**TOPIC 2/2**

**Contemporary threats occurring in potential military operations**

**TYPES OF THREATS**

**Sources of Threat and Hazard.** The threats and hazards faced by a force come from three sources: the adversary, the activities of the force and the environment in which the force exists:

**Adversarial Threat.** Modern warfare is rarely symmetrical. Adversaries normally differ in capability, intent, culture and methods of fighting. The threat from a specific adversary therefore comes both from the damaging effect of deployed weapons and from the methods by which those weapons are used. For example, an artillery shell can be used either as an indirect fire weapon or as a command detonated IED. It is possible to discern three broad types of methodology used by an adversary and, in practice, the tactics of an adversary are likely to encompass all three elements to a varying degree.

* **Professional.** The professional is likely to use in-service weapons and weapon platforms in an efficient and directed way, most probably in the manner for which these weapons were originally designed. Attacks may be controlled and coordinated at a higher level as part of a campaign.
* **Opportunist.** The opportunist may exploit a transient opportunity to attack. This may occur when a weapon or a means of attack becomes available or when a force exposes a weakness. Such an adversary may use novel tactics with conventional weapons.
* **Fundamentalist.** The fundamentalist is motivated by religious or ideological aims. Attacks are characterized by scant regard for self-preservation or the lives of others, including non-combatants: suicide attacks are the most extreme example.

**Occupational Hazards.** Any deployed force is at some risk from its own weapons and activities. A force wishes to minimize the chance of fratricide or lethal accident. Protection may therefore be required from accidental or mistaken discharge of weapons. Procedural measures are the principal means of protection; physical FPE measures are of limited use except for limiting the danger, such as the barriers used to minimize the effects of the sympathetic detonation of bombs on parked, armed aircraft and within explosive storage areas.

**Environmental Hazards.** A danger may exist from natural hazards such as climate or man-made hazards such as toxic industrial materials (TIMs). These hazards may be exploited by an adversary or may be released other than by attack (ROTA). Shelter from the climate is not considered to be FPE.

**Destruction means** - part of contemporary armies and non-military organizations armament can be classified as:

**1. Conventional weapons**

  All armament (weapon) used by ground, air and naval forces except for NBC.

**2. Improvised explosive devices (IED)**

  Devices placed or made by improvised way. They include destructive, lethal, noxious, explosive or incendiary agents to destroy, unable or take own forces 'mind off service. It can include military materials but it is usually made of non-miltary components.

**3. Mass destruction weapons (NBC)**

  Overall term designating nuclear, biological and chemical weapon. Using of this weapon causes mass casualties, material destruction and widespread destruction of infrastructure. They are destined for using by armed forces to achieve strategic military or political objectives. Their using for purpose of terrorism cannot be exclude.

**Conventional weapons**

**Air means**

**Air means** are classify into aircraft guns of 20 to 30 mm caliber and additional weaponry including Land attack guided missiles, unguided rockets, bombs and cluster bombs. High-explosive and frangible ammunition of 100 to 500 kg weight is usually used to destruction of important objectives, armored equipment, personnel and field fortifications in the enemy´s defense area. Explosive is 50 to 70% of bomb´s weight. For destruction of strong ffortifications can be used penetrative bombs with long-delay fuse.

Air means are in threat identification context divided into two groups:

* aircrafts – means to deliver ammunition to the target,
* aircraft ordnance- immediate source of destructive effects. It can be divided into air bombs and Air Missiles.

If air means can represent a threat adversary will have to own both categories of it. Aircraft ordnance can be also used as a part of IED.

An **aerial bomb** is a type of explosive or incendiary weaponintended to travel through the air on a predictable trajectory usually designed to be dropped from an aircraft. Aerial bombs include a vast range and complexity of designs, from unguided gravity bombs to guided bombs. As with other types of explosive weapons, aerial bombs are designed to kill and injure people and destroy materiel through the projection of blast and fragmentation outwards from the point of detonation. Aerial bombs typically use a contact fuse to detonate the bomb upon impact, or a delayed-action fuze initiated by impact.

A **general-purpose bomb** is an air-dropped bomb intended as a compromise between blast damage, penetration, and fragmentation in explosive effect. They are designed to be effective against enemy troops, vehicles, and buildings.

