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**MILITARE**  
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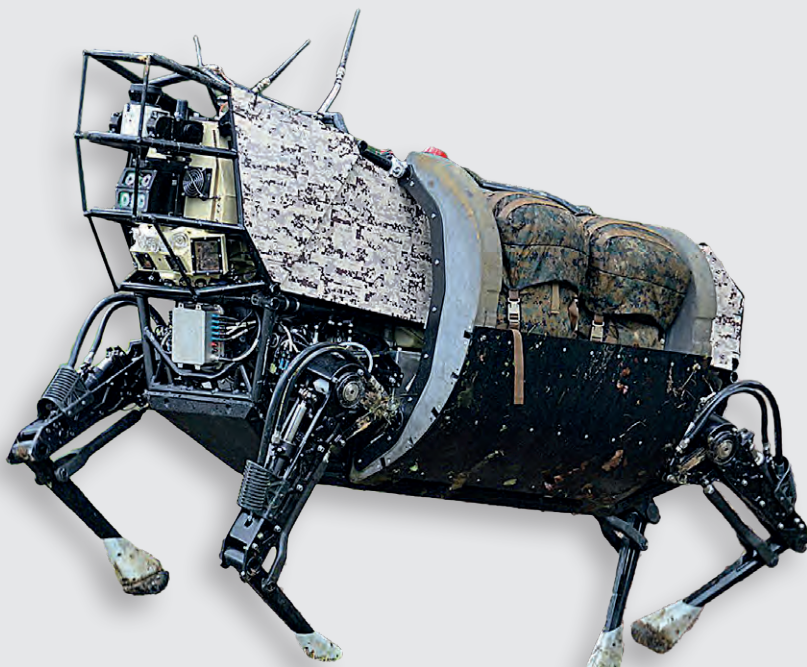
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**Storia Militare Contemporanea**

a cura di

PIERO CIMBOLLI SPAGNESI



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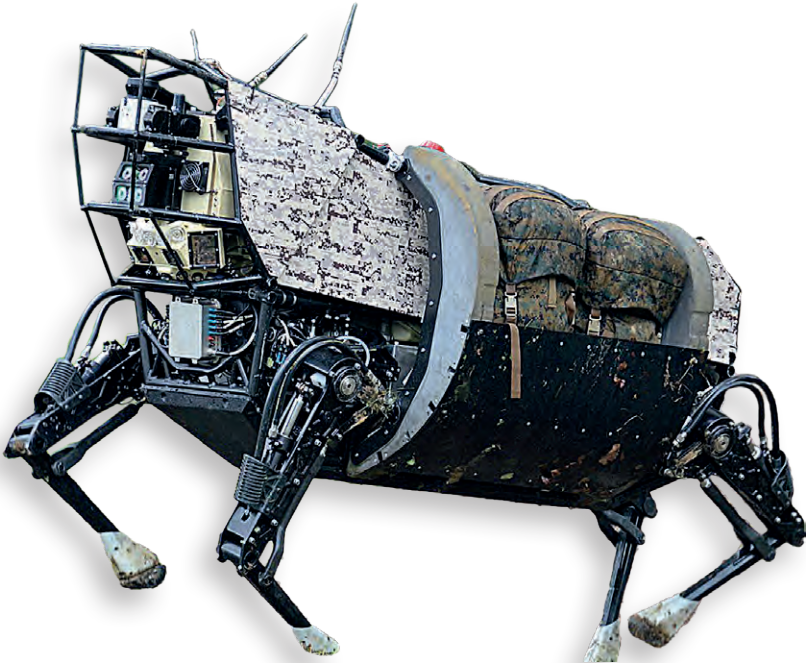
# ANTOLOGIA MILITARE

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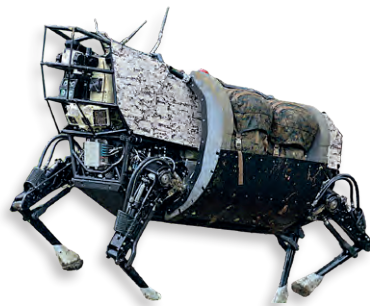
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Legged Squad Support System robot prototype, 2021, DARPA image.  
Tactical Technology Office, Defense Advanced Research Projects Agency,  
U.S. Department of Defense, 2012 (wikipedia commons)

## World War Two and Artillery

Because of the enormous number of anti-tank weapons which today will be met with in attacks on narrow and strongly fortified fronts, the tank, originally designed to storm parapets and trenches, had ceased to be an effective siege warfare weapon.'

J.F.C. Fuller, War Weekly, 10 November 1939.

By JEREMY BLACK

The role of artillery is one of the most underrated aspects of the Second World War. A headline story near the start of the war, one resonant for the conflict in Ukraine in 2022, was the heavy defeat of Soviet advances into Finland in December 1939, as the Finns outmanoeuvred road-bound Soviet armoured columns. Less attention was focused on the aftermath. After a reorganisation of their forces in January 1940, the Soviets in February and March used their superior artillery through the fortified Mannerheim Line, leading the Finns to accept peace. Meanwhile, the weakness of Polish antitank guns and training had magnified the impact of German and then Soviet armour attacks in 1939, but there was sufficient resistance to oblige both to rely on artillery. A German tank advance into Warsaw was stopped in street fighting by Polish antitank guns and artillery and Warsaw was not captured by land assault. In contrast, under heavy artillery and air attack, and short of food and ammunition, its garrison surrendered. Polish resistance stopped the initial Soviet attack on Grodno, but the destructiveness of Soviet artillery then led the Poles to abandon the city.

