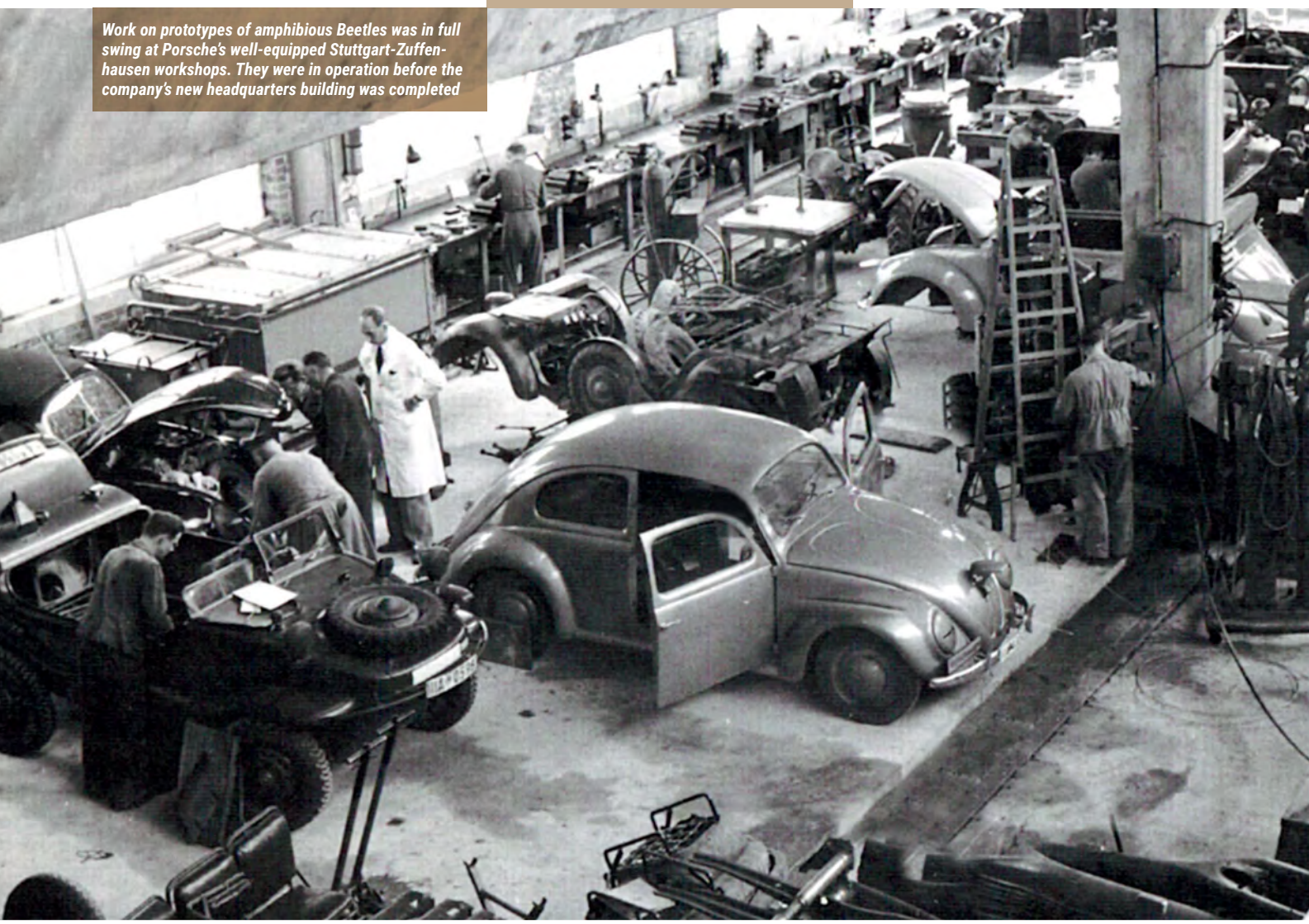
The testers said that this trip 'demonstrated to us as never before the Type 128's extraordinary off-road capability when driven sensibly. We drove on paths that had never before seen a motor vehicle and the total cargo always amounted to almost half a ton.' The HWA's experts found plenty of faults, however. Much strengthening was needed, particularly in the propeller drive whose durability they found unfit for purpose.