An **unguided bomb**, also known as a **free-fall bomb**, **gravity bomb**, **dumb bomb**, or **iron bomb**, is a conventional aircraft-delivered bomb that does not contain a guidance system, simply follows a ballistic trajectory.

A **guided bomb** (also known as a **smart bomb**, **guided bomb unit**, or **GBU**) is a precision-guided munition designed to achieve a smaller circular error probable (CEP). Because the damage effects of explosive weapons fall off with distance according to a power law, even modest improvements in accuracy (and hence reduction in miss distance) enable a target to be effectively attacked with fewer or smaller bombs. Therefore, with guided weapons, fewer air crews are put at risk, less ordnance spent, and collateral damage reduced.

An **air-to-surface missile** (**ASM**) or **air-to-ground missile** (**AGM** or **ATGM**) is a missile designed to be launched from military aircraft at targets on land or sea. There are also unpowered guided glide bombs not considered missiles. The two most common propulsion systems for air-to-surface missiles are rocket motors, usually with shorter range, and slower, longer-range jet engines. Some Soviet-designed air-to-surface missiles are powered by ramjets, giving them both long range and high speed. Guidance for air-to-surface missiles is typically via laser guidance, infrared guidance, optical guidance or via satellite guidance signals. The type of guidance depends on the type of target.

**Anti-ship missiles** are guided missiles that are designed for use against ships and large boats. Most anti-ship missiles are of the sea skimming variety, and many use a combination of inertial guidance and active radar homing. A good number of other anti-ship missiles use infrared homing to follow the heat that is emitted by a ship; it is also possible for anti-ship missiles to be guided by radio command all the way.

**Anti- aircraft** or **air-to-air missile** (**AAM**) is a missile fired from an aircraft for the purpose of destroying another aircraft. AAMs are typically powered by one or more rocket motors, usually solid fueled but sometimes liquid fueled. Ramjet engines, as used on the Meteor (missile) are emerging as propulsion that will enable future medium-range missiles to maintain higher average speed across their engagement envelope. Air-to-air missiles are broadly put in two groups. Those designed to engage opposing aircraft at ranges of less than 30 km are known as short-range or "within visual range" missiles (SRAAMs or WVRAAMs) and are sometimes called "dogfight" missiles because they are designed to optimize their agility rather than range. Most use infrared guidance and are called heat-seeking missiles. In contrast, medium- or long-range missiles (MRAAMs or LRAAMs), which both fall under the category of beyond visual range missiles (BVRAAMs), tend to rely upon radar guidance, of which there are many forms. Some modern ones use inertial guidance and/or "mid-course updates" to get the missile close enough to use an active homing sensor.

**BALLISTIC MISSILES**

**Ballistic missile** follows a ballistic trajectory to deliver one or more warheads on a predetermined target. These weapons are only guided during relatively brief periods of flight—most of their trajectory is unpowered, being governed by gravity and air resistance if in the atmosphere. Shorter range ballistic missiles stay within the Earth's atmosphere, while longer-ranged intercontinental ballistic missiles (ICBMs), are launched on a sub-orbital flight trajectory and spend most of their flight out of the atmosphere. Ballistic missiles can vary widely in range and use, and are often divided into categories based on range.

Various schemes are used by different countries to categorize the ranges of ballistic missiles:

* Tactical ballistic missile: Range between about 150 km and 3500 km : Short-range ballistic missile (SRBM): Range between 300 km and 1,000 km, Medium-range ballistic missile (MRBM): Range between 1,000 km and 3,500 km,
* Intermediate-range ballistic missile (IRBM) or long-range ballistic missile (LRBM): Range between 3,500 km and 5,500 km,
* Intercontinental ballistic missile (ICBM): Range greater than 5,500 km.

**Tactical ballistic missiles** are usually mobile to ensure survivability and quick deployment, as well as carrying a variety of warheads to target enemy facilities, assembly areas, artillery, and other targets behind the front lines. Warheads can include conventional high explosive, chemical, biological, or nuclear warheads. Typically tactical nuclear weapons are limited in their total yield compared to strategic rockets.

