

Chemistry of Bombs and Missiles used in Russia Ukraine War

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ABSTRACT

The Russian forces have been accused of using phosphorus bombs to target civilian areas. Earlier this month, a cop in Donbas region had accused Putin's forces of using phosphorus munition to attack civilians. Phosphorus is a substance used by militaries across the world to cause smoke, illumination and incendiary munitions. It burns brightly when exposed to air and produces a large amount of smoke. Phosphorus is used to mark enemy targets and produce a smokescreen to hide troop movements. Zelensky told that phosphorous used by the Russian military, while igniting, gave serious burns to the targets. These are the hypersonic missiles used by Russia I the Ukraine war. Kinzhal, Russian for “dagger”, was launched from the air, most likely by a MiG-31 warplane, according to the BBC. Hypersonic missiles can travel at more than five times the speed of sound, or Mach 5. According to Russia, Kinzhal has a range of 2,000 kilometres. The length of the missile is 8 metres. The NATO has expressed concerns over Russia's attacks on Ukraine, alleging that Moscow could use the pretext of the alliance preparing for a biological attack to carry out the same in Ukraine. “NATO allies have agreed to supply weapons to Ukraine to tackle such attacks. We have activated our chemical, biological, and nuclear defence elements,” the alliance chief said.

KEYWORDS: phosphorus, bombs, smokescreen, hypersonic, missiles, weapons, smoke

INTRODUCTION

Russian agents used a deadly nerve agent, novichok, in Salisbury in 2018, killing a woman. It was used again by agents to poison the opposition leader Alexei Navalny in August 2020. Investigative journalists believe Russia retains a covert chemical weapons programme, while its ally, Syria, is accused of repeatedly using a range of chemical weapons during the long-running civil war there. Helicopters dropping chlorine gas. A chlorine or ammonia attack, which they create as an industrial accident, and the use of chemical weapons specifically designed to kill civilians also. Utilization of more higher specification arms, fighter jets, tanks, rocket artillery and air defence systems. Russia has already used hypersonic missiles, which are more difficult to detect than conventional ballistic missiles, to bombard Ukrainian cities. Russia is instead bogged down in an increasingly attritional, costly and uncertain military campaign, with untold numbers of dead, no

immediate end in sight, and encircled by western sanctions biting hard on its economy and currency.[1]

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While few chemicals find use as military explosives, these can be combined with plasticizers and other materials to create a plethora of formulations. The problem of terrorism and bombers, however, narrows the focus to high explosives. Several such explosives, as well as some plasticizers and taggants found in plastic explosives, along with their abbreviations. The devastating shock wave that accompanies detonation of a high explosive (HE), results in widespread damage and loss of life. High explosives consist of an intimate mixture of oxidant and reductant, either within a single molecule, such as nitroglycerin, pentaerythritol tetranitrate (PETN), trinitrotoluene (TNT), or triacetone triperoxide (TATP), or within an ionic solid, such as ammonium nitrate, when mixed with fuel oil. Mixtures of high explosives are frequently used. For example, Semtex is a blend of cyclomethylenetrinitramine (RDX) and PETN. Reductants (e.g., aluminum powder, fuel oil)[2]

TNT, which has the same composition as dinitroanthranilic acid. The latter compound is carcinogenic and was a former dye intermediate that is being phased out. The diacetone and triacetone peroxides (e.g., TATP) pose the greatest problem for a detection scheme based solely on elemental constituents. These explosives have the same elemental composition as several organic compounds, including the specialty polymer poly (propylene adipate). However, the high volatilities of these compounds might make it feasible to detect the vapor plume by molecular spectroscopic techniques, such as microwave or infrared (IR) spectroscopy. All explosives must contain both oxidizing and reducing agents. Strong oxidizing agents require the use of the most electronegative elements nitrogen, oxygen, fluorine, and chlorine. Therefore, one common aspect of HE compositions is a large percentage of the more electronegative elements nitrogen and oxygen.[3,4] Chlorine and fluorine are used less often in explosives because of its difficult chemistry and greater expense. Also, fluorine's extreme oxidizing power may lead to unstable explosive formulations. The preponderance of highly electronegative elements in explosives is one reason why their detection by IMS (ion mobility spectrometry), which employs electron attachment to neutral explosive molecules, succeeds. The light elements carbon and hydrogen usually serve as the reducing components of HE formulations. Occasionally, metal powders of the lighter elements (aluminum or magnesium) are added as supplemental reducing agents in explosive mixtures. Black powder, which is a less energetic material, uses both charcoal and elemental sulfur as reductants.

