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WORLD WAR II

ENCYCLOPEDIA

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VOLUME 21

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WORLD WAR II

ENCYCLOPEDIA

AN *U*NBIASED ACCOUNT OF THE MOST DEVASTATING WAR KNOWN TO MANKIND... CONTAINS THE ORIGINAL TEXT PREVIOUSLY PUBLISHED IN THE UNITED KINGDOM PLUS BACKGROUND ARTICLES BY A GROUP OF DISTINGUISHED HISTORIANS... ENLIVENED WITH COLOR PHOTOGRAPHS RECENTLY UNCOVERED

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THE KEY WEAPONS:
THE LAND WAR

Naturally enough, by the end of the war in Europe, tactics and weapons had altered considerably in the light of the previous five years of combat experience. In the following pages we take a look at some of the land weapons that played an important part in the final operations in Europe, marked the culmination of wartime trends, or opened the way for future developments.

In the field of armour, there was a considerable increase in gunpower and protection, with increasing emphasis placed on improved suspension and scope for considerable development of the basic design. There was also a considerable proliferation in the number of self-propelled guns, particularly in the anti-tank rôle.

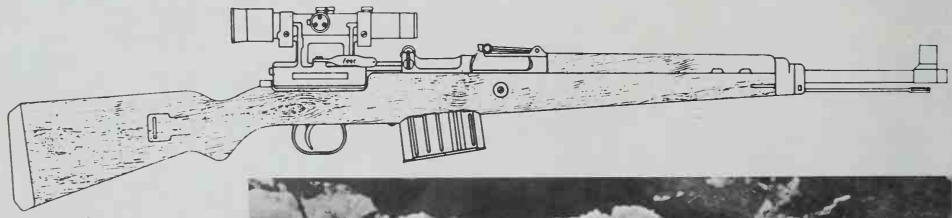
And with the increase in the power and protection of the tank there arose the need for weapons to cancel them out. Thus were borne the family of anti-tank missiles that have become more and more important since the end of the war.

Of course ground captured by any means had to be held by the infantry in the long run, and so the importance of their guns cannot be overemphasised. In the next few pages a few are illustrated and described.

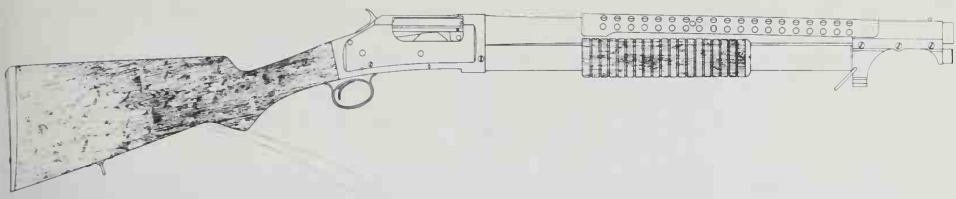
Naturally, the weapons dealt with here are only a few of the multitude produced by governmental arms departments or improvised in the field. The list is not intended to be comprehensive, but to give an idea of the weapons in use or under development in the last months of the war.

▽ *The Russian* "Katyusha".

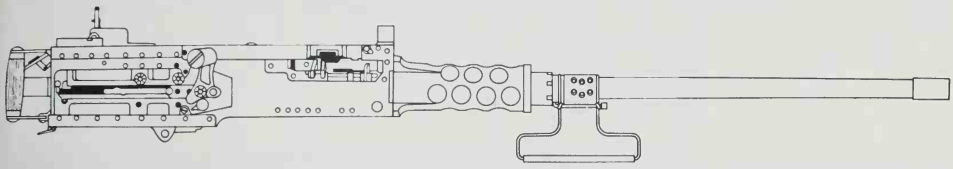
The St.G. (Sturmgewehr) 44 7.92-mm Assault Rifle. The St.G. 44 was adopted after 1944 to replace the rifle, sub-machine gun, and light machine gun of the infantry squad. It was a selective fire weapon with a 30 round magazine, and a cyclic rate of 500 rounds per minute. The chief feature of interest was the ammunition, 7.92-mm *kurz* or short round, which was two-thirds the weight of the standard 7.92-mm round, but at 2,300 feet per second was effective up to 400 yards. Its power and weight allowed the Germans to develop a range of assault rifles. The St.G. 44 was produced by Haenel, Mauser, and Erma, with about seven sub-contractors making the components. By February 1944, production had risen to about 5,000 a month. It weighed 11.5 lbs and had an overall length of 37 inches.



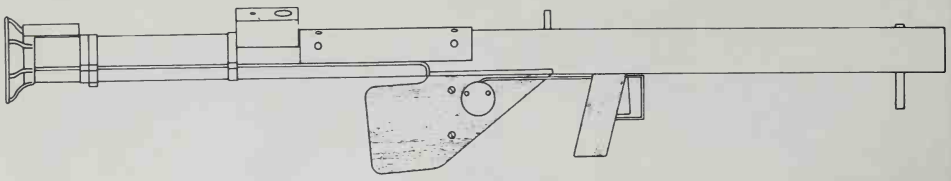
The Gewehr 43 (G43) Semi-automatic Rifle. With a ten round magazine and a weight of 9.5 lbs, the G43 or K43 was an efficient weapon. It was made from a number of stampings, castings, and forgings, and machined only where this was necessary. All G43's had a fitting to take the 1½ power ZF 41 scope. Issued in large numbers, they were used by snipers and were even employed by the Czech Army after the war. It was 44 inches long and had a muzzle velocity of 2,550 feet per second. Variants of this weapon had a handguard of wood or plastic, and on some the bolt carrier latch, which locked the bolt and carrier to the rear, could be either on the left or the right.



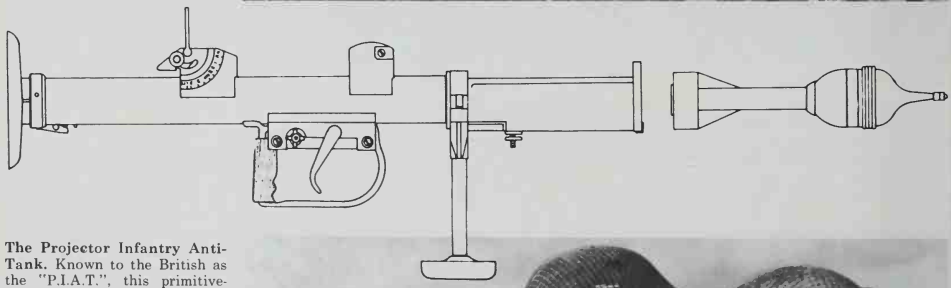
The Winchester Model 1897 Trench Gun. Derived from slide-action Model 1897 shot gun, the Trench Gun has been used by the U.S. Army in almost all the wars in which it has been involved in the 20th Century, up to the Vietnam War. It was a 12-bore gun which took six cartridges loaded with nine .34 calibre shot, and was designed to take the 1917 Enfield bayonet. Though not regarded as an official weapon, it was a very effective man-stopper and was favoured for jungle operations. The Americans favoured the slide-action shot gun, which they regarded as a safer weapon than the automatic shot gun. It had an effective range of about 80 yards, but in raids and patrols would be used at much shorter ranges.



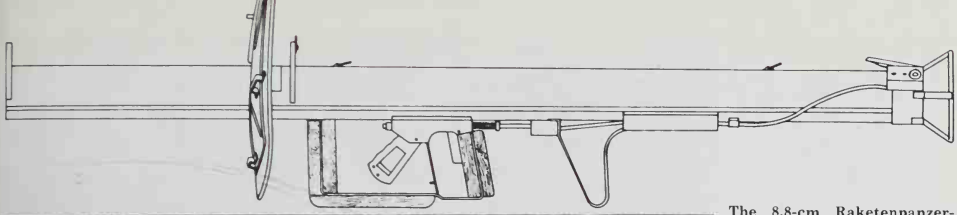
The Browning .50-inch M2 Heavy Machine Gun. The U.S. Army was one of the few armies to retain an interest in heavy calibre machine guns after World War I. The M2 weighed 81 lbs and had a 36 or 45-inch air-cooled barrel, with a cyclic rate of 400 to 500 rounds per minute. It had a muzzle velocity of 2,930 f.p.s. and a maximum range of 7,200 yards. The "50 cal" as it was known, was used as an anti-aircraft gun, both on the ground and in the air. As a ground weapon it had an awesome reputation for powerful defensive fire. It was fitted to armoured and soft skinned vehicles, and as the "quad 50" used in a four barrelled anti-aircraft mounting.



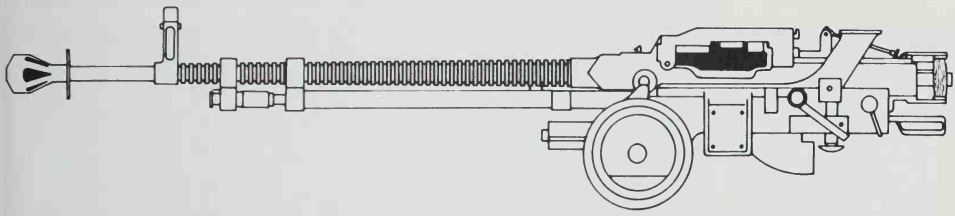
The 2.36-inch Anti-Tank Rocket Launcher. Known to the Allies as the "bazooka" after the bizarre gas-pipe horn of Bob Burns, this weapon was sighted from 100 to 400 yards. It weighed about 12 pounds and was 54 inches long. Breach-loaded, it fired a rocket by an electrical impulse from a dry cell battery fitted to the barrel. The three and a half pound rocket was capable of penetrating most armour, and a variety of warheads allowed the weapon to be used in an anti-personnel rôle. The armour-piercing properties of the rocket were the result of the "Munroe effect" of its hollow-charge warhead.



The Projector Infantry Anti-Tank. Known to the British as the "P.I.A.T.", this primitive-looking weapon could penetrate four inches of armour at short ranges. It fired a 3-lb rocket projectile, but was far from recoilless–indeed the regulation position for the operator was a prone position. One man fired the P.I.A.T. from a standing position and knocked out a Panther, but he was knocked flat by the recoil. It was parachuted to the Polish Home Army during the Warsaw Rising, and used for tank hunting by the paratroops at Arnhem. Like all infantry anti-tank weapons it required the nerves of a big game hunter to get the best results.



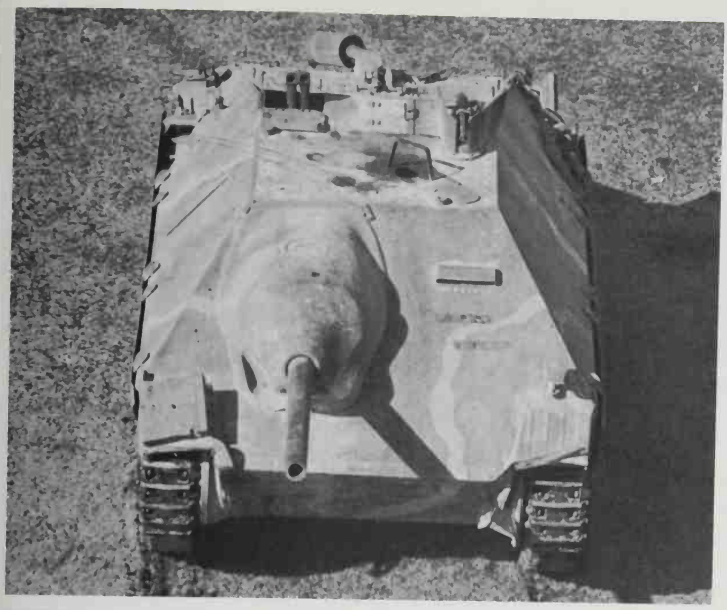
The 8.8-cm Raketenpanzerbüchse 54/1. At 21 lbs, this was both a heavier and a bulkier weapon than the bazooka. It was four feet four and a half inches long. The sights were designed to adjust to the different types of ammunition issued for extreme temperatures. The rockets could penetrate up to eight and a half inches of vertical armour and six inches sloped at 40°. Later marks of the *Raketenpanzerbüchse Grenate* had a range of up to 220 yards, but the propellent charge, which burned for about seven feet of the rocket's travel, necessitated the fitting of a protective shield, and made camouflage difficult. It was superseded by the *Panzerfaust*.



The DShk 12.7-mm M1938/46 Heavy Machine Gun. Like the Browning, the DShK M1938/46 was employed as an anti-aircraft and ground weapon. It was fitted to armoured vehicles in the latter part of the war, and mounted on a small wheeled trailer. It was 62.5 inches long, weighed 78.5 lbs, and had a cyclic rate of fire of 540 to 600 r.p.m. A simple, sturdy weapon, it was air cooled, and had a relatively easily changed barrel. It is still in service with satellite armies of the Soviet Union, and has seen action in Vietnam and the Middle East. A gas-operated weapon, it uses a 50-round metallic link belt, and has a muzzle velocity of 2,822 f.p.s. On armoured vehicles it is fitted with a telescopic sight.

Tiger II (Ausf. B) "Königstiger". The Tiger II first saw action on the Russian front in May 1944, and was later employed in the Normandy area in August of the same year. It was in effect a Tiger I, but redesigned with thicker armour, sloped like that of the Panther or T-34. It mounted an 8.8-cm KwK 43 L/71 gun, two MG 34's in hull and turret, and an MG 42 on the cupola for A.A. defence. Its armour came as a shock to the Allies: the turret front, sloped at 10°, was 185 mm thick, with a superstructure front of 150 mm at 50°. The thinnest armour was 25 mm, on the hull belly. However, for this armour thickness the tank sacrificed speed: on roads it had a maximum of 25.7 m.p.h. and cross-country between 9 and 12 m.p.h. But since most German armour was used defensively in the latter part of the war, the gun and armour were more important. The Tiger II carried 80 rounds of 8.8-cm ammunition, and 5,850 rounds of machine gun ammunition. The 8.8-cm KwK 43 L/71 was the largest calibre and calibre/length gun to be employed operationally in World War II, being almost 21 feet long.

The Heavy M26 90-mm Gun Tank, Pershing. The Pershing was the result of lengthy research and development in the United States. Its gun was incorporated after the shortcomings of the 76-mm gun in the M4 had become fatally obvious in Normandy. Its 500 brake horsepower Ford Model GAF 60° V-8 inline engine gave it a maximum governed speed of 30 m.p.h. Armour varied from the upper hull front and turret front of 101.6-mm to 50.8-mm on the hull and turret rear. Auxiliary armament was two .30-inch Brownings plus another, of .50-inch calibre, on a pintle mounting on the turret. The tank carried 70 rounds of 90-mm ammunition, 500 of .30- and 550 of .50-inch. The first Pershings were assigned to the 3rd and 9th Armoured Divisions of the 1st Army. Training was conducted by a team of civilian and military instructors sent over from the United States. On V.E. Day there were 310 Pershings in Europe; 200 had been issued to the troops and 20 had seen action. Some of these were with the 9th Armoured Division when one of its units captured the Ludendorff Bridge at Remagen.



The Jagdpanzer 38(t) "Hetzer". Based on a widened version of chassis of the Czech TNHP-S light tank, the *Hetzer* was compact, simple, and reliable. It continued in service with the Swiss and Czech armies after World War II. It carried a 7.5-cm L/48 anti-tank gun, with a remotely controlled machine gun mounted on the roof for close defence. The six-cylinder water-cooled engine was uprated to 160 h.p. at 2,800 r.p.m. and the tracks were strengthened. Fuel capacity was increased from 48 to 73 gallons. *Hetzers* were first employed in the East, and later in the West, notably in the Ardennes offensive. A total of 1,577 vehicles was built, manufacture beginning in December 1943 at BMM and Skoda of Königgrätz.

It carried a crew of four, with 41 rounds of 7.5-cm and 600 rounds of 7.9-mm MG 34 ammunition. It had a speed of 24 m.p.h. on roads and 10 m.p.h. cross-country, with a cross-country radius of action of 60 miles. It was a typical example of a war-time conversion, attempting to provide mobile protection against massed Russian armour.

8.8-cm PaK 43/3 Panzerjäger "Jagdpanther" Sd.Kfz. 173. This was one of the most successful German tank destroyers: earlier models had proved to be either underarmoured or too slow. The *Jagdpanther* was fast, well-armoured, and mounted the deadly 8.8-cm gun. Introduced in January 1944, it had a weight of 51.3 tons, a crew of five, and a speed of 29 m.p.h. on roads and 16 to 19 cross-country. A 7.92-mm machine gun was fitted in the bow. Ammunition stowage was 60 rounds of 8.8-cm ammunition and 300 rounds of 7.9-mm ammunition. The HL 230 P30 Maybach engine developed 700 HP at 3,000 r.p.m. The *Jagdpanther* had a range of 124 miles on roads and 62 miles cross country. With a gun range 9,000 yards and a height of 8.9 feet, the *Jagdpanther* was a formidable defensive weapon. The crew consisted of a commander, gunner, 1 or 2 loaders, wireless operator/machine gunner, and driver. By May 1945, 382 had been completed and it was intended to produce 150 vehicles a month, as the basis of the tank destroyer units in Germany's rearmed Panzer divisions.

The Tank Infantry, Black Prince (A43). The Black Prince was based on the Churchill, but carried the more powerful 17-pounder gun. It was heavier than the Churchill and had a wider turret to take the bigger gun. Consequently the suspension had to be strengthened. Wider tracks, measuring 24 inches, were fitted. Six prototypes were built by Vauxhall Motors Ltd., and completed by 1945. Though the tank was never employed operationally, it represents the culmination of the pre-war concept of the Infantry Tank. In 1946, however, in company with the early Centurion, it compared favourably with a Panther tank reconstructed by the British. The Black Prince weighed 50 tons, had a crew of five, and mounted a 17-pounder and two Besa machine guns. Armour was similar to that of the Churchill, ranging between 152-mm and 25-mm, but it had the unsatisfactory speed of 11 m.p.h. It had the Bedford Twin Six engine and Merritt Brown gearbox: and communications were provided by the No. 19 wireless set. An interesting innovation was an all-round vision cupola for the tank commander.

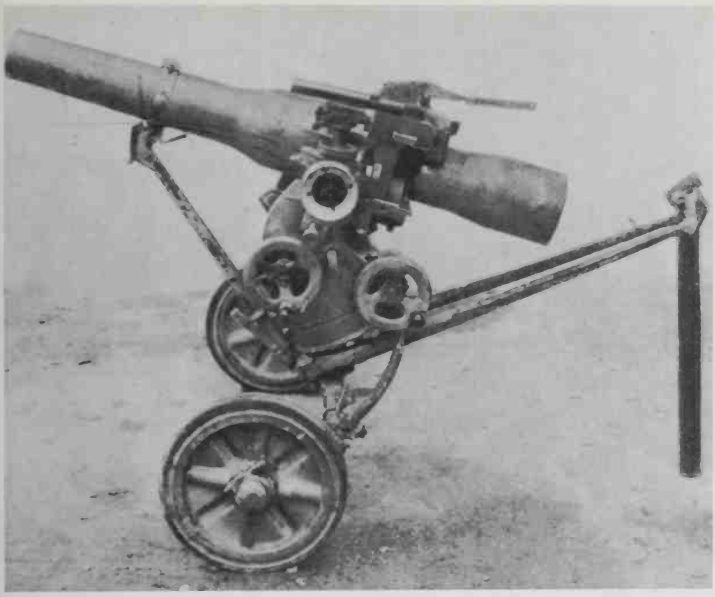
The Tank, Cruiser, Centaur (A27(L)). The Centaur was one example of the return to the Christie-type suspension which had proved so efficient on the Eastern Front. The Centaur IV was employed by the Royal Marine Armoured Support Group in Normandy in 1944. The earlier marks carried an auxiliary fuel tank, and mounted two Besa machine guns and a 6-pounder. Powered by a Nuffield Liberty 395 b.h.p. engine, it weighed 27.5 tons. The Cromwell I was never used in action, but a version modified as an Observation Post tank was used by some units of the Royal Artillery in North-West Europe. It was 20 feet 10 inches long, 9 feet 6 inches wide, and 8 feet 2 inches high, with a crew of five. It had a range of 165 miles. Centaurs were modified as A.A. tanks and armoured bulldozers. Centaur Mk. IV's operated by the Royal Marines mounted a 95-mm howitzer, and though intended to provide support from offshore landing craft, they were landed and gave support in the Normandy beach-head.

The Joseph Stalin 2 heavy tank. The JS-2 appeared in 1944, and mounting a 122-mm gun, it was the most powerfully armed tank in the world at that time. The chassis was based on the Klimenti Voroshilov series. The nose plate was 127-mm thick at 30°, the rolled hull sides were 89-mm thick, and the front pannier sides 133-mm thick at 12°. The driver was in the unhappy position of having no roof hatch, and had to escape either through the turret or a belly hatch well to his rear. To add to his discomfort, he had fuel tanks located either side of his seat. He fired a rigidly mounted 7.62-mm machine gun through an aperture in the glacis plate. The tank had a top speed of 27 m.p.h. and a weight of 45.5 tons, but its track width of 25.5 inches still gave it greater manoeuvrability over soft ground than the Tiger. The turret crew consisted of a commander, gunner, and loader, above whom was a hatch which incorporated a mounting for a 12.7-mm DShK anti-aircraft machine gun. The turret was cramped, dominated by the 122-mm gun, with a low roof, and a turret ring restricted by the hull sides.

The JSU-152 assault gun. This is another example of the Klimenti Voroshilov tank chassis being used to take a powerful gun. Its 152-mm M1937/43 gun could provide fast, accurate, and heavy H.E. support for advancing infantry quicker than any towed pieces. The gun had a total arc of traverse of 10° and an elevation of up to 31°; 20 rounds of A.P. and H.E. were carried, and the vehicle was fitted with a telescopic sight for direct fire. Like most Soviet A.F.V.'s it carried a 12.7-mm anti-aircraft M.G. Though it had a weight of 50 tons, this was spread on its broad tracks, and it was capable of 23 m.p.h. on roads and 10 m.p.h. cross-country. Equipped with additional tanks it had a range of 190 miles. The crew varied between four and five men. Its armour ranged from a massive 127-mm glacis plate to 19-mm on the belly, and since the vehicle stood about eight feet high, it was a formidable target for any German anti-tank gunner unfortunate enough to be in its path. The JSU-152 is still in service with the armies of the United Arab Republic and of Algeria.

The 21-cm Nebelwerfer 42. This five-barrelled launcher fired the 21-cm *Wurfgrenate* 42 *Spreng*, a rocket projectile with a 90-pound warhead containing 22.4 lbs of T.N.T. This had a range of 8,530 yards, though some rockets were reported to reach a range of 10,000 yards. The carriage for the launcher was derived from that for the 3.7-cm anti-tank gun. It had an elevation from –5° to + 45° and a traverse of 12° either side. It weighed 12 cwt and so was an easily manoeuvred weapon. To load, the rocket was slipped in from the rear until a spring-loaded clip held it secure. The firing was done by remote control with a hand generator. The firer retired to cover about ten yards from the projector. The Allies first experienced the *Nebelwerfer* 41 in North Africa, where it was dubbed the "Moaning Minnie" or "Screaming Mimi" as a result of the shriek of its missiles in flight. Though not an accurate weapon, it had a fast rate of fire and high blast effect. It was easy to manufacture and considerably cheaper than a conventional artillery piece.

The 15-cm Panzerwerfer. This was an attempt to give the 15-cm *Nebelwerfer* battlefield mobility. The smoke trails which followed the rockets when they had been fired meant that the batteries had to move from their site before they were located and taken under counter-battery fire. The chassis was a 2-ton semi-track truck, the Opel *"Maultier"*. It was lightly armoured, sufficient to withstand small arms fire. About 300 of these trucks, with their Carden-Lloyd type tracks, were produced to serve as weapons carriers, mounting ten 15-cm barrels. In addition to the ten rockets loaded, another ten were carried internally. It had a good cross-country performance, with its 3.6-litre six-cylinder engine giving a speed of 25 m.p.h. over flat ground. Later it was superseded by the more heavily armoured Büssing-N.A.G.S.W.S., which came into action in 1944, and had a greater internal stowage capacity. The drill for operating the *Nebelwerfer* was to fire from inside the cab, and then move off to reload the barrels.



The 7.5-cm leichtes Geschütz 40 recoilless gun. This compact and efficient weapon was first encountered by the Allies in North Africa. It was built out of an aluminium alloy which gave it a weight in action of 321 lbs. It was a mere 45.28-inches long. In action the wheels were removed. It fired an H.E. shell weighing 12 lbs 9 ozs, which had a maximum range of 8,900 yards, Armour Piercing Cored Ballistic Capped rounds weighing 15 lbs, and a 10-lb 2-oz hollow-charge shell which could penetrate 50-mm at an angle of 30° at a maximum range of 7,437 yards. In practice firing the crew observed a danger area of 110 yards to the rear of the weapon, but in action this was reduced to 55 yards. However, the blast could pick up stones and debris and the crew was advised to avoid this area. The blast could also damage ear drums and crew were warned that they should plug their ears with clay or mud. The gun was also designed so that it could not be traversed at high angles or elevated when used on an all-round traverse, to ensure stability when in action.

Soviet 2½-ton truck 6 x 6, Rocket Launcher "Katyusha". The Russians used a variety of trucks to carry the launching rails for their 130-mm rockets, but the Lend-Lease Studebaker was among the most popular. It fired 16 rockets, initiated by electrical impulse, in about 8 to 10 seconds. *Katyusha* was used as a general name for all Soviet rocket projectiles, which ranged from 75-mm to 408-mm. The 130-mm missiles had a range of 6,500 yards and a 48-lb warhead. Like the *Nebelwerfer*, *Katyusha*, or "Stalin's Organ Pipes", made a noise in flight which earned it this apt nickname. The first Germans to experience its devastating fire were caught in the open as they were moving up for an attack. When the rockets began to howl down they turned and fled. It was not an accurate weapon, but massed batteries made up for this by drenching their target with fire. The Russians, however, claimed that in its first operational use 17 tanks and 15 artillery pieces were knocked out. The mounting and rails weighed 7.1 tons, elevated 15° to 45° and traversed 10° to 20° on the mount.

THE KEY WEAPONS:
THE SEA WAR

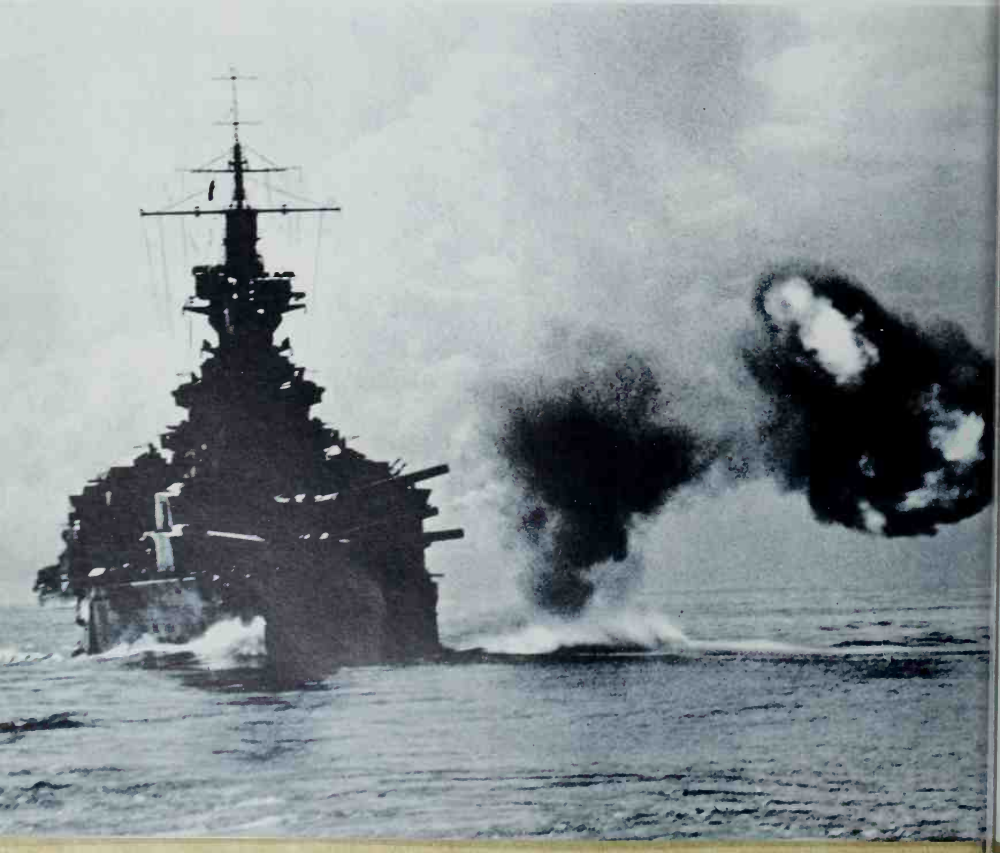
As the war on land was entering its last desperate struggles, the war at sea was tapering off. The hardest days had been earlier in the war, when German U-boats had stood a good chance of severing Great Britain's sea communications with the rest of the world. The threat had been averted, chiefly by British corvettes, sloops, and frigates. But Germany was working on new designs at the end of the war, and these could have posed the same problem yet again.

Germany's surface forces, although small, were of a high quality in their *matériel*, and continued to worry British naval planners until the great battleship *Tirpitz* was put out of the picture. But for this threat, the British naval forces in the Mediterranean could have been strengthened in the critical days of 1942, and the fleet in the Far East made into a major force much earlier than it was.

Insofar as the types of ships are concerned, it is worth noting the decline of the battleship as a capital weapon, and the emergence of the aircraft-carrier in its place. This was to be a fact brought home in the Pacific.

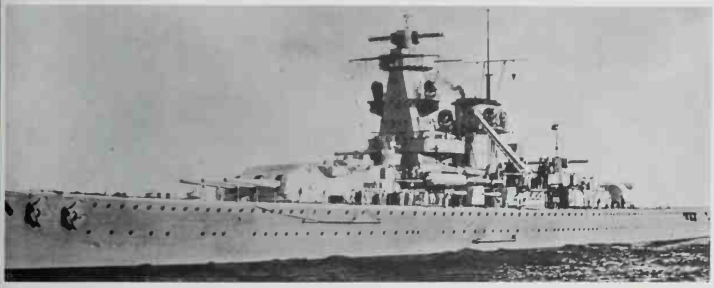
The submarine continued to evolve as a major factor, but it was still severely hampered by its need for air–even with a *Schnorchel*, there was a good chance of the submarine being detected. It might be better to call the boats of this period submersibles rather than submarines, reserving the latter word for nuclear-powered boats.