**An** **intermediate-range ballistic missile** (**IRBM**) is a ballistic missile with a range of 3,000–5,500 km (1,864–3,418 miles), between a medium-range ballistic missile (MRBM) and an intercontinental ballistic missile (ICBM). Classifying ballistic missiles by range is done mostly for convenience; in principle there is very little difference between a low-performance ICBM and a high-performance IRBM, because decreasing payload mass can increase range over ICBM threshold. The range definition used here is used within the U.S. Missile Defense Agency. Some other sources include an additional category, the **long-range ballistic missile** (**LRBM**), to describe missiles with a range between IRBMs and true ICBMs. The more modern term theater ballistic missile encompasses MRBMs and SRBMs, including any ballistic missile with a range under 3,500 km (2,175 mi). IRBMs are currently operated by the People's Republic of China, India,Israel, and North Korea. The United States, USSR, United Kingdom, and France were former operators.

**An** **intercontinental ballistic missile** (**ICBM**) is a guided ballistic missile with a minimum range of 5,500 kilometres (3,400 mi) primarily designed for nuclear weapons delivery (delivering one or more thermonuclear warheads). Similarly, conventional, chemical, and biological weapons can also be delivered with varying effectiveness, but have never been deployed on ICBMs. Most modern designs support multiple independently targetable reentry vehicles (MIRVs), allowing a single missile to carry several warheads, each of which can strike a different target.

Early ICBMs had limited precision, which made them suitable for use only against the largest targets, such as cities. They were seen as a "safe" basing option, one that would keep the deterrent force close to home where it would be difficult to attack. Attacks against military targets (especially hardened ones) still demanded the use of a more precise, manned bomber. Second- and third-generation designs (such as the LGM-118 Peacekeeper) dramatically improved accuracy to the point where even the smallest point targets can be successfully attacked. ICBMs are differentiated by having greater range and speed than other ballistic missiles: intermediate-range ballistic missiles (IRBMs), medium-range ballistic missiles (MRBMs), short-range ballistic missiles (SRBMs) and tactical ballistic missiles (TBMs). Short and medium-range ballistic missiles are known collectively as theatre ballistic missiles.

**THERMOBARIC WEAPONS AND FUEL-AIR EXPLOSIVES (FAE)**

**A thermobaric weapon** is a type of explosive that uses oxygen from the surrounding air to generate a high-temperature explosion, and in practice the blast wave typically produced by such a weapon is of a significantly longer duration than that produced by a conventional condensed explosive. The fuel-air bomb is one of the best-known types of thermobaric weapons.

Most conventional explosives consist of a fuel-oxidizer premix (gunpowder, for example, contains 25% fuel and 75% oxidizer), whereas thermobaric weapons are almost 100% fuel, so thermobaric weapons are significantly more energetic than conventional condensed explosives of equal weight. Their reliance on atmospheric oxygen makes them unsuitable for use underwater, at high altitude, and in adverse weather. They are, however, considerably more destructive when used against field fortifications such as foxholes, tunnels, bunkers, and caves—partly due to the sustained blast wave and partly by consuming the oxygen inside.

Thermobaric explosives apply the principles underlying accidental unconfined vapor cloud explosions, which include those from dispersions of flammable dusts and droplets. Previously, such explosions were most often encountered in flour mills and their storage containers, and later in coal mines; but, now, most commonly in partially or fully empty oil tankers and refinery tanks and vessels, including an incident at Buncefield in the UK in 2005 where the blast wave woke people 150 kilometers (93 mi) from its centre.

A typical weapon consists of a container packed with a fuel substance, in the center of which is a small conventional-explosive "scatter charge" (often contained within a shell of fused quartz, which - being highly piezoelectric - imparts a large electrostatic charge to the dispersed fuel substance, resulting in its ionization, and thus, enhanced reactivity).Fuels are chosen on the basis of the exothermicity of their oxidation, ranging from powdered metals, such as aluminum or magnesium, to organic materials, possibly with a self-contained partial oxidant. The most recent development involves the use of nanofuels.

