

## Military economies

- 30,000 BCE Hunters develop the first primitive bow
- 12,000 BCE Arrows, maces, and slings developed; spear throwing devices used
- 8000 BCE Walls of Jericho built to protect the settlement from human intruders
- 8000 BCE Sharpened stone heads used on axes, spears, and arrows to improve hunting
- 3000 BCE Metal daggers and swords made with the onset of the Bronze Age in Greece and China
- 2500 BCE Sumerians first use the chariot, a four-wheeled cart drawn by wild asses, in warfare
- 1760–1520 BCE The Shang dynasty in China popularizes the *Qiang*, a long shaft with a steel or bronze tip
- 1500 BCE The compound or composite bow, made by gluing wood, horn, and sinew together to increase strength and elasticity, invented on the steppes of Central Asia
- 1500 BCE Pharaoh Ramesses II uses 11,000 mercenaries during his battles in Egypt
- 1327 BCE Slings buried in the tomb of Pharaoh Tutankhamen, who dies around this date
- 1210 BCE The first recorded sea battle, in which Suppiluliuma, king of the Hittites, defeats a fleet from Cyprus
- 1200 BCE Iron weapons replace bronze weaponry as the Iron Age begins in Anatolia and Caucasus, then spreads rapidly through the Near East
- 1100 BCE The first military use of elephants in what is today northern India and Pakistan
- 770 BCE The Chinese Zhou dynasty replaces the bronze tip of the *Qiang* with a steel tip; the *Qiang* used until the Qing dynasty (1644–1911)
- 700 BCE A new military system called the phalanx, a column formation of heavy infantry carrying long spears, pikes, or swords, established in Greece
- 669 BCE Pheidon of Argos first uses hoplites — heavy infantry soldiers protected by helmets, cuirasses, and leg armor — to achieve a military victory against Sparta
- 582 BCE Byzantine emperor Maurice I writes *Strategikon*, often considered the first sophisticated formulation of combined arms theory
- 512 BCE Sun Tzu finishes *The Art of War*, a Chinese treatise on military strategy, in which he writes: “All warfare is based on deception. . . . Hold out baits to entice the enemy. Feign disorder, and crush him”
- 500 BCE Heraclitus argues that “It should be understood that war is the common condition, and that all things come to pass through the compulsion of strife”
- 500–400 BCE Chain mail in use during this period
- 475 BCE The Chinese historical novel *Zhao Ye: The Romance of Wu and Yue* places the invention of the crossbow in China around this date; in the novel, the character Young Woman of Yue advises the king: “Overshadow your adversary like the sun, but scuttle like a flushed hare. Become a whirl of silhouettes and shadows; shimmer like a mirage”
- 415 BCE Cavalry becomes crucial to Syracuse’s success in warding off Athenian forces during Athens’ Sicilian expedition
- 403 BCE The Zhou dynasty in China invents methods of siege warfare and adopts cavalry warfare from nomads to the north
- 400 BCE Catapults that fire spears first used as field artillery by the Greeks
- 372–312 BCE Pyrrhus, king of the Molossians and Macedonia, first uses cataphracts, heavily armed and armored cavalry men, in battles against the Romans

331 BCE Persian king Darius III uses war elephants at the Battle of Gaugamela, where Alexander the Great defeats the Persian army

216 BCE Hannibal uses the double envelopment, a basic element of military strategy, in the Battle of Cannae

200 BCE Shih Huang-Ti, the first emperor of a united China, connects a number of existing defensive walls into a single system now known as the Great Wall of China

100 BCE The Romans develop the *pilum*, a throwing spear comprised of an iron shank and a pyramidal head

40 BCE The Romans design ships with large catapults and towers

100 Romans begin to use the *lorica segmentata*, a type of armor consisting of broad ferrous (iron or steel) strips fastened by leather straps

322 The first evidence of stirrups, an invention that greatly increased an animal's usefulness in communication, transportation, and warfare

