TAB A -- Acronyms, Abbreviations, and Glossary

This tab provides a listing of acronyms and abbreviations found in this report. Additionally, the Glossary section provides definitions for selected technical terms not found in common usage.

Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ACR	armored cavalry regiment
AD	armor division
AED	aerodynamic equivalent diameter
AEPI	US Army Environmental Policy Institute
AEPI	
AFRRI	Armed Forces Radiobiology Research Institute
AHA	Abrams heavy armor
ALARA	as low as reasonably achievable
ALI	Annual Limit on Intake
AMAD	Activity Median Aerodynamic Diameter
AEPI	
AMC	Army Materiel Command
AMCCOM	US Army Armament Munitions and Chemical Command
ANSI	American National Standards Institute
AP	armor piercing
APFSDS	armor-piercing fin stabilized discarding sabot
AEPI	
APFSDS-T	armor-piercing fin stabilized discarding sabot with tracer
API	armor piercing incendiary
ARDEC	Armament Research, Development and Engineering Center
ARNG	Army National Guard
ASTM	American Society for Testing Materials
AEPI	
AT	anti-tank
ATSDR	Agency for Toxic Substances and Disease Registry
BDAT	Battle Damage Assessment Team
BEIR	Committee on the Biological Effects of Ionizing Radiation
BFV	Bradley Fighting Vehicle (tracked)
AEPI	
BMP	Soviet-made armored fighting vehicle (tracked)
Bn	Battalion
BTR	Soviet-made armored personnel carrier (wheeled)
CCEP	Comprehensive Clinical Evaluation Program
CDE	Committed Dose Equivalent
CDE	
CECOM	US Army Communications-Electronics Command
CEDE	Committed Effective Dose Equivalent
CFR	Code of Federal Regulations
CFV	Cavalry Fighting Vehicle (Bradley variant)
CHPPM	US Army Center for Health Promotion and Preventive Medicine
CDE	
CIWS	close-in weapon system (20mm air defense gun); also called Phalanx

Co	Company
DoD	Department of Defense
DU	depleted uranium
DULLRAM	depleted uranium /low-level radioactive materials
CDE	
ECC	Environmental Chemical Corporation
EOD	Explosive Ordnance Disposal
FASCAM	Family of Scatterable Mines
GAO	General Accounting Office
HA	Heavy Armor
CDE	
HE	high explosive
HEAT	high explosive anti-tank
HEI	high explosive incendiary
HET	heavy equipment transporter
HMMWV	high mobility multipurpose wheeled vehicle
CDE	
IARC	International Agency for Research on Cancer
ICRP	International Commission on Radiological Protection
ID	infantry division
IEEE	Institute of Electrical and Electronic Engineers
IOC	Industrial Operations Command
IOM	Institute of Medicine
JTCG/ME	Joint Technical Coordinating Group for Munitions Effectiveness
KE	kinetic energy
KeV	kilo electron volts
KKMC	King Khalid Military City, Saudi Arabia
CDE	
LAR	logistics assistance representative
LUDEP	Lung Dose Evaluation Program
MeV	million electron volts
MILVAN	military-owned demountable container of military cargo
MLV	Most Likely Value
CDE	
MMAED	mass median aerodynamic equivalent diameter
MOPP	Mission Oriented Protective Posture
MPC	maximum permissible concentration
MPOC	Maximum Permissible Organ Concentration
mrem	millirem (one thousandth of a rem)
CDE	
NAS	National Academy of Sciences
NBC	nuclear, biological, and chemical
NCO	noncommissioned officer
NCRP	National Council on Radiation Protection and Measurements
ng/g	nanograms per gram (10^{-9} grams per gram)
CDE	
NJARNG	New Jersey Army National Guard
NRC	Nuclear Regulatory Commission

