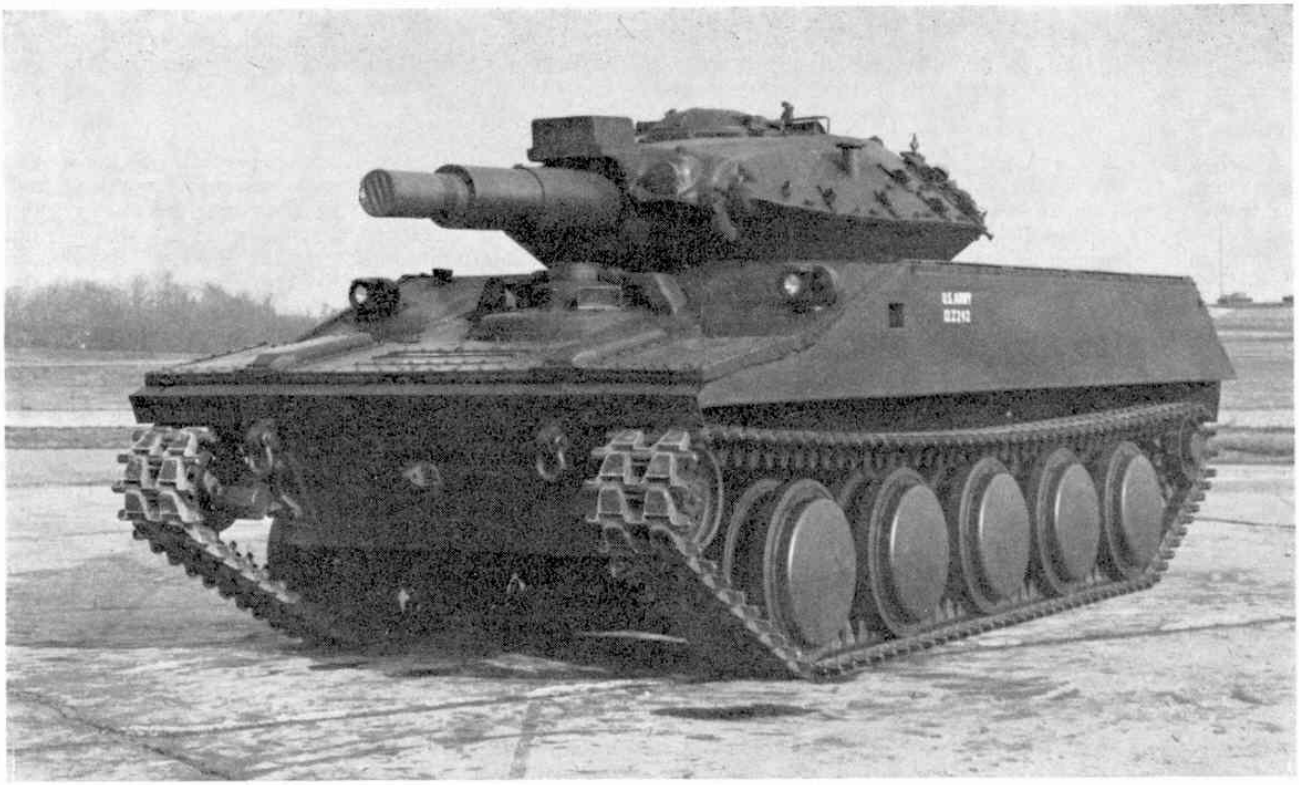


U.S. Airborne Tank M551 " Sheridan "—note riveted construction.

ARMOUR IN THE SKY

Our Armoured Fighting Vehicle expert Jack Wheldon traces the history and development of the light tank . . . .

READERS WHO HAVE FOLLOWED MY SERIAL HISTORY of modern armour will know that the small, fast, thinly armoured tank originated with Messrs. Vickers in the late 'twenties, largely as a commercial venture. Various roles were envisaged for it in high-speed mechan'sed warfare, and readers interested in tank-warfare theory of those days should ask for ' The Battle of Dora ' by Graham, published by Clowes 1931, at their local library. In this book, a soldier describes co-operation between medium and light tanks in ' flanking ' and ' pursuit ' actions.

