



Glossary

abnormal environment

Environments as defined in a weapon's stockpile-to-target sequence and military characteristics in which the weapon is not expected to retain full operational reliability.

alteration

Material change to, or a prescribed inspection of, a nuclear weapon or major assembly that does not alter its operational capability but is sufficiently important to the user (regarding assembly, maintenance, storage, or test operations) as to require controlled application and identification.

atom

Smallest (or ultimate) particle of an element that still retains the characteristics of that element. Every atom consists of a positively

charged central nucleus, which carries nearly all the mass of the atom, surrounded by a number of negatively charged electrons, so that the whole system is electrically neutral.

atomic bomb

Term sometimes applied to a nuclear weapon utilizing fission energy only.

atomic mass

Number of protons plus neutrons in the nucleus of an atom.

atomic number

Number of protons in the nucleus of an atom.

authorization

Legislation that establishes, changes, or continues a federal program or agency. Authorizing legislation is normally a

prerequisite for appropriations. For some programs, primarily entitlements, the authorizing legislation itself provides the authority to incur obligations and make payments. Like Appropriations Acts, authorizing legislation must be passed by both Houses of Congress and must be signed by the president to become law.

ballistic missile

Any missile that does not rely upon aerodynamic surfaces to produce lift and consequently follows a ballistic trajectory when thrust is terminated.

blast wave

Sharply defined wave of increased pressure rapidly propagated through a surrounding medium from a center of detonation or similar disturbance.

channel

Joint arrangement between the United States and a foreign government for the exchange of specific project or program-type information.

component

Assembly or any combination of parts, subassemblies, and assemblies mounted together in manufacture, assembly, maintenance, or rebuild.

criticality

Term used in reactor physics to describe the state when the number of neutrons released by fission is exactly balanced by the neutrons being absorbed (by the fuel and poisons) and escaping the reactor core. A reactor is said to be “critical” when it achieves a self-sustaining nuclear chain reaction, as when the reactor is operating.

critical mass

Minimum amount of fissionable material capable of supporting a chain reaction under precisely specified conditions.

countering nuclear threats

To prevent a nuclear attack against the United States and its interests, or in the event of an attack, to respond effectively, avoiding additional attacks and bringing the perpetrators to justice.

cruise missile

Guided missile, the major portion of whose flight path to its target is conducted at approximately constant velocity; a cruise missile depends on the dynamic reaction of air for lift and upon propulsion forces to balance drag.

Defense Acquisition System

Management process that guides all DoD acquisition programs. DoD Directive 5000.1, The Defense Acquisition System, provides the policies and principles that govern the defense acquisition system. DoD Instruction 5000.2, Operation of the Defense Acquisition System, establishes the management framework that implements these policies and principles.

Defense Planning Guidance

Document issued by the Secretary of Defense that provides firm guidance in the form of goals, priorities, and objectives, including fiscal constraints, for the development of the Program Objective Memorandums by the Military Departments and defense agencies.

deuterium

Isotope of hydrogen with one proton and one neutron in the nucleus of each atom.

disassembly

Process of taking apart a nuclear warhead and removing one or more subassemblies, components, or individual parts. Disassembly may be required to support quality assurance inspection, reliability testing, or subassembly/component exchange as a part of scheduled maintenance or refurbishment; it is normally done in a manner that permits re-assembly with either the original or replacement subassemblies/components.

dismantlement

Process of taking apart a nuclear warhead and removing all subassemblies, components, and individual parts for the purpose of physical elimination of the nuclear warhead. Dismantled subassemblies, components and parts, including nuclear materials, may be put into a disposal process, may be used again in another warhead, or may be held in strategic reserve.

dynamic pressure

Air pressure that results from the mass air flow (or wind) behind the shock front of a blast wave.

electromagnetic hardening

Action taken to protect personnel, facilities, and/or equipment by filtering, attenuating, grounding, bonding, and/or shielding against undesirable effects of electromagnetic energy.

electromagnetic pulse

Electromagnetic radiation from a strong electronic pulse, most commonly caused by a nuclear explosion that may couple with electrical or electronic systems to produce damaging current and voltage surges.