While the HWA was mulling over its test results, Porsche's aquatic-Beetle project received a sharp shove forward. On December 3, 1940 Berlin's Waffen-SS took an interest in the development of a new light armoured scout car, thanks to the quick thinking of Ferry Porsche. His timely suggestion during a meeting in Stuttgart with the regional chief of Heinrich Himmler's elite military staff brought his attention to the work being done on an amphibian version of the Type 87. The needs of the SS could merge well with those that had hitherto guided work on the Type 128.

What the Waffen-SS wanted was a replacement for the motorcycles with sidecars used by its mobile guard units. Motorcycles were proving unequal to the demands of modern warfare in difficult terrain. The utility of BMW, NSU and Zündapp motorcycles on scouting and courier work in the easy conditions of Hitler's first campaigns in West Europe was undisputed. But in rustic Poland and in Africa, where roads were poor or non-existent,

Instead of the prototype's abbreviated windscreen the final Schwimmwagen had a full-width screen. Its silencer was well clear of the water from which it emerged with its propeller still in seagoing position

'When the vehicle comes out of the water there are no brakes'



Work on prototypes of amphibious Beetles was in full swing at Porsche's well-equipped Stuttgart-Zuffenhausen workshops. They were in operation before the company's new headquarters building was completed

they fared poorly.

Blower-cooled motorcycle engines were being studied near the end of the war. As well the idea of designing a motorcycle powered by the Volkswagen's flat four was explored. This was not pursued, Ferdinand. Porsche arguing successfully that even with enhanced power a motorcycle with sidecar would never be a well-integrated vehicle. To cap the argument against them, motorcycles cost more than their VW-based counterpart, at least in Kübelwagen form.

On December 22 Porsche received a contract for the development of a vehicle that would meet the needs of the Waffen-SS, sweetened with a fee of half a million marks for development and the loan of ten engineering draftsmen from SS ranks. While the Type 128 was promising, it was not yet the complete article. Built as it was on the long 2.4-metre wheelbase of the Types 60 and 82/87, the Type 128 was not as agile as it needed to be to fulfil its mission. This had been especially evident in its awkward entries and exits to and from water.

The solution was a shorter wheelbase of two metres, 78.7 inches. 'We began work on the drawing board in April 1941,' wrote Ferry Porsche. 'By August of that year the first prototype was ready for testing.' All relevant sources identify this final Schwimmwagen design as Porsche's Type 166, which is described in the original list of Porsche type numbers as VW-Krad-Wagen, meaning 'VW motorcycle car'—a description more of its mission than of its design.

That autumn the first prototype had a high-level viewing. The younger Porsche was 32 at the time. "I was asked to bring this car to Hitler's headquarters for a demonstration," he said, 'and he appeared to be pleased.' The headquarters in question was the eastern Wehrmacht headquarters at Rastenburg in East Prussia, the Wolfsschanze. Literally 'Wolf's entrenchment' this is known in English as 'Wolf's Lair'. The request to bring the first Type 166 there was certainly made by Heinrich Himmler, whose SS had commissioned it.

Looking even more obsequious than usual in the presence of his Führer, nervously twisting his gloves as he sought Hitler's approval, the odious Himmler was the man on the spot at the forest presentation of Porsche's spruce amphibian with its SS license plates. Mufti-garbed Ferry showed the features of the versatile auto to a platoon of uniformed military leaders including Keitel and Jodl of the Army and Wolff of the SS.

