WASC-2382

Explosives Terms and Definitions

A 32/ARTS/R & D/678

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MINISTRY OF DEFENCE
(Army Dept.)

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FOREWORD

In any scientific field it is of great importance to be able to discuss phenomena as clearly, unambiguously and economically as possible. This is as true of explosives technology as of any, and agreement on the use of certain technical terms is thus always a useful goal. The Ministry of Defence Advisory Council on Scientific Research and Technical Development ("Scientific Advisory Council") agreed to a proposal from one of its Committees to improve on the existing situation with the aim not only of making progress in usage within Government Establishments, but also of producing a document acceptable to authors and editors of scientific journals.

This booklet is the outcome. It was produced by a group comprising representatives from the Royal Armament Research and Development Establishment, the Explosives Research and Development Establishment, the Atomic Weapons Research Establishment, Industry, Universities and learned societies. Reference to parent bodies has been possible at all stages and it is hoped that this list of definitions and recommendations will find wide acceptance. Comments have been included on the undesirability of certain rather nebulous terms, especially where clarity is important. The list is not exhaustive, and definitions of terms which are already clearly defined in normal dictionaries are omitted. It is intended that the list will be improved from time to time as shortcomings become apparent and new terms are introduced.

The terms are arranged in alphabetical order and where words are used which are themselves defined in the glossary, such words are printed in capitals. The names of the more common explosives appear as a separate list which is also in alphabetical order.

The Scientific Advisory Council is indebted to several Government Establishments and to members of the staffs of several Universities for their interest and help in compiling the lists, and in particular to:—

Professor P. G. Ashmore (University of Manchester).

Mr. G. P. Cachia (A.W.R.E.).

Professor P. Gray (University of Leeds).

Mr. N. Griffiths (R.A.R.D.E.).

Dr. O. A. Gurton (I.C.I. Nobel Division).

Mr. W. S. Hall (R.A.R.D.E.).

Dr. A. L. Lovecy (E.R.D.E.).

Professor J. S. Rowlinson (Imperial College of Science and Technology).

W. R. HAWTHORNE,
Chairman,
Advisory Council on Scientific Research and Technical Development, Ministry of Defence (Army Department).

EXPLOSIVES TERMS

In each definition where they occur, words which are themselves defined elsewhere in the list are printed in upper case.
"Explosive" has been treated as an exception and is not so printed.

AMORCE

A toy pistol CAP consisting of a small quantity of explosive in a paper container.

ARM

To prepare an explosive device for functioning by removing the normal safety restraints.

ATTENUATE

To reduce in force or value. The term is often used to describe the weakening of a SHOCK WAVE by decreasing its amplitude or duration.

BLAST

A destructive wave produced in the surrounding atmosphere by an EXPLOSION. The blast includes a SHOCK FRONT, high pressure gas behind the shock front and a rarefaction following the high pressure.

BLASTING CAP

In the United States, this term refers to a demolition DETONATOR.

BLASTING EXPLOSIVE

Explosive used for industrial mining, quarrying, etc.

BRISANCE

The shattering property shown by an explosive. The property is estimated by firing explosives in contact with metals or other solids and measuring the deformation or shattering. The effect is associated with the detonation pressure and the characteristics of the SHOCK WAVE produced in the material in contact with the explosive. It is therefore a nebulous term the use of which is not recommended.

BURNING

The propagation of an exothermic reaction by conduction, convection and radiation.

CAMOUFLET

The type of cavity produced when a charge explodes underground without breaking the surface of the earth. (See Crater.)

CAP

A small metal container filled with a flame-producing explosive composition. In the United States the term BLASTING CAP refers to a demolition DETONATOR.

CAVITATION

This term is used loosely to represent the erosive effect of a SHAPED CHARGE. It has another accepted definition in hydro-dynamics and in reference to solid bodies. Its use as an explosives term is not recommended.

CHAPMAN-JOUGUET SURFACE

In a DETONATION wave, this is the surface behind the SHOCK FRONT at which material is receding from the wave-front at the local speed of sound.

CHAPMAN-JOUGUET LAYER

This term may be used to describe either the Chapman-Jouguet surface or the zone between the surface and the SHOCK FRONT. (See Reaction-Zone thickness)

COMBUSTION

An exothermic oxidation reaction.