ODS/DS	Operation Desert Shield/Desert Storm
OSAGWI	Office of the Special Assistant for Gulf War Illnesses
OSHA	Occupational Safety and Health Administration
CDE	
PEL	permissible exposure limit
PNNL	Pacific Northwest National Laboratory
PPE	personal protective equipment
RADCON	radiological control
RADIAC	radiation detection, identification and computation
CDE	
Rem	roentgen equivalent in man
RHS	rolled homogenous steel (armor)
RPG	rocket propelled grenade
RPO	radiation protection officer
SCE	sister chromatid exchange
CDE	
SI	International System of Units
STEL	short-term exposure limit
SWA	Southwest Asia
T-72	Soviet-made main battle tank
TACOM	US Army Tank Automotive Command
CDE	
TB	technical bulletin
TLV®	threshold limit value
TOW	tube-launched, optically-tracked, wire-guided antitank missile
TWA	time weighted average
TRU	transuranics
CDE	
µg	microgram (one millionth of a gram)
µm	micrometer or micron (one millionth of a meter)
USACHPPM	US Army Center for Health Promotion and Preventive Medicine
UXO	unexploded ordnance
VA	Department of Veterans Affairs
CDE	
VAMHCS-BT	Veterans Affairs Medical Health Care System -Baltimore Division
WA	93% tungsten/7% binder in tungsten alloy
S_g	geometric standard deviation

Glossary

Absorbed Dose	The energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and gray (Gy).
Activity	The number of nuclear transformations occurring in a material per unit of time. (see Curie and becquerel)
Activity Median	The diameter in an aerodynamic particle size distribution for which the total activity

Aerodynamic Diameter (AMAD)

above and below this size are equal. A lognormal distribution of particle sizes is assumed. The AMAD refers to the entire distribution. The AMAD is the AED for which one-half of the radioactivity in a distribution has an AED smaller than the AMAD and one-half of the radioactivity in a distribution has an AED larger than the AMAD. The AMAD (along with the associated s_g) is the most useful diameter for characterizing the behavior of the aerosol in air, in sampling instruments, and the respiratory tract.

Aerodynamic Equivalent Diameter (AED)

The diameter of a sphere, in µm, of unit density (1 g/cm^3) that has the same terminal settling velocity in air as the particle of interest (A 1 µm AED particle has 1000 times the volume of a 0.1 µm AED particle). The AED refers to an individual particle.

ALARA

Acronym for "as low as reasonably achievable." The Nuclear Regulatory Commission defines ALARA as making every reasonable effort to maintain radiation exposures as far below the dose limits as is practical -- taking into account the state of technology, the economics of improvement in relation to the state of technology, the economics of improvement in relation to the benefits to the public health and safety, and other societal and socioeconomic considerations.

Alpha Particle (α)

A charged particle emitted from the nucleus of an atom, having a mass and charge equal in magnitude to a helium nucleus (two protons and two neutrons stripped of both electrons, thereby, retaining a $+2$ charge).

Annual Limit on Intake (ALI)

The activity in µCi of a radionuclide which taken alone would irradiate a person represented by reference man, to a limit established by a regulatory agency for each year of occupational exposure.

Atom

The smallest unit of an element that is capable of entering into a chemical reaction.

Atomic Mass

The mass of a nuclide's neutral atom, usually expressed in terms of "atomic mass units." The "atomic mass unit" is one-twelfth the mass of one neutral atom of carbon-12, equivalent to 1.6604×10^{-24} gm. (Symbol: amu).

Atomic Number

Number of protons contained in the nucleus of an atom.

Atomic Weight

The weighted average of the masses of the isotopes of an element, expressed in atomic mass units.

Background Radiation

Radiation arising from radioactive material other than the one directly under consideration. Also see natural background radiation.

Becquerel (Bq)

International System of Units unit of radioactivity equal to the amount of radioactive material that yields one nuclear transformation (disintegration) per second. (1 Bq = 1 disintegration per second = 2.7×10^{-11} Curie).

Beta Particle (β)

A negatively charged particle whose mass and charge are the same as that of an electron. Beta particles are emitted from the nucleus of certain radioactive atoms.

Carcinogenic

Capable of producing cancer.