Discussion

Although the Kremlin says its operation is going to plan, Russian forces have taken heavy losses, stalled on most fronts and faced supply problems. They have turned to siege tactics and bombardments, causing huge destruction and many civilian deaths. Russia's defence ministry says it attacked Ukraine with cruise missiles from ships in the Black and Caspian Seas, and with hypersonic missiles from Crimean airspace. This is a missile capable of carrying nuclear warheads and is believed to be undetectable by western air defence systems. The US has actively pursued the development of hypersonic weapons – manoeuvring weapons that fly at speeds of at least Mach 5 – as a part of its conventional Prompt Global Strike programme.[5]

The proliferation of chemical and biological weapons, together with the capability to deliver them with cruise or ballistic missiles, is increasing at a much more dramatic rate than is nuclear proliferation. Compared with nuclear weapons, chemical and biological agents are technologically easier to develop, significantly less expensive, and the facilities and products are easier to hide. From a military use standpoint, chemical and biological weapons also have advantages — they can kill large numbers of people, but without the collateral damage of nuclear weapons. A missile is a guided airborne ranged weapon capable of self-propelled flight usually by a jet engine or rocket motor. Missiles are thus also called guided missiles or guided rockets (when in rocket form). Missiles have five system components: targeting, guidance system, flight system, engine and warhead. Missiles come in types adapted for different purposes: surface-to-surface and air-to-surface missiles (ballistic, cruise, anti-ship, anti-tank, etc.), surface-to-air missiles (and anti-ballistic), air-to-air missiles, and anti-satellite weapons. Airborne explosive devices without propulsion are referred to as shells if fired by an artillery piece and bombs if dropped by an aircraft. Unguided jet- or rocket-propelled weapons are usually described as rocket artillery.[6]

A chemical weapon (CW) is a specialized munition that uses chemicals formulated to inflict death or harm on humans. According to the Organisation for the Prohibition of Chemical Weapons (OPCW), "the term chemical weapon may also be applied to any toxic chemical or its precursor that can cause death, injury, temporary incapacitation or sensory irritation through its chemical action. Munitions or other delivery devices designed to deliver chemical weapons, whether filled or unfilled, are also considered weapons themselves



Chemical weapons are classified as weapons of mass destruction (WMD), though they are distinct from nuclear weapons, biological weapons, and radiological weapons. All may be used in warfare and are known by the military acronym NBC (for nuclear, biological, and chemical warfare). Weapons of mass destruction are distinct from conventional weapons, which are primarily effective due to their explosive, kinetic, or incendiary potential. Chemical weapons can be widely dispersed in gas, liquid and solid forms, and may easily afflict others than the intended targets. Nerve gas, tear gas and pepper spray are three modern examples of chemical weapons.

Lethal unitary chemical agents and munitions are extremely volatile and they constitute a class of hazardous chemical weapons that have been stockpiled by many nations. Unitary agents are effective on their own and do not require mixing with other agents. The most dangerous of these are nerve agents (GA, GB, GD, and VX) and vesicant (blister) agents, which include formulations of sulfur mustard such as H, HT, and HD. They all are liquids at normal room temperature, but become gaseous when released. Widely used during the World War I, the effects of so-called mustard gas, phosgene gas and others caused lung searing, blindness, death and maiming.

