GICHD

EXPLOSIVE ORDNANCE GUIDE FOR UKRAINE

SECOND EDITION

Cover: A motor section of a rocket in a residential garden. Chernihiv. Ukraine. 03 August 2022.
Image © John Montgomery

ACKNOWLEDGEMENTS

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INTRODUCTION

The second edition of the GICHD Ukraine Ordnance Guide is intended to provide a basic explosive ordnance recognition guide for qualified EOD operators in Ukraine conducting mine action activities. It may also be used by trained survey staff.

While an improvement on the first edition, with the addition of over 70 new entries, as before the guide cannot be deemed complete. It does cover a reasonable range of the explosive ordnance confirmed as seen in Ukraine.

The guide provides only basic information about explosive ordnance found in Ukraine. The guide provides no information on Render Safe Procedures.

As the current use of various models of explosive ordnance progressively becomes apparent, and as a wider range of explosive ordnance is found in Ukraine, the guide will inevitably become dated. It remains the intention to continue to update the guide in time.

This guide was developed using a range of data including the CORD data base. CORD can be accessed at https://ordata.info/

The guide has been written for use by humanitarian actors who are involved in explosive ordnance risk reduction in Ukraine. The purpose of the guide is entirely humanitarian in nature.

ABBREVIATIONS OR DESIGNATIONS

APM	Anti-Personnel Mine
AVM	Anti-Vehicle Mine
AXO	Abandoned Explosive Ordnance
EFP	Explosively Formed Projectile
ERW	Explosive Remnants of War
HMX	Cyclotetramethylene-Tetranitramine
OF	Oskolocho-Fygasnaya
MANPAD	Man Portable Air Defence System
MON	Mina Oskolochnaya Napravlennogo
PETN	Pentaerythritol Tetranitrate
PIBD	Point Initiating Base Detonating
RBK	Razovaya Bombovaya Kasseta
RDX	Cyclotrimethylenetrinitramine
RGD	Ruchnaya Granata Distantsionnaya
RKG	Ruchnaya Kumulyativnaya Granata
RPG	Ruchnoy Protivotankovy Granatomyot
SAM	Surface to Air Missile
TNT	Trinitrotoluene
UXO	Unexploded Ordnance
UZRGM	Universal'nyi Zapal Ruchnaya Granata Modernizirovannyi

ANTI-PERSONNEL MINES

MON-50

Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Anti-Personnel Directional Fragmentation
EXPLOSIVE FILL (g)	700g PVV-5A
AUW (g)	2000g
DIMENSIONS (mm)	226x156x66
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	MUV/VPF/EPDr/NM with MD-5

MON stands for 'Mina Oskolochnaya Napravlennogo' and was developed as a Soviet version of the M18 Claymore. It is a directional fragmentation anti-personnel mine. It has a plastic casing, either green or brown in colour. On the concave side will be printed MON-50 with respective factory markings. For Russian version, on the other convex side the phrase "К ПРОТИВНИКУ" (k protivniku, "towards enemy") may be printed onto the plastic in black. The mine contains 700g of Plastichnym Vzryvchatym Veshchestvom - 5A (PVV-5A), an RDX based plastic explosive with 20% plasticiser.

The two detonator cavities enables two different means of initiation. For example the mine could be set for command initiation in one fuze well, and victim initiation by means of trip wire in another. For command initiation this mine is often used with the NM electrical initiator. For tripwire initiation, the MUV series of mechanical switches is most often used.

There have been recent reports that MON-50 and MON-90 AP mines have been found with anti-handling (tilt) devices in Ukraine or protected by 'keeper' anti-personnel blast mines. MON-50 mines in Ukraine have also been placed on top of ML-8 anti-lift initiators. Consideration should be given to pulling these devices using hook and line if boobytraps are suspected.

MON-90

Image © Fenix Insight

ORDNANCE SUB-CATEGORY	Anti-Personnel Directional Fragmentation
EXPLOSIVE FILL (g)	6200g PVV-5A
AUW (g)	12100g
DIMENSIONS (mm)	345x202x153
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	MUV/VPF/EPDr/NM with MD-5

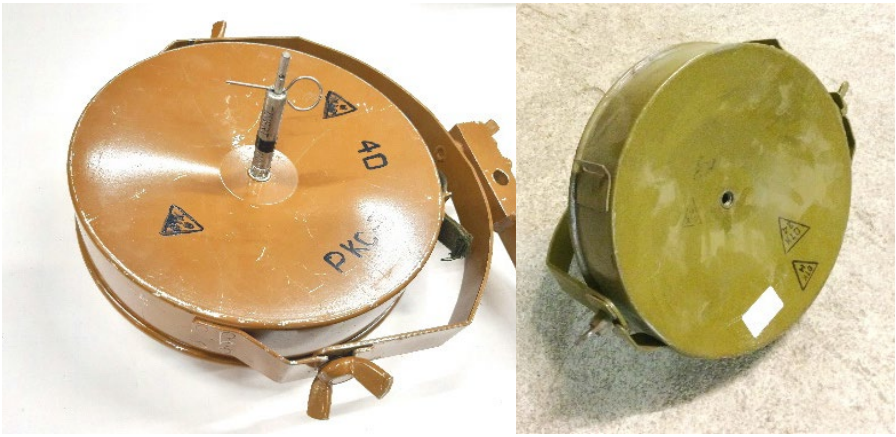
This is a larger version of the MON-50, with a greater range. The MON-90 designation indicates an effective range of 90m.

Unlike the MON-50, the MON-90 is not equipped with scissor legs. It may utilise a tree spike mounting. The MON-90 comes with a distinctive case (the same size as an 82mm mortar case) with an aiming marker indentation on the lid that braces the mine. Sometimes the MON-90 can be found deployed on this storage box.

As with the MON-50 the mine has two fuze wells with M-10 threads enabling employment of two different fuze types. The mine's fragmentation consists of 2,000 pieces of chopped steel, each 7 mm long. For command initiation this mine is often used with the NM electrical initiator. For tripwire initiation, the MUV series of mechanical switches is most often used.

The mine is typically a green base colour with black, stencilled markings. MON-90 and the batch number is stencilled on the rear of the body.

MON-100



Left, INERT MON-100 with INERT MUV-1 fuze. Image © Swiss EOD Center
Right, Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Anti-Personnel Directional Fragmentation
EXPLOSIVE FILL (g)	2000g TNT
AUW (g)	5000g
DIMENSIONS (mm)	236x83
COUNTRY OF ORIGIN	Russia
FUZE	MUV/VPF/EPDr/NM with MD-5

The MON-100 is the second-largest in the MON series, with the 100 designation indicating its intended lethal range of 100 metres. The MON-100 and the MON-200 are both large cylindrical directional fragmentation mines that are distinctly different from the smaller MON-50 and MON-90. The mine has a single fuze well in the centre of the concave face of the body. It can hold either electrical or non-electric detonators. It has a U-shaped, metal, frame, fitted with a spike for mounting. The metal frame has 2 pivots, which allow the mine to be aimed in a specific direction. The mine is also fitted with a canvas carrying handle on the side of the body. The mine's fragmentation consists of 400 pieces of chopped steel, each 10 mm long. The fragmentation is set into a resin matrix, immediately behind the convex side of the mine body. Owing to its size, the mine is typically command initiated, usually with an NM type initiator, but it could also be tripwire initiated, usually with an MUV-type mechanical switch.

MON-200

Left, Image © Fenix. Right, Image © Robert Friedel

ORDNANCE SUB-CATEGORY	Anti-Personnel Directional Fragmentation
EXPLOSIVE FILL (g)	12000g TNT
AUW (g)	25000g
DIMENSIONS (mm)	434x130
COUNTRY OF ORIGIN	Russia
FUZE	MUV/VPF/EPDr/NM with MD-5

The MON-200 is one of, if not the, largest conventional anti-personnel mine, by NEQ and AUW, and is the largest mine in the MON series. The 12000g TNT explosive charge would be large for an anti-vehicle mine, let alone an anti-personnel mine. The 200 designation indicates that it has an intended lethal range of 200 metres. Its large size means that it can be effective against lightly armoured targets, in addition to personnel. Like the MON-100, the MON-200 has a single M10 threaded fuze well in the centre of the concave face of the body. It can hold either electrical or non-electric detonators. The mine is also fitted with a canvas carrying handle on the side of the body. The mine's fragmentation consists of 900 pieces of chopped steel rod. Each piece of rod has a diameter of 10 mm and a length of 12 mm. The fragmentation is set into a resin matrix, immediately behind the convex side of the mine body.

OZM-72

Images © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Anti-Personnel Bounding
EXPLOSIVE FILL (g)	660g TNT
AUW (g)	5000g
DIMENSIONS (mm)	172x108
COUNTRY OF ORIGIN	Russia
FUZE	MUV/VPF/NM initiator

The OZM-72 (Осколочно-Заградиительная Мина 72) is a bounding fragmentation mine with a larger high explosive charge than its predecessors the OZM-3 and OZM-4.

The inner mine body is contained within a sheet-steel outer body. The top of the mine has an offset, threaded, fuze well and a central detonator well, which is sealed with a steel plug. The fragmentation for this mine is made up of pre-formed fragments of chopped steel rod. The mine is typically tripwire initiated, most often with a mechanical, MUV-type fuze, but it can also be command initiated, usually with an NM type electrical initiator. The mine can also be initiated by an MVU-P fuze (associated with the seismically initiated VP 12/13 firing switch). The mine can also be fitted with the MVE-72 break-wire system. When the fuze is initiated, a black powder expulsion charge in the base forces the inner body into the air. When the mine reaches a height of 1 m, the tether wire becomes taut, which pulls the striker down, compressing its spring. The compression of the spring allows the retaining balls to escape and release the striker into the stab-sensitive detonator, thereby initiating the main charge. The OZM-72 is usually supplied in kits of 6 mines in a wooden box with Styrofoam packaging inserts that if discarded near where the mines are emplaced can be an indicator of their presence.

After initiation, the OZM-72 mine casing will very likely remain buried in the ground with the metal lanyard attached. While this might seem harmless any anti-lift device can remain under this casing. This mine has been known to be used with MS-3, ML-7 and ML-8 anti-lifting devices. Caution is advised.

PFM-1

Images © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Anti-Personnel Blast Mine / SCATMIN
EXPLOSIVE FILL (g)	37g VS-6D
AUW (g)	75g
DIMENSIONS (mm)	120x61x20
COUNTRY OF ORIGIN	Russia
FUZE	VGM-6

The PFM-1 (ПФМ-1) is an anti-personnel mine, scattered by means of either artillery rocket carriers or dispensed from aircraft. It can also be emplaced by ground troops. It is a copy of the BLU-43 Dragon's Tooth mine. The mine contains a relatively small charge of 37g of a liquid explosive. The mine is known as 'Lepestock' (Лепесток) which literally translates to petal. Colloquially they have been termed "butterfly mines" over time although this is not an official designation. A (Y) cyrillic stencilled into the wing designates a training version, U-PFM-1 (У-ПФМ-1). учебный, uchebnyy literally translates as "for training". This mine may be scattered from a KMGU dispenser attached to an aircraft, or by ground troops using a hand emplaced PKM projection cannister. It may also be delivered by means of 122mm Grad 9M22K or 220mm Uragan 9M27K3 rockets. The KSF-1 canister holds 8 racks of 9 PFM-1s each. (Image top right). If practicable EOD operators should try to establish the means of delivery in order to estimate the likely size of minefield. The aluminium KSF-1 clips are sometimes a good visual indicator of the presence of PFM mines. This mine is relatively easy to detect, since although the fuze is largely made of aluminium, there are ferrous components (springs, locking balls etc). As a form of SCATMIN the items are also usually found on the surface. The fuze utilizes the hydraulic pressure of the enclosed VS-6D liquid explosive. The fuze is designed to operate when approximately 5 - 25 kg is applied to the mine body. The PFM is not designed to remain functional for many years due to the lightness of its casing which can be degraded by UV light. Due to the toxic contents, every effort should be made to avoid contact with the skin and ingestion of the fumes if the VS-6D explosive charge sack ruptures. A PFM-1S variant exists which incorporates a self-destruct mechanism. The self-destruct mechanism is not very reliable and may leave mines in a sensitive condition.

PMN

Image Left © Danish EOD and Search Center. Image Right © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Anti-Personnel Blast
EXPLOSIVE FILL (g)	220-240g TNT Main Charge. 9g Tetryl booster.
AUW (g)	600g
DIMENSIONS (mm)	112x57
COUNTRY OF ORIGIN	Russia
FUZE	MD-9

The PMN (ПМН) is possibly the most common anti-personnel mine ever made. For an anti-personnel blast mine the charge is relatively large. The MD-9 fuze incorporates a cocked striker. A lead shear arming delay is initiated once the pin is removed. The typical arming delay is 12-15 minutes but this time can change with temperature extremes. Once a cutting wire shears through the lead retainer the striker assembly is only prevented from contact with the primer by the cylinder stop holding device. The cylinder stop is held in place by a vertical cylinder spring. This can weather and degrade over time reducing the support to the cylinder stop and making the mine more sensitive to handling. The fuze is designed to operate when approximately 8 - 25 kg is applied to the pressure plate.

If the metal collar for the cover is in place the mine should be readily detectable. Even without the collar there are enough metallic components to make this mine relatively easy to detect.

While most often found with a brown bakelite casing, other green plastic versions have been manufactured. The mine has been widely copied by numerous countries, sometimes with slight variations in design. The PMN mine is very similar in construction to the MS-3 anti-lift and great care should be taken not to mistakenly identify an MS-3 device as a PMN mine.

It is advised that these mines are considered no touch and destroyed in situ.

PMN-2

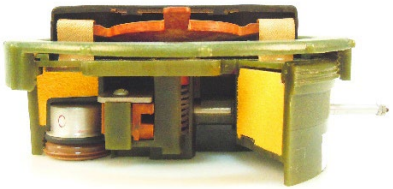


Image Left © Danish EOD and Search Center. Image Right Cutaway © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Anti-Personnel Blast
EXPLOSIVE FILL (g)	100g TG-40 (RDX/TNT 60/40)
AUW (g)	420g
DIMENSIONS (mm)	120x53
COUNTRY OF ORIGIN	Russia

The PMN-2 (ПМН-2) is a blast anti-personnel mine. It has a distinct cruciform rubber pressure plate, designed to limit the susceptibility of the mine is to blast overpressure. The mine casing is made from injection moulded plastic and is usually green in colour. There is some anecdotal evidence that the plastic casing of this mine can lead to plastic fragmentation that is very difficult for surgeons to remove - often giving rise to infections and possible double lower limb amputations. The mine contains less than half of the explosive used in a PMN, albeit the more powerful RDX-based TG-40 explosive is employed.

Like the PMN, the PMN-2 uses a transverse fuzing system, although the actual fuzing system itself is noticeably different. The PMN-2 fuze contains a cocked-striker and an integral detonator. Unlike the relatively simple lead shear arming delay of the PMN, the PMN-2 has a much more complex arming mechanism. This involves pneumatic bellows and a spring-loaded detonator slide. To arm the mine, the T-shaped arming key in the side of the body is both rotated and pulled away from the body. When approximately 15 kg of weight is applied to the pressure plate, it depresses a central plunger, which allows the detonator to be pushed into line with the striker.

The mine is often stored in white Styrofoam packaging that if discarded near where the mines are emplaced can be an indicator of their presence. Discarded arming keys can also be a good visual indicator.

PMN-4

Images © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Anti-Personnel Blast
EXPLOSIVE FILL (g)	52-60g TNT/TG-40
AUW (g)	300g
DIMENSIONS (mm)	95x42
COUNTRY OF ORIGIN	Russia

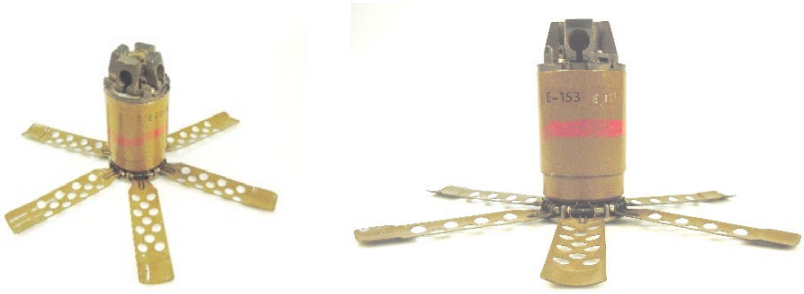
The PMN-4 (ПМН-4) is a blast anti-personnel mine. The mine consists of a plastic casing with a neoprene cover over an alloy pressure plate. The fuze mechanism is enclosed in a cast aluminium housing within the body of mine and is surrounded by the main explosive charge. The mine is fitted with a steel safety clip which is attached to a wire which is in turn fixed to the fuze arming mechanism. Removal of the safety clip causes the attached wire to rotate the fuze arming mechanism. This in turn releases a spring-loaded arming plunger within a viscous gel. The arming delay is dependent on temperature and varies from approximately 1 to 40 minutes. Once fully armed, pressure applied to the pressure plate will lift a block and release a spring-loaded striker into the mine detonator. The fuze is designed to operate when approximately 5 - 10 kg is applied to the pressure plate.

The TNT explosive charge is relatively small compared with its antecedents at 60g. Some sources state that the fill is TG-40.

The PMN-4 is not a minimum metal mine and is relatively easy to detect.

This mine can be used with MS-3, ML-7 and ML-8 anti-lifting devices. Caution is advised.

POM-2



Images © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Anti-Personnel Fragmentation / SCATMIN
EXPLOSIVE FILL (g)	140g TNT
AUW (g)	1600g
DIMENSIONS (mm)	180x63
COUNTRY OF ORIGIN	Russia
FUZE	"Mechanical with tension-type target sensors."

POM-2 (ПОМ-2) is a scatterable, Anti-Personnel (AP), fragmentation mine, which can be delivered by a range of different methods, including by helicopter, fixed wing aircraft and multi-barrelled rocket launchers. The mine may also be delivered manually using a method similar to the PKM delivery system. The mine can come from a batch of 4 mines in one KPOM-2 canister. A 122mm GRAD 9M18 rocket can carry 5 mines. A 220mm URAGAN 9M59 rocket can carry nine POM-2 mines. A full salvo of 16 rockets from one URAGAN launcher could create a minefield of 144 mines. If one mine is found, assume others are present. A pursuit deterrent version of this mine, the POM-2R (ПОМ-2Р), which is used by special forces, can also be delivered manually. This variant of the mine has a pyrotechnic pull cord igniter.

The body is a cast-steel cylinder fitted with an alloy tripwire dispenser at the top. The tripwire dispenser contains 4 spring-loaded tripwires, each of which is 9.5 m long. The fuzing system is located in a vertical well that runs through the middle of the mine body. The upper part of the fuzing system contains a cocked striker with a detonator and booster assembly below it. Six, spring-loaded fins are fitted to the bottom of the mine.

The fuze is extremely sensitive and only requires approximately 300g of weight on one of the 4 tripwires to initiate it. The self-destruct mechanism is supposed to function between 4-100 hours after the fuze is armed. If the mine is found after this period has passed it can be in a delicate and dangerous condition. This mine can be neither neutralised nor disarmed.

POM-3

Image © SESU

ORDNANCE SUB-CATEGORY	Anti-Personnel Fragmentation (SCATMIN)
EXPLOSIVE FILL (g)	100g A-IX-1
AUW (g)	1200g
DIMENSIONS (mm)	183x60
COUNTRY OF ORIGIN	Russia
FUZE	Electronic fuzing based on a microprocessor controlled seismic sensor

The POM-3 (ПОМ-3) is a new type of scatterable anti-personnel mine which has so far only been delivered operationally by the multi-launch rocket Zemledeliye mine delivery system. The mine is sometimes referred to as Medal'on (Медальон) meaning 'medallion'. It is considered likely that this mine is also capable of being delivered by helicopters or truck mounted KPOM type canister-based mine delivery systems. The mine is superficially similar to the POM-2S in that the main body is cylindrical and it has six spring-loaded supports. There are indications that the POM-3 contains some form of seismic sensor spike that implants in the ground beneath the upright mine. Unlike the POM-2S, the POM-3 is not fitted with tripwires. It is reported that the mine contains an electronic microprocessor based seismic detector which can differentiate between the amplitude of a typical human and other false positives such as a wild animal or vehicle.

When initiated, the mine acts in a manner similar to a bounding fragmentation mine with the warhead propelled to 1-1.5m above the ground before detonating. The POM-3 is believed to have a programmable self-destruct capability but the available time delays are not known. It is not known if this mine incorporates some form of anti-disturbance device and whether fuzing is dependent on the life of a battery or capacitor.

Given the human-targeted seismic based initiation system used with this type of mine, manual methods of neutralisation are not recommended. Remote employment of disposal charges, or the use of stand-off small arms, fired from a safe distance, may be appropriate. Extreme caution is advised when dealing with this mine.

M18A1 CLAYMORE

Image © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Anti-Personnel Directional Fragmentation
EXPLOSIVE FILL (g)	680g C4
AUW (g)	1590g
DIMENSIONS (mm)	216x172x35
COUNTRY OF ORIGIN	USA
FUZE	M57 firing device and M4 blasting cap

The M18A1 Claymore was the first conventionally manufactured directional fragmentation mine. It has been supplied for initiation by command. Mine M18A1 has a curved, rectangular, olive drab, moulded case of fiberglass-filled plastic. The front face is lined with steel spheres embedded in a plastic matrix. The back portion of the case, behind the matrix, contains C4 explosive. The fragmentation face is convex, horizontally, to direct the fragments in a 60 degree arc, and concave, vertically, to control the vertical dispersion of the fragments. A built-in sight and two pairs of scissors-type folding legs allow aiming of the mine. Two detonator wells located in the top of the mine enable the mine to be fired from two locations. The wells are sealed by the plug ends of the shipping plug priming adapters. The adapter is reversed when the mine is to be armed and the slotted end of the adapter is used to hold the mine detonator. Similar directional fragmentation mines have been known to be booby trapped or protected by concealed antipersonnel blast mines. Caution is advised. If initiated by command this item would not contravene the Mine Ban Treaty.

ANTI-VEHICLE MINES

TM-62M

Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Anti-Vehicle Mine
EXPLOSIVE FILL (g)	7500g TNT
AUW (g)	9500g
DIMENSIONS (mm)	320x128
COUNTRY OF ORIGIN	Russia
FUZE	MVCh-62 / MVP-62

The TM-62M is a metal-bodied, AV, blast mine, which was developed from the earlier TM-57. The mine has a single, large, bakelite, central fuze well, with a metal-cased booster screwed into the bottom of the fuze well. Like all other mines in the TM-62 series, the TM-62M will accept all fuzes that were developed for the TM-62 series, the TM-72 series and the TM-80 series of mines. Therefore, potentially this mine can be fitted with a range of magnetic influence fuzes. The TM-62M is typically fitted with the pressure-actuated, MVCh-62 pressure fuze, which contains a cocked-striker retained by ball bearings. It is armed by removing the safety clip from the arming button. This begins a clockwork arming delay where a spring-loaded striker moves from the horizontal to the vertical and in line with the detonator. Once armed a weight greater than 150 kg will initiate the fuze.

The image above shows the mine with an MVP minimum metal fuze. If deployed in the field in this way, it would be a waste of a fuze and would indicate a potential lack of training or lack of alternative fuzes for those who emplaced the mine.

The TM-62M is confirmed as being widely used in Ukraine since 2014. It is known to be used at roadblocks amongst other locations.

TM-62P3


Image Left © Danish EOD and Search Center. Image Right © Roly Evans

ORDNANCE SUB-CATEGORY	Anti-Vehicle Mine
EXPLOSIVE FILL (g)	6500g TNT
AUW (g)	8000g
DIMENSIONS (mm)	310x85
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	MVCh-62 (Above left) MVP-62 (minimum metal) (Above right)

The TM-62P3 is a large, plastic-bodied, AV, blast mine, which was developed from the earlier TM-62M. The mine has a single, large, central fuze well, with booster screwed into the base. The booster consists of 180 g of pressed TNT. The TM-62P3 has a distinctive canvas carrying sling that wraps around the body. (See image above right). Like all other mines in the TM-62 series, the TM-62P3 will accept all fuzes that were developed for this series, the TM-72 series and the TM-80 series of mines. Therefore, this mine may be fitted with a range of magnetic influence fuzes. The TM-62P3, when used with an MVP fuze, can be deemed a minimum metal mine. Opinions vary on how easy it can be to detect with an MVP fuze.

PTM-1

Image © Swiss EOD Center

ORDNANCE SUB-CATEGORY	Anti-Vehicle Mine
EXPLOSIVE FILL (g)	1100g PVV-12S-1
AUW (g)	8000g
DIMENSIONS (mm)	310x85
COUNTRY OF ORIGIN	Russia
FUZE	MVDM-G

The PTM-1 (ПТМ-1) is a scatterable, AV mine, delivered normally by 122mm and 220mm multi-launch rocket systems. The PTM-1 is not designed to be emplaced by hand. The PTM-1 employs the MVDM fuze which contains a clockwork self-destruct mechanism and a pyrotechnic delay element. The MVDM fuze is designed to operate when approximately 150 - 400 kg is applied to the mine body. The PTM-1 arming sequence begins when the mine is ejected from its dispenser and the pyrotechnic delay element is ignited. The mine has an arming delay of 60-100 seconds. After this delay, a spring-loaded arming rod aligns the detonator with the striker and the hydraulic fuze with the igniter. Once the mine is armed and sufficient weight is applied to the body, the liquid explosive is forced through apertures in the fuze body. This lifts a diaphragm and the inner fuze components until 2 locking balls are displaced, thereby releasing the cocked striker onto the detonator and detonating the mine. The self-destruct mechanism consists of another cocked-striker and igniter and can be factory set to function after 6, 12 or 20 hours. These mines cannot be disarmed or neutralised by manual techniques. PTM-1 mines should not be approached within the self-destruct period. If these mines are found outside the rocket carrier they should be assumed to be armed. The PTM-1 was formerly known as the PGMDM, and PGMDM should no longer be used when referring to this model of mine.

PTM-3

Images © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Anti-Vehicle Mine
EXPLOSIVE FILL (g)	1800 TG-40 (RDX/TNT 60/40)
AUW (g)	4900g
DIMENSIONS (mm)	330x84x84
COUNTRY OF ORIGIN	Russia
FUZE	BT-06 magnetic influence fuze

The PTM-3 (ПТМ-3) is a scatterable magnetic influence fuzed anti-vehicle mine. The mine is normally dispensed from the KPTM-3 canister (each containing two mines) which can be deployed in vehicles and helicopters. It can also be dispensed from 122mm GRAD (9M22K), BM-27 220mm URAGAN (9M59) and 300mm SMERCH (9M55K4) multi-launch rocket systems. It is also possible to manually emplace this mine using the PKM/KPTM canister launching system. The mine is designed to attack the belly armour of a tank. The mine utilises a shaped charge of 1800g of TG-40 (60/40 RDX/TNT). Whichever way the mine lands a shaped charge will be orientated upwards since a copper elongated concave liner is found on each side with the 1800g TG-40 charge applicable to each.

When the PTM-3 mine is ejected from its carrier a series of pyrotechnic charges ignite which arm the fuze in approximately 60 seconds. The PTM-3 incorporates a battery powered BT-06 magnetic influence fuze. If no target presents itself, the mine should in theory self-destruct 16-24 hours after deployment.

Due to its magnetic influence method of operation, any attempted movement of an armed mine is likely to result in detonation. As with all influence fuzed munitions, minimum metal precautions should be taken. PTM-3 mines should not be approached within the self-destruct period. Substantial donor charges should be used to destroy PTM-3 mines found in KPTM-3 canisters as inadequate charges may cause PTM-3 mines to become armed if ejected during demolition.

PTM-4

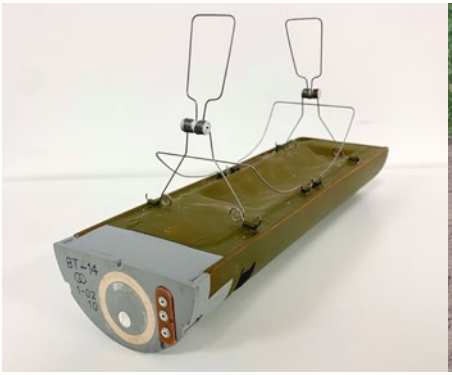


Image Left © Fenix. Image Right © SESU

ORDNANCE SUB-CATEGORY	Anti-Vehicle Mine
EXPLOSIVE FILL (g)	1400g
AUW (g)	3250g
DIMENSIONS (mm)	350x110x55
COUNTRY OF ORIGIN	Russia
FUZE	VT-14 (BT-14) battery-powered magnetic influence (MI) fuze

The PTM-4 (ПТМ-4) is a scatterable magnetic influence fuzed anti-vehicle mine. The mine is normally dispensed from the KPTM-4 canister (each containing two mines) which can be deployed in vehicles and helicopters. It is assessed that this mine is also capable of deployment by larger (220mm and 300mm) multi-launch rocket systems. It is also possible to manually emplace this mine using the PKM/KPTM canister launching system. The PTM-4 is distinguishable by its fabric chute that opens by action of a spring on release from the canister. The image above shows the mines with the fabric chute partially removed, and the springs visible. The PTM-4 incorporates a battery powered VT-14 magnetic influence fuze. If no target presents itself, the mine will in theory self-destruct at the end of a programmed period of time. These are reported to be: 8, 12, 24 and 48 hours, or up to 120 days.

Relatively little is known about this mine, including the levels of magnetic influence that would initiate the fuzing system. Any movement of an armed mine is likely to result in detonation. As with all influence fuzed munitions, minimum metal precautions should be taken by personnel involved in search and clearance operations. PTM-4 mines should not be approached within the self-destruct period. Substantial donor charges should be used to destroy PTM-4 mines found in KPTM-4 canisters as inadequate charges may cause PTM-4 mines to become armed if ejected during demolition.

PARM 2 / DM-22

Image © Open Source

ORDNANCE SUB-CATEGORY	Anti-Vehicle Off Route Mine
EXPLOSIVE FILL (g)	Unknown. Estimated at 1900g.
AUW (g)	20000g
DIMENSIONS (mm)	
COUNTRY OF ORIGIN	Germany

Little is known about the DM-22. It is a development from the earlier DM-12. Its German designation translates as Mine, Panzerabwehr, DM22, Hohlladung, Richtmine. It is believed to incorporate a fin stabilized rocket with a shaped charge warhead.

