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## French Infantry Tanks: Part II (including R 35 and FCM 36)

by Major James Bingham, Royal Tank Regiment





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*Renault R 35 tanks in partial concealment.*

(E. C. Armées)

# French Infantry Tanks (Part II)

by Major James Bingham, Royal Tank Regiment

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## LIGHT TANKS

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### RENAULT FT

IN 1921 there were 3,737 Renaults FT in French service, and these, apart from a few heavy tanks, formed the entire tank strength of all units. There was a wide variety in role and armament, with nearly two-thirds (2,109) being armed only with the Hotchkiss 8mm machine-gun, while 1,246 had the 37mm SA gun, 39 were armed with the short 75mm BS gun, 188 were equipped as wireless tanks (without guns), and 155 were set aside for training.

As a small, two-man tank the Renault FT's role was severely limited but it answered the purpose for which it was required as a close support weapon for the infantry. It was proven in war, it was cheap and it was simple, and it set the pattern for numerous variations which were bought or made by other countries that wanted to build up their own tank forces. In France there could be no question of any large scale replacement unless or until major changes at home or abroad demanded it, but in the meantime, improvements and modifications could be tested. Important amongst these trials were those concerned with the suspension and tracks to improve speed and tactical mobility. These included experiments from 1921 with the continuous rubber track of the Citroën-Kégresse suspension that had already been used success-

fully on half-track vehicles, and in 1925 a small number of Renaults FT were specially converted to this form of track and suspension for field trials and practical experience during operations in Morocco. They were generally known as Renault Kégresse-Hinstin, and the conversion included detachable rollers at front and rear to improve trench-crossing performance.

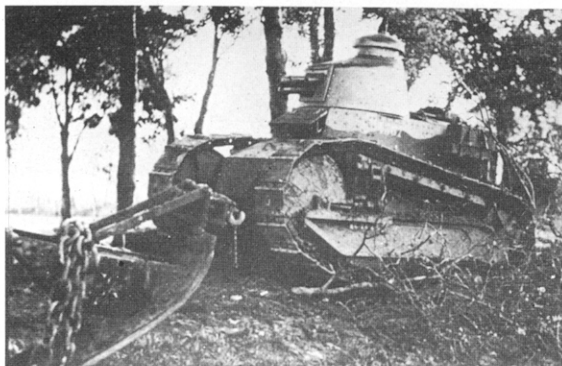
One company was equipped with the Kégresse-Hinstin tanks and it went to join two tank battalions engaged in operations against the Rifs. However, during one short action under fire in October 1925 the main weaknesses of the new suspension were revealed when the tracks came off on rough and rocky ground. At the same time, it was seen that the tracks took too long to repair even with a well-trained crew. The Kégresse-Hinstins did not remain long in operations, although the other FT tanks gave valuable service.

In the following year the Carden-Loyd light, short-pitch steel track appeared in Britain, offering greater advantages in speed and durability, and further interest waned in the Kégresse system for a tank track. Meanwhile, the Renault FT continued in service virtually unchanged.

## RENAULT NC

The first step towards replacement of the FT was the completion of the prototype Renault NC, which appeared in 1924, and by 1926 was deemed to be sufficiently far advanced to go into production if need be. The hull and superstructure showed its origin in the FT, but the most obvious external difference was a completely new form of suspension which included three assemblies of four bogie wheels on each side, with vertical coil springs. It was slightly larger, carrying the same two-man crew, and with more armour (30mm) the weight had gone up to 8 tons, but a more powerful Renault 60 h.p. engine raised the speed to 18 k.p.h.

There was an innovation in armament in that a machine-gun was carried in a fixed mounting in the hull front, controlled and fired by the driver, and this type of mounting was to be copied in later generations of light and medium tanks. Two similar types of the NC tank were produced, both having the fixed machine-gun in the hull. The first, known as NC 1 (also as NC 27) carried the same turret as the FT with a single 1918



model 37mm gun; the NC 2 (or NC 31) carried co-axial twin machine-guns in a similar turret.

Mechanically the Renault NC was a considerable advance on the FT, and one major improvement was the introduction of the controlled differential for steering (commonly known as the Cletrac system after the American commercial tractor to which it was also applied in 1927). The Cletrac differential steering was subsequently used on all French light tanks until 1940, and was also widely used on American tanks.

As trials continued in the late 1920's the cavalry also studied the NC as coming some way towards their need for a tracked *auto-mitrailleuse*, but it was the only new light tank then under active development. The Japanese also showed interest, and in 1930 bought several models which were then known in Japan as Renault B (or ETSU B). These were used in action against the Chinese during the Shanghai Incidents of 1931/32, but they were not particularly successful and the Japanese showed no marked enthusiasm for them.

For the French infantry, the Renault NC offered a better performance than the FT, but it was not significantly more effective as a support weapon on the battlefield. Circumstances did not justify production in quantity and the project was abandoned as progress was made on its successor, the Renault D.

## RENAULT D

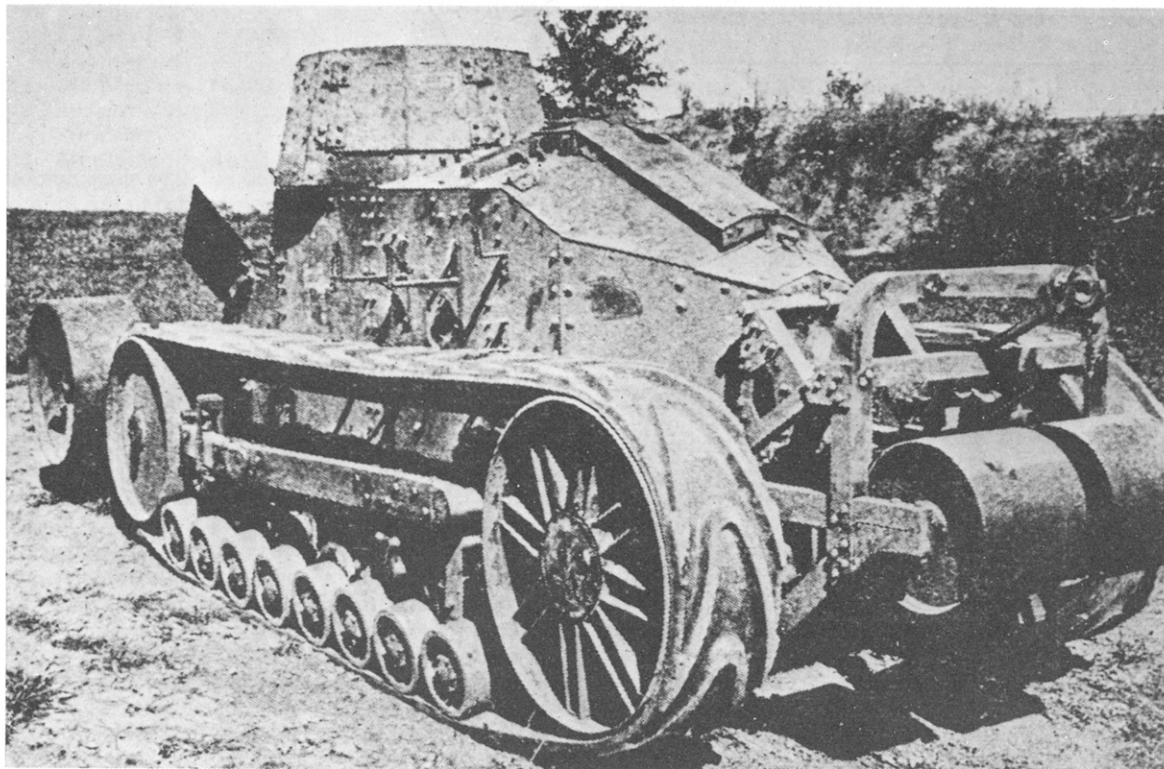
Design studies by Renault for another light tank, which was very similar to but about three tons heavier than the NC, resulted in an order for 10 prototypes. Building

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*Over 500 of the aged Renault FT tanks were deployed for action in France in 1940, mostly behind the Maginot Line.*

(I.W.M.)

*The Kégresse-Hinstin was a Renault FT converted to the Kégresse rubber track and suspension system. A small number were used in field trials during operations in Morocco in 1925.*





started in 1929 and, under the name of *Char Renault D 1*, prototype trials were completed in 1931. A production order followed, but as these tanks were later classified and used as medium tanks they are described under that heading.

### '6 TON TANK'

Following the combined exercises in 1932 and 1933, where the Renault D 1 had shown itself to be of more use as a medium tank than as a replacement for the light Renault FT, the infantry called for the design of what was colloquially known as a '6 ton tank', although the amended specifications which were approved in May 1934 gave it a weight of 8 tons, without crew and ammunition. It was to have a crew of two, armament of one or two 7.5mm machine-guns or a 37mm gun, armour of 40mm and a speed of 15–20 k.p.h. with minimum radius of 40 kms. (Wireless was not a requirement, and when this was added in about 1937 the production programmes were too far advanced for it to be introduced except as an improvisation.)

Four firms took part in design studies to meet the new specifications – Renault, Forges et Chantiers de la Méditerranée (F.C.M.), Delaunay-Belleville, and the Compagnie Général de Construction des Locomotives.