Thin-skinned little tanks contributed greatly to the swift German successes of 1939-41, when they were used to effect Strategical Paralysis of the Allied command systems. But when Hitler over-reached himself, the war changed to a process of attrition, of pitched battles and struggles for positions, and in these activities light tanks were found to have a short and not very useful life. They even lost their usefulness for battle reconnaissance, and by 1943 only the Americans were continuing their development. Curiously, the U.S. Light tank of 1945 strongly resembled the Russian T34 medium tank of 1939 !

After 1945 the general-purpose medium tank was thought most suitable for full scale war with added nuclear hazards, and the light tank, which was merely a weaker ' medium ' without any useful increase in speed or range, was of small account. The conventional light tank thus became a back number for a quarter of a century.

But in the 'sixties, arguments in favour of a new approach to light tank design repeatedly made themselves heard, and we might summarise them thus:

(a). As well as preparing against large-scale war, soldiers have an important police-type role. The Russians use heavily-equipped armoured divisions for this as in Hungary and Czechoslovakia, partly because Communist politicians do not fear accusations of ruthlessness, and partly because the Red Army enjoys interior lines of communication, which can carry heavy units direct to most important centres within the modern Russian Empire.

By contrast, British and American politicians cannot use overwhelming force against troublemakers, and they have to use road, sea, air and rail transport when sending troops to distant commitments. Under these circumstances, a light, air-portable tank-type fighting vehicle has often been wanted—but has not been available.

Upper: Scorpion prototype, the inner headlamps are infra-red. Note flotation screen foundation at track-guard level.

Lower: The Scorpion at speed in ' impassable ' country. Note ' relaxation ' of crew, evidence of a competent suspension.

(b). Although the conventional main battle tank is so expensive, it is easily destroyed, since no armour affords full protection against modern AT weapons, which either melt holes in it or shatter it internally with shock-waves. Some people think that a weapon-system of small related vehicles would be better than one expensive M.B.T., since while this would offer a total firepower superior to the M.B.T.'s; it would also be cheaper, it would offer a wider utility range, and its survival chances would be greater.

(c). Because of the dreadful cost of conventional war and the risk of its sliding into nuclear disaster, some soldiers are re-considering the Fuller-Liddell Hart theories of strategical paralysis, for which highly mobile armour would be essential. By highly mobile, we mean a mobility superior to contemporary civilian standards. The conventional 50 ton tank does not have this !

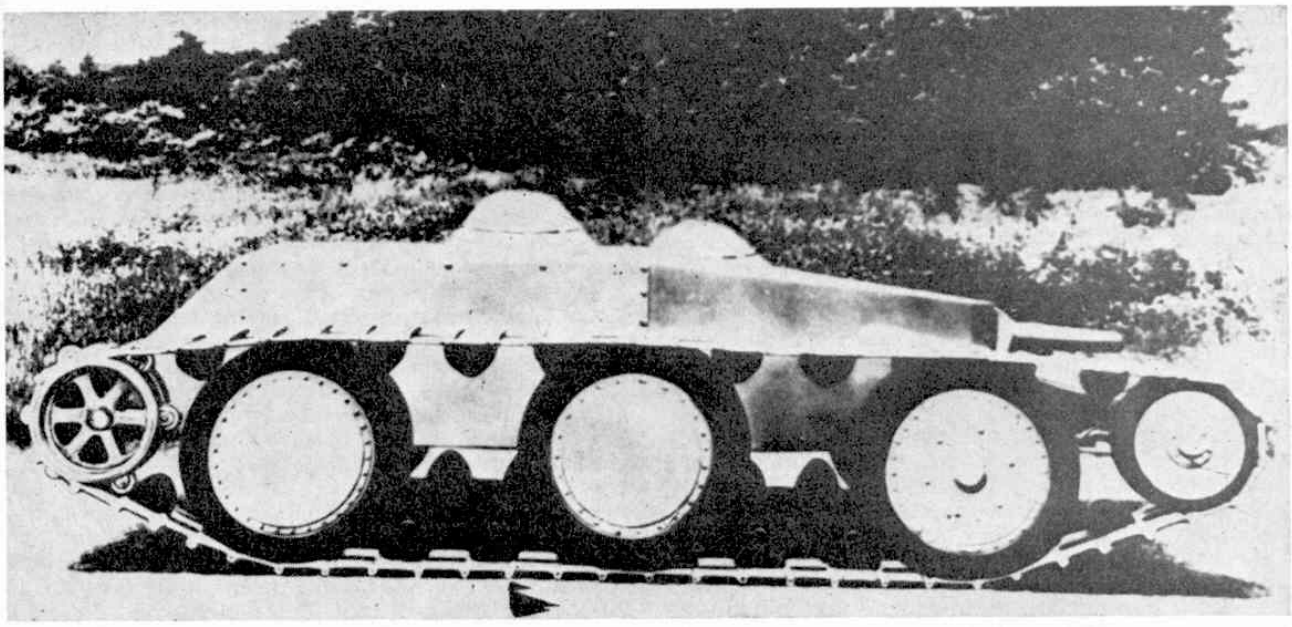
(d). A weapon system of which the parts can be purchased separately is more viable commercially than very expensive indivisible units. Not many small nations want Chieftain, but they may become regular purchasers of cheaper vehicles, each of which does part of Chieftain's work. The French have been selling a 13 tonner multi-purpose chassis since the 'fifties.