678 Greek fire — a missile weapon made of sulfur, rock salt, resin and petroleum, first used by the Byzantines to destroy two Saracen fleets during an attempted siege of Constantinople

1040 Tseng Kung-Liang invents gunpowder, a mixture of charcoal, saltpeter, and sulfur, in China; he notes its usefulness in his encyclopedia *Wu Ching Tsung Yao* (Collection of the Most Important Military Technologies) for flame throwing devices, fireworks, and rockets

1126 The Song dynasty in China begins to load gunpowder into the middle of bamboo as a projectile firearm

1242 English monk Roger Bacon records the first formula for making gunpowder: 41.2% saltpeter, 29.4% charcoal, and 29.4% sulfur

1307 The first guillotine-like machine used in Ireland

1326 An illustration of a cannon featured in *De Officiis Regum* (On the Duty of Kings), a manuscript of war written by Walter de Millimete and dedicated to Edward III of England

1330 German Franciscan monk and alchemist Berthold Schwarz develops the first bronze cannon in Europe

1332 The oldest surviving Chinese cannon cast in bronze inscribed with this date

1346 The cannon first used at the Battle of Crécy-en-Ponthieu, a decisive battle in the Hundred Years' War between England and France

1365 Sultan Murad I creates the first Ottoman standing army by founding the janissaries, infantry units comprised generally of non-Muslims

1370 The steel crossbow, a weapon consisting of a bow mounted on a stock that fires arrows, used as a weapon of war

1385 Portuguese and English armies effectively use slings against the Castilian army at the battle of Aljubarotta, which helps maintain Portuguese independence from Castile

1430 Iron-cast gun produced in Ferrara, now part of Italy

1440 Full plate armor, which quickly replaces chain armor, developed

1453 The missile weapon Greek fire disappears from use after the fall of Constantinople

1475 The first muzzle loaded rifles developed in Italy and Germany

1475 A matchlock, one of the earliest mechanical devices used to ignite gunpowder in firearms, first illustrated

1480–1500 Leonardo da Vinci makes sketches of the submarine, the armored car, rapid-fire guns, and the *ballista*, or giant crossbow

1501 France cuts gun ports into naval vessels, a practice that quickly becomes a common feature of contemporary warships

1537 Niccolò Tartaglia studies the trajectory of bullets

1543 Ralph Hogge of England casts the first cast iron cannon

1624 Cornelius Drebbel invents the first submarine (with reliable information about its construction)

1718 London lawyer James Puckle patents the first machine gun

1776 The *Turtle*, the first submarine ever used in combat and invented by American David Bushnell, debuts in the American War of Independence against the British

1792 The guillotine, a device conceived and proposed by Joseph Guillotin as a humane form of execution, set up in Paris

1803 The British army uses an exploding canister shell invented by English artillery officer Henry Shrapnel in an attack on the Dutch defenders of Fort Amsterdam in Batavia

1822 The first iron steam ship, conceived of by British naval officer Charles Napier, crosses the English Channel

1823 French General Henri-Joseph Paixhans invents the first shell gun, which combines explosive shells and the flat trajectory of cannons

1832 Carl von Clausewitz's *On War*, an influential book on military strategy, posthumously published; Clausewitz writes: "The end for which a soldier is recruited, clothed, armed, and trained, the whole object of his sleeping, eating, drinking, and marching is simply that he should fight at the right place and the right time"

1835 Samuel Colt invents the revolver pistol

1850 The French ship *Le Napoléon* becomes the world's first steamship built for the purpose of battle

1853–56 The Russians use blockade mines during the Crimean War

1859 The French launch *La Gloire*, the first sea-going ironclad warship protected by metal armor impossible for British cannonballs to penetrate

