

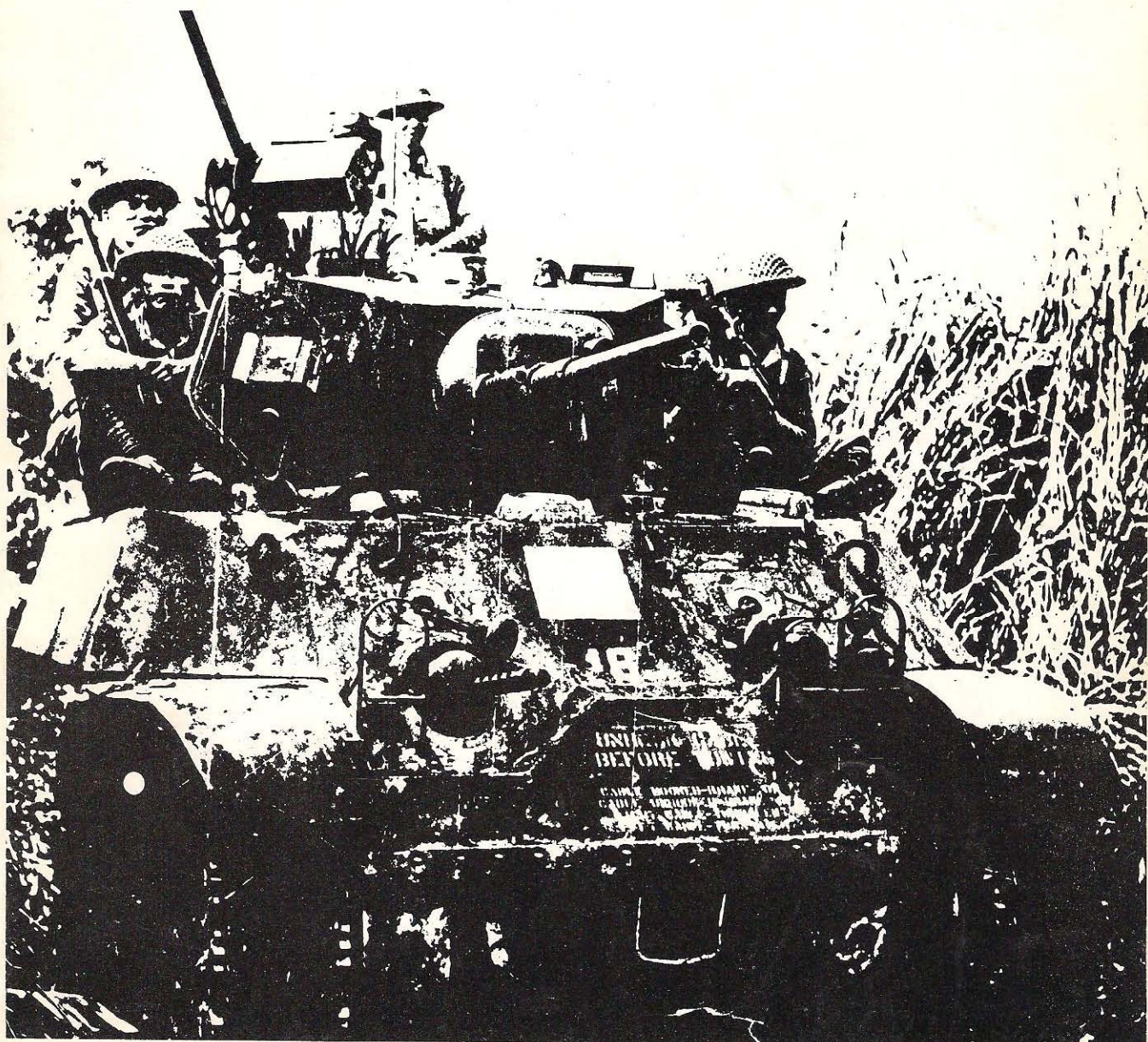
**PROFILE**  
**AFV**  
**WEAPONS**

**4**

R. E. I. F.

**Light Tanks M1 – M5**

by Chris Ellis and Peter Chamberlain



# AFV/Weapons Profiles

Edited by **DUNCAN CROW**

Check list of published titles:

- 1 **Churchill—British Infantry Tank Mk. IV**  
*by B. T. White*
- 2 **PanzerKampfswagen III**  
*by Walter Spielberger*
- 3 **Tanks Marks I to V**  
*by Chris Ellis and Peter Chamberlain*
- 4 **Light Tanks M1—M5 (Stuart/Honey)**  
*by Chris Ellis and Peter Chamberlain*
- 5 **Light Tanks Marks I—VI**  
*by Major-General N. W. Duncan*
- 6 **Valentine—Infantry Tank Mark III**  
*by B. T. White*
- 7 **Medium Tanks Mks A to D**  
*by Chris Ellis and Peter Chamberlain*
- 8 **Crusader—Cruiser Mark VI (includes Cruisers Marks I—VI)**  
*by Major J. K. W. Bingham, Royal Tank Regt.*
- 9 **Early (British) Armoured Cars**  
*by Major-General N. W. Duncan*
- 10 **PanzerKampfswagen V Panther**  
*by Chris Ellis and Peter Chamberlain*
- 11 **M3 Medium (Lee/Grant)**  
*by Peter Chamberlain and Chris Ellis*
- 12 **Mediums Marks I—III**  
*by Major-General N. W. Duncan*
- 13 **Ram and Sexton**  
*by Peter Chamberlain and Chris Ellis*
- 14 **Carriers**  
*by Peter Chamberlain and Duncan Crow*
- 15 **PanzerKampfswagen I and II**  
*by Major-General N. W. Duncan*
- 16 **Landing Vehicles Tracked**  
*by Colonel Robert J. Icks, USAR Retd.*
- 17 **Russian KV and IS**  
*by Major Michael Norman, Royal Tank Regt.*
- 18 **Chieftain and Leopard (Development)**  
*by Major Michael Norman*
- 19 **Chieftain and Leopard (Description)**  
*by Major Michael Norman*
- 20 **Churchill and Sherman Specials**  
*by Peter Chamberlain and Chris Ellis*
- 21 **Armoured Cars—Guy, Daimler, Humber, A.E.C.**  
*by B. T. White*
- 22 **PanzerKampfswagen 38(t) and 35(t)**  
*by John Milsom*
- 23 **Soviet Mediums T44, T54, T55 and T62**  
*by Major Michael Norman*
- 24 **The M48/M60 Series of Main Battle Tanks**  
*by Colonel Robert J. Icks*
- 25 **Cromwell and Comet**  
*by Major James Bingham*
- 26 **Hellcat, Long Tom, and Priest. PLUS Complete Check List of All U.S. World War II SPs**  
*by Colonel Robert J. Icks*
- 27 **Saladin Armoured Car**  
*by Major Michael Norman*
- 28 **S-Tank**  
*by R. M. Ogorkiewicz*
- 29 **M4 Medium (Sherman)**  
*by Peter Chamberlain and Chris Ellis*
- 30 **Armoured Cars—Marmon-Herrington, Alvis-Straussler, Light Reconnaissance**  
*by B. T. White*
- 31 **Australian Cruiser-Sentinel; and Australian Matildas**  
*by Major James Bingham*
- 32 **M6 Heavy and M26 (Pershing)**  
*by Colonel Robert J. Icks*
- 33 **German Armoured Cars**  
*by Major-General N. W. Duncan*
- 34 **Scorpion Reconnaissance Tank**  
*by R. M. Ogorkiewicz*
- 35 **British Armoured Recovery Vehicles + Wheels, Tracks and Transporters**  
*by Peter Chamberlain and Major-General N. W. Duncan*
- 36 **Chars Hotchkiss H35, H39, and Somua S35**  
*by Major James Bingham*
- 37 **Russian BT Series**  
*by John F. Milsom*
- 38 **Conqueror Heavy Gun Tank**  
*by Major Michael Norman*
- 39 **Panhard Armoured Cars**  
*by R. M. Ogorkiewicz*
- 40 **U.S. Armored Cars**  
*by Colonel Robert J. Icks*
- 41 **M103 Heavy Tank + M41 Light Tank (Walker Bulldog)**  
*by Colonel Robert J. Icks*
- 42 **Modern Swedish Light Armoured Vehicles**  
*by R. M. Ogorkiewicz*
- 43 **PanzerKampfswagen IV**  
*by Walter Spielberger*
- 44 **Ferrets and Fox**  
*by R. M. Ogorkiewicz*
- 46 **Light Tanks M22 (Locust) and M24 (Chaffee)**  
*by Colonel Robert J. Icks*
- 47 **T-34**  
*by J. M. Brereton and Major Michael Norman*

AFV/Weapons Series 1—42 inclusive 35p each; 43 onwards 40p each.

If you have any difficulty in obtaining Profiles from your local book or model shop please write direct to:

Mail Order/Subscription Department,

PROFILE PUBLICATIONS Ltd, Coburg House, Sheet Street, Windsor, Berks. SL4 1EB



*Into the mechanised age; an almost symbolic scene during the U.S. Army Summer exercises of 1940 as a M2A4 light tank of the 7th Cavalry Brigade (Mechanised) overtakes a horsed squadron of the U.S. Cavalry. The M2A4 was the first U.S. tank to be built in quantity in the 1940-45 period. (Chamberlain Collection)*

## Light Tanks M1-M5 By Chris Ellis and Peter Chamberlain

**"If fast tanks can operate in this [aggressive striking] manner, we will greatly aid in restoring mobility to warfare: in keeping with the doctrine of operating on the flanks and rear and through the gaps, and in forcing the enemy to make detachments to guard his lines of communications . . . and bases, we would so considerably weaken his main forces in battle that a quicker decision will be reached." Lt-Col Adna R. Chaffee (later first commanding general of the US Armored Force), writing as executive officer of the Experimental Mechanised Force, 1932.**

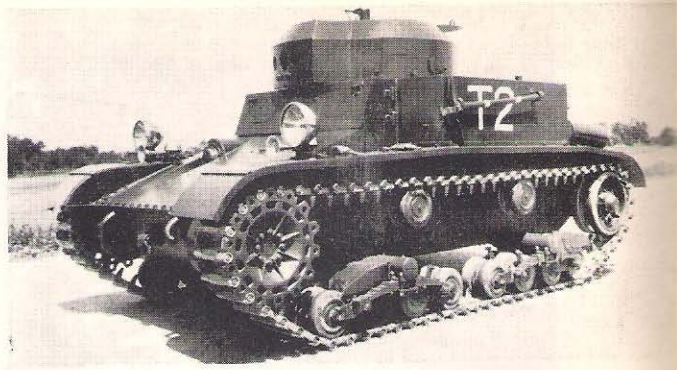
PRIOR to the second world war, the development of armoured vehicles in the United States took place on an even smaller scale than development in Britain. At the same time, the evolution of an armoured doctrine followed a similar pattern to that which crystallised in the 'twenties and 'thirties in Britain, and to a great extent it was strongly influenced by British ideas. Indeed the advocates of the tank in the US Army had a far tougher fight for survival than the British tank men. Partly due to post-war euphoria and partly due to strong infantry influence on the General Staff, the US Tank Corps, most junior of the US Army's branches, was completely disbanded in 1919 and in 1920 a new National Defense Act decreed that in future tanks would be regarded as an infantry responsibility and that the infantry would be charged with outlining tank requirements to the General Staff who would then authorise procurement as they considered necessary.

Tanks thus became a low priority weapon in the immediate post-war years in the eyes of both the General Staff and the infantry "traditionalists". It was not until April, 1922 that any future tank policy was formulated, and this was based closely on a memorandum submitted to the General Staff in 1919, just before the Tank Corps was disbanded, by Major R. E. Carlson, a member of the Anglo-American Tank Commission which had been responsible for the Mk. VIII "Liberty" tank. The new policy document confirmed the then prevailing view (which was adopted also in Britain) that the tank was essentially an infantry support weapon. The opening sentence read: "The primary mission of the tank is to facilitate the uninterrupted advance of the riflemen in attack". It went on to state that for economy reasons, the number of tank types was to be kept to a minimum and that two should be developed, a "light tank" not exceeding 5 tons in weight and transportable by lorry, and a "medium tank", not exceeding 15 tons which was then the loading limit of Engineer Corps pontoon bridging equipment. It was acknowledged that "the tank is not likely to decrease in importance as a war weapon" and that "the Chief of Ordnance will be allowed great latitude in the development of a pilot tank for test purposes in close co-operation with the Chief of Infantry". Initial efforts it was decreed, should be concentrated on developing a medium tank and, above all, the need for continual economy was stressed.

It was not until 1928 that any official change in this "infantry tank" policy was made. In that year the US

Secretary for War, Dwight F. Davis, visited Britain and was able to see the recently-formed "Experimental Mechanised Force" on exercises. This small but advanced "armoured brigade" had a well-balanced establishment of light and medium tanks with supporting self-propelled artillery and motorised infantry; subsequently disbanded in this form, the British mechanised force developed tactics and ideas which were used to great effect by the German panzers in 1939-40. Impressed with what he saw, Davis ordered the immediate establishment of a similar Mechanised Force in the US Army, though this had been anticipated—on paper at least—by the Army Chief of Staff who had made moves to form such a unit the previous year when he first heard of the British developments in this direction.