In the invasion of France in 1940, one in which German tank advances are the headline story, the Germans also used antitank guns effectively. Yet, the Germans could be faced by the challenge posed by the buildup in tank capability. At Arras on 21 May, the armour of British Matilda II tanks proved effective against the German 37mm antitank guns. The invasion of France showed that artillery superiority did not necessarily lead to victory. The French had good artillery in 1940, and it worked well in defence at Gembloux on 14-15 May, despite the defence being more improvised on open terrain than the French intended. The limitations

of the tactical system identified as blitzkrieg in the face of an artillery-strong defence was demonstrated, although the Germans proved reluctant to accept this<sup>1</sup>. Moreover, the ability of surprise tank advances in a mobile campaign without a clear front line to outflank artillery defences was shown. The lack of the Anglo-French reserves available to stem German advances in 1918 was also important. These factors were also to play a significant role in the Anglo-German conflict in North Africa in 1941-3, with combined arms doctrine and techniques both of great consequence. In 1940, a poor overall strategy and a lack of operational flexibility ensured that the French were rapidly defeated by the Germans.

Overall, however, during the war, artillery superiority was a key element in the war, one underplayed as a result of the emphasis on armour and aircraft. It was also an element that greatly benefited the Allies: Britain and, from 1941, the Soviet Union and America. This was particularly important because, as in the First World War, more battlefield casualties were killed by artillery fire than by any other weapons system. Artillery, furthermore, was more effective than in the earlier war because of improvements in shells and fuses, such as proximity fuses from the Battle of the Bulge of December 1944 where the American artillery proved highly effective against German attacks.

Benefiting from impressive guns, such as the American 105mm howitzer, Allied artillery was more intensive and overwhelming in firepower, although the British lacked an adequate modern heavy artillery. The British, Americans and Soviets (who had particularly plentiful artillery, their Red God of War<sup>2</sup>) were very keen on using big artillery bombardments to accompany their offensives, whereas the Germans, who used large-scale artillery when they could, for example in the battle for Stalingrad in 1942, had no real answer. Thus, in late 1943, Soviet attacks benefited from the lack of adequate artillery support for Germans in prepared positions as well as from the lesser significance of such ‘hedgehog’ positions when faced by broad front attacks. German field guns suffered because many were horse-drawn. As with other periods, effectiveness was not just a matter of the actual firing, but of the gun as a whole. Unlike the Germans, the Italians favoured a doctrine of massive artillery fire, but Italian artillery was old and had too little ammunition. The Japanese relied on the terrain, frequently digging in underground

1 J.A. GUNSBURG, ‘The Battle of Gembloux, 14-15 May 1940: The “Blitzkrieg” Checked,’ *JMH*, 64 (2000), pp. 138-40.

2 C. BELLAMY, *Red God of War: Soviet Artillery and Rocket Forces* (London, 1986).

and using the cover for artillery and mortars as on the islands of Iwo Jima and Okinawa in early 1945.

Artillery fire, particularly that of the Americans, benefited from improved aiming and range that reflected not only better guns but also radio communication with observers and meteorological and survey information. The Americans, with their high-frequency radios, were particularly adept at this. The British continued their effective artillery techniques, as in counter-battery warfare, for which, as in the previous conflict, they had flash spotting posts



Royal Artillery Cap badge. Europeana 1914-1918 project, wikipedia commons.

and sound ranging bases. The British benefited from an effective field gun in the shape of the highly versatile 25-pounder which was also used by the Americans at the start of the war. Although the Americans then switched to the 105mm, the ammunition was less good, and, by the end of the war, the Americans were back on the 25-pounder. The latter had high reliability, more so than Soviet field guns, and was particularly well-served by the ring that was slung under it in transit and which could be used to turn the gun quickly and with stability when in action. In service until 1972, the 25-pounder was in reserve until 1992, while the Irish army continued its use of them until recently.

The British also developed a new structure for their artillery, the Army Group Royal Artillery (AGRA), which provided medium and heavy artillery to higher formation, generally corps. In effect, the AGRA was an artillery brigade, as used in the First World War, and was developed from 1941. An AGRA could be allocated to help individual corps facing particular tasks. This proved of great assistance to the British in 1944-5 as they faced serious manpower shortages.

There was also a significant improvement on the Allied side across the range of artillery. Thus, in the Pacific, Allied, principally American, firepower was largely provided by warships and air attacks, although the plunging fire of mortars was important to close-quarter conflict on the islands.

In general, artillery became stronger and more mobile. The Germans found the

88mm an effective dual purpose anti-aircraft and antitank (using armour-piercing ammunition) gun, used for example against British tanks to deadly effect as in stopping Operation Battleaxe, an attempt to relieve Tobruk in June 1941. The Germans heavily relied on antitank guns for defence in North Africa, an aspect of the provision of artillery and mechanised infantry in German armoured divisions, while the British ones were dominated by tanks. In contrast, the British failed to coordinate their artillery with their armour, in part because the former was insufficiently mobile. In a reminder of the key element of contact, doctrine and tactics that had worked in 1940 when employed against the limited antitank guns available to the Italians, proved less effective against the Germans. Reliant on their two-pounder guns, the British also failed to use their 3.7 inch anti-aircraft gun in an antitank role, as the Germans did with the 88mm gun. The Germans at this stage were stronger in antitank design and use, irrespective of the 88mm, which proved a game-changer, mostly due to its longer range and penetrating power. German guns also benefited from finely ground sights, which were consistently better than whatever the Allies could employ and helped with accuracy. What both sides needed was not so many, more or better tanks, but more good antitank guns.

The German skilful use of antitank guns in order to thwart opposing armour was also shown in July 1941, notably near Leipel, when Soviet counterattacks on the Eastern Front were defeated. In turn, the Soviets inflicted heavy losses on German armour, and notably so when defence in depth was provided to make the best use of antitank guns.