Towards the end of the war, there sprang up a strange tribe of small craft associated with the Allies' needs for invasion purposes, and the Germans' for cheap and easily-obtained ways of countering the Allies' forces, both great and small. Thus were born the assortment of landing craft and midget submarines.

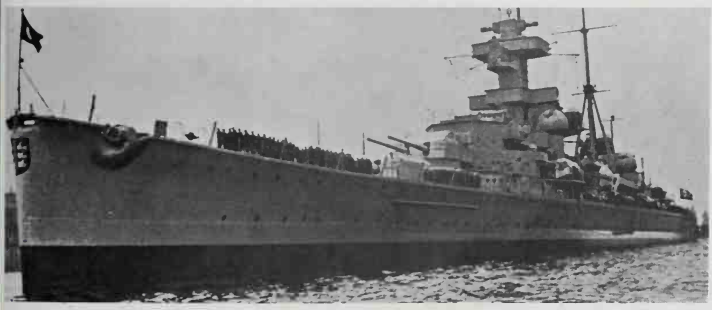


The British aircraft-carrier *Indomitable*. This fleet carrier was one of the six units of the "Illustrious" class, and was launched on March 26, 1940 at the Barrow yards of Vickers-Armstrong. The class was notable for the provision of an armoured hangar, which proved invaluable, especially in the Pacific during 1945. The first four of the class *(Illustrious, Victorious, Formidable,* and *Indomitable)* displaced 23,000 tons, and the last two *(Implacable* and *Indefatigable)* 26,000 tons, which enabled them to carry 72 aircraft instead of the first four's 36.

The British battleship *Rodney*. This capital ship was launched at the Cammell Laird yards on December 17, 1925, and was armed with nine 16-inch guns. These were, however, disposed oddly, in three triple turrets, all forward. As a result of the Washington Naval Treaty, engine power was low, and this resulted in a truncated stern, giving the unbalanced appearance there. During the war anti-aircraft armament was greatly increased, thirty-two 2-pounders, sixteen 40-mm, and sixty-five 20-mm guns being added.



The German pocket-battleship *Admiral Graf von Spee*. Designed as commerce raiders, the three units of this *Panzerschiffe* class were built to a scaled down battle-cruiser concept, to outrun what they could not outgun, and outgun all other vessels. The design, with six 11-inch guns in a 12,000-ton hull, was an interesting one, but not altogether successful. However, the two units that survived after 1939, *Lützow* (ex-*Deutschland*) and *Admiral Scheer,* remained very considerable threats in the Baltic.



The German heavy cruiser *Admiral Hipper*. Built at the Blohm und Voss yards in Hamburg, *Hipper* was launched on February 6, 1937 and was the fifth and last of Germany's superb heavy cruisers. With eight 8-inch guns, 5-inch armour, and a speed of 32 knots, these were ship-for-ship superior to any British heavy cruiser afloat. *Lützow* had been given to Russia in 1940, and *Blücher* sunk during the invasion of Norway on April 9, 1940, but the other three *(Seydlitz, Prinz Eugen,* and *Hipper),* proved very useful in the Baltic in the closing stages of the war.

The British battleship *Duke of York*, one of the five units in the "King George V" class. The others were *King George V*, *Prince of Wales*, *Anson*, and *Howe*. The class was designed after Nazi Germany's intentions became clear, and the non-availability of 16-inch mountings, as the result of an agreement of 1935 between Britain, France, Russia, and the United States, meant that a main battery of 14-inch calibre had to be used. Ten of these guns were mounted, and with armour up to 16 inches thick, and a speed of 29 knots, the five "K.G. Fives" were very useful ships.

The British light cruiser *Diadem*. This was one of a second group of five ships in the 16-strong "Dido" class, all launched between 1939 and 1942. Displacing 5,770 tons, *Diadem* had an armament of eight 5.25-inch dual purpose (anti-aircraft and surface) guns in four twin turrets, compared with the ten guns of the first group's ships. Speed was 33 knots, and maximum armour thickness 3 inches. The *Diadem* was launched on August 26, 1942, and spent all her war-time career with the Home Fleet. She was sold to Pakistan in 1956.

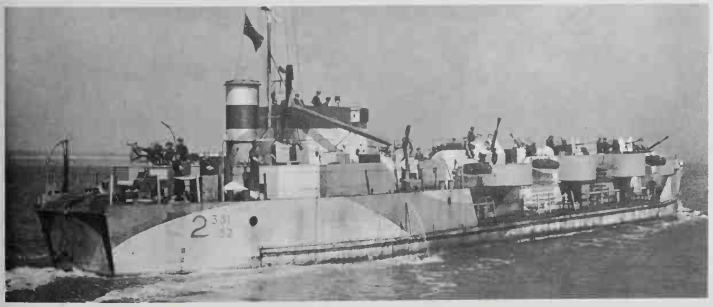
The British cruiser *Belfast*. This was a sister ship of *London*, and the two formed the third group of the ten-strong "Southampton" class, launched between 1936 and 1938. The first two groups displaced 9,100 and 9,400 tons, but the third had additional protection (hull bulges and up to 4½ inches of armour) and so displaced 10,000 tons. Armament was twelve 6-inch guns in four triple turrets. Speed was 32 knots. *Belfast* served with the Home Fleet from 1938 to the end of the war, performing notably in the Normandy invasion.

The British Landing Craft, Tank (Rocket). Many such craft were produced by adapting L.C.T.(2)s and (3)s. Provision was also made for quick re-conversion if the need arose. False decks were fitted over the hold, and on this a converted (2) could mount 792 5-inch rockets, and the (3) 1,080. The rockets were fired electrically, in 24 salvoes. Range was fixed at 3,500 yards, and an area of 750 yards by 160 yards was saturated to the density of one rocket per 100 square yards. Another rocket-armed vessel was the Landing Craft, Support (Rocket).

The British frigate *Test.* This was one of the large "River" class of frigates. Early war service had shown corvettes to be too small for ocean escort work, so a new type, soon named frigate, was designed to replace corvettes on the slips. The "River" class was introduced in 1941, and displaced 1,370 tons compared with the average corvette's 950 tons. Speed was not vital in anti-submarine craft, as reflected in the "River" class's 20 knots. Main armament was two 4-inch guns, but more important was the "Hedgehog" anti-submarine weapon.

The British destroyer *Whirlwind.* She was a "W" class destroyer, launched on August 30, 1943. The class had a relatively light anti-aircraft armament (two 40- and eight 20-mm guns), but a main armament of four single 4.7-inch guns and eight 21-inch torpedo tubes. The engines developed 40,000 horsepower, which enabled a top speed of 36¾ knots to be reached. There were eight "W" class ships, and eight in the basically similar "Z" class. Both classes served with the Home Fleet until Germany's surrender.

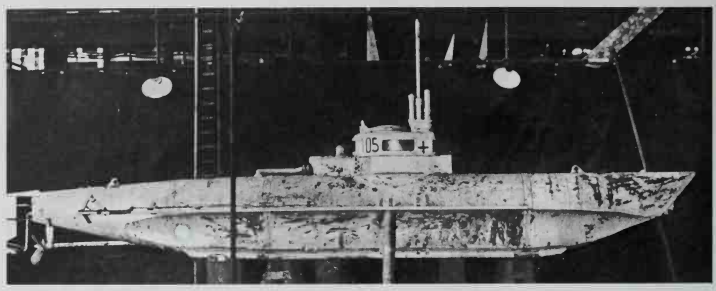
The British monitor *Erebus.* The design philosophy behind monitors is a simple one: the ship is nothing more than a means of moving heavy guns to the point where they may undertake a shore bombardment. *Erebus* was typical of this idea, with a main armament of two 15-inch guns in a massive turret, made of armour up to 13-inches thick. So that she could close in near to the coast, she had a shallow draught (11 feet), and speed (at 12 knots) was low. *Erebus* was launched on June 16, 1916 and displaced 7,200 tons.



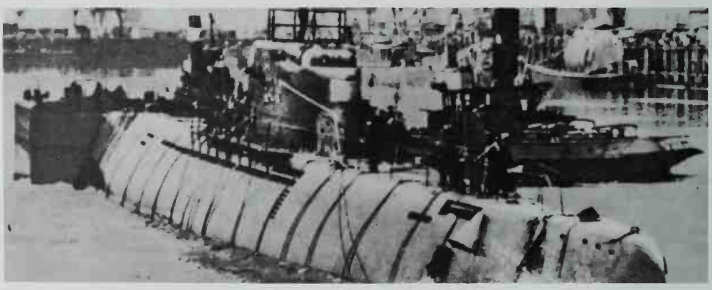
The British Landing Craft, Flak (4). Vessels of this class were adaptations of the L.S.T., and were later redesignated L.C.F. (L.). Twenty-eight of the Mark IV type were built. Displacement was 415 tons and speed a mere 11 knots, but the armament of four 2-pounder and eight 20-mm anti-aircraft guns was heavy for a craft of this size. Some of the earlier L.C.F.s had an armament of up to four 4-inch or eight 2-pounder guns, plus a considerable cannon barrage. Two L.C.F. (2)s and 16 L.C.F. (3)s were built. Draught in the L.C.F. (3) type was only 4½ feet.

The German Schnellboote or E-boat. These were very useful craft, fulfilling much the same functions as the British motor torpedo boats and motor gun boats. The E-boats had a distinct advantage in their larger size and more solid construction. Most were of about 100 tons displacement and armed with two 21-inch torpedo tubes, plus one 40- or 37-mm and five 20-mm guns. Six to eight mines could be carried instead of reload torpedoes. The speed of the various classes differed from 36 to 42 knots, with most capable of about 40 knots.

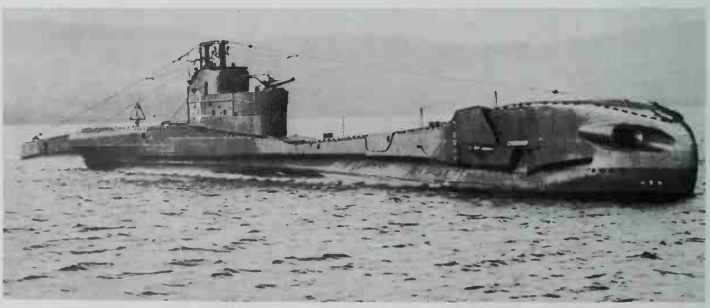
The German "Biber" type midget submarine. Several types of midget U-boats were designed towards the end of the war, when it was thought that they would be capable of piercing the Allies' U-boat defences and wreaking havoc on the invasion fleets. None of the types was especially successful. The *Biber* type was of 6½ tons displacement and could make 5 knots underwater, at which speed range was 40 miles. Crew was one and armament two 21-inch torpedoes. Deschimag of Bremen built all the 324 placed in service.



The German Type XXI U-boat. This was the most advanced conventional type developed by Germany, and it could run its diesel engines underwater by use of a *Schnorchel*. Combined with a carefully streamlined hull, without a deck, and an all-welded hull, this allowed a top speed of 16 knots underwater. For silent running there were electric engines, giving a speed of five knots. Submerged displacement was 1,819 tons, and armament six 21-inch tubes with 23 torpedoes. Luckily for the Allies, none saw active service.



The British "T" class submarine. This class, some 51 boats strong, displaced 1,575 tons submerged, and carried an armament of 10 or 11 tubes and one 4-inch gun. Submerged speed was nine knots. Boats of the class served in home waters, the Mediterranean, and the Far East with considerable success. War experience soon showed that more range was needed, and some of the ballast tanks were turned into extra fuel tanks. The type was superseded on the stocks by the "A" class in 1944, but the boats of this class were too late to see Pacific service.



THE KEY WEAPONS:

THE AIR WAR

The greatest technical strides made in the war were those in the field of aeronautics and associated areas. In 1939, aircraft were still relatively simple: uncomplicated airframe, piston engine, relatively light armament, and few technical aids. By 1945 aircraft were far larger and heavier, making considerable use of advances in aerodynamics, possessed of much heavier and more sophisticated offensive and defensive weapons, and advanced electronic aids to navigation and interception.

The typical fighter of 1939 was powered by a 1,000-hp engine, capable of about 350 mph at its optimum altitude (in the region of 15,000 feet), with a service ceiling of about 32,000 feet and range of 400 miles, and an armament of light machine guns and the occasional cannon.

By 1945, fighters were over twice as heavy, at some 10,000 lbs, powered by massive engines developing about 2,500 hp, able to reach 450 mph at rated altitude (20,000+ feet), with a service ceiling in excess of 40,000 feet and a range of over 1,000 miles, and an armament of heavy machine guns, large calibre cannon, bombs, and rockets.

Bombers had also undergone an enormous transformation. To take only the example of the heavy bomber: in 1939, a typical "heavy" bomber could carry a load of 7,000 lbs of bombs at under 230 mph for under 1,000 miles. Defensive armament was a matter of only five or six light machine guns. Loaded weight was up to about 30,000 lbs and power was provided by two 1,000-hp engines.

1945 bombers were radically different. Apart from electronic aids such as H2S, Gee, and Oboe, the bomb-load had doubled to about 15,000 lbs maximum, and speed had increased to about 290 mph, with a range of 2,000 miles or more available. Defensive armament had increased, in British bombers up to eight light machine guns, in American machines up to 14 heavy machine guns, and in German aircraft up to two cannon and five heavy machine guns.

Apart from the growth of established classes, new classes, such as fighter-bombers, night fighters, and specialised ground attack aircraft, not to mention anti-submarine and anti-shipping machines, made their appearance, and even took over from such types as interceptors and light bombers in importance. Aircraft capable of undertaking several rôles were becoming ever more important.

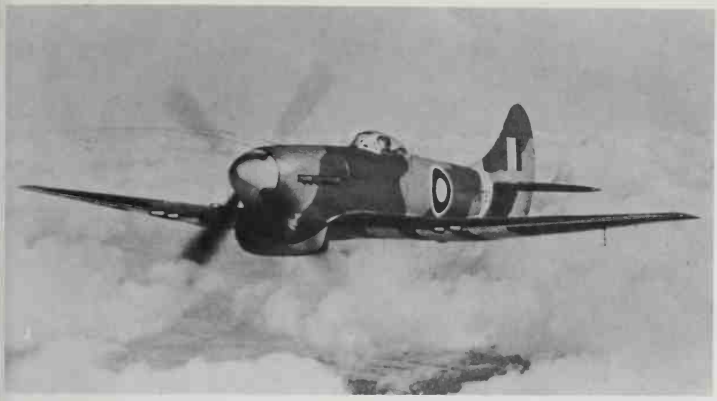
Finally, the closing stages of the war saw a revolution in aircraft propulsion. There were oddities such as the Messerschmitt 163 rocket interceptor. And there were truer portents of the future in turbojet-propelled types such as the Me 262.

△ *Best all round fighter of World War II, the beautiful North American P-51 Mustang. Furthest from the camera is a P-51C, with the original framed canopy, with three P-51D's, the first model to feature a blister canopy. All four would have been powered by American Packard-built Merlin inline engines.*

The British Bristol Beaufighter Torpedo-Fighter X. Derived from the Beaufort torpedo bomber, the Beaufighter heavy fighter first flew in July 1937. The type had been ordered for the R.A.F. even before it flew, and the first production models entered service in September 1940. By the end of the year, several examples had been fitted with primitive Airborne Interception radar for the night fighter rôle, a rôle in which the Beaufighter continued to give much valuable service. In the summer of 1941, the Merlin powered Mark IIF entered service, to be superseded in 1942 by the Mark VI. This could carry rockets or a torpedo. The last major model produced was the Mark X, the best anti-shipping strike fighter of the war.

The British de Havilland Mosquito Fighter-Bomber VI. The Mosquito had a simple and unique bonded wood construction pioneered by the manufacturers. The prototype flew in November 1940, and production models started to enter service in July 1941. The first three production models were the Photographic Reconnaissance I, Night Fighter II, and Bomber IV, the last of which was unarmed, being faster than contemporary German fighters. Next came the F.B. VI, which was built in greater numbers than any other model. This was followed by the F.B. XVIII, armed with a 57-mm gun. The B. IX and XVI, then followed, while the N.F. XII, XIII, XVII, XIX, and 30 completed the night fighters.

The British Gloster Meteor III. This was Britain's first jet fighter, and the only Allied jet to see service in the war. The prototype, which had benefited considerably from experience gained with the Gloster E.28/39, Britain's first jet aircraft, flew on March 5, 1943, and was powered by two Halford turbojets. Production models, powered by Rolls-Royce Welland engines, entered service in July 1944, and were soon in action against V-1 flying bombs. The speed of the Meteor I was only 410 mph, but the Mark III, which entered service at the beginning of 1945, had Derwents, which had 300 lbs thrust per engine more. This boosted top speed up to 493 mph. Mark III's started to serve in North-West Europe from spring 1945.



The British Hawker Tempest V. This excellent fighter was conceived as an updated version of the Typhoon, which had entered service in July 1941. The new Tempest featured a better canopy, stronger tail surfaces, a more powerful engine, and a thin laminar-flow elliptical wing, and flew for the first time on February 24, 1943. Various engines (Napier Sabre II and IV, Bristol Centaurus, and Rolls-Royce Griffon) were tried, but only the Marks II (Centaurus) and V (Sabre II) were persevered with. The Mark V entered service first, in January 1944, and proved a worthy companion for the Typhoon. Fixed armament comprised four 20-mm cannon, and eight rockets or 2,000 lbs of bombs could be carried, giving a powerful attack capability.

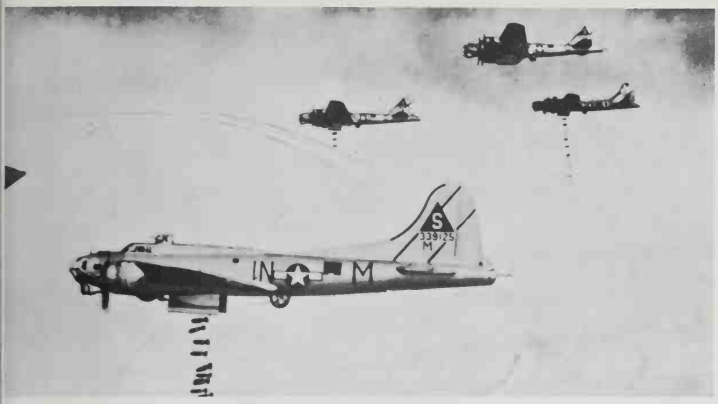
The British Hawker Tempest II. As noted above, this was the version of the Tempest using the 2,500-hp Bristol Centaurus V or VI radial. With its engine enclosed in a neat cowling, the Tempest II had a pleasing and aggressive look to it. Trouble with vibration somewhat hampered early trials, and production did not start until August 1944, deliveries to the Royal Air Force only commencing three months after the war. The Tempest II was a good aircraft, however, having the same armament as the Mark V, and better performance, with a top speed 6 mph greater at a lower altitude of 15,000 feet, a climb to that altitude 30 seconds faster, at 4 minutes 30 seconds, and 110 miles extra range, at 1,640 miles.

The British Supermarine Spitfire 21. This was the final war-time version of Britain's most famous fighter, but it appeared in R.A.F. service just too late to see service. Although superficially similar to its predecessors, the Spitfire 21 had undergone a structural redesign, the most obvious sign of which was a new wing. This was of increased area and so of a different shape to the distinctive elliptical planform of the earlier models. The powerplant was a Rolls-Royce Griffon inline, top speed 454 mph, ceiling 43,500 feet, and range 880 miles. The Mark 22 was similar, but featured a blister canopy and redesigned tail surfaces, which also appeared on the last Spitfire, the Mark 24, which had zero-length rocket rails and short-barrelled cannon.

The British Avro Lancaster III. The most famous British bomber of the war, the Lancaster had its origins in the unsuccessful two-engined Manchester. The prototype flew for the first time on January 9, 1941, and service deliveries started in December. The basic Mark I, of which more than 3,500 were built, was supplemented in 1942 by the Mark X, Canadian-built Mark I's using the American Packard-built Merlin. The Mark II featured Bristol Hercules radial engines, as it was feared that Merlin output could not match demand, but the fears proved groundless and only 300 Mark II's were built. The Mark III was generally similar to the Mark I but had Packard Merlin engines. About 3,000 of this second major mark were built.

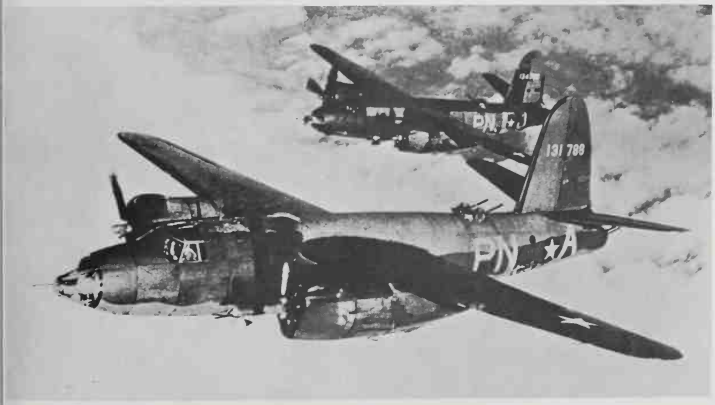
The American Consolidated B-24 Liberator. Although not as celebrated as its fellow bomber the Fortress, the Liberator was a very successful aircraft, and served in a much wider variety of rôles: bomber, maritime reconnaissance bomber, and transport. Noteworthy features were the high aspect ratio, low drag wing, the large fuselage, and the mounting of the wing at the shoulder position, which did not take up much fuselage space and thus allowed easy conversion of the type into a transport. The Liberator also had a tricycle undercarriage, made desirable by the wing's position. The Liberator was a rugged machine, possessed of exceptional range (over 3,000 miles maximum), which suited it well for maritime rôles.

The American Douglas A-20 Havoc. Known to the Royal Air Force as the Boston, this was the most successful American attack aircraft of the war. The type's direct ancestor was the DB-7 light bomber, many of which were ordered by France and taken over by Britain as Bostons after the fall of that unhappy country. The first American A-20's were converted to night fighters and reconnaissance machines, and thereafter the type served in a multitude of rôles: attack bomber, reconnaissance, heavy fighter, night fighter, night intruder, and maritime strike machine. Armament carried could comprise a torpedo or up to 4,000 lbs of bombs, plus a 37-mm cannon and a mixture of 20-mm cannon and .5-inch machine guns. A total of 7,385 was built.



The American Boeing B-17G Flying Fortress. The American equivalent of the British Lancaster, the Flying Fortress was designed as a high altitude precision day bomber. The prototype flew on July 28, 1935, and after trials the test aircraft were accepted for service as the B-17 and 17A. The first production model, the 17B, was phased out of building early in 1940 in favour of the more powerful 17C. By 1942 the generally similar 17D was in production. The 17E had the new tail design and a rear turret, and the 17F included only minor improvements. Finally came the 17G, which incorporated the most important modification deemed necessary after combat experience, a chin turret. The 17G could carry 17,600 lbs of bombs.

The American Northrop P-61 Black Widow. This was the first U.S. aircraft designed as a night fighter. The prototype first flew on May 21, 1942, and service aircraft were operating over North-West Europe by 1944. This large twin-engined, twin boom machine had an armament of four 20-mm cannon and four .5-inch machine guns, and a crew of three. As the nose was occupied by the radar antenna, the cannon were fitted in the belly of the aircraft, and the machine guns in a remotely-controlled turret on top of the fuselage. The top turret was deleted after 37 P-61A's had been delivered, only to be restored on the last 250 P-51B's, which also had provision for four 1,600-lb bombs on underwing points.

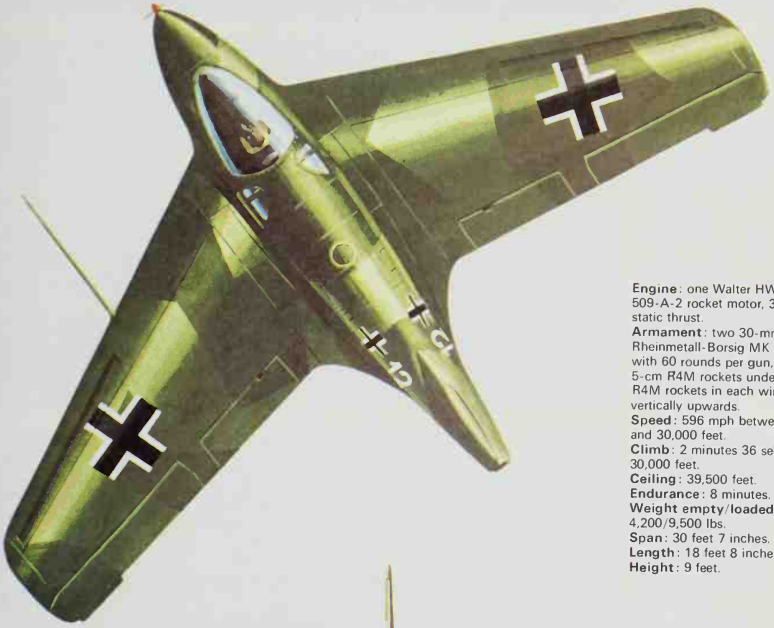


The American Martin B-26 Marauder. The first example of this medium bomber flew on November 25, 1940, and the type entered service quickly. The B-26B introduced a twin-gun rear turret. The Marauder had a high wing loading, and was thus somewhat tricky to fly, but in the hands of a competent pilot it was an excellent machine, suffering very few losses in the closing stages of the war in Europe. The final model of the Marauder, the B-26G, could carry up to 4,000 lbs of bombs, had a machine gun armament of eleven .5-inch guns, a top speed of 283 mph, and a range of 1,100 miles. Surprisingly, in a relatively small aircraft, there were seven crew members. A total of 5,157 Marauders was built before production ceased.

The German Messerschmitt Me 262A-1a *"Schwalbe"* (Swallow) fighter

Engines: two Junkers Jumo 004B–1 turbojets, 1,980-lbs static thrust each.
Armament: four 30-mm Rheinmetall-Borsig MK 108 cannon with 100 rounds per gun for the upper pair and 80 rounds per gun for the lower pair.
Speed: 542 mph at 19,684 feet.
Climb: 6 minutes 48 seconds to 19,684 feet.
Ceiling: 37,565 feet.
Range: 652 miles.
Weight empty/loaded: 9,741/14,101 lbs.
Span: 40 feet 11½ inches.
Length: 34 feet 9½ inches.
Height: 12 feet 7 inches.

The German Messerschmitt Me 163B-1a *"Komet"* interceptor



Engine: one Walter HWK 109-509-A-2 rocket motor, 3,750-lbs static thrust.
Armament: two 30-mm Rheinmetall-Borsig MK 108 cannon with 60 rounds per gun, plus 24 5-cm R4M rockets underwing or 4 R4M rockets in each wing, firing vertically upwards.
Speed: 596 mph between 10,000 and 30,000 feet.
Climb: 2 minutes 36 seconds to 30,000 feet.
Ceiling: 39,500 feet.
Endurance: 8 minutes.
Weight empty/loaded: 4,200/9,500 lbs.
Span: 30 feet 7 inches.
Length: 18 feet 8 inches.
Height: 9 feet.

The American North American B-25G Mitchell. This medium bomber was ordered "off the drawing board", and the first example flew on August 19, 1940, production of the B-25A getting under way swiftly. By the end of 1941 the B-25B was in production. This had an improved armament. The 25C and 25D were basically similar, although some examples had provision for a torpedo. The next production model was the celebrated 25G, which had a "solid" nose mounting a 75-mm gun for attacking shipping and ground targets. The 25H carried a phenomenal armament: a lighter 75-mm gun, fourteen .5-inch machine guns, and a torpedo or 3,200 lbs of bombs. Finally came the definitive 25J, of which 4,318 were built.

The American North American P-51D. This most celebrated of American fighters was flown for the first time in October 1940. As the machine was the result of British enquiries and requirements, it incorporated the lessons of European combat experience. The original P-51 and 51A models were good machines, but the limitations of the Allison engine used meant that it was only at low level that the P-51 excelled. But in 1942 it was suggested that the Merlin should be fitted to the Mustang, and so was born the best all round fighter of the war. The Merlin-engined P-51B still had the framed canopy, however, and it was not until the advent of the P-51D that the blister canopy was introduced.

The American Republic P-47N Thunderbolt. This was, with the Mustang, The United States' most famous fighter, and was the largest and heaviest single-engined fighter of World War II. The prototype, the XP-47B, flew on May 6, 1941 and was immediately ordered into production, deliveries commencing in November. The 47C featured a ventral fuel tank and was longer; the 47D, 12,602 of which were built, had provision for underwing stores, and more importantly, introduced the blister canopy. Several experimental models followed, one of which attained a speed of 504 mph, and the next production model was the 47M, a special sprint model capable of 470 mph. Final model was the 47N, which had a larger wing, and was strengthened for heavier loads.

The German Focke Wulf Ta 152H. Derived from the long-nosed inline-engined Fw 190D, the 152 series was the ultimate in German piston-engined fighter designs. Although the Fw 190 had been designed with a radial engine, the D series was fitted with a Junkers Jumo inline, while still maintaining the appearance of a radial-engined type, and proved immensely successful. The Ta 152 series initially differed little from the 190D-9, but the B introduced an engine-mounted 30-mm cannon and was produced from August 1944. The 152C, however, was powered by a Daimler-Benz engine, and was the only 152 model to see service. Final model was the 152H, intended as a high altitude interceptor, and capable of 472 mph.

The German Heinkel 177 "Greif". This was Germany's best attempt at a strategic heavy bomber, but did not turn out to be a success. The prototype flew in November 1939, but trouble was soon experienced with the engines. These were of an unusual and advanced design, with two Daimler-Benz 601 inlines coupled to a single crankshaft and driving a single propeller. One of these double engines was fitted in each wing, and difficulties, never fully eradicated, were encountered with cooling problems. The engines, in fact, had an alarming tendency to catch fire in the air. The best model was the 177A-5, which had a top speed of 295 mph, and could carry a bomb-load of 13,225 lbs. Range was 2,260 miles maximum.

The German Junkers 88G-1. The Junkers 88 series was Germany's most versatile aircraft of World War II, serving as a bomber, ground attack, reconnaissance, and day and night fighter aircraft. The prototype flew in December 1936, production of the basic bomber version starting in 1938 and deliveries in 1939. The type's excellent performance soon recommended it as an all-purpose machine, and it was quickly pressed into service in other rôles. The first night fighter series was the 88C, the first examples of which appeared at the end of 1940. But the ever-increasing numbers and efficiency of British night bombers led to introduction of the heavily-armed 88G series in the summer of 1944.