Class

Also referred to as Lung Class or Inhalation Class. A solubility classification scheme for inhaled material which ranks the material according to its rate of clearance from the pulmonary region of the lungs. Materials are classified as D, W, or Y, depending on how fast the material clears the lungs. Class D (days) materials are cleared in less than 10 days. Class W (weeks) materials are cleared between 10 and 100 days. Class Y (years) materials are cleared in more than 100 days. Recent recommendations in the International Commission on Radiological Protection Report 66 have replaced classes D, W, and Y with lung absorption Types F (fast), M (moderate), and S

(slow).

Committed Dose Equivalent (CDE)	The dose equivalent to organs or tissues (targets) of reference that will be received from an intake of radioactive material by an individual during the 50 year period following the intake of the radioactive material, such as DU.
Committed Effective Dose Equivalent (CEDE)	The sum of the committed dose equivalents to various tissues in the body, each multiplied by its tissue weighting factor.
Conexes	Storage trailers used to store DU munitions. Also called MILVANs.
Creatinine	A metabolic waste product in urine that remains relatively constant in an individual and that may be used to establish baseline renal function.
Curie (Ci)	A unit of radioactivity. One curie is the amount of material in which 3.7×10^{10} atoms transform per second. A unit known as the becquerel (Bq) is also commonly used. One Bq is equal to 2.7×10^{-11} Ci (or 1.0 disintegration per second). The activity of 1 gram of radium is approximately 1 Ci. Several fractions of the curie are in common usage:
	Millicurie (mCi): One-thousandth of a curie (3.7×10^{7} disintegrations per second).
	Microcurie (μ Ci): One-millionth of a curie (3.7×10^{4} disintegrations per second).
	Picocurie (pCi): One-millionth of a microcurie (3.7×10^{-2} disintegrations per second or 2.2 disintegrations per minute).
Depleted Uranium DU	Uranium consisting of the same three isotopes (^{234}U, ^{235}U, and ^{238}U) as natural uranium, but with a slightly greater percentage of ^{238}U (99.8 percent instead of 99.3 percent).
Disintegration (Nuclear)	A spontaneous nuclear transformation (radioactivity) characterized by the emission of energy and mass from the nucleus of the atom.
Dose	A general term denoting the amount of something received. Depending on the context, it may indicate absorbed dose, dose equivalent or committed effective dose equivalent. (see individual definitions)
Dose Equivalent	Radiation dose derived from absorbed dose in tissue, but modified to take into account differing biological effectiveness of various types of radiation. The units of dose equivalent are the rem and sievert. (1 sievert = 100 rem)
Dosimeter	An instrument, device, or material used to detect and measure accumulated radiation exposure. During the Gulf War, US forces used two types of dosimeters: a pencil-sized ionization chamber with a self-indicating (one capable of being read by the user) electrometer, and a wrist watch dosimeter, which must be sent to a laboratory to be read. The wrist watch dosimeter measures both gamma and neutron radiation and is designed to measure high doses -- i.e., following the explosion of a nuclear weapon on the battlefield. Neither was designed to detect or measure DU contamination.
Dyne	The unit of force, which when applied to a one gram mass will give it an acceleration of one centimeter per second per second.
Erg	The unit of work, equal to one dyne expended along a distance of one centimeter.
External Dose	That portion of the dose received from radiation sources outside the body.

Gamma Ray (γ)	The short wavelength electromagnetic radiation (range of energy from 10 thousand electron volts to 9 million electron volts) emitted from the nucleus. After a gamma ray is formed, it is identical to an x-ray. Both are photons of energy. The difference is that gamma rays originate in the nucleus of the atom, and x-rays originate in the extranuclear part of the atom.
Geometric Standard Deviation (s_g)	For a lognormal distribution it is the exponential of the standard deviation of the associated normal distribution (always ≥ 1).
Gray (Gy)	The standard international unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram of absorber material or 100 rads.
Half-life (Biological)	The time required for an organ, tissue or the whole body to eliminate (excrete) one-half of an administered quantity of any substance by regular process of elimination. A biological half-life is approximately the same for both the stable and radioactive isotopes of any particular element.
Half-life (Effective)	Time required for an internally deposited radioactive element in a body to be diminished 50 percent as a result of the combined action of radioactive decay and biological elimination;