Meanwhile, the British moved from two-pounder to six-pounder anti-tank guns, which proved important in stopping the German armoured advance into Egypt in 1941-2, as at Deirel Shein on 1 July. In contrast, a fortnight later there were too few antitank guns to help a New Zealand force protect Ruweisat Ridge from a German tank counterattack. Günter Halm, a gunner with an antitank platoon in a panzergrenadier regiment in the 21st Panzer Division destroyed 15 British tanks there a week later in the First Battle of El Alamein. His gun was one of the two captured 76mm Soviet antitank guns that comprised the platoon<sup>3</sup>. Luring opposing tanks onto antitank guns was a necessary skill. At Alam Haifa, later in the summer, the British relied on antitank guns, a technique learned from

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3 I. MÖBIUS, *Ein Grenadier entscheidet eine Schlacht* (Chemnitz, 2012).





Cover of the Günter Halm's Memoirs

the Germans, and inflicted serious losses on attacking German tanks, a tactic repeated in defeating a German counterattack in the final battle of El Alamein later that year.

The effective Allied use of artillery in Tunisia in early 1943, helped the Americans rally when faced by an initially successful German tank offensive in the battle of the Kasserine Pass in February, and in March at Medenine by the British using 57mm/6-pounder guns, and by the American artillery<sup>4</sup> and tank destroyers later that month at El Gueltar. In turn, German antitank guns halted a British armour advance, requiring infantry and artillery use for later success, with the Americans similarly able to break through German positions in April, leading to the surrender of German-Italian forces in Tunisia.

Tank-killing artillery was a key requirement. Lieutenant-General Lesley McNair, an American artillery officer who became the thoughtful head of the Army Ground Forces from 1942 to 1944, was primarily responsible for the contentious decision by the American army to focus on the 57mm antitank gun and on tank destroyers, rather than a stronger tank. At the same time, the stronger armour carried by many tanks posed a challenge to antitank gunnery, both weaponry and practice. The 57mm antitank gun was ineffective against front armour unless perilously close to the target. The thick armour of the heavier Soviet tanks deployed in 1943 was resistant to German antitank shells and also too strong in Southern Russia for the Hungarians' antitank guns.

Moreover, both to engage other tanks and as part of a heavier gunning against all targets, the guns carried by tanks became more powerful. The Soviet KV-1A and T-34/76A each carried 76.2mm guns, which proved a challenge to the Germans. Thicker armour led all powers to a concern for larger, high-velocity guns, whether these guns were provided by other tanks, tank-destroyers, self-propelled guns, or antitank guns. Thus, the British replaced undergunned tanks such as the Mark I Matilda, Valentine and Crusader 1; the Churchill I, which entered service in 1941, had a 76mm gun. The undergunning of tanks was a moving problem, affected by the nature of opposing armour. The American Sherman M4, the first truly universal fighting vehicle, had, at 75mm, what was in 1942 a medium-calibre gun. This gun gave the British, who were provided with Shermans,

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4 J.R. LANKFORD, 'Jacob L. Devers and the American Thunderbolt,' *On Point*, 16, no. 3 (winter 2011), pp. 34-41.

greater lethality. Upgunning saw the use of the more capable 76mm gun on some and regunning others with a 17-pounder, but the 90mm gun on M36 tank destroyers neglected an awareness of the need for up-gunning. So also with the new model T-34 of 1944 which had 85mm guns. Introduced in 1942, the German Mark IVG had a high-velocity 75mm (just below 3-inch) gun. Yet, as always with guns, there were trade-offs and resulting problems. Although the 75mm gun of the Mark IVG was fitted with a muzzle brake to reduce recoil impact, the longer barrel of the gun added stress to the brake mechanism. Similarly, heavier and better-gunned tanks, such as the German Tiger and Panther, carrying respectively the 88mm and 75mm guns, limited mobility and had implications for fuel needs.

The British redesigned the Crusader in 1942 from taking a 40mm/2-pounder gun to take a 57mm/6-pounder gun. Larger-calibre British guns, the 3-inch (76.2mm) were used by the British A27M Cromwells and A22/42 Churchills as well as to produce the 17-pounder antitank gun. Guns and ammunition had to be in synergy, a continued need seen for example in the earlier use of grapeshot. Armour-piercing ammunition was crucial in operating against tanks, but high-explosive ammunition was necessary for infantry support. It was therefore valuable to have guns that could fire both,



Lieutenant General Lesley McNair photographed after being awarded the Purple Heart in Tunisia.

April 24, 1943. Associated Press (uncredited photographer). Published after his death in 1944, including "Gen. L. J. McNair Killed in Action in Normandy" (Allentown, Pennsylvania's "The Morning Call", July 28, 1944), and "Lt. Gen. McNair Killed in Normandy" (Rochester, New York's "Democrat and Chronicle", July 28, 1944).

such as the 75mm one on the Grant tank. Difficulty in destroying heavy tanks led to the use instead, of anti-concrete shells designed to be employed against concrete bunkers. The thickening of armour and its increased sloping led to the response of increased velocity and hitting power. As a result, discarded sabots with subcalibre rounds and armoured caps were among the innovations introduced. APDS (armour-piercing discarding sabots) was a British invention for providing projectiles fired from standard guns with greater kinetic energy and velocity to penetrate German armour. Developed in 1941-4 at the Armaments Research Department at Fort Halstead, it was used operationally from mid-1944, first with the 6-pounder antitank gun and then with the 17-pounder, the first really effective British antitank gun, and one that, irrespective of the discarding sabots, which gave another leap forward, had greater velocity than the German 88mm and was an exceptional antitank gun. Armour-piercing capped rounds were used by the British with the 17-pounder (76mm) gun on their modified Shermans known as Fireflys, which could take on Tiger Is. Faced by the inadequacy of their existing tank guns and ammunition, the Americans from mid-1944 used the 76mm guns on their upgraded Shermans and new high-velocity armour-piercing ammunition to penetrate the front plates of Panthers and Tiger Is.