Many features of this first Type 166 differed from the final configuration. A design outline was confirmed in the late autumn of 1941 for the production, at the Porsche works in Zuffenhausen, of a pre-series of 125 vehicles. Such a large pre-series was a reflection of the urgent need for vehicles of this genre, especially in Russia. That November Ferdinand Porsche met

In the spring of 1943 a Schwimmwagen navigated the waters of Brittany in a training exercise. Like the Kübelwagen, surviving examples would become prized trophies for the Allies when they invaded the following year

The occupying Allies evaluated the Type 166 at Fallersleben. Tragically the dies for its hull were trashed after the British government declined to accept high-level recommendations that it take advantage of this ingenious machine

Carrying only two soldiers, a Schwimmwagen's freeboard was more than adequate as it cruised down a French canal. Strong bow waves suggest that it was running at its maximum speed in water of 5½ knots

The end of September 1940 found Ferry Porsche at the wheel of the first Type 128 prototype as it surfed the Max Eyth Reservoir with a full complement aboard. Its Drauz-built body was doorless

'Blower-cooled motorcycle engines were being studied near the end of the war'

twice with Hitler and his retinue at the Wolf's Lair.

After a winter's work on the Type 166 the Max Eyth Reservoir was again the basin for the formal baptism of the new model in March 1942. Experience in the field with the pre-series proved beneficial in improving the design of the final production version, which was accepted by the HWA on 29 May 1942, the end of the month in which it began to be made at the Volkswagen factory at Fallersleben.

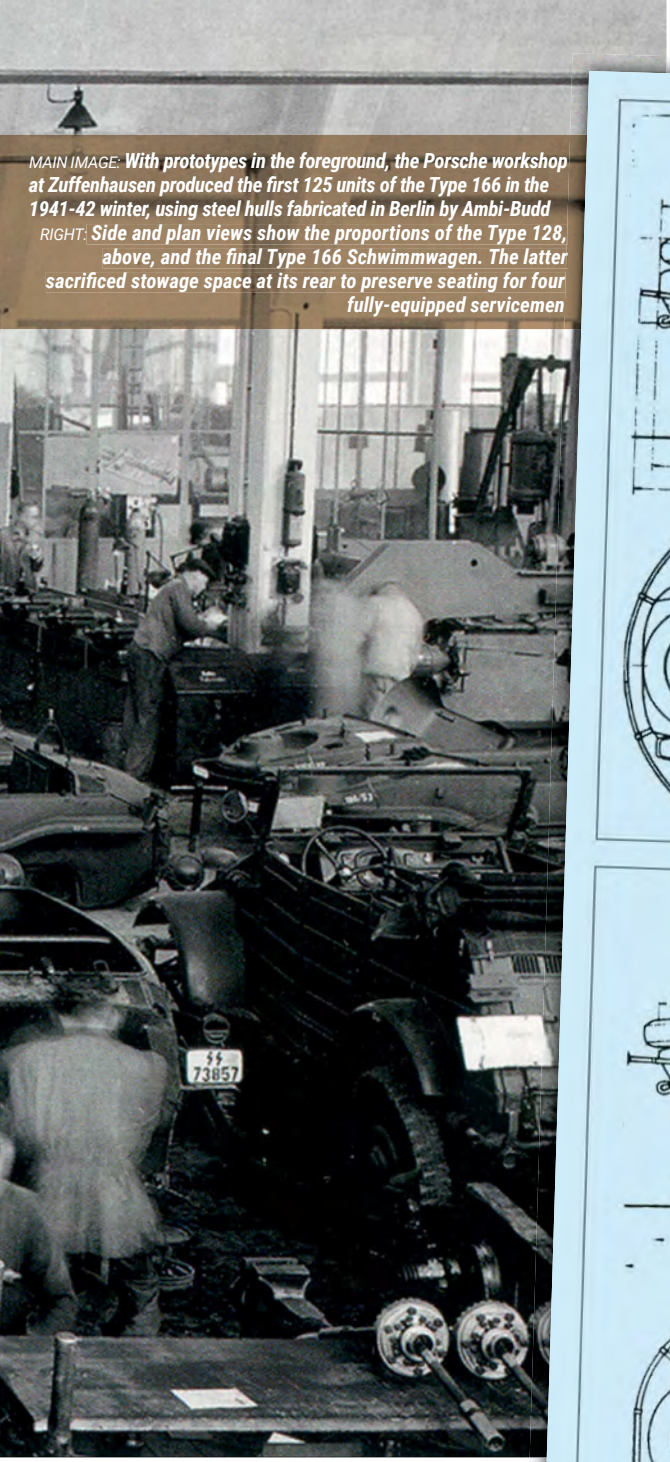
Its one-piece welded body-hull was produced in Berlin by Ambi-Budd and fitted at Fallersleben. The advantages of Ambi-Budd's press techniques were shown in the 166's one-piece side-panel pressings. Weighing 122 pounds when hammer-formed and taking 29 hours to make, when die-stamped each was produced in 65 minutes and weighed 60 pounds.