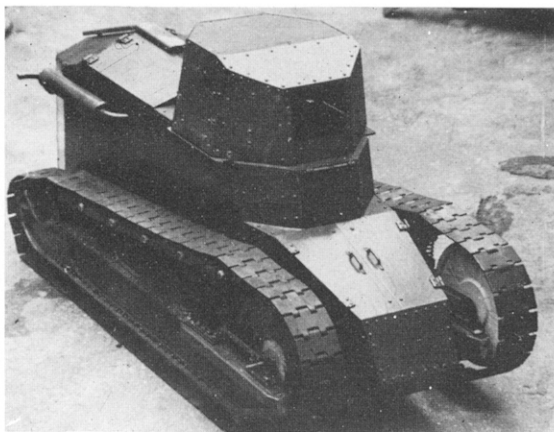
### RENAULT ZM (R 35)

The first prototype which appeared to the new specifications was offered by Renault at the end of 1934, and was sent to the trials commission at Vincennes. Clearly it owed much to the work which had been carried on simultaneously for the cavalry, since the suspension was adapted from that of the tracked *Auto-mitrailleuse de Reconnaissance 1935 Type ZT* which had already been accepted for service.

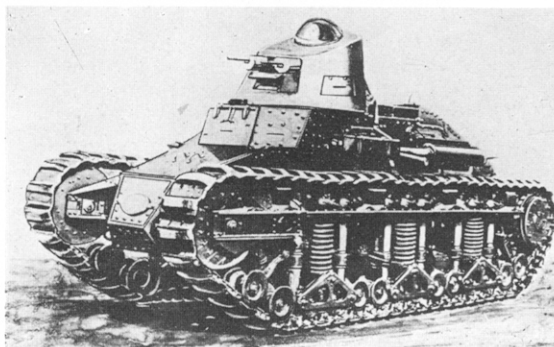
In accordance with the original specifications of 1933, the new prototype Renault ZM had a maximum of only 30mm armour, and almost immediately an increase was demanded to 40mm; the weight was to go up to nearly 10 tons. Trials started in January 1935 and continued through the spring at Vincennes and Mourmelon, but events in Germany then began to hasten the process of development. Following the March crisis and the demand for immediate rearmament, the Renault ZM was accepted in April for production without waiting for completion of trials, and an initial order was confirmed in May for 300, under the name of *char léger modèle 1935-R* (or R 35) armoured to 40mm and carrying the Puteaux turret with co-axial 37mm gun and machine-gun. It was intended that they be used in a re-equipment programme starting in the spring of 1936, which would, at last, replace the Renault FT. Easier said than done, perhaps, for there were many problems ahead in starting large-scale production while trials were completed, modifications designed and introduced, but the R 35 became the most numerous light infantry tank in service in 1940; over 1,600 were built. The R 35 is described in detail below but, in the meantime, other prototypes were also examined and put into production.

### F.C.M. 36

The next prototype to appear from the '6 ton tank' specification was offered by F.C.M. at Vincennes in April 1935—if one discounts the Hotchkiss tank that was rejected initially by the infantry but accepted by the cavalry as the H 35.



*An experimental, shorter pitch track tested on the Renault FT to try to improve speed and mobility.*



*The Renault NC 2 mounting twin machine-guns in the turret. Although the NC was not taken into French service it was important as a link in the development of later tanks. The NC 1 was similar but had the same turret as the Renault FT. For a photograph of the NC 1 see the Profile on Japanese Medium Tanks. The Japanese took several NC 1 tanks into service, but did not find them particularly satisfactory.*



*Development of the R 35 owed much to work carried on simultaneously for the cavalry auto-mitrailleuses, including the A.M.R. Renault 33 VM seen here in the Bastille Day military parade in Paris on 14 July, 1935. The A.M.R. Renault 33 VM was in action in 1940. (E. C. Armées)*

*The suspension of the A.M.R. Renault 35 ZT was very similar to that adopted for the R 35, but with four wheels instead of five. (E. C. Armées)*





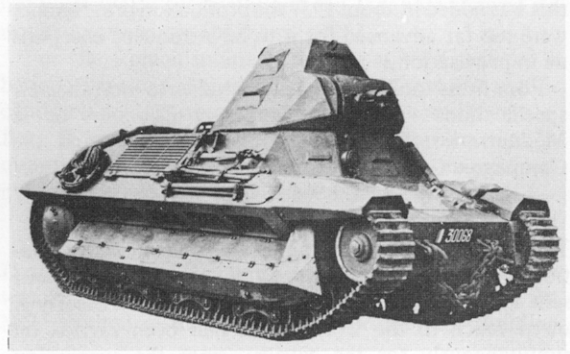
The suspension of the R 35, with bogies arranged in pairs or singly on bell cranks and with rubber springs, was similar to that of all the cavalry's auto-mitrailleuses.



A column of R 35s advancing to take up positions in close support of infantry. (E. C. Armées)



The F.C.M. 36 was different in almost every respect from other French light tanks, although armed with the same 1918 model 37mm gun and machine-gun. (E. C. Armées)



The mosaic pattern of welded armour plates on the F.C.M. 36 offered sloping surfaces to increase ballistic protection. This technique was seldom used in the 1930s.

The F.C.M. tank, weighing 10 tons without crew and ammunition in prototype form, was different in almost every respect from any of the other light tanks. It had a Berliet 90 h.p. diesel engine, Type MDP, which gave the tank a speed of 24 k.p.h. and a radius of action extended to 225 kms. It carried an APX turret with the same armament as the R 35, but the hull and skirting plates over the suspension were made up of angled, sharply sloping plates. The suspension was of the same type as that of the Char B 1, mounted *à poutre*, with two assemblies of four bogie wheels in pairs on each side, controlled by vertical

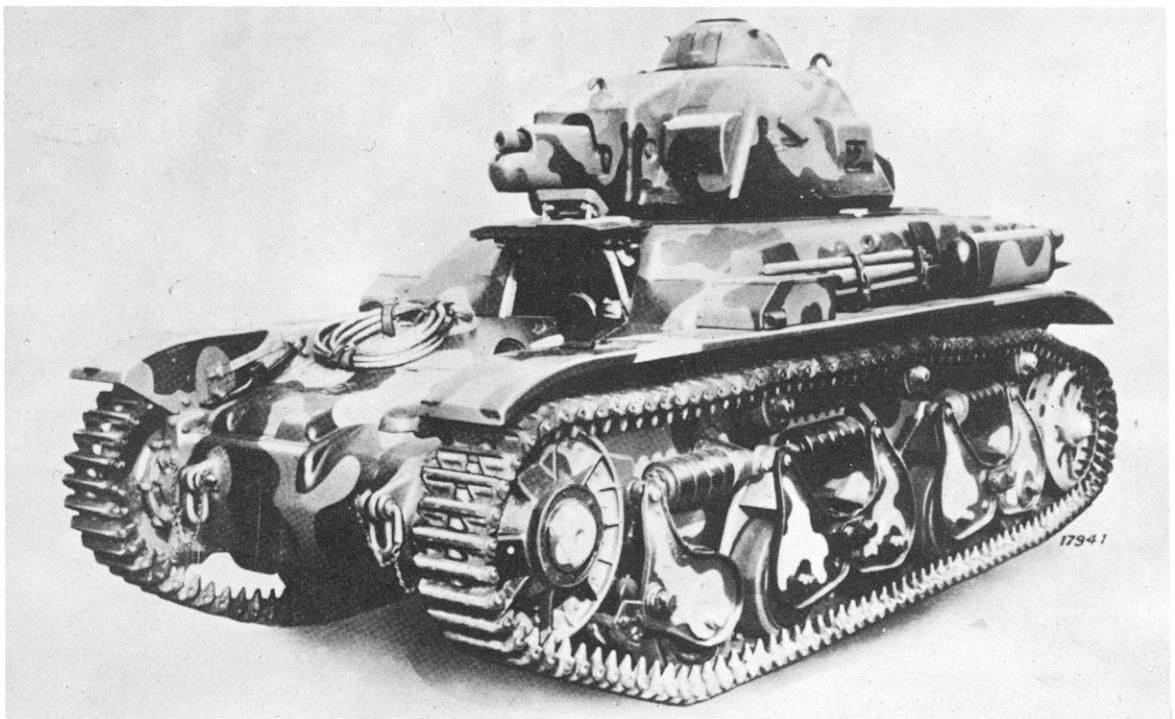
coil springs, and single wheels independently at the front. The track was also of the Char B pattern.

The tank was accepted in 1936 for production as the *char léger modèle 1936 F.C.M.*, and in its final form it had an unusual octagonal turret, carrying the same guns, but with sloping sides rising to a fixed commander's cupola. The tracks were also changed to the short-pitch type which were used on the other light tanks. However, the mosaic pattern of welded armour plates did not stand up well to attack, and a weakness against damage by mines was reported on the suspension. An order for 100

A diesel engine gave the F.C.M. 36 a reasonable speed and a good radius of action (225 kms.). These F.C.M. 36 tanks are in the 1939 Bastille Day parade. The Arc de Triomphe in the background. (I.W.M.)







*The upper part of the driver's door on the R 35 was raised with the help of a hydraulic ram. Note the tow rope.*

was given in June 1936 and completed nearly three years later, enough to equip two battalions.