These arguments gained force until in the late 'fifties both Britain and the U.S.A. undertook development of a new class of air-portable tank-type vehicles. Vehicles which would have light-alloy armour, which could be dropped by parachute; which could cross marshes; which would be very fast over long distances. The Americans were first in production, their 16 ton M551 Sheridan entering service with the 1st Air Cavalry in Vietnam 2 years ago. The British, however, aimed not for a single tank but for a family of vehicles, and the first of these, the 7.8 ton Scorpion, is just now entering service.

Now it is clear that Sheridan and Scorpion are not conventional light tanks. The latter have always been the poor man's medium tank, with cheapness their only advantage. The main idea behind Sheridan and Scorpion is quite obviously not cheapness, for both have survived very costly development programmes. It is Availability! These are machines with a world-wide circuit of action based on air-portability, a high-power weight ratio, and a wide range of operational usefulness based on a careful choice of new and old weapons. Low production and maintenance costs are an added, and very welcome, bonus.

Their true ancestor is the Christie airborne tank built for the same reasons in the 'thirties. Mr. J. W. Christie (1866-1944), of New Jersey, entered tank design late in World War One after being commissioned by the U.S. Ordnance Dept. to build several types of self-propelled gun. He believed that speed and circuit of action were the most important characteristics of a fighting vehicle, and went on to build examples that could swim powerfully and race across country, and finally in 1932, he produced an air-portable machine which could do 60 mph on tracks or 120 mph on wheels. With 150 b.h.p. per ton, it could leap 20 feet on level going. Christies gave it a transfer gear box with a view to fitting a helicopter rotor (to solve the problem of releasing it from an aircraft) but did not pursue this line of development. He could not interest his Government in this machine, but he did not give up. He built a second one in 1933/4, and used it to demonstrate the practical possibility of dropping armour from the sky. He built an " Expendable Airborne Offense Tank " in 1938, and its companion " Airborne Tank Destroyer " in 1941, and in the last years of his life he made a scale working model of an improved version. All these machines were turret-less (Christie tended to avoid the detailed designing of fighting compartments): all featured his knee-action, telescopic, independent suspension system which gave wheel deflection up to 2 feet: all had dural wheels and light-alloy engines etc.; all had sloped, part-welded armour, and the heaviest weighed 6 tons. Their power-weight ratios were so high that additional weight could have been carried easily, and they had disc brakes all round.

They were sometimes criticised on grounds of petty unreliability, but this was grossly unfair, because they were isolated experimental machines. Such charges



Christie's 2nd Airborne AFV, M.1933/4. Shown as originally designed—a 6 wheel tracklayer, with pneumatics. Wt. 2.2 tons. BHP 250—Length 14 ft. Was later modified to become 4-wheel armoured car (no tracks). Was the vehicle in which Christie's son was dropped (successfully) from factory roof.

are never levelled against officially accepted developments, where unreliability is accepted beyond the pilot-series stage! The most honest military criticism of it was that " no funds existed for its development, because no requirement for it existed." Which can be translated to mean that it was more than fifteen years ahead of conventional military thinking. . . .