1860 The first repeating rifle designed

1861 \$50,000,000 in U.S. notes issued to help finance the U. S. Civil War

1861 65 Torpedo boats used in the U.S. Civil War

1867 Alfred Nobel patents a special type of nitroglycerine that he calls dynamite: later to improve his legacy to the world, he includes a provision in his will that inaugurates the Nobel prizes

1870 The first warships resembling modern battleships built in the U.K.; these ships are the first ocean-going capital ships that mount the entire main armament on the hull's top rather than inside and do not carry sails

1870–71 With the Franco-Prussian War, the study of logistics expands to include new communication technologies such as rail transport and telegraphy

1880 The British Royal Navy uses steam-powered torpedo boats for harbor defense

1886 Paul Vieille in France invents *Poudre B*, a smokeless gunpowder that burns evenly and is three times more powerful than regular gunpowder

1887 Nobel invents *Ballistite*, a gunpowder that leaves behind no solid particles when burned

1889 Frederick Abel and James Dewar, members of the U.K. government's Explosive Committee, patent Cordite, a smokeless gunpowder easier to handle and more powerful than Poudre B

1895 John Holland's first contract submarine becomes the blueprint adopted by navies worldwide until 1914

1902 First armored car developed in France

1904 Radar (limited to a one-mile range) patented by Christian Hulsmeyer

1904–05 Wireless communications used in war for the first time during the Russo-Japanese War

1905 *Dreadnought*, the first battleship with a mechanized weapon system, built in the U.K.; the ship features ten 12-inch guns, a steam turbine power plant, and a 21-knot maximum speed

1906 Lewis Nixon invents the first passive sonar-type listening device

1910 An aircraft takes off from a warship and lands on a nearby peninsula in Virginia

1911 An airplane lands on a warship in California

1914 Garrett Morgan invents the gas mask, originally called the Safety Hood and Smoke Protector and later refined for use by the U.S. army in World War I

1914 The first British grenade used

1914 A zeppelin (also known as a dirigible) bombs Liège, making it the first aerial bomber of a city in military history

1915 French physicist Paul Langevin and Russian émigré Constantin Chilowski invent the first active sonar-type device for detecting submarines

1915 The German army uses a highly lethal chlorine gas in the Second Battle of Ypres in France; this marks the first time Germany uses chemical weapons on a large scale

1915 German fixed wing bombers begin sustained bombing campaigns

1916 Robert Boyle develops a prototype of an active sonar-type device for the British government

1916 The British ship rudimentary tanks to the Western Front and spearhead an attack against German forces in Somme, France

1918 The first cruise missile, the unmanned, propeller-driven Kettering "Bug" Aerial Torpedo, completed near the end of World War I; the war ends before the missile can enter combat

1918 Both the U.S. and U.K. now have active sonar or sonar-like systems

1920 John Thompson patents the Tommy gun, the first handheld machine gun

1926 Robert Goddard builds the first liquid-fueled rocket to reach flight

1930 Frank Whittle and Hans von Ohain invent the jet engine, which can fly higher and faster than propeller powered aircraft

1935 Robert Watson-Watt pioneers aircraft-detecting radar

1940 The American Bantam Car Company constructs prototypes for the Jeep, originally conceived by the U.S. Army

1940 The German military puts the Nebelwerfer, its first artillery rocket, in production

1940 Zyklon B, a cyanide-based insecticide, first used to gas prisoners at Auschwitz-Birkenau

A destruction, an annihilation that only man can provoke, only man can prevent — Elie Wiesel, Auschwitz survivor and Nobel Laureate

1941 The Russian army launches the Katyusha, a highly explosive warhead created in response to Germany's Nebelwerfer; though not accurate, the Katyusha proves highly effective in saturation bombardment

1941 The U.S. begins construction on the Pentagon

1942 The bazooka, a shoulder-held weapon used to fire armor-piercing rockets at short range, invented; the weapon used extensively during World War II (first by the Allies, then by the Germans) to destroy heavily armored vehicles and fortified positions