Electromagnetic radiation

Radiation including visible light, radio waves, gamma rays, and X-rays where electric and magnetic fields vary simultaneously.

electron

Particle of very small mass with a negative charge.

element

Any of the more than 100 known substances (of which 92 occur naturally) that cannot be separated into simpler substances and that singly or in combination constitute all matter.

enacted appropriations

Appropriations bills in which a definite amount of money is set aside to pay incurred or anticipated expenditures.

enhanced nuclear detonation safety

System of safety features engineered into modern nuclear weapons resulting in a one in a billion chance of a weapon detonating in a normal environment and a one in a million chance of a weapon detonating in an abnormal environment.

expenditure

Charges against available funds. Expenditures result from a voucher, claim, or other document approved by competent authority. Expenditures represent the presentation of a check or electronic transfer of funds to the performer of work.

fallout

Precipitation to Earth of radioactive particulate matter from a nuclear cloud; also applied to the particulate matter itself.

fire-resistant pit

Primary in a thermonuclear weapon in which the fissile material is encased in a

metal shell with a high melting point and is designed to withstand exposure to jet fuel fire of 1,200 degrees Celsius for several hours. Fire-resistant pits are only used in weapons with insensitive high explosive.

fireball

Luminous sphere of hot gases that forms a few millionths of a second after detonation of a nuclear weapon or nuclear device and immediately starts expanding and cooling.

fissile

Capable of being split by slow (low-energy) neutrons as well as by fast (high-energy) neutrons.

fission

Process whereby the nucleus of a particular heavy element splits into (generally) two nuclei of lighter elements, with the release of substantial amounts of energy.

flag-level

Term applied to an officer holding the rank of general, lieutenant general, major general, or brigadier general in the U.S. Army, Air Force, or Marine Corps or admiral, vice admiral, or rear admiral in the U.S. Navy or Coast Guard. Also may be used for a government official in the senior executive level (SES) grades.

flash blindness

The impairment of vision resulting from an intense flash of light. It includes temporary or permanent loss of visual functions and may be associated with retinal burns.

fusion

The process whereby the nuclei of light elements, especially those of the isotopes of hydrogen, namely, deuterium and tritium, combine to form the nucleus of

a heavier element with the release of substantial amounts of energy and a high-energy neutron.

gamma rays

Electromagnetic radiations of high photon energy originating in atomic nuclei and accompanying many nuclear reactions (e.g., fission, radioactivity, and neutron capture).

gun assembly weapon

Device in which two or more pieces of fissionable material, each less than a critical mass, are brought together very rapidly so as to form a supercritical mass that can explode as the result of a rapidly expanding fission chain.

half-life

Time required for the activity of a given radioactive species to decrease to half of its initial value due to radioactive decay.

height of burst

Vertical angle between the base of a target and the point of burst.

hydrogen bomb

Term sometimes applied to nuclear weapons in which part of the explosive energy is obtained from nuclear fusion (or thermonuclear) reactions.

igloo

Unofficial but common term to mean a munitions storage bunker, usually protected by several feet (or more) of earth on all sides except for the door, which is normally constructed from large amounts of thick, heavy, metal.

ignition

In theory, the conditions required to heat and compress a fuel of deuterium and tritium to pressures and temperatures that

will ignite and burn the fuel to produce an energy gain.

implosion assembly weapon

Device in which a quantity of fissile material, less than a critical mass, has its volume suddenly decreased by compression, so that it becomes supercritical and an explosion can take place.

improvised nuclear device

Crude nuclear device built from the components of a stolen or bought nuclear weapon or built from scratch using nuclear material (plutonium or HEU).

induced radiation

Radiation produced as a result of exposure to radioactive materials, particularly the capture of neutrons.