A major challenge facing the designers was the provision of space for four fully equipped soldiers in spite of the shortened wheelbase. This was solved with style in the final Schwimmwagen design. To increase range it had more fuel capacity, storing a total of 11 gallons in two tanks of equal size. Inherently buoyant, the Type 166 combined manually selected four-wheel drive with a swing-down propeller at the rear driven directly by a dog clutch and roller chain from the engine's crankshaft. Its short wheelbase, extra-low gear and four-wheel-drive made it an even more effective off-roader than the standard Kübelwagen.

After final changes to its design were made, the Schwimmwagen had to be type-approved by the respective authorities before it could be released for service with the Pioneers - Germany's engineer corps - and other forces. As a vehicle this presented few problems but the Type 166 was not just a vehicle. It was also a boat, said the HWA's approval commission, and boats have to display bow lights, red on the port side and green to starboard. 'The Porsche engineers thought the HWA people were crazy,' wrote Richard von Frankenberg, 'and had no thought of installing such lights. This bothered the HWA not at all—the vehicle was simply not accepted.'

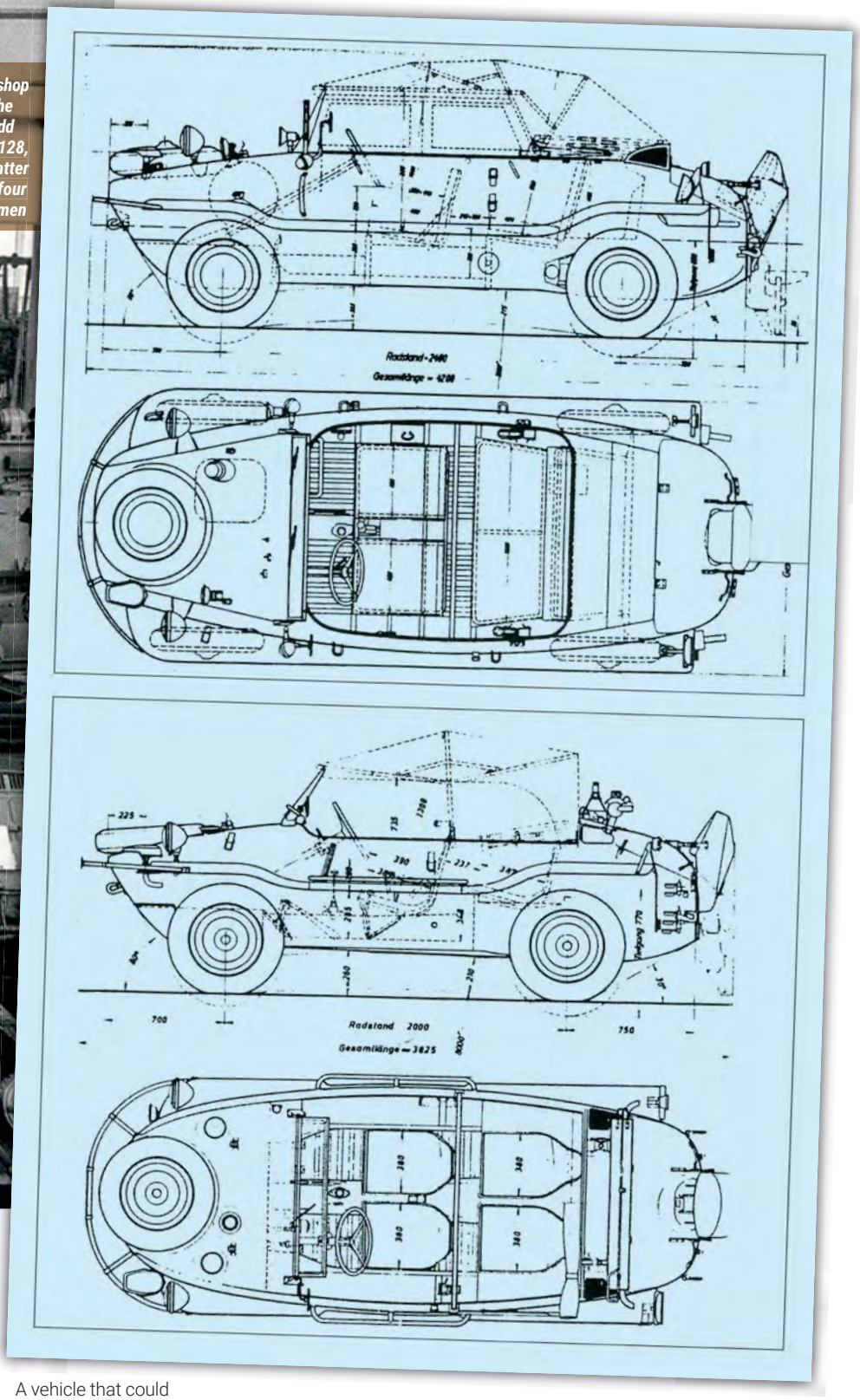
By June 6, 1942 the first 100 had been completed at Fallersleben. The German military paid RM4,200 for each of its water Beetles. The price paid bore little relation to the real cost of the Type 166, which was so complex that it heavily burdened the largely Italian workforce that assembled it. For this reason its production was halted on August 26, 1944, in the wake of the final bombing of the factory, after 14,276 were produced. This fell well short of the 20,900 orders that the factory had booked for this remarkable vehicle.