The mine can use a SAPIR infra-red sensor and can be active up to 30 days after employment. After the programmed period the mine should self-neutralize. The mine can also be initiated by command.

PTKM-1R

Image © Private

ORDNANCE SUB-CATEGORY	Anti-Vehicle
EXPLOSIVE FILL (g)	N/K
AUW (g)	19900g
DIMENSIONS (mm)	510x220
COUNTRY OF ORIGIN	Russia
FUZE	N/K

This manually deployed anti-vehicle mine was only shown at arms fairs in 2021. Relatively little is known about this mine.

The mine has four acoustic sensors and two seismic sensors. The manufacturers claim the mine can classify and select targets, with a priority for armoured vehicles. On initiation a sensor-fuzed munition/submunition (SFM/SFS) is launched into the air in order to effect a top attack by means of an EFP. The EFP is directed by IR sensors that are projected into the air as part of the warhead. It is likely the mine will be employed near routes or likely trafficable areas.

The PTKM-1R is fitted with a self-destruct mechanism, the longest extent of which is 10 days. EOD operators should consider the development of standard soak period when dealing with this mine. It is not known whether the mine incorporates any anti-disturbance device.

DM-31

Image © Swiss EOD Center

ORDNANCE SUB-CATEGORY	Anti-Vehicle Mine - EFP
EXPLOSIVE FILL (g)	3900-4000g TNT/RDX
AUW (g)	8400g
DIMENSIONS (mm)	254x134
COUNTRY OF ORIGIN	Sweden/Germany

The DM-31 (Panzerabwehrverlegemine DM31) is a full-width attack influence initiated anti-vehicle mine that dates from the 1970s. The mine is the German version of the Swedish FFV 028. The mine employs the Misznay Schardin effect to create an explosively formed projectile in order to attack the underside of an armoured vehicle. The fuze is initiated by magnetic influence and has an arming delay of 60 minutes.

Given the method of operation of the fuze, this mine is susceptible to premature initiation if approached by hand-held or vehicle mounted detectors. Given the nature of fuzing employed this item should be considered high risk for EOD and demining personnel. If there is evidence that these items are buried in an area, survey and clearance methods that will not risk initiating the fuzing should be considered.

HPD-2A2

Image © Swiss EOD Center

ORDNANCE SUB-CATEGORY	Anti-Vehicle Mine - (EFP)
EXPLOSIVE FILL (g)	2800g Composition B (RDX/TNT)
AUW (g)	7000g
DIMENSIONS (mm)	278x189x104
COUNTRY OF ORIGIN	France

The HPD-2 is a full-width attack influence initiated anti-vehicle mine. The mine employs a Misznay Schardin form of shaped charge. The full French designation MI AC HPD F2 stands for 'Mine Antichar à Haut Pouvoir de Destruction Modèle F2'. The mine functions by means of a mutual-inductance sensor. The HPD-2 mine consists of two principal sub-assemblies: the first is the electronic fuze unit containing the sensor, the mission management electronics, the safety and arming unit, and the power source; the second is the mine warhead containing the explosive charge. The mine incorporates a selectable anti-handling switch and may be programmed to self-destruct or self-neutralize after a pre-determined period. Given the method of operation of the fuze, this mine is susceptible to premature initiation if approached by hand-held or vehicle mounted detectors. Given the nature of fuzing employed this item should be considered high risk for EOD and demining personnel. If there is evidence that these items are buried in an area, survey and clearance methods that will not risk initiating the fuzing should be considered. The mine has an active period of up to 90 days once set.

EXPLOSIVE SUBMUNITIONS

3B30

Images © SESU

ORDNANCE SUB-CATEGORY	Submunition – DPICM (HEAT/Frag)
EXPLOSIVE FILL (g)	46g OMA (HMX based)
AUW (g)	240g
DIMENSIONS (mm)	128x43
COUNTRY OF ORIGIN	Russia
FUZE	Impact/inertia with self-destruct

The 3B30 is a modern Dual Purpose Improved Conventional Munition (DPICM) designed primarily for delivery by multi-launch rocket systems. The submunition has also been referred to as 'КОБЭ'. KOBE stands for Kumulyativno-Oskolochnymi Boyevymi Elementami (Кумулятивно-Осколочными Боевыми Элементами), which literally translates to "cumulative (i.e. shaped charge) fragmentation combat elements".

When contained in the carrier, the lower part of the 3B30 body fits around the upper part. On release, the lower part springs down to provide stand-off for the shaped charge. The base fuze is armed when a ribbon unscrews the arming mechanism during the descent. On impact, the detonator is driven into a stab-sensitive detonator, which causes the main charge to function. The fuze has a secondary self-destruct mode of operation of 130-260 seconds. The submunition is 62.5 mm long when in the carrier munition. Once deployed, it springs open to its operational length of 118 mm. The 3B30 uses the high-energy OMA HMX based explosive and has copper shaped charge liner with a cone diameter of approximately 40mm. The usual method of deployment is the 122mm Grad, with 9M218/9M541 rockets deploying 45 submunitions, or the 300mm Smerch, with the 9M55K rocket deploying 588 to 646 submunitions. A 152 mm (3-O-33) artillery projectile that delivers 42 submunitions has also been reported. Fully extended submunitions should be assumed to be armed and should be destroyed in situ.

9N24

Image © SESU

ORDNANCE SUB-CATEGORY	Submunition – Blast/Frag
EXPLOSIVE FILL (g)	1480g A-IX-2 (aluminised RDX)
AUW (g)	7450g
DIMENSIONS (mm)	373x88
COUNTRY OF ORIGIN	Russia
FUZE	9E237 impact/inertia with self-destruct

The 9N24 is a high explosive fragmentation submunition designed for delivery by guided missiles. The 9N24 has been employed in Ukraine by the 9M79 Tochka (NATO SS-21 Scarab) short range ballistic missile. The 9N24 uses a long white ribbon to stabilize itself in flight and to orientate the munition in its optimum position to enable the impact fuze to function. Each submunition fuze contains a self-destruct element, which is reported to operate 30 – 60 seconds after deployment.

The 9M79 Tochka missile can be fitted with a number of types of warhead, the most common submunition variant, the 9N123K, contains 50 x 9N24 submunitions. Missile strikes involving the 9N24 usually have 9N24 (9H24) marked metal end caps found short of the strike zone, 9N24 munitions within the strike zone, and the main motor and body section of the 9M79 missile beyond the strike zone. Analysis of the position of recovered items can also aid in determining the direction of the missile launch site.

The 9M714 Oka (NATO SS-23 Spider) also employs the 9N24 sub munition. There are reports that the 9N722K5 warhead associated with the Iskander-M (NATO SS-26 Stone) can deploy 54 large sub munitions similar in type to the 9N24.

9N24 submunitions which have deployed from their carrier missile should be assumed to be armed and destroyed in situ. The white ribbons are an important indicator that a cluster strike has taken place. Consistent strike marks, including on hard surfaces, should not necessarily be deemed sufficient proof of a strike without corroborating evidence of ribbons, associated fragmentation, and metal end caps.

PTAB-1M

Image © John Montgomery

ORDNANCE SUB-CATEGORY	Submunition – HEAT
EXPLOSIVE FILL (g)	110g K991 (RDX based)
AUW (g)	934g
DIMENSIONS (mm)	260x42
COUNTRY OF ORIGIN	Russia
FUZE	Impact/inertia with self-destruct

The PTAB-1M is a fin stabilised HEAT submunition which can be delivered by an RBK-500 PTAB 1-M cluster bomb (263 submunitions) or by a KMGU dispenser using a BKF PTAB-1M (БКФ ПТАБ-1М). A base detonating impact fuze contains a pyrotechnic 20-40 second self-destruct element. Given how the submunitions are dispersed from the RBK it is assessed that this fuze arms, at least partially, by centrifugal force. There is some speculation that the fuze is point initiating base detonating (PIBD) and similar in design to a VP-7.

Within the RBK-500 there are three sections that contain 80 submunitions and a fourth at the rear that contains 28 submunitions. The RBK-500 carrier munition contains a central low-explosive bursting charge, which is initiated by a preconfigured mechanical time fuze. In the event of a failure in either the bomb fuze or the bursting charge, the bomb will impact the ground intact and may burst open on impact, scattering submunitions. PTAB literally translates Противотанковая Авиабомба, “Antitank Aviation Bomb”. This version was developed in the 1980s by Bazalt. An improved PTAB-1U (ПТАБ-1У) exists. It is not known what modifications these incorporate.

PTAB-1M submunitions which have deployed from their bomb carrier or dispenser should be assumed to be armed and destroyed in situ.

SPBE

Image Open Source

ORDNANCE SUB-CATEGORY	Sensor Fuzed Submunition – EFP
EXPLOSIVE FILL (g)	4500g
AUW (g)	15500g
DIMENSIONS (mm)	384x185
COUNTRY OF ORIGIN	Russia
FUZE	Infrared/millimetric wave sensing

The SPBE is a parachute retarded sensor-fuzed anti-vehicle submunition. The SPBE is most commonly associated with the RBK-500 aircraft delivered carrier munition although multi-launch rocket system variants may also exist. SPBE (samopritselivayushchiysya boyevoy СамоПрицеливающийся Боевой Элемент) literally translates to self-guided submunition.

The SPBE submunition has a warhead design based on an explosively formed projectile (EFP) and this gives the munition the ability to penetrate armoured targets at considerable standoff (70mm of armour from up to a 100m standoff). The submunition employs a detector based on infrared or millimetric wave sensing. This is reported to provide the submunition with the capability to act as an anti-vehicle mine if no target is detected during its descent. The dual-mode infrared/millimetric sensor is fitted to the side of the large EFP warhead and is used to detect large metal objects such as armoured vehicles. The SBPE descent is retarded by three small parachutes making strikes involving the SPBE readily identifiable. The SPBE submunition is usually delivered by aerial bomb and the RBK-500 SPBE cluster bomb contains 15 submunitions. The RBK-500 carrier munition contains a central low-explosive bursting charge, which is initiated by a preconfigured mechanical time fuze. It is believed modified versions SPBE-D and SPBE-K exist although it is not clear what modifications these incorporate. It is strongly recommended that a suitable soak period be applied before suspected SPBE strike locations are approached. Once identified, SPBE submunitions should not be approached from the direction of the sensor and, ideally, remote means of neutralisation should be employed.

9N210

Image © SESU

ORDNANCE SUB-CATEGORY	Submunition – Blast/Frag
EXPLOSIVE FILL (g)	270g A-IX-10
AUW (g)	1850g
DIMENSIONS (mm)	265x65
COUNTRY OF ORIGIN	Russia
FUZE	9E246/9E246M

The 9N210 is a fin-stabilized high explosive fragmentation submunition. The 9N210 is delivered by the 220mm 9M27K artillery rocket with 30 submunitions. The 9N210 utilizes 270g of A-IX-10 an RDX based explosive. The 9N210 has only one size of pre-formed fragmentation (2g). Two fuzes may be employed with this submunition, the 9E246 and the improved 9E246M. The 9E246 has no pyrotechnic time self-destruct element. The exact fuze designation is normally stencilled into the metal body of the fuze just proud of the main body of the submunition. The submunition model is normally marked with black stencilling on the warhead body. The fragmentation produced by both the 9N210 and 9N235 is distinctive. Usually in any strike the distinguishing black fins will be found. These items should be destroyed in situ and not moved. The 9N210 is known to have a high failure rate.

9N235

Image © Roly Evans

ORDNANCE SUB-CATEGORY	Submunition – Blast/Frag
EXPLOSIVE FILL (g)	310 K-991
AUW (g)	1850g
DIMENSIONS (mm)	265x65
COUNTRY OF ORIGIN	Russia
FUZE	9E272

The 9N235 is a fin-stabilized high explosive fragmentation submunition. It can be delivered by the 220mm 9M27K1 rocket, with 30 submunitions, or the 300mm 9M55K rocket, with 72 submunitions. The 9N235 employs 310g of K-991 rather than 270g of A-IX-10 used in the 9N210. The 9N235 has two sizes of pre-formed fragmentation (0.5g and 4.5g). The 9N235 employs a mechanical fuze where the firing pin acts as a holding device on a slider under lateral spring pressure. The submunition has a 9E272 (9Э272) impact fuze that incorporates a circular pyrotechnic delay self-destruct element of 110 seconds. This is different from the fuze employed with the 9N210. The fuze designation is stencilled into the base of the visible fuze. Like the 9N210, the 9N235 has a high failure rate. The submunition model is marked with black stencilling on the warhead body. These submunitions have been widely encountered by EOD teams during the conflict to date. Some of the fragmentation produced by the 9N235 (and 9N210) is distinctive. Usually in any strike the distinguishing black fins will be found. The tail unit of the carrier rocket will invariably fly further than the strike and embed with some force in the ground or building. These items should be destroyed in situ and not moved.

3-O-10

Image © SESU

ORDNANCE SUB-CATEGORY	Submunition - High Explosive/Fragmentation
EXPLOSIVE FILL (g)	640g A-IX-2
AUW (g)	3900g
DIMENSIONS (mm)	300x65
COUNTRY OF ORIGIN	Russia

The 3-O-10 is a high-explosive, fragmentation submunition associated with ammunition fired by the Russian 2S4 Tyulpan self-propelled mortar. It is delivered by the 240mm 3-O-8 rocket assisted mortar cluster carrier munition, which contains fourteen 3-O-10 submunitions. Each 3-O-10 submunition is stabilised by a PS-69 series white parachute, which is this submunition's distinctive signature. EOD operators will probably notice the munition parachutes prior to seeing the actual submunition.

The 3-O-10 may be mistaken for the 3-O-16, a similar submunition, which, apart from the overall length, differs only in its markings. The 3-O-10 is longer than the 3-O-16 by over 100mm. The 3-O-16 also uses a ribbon stabilizer instead of a parachute.

3-O-16

Image © Roly Evans

ORDNANCE SUB-CATEGORY	Submunition - High Explosive/Fragmentation
EXPLOSIVE FILL (g)	230g A-IX-2
AUW (g)	1375g
DIMENSIONS (mm)	193x52
COUNTRY OF ORIGIN	Russia
FUZE	9E246M1

The 3-O-16 is a high-explosive, fragmentation submunition and is delivered by either the 3-O-13 improved conventional munition (ICM) 152mm artillery projectile, which contains eight submunitions; or the 3-O-14 ICM 203mm projectile, which contains 24 submunitions. The 3-O-13 152mm projectile may be fired by all Russian 152mm howitzers, the 3-O-14 203mm projectile is associated solely with the 2S7 Pion self-propelled howitzer. Use of the 3-O-13 was confirmed in the Kharkhiv area in April 2022. Each 3-O-16 submunition is stabilised by four ribbons. EOD operators will probably see these white ribbons prior to seeing the actual submunition. The 9E246M1 fuze has a self-destruct mechanism based on a pyrotechnic delay. However, there are indications that this is unreliable. Fuzes breaking off on impact have been observed. The setback on expulsion from the carrier projectile is the main means of arming the 9E246M1 fuze. The 3-O-16 is easy to mistake for the 3-O-10, a similar submunition. The 3-O-16 is approximately 100mm shorter, with ribbons as a stabilizer rather than a parachute. The presence of ribbons could also be an indicator of use of the 9N24 submunition, that also are ribbon stabilised. If markings are obscured, the submunition length, fuze shape and fragmentation jacket perforations are the easiest way to correctly identify this submunition.

AERIAL BOMBS

RBK-250-275

Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Aerial Bomb - Carrier
EXPLOSIVE FILL (g)	N/A
AUW (g)	250000-275000g
DIMENSIONS (mm)	2150x325
COUNTRY OF ORIGIN	Russia
FUZE	ATK-ET

The RBK-250/275 is a carrier that is often employed as a cluster bomb, dependent on the submunitions carried. Razovaya Bombovaya Kasseta' (Разовая Бомбовая Кассета) literally translates as 'Single-Use Bomb Dispenser'. When the cargo is explosive submunitions the RBK can be deemed a cluster bomb under Article 2 of the Convention on Cluster Munitions. The numbers 250 or 275 refer to the weight of the munition (approximate). There are a range of configurations for the RBK-250 and the RBK250/275. Regardless of the cargo the RBK series typically use an ATK-EB electro-mechanical time fuze. EOD operators are reminded that an intact RBK includes not only the fuze and cargo but also a low explosive expulsion charge. Explosive submunitions that can be employed by this carrier munition include the AO-1, the PTAB-2.5, the PTAB-2.5M, and the AO-2.5RT.

The RBK-250/275 can also carry the ZAB-2.5 incendiary submunition. While such cargo is certainly a significant hazard, in such circumstances the RBK-250-275 does not satisfy the legal definition of a cluster munition.

The casing, a combination of steel and aluminium, is sometimes badly damaged on impact to the extent that it can be difficult to discern the black markings stencilled. The tail unit is more robust. For a typical strike, and assuming the munition functioned as intended, the tail unit will land first along the flight path, the cargo second and the nose unit furthest. All components are key evidence whose position should be strictly recorded in order to better map and then efficiently clear the strike.

RBK-500

Image © Vitaly V. Kuzmin

ORDNANCE SUB-CATEGORY	Aerial Bomb - Carrier
EXPLOSIVE FILL (g)	N/A
AUW (g)	500000g
DIMENSIONS (mm)	1955x450
COUNTRY OF ORIGIN	Russia
FUZE	ATK-ET

The RBK-500 is a carrier that is often employed as a cluster bomb, dependent on the submunitions carried. Razovaya Bombovaya Kasseta' (Разовая Бомбовая Кассета) literally translates as 'Single-Use Bomb Dispenser'. When the cargo is explosive submunitions the RBK can be deemed a cluster bomb under Article 2 of the Convention on Cluster Munitions. The number 500 refers to the weight of the carrier munition (approximate). There are a range of configurations for the RBK-500. Regardless of the cargo the RBK series typically use an ATK-EB electro-mechanical time fuze. Operators are reminded that an intact RBK-500 includes not only the fuze and cargo but also a low explosive expulsion charge.

Explosive submunitions that can be employed by this carrier munition include the PTAB-1M (above) and the SPBE. The RBK-500 SPBE and RBK- PTAB-1M has a distinct shape with a pointed nose cone and an enclosed fin configuration. There are over fifteen RBK-500 versions.

The casing, a combination of steel and aluminium, is often badly damaged on impact to the extent that it can be difficult to discern the black markings stencilled. The tail unit is more robust. For a typical strike, and assuming the munition functioned as intended, the tail unit will land first along the flight path, the cargo second and the nose unit furthest. All components are key evidence whose position should be strictly recorded in order to better map and more then efficiently clear the strike.

FAB-500 M62

Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Aerial Bomb
EXPLOSIVE FILL (g)	209000 TNT
AUW (g)	497000g
DIMENSIONS (mm)	2470x400
COUNTRY OF ORIGIN	Russia
FUZE	AVU-ET

The FAB-M62 is a common high explosive aerial bomb. It is typically fuzed with an electro-mechanical impact fuze such as an AVU-ET. There are fuze wells in the nose and in the rear underneath the tail assembly. The fuze in the nose will often be fitted with a fuze adaptor. The casing around the nose is reinforced to assist penetration.

The body is more streamlined than earlier FAB-500 models.

While many versions use TNT as the main explosive fill, later versions might use TGAF (59% TNT, RDX 19%, Aluminium 17%, 5% wax).

OFZAB-500

Image © Vitaly V. Kuzmin

ORDNANCE SUB-CATEGORY	Aerial Bomb
EXPLOSIVE FILL (g)	37500 EXPL -250000 OM-100MI-3L
AUW (g)	500000g
DIMENSIONS (mm)	2500x450
COUNTRY OF ORIGIN	Russia
FUZE	AVU-ET

The OFZAB-500 combines both incendiary and high explosive fragmentation roles. Oskolochno-Fugasnaya Zazhigatelnaya Aviatsionnaya Bomba literally translates as Fragmentation High Explosive Incendiary Bomb. Arguably it could be classified as a form of thermobaric bomb. The OFZAB-500 is typically fuzed with an electro-mechanical impact fuze such as an AVU-ET. It can only be fuzed in the nose.

It is not confirmed what high explosive is used with the OFZAB. The incendiary/ thermobaric composition is OM-100MI-3L.

The bomb is normally marked with black stencils near the lugs.

FUZES

MVCH-62

Image © Swiss EOD Center

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	15 g PETN booster plus mine detonator
AUW (g)	No data
DIMENSIONS (mm)	144
COUNTRY OF ORIGIN	Russia/Bulgaria/Romania

The MVCh-62M is the most common minimum metal fuze threaded at 85mm for the TM-62, TM-72 and TM-80 series of mines. The casing is made of bakelite/plastic. The fuze contains a clockwork arming mechanism. Removal of the safety clip and depression of the green arming button initiates the arming delay. The clockwork mechanism brings the detonator into line with the striker. The fuze is designed to operate when approximately 200 kg is applied to the pressure plate.

While originally claimed to be minimum metal, the MVCh-62 is relatively easy to detect, even though parts of the clockwork mechanism are plastic. The safety clip is slightly different from that found on the MVP.

Th “y” prefix on the item above indicates this was a training version.

MVP-62M

Image © Roly Evans

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	No data
AUW (g)	No data
DIMENSIONS (mm)	122x80
COUNTRY OF ORIGIN	Russia/Bulgaria

The MVP -62M is a minimum metal fuze threaded at 85mm for the TM-62, TM-72 and TM-80 series of mines. The fuze body is made out of bakelite. The fuze is armed by removal of the metal clip and then depressing the prominent arming button on the upper surface. The fuze has a bellows system that retards the movement in line of the detonator by up to 300 seconds. The fuze is designed to operate when approximately 120 kg is applied to the pressure plate. While "minimum metal", the striker, the striker spring, larger side spring and detonator capsule make this mine detectable with most modern electro-magnetic induction detectors. The safety clip for the mine is subtlety different from that of the MVCh-62 with a round contour to hold the arming button. Discarded clips can be a good indicator as to the presence of AV mines.

Bulgarian versions usually have the 46 Dunarit marking in the distinct double circle. The Russian versions are either made in factory 583 or Russian state factories, symbolised by two semi circles or overlapping circles as per the image above.

M-6

Image © Roly Evans

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	6-10g Tetryl.
AUW (g)	168g
DIMENSIONS (mm)	51x83x40
COUNTRY OF ORIGIN	Russia / Bulgaria

The M6 is a point detonating impact fuze that incorporates a long standing Soviet fuze design. It has no setting bolt and will only function in Superquick mode. The internal workings incorporate a number of holding devices including a creep spring, set back sleeve, and locking balls. The firing pin acts as a holding device on the slider until arming. The fuze is armed by setback. There is some speculation that the fuze cap is left on in order to try to artificially create a delay function although this is unconfirmed.

The fuze is usually found in hermetically sealed round tins stored in a side compartment of a box of ten 82mm mortars. Most Russian or Bulgarian versions of this fuze utilise aluminium for the windshield. Chinese versions utilise a distinct brown bakelite. Unfired mortar bombs fitted with this fuze and ejected from the seat of an explosion (such as in a vehicle or explosive store house) may become armed and should be treated accordingly.

M-12

Image © Roly Evans

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	23g Tetryl
AUW (g)	535g
DIMENSIONS (mm)	117x40
COUNTRY OF ORIGIN	Russia/China

The M-12 is the standard impact fuze for 120mm high explosive mortar rounds. It dates from the late 1950s. Versions seen in Ukraine tend to be largely coloured black. A modified version designated the 3V35 that is almost identical is known to be in circulation.

The fuze utilizes the standard set back armed mechanical fuze design that incorporates holding devices including a creep spring, set back sleeve, locking balls. The firing pin acts as a holding device on the slider until arming. The basic fuze mechanism differs from the M-6 mortar fuze used on smaller calibres in that a setting bolt is incorporated that enables selection of superquick or delay. This is done by placing the respective flash channel with pyrotechnic delay in line. The booster incorporates a tetryl charge of just under 23g. Tetryl is no longer used as a booster charge by a number of nations. Tetryl exposure to the skin is not advised. If destroying these items in bulk consideration should be given as to the potential environmental impact.

Unfired mortar bombs fitted with this fuze and ejected from the seat of an explosion (such as in a vehicle or explosive store house) may become armed and should be treated accordingly.

RGM-2/V-429 PROJECTILE FUZE

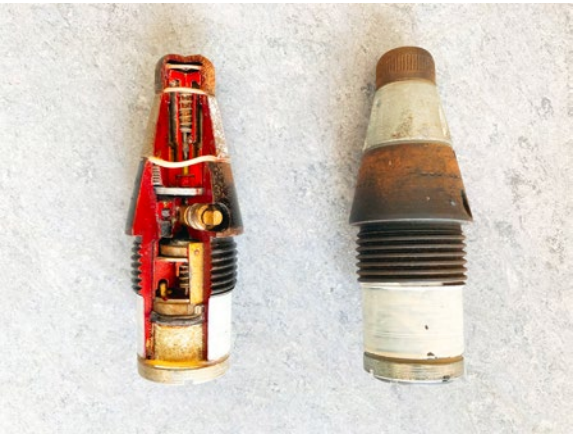


Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	12.5g Tetryl
AUW (g)	438g
DIMENSIONS (mm)	106x40
COUNTRY OF ORIGIN	Russia

The RGM-2 is a Russian percussion or point detonating artillery fuze. The setting bolt changes the pyrotechnic delay to give options of superquick and delay. The mechanism employed is the same as many old soviet mechanical point-detonating fuzes, and incorporates a setback sleeve, creep spring and locking ball assembly. The RGM-2 are routinely used with common 122mm HE-FRAG artillery ammunition such as the OF-462 of 3OF56. The V-429, whilst almost externally identical, tends to be used with smoothbore tank ammunition such as the OF-19 or OF-26.

Like many fuzes, the RGM-2 is manufactured at Russian Factory 50.

GPV-3

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	
AUW (g)	
DIMENSIONS (mm)	125x40
COUNTRY OF ORIGIN	Russia

The GPV-3 is used with 152mm HEAT ammunition. In this role the D-20 howitzer, or equivalent, fires the munitions in a direct fire role. This electromechanical fuze is setback armed, even though the rifled 152mm barrel will impact significant centrifugal force to the projectile. The fuze contains a rotor masking device. The fuze does not include any sort of pyrotechnic time delayed self-destruct mechanism. On impact the crushing of the piezo initiatites the main shaped charge in the warhead by means of spitback.

It is believed that GPV stands for Golovnoy Pyezoelektricheskiy Vzryvatel which can be translated as 'head piezo-electric fuze'. As with many Russian projectile fuzes, the thread is 36mm.

AR-5

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	Tetryl
AUW (g)	500g
DIMENSIONS (mm)	130x44
COUNTRY OF ORIGIN	Russia

The AR-5 is a standard proximity fuze used with 122mm and 152mm artillery projectiles. It can be referred to using the name "Signal". It dates from the late 1970s. It arms by setback and centrifugal force.

The plastic windshield of the fuze is usually green in colour. A setting ring with red lettering is found at the base of the green windshield. As with many Russian projectile fuzes, the thread is 36mm.

There is some evidence that this fuze is in short supply, with most fire missions against entrenched positions utilizing sub-optimal mechanical impact fuzing.

As with all proximity fuzing, EOD operators should be cautious approaching a fuze where there is a realistic chance of a residual charge in the capacitor.

T-7

Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	7g
AUW (g)	626g
DIMENSIONS (mm)	157x64
COUNTRY OF ORIGIN	Russia

The T-7 is a Powder Train Time Fuze (PTTF) with a super quick impact function. It is used with carrier projectiles such as the 122mm S-463 illumination round. It can also be used with old means of delivering leaflets such as the A1 122mm base ejection projectile, which has been seen in Ukraine.

MRV/MRV-U ROCKET FUZE

Left, MRV fuze. Right, MRV fuze cutaway. Image © Dutch EOD Center.

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	29g Tetryl or PETN
AUW (g)	746g
DIMENSIONS (mm)	195x64
COUNTRY OF ORIGIN	Russia

The MRV-U is the standard point-detonating impact fuze used with high explosive 122mm 9M22U rockets. It dates from the early 1970s. The key recognition difference from the earlier MRV is the shape of the nose cap. The basic fuze design is similar in principle to the M-12 mortar fuze. The basic set-back sleeve configuration is supplemented by a setting bolt controlling a slider masking device. The setting bolt has Delay and Superquick options. The fuze arms by setback. MRV fuzes are normally packaged in hermetically sealed metal boxes. The fuze is widely made, not just by former Soviet countries but also in the Balkans, Iran and India. While dated, this fuze is still in production and widely operational. The fuze has other designations dependent on country of manufacture, such as MJ-4 (China).

Unfired rockets fitted with this fuze and projected from the seat of an explosion (such as in a vehicle or explosive store house) may become armed and should be treated accordingly. The booster may be tetryl for older MRV versions, or PETN for newer MRV-U versions.

TM-120 ROCKET FUZE

Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	N/K quantity of black powder/pyrotechnic composition
AUW (g)	694g
DIMENSIONS (mm)	196 x 64
COUNTRY OF ORIGIN	Russia

The TM-120 is the standard mechanical time fuze used for 122mm Grad 9M22 carrier rockets. The fuze can also be used with the 220mm 9M27K Uragan carrier rockets.

The fuze is armed by setback and contains a clockwork mechanism.

The fuze body is marked with TM-120 and 42.M just above the fuze thread. the functioning time is selected by rotating the gradations on the windshield. Functioning delay can range from 4 to 120 seconds.

If this fuze is used in error with rockets containing a unitary high explosive warhead it will fail to initiate the warhead.

ATK MT SERIES

Image © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	100g pyrotechnic composition
AUW (g)	N/K
DIMENSIONS (mm)	64 x 86
COUNTRY OF ORIGIN	Russia

The ATK Mechanical time (MT) series of fuzes are routinely used with non-explosive Russian aircraft bombs such as the RBK carrier units for cluster munitions, the ZAB parachute flare series and the Photab photoflash bomb. The fuze is often referred to as electro-mechanical in nature since it is armed by initiation of an electrical squib which in turn initiates a pyrotechnic pellets that serves as a holding device on the mechanical clockwork mechanism. ATK fuzes can be found in either the nose or the tail fuze pockets of a carrier bomb. There are no external indications as to whether the fuze has been armed. If found on dropped aerial ordnance the fuze should be considered as armed. Usually the ATK is emplaced with a lockring. There three versions: ATK-EB, ATK-EA and ATK-B. The ATK-EB is the version more commonly found. The 'E' (Э) refers to the electro pyrotechnic nature of the arming process.