COMPOSITE DETONATOR

A DETONATOR containing a PRIMARY EXPLOSIVE and a less sensitive explosive which is set off by the Primary Explosive.

CRATER

The open cavity caused at the surface of a material when energy is released suddenly at or near this surface. (See Camouflet)

DEFLAGRATION

(i) A rapid BURNING in which convection often plays an important role.

(ii) Used in mining to describe the burning of an explosive which has failed to DETONATE.

DETONATION

An exothermic reaction wave which follows and also maintains a SHOCK FRONT in an explosive.

See also: High Order Detonation.
Low Order Detonation.
Sympathetic Detonation.
Velocity of Detonation.

DETONATOR

An explosive device for starting DETONATION. It is usually small and may be set off by impact, friction, electricity, flame, heat, etc.

See also: Composite Detonator.
E.B.W. Detonator.
Flash Detonator.
Electric Detonator.

DETONICS

The study of DETONATION and related phenomena.

E.B.W.
(Exploding Bridgewire) Detonator

A DETONATOR in which a low density SECONDARY EXPLOSIVE filling is detonated by electrically exploding a fine wire embedded in it.

ELECTRIC DETONATOR

Detonator initiated by electrical means.

EXCITATION TIME

The period for which current must be supplied to an electro-explosive device to ensure functioning.

EXPLODER

(i) See Primer (i).

(ii) A portable electric generator designed for setting off ELECTRIC DETONATORS.

EXPLOSION

A violent expansion. (See also Thermal Explosion)

EXPLOSIVE

A chemical substance or mixture which can react to produce an EXPLOSION.
See also: Blasting Explosive.
High Explosive.
Low Explosive.
Primary Explosive.
Secondary Explosive.

EXPLOSIVE POWER

The work done during the EXPLOSION of a standard quantity of an explosive in a prescribed test. It is usually expressed as a percentage of the work done by a standard explosive under the same conditions. It is commonly measured by a "Ballistic Mortar". In the U.S.A. the term Explosive Strength is used.

Note:—Explosive Power is NOT rate of doing work although the rate may affect the measured value.

EXPLOSIVE TRAIN

(i) An arrangement used to lead explosive reactions from one place to another.

(ii) A sequential arrangement of DETONATOR, PRIMER and main explosive.

FLAME

Luminous phenomena accompanying COMBUSTION.

FLASH

(i) Short lived radiation pulse accompanying an EXPLOSION.

(ii) A short lived FLAME used to ignite a FUSE or DETONATOR.

FLASH DETONATOR

(i) A small DETONATOR which can be set off by FLASH or FLAME. It has no self-contained means of IGNITION. It is better referred to as a flash sensitive detonator.

(ii) A small device with the appearance of a detonator but which produces FLASH rather than a detonation wave. (See Cap.)

FRAGMENTATION

The shattering effect of an explosive upon its container, *e.g.* fragmentation of a shell case by its explosive filling.

FUSE

Cord or tube for the transmission of FLAME or EXPLOSION. Bickford fuse, which consists of gunpowder spun into a rope, burns. Cordtex fuse or Primacord are similar to Bickford fuse, but contain a high explosive. They detonate.

Note:—The spelling FUZE may also be met for this term. That given is the one normally met.

FUSE, ELECTRIC

A form of IGNITER, ELECTRIC which is fired by electrical heating of a fine resistance wire (bridge-wire).

FUZE

A device with explosive components designed to initiate a main charge.

Note:—The spelling FUSE may also be met for this term. That given is the one normally met.

GAINE

An EXPLOSIVE TRAIN arranged to achieve, maintain or enhance DETONATION. [See Primer (i)]

HIGH EXPLOSIVE

An explosive which is capable of DETONATION.

HIGH ORDER DETONATION

Detonation at a velocity approaching the maximum stable VELOCITY OF DETONATION for the system.

HOT SPOT

A small region characterised by a temperature much higher than its surroundings.

IGNITER

A device for starting BURNING of a receptor charge. There are two types:

(i) *IGNITER, ELECTRIC* for which the receptor is usually either a DETONATOR or a PYROTECHNIC charge.