initial nuclear radiation

Radiation resulting from a nuclear detonation and emitted from the fireball within one minute after burst. Also called prompt nuclear radiation.

insensitive high explosive

Type of explosives used in the primary of some modern thermonuclear weapons that are remarkably insensitive to shock, high temperatures, and impact when compared to conventional high explosives.

ion

Atom that has gained or lost an electron and thus carries an electrical charge.

ionizing radiation

Electromagnetic radiation (gamma rays or X-rays) or particulate radiation (alpha particles, beta particles, neutrons, etc.) capable of producing ions directly or indirectly in its passage through, or interaction with, matter.

life-cycle

Total phases through which a nuclear weapon passes from the time it is initially developed until the time it is either consumed in use or retired, dismantled, or disposed of.

limited life component

Weapon component that decays with age and must be replaced periodically.

major assembly

Term for a complete nuclear warhead, usually used in the process of approving or revalidating the design.

markup

Process by which congressional committees and subcommittees debate, amend, and rewrite proposed legislation.

military characteristics

Required characteristics of a nuclear weapon upon which depend its ability to perform desired military functions, including physical and operational characteristics but not technical design characteristics.

modification

Change in operational capability that results from a design change that affects delivery (employment or utilization), fusing, ballistics, or logistics.

mutual assured destruction

A U.S. doctrine of reciprocal deterrence resting on the United States and the Soviet Union being able to inflict unacceptable damage on the other in retaliation for a nuclear attack.

munition

Complete device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological, or

chemical material for use in military operations, including demolitions. Also called ammunition.

National Defense Authorization Act

NDA is legislation voted on by Congress for each fiscal year to determine and permit the budget for the DoD and national security programs maintained by the DOE.

national security

Collective term encompassing both national defense and foreign relations of the United States. Specifically, the condition provided by: a) a military or defense advantage over any foreign nation or group of nations; b) a favorable foreign relations position; or c) a defense posture capable of successfully resisting hostile or destructive action from within or without, overt or covert.

near-surface burst

Detonation in the air that is low enough for the immediate fireball to touch the ground.

neutron

Neutral particle (i.e., with no electrical charge) of approximately unit mass, present in all atomic nuclei, except those of ordinary (light) hydrogen.

nonproliferation

Actions (e.g., diplomacy, arms control, multilateral agreements, threat reduction assistance, and export controls) taken to prevent the proliferation of weapons of mass destruction by dissuading or impeding access to, or distribution of, sensitive technologies, material, and expertise.

normal environment

Expected logistical and operational environments as defined in a weapon's stockpile-to-target sequence and military

characteristics in which the weapon is required to survive without degradation in operational reliability or safety performance.

nuclear command and control

Exercise of authority and direction by the President, as commander in chief through established command lines over nuclear weapon operations of military forces, as chief executive over all government activities that support those operations, and as head of state over required multinational actions that support those operations.

nuclear command and control system

Collection of activities, processes, and procedures performed by appropriate commanders and support personnel who, through the chain of command, allow for senior-level decisions on nuclear weapons employment to be made based on relevant information and subsequently allow for those decisions to be communicated to forces for execution.

nuclear command, control, and communications

Facilities, equipment, communications, procedures, and personnel that enable presidential nuclear direction to be carried out.

Nuclear Enterprise

Composite of the DoD U.S. nuclear forces and elements, to include the deterrent forces of the Air Force's nuclear capable bombers and fighters and associated nuclear weapons, as well as ICBMs; the Navy's ballistic missile submarines and associated nuclear SLBMs; the nuclear infrastructure to build, maintain, and sustain the nuclear forces; U.S. nuclear capable bases and scientific facilities; nuclear command

and control; and military personnel, civilians, and contractors performing the nuclear mission.

Nuclear Posture Review

Legislatively-mandated review that establishes U.S. nuclear policy, strategy, capabilities, and force posture for five to ten years into the future.

nuclear radiation

Particulate and electromagnetic radiation emitted from atomic nuclei in various nuclear processes. The important nuclear radiations, from the nuclear weapon standpoint, are alpha and beta particles, gamma rays, and neutrons.