The fuze contains a spring-loaded firing pin and fuzes on dropped bombs should not be jarred or moved.

AVU SERIES

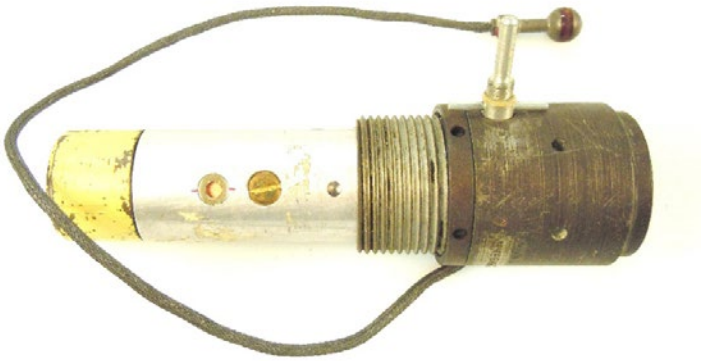


Image © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	60g booster plus other pyrotechnic charges
AUW (g)	1970g
DIMENSIONS (mm)	658 x 598 x 191
COUNTRY OF ORIGIN	Russia/Bulgaria

The AVU is a common Russian bomb fuze. It can be found in the nose or tail of the bomb. As with the ATK the fuze is armed by means of an electrical squib initiating a pyrotechnic holding device. The fuze is impact inertia always acting. Impact from any angle should initiate a functioning fuze. The fuze has a selectable arming function (instantaneous, short delay, and long delay).

A safety screw/pin assembly is found opposite the coaxial cable. This is inverted prior to flight, and the red safety flag removed. Some believe that the presence of the screw indicates that the fuze is unarmed. This is incorrect. If the longer safety pin is visible rather than the screw the fuze should be considered as armed. The electro-pyrotechnic initiating cable protruding from a tail assembly is a tell-tale that an electro-pyrotechnic fuze of some description is present.

This fuze is commonly associated with the FAB, OFAB, BETAB-500, KhAB, OFZAB and ZAB series of aircraft bombs.

UZRGM-2

Image © Swiss EOD Center

ORDNANCE SUB-CATEGORY	Grenade Fuze
DIMENSIONS (mm)	104 (39mm prominent from grenade body).
COUNTRY OF ORIGIN	Russia/Bulgaria

The UZRGM and UZRGM-2 are probably the most common mechanical grenade fuzes in existence. Useable in any grenade that has a M-10 (10mm) thread, they are routinely found in common grenades such as the F-1 and RGD-5.

UZRGM stands for Universal'nyi Zapal, Ruchnaya Granata, Modernizirovannyi, which translates to Universal Igniter Hand Grenade Improved.

The fuze operates in a standard manner for simple mechanical grenade fuze. Once the pin is pulled and the hand grip released from the fly off lever there is nothing to hold the cocked striker from driving the striker into the primer to initiate the pyrotechnic delay and subsequently the detonator.

The primer is lead azide based. The fuze body is made of aluminium. The pyrotechnic delay in grenade fuzes is stated as being 3.2-4.0 seconds. An instantaneous variant of the UZRGM fuze has been encountered and has been designed for use in booby traps. Grenades with UZRGM fuzes found as Abandoned Explosive Ordnance (AXO) should therefore be treated with caution.

A-670M

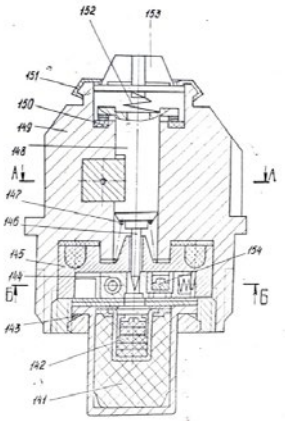
Images © Left: SESU and Right: Arcus

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	NK
AUW (g)	49g
DIMENSIONS (mm)	69x20
COUNTRY OF ORIGIN	Russia

The A-670M is a point detonating fuze used with 30x165mm High Explosive Incendiary (HE-I) and High Explosive Tracer (HET) rounds. Such canon rounds are often associated with 2A38, 2A42 and 2A72 canons employed by a range of Armoured Fighting Vehicles (BMP-2, BMP-3, BMD-2, BMD-3, BTR-80A and BTR-90) but also attack helicopters such as the KA-50, KA-52 and MI-28.

These fuzes have more often been found as AXO on cannon rounds such as the 3UOR6. The fuze has a pyrotechnic self-destruct element that is initiated by setback.

9E246M

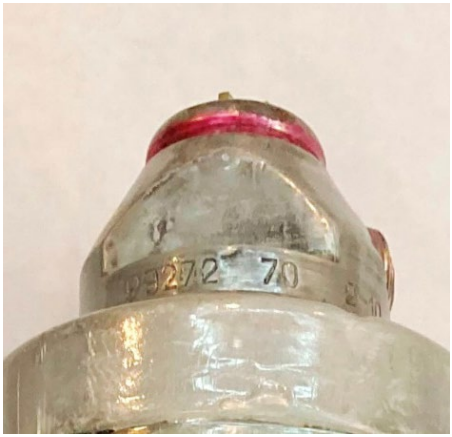


Images © SESU

ORDNANCE SUB-CATEGORY	Impact fuze
EXPLOSIVE FILL (g)	NK
AUW (g)	NK
DIMENSIONS (mm)	NK
COUNTRY OF ORIGIN	Russia

The 9E246M is an improved impact fuze used on the 9N210 submunition. Unlike its predecessor the 9E246, the 9E246M has a pyrotechnic self-destruct element. The fuze is slightly smaller than the 9E246M1 fuze used on the 3-O-16 submunition but is believed to have a similar design. Incorporating a small lateral slider, with the firing pin acting as a holding device on that slider until the arming process initiates on expulsion from the carrier rocket. Even with the self-destruct element, these fuzes have been noted for high failure rates. Some sources indicate that a square imprint on the sphere on the side of the submunition indicates that a holding device has moved away from the striker assembly and that the fuze has armed. Fuzes have also been known to break off the parent 9N210 submunition on impact. If found separated it should be remembered that the fuze alone still contains primers, a pyrotechnic train and a small booster and should be treated with caution. The 9N210 is carried by 9M27K URAGAN artillery rockets.

9E272



Images © Roly Evans

ORDNANCE SUB-CATEGORY	Impact fuze
EXPLOSIVE FILL (g)	NK
AUW (g)	NK
DIMENSIONS (mm)	NK
COUNTRY OF ORIGIN	Russia

The 9E272 is an improved impact fuze used on the 9N235 submunition. Like the 9E246M it has a pyrotechnic self-destruct element. More information is required concerning the exact differences between these fuzes although they are believed to be minor. Even with the self-destruct element, these fuzes have been noted for high failure rates during the conflict. Fuzes have also been known to break off the parent 9N235 submunition on impact. If found separated it should be remembered that the fuze alone still contains primers, a pyrotechnic train and a small booster and should be treated with caution.

The 9N235 may be carried by both 220mm URAGAN and 300mm SMERCH artillery rockets.

GO-2 RECOILLESS PROJECTILE FUZE

Images © VMZ Sopot

ORDNANCE SUB-CATEGORY	Fuze - Mechanical Point Detonating
EXPLOSIVE FILL (g)	10g Tetryl/PETN
AUW (g)	204g
DIMENSIONS (mm)	131x40
COUNTRY OF ORIGIN	Russia/Bulgaria

The GO-2 is a simple mechanical point detonating fuze. It is used on OG-9 and OG-15 high explosive fragmentation rounds fired by the smoothbore SPG-9 recoilless gun and the 2A28 recoilless gun found on the BMP-1. It should be noted that this fuze is not marketed as "bore-safe" and even when found as abandoned explosive ordnance (AXO), EOD operators should be mindful that the primer is in line with the striker. The weighted setback sleeve should provide a graze function if the recoilless projectile glances a target.

Fuzes prepared for firing should have the nose cap with beige fabric tab removed. Older versions of this fuze employ a tetryl booster, newer versions use a PETN booster. One Bulgarian version (Arsenal) of the GO-2 is designated the AF71, the VMZ Sopot version is marketed as the GO-2. The GO-2 is also fitted to more modern OG-7 rounds.

OG-9 and OG-15 projectiles fitted with the GO-2 fuze which have been involved in fires and have been ejected from the seat of an explosion e.g. an armoured fighting vehicle or ammunition dump, should be assumed to be armed and treated with caution.

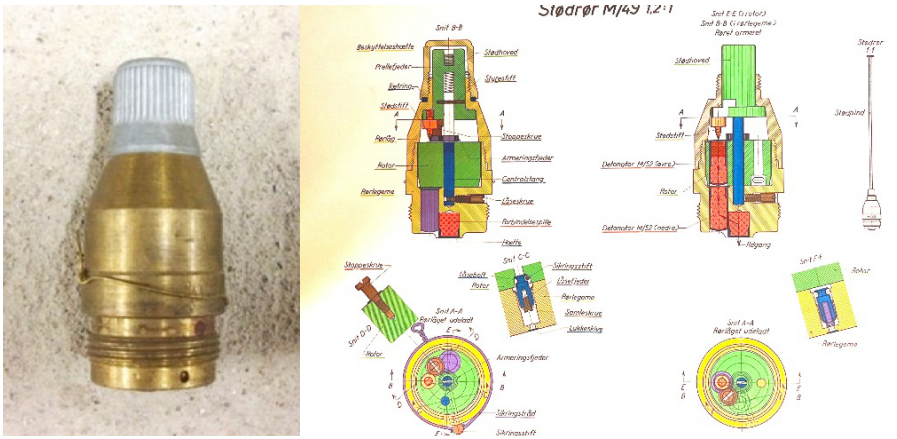
DTM-75 ARTILLERY FUZE

Images © Left: Roly Evans Right: Soviet Manual

ORDNANCE SUB-CATEGORY	Fuze - Mechanical Time
EXPLOSIVE FILL (g)	Black Powder
AUW (g)	580g
DIMENSIONS (mm)	140x63
COUNTRY OF ORIGIN	Russia

The DTM-75 is a common Mechanical Time (MT) fuze associated with 122mm and 152mm carrier and other non-HE projectiles. It dates from the 1970s. Like most artillery fuzes, it arms by set-back and centripetal force. A slider maintains the detonator out of line until setback unlocks a detent on firing. If found as abandoned explosive ordnance (AXO) the DTM-75 may have a transport cap fitted. Unlike the German ZtZ.S30, the fuze of which the DTM-75 is a copy, the fuze has no self-destruct powder train element.

M/49 MORTAR FUZE



Images © Danish EOD and Search Center and Forsvarets Krigsmateriel Forvaltning

ORDNANCE SUB-CATEGORY	Fuze Mortar Point Detonating
EXPLOSIVE FILL (g)	NK
AUW (g)	NK
DIMENSIONS (mm)	NK
COUNTRY OF ORIGIN	Sweden

The M/49 is a percussion made by Forsvarets Krigsmateriel Forvaltning in Sweden. The fuze has a brass pin that acts as an extra holding device. This, and the silver fuze cap, are removed before firing. The fuze arms by setback, a detent holding the rotor out of line.

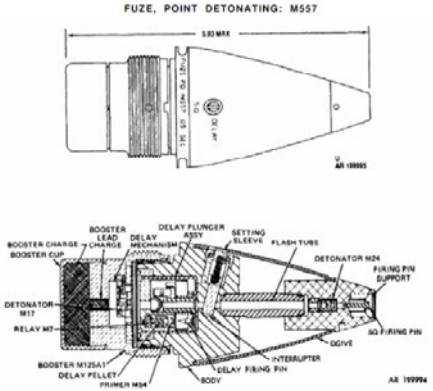
M-5M FUZE

Images © Left: Dutch EOD Center. Right: SESU

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	7g Tetryl
AUW (g)	77g
DIMENSIONS (mm)	68x39
COUNTRY OF ORIGIN	Russia

The M-5M is a simple point detonating mortar fuze. It is often used with 60mm HE mortar rounds, although it is also compatible with 82mm rounds. Since the windshield is made of bakelite, the fuze may be mistaken for common Chinese point detonating fuzes, although it is Russian. As with many older Russian fuzes the booster contains tetryl. The M-5M, employing a simple setback sleeve and creep spring, arms by setback. The fuze has fewer holding devices than other Russian mechanical setback fuzes and should be treated with caution. The fuze functions only instantaneously (superquick), there is no delay setting. The Bulgarian M-5A has an aluminium rather than bakelite windshield. Otherwise the fuze is identical. While not widely seen, use of such an old fuze may indicate shortage of mortar fuzes in certain locations.

M557 ARTILLERY FUZE

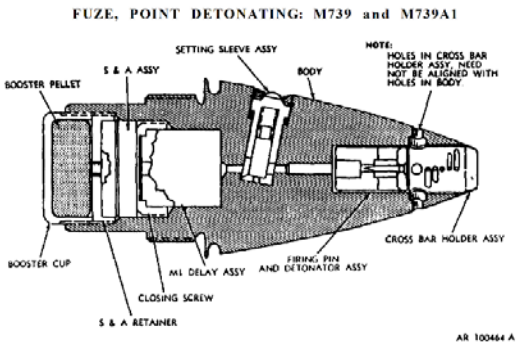


Images © Danish EOD Center and US DoD TM 43-001-28

ORDNANCE SUB-CATEGORY	Fuze Artillery Point Detonating
EXPLOSIVE FILL (g)	15 g PETN booster plus M55 detonator
AUW (g)	976g
DIMENSIONS (mm)	151x61
COUNTRY OF ORIGIN	USA

The M557 is a point detonating fuze commonly used with NATO 155mm HE artillery projectiles. It has been in use since the 1960s. This mechanical fuze has a firing pin and detonator in the distinctive nose cap. A firing pin support acts as a holding device that maintains separation between the pin and the M24 detonator. A flash channel leads to an interrupter. A setting bolt/sleeve on the windshield operates the interrupter with either delay or superquick options. The delay element involves a pyrotechnic composition positioned on a masking device that is moved by operation of the setting bolt. As with most artillery projectile fuzes, the M557 arms by setback and centrifugal force. If found as abandoned explosive ordnance (AXO), EOD operators are advised that burning this fuze provides no assurance that the delay element of the superquick detonator has been initiated. Some old versions have a tetryl booster. The M557 is easy to confuse with the improved M739 point detonating fuze. The model code is often stencilled into the windshield just proud of the fuze thread. It might also be digitally printed onto the fuze body. The M572 is also almost identical to the M557, the main difference being the former has a cavity filled with epoxy resin. This stiffens the fuze structure, improving resilience to the acceleration forces on the fuze windshield.

M739 ARTILLERY FUZE

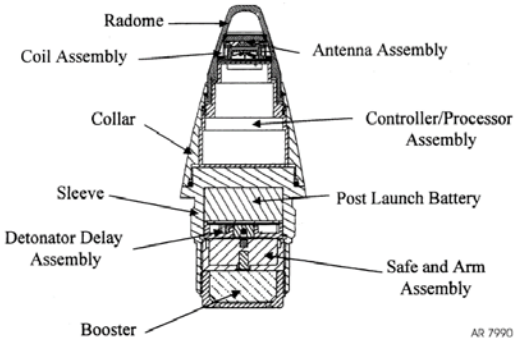


Images © US DoD TM 43-001-28

ORDNANCE SUB-CATEGORY	Fuze Artillery Point Detonating
EXPLOSIVE FILL (g)	19g A5 booster plus stemming and detonators
AUW (g)	976g
DIMENSIONS (mm)	152x61
COUNTRY OF ORIGIN	USA

The M739 is a point detonating fuze commonly used with NATO 155mm HE artillery projectiles. The fuze is similar to the M557 but there are important differences. These differences are relevant when designing an RSP. The M739 mechanical fuze has a firing pin and detonator, but it is situated in the main fuze body, not within the distinctive nose cap. A firing pin is held by a support wire. A flash channel leads to an interrupter. A setting bolt/sleeve on the windshield operates the interrupter with either delay or Superquick options. Between the delay pellet and the booster sits the safe to arm assembly. As with most artillery projectile fuzes, the M739 arms by setback and centrifugal force. If found as abandoned explosive ordnance (AXO), EOD operators are advised that burning this fuze provides no assurance that the delay element of superquick detonator has been initiated. The M739 is easy to confuse with the improved M557 point detonating fuze. It is often distinguishable by a green glaze appearance. The model code is often stencilled into the windshield just proud of the fuze thread. It might also be digitally printed onto the fuze body.

M782 MOFA ARTILLERY FUZE



Images © Mil-Spec Industries and US DoD TM 43-001-28

ORDNANCE SUB-CATEGORY	Fuze Artillery Multi-Function
EXPLOSIVE FILL (g)	19g PBXN-5 booster plus stemming and detonators
AUW (g)	748g
DIMENSIONS (mm)	151x61
COUNTRY OF ORIGIN	USA

The M782 Multi-Option Artillery Fuze (MOFA) can act in as a point detonating, time and proximity (variable time) fuze. The point detonating has superquick and delay options. An electronic timing system controls the time function. A proximity sensor in the nose is also enabled by an electronic microcomputer. If set for point detonating mode, the fuze initiates by means of a crush switch

The fuze was designed with EOD considerations in mind. The voltage in the battery bleed resistor and processor should dissipate within 30 minutes of arming and failure. Another circuit is incorporated into the design to discharge the battery as a fail-safe.

Fuzes are packaged in lots of eight per M2A1 container.

MUV-4

Image © Bob Seddon

ORDNANCE SUB-CATEGORY	Mine/Boobytrap Switch/Fuze
EXPLOSIVE FILL (g)	NA
AUW (g)	NA
DIMENSIONS (mm)	117x17
COUNTRY OF ORIGIN	Russia

The MUV-4 (МУВ-4) is a mechanical fuze that is initiated by pull. It is typically employed with a trip wire and is used as boobytrap or victim operated initiator. The M-10 thread on the MD-5 detonator enables use with any mine, typically a fragmentation mine. The MUV-4 is typically used with OZM-72, MON-50, and MON-90 mines, although it can also be used with MON-100 and MON-200 mines as well. The fuze arms by removal of the large thinner round pin. This releases a spring-loaded plunger, which slowly pushes its way through a silicone gel. Once armed, two locking balls and the green plastic fuze top are discarded. If no plastic fuze top is visible the fuze is armed. The MUV-4 fuze typically operates with a pull of less than 1 kg.

The MUV-4 is an improvement on the MUV-3 with a re-designed hydraulic arming delay element. The fuze can be marked in different colours, each representing an arming delay; Green indicates 130 minutes, Black 85 minutes, Red 60 minutes and white 45 minutes. Colourless 25 minutes.

Even when separated from its detonator the cocked striker of this mine represents a risk. The fuze should never be pointed at anybody.

KZ 984 ARTILLERY FUZE

Images © MSM Group

ORDNANCE SUB-CATEGORY	Multi-Option Artillery Fuze
EXPLOSIVE FILL (g)	21.5g RDX
AUW (g)	700g
DIMENSIONS (mm)	141x60
COUNTRY OF ORIGIN	Slovakia

The KZ-984 is a point detonating fuze compatible with NATO 2" fuze wells made by Konstukta-Defence based in Slovakia. The fuze arms by setback and centripetal force. Setback arming includes a setback sleeve in the nose and a detent on the rotor positioned adjacent to the fuze threads. A setting bolt enables selection of superquick and delay functions. While a relatively simple mechanical design, the fuze conforms to the relevant NATO STANAGs.

The KZ-984 has been confirmed as used with Slovakian M107 155mm artillery rounds.

RALEC F3 ARTILLERY FUZE

Image © US DoD

ORDNANCE SUB-CATEGORY	Fuze Artillery Proximity
EXPLOSIVE FILL (g)	NK
AUW (g)	626g
DIMENSIONS (mm)	151x61
COUNTRY OF ORIGIN	France

The RALEC F3 is a proximity fuze with a point detonating function which is associated with NATO standard 155mm HE ammunition. Selection is made by turning the white dial on the tip of the nose. The fuze arms by means of setback and centripetal force. On firing, an ampoule containing electrolyte is broken, which can then enable charging of a capacitor. Centrifugal force distributes the electrolyte and moves a contact in order to ready the circuit and moves the rotor in line.

T90 FUZE

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Fuze Mechanical Time
EXPLOSIVE FILL (g)	2g igniferous composition
AUW (g)	482g
DIMENSIONS (mm)	108x41
COUNTRY OF ORIGIN	Russia/China

The T90 is a Mechanical Time Super Quick (MTSQ) fuze employed with 122mm and 152mm artillery carrier projectiles. Typically the T90 is employed with illumination projectiles such as the 122mm S-4 and the 152mm 3VS17. The T90 arms by setback and centripetal force.

The fuze is very easy to mistake for the V-90, with the main difference being 15g tetryl fuze booster that is employed by the V90. The V90 will indented with the marking B-90 just above the fuze thread. The T90 will be marked T-90 at the equivalent position. The V90 tends to be employed with high explosive 122mm and 152mm artillery projectiles. Both types of fuze are fitted with a metal shipping cap.

V-24A ROCKET FUZE

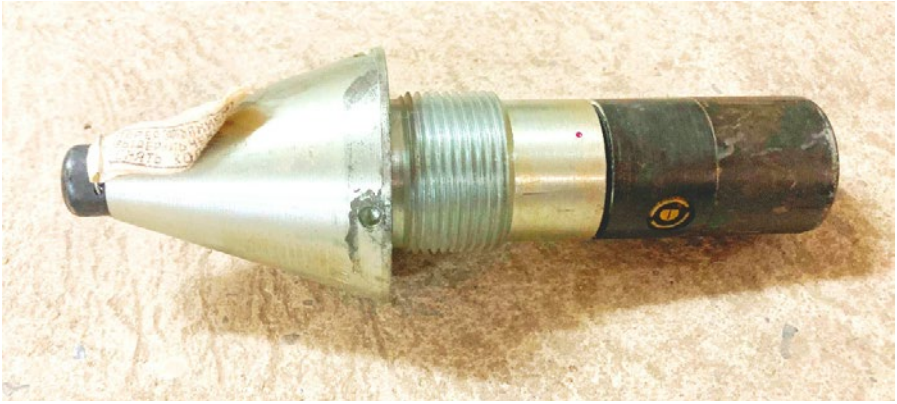


Image © Roly Evans

ORDNANCE SUB-CATEGORY	Fuze Rocket Point Detonating
EXPLOSIVE FILL (g)	55g Tetryl
AUW (g)	2650g
DIMENSIONS (mm)	229x80
COUNTRY OF ORIGIN	Russia

The V-24A is a relatively dated electro-mechanical point detonating fuze used on air-to-surface S-24 240mm rockets. It is armed by setback, with the setback sleeve acting as an inertia weight enabling a graze function. The shipping cap is typically removed by the armourers immediately prior to flight. The setting bolt is found near the gaine of the fuze and is obscured by the fuze pocket once fitted to the S-24.

This fuze is extremely sensitive and rockets which have failed to function should not be jarred or dropped. Preferably, they should be destroyed in situ.

RV-25 ROCKET FUZE

Image © US DoD

ORDNANCE SUB-CATEGORY	Fuze Rocket Proximity
EXPLOSIVE FILL (g)	20g Tetryl
AUW (g)	4820g
DIMENSIONS (mm)	454x170
COUNTRY OF ORIGIN	Russia

The RV-25 is a proximity fuze used on air-to-surface S-25 266mm rockets. The fuze employs a combination of mechanical and electrical arming and may be set for impact or proximity mode.

The fuze body is made of bakelite. It is not known how long the firing capacitor within this fuze takes to discharge, so prudent use of soak time (safe waiting period) and caution is advised for EOD operators.

VP-7M FUZE

Images © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	10g PETN
AUW (g)	96g
DIMENSIONS (mm)	96x76
COUNTRY OF ORIGIN	Russia/Bulgaria

The VP-7M is the fuze found on the PG-7M recoilless rocket. It has two parts, a piezo element in the nose of the warhead and the main fuze element at the base of the warhead. The fuze arms by setback. On firing, a small inertia weight firing pin assembly initiates pyrotechnic pellet that acts as a holding device on a shutter. Once the pyrotechnic pellet is burnt the two lateral springs can push the slider from a position where a short circuit exists, to a position where a circuit can be completed on crushing of the piezo crystal in the nose. Even if no impact occurs the self-destruct element should initiate after approximately 900m of flight. Unless a PG-7 projectile has failed to detonate, and has broken apart on impact, this fuze is unlikely to be encountered by EOD operators. All PG-7 type warheads which have failed to function should be treated with care and preferably destroyed in situ.

VP-22 FUZE

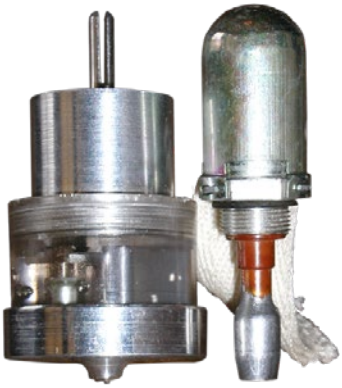


Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Fuze
EXPLOSIVE FILL (g)	10g PETN
AUW (g)	80g
DIMENSIONS (mm)	96x76
COUNTRY OF ORIGIN	Russia/Bulgaria

The VP-22 (ВП-22) fuze is an improvement on the VP-7M. The basic design is very similar, however there are differences, such as spring tensions, in order to reduce failure rates. The fuze body is made of aluminium and plastic rather than bakelite used with the VP-7M. The piezo nose element is designated the VP-16GCh and the base fuze element is designated VP-22DCh.

The fuze is utilized not only on the RPG-22 disposable launcher, but the two different elements are employed on other recoilless rockets. The base element, or a close variant of it, is used on one of the shaped charges within the PG-7R, PG-26, PG-27 and PG-29. The VP-16GCh piezo nose element is used on the PG-16, PG-18, and PG-26. Unless a PG-7 projectile has failed to detonate, and has broken apart on impact, this fuze is unlikely to be encountered by EOD operators. All PG-7 type warheads which have failed to function should be treated with care and preferably destroyed in situ.

V5-K

Images © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Fuze – Unguided Rocket
EXPLOSIVE FILL (g)	NK
AUW (g)	168g
DIMENSIONS (mm)	119x40
COUNTRY OF ORIGIN	Russia/Bulgaria/Serbia

The V-5K is a point-detonating fuze used on 57mm explosive fragmentation rockets such as the S-5K, S-5MO and S-5KO. The V-5K employs a version of the standard Soviet setback sleeve/creep spring/locking ball design. On firing setback causes the setback sleeve to compress the creep spring. This releases the locking balls, and as setback eases the firing pin is freed and able to contact the primer on impact. Once armed, the creep spring remains the only holding device separating the firing pin and primer. The fuze is similar to the GO-2 used on 73mm HE-FRAG recoilless ammunition. Since the firing pin is in line with the primer, even when the fuze is not armed, this item should be not considered “bore safe”. Caution is advised. Unlike the V-5 fuze, also used with S-5 HE rockets, the V-5K has no self-destruct element.

GRENADES

F-1

Bulgarian F1 and UZRGM-2 fuze. Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Grenade - HE/FRAG
EXPLOSIVE FILL (g)	60g TNT
AUW (g)	600g
DIMENSIONS (mm)	130x55
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	UZRGM-2

Despite its age the F-1 remains one of the most common high explosive fragmentation grenades. The UZRGM-2 fuze is a simple cocked striker. The fly off lever which retains the cocked striker is held by a standard pin as a holding device.

The pre-scored fragmentation is relatively low quality and rarely fragments evenly. The fragmentation is claimed to be lethal up to 200m although lethal fragmentation within 30m is more likely.

UZRGM-2 fuzes, made in a range of countries, can be used with this grenade. The fuze will typically initiate 3.2-4.2 seconds after the fly off lever is released. Theoretically any firing device with an M-10 thread could be used with the F-1 grenade. For example a simple MUV fuze with an MD-5 detonator can easily be attached as a firing device. These grenades are often employed as crude boobytraps in Ukraine, typically using some sort of pull mechanism such as a trip wire. The grenades can also be used as anti-lift devices when placed with the pin removed under an object, or as an anti-tamper device when placed adjacent in the ground to an omni-directional mine stake or adjacent to a buried bounding fragmentation mine.

RGD-5

Images © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Grenade - HE/FRAG
EXPLOSIVE FILL (g)	110g TNT
AUW (g)	310g
DIMENSIONS (mm)	114x58
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	UZRGM-2

In use since the 1950s, the RGD-5 is a common offensive grenade. The reduced fragmentation means a reduced effective range of 15-20m. The M-10 fuze thread accepts the standard UZRGM-2 fuze, can an also accept compatible switches such as a MUV series fuze with an MD-5 detonator. As with other grenades the UZRGM-2 has a 3.2-4.2 second delay.

This item can still be readily used as a booby trap,

The grenade is usually marked with a black capital T to indicate a TNT fill. The markings differ depending on where the grenade was manufactured. Markings will also be found on the fly off lever of the UZRGM-2 fuze.

VOG-17/VOG-17M

VOG-17M. Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Grenade - HE/FRAG
EXPLOSIVE FILL (g)	34g A-IX-1
AUW (g)	350g
DIMENSIONS (mm)	132x30
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	VMG/VMG-M

The VOG-17 is a projected HE/FRAG grenade. It is typically fired by AGS-17 grenade launcher and can be used as a form of light local indirect fire support. The VMG is a point detonating and graze fuze that arms by setback and centrifugal force. A VMG-M version, used on the VOG-17M, includes a pyrotechnic delay self-destruct feature that is initiated by setback on launch. It should be noted that the VMG-M contains a small rotor that maintains the primer out of line until the holding devices are removed during the arming sequence. The VMG has no such rotor and thus contains an inline primer, and therefore is not bore safe. VOG-17s with VMG fuzes, even when found as AXO, should be handled accordingly. The grenade is projected by means of a single based nitrocellulose propellant charge initiated on indentation of the primer by a firing pin in the AGS-17.

On impact the striker, now in line with the primer if a VOG-17M, overcomes a relatively weak creep spring to initiate the explosive train.