1942 Harvard scientists led by Louis Fieser develop napalm

1942 The U.S. government creates the Manhattan Engineering Project to step up efforts to build an atomic bomb

1943 The first use of air-launched, radio-guided, anti-ship missiles

1944 Germany's V-1, the first guided missile, used in World War II, chiefly in bombing raids of London and Amsterdam; once launched, these weapons fly without human intervention

1944 U.S. pilots drop napalm incendiary bombs near Saint Lô, France

1944 Allied forces launch the D-Day invasion, the largest amphibious landing in military history

1945 The U.S. drops a uranium-based atomic bomb on Hiroshima and detonates a plutonium-based bomb at Nagasaki three days later

As the bomb fell over Hiroshima and exploded, we saw an entire city disappear. I wrote in my log the words: "My God, what have we done?" — Copilot Robert Lewis

1948 With the formation of the North Atlantic Treaty Organization (NATO), sonar-like signals become streamlined; this leads Britain to drop its alternative system

1949 The U.S.S.R. tests its first nuclear weapon, based partially on information obtained from Soviet espionage in the U.S.

1950 U.S. army scientists invent Night Vision

1952 The U.S. detonates the first hydrogen bomb (a thousand times stronger than the atomic bomb dropped on Hiroshima) in the Marshall Islands

1954 The Soviet army explodes a test atomic bomb in the Ural mountains

1955 The *USS Nautilus SSN 571*, the first nuclear-powered submarine, begins trials

1954 The U.S. conducts a second test explosion of a hydrogen bomb in the Marshall Islands, producing the biggest ever human-made explosion

1956 Christopher Cockerell invents the hovercraft, which ejects air downward so the vehicle can travel over any smooth surface (including water) without direct contact

1957 The U.S.S.R. conducts its first (unsuccessful) test of an intercontinental ballistic missile (ICBM)

1957 Julius Hagemann, a German working at the U.S. Navy Mine Defense Laboratory, patents side-scan sonar, which efficiently creates an image of large areas of the sea floor

1958 Gordon Gould invents the laser (Light Amplification by the Stimulated Emission of Radiation), later used as a target designator for weapons

1960 With the U.S. launch of the F-4 Phantom II (which could launch air-to-air and air-to-ground missiles and unguided, guided, and nuclear bombs, and provide a

reconnaissance platform), multi-role aircrafts begin to replace the fighter-bomber in the U.S. and other countries

1960 The U.S. navy successfully tests the first satellite navigation system

1960 France tests its first nuclear weapon, named Gerboise Bleue

1960 Minuteman I, a U.S. nuclear missile, becomes one of the first weapons to have an embedded digital flight computer

1961 The U.S. military uses Agent Orange, a powerful herbicide and defoliant, as part of its herbicidal warfare program during the Vietnam War; studies of populations highly exposed to the dioxins in Agent Orange demonstrate increased risk of various types of cancer

1961 *USS Long Beach*, the first nuclear powered surface warship, commissioned

1961 The U.S.S.R. launches the first in a series of military spy satellites under the name Zenit

1961 The U.S. army Institute of Environmental Medicine activated to research how exposure to extreme heat, high altitude, and other environmental factors affects the health and performance of military personnel

1962 U.S. launches its first “ferret” satellite to intercept the transmission of Soviet and other radar systems

1963 The U.S. and the U.S.S.R. sign the Limited Test Ban Treaty, which prohibits underwater, atmospheric, and outer space nuclear testing; to monitor compliance with the treaty, the U.S. launches its first satellite to detect nuclear detonations

1964 China tests its first nuclear weapon

1965 Lockheed creates the fastest unmanned aerial vehicle (UAV) in history

1967 The U.S. Department of Defense funds the initial development of ARPANET (Advanced Research Projects Agency Network), a progenitor of the internet

1967 The U.S.S.R. places a series of radar-equipped ocean reconnaissance satellites in low orbit, originally created to target U.S. ships for destruction