The need for improved guns led to larger calibres, for example 105mm German guns, instead of 88mm ones; and Soviet 100mm guns, instead of 76mm ones. Longer barrels were useful as were better projectiles. Muzzle velocity was improved by adapting the shot.

Separately, HEAT (high-explosive antitank) warheads applied the principle used for infantry antitank weapons. HEAT is a shaped-charge munition that employs the Munroe effect to penetrate armour. The shaped charge has a metal liner that, on detonation, collapses on itself and focuses the explosive energy, with fusion occurring at a relatively low temperature to form a high-velocity, very hot, superplastic jet of metal that penetrates by virtue of kinetic energy combined with the high temperature of the jet. After the jet entered the tank, its high temperature caused the explosion of the shells contained inside the turret and burned alive the crew so quickly and so completely that normally nothing remained of the bodies but some bones covered by the melted and burned remains of flesh.

Context was crucial. The circumstances of combat affected the effectiveness of antitank guns and ammunition. Thus, on the Eastern Front and in Normandy,

the impact of German long-range antitank guns was lessened by the close distance of many actual engagements. Separately, HEAT warheads did not have a long range, which meant they had to be fired from near the target tanks.

More powerful guns were sought by Devers, commander of the European Theater of Operations for the American army in 1943, namely the 90mm gun used in open-turret M36 tank destroyers in M26 Pershing tanks, but a lack of support in senior military circles ensured that the Pershing did not enter full production until March 1945. This was the same month as the British Comet which had a newly-designed 77mm gun, and was capable of taking on Panthers and Tigers on equal terms.

Other tanks designed to cope with German heavy armour were cumbersome, notably the British Charioteer with an 83.4mm, 20-pounder gun, which entered service in 1947, but had a turret too full of gun breach for observing. Tested in 1948, the Tortoise, with a 94mm, 32-pounder gun never went into production, as it was difficult to transport, while the German super tank, the Maus, with a 128mm main gun, was ordered by Hitler in 1943, but was too heavy, and there were also problems with producing an engine able to offer sufficient power and fit inside the tank. None was completed.

In comparison, antitank guns were cheap and flexible. Antitank guns had an advantage over tanks in that the latter were more prominent targets, while it was more difficult to deliver accurate fire while on the move. Infantry antitank weapons, such as the British PIAT (Projection, Infantry, AntiTank) which entered service in 1943 and the American bazooka, in contrast had to be used close-up to the target, which meant exposure to defending fire. Antitank guns could be fired from a distance, while their small size meant that they could be concealed as easily to ambush tanks, as the Germans did in Normandy in 1944. Not leaving tracks visible from the air, these guns were far less vulnerable than tanks to observation and air and tank attack, although air-burst artillery shells killed the crews. Moreover, antitank guns did not break down or require petrol, at least until they had to be moved, and not even then if there was a reliance on horses. As with the use of entrenchments during in particular the Italian Wars of 1494-1559, the guns were combined with antitank ditches, as by the Soviets at Kursk in 1943, increasing the effectiveness of the guns. This was less necessary in terrain where there was cover, such as Normandy.

The use of mechanical and self-propelled guns increased the mobility of artillery. The Americans and Germans proved particularly active in the development of self-propelled guns. Major General Jacob Davers, who became chief of the Armored Force in 1941, advocated a self-propelled gun to both replace the artillery in American armoured divisions and to increase their strength. This led to the M7, a 105mm howitzer on a medium tank chassis.<sup>4</sup> Deployed in 1943 at the battle of Kursk, the German Ferdinand carried a 88mm gun and was well-protected by armour. However, its size and weight (65 tons) ensured that the maximum speed was 19 mph, while the vehicle required a crew of six. The lack of any way to train its gun meant that the Ferdinand was less effective than a tank, and as an example of a limitation of such guns, it also suffered from a lack of machine guns. On the attack at Kursk, the 89 Ferdinands proved vulnerable to mines, obstacles, and well-placed antitank guns. When, in contrast, the Ferdinand was pulled back and used in a defensive, tank-destroyer role, it proved highly effective. Tank-destroyers were in effect self-propelled antitank guns.

The high costs of tanks encouraged some Germans to support a focus on the artillery-manned *sturmgeschütz* (assault guns), notably the StuG 3, an effective tank-destroyer built on the chassis of the Panzer Mark III. Its average cost was about 87,000 Reichsmark, compared to 103,000 for a Mark III, 107,000 for a Mark IV, 130,000 for a Panther, and 300,000 for a Tiger. Tank Destroyers were harder to destroy than tanks because they had a lower profile and in battle had a good rate of destroying enemy tanks for their own loss. The StuG 3, however, was officially under the artillery, and Guderian's attempt to bring them under his control as Inspector General of Armored Troops failed. Nevertheless, Hitler did order 100 StuGs of each month's production to be turned over to the Armored Troop Command: in 1943, it received 25% of the production, and the Waffen-SS 13%. The idea of focusing on StuGs was discussed, not least due to problems with tank production in 1942, but Guderian opposed it because, like Hitler, he preferred strong tanks. Because the panzer divisions received more and more of the total production of StuGs, the infantry formations, for which they were originally designed as anti-tank weapons, received fewer and were short of anti-tank weaponry. The StuG 3 influenced the Italian self-propelled 75/18 mm howitzer, of which 491 were manufactured.

In America, McNair favoured turreted tank-destroyers and anti-tank guns over heavier tanks with bigger guns, arguing that lightly-armoured (and thus easier

to make) Tank-destroyers, manned by his branch, the artillery, were the best defense against German tanks, and that American tanks should focus on providing armoured mass for the main attack. Indeed, “the tank destroyer was the artiller-  
yman’s solution to the problem posed by a mobile, armoured target.”<sup>5</sup> Although this approach could lead to an underplaying of the role of the tank as in practice a tank destroyer, motorized tank destroyers indeed had an impact. Effective German versions were eventually matched by American tank-destroyers. The latter were also good anti-bunker weapons.