A thermobaric bomb's effective yield requires the most appropriate combination of a number of factors; among these are how well the fuel is dispersed, how rapidly it mixes with the surrounding atmosphere, and the initiation of the igniter and its position relative to the container of fuel. In some designs, strong munitions cases allow the blast pressure to be contained long enough for the fuel to be heated up well above its auto-ignition temperature, so that once the container bursts the super-heated fuel will auto-ignite progressively as it comes into contact with atmospheric oxygen. Conventional upper and lower limits of flammability apply to such weapons. Close in, blast from the dispersal charge, compressing and heating the surrounding atmosphere, will have some influence on the lower limit. The upper limit has been demonstrated strongly to influence the ignition of fogs above pools of oil. This weakness may be eliminated by designs where the fuel is preheated well above its ignition temperature, so that its cooling during its dispersion still results in a minimal ignition delay on mixing. The continual combustion of the outer layer of fuel molecules as they come into contact with the air, generates additional heat which maintains the temperature of the interior of the fireball, and thus sustains the detonation.

In confinement, a series of reflective shock waves are generated, which maintain the fireball and can extend its duration to between 10 and 50 ms as exothermic recombination reactions occur. Further damage can result as the gases cool and pressure drops sharply, leading to a partial vacuum. This rarefaction effect has given rise to the misnomer "vacuum bomb". Piston-type afterburning is also believed to occur in such structures, as flame-fronts accelerate through it.

**A fuel-air explosive (FAE)** device consists of a container of fuel and two separate explosive charges. After the munition is dropped or fired, the first explosive charge bursts open the container at a predetermined height and disperses the fuel (also possibly ionizing it, depending on whether a fused quartz dispersal charge container was employed) in a cloud that mixes with atmospheric oxygen (the size of the cloud varies with the size of the munition). The cloud of fuel flows around objects and into structures. The second charge then detonates the cloud, creating a massive blast wave. The blast wave destroys reinforced buildings and equipment and kills and injures people. The antipersonnel effect of the blast wave is more severe in foxholes and tunnels, and in enclosed spaces, such as bunkers and caves.

**DIRECT FIRE WEAPONS**

**Direct fire weapons** are those that are designed to fire directly at their intended target. They therefore either have only a short range or they fire a round at very high speed. In general, the calibre of the round, its tip (ball/AP, etc) and the muzzle velocity of the weapon are the principal items of information required to determine the hazard they pose.

**Small Arms**

Weapon calibres up to and including 14.5 mm are considered in this publication to be small arms. They are all man-portable weapon systems, although the larger weapons can only be fired from heavy platforms. The rounds fired from these weapons are solid and use their kinetic energy to cause damage. The way in which the weapons are used significantly influences the way in which countermeasures are deployed.

* ***Sniping.*** A sniper fires a few, aimed shots. This form of attack can be defeated by obscuring the sniper’s target with cover-from-view.
* ***Drive-by/Random Fire.*** Random small arms fire, usually from automatic weapons, or a ‘drive-by’ shooting is an opportunist attack. Although it is not possible to take careful aim, the high number of rounds fired increases the likelihood of a hit.
* ***Assault.*** A coordinated attack by a regular or irregular force requires defence in depth to counter it.
* ***Celebratory Fire.*** Rounds fired high into the air can, in effect, pose an indirect fire threat.

**Small arms ammunition**

**Lead:** Simple cast, extruded, swaged, or otherwise fabricated lead slugs are the simplest form of bullets. At speeds of greater than 300 m/s (1000 ft/s) (common in most handguns), lead is deposited in rifled bores at an ever-increasing rate. Alloying the lead with a small percentage of tin and/or antimony serves to reduce this effect, but grows less effective as velocities are increased. A cup made of harder metal, such as copper, placed at the base of the bullet and called a gas check, is often used to decrease lead deposits by protecting the rear of the bullet against melting when fired at higher pressures, but this too does not solve the problem at higher velocities.

**Jacketed lead:** Bullets intended for even higher-velocity applications generally have a lead core that is jacketed or plated with gilding metal, cupronickel, copper alloys, or steel; a thin layer of harder metal protects the softer lead core when the bullet is passing through the barrel and during flight, which allows delivering the bullet intact to the target. There, the heavy lead core delivers its kinetic energy to the target. Full metal jacket or "ball" bullets (cartridges with ball bullets (which despite the name are not spherical) are called ball ammunition) are completely encased in the harder metal jacket, except for the base. Some bullet jackets do not extend to the front of the bullet, to aid expansion and increase lethality; these are called soft point (if the exposed lead tip is solid) or hollow point bullets (if a cavity or hole is present). Steel bullets are often plated with copper or other metals for corrosion resistance during long periods of storage. Synthetic jacket materials such as nylon and Teflon have been used, with limited success, especially in rifles; however, hollow point bullets with plastic aerodynamic tips have been very successful at both improving accuracy and enhancing expansion. Newer plastic coatings for handgun bullets, such as Teflon-coated bullets, are making their way into the market.