Effective half-life = Biological half-life X Radiological half-life
Effective half-life = Biological half-life + Radiological Half-life

Half-life (Radioactive)	The time required for a radioactive substance to lose one-half of its activity by natural decay. Each radionuclide has a unique half-life.
Internal Dose	That portion of the total dose to the body received from radioactive material taken into the body.
Ion	An atom or group of atoms that has acquired an electric charge (negative or positive) by gaining or losing one or more electrons.
Ionizing Radiation	Radiation capable of producing ions as it passes through matter.
Isotope	Atoms of the same element having the same number of protons in their nuclei (and therefore the same atomic number), but a different number of neutrons (and therefore a different mass number). All isotopes of an element have identical chemical properties.
Joule	The unit of work, equal to a force of one newton (see definition below) expended along a distance of one meter (1J = 1N X 1m).
Kilo Electron Volt (keV)	One thousand electron volts or 10^3 electron volts.
Lead Sheet	A record of interviews with veterans, subject matter experts, etc. written by OSAGWI investigators to provide formal documentation of the interview/discussion.
Localized Effects	Localized effects are changes in the cells at the site (cell death, cell multiplication) and changes between the cells at the site (scarring, fluid accumulation, build up of other cells, as in inflammatory response). The result would be things like redness, swelling, tumor, scarring, soreness, etc.
Mass Median Aerodynamic Equivalent Diameter (MMAED)	The aerodynamic diameter of a particle having a median mass i.e., the masses of particles above and below this value are equal. It is the diameter that divides the graphical representation of the distribution of mass into two equal area segments also called the mass median diameter (MMD).
MILVANs	See conexes.

Natural Background Radiation	The radiation in the earth's natural environment, including radiation originating outside the earth's atmosphere and radiation from the naturally occurring radioactive elements on earth. These elements may be found both in the environment and inside the bodies of men and animals.
Maximum Permissible Concentration (MPC)	The MPC is the maximum permissible concentration for exposure for 540 hours during a single calendar quarter of 13 weeks.
Newton	The unit of force, which when applied to a one kilogram mass will give it an acceleration of one meter per second per second ($1N = 1kg \times 1m/s^2$).
Nonstochastic Effect	A health effect, the severity of which increases with the size of the dose and for which a threshold exists. Radiation-induced cataract formation is an example of a nonstochastic effect. Also called a deterministic effect.
Occupational Dose	The Nuclear Regulatory Commission defines occupational dose as the dose received by a radiation worker during the course of employment, in which the individual's assigned duties involve exposure to radiation and radioactive material from licensed and unlicensed sources of radiation. Occupational dose does not include the dose from background radiation, from any medical procedures, from voluntary participation in medical research programs, or from any activity outside the workplace.
Oxide	A chemical compound in which oxygen is combined with a metal or nonmetal.
Permissible Exposure Limit (PEL)	A maximum allowable atmospheric level of a substance in workplace air averaged over an 8-hour shift.
Proximal Tubular Necrosis	The destruction of the cells in the initial part of the urine collecting tubes in the kidney, called the proximal tubular region. Heavy metals, such as uranium, are just one of several potential causes of proximal tubular necrosis.
Public Dose	The Nuclear Regulatory Commission defines public dose as the radiation dose received by a member of the public from a licensed source of radiation. The public dose does not include the occupational dose or doses from background radiation, from any medical procedures, or from voluntary participation in medical research programs.
Rad (radiation absorbed dose)	A unit of absorbed dose. One rad is 0.01 Joule absorbed per kilogram of any material. Also defined as 100 ergs per gram. Rad is being replaced by gray (Gy). One rad equals 0.01 gray.
RADIAC Equipment	RADIAC is the acronym for radiation detection, identification and computation. RADIAC equipment is used to detect, identify, and measure radiation.
Radioactive/Radioactivity	The spontaneous decay or disintegration of an unstable atomic nucleus, usually accompanied by the emission of ionizing radiation, such as alpha (α) or beta (β) particles or gamma (γ) rays.
Radioisotope	The isotopes of an element that are unstable (radioactive).
Rem (roentgen equivalent man or mammal)	A unit of dose, called the "dose equivalent," that is used in the regulatory, administrative, and engineering design aspects of radiation safety practice. The dose equivalent in rem is numerically equal to the absorbed dose in rad multiplied by the quality factor (1 rem is equal to 0.01 sievert).
Risk	A measure of the chance that an undesirable event or effect may actually happen. For example, a risk of 1×10^{-6} means that there is one chance in a million of the event happening. As applied to radiation risk, this means that if 1,000,000 persons