Based at Fort Eustis, Virginia, the new Mechanised Force was composed of personnel drawn from infantry tank units, the cavalry, artillery, and other main arms. To equip the new force an establishment of 72 light tanks and 16 medium tanks was planned—though in 1928 no completely new designs existed for these. Impetus to development was given by the appointment of General Douglas MacArthur as the new Army Chief of Staff in 1931. He instituted a vigorous policy of "mechanisation and motorisation" for the entire army and modified the 1922 policy statement on tanks to fit in with his characteristically aggressive views of warfare. MacArthur acknowledged that the infantry always bore the brunt of the task of dislodging the enemy from defensive positions. But instead of a slow lumbering supporting tank for the infantry he reasoned that "the ideal machine for assistance in this



*Progenitor of the M1-M5 series of light tanks was the T2 light tank/combat car prototype of 1933. Note the Vickers-type suspension and a hull form similar to that of the Vickers 6 ton tank. (U.S. Official)*

mission must of necessity have a high degree of tactical mobility . . . [and] . . . sufficient armor to protect [it] against the preponderant mass of . . . fire, namely that from all types of small arms". For protection from field guns, he wrote, the vehicle would mainly have to rely on its speed. MacArthur went on to state that ". . . the traditional cavalry missions of covering the advance or retreat, . . . conducting reconnaissance, and exploiting victory by pursuing a disorganised army remain unchanged. Cavalry interest . . . [is now] . . . centered on armored cars and cross-country vehicles possessing a high degree of strategic mobility, with fighting and tactical mobility an important though secondary consideration."

When MacArthur formulated these ideas (in a

*A Combat Car M1 of the U.S. 1st Cavalry Regt, 7th Cavalry Brigade, seen at high speed during 1939 manoeuvres. (Chamberlain Collection)*



report to the Secretary of War), the only light tank design under development was one which had been initiated by the infantry in 1926 to conform closely with the 1922 stipulations. The Chief of Infantry had asked the Ordnance Department to design a vehicle with a maximum speed of about 12 m.p.h., a crew of two, a 37 mm. gun, armour proof against .30 calibre ammunition and grenades, and a top weight within the 5 ton limit. This inhibiting qualification, incidentally, was a not unsound idea for the time since transportation by truck speeded up the time taken to get the tanks into the front line, and—more important—conserved track life, always a weak feature of the early tanks. Experience with the truck-portable Renault FT tank in 1918 had led directly to Carlson including this recommendation in his original tank memorandum to the US General Staff. The new tank designed at Rock Island Arsenal was designated Light Tank T1. It had a front-mounted engine and rear-mounted turret, while the tracks were of the tractor type and not unlike those used on the Renault FT and other World War I designs. Financial stringency was the order of the day, and the T1 was used only as a development vehicle. Between 1927 and 1931 the T1 series ran to several improved models of similar appearance, culminating in the T1E4 which had a rear-mounted engine and had crept up to 7 tons in weight. By this time MacArthur, as we have seen, had modified official General Staff policy on tanks. The slow T1 series vehicles intended solely to accompany infantry were considered out-moded and no further work was done on these designs.

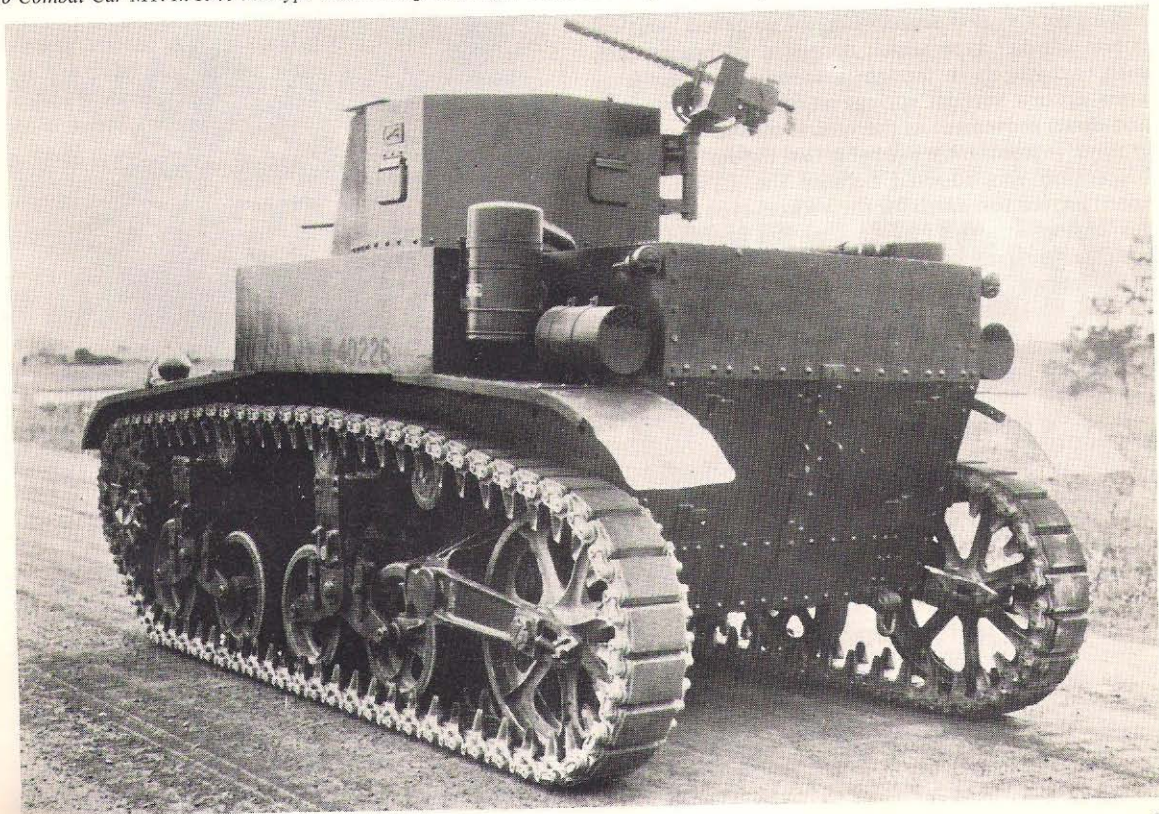
In 1932, with MacArthur as their champion, the US

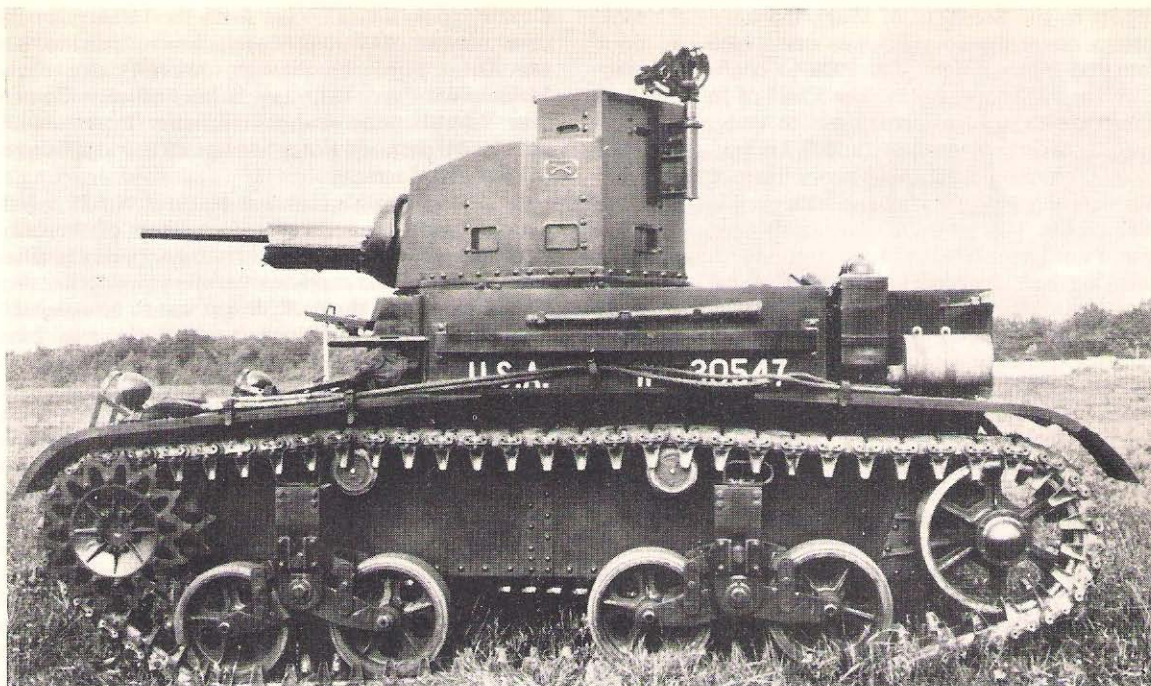
Cavalry took the initiative from the infantry in the development of armoured vehicles and tactics. On MacArthur's orders the cavalry took full charge of the Mechanised Force (with two cavalry officers, Colonel Van Voorhis and Lieut.-Col. Chaffee in command) and the Mechanised Force headquarters was moved to Fort Knox, Kentucky.

In 1933 a new light tank was designed, the T2, which was to meet the modified requirements of the MacArthur regime, principally with a high speed and small calibre guns at the expense of armour protection. For economy reasons the basic design was to be adaptable to meet the needs of the infantry in the traditional "infantry support" role and the needs of the cavalry in their new "mechanised cavalry" role as laid down by MacArthur. From the old T1E4, the T2 inherited only the rear engine/front drive layout but was otherwise radically different. Several features were copied almost exactly from the contemporary Vickers 6 ton design which was then being sold to many small nations by the British firm. In particular the leaf spring suspension was exactly similar, as were the sponsons which overhung the track, and the long sloping glacis plate.

The T2 was designed to mount a .30 calibre machine-gun in the hull front—operated by the co-driver—and a second .30 calibre weapon, with a .50 calibre machine-gun, in the turret. There was a crew of four and the dry weight was about 6½ (short) tons, the weight limit having by this time been raised officially to 7½ tons. To give the requisite high speed, a Continental air-cooled 7-cylinder radial aero engine was adopted, of a nominal 250 h.p. This was a lightweight unit with a good reserve of power and obviated the

*Significant development was the Combat Car M2 which first introduced the distinctive trailing idler. Turret and armament were similar to Combat Car M1. In 1940 this type was re-designated Light Tank M1A1. (U.S. Official)*





*The M2A4 was the model which introduced the 37 mm. gun in a traversing turret. Note the wider-spaced bogies which had been introduced in the M2A3. (U.S. Official)*

necessity to develop a special tank engine at a time when funds for such work were in any case practically non-existent. With this power unit, the T2 could achieve a top speed of 35 m.p.h. After trials with the T2, Rock Island Arsenal built a second prototype, the T2E1 which differed principally in having a fixed turret the full width of the hull and box-like in shape. It also had an entirely new suspension, the so-called "vertical volute spring" type which consisted of bogies each with two wheels in tandem suspended on cantilever arms against vertical springs which damped the up-and-down movement as the vehicle moved over rough ground. It seems most probable that the vertical volute suspension was adopted because the T2's high top speed proved too much for the Vickers-type leaf spring suspension, though the suggestion remains that Vickers may in any case have disapproved of the use of their "patent" system. A further prototype was built in 1934, designated T2E2, which was identical to the T2E1 except that it had twin fixed turrets side by side, one for each machine-gun, instead of one full-width turret. Late in 1935, the T2E1 was standardised as the Light Tank M2A1 and 19 vehicles were ordered in addition to the prototype, production being completed in 1936 at Rock Island. This was, in fact, the first US tank to be standardised for quantity production since the Mk. VIII of 1919, all intervening designs being produced as "one off" prototypes or non-standardised development vehicles only.

### THE COMBAT CAR

With their fixed turrets, the T2E1 and T2E2 were intended for the "infantry" role only to equip the infantry tank regiments. The cavalry required a fully rotating turret for their pursuit and harassment function, and to meet this need Rock Island Arsenal

built a further prototype, the T2E3 which was identical to the T2E1 except that a simple hand-traversed 360 degree turret was installed in place of the rigid fixed turret. Armament and physical characteristics were otherwise the same. This vehicle was chosen to equip the Mechanised Force which by this time had been

*Close view of a company of M1 Combat Cars of 1st U.S. Cavalry in 1939. Note the simplicity of the traversing turret with its vision ports and machine-guns. (Chamberlain Collection)*

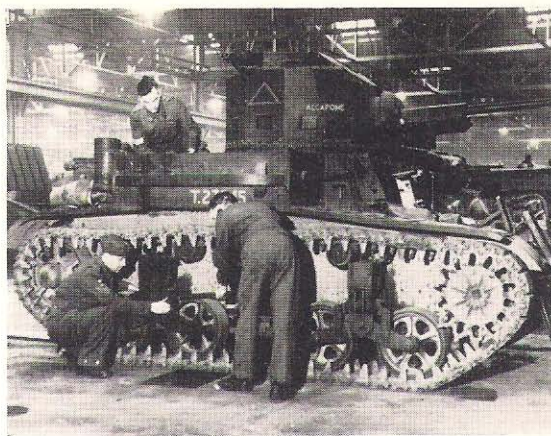


re-organised as the 7th Cavalry Brigade (Mechanised) consisting of the 1st and 13th Cavalry Regiments. To overcome the legal complexities of the 1920 National Defense Act, however, which decreed that only the infantry could have tanks, tracked armoured vehicles used by the cavalry were called Combat Cars,\* and the T2E3 was standardised and put into production at Rock Island Arsenal as the Combat Car M1. Meanwhile the T2E2 with its twin fixed turrets was also standardised, becoming the Light Tank M2A2. About 170 M1 combat cars and M2A2 light tanks were built, the order being completed in 1937. Aside from the details noted, all these T2 series vehicles were physically similar to the T2 prototype but with the vertical volute suspension and an armour maximum of 16 mm. and a minimum of 6 mm. Loaded weight was increased to 9½–10 (short) tons in the production vehicles, however, with a consequent drop in speed to about 30 m.p.h. These vehicles set the pattern for all future US light tanks, until the M24 Chaffee of 1944 introduced a radically different “second generation” of so-called “light” tanks which were heavier and more powerfully armed than US medium tanks in service in 1940.

