

World War II[b] or the Second World War was a global conflict that lasted from 1939 to 1945. The vast majority of the world's countries, including all the great powers, fought as part of two opposing military alliances: the Allies and the Axis. Many participating countries invested all available economic, industrial, and scientific capabilities into this total war, blurring the distinction between civilian and military resources. Aircraft played a major role, enabling the strategic bombing of population centres and delivery of the only two nuclear weapons ever used in war. It was by far the deadliest conflict in history, resulting in 70–85 million fatalities. Millions died due to genocides, including the Holocaust, as well as starvation, massacres, and disease. In the wake of Axis defeat, Germany, Austria, and Japan were occupied, and war crime tribunals were conducted against German and Japanese leaders.

The causes of the war are debated; contributing factors included the rise of fascism in Europe, the Spanish Civil War, the Second Sino-Japanese War, Soviet–Japanese border conflicts, and tensions in the aftermath of World War I. World War II is generally considered to have begun on 1 September 1939, when Nazi Germany, under Adolf Hitler, invaded Poland. The United Kingdom and France declared war on Germany on 3 September. Under the Molotov–Ribbentrop Pact of August 1939, Germany and the Soviet Union had partitioned Poland and marked out their "spheres of influence" across Finland, Estonia, Latvia, Lithuania, and Romania. From late 1939 to early 1941, in a series of campaigns and treaties, Germany conquered or controlled much of continental Europe in a military alliance called the Axis with Italy, Japan, and other countries. Following the onset of campaigns in North and East Africa, and the fall of France in mid-1940, the war continued primarily between the European Axis powers and the British Empire, with the war in the Balkans, the aerial Battle of Britain, the Blitz of the UK, and the Battle of the Atlantic. In June 1941, Germany led the European Axis powers in an invasion of the Soviet Union, opening the Eastern Front, the largest land theatre of war in history.

Japan aimed to dominate East Asia and the Asia-Pacific, and by 1937 was at war with the Republic of China. In December 1941, Japan attacked American and British territories with near-simultaneous offensives against Southeast Asia and the Central Pacific, including an attack on Pearl Harbor which resulted in the United States and the United Kingdom declaring war against Japan. The European Axis powers declared war on the US in solidarity. Japan soon conquered much of the western Pacific, but its advances were halted in 1942 after losing the critical Battle of Midway; Germany and Italy were defeated in North Africa and at Stalingrad in the Soviet Union. Key setbacks in 1943—including German defeats on the Eastern Front, the Allied invasions of Sicily and the Italian mainland, and Allied offensives in the Pacific—cost the Axis powers their initiative and forced them into strategic retreat on all fronts. In 1944, the Western Allies invaded German-occupied France, while the Soviet Union regained its territorial losses and pushed Germany and its allies back. During 1944–1945, Japan suffered reversals in mainland Asia, while the Allies crippled the Japanese Navy and captured key western Pacific islands. The war in Europe concluded with the liberation of German-occupied territories; the invasion of Germany by the Western Allies and the Soviet Union, culminating in the Fall of Berlin to Soviet troops; Hitler's suicide; and the German unconditional surrender on 8 May 1945. Following the refusal of Japan to surrender on the terms of the Potsdam Declaration, the US dropped the first atomic bombs on Hiroshima on 6 August and Nagasaki on 9 August. Faced with imminent invasion of the Japanese archipelago, the possibility of more atomic bombings, and the Soviet Union's declared entry into the war against Japan on the eve of invading Manchuria, Japan

announced on 10 August its intention to surrender, signing a surrender document on 2 September 1945.

World War II changed the political alignment and social structure of the world, and it set the foundation for the international order for the rest of the 20th century and into the 21st century. The United Nations was established to foster international cooperation and prevent conflicts, with the victorious great powers—China, France, the Soviet Union, the UK, and the US—becoming the permanent members of its Security Council. The Soviet Union and the United States emerged as rival superpowers, setting the stage for the Cold War. In the wake of European devastation, the influence of its great powers waned, triggering the decolonisation of Africa and Asia. Most countries whose industries had been damaged moved towards economic recovery and expansion.