The Schwimmwagen was a prized asset in all the Wehrmacht and Waffen-SS theatres. When the Waffen-SS paraded in Paris in 1942 it was with a long line of Type 166s. Pristine or battered, armed or as transport, they were ubiquitous at the fronts in spite of their relatively small numbers. Especially in the east their versatility was prized. Porsche supported the model's development throughout the war, using the fifth Type 166 from the pre-series as its guinea pig.



MAIN IMAGE: ***With prototypes in the foreground, the Porsche workshop at Zuffenhausen produced the first 125 units of the Type 166 in the 1941-42 winter, using steel hulls fabricated in Berlin by Ambi-Budd***

RIGHT: ***Side and plan views show the proportions of the Type 128, above, and the final Type 166 Schwimmwagen. The latter sacrificed stowage space at its rear to preserve seating for four fully-equipped servicemen***



After the war one British officer took a special interest in Porsche's Type 166. This was Major General Percy Hobart, who had been responsible during the war for all the 'funnies' in the Tank Corps: flamethrowers, mine-destroying flails and the like. He set up a visit to Wolfsburg especially to see and assess the Type 166 Schwimmwagen. Although the works could not produce its four-wheel-drive system for lack of certain forgings, it still had the complex and costly dies for the steel pressings that made up its sophisticated hull, which like those for the Kübelwagen had been sent there for safe-keeping by Ambi-Budd. The officer in charge at the factory, Major Ivan Hirst, took care to set these aside for possible future use.

'The General arrived in a Jeep,' Hirst recalled, 'and we had a contest with the Schwimmwagen. It easily went where the Jeep couldn't. As a result of these trials Hobart tried to get the British government interested in the Schwimmwagen, but he was told that no money was available for that sort of thing. So I had to let the dies go.' A vehicle that could justly be termed one of the masterworks of the Porsche office could no longer be produced.

The Type 166 was also of great interest to the Americans. A fully operational sample was shipped to Aberdeen, Maryland and given an initial assessment in a memorandum report dated October 30, 1944. This gave the first impressions of US Army ordnance experts on this Porsche creation.

They liked it. 'The torsion bar suspension on this vehicle enabled it to perform extremely well over smooth and rough terrain,' the Aberdeen experts found, and 'the front and rear locking differentials were very effective for mud operation.' Its engineering attracted admiration: 'The simplicity in design of this vehicle lends itself well to mass production.'