The 1932 Christie Airborne was eventually sold to Russia, but the Red Army didn't use it. Was it scrapped, or is it now in a museum ? The 1933/4 model was converted to run as a 4-wheel armoured car, then dismantled and its parts put into store. The Offense Tank of '38 is now in a private collection in the U.S.A. The Tank Destroyer was used as a tracked jeep for some time, then finally scrapped. The Mark 2,a ⅛ scale model Offense Tank, is believed to have been stolen following Mr. Christie's death.

As already noted, it was not until 1956 that the British and U.S. Armies officially awoke to the possibility of using armour from the sky, and even then the motivation was not so much to effect ultra-deep penetration and strategic paralysis, as to ease the load on exterior lines of communication.

But of the Sheridan and Scorpion, which is nearer to the Christie ideal ? Well, Sheridan can be dropped on 2 parachutes; its hull, and much of its insides, are made of light alloy, and its engine (like Christie's) churns out more than 300 b.h.p. It has knee-action suspension and a crew of only 3. But it is fairly large (19 feet long) and has been designed as a general purpose vehicle, and this in turn has necessitated a heavy steel turret to take the trunnion-pull from its ' Shillelagh ' weapon system. The latter is a sort of combined howitzer, mortar and rocket-projector of 152 mm calibre. So Sheridan weighs 16 tons, has only 20 bhp per ton; and is more conspicuous than it should be. In my opinion it is not progressive enough; its owners have been too reluctant to drop the conventional ' tank image '.

Scorpion superficially resembles Sheridan in having an angular, under-cut turret, and light alloy armour. But it is much smaller (14½ feet overall); its engine is in front with the driver beside it on the left; its armour is assembled by welding instead of riveting and screwing (quite a break-through, this), and it is much lighter at 7.8 tons. But its power-weight ratio is not much higher, because it uses a commercial motor-car engine of only 4 litres, the Jaguar XK. Still, it can do 50 mph on the level, and it is also extremely agile. The cross-drive, which is in the nose to drive the front sprockets, is regenerative (that is, when the tank turns, the energy from the slowed down track is fed across to the outside one), but unlike earlier British steering-gearboxes of this nature it is semi-automatic—a ' hot shift ' as it is called. Those who have heard a learner-driver sorting out his non-syncromesh gears on a Centurion while balanced on a knife-edge crest, will appreciate the joys of the hot shift. Scorpion, moreover, has 7 gears forward or reverse, and disc brakes all round. There are 5 road wheels on each side, of light alloy with rubber tyres, sprung on torsion bars which give 8 inches deflection. Not enough in my opinion, but still a lot more than your family car can boast. The track is of steel links, with rubber hinges, road pads and wheel paths, and very wide so that the Scorpion has a low ground pressure and is something of a marsh-buggy. The XK motor is quiet (very important) and the use of so many commercial parts makes the vehicle reliable and easy to service.

And it is light! Only 7.8 tons, for vehicle, crew and armament! Not so light as the Christie, but then, the latter did not carry much equipment—certainly not the advanced navigational and optical equipment, and the NBC clean-air pack (against chemical and nuclear hazards) that Scorpion carries. But light enough. A C/130 transport can ferry 2 Scorpions through 1,000 miles across the sky, and when under its own power it can swim across water obstacles with ease, after the quick-fitting flotation screens are snapped together.

Again like the Christie, it has been designed first and foremost as a parent type from which a team of fighting vehicles can be created, and this is undoubtedly a good thing. Development of this work has been entrusted to Alvis Ltd., who in the 'thirties, pioneered the manufacture of monocoque—construction armoured cars in this country, and who, in the early fifties,

collaborated with the Army in evolving the highly successful 6 × 6 wheeled AFV family—Saladin, Saracen and Stalwart. This 'S' name tradition is maintained by Alvis with the new vehicles—and the new names are delightfully apt. Thus, Scorpion has its deadly sting in the rear-mounted turret—a light-weight semi-automatic 76 mm. cannon. This may seem small-calibre compared with the MBT's 120 mm. weapon, but it delivers an adequate H.E. shell in the fire support role, and can penetrate MBT armour at any range with HESH (Squash Head) ammunition, which does its work through shock waves and does not try to punch a hole by brute force and weight. This versatile gun also fires smoke and star shell, and (this may sound Napoleonic) canister as well, for dealing with close range targets in guerilla warfare—a deadly answer to the jungle ambush. Needless to say, a machine gun is mounted co-axially with the cannon. If required, Scorpion can be equipped with a smaller cannon—the Rarden semi-automatic 30 mm.—having a larger ammunition reserve, and this is known as SCIMITAR.