(ii) *ROCKET IGNITER* which is an assembly for which the receptor charge is the PROPELLANT in a rocket motor. In small arms ammunition, a CAP frequently serves this purpose and, in cartridges for guns, a PRIMER is used.

IGNITION

The start of BURNING.

See also: Partial Ignition.
Temperature of Ignition.

INHIBITOR

(i) A substance employed to prevent or oppose chemical change in a system.

(ii) An adherent layer of material applied to part of the surface of a PROPELLANT to prevent BURNING at that surface.

INITIATOR

A device for setting off detonating explosives, *e.g.* a DETONATOR or FUZE. The term is also used as an abbreviation for the initiatory composition used in these devices. Such compositions may also be known as PRIMARY EXPLOSIVES.

LAG TIME

The period between first applying current to an electro-explosive device and subsequent breaking of the circuit.

LOW EXPLOSIVE

An explosive which does not DETONATE. The use of this term is not recommended.

LOW ORDER DETONATION

Detonation of an explosive at a velocity well below the maximum stable VELOCITY OF DETONATION for the system.

MUNROE OR NEUMANN EFFECT

A concentration of the effect of a DETONATION by shaping the explosive charge. (See Shaped Charge)

PARTIAL IGNITION

IGNITION in which the BURNING fails to propagate throughout the sample. It would be more properly referred to as a partial burning.

POWER

See Explosive Power.

PRIMARY EXPLOSIVE

A sensitive explosive which is readily ignited and exploded. Examples are lead azide and mercury fulminate.

PRIMER

(i) Intermediate explosive used to augment the impulse from the initiatory explosive to a magnitude sufficient to cause DETONATION of the main explosive charge. The terms EXPLODER, GAINE or booster are frequently used in connection with shells, bombs and torpedoes.

(ii) In a gun cartridge, it is the explosive device containing a CAP and a booster charge of PYROTECHNIC which is used to ignite the PROPELLANT charge.

PROPELLANT

Explosive used to propel a missile or to do other work by the expansion of high pressure gas produced by BURNING, *e.g.* for starting engines, lowering landing wheels, etc. The spelling propellent is not recommended.

REACTION-ZONE THICKNESS

This is the distance between the SHOCK FRONT and the CHAPMAN-JOUGUET SURFACE in a detonation wave. (See Chapman-Jouguet layer)

RETONATION WAVE

A reactive SHOCK WAVE travelling in the reverse direction to that of the initiating shock.

R.F. HAZARD

The danger of the accidental initiation of an electro-explosive device by radio frequency electromagnetic radiation.

SECONDARY EXPLOSIVE

A substance or mixture which will DETONATE when initiated by a SHOCK WAVE or detonation wave but which normally does not detonate when heated or ignited.

SENSITISE

To increase the SENSITIVENESS or the SENSITIVITY of an explosive.

SENSITIVENESS

A measure of the ease with which an explosive may be ignited or initiated by a prescribed stimulus. (An inverse measure of the safety of an explosive against accidental initiation.)

SENSITIVITY

A measure of the ease with which reliable functioning may be assured in an explosive or explosive system in the intended conditions of use.

SET BACK

The inertial forces acting upon the contents of a projectile due to its being accelerated in a gun barrel.

SHAPED CHARGE

An explosive charge shaped to concentrate its effect when detonated. (See Munroe effect.) The effect of the charge is often enhanced by the addition of a metal liner.

SHOCK FRONT

A discontinuous change in the pressure and other properties of a medium. This change is propagated at supersonic speed.

SHOCK WAVE

When it is intended not only to refer to the SHOCK FRONT but also to the associated phenomena, this term is frequently used. (See Blast.)

SHUTTER

A safety device in an EXPLOSIVE TRAIN for isolating the initiating explosive.

SPEED OF DETONATION

See under Velocity of Detonation.

SQUIB

A small electro-explosive device for producing a rapid evolution of gas to power a mechanical device or for igniting a PYROTECHNIC (term of U.S. origin). (See also igniter, electric and fuse, electric)

STABILISER

A substance which stops or reduces self-catalytic decomposition of explosives.

STAND OFF

The distance of a SHAPED CHARGE from a target at the instant of detonation. There is an optimum value at which best performance is achieved.