### DESCRIPTION OF R 35

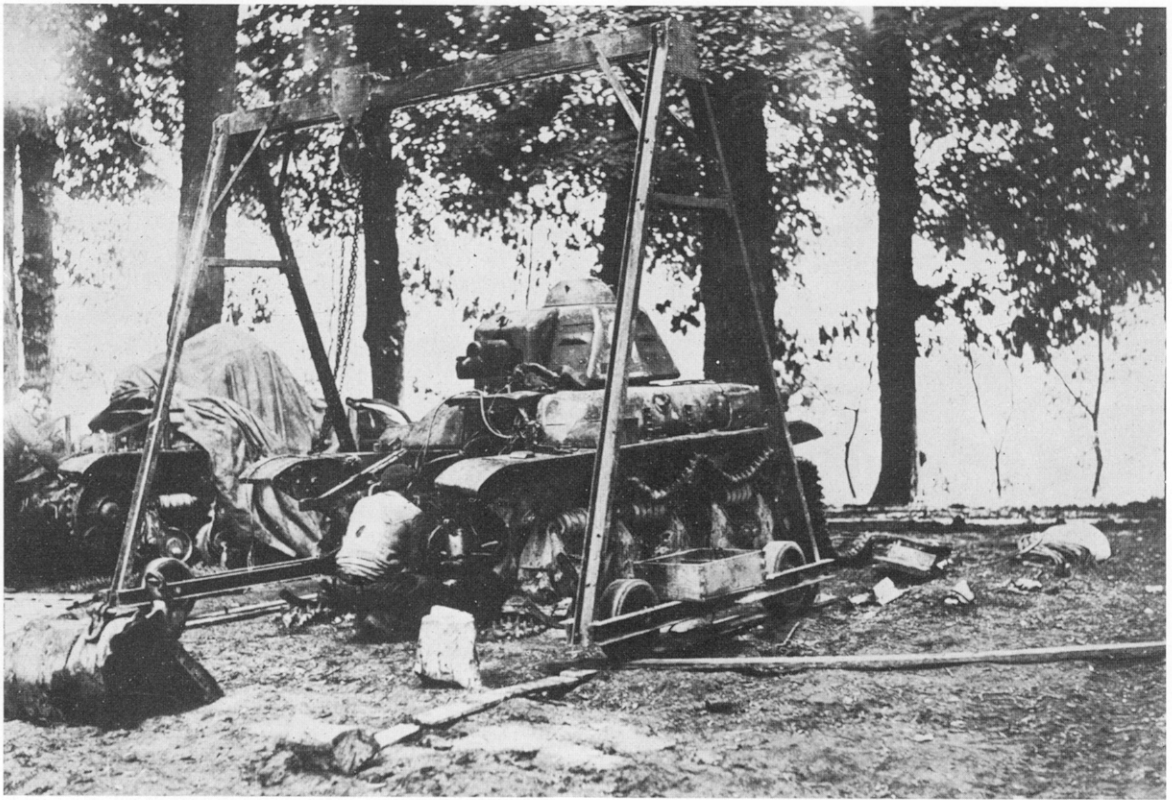
The hull comprised three main cast sections which were bolted together with rolled armour plates that made up the sides and the floor. The two side plates carried the suspension assemblies and the front driving sprocket. A cast armour front section housed the differential and final drive assembly, whilst the rear section included two access doors to the engine at the back end and carried the idler wheels (tensioners). The cast superstructure, above the level of the track guard, incorporated the driver's hood, covered the engine compartment and carried the cast APX-R turret which was standard to the R 40, the Hotchkiss H 35 and H 39.

*An H 39, in comparison with the R 35, indicating a recognition point with the driver sitting on the right side of the tank.*



The internal layout was very similar to that of the Hotchkiss tanks which had the same two-man crew, but with the main difference that the driver sat on the left while the engine and transmission assemblies took up the right side. The driver's controls included the usual accelerator, brake and clutch pedals, steering levers on each side and with hand brake and gear lever on the right. Unusually, a handthrottle was fitted to the left hand steering lever, together with a button switch for the horn. There was ready access to the driver's position by two doors which opened upwards and forwards; the upper half incorporated an episcopes with armoured visor, whilst vision to either side was provided through slits backed by armoured shutters.

The tank commander stood on the floor of the fighting compartment, but was supported also by a seat which was suspended from and rotated with the turret. Access to this position was by a door at the back of the turret, which was normal practice in the infantry tanks as the dome-shaped, rotating cupola on top had no hatches and was used only for observation. Even so, vision when closed down was somewhat restricted. The cupola had only one visor and, although there were three periscopic binoculars (or episcopes) in the turret walls, it must have been difficult for the commander/gunner to keep all-round observation and search for targets if he had to move his head to several different positions, apart from the gun sights. The 1918 Model 37mm gun, with coaxial machine-gun, was mounted on all the R 35 tanks, in common with most of the light infantry tanks and the cavalry's H 35. (Only about 500 of the long-barrelled 1938 Model 37mm guns were produced and available, and these were mounted on some, but not all, of the later models R 40 and H 39.) Empty cases from the machine-gun were disposed of by chute to a hole in the floor of the tank.



*In a temporary workshops in the field, the front armour section of the R 35 is lifted off for repairs to the differential and final drive assemblies.*

*This picture of an R 35 clearly shows the periscopic binoculars fitted in the turret walls. Some tanks had episcopes behind vision slits instead. Note the horn behind the hooded headlamp.* (E. C. Armées)

*An R 35 abandoned. Note the fitting of the skid tail and carriage of a spare bogie wheel. The turret is reversed.*

*Close-up of the short 37mm gun in the APX-R turret on the R 35. The visor in the cupola was known as the 'Fente Estienne'.*





A fire-proof partition separated the fighting compartment from the rear part which included the Renault 4-cylinder engine, with radiator and fuel supply. The self-sealing fuel tank was mounted on the left side immediately behind the partition, and was itself divided in two parts; the main tank supplied fuel by pump to the carburettor while a reserve tank on top provided a direct, gravity feed. Fuel replenishment was made by a single filler under the engine deck, through the reserve tank to the main tank, and the driver's instrument panel included fuel gauges for both.

Behind the fuel tank, mounted laterally, was the radiator and engine oil cooler; behind that again was the belt-driven fan drawing air in through grills in the engine deck and from the fighting compartment, through the radiator and ducted out above the fan. The engine, on the right, transmitted power forwards through clutch and gearbox in the fighting compartment to the differential unit at the front and thence through final drive reduction to the sprockets. Brake bands in the differential, operated by the steering levers, controlled the drive through epicyclic gears to each track in a simple but effective regenerative system that reduced loss of power when steering. The oil in the differential was passed by pump to an oil cooler mounted beside the gearbox from which the oil pump was driven. The cooling medium in this system was the water for engine cooling, which was piped through the differential oil cooler on its way from the radiator back to the engine.

The suspension was similar to that of the other Renault light tanks of the cavalry, with five wheels each side, one mounted independently and two pairs on bell-cranks in a 'scissors' arrangement acting upon each other through rubber springs between the upper arms. Three top rollers carried the track forward, and the trailing idler wheel, mounted low, may have helped to improve stability. A skid tail could be attached at the rear to extend trench-crossing performance.



An R 35 apparently bogged down in the mud. Note the grills in the engine deck for air-flow through the radiator, and the stowage bins on the track guard (which were not carried on the Hotchkiss tanks).

#### R 40 (A.M.X. 40)

Another version of the R 35 was developed by A.M.X. with a new suspension that gave slightly more ground clearance and a better cross-country performance. The track was of a similar type to that of the Char B 1, and the suspension consisted of 12 small wheels each side mounted in pairs with vertical coil springs; the suspension was protected by skirting plates. In other respects this tank was much the same as the R 35 although some models mounted the long-barrelled 37mm SA 38 gun. It was generally known as the R 40, but is also referred to as A.M.X. 40. Two battalions were equipped with this tank in 1940.

#### IN GERMAN SERVICE

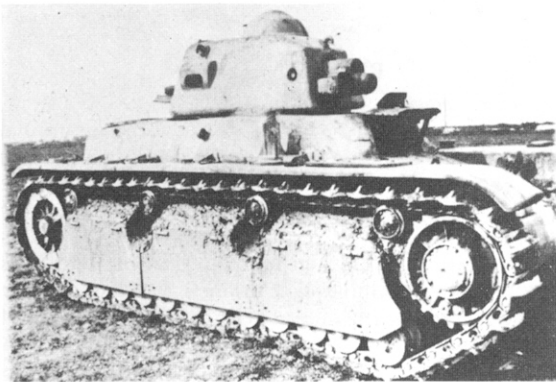
For the German campaign in Russia about 200 of the R 35 were issued in 1941 to German units for reconnaissance duties, designated *Pz Kpfw R 35 (4,7cm)*. Later on,

Compared with the H 39, a point of recognition at the rear of the R 35 is the prominent exhaust pipe leading to the silencer on the left track guard. (I.W.M.)