received a certain radiation dose, then we would expect that one person may show the harmful effect. The estimated risk from low doses of radiation, where no harmful effects have actually been seen, is extrapolated from high radiation doses, where the effects have been seen. In making this extrapolation, it is assumed that the chance of injury from the low dose is proportional to the chance of injury from the high radiation dose.

Roentgen (R)

A measure of exposure to X and gamma radiation. Although a roentgen does not directly provide exact information about the radiation close to the exposed person, an exposure of one roentgen results in a dose equivalent of one rem. Named after William Roentgen, a German scientist who discovered x-rays in 1895.

Sabot

A lightweight carrier designed to center a smaller caliber projectile in a larger gun barrel. When the sabot round is fired, the sabot is normally discarded a short distance from the muzzle.

Short-Term Exposure Limit (STEL)

The maximum concentration to which workers can be exposed for up to 15 minutes continually. No more than four excursions are allowed per day, and there must be at least 60 minutes between exposure periods. The daily TLV®-TWA (time-weighted average) cannot be exceeded.

SI Units

The International System of Units as defined by the General Conference of Weights and Measures in 1960. The units are generally based on the meter/kilogram/second units, with special quantities for radiation including the becquerel, Gray, and sievert.

Sievert (Sv)

The international unit of dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays (see gray above) multiplied by the radiation weighting factor and tissue weighting factors. One Sv = 100 rem.

Sister Chromatid Exchange (SCE)

Damage to the genetic material of a cell where chromosomes break then rejoin improperly, often used to indicate whether something is harmful to genes.

Solubility

The capability of being dissolved in a fluid, such as body fluids.

Specific Activity

The activity of the radionuclide per unit mass of the material that contains the radionuclide. [For DU the specific activity is about 0.4 µCi/g.)

Stochastic Effect

A health effect that occurs randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose, with no threshold. In other words, the probability of the effect occurring is zero, only when the dose is zero. Incremental increases in dose will cause proportional increases in the probability of the effect occurring. Hereditary effects and cancer incidence are examples of stochastic effects. Also called non-deterministic.

Strafe

Attack by machine gun or cannon fired from an aircraft.

Subtle Perturbations

Medical testing is expected to yield results which are either normal or abnormal. The truth is that "normal" is usually a range. When testing is done on a group of people in a research project, there may be clustering of results at the high or low end of normal, at times including results which are just below or above the low and high normal cutoffs. When this occurs and there is no ready explanation, the results are called subtle perturbations.

Threshold Limit Value (TLV®)

The maximum concentration of a substance to which most workers can be exposed without adverse effects. TLV is a term used exclusively by the American Conference of Governmental Industrial Hygienists (ACGIH). Other terms used to express the same concept are the MAC (maximum allowable concentration) and the OSHA equivalent PEL (permissible exposure limits).

Transuranic (TRU)

An element with an atomic number greater than that of uranium (92). Neptunium

(Np) has an atomic number of 93, plutonium (Pu) has an atomic number of 94, and americium (Am) has an atomic number of 95. All transuranics are man-made. Transuranics are found in DU as low-level contaminants from recycled nuclear fuel or waste material.

Tritium

An isotope of hydrogen with one proton and two neutrons in the nucleus. Tritium is radioactive with a half-life of about 12 years and emits beta particles. It occurs naturally and is also man-made.