Nuclear Security Enterprise

Composite of the DOE/NNSA nuclear weapons complex, to include the laboratories, plants, test sites, science and technology, computing tools, and federal and contractor personnel.

nuclear threat device

Improvised nuclear or radiological device, a foreign nuclear weapon of proliferation concern, or any nuclear device that may have fallen outside of a foreign nuclear weapon state's custody.

nuclear weapon

Complete major assembly (i.e., implosion, gun, or thermonuclear), in its intended ultimate configuration, or in a disassembled configuration for a temporary period of time, which, upon completion of the prescribed arming, fusing, and firing sequence, is capable of producing the intended nuclear reaction and release of energy.

nuclear weapon surety

Procedures and actions contributing to the physical security of nuclear weapons, and to

the assurance that there will be no nuclear weapon accidents, incidents, or unauthorized weapon detonations, nor any degradation of weapon performance over target.

nuclear yields

Energy released in the detonation of a nuclear weapon, measured in terms of the kilotons or megatons of TNT required to produce the same energy release.

Yields are categorized as follows:

very low: less than 1 kiloton;

low: 1 kiloton to 10 kilotons;

medium: over 10 kilotons to 50 kilotons;

high: over 50 kilotons to 500 kilotons; and

very high: over 500 kilotons.

nucleus

Small, central, positively charged region of an atom, which carries essentially all the mass. Except for the nucleus of ordinary (light) hydrogen, which is a single proton, all atomic nuclei contain both protons and neutrons.

one-point safety

Probability of achieving a nuclear yield greater than 4 pounds TNT equivalent in the event of a one-point initiation of the weapon's high explosive must not exceed one in a million.

peak overpressure

Maximum value of overpressure at a given location that is generally experienced at the instant the shock (or blast) wave reaches that location.

Phase 6.X Process

Established in 2000, this process focuses on development and fielding of replacement nuclear components for the nuclear stockpile; whereas the original Nuclear

Weapons Life-Cycle Process focuses on development of a complete new warhead.

photon

Unit of electromagnetic radiation consisting of pure energy and zero mass.

project officers groups

Joint DoD–DOE groups associated with each warhead-type, created at the beginning of a weapon development program and charged with the responsibility to coordinate the development and assure the compatibility of a warhead-type with its designated delivery system(s).

prompt radiation

Gamma rays produced in fission and as a result of other neutron reactions and nuclear excitation of the weapon materials appearing within a second or less after a nuclear explosion. The radiations from these sources are known either as prompt or instantaneous gamma rays.

proton

Particle of mass (approximately) unit carrying a unit positive charge; it is identical physically with the nucleus of the ordinary (light) hydrogen atom. All atomic nuclei contain protons.

Quadrennial Defense Review

Legislatively-mandated review of DoD strategy and priorities.

radioactivity

Spontaneous emission of radiation, generally alpha or beta particles, often accompanied by gamma rays, from the nuclei of unstable isotopes.

readiness state

Refers to the configuration of weapons in the active and inactive stockpiles.

reliability

Probability, without regard to counter-measures, that a nuclear weapon, subassembly, component, or other part will perform in accordance with its design intent or requirements.

reliability replacement warheads

Warheads retained in the inactive stockpile that provide the assets to replace active stockpile warheads should reliability or safety problems develop.

residual radiation

Nuclear radiation caused by fallout, artificial dispersion of radioactive material, or irradiation that results from a nuclear explosion and persists longer than one minute after burst.

special nuclear material

Defined by the Atomic Energy Act of 1954 as plutonium, U-233, or uranium enriched in the isotopes of U-233 or U-235.

staged weapon

Weapon in which energy from the primary initiates the explosion of a secondary.

stockpile flight test

Joint DoD–DOE flight tests conducted periodically on weapon systems randomly selected from the stockpile.