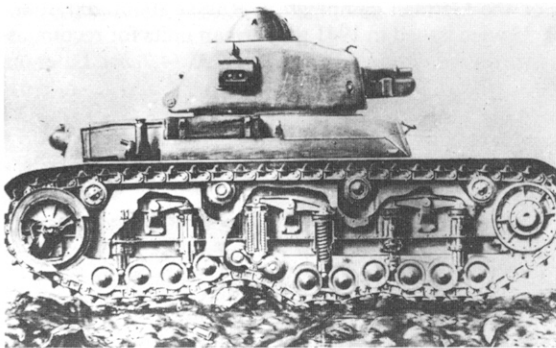




A prototype of the R 40, with lower skirting plates, three top rollers, spudded tracks, and a light shield covering the bogie wheels.

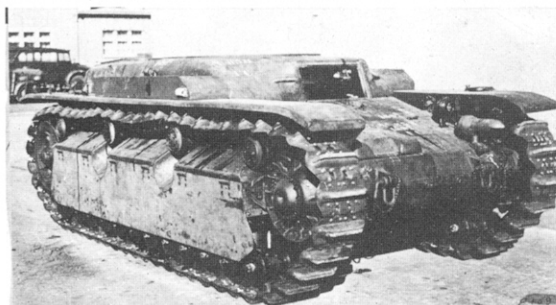


Apart from the suspension the R 40 was very much the same as the R 35, although some mounted the long 37mm gun. Two battalions were equipped with the R 40 for action. (E. C. Armées)



The suspension of the R 40 was developed by A.M.X. to give this tank a better cross-country performance. Hence, it is sometimes called the A.M.X. 40.

An R 40 without its turret, showing the similarity of the front hull to the R 35. The track plates were of the same type as those of the Chars B1.



when the weather and ground conditions in Russia deteriorated, large numbers were called into use as tractors or as ammunition carriers to support or to replace wheeled transport; in this role, without turrets, they were known as *Traktor* or *Munitionpanzer 35 R (f)*, and they were joined in this service by the H 35 and H 39. A machine-gun was sometimes fitted to these turretless tractors in an improvised mounting behind a light armour shield on the turret ring.

More elaborate conversions were made for the role of self-propelled artillery, mainly for use in France and neighbouring countries, and in each case the weapon was mounted in an open-topped, armoured superstructure carried on top of the hull. The Czechoslovakian 47mm anti-tank gun was mounted in this way and about 100 of these conversions were made, to become *4,7cm PaK (t) auf Gw R 35 (f)*, with a crew of 3 or 4. The standard German 105mm field howitzer was also mounted on the R 35 in conversions made in 1943/44 by the firm of Alfred Becker, Krefeld, which made similar mountings on the H 39, the F.C.M. 36 and the Char B 1. In this conversion to field artillery the R 35 was designated *10,5 cm le F.H. 18 auf Gw 35 R (f)*, with a crew of 5. Yet a further conversion was made to give mobility and light armour protection for the 80mm mortar, known as *8cm s Gr W 34 auf Pz Kpfw 35 R (f)*. The number of these conversions is not known but they were probably few.

The mobility and performance of the R 35 must have suffered under the added weight of these later conversions. Nevertheless, the R 35 in its various forms, and the other French tanks, played an important part in German service as they were called upon to fill the gaps created by the mounting losses suffered from 1942 onwards.

## ORGANISATIONS AND EMPLOYMENT

When discussing the employment of French infantry tanks in the 1920's and 1930's one cannot set them apart as completely separate from the tanks and so-called *autos-mitrailleuses* of the cavalry. Development of both continued in tandem, with influence on each other, and from 1935 the industrial and military technical resources were brought together under the guidance of the *Direction des Etudes et Fabrications d'Armement*. By the late 1930's both cavalry and infantry tanks were of comparable performance, were armed with the same guns and were sometimes identical in type, although they were used in armoured formations or units that were organised for different roles. Together they represented a formidable array of armoured fighting vehicles (AFVs) to be matched against the German panzer divisions in May 1940, and any comment upon the employment of French tanks in action at that time must take into account the whole range of tracked AFVs rather than particular groups on their own. However, the developments in armoured organisations between 1919 and 1940 were tortuous and slow, until some hasty improvisations were made at the end.

## ARMOURD FORMATIONS

In the years immediately after the First World War, General Estienne strongly advocated the replacement of the Renault FT by a new and more powerful *char de bataille* that could, by its mobility and use in mass, exercise a decisive influence in operations. He accepted





the need also for a smaller *char d'accompagnement* (accompanying tank) for close support of the infantry but, in his view, this was subordinate to the need for battle tanks as part of an independent mechanised force which included motorised infantry and self-propelled artillery.

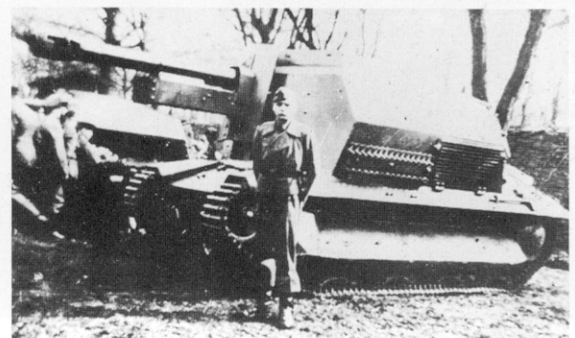
Such recommendations were akin in concept to those of armoured protagonists like Colonel Fuller and Liddell Hart in Britain, but they went unheeded in France amongst the General Staff which refused to contemplate conditions of war beyond those of 1918. The headquarters of the wartime *Artillerie d'Assaut*, which might have served as the nucleus of an independent armoured force, was disbanded in 1920, and when tanks were transferred to control by the infantry further development for any purpose other than infantry support was virtually stifled. For the next two decades this remained their only role. Indeed, when almost the entire tank strength of over 3,500 vehicles consisted of light, two-man tanks with a maximum speed of 8 k.p.h., and which were likely to remain in service for years, it was difficult to practice or to visualise anything more enterprising. Without a new and independent arm such as

*An R 35 in action under German colours. It was designated PzKpfw R 35 (4,7cm), or PzKpfw 35 R 731 (f).*

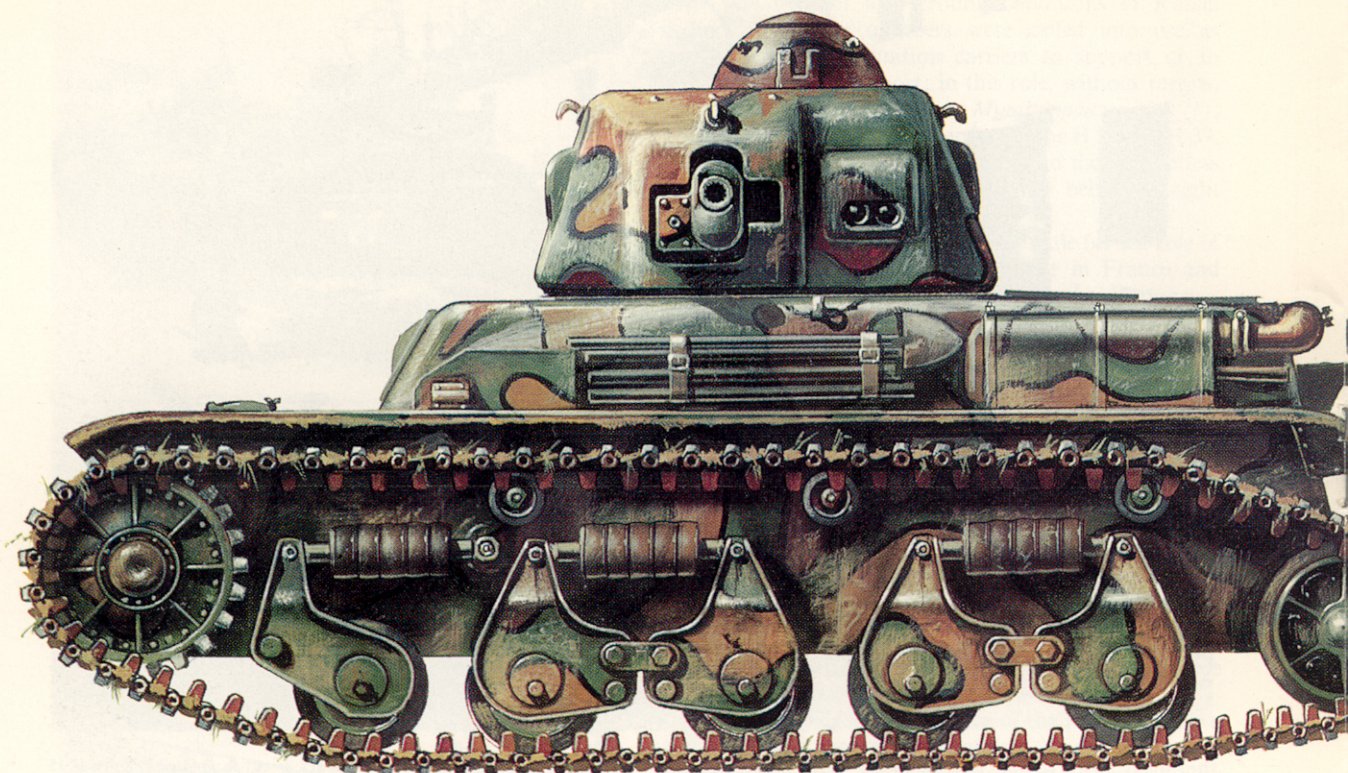
*The R 35, without turret, was used in large numbers in German service as a tractor for wheeled transport or as an ammunition carrier during the Russian campaign. It was designated Traktor or Munitionspanzer 35 R (f). (I.W.M.)*