\*Despite popular fallacy to the contrary there was no difference between a combat car and a tank except in name and—to a lesser extent—function, (i.e. the “cavalry” or “infantry” role).

### REFINING THE DESIGN

From the 1937 debut of the M1 combat car, the distinction between light tanks for the “infantry” and “cavalry” roles began to disappear. With its fully traversing turret the Combat Car M1 was the true forerunner of the M3/M5 series light tanks which were to see wide production and service in the war years looming ahead. Advantages of the traversing turret were so clear that design work was put in hand to produce a version of the M2 light tank for the infantry with a turret and 37 mm. gun similar to that carried



*A small number of M2A4s were delivered to the British for training. This vehicle belongs to a U.K.-based armoured division in late 1941. (Chamberlain Collection)*

in the T1 series light tanks. Meanwhile an improved version of the M2A2 was built, the M2A3, which incorporated detail refinements including slightly thicker frontal armour, improved engine cooling and access, increased gear ratios and constant mesh transmission. To improve the riding qualities, longer stroke springs were fitted in the volute suspension and the bogies themselves were set 11 inches further apart.

Parallel improvements were incorporated in the second production run of combat cars for the cavalry. Designated Combat Car M2, an extra and fundamental change was the replacement of the fixed idler wheel with a trailing idler on a sprung arm, this giving increased ground contact and hence a better ride. The other big change was the installation of a Guiberson T1020 air-cooled diesel motor in place of the Continental in an attempt to keep running and production costs down. In the event this was a useful idea, for a few years later Guiberson diesels could be similarly installed in M3 series vehicles when there was an acute shortage of Continental aero engines.

*The M2A4 saw limited combat service. This U.S. Marine Corps vehicle moves forward into the jungle at Guadalcanal Island, Solomons, in September 1942. It belongs to the same battalion as the M3 light tank shown as a colour illustration on page 13. (Chamberlain Collection)*



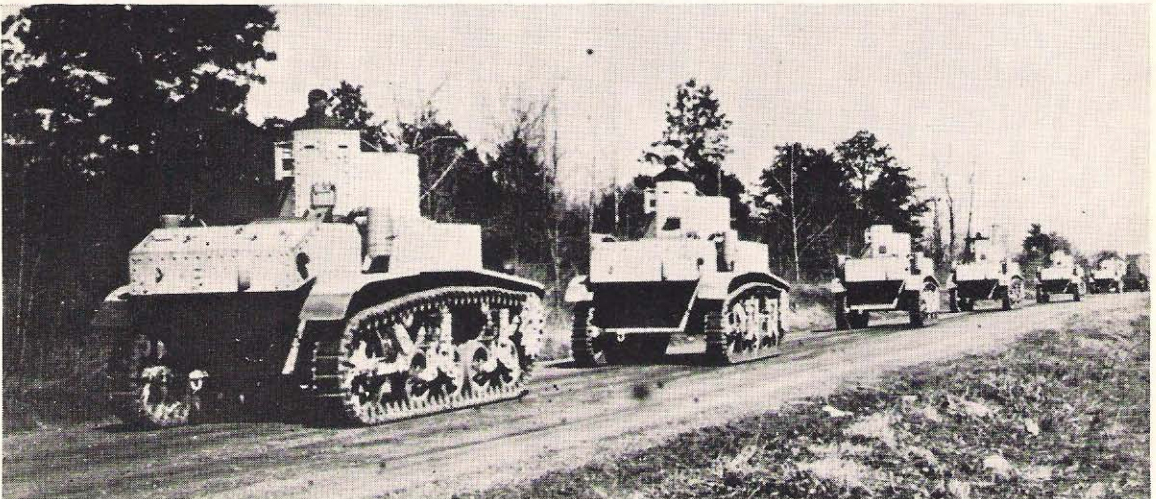


*An early production M3 light tank, showing the all-riveted construction. This is an early trials vehicle with the machine-guns not fitted. (Chamberlain Collection)*

Only about 50 M2 combat cars and M2A3 light tanks were built, production by Rock Island Arsenal being completed in early 1939. Some of the improved features were incorporated, also, in the later production M1 combat cars, and vehicles so altered—they also had the wider-spaced bogies—were designated Combat Car M1A1.

By the spring of 1939, Rock Island Arsenal had completed the pilot model of the 37 mm. gun vehicle. Designated M2A4, this was essentially an M2A3 with a simple riveted manually-traversed turret replacing the twin fixed turrets of the earlier model. There was a pintle for a Browning .30 calibre machine-gun on the turret rear, vision ports were fitted in each face of the turret, and the fixed cupola on the turret top had vision slits cut in each of its six sides. Armour thickness was increased to 25 mm. on the hull sides and front, and this and the turret brought the weight up to just over 12 tons at the expense of normal top speed which fell to 25 m.p.h. In addition to the bow-mounted .30 calibre machine-gun, there were three other weapons of this calibre; one was mounted co-axially with the 37 mm. gun and the other two were in fixed forward-firing mounts, one in each side sponson. The Continental engine was retained, and synchromesh trans-

*Brand new M3s still in primer finish running on road tests from the American Car & Foundry factory in June or July 1941. (Chamberlain Collection)*



*Prime Minister Winston Churchill and Defence Staff chiefs inspect a brand new M3 light tank equipping a U.K.-based armoured division in late Summer 1941. This vehicle has the welded turret. Note driver's vision slit, and the mount for the sponson machine-gun which has been removed. (Imperial War Museum)*

mission was installed, with five forward speeds and reverse. The crew of four was composed of driver (front left), assistant driver/hull gunner (front right) and gunner and commander in the turret.

## INTO PRODUCTION

Fate now fixed the fortunes of the M2A4 and changed it from being just another transitional type built in small numbers into the first American tank to go into mass production on the scale that was to become commonplace in America in the next few years. Just as the M2A4 pilot model finished its trials in September 1939, Germany invaded Poland, war was declared in Europe, and the United States was suddenly plunged into a massive re-armament programme to make up for the years of neglect.

At this time there were no facilities for tank production on a large scale in existing government arsenals. Rock Island Arsenal had built the small numbers of light tanks previously ordered but was essentially an artillery producer with no space for large tank production lines. The Ordnance Department had,





*An absolutely standard M3 light tank, Stuart I, with welded turret, showing all the .30 machine-guns in place. Picture taken on delivery of the vehicle to Britain. (Imperial War Museum)*

however, planned to contract out tank building to locomotive and heavy engineering companies in the event of emergency re-armament on the grounds that such firms had the plant and experience for handling the heavy assembly work required in tank building. Tenders were therefore invited from suitable firms to make M2A4s and the best bid, on a fixed price contract, came from American Car & Foundry Co, Berwick, Pennsylvania, who received an order for 329 vehicles in October 1939. First delivery was to be made in April 1940. This was an ambitious target by any standards since the M2A4 had 14,000 separate parts and there were some 2,000 blueprints involved. Suitable production plant had to be installed as did forging facilities for the armour plate since the firm discovered at the last moment that their usual steel suppliers were unable to provide suitable face-hardened plate. By the terms of the contract such items as the Continental engines, the guns, radio equipment, and other accessories were to be supplied to American Car & Foundry as "government free issue" which greatly speeded up the task of getting the M2A4 into production swiftly since all these items had been well proven in the earlier models and were already stock-piled or being manufactured.

### THE TANK CRISIS

By "round the clock" working, American Car & Foundry kept to its stiff deadline, however, and duly

*A Stuart I (M3) with all the stowage changes made by the British, including extra stowage boxes, sand-shields, and track shoes on hull sides. (Imperial War Museum)*



delivered the first production M2A4 light tank in April 1940. On May 10, 1940, the German panzer divisions swept into France and Flanders, initiating their classic blitzkrieg campaign which decimated the British, French and Belgian armies in a matter of days. On that same day the US Army possessed only 28 tanks which were not completely obsolete by German standards. Of these, 18 were M2 medium tanks (which had gone into production just before the M2A4 light tanks) and the remaining 10 were the first of the M2A4s. These were the only modern tanks with 37 mm. guns out of less than 300 armoured vehicles of all kinds in the whole US Army. All others were either old outmoded types or the earlier M2 type light tanks armed with machine-guns only. The only fully organised tank force was the 7th Cavalry Brigade—which was below its strength on paper—and the remainder were the scattered and unco-ordinated tank companies attached to the infantry regiments.

The events in France caused a massive acceleration in the US re-armament programme, with a special emphasis on making up the inadequacies in the tank situation. On June 30, 1940 a new Munitions Program was instituted to expand mass-production plans which included the setting up of new arsenals specifically for tank production, drawing on the resources of the automotive industry in particular for plant, management and manpower. On July 10 the War Department ordered the establishment of a new Armored Force which was to integrate the differing infantry and cavalry interests in tanks and take over and control all existing armoured units and personnel. Designated commanding general of the new arm was Brigadier-General Adna R. Chaffee who had been one of the original commanders of the Mechanised Force back in 1932. Two new armoured divisions were created, 1st and 2nd Armored Divisions, plus the 70th GHQ Tank Battalion. The Mechanised Cavalry depot at Fort Knox became the new headquarters of the Armored Force and an Armored Force School was also established there the following October. Commander of the 2nd Armored Division was Major-General George S. Patton, later to win fame as the greatest US tank general of World War II. He was another of the relatively small band of senior army officers with tank experience, in his case dating back to the days of the US Tank Corps in France in 1918.

Meanwhile the Ordnance Department worked quickly to design an improved version of the M2A4 incorporating what lessons they had been able to learn from observation of the German campaigns in Poland and France. Most urgent requirement was for increased armour protection and the maximum thickness was brought up to 37 mm. while the large vision ports in the turret sides were eliminated. This brought the weight up to about 13½ (short) tons and to compensate for this the trailing idler, first used in the Combat Car M2, was incorporated in place of the fixed idler, so lengthening ground contact and improving stability; in fact with these alterations the new improved design showed no appreciable loss of performance compared to the M2A4, despite the increase in weight. The other major improvements effected were thicker engine covers as a measure against strafing from the air, and the rearward extension of the hull superstructure to cover the previously exposed exhaust

pipes and silencers. The alterations did not fundamentally change the basic layout and form of the design.

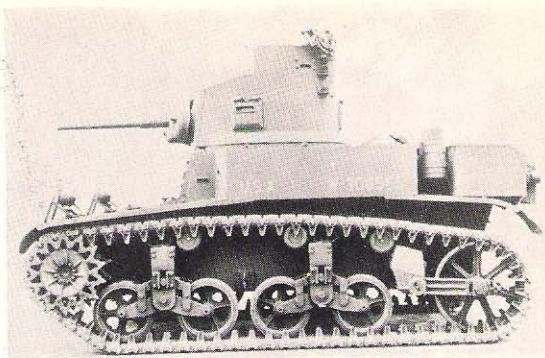
The pilot model, a converted M2A4, was completed at Rock Island Arsenal early in July and approved for standardisation as the Light Tank M3 on July 5, 1940. American Car & Foundry were asked to switch to making the M3 as soon as possible after trials and production details had been worked out and the first M3 did, in fact, leave the line in March 1941, following on M2A4 production without a gap. In the intervening period the M2A4 order had been increased to 365, while Baldwin Locomotive Co built another 10 as a relic of a puny "educational" order which had been placed in autumn 1939 before it was decided to concentrate on one contractor.

The M2A4 thus earned a small place for itself in the history of armour development as the first of the American tanks to be produced on a grand scale in the 1940-45 period. Its builders, American Car & Foundry, earned just praise from the US War Department for their great achievement in turning out these vehicles at better than one a day, no mean feat for a firm with no previous munitions, let alone mass-production, experience. Even so this was nothing compared to the output which the firm was to achieve with its successor the M3. By comparison with the M3 light tank, the M2A4 is almost forgotten. It did, however, form the major part of the Armored Force's tank strength in the uncertain days of 1940-41, since mass-production of medium tanks trailed the M2A4 for nearly a year, to early summer 1941, due to the change in plan which called for a tank with a 75 mm. gun to match the heaviest calibre then being mounted in German tanks. In the early days of United States involvement in World War II, the fighting retreat before the Japanese in the Pacific in 1942, the M2A4 saw combat service as well. It was also the first US tank to be delivered to the British in 1941 following the Lend-Lease Act when a number of M2A4s were sent to Britain and the Middle East, together with the first deliveries of M3 light tanks, specifically as training vehicles for units destined to re-equip with M3s. The M2A4 performed a similar mundane but essential role at the US Army's tank training schools in the earlier part of the war.

In passing it should be mentioned that the earlier M2 series vehicles were used also in the training role at least until 1942 when displaced in the Armored Force by the M2A4 and M3 light tanks. Some were given a new lease of life-by being re-engined with GM diesels in place of their Continental motors in 1940, while several were used for experimental work, one, the M2A3E2, being tested with Electrogear transmission. By a stroke of irony the combat cars were re-designated as tanks in July 1940 when formation of the Armored Force led to the formal abolition of the distinction between "cavalry" and "infantry" vehicles. The Combat Car M1 became the Light Tank M1A2, while the Combat Car M2 became the Light Tank M1A1, thus filling the "gaps" in the sequence of light tank designations.

### LIGHT TANK M3 PRODUCTION

Because of the urgent need for tanks in quantity there was not time to design a new type of light tank from



Late production M3 light tank with all-welded hull and cast homogeneous cylindrical turret. (U.S. Official)



Pilot model of the M3A1 light tank which dispensed with the cupola. Early vehicles still had the riveted hull. (U.S. Official)

scratch in the early war years. The M2/M3 series had many inherent design faults by the standards of the German tanks they were likely to have to face. The silhouette was too high and they were too narrow—this being a legacy from military engineering restrictions of the 'thirties when tanks had to fit the width of pontoon bridges of the period. The narrow hull restricted gun calibre as well, which prevented installation of the 75 mm. gun considered desirable to match German concentration on guns of this size. Narrow tracks gave inadequate ground pressure and, finally, the angular hull shape offered poor shot protection and deflection. Improvements incorporated

New Lend-Lease Stuart Is (with M3 Grant mediums beyond) at a railhead in Egypt ready to be transported forward to the 7th Armoured Division. Note the sand-shields and the smoke dischargers on the turret both of which were a British modification. (Imperial War Museum)



during the M3's production life reflected an attempt by the Ordnance Department to overcome some of these defects without holding up supply of new vehicles.