Start and end dates

See also: List of timelines of World War II

Timelines of World War II

Chronological

Prelude

(in Asiain Europe)

1939194019411942

194319441945 onwards

By topic

Diplomacy

Declarations of war

EngagementsOperations

By theatre

Battle of Europe air operations

Eastern FrontManhattan Project

United Kingdom home front

Surrender of the Axis armies

vte

World War II began in Europe on 1 September 1939^{[1][2]} with the German invasion of Poland and the United Kingdom and France's declaration of war on Germany two days later on 3 September 1939. Dates for the beginning of the Pacific War include the start of the Second Sino-Japanese War on 7 July 1937,^{[3][4]} or the earlier Japanese invasion of Manchuria, on 19 September 1931.^{[5][6]} Others follow the British historian A. J. P. Taylor, who stated that the Sino-Japanese War and war in Europe and its colonies occurred simultaneously, and the two wars became World War II in 1941.^[7]

Other theorised starting dates for World War II include the Italian invasion of Abyssinia on 3 October 1935.[8] The British historian Antony Beevor views the beginning of World War II as the Battles of Khalkhin Gol fought between Japan and the forces of Mongolia and the Soviet Union from May to September 1939.[9] Others view the Spanish Civil War as the start or prelude to World War II.[10][11]

The exact date of the war's end also is not universally agreed upon. It was generally accepted at the time that the war ended with the armistice of 15 August 1945 (V-J Day), rather than with the formal surrender of Japan on 2 September 1945, which officially ended the war in Asia. A peace treaty between Japan and the Allies was signed in 1951.[12] A 1990 treaty regarding Germany's future allowed the reunification of East and West Germany to take place and resolved most post–World War II issues.[13] No formal peace treaty between Japan and the Soviet Union was ever signed,[14] although the state of war between the two countries was terminated by the Soviet–Japanese Joint Declaration of 1956, which also restored full diplomatic relations between them.[15]

History

Background

Main article: Causes of World War II

Aftermath of World War I

The League of Nations assembly, held in Geneva, Switzerland (1930).

World War I had radically altered the political European map with the defeat of the Central Powers—including Austria-Hungary, Germany, Bulgaria, and the Ottoman Empire—and the 1917 Bolshevik seizure of power in Russia, which led to the founding of the Soviet Union. Meanwhile, the victorious Allies of World War I, such as France, Belgium, Italy, Romania, and Greece, gained territory, and new nation-states were created out of the dissolution of the Austro-Hungarian, Ottoman, and Russian Empires.[16]

To prevent a future world war, the League of Nations was established in 1920 by the Paris Peace Conference. The organisation's primary goals were to prevent armed conflict through collective security, military, and naval disarmament, as well as settling international disputes through peaceful negotiations and arbitration.[17]

Despite strong pacifist sentiment after World War I,[18] irredentist and revanchist nationalism had emerged in several European states. These sentiments were especially marked in Germany because of the significant territorial, colonial, and financial losses imposed by the Treaty of Versailles. Under the treaty, Germany lost around 13 percent of its home territory and all its overseas possessions, while German annexation of other states was prohibited, reparations were imposed, and limits were placed on the size and capability of the country's armed forces.[19]

Germany

The German Empire was dissolved in the German Revolution of 1918–1919, and a democratic government, later known as the Weimar Republic, was created. The interwar period saw strife between supporters of the new republic and hardline opponents on both the political right and left. Italy, as an Entente ally, had made some post-war territorial gains; however, Italian nationalists were angered that the promises made by the United Kingdom and France to secure Italian entrance into the war were not fulfilled in the peace settlement. From 1922 to 1925, the Fascist movement led by Benito Mussolini seized power in Italy with a nationalist, totalitarian, and class collaborationist agenda that abolished representative democracy, repressed socialist, left-wing, and liberal forces, and pursued an aggressive expansionist foreign policy aimed at making Italy a world power, promising the creation of a "New Roman Empire".[20]