*The R 35 converted for use as a self-propelled anti-tank gun, carrying the Czechoslovak 47mm gun. (bottom left)*

*The F.C.M. 36 converted to self-propelled artillery with the standard German 105mm field howitzer. This gun was also mounted on the R 35, the H 39 and the Char B1 bis. (bottom right)*

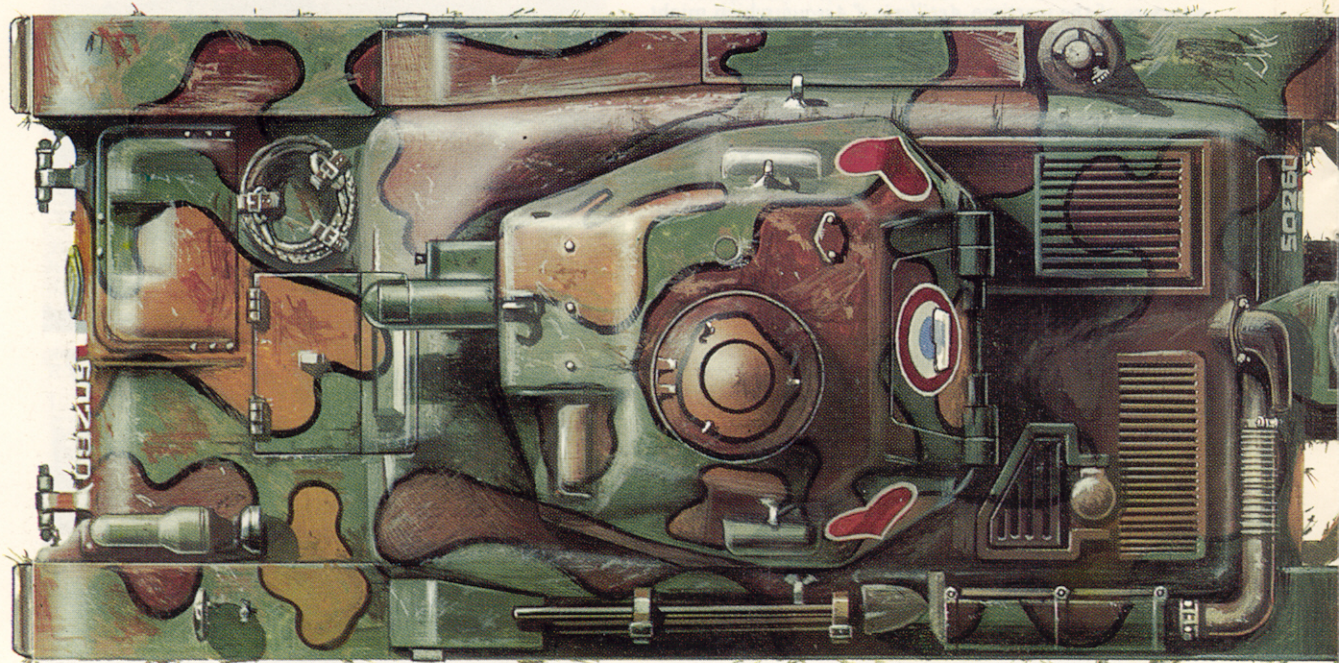




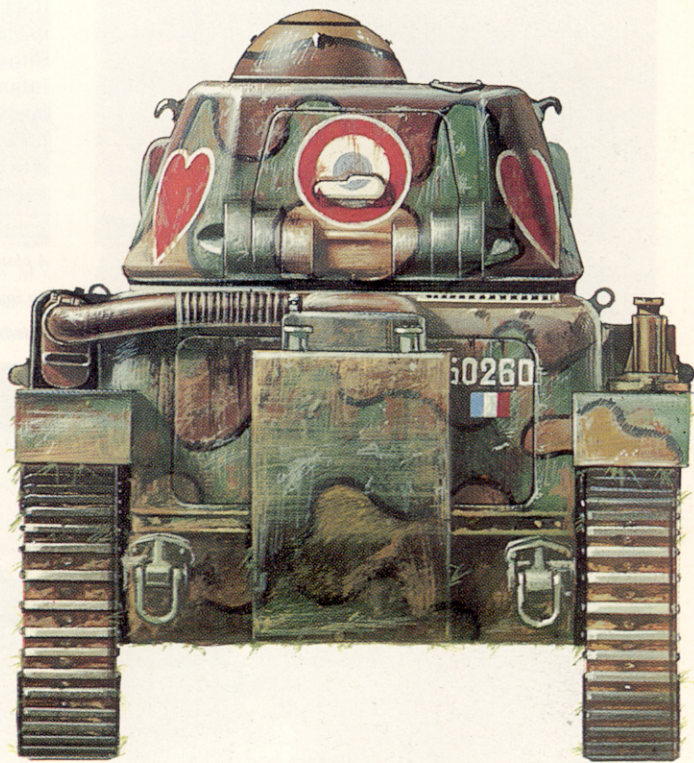
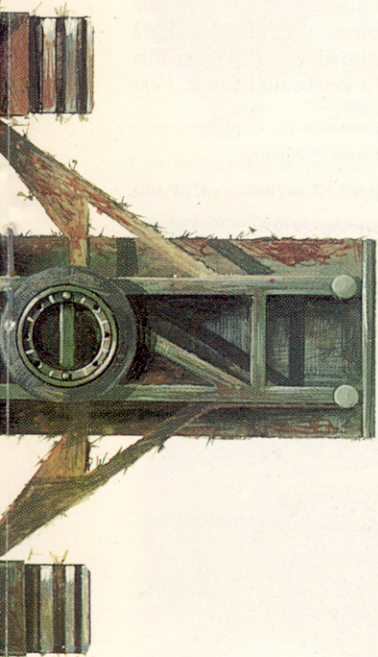
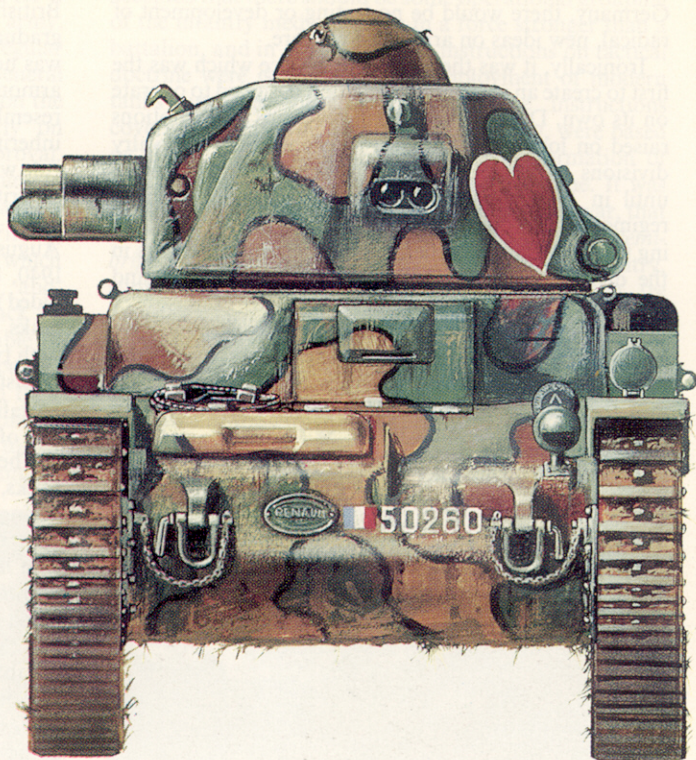
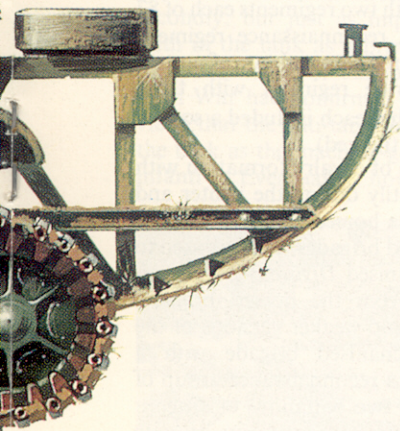


The Renault R 35 was introduced in 1935 to replace the Renault FT of World War I, to fill a similar role as a close support weapon for the infantry. Playing card insignia were frequently painted on the turret for identification of sub-units.

*T. Hadler © Profile Publications Limited*









the Royal Tank Corps in Britain, or the *Panzerwaffe* in Germany, there would be no testing or development of radical, new ideas on armoured warfare.

Ironically, it was the cavalry in France which was the first to create an armoured formation designed to operate on its own. Despite the natural reactions and emotions raised on losing their horses, mechanisation of cavalry divisions had been developed quicker than in Britain until in 1930 one horsed brigade was replaced by a regiment of motorised riflemen (*dragons portés*). Following this, in 1932, the detachment of 36 armoured cars in the division was enlarged to 80, and the cavalry and infantry both took part in combined exercises of mechanised detachments. Whatever lessons may have been learned by the infantry in these exercises, the cavalry assembled a fully motorised division in the following year and this led to the permanent formation of the *1re Division Légère Mécanique* (D.L.M.) in 1934.