The German Heinkel 219 "Uhu". This was undoubtedly Germany's best night fighter of the war. It was designed in 1940 as a high altitude interceptor, but in 1942 was altered into a night fighter when the German air ministry put out a requirement for such an aircraft. The prototype flew on November 15, 1942 and trials confirmed the early promise of the type. Production started in August 1943, and combat success soon followed the type's entry into service. Of particular interest was the *"Shräge Musik"* (Jazz Music) installation. This comprised two 30-mm cannon mounted in the fuselage and firing obliquely forwards and upwards. With this, the pilot could position his machine below and behind a bomber, in its blind spot.

The German Messerschmitt 410A. This machine was derived from the unsuccessful Me 210 of 1941, which was intended to complement the Bf 110 in the fighter-bomber and reconnaissance rôles. Despite its neat and purposeful looks, however, the 210 was a total failure, no modifications making any significant improvement. Production ceased after 325 had been built. After extensive redesign, the type emerged as the 410, which was a better, but not good, aircraft. A total of 1,913 was built, in three main versions: the 410A-1 as a fighter-bomber (4,400-lb bomb-load), the 410A-2 as a heavy fighter (additional two 20-mm and a 50-mm cannon), and 410A-3 as a reconnaissance machine with cameras and fuel in the bomb bay.

The German Arado 234 "Blitz". The only jet bomber to see service in World War II, the *Blitz* was a very advanced design. The prototype was completed in the early winter of 1941, but the non-availability of engines meant that the first flight did not take place until June 15, 1943. The early models had a somewhat unusual undercarriage arrangement: the aircraft took off from a large three-wheeled trolley, which was jettisoned after take-off, and landed on three retractable skids. By the time that the 234B series entered production, however, the type had been provided with a more conventional retractable tricycle undercarriage. Some later development models had four engines, mounted singly or in pairs.

The German Heinkel 162 "Salamander". This unusual jet fighter was designed as a last ditch *"Volksjäger"* or People's Fighter, to be flown by *Hitlerjugend* and the like. It took only ten weeks to design and build, and was constructed of wood and other non-strategic materials, the B.M.W. turbojet being mounted on top of the fuselage piggy-back fashion. Deliveries began in February 1945, and by the time of Germany's surrender, 116 examples had been handed over. The design was structurally defective, however, and also extremely difficult to fly. Maximum speed was 522 mph at 19,700 feet, and the armament of the 162A-2 illustrated was two 20-mm cannon.

The Russian Yakovlev 9. This was the most widely-produced of any Yakovlev fighter, and was an excellent machine, robust, easy to fly, and adequately armed. It was a progressive modification of the Yak 7, from which it differed principally in having redesigned wings, with extra fuel tanks, and the cockpit placed further back along the fuselage. The type went into production in early 1942, and was first encountered by the Germans over Stalingrad in October. In 1943, two new models appeared: the 9D, with reduced armament and increased fuel for escort duties, and the 9T, of which there were two versions. One had a 37-mm cannon and a 12.7-mm machine gun, and the other a 75-mm gun.

The **Russian Lavochkin 5FN.** Early in 1942, the Russians decided to improve the performance of the Lavochkin-Gorbunov-Gudkov 3 by replacing its 1,100-hp inline engine with a 1,640-hp radial. The whole of the nose and front fuselage had to be redesigned, but the new fighter turned out to have a good performance and was placed in production in time for the first service models, the La-5, to see action at Stalingrad in 1942 and the improved La-5FN at Kursk in July 1943. This latter had a more powerful engine and detail improvements, such as a cut down rear fuselage to improve the pilot's view. Armament was two 20-mm cannon, and speed 402 mph at sea level, very useful as most Eastern Front flying was at low level.

The Russian Petlyakov 2. This was one of the best Russian aircraft of the war, and indeed one of the best light bombers to see service with any of the combatants. The type entered service in 1941, and its good performance soon ensured that it was used on ground attack and reconnaissance missions, as well as light bombing. It was also used as a night fighter. With two 1,100-hp Klimov inline engines, the Pe-2 had a top speed of 335 mph at 16,400 feet, and a range of 1,200 miles. Armament consisted of 2,200 lbs of bombs, plus one 12.7-mm and four 7.62-mm machine guns. A development for night fighting, the Pe-3, was introduced in 1943. This had a solid nose with four machine guns, and a shorter canopy with a dorsal turret.

The Russian Ilyushin 2m3 was the best aircraft produced by Russia during the war, and one of the classic military aircraft of all time. Designed only for ground attack, the Il-2 entered service in 1941 as a single-seater. Armament comprised a bomb-load of up to 1,325 lbs, or eight 82-mm rockets and 880 lbs of bombs, plus two 20-mm cannon and two 7.62-mm machine guns. It was soon realised that some rear defence was necessary, however, and a second crew member was added in the Il-2m3 of late 1942. The gunner had a 12.7-mm machine gun. The most important factor in the Il-2's construction was the manufacture of the whole of the forward fuselage from some 1,500 lbs of armour plate.

The American Bell P-63 Kingcobra. The Kingcobra was a development of the P-39 Airacobra, and the first prototype flew on December 7, 1942. The type did not suit American requirements, however, and most of the 3,303 aircraft built were supplied to the Free French and Russian air forces under Lend-Lease. The Russians in particular found the aircraft just right for their low-level tactics, as had been the P-39, and were very pleased with the machine. Armament comprised one 37-mm cannon, four .5-inch machine guns, and up to 1,500 lbs of bombs. Speed was 410 mph. An unusual design feature was the fact that the engine was behind the pilot, driving the propeller via an extension shaft, in an effort to increase manoeuvrability.

Land warfare

The weapons with which the chief combatants began World War II were in many cases linear descendants of basic types that had seen service at the end of World War I.

Tanks and aircraft had been used together for combined attacks in 1918. They were used again at the beginning of World War II by the Germans in the novel tactical doctrine which became known as "Blitzkrieg".

These tactics, employed between 1939 and 1942, concealed the fact that the Germans still relied on horse-drawn vehicles and the marching power of their infantry to consolidate the gains won by the combination of tanks, Stuka dive-bombers, and motorised grenadiers.

Fortunately for the Germans, their enemies were either paralysed by "stand and fight" orders, or restricted to static linear defences. Tactical air strikes on the major lines of communication and airfields by dive-bombers and medium bombers added to the confusion which had been caused by feint attacks on selected points in the enemy's lines.

Then suddenly the full weight of the armoured assault would fall on a comparatively small sector of the front – the *Schwerpunkt* (point of main effort) of the attack.

Once the tanks and motorised infantry had broken through, they plunged into the open country headed by their armoured cars and motorcycle reconnaissance units. With them flew the Luftwaffe, acting as flying artillery. In great enveloping movements these forces would trap their enemy in pockets.

It was by concentrating their armour into Panzer divisions that the Germans gained an advantage over their opponents. For in both France and Russia their tanks were outnumbered and in some cases outclassed. But both France and Russia used tanks as a support arm for their infantry and scattered them along the front in troop- and squadron-sized units.

In the West the Germans had the added advantage of the excellent metalled roads which led deep into the enemy's

▽ *The radio operator of a* Panzerjäger *"Marder III" gives covering fire with a captured Russian PPSh M1941 sub-machine gun. His companion is changing the magazine on his 7.92-mm MG 34 machine gun. The crew are members of the* Waffen-*S.S., and are wearing the characteristic camouflaged uniforms and caps of that organisation.*

territory. In a few days' hard driving they could capture enough urban and industrial centres to make the continuation of the war impossible for their adversary.

In Russia they encountered appalling roads, vast spaces, and an extreme climate. The enormous size of the Soviet Union, its manpower, and its resources meant that it could take losses which would have crippled any Western nation. The Germans believed they were close to victory in 1941, and Hitler boasted "We have only to kick in the door and the whole rotten structure will come crashing down."

But in the winter, outside Moscow, the Blitzkrieg ran out of energy, and in sub-zero temperatures the Russians turned on their aggressors. In 1942 in the Ukraine the Germans again went on the offensive, but this time the Russians traded space for time, evading encirclement by their retreat to Stalingrad.

Here the German 6th Army was ground down in street by street, and even room by room, fighting. It was the antithesis of "lightning war".

In 1943 the Germans made one more major attack in the East, at Kursk in central Russia. Operation "Citadel" culminated in the biggest tank battle in history, and showed that deep field fortifications could halt the Blitzkrieg. Victory came with the Russian counter-attack which followed the German assault. But Kursk is unique, for the "Lucy" spy ring had supplied the Russians with almost all the German plans.

In anticipation the Russians laid out a system of defences in three lines. The first was up to three miles deep, the second was seven miles behind this, and the last line was 20 miles in the rear. The front was covered with a density of 2,400 anti-tank and 2,700 anti-personnel mines per mile, and the system supported by 6,000 anti-tank guns, 13,000 guns, and 1,000 rocket-launchers.

△ *A German soldier armed with a Kar. 98k fitted with a ZF 41 telescopic sight. The standard of German sniping remained high throughout the war, but the sniper could expect little mercy if his position had been spotted – he could be "punched out" by tanks using their main armament. The soldier is wearing the reversible winter uniform introduced in the winter of 1942-43. The button visible on the sleeve near the elbow was for attaching coloured bands which served to identify friendly forces in forward areas.*

▷ *A German officer, a holder of the Knight's Cross, briefs his N.C.O. as they sit on the parapet of a mortar pit. In the foreground the crew of a 8.1-cm mortar are pulling a cleaning rod from the barrel. The mortar could be dug in, or sited in "dead ground", which did not affect its plunging fire and gave some protection from small arms fire. A well-served mortar could give fast, accurate fire, and was particularly effective in mountainous country.*

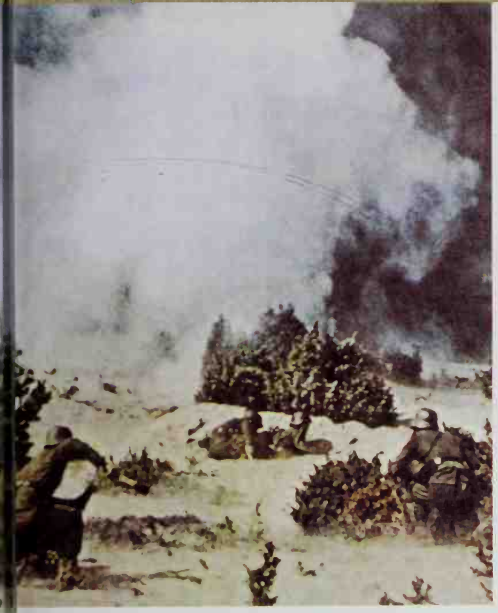
◁ *An MG sited in its curved weapon pit. The shape of the trench allowed the gunner to fire on an almost 360 degree front, while his crew could reload and feed in the ammunition belt. Also visible in the picture are two clips of rifle ammunition, and two St. Hgr. 24 stick grenades for close defence.*

◁▽ *Unusual transport for the Blitzkrieg: a rifle section rides on two railway maintenance cars in Yugoslavia. Behind the officer (checking his map) is the machine gunner, with his gas cape case on his chest.*

▽ *A paratrooper sprints forward with his MP 40 sub-machine gun. Known incorrectly to the Allies as the Schmeisser, the sub-machine gun was first issued to specialist troops, but was later carried by army N.C.O.s.*

◁◁ *The contradictions of the German Army in the Blitzkrieg period. In the foreground 8-ton half-track Sd.Kfz. 7 prime movers tow 15-cm guns, but in the background teams of horses and limbers can be seen with 10.5-cm* le. F.H. *18 howitzers.*
◁ *An MG 34 on an anti-aircraft tripod mounting. It is fitted with a 50-round drum magazine, and an A.A. ring sight.*

◁▽ *A Junkers Ju 52 transport aircraft during the first winter in Russia. A section has piled its arms and waits to load stores.*
▽ *Happier days in Russia. German troops have debussed from their trucks after coming under fire during the advance in the summer of 1941.*



About 40 miles behind this system, the front reserves, ready to go over to the counter-offensive, had dug their own entrenched defence line.

Before considering Germany on the defensive, it is worth examining the partisan war behind her front line. The mountains, swamps, and forests of Europe could conceal large numbers of men (and women), and could only be approached along a few restricted roads. From these natural havens the *maquis*, partisans, and other resistance groups could attack the Axis lines of communication, and even overwhelm small local garrisons.

In the ruthless war in the East it was difficult for civilians to remain neutral when each side executed or murdered its opponents on capturing new territory. As the war swung against the Axis, the partisan bands expanded to become units based on regular army lines.

The prospect of liberation helped the partisan cause, though some men joined through self-interest and self-preservation in the later years.

In the mountains of Yugo-

◁◁ *German gunners on an island on the North Sea coast traverse their gun. The position is draped with camouflage nets, a precaution which became increasingly necessary as the Allies gained air superiority.*

◁ *Under cover of smoke, German troops rise from their positions to go in to the attack. This picture was taken on a training exercise mounted before the troops went up the line to the Eastern Front.*

▽ *An American soldier examines a knocked out Sd.Kfz. 173 "Jagdpanther". It has been hit in the centre of its tracks and has then caught fire. The "Jagdpanther" was probably the finest S.P. tank destroyer to be produced by the Germans. It combined the powerful 8.8-cm anti-tank gun with a low silhouette and the successful Panther chassis.*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◁◁ *U.S. troops with a battered and abandoned* "Sturmtiger". *This vehicle was developed after the German experience of fighting in Stalingrad. The army called for a 21-cm howitzer for close support against difficult targets. The* Raketenwerfer *61 L/54, a 38-cm rocket projector, was finally proposed and about ten Tiger tanks were converted to take this unusual weapon.*
▽ ◁ *A mixed group of Wehrmacht and* Waffen-*S.S. personnel riding in an N.S.U.* Kettenkrad *half-track motorcycle. Developed for airborne forces, it could tow light field guns or weapons containers.*

◁ *An officer stands on the hull and hands down the ammunition as the crew reload a German self-propelled gun. They are wearing the field grey uniform with double-breasted jacket peculiar to tank destroyer and S.P. assault gun crews.*
▽ *A 7.5-cm* Sturmgeschütz *40 grinds past a* Waffen-*S.S. trooper. The assault gun crew have fixed a large wooden box to the rear deck of their vehicle to stow their kit.*

▽ *German assault pioneers operate their* Kleif-*type manpack flame-thrower.*

▷ *Watched by an intrigued member of an assault gun unit, a pioneer readies his equipment. Note his asbestos gloves and heavy one-piece overalls. On the Eastern Front* Flammenwerfer *crews drew higher pay than ordinary pioneers. Their pay books, however, described them as "Engineers, 1st Class", because of the Russian tendency to give them a "fitting" execution.*

slavia and the Massif Central of France, German and Axis forces used artillery, tanks, and aircraft in vast cordon and search operations to root out resistance.

In defence, the Germans drew on the expertise that had built the pre-war *Autobahns*. The Todt Organisation erected the Atlantic Wall, the *Westwall* or Siegfried Line, and the Gustav and Gothic Lines. To these the Wehrmacht added field fortifications and obstacles.

Parts of these systems remain intact today, mute tribute to the German engineers and their conscripted labourers.

The *Westwall* was the most developed line. Massive concrete bunkers were sited in depth along the border with France, so that each could give supporting fire when they came under attack. The bunkers were gas-proof, and equipped with quarters for their garrisons, their own power supply, and weapons which included machine guns, mortars, and field and anti-tank guns. They were dug into hillsides and railway embankments, disguised as farm buildings and houses, and had large trees transplanted and positioned on or around them. In addition, belts of mines, barbed wire, and dragon's teeth anti-tank obstacles scarred the German fields along the French border.

In 1939 the *Westwall* had a sufficiently awesome reputation to discourage the French from attacking. But defences are only as good as the troops manning them, and when the Germans attacked the outworks of the Maginot Line at Sedan in 1940, they hit an area held by low grade reservists.

The paratroops who held the Gustav Line at Monte Cassino blocked the Allied advance in 1943 and 1944 longer than the elderly reservists and sailors who manned the neglected em-

placements on the *Westwall* in 1944 and 1945.

Fixed defences are like river lines–once they are breached they cease to be of any value, for the whole system can be rolled up from behind. Given the time, the men, the means, and most of all the will, any system can be breached if its garrison remains passively defensive.

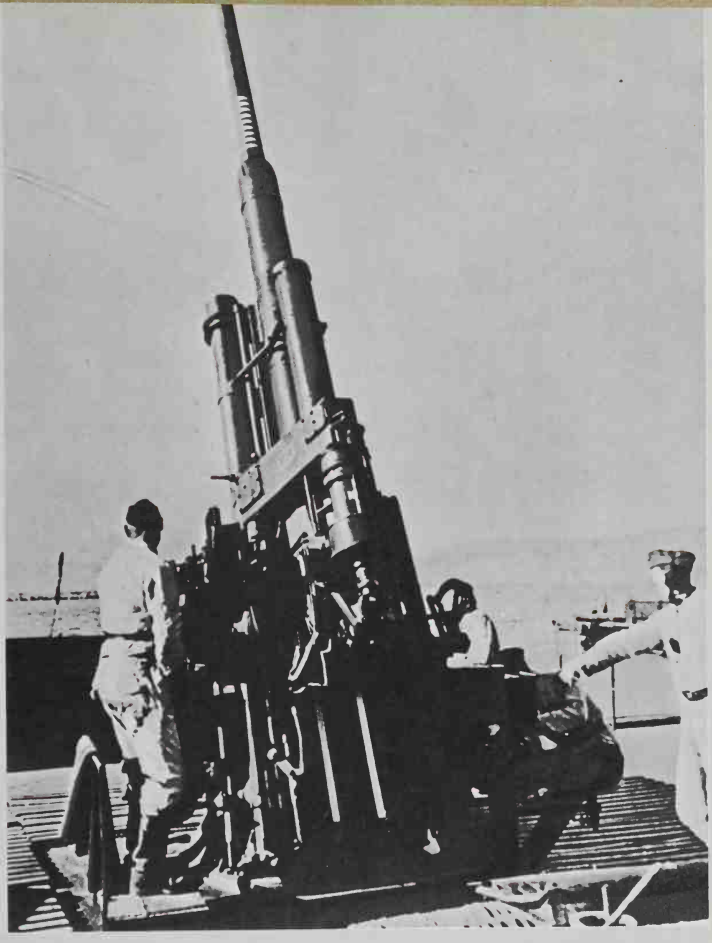
General George Patton visited the *Westwall* after its capture and was surprised by the limited fire-power of some of the emplacements. He learned that the Americans had been able to knock them out by smothering the embrasures with small arms fire and placing a dynamite charge against the back door, or by using self-propelled 155-mm guns at short range. "At three hundred yards the 155 shell will remove a pillbox for every round fired," he explained.

For the British and their allies the early years of the war were grim times, distinguished only by the victories over the Italians in Abyssinia and North Africa, and a series of fighting retreats from Europe. Despite this, they retained cohesion in the face of attacks by the most professional army the world had known. Indeed on Crete they came close to defeating the German paratroop attack, made by a force that Churchill described as "the flame of the Hitler Youth Movement... an ardent embodiment of the Teutonic spirit of revenge for the defeat of 1918".

In retreat the British formed all-arm *ad hoc* units which took

◁ *A 2-cm* Flakvierling *38 mounted on a half track 8-ton Sd.Kfz. 7. With one man on watch the rest of the crew relaxes.*
▷ *A 10.5-cm anti-aircraft gun on a coastal mounting.*

▽ *An Sd.Kfz. 251 half-track, mounting a* PaK *36/37 3.7-cm anti-tank gun.* Panzergrenadier *platoon commanders were issued with this vehicle to give them increased battlefield firepower.*
▽ ▷ *A 3.7-cm anti-aircraft gun with 14 kill rings on the barrel. Throughout the war the Germans were capable of putting up a heavy anti-aircraft barrage at very short notice.*



▷ *A Volkswagen Kdf. 82* Kübelwagen *outside Bizerta in January 1943. The* Kübelwagen *was the German equivalent of the Jeep, but had the added advantage of an air-cooled engine.*

▽ *A "brewed up" Panther* Ausf. *A. It has been strung with chicken wire for attaching camouflage garnish.*
▷▷ *A British Army training poster. Lecture rooms and barracks displayed this type of poster which served both to exhort and instruct.*

Training in Platoon weapons RIFLE

Firing from low cover

A good fire position should.....

1. have a good field of fire
2. permit free use of weapon
3. be inconspicuous

4. be bullet proof

If barrels permit

A good soldier makes a bad target !

5. be easy to move from

▷ *A British gun crew in Egypt in June 1940. After the gas attacks of World War I, all the combatants were trained and equipped for gas warfare.*
▷ ▷ *"Wasp" flame-throwers demonstrate their equipment. The Wasp was one of the many versions of the basic tracked Universal Carrier.*
▽ *British Grant tanks and armoured cars in North Africa, during a briefing.*
▽ ▽ *A 6-pounder anti-tank gun* en portée. *Carried like this, the gun had greater mobility, and could be brought up quickly to provide an anti-tank screen.*
▷ ▽ *A Vickers machine gun crew during a drill in 1940. The sergeant is about to give the signal to fire, which will be passed on to the gunner by his Number Two with a tap on the shoulder.*
▷ ▷ ▽ *British Covenanter Cruiser Tanks Mk. V during training in southern England. Although it did not see much action, this type served extensively as a training vehicle.*

the name of their commanding officer. Later the Germans adopted the same system, calling the units *Kampfgruppen*. Finally they made these formations a regular feature of their operations, and *Kampfgruppe* "Peiper", part of the 1st S.S. Panzer Division, featured prominently in the Ardennes offensive.

All the combatant nations taught small unit tactics as drills. This meant that just as a man could strip and clean his weapon almost without looking, so in an emergency a corporal would instinctively use all the available fire-power in his section.

All drills and plans, however, have to be adapted to circumstances, and from the Corporal to the General there was always a feeling that with a few more resources the job would be easier.

For lack of hand grenades the "bombers" in a house clearing team would have to rake a room with sub-machine gun fire. In North Africa each side tried to conceal its tank strength, or lack of it, by using soft skinned vehicles to stir up dust clouds to resemble tanks on the move.

North Africa was a proving ground for British generalship and Allied co-operation. The Army had its revenge at Alamein, while the Americans armed, supported, and later rivalled their battle-wise Allies.

After the Allied victory in Africa, the war in Europe was punctuated by a series of major amphibious operations, which reached a climax in the D-Day landings in Normandy.

Experience at Dieppe, in Sicily and in Italy prompted the British to develop a series of close support weapons and specialised armour. Batteries of rockets fired from special landing craft would saturate a beach area 750 yards by 160 with 5-inch projectiles.

With the first wave of landing craft an array of armoured "Funnies" rumbled into action against the obstacles and enemy emplacements. They carried bridges, flame-throwers, demolition charges, rolls of hessian matting to provide a path over the sand, and flails to explode the minefields. Some conventional tanks swam ashore using flotation skirts and a special drive off the engine.

After the beach had been secured, flotillas of D.U.K.W. amphibious trucks brought men and stores to inland parks.

A huge range of landing craft

▷ *On the 2nd Baltic Front, January 1945: Soviet "Katyusha" rockets are moved up. Lacking the accuracy of conventional artillery, they were, however, an efficient psychological weapon, with a high blast effect.*

▽ *A German soldier stacks captured Russian 14.5-mm anti-tank rifles. Single shot weapons, they could penetrate 1.2 inches of armour at 500 yards.*
▷ ▽ *The Russian armoured train "Ilya Muromets" in the fighting near Warsaw in 1944. The train is armed with T-34 turrets. In the foreground the railway sleepers have been torn up by a German track demolition device.*

and prefabricated equipment enabled the Allies to establish port facilities and build airstrips. Later, at the assault river crossings of the Rhine, and operations in Walcheren and northern Italy, tracked landing vehicles which had been developed for the island hopping campaigns in the Pacific were used.

Fighter, medium, and even heavy bombers provided tactical support with awesome effects, and in the early days of the landings warships put broadsides into targets as small as a football pitch.

For all these resources and originality, the western Allies never produced tanks which combined an efficient gun with adequate armour. Though their tanks were faster and more mobile than later German types, they were easy to knock out, and the Sherman was given the grisly nicknames of "Ronson" and "Tommy Cooker" by the German gunners because of its tendency to catch fire when hit.

With the complete control of the air by the Allies, the Germans were forced to operate by night. Their anti-tank guns were moved up, sited, and camouflaged in the darkness, but in the "battle of the hedgerows" in Normandy they knocked out the Allied tanks which had moved up freely during the day.

Yet for every 8.8-cm gun lurking in the *bocage*, there were batteries of British and American guns. In the 25-pounder, the British and Allies had a weapon which could serve in either an anti-tank or a conventional rôle. The Americans co-ordinated their fire through a Fire Direction Centre, which enabled them to fire Time on Targets barrage, in which the shells of 100 or more guns would land on the same target at the same time.

In the latter half of the war the Germans still retained a high standard of artillery marksmanship by use of sound and flash location troops and by intercepting radio traffic.

Impressive as an artillery barrage might seem to those who fired or received it, the mortar and mine emerged from the war in the West as among the most efficient killers.

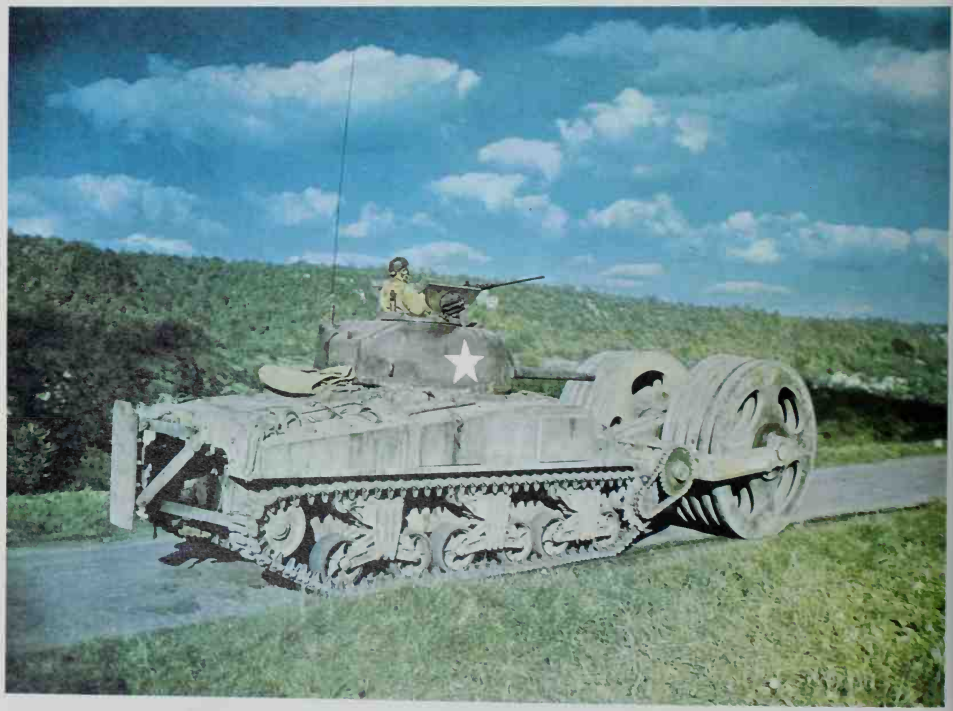
Yet however efficient the weapons, they still needed men to crew or operate them. The generation of officers who held high command in World War II had served in the previous war as junior officers, and from that experience had learned the importance of leadership and morale.

Men were trained to work as a team, from the section with its Bren gun or L.M.G. to the corps or army group with all its supporting arms. In the end, all types of attack are based on the "fire and movement" principle in which the enemy is pinned down by fire, while the assault group moves into a position from which it can rush forward when the fire lifts and overcome the enemy. In any variant of this manoeuvre each half of the team, whatever its size, has to understand its rôle and carry it out effectively.

For the Allies the war was a crusade to liberate occupied Europe. For the Germans the war with Russia was another crusade, to save Europe from the "Slavic sub-humans". The intense ideological emotions generated by the conflict help,

▷ *German officers examine an M3A5 tank knocked out by a Pzkw VI Tiger in North Africa.*
▽ *A Sherman tank fitted with rollers to detonate anti-tank mines. If covered by fire, a minefield could not be lifted by hand, and had to be cleared by special armoured vehicles.*

△▷ *Men of the 83rd Division of the U.S. 9th Army prepare to fire captured German 28-cm rockets on a position in a factory on the east bank of the Rhine. The rockets had a range of 2,300 yards and carried a warhead of 110 lbs of T.N.T. or Amatol.*
▽▷ *A U.S. 81-mm mortar in action in France. The officer is checking the ranges over the field telephone.*
▽▷▷ *A park of captured German 7.5-cm anti-tank guns in France.*



▷ *An M4 Sherman fitted with a flame-thrower in place of the bow machine gun.*
▷▷ *A soldier of the U.S. Chemical Warfare Service with his M1 flame gun. Allied flame-throwers, unlike German weapons, could project unignited fuel through a bunker embrasure, and then follow it with a burst of flame.*

▽ *A height-finder crew during training in the United States.*
▷▽ *A demonstration of an M1 flame gun against a bunker. If the occupants were not caught in the flames, they were overcome when the oxygen inside the emplacement was exhausted.*

in part, to explain the courage, fanaticism, and brutality of the fighting.

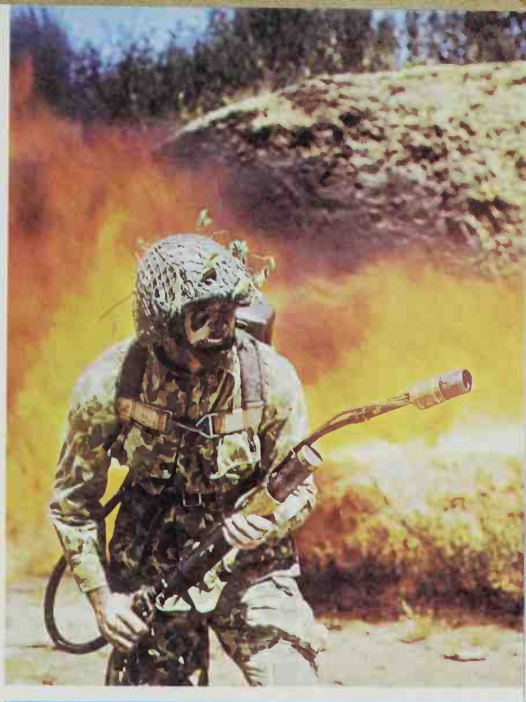
In the Winter War with Finland in 1939, neither the Russian soldier nor his equipment had proved superior to the Finns. It was only by massed attacks that they had broken through the Mannerheim Line, and at heavy human and *matériel* loss forced an armistice on the Finns. Encouraged by this demonstration of military ineptitude, the Germans believed that their superior tactics and equipment would take them to Moscow before winter.