The VOG-17 and VOG-17M are externally virtually identical. Markings are the easiest way to tell the difference. The explosive fill, A-IX-1 is marked on the black body of the grenade.

VOG-17 IMPROVED HAND GRENADE

Image © Private

ORDNANCE SUB-CATEGORY	Grenade - HE/FRAG
EXPLOSIVE FILL (g)	34g A-IX-1 estimated
AUW (g)	300g estimated
DIMENSIONS (mm)	N/K
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	VMG/VMG-M

The VOG-17 improvised grenade has been seen in Chechnya, Syria and Ukraine. It is sometimes referred to as "Khattabka" (хаттабка). Khattabka can also be used to refer to other improvised or adapted grenades, such as those adapted from a VOG-25. The UZRGM-2 fuze works as it would for any other HE/GRAG grenade.

The grenade should not be confused with the conventionally manufactured AR-ROG grenade made in Bulgaria. The different fuzing is the easiest way to tell the difference, the DVM fuze being clearly different from a UZRGM-2.

VOG-25

Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Grenade - HE/FRAG
EXPLOSIVE FILL (g)	48g A-IX-1
AUW (g)	250g
DIMENSIONS (mm)	102x40
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	VMG-K

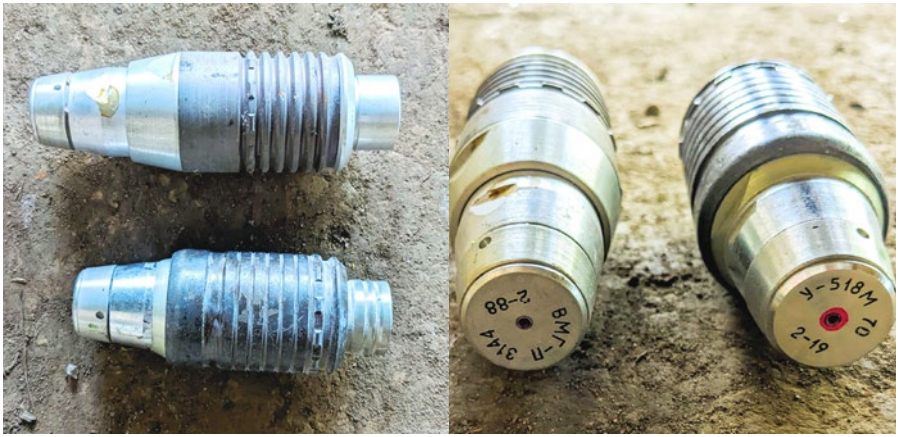
The VOG-25 is a projected HE/FRAG grenade largely used with the GP-25 UGL. Often used as an indirect fire weapon, it is claimed to have an effective range up to 400m. As with other projected grenades the muzzle velocity is relatively low (77m/s). The forces required to arm the fuze are relatively low.

The VMG-K (ВМГ-К) is a point initiating fuze with a pyro technic self-destruct initiated on setback.

Factory markings are usually visible on the nose of the VMG-K fuze.

The windshield of the grenade will typically show indentations on impact. Such impact damage and an indentation on the primer, along with propellant scorch marks, are the easiest way to identify a blind.

VOG-25M



Images © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Grenade - HE/FRAG
EXPLOSIVE FILL (g)	70g A-IX-1
AUW (g)	278g
DIMENSIONS (mm)	107x40
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	VMG-K

The VOG-25M is a 40mm projected grenade. The VMG-K fuze is armed by setback and centrifugal force. A VOG-25PM version with a bounding fragmentation role looks very similar to the VOG-25M. The 68-70g A-IX-1 charge is more than that used with other VOG grenades.

Two versions of the VOG-25M have been seen in Ukraine. It is possible one is a training version.

The Bulgarian version grenade is marketed as the ARFG-25B.

VOG-25M IMPROVISED

Image © Private

ORDNANCE SUB-CATEGORY	Grenade - HE/FRAG
EXPLOSIVE FILL (g)	50g A-IX-1 estimated.
AUW (g)	N/K
DIMENSIONS (mm)	N/K
COUNTRY OF ORIGIN	Chechnya/Syria/Ukraine
FUZE	UZRGM-2

This grenade has also been labelled Hattabka. The fuze body is drilled and a thread tapped to accept a UZRGM-2 10mm fuze. It is unclear if the propellant charge is removed.

It is possible the different fuze mechanism changes the NEQ although the HE/FRAG effect remains in any case. It is also likely that the explosive charge is less than a VOG-25M in order to allow space for the detonator attached to the UZRGM-2 fuze.

RGO/RGN

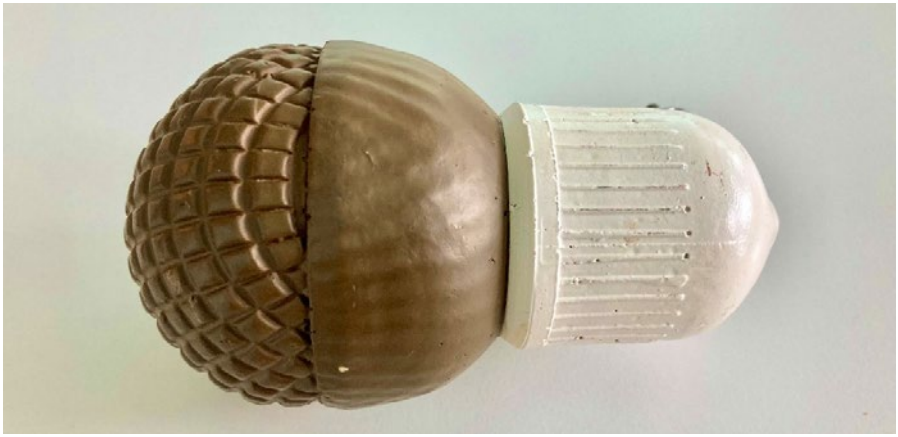


Image © Roly Evans

ORDNANCE SUB-CATEGORY	Grenade - HE/FRAG
EXPLOSIVE FILL (g)	90g-110g A-IX-1 estimated.
AUW (g)	530g
DIMENSIONS (mm)	114x60
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	UDZ

The Ruchnaya Granata Oboronitel'naya (RGO) RGO is a defensive HE-FRAG grenade. It has a UDZ all-ways fuze with two pyrotechnic self-destruct elements. On impact a circular inertia weight, armed after a pyrotechnic delay of 1-2 seconds, pushes a primer onto a striker. In this respect the UDZ is a relatively uncommon fuze for a HE hand grenade. The SD is timed to function after 3.2-4.2 seconds, similar for the delay for a UZRGM-2 in any case.

The RGN is almost identical to the RGO – the main difference being the RGN has an aluminium alloy body where the RGO body is made from steel. Some publications state that the RGN has a 110g main charge vs 90g for an RGO although it is not clear how accurate this is.

While A-IX-1 is the most common modern filling, TG-30 and TG-40 have also been used.

The UDZ all-ways fuze is known to be highly dangerous. EOD operators are advised to be extremely cautious.

RKG-3

Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Grenade - HEAT
EXPLOSIVE FILL (g)	350 TG-50
AUW (g)	1070g
DIMENSIONS (mm)	362x72
COUNTRY OF ORIGIN	Russia/Bulgaria/East Germany
FUZE	Impact Inertia/Cocked Striker

The RKG-3 is HEAT hand grenade, designed to be used in urban combat where it can be deployed from buildings. Ruchnaya Kumulyativnaya Granata (Ручная Кумулятивная Граната) translates to 'Hand Cumulative Grenade'. An RKG-3 M version also exists, that employs a copper rather than steel shaped charge liner. A longer RKG-3EM version with an enhanced standoff configuration is also in circulation.

The easiest way to tell if the item has been armed is the deployment of a small white drogue chute.

Like the RGO/RGN the RKG-3 has an impact fuze. The cocked striker may function when an impact force moves the last holding devices (sleeve and locking balls). The cocked striker fuze is known to be highly dangerous. EOD operators are advised to be highly cautious.

There are indications this item has been adapted for use as a small aerial HEAT bomb labelled the RKG-1600 to be deployed by UAV. In this configuration the fuzing in the handle is replaced by what is assumed to be an in-line impact inertia fuze.

DM-51

Images © SESU and Manniman2

ORDNANCE SUB-CATEGORY	Grenade – HE/Frag
EXPLOSIVE FILL (g)	60g PETN based composition
AUW (g)	450g
DIMENSIONS (mm)	112x40
COUNTRY OF ORIGIN	Germany

The DM-51 is a German universal type hand grenade that can be adapted to both offensive and defensive roles. Use of the fragmentation sleeve (as per image) makes the grenade "defensive". The sleeve is marked in yellow (HE) stencilling "HGR DM51 Splitter" The sleeve contains 6500 2 - 2.5mm steel balls.

The grenade is conventional in operation and uses a flyoff lever with shrouded mousetrap type percussion fuze with a delay stemmed detonator. The grenade fuze has a nominal delay of 3 to 5 seconds and has a lethal radius of 10m (defensive role with fragmentation jacket fitted).

M430A1

Images © Dutch EOD Center and Private

ORDNANCE SUB-CATEGORY	Grenade/Improvised Aerial Bomb
EXPLOSIVE FILL (g)	45g Composition A5
AUW (g)	340g
DIMENSIONS (mm)	112x40
COUNTRY OF ORIGIN	USA
FUZE	Adapted M550

The M430 is a common 40mm projected grenade that has been repurposed for use as a small aerial bomb to be deployed by UAV. The High Explosive Dual Purpose round includes a small copper lined shaped charge that the manufacturer claims can penetrate 76mm of Rolled Homogenous Armour (RHA). It is not known how the munition is modified for use as an aerial bomb. The propellant cartridge is removed in order to incorporate a fin assembly. It is not confirmed if any additional plastic explosive is added to enhance the main charge although this is feasible. The fuzing would require modification and it is unclear exactly how this is done. It is likely that the setback pin will be withdrawn, and the rotor and gear assembly manipulated in order to align an M55 stab detonator with the striker. On impact three hammer weights drive the aligned striker into the detonator and the shaped charge will function by means of spitback. Items attached to UAVs are very likely to be armed and should be treated with extreme caution.

MORTAR ROUNDS

82MM 0-832

Images © Roly Evans

ORDNANCE SUB-CATEGORY	Mortar Round
EXPLOSIVE FILL (g)	440g TNT/TG-42
AUW (g)	3230g
DIMENSIONS (mm)	329 x82
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	M-6

The O-832 is a common high explosive 82mm mortar round. O stands for Oskolocho which translates as 'fragmentation'. These rounds are invariably fuzed with relatively simple M-6 mechanical impact fuzes. These fuzes employ the standard Soviet mechanism of setback sleeve spring. When not fuzed they come with a black plastic transit plug. Mortars usually come ten rounds per box with a side compartment for the fuzes in hermetically sealed tins.

The images above show a slightly improved 53-O-832DU (53-O-832ДУ) version.

120MM 0F-843

Images © Roly Evans

ORDNANCE SUB-CATEGORY	Mortar Round
EXPLOSIVE FILL (g)	1400 TNT or TD-50
AUW (g)	16000g
DIMENSIONS (mm)	674x120
COUNTRY OF ORIGIN	Russia
FUZE	M-12

The OF-843 is a smoothbore high explosive mortar. Typically it is impact fuzed. The M-12 fuze incorporates not only the usual set back sleeve design but also a slider, and a selector for delay and/or Superquick functions. When not fuzed the mortar comes with a black plastic transit plug.

OF stands for Oskolocho-Fygasnaya which translates as Fragmentation High-Explosive.

Usually 120mm high explosive mortars come two per storage box. Fuzes are found in hermetically sealed tins in a compartment at the side of the box. There are a range of OF-843 high explosive mortars with suffixes such as A and B to denote minor differences. Note that bagged supplementary propelling charges associated with this type of mortar ammunition are very easily damaged and care should be taken not to spill propellant during handling.

120MM OF-49

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Mortar Round
EXPLOSIVE FILL (g)	4900 A-IX-2
AUW (g)	17200g
DIMENSIONS (mm)	590x120
COUNTRY OF ORIGIN	Russia
FUZE	M-12

This 120mm high explosive mortar is different from many others in Russian service in that it is not smoothbore but has pre-cut rifling. It is commonly associated with the 2S9 Anona (anemone) 120mm self-propelled mortar.

While more centrifugal force is imparted to the mortar than a standard model, no advantage is taken of this and the round is typically fuzed with the M-12 setback armed fuze.

240MM F-864

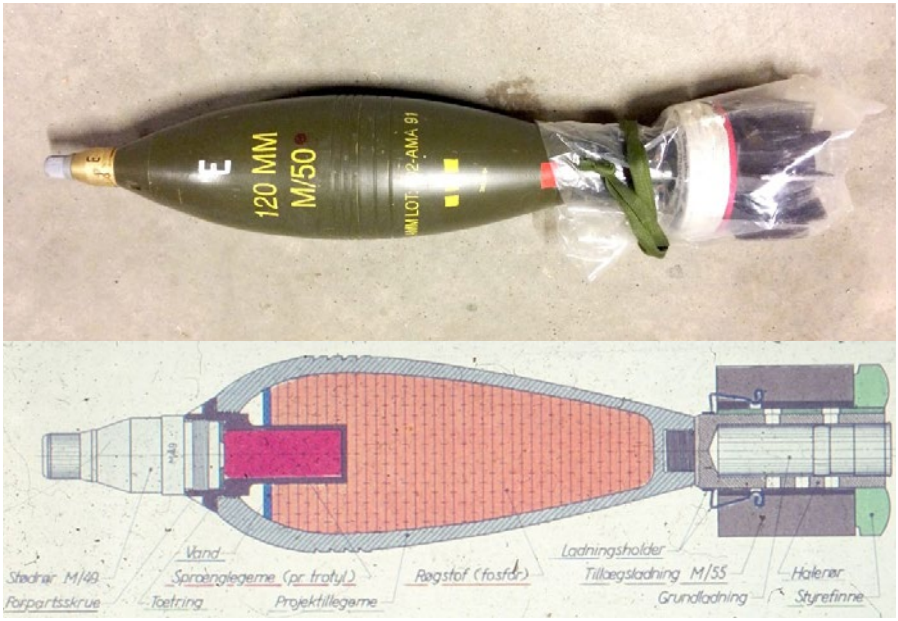
Image © SESU

ORDNANCE SUB-CATEGORY	Mortar Round
EXPLOSIVE FILL (g)	31900 TNT
AUW (g)	130700g
DIMENSIONS (mm)	1541x240
COUNTRY OF ORIGIN	Russia
FUZE	M-16

The 240mm F-864 mortar is most commonly associated with the Russian 2S4 Tyulpan (tulip) self-propelled mortar.

The F-864 is often fuzed with mechanical impact fuzes, most likely the M-16. When not fuzed the rounds are shipped with a grey transit plug as seen above. Each fuze well typically has some form of fuze adaptor. The mortar uses a primary cartridge which is fixed within the tail. The bagged supplementary propelling charges associated with this type of mortar ammunition are very easily damaged and care should be taken not to spill propellant during handling.

M/50 120MM MORTAR



Images © Danish EOD and Search Center and Forsvarets Krigsmateriel Forvaltning

ORDNANCE SUB-CATEGORY	Mortar Round - HE
EXPLOSIVE FILL (g)	2325g TNT
AUW (g)	13800
DIMENSIONS (mm)	590 x120
COUNTRY OF ORIGIN	Sweden

The M/50 120mm mortar has been supplied with M/49 impact fuzes. The mortar has a TNT charge with a plasticised RDX based booster. Any low order attempts should be mindful of the position of the booster charge. The mortar is typically supplied with augmenting charges sealed with plastic attached to the tail.

3VZ4 INCENDIARY MORTAR

Image © SESU

ORDNANCE SUB-CATEGORY	Mortar Round - Incendiary
EXPLOSIVE FILL (g)	NK Incendiary composition
AUW (g)	16900
DIMENSIONS (mm)	612x120
COUNTRY OF ORIGIN	Russia

The 3VZ4 is an incendiary mortar. It is initiated by a T1 Powder Train Time Fuze which is a pyrotechnic time fuze with an optional impact setting. The required time delay is set on the T1 mortar fuze prior to launch and when the fuze functions an expelling charge is ignited. The expelling charge ignites the incendiary pellets and exerts pressure inside the mortar bomb body such that bomb body separates at a joint between the tail and bourrelet. The burning incendiary pellets are then scattered. The incendiary pellets burn for approximately one minute. The type of incendiary composition employed is believed to be a thermite composition. The 3VZ4 120mm incendiary mortar has a distinctive red circumferential marking just below the bourrelet.

3-O-8 MORTAR CARRIER

Image © Open Source

ORDNANCE SUB-CATEGORY	Mortar Carrier/Cluster Munition
EXPLOSIVE FILL (g)	Fourteen 3-O-10 submunitions
AUW (kg)	230 kg
DIMENSIONS (mm)	240
COUNTRY OF ORIGIN	Russia

The 240mm 3-O-8 is a fin-stabilized rocket assisted carrier mortar bomb. 240mm mortar bombs are typically fired from the Russian 2S4 Tyulpan self-propelled mortar. This is the largest calibre mortar system in modern use. The 3-O-8 designation refers to the entire mortar round including the rocket motor. The cargo warhead contains fourteen 3-O-10 submunitions (see separate entry for technical details). The round is fitted with the 3M15 rocket motor which is also associated with several other rocket-assisted mortar rounds. The 3-O-8 round may also be fitted with the 3Ch20 braking ring which is used when the mortar is required to engage targets at short range. The small parachutes that stabilize the 3-O-10 submunition are good visual indicators that this cluster munition has been employed. Each submunition will also make a distinctive fragmentation pattern on a hard surface that will indicate the flight of the submunitions and the parent mortar cluster munition. These indicators can help when surveying the extent of a cluster strike.

PROJECTILES

OF-17

Image © Private

ORDNANCE SUB-CATEGORY	Projectile (tank gun)
EXPLOSIVE FILL (g)	1690g A-IX-2
AUW (g)	18100g
DIMENSIONS (mm)	100x611
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	V-429

The OF-17 is a 100mm unitary high explosive fragmentation round used by the 2A70 tank gun found on BMD-4 armoured vehicles. OF stands for Oskolocho-Fygasnaya which translates as Fragmentation Explosive. This round has been found as kick out around destroyed BMD-4 armoured vehicles. It has also been found as unfuzed AXO. The round is similar to the OF32, albeit slightly heavier.

The round is typically fuzed with a V-429 mechanical impact fuze. The V-429 series are relatively basic mechanical impact fuzes that are armed by setback. The muzzle velocity of the round is 850m/s. The V-429 fuze looks very similar to the RGM-2 fuzes used on artillery projectiles. Another fuze may be used, the V-35. This looks very similar to an M-12 mortar fuze.

OF-19

Image © Arcon Partners Ltd

ORDNANCE SUB-CATEGORY	Projectile (tank gun)
EXPLOSIVE FILL (g)	3150g TNT
AUW (g)	23219g
DIMENSIONS (mm)	125x670
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	V-429

The OF-19 is a spin stabilized 125mm high explosive tank round. It has largely been replaced in inventories by the OF-26. Both rounds use the V429 series of fuzes that are armed by set-back. Both have four fins to provide slow spin stabilization in flight. The main difference is the explosive charge employed, with the OF-19 using TNT rather than A-IX-2. When combined with a 4Z40/4Zh52 propellant charge assembly the whole round is designated the 3VOF22 (3ВОФ22).

The OF-19 look very similar to its successor round the 3OF-26. Markings are the easiest way of telling the difference. If markings are not visible a fuzed OF-19 is 5mm shorter than an OF-26. The V-429 fuze looks very similar to the RGM-2 fuzes used on artillery projectiles.

OF-26

Image © SESU

ORDNANCE SUB-CATEGORY	Projectile (tank gun)
EXPLOSIVE FILL (g)	3340g A-IX-2
AUW (g)	23200g
DIMENSIONS (mm)	125x675
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	V-429

The OF-26 is the standard Russian 125mm HE projectile. Its full GRAU index code is 3OF-26. If found as Abandoned Explosive Ordnance (AXO) the round will come with a separate 4Z40/4Zh52 propellant charge assembly which uses a single based propellant. The complete assembly of 3OF-26 and propellant charge is designated the 3vOF36. The round is fired from smoothbore tank guns and is fin stabilised. The 4 fins provide a slow rate of spin that is not employed in fuze arming. The V-429 series are relatively basic mechanical impact fuzes that are armed by setback. The muzzle velocity of the round is 850m/s.

Identification should be confirmed by markings on the munition – this round is easy to confuse with the OF-19. Usually ОФ-26 and A-IX-2 are marked in black on one side of the munition. Rounds are packaged one round and separate propellant charge per box. The munitions come both fuzed and unfuzed within the packaging. A large number of OF-26 rounds have been found with heat damage around destroyed AFVs. The V-429 fuze looks very similar to the RGM-2 fuzes used on artillery projectiles.

OF-32

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Projectile (tank gun)
EXPLOSIVE FILL (g)	1700g A-IX-2
AUW (g)	15660g
DIMENSIONS (mm)	100x490
COUNTRY OF ORIGIN	Russia
FUZE	V-429

The OF-32 is a 100mm unitary high explosive fragmentation round used by the 2A70 tank gun found on BMD-4 armoured vehicles. OF stands for Oskolocho-Fygasnaya which translates as Fragmentation High Explosive. This round has been found as kick out around destroyed BMD-4 armoured vehicles. It has also been found as unfuzed Abandoned Explosive Ordnance (AXO). The round is similar to the OF17, albeit slightly lighter.

The round is typically fuzed with a V-429 mechanical impact fuze. The V-429 series are relatively basic mechanical impact fuzes that are armed by setback. The muzzle velocity of the round is 850m/s. The V-429 fuze looks very similar to the RGM-2 fuzes used on artillery projectiles. Another fuze may be used, the V35. This looks very similar to an M-12 mortar fuze.

BM-26

Images © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Projectile - APFSDS
EXPLOSIVE FILL (g)	N/A
AUW (g)	4800g projectile. 7050g complete round
DIMENSIONS (mm)	125x395 (projectile only)
COUNTRY OF ORIGIN	Russia
FUZE	N/A

The BM-26 is a common 125mm APFSDS round used with Russian smoothbore tank guns. The core of the round is made from tungsten-nickel-iron alloy, a HMTA (Heavy Metal Tungsten Alloy). The rounds comes as a two-piece construction with the dual propellant cartridges.

The unitary round with the 4Zh63 propelling charge might be referred to as the 3VBM11/3BM26/27. The actual round itself is the BM-26.

These rounds should not be destroyed by explosive means due to the sinters that can result. These rounds should be removed for specialised industrial processing.

BM-32

Image © Open source

ORDNANCE SUB-CATEGORY	Projectile - APFSDS
EXPLOSIVE FILL (g)	N/A
AUW (g)	7050g
DIMENSIONS (mm)	125x585 (projectile only)
COUNTRY OF ORIGIN	Russia
FUZE	N/A

The BM-32 projectile is a common 125mm APFSDS round used with Russian smoothbore tank guns. The core of the round is made from Depleted Uranium. When used with dual propellant cartridges the round is designated 3VBM-13. Dating from the 1980s this was the first Soviet DU APFSDS round. It can be referred to as Vant (Вант) after the research project that developed it.

It is important these rounds are correctly identified and not mistaken for other APFSDS models. These rounds should not be destroyed by explosive means due to the sinters that can result. These rounds should be removed for specialised industrial processing.

BK-13M

Images © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Projectile - HEAT
EXPLOSIVE FILL (g)	1800 A-IX-1
AUW (g)	18200g
DIMENSIONS (mm)	122x637 (projectile only)
COUNTRY OF ORIGIN	Russia
FUZE	N/K

The BK-13 is a 122mm HEAT-FS-T round. It is employed by a D-30 howitzer in direct fire mode. When combined with a propellant charge in a 122mm metallic casing the round may be referred to as 3VBK9M (3ВБК9М). The probe is sometimes referred to as a stand-off spike. There is no tandem charge in the probe. The only shaped charge is in the main warhead. The driving band is typically not painted. The stabilizer is made up of six fins.

The easiest way of telling if the round has been fired is impact damage around the probe/spike.

BK-14

Image © SESU

ORDNANCE SUB-CATEGORY	Projectile - HEAT
EXPLOSIVE FILL (g)	1850 OKFOL
AUW (g)	19020g
DIMENSIONS (mm)	125x677 (projectile only)
COUNTRY OF ORIGIN	Russia
FUZE	V-15

The BK-14 is a 125mm HEAT-FS-T round fired by smoothbore tank guns. It has a single shaped charge in the main warhead. The V-15 fuze is point initiating base detonating. There is no tandem charge in the probe. This HEAT projectile is commonly fired by the T-72 and T-80 main battle tanks.

Usually the identity of the round is stencilled in black markings, but unpainted and unmarked rounds have been observed.

When used with a 4Zh40/4Zh52 propellant charge the complete round is designated a 3VBK10M (3ВБК10М). These are the same propellant charges used with other 125mm smoothbore Russian tank rounds.

The BK-14 may be confused with the BK-29. The easiest way to tell between the two is a subtle difference in the shape of the probe end.

OF-462

Image © Roly Evans

ORDNANCE SUB-CATEGORY	Projectile – HE/FRAG
EXPLOSIVE FILL (g)	3460 TNT
AUW (g)	21760g
DIMENSIONS (mm)	122x645
COUNTRY OF ORIGIN	Russia/Ukraine/Bulgaria/Romania
FUZE	RGM-2

The OF-462 is a common 122mm HE FRAG artillery projectile. The body is made of steel. Fired projectiles will show scoring on the copper driving band. While spin stabilised, the typical RGM-2 impact fuze arms by setback. While there are proximity fuzes with a 36mm thread that are compatible with this projectile, most fuzing seen to date has been relatively simple point-detonating mechanical fuzes.

These rounds are used with D-30 howitzers and can be found as AXO around abandoned or destroyed D-30 positions. It can also be expected in abandoned or destroyed self-propelled 122mm artillery such as the 2S1 (2C1) self-propelled howitzer.

The OF-462 designation, and the TNT explosive fill are marked on one side (usually designated by the letter T), the factory number, lot number and year of manufacture are marked on the other.

S-463

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Projectile – ILLUM
EXPLOSIVE FILL (g)	20g expulsion charge
AUW (g)	21960g
DIMENSIONS (mm)	122x551
COUNTRY OF ORIGIN	Russia
FUZE	T-7

The S-463 is the standard 122mm ILLUM round for D-30 howitzers and self-propelled 122mm artillery such as the 2S1. The copper driving band may be visible or painted over. As with many ILLUM rounds a candle is expelled from the main body of the carrier projectile by a small 20g black powder low explosive expulsion charge. The timing of the deployment is typically governed by a T-7 Powder Train Time Fuze (PTTF). Once deployed the candle is maintained in the air by a white chute. Candles that have landed are usually visible by means of the chute and scorch marks on the ground.

OF-25

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Projectile – HE/FRAG
EXPLOSIVE FILL (g)	6800g A-IX-2
AUW (g)	43560g (unfuzed)
DIMENSIONS (mm)	152x646
COUNTRY OF ORIGIN	Russia
FUZE	RGM-2

The OF-25 is a common 152mm HE FRAG artillery projectile. The body is made of steel. Fired projectiles will show scoring on the copper driving band, which is painted the same grey colour as the rest of the projectile. While spin stabilised, the typical RGM-2 impact fuze arms by setback. While there are proximity fuzes with a 36mm thread that are compatible with this projectile, most fuzing seen to date has been relatively simple point-detonating mechanical in nature.

These rounds are used with D-20 howitzers and can be found as AXO around abandoned or destroyed D-20 positions. It can also be expected in abandoned or destroyed self-propelled 152mm artillery such as the 2S3 (2C3) Akatsiya (Акация).

The OF-25 designation, and the A-IX-2 explosive fill are marked on one side, the factory number, lot number and year of manufacture are marked on the other.

OF-45

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Projectile – HE/FRAG
EXPLOSIVE FILL (g)	7650g A-IX-2
AUW (g)	43560g (unfuzed)
DIMENSIONS (mm)	152x864
COUNTRY OF ORIGIN	Russia
FUZE	RGM-2

The OF-45 is a common 152mm HE FRAG artillery projectile that dates from the 1980s. It is noticeably longer than other 152mm HE artillery rounds. The body is made of steel. Fired projectiles will show scoring on the copper driving band, which is painted the same grey colour as the rest of the projectile. The base unit is hollow, the join to which is visible beneath the driving band. While spin stabilised, the typical RGM-2 impact fuze arms by setback. While there are proximity fuzes with a 36mm thread that are compatible with this projectile, most fuzing seen to date has been relatively simple point-detonating mechanical in nature.

These rounds are used with D-20 howitzers and can be found as AXO around abandoned or destroyed D-20 positions. It can also be expected in abandoned or destroyed self-propelled 152mm artillery such as the 2S3 (2C3) Akatsiya (Акация).

The OF-25 designation, and the A-IX-2 explosive fill are marked on one side, the factory number, lot number and year of manufacture are marked on the other.

BP-540

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Projectile – HEAT
EXPLOSIVE FILL (g)	3920g A-IX-2
AUW (g)	27400g
DIMENSIONS (mm)	152x531
COUNTRY OF ORIGIN	Russia
FUZE	GPV-3

The BP-540 is a 152mm HEAT projectile for use in a direct fire role by D-20 howitzers. The body is made of steel. Fired projectiles will show scoring on the copper driving band, which is painted the same grey colour as the rest of the projectile. There are two distinct spanner holes at the base of the ogive. Although the BP-540 is a spin stabilized round, the GPV-3 fuze that it is commonly used with is setback armed. The fuze is point initiating base detonating, piezoelectric spit-back, without any form of self-destruct. The round has a tracer element.

The factory, lot, year of manufacture and calibre is usually marked on one side, the explosive fill on the other.

As well as being used by the D-20 howitzer, the round can be employed by self-propelled artillery such as the 2S3, 2S19, and 2A65.

OF-43

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Projectile – HE/FRAG
EXPLOSIVE FILL (g)	17800g A-IX-2
AUW (g)	110000g
DIMENSIONS (mm)	203
COUNTRY OF ORIGIN	Russia
FUZE	V-491

The OF-43 is a 203mm HE projectile employed by 2S7 Pion and 2S7M Malka self-propelled howitzers. The projectiles are used with two bag charges.