The initial tank-destroyers used by the Americans proved ineffective. 37 mm guns installed on the rear decks of M-6 trucks were inadequate against German armour, while 75 mm guns on thinly-armoured M-3 half-tracks were both out-classed by German 88 mms and easy targets, with their slow speed and high silhouettes. Moreover, their guns could not traverse. As a consequence, there was a turn to the Sherman tank hulls and chassis used for the M-10 and the M-36 (the M-18 was based on the M-3 chassis). Aside from more powerful guns there was also more effective ammunition. The 76 mm gun on the M18 fired tungsten-carbide-cored, high-velocity, armor-piercing ammunition<sup>6</sup>. These tank-destroyers were in effect lightly armored or simpler tanks fitted with powerful guns, with tankdesign chassis used to this end. The M-10 and M-18 were fitted with anti-tank guns, but faced problems in penetrating the armor of heavy German tanks. Armed with the 90 mm anti-aircraft gun later used on the Pershing (and early Patton tanks), the M-36 proved more effective. The first arrived in service in France in September 1944<sup>7</sup>.

The Germans used a similar concept, but with the cheaper turretless tanks, such as the Hetzer (Jagdpanzer 38), which was based on a light tank and built in Czechoslovakia with a Skoda A7 cannon, which provided destructive power at very long range. Produced in 1944-45, this was Germany’s most common tank-destroyer. It proved particularly useful as a defensive weapon against advancing Allied tanks. The low profile of the Hetzer encouraged its value for ambushes; and a version served after the Second World War with the Swiss army

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5 JOHNSON, *Fast Tanks*: 152.

6 D.A. KAUFMAN, “The 801st Tank Destroyer Battalion,” *On Point*, 16, 1 (summer 2010): 22.

7 H. YEIDE, *The Tank Killers: A History of America’s World War II Tank Destroyer Force* (Havertown, Penn., 2004).

which, fearing Soviet invasion during the Cold War, very much focused on defence against tank attacks. Tank-destroyers could also serve as substitutes for tanks. Thus, on December 15, 1944, the German attack on Kesternich in the Battle of the Bulge was headed by three tank-destroyers and an armored 37 mm anti-aircraft halftrack. Based on the chassis of the Panther tank, and therefore heavier than the Hetzer, the Jagdpanther ('Hunting Panther') entered service in 1944; but only 415 were built, as opposed to the planned 150 a month. The design, which focused on a long-barrelled 88 mm Pak gun, a heavy caliber gun, had been ordered in late 1942. Another form of turretless tank were the Soviet self-propelled anti-tank and direct support guns, the SU-76, SU-85, SU-100, SU-122, and SU-152, the last a self-propelled 152 mm howitzer. Turretless vehicles were less expensive to produce, but, if they were open tops, made the crew vulnerable to aerial bursts.

There was an overlap of technological developments in tanks and anti-tank systems. In a sense, the British Firefly was a tank-destroyer. In practice, there were as many variants of tank destroyers as tanks. The reason for fitting the guns to vehicles, including half-tracks and other vehicles, was mobility. The Italian self-propelled 75/18 and (later) 75/34 howitzers were a surprise to British tanks. Italy also had the 90/53 gun, which was derived from a naval gun that could penetrate tank armour. It was successfully used, especially in North Africa, on a Lancia lorry. 48 were converted for use on the self-propelled heavy 90/53 heavy tank-destroyer employed in Sicily against the Allies in 1943. The Germans overcame the Soviet defences at Sevastopol in 1942, deploying to that end three 600mm self-propelled mortars and one 800mm gun (which had little success) as well as rocket launchers, tracked mines, and heavy air attacks. The Soviets used railway guns that sheltered in tunnels.

Moreover, the extent to which campaigning saw major advances, and notably so in comparison with most campaigning in the First World War, as well as the need in combined operations to match artillery with armour, ensured that it was important for artillery to move forward close to the line of advance. This extended to the Vichy army which in its planning in 1940-2 envisaged a more motorised force so that infantry and armour could move at the same speed as the armour<sup>8</sup>.

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8 J.M. VERNET, 'The Army of the Armistice 1940-1942: A Small Army for a Great Revenge,' in C.R. SHRADER (ed.), *Proceedings of the 1982 International Military History Symposium*:



The Americans came to be adept at moving up their guns, which ensured that it was less serious in 1944-5 to wait to bring up artillery if encountering resistance when advancing. To some British commentators, this combined-arms method risked allowing the Germans to disengage successfully and retreat; but such methods helped avoid the vulnerability of single-arms tactics, as had affected the British army in North Africa in 1941-2. At the same time, as campaigning in Normandy in 1944 showed, a lack of sufficient preinvasion preparation, training and experience made combined operations difficult<sup>9</sup>.

Mass had a definite value, and notably so for the Soviets as at the battle of Kursk in 1943. The following year, the Soviets proved adept at developing good cooperation among artillery, armour and infantry. American help in providing vehicles helped with the mobility of the artillery. In the Vistula-Oder offensive in January-February 1945, the Soviets were greatly helped by plentiful artillery, in which their margin in numbers was about 7.5 to 1. In the April assault from the Oder to Berlin, Marshal Zhukov's 1st Belorussian Front alone deployed about 9,000 guns and 1,400 rocket launchers, although the Soviets were hampered by the night-time German abandonment of the first line of defences before the attack was launched. This ensured that the Soviet artillery had less impact initially than had been anticipated, which drove up Soviet casualties.

Artillery dominance was not only a decisive factor on the Eastern Front into the closing campaigns of the war, but also on the Western, as in the Battle of the Bulge in December 1944. However, this factor tends to be underrated in film portrayals of the war, in favour of tanks. That October, American self-propelled guns and tank-destroyers had already played an important role in providing American infantry with fire support, for example in capturing the city of Aachen, against firm German defences using antitank weaponry. In the final campaign of the war, artillery superiority was very important for the Americans, British and Soviets. It was part of a more general superiority including the command of the air that enabled aerial reconnaissance and spotter aircraft, as well as logistics provision and the mechanisation necessary to move artillery readily.