STEMMING

(i) An explosive filling which has been loaded in increments.

(ii) Inert material such as clay or sand used to close a loaded shot hole during rock blasting.

SYMPATHETIC DETONATION

The DETONATION of an explosive or of an explosive device as a consequence of another detonation. The term is normally used in accident situations.

TEMPERATURE OF IGNITION

The temperature at which an explosive ignites under specified conditions.

THERMAL EXPLOSION

EXPLOSION resulting from exothermic reaction in an explosive charge in a region where heat is liberated more rapidly than it can be transferred away.

TIME

See: Excitation time.
Lag time.

VELOCITY OF DETONATION (Speed of Detonation)

This is the speed at which a DETONATION wave progresses through an explosive. When, in a given system it attains such a value that it will continue without change, it is called the stable velocity of detonation for that system.

COMMON EXPLOSIVES

"A" Mixture

An almost obsolete composition, for use in percussion caps, consisting of mercury fulminate, potassium chlorate, and antimony sulphide—respectively 6, 6, 4, by weight. Other proportions are designated B and C, with suffix numbers for certain modifications.

Amatol

Ammonium nitrate and trinitrotoluene mixed in certain proportions (*e.g.* 80/20) for use as a shell filling.

Ammonal

A mixture of ammonium nitrate (65), TNT (15), aluminium powder (17), and charcoal (3), used as a mine filling.

Ballistite

A class of propellants in the form of flakes comprising nitrocellulose and nitroglycerine, with a stabiliser.

Baratol

Barium nitrate and trinitrotoluene mixed in certain proportions for use in grenades and mines, also in some wave-shaping applications.

BDNPF

bis-Dinitropropyl formal
$[CH_3.C(NO_2)_2.CH_2O]_2.CH_2$

Black Powder

Gunpowder—comprising charcoal, sulphur, and potassium nitrate.

Blasting Gelatine

A commercial explosive comprising a very high proportion of nitroglycerine (*e.g.* 90%) with suitable nitrocellulose to render it gelatinous, and a little chalk.

Composition A

A mixture of RDX 91% with beeswax 9% as desensitiser.

Composition B

A mixture of RDX with TNT, usually 60/40.

Composition C

A mixture of RDX with oil and/or polymeric material in proportions (*e.g.* 88/12) to give a putty-like mass.

Cordite

A class of propellants in the form of extruded cords or tubes (sometimes cut to form 'grains') comprising nitrocellulose and nitroglycerine, with a stabiliser, and other ingredients in most cases.

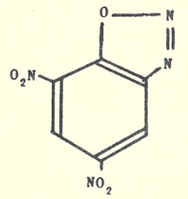
DATB

1, 3-Diamino-2, 4, 6-trinitrobenzene

$(NH_2)_2.C_6H.(NO_2)_3$

DDNP

Diazodinitrophenol, 4, 6-dinitrobenzene-2-diazo-1-oxide, an explosive in the initiator class.



DEGDN

Diethyleneglycol dinitrate, a replacement for nitroglycerine in some circumstances.

$(O_2NOCH_2CH_2)_2O$

DNB

1, 3-Dinitrobenzene

$C_6H_4.(NO_2)_2$

DNT

Dinitrotoluene (mixed isomers, usually)

$(NO_2)_2.C_6H_3.CH_3$

Double Base Propellant

Any of the kinds based on nitrocellulose together with nitroglycerine (or the like) *e.g.* ballistite, cordite.

Dynamite

A class of commercial explosives comprising nitroglycerine absorbed in kieselguhr or other substances.

Explosive D

Ammonium picrate as used in U.S. as high explosive

$(NO_2)_3.C_6H_2.ONH_4$

Gelignite

A commercial explosive of plastic nature related to some types of dynamite.

Guncotton

Nitrocellulose with a nitrogen content above 13%.

HMX

Cyclotetramethylenetetramine, the 'High Melting' explosive produced together with RDX in the Bachmann process.