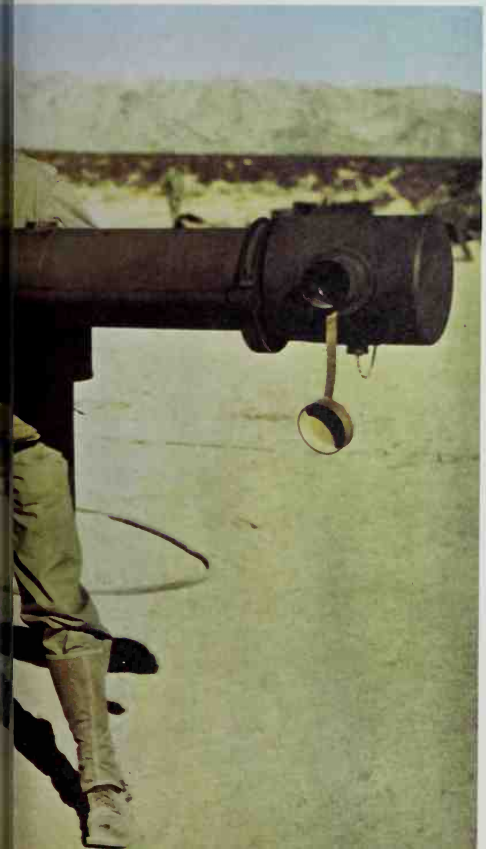
Defending his own homeland, the Russian soldier showed a toughness and stubborn determination which came as a considerable shock. Machine gunners would hide up, and long after the tanks had passed, open fire on the soft-skinned supply vehicles following in the rear.

When the Panzers had encircled pockets of Russian soldiers some would try to fight their way out, or go to ground as partisans.

In the early months of the war, it was not the soldiers but their leaders who were to blame for the huge Russian losses. Counter-attacks were badly prepared, and the men were sent on one-way charges in closely packed lines, which provided ideal, and ultimately sickening, target practice for the Germans. Even the T-34, whose appearance produced a "tank terror" among the Germans, was squandered in penny-packet tactics.

By the time the German armour had reached the approaches to Moscow, its support and supply echelons were bogged down miles to the rear in the mud and slush of the Russian autumn. The only advances could be made by in-





△ *Caught at the wrong end of a rifle. Two U.S. medical corpsmen treat a wounded infantryman during the fighting in Sicily.*

▷ *An American landing craft loaded with wounded after the D-Day landings.*

▷▷ *During training at Edgewood Arsenal, Maryland, troops use M2-2 manpack flame-throwers in a simulated attack. They are covered by two men with Browning Automatic Rifles. Allied flame-throwers were designed to produce a bushy flame which was found to have greater psychological effect.*

fantry on foot. When the winter came, it was against these exhausted and underclad men that the Russians launched their fresh Siberian troops. Not only were they fresh troops, they were equipped with weapons and vehicles adapted to conditions of severe cold, and dressed in warm quilted uniforms. The threat to Moscow was averted, but the Red Army lacked the logistic facilities to permit them to follow up their breakthroughs with their own Blitzkrieg tactics.

In the year following, 1942, the Russians were again defending a city, but this time it was street fighting. At Stalingrad the lines were so close that the Luftwaffe was unable to provide support for fear of hitting their own men. The Russians fought with a determination that at first enraged and later terrified their opponents. Small "storm groups" would make their way through the sewers and gullies which led up from the river, and appear behind the German lines. Other groups would hold out in industrial plants and warehouses and fight until their ammunition was exhausted. In addition to these groups, snipers added to the hazards of the Germans.

When the Russians came to launch their counter-attack at Stalingrad, they preceded it with a massive artillery bombardment. What they lost in accuracy they made up for in density. The weaker units like the Italians and Rumanians were subject to fire

The "Fire and Movement" team in action; the rifleman moves in to occupy the ground.

▷ *U.S. infantrymen enter the village of Marigny in France. They are festooned with bandoliers of ammunition, and the man in the foreground has a rifle grenade fitted to his M1 Garand semi-automatic rifle.*

▷▷ *In the* bocage *fighting, American soldiers dash across an exposed road under rifle fire. In the background is a knocked out Skoda 175 wheeled tractor, and in the foreground a Panther tank.*

▽ *Street fighting in the French village of Saintenay. American soldiers approach cautiously after throwing a smoke grenade to conceal themselves from any enemy remaining in the houses.*

△ *The culmination of "Fire and Movement" on an international scale. A shattered 8.8-cm gun in the square in front of the Reichstag in Berlin, on May 7, 1945. The city had been hit by Bomber Command and the U.S. Army Air Force during the war, and blasted street by street by the Red Army in its battle for the capital of the Reich.*

from 13,500 guns and mortars of all calibres, plus demoralising salvoes of 130-mm Katyusha rockets with their 48-lb high explosive warheads.

The same spirit which had characterised the Red Army in defence now carried it forward in attack. Tank riding infantrymen, armed with sub-machine guns, overwhelmed what remained of the Axis infantry. Unlike the lavishly equipped Western armies, the Russians practised a stricter economy with their equipment and supplies than they did with the lives of their men. Attacks were sometimes sent in so that the Germans would open fire and so reveal their hidden gun emplacements which would then come under counter-battery fire.

In the last days in Berlin this same ruthlessness showed in the Russian determination to take the capital. 203-mm howitzers were brought up to blast buildings at point blank range. Guns were moved up with each advance, positioned in any available open space and Berlin was burned and blasted with white phosphorus and high explosive.

In 1945 the tactical lessons of nearly seven years of fighting were still true. The Blitzkrieg concept of deep penetration by massed armour and motorised infantry had returned to plague its original practitioners. The Germans were faced in the West by Allied armies which were completely mechanised and supported by a formidable air force. In the East were tanks rivalled only by the latest German types, in numbers undreamt of by the Panzer generals even in the early days of the war.

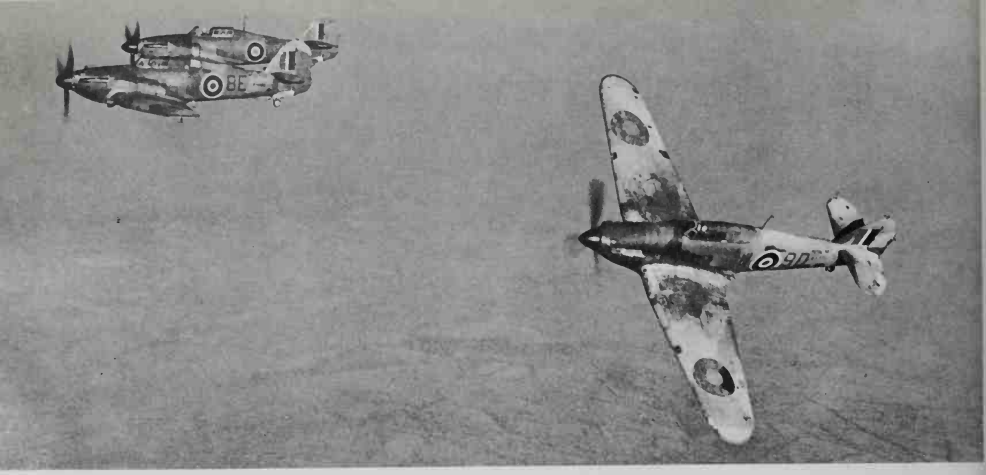
But from what remained of Germany's airfields and *Autobahns* the world's first operational jet fighters and bombers made a brief and spectacular appearance over the front. 1,115 V-2 liquid-fuelled rockets had fallen on Britain, and four months after V.E. Day the first atomic bomb fell on Hiroshima. The victor of the next war would be the survivor who recovered first.

Air warfare

Although aircraft had been used in previous wars, notably World War I, the Spanish Civil War, the Japanese invasion of China, and the Italian campaign against Abyssinia, it was only in World War II that air power began to show its true potentialities.

This is not to say that the rôle aircraft might play had not been foreseen by the theorists of air power. Men such as the British Trenchard and Sykes, the Italian Douhet, the American Mitchell, and the Russian/American Seversky had all devoted much of their lives to anticipating the rôle of the bomber fleets they imagined would be the ultimate "strategic" weapon in the next war. But they were wrong. Estimates of hundreds of thousands dead in a few days of concentrated bombardment were proved erroneous in the London "Blitz" and in the late-war Allied bombardment of German cities: the power of conventional high explosive bombs had been overestimated very considerably, and the will to resist on

Δ *A Supermarine Spitfire VC of No. 303 (Polish) Squadron, R.A.F. Fighter Command. Noteworthy are the Polish chequer on the nose, the 18-inch wide "sky" band round the rear fuselage (indicating that the aircraft was a day fighter), the spinner in the same colour, and the 6-inch wide yellow stripe along the wings' leading edges, introduced in September 1941. The Spitfire proved a superlative and adaptable weapon right through the war and was flown with very considerable success by the aggressive Poles.*



the part of the civilian population underestimated even more. The men left at home had many of them served in the trenches in World War I, and therefore knew how to survive intensive bombardment. This is not to say that bombing was not successful in the strategic rôle–an assessment of the Allies' destruction of the German transport, synthetic rubber, and petroleum industries will provide ample proof of how effective this was in finally humbling the Third Reich. The Allies' mistake lay in realising too late that these were the true strategic targets against which they should be directing their bomber efforts. It was not until the advent of nuclear weapons, and the atom bombings of Hiroshima and Nagasaki, that air power became a true strategic or grand strategic weapon.

Be that as it may, aircraft played an increasingly important part in the war in the European Theatre of Operations (E.T.O.). When the war started, Germany possessed a decided superiority in the air. This does not imply that all her aircraft were superior to those in Allied service, but that her aircraft were entirely adequate for the tasks intended for them, and that the tactics to be used had been thought out and practised carefully, in the Spanish Civil War and in peace-time Germany. First line strength was some 4,840 (including 1,750 medium bombers and 1,200 fighters) with a reserve of similar numbers and an aircraft industry capable of turning out 1,100 aircraft per month.

Great Britain had a similar number of aircraft, but most of these were obsolete fighters and obsolescent bombers, with only about 1,000 modern fighters available. But this last figure was the important one, as the country was geared to the defensive. Here the fighters, aided by radar, could defend the nation in the difficult days before an adequate strike force could be built up. More importantly, better designs were on the drawing boards and would be in action before Germany realised the error of her ways in planning only for a short war.

France's position in the air was very poor. In numbers her air force was weak, with only some 1,400 combat aircraft. For during the 1930's France had let the equipment of her air force gradually decline in standard, and it was only when it was too late that she realised that an up-to-date air force was necessary in a modern war. By then it was too late, and although some excellent designs were produced

Although its design was older than the Spitfire's, the Hawker Hurricane also proved a worthy fighter, shooting down more aircraft in the Battle of Britain than all other British fighters combined.

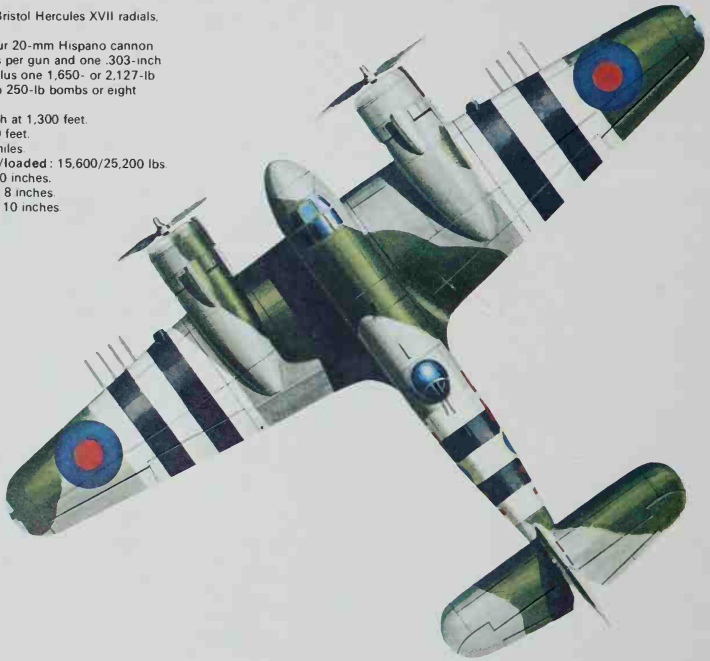
◁ *The Royal Navy's version – Sea Hurricane IA.*

▽ ◁ *The Hurricane IID, armed with two 40-mm cannon. This saw action for the first time in North Africa on June 6, 1942, and soon became the scourge of Axis armour.*

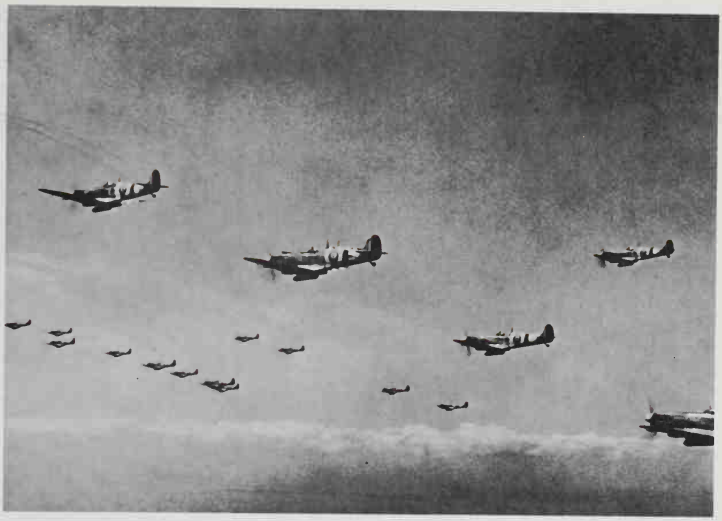
▽ *Probably the best heavy bomber of the war – Britain's Avro Lancaster. This is a Mark I of No. 50 Squadron, R.A.F. Bomber Command. The major failing of the type was lack of adequate defensive armament: few Lancasters were fitted with ventral guns, and the rest were all .303-inch ones.*

The British Bristol Beaufighter Torpedo Fighter X

Engines: two Bristol Hercules XVII radials, 1,770-hp each.
Armament: four 20-mm Hispano cannon with 283-rounds per gun and one .303-inch Vickers K gun, plus one 1,650- or 2,127-lb torpedo and two 250-lb bombs or eight 60-lb rockets.
Speed: 303 mph at 1,300 feet.
Ceiling: 15,000 feet.
Range: 1,470 miles.
Weight empty/loaded: 15,600/25,200 lbs.
Span: 57 feet 10 inches.
Length: 41 feet 8 inches.
Height: 15 feet 10 inches.
Crew: 2.



▷ *Spitfires of the Allied air armada* en route *to Normandy in 1944. Already in service at the beginning of the war, the Spitfire had been developed from the Mark I eight .303-inch machine gun, 365 mph interceptor fighter into the Mark XIVE two 20-mm cannon- and two .5-inch machine gun- (plus 1,000-lb bomb-load) armed 448 mph fighter-bomber. During this time the loaded weight of the aircraft had increased from 5,784 to 8,500 pounds and the horsepower available from the Merlin III (1,030) had increased to that of the Griffon 65 (2,050). Yet the handling characteristics of the machine altered relatively little, with control in roll still very heavy at high speed.*



▽ *Possibly a propaganda photograph faked up by the Germans: an early mark of Spitfire flashes past the nose of a Heinkel 111 medium bomber.*

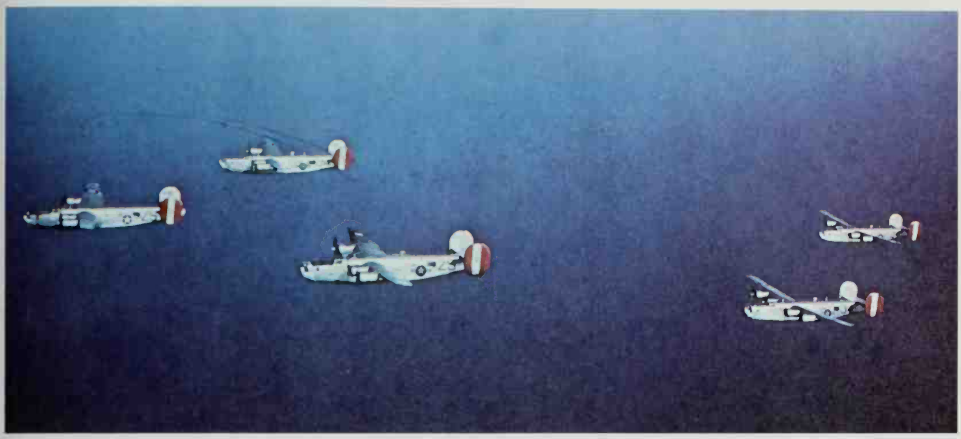
▷ *Part of the Allied day and night bomber offensive: Boeing B-17F's of the U.S. 8th Air Force approach the Dornier factory at Meulan in France above cloud cover. Combat experience with the F model led to the G, which had a twin .5-inch chin turret to counter the German fighters' favourite ploy, the head-on attack.*

▷▷ *The other mainstay of the American heavy day bomber offensive: Consolidated B-24's cross the North Sea on their way to Germany. The aircraft belong to the 458th Bombardment Group of the 2nd Air Division's 96th Combat Wing.*

▽ *Result of combat experience: the chin turret-armed B-17G.*

▽▷ *Britain's first four-engined heavy bomber, the ungainly Short Stirling, posed beside a Bf 109 on a German airfield.*

▽▽▷ *The excellent Wellington.*



in 1939 and 1940, few examples had attained operational status. Training was good, however, and despite the drawback of their equipment, French pilots gave a good account of themselves in the air.

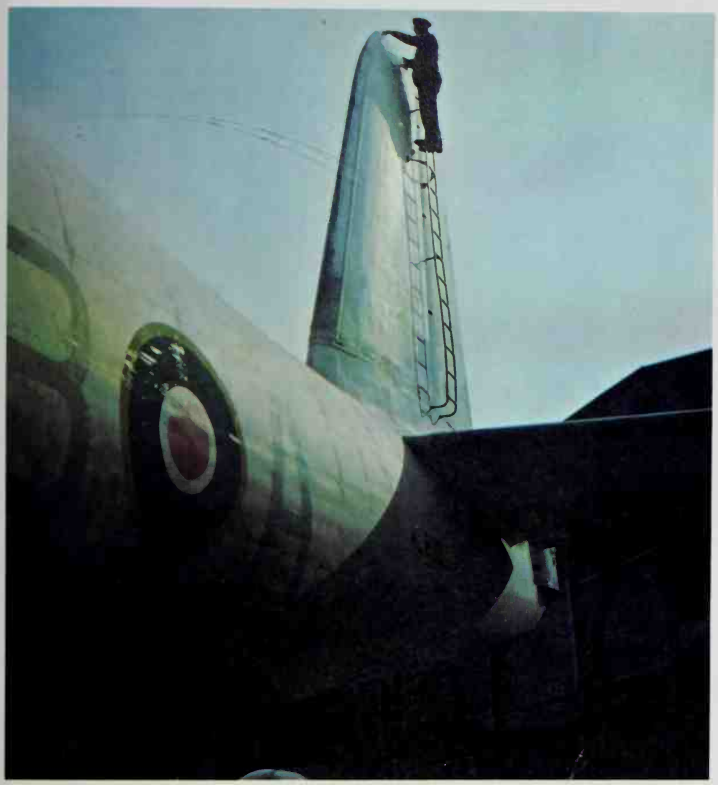
Finally, of the major powers involved in the war's early stages, there was Italy's air force. Here, as with the Germans, Italian pilots had the decided advantage of combat experience in the Spanish Civil War, but their high command had drawn virtually all the wrong conclusions from the campaign. Biplane fighters were still considered adequate, and medium bombers sufficient for Italy's aims. With some 5,000 aircraft (including reserves), however, the Italian Air Force was numerically strong. The total included some 1,000 each of bombers and fighters, and 750 reconnaissance and transport machines.

At this time, the distinction between the various types of aircraft was fairly rigid: the fighter was purely a defensive machine, intended to oppose the enemy's bombers; the light bomber was intended to support ground operations, with reconnaissance aircraft providing the information on which they could act; medium bombers operated well behind the enemy's lines; and maritime aircraft undertook reconnaissance and attack tasks at sea.

The Germans, as is now well known, were the best exponents of this almost purely tactical concept of air war. Their experience in the Spanish Civil War had confirmed their earlier theories that the use of aircraft as flying artillery for their rapidly-advancing ground forces was the best way to ensure success. Combined with this was the very important point that to operate at low level in direct support of the army, it was necessary to provide totally effective fighter cover. Here the Germans excelled–again, combat over Spain had led them to abandon the rigid formations that had characterised World War I operations, in favour of a loose basic formation of four aircraft (*Schwarm*), which divided into two pairs (*Rotten*) of lead pilot and wingman. This ensured the right combination of flexibility and combat safety, with the wingman protecting his leader's rear.

This then was the origin of the aerial side of the "Blitzkrieg", which swept all before it during the Polish campaign in 1939, the sea- and air-borne invasions of Denmark and Norway in 1940, and the attack on the Low Countries and France, again in 1940. Surprise and accuracy once again proved their paramount importance.

The Germans came unstuck in



△ ◁ *Classic ground-attack fighter, the Hawker Typhoon. Armed with four 20-mm cannon and eight 60-lb rockets, this was more than a match for any German tank of World War II.*
▽ ◁ *The magnificent Bristol Beaufighter strike-fighter. Heavy but immensely strong, the Beaufighter could carry a powerful offensive load – used in the anti-shipping rôle, its eight rockets were the equivalent of a broadside from a 6-inch cruiser.*
△ *The cockpit of "General Ike", a B-17G of the 401st Bombardment Group, 1st Combat Wing, 1st Air Division, christened by Eisenhower in April 1944.*
◁ *Fin and rudder of a Short Sunderland III anti-submarine patrol aircraft.*
▽ *Hawker Typhoon.*

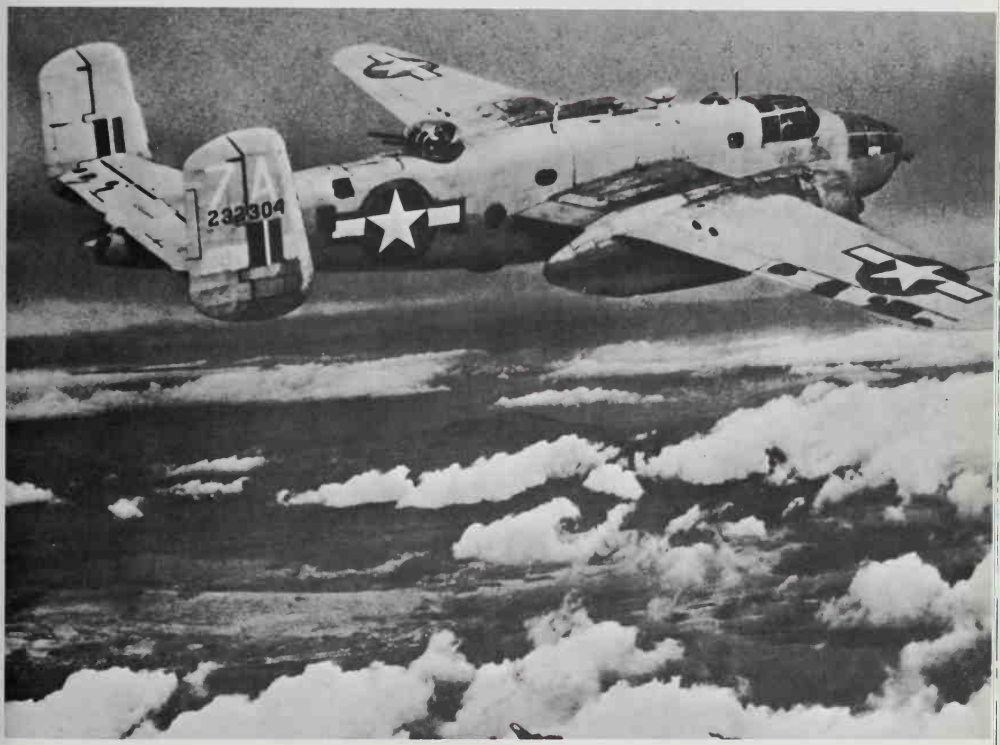
the Battle of Britain, however. No longer was the Luftwaffe acting as a tactical adjunct of the army at short and easily-controlled ranges, but rather attempting to fulfil a purely strategic rôle. Admittedly, the Battle had started with what might be considered "grand tactical" operations against the Royal Air Force, in an effort to clear the way for the army. But this soon gave way to the strategic efforts of the "Blitz". The Luftwaffe's task was an impossible one: the bombers had the range to attack most of the worthwhile targets in Great Britain, but being designed for a different type of mission did not have the bomb-load to cause mortal damage. But the bombers were also incapable of defending themselves by day, and thus required fighter escort. Germany's fighters, however, had been designed for short range missions. Even operating from forward bases on the Channel coast, the Bf 109's and 110's could loiter over southern England for only 30 minutes, and over London for only ten. The offensive was thus doomed to failure. The night Blitz posed fewer problems, but again the tonnage dropped was too small to break the Londoners' will, and night navigation became very difficult after the British had devised means of disrupting the German radio navigation systems.

British results in the early stages of the Battle of Britain were not particularly good, as a result of the pilots' lack of combat experience and an over-adherence to rigid formation attacks. As the battle continued, however, the lessons of experience were assimilated, and the looser German tactical formations adopted. Thus when the British went over to the offensive, launching fighter sweeps over occupied France in 1941, the success ratio was quite good. The range of fighter aircraft was still too low for genuine offensive missions, and strenuous efforts were made by both the British and the Germans to develop droppable fuel tanks to extend fighter ranges. As R.A.F. Fighter Command began to take the war to Germany, Bomber Command was also stepping up its efforts – with notable lack of success. For as with the Germans' Blitz bombing, the British were forced to

◁ ◁ *The best Allied fighter of the war: the magnificent North American P-51D long-range fighter and fighter bomber. Originally designed to a British requirement and fitted with an Allison inline engine, the Mustang proved to be a good low level machine. But fitted with a Merlin engine its performance was spectacular. The D model had the adequate top speed of 437 mph, but the excellent range of 2,080 miles (which enabled it to escort bombers to Berlin and back), plus six .5-inch machine guns and in the ground attack rôle up to 2,000-lbs of bombs or ten 5-inch rockets.*

△ ◁ ◁ *The largest and heaviest single-seat and engined fighter of World War II: the massive Republic P-47 Thunderbolt. This is a D model, the first to have a bubble canopy.*

▽ *The North American B-25 Mitchell medium bomber.*



The British de Havilland Mosquito Fighter-Bomber VI

Engines: two Rolls-Royce Merlin 25 inlines, 1,635-hp each.
Armament: four 20-mm Hispano cannon with 150 rounds per gun and four .303-inch Browning machine guns with 500 rounds per gun, plus 2,000 lbs of bombs or 1,000 lbs of bombs and eight 60-lb rockets.
Speed: 380 mph at 13,000 feet.
Climb: 9 minutes 30 seconds to 15,000 feet.
Ceiling: 33,000 feet.
Range: 1,650 miles maximum.
Weight empty/loaded: 14,300/22,300 lbs.
Span: 54 feet 2 inches.
Length: 40 feet $10\frac{3}{4}$ inches.
Height: 15 feet $3\frac{1}{2}$ inches.
Crew: 2.

fly by night to avoid heavy losses, and navigation was so poor that very few bombers even arrived over their intended targets. The only real benefits were the experience gained at this earlier stage in the game, and an increase in civilian morale.

In June 1941, the Germans made their biggest mistake since starting the war and attacked Soviet Russia. The latter had more than 8,000 combat aircraft at the time, and a large proportion of these was destroyed in the first few weeks of war. But they were mostly obsolete or obsolescent, and in a way the Germans did the Russians a favour. Russia was now able to devote her considerable energies to re-equipping her air force with more modern types. These were, until the closing stages of the war, qualitatively worse than contemporary German and other Allied types, but nonetheless entirely adequate for the tasks intended.

The Russians, with no ambitions in the field of strategic bombing, produced virtually nothing but tactical machines such as the superlative Ilyushin Il-2m3 and Petlyakov Pe-2, plus vast numbers of sturdy, well-armed, low-altitude fighters, which cooperated with the army in driving the Germans back out of Russia right the way back to Berlin. Russian aircrew standards never matched the best that the Germans could produce, but contrary to the common impression, by the end of the war Soviet pilots were of a high and capable general standard. German air strength was gradually and inevitably ground away over the Eastern Front.

Back in the West, the strategic initiative was swinging gradually but decisively towards Great Britain and the United States, now that the latter had been brought into the war by the Japanese blow at Pearl Harbor. The aerial forces deployed by the U.S. were considerable, and of a high standard of *matériel* and training. Previously the U.S. had supplied large numbers of aircraft to the Allies under Lend-Lease, and in return had been informed about combat conditions prevailing over Europe. Thus when American forces began to operate over the continent, their success was fair, with the exception of disastrous raids such as the Regensburg and Schweinfurt attacks. The most immediate contribution made by the Americans, however, was in helping to close the notorious "Atlantic Gap" from the Western side.

The British were also improving at the same time. 1942 saw the arrival of the first true heavy bombers into service, and the raid on Cologne, the first "1,000-bomber raid" on the night of May 30–31, 1942, heralded the steady growth of the R.A.F.'s strategic bomber offensive against Germany. But although heavy damage was caused, British losses became heavier as the Germans developed more efficient radar and night fighter defences. Matters only improved later in the war with the introduction on the British side of more sophisticated air-borne radar and long-range night intruders (such as versions of the de Havilland Mosquito) to take on the German night fighters. Only then did losses to the Lancaster, Halifax, and Wellington fleets decline.

The R.A.F.'s night efforts against the more vulnerable but less important "area" targets were complemented by the day attacks launched by the U.S.A.