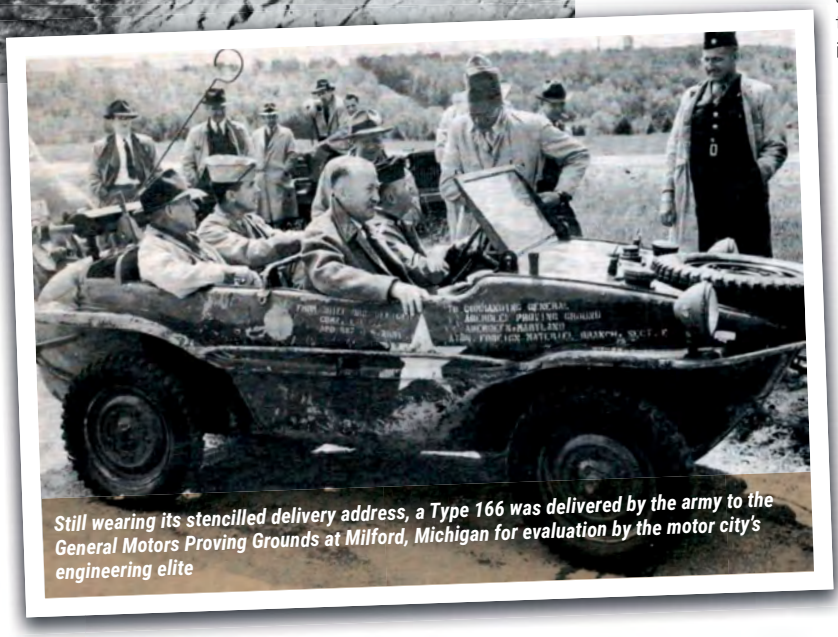
Its seaworthiness won plaudits too. 'The all-around performance of this vehicle in water was exceptionally good,' read the report. 'Front-wheel steering in water instead of using a conventional rudder was found to be very effective.' Summing up the Aberdeen appraisal, Lt Col G B Jarrett found the water Beetle worth emulating: 'Because of the excellent performance of this vehicle during limited tests and because of the simplicity of the design, it is recommended that the vehicle be further investigated with a view toward having our automotive industry adopt some of its salient features.'

With just such a technology transfer in mind another captured Type 166 was forwarded

Doubtless with some trepidation SS cadres had their first taste of motoring Schwimmwagen-style in the waters of the Mittelland Canal adjacent to the KdF-Werke at Fallersleben

With its shortened wheelbase the Type 166 gained agility in entering and leaving the water as tests demonstrated. Its development was funded by the Waffen SS, which provided engineering draftsmen to Porsche for the project

'The vehicle covered the mud and hilly route with much greater ease and smoothness than the American Jeep'



Still wearing its stencilled delivery address, a Type 166 was delivered by the army to the General Motors Proving Grounds at Milford, Michigan for evaluation by the motor city's engineering elite

by Aberdeen to the General Motors Proving Ground at Milford, Michigan where the auto industry could test it on a rich variety of surfaces and gradients, including GM's 'Mud and Billy Goat Hill Test', and piloted into and across Sloan Lake. All the members of the Overall Vehicle Sub-Committee of the Society of Automotive Engineers' Captured Enemy Equipment Committee drove and rode in the little vehicle blazoned with its stencilled Aberdeen address.

They liked it too. Their well-illustrated report, issued in August 1945, could hardly have been more complimentary to the Type 166 and the engineers who conceived it. Their general observations were as follows: "On the surfaced road the smoothness of the ride and the way the vehicle hugged the road and floated along were noteworthy.

The vehicle covered the mud and hilly route with much greater ease and smoothness than the American Jeep, which followed it on each trip around the circuit.

The vehicle was impressive for the manner in which it was manoeuvred by its front wheels in the water, its steadiness in the water and the ease with which it entered and left the lake.