The D.L.M. preceded by one year the formation of the

first German panzer division and by four years that of the British Mobile Division. However, the D.L.M. had gradually evolved in the process of mechanisation and it was not the product of new thoughts on the conduct of armoured warfare. Although the organisation was to resemble that of the panzer division, the D.L.M. had inherited the traditions of the cavalry division and its role was restricted to one of strategic reconnaissance and security, protecting the infantry formations.

By 1938 the second D.L.M. was formed, a third in August 1939, and a fourth was being assembled in May 1940, but was never completed. The organisation provided for a combat brigade with two regiments each of 87 tanks (including reserves), a reconnaissance regiment with two squadrons of armoured cars and two of motorcyclists, and a motorised rifle regiment with three battalions of *dragons portés* that each included a squadron of 20 *autos-mitrailleuses* (tracked).

There was yet another type of cavalry formation with tanks, formed somewhat hastily during the winter and spring of 1939/40, when three horsed cavalry divisions were broken up and five horsed brigades were released to join five new partially mechanised *Divisions Légères de Cavalerie* (D.L.C.). Apart from the horsed brigade, these divisions were smaller and weaker versions of the D.L.M., comprising a mechanised brigade with a combat group of light tanks, a reconnaissance group of armoured cars, supported by two battalions of *dragons portés*. As an improvised union of horsed cavalry with armoured fighting vehicles, it was not a happy or effective relationship.

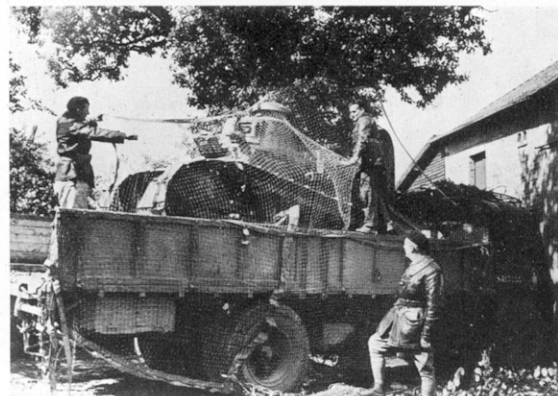
Meanwhile, the infantry had come to accept that tanks would be needed in mass, and had decided that they might be concentrated at the corps or divisional level, but still subordinate to the role of infantry support. This found expression in 1930 when the heavy and battle (later medium) tanks were officially described as *chars de manoeuvre d'ensemble* (operating together), to break into the enemy defences and to open the way for the infantry—closely supported by their light *chars d'accompagnement*—but there was little positive progress in this field apart from the opportunities provided in 1932 and 1933 to practice tactical manoeuvres. It was in this period that Colonel de Gaulle's celebrated book *Vers*



A platoon of R 35s leading a marching column of infantry.

An improvised tank transporter for a Renault FT in 1940. (I.W.M.)

Side-loading of R 35s on to rail flats, September 1939. (I.W.M.)





*L' Armée de Métier* proclaimed in 1934 the need for a highly trained and professional mechanised army. Although this gave a stimulus to the younger regular soldiers it frightened the politicians and the General Staff, and from then on a silence was imposed upon the open discussion of any new ideas, particularly on mechanisation, which did not meet with official approval.

Gradually the infantry evolved plans for grouping together the *chars de manoeuvre d'ensemble* in a permanent form, but, again, progress was slow. Firstly, there was delay in production of the Chars B which would be the main strength of any such force, and, secondly, but just as important, there was a lack of faith in the tank as a prime weapon of war capable of independent offensive action; observations in the Spanish Civil War had confirmed the critics of armour in their views that the anti-tank gun would be as devastating to the tank as the machine-gun had already proved to the infantry. Eventually, however, the High Command

accepted that there should be some operational grouping of the infantry medium tanks in a force stronger than a battalion, and in 1937/38 formal instructions on tactical doctrine were issued upon the employment of modern tanks and armoured formations. The instructions covered general principles and, of necessity, were based on theory as far as they concerned any formation of infantry tanks, since none existed in peacetime. It was not until September 1939, after the outbreak of war, that four battalions of Chars B were united in two *demi-brigades*, with two battalions of motorised infantry, supporting artillery and engineers, to form the *Ire Division Cuirassée de Réserve* (D.C.R.). This organisation was not to last long, and in January 1940 the division was split up to help form a second by re-distribution of the tanks available, replacing two battalions of Chars B by two of the Hotchkiss H 39 (hitherto regarded as a cavalry light tank). The end result in the D.C.R. was two *demi-brigades* each comprising one battalion of 33

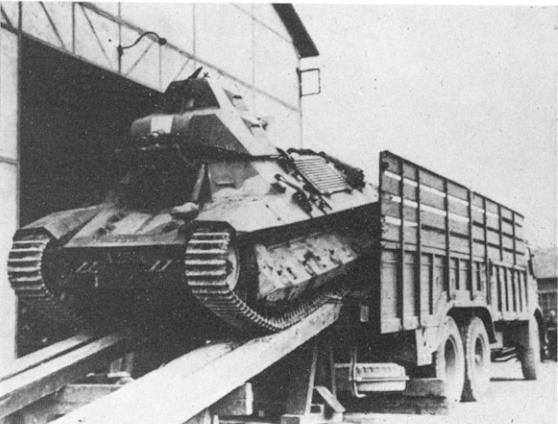


Crew maintenance in the field. (top)

(I.W.M.)

Most of the Chars D1 were deployed in North Africa. (E. C. Armées)

Two tank battalions were equipped with the F.C.M. 36 for close support of infantry, and were deployed near Sedan in 1940.



R 35s bearing a Heart playing card emblem as a platoon identification sign. Tow ropes on French tanks were frequently chains, but not always. (E. C. Armées)

Chars B and one of 45 light tanks H 39, together with one battalion of motorised riflemen, supporting artillery and engineers. The third D.C.R. was formed in March 1940, whilst assembly of the fourth was hurriedly completed under General de Gaulle after the German assault had started, without regard to a fixed organisation.

The D.C.R. contained a preponderance of tanks in relation to infantry, and in this respect alone it was like the British armoured division. There the similarity ended, however, for, unlike the British concept of mobile operations, the role of the D.C.R. was still confined to that of the *chars de manoeuvre d'ensemble*, as a shock force ahead of the infantry, within the framework of a corps fighting on a continuous front. It was an armoured

group of strictly limited capability, without means of reconnaissance, air support or anti-aircraft defence, and with inadequate logistic support of its own for mobile operations. The exploitation of an attack or counter-attack was to be handed over to the D.L.C. or to motorised infantry.

Quite apart from these tanks belonging to the D.C.R., there were over 1,100 other modern infantry tanks, excluding the aged Renaults FT, which were dispersed through France to battalions organic to infantry field formations, or as independent companies allotted directly in support. About half of these were deployed behind the Maginot Line. Their role was as an auxiliary weapon subordinate to the infantry, and the normal basis of allocation was one light tank company to an infantry battalion.

At the same time, there were about 300 modern tanks in French territories overseas. Some of these, as well as the Renault FT, were to see action against the Allies in Syria and in North Africa, and the Chars D I were also to fight the Germans again in Tunisia in 1942.

## LIMITATIONS

By May 1940 the French had built up and deployed for battle in Europe a force of some 2,500 modern tanks, not counting the tracked *autos-mitrailleuses*. Both in numbers and quality the French tanks compared well with their counterparts in Germany. They were well armoured, to a standard of 40 or 60mm when the Germans were only beginning to increase to 30mm. The R 35 and H 35 admittedly carried a short-barrelled 37mm gun (1918 model), which was of little value against armour, but the 1938 model 37mm gun on some of the H 39 or R 40 tanks was considerably better, and the long 47mm gun on the Char B 1 *bis* and the S 35 was one of the best tank guns of its time in its class. Furthermore, the APX 4 turret that was common to the Char B and S 35 had electric power traverse.

Nevertheless, there were serious limitations, which are applicable only in part to the S 35 which was widely regarded as one of the best mediums in the world. The infantry tanks were generally slow, none with a speed of more than 28 k.p.h., while endurance on a full fuel tank

*H 39s, seen from the rear, advancing in mass at a demonstration. Note the recognition roundel, and the cavalry identification numbers on the turret.* (E. C. Armées)

*H 35s, clearly showing the downward slope of the engine deck—a main recognition point between the H 35 and the H 39.* (E. C. Armées)





was limited to a matter of hours. This might be acceptable in the set-piece battles for which training in peace had prepared their crews, but it was a severe handicap during mobile operations with frequent stops for re-fuelling.

More important than this, however, in tank design, were the restrictions due to the one-man turret fitted to all these tanks. For the tank commander it was an impossible task to give full attention to searching for targets, loading, laying and firing his gun, while controlling his own tank and conforming to the movements of others. Effective command and co-operation had to suffer.

Over-riding all these limitations were the problems of training and of command and control at all levels. The D.L.M. had been established longer and were to perform familiar and traditional cavalry roles, but the D.C.R. could build only on the experience of individual units—accustomed to close infantry support. Little thought had been given pre-war to the tactical handling of the D.C.R. as an independent formation, and none was based on

practical experience, with the result that there was no standard doctrine amongst any of the divisions. Even 1 and 2 D.C.R. formed in January 1940, were not fully trained or equipped, while the vital command wireless channels were imperfect (the light tanks had no wireless anyway). Yet, suddenly, in May everyone expected miracles of the D.C.R. in mobility and power to stop the German advance, without real understanding of how they should be used or of the problems involved.