Chemical warfare involves using the toxic properties of chemical substances as weapons. This type of warfare is distinct from nuclear warfare and biological warfare, which together make up NBC, the military initialism for Nuclear, Biological, and Chemical (warfare or weapons). None of these fall under the term conventional weapons, which are primarily effective because of their destructive potential. Chemical warfare does not depend upon explosive force to achieve an objective. It depends upon the unique properties of the chemical agent weaponized.[7]

A lethal agent is designed to injure, incapacitate, or kill an opposing force, or deny unhindered use of a particular area of terrain. Defoliants are used to quickly kill vegetation and deny its use for cover and concealment. Chemical warfare can also be used against agriculture and livestock to promote hunger and starvation. Chemical payloads can be delivered by remote controlled container release, aircraft, or rocket. Protection against chemical weapons includes proper equipment, training, and decontamination measures.



Results

A special unit of the Ukrainian defence forces, fighting the Ukraine war, has claimed that it has managed to destroy the 40-mile convoy of the Russian army heading towards Kyiv. The convoy had come to a grinding halt outside the Ukrainian capital and these amateur drone users said they launched multiple deadly ambushes to deal a death blow to the mechanised column. The fighters use drones with thermal image cameras or those capable of dropping small bombs as well as sniper rifles. Berdyansk is of major strategic value to the Russians, lying between Crimea and the besieged city of Mariupol, some 80km (50 miles) to the east, where an estimated 100,000 people remain stranded facing Russian bombardment. Some of those who have managed to escape Mariupol have arrived in Berdyansk and Ukraine's deputy prime minister has said they will be taken inland to the city of Zaporizhzhia. Capturing the towns of Berdyansk and Melitopol are part of Russia's bid to create a land bridge from Crimea to the Russian border, as well as establishing a route towards Zaporizhzhia. Residents have staged protests against Russia's occupation of Berdyansk, and video posted on social media this week showed the military beating people in an attempt to disperse the crowd.[7]



The main armament of the T-14 is the 2A82-1M 125 mm (4.92 in) smoothbore cannon, a replacement for the 2A46 125 mm gun of previous Russian and Soviet tanks. According to Russian sources, its muzzle energy is greater than that of the German Leopard 2's Rheinmetall 120 mm gun, features include an absence of a fume extractor (due to the unmanned turret), a fire rate of 10–12 rpm (rounds per minute), left side casing ejection port for the 125 mm gun and a maximum effective-penetration range of 8 km with ATGMs. The 2A82-1M 125 mm cannon can fire a wide range of ammunition, including armour-piercing fin-stabilized discarding sabot (APFSDS) projectiles, guided missiles, high-explosive anti-tank (HEAT-FS) shells, air-burst HE-Frag shells and other types of rounds

Conclusions

Russian defence ministry had recently released footage of Russian machinery and military equipment entering the Kyiv region amid a tank formation. Social media has been abuzz with Ukrainians setting up home-made anti-tank obstacles. Russian defence ministry said it has destroyed 606 tanks among other heavy armaments. According to reports, Ukraine has approximately 2,550 tanks which includes light tanks and main battle tanks. Ukraine uses the T-64 battle tank with a crew of three which entered into service in 2005 with a range of 385km. It was built in the former Soviet Union and entered service in the 1960s. Ukraine operates the upgraded 47 Bulat MBTs which entered into service in 2011. It has a 125mm smoothbore gun and can operate in day and night conditions. It also possesses 12.7mm anti-aircraft machine gun and has composite armour for the turret

and the hull. The Ukrainian forces also have Soviet-made T-72 main battle tanks. Ukraine also has 3,666 T-72 tanks however Russia has nearly twice that number at 9,950. Clearly as far as size is concerned the tank strength of the two countries is greatly mismatched.[5]

Russia has in fact developed the T-14 Armata and has already produced 2,300 even since it was unveiled in 2015. It was battle-tested in Syria. It has state of the art laser-guided missiles with Kord 12.7mm and PKTM 7.62mm machine gun.

The T-14 can reportedly withstand nuclear, biological and chemical attacks. Russia currently has 20 T-14s which could prove to be a big hurdle for Ukraine's forces.[7]

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