The V-491 mechanical impact fuze arms by setback. The muzzle velocity on firing is 960 m/s. The V-491 has a selector bolt for delay and super quick functions.

These items are packaged in a wooden rack system similar to those used for Soviet aerial bombs.

30 X 165 MM AP-T 3UBR6

Image © SESU

ORDNANCE SUB-CATEGORY	Cannon Projectile – AP-T
EXPLOSIVE FILL (g)	123g propellant
AUW (g)	853g
DIMENSIONS (mm)	30x292mm complete round 30x165mm projectile
COUNTRY OF ORIGIN	Russia/Bulgaria

The 30 x 165mm Armour Piercing – Tracer (AP-T) is a common Russian cannon round employed by 2A38, 2A42 and 2A72 automatic cannons used on the BMP-2 and BMP-3 and some BTR-80 variants. The ammunition can also be fired by the 30mm NR-30 aircraft cannon and the GSh-30-2 cannon fitted to the Su-25 ground attack aircraft. The complete round in Russian land service has the GRAU designation 3UBR6. The fired projectile is solid steel shot with a zinc ballistic cap. The projectile has a copper driving band that is scored if fired. The tracer pocket should be inspected to confirm no pyrotechnic composition remains. If found as AXO the propellant in the cartridge, typically more than 100g, should be disposed of. It is not advised that these items are disposed of by means of explosive demolition. 30mm cannon ammunition is easy to mistake for 23mm cannon rounds used on ZSU-23-series anti-aircraft guns. The distinct dual crimping around the cannelures is one of the easier ways to tell the difference.

30 X 165 MM HE-I 3UOF8

Image © SESU

ORDNANCE SUB-CATEGORY	Cannon Projectile HE-I
EXPLOSIVE FILL (g)	49g A-IX-2 and 123g propellant
AUW (g)	837g
DIMENSIONS (mm)	30x292mm complete round 30x165 projectile
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	A-670M

The 30 x 165mm High Explosive - Incendiary (HE-I) is a common Russian cannon round employed by 2A38, 2A42 and 2A72 automatic cannons used on the BMP-2 and BMP-3 and some BTR-80 variants. The ammunition can also be fired by the 30mm NR-30 aircraft cannon and the GSh-30-2 cannon fitted to the Su-25 ground attack aircraft. The complete round in Russian land service has the GRAU designation 3UOF8. If just the black oxide coloured 30mm projectile is found, it is designated OFZ 30.

The point detonating A-670M fuze arms by setback and centrifugal force. The fuze has a self-destruct version that is based on a circular powder train time element. The self-destruct functions after 7.5 to 14.5 seconds. Typically, this would equate to 3900–5300m flight distance. The item can be easy to mistake for an OFZ 25 30mm round. In any case, the fuze is the same A-670M. Bulgarian versions of the 3UOF8 are designated AR-302 and have the distinctive Bulgarian factory markings. Cannon rounds should be treated with caution. Fired HE-I rounds should be destroyed in situ.

105MM HE M1

Image © Private

ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	2300g TNT or Composition B
AUW (kg)	13.6kg (projectile)
DIMENSIONS (mm)	552x105
COUNTRY OF ORIGIN	USA/Bulgaria/Italy

The 105mm M1 projectile consists of a hollow steel forging with a boat tail base, a streamlined ogive, and gilding metal driving band. A base cover is welded to the base of the projectile. The high explosive filler within the projectile may be either cast TNT or Composition B. A fuze cavity is formed in the filler at the nose end of the projectile. A cavity liner, to preclude dusting of HE during transportation and handling, is seated in the cavity and expanded into the lower projectile fuze threads. The cartridge case contains a percussion primer assembly and seven individually bagged and numbered propelling charge increments. The base of the cartridge case is drilled and the primer assembly is pressed into the base. The percussion primer assembly consists of a percussion ignition element and a perforated flash tube containing black powder. If found as AXO, the round will be integrated with a brass cartridge case containing 1400g of propellant. L119 howitzers can also fire 105mm projectiles with separate charge propellant. The M1 rounds have been used with M739A1 fuzes when used for point detonating or delay functions.

125MM BK-18 HEAT

Image © SESU

ORDNANCE SUB-CATEGORY	Projectile HEAT
EXPLOSIVE FILL (g)	1760g A-IX-1
AUW (g)	19000g
DIMENSIONS (mm)	680x125
COUNTRY OF ORIGIN	Russia

The 125mm 3-BK-18M HEAT projectile (designated the 3-VBK-16 when combined with the propellant charge and stub case) is the principal fin-stabilised HEAT projectile fired by main battle tanks with a 125mm gun (T-64, T-72, T-80 and T-90). The round is loaded in combination with a semi-combustible propellant case designated the Zh52. The propellant is single based with a TNT additive. The round utilizes a VU-729 piezo based spitback fuze.

The projectile is stencilled BK18M in black on the projectile body. EOD operators should apply standard precautions for destroying HEAT ammunition with this item and should be mindful of the considerable down range hazard posed by the shaped charge jet. Typically fired and armed BK-18 projectiles will have some form of impact damage on the probe.

155MM HE OE 155 F1

Image © US DoD

ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	8800g COMP B or TNT
AUW (g)	42200g
DIMENSIONS (mm)	841x155
COUNTRY OF ORIGIN	France

The OE 155 F1 is a standard 155mm high explosive artillery projectile. It can be used with both NATO standard 155mm/39 calibre and 155mm/52 calibre ordnance. It has been supplied for use by the CEASAR 155mm/52-calibre self-propelled howitzer. The round may employ a Base Bleed Unit containing low explosive for extended range or a hollow base.

The 2" fuze thread can accept a range of NATO compliant fuzes. With the fuze attached the round is 841mm long, without 768mm.

152MM HE OF-29

Image © US DoD

ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	6420g A-IX-2
AUW (g)	46000g
DIMENSIONS (mm)	725x152
COUNTRY OF ORIGIN	Russia
FUZE	RGM-2

The OF-29 is a common Russian 152mm HE fragmentation artillery projectile and may be fired by all Russian in service 152mm howitzers, including the D1 and D-20 towed howitzers, and the 2S3 Akatsiya and 2S19 Msta self-propelled howitzers.

The shell body is made of steel and is conventional in design. The shell is typically fitted with RGM-2 or RGM-2M point detonating fuzes. This shell may optionally be fitted with the V-90 or AR-5 proximity fuzes.

The OF-29 designation, and the A-IX-2 explosive fill are marked on one side, the factory number, lot number and year of manufacture are marked on the other. Typically, A-IX-2 is marked on the ogive rather than next to the model designation. Distinctive recognition features are: the double driving band, the double bourrelets and the fuze adaptor with two tooling holes.

152MM 3-O-13 IMPROVED CONVENTIONAL MUNITION

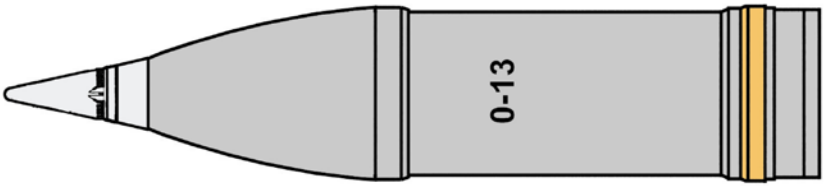


Image © US DoD

ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	1840g A-IX-2 (8 x 3-O-16 submunitions)
AUW (g)	41400g
DIMENSIONS (mm)	664x152
COUNTRY OF ORIGIN	Russia
FUZE	Mechanical Time

The 3-O-13 is a Russian 152mm improved conventional munition (ICM). The 3-O-13 is usually filled with eight 3-O-16 high explosive fragmentation submunitions (see separate entry on the 3-O-16). The projectile, which is of grey painted steel, has a single driving band and bourrelet, and is usually fitted with a mechanical time fuze which ignites a low explosive expulsion charge at the required point in the shell's trajectory. Submunitions are ejected through the base of the projectile. The 3-O-13 designation, and the A-IX-2 explosive fill of the submunitions are marked on one side, the factory number, lot number and year of manufacture are marked on the other.

Use of the 3-O-13 was confirmed in the Kharkhiv area in April 2022. The 3-O-13 satisfies the definition of a cluster munition under Article 2 of the Convention on Cluster Munitions.

If found complete after firing (i.e. with an engraved driving band), EOD operators should use a substantial donor charge to destroy the complete projectile and submunition contents. Use of an insufficient donor charge may result in armed submunitions being ejected from the demolition with obvious hazardous results.

152MM 3OF39 KRASNOPOL

Image © Military-Today.com

ORDNANCE SUB-CATEGORY	Guided Artillery Projectile
EXPLOSIVE FILL (g)	6400g A-IX-2
AUW (g)	58000g
DIMENSIONS (mm)	1305x152
COUNTRY OF ORIGIN	Russia

The 3OF39 is a 152mm laser guided artillery projectile that dates from the late 1980s. When combined with 54-ZhN-546 the whole round is designated the 3OF64. The actual projectile has the designation 3OF39.

The projectile is fitted with a nose mounted mechanical time fuze which allows the aerodynamic shroud protecting the laser seeker to be ejected at an appropriate point in the shell's trajectory. The projectile employs a laser seeker which detects the reflected laser energy from a target illuminated by an appropriately coded laser target designator. The projectile's guidance control unit generates corrective commands to the battery-operated fins which are located just forward of the warhead section. The tail fins provide stability for the projectile in flight. Power for all onboard electrical systems is provided by a thermal battery.

The HE/FRAG warhead is relatively large for a 152mm projectile, weighing 20.5kg, of which 6400g is A-IX-2. One recognition feature is the thin copper driving bank found behind the fins which deploy one fired from the barrel. The driving band will be scored on firing. Black markings are stencilled onto the olive-green body.

This round is also produced in a 155mm version, the Krasnopol-M. It has a slightly reduced NEQ of 6200g A-IX-2.

155MM HE LU 211 IM

Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	8800g EIDS XF 13 333
AUW (g)	43250g
DIMENSIONS (mm)	940x155
COUNTRY OF ORIGIN	France

The LU 211 is a 155mm high explosive artillery projectile. It can be used with both NATO standard 155mm/39 calibre and 155mm/52 calibre ordnance. It has been supplied for use by the CAESAR 155mm/52-calibre self-propelled howitzer. The shell may employ a base bleed unit containing low explosive for extended range (LU 211-IM-BB) or a hollow base (LU 211-IM-HB). The fuze thread of LU 211 is 2" and can accept a range of NATO compliant fuzes. With the fuze attached the round is 940mm long, without 867mm. The LU 211 may be filled with TNT or Composition B, although insensitive versions containing XF 13 333 have been identified on the ground. These will be marked MURAT which stands for Munition à Risques Atténués. XF® 13 333 (31% TNT, 48% NTO, 13.5% aluminium powder and 7.5% wax) is melt castable. EOD operators are advised to destroy this item by means of priming the fuze well if found as unfuzed AXO. If found as fuzed UXO, IM filled munitions should be destroyed with a large donor charge, in order to maximise detonation of the energetic contents. Painted olive drab LU 211s found as UXO often have the paint stripped and may show the steel underneath. With time, this will show signs of weathering. The model designation and the date of manufacture is typically stencilled just above the double copper driving band.

155MM HE OFD MKM

Image © MSM Group

ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	10000g TNT
AUW (g)	43550g
DIMENSIONS (mm)	829x155
COUNTRY OF ORIGIN	Slovakia

The OFd MKM is a 155mm high explosive artillery projectile. It can be used with both NATO standard 155mm/39 calibre and 155mm/52 calibre ordnance. The projectile has a boat tail base bleed unit containing low explosive for extended range or a hollow base. Typically, the round is supplied with KZ984 point detonating fuzes.

The 2" fuze thread can accept a range of NATO compliant fuzes.

155MM HE DM121

Image © Rheinmetall GmbH

ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	1100g COMP B/PBX RH26
AUW (g)	43500g
DIMENSIONS (mm)	841x155
COUNTRY OF ORIGIN	Germany

The DM1221 is the standard German 155mm high explosive artillery projectile. While supplied for use with the PzH 2000 self-propelled howitzer, it can be used with both NATO standard 155mm/39 calibre and 155mm/52 calibre ordnance. It has a hollow base. The round may employ a base bleed unit containing low explosive for extended range.

The 2" fuze thread can accept a range of NATO compliant fuzes.

155MM HE M107

Image © Private

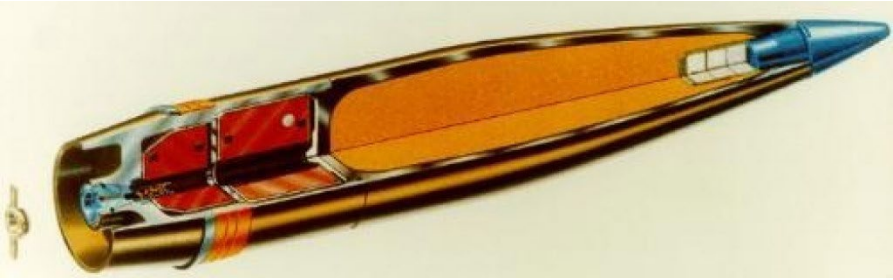
ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	5950g COMP B/TNT
AUW (g)	42600g
DIMENSIONS (mm)	858x155
COUNTRY OF ORIGIN	Slovakia
FUZE	KZ-984

The 155mm M107 High Explosive projectile is an old US design that has been copied by a Slovakian supplier. Of limited range with a smaller main charge than some other 155mm HE ammunition, the M107 is nevertheless compliant with NATO STANAGs and can be fired from NATO 155mm artillery pieces. The item tends to be fuzed with a Slovakian KZ-984 point detonating fuze. Slovak markings conform to NATO colour codes. The copper driving band swages on firing.

While the 2" fuze thread can accept a range of NATO compliant fuzes

Each pallet will contain eight M107 projectiles. The M107 is possibly the most prolific NATO standard 155mm artillery projectile ever produced.

155MM HERA M549



Images © US DoD

ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	10650g COMP B/TNT
AUW (g)	42600g
DIMENSIONS (mm)	858x155
COUNTRY OF ORIGIN	United States

The 155mm M549 High Explosive Rocket Assisted (HERA) projectile incorporates a solid propellant rocket motor that enables target to be engaged at enhanced ranges out to 30km. The warhead joint with the rocket motor section is visible forward of the driving band. These projectiles may be used with M777 howitzers, M109 self-propelled howitzers and other NATO compliant 155mm ordnance. The 2" fuze thread can accept a range of NATO compliant fuzes such as the M557 and M739. The M549 can also be fuzed with Precision Guided Munition (PGM) kits. While technically this item of explosive ordnance is a projectile fired from a gun barrel, some may designate it a form of rocket due to the integral propulsion.

155MM HE M795

Images © US DoD

ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	10940g COMP B/IMX-101
AUW (g)	47060g
DIMENSIONS (mm)	748x155
COUNTRY OF ORIGIN	United States

The 155mm M795 High Explosive is the projectile that replaced the M107 in US service from the 1990s. The gilding metal (copper/zinc) driving band enables use of improved propelling charges than the M107, and consequent enhanced range. Older versions of the M795 use a TNT filling, versions manufactured in the last decade tend to employ an IMX-101. To date TNT versions have been identified in Ukraine. The M795 is typically employed with M777 howitzers although it is compatible with NATO 155mm artillery in accordance with STANAG-4425. It is typically employed with M739A1 point detonating fuzes or M782 Multi Option fuzes. If versions with the IMX-101 filling are found, EOD operators are advised to place donor charges in fuze wells if found unfired or unfuzed. If found as UXO, a large donor charge is advised.

122 MM 3SH1

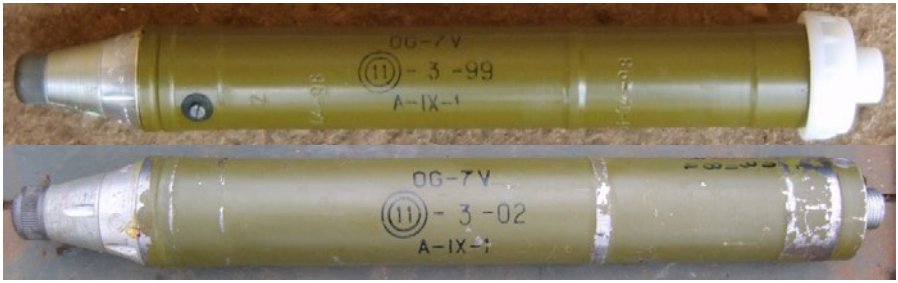
Images © Roly Evans

ORDNANCE SUB-CATEGORY	Artillery Projectile
EXPLOSIVE FILL (g)	Small black powder charge
AUW (g)	22340g
DIMENSIONS (mm)	122x480 (without fuze)
COUNTRY OF ORIGIN	Russia
FUZE	DTM-75

The 3Sh1 (3Ш1) is a 122mm carrier projectile with a flechette payload that dates from the 1970s. Each flechette is made of steel. The projectile body and packaging is often simply marked Sh1. The projectile is designed to function in the air at a time determined by the setting of the DTM-75 time fuze. The flame produced by the functioning of the nose fuze is transmitted via a central tube to a black powder charge in the base of the shell. This charge operates against a pusher plate and the weak joint at the front of the shell. Flechettes are ejected at high velocity. Typically the 3Sh1 is employed by D-30 122mm howitzers but is can also be used by other 122mm artillery, such as the 2S1 Gvozdika self-propelled gun. Ideally, these items should not be destroyed using high-order detonation techniques. If found as UXO, fuze removal prior to transportation and specialised disposal is recommended.

ROCKETS AND RECOILLESS AMMUNITION

OG-7V



Bulgarian OG-7. Images © Roly Evans

ORDNANCE SUB-CATEGORY	Recoilless Blast FRAG
EXPLOSIVE FILL (g)	210g A-IX-1
AUW (g)	1760g
DIMENSIONS (mm)	593x40
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	O-4M

The OG-7 is a blast fragmentation rocket propelled grenade which is fired from the RPG-7 range of 40mm calibre launchers. O stands for Oskolochnymi and indicates the use of fragmentation around the warhead. Its only form of propulsion is the standard expulsion charge used with the range of RPG ammunition. There is no sustain rocket motor section as is found with other RPG anti-tank ammunition thus the muzzle velocity is only that imparted by the expulsion charge, and hence is lower than other RPG rounds. The effective range is also less (280m), although some claim a range out to 1000m.

The 04-M fuze utilizes a simplified version of the standard Soviet setback sleeve design. It is important to note that there is no masking device such as a shutter in the fuze. The primer is in line with the striker, no bore safety is present.

A black metal cap is removed from the fuze before firing. The absence of this cap and any impact damage, along with a burnt-out expulsion charge, are the likely indicators of an armed item. Items found with a white or black plastic transit cap over the flash channel to the expulsion charge are likely to be abandoned explosive ordnance (AXO). An expulsion charge bare of any propellant does not necessarily mean an armed item, since abandoned OG-7s that have nevertheless been prepared for firing will still see the rapid weathering of the expulsion charge cardboard casing and propellant.

PG-7M

Bulgarian PG-7M. Image © Roly Evans

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	320g A-IX-1 / 420g propellant
AUW (g)	1500g
DIMENSIONS (mm)	675x71
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	VP-7M

The PG-7M is a HEAT rocket propelled grenade which is fired from the RPG-7 range of 40mm calibre launchers. The PG-7M functions in a similar way as other PG-7 type rounds. The round is propelled from the launcher by an expulsion charge which is screwed onto the rear of the sustain rocket motor. The sustain motor ignites a safe distance in front of the firer and provides the thrust to take the warhead to its maximum range. The round is fin stabilised and the fins are surrounded by the expulsion charge propellant, which is protected by a waxed cardboard tube. The warhead is fitted with a point-initiating base detonating (PIBD) fuze which also contains a pyrotechnic based self-destruct mechanism which causes the warhead to function at a maximum range of approximately 950 metres.

The PG-7M differs from the PG-7V not only in shape but also in the plastic liner used in the windshield of the warhead in order to minimise short circuit blinds due to the round glancing off an object before the piezo fuze can impact the target.

The PG-7M is still in production. It can easily be mistaken for the PG-7VS, which looks externally almost identical but has a 72mm warhead diameter and different markings: PG-7VS (ПГ-7ВС). Notably the PG-7VS uses OKFOL rather than A-IX-1. Some sources suggest that more recent versions use a VP-22 fuze.

Indicators of a potentially armed fuze include the seals covering the sustain motor venturis being blown, and an indentation on the percussion primer at the motor end of the device. Fired PG-7M rounds which have failed to function should be destroyed in situ and consideration should be given to reducing the hazard posed by the shaped charge warhead.

PG-7V

Bulgarian PG-7V. Images © Roly Evans

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	390g A-IX-1 / 420g propellant
AUW (g)	1750g
DIMENSIONS (mm)	646x85
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	VP-7M

The PG-7V is a HEAT rocket propelled grenade which is fired from the RPG-7 range of 40mm calibre launchers. It is probably the most common PG-7 variant. Protivtankovya' (Противтанковая) literally translates as anti-tank, Granata (Граната) translates as grenade. The round is propelled from the launcher by an expulsion charge which is screwed onto the rear of the sustain rocket motor. The sustain motor ignites a safe distance in front of the firer and provides the thrust to take the warhead to its maximum range. The round is fin stabilised and the fins are surrounded by the expulsion charge propellant, which is protected by a waxed cardboard tube. The round is fitted with a point initiating base detonating (PIBD) VP-7 fuze. The shaped charge has a copper liner. There is also pyrotechnic delay self-destruct detonator initiated by a set-back igniter within the VP-7. This should function after 4.8 to 5 seconds (approximately 950m of flight) although failure is common.

The flash channel from the primer to the expulsion charge should also be void, although sometimes this cannot be seen if the expulsion charge aluminium frame is still attached. Blind rounds are usually found with the expended expulsion charge aluminium tail attached and will usually have impact damage on the external surfaces of the warhead body. Such damage can lead to a short circuit between the piezo and the VP-7 fuze at the base of the shaped charge. Indicators of a potentially armed fuze include the seals covering the sustain motor venturis being blown, and an indentation on the percussion primer at the motor end of the device. Fired PG-7V rounds which have failed to function should be destroyed in situ and consideration should be given to reducing the hazard posed by the shaped charge warhead.

PG-7VL

Russian PG-7VL. Image © Roly Evans

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	1030g OKFOL / 420g propellant
AUW (g)	2600g
DIMENSIONS (mm)	93x40
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	VP-22

The PG-7VL is a HEAT rocket propelled grenade which is fired from the RPG-7 range of 40mm calibre launchers. This is an improved HEAT grenade/rocket that saw service from the late 1970s onwards. The fuzing system is the same as other PG-7 rounds, however the shaped charge is noticeably bigger (93mm diameter). The large (HMX-based) 1kg Okfol shaped charge gives superior armour penetrating performance than earlier PG-7 designs. L stands for Luch, a codename for the development project of this enhanced round. Due to the round being almost 1kg heavier than many other PG-7 rounds, the unchanged motor section consequently produces a lower muzzle velocity. the effective range of this round is only 300m. The round is propelled from the launcher by an expulsion charge which is screwed onto the rear of the sustain rocket motor. The sustain motor ignites a safe distance in front of the firer and provides the thrust to take the warhead to its maximum range. The round is fin stabilised and the fins are surrounded by the expulsion charge propellant, which is protected by a waxed cardboard tube. The round is fitted with a point initiating base detonating (PIBD) VP-7 fuze. Some sources suggest that more recent versions use a VP-22 fuze. The indicators for a fired and potentially armed device are the same as with other PG-7 designs. The windshield will most likely be damaged. The expulsion charge will be burnt out leaving only an aluminium frame. There will be an indention on the primer. The venturi seals will not be present and there will be indications of combustion. Like the PG-7M, the PG-7VL has a line in the nose to reduce the potential for short circuit if the round grazes an object. The VP-22 fuzing is very similar to other standard PG-7 rounds and incorporates a Vp-7 type fuze armed by setback that incorporates a timed pyrotechnic self-destruct mechanism. A piezo fuze in the nose enables impact initiation with stand-off if the item is undamaged. Fired PG-7VL rounds which have failed to function should be destroyed in situ and consideration should be given to reducing the hazard posed by the shaped charge warhead.

PG-7R

Image © Sean Moorhouse.

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	1590g OKFOL / 420g propellant
AUW (g)	3630g
DIMENSIONS (mm)	1230x105 (with expulsion charge)
COUNTRY OF ORIGIN	Russia
FUZE	V-728 base fuze/ K-728 precursor fuze

The PG-7R is a HEAT rocket propelled grenade which is fired from the RPG-7 range of 40mm calibre launchers. The R suffix in PG-7R stands for Rezyume which literally translates as 'Summary'.

The warhead contains a tandem shaped charge which is designed to defeat explosive reactive armour. The PG-7R is essentially the same warhead employed with the PG-27 and PG-29, but adapted for the RPG-7 40mm calibre launcher. The round is propelled from the launcher by an expulsion charge which is screwed onto the rear of the sustain rocket motor. The sustain motor ignites a safe distance in front of the firer and provides the thrust to take the warhead to its maximum range. The round is fin stabilised and the fins are surrounded by the expulsion charge propellant, which is protected by a waxed cardboard tube. The precursor (front) charge is fitted with the K-728 fuze and the main (rear) charge is fitted with the V-728 fuze. Both fuzes arm by setback on firing.

A very similar PG-7VR version exists which is 30mm longer, has the same diameter warhead (105mm) although contains a larger 1740g OKFOL explosive charge.

Fired PG-7R rounds which have failed to function should be destroyed in situ and consideration should be given to reducing the hazard posed by the shaped charge warheads. The precursor charge may break off during impact with hard targets and may need to be disposed of separately.

TG-73

Image © Sean Moorhouse.

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	A-IX-1
AUW (g)	NK
DIMENSIONS (mm)	73
COUNTRY OF ORIGIN	Bulgaria
FUZE	NK

The TG-73 is a round launched by the disposable DRTG-73 launcher. Its components are made by VMZ Sopot and Arsenal in Bulgaria.

Little is known about the round. It is fin stabilised. It does have a tandem warhead. The precursor charge employs A-IX-1. It is not known whether the main charge uses an RDX or HMX based explosive.

As with most Bulgarian munitions factory markings are clearly stencilled in black on both the rocket and the launch tube.

Rounds identified in Ukraine often show manufacturing markings from 2012 and 2014.

TBG-7L

Image © Sean Moorhouse.

ORDNANCE SUB-CATEGORY	Recoilless THERMOBARIC
EXPLOSIVE FILL (g)	NK
AUW (g)	NK
DIMENSIONS (mm)	93 diameter
COUNTRY OF ORIGIN	Russia
FUZE	NK

The TBG-7L is a thermobaric rocket propelled grenade which is fired from the RPG-7 range of 40mm calibre launchers. It is designed to target individuals in enclosed spaces.

PG-15

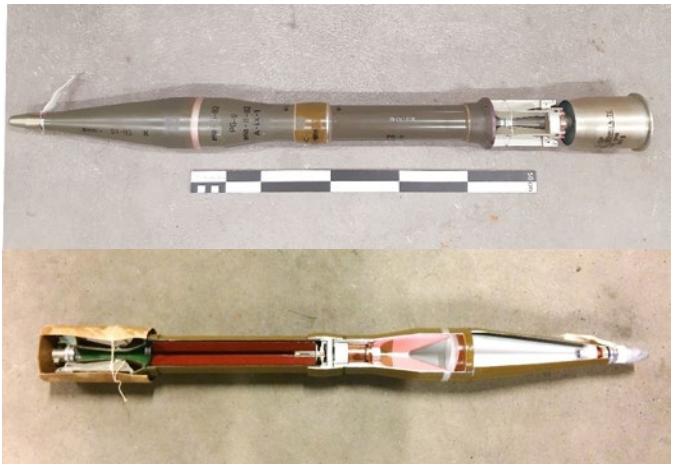


Image Top © Swiss EOD Center. Image Bottom © Danish EOD and Search Center.

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	320g A-IX-1
AUW (g)	3470g
DIMENSIONS (mm)	878x82
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	VP-15

The PG-15 is used in the 73mm 2A28 Grom smoothbore gun found on BMP-1 and BMD-1 armoured vehicles. The PG-15 is similar to the PG-9 but with a different expulsion charge attachment. The easiest way of distinguishing between the two is the size of the expulsion cartridge. The metal encased cartridge for the PG-15 is smaller. The marking on the warhead will often read PG-9 in any case.

The essential functioning of the PG-15 is very similar to that of a PG-7V. The VP-9 fuze is almost identical to a VP-7. Versions with an N suffix tend to use OKFOL rather than A-IX-1.

Fired PG-15 rounds which have failed to function should be destroyed in situ and consideration should be given to reducing the hazard posed by the shaped charge warheads. PG-15 rounds which have been involved in vehicle or ammunition store fires and explosions may become armed during projection and should be destroyed in situ.

OG-15

Image © VMZ Sopot. Image © Dutch EOD Center.

ORDNANCE SUB-CATEGORY	Recoilless Blast Frag
EXPLOSIVE FILL (g)	660g TD-50
AUW (g)	4600g
DIMENSIONS (mm)	828x82
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	GO-2 or O-4M

The OG-15 is used in the 73mm 2A28 Grom smoothbore gun found on BMP-1 and BMD-1 armoured vehicles. The OG-15 is similar to the OG-9 but with a modified expulsion charge attachment. The easiest way of distinguishing between the two is the size of the expulsion cartridge. The metal encased cartridge for the OG-15 is smaller. The explosive used is of a lower quality than that employed in its sister shaped charge munition. Older versions might use TNT, newer versions might use TD-50 which is a 50/50 mix of TNT and RDX. These rounds are fuzed with either a GO-2 or 0-4M. Both types of fuze have in line detonators and cannot be deemed bore safe.

Fired OG-15 rounds which have failed to function should be destroyed in situ. OG-15 rounds which have been involved in vehicle or ammunition store fires and explosions may become armed during projection and should be destroyed in situ.