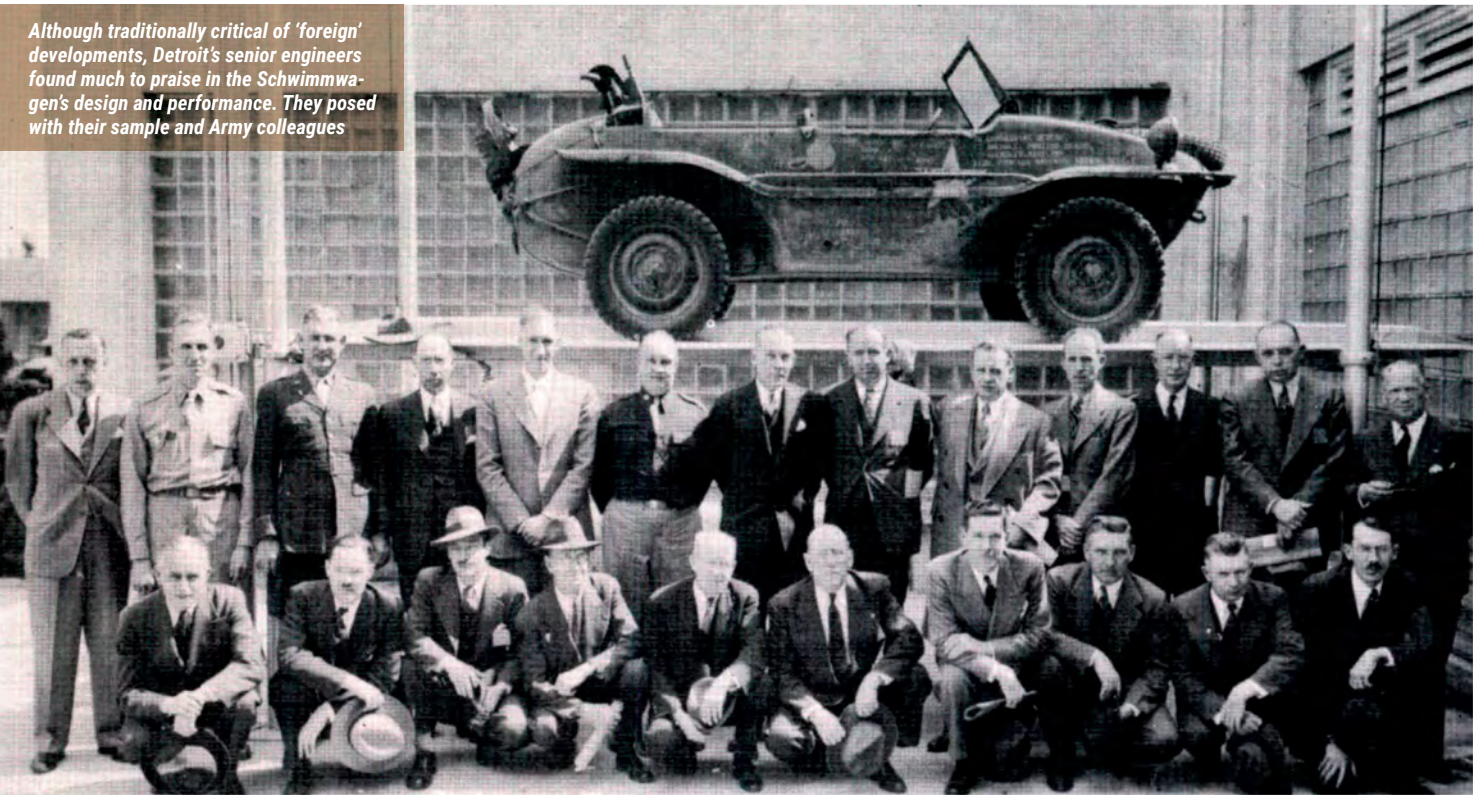
The general overall performance was highly satisfactory for the purpose of reconnaissance for which it was designed."

Still sheltering in a sawmill in Austria, the Porsche engineers would have been gratified by this assessment of their work by the enemy industry whose mass-production skills they had sought to emulate. But clearly the Type 166 was a vehicle of a type that the Americans would not have thought of building. As the engineers remarked, 'American vehicles because of their surplus power can always do more than they were designed for.' They added: "However, in the judgement of the committee this vehicle has sufficient power for its intended purpose, namely that of a reconnaissance vehicle in which it may be called on to cross ponds, small lakes and rivers, soft ground, etc. More power would mean the necessity of larger component parts, which would mean that the vehicle would lose many of its outstanding characteristics. If this vehicle had the power plant of an American Jeep it would probably mean that its weight would go up to that of the standard Jeep. The American Amphibious Jeep weighs approximately 3,400 pounds compared to slightly more than 1,700 pounds [1,725] for the German amphibious Volkswagen."