*'On n'improvise pas une grande unité cuirassée*  
(You do not improvise an armoured formation).<sup>1</sup>

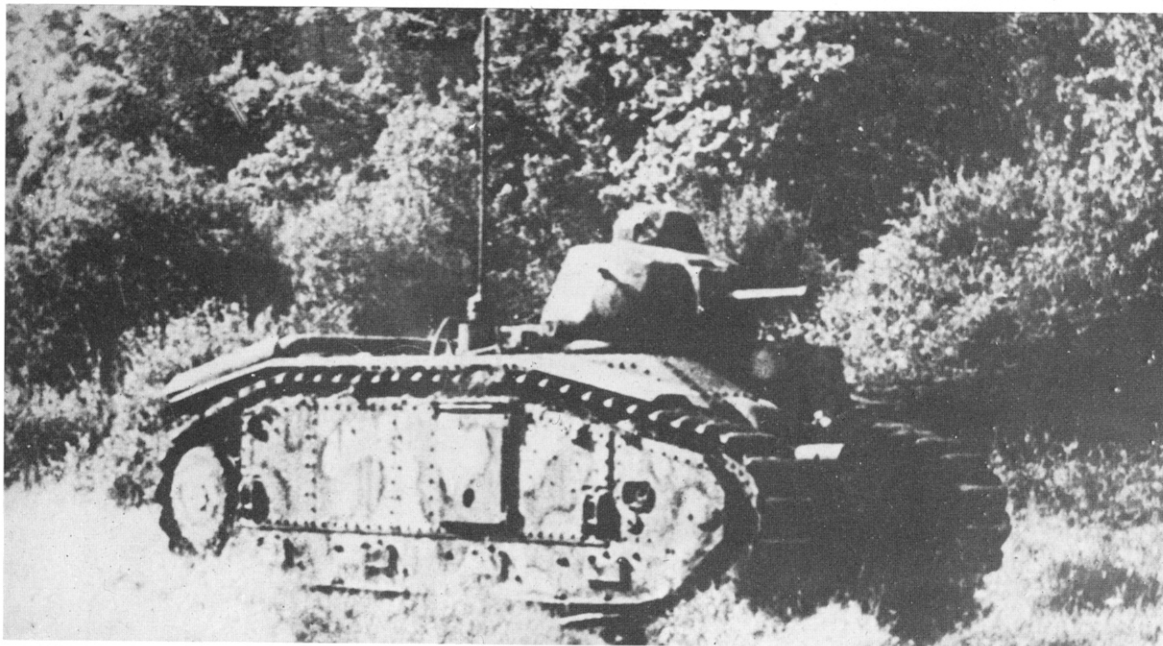
## MAY 1940

On 10 May, as the German forces started their *Blitzkrieg* assault, the three D.L.M. moved forward confidently into Belgium, carrying out their proper task as advance guard and covering force for the occupation of

<sup>1</sup> General Bruneau, commander 1 D.C.R. to La Commission d'Enquête Parlementaire, 1951.

*The Char B1 bis with long 47mm gun in the APX 4 turret. This tank formed the main strength of the Divisions Cuirassées de Réserve (D.C.R.) in 1940. (I.W.M.)*

*The cavalry's H 39 was accepted for equipment of the D.C.R. in 1940 as it was fast enough to work within an armoured division, but nearly two-thirds of them still carried the short 1918 Model 37mm gun. (E. C. Armées)*







*Chars D1 were in action against the Germans in Tunisia in 1942. (left above)* (E. C. Armées)

*Waiting becomes a necessary part of war. (above)*

(I.W.M.)

*A field workshop set up in a barn for major repairs. (left below)* (I.W.M.)

pre-planned defensive positions. On the left, with 7th Army, 1 D.L.M. advanced beyond Antwerp and into Holland. The Cavalry Corps, comprising 2 and 3 D.L.M., was deployed widely on the front of 1st Army in Belgium and it was unable to concentrate in opposition to the advance by 16 Panzer Corps; despite local actions in which the Somua S 35 gave a good account of itself, the Cavalry Corps was forced to withdraw. Before 1st Army had time to occupy the line of the Dyle-Meuse it was committed to the encounter battle which it had sought, above all else, to avoid, and what followed led to the evacuation from Dunkirk. 1 and 4 D.L.C., which had also advanced into Belgium on the front of 9th Army to positions on the Meuse near Dinant, were similarly engulfed.

The three D.C.R. could not move so quickly, being held further back between Reims and Chalons and being partially dependent upon rail transport, but 1 D.C.R. reached its deployment area in 1st Army, near Charleroi, by 14 May. It was then ordered to counter-attack in the area of 9th Army but counter-orders, accompanied by delays in replenishment of fuel, left the tanks to be destroyed where they stood west of Dinant on 15 May by 5 and 7 Panzer Divisions. 2 D.C.R. fared rather better, but confusion in the initial movements left the division scattered with wheeled transport separated from the tanks which were employed in small units, or even as single tanks, in defensive positions. The division was not re-grouped in strength until the end of May.

The third D.C.R. was still incomplete and under training, but on 14 May it was in the battle area south of Sedan. Order, counter-order and lack of logistic support again denied to 3 D.C.R. the opportunity of fighting as an entity, and it was dispersed in defensive positions with the infantry.

Exceptionally, 4 D.C.R. had more success as a fighting formation, despite the fact that it was still being formed and was hurriedly assembled after 10 May. Part of the division carried out what amounted to a raid on 17 May near Laon, towards Montcornet on the southern flank of the German drive from the Ardennes, but the attack was inconclusive due to lack of infantry support. Then on 29 May, in greater strength, 4 D.C.R. attacked the German bridgeheads over the Somme near Abbeville, where the lightly armoured tanks of the British 2 and 3 Armoured Brigades had attacked two days earlier in company with elements of 2 and 5 D.L.C. Appreciable ground was covered but 4 D.C.R. was again inadequately supported by infantry and was checked by mines and artillery; there was no breakthrough and 2 D.L.C., in support, was unable to exploit any further. Nearly a week later, and over the same ground, 2 D.C.R. then followed up the attack with 51st (Highland) Division on 4 June, with similar results.

After that there were no further major engagements for the French armoured forces. The other tanks, which had been dispersed in battalions and companies for infantry support, were dissipated in local actions which were of little effect beyond the units supported. Within a period of three weeks the entire armoured force had been presented for destruction or neutralisation, successively and in detail.

**AFV/Weapons Series Editor:  
DUNCAN CROW**





*Char D2 passing refugees from the battle area after the Blitzkrieg had begun in May 1940.*

(E. C. Armées)

*Knocked out and, perhaps, short of fuel. The Char B1 bis was not designed for the mobility of armoured warfare exemplified in the German Blitzkrieg.*



## SPECIFICATION R 35

### General

Crew	2—Commander/gunner, driver
Battleweight	10 tonnes
Power/weight ratio	8.2 to 1 b.h.p./tonne
Ground pressure	0.67 kg/sq cm

### Dimensions

Length overall	4.20m
Height overall	2.37m
Width overall	1.85m
Width over tracks	1.85m
Track centres	1.55m
Track width	30cm
Length of track on ground	2.50m
Ground clearance	

### Armament

Main 37mm SA 18 (Length 21 calibres, muzzle velocity 1,273 ft/sec.)  
Auxiliary 7.5mm machine-gun 1931 model, co-axially mounted

### Ammunition

37mm—100  
Machine-gun—2,400 (16 boxes)

### Sighting and Vision

Turret Rotating cupola with visor. Telescopic sight co-axial with guns.  
Three periscopic binoculars (or alternatively three episcopes with vision slits) mounted on front face and one on each side wall.  
Armoured shutter in rear door.  
Hull Driver's episcopa, behind armoured visor with narrow vision slit.  
Two vision slits backed by armoured shutters.

### Communications

Flag signals. Voice tube between crew.

### Armour

Cast steel in three main sections bolted to armoured plates making the sides and floor. Cast steel turret (APX-R) armoured to 45mm.  
Front and sides —40mm  
Top and bottom —12mm

Except when otherwise credited all photographs are via R.A.C. Tank Museum.

*In the aftermath of war, the German forces clear away damaged AFVs. On the ground an R 40 (with long 37mm gun). On rail flats an H 39 and a Panhard 178.*

### Engine

Renault, petrol 4 cylinder, water-cooled, 5.8 litres (120 x 130), 82 b.h.p. at 2,200 r.p.m.  
Zenith Type 42 UDD carburettor; Magneto ignition, Scintella 'Vertex' NV 4. Fuel—168 litres

### Transmission

Clutch —Twin plate, dry  
Gearbox —Four speeds forward, one reverse  
Steering —Single differential (Cietrac) controlled by steering levers.