PG-18

Image © Swiss EOD Center

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	400g OKFOL
AUW (g)	2600g (launcher) 1400g (rocket)
DIMENSIONS (mm)	705x64
COUNTRY OF ORIGIN	Russia/Bulgaria/East Germany
FUZE	VP-18

The RPG-18 is a single-shot disposable rocket launcher and is similar to the US 66mm M72 LAW. The actual PG-18 round, outside of the launch tube, looks similar to a PG-9/PG-15, but is over 100mm shorter in length, with a smaller calibre warhead (64mm). It dates from the early 1970s. The lightweight single shot launcher is different from earlier RPG versions that were designed for a reusable launcher. The weapon is intended for use at short range (up to 200m). The VP-18 fuze works broadly in a similar way to the earlier VP fuzes, with a piezo electric point initiating base detonating (PIBD) fuze that incorporates a self-destruct mechanism. The 400g HMX-based OKFOL shaped charge warhead is relatively small compared with more modern single shot rocket launchers. The PG-18 was surpassed by the PG-22 and PG-26 by the 1980s. Old East German versions of the PG-18 have been supplied to Ukraine. The Mukha (myxa) designation translates as 'fly'. While PG-18s in an un-extended launcher may be deemed unarmed, caution is advised given potential booby trapping of these items. Fired PG-18 rounds which have failed to function should be destroyed in situ and consideration should be given to reducing the hazard posed by the shaped charge warhead.

PG-22

Images © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	450g OKFOL
AUW (g)	2700g (launcher) 1480g (rocket)
DIMENSIONS (mm)	755x72.5
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	VP-22

The PG-22 is a second-generation single-shot disposable anti-armour rocket. It contains a slightly larger HMX based shaped charge (450g OKFOL) than its predecessor, the PG-18. It was manufactured until the early 1990s in Russia and is still produced in Bulgaria.

The PG-22 has a truncated motor section compared with its predecessor and consistent with this has a relatively short range (150m). The VP-22 fuze is point initiating base detonating (PIBD) with a self-destruct mechanism. A distinct bulge on the motor section is one way to tell the difference with the PG-26 warhead, another is subtle differences in the shape of the warhead itself. Even on fired rounds markings are usually discernible for identification. If found in the launcher, the PG-22 has an extendable launch tube, the PG-26 does not.

PG-26

Images © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	570g OKFOL
AUW (g)	2900g (launcher) 1480g (rocket)
DIMENSIONS (mm)	770x72.5
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	VP-26

The PG-26 is a second-generation single-shot disposable anti-armour rocket. It has a rigid non-telescoping launch tube and contains a larger shaped charge (570g OKFOL) than its predecessor, the PG-22. The maximum effective range of the rocket is 250m. The round is sometimes referred to as "Aglen". A variant with a thermobaric warhead, the RShG-2, is in circulation. The RShG-2 has a cylindrical warhead configuration.

PG-27

Images © Private

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	1790g HMX
AUW (g)	8300g
DIMENSIONS (mm)	1135x105
COUNTRY OF ORIGIN	Russia
FUZE	V-728 base fuze/ K-728 precursor fuze

The PG-27 is a second-generation single-shot disposable anti-armour rocket and is sometimes referred to as Tavolga ('meadow grass'). It has an effective range of 200m. The warhead contains a tandem shaped charge which is designed to defeat explosive reactive armour. The PG-27 has a significantly larger warhead than its predecessor the PG-26. (1790g of OKFOL vs 570g).

A variant with a thermobaric warhead, the RShG-1, been developed. The RShG-1 (Реактивная ШтурмоваяГраната, Reaktivnaya Shturmovaya Granata), has a single bulbous thermobaric warhead. Another variant, the RMG, has a tandem warhead which employs a HEAT precursor charge and a thermobaric main charge.

Fired PG-27 rounds which have failed to function should be destroyed in situ and consideration should be given to reducing the hazard posed by any shaped charge warheads. For variants with tandem warheads, precursor charges may need to be disposed of separately.

PG-29

Image Public Domain US Government. Image © Private.

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	2330g HMX
AUW (g)	6700g
DIMENSIONS (mm)	1097x105
COUNTRY OF ORIGIN	Russia
FUZE	V-728 base fuze/ K-728 precursor fuze

The PG-29 is a reloadable recoilless anti-tank rocket system and has an effective range of 500m. The warhead contains a tandem shaped charge which is designed to defeat explosive reactive armour. The V-728 base fuze is used for initiation of the main charge, a separate K-728 fuze is used for the precursor charge. Both fuzes arm by setback. PG-29V may be identified by its GRAU index code - 7P29 (7П29). The PG-29 is sometimes referred to as a Vampir (Вампир) launcher. The PG-29 round outside of the launcher is easy to mistake for the PG-7VR since they effectively have the same warhead design. The motor section is different however and is the easiest way of telling the difference. The launch tube is made from reinforced fibreglass. Fired PG-7R rounds which have failed to function should be destroyed in situ and consideration should be given to reducing the hazard posed by the shaped charge warheads. The precursor charge may break off during impact with hard targets and may need to be disposed of separately.

RPG-76 KOMAR

Image © Defence Express

ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	320g A-IX-1
AUW (g)	2100g
DIMENSIONS (mm)	1190x68 (extended)
COUNTRY OF ORIGIN	Poland
FUZE	NK

The RPG-78 is a lightweight disposable HEAT rocket that dates from the 1980s. It is not compatible with 40mm RPG launchers. It has also been termed a "rocket assisted rifle grenade". While a HEAT round it is only effective against lightly armoured vehicles or as a means of targeting bunkers.

The fuzing is different from that employed with other PG-7 variants. The base detonating fuze arms by setback. There is no piezo employed. It is assumed that the fuze contains a slider type masking device that is released by burning a pyrotechnic pellet. It is also assumed that once the slider moves the primer in line the fuze functions by an impact inertia mechanism.

Komar literally translates as 'mosquito'.

RPO-A

Image © NAVEODTECHDIV

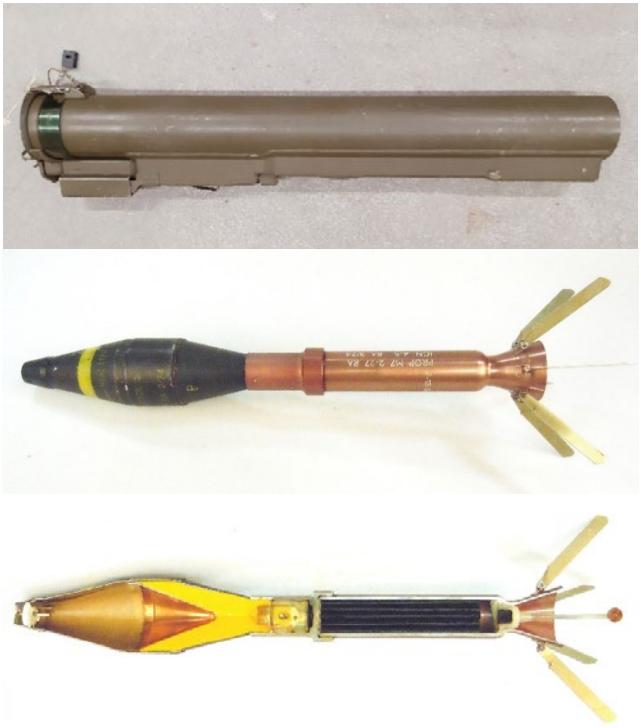
ORDNANCE SUB-CATEGORY	Recoilless Thermobaric
EXPLOSIVE FILL (g)	2100g thermobaric filler
AUW (g)	22000g
DIMENSIONS (mm)	920 x93
COUNTRY OF ORIGIN	Russia
FUZE	NK

The RPO-A (Reaktivnyy Pekhotnyy Ognemet) a shoulder launched thermobaric rocket, designed for use against combatants in enclosed spaces. Reaktivnyy Pekhotnyy Ognemet literally translates as Reactive Infantry Flamethrower and for this reason the weapon is sometimes categorised as a flamethrower rather than a rocket or recoilless projectile. As with PG-7 rounds the rocket has a two-stage propulsion system. An expulsion charge enables the firer to be separated from the efflux of the sustainer rocket motor. The metal expulsion charge is often found at a firing point. The RPO-A has an effective range of up to 200m.

The launch tube is made from reinforced fibreglass. The warhead contains a low explosive burster charger. The thermobaric charge uses atmospheric oxygen to create a high-impulse blast wave which is particularly effective in urban areas. The round itself is metallic silver and is unpainted, unlike the expulsion charge which is painted green with black stripes.

The RPO-A is often referred to as the 'Shmel' but more accurately Shmel refers to a wider family of recoilless shoulder launched weapons. A Ukrainian version of the RPO-A called the RPV-16 has been in production since 2016.

M72 LAW



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ORDNANCE SUB-CATEGORY	Recoilless HEAT
EXPLOSIVE FILL (g)	315g OCTOL
AUW (g)	3450g
DIMENSIONS (mm)	981x66 (extended)
COUNTRY OF origin	USA
FUZE	M412A1

The M72 LAW comes in a series of versions. It is believed only later versions with larger rocket motors and eight fins have been supplied to Ukraine. The explosive fill is OCTOL (HMX 70% / TNT 30%), the motor sections uses double based propellant. A rotor provides bore safety for up to 20m after launch. The M412A1 fuze is impact and graze base detonating. It arms by setback. The M72 launch tube can be mistaken for an RPG-18 or RPG-22. M72A5 versions have been seen in Ukraine.

RGW 90 HH

RGW 90 HH. Images © Dynamit Nobel Defence GmbH. Image Right © Belgian EOD

ORDNANCE SUB-CATEGORY	Recoilless HEAT/HESH
EXPLOSIVE FILL (g)	NK
AUW (g)	8900g
DIMENSIONS (mm)	1000x90
COUNTRY OF ORIGIN	Germany/Israel/Singapore
FUZE	NK

RGW stands for Rückstoßfreie Granatwaffe 90 which literally translates as 'recoilless grenade launcher 90 HEAT/HESH'. The RGW 90 allows selection of both HEAT and HESH warhead effects. When in HEAT mode the munition has a distinctive standoff probe protruding from the front. The probe is retracted when in HESH mode. This weapon is preferred for use in built up areas since its Davis counter-mass systems enables firing from within enclosed spaces. This system expels shredded plastic from the rear of the weapon. This shredded plastic can be evidence for survey and EOR personnel that this weapon system has been used. The RGW 90 has also been marketed as the Panzerfaust-90. Version made under license in Israel and Singapore are sometimes referred to as the MATADOR.

PANZERFAUST 3

Images © Dutch EOD Center

ORDNANCE SUB-CATEGORY	Recoilless HEAT/HESH
EXPLOSIVE FILL (g)	RDX or HMX
AUW (g)	NK
DIMENSIONS (mm)	NK
COUNTRY OF ORIGIN	Germany
FUZE	NK

The Panzerfaust 3 is a man portable recoilless rocket system that dates from the 1980s. The basic rocket motor design has remained broadly similar consistent since then, although new warheads have been developed. The launcher can fire a variety of rocket types with a 60mm diameter motor. Like the RGW 90 HH, the DM-12, DM-32 and DM-72 have a retractable standoff probes. When the probe is not extended all three variations act in a HESH role. The DM-72 has a tandem warhead with a small precursor charge in the extended probe – EOD operators should be careful to destroy this as well as the main warhead. The DM-12 has an RDX based charge whereas the DM-32 and DM-72 use a form of desensitized HMX. These rockets are HCC 1.1E in storage.

AT-4

Images © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Recoilless HEAT/HESH
EXPLOSIVE FILL (g)	830g HMX/TNT
AUW (g)	6800g
DIMENSIONS (mm)	1016x84
COUNTRY OF ORIGIN	Sweden
FUZE	NK

The AT-4 is a disposable recoilless anti-tank rocket. In flight the rocket is fin stabilized. The launch tube is made from reinforced fibreglass. A safety pin is removed by the firer prior to launch. The safety pin is found near the rear of the launch tube. It acts as a holding device on the spring-loaded firing rod that runs down the exterior of the main tube. The safety pin is usually marked with clear white letters. It is possible to see from one end to another in a discarded launcher.

Depending on categorization preference the item can be deemed a recoilless projectile or rocket. There exists a AT4 CS (Confined Space) version for fighting from enclosed positions. Instead of plastic shreds for the countermass, in this version an aerosol of salt water is used.

S-5 KO ROCKET

Images © Dutch EOD Center

ORDNANCE SUB-CATEGORY	HE/FRAG - HEAT
EXPLOSIVE FILL (g)	330g A-IX-1
AUW (g)	4500g
DIMENSIONS (mm)	1004x57
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	V-5K

The 57mm diameter S-5 rockets are designed to be fired from a wide variety of rocket pods from Russian fixed wing ground attack aircraft and armed helicopters. In Ukraine the S-5 has been seen commonly on Su-25 Frogfoot ground attack aircraft, Mil-Mi-24/35 attack helicopters, and the Ka-52 attack helicopter. The S-5 KO is a surface to ground HEAT rocket with a dual-purpose fragmentation jacket visible in the texture of the casing. The warhead utilizes a relatively simple impact fuze based on the standard setback sleeve/ creep spring configuration, designated a V-5K. The design is very similar to the GK-1 fuze used on recoilless ammunition. The fuze arms by setback. As with the 04-M the fuze does not contain a slider. This means the detonator is in line at the point of launch and is therefore not "bore-safe". EOD staff are advised to take extra precautions even for items that are assessed as AXO. If found in a rocket pod such as the UB-16-57U (УБ-16-57) earthing procedures should be observed. KO stands for Kumulyativno-Oskolochnymi - Kumulyativno (cumulative) indicates the presence of a shaped charge in Russian munitions. Oskolochnymi indicates the use of fragmentation around the warhead. For this reason KO is a designation of a dual purpose warhead. Given the sensitivity and limited safety features of the V-5K rocket fuze, S-5 rockets found in rocket pods attached to downed aircraft should be assumed to be armed and handled carefully.

S-8 KO ROCKET

Image © Roly Evans

ORDNANCE SUB-CATEGORY	HE/FRAG - HEAT
EXPLOSIVE FILL (g)	4120g A-IX-10
AUW (g)	11300g
DIMENSIONS (mm)	1570x80
COUNTRY OF ORIGIN	Russia/Bulgaria
FUZE	V-5KP1

The 80mm diameter S-8 rockets are designed to be fired from a wide variety of rocket pods from Russian fixed wing ground attack aircraft and armed helicopters. This tactic is also likely to increase significantly the spread of rockets within the target area.

The S-8 KO is a surface to ground HEAT rocket with a dual-purpose fragmentation jacket visible in the texture of the casing. The warhead utilizes a V-5KP1 fuze that is similar in function to VP-7 type fuzes used on RPG rounds. Piezo precautions should be observed.

The S-8 KO can be carried in 3 launchers. The B8V20 and the B8M pods both carry 20 rockets and the B8S7 only carries 7 rockets.

KO stands for Kumulyativno-Oskolochnymi - Kumulyativno (cumulative) indicates the presence of a shaped charge in Russian munitions. Oskolochnymi indicates the use of fragmentation around the warhead. For this reason KO is a designation of a dual-purpose warhead.

Given the sensitivity and limited safety features of the V-5K rocket fuze, S-8 rockets found in rocket pods attached to downed aircraft should be assumed to be armed and handled carefully.

122MM 9M22 GRAD ROCKET

Image © SESU

ORDNANCE SUB-CATEGORY	HE/FRAG
EXPLOSIVE FILL (g)	6400g A-IX-2
AUW (g)	66000g
DIMENSIONS (mm)	2729x122
COUNTRY OF ORIGIN	Russia/Bulgaria/Poland/Romania/Serbia
FUZE	MRV

The 9M22 series of rockets is perhaps one of the most common artillery rockets in history. Grad refers to the 122mm rocket launcher but has become a label for the rockets themselves.

The warhead is initiated by a simple MRV impact fuze. This fuze is widely copied by a number of countries. The fuze makes use of the standard setback sleeve and creep spring layout, with a slider acting as a masking device.

The 9M22U (У) is an improved version - 'Uluchshennyy' (Улучшенный).

A typical BM-21 launcher contains 40 rockets in four rows of ten. Not every salvo will use all 40 launch tubes however. The launcher can direct fire at targets 5-20km away. These rockets are rarely launched singularly. The reliability of the MRV fuze is not high and unexploded ordnance is common.

220MM 9M27 URAGAN ROCKETS

Images © SESU

ORDNANCE SUB-CATEGORY	Payload dependent
EXPLOSIVE FILL (g)	Payload dependent (51.9kg HE unitary)
AUW (g)	2800g (9M27F)
DIMENSIONS (mm)	4833x220
COUNTRY OF ORIGIN	Russia
FUZE	Payload dependent

The 9M27 rocket series is launched by the 9K57 Uragan MLRS. The system is also referred to as the BM-27. The 9M27 series of rockets is used in a variety of roles. Uragan literally translates as "hurricane" and the rocket is sometimes referred to as hurricane by the media. When used as a carrier the 9M27 can be designated as a cluster munition. The 9M27K1 with a 9N128K warhead can carry 30 9N210 or 9N235 explosive submunitions. The rocket can also be used to deliver scatterable mines and sensor fuzed sub munitions. The 9M27K2 carries 24 PTM-1 AV mines, the 9M27K3 carries 312 AP mines and the 9M59 carries 9 PTM-3 AV mines. HE/FRAG warheads have a typical NEQ of 51.7kg (9M27F), a large HE charge for any sort of artillery munition. Fuzing the 9M27 series often replicates that used for the 122mm GRAD rockets. Point impact MRV fuzes can be used for HE/FRAG warheads (e.g. 9M27F). For carrier versions sometimes simple mechanical time fuzes such as the TM-120 are used. When used with carrier munition warheads (for submunitions or scatterable mines) the expulsion charge is initiated at a specific point in the rocket's trajectory to scatter the munitions over the required target area. The rear rocket motor section will continue on a ballistic trajectory and is often embedded in the ground beyond the strike location. First responders and EOD teams may not be able to identify the precise payload until the remnants of the rocket have been extracted from the ground. EOD Operators should actively seek corroborating evidence to try to discern the nature of the warhead; for example submunition fragmentation. The tail sections of the 220mm 9M27 and 300mm 9M55 rocket series are similar in configuration, the key distinction is the diameter and rear fin slot shape.

300MM 9M55 SMERCH ROCKETS

Image © Private

ORDNANCE SUB-CATEGORY	Payload dependent
EXPLOSIVE FILL (g)	Payload dependent (70kg HE unitary warhead)
AUW (g)	800 kg
DIMENSIONS (mm)	7600x300
COUNTRY OF ORIGIN	Russia
FUZE	Payload dependent

The 9M55 rocket series is launched by the 300 mm 9K58 Smerch MLRS. The launch platform is also sometimes referred to as the BM-30. The 9M55 series of rockets is used in a variety of roles. SMERCH literally translates as "tornado" or "whirlwind" and the rocket is sometimes referred to as such in the media. A Smerch MLRS contains 12 rockets. There are 25 known models with different warheads, of which 19 are believed to be carrier munitions of some sort. All rocket types are fin-stabilised and employ a solid propellant rocket motor. The other warheads are either HE/FRAG or thermobaric in nature. Particular warheads of note include the 9M55K that carries 72 x 9N235 submunitions. The 9M55K4 carries 25 s PTM-3 AV mines. There are three different rocket motor sizes that enable different maximum ranges (70, 90 and 120km).

There are different views as to whether the 9M55 series can be described as missiles or guided weapons although since there is no specific guidance section incorporated within the munition.

The tail sections of the 9M27 and 9M55 rocket series look similar, the key distinction is the diameter and the rear fin slot size. The tail sections will often impact with a high degree of force and can easily penetrate road surfaces or buildings. Corroborating evidence to try to confirm the warhead identity and state should be sought prior to any remote movement of buried motor sections.

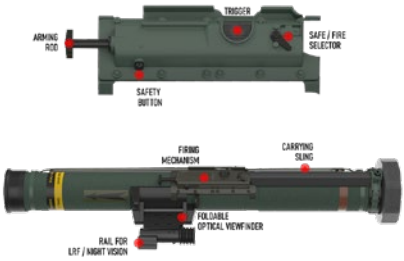
BULLSPIKE PG-22

Image © VMZ Sopot

ORDNANCE SUB-CATEGORY	Recoilless Projectile
EXPLOSIVE FILL (g)	450g OKFOL
AUW (g)	3480g (PG-22)
DIMENSIONS (mm)	774x73
COUNTRY OF ORIGIN	Bulgaria

The BULLSPIKE is an updated version of the RPG-22 disposable rocket launcher. The major difference is that once the launch tube is extended and made ready for use, it can be collapsed again. This is not possible with the original RPG-22. The launch tube for the BULLSPIKE is easily identifiable and distinguishable from standard RPG-22 launch tubes. The rocket projectile is a PG-22 with a HEAT warhead and has VMZ Sopot markings. The launcher is delivered in boxes of five, with each rocket launcher hermetically sealed in transparent plastic.

C90-CR-AM (M3)



Images © Instalaza

ORDNANCE SUB-CATEGORY	Recoilless Projectile
EXPLOSIVE FILL (g)	Warhead dependent
AUW (g)	5200g
DIMENSIONS (mm)	774x90
COUNTRY OF ORIGIN	Spain

The C-90 is a lightweight disposable rocket launcher that dates from the early 1980s. A range of versions with different warheads are produced. These include anti-armour (C90-CR-RB), dual purpose HEAT and anti-personnel (C90-CR-AM), smoke and incendiary (C90-CR-FIM) and anti-fortification (C90-CR-BK).

The C90-CR-AM (M3) is a dual-purpose warhead, with not only a shaped charge to penetrate armour (or concrete) but a fragmentation jacket to target personnel.

The dual-purpose anti-armour and fragmentation warhead is designated by the twin yellow and black circumferential hazard bands marked near the muzzle of the launcher. The rear of the launcher is marked with a brown circumferential hazard band indicating low explosive propellant.

M80 ZOLJA 64MM

Images © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Recoilless Projectile
EXPLOSIVE FILL (g)	300g
AUW (g)	3000g
DIMENSIONS (mm)	800x64 (1200x64mm extended)
COUNTRY OF ORIGIN	Former Yugoslavia

The M-80 is a lightweight disposable recoilless HEAT rocket launcher. It has similarities to RPG-18. The UT PE M80 SP fuze is based on a piezo electric crystal but also has a powder time self-destruct function.

PG-7L

Images © SESU

ORDNANCE SUB-CATEGORY	Rocket/Recoilless
EXPLOSIVE FILL (g)	890g OKFOL/420g propellant
AUW (g)	1500g
DIMENSIONS (mm)	680x93
COUNTRY OF ORIGIN	Russia

The PG-7L is a Russian recoilless rocket/projectile that dates from the late 1970s. The larger shaped charge contains 890g of OKFOL, a phlegmatized version of HMX. The round represents a significant upgrade in penetration capability from its predecessor the PG-7M. The weight of explosive charge is roughly double that of the PG-7M and the explosive used is more powerful in that it creates a higher detonation pressure. The VP-22 fuze also represents an upgrade from the VP-7M. The PG-7L was soon superseded by the PG-7VL (1030g OKFOL) and then progressively by tandem shaped charge warheads. Nevertheless the PG-7L is still in widespread use in Ukraine. As with other VP fuzes, the absence of the VP-16GCh piezo nose fuze element does not mean it is acceptable to move the item. Like the VP-7M, the VP-22 has a self-destruct element. The PG-7L (ПГ-7Л) is marked with black stencilling on the motor section and fuze body. The factory code, lot number and year of manufacture are also marked as per the Russian standard.

OG-9V

Image © VMZ Sopot

ORDNANCE SUB-CATEGORY	Recoilless Projectile
EXPLOSIVE FILL (g)	655-750g TNT derivative usually TD-50
AUW (g)	3700
DIMENSIONS (mm)	774x73
COUNTRY OF ORIGIN	Russia/Bulgaria/Hungary

The OG-9V is a recoilless high explosive fragmentation projectile fired from the 73mm SPG-9 Kopye recoilless gun which dates from the early 1960s. However the accuracy of the SPG-9 recoilless rifle out to 600m has led to the weapon still being used in certain circumstances. The round is essentially the same as that used with an OG-15V and is interchangeable by means of selection of the extra, longer, propellant attachment. The warhead is manufactured from cast iron and has two bourrelets. The tail unit is made of extruded aluminium and provides basic stability for the projectile in flight.

The projectile is fitted with either the GO-2, or O-4M nose mounted point detonating fuze. The GO-2 fuze is based on the standard Russian setback sleeve and locking ball configuration. However the primer is always in line with the firing pin. There is no slider. When unfired the firing pin should be held in a position where it cannot puncture the stab detonator although caution is still advised. If fired and found as UXO, only a creep spring separates the firing pin from the primer. The Bulgarian version of the GO-2 is designated the AF71. Fuzed OG-9 projectiles which have been involved in fires and have been ejected from the seat of an explosion e.g. an armoured fighting vehicle or ammunition dump, should be assumed to be armed and treated with caution.

PG-9V

Image © VMZ Sopot

ORDNANCE SUB-CATEGORY	Recoilless Projectile
EXPLOSIVE FILL (g)	330g A-IX-1
AUW (g)	2530g
DIMENSIONS (mm)	774x73
COUNTRY OF ORIGIN	Russia/Bulgaria/Hungary

The PG-9V is a recoilless HEAT projectile fired from the 73mm SPG-9 Kopye recoilless gun which dates from the early 1960s. Its tactical anti-tank role has now been rendered obsolete by the introduction of light-weight disposable rocket launchers and anti-tank guided missiles. The round is essentially the same as that used with a PG-15 and is interchangeable by means of selection of the extra, longer, propellant charge assembly. The PG-9V has a bourrelet at its midpoint and there is a rear bourrelet between the rocket motor and fin assembly. The round has six fold-out hinged fins located in front of the propellant charge assembly.

The PG-9V is fitted with the VP-9 point initiating base detonating fuze, which is similar to the VP-7; recent production versions use an updated fuze. Some variants might have fuzing equivalent to a VP-22. An improved PG-9VN from Bulgaria is in circulation. It is marked PG-9N on the warhead. A PG-9S version is also in circulation – this has a warhead containing 330g of HMX. The long propellant attachment will also be marked, although this marking will only be visible on unfired abandoned explosive ordnance (AXO). If found as AXO the propellant of the round will very probably have weathered significantly. Propellant attachments usually come in a distinct hard green plastic sleeve.

The PG-9V is packaged in a similar way to the PG-15 round. It usually comes sealed in a transparent plastic sleeve in a wooden case containing six units.

RPG-30

Images © SESU

ORDNANCE SUB-CATEGORY	Recoilless Projectile
EXPLOSIVE FILL (g)	1830g OKFOL
AUW (g)	10300g
DIMENSIONS (mm)	1135x105
COUNTRY OF ORIGIN	Russia
FUZE	K-728 (precursor) V-728 (main charge)

The RPG-30 is an improved tandem warhead recoilless anti-tank launcher. It entered service in 2011 and remains in production. It is easily recognisable by the separate precursor decoy round launch tube, the purpose of which is to defeat active protection systems on modern armoured fighting vehicles. It has a GRAU index code of 7P53. The codename Kryuk is sometimes used, which literally translates to Hook or Crook. It is claimed the main warhead can defeat 600mm of rolled homogenous armour. The PG-30 recoilless projectile is almost identical in appearance to the PG-29, with the same fuzing employed. The main charge is HMX based OKFOL.

RPG-75

Image © Megan Lynn. Image © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Recoilless Projectile
EXPLOSIVE FILL (g)	320g A-IX-1
AUW (g)	800g
DIMENSIONS (mm)	630x68
COUNTRY OF ORIGIN	Czech Republic

The RPG-75 is a lightweight disposable anti-tank system. The RPG-75 stands for Reaktivního Protitankového Granátu Vzor 75. This translates as Reactive Anti-tank Grenade Model 75. The projectile has no motor section and is thus sometimes classified as a projected grenade. The launch tube is 633mm long when in storage configuration; but extends to 890mm when prepared for firing. The HEAT warhead is relatively small and is only effective against lightly armoured vehicles.

A thermobaric warhead, developed in the 2000s, may also be employed. Circumferential coloured hazard bands on the standoff probe are the easiest way of telling the difference between the warheads. Twin black and yellow bands indicates HEAT as per many NATO munitions, twin yellow and red bands indicates a thermobaric warhead. These colour markings are replicated on the outside of the launch tube just behind the muzzle.

S-24

Image © Bob Seddon

ORDNANCE SUB-CATEGORY	Air to Surface Rocket
EXPLOSIVE FILL (g)	29 kg TNT
AUW (kg)	239 kg
DIMENSIONS (mm)	2120x240
COUNTRY OF ORIGIN	Russia
FUZE	V24-A

The S-24 is an unguided air-to-surface rocket that dates from the 1960s. Two versions may be encountered, the S-24A and the S-24B. The difference is in the type of double based propellant used for the motor, with that used for the S-24B producing less smoke. Sometimes the rocket is referred to as "Neupravlyayemaya Aviatsionnaya Raketa" which translates to "Unguided Aviation Rocket". The S-24 rocket is most commonly associated with dedicated ground attack aircraft such as the Su-24, Su-25 and Su-27. The S-24 rocket has been used extensively in Ukraine in seeming preference to guided missiles.

The S-24 warhead contains a 29kg TNT warhead with a 150g tetryl booster. The rocket motor (S-24B) contains 46 kg of a double base propellant and is fitted with a black powder igniter with twin electrical initiators. The initiators are at the forward end of the rocket motor, close to the warhead section. The rocket motor has six distinctive separate nozzles. The S-24 is typically used with a V-24A fuze electrotechnical fuze with impact and delay functions. The rocket may also be fuzed with the V-575 delayed impact fuze if hardened shelters such as bunkers are targeted. Fuzing with a S-24N proximity fuze is also possible.

S-25-O

Images © ruaviation.com

ORDNANCE SUB-CATEGORY	Air to Surface Rocket
EXPLOSIVE FILL (kg)	150kg TNT
AUW (kg)	385kg
DIMENSIONS (mm)	3760x266
COUNTRY OF ORIGIN	Russia
FUZE	Point Detonating or RV-25 Proximity

The S-25-O is an unguided air-to- surface rocket. It has a large HE/FRAG warhead (148kg TNT). The motor section, containing double based propellant, is also a significant hazard. The warhead has a distinctive bulged shape at its nose and is 420mm in diameter at its widest point and has a tough pre-formed fragmentation surface.

The S-25-O may be fitted with a point detonating or RV-25 proximity fuze. If a proximity fuze is fitted, it is not known how long the firing capacitor in this fuze remains energised. Caution is advised.