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*The Impact of Unsuccessful Military Campaigns on Military Institutions, 1860-1980* (Washington, 1984), pp. 241-7, 246-7.

9 M.D. DOUBLER, 'Busting the Bocage: American Combined Arms Operations in France: 6 June-31 July 1944,' *History* (1990).

The use of artillery depended on particular circumstances ranging from availability and terrain to the role of military culture and the actions of opponents. Terrain unsuited to tanks generally proved more suited to artillery, and notably so if there were few axes of advance, not least due to mountainous terrain, as in Italy in 1943-5 and in Eritrea in 1941 where, although the British successfully used tanks in the valley bottoms whereas, in the mountains, progress was slower and largely dependent on artillery. In turn, along the roads, there were clashes between British tanks providing mobile artillery and Italian roadblocks that were backed up with artillery. The actions of opponents led to the need for thwarting counterattacks. A fixity in positions carried different requirements for artillery to the short and savage bombardments used by the Soviets to preface armour-led attacks as a way to open up the battlefield.

In the former case, a sense of continuity can be seen in an extract from the draft report of 30 Corps, part of the British Eighth Army after its victory at El Alamein in Egypt in 1942:

‘The operations proved the general soundness of our principles of training for war, some of which had been neglected during previous fighting in the desert. In all forms of warfare, new methods should never disregard basic principles. The operations involved a reversion, with the difference due to the developments in weapons, to the static warfare of the war of 1914-18. This reversion should not be regarded as an isolated exception unlikely to recur.... Our organisations and weapons must remain suitable both for mobile and periodical static operations<sup>10</sup>.’

Montgomery’s heavy use of artillery to preface his attacks reflected the doctrine and practice of the First World War, as well as the defensive strength of the Germans<sup>11</sup>. So also with his subordinate commanders, who were well aware of the challenge posed to their armour by German antitank guns and the need to engage them.<sup>12</sup>

In an after-action report on the Allied failure in Norway in 1940, General

10 AWM, 3 DRL/6643 3/9, p. 1.

11 S. HART, *Montgomery and ‘Colossal Cracks’: The 21st Army Group in Northwest Europe, 1944-45* (Westport, Conn., 2000); J. BUCKLEY, *Monty’s Men: The British Army and the Liberation of Europe* (New Haven, Conn., 2013).

12 Lieutenant-General Sir Richard O’Connor, Commander Eighth Corps, to Major-General Allan Adair, an armoured division commander, 24 July 1944, LH, *O’Connor papers*, 5/3/22.

Claude Auchinleck included the use of aircraft as artillery: ‘...the enemy made repeated use of low-flanking attacks with machine guns in replacement of artillery to cover the movement of his troops. Troops in forward positions subjected to this form of attack are forced to ground, and, until they have learned by experience its comparative innocuousness, are apt not to keep constant watch on the enemy.’<sup>13</sup>

In practice, air power was weak as a form of artillery, as the Americans were to discover in the assault on Omaha Beach in Normandy in 1944 when aircraft could not deliver the promised quantities of ordnance on target on time. It was artillery in the shape of battleship guns that proved more significant. A form of artillery that was more similar than aircraft to conventional artillery, they were mobile like aircraft, and if, like conventional artillery, faced the problem of a supply of sufficient projectiles, could carry more than aircraft. Earlier in 1943 at Salerno and in 1944 at Anzio, both in Italy, naval gunfire, chiefly from 6- and 15-inch guns, in support of Allied landings, had a devastating effect on German armoured counterattacks. The Germans had two 88mm guns at Omaha, but they were in fixed bunkers and not mobile.

Alongside the alternatives for land operations, there was a focus on conventional artillery, and therefore on established practices. Artillery depended on a clear and accurate set of coordinates to locate their target with precision. Artillery boards were the means, with slide rules, of working out the firing data. Artillery would be sent grid references, usually a two-digit Alfa prefix (to confirm which map), and then a six-figure number of Eastings and Northings, which were computed at the gun battery command post, and the elevation and azimuth sent to each individual gun. Aircraft, in contrast, would, at the tactical level, eyeball the target using their navigator and a map.

Gunnery relied on aerial reconnaissance to help create target information. Thus, for the assault on Iwo Jima in February 1945, the Americans created maps for the benefit of artillery spotters. At a scale of 1:20,000 and printed on highly durable and water-resistance paper, the map had a detailed grid of numbered 1,000-yard target areas and lettered 200-yard target square. A major category of challenge remained that of accuracy, alongside the familiar others of quantity, training, mobility, durability and ammunition supplies. Other times, the same problems.

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13 NA. PREM. 3/328/5, pp. 23-6.

So also with doctrine, and notably the use of artillery to provide teeth to emplaced infantry units, able to offer a defensive capability in order to oppose the consequences of opposing mobility. Indeed, alongside, but also at times in place of, the linear defence doctrine of the previous world war, there was interest in all-round defensive positions able to lessen the consequences of breakthroughs by opposing forces.<sup>14</sup>

Anti-aircraft doctrine was a variant on this practice. There was a concentration on protecting particular targets. Thus, in August 1943, the Germans were able to evacuate from Sicily nearly 60,000 troops, most of their supplies, and a similar number of Italian troops. The Germans had put in place a heavy concentration of flak batteries on both sides of the Strait of Messina and these batteries provided interlocking fire. Although the Germans initially began their evacuation by night, they switched to daylight as their anti-aircraft cover was so effective.