Adolf Hitler at a German Nazi political rally in Nuremberg, August 1933

Adolf Hitler, after an unsuccessful attempt to overthrow the German government in 1923, eventually became the Chancellor of Germany in 1933 when Paul von Hindenburg and the Reichstag appointed him. Following Hindenburg's death in 1934, Hitler proclaimed himself Führer of Germany and abolished democracy, espousing a radical, racially motivated revision of the world order, and soon began a massive rearmament campaign.[21] France, seeking to secure its alliance with Italy, allowed Italy a free hand in Ethiopia, which Italy desired as a colonial possession. The situation was aggravated in early 1935 when the Territory of the Saar Basin was legally reunited with Germany, and Hitler repudiated the Treaty of Versailles, accelerated his rearmament programme, and introduced conscription.[22]

European treaties

The United Kingdom, France and Italy formed the Stresa Front in April 1935 in order to contain Germany, a key step towards military globalisation; however, that June, the United Kingdom made an independent naval agreement with Germany, easing prior restrictions. The Soviet Union, concerned by Germany's goals of capturing vast areas of Eastern Europe, drafted a treaty of mutual assistance with France. Before taking effect, though, the Franco-Soviet pact was required to go through the bureaucracy of the League of Nations, which rendered it essentially toothless.[23] The United States, concerned with events in Europe and Asia, passed the Neutrality Act in August of the same year.[24]

Hitler defied the Versailles and Locarno Treaties by remilitarising the Rhineland in March 1936, encountering little opposition due to the policy of appeasement.[25] In October 1936, Germany and Italy formed the Rome–Berlin Axis. A month later, Germany and Japan signed the Anti-Comintern Pact, which Italy joined the following year.[26]

Asia

The Kuomintang (KMT) party in China launched a unification campaign against regional warlords and nominally unified China in the mid-1920s, but was soon embroiled in a civil war against its former Chinese Communist Party allies[27] and new regional warlords. In 1931, an increasingly militaristic Empire of Japan, which had long sought influence in China[28] as the first step of what its government saw as the country's right to rule Asia, staged the Mukden incident as a pretext to invade Manchuria and establish the puppet state of Manchukuo.[29]

China appealed to the League of Nations to stop the Japanese invasion of Manchuria. Japan withdrew from the League of Nations after being condemned for its incursion into Manchuria. The two nations then fought several battles, in Shanghai, Rehe and Hebei, until the Tanggu Truce was signed in 1933. Thereafter, Chinese volunteer forces continued the resistance to Japanese aggression in Manchuria, and Chahar and Suiyuan.[30] After the 1936 Xi'an Incident, the Kuomintang and communist forces agreed on a ceasefire to present a united front to oppose Japan.[31]

Pre-war events

Italian invasion of Ethiopia (1935)

Main article: Second Italo-Ethiopian War

Benito Mussolini inspecting troops during the Italo-Ethiopian War, 1935

The Second Italo-Ethiopian War was a brief colonial war that began in October 1935 and ended in May 1936. The war began with the invasion of the Ethiopian Empire (also known as Abyssinia) by the armed forces of the Kingdom of Italy (Regno d'Italia), which was launched from Italian Somaliland and Eritrea.[32] The war resulted in the military occupation of Ethiopia and its annexation into the newly created colony of Italian East Africa (Africa Orientale Italiana, or AOI); in addition it exposed the weakness of the League of Nations as a force to preserve peace. Both Italy and Ethiopia were member nations, but the League did little when the former clearly violated Article X of the League's Covenant.[33] The United Kingdom and France supported imposing sanctions on Italy for the invasion, but the sanctions were not fully enforced and failed to end the Italian invasion.[34] Italy subsequently dropped its objections to Germany's goal of absorbing Austria.[35]

Spanish Civil War (1936–1939)