### Suspension

Five rubber-tyred bogie wheels each side, mounted on bell cranks with rubber springs. Four in pairs and one at front independently. Three top rollers and rear tensioner. Track plate: Manganese steel, die stamped, with two guide horns. 58mm pitch

### Electrical System

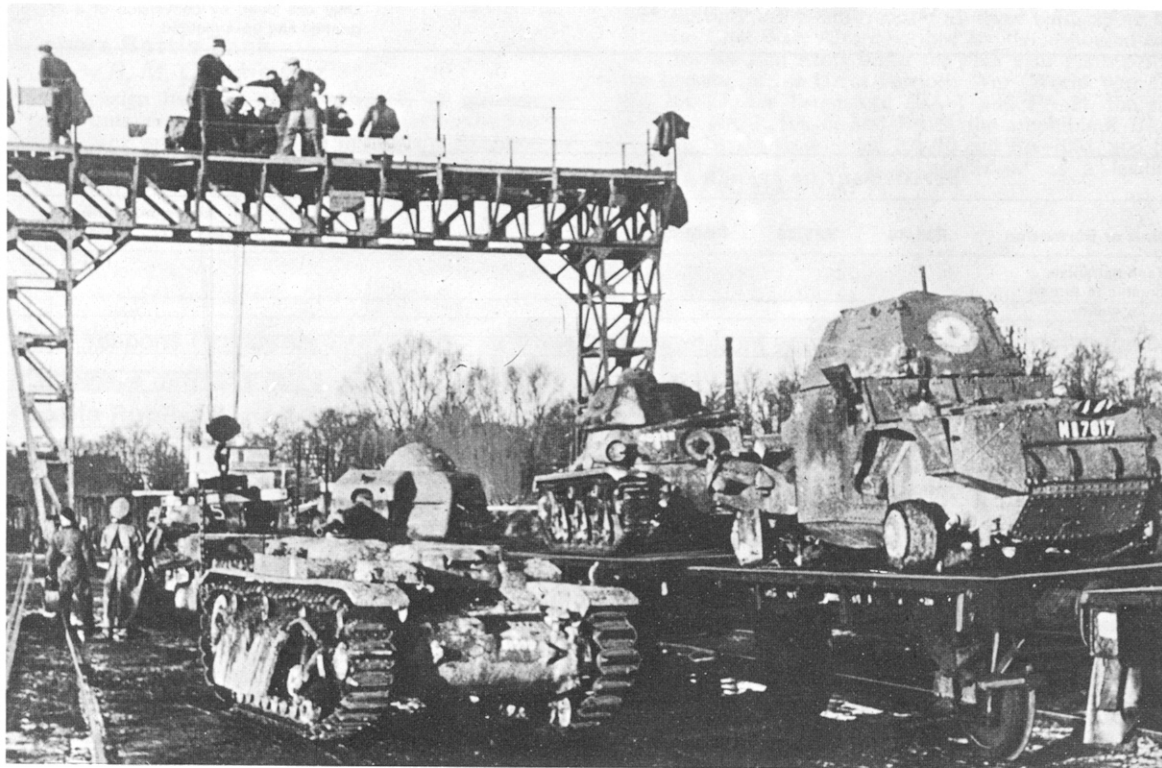
12 volt system, two cadmium-nickel batteries, 80 A.H.

### Performance

Maximum speed —20 k.p.h.  
Maximum gradient —40°  
Vertical obstacle —50cm  
Trench —1.60m (2.0m with tail)  
Wading depth —80cm  
Radius of action —8 hours; 140km

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**COMPARATIVE DETAILS OF FRENCH INFANTRY TANKS**

	Weight (tonnes)	Crew	Armament Main	Aux	Armour Max mm	Speed k.p.h.	Range hours/kms	Remarks
<b>Light</b>								
Renault FT	6.5	2	1-37mm	or 1-MG	22	8	8/60	
NC 1 (NC 27)	8.5	2	1-37mm	1-MG	30	18	9/120	
NC 2 (NC 31)	9.5	2	—	3-MG	34	18	9/120	Not taken into French service, but important in the development of Char D. Models of NC 1 were sold to Japan and used in China.
R-35	10	2	1-37mm	1-MG	40	20	8/140	Armed with 1918 model 37mm gun.
R-40	12.5	2	1-37mm	1-MG	45	20	8/140	Improved version of R 35, with new suspension, and some had the long 37mm SA 38.
F.C.M. 36	12.8	2	1.37mm	1-MG	40	24	12/225	Fitted with Berliet diesel engine.
<b>Medium</b>								
Char D1	14	3	1-47mm	2-MG	35	20	8/96	Developed from Renault NC to specification for a light tank but later reclassified as a medium. Co-axial 47mm gun and machine-gun in ST 2 turret.
D2	20	3	1-47mm	2-MG	40	25	8.5/155	Improved version of the D1, with APX 1 turret.
A.M.X. 38	16	2	1-47mm	1-MG	60	24	8/140	Aster diesel engine. Early models had 37mm SA 38 gun. Only limited numbers produced.
Char B1	28	4	1-75mm 1-47mm	2-MG	40	28	8/200	Short 47mm gun in APX 1 turret, 250 h.p. engine. Limited production until replaced by B1 bis.
B1 bis	32	4	1-75mm 1-47mm	2-MG	60	28	6/150	Improved version of B1, with high velocity 47mm gun in APX 4 turret, up-armoured and 300 h.p. engine.
B1 ter	34	5	1-75mm 1-47mm	2-MG	75	—	—	Same armament as B1 bis, but 75mm gun had 5° traverse each side. Fitted with 350 h.p. diesel engine. Only 5 models produced.
<b>Heavy</b>								
Char 2C	68	13	1-75mm	4-MG	45	12	7.5/—	Only ten built; in service from 1921 until 1940.
2C bis	74	13	1-155mm	4-MG	55	—	—	Only one built, by conversion of a 2C, up-gunned and up-armoured.

**DEPLOYMENT OF FRENCH AFVs IN EUROPEAN OPERATIONS MAY-JUNE 1940**

Unit or Formation	R35/40	H35/39	FCM	Tanks				Autos-mitrailleuses		
				D	B	2C	FT	S35	AMD(Whl)	AMR(Track)
Tank battalions organic to Armies										
Eighteen	810									
Two		90								
Two			90							
One						6				
Eight							504			
Independent Companies										
1 DCR		30		40	57		30			
2 DCR		90			66					
3 DCR		90			66					
4 DCR	135			45	66					
1 DLM		87						87	45	60
2 DLM		87						87	45	60
3 DLM		147						87	45	
1 to 5 DLC		110							70	110
Reconnaissance groups of seven motorised infantry divisions									154	154
	945	821	90	85	321	6	534	261	359	384

NOTE: The numbers are based on the organisation of formed units deployed in this period, and on the equipments available within the respective formations.

# AFV/Weapons Profiles

Edited by **DUNCAN CROW**

FUTURE TITLES WILL INCLUDE:

## **Elefant and Maus (+ E-100)**

*by Walter Spielberger and John Milsom*

Elefant was the conversion of the original Porsche Tiger tank design into a self-propelled tank destroyer. "It turned out to be a technically most complicated and unreliable vehicle. This is said despite the fact that your author was engaged as design engineer on this project and that he participated actively in the action in Russia described at the beginning of this *Profile*."

Maus the largest armoured fighting vehicle ever built, was the culmination of Porsche technical development in the Tiger field. E-100 was the Maus's rival.

## **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.

## **Vickers Battle Tank**

*by R. M. Ogorkiewicz*

"Tank design has become a monopoly of government departments, even where free enterprise has survived in the field of tank production because the designs produced by industry are government prescribed. There is, however, one very notable exception to this in the Vickers battle tank.

This tank was designed by Vickers Limited on their own initiative and its development background is very different therefore from that of all other contemporary battle tanks. The enterprise which Vickers have displayed in developing their battle tank is, however, in keeping with their long and distinguished record in the tank field." The Mark I version of the tank has been adopted by the Indian Army as its main battle tank. Production is carried out near Madras – and these are the first tanks ever to be produced on the Indian sub-continent. The Indian Army has named the tank Vijayanta, which is Sanskrit for "Conqueror". Other Vickers battle tanks are manufactured in Newcastle-upon-Tyne and have been supplied to Kuwait. Development of the tank continues and the new Mark 3 version has a number of improvements including increased depression of the 105mm gun, increased ammunition stowage, and a glacis plate with improved ballistic shape. The tank, weighing 38 tonnes, or 37½ English tons, laden (hence its name the Vickers 37-ton Tank), is uncomplicated and robust, and offers "a combination of highly effective armament with a high degree of mobility at a cost which compares favourably with that of other contemporary battle tanks."

## **Russian Armoured Cars (to 1945)**

*by John F. Milsom*

This *Profile* recounts the development of Russian armoured cars from the first experiments after the turn of the century when the Russo-Japanese War was at its height up to the BA-64 which was the last World War II armoured car used by the Soviet Army. The cars described include the Russo-Baltic, Sheffield-Simplex, Austin-Putilov, Putilov-Garford, Renault-Mgebrov, Poplavko-Jeffery, and the Gulikevich and Austin-Putilov half-tracks – all these built before the Russian Civil War. Also described are the armoured cars built for the Red Army under the Five Year Plans before the opening of the Great Patriotic War (World War II): the BA-27, the Bronieford (FA-1 and FA-2), the six-wheeled BA-3, BA-6, and BA-9, the amphibious BAZ, the BA-20, the six-wheeled BA-10 and BA-10M, and the BA-64. John Milsom is acknowledged as a leading authority on Russian AFVs.

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