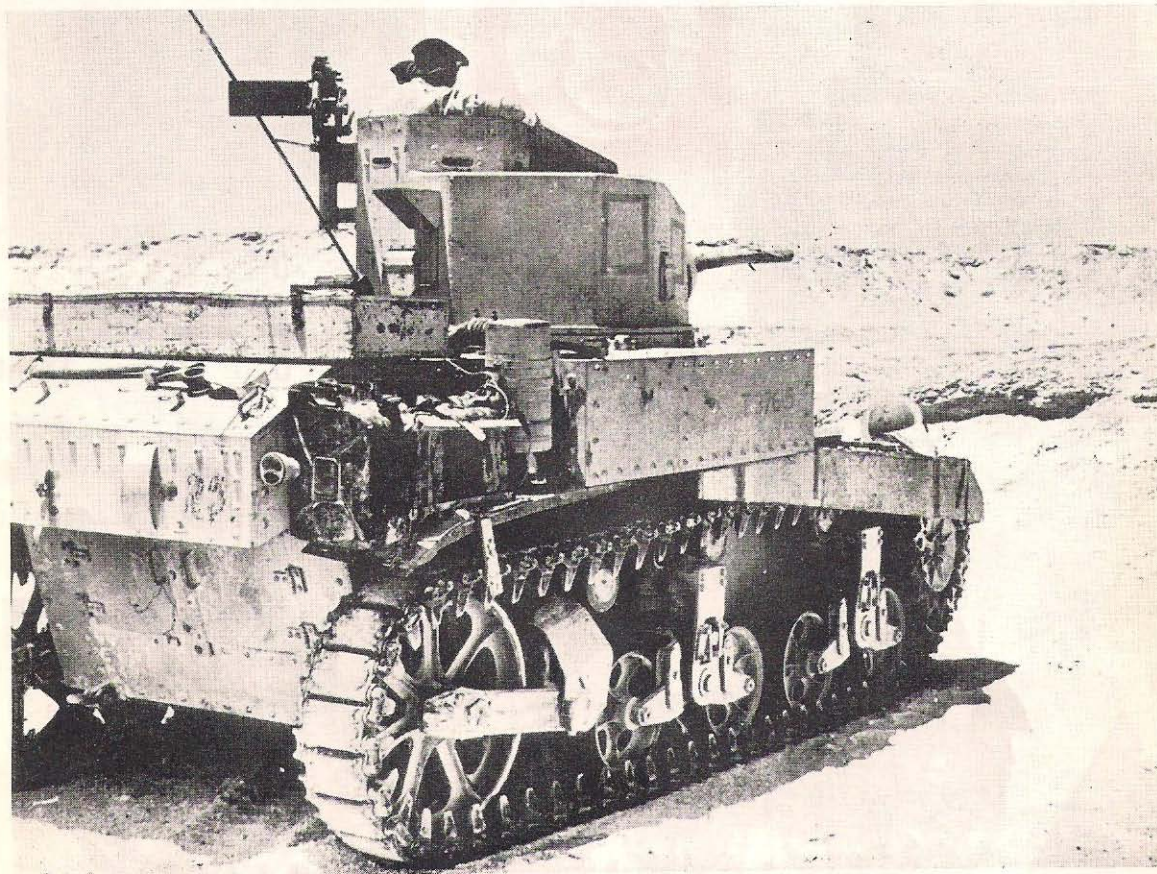
The original M3 light tank (which was called the Stuart by the British) was all-riveted like the M2A4. Successive modifications (in order) included introduction—in about June 1941—of an all-welded seven sided turret in place of the riveted type; a new welded/cast homogeneous turret of cylindrical cross-section—from the end of 1941—and the addition of two jettisonable 25 gallon fuel tanks on the hull top at about the same time as a result of British experience with the type in the Western Desert where the M3's short range sometimes proved embarrassing. The last structural change was to all-welded hulls just before M3 production ceased in August 1942. Vehicles could thus be seen with any of these external variations, but an important innovation in all M3 light tanks from mid-1941 was the addition of a gyro-stabiliser for the 37 mm. gun which became available once M3 medium tank production got under way. (The M3 medium tank—famous as the Grant—was, of course, the tank which introduced this important device.)

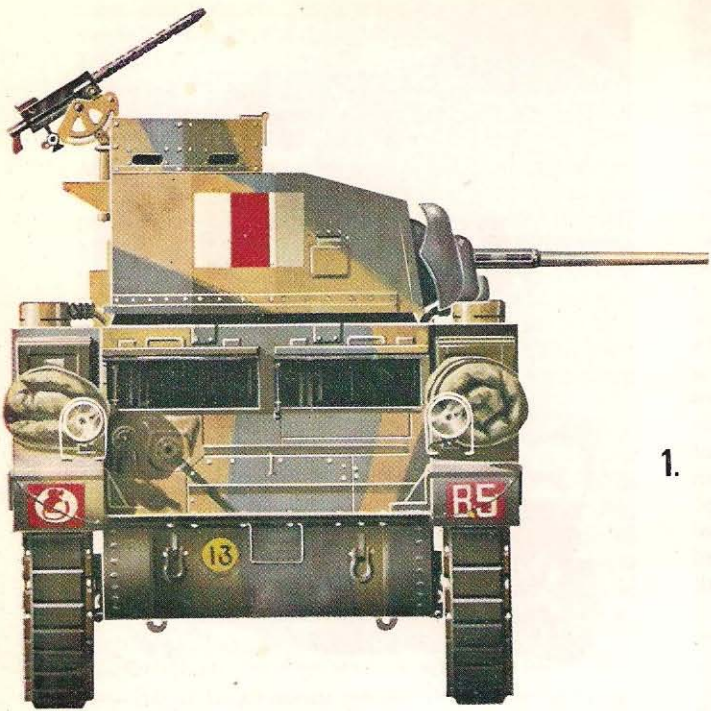
Another internal change was the installation of the Guiberson T1020 diesel engine in place of the Continental radial petrol engine when light tank production outstripped the supply of the Wright-built Continentals in 1942. About a third of all M3 light tanks were built with these reliable diesel motors, but almost all of these were either kept for training only in USA or sent overseas in Lend-Lease consignments



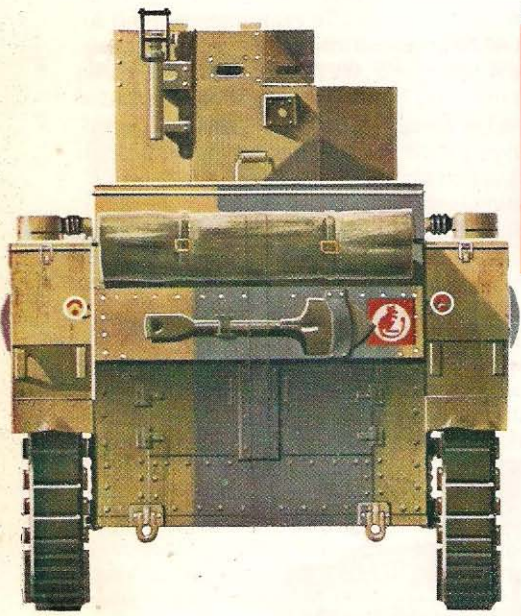
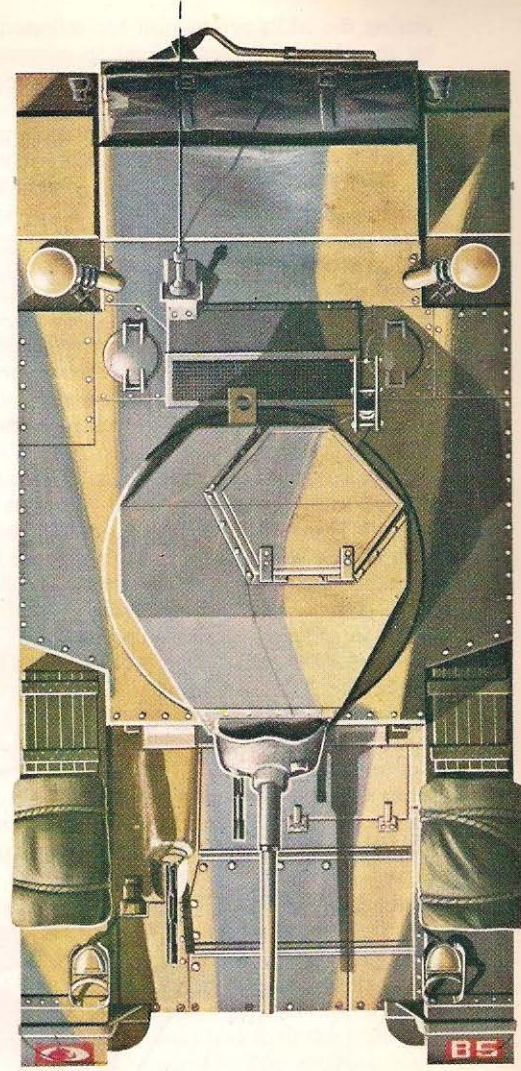
*A squadron commander of the 8th Hussars signals to following vehicles during a desert exercise when the Stuarts were first delivered. (Imperial War Museum)*

*A Stuart tank of 7th Armoured Division patrols the Qattara Depression at the time of first Alamein, July 1942. (Imperial War Museum)*

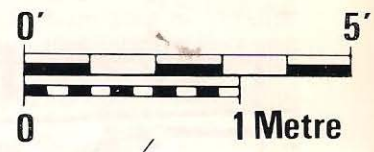
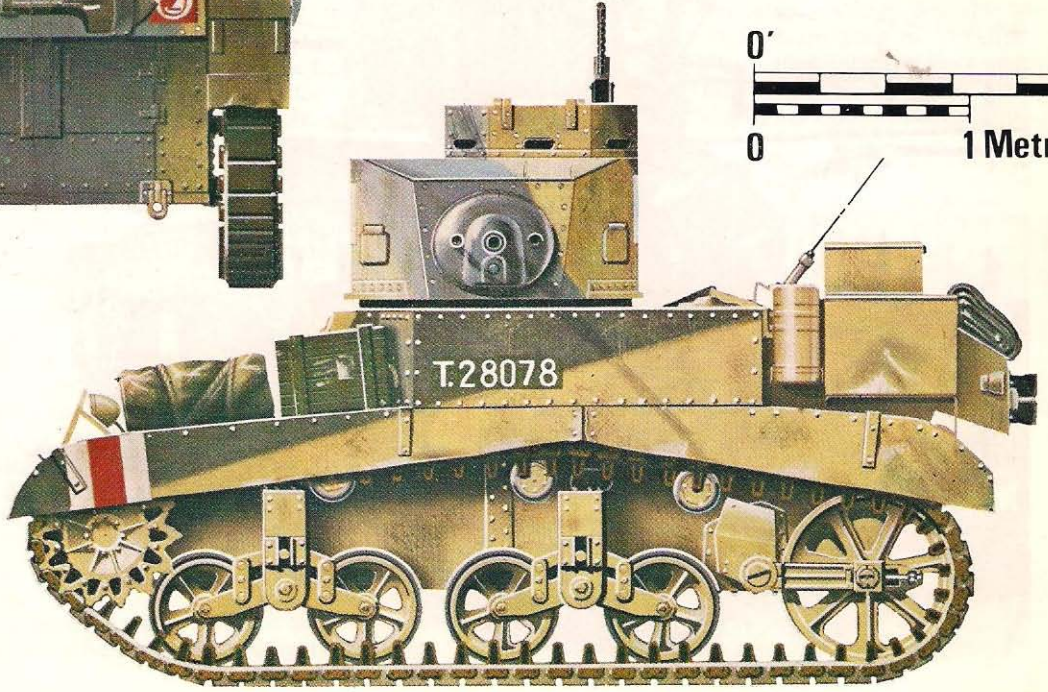


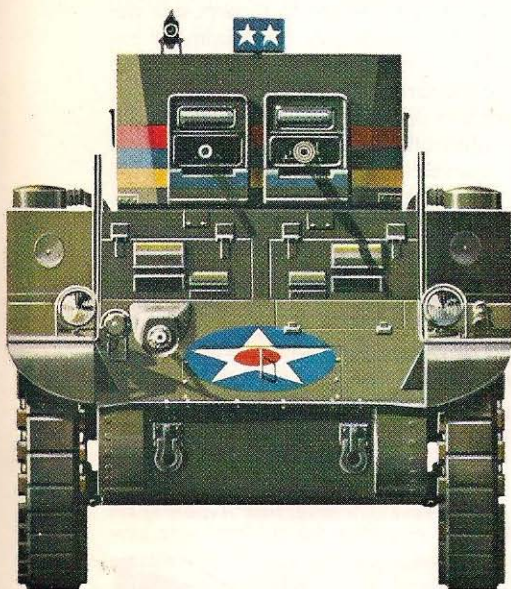
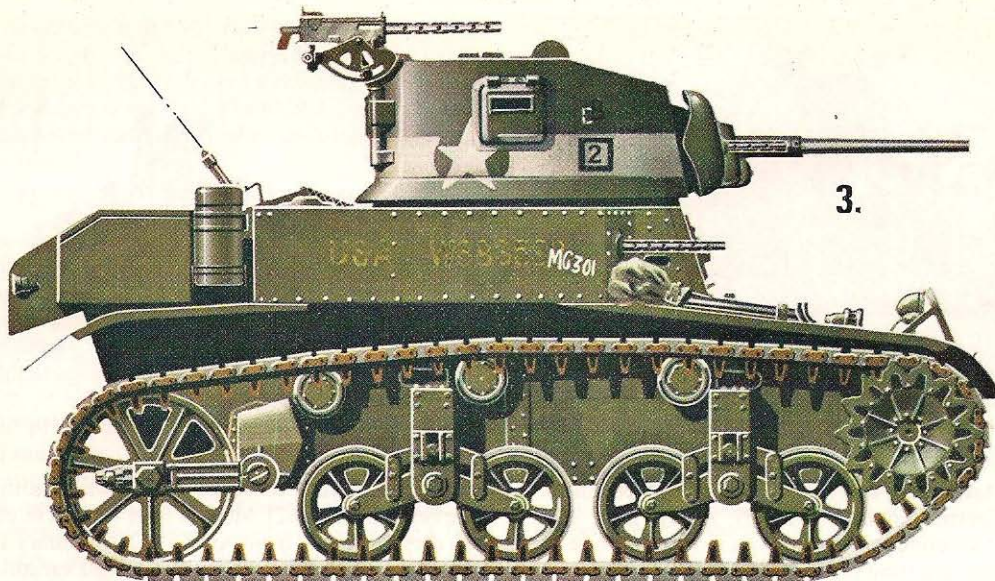


1.