Main article: Spanish Civil War

When civil war broke out in Spain, Hitler and Mussolini lent military support to the Nationalist rebels, led by General Francisco Franco. Italy supported the Nationalists to a greater extent than the Nazis: Mussolini sent more than 70,000 ground troops, 6,000 aviation personnel, and 720 aircraft to Spain.[36] The Soviet Union supported the existing government of the Spanish Republic. More than 30,000 foreign volunteers, known as the International Brigades, also fought against the Nationalists. Both Germany and the Soviet Union used this proxy war as an opportunity to test in combat their most advanced weapons and tactics. The Nationalists won the civil war in April 1939; Franco, now dictator, remained officially neutral during World War II but generally favoured the Axis.[37] His greatest collaboration with Germany was the sending of volunteers to fight on the Eastern Front.[38]

Japanese invasion of China (1937)

Main article: Second Sino-Japanese War

Imperial Japanese Army soldiers during the Battle of Shanghai, 1937

In July 1937, Japan captured the former Chinese imperial capital of Peking after instigating the Marco Polo Bridge incident, which culminated in the Japanese campaign to invade all of China.[39] The Soviets quickly signed a non-aggression pact with China to lend materiel support, effectively ending China's prior cooperation with Germany. From September to November, the Japanese attacked Taiyuan, engaged the Kuomintang Army around Xinkou,[40] and fought Communist forces in Pingxingguan.[41][42] Generalissimo Chiang Kai-shek deployed his best army to defend Shanghai, but after three months of fighting, Shanghai fell. The Japanese continued to push Chinese forces back, capturing the capital Nanking in December 1937. After the fall of Nanking, tens or hundreds of thousands of Chinese civilians and disarmed combatants were murdered by the Japanese.[43][44]

In March 1938, Nationalist Chinese forces won their first major victory at Taierzhuang, but then the city of Xuzhou was taken by the Japanese in May.[45] In June 1938, Chinese forces stalled the Japanese advance by flooding the Yellow River; this manoeuvre bought time for the Chinese to prepare their defences at Wuhan, but the city was taken by October.[46] Japanese military victories did not bring about the collapse of Chinese resistance that Japan had hoped to achieve; instead, the Chinese government relocated inland to Chongqing and continued the war.[47][48]

Soviet–Japanese border conflicts

Main article: Soviet–Japanese border conflicts

In the mid-to-late 1930s, Japanese forces in Manchukuo had sporadic border clashes with the Soviet Union and Mongolia. The Japanese doctrine of Hokushin-ron, which emphasised Japan's expansion northward, was favoured by the Imperial Army during this time. This policy would prove difficult to maintain in light of the Japanese defeat at Khalkin Gol in 1939, the ongoing Second Sino-Japanese War[49] and ally Nazi Germany pursuing neutrality with the Soviets. Japan and the Soviet Union eventually signed a Neutrality Pact in April 1941, and Japan adopted the doctrine of Nanshin-ron, promoted by the Navy, which took its focus southward and eventually led to war with the United States and the Western Allies.[50][51]

European occupations and agreements

Chamberlain, Daladier, Hitler, Mussolini, and Ciano pictured just before signing the Munich Agreement, 29 September 1938

In Europe, Germany and Italy were becoming more aggressive. In March 1938, Germany annexed Austria, again provoking little response from other European powers.[52] Encouraged, Hitler began

pressing German claims on the Sudetenland, an area of Czechoslovakia with a predominantly ethnic German population. Soon the United Kingdom and France followed the appeasement policy of British Prime Minister Neville Chamberlain and conceded this territory to Germany in the Munich Agreement, which was made against the wishes of the Czechoslovak government, in exchange for a promise of no further territorial demands.[53] Soon afterwards, Germany and Italy forced Czechoslovakia to cede additional territory to Hungary, and Poland annexed the Trans-Olza region of Czechoslovakia.[54]