△△ *Hawker Tempest II fighter-bomber. The Tempest was conceived as a successor to the Typhoon, with a more powerful engine and improved aerodynamics and structural integrity. Two main versions of the Tempest appeared: first the Mark V, fitted with a 2,200-hp Napier Sabre inline, and then the Mark II, with a 2,500-hp Bristol Centaurus radial. The Mark II was a very useful machine, with a top speed of 440 mph and an offensive load of 2,000 lbs in addition to its four 20-mm cannon, but was just too late to see service.*

△ *The American Lockheed Lightning long-range fighter, easily distinguishable by its twin booms, central nacelle for the pilot, and boom-mounted empennage.*

△ ◁ *Messerschmitt Bf 110 heavy fighters of* 1 Staffel, *I* Gruppe, Schnelles Kampfgeschwader *210 (1st Squadron, 1st Wing, 210th Fast Bomber Group). Designed as a heavy bomber destroyer, the Bf 110 was pressed into service at the beginning of the war as a long range fighter, as which it proved very vulnerable to British single-engined fighters. But as the Allied bomber fleets started to pound Germany, the 110 began to be used in its true rôle by day and night and showed itself to be more than adequate for its tasks.*

◁ ◁ *The wreckage of a shot-down Junkers Ju 88. This, one of the most versatile aircraft of the war, was used as a medium bomber, maritime reconnaissance, torpedo-bomber, minelayer, fighter, ground attack, and photographic reconnaissance machine.*

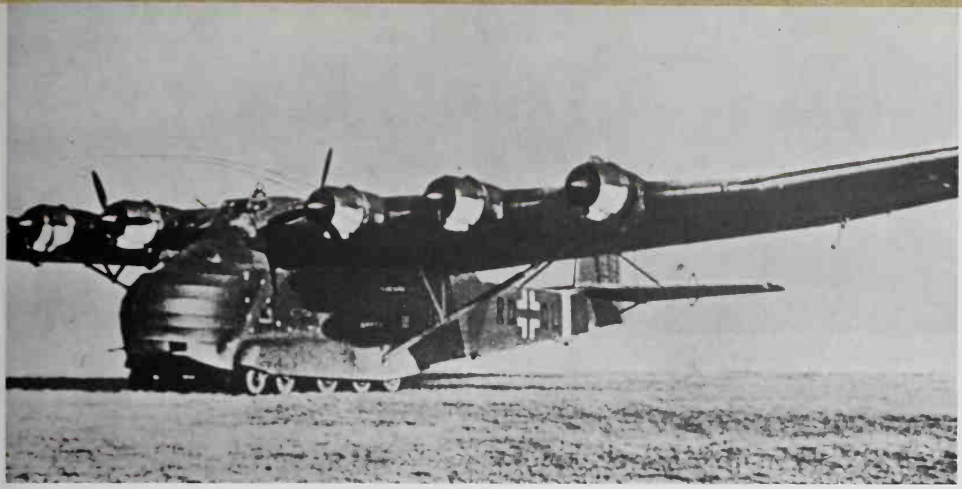
△ *A Heinkel He 177* "Greif" *(Griffin) goes up in flames after an R.A.F. raid. The 177 was Germany's attempt at a heavy bomber, but its advanced features made it very unreliable. Its most serious problems stemmed from the use of two engines coupled to drive a single propeller in each wing. The installation tended to overheat rapidly, resulting in mid-air fires.*

◁ *Quadruple 2-cm mounting.*

▷ *Focke Wulf Fw 200* "Kondor" *in flight. Originally designed as a long-range airliner, the Fw 200 was pressed into war-time service as a maritime reconnaissance bomber, where its endurance and 3,300-lb bomb-load proved very useful. Relatively few were built, however.*

▽ *Classic fighter – the Messerschmitt Bf 109F. This model was the best flying machine of the series, with fully developed aerodynamics and engine, but the armament of one 20-mm and two 7.92-mm guns was deemed too light. The G model was fitted with heavier armament, but this increased weight and spoiled the type's clean lines, with a consequent harmful effect on flying qualities.*

▷ *Part of a myth: a line-up of Heinkel He 100D fighters. In fact only 12 production models of this rival to the Bf 109 were built, but German propaganda used photographs of these, painted in many different markings, successfully to fool Allied Intelligence that the type was in widespread service.*



A.F. against small targets in "precision" raids. Flying in large "combat boxes", so that their defensive armament could cover each other, large numbers of B-17 Flying Fortresses raided important industrial targets in Germany and occupied Europe. But the tactics proved inadequate against the heavy armament and aggressive tactics of the German fighter arm – now composed principally of late model Bf 109's and the excellent Focke-Wulf Fw 190. Only with the arrival of long-range escort fighters, such as the Lockheed Lightning, North American Mustang, and Republic Thunderbolt, did day bombers reduce their losses. The American fighters also took a heavy toll of their German counterparts.

The basic choice of target for this vast bombing effort was not the best one, however. It was not until the last year of the war that the right one was found: the German transport system, and the industrial centres producing artificial rubber and petroleum products. The elimination of these produced almost immediate results – German troops could not be moved adequately, and even when they did arrive, transport and tanks were short of fuel. Moreover, many aircraft were grounded for lack of fuel.

At the tactical level, the Allies had produced a superb weapon. The origins of this magnificent force lay in the experiences of the British in North Africa, where the tactics of close co-operation between ground forces and heavily-armed fighter-bombers, such as the Hawker Hurricane IID, had been evolved. As in the early days of the war, ground troops were able to call in aircraft to halt enemy tanks for them or clear strong positions. This schooling was perfected in Italy, and by the time that the Allies invaded Normandy, the tactical air forces (equipped with medium bombers such as the American Mitchell and Marauder, and fighter-bombers such as the British Typhoon and later Tempest) were an all but irresistible weapon. The Germans found it impossible to move forces by day.

△ *The monstrous Messerschmitt Me 323* "Gigant" *(Giant). Designed as a glider, six engines were later fitted to make this a very good transport aircraft, capable of carrying 130 troops.*

▽ *The excellent Ju 88, here represented as a night-fighter Ju 88G-6b, with radar and six 20-mm cannon, two firing upwards and forwards at an oblique angle.*

Sea warfare

The most dangerous threat to Great Britain's ability to stay in the war came from the U-boats of the Kriegsmarine, which waged a savage and courageous battle against the Royal Navy and Royal Air Force throughout the war. Although Germany's major U-boat offensive had been defeated by May 1943, the morale of her submariners still remained high, and with the new types of boat being developed towards the end of the war, another serious problem for the Allies could have arisen.

▽ *U-190 meets her end after the war. She was a Type IXC/40 boat (displacing 1,247 tons submerged, armed with 22 torpedoes and 42 mines in addition to her gun armament) which surrendered to the Canadians in May 1945. On October 21, 1947 she was sunk in a Canadian Navy exercise. She is seen here beginning to settle in the water after being hit by rockets from a Fairey Firefly.*

▷ *The business of submarine war: the view through the periscope of a U-boat.*

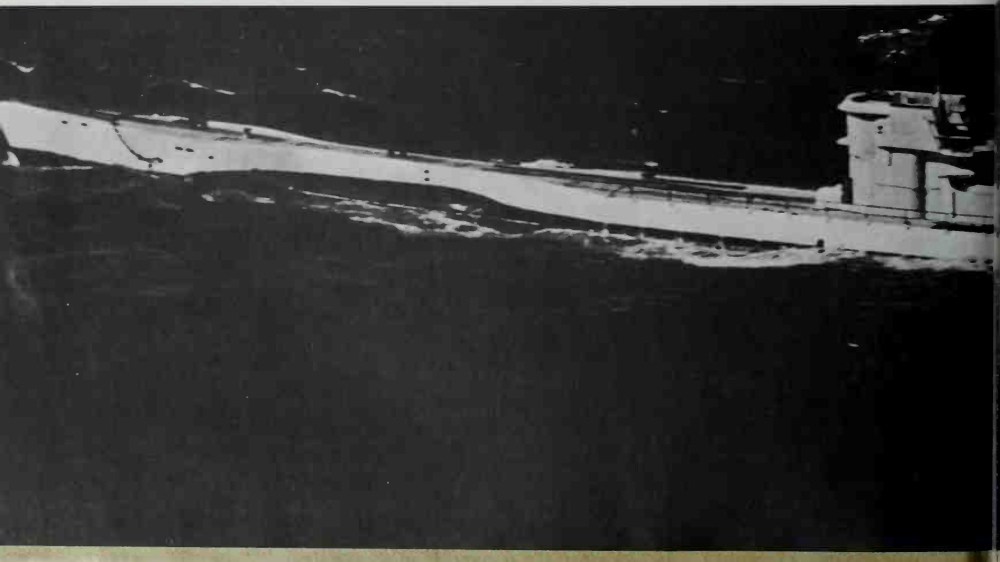
In the European Theatre of Operations (E.T.O.), the war at sea not only revolved around the Battle of the Atlantic but took in the fight for the Mediterranean and the north Russian convoy route. The English Channel, for centuries the arena for decisive sea battles, remained little more than a naval no-man's land sterilised by air power: a perilous route for German surface warships taking the most direct route to and from home waters. At night the Channel was the scene of bitter fighting between British and German light surface flotillas.

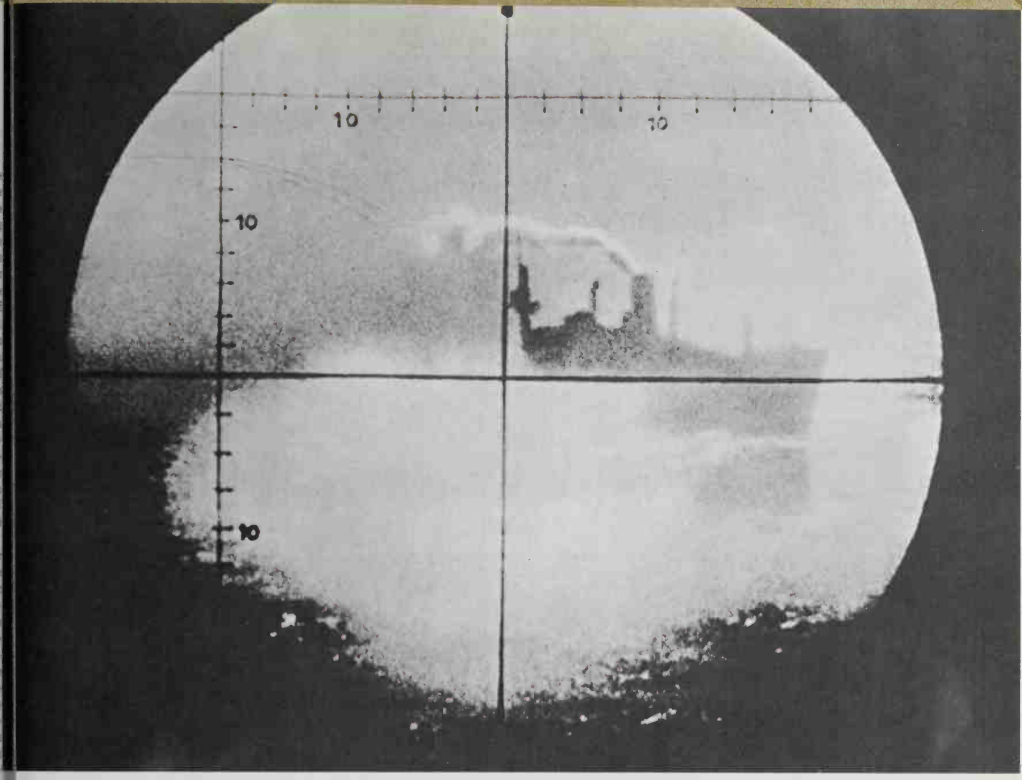
As in the Pacific theatre, naval strategy was dominated by air power in the E.T.O. Galland's efficient fighter screen defied every effort by the R.A.F. to prevent *Scharnhorst* and *Gneisenau* from escaping up-Channel in February 1942. The Luftwaffe savaged the British and French warships during the Norwegian campaign, but the aircraft of the British carrier *Glorious* were powerless to save her from destruction by the guns of *Scharnhorst* and *Gneisenau* – the first of the only two occasions in World War II when carriers were surprised by enemy surface warships (the second being at Leyte Gulf in October 1944). However, the British Fleet Air Arm cut the Italian battle fleet down to size with its raid on Taranto in November 1940 and was thus instrumental in the winning of Cunningham's night victory over the Italian survivors at Matapan the following March.

The Luftwaffe earned ample revenge for Taranto and Matapan by the damage it dealt out to the British Mediterranean Fleet during the evacuations of Greece and Crete: and it had already become apparent that the struggle for Malta would be won or lost in the air, for Malta was like Midway atoll: an "unsinkable aircraft-carrier". Malta could never have held out without the aircraft repeatedly flown in by carriers steaming as far east as they dared from Gibraltar, with even the American *Wasp* lending a hand before sailing to her eventual doom off the Solomons. Out in the Atlantic the *Bismarck* would certainly have won through to Brest had she not been crippled by Fleet Air Arm Swordfish from the veteran *Ark Royal;* and the tragedy of P.Q.17 was as much the work of the Luftwaffe as of U-boat attacks. Finally *Tirpitz*, the one-vessel "fleet in being" which Dönitz had maintained for so long, was split open and capsized in Tromsö Fjord by the massive "Tallboy" bombs of R.A.F. Lancasters.

Air power thus remained the *leitmotif* of the war at sea in the E.T.O., but several naval battles proved that traditional fighting qualities were far from obsolete at sea. Cunningham's victory at Matapan was one of the last classic night sea battles, while the interception of *Scharnhorst* off the North Cape on December 26, 1943 was the last fight between British and German capital ships. The indomitable manoeuvres of Vian's puny force of destroyers and light cruisers at "Second Sirte" in March 1942 saved a vital Malta convoy from a powerful Italian battle squadron. Deduction, luck, and frantic work in the engine-rooms just sufficed to get *Rodney* and *King George V* in position to pulverise *Bismarck* before their fuel ran out.

In the Far North, two particular operations illustrate the value of the "little ships" in World War II. The first came on the afternoon of May 1, 1942, when three of the tough new German destroyers tried to attack the return Russian convoy Q.P.11. The British destroyer escort was considerably out-gunned but its aggressive tactics induced the Germans to withdraw. A repeat performance came at the end of the year in the Battle of the

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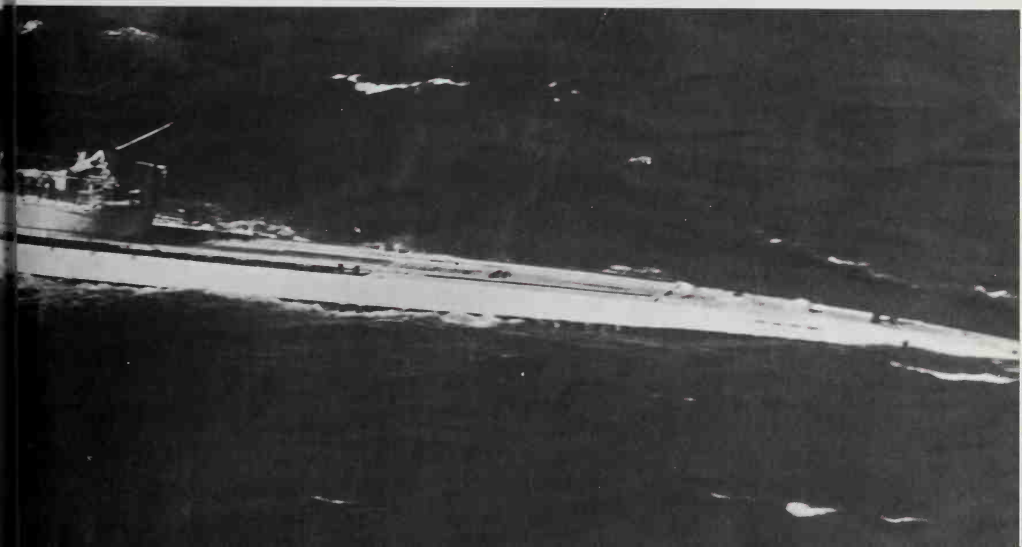
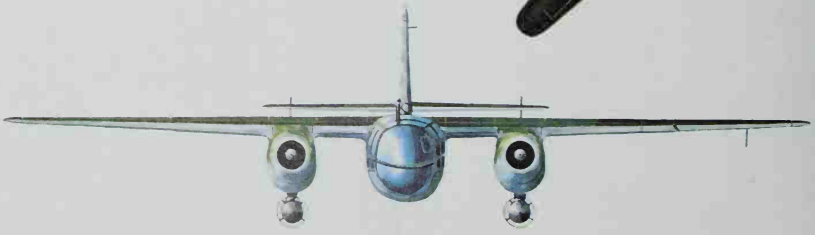
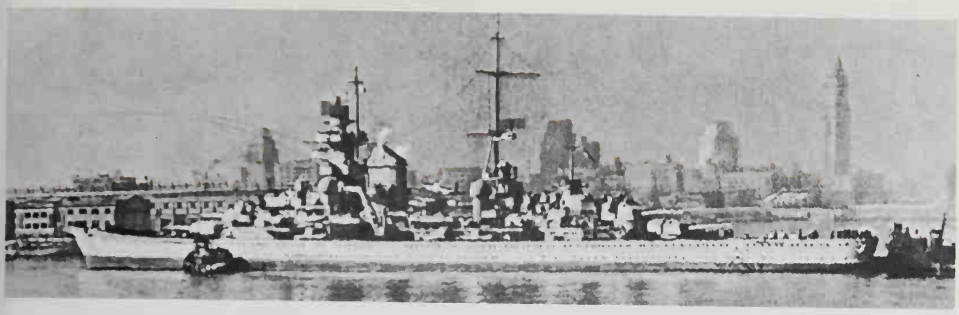


The German Arado Ar 234B-2 *"Blitz"* reconnaissance bomber

Engines: two Junkers Jumo 0048 *"Orkan"* turbojets, 1,980-lbs static thrust each.
Armament: two 20-mm MG 151 cannon with 200 rounds per gun (firing rearwards) and up to 3,300 lbs of bombs.
Speed: 461 mph at 26,250 feet.
Climb: 21 minutes 36 seconds to 19,685 feet (with 3,300-lb bomb-load)
Ceiling: 32,810 feet.
Range: 1,013 miles maximum.
Weight empty/loaded: 11,464/21,715 lbs.
Span: 46 feet 3½ inches.
Length: 41 feet 5½ inches.
Height: 14 feet 1¼ inches.
Crew: 1.





Barents Sea. Admiral Kummetz's *Regenbogen* ("Rainbow") plan caught Convoy J.W.51B between the heavy cruiser *Hipper* and the pocket-battleship *Lützow*. It was the closest the German surface fleet ever came to destroying a convoy to Russia, but again repeated "false torpedo attacks" by the British destroyers under Captain Sherbrooke caused the Germans to lose heart and withdraw.

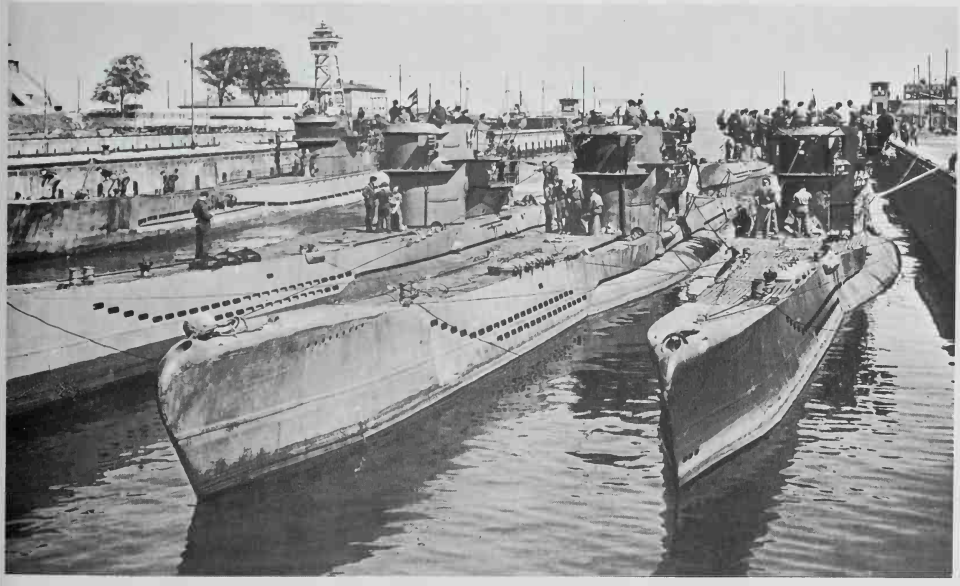
In the war beneath the sea the German U-boat arm started the war promisingly when Prien's *U-47* sank the British battleship *Royal Oak* in Scapa Flow in October 1939, a month after Schuhardt's *U-29* had sunk the elderly carrier *Courageous* in the Western Approaches. But the next successes of the U-boats against the Royal Navy were scored in the Mediterranean: the *Barham* and *Ark Royal* in 1941 and *Eagle* the following August. The German U-boat operations in the Mediterranean, however, despite these successes, were a vital distraction from their main offensive in the Atlantic.

The Italian Navy began the war with a powerful fleet but its performance never came up to expectations. Of far more importance was the Italian development of the two-man "human torpedo". The successful use of these weapons at Alexandria in December 1941 sank the British battleships *Valiant* and *Queen Elizabeth* at their moorings and temporarily deprived the British Mediterranean Fleet of battleship support. This flash of Italian initiative led directly to the development of the two-man British "Chariot" (which failed even to reach the *Tirpitz*, let alone disable her) and the "X-craft" midget submarine (which did).

Storm-centre of the submarine war was, of course, the Atlantic.

△ *Germany's magnificent heavy cruiser* Prinz Eugen *arrives in Boston after the war. She was used in the atom bomb test at Bikini atoll on June 17, 1946 and sunk at Kwajalein on November 15, 1947.*

▽ *U-boats in Wilhelmshaven – at the extreme left is the Type IXD/2* U-883 *(surrendered at Wilhelmshaven and scuttled in the Atlantic in 1946) with three Type VIIC boats. Together the Types VII and IX boats formed the backbone of Germany's ocean raiding force.*



△ *Preparing the minesweeping gear on board a British minesweeper. The Germans produced several very tricky mines at the beginning of the war, but lost their potential advantage in this field by using new types as they began to come off the production lines, rather than waiting to use them* en masse *to swamp the unprepared British*

▷ *The British also used mines to good effect where what little German sea transport there was had to operate, such as along the coast of Norway. Seen here are German motor minesweepers off the Lofoten Islands.*

Here the Germans began with brilliant successes by individual U-boat aces – Prien, Schepke, and Kretschmer being the most famous names – and rapidly evolved the more methodical "wolf-pack" concerted tactics. To this the Allies retaliated with "hunter-killer" groups, adopting the American voice-contact T.B.S. ("talk-between-ships"), "Hedgehog" projectors for firing spreads of depth-charges, and the all-important "Huff-Duff" (High Frequency Direction Finding) for tracking down and counter-attacking lurking U-boats. Of paramount importance, however, was the gradual extension of air cover to screen the entire Atlantic route – "bridging the Black Gap", as the process was known. Stop-gap escort warships as typified by the "Flower" class corvettes were pressed into service and did sterling work until the more sophisticated anti-submarine frigates could join the fray.

British submarines in the Western Approaches had a disappointing war. They failed to prevent the escape of the German squadron from Brest, and were never given a fair shot at either *Tirpitz* or *Scharnhorst* in the Far North. But in the Mediterranean they were the spearhead of the British Malta-based attacks on the Axis supply-route to North Africa. The most famous of many British submarine aces in the Mediterranean was Wanklyn of the *Upholder*. Later, when the Axis bombardment of Malta had virtually neutralised the base and its fall seemed imminent, submarines were pressed into service to run in supplies for the hard-pressed garrison.

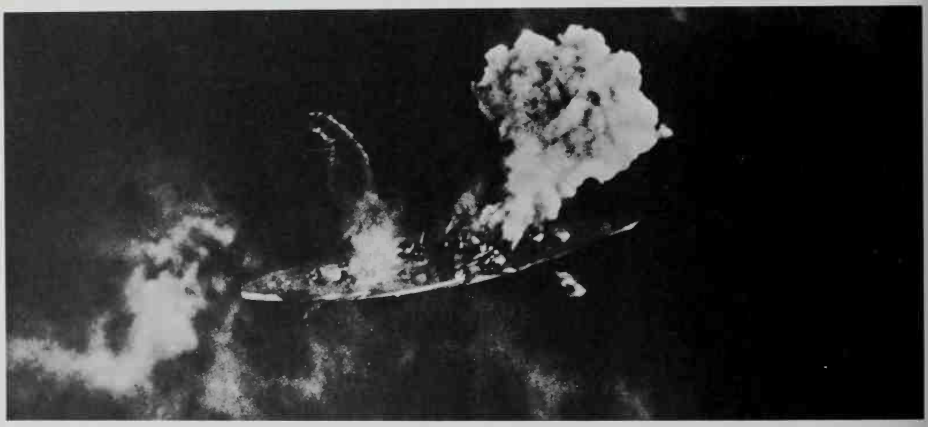
Sea power, one of the most traditional weapons of strategy, was remorselessly affected by 20th Century technology in World War II. To a large extent, as we have seen, it was forced to dance to the tune of air power. Radar and other electronic aids meant that battles were brought on by more accuracy than that supplied by the naked eye. But at all levels of the war at sea, from the biggest fleet action to destroyer duels and skirmishes between E-boats and M.T.B.s, the human element remained the decisive factor. Radar could locate. Radio could communicate. Powerful engines could close the range. But when it came to the sticking-point all that mattered was the application of skilled men wielding the tools of their trade despite the dangers of battle. And there can be little doubt that the men of the fighting ships found it easier to endure than did the crews of the merchantmen who owed their lives to their escorts. On the long, slow convoys whose safe arrival decided the outcome of the war, the dedication and courage of the merchant seamen played no less a part. Together with the fighting seamen, they proved that the best warship in the world must always be useless in the absence of seamanship and courage.

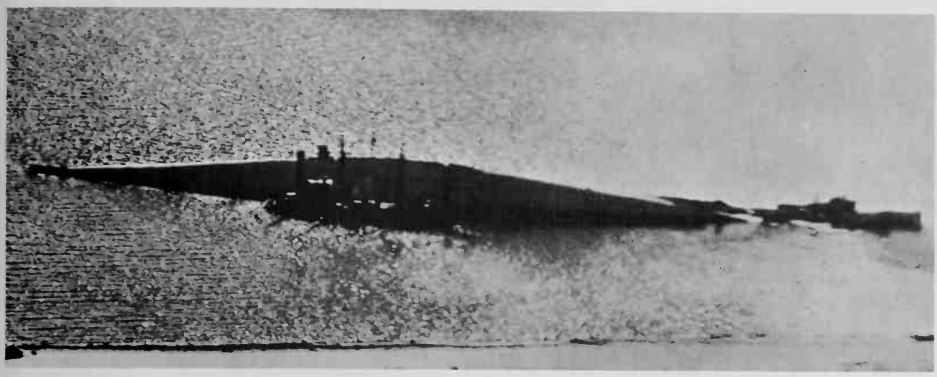
▷ *British submarines did not have the same scope of action as their German counterparts, as the merchant navies of the Axis powers were considerably smaller than those of the Allies. Nevertheless, British boats won some notable successes, in particular against the Italians in the Mediterranean, and also performed useful services in the delivery and retrieval of agents and raiding parties. Seen here is the conning tower of the S-class* Seraph. *The class as a whole proved an excellent design.*

▽ *The British cruiser* Belfast, *one of the two ships in the third variation of the* Southampton *class. She displaced some 10,000 tons and was armed with twelve 6-inch guns, with which she supported the landings in Normandy very successfully.*

The British Gloster Meteor III interceptor fighter

Engines: two Rolls-Royce Derwent I turbojets, 2,000-lbs static thrust each.
Armament: four 20-mm Hispano Mk. III cannon.
Speed: 493 mph at 30,000 feet.
Climb: 3,980 feet per minute initially.
Ceiling: 44,000 feet.
Range: 1,340 miles.
Weight empty/loaded: 8,810/13,300 lbs.
Span: 43 feet.
Length: 41 feet 3 inches.
Height: 13 feet.





The German battleship *Tirpitz*, younger sister of the celebrated *Bismarck*, was possibly the most important single factor in the Royal Navy's planning from her move to Norway at the beginning of 1942 to her loss at the end of 1944. As long as she lay poised to foray out into the Atlantic like *Bismarck*, powerful forces had to be kept in the Home Fleet to deal with her. This goes a long way towards explaining Cunningham's acute shortage of heavy vessels in the Mediterranean and the slow growth of the Eastern Fleet. Offensive measures also cost Britain dear: the raid on St. Nazaire (to destroy the only Atlantic dock capable of accommodating her), a midget submarine attack on September 23, 1943, naval air strikes on April 3, August 22, and August 24, 1944 (the first and last of which damaged her), and Bomber Command attacks on September 15 and November 12, 1944 with 12,000-lb "Tallboy" bombs. The first R.A.F. raid caused damage that prevented *Tirpitz* putting out to sea, and the second capsized her at her moorings at Tromsö.

△ △ ◁ Tirpitz *in her lair.*
△ ◁ *The raid of April 3 by Fleet Air Arm Barracuda dive-bombers. Forty-two aircraft took part, scoring 14 hits and killing 122 crew.*
◁ ◁ *Rudder and propeller shaft bracket after the capsizing.*
△ *Bottom up in Tromsö fjord.*
◁ *Salvage work.*

The end of Germany's massive U-boat effort.
△ *The U-boat pens at Finkenwärde. These had been built over a period of four years by 1,700 slave labourers, and were blown up by 32 tons of captured German bombs detonated inside them.*
▷ *The ruin of the U-boat pens in Kiel.*

▽ *Inside the pens at Finkenwärde after their destruction.*

The Medals

Man's desire to commemorate his acts of heroism has existed since the earliest and most primitive battles. Statues, and epic songs and ballads sufficed until the advent of the mass armies of the late 18th and early 19th Centuries.

The naval and land battles of the Napoleonic Wars started the British tradition of medals for battles and campaigns. In the mid 19th Century retrospective campaign medals were issued for operations in India.

The Crimean War saw the creation of what has become Britain's premier award. The Victoria Cross, founded by Queen Victoria, was intended for all ranks "who had performed some signal act of valor".