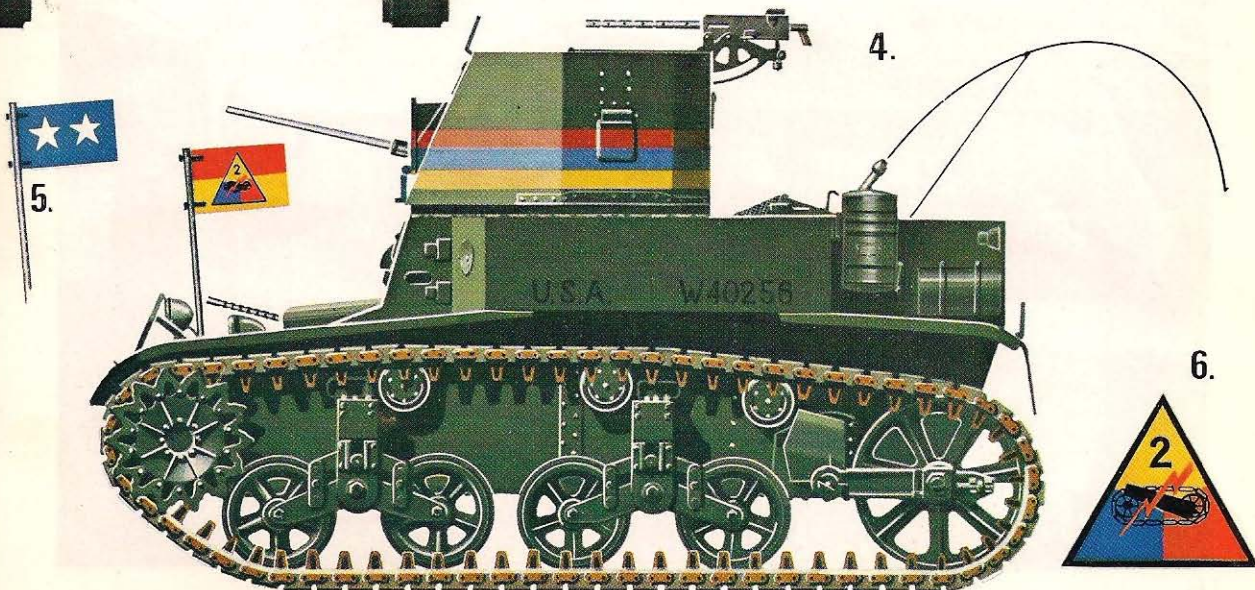
2.

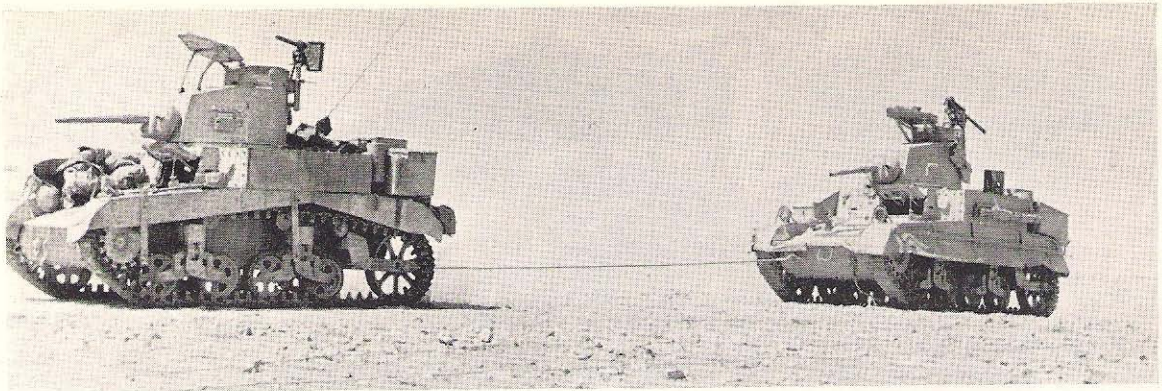




- 1 Stuart Mk 1 (Light Tank M3) of 8th King's Royal Irish Hussars, 4th Armoured Brigade, 7th Armoured Division, Battle of Sidi Rezegh, November 1941
- 2 Formation sign of 7th Armoured Division ('Desert Rats')
- 3 Light Tank M3A1 of U.S. Marine Corps, Guadalcanal Island, Solomons, September 1942
- 4 Light Tank M1A1 (formerly Combat Car M2), personal command vehicle of Major General George S. Patton, Commanding General U.S. 2nd Armored Division, Summer 1940
- 5 Insignia of major general, U.S. Army mounted on right track cover
- 6 Emblem of U.S. 2nd Armored Division

Terence Hadler © Profile Publications Ltd





*A battle-worn Stuart I tows in an immobilised companion vehicle at the time of the first Alamein battle, July 1942. (Imperial War Museum)*

since the Armored Force and Ordnance Department favoured petrol engines for US Army use. The shortage of Continental engines was, in fact, just one of the problems besetting the tank builders in America at this time since the aviation industry also had urgent demands for these power plants which were given priority. Total M3 production from American Car & Foundry was 5,811 vehicles between March 1941 and August 1942.

In April 1942 production of an improved model began, the M3A1. This featured a turret basket and power traverse for the first time as well as the gyro-stabiliser for the gun. In an attempt to reduce the silhouette, the cupola was removed from the cast homogeneous turret, while to give increased ammunition space in the hull the two sponson-mounted .30 calibre machine-guns were eliminated. Many of the earlier M3s had had these guns similarly removed by their crews as a field modification since they were of limited fighting value. The prototype for the M3A1, a suitably modified M3, was tested, approved, and standardised in August 1941. Production vehicles followed on the M3 line at American Car & Foundry without a break and, in fact, there was a period of

overlap from April to August 1942 when both types were being built. 4,621 M3A1s were built (211 of them with diesel engines) from April 1942 to January 1943.

By this time the final and much refined variant of the M3 series vehicles was in production. This was the M3A3, which had all the features of the M3A1 plus many other changes in an attempt to incorporate the lessons passed on by the British from combat experience with M3s in North Africa. To speed up production and at the same time give improved shape, an all-welded hull was designed with angled sides and no separate side sponsons. Sandshields were standard—though often removed in service—and, following the British fashion, the radio equipment was moved from the fighting compartment to a bulge added in the rear of the turret. Numerous detail modifications included drivers' hatches in the hull roof instead of the front plate, extra fuel tanks in the roomier hull sides, periscopes for all crew members, increased ammunition stowage, and better driving controls. Full production of the M3A3 started in December 1942, and 3,427 had been completed by the following August when production of M3 series tanks ceased at American Car & Foundry in favour of a new model, the M5A1.

*Stuarts in the Western Desert. First regiment of the 8th Army equipped with U.S. tanks were the 8th King's Royal Irish Hussars of 4th Armoured Brigade, seen here in September 1941 with their new mounts. (Imperial War Museum)*

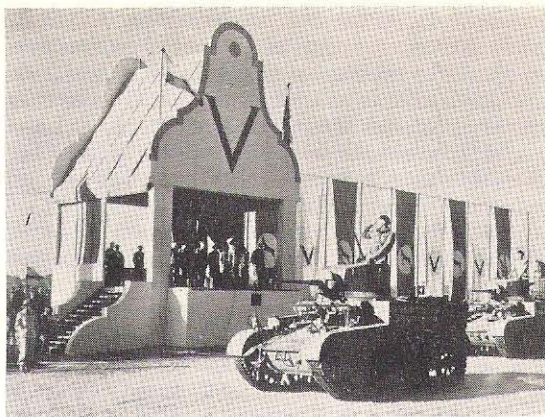


There never was a M3A2; this designation had been allocated for the all-welded version of the M3A1 but in the event no official distinction was made between welded and riveted models. The M3A3 pilot model was built, approved, and standardised in August 1942.

### NEW ENGINES, NEW IDEAS

Despite the Ordnance Department's original idea that heavy engineering firms should be the prime producers of tanks in the US re-armament programme, it was the automotive industry which eventually played the dominant part. The motor car and truck builders had the valuable experience of mass-production and streamlined business techniques which, when quantity was the principal requirement, was more important than familiarity with heavy assembly; the heavy engineering firms had been more used to "one off" or limited output of cranes and locomotives. Since the major requirement was for medium tanks, and light tanks were, in any case, already being turned out by American Car & Foundry, the motor manufacturers like Chrysler, Ford, and GMC were mainly concentrated at first on M3 and M4 medium tank production.

First excursion by a motor manufacturer into the light tank field was typical of the fresh thinking that the automobile industry brought to tank technology. To overcome the ever-threatening shortage of Continental engines for tank use various commercial motors were considered. Cadillac Division of General Motors, Detroit, suggested to the Ordnance Department that it would be possible to use two V-8 standard Cadillac auto engines in the M3 series light tanks, ganging them together side by side to give the necessary power output. They also suggested that the new Cadillac Hydra-Matic automatic transmission, just developed for cars, could be used in conjunction with the twin engines. The Ordnance Department were sceptical, but Cadillac converted a standard M3 light tank in October 1941 to prove that the idea would work, then drove the modified vehicle direct from their Detroit plant to the Ordnance Department's test ground at Aberdeen, Maryland, over 500 miles away. The trip was absolutely trouble free and this effective demonstration led to instant approval for the project and Cadillac were asked to go ahead and incorporate the



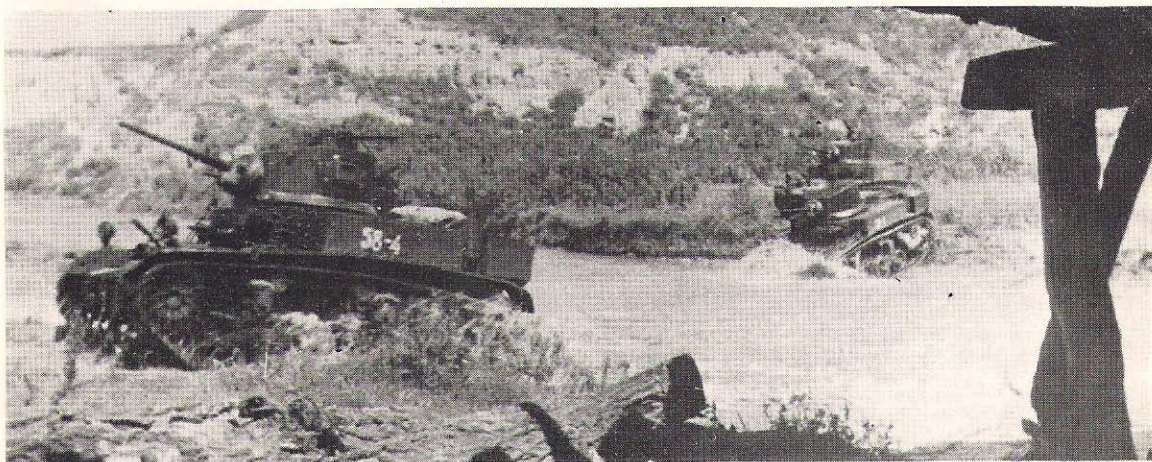
*M3A1s (British Stuart III) of the South African Tank Corps parade past Field Marshal Smuts in Pretoria, June 1944. Nearest vehicle is an "adopted" machine bearing the legend "S.A. Permanent Mutual Building and Investment Society". (Imperial War Museum)*

other detail improvements to the vehicle which they had suggested at the same time.

Designated Light Tank M3E2 (the M3E1 was a less successful Ordnance Department test vehicle with a Cummins diesel engine), the changes were basically simple. To accommodate the twin V-8 motors, the rear hull decking was raised and the superstructure lengthened slightly. The front hull was re-shaped to eliminate the vertical superstructure front and also to provide more room. The drivers' access hatches were, at the same time, moved to the hull top. The hull was all-welded of homogeneous armour plate with an extra thickness on the front bringing armour maximum up to 51 mm. These hull modifications gave extra stowage space for fuel and ammunition, and even more space was given by moving the stabiliser and traversing gear beneath the turret cage, this being made possible by the more compact and lower drive shaft from the Cadillac engines. The turret, armament, chassis, and suspension remained the same as in the M3A1.