When empty the two vehicles had similar ratios of power to weight, the SAE experts reported, although the Jeep weighed almost twice as much as its amphibious Beetle equivalent. 'There are important lessons in the reduction and saving of weight in this vehicle, especially in the engine, and the hull construction,' they added.

After their meticulous analysis of the structure and concept of the Schwimmwagen the American auto engineers gave it a rave review: 'The general architecture of the job offers an ideal combination of structural strength, maximum passenger space and low silhouette. Such items as the elimination of side-entrance openings, the relocation of exhaust system and the torsion bar method of suspension, while lending themselves to the nautical personality of the job, have definitely contributed to its light weight as well as to its performance and stability as a land vehicle.'

A dichotomy of the Type 166 design was noted in the report: 'The general feeling of the engineers present was that they would not design an amphibious vehicle for an air-cooled engine.' With all that water around, they thought it should be exploited. They opined that 'the



Although traditionally critical of 'foreign' developments, Detroit's senior engineers found much to praise in the Schwimmwagen's design and performance. They posed with their sample and Army colleagues

definite trend of the German designers toward air cooled engines resulted from the problem they faced in winter fighting on the eastern Russian front.'

A complaint common to all the early Volkswagen designs was expressed here as well: 'Brakes are inferior. When the vehicle comes out of the water there are no brakes. They are not kept dry. It was explained that the brakes had not been good since the vehicle arrived from Germany.'

Many of the American engineers - among them the technical directors of their respective firms - were having a first opportunity to experience Beetle-style handling. 'There was a feeling that the vehicle steers too fast - over steers - on land,' they reported. 'It was pointed out that even though the steering is fast in [comparison] with American practice it probably is a national German desire to have fast steering. It will hold anywhere on a curve.'

A detailed breakdown of the welded-steel hull of the Type 166 was performed. 'Efficient shaping of the body panels,' said the report, 'has resulted in a job having unusual roominess and a pleasing appearance. It has also contributed to light weight, structural stability and seaworthiness.' Specifically, the SAE engineers concluded: "In the judgement of the committee the body or hull of this vehicle creates the impression of a well engineered product. It is composed of a minimum number of stampings of substantial size, calling for an elaborate and expensive tooling program. The entire vehicle would be costly to build from our standard for small vehicles. However, cost in a military vehicle is secondary to the man hours required in manufacture."

In this finding they put their fingers on some of the considerations - complexity and the manufacturing-manpower requirement - hat had led to the VW works' decision to cease production of the Type 166 in August 1944 after the waves of bombings.

Their experiences in and out of GM's Sloan Lake impressed the assessors with the shrewdness of the Schwimmwagen's hull contours. They praised the way the underside of its 'bow' was configured to permit the front wheels to steer the craft so effectively. 'Road and water tests have proven [that] a great deal of thought has been given to the actual contour of the hull,' they found, adding, 'It may well be advisable to make a more complete study of this hull by making a female plaster cast of same, which could be used as a basis for further experimentation and development.'

Their careful evolution from the Type 87 to the 128 and then to the 166 in the waters of the Max Eyth Reservoir had rewarded the Porsche team with enviable engineering success, not only in the eyes of the soldiers that used their creations but also in the eyes of their peers. The Schwimmwagen was and remains a tribute to their skills.

Ferry Porsche, who led work on wartime development of VW variants, presented the T166 prototype to Hitler and—behind windscreen—Himmler at the Wolf's Lair in the autumn of 1941. Keitel and Bormann were at the right

'He appeared to be pleased' said Ferry of Adolf Hitler's reaction to the SS-backed Type 166 at its autumn 1941 Wolfschanze presentation. It brilliantly married four-wheel drive to full amphibious capability