At sea, a doctrine of reliance on anti-aircraft fire had been revealed as unsatisfactory. Admiral Sir Dudley Pound, the First Sea Lord, remarked: 'The one lesson we have learnt here is that it is essential to have fighter protection over the Fleet whenever they are within reach of the enemy bombers';<sup>15</sup> but that lesson was repeatedly to prove difficult to apply. Battleships tend to be underplayed in accounts of the war in favour of aircraft carriers, but their big guns proved important against other ships, particularly the armour of rival capital ships including cruiser escorts, as with the damage inflicted by 15-inch guns of British battleships on Italian warships off Cape Matapan in 1941. Battleships were also important in engaging land targets, notably in support of amphibious operations. The threat posed to the main American Atlantic base of Norfolk, Virginia by the eight 15-inch guns of the German battleship *Bismarck* led to the deployment of land-based 16-inch guns with a maximum range of 45,100 yards, capable of outfiring the *Bismarck* with its gun range of 39,900 yards.

So also with other warships. For example, Vichy French warships defeated the Thais in January 1941 at the battle of Koh-Chang when Thailand attacked French IndoChina. The Vichy navy launched an incursion in response to the Thai attack on land. Five Vichy ships, including a light cruiser, used their overwhelming

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14 Auckinleck, memorandum on 'general principles governing all the strategy of the defence,' 18 Oct. 1941, AWM. 3 DRL/6643, 1/27.

15 Pound to Admiral Cunningham, May 20 1940, BL. Add. 52560 fol. 120.



USSR stamp 60 Kopecky: “Artillery the War God” (Артиллерия - бог войны), 1945, CPA #1027, used. Personal collection, scanned and uploaded by Vizu, 2007 (commons wikimedia)

firepower against three Thai warships (two of them torpedo boats), causing heavy casualties. The Thais suffered from not using their four newly-acquired Japanese-built submarines to patrol their waters as these submarines could have destroyed the Vichy warships.

The continued desirability of surface gunnery was shown in the wartime shipbuilding. Under the Two-Ocean Naval Expansion Act of 1940, the Americans envisaged an additional 18 fleet carriers, but also 11 battleships (four of 45,000 tons and seven of over 60,000 tons), six battlecruisers, and 27 cruisers. Moreover, the specification for these ships were intended to bring this gunfire into ready use. Thus, the four, 45,000 ton Iowa class battleships for which keels were laid down in 1941, were well-armoured and, at 33 knots, very fast.

At the same time, air power was often as significant for ship-killing. Thus, the *Glorious* was sunk by the battle cruiser *Scharnhorst* in the North Sea in 1940, but carriers usually fell victim to aircraft or submarines.

So also with battleships. Having earlier in 1941 sunk the battlecruiser Hood and seriously damaging the battleship Prince of Wales which in turn had inflicted damage, the Bismarck was crippled by a hit on the rudder by an aircraft-launched torpedo, before being heavily damaged by fire from British battleships and falling victim to a cruiser-launched torpedo. Later that year, Japanese aircraft inflicted serious damage on American battleships at Pearl Harbor and sank the Prince of Wales which had good radar for its anti-aircraft guns as well as main guns,<sup>16</sup> but inadequate anti-aircraft armament. So also with losses to Japanese air attack in the Java Sea, the Indian Ocean and the Pacific in 1942 and of the Japanese to American air attack, notably at the battle of Midway. Battleships played a significant role in the planning for the latter. The Japanese hoped to lure the American carriers to destruction under the guns of their battleships in what was intended as a decisive battle. In the event, there was no opportunity for the Japanese to use their battleships, as the American carriers, after the sinking of their Japanese counterparts, prudently retired before their approach, while the American battleships had already been sent to the West Coast. More generally, American carrier practice in 1942 was in part a shortage-of-battleships one.

The introduction in the late 1930s and early 1940s of carrier-capable aircraft that had substantial range had significantly improved carrier capability. Before that, it was not unusual for carrier aircraft to be limited to an operational range of only about 100 miles, which made the carriers very vulnerable to surface attack. Indeed, during the American “fleet problems” or planning exercises, carriers were quite often “sunk” or at least threatened by battleships. The battle of Midway demonstrated the new power of carriers, but also their serious vulnerability not least if, like the Japanese, they had poor damage-control practices. Carriers were essentially a first-strike weapon, and their vulnerability to gunfire and air attack led to a continued stress on battleships and cruisers, both of which were also very important for shore bombardment in support of amphibious operations. Air power in the Pacific was seen as a preliminary to these operations, rather than as a war-winning tool in its own right.

In addition, battleships were still necessary while other powers maintained the type. Furthermore, until reliable all-weather day and night reconnaissance and strike aircraft were available (which was really in the 1950s), surface ships

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16 D. HOWSE, *Radar at Sea: The Royal Navy in World War 2* (Basingstoke, 1993), pp. 123-4.

provided the means of fighting at night. Surface ships, moreover, provided a powerful anti-aircraft screen for the carriers, while the Americans also had dedicated anti-aircraft cruisers in the Pacific.

The naval campaign off Guadalcanal indicated the key role of warships other than carriers. Aside from their heavy losses at Midway, carriers could play little role in night-time surface actions. Destroyer torpedo attacks could be highly effective, as when used by the Japanese, with their effective Long Lance torpedoes, off Guadalcanal on November 13 and 30, the last, the battle of Tassafaronga, leading to one American cruiser sunk and three more badly damaged. The Japanese maintained a capability in naval night fighting. Moreover, their submarines were responsible for important American losses, whereas the poorly-managed American submarine role was inadequate.<sup>17</sup> In mid-November 1942, however, in what was to be a turning-point in the conflict off Guadalcanal, success was won by the Americans in a three-day sea action focused on surface warships fighting by night. For example, on November 14, the radar-controlled fire of the battleships Washington and South Dakota hit hard the battleship Kirishima, which capsized on November 15. Japanese battleships lacked radar-controlled fire. The Americans inflicted important losses on the Japanese in the Guadalcanal campaign in what was attritional fighting. There was an equal loss of warships, but the build-up of American naval resources ensured that they were better able to take such losses. Moreover, the Japanese suffered from the repetition of their tactical methods, a repetition to which the Americans quickly responded.