Although all of Germany's stated demands had been satisfied by the agreement, privately Hitler was furious that British interference had prevented him from seizing all of Czechoslovakia in one operation. In subsequent speeches Hitler attacked British and Jewish "war-mongers" and in January 1939 secretly ordered a major build-up of the German navy to challenge British naval supremacy. In March 1939, Germany invaded the remainder of Czechoslovakia and subsequently split it into the German Protectorate of Bohemia and Moravia and a pro-German client state, the Slovak Republic.[55] Hitler also delivered an ultimatum to Lithuania on 20 March 1939, forcing the concession of the Klaipėda Region, formerly the German Memelland.[56]

German Foreign Minister Joachim von Ribbentrop (right) and the Soviet leader Joseph Stalin, after signing the Molotov–Ribbentrop Pact, 23 August 1939

Greatly alarmed and with Hitler making further demands on the Free City of Danzig, the United Kingdom and France guaranteed their support for Polish independence; when Italy conquered Albania in April 1939, the same guarantee was extended to the Kingdoms of Romania and Greece.[57] Shortly after the Franco-British pledge to Poland, Germany and Italy formalised their own alliance with the Pact of Steel.[58] Hitler accused the United Kingdom and Poland of trying to "encircle" Germany and renounced the Anglo-German Naval Agreement and the German–Polish declaration of non-aggression.[59]

The situation became a crisis in late August as German troops continued to mobilise against the Polish border. On 23 August the Soviet Union signed a non-aggression pact with Germany,[60] after tripartite negotiations for a military alliance between France, the United Kingdom, and Soviet Union had stalled.[61] This pact had a secret protocol that defined German and Soviet "spheres of influence" (western Poland and Lithuania for Germany; eastern Poland, Finland, Estonia, Latvia and Bessarabia for the Soviet Union), and raised the question of continuing Polish independence.[62] The pact neutralised the possibility of Soviet opposition to a campaign against Poland and assured that Germany would not have to face the prospect of a two-front war, as it had in World War I. Immediately afterwards, Hitler ordered the attack to proceed on 26 August, but upon hearing that the United Kingdom had concluded a formal mutual assistance pact with Poland and that Italy would maintain neutrality, he decided to delay it.[63]

In response to British requests for direct negotiations to avoid war, Germany made demands on Poland, which served as a pretext to worsen relations.[64] On 29 August, Hitler demanded that a

Polish plenipotentiary immediately travel to Berlin to negotiate the handover of Danzig, and to allow a plebiscite in the Polish Corridor in which the German minority would vote on secession.[64] The Poles refused to comply with the German demands, and on the night of 30–31 August in a confrontational meeting with the British ambassador Neville Henderson, Ribbentrop declared that Germany considered its claims rejected

The Allies established occupation administrations in Austria and Germany, both initially divided between western and eastern occupation zones controlled by the Western Allies and the Soviet Union, respectively. However, their paths soon diverged. In Germany, the western and eastern occupation zones controlled by the Western Allies and the Soviet Union officially ended in 1949, with the respective zones becoming separate countries, West Germany and East Germany.[315] In Austria, however, occupation continued until 1955, when a joint settlement between the Western Allies and the Soviet Union permitted the reunification of Austria as a democratic state officially non-aligned with any political bloc (although in practice having better relations with the Western Allies). A denazification program in Germany led to the prosecution of Nazi war criminals in the Nuremberg trials and the removal of ex-Nazis from power, although this policy moved towards amnesty and re-integration of ex-Nazis into West German society.[316]

Germany lost a quarter of its pre-war (1937) territory. Among the eastern territories, Silesia, Neumark and most of Pomerania were taken over by Poland,[317] and East Prussia was divided between Poland and the Soviet Union, followed by the expulsion to Germany of the nine million Germans from these provinces,[318][319] as well as three million Germans from the Sudetenland in Czechoslovakia. By the 1950s, one-fifth of West Germans were refugees from the east. The Soviet Union also took over the Polish provinces east of the Curzon Line,[320] from which 2 million Poles were expelled;[319][321] north-east Romania,[322][323] parts of eastern Finland,[324] and the Baltic states were annexed into the Soviet Union.[325][326] Italy lost its monarchy, colonial empire and some European territories.[327]