1967 Minuteman II, the first missile to use a computer constructed from integrated circuits and miniaturized discrete electronic parts, completed

1968 The U.S.S.R., U.K., and U.S. sign the Nuclear Nonproliferation Treaty, which calls for a halt to the spread of nuclear weapon capabilities

1968 The first Soviet and U.S. versions of surface-to-air missiles become operational

1968 Laser-guided weapons used for the first time by the U.S. in Vietnam

1972 The U.S. and U.S.S.R. sign the Anti-Ballistic Missile Treaty to limit anti-ballistic missile systems used to defend against missile-delivered nuclear weapons (ended by the U.S. in 2002)

1972 The Strategic Arms Limitation Talks (SALT) Agreement signed by the U.S. and U.S.S.R. to freeze the number of strategic ballistic missile launchers and cap the addition of submarine-launched ballistic missiles to the same number as older ICBMs

1973 The U.S. and U.S.S.R. sign the Prevention of Nuclear War agreement, an attempt to establish ground rules to help resolve conflicts before they escalate to nuclear war

1974 India tests its first nuclear weapon

1976 The U.S. military launches a satellite system to monitor naval movements, especially those of the Soviets

1978 First experimental global positioning satellite (GPS) launched

1979 China begins modernizing its weapons facilities to emphasize the production of both military and civilian products, a policy shift that helps justify greater investment and new application of technologies across sectors

1979 The U.S. and USSR sign SALT II, which establishes broad limits on strategic offensive weapons systems

1980 AM General produces its first prototype of a High Mobility Multipurpose Wheeled Vehicle (HMMWV or HUMVEE) according to specifications drafted by the U.S. army

1981 The U.S. begins to develop the B-2 aircraft, a multi-role stealth bomber capable of delivering both conventional and nuclear munitions

1983 After a Soviet interceptor aircraft shoots down a civilian airliner (KAL 007), President Ronald Reagan announces that GPS would be made available for civilian use once completed

1983 After labeling the U.S.S.R. "the evil empire," President Reagan announces the Strategic Defense Initiative (SDI, popularly known as Star Wars), conceived as ground-based and space-based systems to protect the U.S. from nuclear ballistic missile attacks

1985 The U.S.S.R. announces a nuclear testing moratorium

1987 Soviet President Mikhail Gorbachev and President Reagan sign the Intermediate-Range Nuclear Forces (INF) treaty, the first treaty calling for the elimination of intermediate-range missiles

1987 A national missile defense concept, consisting of ground- and space-based sensors and weapons and a central battle management system, developed as part of the SDI program

1988 The M24 SWS (short for Sniper Weapon System), which offers high long-range accuracy, becomes the standard-issue sniper rifle for the U.S. army

1989 The F-117A Nighthawk, the world's first operational aircraft to use low-observable stealth technology, used in the U.S. invasion of Panama

1990 The Conference on Security and Cooperation in Europe formally ends the Cold War and reduces Warsaw Pact and NATO conventional forces

1991 In the Persian Gulf War the U.S. first uses the F-117 stealth fighter, designed to be almost undetectable by radar

1991 The U.S.-led coalition in the Persian Gulf War uses the A-10 "Warthog," an anti-tank weapon that fires 30mm rounds reinforced with depleted uranium; scientists later establish a link between these weapons and an increase in stillbirths, birth defects, and childhood leukemia in the area of southern Iraq near Basra

1991 President George H.W. Bush and Gorbachev sign the Strategic Arms Reductions Treaty (START I) to reduce the number of U.S. and Soviet long-range missiles and nuclear warheads from 10,000 to 6,000 per side

1994 The Rwandan civil war culminates in genocide mostly through the use of machetes

1994 By signing the Mutual Detargeting Treaty, the U.S. and Russia agree to no longer have strategic ballistic missiles targeted at each other