In the two World Wars there were medals for men who served in the various arms and theatres as well as general awards for service throughout the war. Stars for operations in the Pacific, Atlantic, Burma, Italy, France, and Germany as well as the Air Crew Europe Star covered land, sea, and air warfare.

In Germany only one true campaign medal was awarded, for the 1941–42 winter campaign in the East, or "frozen meat medal". Gallantry awards were expanded and two new campaign awards were introduced. Arm shields and cuff ribbons went to all ranks who had fought in individual actions like Narvik, or campaigns such as North Africa. The range of pin-backed badges which had originated with the wound badge was enlarged to include infantry and armoured assault awards. As Germany went over to the defensive, a tank-destroyer's stripe was introduced for the single-handed destruction of a tank without the use of an anti-tank weapon. The German soldier could also collect badges for sniping, and shooting down low flying aircraft. The Germans took a special delight in wearing their medals and awards in the field.

Among the medals and awards issued by the United States, the Purple Heart is probably better known than the Medal of Honor. The Purple Heart was originally given by George Washington as an award for bravery. Two hundred years after Washington's death it was revived, on February 22, 1932, as an award for those who have been killed or wounded in the service of the United States.

In contrast with many European armies the Medal of Honor, which was created in the early 1860's, was originally intended for enlisted men only, and officers were admitted later. The Army and Navy have their own designs for this award which is given for displaying "courage above and beyond the call of duty".

Like other Allied armies, the United States produced a series of campaign medals. After the war a special Humane Action Medal was struck to commemorate the Berlin Airlift of 1948–49.

▽ *The Naval Medal of Honor introduced in 1861, a year before the Army version. It is usually presented in person by the President of the United States.*

The Royal Pioneer Corps.

Royal Army Education Corps.

The West Yorkshire Regiment.

The Royal Welch Regiment.

The Hampshire Regiment.

The Royal Scots Greys.

The King's Royal Rifle Corps.

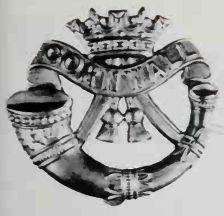
The Royal West Kent Regiment.

Reconnaissance Corps.

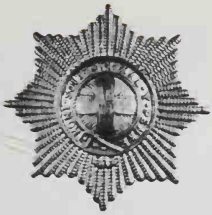
Scots Guards.

Royal Tank Regiment.

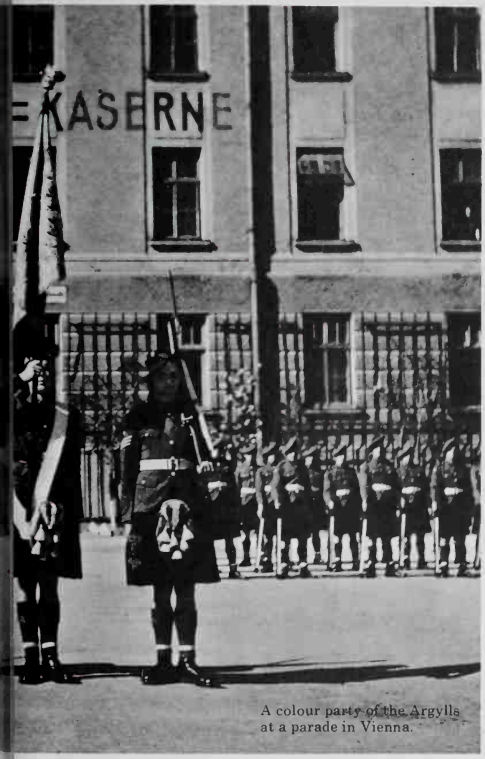
The South Wales Borderers.



The Duke of Cornwall's Light Inf.



Coldstream Guards.



A colour party of the Argylls at a parade in Vienna.

Royal Armoured Corps.

The Leicestershire Regiment.

Royal Corps of Signals.

The South Lancashire Regiment.

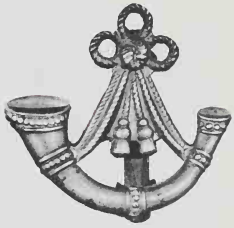
The Royal Fusiliers.

Royal Army Pay Corps.

The Artists Rifles.

King's Own Royal Regiment.

The York and Lancaster Regiment.



The Oxfordshire and Buckinghamshire Light Infantry.

"For Valour"

Instituted in 1856, the Victoria Cross was made retrospective to the autumn of 1854 to cover the fighting in the Crimean War.

Queen Victoria expressed the hope that "the new decoration should be highly prized and eagerly sought after". In the early days the gallantry awards which could be won in the field were the V.C. and the D.C.M. Consequently the Indian Mutiny and Britain's colonial wars produced a greater number of V.C.s than the two World Wars. In 1915, however, the Lancashire Fusiliers boasted "six V.C.s before breakfast" in the landings at Gallipoli.

The youngest recorded recipient of the V.C. is Hospital Apprentice Arthur Fitzgibbon, who won it at Taku Forts in China, aged 15 years and three months. The oldest man was Lieutenant William Raynor of the Bengal Veteran Establishment, who won his V.C. at the Delhi Magazine in the Indian Mutiny on May 11, 1857, when he was aged 69.

Brigadier Sir John Smyth, V.C. who won his cross in World War I, comments that courage is without rhyme or reason: "If there is any single common denominator amongst all V.C.s I would be inclined to say that it is a degree of obstinacy – a refusal to be beaten or pushed around."

Over 1,350 V.C.s have been won in the course of the medal's history; in World War II, 182 were awarded. The first went posthumously to Lieutenant-Commander G. B. Roope, and though he won the cross for his attack on the German heavy cruiser *Hipper* on March 8, 1940, the award was not gazetted until July 10, 1945.

With the German invasion of the Low Countries the R.A.F. won its first two awards. They went to Flying-Officer D. E. Garland and Sergeant T. Gray, who flew in the lead bomber of a formation of five Fairey Battles on May 12, 1940. Only one bomber returned from the successful attack on a tactically important bridge over the Albert Canal. Much of the responsibility for the success was due to the lead aircraft, whose crew received the award posthumously.

The Army won its first V.C. three days later when 2nd Lieutenant R. W. Annand of the Durham Light Infantry led two counter-attacks against the enemy who were trying to cross the River Dyle in Belgium. Wounded, he joined in a third attack, and then went back to retrieve his wounded batman; after this he collapsed as a result of his own wounds.

The last R.A.F. cross of the war went posthumously to Flight-Sergeant G. Thompson. He won it when his Lancaster was hit by flak in an attack on the Dortmund-Ems Canal on January 1, 1945.

Canada and Australia won the last two awards given to the Army and Navy in 1945. Temporary Lieutenant R. H. Gray of the R.C.N.V.R. won his cross posthumously in an action in the Far East at Onagawa Wan on August 9, 1945.

Private F. J. Partridge of the 8th Australian Infantry, wounded three times, inspired his comrades and twice relieved a critical situation in the struggle to eliminate an enemy position in Bougainville. At the time of the action on July 24, 1945 he was 21 years old.

Though three men have won the V.C. twice, only Captain C. H. Upham of the 20th Bn., N.Z. Military Forces, added a bar to his V.C. in World War II. The first occasion was in the fighting for Máleme airfield in Crete in May 22–30, 1941, and the second was in the Western Desert on July 14–15, 1942.

Born in Christchurch, New Zealand in 1911 he was thus 30 years old when he won his first V.C. In 1939 he joined the 20th New Zealand Battalion as a private soldier and received a commission in November 1940. In March the following year his battalion was posted to Greece and later after the mainland campaign evacuated to Crete. It was in heavy fighting with German paratroopers around the vital Máleme airfield that he won his first V.C. He was blown up by a mortar bomb and badly wounded by another. He also received a bullet in the foot. Despite these wounds, and severe dysentery, which had reduced him almost to a skeleton, he refused to be sent to a hospital and fought on until the battered defenders were evacuated to North Africa. Throughout these operations he displayed "superb coolness, great skill and dash and complete disregard for danger".

A year later, commanding a company of New Zealand troops in the fighting which led to the capture of El Ruweisat Ridge, Upham won his second V.C.

Already twice wounded, once when he destroyed a truckload of German soldiers with hand grenades, Upham insisted on remaining with his men for the final assault. During the fierce fighting which followed he destroyed a tank and several guns and vehicles. Although his arm had been broken by a bullet he continued to dominate the position and held off a violent enemy counter-attack.

After having his wound dressed at the regimental aid post he returned to his men and remained with them throughout the day. Immobilised by a fourth wound, he was captured when the Germans overran the position. Of the three men who have won the V.C. twice Upham is the only survivor.

Subadar Lalbahadur Thapa, whose picture appears above, won his medal in a night attack on April 5, 1943 on the Rass-ez-Zouai. Fighting with kukri and bayonet, he and his men secured the whole feature which was essential for the advance of the brigade and the division. Subadar Lalbahadur Thapa personally killed four men with his kukri and two with his revolver.

▷ *Wing-Commander G.W. Tuttle receives the O.B.E. from the King.*

The Victoria Cross

Distinguished Service Order

Distinguished Service Cross

Military Cross

Conspicious Gallantry Medal

Distinguished Conduct Medal

Distinguished Service Medal

Military Medal

Distinguished Flying Medal

Indian D.S.M.

1939–1945 Star

Atlantic Star

Air Crew Europe Star

Africa Star

Pacific Star

Burma Star

Italy Star

France and Germany Star

Defence Medal

War Medal 1939–1945

New Zealand War Service Medal

Australian War Service Medal

Virtuti Militari (First Class)

Order of Orange Nassau

▽ *De Gaulle bestows the traditional embrace on General Arnold at a presentation of the Legion of Honour. At the right is General Somervell.*
▷ *Three officers of the Normandie Squadron receive the Legion of Honour in Paris.*

Legion of Honour

Croix de Guerre Operations Extérieurs

Military Medal

Croix de Guerre

Croix des Combattants

Mérite Maritime

Volunteers for Combat

Colonial Medal

Medal of Liberated France

▷ *General de Gaulle decorates General Koenig with the* Croix de la Libération.
▽ *General Catroux decorates Marshal Zhukov with the Grand Cross of the Legion of Honour.*
▽▷ *General Eisenhower receives the Liberation Medal.*
▽▷▷ *De Gaulle adds the* fourragère *of the* Croix de Guerre *to the standard of the 4th Regiment of the* Tirailleurs.
▷▷ *Generals Jacob Devers and Alexander Patch receive the* Croix de Guerre *with Palm.*


PARIS

"For Conspicuous Gallantry"

The Medal of Honor was instituted by Congress five years after the Victoria Cross. Unlike the V.C., however, there have been several alterations to the design of the Army version. The Navy, too, made changes in the design, but in August 1942 it returned to the original pattern of 1861.

The Medal of Honor is awarded for gallantry and intrepidity above and beyond the call of duty without detriment to the mission. The grant is only made after a most searching enquiry. As a mark that this is the premier award of the United States both the Army and Navy medals are worn as a neck order.

Originally only enlisted men were to be entitled to the award, but a few years later it was made universal. The U.S. Coast Guard service, which in war comes under naval command, is also entitled to the Medal of Honor. Enlisted men in the Army and Navy who win the medal qualify for a gratuity of $2 a month from the date of the action for which the medal is granted.

Like any award for great courage the Medal of Honor can bring fame and publicity to reluctant heroes.

When Lieutenant Audie Murphy returned to the United States in June 1945, he was America's most decorated soldier. He was also a natural for the publicity machine: youthful, he had risen from the ranks and was one of a large family. His skill with a rifle was not learned on an Army rifle range, but as a hunter in the woods around Farmersville, Texas.

By July 1948 he had been awarded the Medal of Honor, the Bronze Star, the Distinguished Service Cross, the Silver Star, and the Legion of Merit. In addition he had four Purple Hearts, a Bronze and a Silver Star, the European Medal with seven Battle Stars, Good Conduct Medal, Distinguished Unit Badge, Combat Infantryman Badge, Expert Infantryman Badge, and the French Croix de Guerre and Fourragère. In 1948 he received the Cross of the Chevalier of the Legion of Honor from Marshal de Lattre de Tassigny.

It is an interesting feature of the Medal of Honor that its recipients can leave the Services. In World War I a considerable number of men who received the V.C. were later killed in action, and a country prefers its heroes alive.

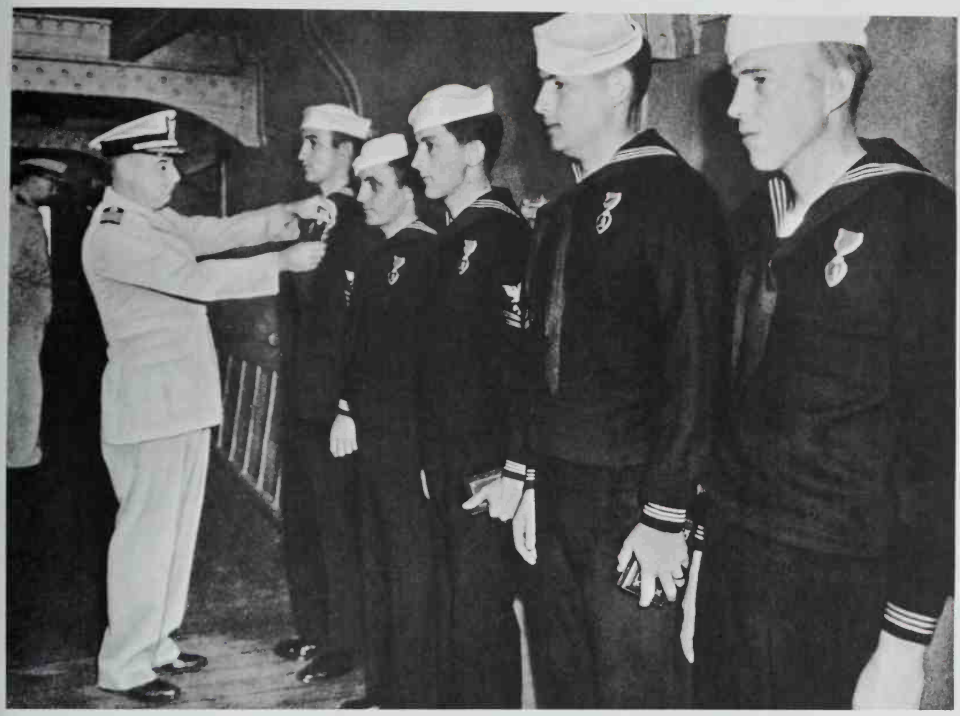
Americans regard the Medal of Honor as a higher award than the Victoria Cross and the French Legion of Honour. It is not given for simply performing one's duty courageously, but for some voluntary act of valour beyond the call of duty.

In its history, a little over 2,000 medals have been awarded. Each award is engraved on the back with recipient's name "Congress to....." hence the misconception that the medal is known as "The Congressional Medal of Honor".

During World War II some 431 medals were awarded to the men of the Armed Services. It is interesting to compare this with the 182 Victoria Crosses awarded to British and Empire men.

Only one woman has received the Medal of Honor. She was Dr. Mary Walker. Congress authorised her decoration in 1861.

◁ *Lt.-Commander John D. Bulkeley receives his Medal of Honor from President Roosevelt.*

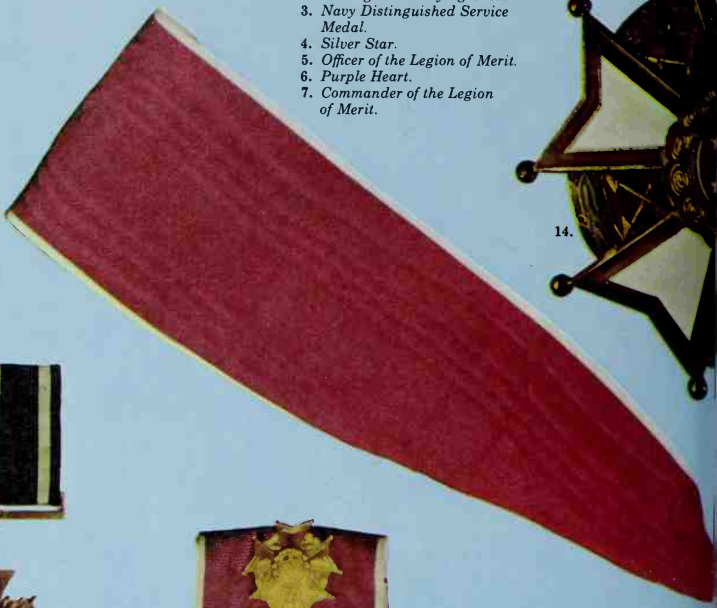


△ *The Purple Heart is awarded to five members of the Coast Guard by Captain Raymond J. Mauerman. These men were wounded while putting infantry ashore at Salerno. Further wounds are recognised by the addition of a Gold Star.*

◁ *Louis George Finch of Lowell, Massachusetts, receives the Merchant Marine Distinguished Service Medal. Finch, on his first voyage, climbed aloft to re-rig his ship's radio antenna while under fire from a U-boat off California. The medal was created in 1942 and was the highest of several awards for men of the Merchant Marine.*

1. *Distinguished Service Cross*
2. *Distinguished Flying Cross*
3. *Navy Distinguished Service Medal.*
4. *Silver Star.*
5. *Officer of the Legion of Merit.*
6. *Purple Heart.*
7. *Commander of the Legion of Merit.*

1.



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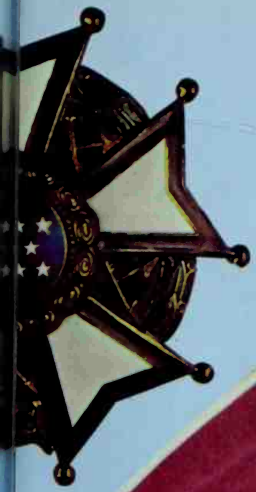
8. *Bronze Star.*
9. *Legionnaire of the Legion of Merit.*
10. *Navy and Marine Corps Medal.*
11. *Air Medal.*
12. *Distinguished Service Medal.*
13. *Navy Cross.*
14. *Chief Commander of the Legion of Merit.*



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△ *Admiral Nimitz, C.-in-C. Pacific Fleet, congratulates Captain A. B. Hanson, U.S. Marine Corps. Hanson received the Bronze Star for the destruction of a bunker and magazine on the Marshalls.*
▷ △ *Lieutenant-General Mark W. Clark awards the Medal of Honor to Technical Sergeant C. E. Kelly.*
▷ *Pfc. Dorothy E. Whitfield of the U.S. Women's Army Corps receives the Purple Heart from Lt. Col. Wilson, W.A.C. Director in Europe.*
▷▷ **1.** *and* **2.** *Long and Faithful Service award.* **3.** *Knight's Cross of the War Merit Cross, with swords.* **4.** *S.S. Long Service award.* **5.** *Decoration for Bravery and Merit of the Eastern People (silver).* **6.** *Knight's Cross of the War Merit Cross, without swords.* **7.** *Eastern People's Award (gold).* **8.** *Faithful Service decoration.* **9.** *War Merit Cross 1st Class.* **10.** *Westwall Medal.* **11.** *War Merit.* **12–17.** *Eastern People's Awards:* **12.** *1st Class with Swords;* **13.** *1st Class:* **14.** *2nd Class with swords;* **15.** *2nd Class;* **16.** *3rd Class with swords;* **17.** *3rd Class.*

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Divisional Insignia of the Waffen-S.S.

1st Panzer Div.
"Leibstandarte Adolf Hitler"

2nd Panzer Div.
"Das Reich"

3rd Panzer Div.
"Totenkopf"

8th Kavallerie *Div.*
"Florian Geyer"

9th Panzer Div.
"Hohenstaufen"

10th Panzer Division
"Frundsberg"

11th Panzergrenadier *Div.*
"Nordland"

16th Panzergrenadier *Div.*
"Reichsführer-*S.S.*"

17th Panzergrenadier *Div.*
"Götz von Berlichingen"

18th Panzergrenadier *Div.*
"Horst Wessel"

19th Grenadier Div.
(Lettische *Nr2*)

24th Gebirgs *Div.*

25th Grenadier Div. (Ungarische *Nr1*) "Hunyadi"

26th Grenadier Div. (Ungarische *Nr2*)

27th Grenadier Div.
"Langemarck"

31st Panzergrenadier *Div.*

32nd Panzergrenadier *Div.*
"Januar *30*"

33rd Kavallerie *Div.*
"*Charlemagne*"

34th Grenadier Div.
"Landstorm Nederland"

4th S.S.-Polizei Panzergrenadier *Div.*

5th Panzergrenadier *Div.* "Wiking"

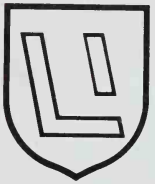
6th Gebirgs *Division* "Nord"

7th Gebirgs *Div.* "Prinz Eugen"

12th Panzer Div. "Hitlerjugend"

13th Gebirgs *Div.* (Kroatische *Nr1*) "Handschar"

14th Grenadier Div. (Galizische *Nr1*)



15th Grenadier Div. (Lettische *Nr1*)

20th Grenadier Div. (Estnische *Nr1*)

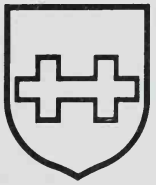
21st Gebirgs *Div.* (Albanische *Nr1*) "Skanderbeg"

22nd Kavallerie *Div.*

23rd Panzergrenadier *Div.* "Nederland"

28th Panzergrenadier *Div.* "Wallonie"

29th Grenadier Div. (Italienische *Nr1*)



30th Grenadier Division (Russische *Nr2*)

31st Panzergrenadier *Div.* *(Variant)*

35th Grenadier Div. Polizei *Nr2*

36th Sturm *Div.* *"Dirlewanger"*

37th Kavallerie *Div.* *"Lutzow"*

38th Panzergrenadier *Div.* "Nibelungen"

"For the Reich"

The Iron Cross was first established in 1813 by Frederick III. It was revived in the Franco-Prussian War and World War I. On September 2, 1939 Hitler revived the order and it was expanded to include the Knight's Cross, to which could be added Oak Leaves and Swords.

The Iron Cross in its various forms was granted more freely than British gallantry awards and consequently further distinctions were added to upgrade its value. Diamonds and even golden oak leaves could be awarded. The Grand Cross, larger than the Knight's Cross, was awarded for activities having a decisive influence on the course of the war. It was granted only once, and went, predictably, to that lover of regalia Hermann Göring, for the surrender of France in 1940.

Among the first Knight's Crosses to be awarded were those won by the men of Assault Detachment Koch. This élite group was employed in the attack on the Belgian Fortress of Eben Emael and the bridges over the Albert Canal near Maastricht. In 1940 these bridges were essential to allow the bulk of German forces to enter Belgium and draw off the mobile elements of the Anglo-French armies.

The Knight's Cross was a neck order suspended from a ribbon which was the same colour as the Iron Cross Second Class, though slightly broader. A *Ritterkreuzträger* wore his award even when in shirt sleeve order, and holders of the *Pour le Mérite* wore both medals.

In the closing months of the war a unique decoration was minted for Hans-Ulrich Rudel of *Stukageschwader* 2. Flying a Ju 87G armed with 3.7-cm cannon he destroyed a total of 519 Russian tanks in the last two-and-a-half years of the war. In January 1945 he received the Golden Oak Leaves of the Knight's Cross.

Whereas the Victoria Cross has only been awarded to foreign nationals in British service, with the one exception of the American Unknown Soldier, the Iron Cross was widely distributed. In its various grades it was used as a diplomatic sweetener with Germany's Axis allies, and was not necessarily awarded for a specific act of heroism.

In the final fighting in Berlin in 1945 some of the last soldiers to receive the Iron Cross were Frenchmen. As members of the *Waffen*-S.S. they had become the pariahs of the new government of de Gaulle. With nothing to live for, they fought and died with greater heroism than their German masters.

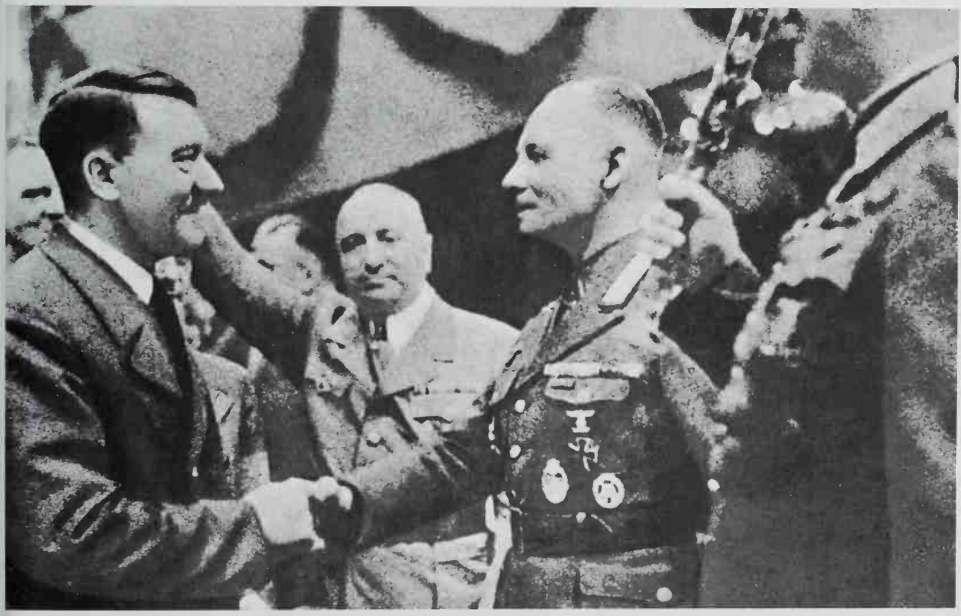
In the starvation and austerity which followed V.E. day in Germany there remained a final indignity for the Iron Cross: it was sold for cigarettes– the nation's new medium of currency.

Holders of most World War II medals are now permitted to wear them in West Germany as long as they do not show the swastika.

◁ *Adolf Galland receives the Knight's Cross with Oak Leaves, Swords, and Diamonds.*

◁ *In the closing days of the war old men and young boys were drafted into the defence of the Reich. Hitler shakes hands with Alfred Czech of the* Deutsches Jungfolk *who at 12 was the youngest recipient of the Iron Cross Second Class.*

▽ *Under the admiring gaze of Dr. Ley, Hitler greets Field-Marshal Rommel. Rommel, who had won the* Pour le Mérite *in World War I, was to receive the Knight's Cross with swords and oak leaves. On his tunic can be seen the wound badge and tank battle badge of the Iron Cross first class with the bar for World War II. Medals and promotion, however, were no substitutes for the fuel and supplies which he needed for the* Afrika Korps.



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▷ *A post-war photograph of Marshal Zhukov wearing the Soviet and Allied medals he received during and after the war.* **1.** *The Order of Kutuzov. Awarded in three classes.* **2.** *Order of Patriotic War, 1st Class.* **3.** *Order of Alexander Nevesky. Instituted in July 1942.* **4.** *Order of Suvorov. Instituted in July 1942 in three classes.* **5.** *Defence of Leningrad.* **6.** *Defence of Sevastopol'.* **7.** *Defence of Odessa.* **8.** *Order of Lenin.* **9.** *Hero of the Soviet Union.*

8.

9.

4.

◁ *Field Marshal Montgomery places the ribbon of the Knight Commander of the Order of the Bath around the neck of Marshal Zhukov. With them are Rokossovsky and Sokolovsky.*
▽ *The ceremony over, Montgomery shakes hand with Zhulov. Rokossovsky received a K.C.B. and Sokolovsky became a Knight Commander of the British Empire.*
▷ **1.** *Czech Medal for Valour.* **2.** *Order of the Rising Sun, 7th Class.* **3.** *Order of the Rising Sun, 1st Class.* **4.** *Order of the Sacred Treasure (Japanese).* **5.** *German-Italian Campaign in Africa.* **6.** *Military Order of Savoy.* **7.** *Order of St. Maurice and St. Lazarus (Italian).* **8.** *Italian War Cross.* **9.** *Spanish Medal for the Blue Division.* **10.** *Reverse of Spanish Medal.* **11.** *Polish Virtuti Militari.* **12.** *Cross of Valour (Poland).*

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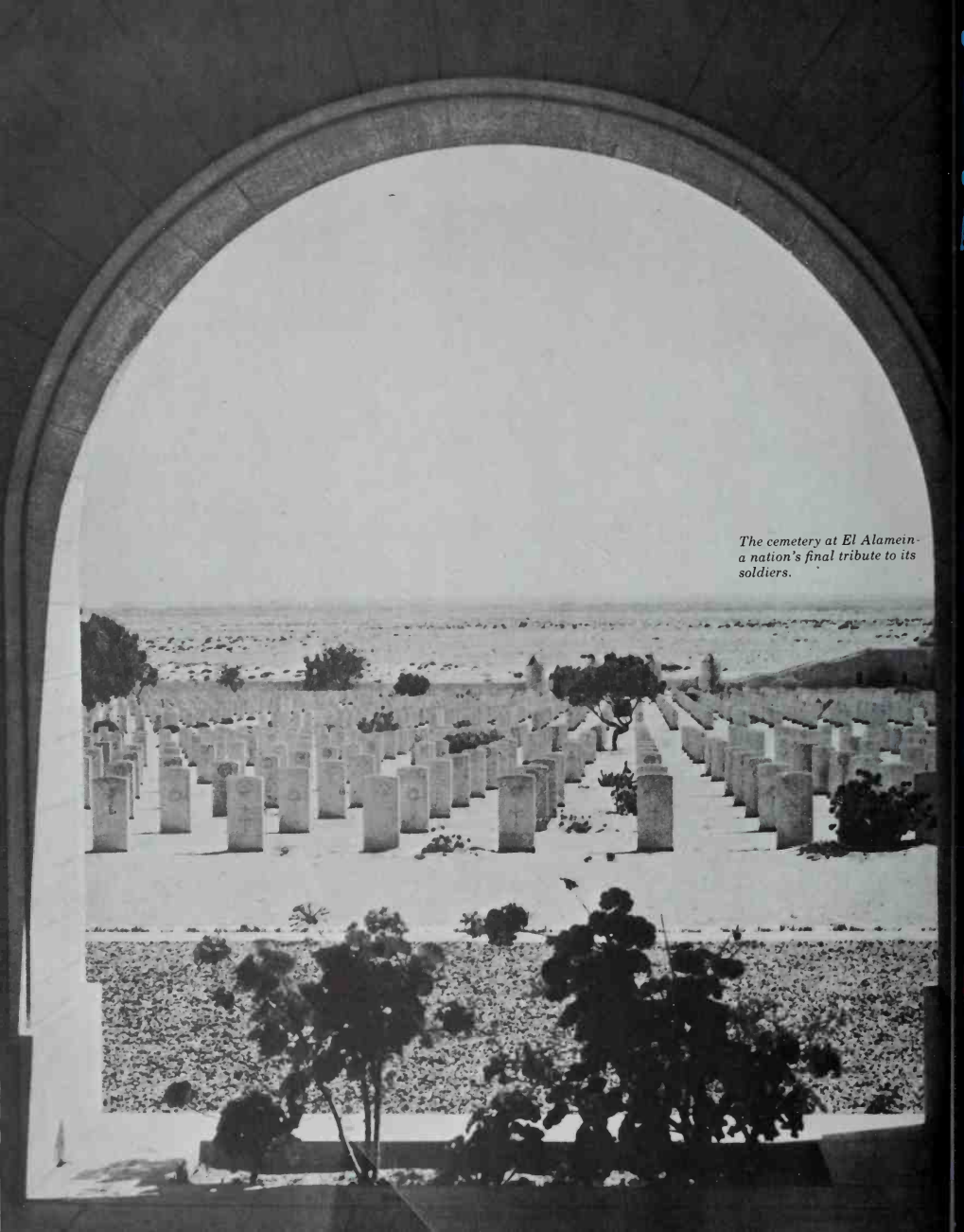
The triumphant Red Army displays captured Nazi standards during its Victory Parade in Red Square, June 24 1945.