With its automatic transmission the M3E2 broke new ground for a tank; it proved much easier to drive and handle than the M3 series vehicles, while the Cadillac automobile engines were smoother running and more flexible than the Continental radial. Tests

*M4A1 light tanks of the Red Army fording a river in the Taman Peninsula, Eastern Front, in 1943. Soviets received these vehicles under Lease-Lend. (Imperial War Museum)*



were most successful and on November 13, 1941, Cadillac were given approval to go ahead with production plans, the production vehicle to be standardised and designated Light Tank M4. Later, however, in February 1942, this designation was changed to Light Tank M5 to avoid possible confusion with the Medium Tank M4—the Sherman—which was then in full production.

Cadillac had until then been making cars, but at the end of 1941 it ceased this work and made a hurried change over to M5 tank production at Detroit, the first vehicles being completed at the end of March 1942. The earliest M5s were, in fact, hand tooled and hand built due to delays in procuring and installing jigs and other plant, but by the following June full mass production was under way. Also in July 1942, Cadillac started up M5 production in a second plant, at Southgate, California, and in their peak output month, October 1942, the two plants between them turned out more than 500 vehicles. Also in July 1942, Massey-Harris, the tractor company, came into the M5 "production group" and started making M5s at its plant in Racine, Wisconsin. Total M5 light tank production totalled 2,074 when production ceased in December 1942 in favour of an improved model.

Designated M5A1, and last of the line, this improved vehicle introduced modifications parallel to those of the M3A3 which had been built in prototype form in August 1942. The M5A1 had the new lengthened turret with bulge at the rear for the radio, sand-shields as a standard fitting, an escape hatch in the hull floor, water-proof seals to the drivers' hatches, and an improved gun mount which incorporated a direct sighting telescope. There were extra roof periscopes in the turret, including one for observation to the rear, and lockable pistol ports in the turret sides. An extra modification unique to the M5A1 was the provision of an improved AA machine-gun mount on the right side of the turret. This was protected by an armoured fairing and included on the mount was a control handle which enabled the commander to



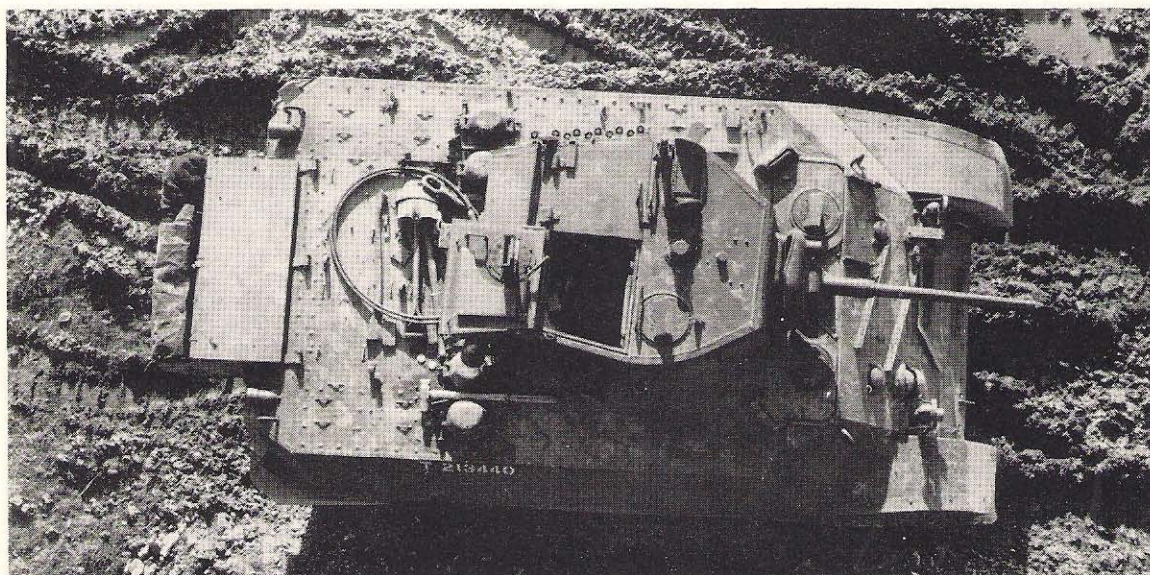
*Stuart V reconnaissance tank with added folding canopy, seen in Tunis in 1943. (Chamberlain Collection)*

traverse the turret independently while he was firing the machine-gun. The M5A1 prototype was built in September 1942, standardised on the 24th of that month, and put into production in November, replacing M5 production completely the following month. In September 1943, as previously noted, American Car & Foundry stopped making M3A3s and switched, also, to M5A1 production, this vehicle becoming the most widely produced of all the M1-M5 series models. When production ceased in June 1944, 6,810 M5A1s had been completed. Two months previously, Cadillac and Massey-Harris had built their first M24 Chaffee light tanks. The M24 was a new generation vehicle in every sense of the word, designed to incorporate all the combat lessons of the previous few years and a far cry in all respects from the M5A1 which, despite all the improvements, was still essentially based on pre-war ideas. The M24, however, is another story.

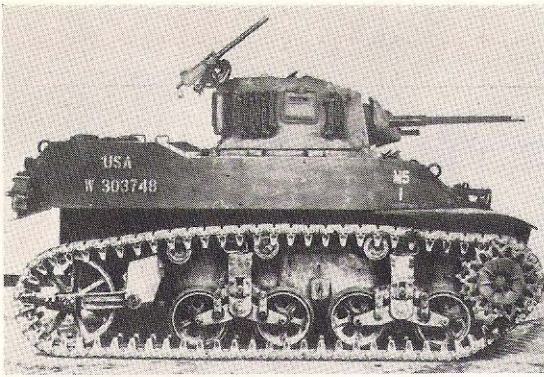
## HOWITZER MOTOR CARRIAGE M8

One last major production variant in the M1-M5 light tank series was also based on the M5 and was in

*An M3A3 light tank in British service as a Stuart V showing the much "cleaned-up" shape of the welded hull. This top view clearly shows the lengthened turret. (Imperial War Museum)*







*The Light Tank M3E3 was the prototype for the M5, converted by Cadillac as the first M5 pilot model. Note the raised rear decking over the engine compartment. (U.S. Official)*

fact virtually identical save for its turret and armament. This was the M8 howitzer motor carriage which was developed following a request in early 1942 from the Armored Force for a howitzer-armed vehicle for service with HQ companies (squadrons) of medium tank battalions in the close support role. As a stopgap vehicle, the Ordnance Department adapted a M3 half-track for this function, fitting it with a 75 mm pack howitzer. In this form the vehicle was designated T30. This was an unsatisfactory improvisation, however, since a fully-tracked standard chassis had been requested as the basis for the vehicle. To develop such a chassis, the Cadillac-engined M5 appeared to offer a good reserve of power for the extra weight involved with the 75 mm howitzer.

One of the first M5 tanks off the line was therefore taken in hand by the Ordnance Department, the hull top was cut away, the fighting compartment was widened by 12 inches, and a 75 mm howitzer was mounted in a limited traverse mount on the centre line with a fabricated gun shield on the lines of the M7 Priest. Designated Howitzer Motor Carriage T41, the prototype modifications were in mild steel only for tests. Trials showed that there was inadequate crew protection in this vehicle, while the design, with a widened hull top, would introduce unnecessary

production complications as well as the inherent disadvantages of the limited traverse mount. To overcome these problems, therefore, another mock-up was made on a M5 tank with an open-topped overhanging turret which fitted into the M5 turret ring and carried the 75 mm howitzer in an armoured mantlet. This gave elevation limits of  $-20^{\circ}$  to  $+40^{\circ}$  plus the advantage of a  $360^{\circ}$  traverse. The only change found necessary in the standard hull was to move the drivers' hatches on to the front plate since they were otherwise fouled by the overhang of the new turret. This also meant removing the hull machine-gun. The new prototype was designated T47. Trials showed the design to be most satisfactory and the vehicle was instantly standardised as the Howitzer Motor Carriage M8 on April 23, 1942. Production was started by Cadillac in September 1942 and 1,778 M8s were built from then until January 1944. At about  $17\frac{1}{2}$  (short) tons, the M8 was the heaviest of the whole M1-M5 "family". Due to limited stowage space inside the vehicle, the M8 was fitted to tow an ammunition trailer carrying extra rounds. M8s gave useful service with US armoured regiments, mainly in the European theatre. From late 1944, however, they began to be replaced by M4s with 105 mm howitzers though many were still in use until the war's end.

## BRITISH SERVICE

In the British Army, the M3 and M5 were known as the Stuart and examples of the different models produced and delivered were distinguished by mark numbers in the usual British practice. Those with Guiberson diesel motors were sometimes called "Stuart Hybrids" though not officially distinguished as such. The various British mark designations together with the US equivalent designations are given at the end of this Profile.

British interest in these US light tanks started at a relatively late stage. At the end of June 1940 a British Tank Mission was sent to the United States to purchase tanks in quantity from American firms.

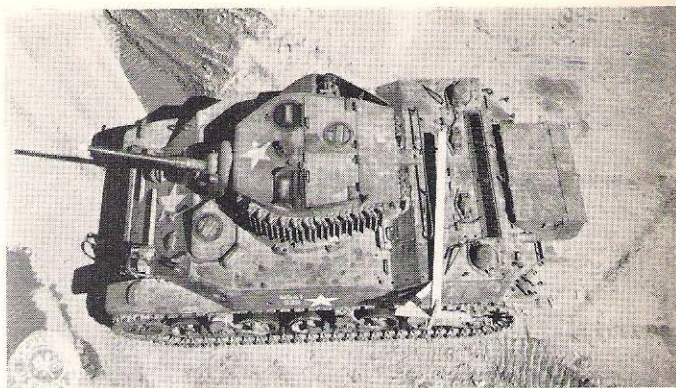
*Platoon of M5 light tanks of a U.S. armoured division on exercises in Britain in 1943. (Chamberlain Collection)*



Initially they planned to ask for tanks to be built to British designs, but at this period American Car & Foundry were the only firm with tanks in production and these, of course, were M2A4 light tanks. Britain at that time was interested only in medium tanks, however, to make good her losses in the campaign in France and supplement her general shortage of this class of vehicle. A new medium tank, the M3, was then only just in the design stage and the British Tank Mission ordered only this type, since it was made clear that resources could not be diverted to making other designs specially for British use. These medium tanks were ordered under the "cash and carry" scheme then in force, and it was not until the Lend-Lease Act became law on March 11, 1941, making all US arms available for transfer to Allied nations, that the British Tank Mission considered the light tanks.

Though official British policy had turned against this class of tank following early combat experience which showed their limitations, it was realised that the M3 light tanks were much nearer the older British cruiser tanks in performance and hitting power. For the Middle East campaign where there was an acute shortage of tanks, it appeared that the M3s could be of value. Thus a total of 280 M3 light tanks out of the 538 produced in April, May, June 1941 were shipped to Suez and Massawa, the first 84 arriving in the first Lend-Lease shipment in July 1941. These were used to equip the 8th Hussars, a 7th Armoured Division unit. Named the Stuart, the M3s replaced A9s, A10s, A13s, and were used in the cruiser tank role. They were the first US tanks in service with the British and also the first US tanks to see combat, being first in action in November 1941 at the Battle of Sidi Rezegh when they fully equipped all three battalions of 4th Armoured Brigade.

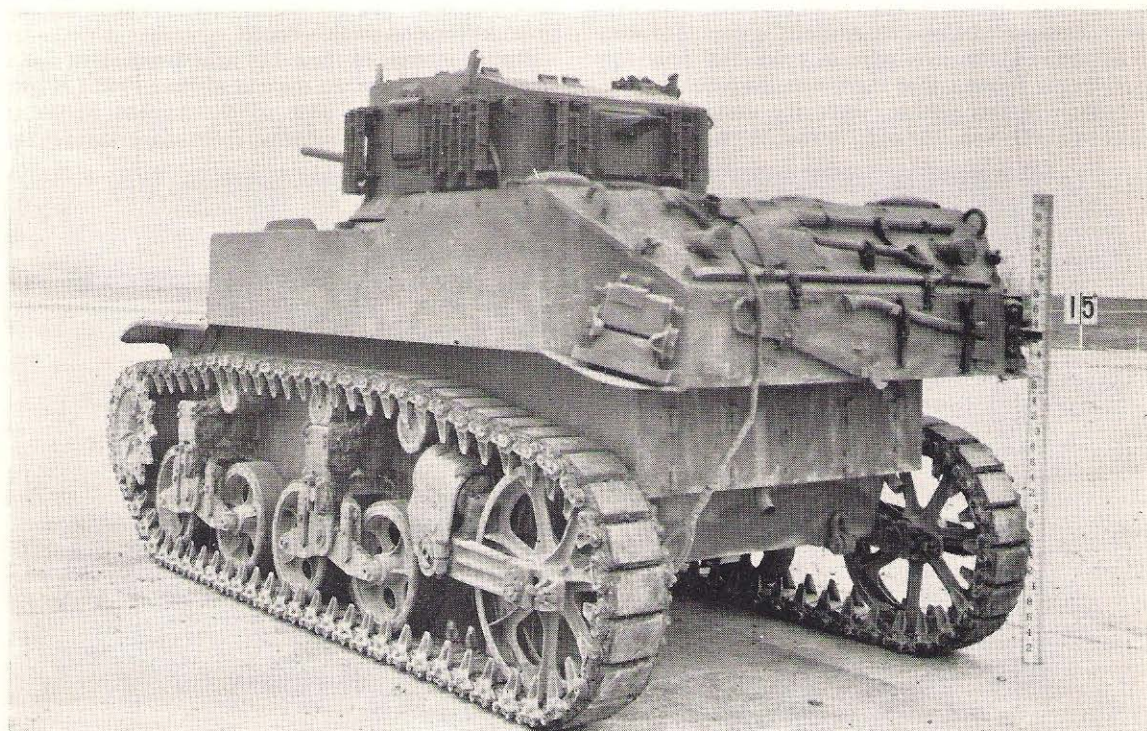
*Fine rear view of a standard M5A1 with stowage positions for tools clearly shown. Note also the standard rubber-shoe track. (U.S. Official)*



*Pilot model of the M5A1, top view, showing the lengthened turret and the armoured fairing over the AA machine-gun pintle. Note stowage box added at rear. (U.S. Official)*

Stuarts were used by the British throughout the remainder of the North Africa campaign, though a few were issued also to armoured divisions in Britain. By 1944 they were only being used as gun tanks by the armoured reconnaissance regiments of armoured divisions in the NW Europe campaign, but in Burma they were much more widely employed where armoured opposition by the Japanese was very feeble. Popular name for the Stuart with the British was "Honey", reflecting the vehicle's pleasing handling qualities and well-appointed layout. Allegedly this nickname stuck when a British tank driver tried one of the first M3s delivered and returned from a fast test drive with the verdict "It's a Honey!"