1995 The Predator RQ-1, the first of a series of unmanned reconnaissance aircraft intelligence, used in Bosnia in support of NATO

1995 Chechen rebels partially bury a container with a small amount of cesium-137 in Moscow and then notify a Russian television crew, marking the first widely reported incident of radioactive terrorism

1996 The U.S. National Imagery and Mapping Agency established to combine the government's mapping and imagery analysis into a single agency; using sophisticated software, the agency creates animated renditions of imagery and geospatial data, which allow users to visualize inaccessible terrain

1996 71 countries sign the Comprehensive Test Ban Treaty to prohibit all nuclear test explosions (the U.S. Senate rejects ratification in 1999)

1998 Pakistan tests its first nuclear weapon

1999 NATO uses depleted-uranium ammunition and cluster bombs in Kosovo; many do not explode and kill civilians after the war

1999 The B-2 stealth bomber makes its combat debut, dropping satellite-guided 2,000 pound bombs on Yugoslavian targets as part of the NATO war against Serbia

1999 Serbian forces shoot down an F-117A stealth bomber, prompting widespread debate about the efficacy of stealth technology

1999 The U.S. army announces a \$117 billion modernization program called Future Combat Systems, a joint networked system aimed to offer soldiers, linked to sensors and platforms, data concerning the surrounding area

2000 Strategic Arms Reduction Treaty II (START II) signed by the U.S. and Russia to lower the number of long-range missiles and nuclear warheads from 6,000 to 3,500–3,000 per side

2001 A series of coordinated terrorist attacks in the U.S. use four commercial passenger jet liners as missiles, crashing into the World Trade Center in New York, the Pentagon in Washington, and rural Pennsylvania

2001 The U.S. uses the high-altitude, unmanned aerial vehicle (UAV) Global Hawk in military operations against the Taliban regime in Afghanistan; precision-guided weapons come to account for nearly 70% of munitions expended in this war, versus 9% in the Persian Gulf War

2002 Treaty on Strategic Offensive Reductions (the Moscow Treaty) signed by Russia and the U.S. to limit each side's nuclear arsenal to 1,700–2,200 operationally deployed warheads

2002 As part of its Future Combat Systems project, the U.S. army displays a prototype of the Objective Force Warrior, a fully integrated individual combat system, including weapons, individual protection, netted communications, power sources, and enhanced human performance aids

2002 The U.S. army launches America's Army, a free online video game as "a cost-effective recruitment tool"; the game becomes one of the five most popular online video games

2003 The U.S. army announces plans to enable a ground combat force for which up to 33% of its systems would be unmanned by 2015

2003 The U.S. hires one civilian contractor for every 10 soldiers for the invasion of Iraq (versus 1 for every 100 in the first Persian Gulf War)

2003 GM and the U.S. army design a diesel hybrid military pickup truck with a fuel cell auxiliary power unit

2003 The U.S. uses precision-guided munitions, also called smart bombs, for about 7.4% of the total bombs dropped as part of the U.S.-led invasion of Iraq

2003 The U.S. uses patriot missile defense system to intercept ballistic missiles for the first time in combat during the U.S.-led invasion of Iraq

2004 The U.S. marines test the Dragon Runner, a throwable 15-inch remote-controlled robot designed for surveillance in urban areas, in Iraq

2004 The U.S. Department of Defense adopts a Web-based patient-tracking application to share medical information between commanders, case managers, and health-care providers

2004 The eight-wheel drive combat vehicle Stryker becomes the first new military vehicle to enter the U.S. army since the 1980s

2005 The U.S. sends 18 remote-controlled robotic sharpshooters to fight in Iraq; controlled by a human operator a mile away, the robot can fire 750–1,000 rounds per minute

2006 Nearly 10,000 robots deployed in Iraq by the U.S. army to perform tasks such as disarming roadside bombs, scouting dangerous territory, and patrolling airspace