**Tracer.** These have a hollow back, filled with a flare material. Usually this is a mixture of magnesium metal, a perchlorate, and strontium salts to yield a bright red color, although other materials providing other colors have also sometimes been used. Tracer material burns out after a certain amount of time. Such ammunition is useful to the shooter as a means of learning how to point shoot moving targets with rifles. This type of round is also used by all branches of the United States military in combat environments as a signaling device to friendly forces. Normally it is loaded at a four to one ratio with ball ammunition and is intended to show where the shooter are firing so friendly forces can engage the target as well. The flight characteristics of tracer rounds differ from normal bullets due to their lighter weight.

**Armor-piercing.** Jacketed designs where the core material is a very hard, high-density metal such as tungsten, tungsten carbide, depleted uranium, or steel. A pointed tip is often used, but a flat tip on the penetrator portion is generally more effective. Jacketed designs where the core material is a very hard, high-density metal such as tungsten, tungsten carbide, depleted uranium, or steel. A pointed tip is often used, but a flat tip on the penetrator portion is generally more effective.

**Frangible.** Designed to disintegrate into tiny particles upon impact to minimize their penetration for reasons of range safety, to limit environmental impact, or to limit the shoot-through danger behind the intended target. An example is the Glaser Safety Slug, usually a pistol caliber bullet made from an amalgam of lead shot and a hard (and thus frangible) plastic binder designed to penetrate a human target and release its component shot pellets without exiting the target.

**Multiple impact bullet:** Bullets that are made of separate slugs that fit together inside the cartridge, and act as a single projectile inside the barrel as they are fired. The projectiles part in flight, but are held in formation by tethers that keep the individual parts of the "bullet" from flying too far away from each other. The intention of such ammo is to increase hit chance by giving a shot-like spread to rifled slug firing guns, while maintaining a consistency in shot groupings. Multiple impact bullets may be less stable in flight than conventional solid bullets because of the added aerodynamic drag from the tether line holding the pieces in formation, and each projectile affects the flight of all the others. This may limit the benefit provided by the spread of each bullet at longer ranges.

**Large Caliber Guns**

**Larger caliber cannons** and guns are usually fitted to a vehicle or trailer and are not man-portable. Weapons of this type may fire explosive rounds such as high explosive squash head (HESH). Solid rounds such as armor piercing disposable sabot (APDS) may travel extremely quickly.

**A heavy machine gun** or HMG is a class of machine gun implying greater characteristics than general purpose or medium machine guns.

An **autocannon** or **automatic cannon** is a large, fully automatic, rapid-fire projectile weapon that fires armor-piercing or explosive shells, as opposed to the bullet fired by a machine gun. Autocannons often have a larger caliber than a machine gun (e.g., 20 mm or greater, most often in the range of 20 mm - 60 mm), but are usually smaller than a field gun or other artillery. When used on its own, the word "autocannon" indicates a single-barrel weapon. When multiple rotating barrels are involved, the word "rotary" is added, and such a weapon is referred to as a "rotary autocannon". Modern autocannons are typically not single soldier-portable or stand-alone units, rather they are usually vehicle-mounted, aircraft-mounted, or boat-mounted, or even remote-operated as in some naval applications. As such, ammunition is typically fed from a belt to reduce reloading or for a faster rate of fire, but a magazine remains an option. They can use a variety of ammunition: common shells include high-explosive dual-purpose types (HEDP), any variety of armor-piercing (AP) types, such as composite rigid (APCR) or discarding sabot types (APDS).

**Tank gun** is the main armament of a tank. Modern tank guns are large-caliber high-velocity guns, capable of firing kinetic energy penetrators, high explosive anti-tank rounds, and in some cases guided missiles. Anti-aircraft guns can also be mounted to tanks. As the tank's primary armament, they are almost always employed in a direct fire mode to defeat a variety of ground targets at all ranges, including dug-in infantry, lightly armored vehicles, and especially other heavily armored tanks. They must provide accuracy, range, penetration, and rapid fire in a package that is as compact and lightweight as possible, to allow mounting in the cramped confines of an armored gun turret. Tank guns generally use self-contained ammunition, allowing rapid loading (or use of an autoloader). They often display a bulge in the barrel, which is a bore evacuator, or a device on the muzzle, which is a muzzle brake.