Stuarts of all marks became popular mounts for miscellaneous duties, due to their speed, compactness, and general reliability. They were used by armoured and infantry regiments for reconnaissance work, the



turret being removed and machine guns being fitted on pintles. Called "Stuart Recce" in this form, there were several local variations in the style of modification. Some were given a folding canvas tilt over the fighting compartment. Similar turretless Stuarts were also used as command tanks with added radio equipment, some were used as Kangaroo infantry carriers, and some were used as anti-tank gun tractors. In these roles, a few Stuarts survived in British army service till at least the mid 'fifties. Perhaps the strangest Stuart variant of all, however, was the turretless vehicle which had a complete 18 pdr. field gun—less its wheels—bolted on to the hull top by an enterprising artillery unit in the Western Desert to make what was probably the crudest piece of self-propelled equipment of the whole war.

### OTHER VARIANTS

The M3/M5 series light tanks proved too light and unstable for adaptation to special purpose roles like those devised for the medium tanks. Early attempts by the Ordnance Department to fit a T2 mine exploder on the front of a M3 failed, due to the great weight of the booms and rollers used in this equipment. An attempt to fit a quad .50 calibre machine-gun turret in place of the normal turret, so making an AA tank, was abandoned when it was decided to use the standard half-tracks for this role instead. It was as flame-throwing tanks that M3/M5 vehicles were more widely used. Most successful was the Satan, a US Marine Corps modification of the M3A1 in the Pacific for attacking Japanese bunkers. Canadian Ronson flame-throwing equipment (as used in the Wasp flame-throwing Carrier) was fitted in the fighting compartment. The projector was fitted in the mantlet in place of the 37 mm. gun. Also developed was a

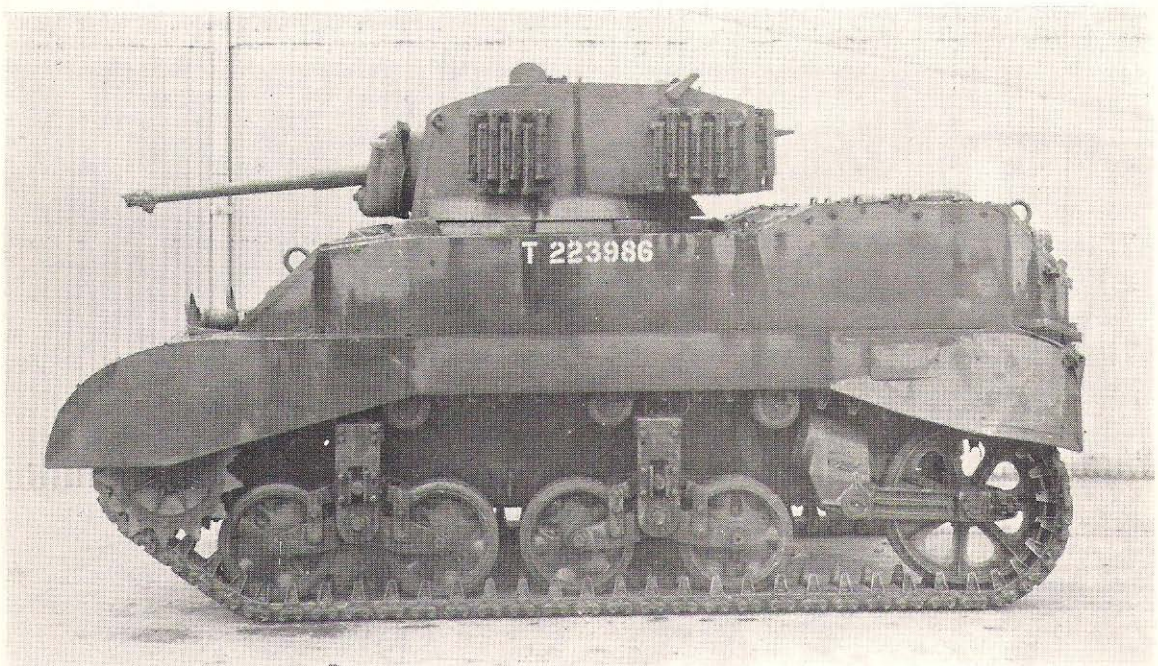
*Both the M5 and M5A1 were designated Stuart VI by the British. Sand-shields were standard fittings on the M5A1 variant shown here, though they were often removed. (Imperial War Museum)*



*Another view of the same Stuart VI. British usually removed the armoured fairing over the AA machine-gun pintle on the turret on M5A1 vehicles. (Imperial War Museum)*

version of the E5R2 portable flame-thrower as a kit for installation in the hull of light tanks M3 and M5. The projector took the place of the hull machine-gun and this equipment was widely used by US Army and Marines tank battalions.

Like the British, the Americans used turretless M3/M5 tanks in a variety of miscellaneous roles. Proposed vehicles, built in prototype form only, were the T27 and T28 Mortar Motor Carriages, designed to take an 81 mm and 4.2 inch mortar respectively. Both were abandoned due to inadequate crew protection and lack of sufficient ammunition space. In 1944 when the Chaffee came into service, a number of redundant M5s were converted to reconnaissance vehicles by removal of the turret and provision of a gun ring round the fighting compartment to take a .50 calibre Browning machine-gun. These were classed as "limited standard" and designated T8. A further modification, with racks for carrying landmines, was designated T8E1. Finally there was a command tank conversion,



usually of “local” origin, which had the turret removed and a low box-like superstructure welded in its place from armour plate. Vehicles so modified were a favourite mount for senior officers of armoured battalions. A final M3/M5 variant of note was the Psy-war vehicle, a standard tank equipped with loudspeakers and amplifiers for broadcasting to enemy personnel in the front line. These were used in Germany and the Pacific in the later stages of the war.

Space does not permit coverage here of a very large number of experimental vehicles based on the M3/M5 series chassis. Mostly these were of a technical nature used to test engine installations and so on. One or two of the more significant of such vehicles have previously been mentioned.

## IN RETROSPECT

The M1-M5 series light tanks were essentially simple and unsophisticated designs which meant that they could be built quickly and maintained easily, virtues which they shared with the US medium tanks produced in World War II. Layout in each case followed conventional US tank practice with a rear engine, drive to front sprockets, and controlled differential steering. Gears and drive were in the nose with the driver sitting to the left, and assistant driver/hull gunner to the right of the gearbox. A bulkhead separated the engine from the fighting compartment and ammunition and fuel tanks were sited in the sponsons on either side of the fighting compartment. The two-man turret crew were accommodated in the turret cage (from the M3A1 onwards) with power traverse and gyro-stabiliser similar to the arrangement in the medium tanks. In the earlier vehicles they simply stood on the hull floor above the drive shaft, with a handwheel for turret traverse. With easy engine access, ample power, sturdy rubber tracks, and tough



*Fine view of a U.S. Army M5A1 (in this case also with the pintle fairing removed) on pre-invasion training exercises in Britain, 1944. Direct sighting telescope aperture is clearly visible to right of mantlet. (Chamberlain Collection)*

easily replaceable volute bogies, they were among the most reliable and well-liked tanks ever produced.

The Stuart tank family could never lay claim to being the most important design in the history of armoured warfare but they matched the original

*M5A1 light tanks of a U.S. armoured division move through the French village of St Amand to cross the Belgian border, September 1944. Leading vehicle is fitted with “prongs”—the Cullin Hedgerow Device—more usually fitted to medium tanks to cut through hedges and foliage in close country. (U.S. Official)*

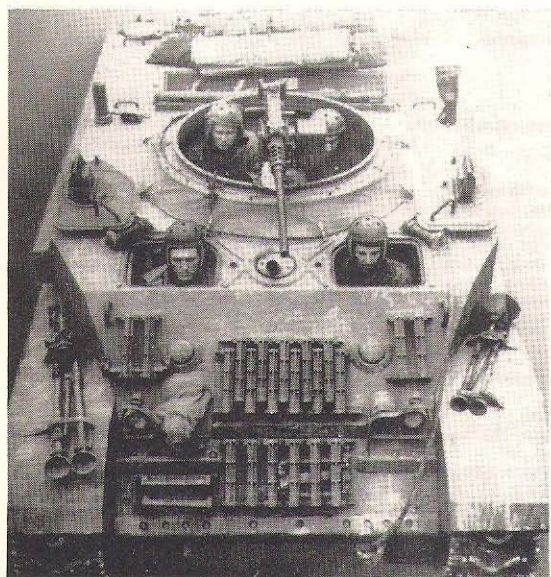




An M5A1 of 43rd Tank Battalion, 12th Armored Div, XXI Corps, 7th Army, accompanies half-tracks (background) into the town of Neustadt, Germany, which has just been surrendered to U.S. forces, April 16, 1945. Armoured fairing over AA machine-gun pintle is clearly shown here. (U.S. Official)



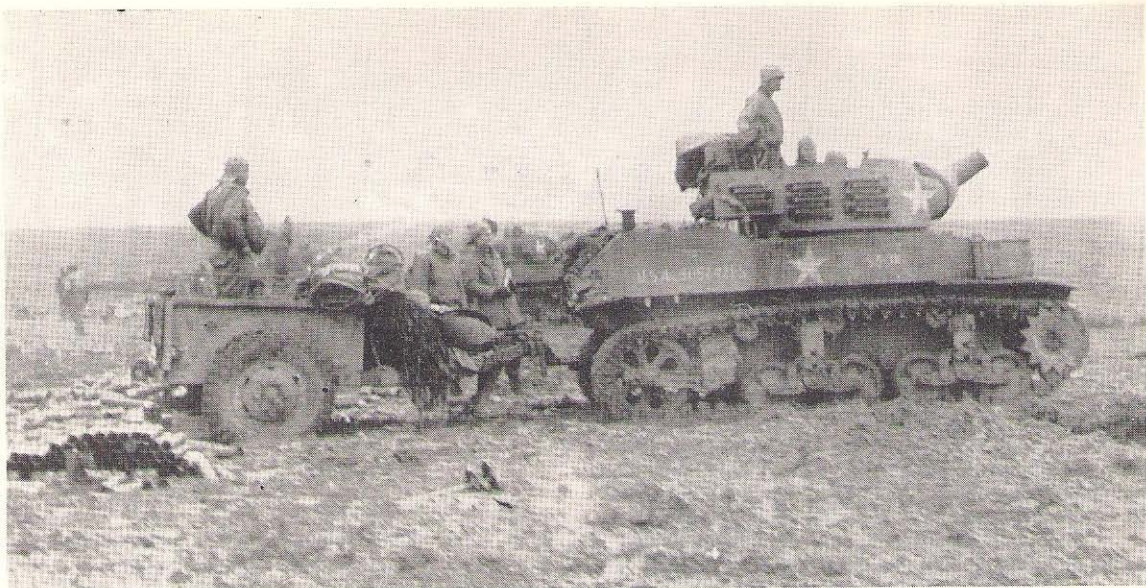
Above and below: Two views of the T8E1 Reconnaissance Vehicle, which was converted from the M5A1 light tank. Note stowage box for carrying landmines on hull side. Same vehicle also has a twin .50 Browning instead of a single mount. (Chamberlain Collection)



concept of Chaffee and MacArthur almost to the letter—fast, lightly armed, lightly protected, and able to penetrate quickly behind the enemy's rear. Unlike their contemporaries, the British, German, and Italian light tanks of the immediate pre-war era, they were not so small as to be insignificant and valueless in the test of war. Of all the light tanks conceived pre-war, the Stuarts were the only ones still in first line service at the war's end. To this day they remain the most memorable.

#### A.F.V. Series Editor: DUNCAN CROW

U.S. Service Designation	British Designation	Year
M2A4 Light Tank	Some used; loosely called "Stuart"	1940
M3 Light Tank	Stuart I	1941
M3 (Diesel)	Stuart II	1941
M3A1 Light Tank	Stuart III	1942
M3A1 (Diesel)	Stuart IV	1942
M3A3 Light Tank	Stuart V	1942
M5 Light Tank	Stuart VI	1942
M5A1 Light Tank	Stuart VI	1942



M8 75 mm. Howitzer Motor Carriage fires on German positions in Alsace-Lorraine, 1944. Note the ammunition trailer and the ammunition supply numbers passing rounds forward to the vehicle. (U.S. Official)

## SPECIFICATION—LIGHT TANKS M3—M5

### General

Crew: Four—driver, assistant driver/hull gunner, commander, gunner.

	M3	M5
Battle weight:	27,400 lbs.	33,000 lbs.
Dry weight:	24,800 lbs. (approx)	30,000 lbs. (approx).
Ground pressure:	10.47 lb/sq. in.	12.4 lb/sq. in.

### Dimensions

	M3	M5
Length overall:	14 ft. 10 $\frac{3}{8}$ in.	14 ft. 2 $\frac{3}{4}$ in.
Height overall:	8 ft. 3 in.	7 ft. 6 $\frac{1}{2}$ in.
Width overall:	7 ft. 4 in.	7 ft. 4 $\frac{1}{2}$ in.
Track centres:	6 ft. 1 in.	6 ft. 1 $\frac{1}{2}$ in.
Track width:	11 $\frac{5}{8}$ in.	11 $\frac{3}{8}$ in.