In an effort to maintain world peace,[328] the Allies formed the United Nations,[329] which officially came into existence on 24 October 1945,[330] and adopted the Universal Declaration of Human Rights in 1948 as a common standard for all member nations.[331] The great powers that were the victors of the war—France, China, the United Kingdom, the Soviet Union and the United States—became the permanent members of the UN's Security Council.[332] The five permanent members remain so to the present, although there have been two seat changes, between the Republic of China and the People's Republic of China in 1971, and between the Soviet Union and its successor state, the Russian Federation, following the dissolution of the USSR in 1991. The alliance between the Western Allies and the Soviet Union had begun to deteriorate even before the war was over.[333]

Post-war border changes in Central Europe and creation of the Communist Eastern Bloc

Besides Germany, the rest of Europe was also divided into Western and Soviet spheres of influence.[334] Most eastern and central European countries fell into the Soviet sphere, which led to establishment of Communist-led regimes, with full or partial support of the Soviet occupation

authorities. As a result, East Germany,[335] Poland, Hungary, Romania, Bulgaria, Czechoslovakia, and Albania[336] became Soviet satellite states. Communist Yugoslavia conducted a fully independent policy, causing tension with the Soviet Union.[337] A Communist uprising in Greece was put down with Anglo-American support and the country remained aligned with the West.[338]

Post-war division of the world was formalised by two international military alliances, the United States-led NATO and the Soviet-led Warsaw Pact.[339] The long period of political tensions and military competition between them—the Cold War—would be accompanied by an unprecedented arms race and number of proxy wars throughout the world.[340]

In Asia, the United States led the occupation of Japan and administered Japan's former islands in the Western Pacific, while the Soviets annexed South Sakhalin and the Kuril Islands.[341] Korea, formerly under Japanese colonial rule, was divided and occupied by the Soviet Union in the North and the United States in the South between 1945 and 1948. Separate republics emerged on both sides of the 38th parallel in 1948, each claiming to be the legitimate government for all of Korea, which led ultimately to the Korean War.[342]

In China, nationalist and communist forces resumed the civil war in June 1946. Communist forces were victorious and established the People's Republic of China on the mainland, while nationalist forces retreated to Taiwan in 1949.[343] In the Middle East, the Arab rejection of the United Nations Partition Plan for Palestine and the creation of Israel marked the escalation of the Arab–Israeli conflict. While European powers attempted to retain some or all of their colonial empires, their losses of prestige and resources during the war rendered this unsuccessful, leading to decolonisation.[344][345]

The global economy suffered heavily from the war, although participating nations were affected differently. The United States emerged much richer than any other nation, leading to a baby boom, and by 1950 its gross domestic product per person was much higher than that of any of the other powers, and it dominated the world economy.[346] The Allied occupational authorities pursued a policy of industrial disarmament in Western Germany from 1945 to 1948.[347] Due to international trade interdependencies, this policy led to an economic stagnation in Europe and delayed European recovery from the war for several years.[348][349]

At the Bretton Woods Conference in July 1944, the Allied nations drew up an economic framework for the post-war world. The agreement created the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development (IBRD), which later became part of the World Bank Group. The Bretton Woods system lasted until 1973.[350] Recovery began with the mid-1948 currency reform in Western Germany, and was sped up by the liberalisation of European economic policy that the U.S. Marshall Plan economic aid (1948–1951) both directly and indirectly caused.[351][352] The post-1948 West German recovery has been called the German economic miracle.[353] Italy also experienced an economic boom[354] and the French economy rebounded.[355] By contrast, the United Kingdom was in a state of economic ruin,[356] and although

receiving a quarter of the total Marshall Plan assistance, more than any other European country,[357] it continued in relative economic decline for decades.[358] The Soviet Union, despite enormous human and material losses, also experienced rapid increase in production in the immediate post-war era,[359] having seized and transferred most of Germany's industrial plants and exacted war reparations from its satellite states.[c][360] Japan recovered much later.[361] China returned to its pre-war industrial production by 1952