**Hand-Thrown Weapons**

Hand-thrown weapons can be easily concealed by an aggressor until they are deployed. Once thrown, the aggressor then no longer poses an immediate risk to life. An adversary may therefore use this tactic to seek to exploit our rules of engagement. The short range inherent in this form of attack makes it only really a threat to assets close to a protected perimeter.

**Grenades and Explosive Devices.**If fitted with a short delay, it is possible for an attacker to throw a device with a relatively large charge (eg up to 15 kg) and move away to a safe distance before it detonates.

**Inert Projectiles.**Stones, bricks, bolts and glass bottles can all causeserious injury to personnel.

**Petrol Bombs.**A petrol bomb thrower is relatively easily hidden inside a crowd throwing inert projectiles. If petrol bombs shatter on impact, they spray burning fuel.

**Shoulder-Launched Weapons**

**Shoulder-Launched Weapons** are most commonly designed to engage vehicles. However, they are also effective against structures. This weapon threat is largely characterised by the diameter of the warhead, the type and quantity of explosive used and the range of the launcher. Both the maximum ‘accurate’ range and the maximum possible ranges are significant. The first is used to determine the hazard to specific targets and the second to larger targets such as entire camps. In general, there are two types of warhead, shaped-charge and thermobaric.

**Anti-vehicle weapons.**Most anti-vehicle weapons are designed for use against armoured vehicles and the most common type of warhead is a shaped charge. The molten jet of metal it forms is capable of penetrating considerable thicknesses of most materials. As the warhead detonates and forms the molten jet, the casing around the warhead splits. The casing fragments present much the same hazard as a hand-thrown grenade, but are slightly more powerful.

***RPG-7.***The RPG-7 variants are the most common weapons of this type. The original RPG-7 was designed by the Soviet Union but has been copied and modified by a number of countries. The most common variant is the 7M. The fusing and quality of manufacture of the many copies of this weapon are varied. Some have a time delay (4-7 seconds) in addition to an impact fuse. Unless the precise type of warhead is known, it is difficult to make accurate predictions of weapon performance and, in particular, the likelihood of it being rendered ineffective on a rocket screen.

***Shaped Charges.***Shaped charges are often referred to as high explosive anti-tank (HEAT) rounds as their primary role is usually to defeat armoured vehicles.

An anti-tank guided missile (ATGM), anti-tank missile, anti-tank guided weapon (ATGW) or anti-armor guided weapon is a guided missile primarily designed to hit and destroy heavily armored military vehicles. ATGMs range in size from shoulder-launched weapons, which can be transported by a single soldier, to larger tripod-mounted weapons, which require a squad or team to transport and fire, to vehicle and aircraft mounted missile systems.

The introduction to the modern battlefield of smaller, man-portable ATGMs with larger warheads has given infantry the ability to defeat light and medium tanks at great ranges, though main battle tanks (MBTs) using composite and reactive armors have proven to be resistant to smaller ATGMs. Earlier infantry anti-tank weapons, such as anti-tank rifles, anti-tank rockets and magnetic anti-tank mines, had limited armor-penetration abilities or required a soldier to approach the target closely. As of 2016, ATGMs were used by over 130 countries and many non-state actors around the world.

**Anti-structure weapons.** Some weapons are optimised to destroy structures and so the warhead carries a far higher quantity of explosive than is normal for anti-vehicle weapons. The explosive itself is likely to be designed to maximise overpressure and cause damage and injury through blast rather than fragmentation. For it to have maximum effect, it must detonate inside a structure. Therefore it must either be fired in through an opening, such as a window or door, or use a two-stage warhead that cuts a hole with a shaped charge through which the main charge passes.

***RPO-A.*** *The RPO-A* is the most common of this type; it is not a two-stage warhead. It uses a thermobaric explosive of about 2.2 kg. The blast output is similar to around 2.5 kg of PE4. The thermobaric explosive also produces a lot of heat and, even if the charge fails to detonate, it may produce a very fierce fire. The detonation or burning of this thermobaric explosive in enclosed conditions, such as in a tunnel, uses up large quantities of oxygen, possibly suffocating any occupants.