### Armament

	M3	M5
Main:	1 × 37 mm M5 or M6 in mount M22 1 × .30 cal. MG (co-axial)	1 × 37 mm M6 in mount M23 1 × .30 cal MG (co-axial)
Secondary:	1 × .30 cal. MG M1919A4 (flexible in bow mount) 1 × .30 cal. MG M1919A4 (flexible on turret pintle) 2 × .30 cal. (sponsons).	—

### Fire control:

M3	Hand traverse and elevation.	M5	Hydraulic power traverse with stabilisation in elevation.
----	------------------------------	----	---

### Ammunition

M3	103 rds. × 37 mm (APC, HE, Canister) 8,270 rds. × .30 cal. 500 rds. × .45 cal. (for crews' personal weapons) 12 grenades, assorted	M5	123 rds. × 37 mm (APC, HE, Canister) 6,250 rds. × .30 cal. 420 rds. × .45 cal.
----	--	----	--

### Sighting and Vision

M3	Protectoscopes in pistol ports (2). Vision slits.	M5	Periscopes (4) and protectoscopes in pistol ports (3).
----	--	----	--

### Communications

M3	SCR-245	M5	SCR-508, 528, or 538 (SCR-506 in command vehicles)
----	---------	----	--

Plus interphone for crew.  
(Note: No. 19 set was fitted in most British vehicles)

### Armour

M3	Face hardened, riveted (welded homogeneous turret in later vehicles)	M5	Welded homogeneous
----	--	----	--------------------

### Armour Thickness

Hull front, upper:	1 $\frac{1}{2}$ in.	2 $\frac{1}{8}$ in.
lower:	$\frac{5}{8}$ –1 $\frac{3}{4}$ in.	2–2 $\frac{1}{2}$ in.
Sides and rear:	1 in.	1–1 $\frac{1}{8}$ in.
Top:	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.
Bottom:	$\frac{3}{8}$ – $\frac{1}{2}$ in.	$\frac{3}{8}$ – $\frac{1}{2}$ in.
Turret front:	1 $\frac{1}{2}$ in.	1 $\frac{3}{4}$ in.
sides:	1 $\frac{1}{2}$ in.	1 $\frac{1}{2}$ in.
top:	$\frac{1}{2}$ in.	$\frac{1}{2}$ in.

### Engine

M3	Continental W970–9A radial, 7 cylinders (or Guiberson T1020–4 9 cylinder radial diesel)	M5	Twin-Cadillac V-8, Series 42
----	---	----	------------------------------

### Power Output

M3	250 hp at 2,400 rpm (220 hp at 2,200 rpm with Guiberson diesel)	M5	220 hp at 4,000 rpm
----	---	----	---------------------

### Fuel Capacity

M3	56 US gals. (or 101 gals. with jettisonable tanks)	M5	89 US gals.
----	--	----	-------------

### Transmission

M3	Manual shift, controlled differential steering.	M5	Hydra-Matic (automatic), controlled differential steering.
----	---	----	--

### Suspension

M3	Vertical volute spring type with trailing idlers. Rubber tyred twin bogies. Rubber block track shoes, 132 per track.
----	--

### Electrical System

M3	Battery 12 volts.	M5	Battery, 12 volts. Auxiliary generator.
----	-------------------	----	---

### Performance

M3	Max. road speed: 36 m.p.h.	M5	36 m.p.h.
M3	Grade ability: 60%	M5	60%
M3	Trench crossing: 6 ft.	M5	5 ft. 4 in.
M3	Vertical obstacle: 2 ft.	M5	1 $\frac{1}{2}$ ft.
M3	Forcing depth: 3 ft.	M5	3 ft.
M3	Range: 70 miles	M5	100 miles.

### Elevation

–10° to +20°

### Traverse

360°

### Note

Other M3 and M5 models were basically similar in specification, except:

M3A7: 28,500 lb., height: 7 ft. 6 $\frac{1}{2}$  in.  
M3A3: 31,752 lb., width: 8 ft. 3 in., height: as M3A1.  
M5A1: 33,907 lb., height: 7 ft. 10 $\frac{1}{2}$  in., length: 15 ft. 10 $\frac{1}{2}$  in. (with stowage box), width: 8 ft. 6 in. (over sand-shields).  
M8: 34,600 lb., ammunition: 46 rds. × 75 mm, 400 rds. × .50 cal., armament: 1 × 75 mm howitzer M2 or M3, 1 × .50 cal. MG (AA).

# AFV/Weapons Profiles

Edited by **DUNCAN CROW**

FORTHCOMING TITLES:

**45 Vickers Main Battle Tank**  
(publication delayed).

**48 PanzerKampfwagen VI - Tiger I and II**  
"Slow and heavy, large and cumbersome" the Tiger may have been, but it was a formidable tank to encounter and could stand tremendous punishment on its thick frontal armour. This Profile tells the story of the legendary Tiger – both the Tiger I (SdKfz 181) and the Tiger II or King Tiger (SdKfz 182). They had their drawbacks from the logistic and tactical points of view – faults that were rarely apparent to those who had to face them. Also included is the "tank hunter" version of the King Tiger – the Jagdtiger. (Tiger I is a revised Armour in Profile, the rest is new).

**49 Japanese Medium Tanks**  
Japanese tank development started from 1925. One of the officers of the Imperial Japanese Army concerned with this development from the very outset was Captain (now LIEUTENANT-GENERAL) TOMIO HARA. From his own unrivalled personal experience General Hara in this Profile describes the designing, building, and performance of Japanese medium tanks from Prototype No. 1 (1925-27) through Type 89 (1929), Type 97 (CHIHA) (1937), Type 1 (CHIHE) (1940), Type 3 (CHINU) (1943), Type 4 (CHITO) (1943), to Type 5 (CHIRI) (1944). Also included is a detailed explanation of the year/model designation given to Japanese tanks and the abbreviations used in nomenclatures.

**50 Swiss Battle Tanks**  
Prototypes of the Pz 61, the Swiss Army's Main Battle Tank, were built in 1958 and 1959 and pre-production vehicles with a 90mm gun appeared in 1961: they were designated Pz 58. The Pz 58 was then equipped with a 105mm gun and went into production as the Pz 61. The Pz 68 is a further development. The Profile also includes an account of Swiss tanks since World War I.

BY R. M. OGORKIEWICZ.

**51 The Abbot**  
The Abbot (FV 433 105mm Field Artillery Self-Propelled) is the first British gun designed specifically for the self-propelled role. It was produced to replace the 25pdr field gun and went into troop service in 1965 when the first regiment to be equipped with it was the 3rd Royal Horse Artillery. This Profile by CHRISTOPHER F. FOSS also includes the Value Engineered Abbot and the Falcon Anti-Aircraft System.

**52 M47 Patton**  
*by Colonel Robert J. Icks*  
The tank that missed Korea. M26 <sup>M46</sup> } M47 M48  
T42 }

**53 FV 432**  
*by Christopher F. Foss*  
The British Army's APC developed from the earlier FV420 series, originally called Trojan.

The publishers reserve the right to alter sequence of list without notice.

FUTURE TITLES WILL INCLUDE:

**Japanese Light Tanks**  
*by Lieut.-General Tomio Hara*  
Including combat cars and tankettes (to 1945).

**Missile Armed Vehicles**  
*by R. M. Ogorkiewicz*  
From the earliest installation of the pioneer French SS-10 through various French, British, German and Soviet applications to the American vehicles armed with gun-cum-missile launchers, i.e. M551 Sheridan, M60A1E1, and MBT-70/XM803.

**German Self-Propelled Weapons**  
*by Peter Chamberlain*  
An illustrated guide to all the SP weapons used by the Germans in World War II.

**French Infantry Tanks, Part I**  
*by Major James Bingham*

**French Infantry Tanks, Part II**  
*by Major James Bingham*  
Having described the tanks used by the French cavalry in AFV/Weapons 36 Major Bingham, in these two Profiles, now examines in equal detail the tanks used by the French infantry from 1919 to 1940.

**SdKfz 250 and 251**  
*by Walter Spielberger and P. Chamberlain*  
German half-track vehicles of World War II.

**Armoured Personnel Carriers**  
*by Major-General N. W. Duncan*  
Their development and use in different armies.

**The Twenty-Five Pounder**  
*by Colonel Farrerly, R.A.*  
The history of the British Army's famous field gun.

**Commando and Twister Armored Cars**  
*by Christopher F. Foss*  
The multi-mission Commando and the revolutionary Lockheed Twister XM-808.

**AMX-30**  
*by R. M. Ogorkiewicz*  
France's Main Battle Tank.

**French Armoured Cars**  
*by Major James Bingham*  
The story of French armoured cars from before World War I until the end of World War II.

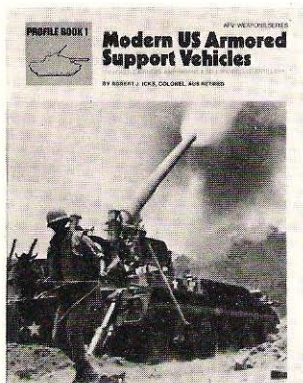
**PT-76**  
*by Christopher F. Foss*  
The Russian amphibious light tank and its many variants.

AFV/Weapons Series 1–42 inclusive 35p each; 43 onwards 40p each.

If you have any difficulty in obtaining Profiles from your local book or model shop please write direct to:

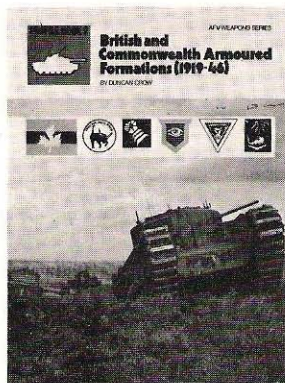
Mail Order/Subscription Department,  
PROFILE PUBLICATIONS Ltd, Coburg House, Sheet Street, Windsor, Berks. SL4 1EB

# Profile Books are new, authoritative, well priced



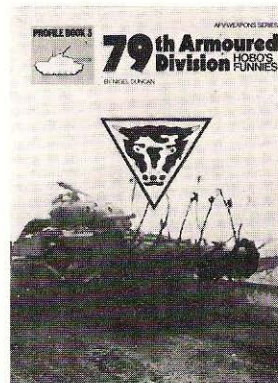
**PROFILE BOOK 1**

**Modern US Armored Support Vehicles**  
by Robert J. Icks,  
*Colonel US Army Retired.*



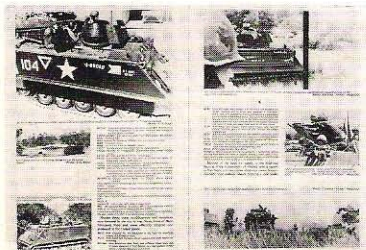
**PROFILE BOOK 2**

**British and Commonwealth Armoured Formations (1919-46)**  
by Duncan Crow  
*(Editor AFV/Weapons series).*



**PROFILE BOOK 3**

**79th Armoured Division. Hobos Funnies**  
by Major-General N. W. Duncan,  
CB, CBE, DSO.



*Contents include,* Armored Personnel Carriers: the T18 (M75) Series; the T59 (M59) and related vehicles; the T113 and subsequent vehicles; the T114 and T117; M107-M110 Series of Self-Propelled Mounts; LVTs since World War II.

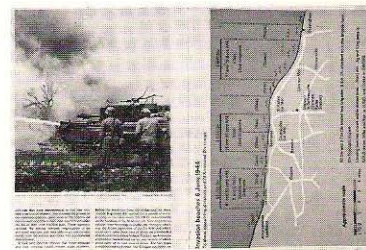
Authoritatively written by one of the US leading experts. Profusely illustrated with over 120 pictures, 4 pages of colour drawings. 52 pages. Hard-back binding, with tough laminated coloured covers. 10" x 7½".

SBN 85383 080 0 £1.50.



For the first time in one volume a complete and specific account of the development, organisation, and service history of all the armoured formations in the British and Commonwealth armies from 1919 until the end of World War II, including a short "biography" of each armoured division, armoured brigade, and tank brigade up till 1946. Includes eight pages of colour, showing 75 regimental badges; 31 Brigade signs; 23 Armoured Divisions signs; 27 Corps signs; 10 Army signs and 16 Higher Formations. Plus 96 pages of text including 220 black and white illustrations.

Hard-back binding, with tough laminated coloured covers. 10" x 7½".  
SBN: 85383 081 9 £2.25.



Formed as a normal British armoured Division in 1942, the 79th's role was changed in spring 1943. It became a unique all-armoured formation responsible for the operation of the special purpose armoured equipment that cracked open Festung Europa on the beaches of Normandy in June 1944, and then smashed into the Channel ports, assaulted Walcheren, fought in Operation "Veritable" to clear the Reichswald, and took part in the crossing of the Rhine, the liberation of the Netherlands, and conquest of northern Germany. Excitingly told in this book by Nigel Duncan, who commanded the division's 30th Armoured Brigade.

74 pages, which includes eight pages of coloured maps and diagrams, and 100 black and white illustrations.

Hard-back binding, with tough laminated coloured covers. 10" x 7½".  
SBN 85383 082 7 £1.95.

Note. The contents of Profile Books 1, 2 and 3 are also included in volumes of AFVs of the World series.

All Profile Books are available from your regular Profile stockist. If you have any difficulty in obtaining these books, write direct to the Publishers. Add 20p to your order to cover postage and packing.

**PROFILE PUBLICATIONS LIMITED + HYLTON LACY PUBLISHERS**  
Coburg House, Sheet Street, Windsor, Berks. SL4 1EB.

*Publishers of the world-renowned Aircraft, Car, Warship, AFV/Weapons and Small Arms series.*