Estimates for the total number of casualties in the war vary, because many deaths went unrecorded.[363] Most suggest that some 60 million people died in the war, including about 20 million military personnel and 40 million civilians.[364][365][366]

The Soviet Union alone lost around 27 million people during the war,[367] including 8.7 million military and 19 million civilian deaths.[368] A quarter of the total people in the Soviet Union were wounded or killed.[369] Germany sustained 5.3 million military losses, mostly on the Eastern Front and during the final battles in Germany.[370]

An estimated 11[371] to 17 million[372] civilians died as a direct or as an indirect result of Hitler's racist policies, including mass killing of around 6 million Jews, along with Roma, homosexuals, at least 1.9 million ethnic Poles[373][374] and millions of other Slavs (including Russians, Ukrainians and Belarusians), and other ethnic and minority groups.[375][372] Between 1941 and 1945, more than 200,000 ethnic Serbs, along with Roma and Jews, were persecuted and murdered by the Axis-aligned Croatian Ustaše in Yugoslavia.[376] Concurrently, Muslims and Croats were persecuted and killed by Serb nationalist Chetniks,[377] with an estimated 50,000–68,000 victims (of which 41,000 were civilians).[378] Also, more than 100,000 Poles were massacred by the Ukrainian Insurgent Army in the Volhynia massacres, between 1943 and 1945.[379] At the same time, about 10,000–15,000 Ukrainians were killed by the Polish Home Army and other Polish units, in reprisal attacks.[380]

Bodies of Chinese civilians killed by the Imperial Japanese Army during the Nanjing Massacre in December 1937

In Asia and the Pacific, the number of people killed by Japanese troops remains contested. According to R.J. Rummel, the Japanese killed between 3 million and more than 10 million people, with the most probable case of almost 6,000,000 people.[381] According to the British historian M. R. D. Foot, civilian deaths are between 10 million and 20 million, whereas Chinese military casualties (killed and wounded) are estimated to be over five million.[382] Other estimates say that up to 30 million people, most of them civilians, were killed.[383][384] The most infamous Japanese atrocity was the Nanjing Massacre, in which fifty to three hundred thousand Chinese civilians were raped and murdered.[385] Mitsuyoshi Himeta reported that 2.7 million casualties occurred during the Three Alls policy. General Yasuji Okamura implemented the policy in Hebei and Shandong.[386]

Axis forces employed biological and chemical weapons. The Imperial Japanese Army used a variety of such weapons during its invasion and occupation of China (see Unit 731)[387][388] and in early

conflicts against the Soviets.[389] Both the Germans and the Japanese tested such weapons against civilians,[390] and sometimes on prisoners of war.[391]

The Soviet Union was responsible for the Katyn massacre of 22,000 Polish officers,[392] and the imprisonment or execution of hundreds of thousands of political prisoners by the NKVD secret police, along with mass civilian deportations to Siberia, in the Baltic states and eastern Poland annexed by the Red Army.[393] Soviet soldiers committed mass rapes in occupied territories, especially in Germany.[394][395] The exact number of German women and girls raped by Soviet troops during the war and occupation is uncertain, but historians estimate their numbers are likely in the hundreds of thousands, and possibly as many as two million,[396] while figures for women raped by German soldiers in the Soviet Union go as far as ten million.[397][398]

The mass bombing of cities in Europe and Asia has often been called a war crime, although no positive or specific customary international humanitarian law with respect to aerial warfare existed before or during World War II.[399] The USAAF bombed a total of 67 Japanese cities, killing 393,000 civilians, including the atomic bombings of Hiroshima and Nagasaki, and destroying 65% of built-up areas