The cemetery at El Alamein - a nation's final tribute to its soldiers.

INSIGNIA

AND MARKINGS OF WORLD WAR II

1st Air Force

2nd Air Force

3rd Air Force

4th Air Force

5th Air Force

UNITED STATES A

11th Air Force

12th Air Force

13th Air Force

6th Air Force

7th Air Force

8th Air Force

9th Air Force

10th Air Force

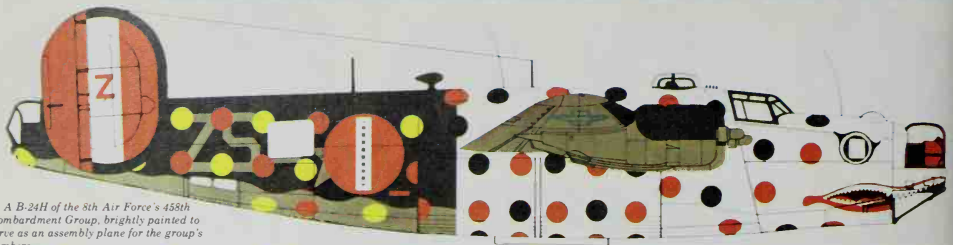
RMY AIR FORCES

14th Air Force

15th Air Force

20th Air Force

U.S.A.A.F. BOMBARDMENT GROUPS



△ A B-24H of the 8th Air Force's 458th Bombardment Group, brightly painted to serve as an assembly plane for the group's bombers

816th Bombardment
818th Bombardment
863rd Bombardment
864th Bombardment
865th Bombardment
869th Bombardment
584th Bombardment
585th Bombardment
414th Bombardment
416th Bombardment
418th Bombardment
425th Bombardment
439th Bombardment
464th Bombardment
465th Bombardment
474th Bombardment
491st Bombardment
494th Bombardment
497th Bombardment
498th Bombardment
502nd Bombardment
503rd Bombardment
504th Bombardment
505th Bombardment
512th Bombardment
513rd Bombardment
514th Bombardment
515th Bombardment
528th Bombardment
532nd Bombardment
426th Bombardment
435th Bombardment
499th Bombardment
500th Bombardment
533rd Bombardment
537th Bombardment
551st Bombardment
552nd Bombardment
475th Bombardment
478th Bombardment
509th Bombardment
510th Bombardment
554th Bombardment

The American approach to unit badges and individual aircraft markings was typically idiosyncratic and flamboyant. As can be seen from the illustrations on the left-hand page, squadron markings exemplified the nature and aggressive intentions of combat squadrons. But unlike British squadron badges, which were very restricted in format, American badges were allowed considerable latitude in their content and design. Nevertheless, all squadron badges had to be vetted before official adoption was allowed.

Of a more personal nature were the markings permitted on individual aircraft. These were decided upon by the aircraft's crew, and usually featured a comic subject or a mock pin-up. Occasionally the authorities tried to restrict such personal markings, but they were too much a part of the U.S.A.A.F. *ethos* to be dispensed with. Typical examples are illustrated on the right-hand page.

Other markings on American aircraft were the unit codings. In the case of bombers, these consisted of a distinctive combination of colours, patterns, and code letters to identify a particular machine's division, wing, and squadron; the code was marked across the fin and rudder.

For fighter aircraft, the unit codings were simpler, as they had to be marked on smaller surfaces, and letter codes were mostly reserved for internal identification within each squadron. Fighter unit markings were normally applied on the nose and vertical tail surfaces, and were more colourful than bomber markings.

As well as unit markings, all U.S. aircraft carried national markings. In the early stages of the war these consisted of a blue circle enclosing a five-pointed white star with a red circle in its centre (on both wings) and a striped rudder.

From August 18, 1942 the red centre was discontinued to avoid confusion with the Japanese "meatball". The rudder striping was dropped on the same day. The new markings could still be mistaken for the Japanese ones, however, and from June 29, 1943 two white bars were marked on each side of the circle. The whole was at first outlined in red, and from September 16, 1943, in blue.

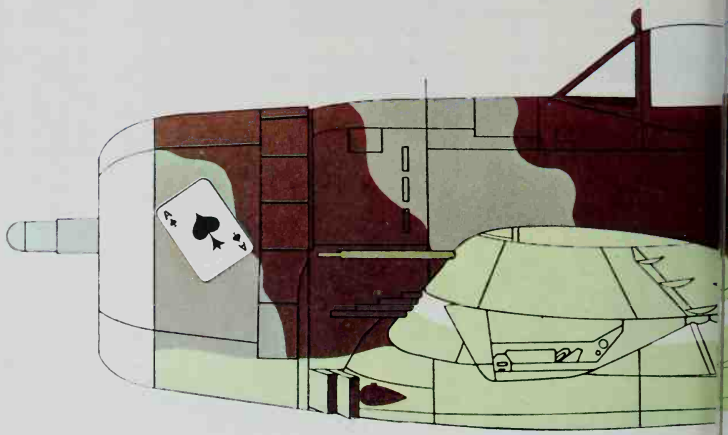
U.S.A.A.F. PURSUIT

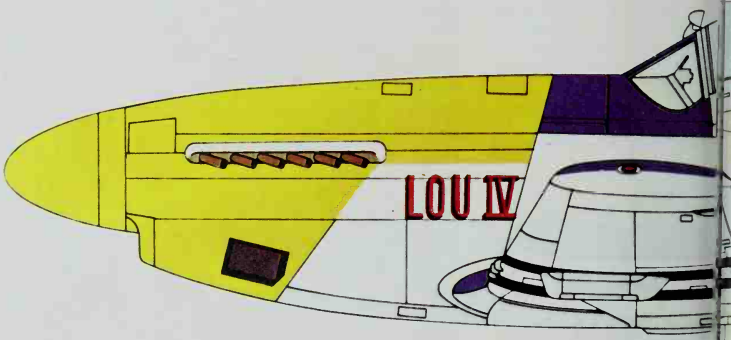
Apart from their operational and national markings, all American combat aircraft had a specific general (sometimes camouflaged) finish. At the outbreak of war this was normally a garish scheme of yellows, blues, reds, and greens on smaller aircraft, with larger machines sporting a basic metal finish.

Early war experience soon showed up the limitations of the concept, and from early in 1942 production aircraft left the factory in a light brown and green camouflage similar to the British temperate zone scheme. This idea was soon dropped, however, in favour of an overall upper surface finish of olive drab, with under surfaces of grey or azure blue for the European or Pacific theatres respectively. The paints themselves were matt, and the two colours applied were merged into each other.

As the lessons of combat were assimilated, colour schemes to suit different theatres were evolved. Thus aircraft in North Africa sported a sand finish. Night fighters and intruders were finished in black, often glossy.

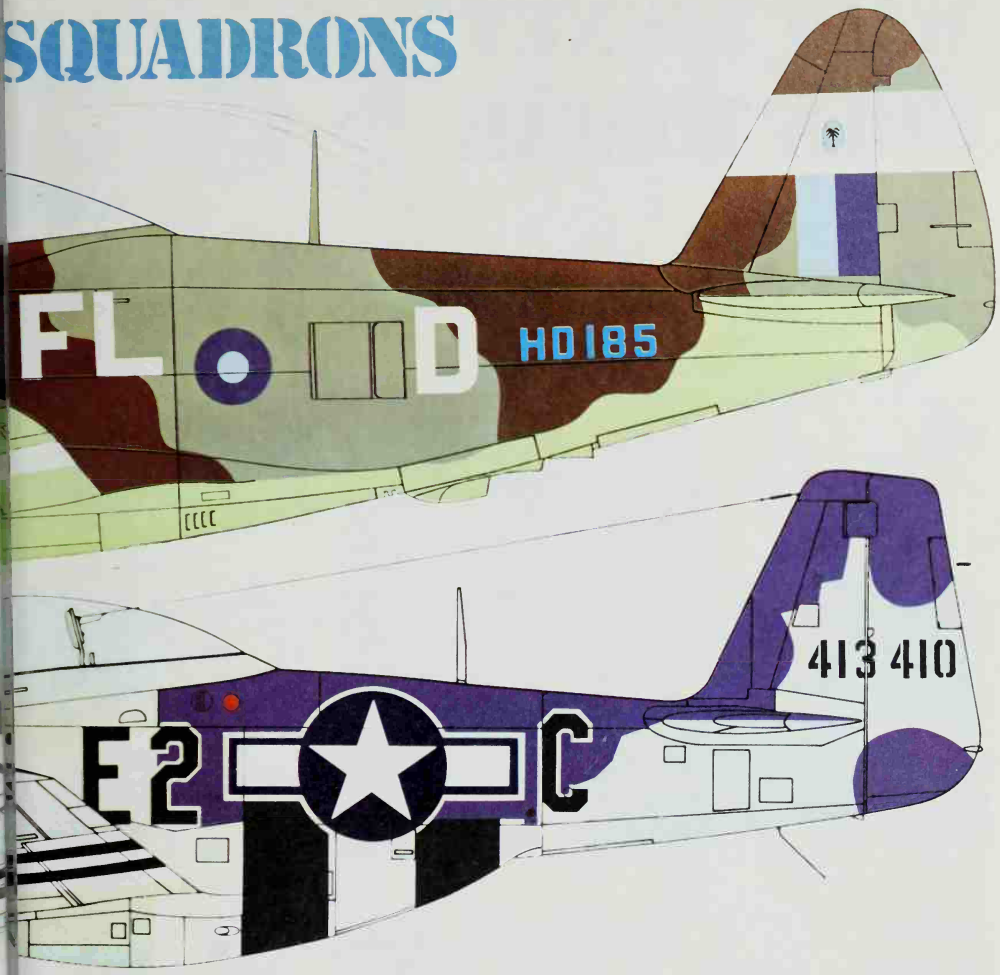
As the Allies began to win a clear measure of aerial superiority over the Axis, the Americans abandoned the idea of camouflage, and their aircraft began to roam the skies over Germany and Japan in basic metal finish; the only paint applied was for national insignia, anti-glare panels in front of the cockpit, and tactical markings such as the black and white D-Day stripes.





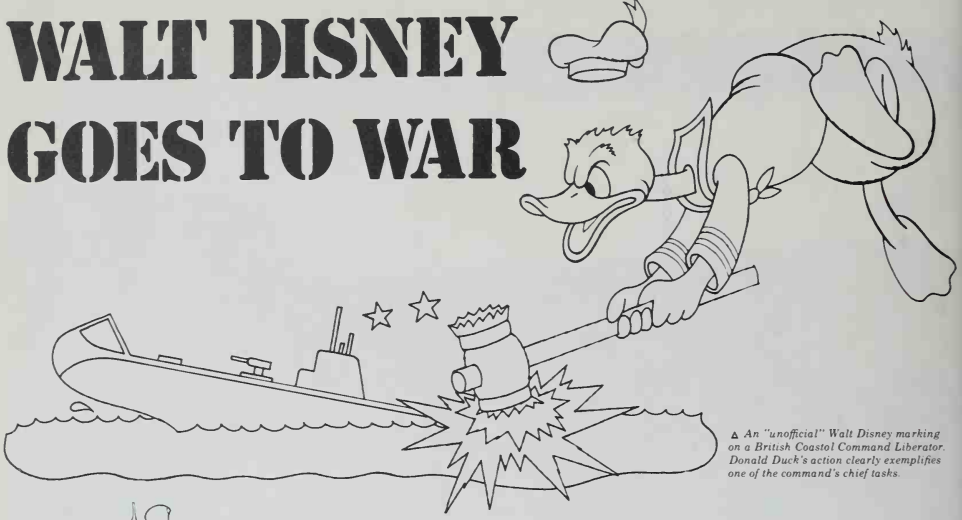
△▷ *A Republic Thunderbolt I of the R.A.F.'s No. 135 Squadron in standard South-East Asia Command camouflage. Note the roundel without the red centre.*
▷ *A North American P-51D-5 Mustang of the 375th Fighter Squadron of the 8th Air Force's 361st Fighter Group in post-August 1944 markings.*

SQUADRONS

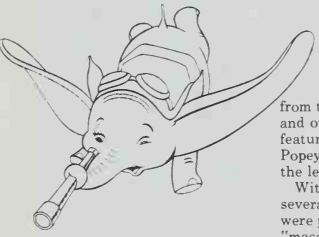

FL D
HD185
413 410
E2 C


d Fighter
64th Fighter
76th Fighter
325th Fighter
326th Fighter
329th Fighter
330th Fighter
332nd Fighter
338th Fighter
ter
305th Fighter
306th Fighter
339th Fighter
340th Fighter
344th Fighter
353rd Fighter
354th Fighter
355th Fighter

WALT DISNEY GOES TO WAR



▲ *An "unofficial" Walt Disney marking on a British Coastol Command Liberator. Donald Duck's action clearly exemplifies one of the command's chief tasks.*



▲ *The Dumbo emblem of the 6th Reconnaissance Group.*

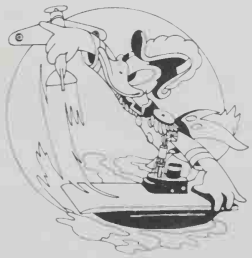
The development of animation techniques and the introduction of colour film, in the early and late 1920's respectively, meant that cartoons of the Walt Disney type became an enormously popular cult on both sides of the Atlantic. Cartoons featuring Disney characters such as Mickey Mouse, Pluto, Donald Duck, Goofy, and several characters from the Aesop animal fables, and other companies' series featuring Tom and Jerry, Popeye, and Felix the Cat, were the leaders in the field.

With the advent of war, several of these popular figures were pressed into service as "mascots", particularly on aircraft, often with appropriate verbal tags added. Where it seemed suitable, the Walt Disney studio even went to the extent of designing special adaptations of its characters as emblems. All but the top one on this page were such special designs.

Although, as we have seen, several stock Disney characters were "drafted" into war-time service as emblems, it was the Popeye the Sailor Man figure that played the greatest part in the American cartoon's contribution to the Allied war effort. Without regard for his own safety or for the truth, Popeye single-handedly fought his way through to Great Britain with cargoes of spinach, sinking or otherwise defeating numberless U-boats *en route*; or disposed of vast Japanese battle-fleets, manned by hordes of crudely-depicted parodies of the "archetypal" oriental, while bringing succour, again in the form of tinned spinach, to beleaguered American garrisons in the Far East.

Overtly patriotic or merely adapted for use as mascots in the war, Hollywood's cartoon characters played an important morale part in World War II.

▲ *A Texas-based Bombardment Training Group.*



▲ *The British carrier* Illustrious.

▲ *The American carrier* Hornet.

▲ *The U.S.N.'s 7th Pursuit Squadron.*

U.S. ARMY SHOULDER FLASHES

Army Ground Forces

Army Air Forces

Army Service Forces

1st Army Group

1st Army

2nd Army

3rd Army

4th Army

5th Army

6th Army

7th Army

8th Army

14th Army

I Corps

II Corps

III Corps

IV Corps

V Corps

VI Corps

VII Corps

VIII Corps

IX Corps

X Corps

XI Corps

XII Corps

XIII Corps

XIV Corps

XV Corps

XVI Corps

XVIII Corps

XIX Corps

XX Corps

XXI Corps

XXII Corps

XXIII Corps

XXXI Corps

XXXIII Corps

Heraldry, in its hey-day during the late middle ages and early days of the renaissance, served a dual purpose: advertising the achievements of the wearer and his antecedents, and serving to identify the wearer to his retainers and other followers in the heat of battle. This latter factor was to play an important part when heraldry, in a different form, reappeared in military use in the early part of the 20th Century.

During World War I, the ever increasing complexity of the military machine, as regards both front line units and their rear-area service echelons, led to the need for identification markings once again. These would allow members of any particular division to recognise each other, and sign-posts bearing the device of the division would guide transport vehicles bringing up supplies from the rear to the correct delivery areas.

Thus were borne the divisional shoulder patches and vehicle markings that are so important in the identification of units from photographs. With increasing complexity in army structure in World War II, insignia for corps, armies. and army groups also became common. Some of these emblems were designed to impress the viewer by their originality, as well as express the sentiments of the wearers–such an emblem was the wildcat of the American

81st Division in both World War I and II. Others had a design based on geometrical or numerical values–such an emblem was the double pentagon of the American 55th Division, the halved 9 and 4 of the 94th Division and, slightly more complex, the intertwined Arabic 9 and Roman V or 5 of the 95th Division. Yet again, there were some formations that took their emblems from a whim of their commander or from some aspect of the division itself. An example of the first was the monogram JP of the British 54th (East Anglian) Division, derived from the initials of its wartime commander, Major-General J. H. T. Priestman; an example of the second can be found in another monogram, the famous HD of the 51st (Highland) Division, derived of course from the words Highland Division. This latter was an emblem worn by the men, and also painted on vehicles and road-signs, so liberally during the Italian campaign between 1943 and the end of the war that the division became known as the "Highway Decorators".

On the Western side, formations could be identified easily enough by the English-speaking Allies, but insignia greatly eased the problem with French North African troops and other non-English speakers. The problem was as difficult, if not worse, on the German side.

Southern Defense Command

Eastern Defense Commond

Military District of Washington

Alaskan Department

Atlontic Base Commands

Persion Gulf Service Command

Supreme Heodquarters Allied Expeditionary Force

Caribbean Defense Command

Army Forces South Atlantic

Amphibious units

Army Forces Middle East

Ronger bottalions

South-Eost Asia Command H.Q.

Allied Force H.Q.

Ports of emborkotion

E.T.O.

Hawaiian Seporate Coast Artillery Bde.

Icelond Base Commond

99th Infantry Battalion

Airborne Command

A.A. Artillery Commond, Southern Defense Command

A.A. Artillery Commond, Western Defense Command

A.A. Command

Labrodor, North-East ond Centrol Canoda Commond

Greenland Bose Commo

442nd Combat Team

General Headquarters Reserve

Replocement and School Command

Army Ground Forces Replocement Depots

North African Theotre

1st Filipino Unit

BRITISH ARMY FORMATION BADGES

G.H.Q. Home Forces

G.H.Q. India

Allied Land Forces South-East Asia

South-East Asia Command

15th Army Group

21st Army Group

Central Mediterranean Force

1st Army

2nd Army

8th Army

9th Army

10th Army

12th Army

14th Army

I Corps

II Corps

III Corps

IV Corps

V Corps

VIII Corps

IX Corps

X Corps

XI Corps

XII Corps

XIII Corps

XXV Corps

XXX Corps

Guards Armoured Division

1st Armoured Division

2nd Armoured Division

6th Armoured Division

7the Armoured Division (1st pattern)

7th Armoured Division (2nd pattern)

8th Armoured Division

9th Armoured Division

10th Armoured Division

11th Armoured Division

42nd Armoured Division

79th Armoured Division

4th Armoured Brigade

6th Armoured Brigade

7th Armoured Brigade

8th Armoured Brigade

9th Armoured Brigade

16th Armoured Brigade

20th Armoured Brigade

22nd Armoured Brigade

23rd Armoured Brigade

25th Armoured Brigade

27th Armoured Brigade

31st Brigade

33rd Armoured Brigade

34th Armoured Brigade

35th Armoured Brigade

1st Arm'd. Replacement Group, C.M.F.

21st Army Tank Brigade (1st pattern) (2nd pattern)

23rd 24th 25th 36th

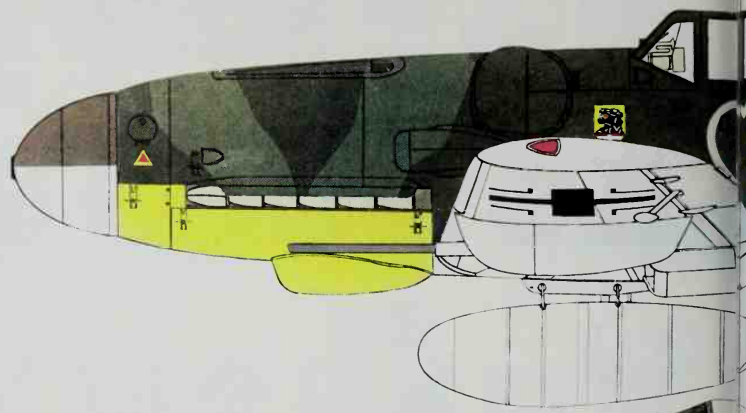
Army Tank Brigade

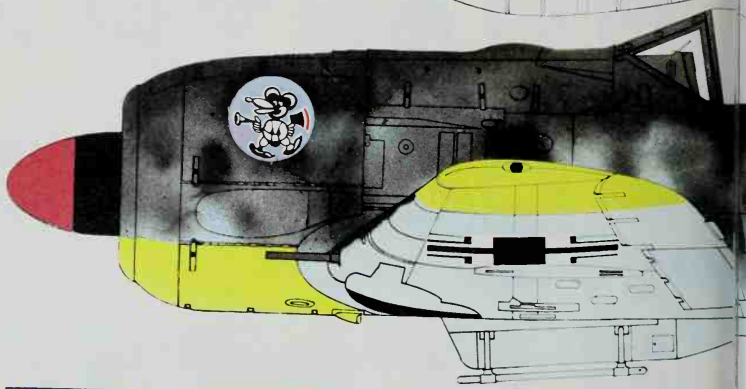
LUFTWAFFE FIGHTER UNI

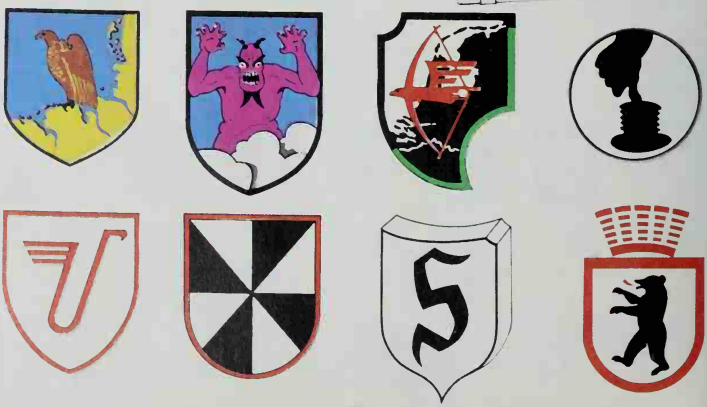
Two conflicting factors have to be taken into account in determining the colouring of fighter aircraft: camouflage for concealment at range, and bright markings for easy recognition in combat. The first led to the many and diverse camouflage schemes used by the Luftwaffe, and the second to the bright distinctive markings applied by the pilots themselves.

The first Luftwaffe colour scheme consisted of an overall light grey finish with pale blue undersurfaces. In 1938 this was altered, and all surfaces that could be seen from above were finished in black-green. The lines at which colours met was sharp. The national markings on the fuselage and wings consisted of Balkan crosses outlined in white and black, and on the tailplane of a swastika outlined in white. The code number of the *Staffel* was painted in front of the Balkan cross on the fuselage in the *Staffel* colour (white for the 1st, 4th, and 7th; red for the 2nd, 5th, and 8th; and yellow for the 3rd, 6th, and 9th). The *Gruppe* marking, often in the same colour as the *Staffel* one, was painted behind the Balkan cross.

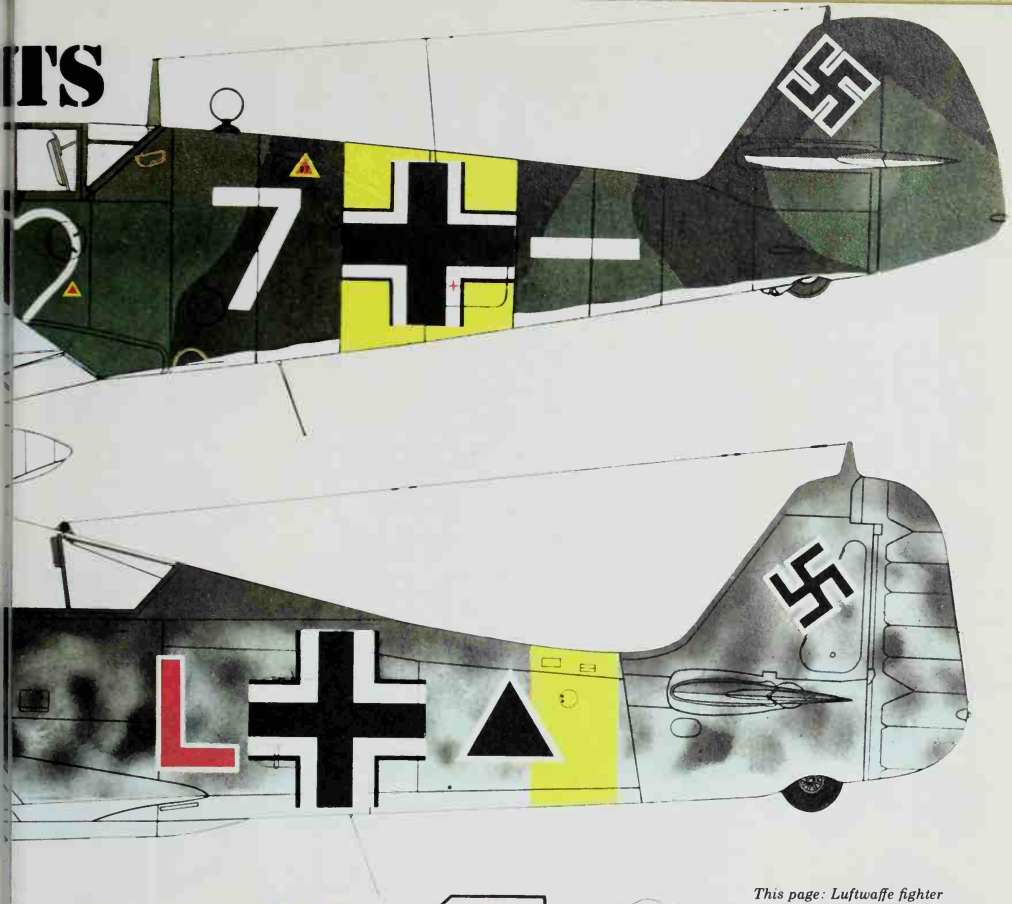
After the Polish campaign the black-green uppersurface colour was replaced by a jagged scheme of light and dark green. This in turn was superseded from 1941 by a scheme of light grey flecked with dark grey patches, gradually blending into the light blue undersurfaces.





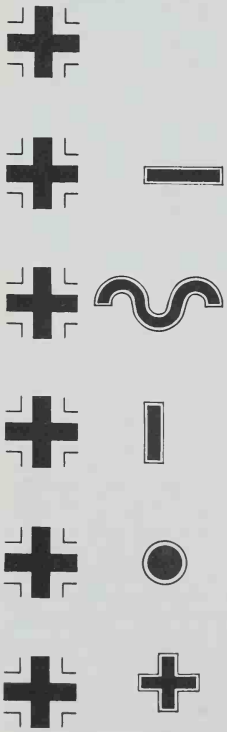


This page: *Luftwaffe fighter insignia.* Top row, from left to right: Jagdgeschwader (*JG*) *"Schumacher", and later the staff of JG 1 from November 1, 1939 to the end of 1940;* Gruppe I *of JG 1 (I/JG 1); III/JG 1; and the 7th* Staffel *of JG 2 "Richthofen" (7/JG 2).* Bottom row, from left to right: *JG 3 "Udet"; II/JG 3; JG 26 "Schlageter"; and II/JG 27* (Gruppe II *had been adopted by Berlin, whose symbol, the bear, thus appeared on the* Gruppe *badge.) These emblems normally appeared on the nose or under the cockpit of the aircraft.*



This page: Luftwaffe fighter insignia. Top row, from left to right: *12/JG 2 "Richthofen"; JG 51 "Mölders"; II/JG 51 up to the summer of 1943; and 7/JG 27.* Bottom row, from left to right: *I/JG 51 (the* Gruppe *was formed in Bad Aibling in the Alps, south of Munich–hence the chamois motif); II/JG 54* "Grünherz" *(Green Heart), which was formed in Wien-Aspen; 8/JG 51 (previously 2/JG 20); and JG 52. All these are unit markings, and should not be confused with the personal markings also carried on many aircraft.*
△△ A Messerschmitt Bf 109G-6 of the 4th Staffel *of II/JG 54.*
△ A Focke-Wulf Fw 190G in late war markings.

△ *Mainstay of the Luftwaffe's* Jagdverbände *(fighter units) throughout the war – the Messerschmitt Bf 109.*
▽ Gruppe *identification markings for fighter units.*
▽▷ *Staff* (Stab) *identification markings for fighter units.*



Included in the comprehensive system of German identification markings were those for the *Gruppe* within the *Geschwader* and the staff officers at *Geschwader* and *Gruppe* level. The *Gruppe* markings appeared behind the fuselage Balkan cross. The staff markings always appeared in front of the cross.