Victory offshore was crucial to the American success on Guadalcanal in January 1943. In the campaign, the Americans developed a degree of co-operation between land, sea and air forces that was to serve them well in subsequent operations. The naval battles around Guadalcanal involved more uncertainties than during the battle of Midway. The latter was a classic battle, within a limited timetable and with a clear order of battle. Guadalcanal involved a much longer period.

Covering the landing on the island of Bougainville in the Solomons on November 1, 1943, a force of American cruisers and destroyers beat off an attack that night by a smaller Japanese squadron with losses to the latter, in the first battle fought entirely by radar.

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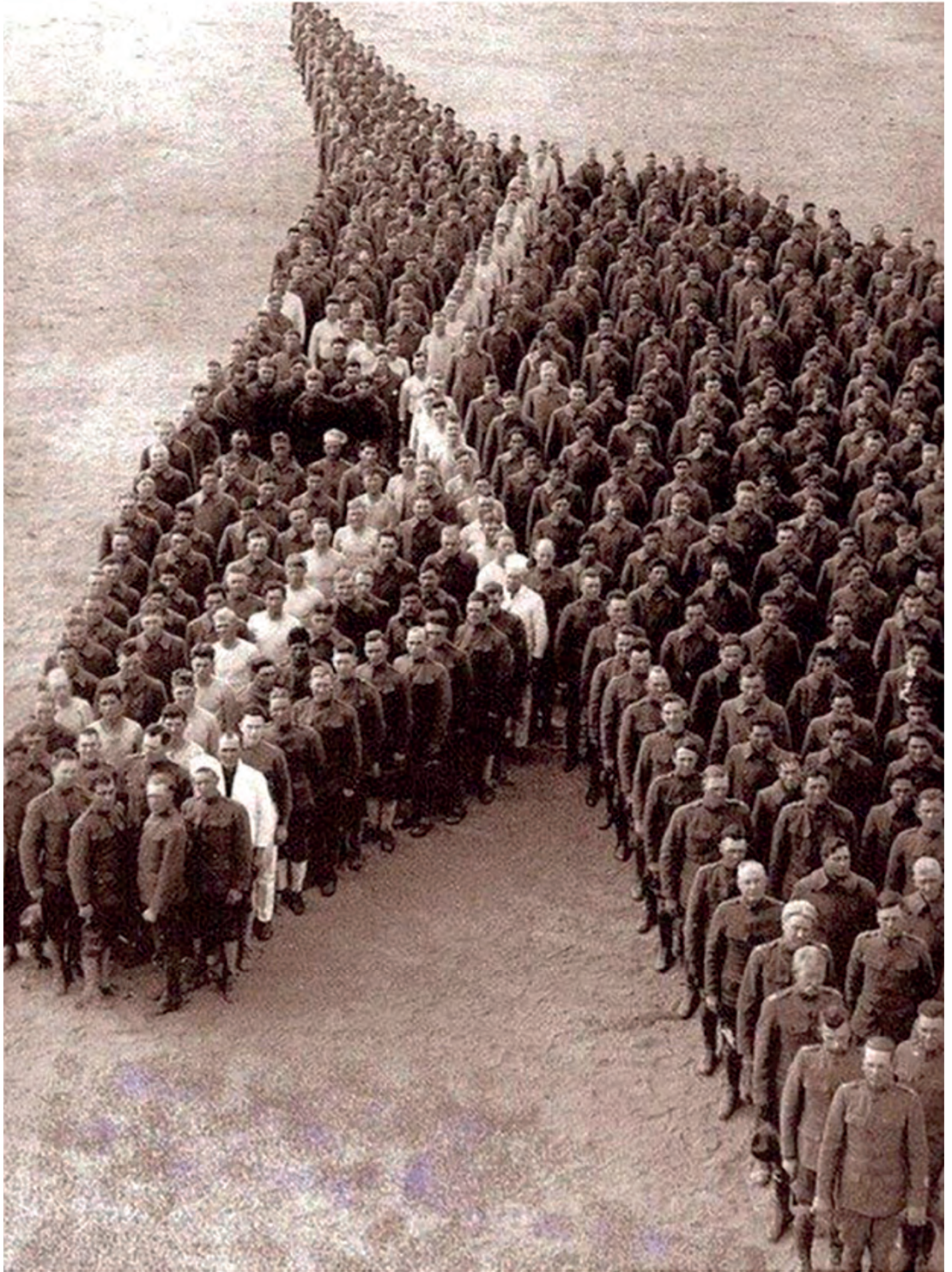
17 James SMITH, "Admiral William Pye's 1943 Evaluation of the Naval Battle of Guadalcanal, November 13-15, 1942," *U.S. Military History Review*, 1, 1 (2014): 48-51.

The Americans invaded the island of Okinawa on April 1, 1945. The Japanese sent their last major naval force, led by the battleship Yamato, on a kamikaze mission, with only enough oil to steam to Okinawa. However, it was intercepted by 380 American carrier-based aircraft, and the Yamato, a cruiser and four of the eight accompanying destroyers were sunk on April 7. The vulnerability of surface warships without air cover was amply demonstrated. The battleships on which the Japanese had spent so much had become an operational and strategic irrelevance.

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650 Officers and Enlisted Men of Auxiliary Remount Depot N° 326 Camp Cody, N. M., In a Symbolic Head Pose of "The Devil", Saddle Horse ridden by Maj. Frank Brewer, remount commander / Photo by Almeron Newman, *Rear 115 N. Gold Ave., Deming, N.M.*.(1919)  
Library of Congress Prints and Photographs Division Washington, D.C. 20540 USA

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