**INDIRECT FIRE WEAPONS**

Weapons used in the indirect fire role are not pointed directly at the target but their point of impact is either calculated or estimated. They travel high into the air before coming down on to the target. They are far more likely to strike the roof of a target than direct fire weapons. The vast majority of indirect fire weapons use fragmentation to kill. The hazard from fragmentation can either be determined from range arena tests or calculated from the case (weight and shape) and explosive (quantity and type). However, if the round is designed to penetrate before detonation or is likely to be a dud, its kinetic energy may still be a serious hazard, in which case the all-up weight and impact velocity are significant.

**Battlefield Rockets, Artillery and Mortars**

The vast majority of rockets, artillery and mortars encountered on operations other than warfighting are typically small, battlefield weapons. Typical examples are listed in Table 3-5. The US uses the term ‘RAM’ (rocket, artillery and mortar) to describe this threat. These weapons have a small range and warhead weight compared to large, long-range missiles or aerially-delivered bombs. Improvised mortars, although usually quite small in size, can be particularly large: the PIRA Mk 15 mortar can carry 70 kg of explosive and has a range of up to 300 m. Such weapons tend to have a more crude and less sensitive fusing system.

***Significance of Weapon Fusing.***

The fusing of the weapon and the overall condition of the munition significantly affects the threat that it poses.

1. ***Point Detonation (Super-Quick).*** The majority of rocket, artillery and mortar weapons are launched with a fuse setting of ‘point detonation’, also known as ‘super-quick’. Tests have shown1 that fuses set to superquick are highly likely to be initiated by even very lightweight materials such as canvas. Furthermore, most weapons can be expected to detonate almost instantaneously upon the initiation of the fuse without travelling any appreciable distance. However, some rockets adapted from the air-to-surface role do not have this ‘graze function’ and require substantial impact to function.
2. ***Delay.*** On most weapons, it is possible to reset a fuse to ‘delay’ manually. Light impact has been shown to initiate a delay fuse. However, a weapon fused in this way is likely to travel up to 20 m in air before detonating (around 15 m for the 120 mm mortar and 5 m for the 107 mm rocket).
3. ***Proximity.***A proximity fuse is used to detonate a round at some predetermined height above ground, typically 1 to 20 m. Radar is usually used in modern weapons; however, a timed delay may be used in older, more rudimentary weapons. Should its proximity fuse fail to function, the weapon is usually configured to detonate on impact.

***Dud.***

If a round fails to function, its kinetic energy alone can make it a lethal weapon. Indeed, a dud round may penetrate further into a solid material than the fragments it would have produced had it point detonated. For example, a dud 107 mm rocket can penetrate 5 to 6 m into sand and up to 10 m in clay.

**Incendiary weapons**

**Incendiary weapons** (for example phosphorus, napalm etc.) are obsolete but efficient mean useful for personnel, equipment, material and building destruction. Apart from the fact that they are very efficient they have also great psychological impact on forces. Destructions factors are huge temperature of flames, toxic effect of carbon monoxide and other combustion gases and also oxygen reduction in air.

Modern incendiary bombs usually contain thermite, made from aluminium and ferric oxide. It takes very high temperatures to ignite, but when alight, it can burn through solid steel. In World War II, such devices were employed in incendiary grenades to burn through heavy armour plate, or as a quick welding mechanism to destroy artillery and other complex machined weapons. A variety of pyrophoric materials can also be used: selected organometallic compounds, most often triethylaluminium, trimethylaluminium, and some other alkyl and aryl derivatives of aluminium, magnesium, boron, zinc, sodium, and lithium, can be used. Thickened triethylaluminium, a napalm-like substance that ignites in contact with air, is known as thickened pyrophoric agent.

**IMPROVISED EXPLOSIVE DEVICES - IEDs**

**An improvised explosive device (IED)** is an explosive device placed or fabricated in an improvised manner. It may incorporate military stores, but is normally devised from non-military components. An IED typically consists of an explosive charge, possibly a booster charge, a detonator and a mechanism, either mechanical or electronic, known as the ‘initiation system’. IEDs are extremely diverse in design, may be of any size and may contain any type of firing device or explosive. Due to the wide range of possible sizes, it is usual to categorise IEDs by the container in which they are placed or delivered, eg vehicle, suitcase, etc, and the means by which they are initiated, eg victim-operated, remote control, suicide, etc.