Scorpion's running mate is STRIKER, specialising in the anti-tank role. Striker has a crew of 2 and a remote-controlled unmanned rocket launching turret. The launch is programmed, making it very quick into action, and so capable of action against close-range targets, whether armour or fortified position.

A fully-equipped infantry section of 7 men can travel in SPARTAN, the armoured personnel carrier. It has a slightly modified turretless hull, with a cupola fitted with machine gun and advanced optical equipment.

Control of large formations is effected from SULTAN, the armoured command vehicle. The hull resembles Spartan's, but has 12 in. greater headroom, a luxurious telecommunications console, and a tent extension.

Casualties to both men and machines must be given every aid, and to rescue the former we have SAMARITAN, a 4 berther, which will give a more comfortable ride on difficult ground than almost any wheeled vehicle. An armoured ambulance is essential in danger zones—especially when the enemy are guerillas who do not observe a civilised code of warfare.

Vehicle casualties are rescued by SAMSON the A.R.V., with his twin spades at the rear, his internal winch, and experimental equipment for rescuing 'drowned' vehicles on amphibious operations.

And that is the 'new look' family of light-alloy, air-portable British AFVs that Alvis and the Fighting Vehicle Research and Development Establishment are jointly creating. Can it herald the kind of development in military theory that Christie anticipated 40 years ago? Mechanised armies with armour from the sky, getting around at really high speeds, and jumping on trouble before it can get dangerous? Can it be that we are about to witness the fade-out of the 50 ton MBT? After all, the latter is something of a dinosaur, and we know that those monsters were replaced by animals a lot smaller and a lot more agile.

The writer wishes to express his gratitude to ALVIS LTD. for their kindness in providing data and photographs of the SCORPION family.

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by a member of our Royal Family who performed the opening ceremony as well. The Prince of Wales opened Tower Bridge on June 30, 1894, after having performed the laying of the foundation stone some eight years earlier.

The Bridge is one integral whole, though consisting of two bascule leaves and two suspension bridges. In addition to the two main towers, which are of steel and are built on the piers, there are two smaller ones on the shore, one on the Surrey side and the other on the Middlesex bank.

From these land towers stretch straight anchor ties that go right through the road to be riveted to a huge anchor tube kept in place by many tons of concrete. Between the main towers and the smaller towers hang the chains suspending the shore spans.

In 1961, however, the load of the chains was altered. Up to that year, the top of the chains on the north side was connected to that on the south side by steel ties, and the weight of these ties was taken by the high level footways. Since April, 1961, the load has been transferred to 2-inch lock coil cables suspended from the main top pins conecting the long chains and ties.

Allowance has also been made for expansion and loading of the bridge by enabling the connected chains and ties to rest on special roller bearing plates attached to the four towers. In fact, the steel-work between the anchors on the approaches extends for nearly a quarter of a mile!

Nearly 37,000 tons of concrete, 27,260 tons of brickwork, and 30.000 tons of masonry went into the building of the Tower Bridge, and its construction consumed 20,000 tons of Portland cement, 11,300 tons of iron and steel (not including machinery), and 1,500 tons of cast-iron. It required 3,900 tons of granite and 5,700 yards of wood for the 9,500 superficial yards of footway paving, and the total cost was more than £1,000,000—equivalent to at least £10,000,000 today.

Each bascule leaf weighs over 1,000 tons and rotates on a shaft 21 inches in diameter carried on roller bearings. Concealed inside each main tower is a counterpoise member which balances the visible part of the bascule pivoted there.

Because it can be lifted to let ships pass through, the Tower Bridge does not prevent vessels up to 10,000 tons from going up the Thames beyond the Port of London.

Two geared quadrants on each counterpose engage with pinions driven by two hydraulic engines, the latter being housed and arranged in such a way that either is capable of raising and lowering the bascule alone under normal conditions. Each bascule is also independently controlled, and all the operations are performed—mostly by remote control—from cabins on the downstream side of the Bridge.