1, 3, 5, 7-tetranitro-1, 3, 5, 7-tetra-azacyclo-octane

$[CH_2.N(NO_2)]_4$

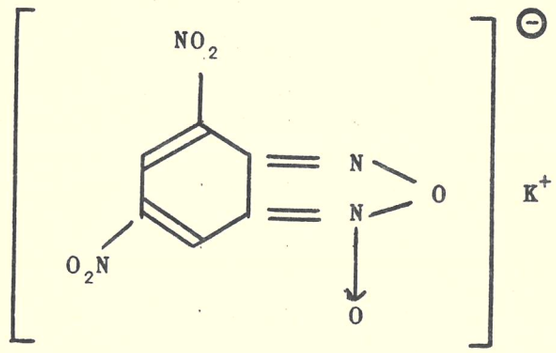
KDNAN

Potassium dinitroacetonitrile

$KO_2N{=}C(NO_2)CN$

KDNBF

Potassium 4, 6-dinitrobenzofuroxan



LDNR

Lead salt of 2, 4-dinitroresorcinol or of 4, 6-dinitroresorcinol

$(NO_2)_2.C_6H_2.O_2Pb$

Lead Styphnate

Lead salt of 2, 4, 6-trinitroresorcinol

$(NO_2)_3.C_6H.O_2Pb.H_2O$

LMNR

Lead salt of 4-nitroresorcinol

$NO_2.C_6H_3.O_2Pb$

Mercury Fulminate

The compound $Hg(ONC)_2$

Neonite

Proprietary name for I.C.I. small arms propellant(s).

Nitrocellulose, NC

Nitric esters of cellulose having a nitrogen content depending upon conditions of preparation; compare guncotton.

Nitroglycerine

Glycerol trinitrate

$O_2.NO.CH(CH_2.ONO_2)_2$

Nitroglycol

Ethyleneglycol dinitrate

$CH_2.ONO_2)_2$

Pentolite

A mixture of PETN and TNT.

PETN

Pentaerythritol tetranitrate

$C.(CH_2.ONO_2)_4$

Picric Acid

2, 4, 6-Trinitrophenol

$(NO_2)_3.C_6H_2.OH$

Picrite

Service code name for nitroguanidine

$(NH_2)_2C{=}N.NO_2$

Plastic Explosive

RDX made into a putty-like mass by mixing with an inert binder of suitable characteristics; PE4 is an example.

RDX

Cyclotrimethylenetrinitramine; 1, 3, 5-trinitro-1, 3, 5-triazacyclohexane, (synonyms cyclonite, hexogen)

$[CH_2.N.(NO_2)]_3$

SFG

Sulphur-free gunpowder, *i.e.* charcoal and potassium nitrate composition.

Single Base Powder (or Propellant)

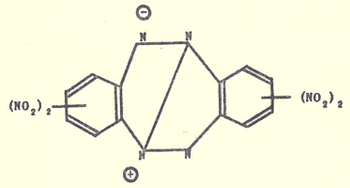
A class of propellants comprising nitrocellulose without nitroglycerine (or equivalent), plus small amounts of stabiliser, surface coating, etc.

Solventless Cordite

Cordite composition so devised as to permit manufacture and extrusion without use of a volatile solvent at any stage.

TACOT

Proprietary name for du Pont explosive. Tetranitrodibenzo-1, 3a, 4, 6-tetraazapentalene.



TATB

Symmetrical triaminotrinitrobenzene

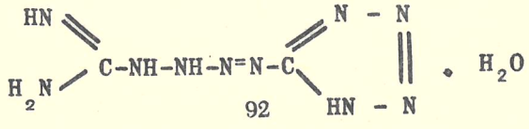
$(NH_2)_3C_6(NO_2)_3$

Tetryl

See C.E.

Tetrazene

1-Guanyl-4-tetrazoiyltetrazene monohydrate



TNA

2, 4, 6-Trinitroaniline

$(NO_2)_3.C_6H_2.NH_2$

TNB

2, 4, 6-Trinitrobenzene

$C_6H_3.(NO_2)_3$

TNT

2, 4, 6-Trinitrotoluene

$(NO_2)_3.C_6H_2.CH_3$

Torpex

Mixtures of RDX, TNT, and aluminium, used for bomb fillings and other purposes; wax is also used in some of these compositions.

VH2

'Von Herz' mixture, for caps, consisting of lead styphnate, barium nitrate, antimony sulphide, calcium silicide, and lead peroxide, sensitised with tetrazene.