stockpile management

Sum of the activities, processes, and procedures for the design, development, production, fielding, maintenance, repair, storage, transportation, physical security, employment (if directed by the president), dismantlement, and disposal of U.S. nuclear weapons and their associated components and materials.

stockpile sustainment

Encompasses the refurbishment of existing warheads and the reuse or replacement of nuclear and non-nuclear components in order to maintain the security, safety, reliability, and effectiveness of the nuclear weapon stockpile.

stockpile-to-target sequence

1) Order of events involved in removing a nuclear weapon from storage and assembling, testing, transporting, and delivering it on the target. 2) Document that defines the logistic and employment concepts and related physical environments involved in the delivery of a nuclear weapon from the stockpile to the target. It may also define the logistic flow involved in moving nuclear weapons to and from the stockpile for quality assurance testing, modification and retrofit, and the recycling of limited life components.

subcritical

State of a given fission system when the specified conditions are such that a less than critical mass of active material is present.

supercritical mass

Quantity of fissionable material needed to support a multiplying chain reaction.

surety

Materiel, personnel, and procedures that contribute to the security, safety, and reliability of nuclear weapons and to the assurance that there will be no nuclear weapon accidents, incidents, unauthorized weapon detonations, or degradation in performance at the target.

surveillance

Activities involved in making sure nuclear weapons continue to meet established safety, security, and reliability standards.

thermal radiation

1) Heat and light produced by a nuclear explosion. 2) (DoD only) Electromagnetic radiations emitted from a heat or light source as a consequence of its temperature; it consists essentially of ultraviolet, visible, and infrared radiations.

thermonuclear

Refers to the process (or processes) in which very high temperatures are used to bring about the fusion of light nuclei such as those of hydrogen isotopes (e.g., deuterium and tritium) with the accompanying release of energy and high-energy neutrons.

TNT equivalent

Measure of the energy released from the detonation of a nuclear weapon or from the explosion of a given quantity of fissionable material in terms of the amount of TNT that could release the same amount of energy when exploded.

Transclassified Foreign Nuclear Information

Information from any intelligence source concerning the nuclear energy programs of foreign governments that was removed from the RD category (by transclassification) under section 142(e) of the Atomic Energy Act by past joint agreements between DOE and the Director of Central Intelligence or past and future agreements with the Director of National Intelligence.

transient radiation effects on electronics

Effects on electronics that are exposed to transient gammas, neutrons, and X-rays.

tritium

Radioactive isotope of hydrogen, having a mass of 3 units; it is produced in nuclear reactors by the action of neutrons on lithium nuclei.

two-person rule

Continuous surveillance and control of positive control material at all times by a minimum of two authorized individuals, each capable of detecting incorrect or unauthorized procedures with respect to the task being performed and each familiar with established security requirements.

underground burst

Explosion of a nuclear (or atomic) weapon with its center more than $5W^{0.3}$ feet, where W is the explosion yield in kilotons, beneath the surface of the ground.

underwater burst

Explosion of a nuclear (or atomic) weapon with its center beneath the surface of the water.

use control

Positive measures that allow the authorized use and prevent or delay unauthorized use of nuclear weapons. Use control is accomplished through a combination of weapon system design features, operational procedures, security, and system safety rules.

warhead

That part of a missile, projectile, torpedo, rocket, or other munitions that contains either the nuclear or thermonuclear system, high explosive system, chemical or biological agents, or inert materials intended to inflict damage.

weapon surveillance

Activities involved in making sure nuclear weapons continue to meet established safety, security, and reliability standards.

weapon system

Combination of one or more weapons with all related equipment, materials, services, personnel, and means of delivery and deployment (if applicable) required for self-sufficiency.

X-ray

Electromagnetic radiations of high energy having wavelengths shorter than those in the ultraviolet region.

yield

Total effective energy released in a nuclear (or atomic) explosion. It is usually expressed in terms of the equivalent tonnage of TNT required to produce the same energy release in an explosion.