ANTI-TANK GUIDED WEAPONS

9K111 FAGOT AT-4 SPIGOT

Image © VMZ Sopot

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	1800g OKFOL
AUW (g)	13000g
DIMENSIONS (mm)	Missile 875 mm long 120 mm diameter
COUNTRY OF ORIGIN	Russia, Bulgaria
FUZE	Electrical contact

The 9K111 Fagot is a wire guided semi-automatic command to line-of-sight (SACLOS) anti-tank guided weapon (ATGW) system that dates from the early 1970s. The system comprises the 9M111 missile and the 9P135 launcher. The NATO reporting name for the 9K111 is AT-4 Spigot. The missile is transported within an environmentally sealed fibreglass tubular launch container. On launch, the 9Kh147 launch motor ejects the missile from the launch tube and the 9Kh145 sustain motor then ignites approximately 10 metres in front of the launcher. The 9M111 missile employs a single 9N122 HEAT warhead which contains approximately 1.8kg of HMX-based explosive with a copper shaped charge liner and is capable of penetrating 40 cm of rolled homogenous armour. The operator tracks the target throughout flight and the launcher automatically transmits guidance corrections to the missile via a fine wire which is paid out from the rear of the missile. Infrared flares on the rear of the missile aid tracking. A tandem warhead variant of the 9M111 exists and is designated the 9M111M. An anti-tank guided missile team will typically consist of three people, with one carrying the tripod/launch post and two others carrying two missiles each. If supported by an infantry fighting vehicle (BTR/BMP), a further eight missiles are normally available. There are superficial similarities between the 9M111 Fagot (AT-4 Spigot) and the 9M113 Konkurs (AT-5 Spandrel).

9K113 KONKURS AT-5 SPANDREL

Image Top © Sean Moorhouse. Image Base © Thomas T.

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	1800g OKFOL
AUW (g)	14500g
DIMENSIONS (mm)	Missile 955 mm long 120 mm diameter
COUNTRY OF ORIGIN	Russia
FUZE	Electrical contact

The 9M113 is a wire guided semi-automatic command to line-of-sight (SACLOS) ATGW that dates from the mid-1970s. The 9M113 missile may be fired from the same launcher (9P135) associated with the 9K111 Fagot system but it is also mounted on infantry fighting vehicles, with the 9P148 launcher, such as the BMP-2, BMD-2 and BRDM-2. The NATO reporting name for the 9M113 is AT-5 Spandrel.

The missile is transported within an environmentally sealed fibreglass tubular launch container. The 9M113 missile employs a single 9N131 HEAT warhead which contains approximately 1.8kg of HMX-based explosive with a copper shaped charge liner and is capable of penetrating 60 cm of rolled homogenous armour.

The 9M113M version has a distinct probe compared with the 9M113. Both versions have a tandem warhead to overcome ERA. EOD operators are advised to ensure destruction of each warhead and any residual solid motor propellant.

9M119 SVIR AT-11 SNIPER

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Gun fired anti-tank missile
EXPLOSIVE FILL (g)	Precursor 800g Primary 2250g OKFOL
AUW (g)	17200g
DIMENSIONS (mm)	695 mm long 125 mm diameter
COUNTRY OF ORIGIN	Russia
FUZE	Nose crush switch with pyro delay arming

The 9M119 is a fin stabilized 125mm smoothbore gun-launched anti-tank guided missile. The missile employs laser beam riding guidance where the gunner in the launching tank continuously illuminates the target and the missile automatically guides itself to the designated target. The 9M119 employs a tandem shaped charge warhead and is thus capable of defeating explosive reactive armour.

The 9M119 missile has an unconventional configuration in that the primary warhead is located behind the sustain rocket motor section. EOD operators should note that the main warhead is behind the forward nozzles and in front of the missile fins. The 9M119 has a range of up to 4km.

The missile is designated Svir or REFLEXS by the Russians, and AT11AA SNIPER by NATO. 9M119F and 9M119F1 versions have enhanced warheads although it is not clear what design features this entails. SVIR and REFLEXS are not identical, there are minor differences in design. A 9M119M INVAR version dates from the early 1990s.

If the missile has been fired, it should be considered to be armed. The missile contains a pyrotechnic based self-destruct mechanism which may operate between 25 and 45 seconds after firing.

9K127 VIKHR AT-16 SCALLION

AT-16 missile warhead and guidance section. Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Air Launched Anti-Armour Missile
EXPLOSIVE FILL (g)	4300g OKFOL
AUW (g)	47000g
DIMENSIONS (mm)	2750x130
COUNTRY OF ORIGIN	Russia
FUZE	

The 9K127 Vikhr missile system is a tube-launched fin stabilized laser beam riding air to surface anti-tank missile based around the 9M127 Vikhr missile. It is commonly used by the Ka-52 attack helicopter. It dates from the early 1990s. The laser guidance system is very similar to that used by the 9M119 Svir missile/projectile. The missile is steered via four nose mounted canards and stabilised with four fins at the rear.

The missile employs a two-stage solid propellant rocket motor and is fitted with a tandem warhead which provides both shaped charge and fragmentation effects. The missile has both impact and proximity fuze with a self-destruct element armed by set-back. The missile has a maximum speed of 600m/second, three times that of the equivalent portable ATGW. The missile is carried in groups of 6 launch tubes under each helicopter pylon. The launch tubes have hinged caps at the front that open prior to launch

The 9K121 Vikhr can be fitted to the Ka-50 and Ka-52 attack helicopters and the Su-25T and Su-25TM/Su-39 fixed wing attack aircraft. The 9M127 Vikhr/AT-16 Scallion missile has been widely encountered in Ukraine on downed Ka-52 attack helicopters.

9K133 KORNET AT-14 SPRIGGAN

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	HEAT variant 4300g OKFOL
AUW (g)	27000g
DIMENSIONS (mm)	1250 mm long x 152 mm diameter
COUNTRY OF ORIGIN	Russia
FUZE	Electrical crush fuze

The 9K133 Kornet missile system is a tube-launched fin stabilized laser beam riding anti-tank missile based around the 9M133 Kornet missile. The NATO designation is AT-14 Spriggan. The Kornet is often deployed with BMP-3 fighting vehicles or may be launched from a crew portable tripod. The missile is fitted with either a tandem charge HEAT warhead (9M133), which is optimised for anti-armour applications or an enhanced blast (thermobaric) warhead (9M133F) which is optimised for operations in built up areas. The 9M133 variant employs an HMX-based explosive, the 9M133F contains a mixture of RDX, aluminium and isopropyl nitrate. The 9M133 Kornet missile employs a boost motor which contains approximately 850 g of propellant and a sustain rocket motor comprising of a single solid grain of double base propellant. The latter gives the missile a low visibility signature in flight. Missile guidance is achieved in flight through the use of canards mounted towards the front of the missile. Stability is provided by fins at the rear of the missile.

The tandem warhead is separated to a greater degree than with earlier Soviet ATGW. A small, shaped charge is found in the nose, the main warhead is just forward of the rear fins. The two warheads are separated by the main solid fuel motor section positioned in the centre of the missile. Another solid fuel expulsion charge is found at the rear. The venturis are found next to the smaller forward fins. Heat discolouration here, at the rear expulsion charge, along with impact damage, and with the appearance of the missile outside of its launch tube are good indicators of a potentially armed item.

SKIF/STUGNA-P

Image © SESU

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	NK
AUW (g)	37000g
DIMENSIONS (mm)	1435x130-152
COUNTRY OF ORIGIN	Ukraine
FUZE	Not known probable electrical crush sensor

The SKIF/Stugna-P is a Ukrainian designed and manufactured anti-tank guided missile which utilizes laser beam riding guidance. The missile itself has a distinct shape with a bulge near the front of the missile indicating the location of one of the two shaped charges and fragmentation warheads.

When vehicle based the weapons systems might be designated Amulet, when portable it can be designated Stugna-P. It also appears that export versions of this system are designated SKIF whilst versions in use by the Ukrainian armed forces are designated Stugna-P. The Ukrainian designation code is RK-2M-OF. For the Stugna-P there are both 130mm and 152mm missile options.

The main warhead combines an explosively formed projectile (EFP) with a fragmentation jacket. The explosive fill is unknown although is believed to be HMX based.

NLAW

Image Left © UK MoD. Image Right © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	850g of Insensitive PBX
AUW (g)	12500g
DIMENSIONS (mm)	1000 mm long 310 mm diameter
COUNTRY OF ORIGIN	UK/Sweden
FUZE	Proximity fuze

The Round Guided Missile NLAW HE Anti-Tank K170A2 was first introduced into UK service in 2009, is widely favoured for short range anti-tank engagements in Ukraine. A disposable one-shot launcher, theoretically the weapon can engage targets as close as 20m, but as far out as 800m. Once the missile leaves the launcher it is not externally guided but employs a Predicted Line of Sight (PLOS) inertial based guidance system. This requires the firer to track the target for 3-6 seconds before launching. If the target is moving the flight path of the missile is predicted. Two attack modes can be selected, Overfly Top Attack and Direct Attack. The NLAW has a countermass system enabling launch from within enclosed space.

The launch motor comprises of approximately 120 g of a double base propellant and is separated from the missile after firing. The sustain motor contains approximately 750 g of a double base propellant and ignites a safe distance in front of the firer.

The NLAW warhead uses an insensitive PBX based explosive material with an overall net explosive content of less than 1 kg. EOD operators are advised to consider using a sufficiently large donor charge if disposing of NLAW blinds. EOD operators are advised to employ a safe waiting period of 30 minutes before approaching a crashed NLAW missile. Ideally the missile should be approached from the rear and the hazard posed by the HEAT warhead and laser proximity fuze should be considered.

The Swedish name for NLAW is Rb 57 (Robot 57), the Finnish name is 102 RSLPSTOHJ NLAW. In its packaging the Javelin is HCC 1.2E.

FGM-148 JAVELIN

Image Left © Lockhead Martin. Image Right © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	HMX based PBX 220g precursor 2000g primary
AUW (g)	16 kg (missile only not including CLU)
DIMENSIONS (mm)	1200 mm long 127 mm diameter
COUNTRY OF ORIGIN	USA
FUZE	

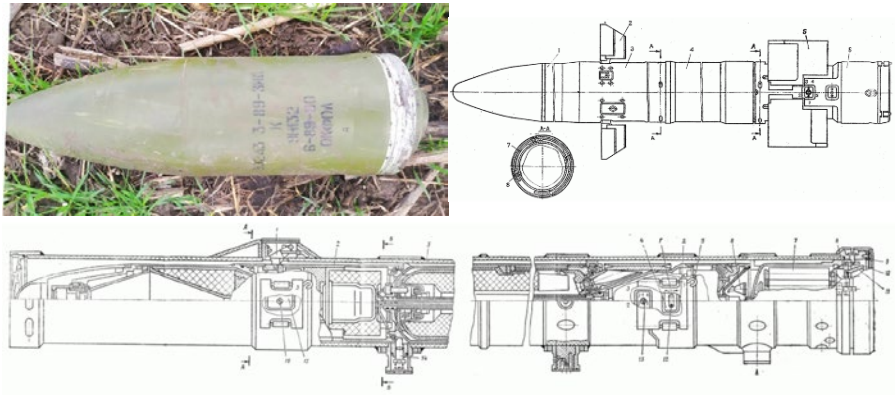
The FGM-148 is a man portable Anti-Tank Guided Missile with a range out to 4km. It is effective against all modern main battle tanks. The Javelin incorporates a tandem warhead found in front of the front stabilizer fins. The main components from the nose are the sensor system, precursor charge, main shaped charge, and solid fuel flight motor and a soft launch motor. The soft launch motor enables firing from enclosed spaces.

The nose contains an IR seeker. The warhead usually employs overhead top attack.

The energetic used for the precursor and main charge is an insensitive PBX explosive. EOD operators are advised to plan demolition methods accordingly. EOD operators are advised to employ a safe waiting period of 30 minutes before approaching a crashed Javelin missile. Ideally the missile should be approached from the rear and the hazard posed by the HEAT warhead should be considered.

There are a number of iterations of the Javelin – the latest is the FGM-148G. In its packaging the Javelin is HCC 1.2E.

9M114 KOKON AT-6 SPIRAL



Images © SESU

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	2200g OKFOL
AUW (g)	35000
DIMENSIONS (mm)	130x2300mm (missile probe extended)
COUNTRY OF ORIGIN	Russia
FUZE	Electrical contact

The 9M114 Shturm is a VHF radio guided, semi-automatic command to line-of-sight (SACLOS) anti-tank guided weapon (ATGW) system that dates from the mid-1970s. The system comprises the 9M114 missile and the 9P135 launcher. The NATO reporting name for the 9M114 is AT-6 Spiral. The missile is transported within an environmentally sealed fibreglass tubular launch container. The missile is used both on Mi-24 Hind D attack helicopters and MTLB armoured vehicles (9P149). This missile has largely superseded by the AT-9 Spiral (9M120 Ataka). It has been used extensively in Ukraine. The missile is controlled by two pop-out fins in the forward section of the missile and it is fitted with four wrap-around fins at the rear to provide stability in flight. The missile uses an ejection motor which contains 1.1 kg of double base propellant to eject the missile from the launch tube. The sustain motor contains a single propellant grain of 10 kg (AT-6B) to 15 kg (AT-6C) of double base propellant. The warhead is marked with the GRAU code 9H132. It sits at the front of the missile, ahead of the forward fins. It contains a 2200g OKFOL shaped charge. A small booster charge launches the missile from the tube. At about 20 m a sustainer solid fuel motor section takes over. Once launched an operator controls the flight of the missile to the target. The motor section should be identified and destroyed during a demolition – if initiated the missile can travel at 345 m/s. A thermobaric warhead variant (9M114F) also exists.

9M116 METIS – AT-7 SAXHORN

Motor section of fired 9M116. Image © SESU

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	1000g OKFOL
AUW (g)	4800g
DIMENSIONS (mm)	733x93
COUNTRY OF ORIGIN	Russia/Bulgaria

The 9M116 is the missile component of the 9K115 METIS Anti-Tank Guided Weapon System. Metis literally translates to "cross-breed". The system entered service in the late 1970s. 9M116 Metis is a tube-launched, wire-guided, semi-automatic command to line-of-sight (SACLOS) anti-tank guided weapon (ATGW) system. It employs a pneumatically powered aerodynamic control system, using canards at the front of the missile. The missile is fitted with three large wrap-around fins to provide lift and stability in flight. It has a two-stage propulsion system, consisting of a 250 g single base propellant ejection charge, which propels the missile a safe distance from the launch tube, before igniting a 1.2 kg double base propellant sustain motor. The GRAU index coding can be confusing, on the fibreglass Container Launch Unit (CLU), the missile can be marked as 9M115. Incorporating only a single HEAT warhead, these missiles are now obsolete for the attack of main battle tanks with explosive reactive armour but can still be effective against lighter armoured vehicles. The body of the missile is typically painted black. The missile shape and dimensions are very similar to the 9M111/AT-4 Spigot. The two are easy to mistake for each other, the 9M116 only has three fins, the 9M111 has four. The motor section on the 9M116 is smaller than on the 9M111, and the missile is therefore lighter. The missile is fitted with a pyrotechnic self-destruct delay which initiates between 20 and 25 seconds after launch. It is recommended that a 30-minute safe waiting period is applied before approaching the missile. Given the sensitivity of the missile contact fuze, the missile should not be jolted or moved and should be destroyed in situ.

9M117 BASTION/AT-10 STABBER

Image © John Culp

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	1350 g OKFOL 3.5
AUW (g)	18800g
DIMENSIONS (mm)	1092x137mm (with cartridge).
COUNTRY OF ORIGIN	Russia

The 9M117 Bastion is a gun launched, laser beam riding, optically tracked, high explosive anti-tank (HEAT) missile which dates from the early 1980s. Variants of the 9M117 missile may be fired from several 100 mm and 115 mm guns. The configuration of the propelling charge is dependent on the gun from which the missile is fitted and the complete 9M117 Bastion round, when fitted inside its cartridge case, is similar in appearance to other large calibre fixed cartridge case rounds. The 9M117 missile employs laser beam riding guidance where the gunner in the launch platform continuously illuminates the target, and the missile automatically guides itself to that target. The control section is in front of a single HEAT warhead and is based on steerable canards. A BMP-3 infantry fighting vehicle might typically carry up to eight 100mm 9M117s (GRAU code 3UBK10-3) to be launched from the 100mm 2A70 rifled gun. There are seven other variants of the missile with different GRAU designations. The missile launch propelling charge is contained within a lattice body within the cartridge case. At a distance of approximately 200m, the main sustain rocket motor ignites. The sustain motor contains approximately 2 kg of a double base propellant. The missile's range is 4000m and has a flight time of approximately 12 seconds. The tandem warhead variant (9M117M) contains two OKFOL based shaped charges with copper liners. The fuze incorporates a self-destruct element that functions 26-42 seconds after initial arming. A small window in the rear of the missile is used to detect the position of the missile in the guidance laser beam. It is recommended that a 30-minute safe waiting period is applied before approaching the missile. Given the sensitivity of the missile contact fuze, which is located adjacent to the control canards, the missile should not be jolted or moved and should be destroyed in situ.

9M120 ATAKA – SPIRAL-2/AT-9

Image © SESU

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	7400g OKFOL 3.5 Tandem Warhead
AUW (g)	48300g
DIMENSIONS (mm)	1630x130
COUNTRY OF ORIGIN	Russia

The 9M120 Ataka is the successor to the 9M114 (AT-6 Spiral) missile. It is the principal anti-tank guided weapon on the Mi-28 Havoc attack helicopter and may also be launched from modern variants of the Mi-35 Hind E and Ka-52 Hokum attack helicopters. The 9M120 is compatible with the radio command guidance system of the Mi-24 Hind D. It has been used extensively in Ukraine. It is a dual mode guidance system and may be guided by both radio command or by laser beam riding with semi-automatic command line of sight (SACLOS). The system dates from the 1980s. The missile is controlled by two pop-out fins in the forward section of the missile and it is fitted with four wrap-around finds at the rear to provide stability in flight. It is usually deployed from attack helicopters although its fibreglass launch tube can also be mounted on armoured vehicles such as the 9P149 version of the MTLB. The NATO reporting name is Spiral-2 and the US DoD designation is AT-9. The anti-tank variant employs a tandem HEAT warhead and has a spring out nose mounted probe which extends after launch. The missile has distinctive infra-red lamp and reflector mounted in its tail. Adjacent to the silver reflector is a receiver horn for the radio command link and for more recent versions (9M120-1) a laser receiver as well. The 9M120-1 has a larger tandem shaped charge warhead. There are also variants of the missile fitted with a thermobaric warhead (9M120F) and an anti-aircraft variant using a continuous rod type fragmenting warhead.

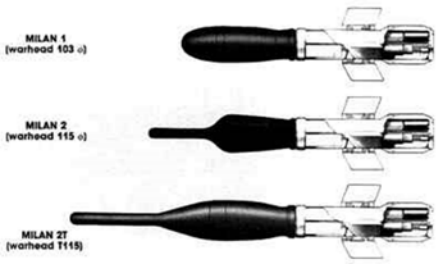
9M131 METIS–M / SAXHORN-2 AT-13

Image © SESU

ORDNANCE SUB-CATEGORY	ATGW
EXPLOSIVE FILL (g)	NK
AUW (g)	4800g
DIMENSIONS (mm)	733x130
COUNTRY OF ORIGIN	Russia/Bulgaria

The 9M131 Metis M is an improved variant of 9M115 (AT-7 Saxhorn). The 9M131 is the employed in the 9K-115-2 METIS-M and METIS-M1 systems. It is wire guided SACLOS. Metis literally translates to "cross-breed". The difference between the two is extended range (due to a different wire spool design) for the M1, along with an enhanced warhead, which incorporate a larger diameter (130 mm) shaped charge. The missiles are housed in fibreglass tubes sometimes referred to a Container Launch Units (CLUs). The missile itself is coloured black with white stencilled markings. Unlike earlier versions of the METIS, 9M-131 is consistently marked on both the CLU and missile. The missile is usually fired from the 9P151 tripod ground launcher. The missile is 733mm in length, although the CLU is 980mm. The missile is fitted with a pyrotechnic self-destruct delay which initiates after launch. It is recommended that a 30-minute safe waiting period is applied before approaching the missile. Given the sensitivity of the missile contact fuze, the missile should not be jolted or moved and should be destroyed in situ. It should be noted that the main warhead on this missile is situated towards the rear of the missile and is positioned between the wing and the sustain rocket motor venturi. The precursor warhead is in front of the forward control surfaces and may become separated from the main missile fuselage on missiles which have failed to explode.

MILAN-2



Images Left © davric Right: Open Source.

ORDNANCE SUB-CATEGORY	Anti-Tank Guided Weapon
EXPLOSIVE FILL (g)	1850g Octol (HMX/TNT)
AUW (g)	6730g
DIMENSIONS (mm)	769x133
COUNTRY OF ORIGIN	France/Germany

The MILAN is a French/German anti-tank missile. The name MILAN is derived from 'Missile d'Infantrie Leger Anti-Char' (Infantry light Anti-Tank Missile). The missile is wire guided and utilises a semi-automatic to line-of-sight (SACLOS) guidance. The first versions date from the 1970s. The system has been extensively developed since then, including the change to a tandem warhead to defeat explosive reactive armour (MILAN 2T). The net explosive content of the missile depends on the version of missile employed. There are two single warhead variants, J103 and K105 and both use an OCTOL (HMX/TNT) -based composition in both the main charge and the booster. The J103 has the smaller warhead of 103mm diameter and a main charge of 1450g 75/25 OCTOL. The K115 has a 115mm warhead with a main charge of 1850g, also of 75/25 OCTOL. Both warheads have a 78g 85/15 OCTOL booster. The K115 also has a distinct standoff probe containing crush contacts. All variants of the missile use a propulsive gas generator which ejects the missile from the launch tube and a dual-grain boost and sustain rocket motor which contains approximately 1kg of double based propellant. The safe to arm mechanism works on gas pressure from the motor section. In simple terms, a shutter is unlocked, and in moving un-shorts the firing circuit. The missile arms 20m from the firing post. As all variants of the missile contain a sensitive nose mounted crush sensor, missiles should absolutely not be jolted or moved and should be destroyed in situ. Operators are reminded of the need for RF precautions when dealing with all guided weapon UXOs, and especially those with wire guidance.

MANPADS

9M32M STRELA 2 / SA-7B GRAIL

Image © Fenix Insight

ORDNANCE SUB-CATEGORY	Missile
EXPLOSIVE FILL (g)	370g A-IX-1
AUW (g)	9150g
DIMENSIONS (mm)	1440x72
COUNTRY OF ORIGIN	Russia

The 9M32M is the missile component of the 9K32 Strela-2 MANPAD. The NATO reporting name is SA-7b GRAIL. Dating from the early 1970s this was the first Soviet developed MANPAD. It is now obsolescent and is defeated easily by modern active countermeasures. However it remains effective against unprotected aircraft. The principal components of the system are the 9P54M (9П54М) launch tube which contains the 9M32M missile, the 9B17 (9Б17) thermal battery, and the 9P58 (9П58) gripstock. The SA-7b is noticeably shorter than the SA-16 and has no aerospike over the infra-red seeker dome on the nose of the missile.

The easiest way to identify the launch tube is the distinct shape of the 9B17 thermal battery. Black identification markings should be found on the upper body of the tube between the gripstock and the battery. It should be noted that this missile system uses an uncooled infra-red seeker and, unlike later Russian MANPADS, does not require the use of a battery coolant unit (BCU). The thermal battery is operated by the front mounted twist switch and the battery itself becomes hot when operated. Scorched paint is an indicator of an expended battery. The thermal battery is removed from the missile launch tube by a lever on the missile body. The gripstock is fitted to the missile launch tube with a hinged clip.

Despite its age and relatively poor performance by modern standards, substantial numbers of SA-7b systems are still in circulation and have been employed in Ukraine.

9M36 STRELA 3 / SA-14 GREMLIN

Image © war-time.ru

ORDNANCE SUB-CATEGORY	Missile
EXPLOSIVE FILL (g)	370g OKFOL
AUW (g)	10300g
DIMENSIONS (mm)	1470x72
COUNTRY OF ORIGIN	Russia

The 9K34 Strela-3 is the third iteration of the Russian Strela range of shoulder-fired air defence systems developed by the Russian KBM Design Bureau. The Strela-3 addresses some of the technical deficiencies associated with the 9K32M Strela-2 (NATO SA-7b Grail) system through the introduction of an improved cooled missile seeker head. The system uses a combined thermal battery and gas reservoir known as a battery coolant unit (BCU). The BCU designated for use with the 9M36 missile is the 9P51 (9П51). The system employs a grip stock which is superficially similar to that associated with the 9K32M Strela-2 system, but the grip stocks ARE NOT interchangeable. The grip stock used with the 9K34 Strela-3 is the 9P58M (9П58M). The missile launch tube associated with the system is the 9P59 (9П59). The warhead associated with the 9M36 missile is designated the 9N129 and contains an HMX based explosive within a pre-formed cylindrical fragmentation jacket.

The BCU contains a pressurized nitrogen bottle. EOD operators should be aware of the potential compressed gas hazard. The BCU is removed from the launch tube by pressing the release catch and sliding the unit forward. If the arming lever is rotated whilst the BCU is fitted it will be initiated. Black identification markings should be found on the upper body of the tube between the gripstock and the BCU. Otherwise the slight increase in length (30mm) is one way to tell the difference with the 9M32.

9M313 IGLA-1 / SA-16

Image © Fenix Insight

ORDNANCE SUB-CATEGORY	Missile
EXPLOSIVE FILL (g)	400g OKFAL
AUW (g)	10800g
DIMENSIONS (mm)	1673x72
COUNTRY OF ORIGIN	Russia

The 9K310 Igla-1 is a second-generation development of the Russian Strela range of shoulder-fired air defence systems developed by the Russian KBM Design Bureau. The 9M313 missile associated with Igla-1 system has a much greater degree of resistance to countermeasures and has a more powerful sustainer rocket motor, which together with the guidance and control system enhancements, give it a significantly improved kinematic performance compared to the Strela (NATO SA-7b Grail and SA-14 Gremlin) missiles.

The 9M313 rocket motor composition uses a high energy composite propellant based on ammonium perchlorate, aluminium and a polymeric binder and an RDX-based nitramine composition is also believed to have been added to improve thrust. The added high explosive also enables a supplementary charge in the warhead to detonate unconsumed propellant on warhead functioning. The BCU designated for use with the 9M313 missile is the 9B238 (9Б238). The grip stock used with the 9K310 Igla is the 9P519 (9П519). The BCU orientation on the Igla launch tube is angled downwards, rather than parallel to the launch tube as on the Strela-3/SA-14.

The SA-16 has a distinct aerospike on a wire tripod sitting above the domed seeker window. Markings should be evident to assist identification but if not, this missile is over 20cm longer than its SA-7b equivalent. OKFAL is a plasticised HMX based explosive and differs from OKFOL by the addition of aluminium to increase the heat of explosion. The BCU contains a pressurized nitrogen bottle.

EOD operators should be aware of the potential hazard. The BCU is removed from the launch tube by pressing the release catch and sliding the unit forward. If the arming lever is rotated whilst the BCU is fitted it will be initiated. SA-16 is typically packed two per wooden storage case. At the place of firing the launch tube may be abandoned. Other tell tales include presence of the ejection charge, tube end cap and BCU. The SA-16 has been produced under licence in a number of countries including Bulgaria, China, North Korea and Ukraine. A naval variant of this MANPAD designated SA-N-10 Grouse may also be encountered.

9M39 IGLA-2 / SA-18

Image © Fenix Insight

ORDNANCE SUB-CATEGORY	Missile
EXPLOSIVE FILL (g)	400g OKFAL
AUW (g)	10600g
DIMENSIONS (mm)	1639x72.2
COUNTRY OF ORIGIN	Russia

The 9K38 Igla-2 is a third-generation development of the Russian Strela range of shoulder-fired air defence systems developed by the Russian KBM Design Bureau. The BCU designated for use with the 9M39 missile is the 9B238 (9Б238). The grip stock used with the 9K38 Igla-2 is the 9P516 (9П516). The BCU orientation on the Igla-S launch tube is angled downwards like the Igla/SA-16.

The fuze, warhead (400g OKFAL) are similar to those used in the SA-16. The markings are stencilled in black on the 9M39 missile and on the 9K38 launcher. The aerospike design is a key recognition difference. The 9K38 launcher has a distinct flared nose cap. The horseshoe shroud that encloses the end of the BCU is often an easy recognition feature, although this design has been seen on some versions of the SA-16. The 9B238 Battery Cooling Unit (BCU) is the same as that used on the SA-16. It should have designation markings stencilled in black at the end of the cylinder. A naval variant is in circulation. It has the NATO reporting name SA-N-10 GROUSE.

Substantial quantities of Igla-2/SA-18 are still in service. This missile system has been used widely in Ukraine.

9M342 IGLA S / SA-24

Image © V.Kuzmin

ORDNANCE SUB-CATEGORY	Missile
EXPLOSIVE FILL (g)	OKFAL
AUW (g)	11300g
DIMENSIONS (mm)	1690x72.2
COUNTRY OF ORIGIN	Russia

The 9M342 is the missile component of the 9K338 Igla-S MANPAD that dates from the early 2000s. The US DoD designation is SA-24. The NATO reporting name is GRINCH. The warhead utilizes an OKFAL charge although the exact amount is not confirmed. The BCU designated for use with the 9M342 missile is the 9B238 (9Б238). The grip stock used with the 9K338 Igla-S is the 9P522 (9П522). The BCU orientation on the Igla-S launch tube is angled downwards like the Igla-1/SA-16 and the Igla-2/SA-18.

The nose cap of the 9K338 launcher is distinct from its SA-18 predecessor. The same 9B238 BSU is used however. The aerospike on the 9M342 missile is also the same as used on the 9M39 missile. Apart from the stencilled markings, one way of telling the difference is that the 9M342 missile is 41mm longer.

PPZR PIORUN

Image © Mesko S. A.

ORDNANCE SUB-CATEGORY	Missile
EXPLOSIVE FILL (g)	N/K
AUW (g)	10250g
DIMENSIONS (mm)	1596x72
COUNTRY OF ORIGIN	Poland

The PIORUN is an improved model of the GROM, which itself is a Polish version of the 9K38 SA-18 GROUSE. Piorun translates as 'thunderbolt'. It came into service in 2020. It incorporates improved seeker, and an improved proximity fuze. The absence of ribs on the nose cap is way of telling the difference with an SA-18.