To make Luftwaffe nomenclature more readily intelligible, a brief account of *Jagdverbände* organisation follows. The smallest tactical unit was the *Rotte* of two aircraft, four aircraft comprising a *Schwarm*. Twelve aircraft formed a *Staffel*, led by the *Staffelkapitän* or Squadron Captain. (*Staffelkapitän* was a title and not a rank.) Three *Staffeln* made up a *Gruppe*, led by the *Gruppenkommandeur* or Group Commander (another title). Three *Gruppen* formed a *Geschwader*, in turn led by the *Geschwaderkommodore* or *Geschwader* Commodore (another title). It should be noted that although the relationship between the various command levels remained constant, the actual numbers did not, tactical or logistical considerations often necessitating changes. Another change occurred in the autumn of 1940, when a fourth *Staffel* was added to many fighter *Gruppen*, and a fourth *Gruppe* to several *Geschwader*. The identifying colour for the fourth *Staffel* was blue.

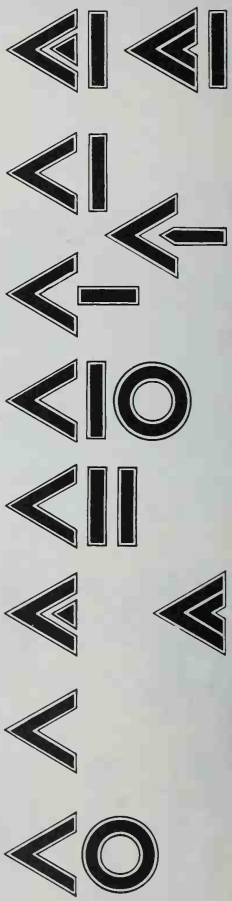
The *Gruppe* identification markings to the left were as follows, reading from top to bottom: I *Gruppe* (no marking behind the Balkan cross); II *Gruppe*; III *Gruppe*; III *Gruppe* variation from the spring of 1941 (the vertical band ran round the fuselage); IV *Gruppe*; and IV *Gruppe* variation.

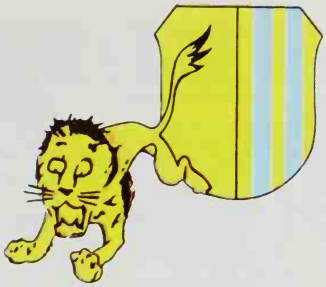
The staff identification markings to the right were as follows, reading from top to bottom: two versions of the *Geschwaderkommodore*; the *Geschwader* adjutant; two variations of the *Geschwader* Intelligence officer; the *Geschwader* technical officer; the staff major; two variations of the *Gruppenkommandeur*; the *Gruppe* adjutant; and the *Gruppe* technical officer.

For practical considerations, staff officers were prohibited from flying operationally in aircraft marked with their official insignia. At the same time *Staffel* commanders were told not to fly in their *Staffel's* lead aircraft from the end of 1940.

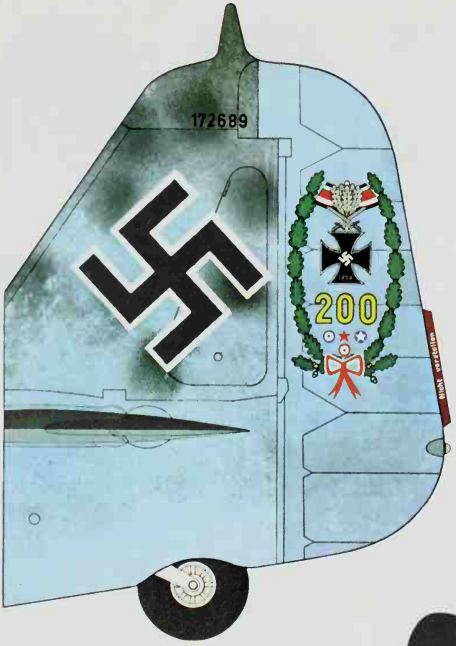
Other operational markings carried by German aircraft were rings of solid colour round the fuselage in front of the tailplane. It is still uncertain what the exact significance of these markings was, although it is probable that they denoted the theatre in which the aircraft was fighting: white for North Africa, the Mediterranean, and southern Russia; yellow for central and northern Russia, Scandinavia, and north-west Europe; and parallel bands of yellow, red, and yellow for the "defence of the Reich" from the beginning of 1944.

Propeller spinners also had distinctive colourings, although there was no completely logical scheme behind these markings, as there was with the others. Nevertheless, certain patterns are discernible: a solidly-coloured spinner for a *Staffel*; half-coloured (normally green) for the staff; three-quarter-coloured as an alternative *Staffel* marking; and quartered as a further alternative for *Staffel* markings. There were also ring and spiral markings.

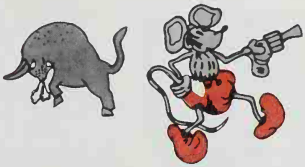


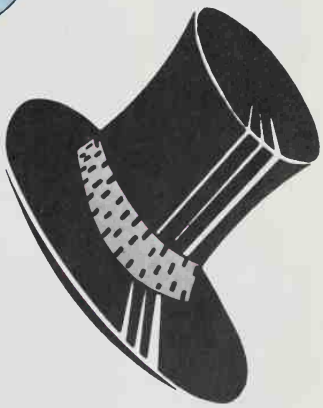


As we have noted, the standard Luftwaffe markings were often supplemented by the unofficial markings of fighter pilots. Six of these personal insignia, plus a typical victory tally marking, are illustrated here. *Top row, from left to right*: the personal marking of *Oberstleutnant* (Lieutenant-Colonel) Adolf Galland while on the *Geschwader* staff of JG 26 "Schlageter". Galland scored 103 victories in all, and ended the war as a Lieutenant-General and ex-*General der Jagdflieger*; of *Hauptmann* (Captain) Heinz Bär, while *Kommandeur* of I/JG 77 in Sicily during May 1942 (the coat of arms is that of Leipzig); of *Oberstleutnant* (Lieutenant-Colonel) Witt, while on the *Geschwader* staff of JG 26 "Schlageter"; the victory tally markings on the tail of Major Heinz Bär's Fw 190 in which, on April 22, 1944, he shot down the 200th of his 220 victims (the markings indicate the score, the award of the Knight's Cross of the Iron Cross with Oak Leaves and Swords, and the British, French, Russian, and American national markings of his victims); the personal bear insignium of *Oberleutnant* (1st Lieutenant) Werner Ursinus, while *Gruppe* Adjutant of II/JG 53 "*Pik As*" in 1939 and 1940; of Major Handrick, while on the *Geschwader* staff of JG 26; and of Captain Knüppel, while on the *Gruppe* staff of JG 26. Personal insignia were usually applied under the cockpit on the port side of the fuselage, often repeated on the starboard side.



It is also worth noting that the painting of victory tallies on the empennage was officially banned, but that the authorities on the whole overlooked the almost universal practice of so doing. The official attitude was that a display of victories would lead to a situation in which enemy fighters would concentrate against the most prominent German aces. The markings, however, served a useful morale and identification purpose.





WEHRMACHT FOREIGN L

Georgia

Vlasov Army (late pattern)

Vlasov Army (early pattern)

Don

Don Cossack

Kuban'

Kuban' Cossack

Armenia

Turkistan (3rd pattern)

Turkistan (1st pattern)

Caucasus

Terek Cossack

Terek

Azerbaijan

Kalmuk

Volga Tartar

Volga Tartar

Volga Tartar

Ukraine

Ukraine

Belorussia

Estonia

Kaminsky Brigade

Latvia

Lithuania

EGION SLEEVE FLASHES

From the earliest days of the war, the German armed forces took in volunteers of racially-acceptable stock for service in the army and the *Waffen*-S.S. These foreign volunteers came at first from countries such as Belgium, Holland, Denmark, and Norway, and throughout the war proved loyal and efficient bodies of troops, serving under S.S. control in the latter stages of the war, after starting under army command.

After Hitler turned his attention to the East and Russia, the Germans found that large numbers of Russian prisoners-of-war were willing to serve with the Germans against their former comrades. Moreover, minority racial groups in "liberated" areas also wished to fight against the Russians. At first the Germans were sceptical of the value that units formed from such groups would represent. Such units as were raised had no separate identity, and were used as lines-of-communication troops and for security operations.

However, as Germany's fortunes in the East began to wane, these nationalist forces began to be given an identity of their own, and a more martial part to play in the so-called "Struggle against Communism". Originally this had also been an attempt to destroy the "Slavic sub-humans", but the fortunes of war now meant that these same "sub-humans" had to be accepted for service with the previously racially-pure S.S. As the Germans pulled back between 1943 and 1945, the homelands of these ethnic groups serving with the Germans were overrun, leaving them no alternative but to see the war out with their masters.

Possibly the most celebrated of these foreign formations was the Vlasov Army, raised from Russian P.O.W.s by Lieutenant-General Andrei Vlasov, who had been captured by the Germans before Leningrad in 1942. The army was involved in an abortive revolt in Czechoslovakia in 1945, but after its surrender, the Western Allies handed Vlasov over to the Russians, who shot him.

Russia

Spain

France

Flanders

Turkistan (2nd pattern)

Belgium

Holland

Italy


Crimean Tartar

Slovakia

Hungary


Bulgaria

Siberian Cossack

Rumania

Croatia

Croatia

Denmark


Finland

India

WAFFEN S.S. CUFF TITLES

11th "Nordland" *Volunteer* Panzergrenadier *Division*

"Nordwest" *Battlion (later* Freikorps "Danmark")

Freikorps "Danmark" *(attached to the* "Nordland" *Division)*

24th "Danmark" Panzergrenadier *Regiment* ("Nordland" *Division)*

"Norwegen" *Legion* ("Nordland" *Division)*

23rd "Norge" Panzergrenadier *Regiment* ("Nordland" *Division) or* "Norge" *Ski Bottalion* ("Nord" *Division)*

11th "Hermann von Salza" *Ponzer Battalion* ("Nordland" *Division)*

27th "Langemarck" *Volunteer Grenodier Division*

28th "Wallonien" *Volunteer* Panzergrenadier *Division*

"Vlaanderen" *Legion (become* "Wallonie" *and* "Nederland")

"Niederlande" *Volunteer Legion (became* "Nederland")

Heimwehr *"Danzig"*

5th "Wiking" Panzergrenadier *Division*

"Germania" Panzergrenadier *Regiment* ("Wiking" *Division)*

10th "Westland" Panzergrenadier *Regiment* ("Wiking" *Division)*

16th "Michael Gassmair" Gebirgsjäger *Regiment (6th* "Nord" Gebirgs-*Division)*

7th "Prinz Eugen" *Volunteer* Gebirgs-*Division*

18th "Horst Wessel" *Volunteer* Panzergrenadier *Division*

21st "Skanderbeg" *(1st Albanian)* Gebirgs-*Division*

23rd "Nederland" *Volunteer* Panzergrenadier *Division*

43th "De Ruyter" *Volunteer* Panzergrenadier *Regiment* ("Nederland" *Division)*

34th "Landstorm Nederland" *Grenodier Division*

AND COLLAR EMBLEMS

Britisches Freikorps

33rd "Charlemagne" *(1st French) Grenadier Division*

Indian Volunteer Legion

30th (2nd Russian) Grenadier Division

30th (2nd Russian) Grenadier Division (variant)

S.S. runes

13th "Handschar" *(1st Croatian)* Gebirgs-*Division*

15th (1st Latvian) Grenadier Division

23rd "Nederland" *Volunteer* Panzergrenadier *Division*

28th "Wallonie" *Volunteer* Panzergrenadier *Division*

5th "Wiking" Panzergrenadier *Division*

14th "Galizien" *Grenadier Division*

18th "Horst Wessel" *Volunteer* Panzergrenadier *Division*

23rd "Nederland" *Volunteer* Panzergrenadier *Division (variant)*

29th (1st Russian) Grenadier Division

33rd "Charlemagne" *(1st French) Grenadier Division (variant)*

30th (2nd Russian) Grenadier Division (variant)

20th (1st Estonian) Grenadier Division

23rd "Kama" *(2nd Croatian)* Gebirgs-*Division*

29th (1st Russian) Grenadier Division

7th "Prinz Eugen" *Volunteer* Gebirgs-*Division*

19th (2nd Latvian) Grenadier Division

21st "Skanderbeg" *(1st Albanian)* Gebirgs-*Division*

25th "Hunyadi" *(1st Hungarian) Grenadier Division*

29th (1st Italian) Grenadier Division

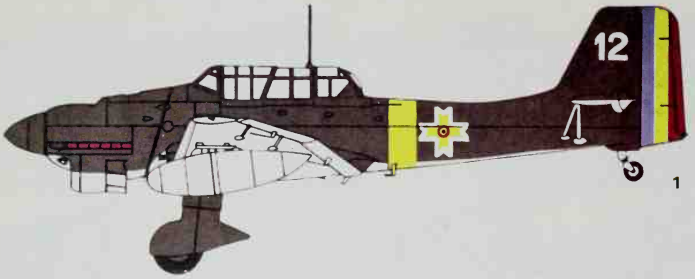
11th "Nordland" *Volunteer* Panzergrenadier *Division*

Estonian Legion

22nd "Maria Theresa" *Volunteer Cavalry Division*

27th "Langemarck" *Volunteer Grenadier Division*

AXIS AIR FORCES



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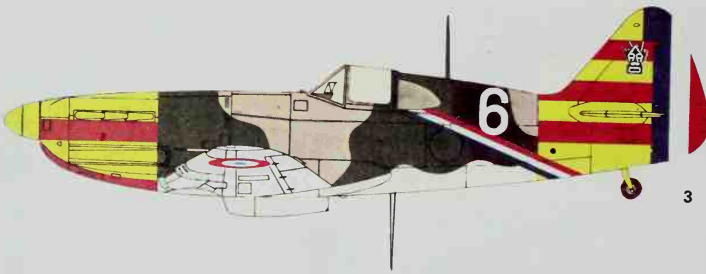

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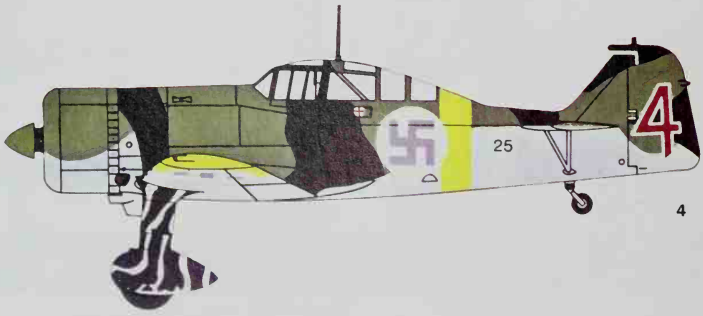


4

Although Germany's Luftwaffe bore the brunt of the Axis war effort in the air, there were nevertheless important contributions made by the air forces of the other powers allied to Germany.

The most important of these other nations was Italy, partner in the Axis agreement with Nazi Germany. Some nations, such as Slovakia, were mere satellites, while others, such as Finland, were true allies. In both of the latter cases, most of the equipment, especially in the closing stages of the war, was of German origin.

1. *Rumanian Junkers Ju 87R-2. The Rumanian Air Force was the largest of Germany's satellite air forces, and the original markings shown were later simplified, the blue.being dropped.*

2. *Italian Macchi C.202* Folgore. *The* fasces *symbol was located above and below the wings, and just in front of the cockpit; the red, white, and green rudder stripes were abandoned in favour of the white cross to avoid confusion with French markings in June 1940.*

3. *Vichy French Dewoitine 520. The noteworthy feature of these markings was the combination of the ordinary French markings with the Vichy orange and red stripes on the nose, rear fuselage, and fin.*

4. *Finnish Fokker D-XXI, in standard camouflage and national markings. Unlike most other countries, Finland did not use national markings on the tailplanes of her aircraft.*

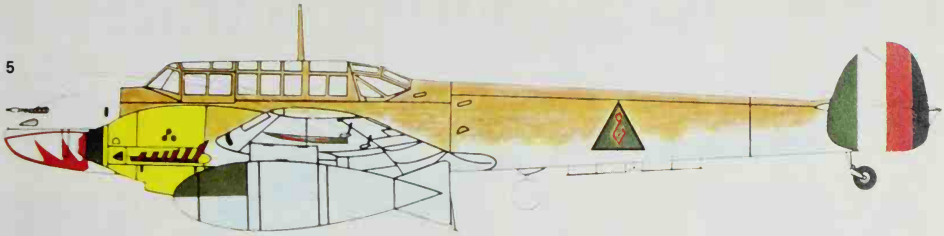
5. *Iraqi Messerschmitt Bf 110D-3. German aircraft operating in Iraq against the British were German-flown, and the Iraqi markings were "colours of convenience".*

6. *Finnish Dornier 17Z-2. Finnish serials were often derived from the aircraft's nomenclature, JK standing for Junkers, MT for Messerschmitt, DB for the Ilyushin DB-3, and PE for the Petlyakov PE-2.*

7. *Slovakian Heinkel 111H. Wing markings were as for the Luftwaffe. The Slovakian Air Force was the smallest of those possessed by Germany's allies, numbering under 100 aircraft.*

8. *Hungarian Junkers 88A. Between 1939 and 1941, Hungarian markings had consisted of red, white and green chevrons on the wings and rudder. In 1941 these were replaced by the markings shown.*

5



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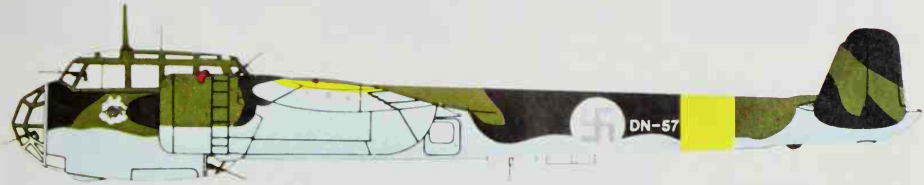

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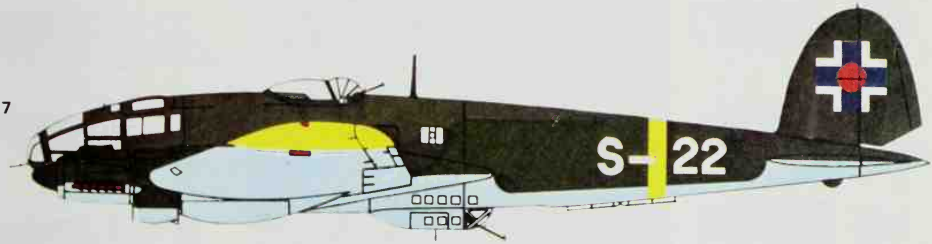

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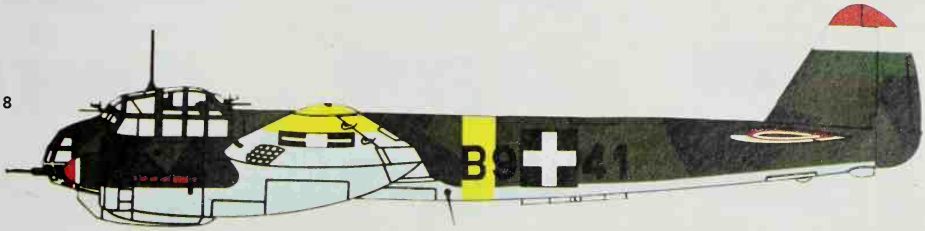
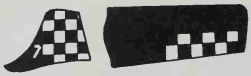


U.S. PACIFIC CARRIER MARKINGS


Saratoga (CV-3)


Independence (CVL-22)

Ticonderoga (CV-14)

Yorktown (CV-10)


Monterey (CVL-26)

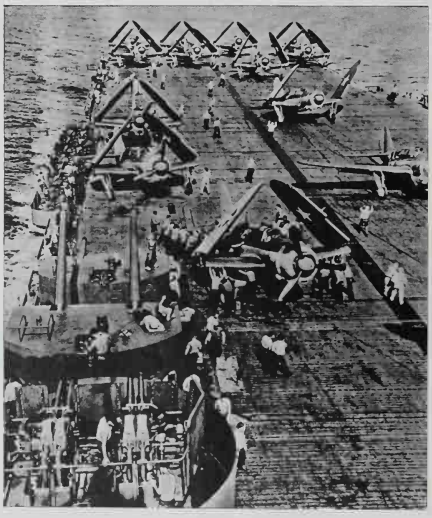

Essex (CV-9)


Franklin (CV-13)


Bataan (CVL-29)

Hornet (CV-9)


Lexington (CV-16)




Randolph (CV-15)

Hancock (CV-19)


Wasp (CV-18)


Bonhomme Richard (CV-31)


Boxer (CV-21)


Lake Champlain (CV-39)


Shangri-La (CV-38)


Cowpens (CVL-25)


Belleau Wood (CVL-24)

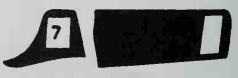

Cabot (CVL-28)


Bunker Hill (CV-17)


Langley (CVL-27)


Enterprise (CV-6)


Bennington (CV-20)


San Jacinto (CVL-30)


Intrepid (CV-11)


Antietam (CV-36)


Rudyard Bay (CVE-81)

ITALIAN AIR FORCE MARKINGS

79, 81, & 88/1/6

70, 74, & 75/3 "Vespa"*/23*

73, 96, & 97/4
"Cavallino Rampante"*/9*

84, 90, & 91/4
"Cavallino Rampante"*/10*

150, 151, 152 & 358/6
"Diavoli Rossi"*/2*

410 Squadron (Addis Ababa, 1940-41)

97/–/9

90/–/10

351, 352, & 353/51/20

167, 168, & 169/54/16

150, 151, 152, & 358/–/2

83, 85, & 95/–/18

357, 358, 359, 362, 369, & 371/–/22 "Spauracchio"

363, 364, & 365/–/150

368 & 370/–/152
"Asso di Spade"

372, 373, & 374/–/153
"Asso di Bastoni"

361, 376, & 395/–/154

384, 385, 386, 357, & 371/–/157

393, 394, 395, 375, 393, & 394/–/160

162/–/161

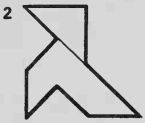
Italian national markings consisted of a stylised representation of the *fasces* (the Roman symbol of authority: an axehead protruding from a bundle of rods) painted in black or white on the upper and lower surfaces of the wings, a full-colour representation under the cockpit or on the fuselage nose, and a white cross with the arms of the house of Savoy in its centre on the rudder. Before the war Italian aircraft had possessed rudders striped in red, white, and green, but this practice had been discontinued in June 1940 to avoid confusion with French markings. Aircraft of the Italian Co-Belligerent Air Force serving with the Allies in 1944 and 1945 reverted to these pre-war markings.

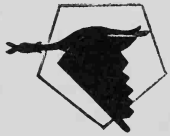
The standard *Regia Aeronautica* camouflage scheme consisted of a very light brown colour on the undersurfaces (although light blue or light grey was sometimes used) with mid-green, mottled with mid-brown (and yellow for aircraft operating in North Africa), on the upper surfaces.

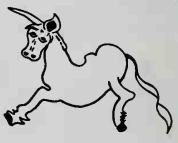
Apart from these markings, the Italians also used a variety of operational insignia. The most notable of these was the white band painted round the fuselage of aircraft working in co-operation with Luftwaffe units. The band was painted on the fuselage one metre in front of the tailplane, and was half a metre wide for single-engined machines and one metre wide on all others.

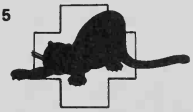
The other major markings borne by Italian aircraft were squadron (*squadriglia*) emblems, which were often bizarre and always very colourful.

△ *A Fiat CR 42 of the* Regia Aeronautica's *384th Squadron, which was serving in Albania in 1941. In the illustrations on the left, the figures before the first oblique stroke indicate the* squadriglie, *before the second to the* stormo, *and after the second to the* gruppo.







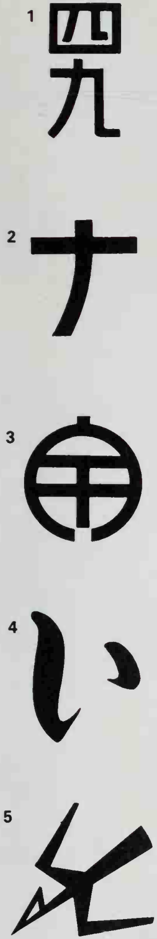


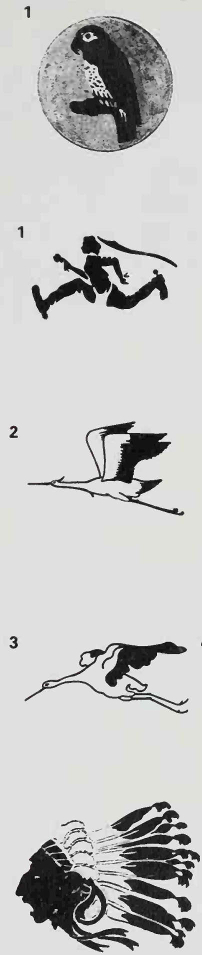
Polish Air Force markings:
1. *No. 111* "Kosciuszko" *Squadron of the 1st Air Regiment in Warsaw.* **2.** *No. 121 Squadron of the 2nd Air Regiment in Krakow.* **3.** *No. 132 Squadron of the 3rd Air Regiment in Poznan.* **4.** *No. 161 Squadron of the 6th Air Regiment in L'vov.* **5.** *No. 55 Squadron of the Bomber Brigade. The first four units flew P.Z.L. P-11c fighters.*

Polish Air Force markings:
1. *No. 112 Squadron of the 1st Air Regiment in Warsaw.* **2.** *No. 122 Squadron of the 2nd Air Regiment in Krakow.* **3.** *No. 141 Squadron of the 4th Air Regiment in Torun.* **4.** *No. 21 Squadron of the Bomber Brigade.* **5.** *No. 64 Regiment of the 6th Air Regiment in L'vov. The first three units flew the P.Z.L. P-11c and the last two the P.Z.L. P-23b* "Karaś" *bomber.*

Finnish Air Force units:
1. *No. 2 Maritime Squadron (Hansa-Brandenburg).* **2.** *No. 24 Fighter Squadron (Brewster 239 Buffalo).* **3.** *Night Fighter Flight of No. 31 Fighter Squadron (Messerschmitt Bf 109G).* **4.** *1st Flight of No. 12 Reconnaissance Squadron (Fokker D-XXI).* **5.** *The Military Flying School.*

Finnish Air Force units:
1. *2nd Flight of No. 24 Fighter Squadron (Brewster 239 Buffalo).* **2.** *No. 48 Bomber Squadron (Petlyakov Pe-2).* **3.** *No. 46 Bomber Squadron (Bristol Blenheim IV and Dornier Do 17Z-2).* **4.** *2nd Flight of No. 12 Reconnaissance Squadron (Fokker D-XXI).* **5.** *No. 11 Fighter Squadron.*





Japanese Army Air Force training formations:
1. *Akeno Training School (1938–42).* **2.** *Shimoshizu Flying School (1941–4).* **3.** *Utsonomia Flying School (1940–4).* **4.** *Tokorosawa Air Maintenance School (1943–4).* **5.** *39th Flight Training Company on Yokoshiba airfield (1945).*

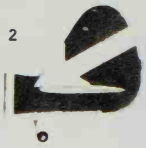
Japanese Army Air Force training formations:
1. *Akeno Training School (1942–3).* **2.** *Kumagaya Flying School (1938–45).* **3.** *Tachiarai Flying School (1940–5).*
4. *Hitachi Air Training Division Instructor Squad (1944–5).*
5. *Flight Training Company on Kallang airfield, Singapore.*

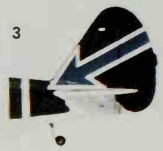
Royal Netherlands Air Force:
1. *No. 332 Squadron.*

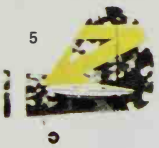
French Air Force units:
1. *No. 2 Squadron of* Groupe de Chasse *II/4.* **2.** *No. 2 Squadron of* Groupe de Chasse *II/5.*
3. *SPA 103 Squadron.* **4.** *No. 1 Squadron of* Groupe de Chasse *II/5.*

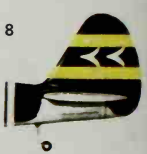
French Air Force units:
1. *No. 4 Squadron of* Groupe de Chasse *II/6.* **2.** *No. 2 Squadron of* Groupe de Chasse *I/4.* **3.** Groupe de Chasse *III/6.* **4.** *No. 4 Squadron of* Groupe de Chasse *II/7.* **5.** Groupe de Chasse *III/7.*

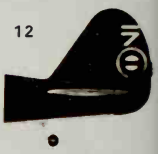
MARKINGS OF THE JAPANESE AIR FORCES











Japanese Army Air Force Nakajima Ki-43 *"Hayabusa"* units.
1. *3rd Company, 64th Air Combat Regiment (Malaya/Burma 1941–2).* **2.** *1st Company, 64th Reg't. (Thailand 1942).* **3.** *H.Q. Company, 64th Reg't. (Thailand 1943).* **4.** *2nd Company, 64th Reg't. (Thailand 1944).* **5.** *Squad Leader, 3rd Company, 64th Reg't. (Thailand 1944).* **6.** *1st Company, 77th Air Combat Regiment (Manchuria/Burma 1943).* **7.** *2nd Company, 77th Reg't. (Manchuria/Burma 1943).* **8.** *3rd Company, 77th Reg't. (Manchuria/Burma 1943).* **9.** *1st Company, 77th Reg't. (Burma/New Guinea 1943–4).* **10.** *2nd Company, 77th Reg't. (Burma/New Guinea 1943–4).* **11.** *71st Independent Fighter Company (French Indo-China/Malaya 1945).* **12.** *Kumagaya Army Flying School, 1942–4.* **13.** *1st Company, 1st Air Combat Regiment (South-West Pacific 1943).* **14.** *2nd Company, 1st Reg't. (South-West Pacific 1943).* **15.** *1st Company, 1st Reg't. (Philippines 1944).* **16.** *3rd Company, 11th Air Combat Regiment (Dutch East Indies/South-West Pacific 1942–3).* **17.** *2nd Company, 13th Air Combat Regiment (New Guinea 1943).* **18.** *3rd Company, 20th Air Combat Regiment (Japan 1943–5).* **19.** *2nd Company, 25th Air Combat Regiment (China 1942).* **20.** *1st Company, 25th Reg't. (China 1943).* **21.** *H.Q. Company, 25th Reg't. (China 1943–5).* **22.** *1st Company, 25th Reg't. (China 1943–5).* **23.** *2nd Company, 63rd Air Combat Regiment (New Guinea 1944).* **24.** *3rd Company, 63rd Reg't. (New Guinea 1944).*