***Means of Delivery.***The means of delivery are diverse.

* ***Placed IED.*** *A device placed and detonated some time later.*
* ***Delivered or Vehicle-borne I ED.***Vehicle-borne IEDs can be huge. Not all drivers of VBIEDs are adversaries; some may be coerced into delivering the device. A device delivered in this way is sometimes referred to as a ‘proxy bomb’. Although the main threat from a vehicle is as a delivery platform for an explosive device, its speed also makes it a weapon in itself. Annex B shows the variation in vehicle threat. Attacks may be launched from multiple vehicles, either simultaneously or within a short time, typically 15 to 90 minutes.
* ***Suicide Vehicle-borne or Personnel-borne Bomb.***It is difficult to identify such an attack remotely. Experience has shown that when effectively challenged, the bomber almost invariably initiates the device.

**Vehicle-borne Improvised Explosive Devices (VBIEDs)** – The nature of the explosive, its location in the vehicle and the manner in which the vehicle fragments all have a significant influence on the level of hazard from this type of weapon. They may be initiated on impact, remotely or by the driver.

* **Heavy truck** >4000 kg TNT
* **Medium truck** 4000 kg TNT
* **Van** 1500 kg TNT
* **Passenger vehicle** 400 kg TNT
* **Motorbike** 50 kg TNT

**Personnel-borne Improvised Explosive Devices (PB IEDs)** – The devices carried vary in size, typically from 2 to 10 kg. However, for planning purposes a worst case body-borne device is often assumed to be around 9 kg of TNT with 1 kg of metal fragments.

* **Bag/suitcase** 20 kg TNT
* **Body-borne device** 9 kg TNT, fragments
* **Large briefcase** 9 kg TNT
* **Package** 1,5 kg TNT
* **Letter bomb** 0,125 kg TNT

**MASS DESTRUCTION WEAPONS (NBC)**

**Chemical weapons –** toxic agent ammunition - considered as the technologically and economically accessible means of mass destruction. They are prohibited in accordance with Geneva conventions, bud their usage by non-military oorganizations can occur.

**Biological weapons –** currently are in no army´s armament, but their abuse by non-military organizations can create a threat. Chemical and biological weapon have no impact on field fortifications resistance, but they affect personnel being in protective structures. Protective buildings have to be water-proofed and gas-proofed and they must be detachable from outdoor atmosphere in case of NBC usage risk. They also have to be ventilated and there must be overpressure in inner area of structures.

**Nuclear weapon**- considered to be the most destructive weapon. The greatest risk of their usage was during The Cold War. Currently it is prohibited in accordance with international agreements, but it is not banned to make and develop it. Destructive effect is based upon energy ensued by nuclear blast caused by nuclear reaction. Nuclear weapons are divided to two groups fission (atomic) weapons and fusion (thermonuclear) weapons. Effects of nuclear weapons are:

* nuclear blast (about 50 % of blast energy),
* thermal radiation (about 35 % of blast energy),
* ionizing radiation (about 10 % of blast energy),
* nuclear fallout (about 5 % of blast energy),
* electromagnetic pulse.

**OTHER TYPES OF THREATS**

***Crowds.*** Rioting crowds can pose a lethal threat without having particularly dangerous weapons. Techniques and systems that provide separation and delay can allow time to mount an effective response without having to use lethal force.

***Theft.***Theft can be a threat to operational effectiveness. The high black-market value of military equipment, local impoverishment and lawlessness may make this threat significant.

***Sabotage.*** Sabotage can deny the use of critical assets to a force.

***EMS.***Weapons that cause harm by directly employing the electromagnetic spectrum (EMS) are, as yet, a few years away from posing a threat to a deployed force. However, as forces grow ever more dependent on the EMS, this vulnerability may be exploited. Protection from directed energy threats is unlikely to be gained primarily from FPE means.

***Soft Attack.*** The threats from adverse public relations, espionage, subversion, and computer attack may present a hazard to the force, but are rarely countered by FPE means.