STARSTREAK (HIGH VELOCITY MISSILE)

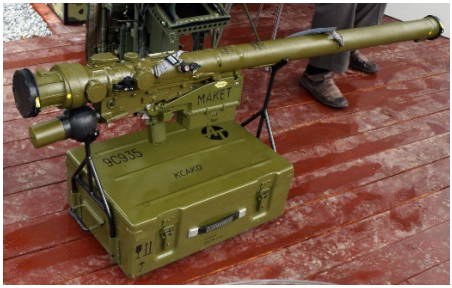
Image © Roly Evans

ORDNANCE SUB-CATEGORY	Missile
EXPLOSIVE FILL (g)	NK
AUW (g)	14000g
DIMENSIONS (mm)	1400x130
COUNTRY OF ORIGIN	United Kingdom

The K130 Starstreak, or High Velocity Missile (HVM) is a surface-to-air missile system designed specifically for use against low-level attacking aircraft. It has an all-aspect attack profile and may be fired from an armoured vehicle (Stormer), the lightweight multiple launcher (LML), or from the shoulder. The missile contains three submunitions which are carried initially on a rocket propelled launch vehicle. Unlike many other MANPAD SAMs, Starstreak using laser beam riding guidance rather than infra-red homing, due to the prevalence of infrared countermeasures. The missile employs a first stage all-burnt on launch Brambling rocket motor, which propels the missile a safe distance from the launcher before the second stage sustain motor ignites. Each of the three dart-type submunitions contains a small RDX based main charge.

The system is also marketed by Thales as ForceSHIELD.

9M336 VERBA



Images © warms-expo.ru and nevskii-bastion.ru

ORDNANCE SUB-CATEGORY	Missile
EXPLOSIVE FILL (g)	400g prob HMX composition
AUW (g)	17250g
DIMENSIONS (mm)	1447x72
COUNTRY OF ORIGIN	Russia

The 9M336 is the missile component of the 9K333 Verba MANPAD (translation 'Willow'). It dates from the 2010s. The US DoD designation is SA-25. To date no NATO designation has been assigned. The components that combine to make up the 9K333 system include the 9P333 (9П333) fibreglass launch tube, the 9B238 (9Б238) Battery Cooling Unit (BCU), the 9P521 (9П521) gripstock and the 9M333 missile. The BCU contains compressed nitrogen for the purpose of cooling the thermal seeker in the nose of the missile. The BCU associated with the 9K333 Verba system is also compatible with the 9K310 (Igla-1/SA-16 Gimlet), the 9K38 (Igla/SA-18 Grouse), and the 9K338 (Igla-S/SA-24 Grinch). The 9K333 Verba system may make optional use of the 1L229V (1Л229B) target cueing system and the 1PN97 (1ПН97) optical infra-red sight. The missile guidance system is an incremental improvement of that employed with the 9K338 and employs a multi-spectral sensor operating in the ultraviolet, near-infrared, and mid-infrared bands. This reduces the effectiveness of aircraft IR countermeasure systems. The missile employs four pop-out control canards, located in the forward section of the missile, and flight stability is provided by four wrap-around fins at the rear. The kinematic performance of the missile is very similar to that of the 9K338 (Igla-S/SA-24 Grinch). The SA-25 and SA-24 are very easy to mistake for one another. Black stencilled marking on the motor section should be used to confirm identity. The BCU contains a pressurized nitrogen bottle. EOD operators should be aware of the potential hazard. Operators should also be aware that removing the BCU by pressing the release catch and sliding the unit forward will initiate the system if the arming lever is rotated. The arming lever must be checked before any positive action. Caution is advised.

SAMS

9M37K BUK - SA-11 GADFLY /SA-17 GRIZZLY

Images © John Montgomery

ORDNANCE SUB-CATEGORY	Surface to Air Missile
EXPLOSIVE FILL (g)	21000g
AUW (g)	690000g
DIMENSIONS (mm)	5500x400
COUNTRY OF ORIGIN	Russia

The Buk (literal translation 'beech') is a medium to long range surface to air missile system that originally dates from the early 1970s. It was the first Russian radar guided air defence system to have all missile system components contained within a single transporter, erector, launcher and radar (TELAR) platform. The Buk missile incorporates a dual stage solid rocket motor and is rail launched from a tracked armoured vehicle. The missile employs semi-active radar homing and has a seeker head mounted in the front section of the missile. Later variants of the Buk system employ a tube launched missile. The earlier versions of the Buk missile are designated the SA-11 by the US DOD and GADFLY by NATO. The later Buk-M1-2 and Buk-M2 have the DoD designation of SA-17 and the NATO designation of GRIZZLY. The BUK M3 has the DoD designation SA-27. Later versions tend to have a slightly extended range – up to 45km. Earlier missiles for the SA-11 have a 9M38 or 9M38M1 GRAU code. Later versions associated with the SA-17 GRIZZLY have the 9M317 GRAU code. All missiles use a semi-active homing radar. Missiles are fuzed with proximity, impact and self-destruct fuzing. Different warheads can be fitted to the 9M38/9M38M1 and 9M317missiles. The most commonly encountered warhead, the 9N314M, has a distinctive bow tie shaped preformed fragmentation. Missiles usually have an overall body colour of green and the radome (nose) is normally painted white. The missile designation is stencilled in black between the set of fins found just forward of the motor section, approximately halfway along the body of the missile. If the warhead has functioned then the rear section of the expended rocket motor will normally be encountered on the ground. The spherical compressed air reservoir for the missile guidance system and the cylindrical gas cylinders for fin control may also be encountered intact. Missiles which have missed their designated targets and have failed to self-destruct may be encountered with complete warheads and attached safety and arming units. The warhead weight is often given as 50-70kg, although the NEQ is believed to be 21Kg.

BALLISTIC MISSILES

OTR-21 9K79/9M79 TOCHKA SS-21 SCARAB

Images © SESU

ORDNANCE SUB-CATEGORY	Short Range Ballistic Missile
EXPLOSIVE FILL (g)	Various
AUW (g)	2000000g
DIMENSIONS (mm)	6400x650
COUNTRY OF ORIGIN	Russia

The OTR-21 TOCHKA is a short range ballistic missile (SRBM) capable of carrying a range of warheads that dates from the 1970s. Its NATO reporting name is SCARAB. The US DoD designation is SS-21. OTR stands for Operativno-Takticheskiy Raketnyy which translates as Operational Tactical Missile. The missile utilizes a single-stage solid propellant motor, with fin stabilisation and lattice type aerodynamic control surfaces. The GRAU code for the missile is 9M79. The missile uses an inertial guidance system. The 9M79 missile may be fitted with a variety of unitary or sub-munition warheads. The unitary warhead (9N123F) employs a primary laser fuzing system with a secondary impact fuze. The sub munition warhead (9N123K) employs a radar altimeter fuze which is programmed to release sub-munitions at the optimum height based on the sub munition footprint required.

The image above right shows a crashed Tochka with a 9N123K warhead. This warhead carries 50 9N24 explosive submunitions. When fitted with the 9N123K warhead the TOCHKA can be termed a cluster munition under Article 2 of the Convention on Cluster Munitions. The 9N123F unitary high explosive fragmentation warhead contains 162kg of TG-20 explosive (20%TNT/80%RDX). The single-stage rocket motor consists of approximately 900 kg of composite (ammonium perchlorate, aluminium and binder) propellant. Propellant efflux when mixed with water is toxic and acidic. Care should be taken when recovering rocket motor sections associated with 9M79 Tochka missile strikes.

Further versions of the TOCHKA may be referred to by combination of the NATO and US DoD designations, for example SS-21a SCARAB A. Nuclear and chemical filled variants of the Tochka missile were developed. The nuclear variant is thought to have had two yield options. The chemical filled variant is believed to contain approximately 250 kg of persistent nerve agent, probably VX.

9K715/9K720/9K728/ ISKANDER SS-26 STONE

Image © TASS

ORDNANCE SUB-CATEGORY	Short Range Ballistic Missile
EXPLOSIVE FILL (g)	Various
AUW (g)	
DIMENSIONS (mm)	7.2 metres long 920 mm diameter
COUNTRY OF ORIGIN	Russia

The code name Iskander covers a family of short-range ballistic missiles (SRBM) and cruise missiles which are launched from a common transporter erector and launcher (TEL) platform (9P78-1). The family name used by the US DoD and NATO is SS-26 Stone. The maximum stated range of the Iskander/SS-26 Stone is 500 km, though it may have the capability to operate at significantly longer ranges. The base model of the Iskander family, known as the 9K720 or Iskander-M is due to replace the 9M79/SS-21 Scarab in Russian service.

The missile employs a two-stage solid propellant motor, with fin stabilisation and thrust vector control. The missile uses a combination of inertial guidance, GLONASS satellite guidance, and terminal guidance based on digital scene matching and area correlation. The Iskander missiles may be fitted with a variety of unitary or sub-munition warheads. The 9M723 missile has a non-detaching warhead section and has two known variants; the 9N722K1 is thought to be the unitary warhead and the 9N722K5 the sub-munition warhead. Both warheads are thought to operate in conjunction with the 9E156 radar proximity fuze. A variable yield nuclear armed variant of the Iskander is thought to exist but no technical details are known.

The 9M728 Iskander variant is a ground launched cruise missile and is based on the maritime 3M14 Kalibr cruise missile. The 9M728 missile employs a solid fuel boost motor to eject the missile from its transport container and then makes use of an air-breathing turbofan for flight. Lift is provided by pop out wings on the missile. A 'hypersonic' air-launched variant of the Iskander, sometimes referred to as the Kinzhal or Kh-47M2, is capable of being launched from Tu-22 strategic bombers and MiG-31 aircraft.

Some variants of the Iskander missile are equipped with deployable electronic countermeasure systems (also known as penetration aids) which are deployed during the terminal phases of the missile trajectory.

ANTI DISTURBANCE DEVICES

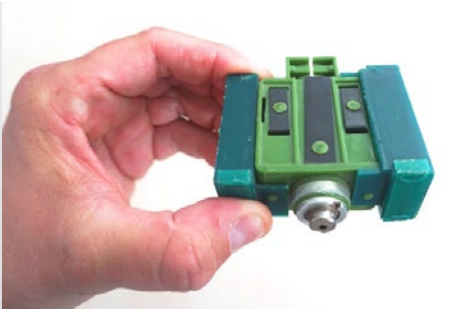
MS-3

Images © Dutch EOD Center and Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Anti-Disturbance Device
EXPLOSIVE FILL (g)	310 TNT
AUW (g)	630
DIMENSIONS (mm)	110 x 65
COUNTRY OF ORIGIN	Russia/Romania

The MS-3 is a Russian anti-disturbance device. It functions by means of pressure release. It was originally designed for use with bounding fragmentation anti-personnel mines such as the OZM-72, although it can also readily be employed with anti-vehicle mines, or indeed with any object of sufficient weight (4kg) to act as a holding device. The device can easily be mistaken for a PMN. The prominent protrusion of part of the pressure release mechanism on the cover of the device is the easiest way of telling the difference. Otherwise the device looks almost identical to a PMN with a brown bakelite body and black rubber cover. MC-3, along with the lot number and year of manufacture, and the explosive type, are usually marked on the cover. The mine contains more TNT (310g) than a PMN (220-240g). The diameter of the MS-3 is the same as an OZM-72. The device is very similar in function to a PMN with some key differences. The cylinder spring is in compression. Once armed it is prevented from pushing the cylinder upwards, so that the firing pin assembly can impact the detonator and booster assembly, by a weight placed on the cover. Remove the weight and the spring can align the cylinder; the final holding device is removed and the device will function. The MS-3 is described in some old marketing literature Russian manufacturers as a “surprise mine”. An inert practice version U-MS-3 exists. It is usually marked У-МС-3 on the cover. Confirmed use of the MS-3 should be actively and accurately recorded to improve threat assessment for deminers and EOD operators. Great caution should be exercised when dealing with suspected MS-3 devices. Attempts to remove holding charges with remote and semi-remote techniques such as hook and line must only be undertaken with great care.

ML-7



Images © Robert Seddon

ORDNANCE SUB-CATEGORY	Anti-Disturbance Device
EXPLOSIVE FILL (g)	30g PVV-5A / 10g Tetryl
AUW (g)	100
DIMENSIONS (mm)	110 x 65
COUNTRY OF ORIGIN	Russia
FUZE	VGMS-1

The ML-7 is a small anti-disturbance device. It is made of green plastic with a central fuze position. Aside this are two booster capsules in small shallow metal drums (each containing 5g tetryl). Each dark green side jacket contains 15g of 40 PVV-5A explosive. The VGMS-1 fuze is similar to that used by a PFM-1 mine, incorporating a viscous arming delay. The safety pin is removed to arm the fuze. Once removed the ML-7 will arm within 5 minutes. The pin often has a red ribbon attached. Discarded ribbons/pins can be a good tell tale of the presence of an ML-7. When in anti-lift mode the lid requires 300g of weight to prevent initiation. PVV-5A is a Russian RDX based plastic explosive used in mines such as the MON-50. While the ML-7 is classically employed in a pressure release function, it can also function by pull. The markings are found on one of the small sides of the main charges as well. The marking includes abbreviation of the mines name (мл-7 or У-мл-7), manufacturer code, batch number and year of manufacture. Some batches have no marking. Training devices У-мл-7 have the marking Инерт (inert) below the batch number. The ML-7 has also been referred to as a VP-11 in some literature. Confirmed use of the ML-7 should be actively and accurately recorded to improve threat assessment for deminers and EOD operators. Great caution should be exercised when dealing with suspected ML-7 devices. Attempts to remove holding charges with remote and semi-remote techniques such as hook and line must only be undertaken with great care.

ML-8

Images © Open Source

ORDNANCE SUB-CATEGORY	Anti-Disturbance Device
EXPLOSIVE FILL (g)	80 PVV-5A
AUW (g)	370
DIMENSIONS (mm)	60x40
COUNTRY OF ORIGIN	Russia

The ML-8 is an anti-lift devices for use with landmines but also everyday objects. A pyrotechnic arming delay element arms the fuze after 120 - 150 seconds from the moment of the removal of the red cap with a 800mm nylon thread. A spring-loaded metal plate with two simple hinges at each end is held down by the mine or other object. This metal plate acts as a holding device on a cocked striker fuze. Once weight is removed its springs lift it and it no longer acts as a holding device. PVV-5A is a Russian RDX based plastic explosive used in mines such as the MON-50. Like the ML-7, once the ML-8 is armed it cannot be disarmed. The presence of the transparent/white nylon thread discarded on the ground can be an indicator that an ML-8 is present.

The raised markings apply on the cap closing the rectangle casing of the ML-8. The marking is standard, it includes abbreviation of the mine's name (мл-8 or У-мл-8), manufacturer code, batch number and year of manufacture. Possible colours of the ML-8 are green, olive and brown. The casing of the ML-8 and the plastic cover can be of different colour. Confirmed use of the ML-8 should be actively and accurately recorded to improve threat assessment for deminers and EOD operators. Great caution should be exercised when dealing with suspected ML-8 devices. Attempts to remove holding charges with remote and semi-remote techniques such as hook and line must only be undertaken with great care. This device has been used widely in Ukraine in conjunction with more visible anti-personnel mine systems, such as the MON-50 directional fragmentation mine and OZM-72 bounding fragmentation mine.

MISCELLANEOUS

9B899 (9Б899) DECOY

Image © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Decoy
EXPLOSIVE FILL (g)	N/A
AUW (g)	
DIMENSIONS (mm)	
COUNTRY OF ORIGIN	Russia

The 9B899 is an electronic countermeasure device deployed from the base of the 9M723-Iskander (SS-26 Stone) missile. The device appears to be a programmable multi-channel inhibitor powered by a thermal battery which is mounted in the rear section of the device. Programming and pre-deployment control of the device is achieved using a seven pin data port just forward of the fins. The exact method of operation of the device is unclear but it appears to be of a four channel, dual redundant design and contains a well-engineered redundant power amplifier system. The device antennae appear to be built into the external cylinders surrounding the electronic systems. The device is most likely configured to act as a penetration aid and is ejected by the Iskander missile in the mid to terminal stage of its trajectory. The device is probably configured to inhibit the communication links between ground based radars and surface to air missile systems. The 9M723 missile has six cylindrical ports in its base which are designed to house the 9B899 devices during transit, launch and flight. 9B899 devices which have failed to function may still contain live thermal batteries and should be handled accordingly. A lack of scorching present on the fins may indicate that the thermal battery has failed to function.

OFS AERIAL BOMB

Images © Private

ORDNANCE SUB-CATEGORY	Aerial Bomb
EXPLOSIVE FILL (g)	N/A
AUW (g)	
DIMENSIONS (mm)	200x40
COUNTRY OF ORIGIN	Russia

This item was named locally as an OFS. The fragmentation jacket has a 40mm diameter.

The fuze is not identified but appears to be a simple mechanical impact inertia fuze that should be assumed to be in line and armed. The explosive fill is estimated to be 100-150g of HE.

RKG-1600 AERIAL BOMB

Images © Open Source

ORDNANCE SUB-CATEGORY	Aerial Bomb
EXPLOSIVE FILL (g)	440g TG-50
AUW (g)	1115g
DIMENSIONS (mm)	387x76
COUNTRY OF ORIGIN	Russia

This appears to be a repurposed RKG-EM grenade – deployed by an UAV. Some sources state that this device was developed by a conventional manufacturer in Ukraine and is designated the RKG-1600. The warhead targets the thinner armour on top of an armoured vehicle.

The fuze is inevitably different from the standard RKG-EM. It is possible there are limited safety features with the fuze and that any item found should be considered in line and armed.

UDSH SMOKE POT

Images © Sean Moorhouse

ORDNANCE SUB-CATEGORY	Smoke Pot
EXPLOSIVE FILL (g)	N/A
AUW (g)	13500g
DIMENSIONS (mm)	318x139
COUNTRY OF ORIGIN	Russia
FUZE	

The UDSh smoke generator/pot can easily be mistaken for a TM-62M anti-vehicle mine. The key distinguishing features are the prominent fuze, and the green plastic fuze cap. There are also subtle difference on the body of the device. UDSh is usually stencilled in black on the side. UDSh 'Unifitsirovannaya Dymovaya Shashka' literally translates as 'Unified Smoke Block'. Some sources state that these devices are largely used by NBC defence troops.

DM-11 SMOKE POT

Images © John Montgomery

ORDNANCE SUB-CATEGORY	Smoke Pot
EXPLOSIVE FILL (g)	N/A
AUW (g)	3100g
DIMENSIONS (mm)	159x106
COUNTRY OF ORIGIN	Russia

The DM-11 is a smoke generating device, sometimes referred to as a smoke pot. Beneath a lid with a thin handle ten vent holes are sealed with foil. It is believed the composition used is hexachloroethane

The DM-11 looks very similar to the later NDSh and ShD-MM smoke pot models. EOD Operators are advised to confirm the model by the black stencilled markings on the side. Some sources state that these devices are largely used by NBC defence troops.

KONTAKT- 5

Images © John Montgomery

ORDNANCE SUB-CATEGORY	Special Purpose Ammunition
EXPLOSIVE FILL (g)	34g PDX
AUW (g)	NK
DIMENSIONS (mm)	250x130x10
COUNTRY OF ORIGIN	Russia

Kontakt-5 is an improved form of Explosive Reactive Armour found in box containers on most main battle tanks and many armoured fighting vehicles in Ukraine. The Kontakt-5 is supposedly effective not only against tandem HEAT warheads but also APFSDS projectiles. Plates are of different sizes dependent on where they are positioned on the vehicle. For a Main Battle Tank, there are front plates for the front of the hull near the driver's position, side plates that sit above the track, and V-plates that protect the turret. Explosive sheets are contained in steel boxes – some boxes contain up to 4 sheets in a tray. While not initiated by any form of fuzing ERA still poses an explosive hazard. ERA should always be removed with a manual tool (e.g. adjustable spanner or socket) rather acetylene cutting equipment. ERA should be removed from AFVs prior to handover to waste metal personnel.

KZ-6

Images © Left: t.me/razved Right: Lex Peverelli

ORDNANCE SUB-CATEGORY	Demolition Charge
EXPLOSIVE FILL (g)	1800g TG-40
AUW (g)	3000g
DIMENSIONS (mm)	292x112
COUNTRY OF ORIGIN	Russia

The KZ-6 is a demolition charge that incorporates a conical liner shaped charge. It is used for cutting/perforating metal and concrete. In its conventional application the M-10 thread can accept detonators associated with MUV fuzes or NM Initiators such as the MD-5M. The black stencilled markings are found at the base of the munition. TG-40 (ТГ-40) is a 40/60 mix of TNT (Т = Тротил = Trotil) and RDX (Г = Гексоген = Geksogen). There is evidence to suggest that the KZ-6 has been adapted for use as an improvised aerial bomb. If so, this would be amongst the larger of such devices yet seen during the conflict. It is not clear how this an improvised aerial bomb is fuzed, although an inline impact inertia fuze would be logical. As with the fuzing of all improvised aerial bombs, caution is advised.

MD-5M

Image © Swiss EOD Center

ORDNANCE SUB-CATEGORY	Detonator
EXPLOSIVE FILL (g)	Lead Azide/Lead Styphnate/Tetryl
AUW (g)	9.7g
DIMENSIONS (mm)	50x13
COUNTRY OF ORIGIN	Russia

The MD-5M (МД-5М) is the standard Russian stab sensitive detonator typically employed with mechanical cocker striker fuzes. The detonator has two threads, one to screw into the basis of a switch, typical a MUV switch, and the other to screw into the body of a mine such as a MON-50 or explosive charge. The MD-5M has a KV-11 stab sensitive primer composed of lead azide and lead styphnate and a No.8 detonator body with a tetryl filling. The MD-5M can also be used with electromechanical devices such as the NM initiator.

MVE-72

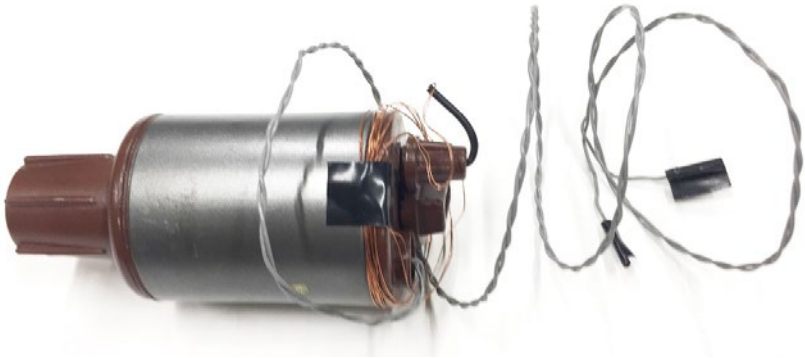


Image © Swiss EOD Center

ORDNANCE SUB-CATEGORY	Firing Device
EXPLOSIVE FILL (g)	N/A
AUW (g)	600g
DIMENSIONS (mm)	150x65
COUNTRY OF ORIGIN	Russia

The MVE is an electronic firing device that operates with a breakwire (collapsing circuit). The device consists of a metal cylinder casing, with a bakelite base. The bakelite base unscrews to accept a 1.5V battery. On the top of the device are two connection pods, one for the breakwire, the other for the connecting wire to the initiator, which can be a simple electrical detonator, or more likely an NM initiator. If the latter is used, the MVE-72 is often employed with area fragmentation weapons, such as the OZM-72 bounding or MON-series directional fragmentation mines. The metal body is usually painted olive green with markings stencilled in black. Some sources designate the item MVZ-72. There are similar improved versions, MVE-NS, MVE-92 and MVE-08 respectively. The device is viable for as long as the battery has a potential. The MVE-72 should deactivate when the battery is fully discharged. The device is armed by pulling a friction type igniter. It has an arming delay of 50 – 180 seconds. The filament breakwire is extremely difficult to see with the naked eye and is a significant hazard where devices have been emplaced and vegetation has later grown and obscured the wire.

NM INITIATOR

Image © Swiss EOD Center

ORDNANCE SUB-CATEGORY	Firing Device
EXPLOSIVE FILL (g)	Lead Azide/Lead Styphnate/Tetryl
AUW (g)	9.7g
DIMENSIONS (mm)	54x39
COUNTRY OF ORIGIN	Russia

The NM initiator is the standard Russian electrical-mechanical initiator. It is a usually used in conjunction with an MD-5M detonator that is screwed into its base. (Use with an MD-2 detonator is also possible). The NM is more accurately an electro-mechanical device. A firing pin and spring assembly is in line with the primer of the MD-5M once attached. The firing pin is only retained by a thin shear ring holding device. A current of sufficient voltage burns a squib, the enclosed gas from which has sufficient pressure to rupture the retaining shear ring. The coiled spring then pushes the firing pin onto the primer of the MD-5M detonator. The initiator has a distinct bakelite body. This initiator will typically be used with OZM-72 bounding and MON-series directional fragmentation mines. It can be initiated by VP-13 and MVZ-72 firing devices.

NVU-PM/VP-13

Images © Danish EOD and Search Center

ORDNANCE SUB-CATEGORY	Firing Device
EXPLOSIVE FILL (g)	NA
AUW (g)	2000g
DIMENSIONS (mm)	250x110
COUNTRY OF ORIGIN	Russia

The NVU is a seismic initiation system that can be connected to up to five items of explosive ordnance, typically directional fragmentation or omni-directional mines. The top of the unit has five connections that can accept wires, typically from NM initiators. The device has a geophone that can detect ground vibrations within a radius of 15 meters. The device is sometimes referred to as 'Kolada' which literally translates as "pack of cards".

The unit is powered by six 1.5V batteries in the base. The sensor body is green with black stencilled markings. The SV-20-P geophone is silver coloured with a red connecting top. The unit is armed by initiating the MUV-4. The striker completes an electrical circuit, that will arm in six minutes after contact.

EOD operators are advised not to approach an identified unit if there are reasonable grounds to believe the battery still retains a charge. It should be noted that cutting wires to the VP-13 will initiate the next mine of the five in sequence. This device is typically fitted with a self-destruct charge in the form of a demolition charge and operates when the battery charge falls below the minimum potential. The self-destruct charge usually consists of an NM initiator, MD-5M, and TNT demolition charge.

SM-320 SIGNAL MINE

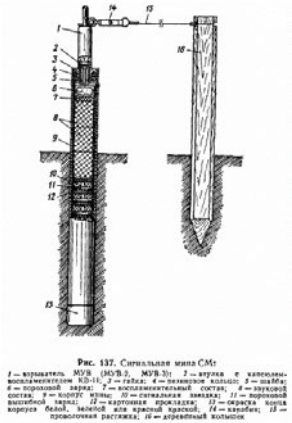


Рис. 137. Сигнальная мина СМ:

Images © Yuri Shahramanyan and Soviet technical manual

ORDNANCE SUB-CATEGORY	Trip Flare
AUW (g)	400g
DIMENSIONS (mm)	278x25
COUNTRY OF ORIGIN	Russia

The SM-320 (CM-320) Signal Mine as it is known in Russian service is neither an anti-personnel nor an anti-vehicle mine. The best literal translation would be “trip flare”. The flare has an M-10 screw thread that can accept the full range of MUV type fuzes. Typically, the SM-320 is initiated by trip wire. The signal mine body is made of steel and contains a pyrotechnic composition which, when initiated, emits 12 – 15 luminous stars to a height of 5 – 15 m, with an audible report which can be heard up to 500 m away. The colour of the flares emitted by the signal mine is indicated by the colour painted on the base of the mine body. The SM-320 is supplied in kits with stakes for ground mounting. The SM-320 may easily be taped or fixed to buildings or street furniture for use in urban operations. It is often used in conjunction with tripwire initiated bounding mines (OZM-72), directional fragmentation mines (MON series), or POM-2R hand delivered fragmentation anti-personnel mines. The Factory-Lot-Year of Manufacture are marked in black on the olive-green body of the flare.

SZ-6

Image © Lex Peverelli

ORDNANCE SUB-CATEGORY	Demolition Charge
EXPLOSIVE FILL (g)	5900-6100g TNT
AUW (g)	7300g
DIMENSIONS (mm)	395x142x98
COUNTRY OF ORIGIN	Russia/Bulgaria

The SZ-6 is a demolition charge. While it is traditionally associated with maritime demolitions, it has been used as a demolition charge on land. In this role, the charge has been used in attempts to sabotage or destroy railway lines. SZ stands for "Sosredotochennyye Zaryady" which literally translates to "concentrated charge". Stated NEQs for the SZ-6 range from 5900-6100 grams, dependent on what booster is fitted. The numeral "6" alludes to the nominal main charge weight of 6kg. The main charge is TNT, the booster is RDX. Some sources state that the main charge is TG-50, which might give slightly more brisance if trying to cut thick metal. If used underwater a VPZ-1 firing device may be employed. Alternatively, an M-10 fuze thread can accept switches compatible with MD-2 and MD-5 detonators.

OZ-1

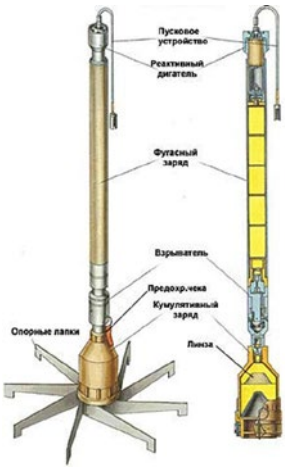


Image Left © Roly Evans Right: Soviet Manual

ORDNANCE SUB-CATEGORY	Entrenching Charge
EXPLOSIVE FILL (g)	1100g A-IX-1
AUW (g)	3500g
DIMENSIONS (mm)	900x420
COUNTRY OF ORIGIN	Russia

The OZ-1 is designed to break the soil, especially in frozen conditions, in order to make manual digging easier. The system will disturb the earth to a depth of up to 2.5m dependent on ground conditions. The A-IX-1 explosive can be found not only in the shaped charge in the bakelite cone but also in the green extension. It is believed the shaped charge contains 450g of A-IX-1 and the extension contains 650g. On the side of the bakelite cone there should be a black KZ-OZ marking. On the side of the extension there should be a black FZ-OZ marking. The bakelite charge is stabilized with a green metal stand of 8 legs. More information is required on the complete mechanism and how both charges work in sequence. The charges can be used together or separately. OZ-1s have also been used to breach structures during urban warfare.

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