Aircraft were used for reconnaissance, as fighters, bombers, and ground-support, and each role developed considerably. Innovations included airlift (the capability to quickly move limited high-priority supplies, equipment, and personnel);[432] and strategic bombing (the bombing of enemy industrial and population centres to destroy the enemy's ability to wage war).[433] Anti-aircraft weaponry also advanced, including defences such as radar and surface-to-air artillery, in particular the introduction of the proximity fuze. The use of the jet aircraft was pioneered and led to jets becoming standard in air forces worldwide.[434]

Advances were made in nearly every aspect of naval warfare, most notably with aircraft carriers and submarines. Although aeronautical warfare had relatively little success at the start of the war, actions at Taranto, Pearl Harbor, and the Coral Sea established the carrier as the dominant capital ship (in place of the battleship).[435][436][437] In the Atlantic, escort carriers became a vital part of Allied convoys, increasing the effective protection radius and helping to close the Mid-Atlantic gap.[438] Carriers were also more economical than battleships due to the relatively low cost of aircraft[439] and because they are not required to be as heavily armoured.[440] Submarines, which had proved to be an effective weapon during the First World War,[441] were expected by all combatants to be important in the second. The British focused development on anti-submarine weaponry and tactics, such as sonar and convoys, while Germany focused on improving its offensive capability, with designs such as the Type VII submarine and wolfpack tactics.[442][better source needed] Gradually, improving Allied technologies such as the Leigh Light, Hedgehog, Squid, and homing torpedoes proved effective against German submarines.[443]

Nuclear Gadget being raised to the top of the detonation "shot tower", at Alamogordo Bombing Range; Trinity nuclear test, New Mexico, July 1945

Land warfare changed from the static frontlines of trench warfare of World War I, which had relied on improved artillery that outmatched the speed of both infantry and cavalry, to increased mobility and combined arms. The tank, which had been used predominantly for infantry support in the First World War, had evolved into the primary weapon.[444] In the late 1930s, tank design was considerably more advanced than it had been during World War I,[445] and advances continued throughout the war with increases in speed, armour and firepower.[446][447] At the start of the war, most commanders thought enemy tanks should be met by tanks with superior specifications.[448] This idea was challenged by the poor performance of the relatively light early tank guns against armour, and German doctrine of avoiding tank-versus-tank combat. This, along with Germany's use of combined arms, were among the key elements of their highly successful blitzkrieg tactics across Poland and France.[444] Many means of destroying tanks, including indirect artillery, anti-tank guns (both towed and self-propelled), mines, short-ranged infantry antitank weapons, and other tanks were used.[448] Even with large-scale mechanisation, infantry remained the backbone of all forces,[449] and throughout the war, most infantry were equipped similarly to World War I.[450] The portable machine gun spread, a notable example being the German MG 34, and various submachine guns which were suited to close combat in urban and jungle settings.[450] The assault rifle, a late war development incorporating many features of the rifle and submachine gun, became the standard post-war infantry weapon for most armed forces.[451]

Most major belligerents attempted to solve the problems of complexity and security involved in using large codebooks for cryptography by designing ciphering machines, the most well-known being the German Enigma machine.[452] Development of SIGINT (signals intelligence) and cryptanalysis enabled the countering process of decryption. Notable examples were the Allied decryption of Japanese naval codes[453] and British Ultra, a pioneering method for decoding Enigma that benefited from information given to the United Kingdom by the Polish Cipher Bureau, which had been decoding early versions of Enigma before the war.[454] Another component of military intelligence was deception, which the Allies used to great effect in operations such as Mincemeat and Bodyguard.[453][455]

Other technological and engineering feats achieved during, or as a result of, the war include the world's first programmable computers (Z3, Colossus, and ENIAC), guided missiles and modern rockets, the Manhattan Project's development of nuclear weapons, operations research, the development of artificial harbours, and oil pipelines under the English Channel.[456] Penicillin was first developed, mass-produced, and used during the war