



Depleted Uranium Weapons and Platforms Worldwide

Depleted Uranium (DU) Weapons have been a topic of controversy and concern for many years due to their hazardous effects on human health and the environment. As the use of these weapons continues to be a subject of debate in military conflicts around the world, it is crucial to have a comprehensive understanding of the various types and quantities of depleted uranium weapons and the platforms which can deploy them.

This list, compiled by ICBUW, the International Coalition to ban Uranium Weapons, aims to shed light on the extent of depleted uranium weapons currently in use worldwide to provide policymakers, researchers, and the public with this valuable information. By documenting and categorizing these weapons we hope to raise awareness about the consequences of their use and work ending their use in armed conflicts against the background of banning them.

Please note that this list has been compiled using only public access sources and materials. Information on military materials, weapons and platforms is restricted.

This document has been compiled by Maximilian Stimmel as intern for ICBUW Germany. He or ICBUW Germany cannot be held responsible for the contents or accuracy of this document. This list does not claim to be exhaustive due to the limited availability of public information.

This document should be reviewed regularly to ensure that its up-to-date and follows the latest discoveries.

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I. US Produced Weapons and Platforms

a. Platforms

1. A-10 Thunderbolt Aircraft

- US produced aircraft for ground support
- Capable of shooting PGU-14/B API DU-round
- Heavily used in the Gulf War and Balkans
- estimated to be responsible for most of the DU rounds fired in the 1991 Gulf War and for almost all DU contamination.

Overview

The A-10 Thunderbolt (also called “Warthog”) is an US produced aircraft designed for close air support of ground forces. It can be used against light maritime attack aircraft and all ground targets, including tanks and other armored vehicles. It is in service since 1975.¹

The A-10 Thunderbolt is estimated to be responsible for the largest share of DU ammunition fired by US forces in both Gulf War and the Balkans.²



Source: Master Sgt. William Greer, U.S. Air Force,
<https://www.flickr.com/photos/usairforce/5711148476/in/photostream/>

Armament and Ammunition

The main armament of the A-10 Thunderbolt is the GAU-8/A, a seven barreled gatling cannon, capable of shooting both the PGU-14/B Armor Piercing Incendiary (API) DU Round and the PGU-13/B High Explosive Incendiary (HEI) round.³ The rounds are typically fired in a ratio of 5 API to 1 HEI.

A spokesperson for Air Combat Command stated that the Service is beginning to use belts with 30mm ammunition with a ratio of 2 DU API for every 1 HEI round, therefore

¹<https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104490/a-10c-thunderbolt-ii/>, last visited 18. March 2024.

² Dan Fahey, Science or Fiction? Facts, Myths and Propaganda In the Debate Over Depleted Uranium Weapons, P. 7, access: <https://www.wise-uranium.org/pdf/dumyths.pdf>, last visited 18. March 2024.

³ <https://nationalinterest.org/blog/reboot/uranium-bullets-10-warthogs-cannon-truly-fearsome-weapon-164803>, last visited 18. March 2024.

lowering the amount and ratio of DU API rounds used.⁴ There is also an ammo load containing only HEI rounds and no DU rounds for engaging non-armoured targets.

Impact and Deployment

Considering the GAU-8/A cannons capability to fire 3900 rounds of ammunition per minute⁵, it can be estimated to be responsible for most of the DU rounds fired in the 1991 Gulf War and for almost all DU contamination. The Pentagon claimed in 2015, that the U.S. Air Force would not be using PGU-14 DU Ammunition in its air campaign against the Islamic State in Iraq and Syria.⁶ Contradicting these claims, it was later discovered that the Pentagon did use DU Ammunition in its air campaign.⁷

The A-10 Thunderbolt aircrafts did also fire DU rounds in the Pohakuloa Training Area in Hawaii.

Future use/ Prospects

While discussions about the A-10s future are ongoing, it appears that the F-35A as replacement might not be suitable after all. The A-10 Thunderbolt might be continuously upgraded instead and will be part of the US forces for some time to come.⁸

In 2018, the U.S Air Force reportedly began to evaluate the future ammunition for the GAU-8/A cannon and to look into the possibility of replacing the current DU rounds with a tungsten penetrator instead.⁹ Since 2019, the U.S. military was investigating possible methods and costs of dismantling and disposing of more than 35.000.000 rounds of ammunition containing depleted uranium. This ammunition is predominantly made up of 30mm shells for the GAU-8/A cannon, but also includes 105mm and 120mm shells.¹⁰ Recently in 2021, the U.S. Army has awarded a contract to General Dynamics for the demilitarization and disposal of DU ammunition.¹¹

⁴ <https://taskandpurpose.com/news/a-10-warthog-armor-piercing-incendiary-rounds/>, last visited 18. March 2024.

⁵ <https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104490/a-10c-thunderbolt-ii/>, last visited 18. March 2024.

⁶ <https://medium.com/war-is-boring/a-10s-leave-controversial-ammo-at-home-during-middle-east-strikes-c5f6654fc6d6>, last visited 25. March 2024.

⁷ <https://www.thenewhumanitarian.org/investigations/2016/10/06/exclusive-iraq-war-records-reignite-debate-over-us-use-depleted-uranium>, last visited 07. July 2024; <https://airwars.org/news/depleteduranium1/>, last visited 07. July 2024.

⁸ <https://aircosmosinternational.com/article/a-10-thunderbolt-ii-improves-postponing-its-replacement-by-the-f-35-3710>, last visited 18. March 2024.

⁹ <https://www.twz.com/20875/a-10-warthogs-may-stop-firing-controversial-depleted-uranium-ammunition-for-good>, last visited 24. March 2024.

¹⁰ <https://www.twz.com/30045/pentagon-may-scrap-35-million-depleted-uranium-rounds-used-by-the-a-10-warthogs-gun>, last visited 25. March 2024. See Article for a full list of rounds of each type that could be broken down.

¹¹ <https://defence-blog.com/us-army-awards-contract-to-general-dynamics-for-disposal-of-depleted-uranium/>, last visited 25. March 2024.

2. M2 & M3 Bradley Fighting Vehicle

- US produced armored personnel carriers,
- can engage enemy vehicles and provide fire support.
- 25mm M242 Bushmaster cannon, M919 APFSDS DU rounds.
- 6720 units bought by US Army

Overview

The M2 & M3 Bradley are armored personnel carriers, and their primary function is to transport troops into battle. It can also be used to engage enemy vehicles and to provide fire support.

The Bradley Fighting Vehicle Family currently consists of the M2 Infantry Fighting vehicle and the M3 Cavalry Fighting Vehicle.¹²

Armament and Ammunition

The Bradley fighting vehicle is equipped with a 25mm M242 Bushmaster cannon. This cannon works with a “dual feed” mechanism: The gunner is able to switch between armor piercing M919 APFSDS depleted uranium round, M792 high explosive rounds, and M791 APFSDS-T armored piercing rounds (tungsten core). The 25mm M242 Bushmaster cannon can be selected to fire single shots or at a fire rate of 100 or 200 rounds per minute.



Bradley 2 / M3 Fighting Vehicle

Source:

<https://www.military.com/equipment/m2-m3-bradley-fighting-vehicle>

Impact and Deployment

The US army is reported to have bought 6.720 Bradley's, 400 have been sold to Saudi Arabia and 32 to Lebanon. The M2 Bradley has first been issued in 1981 to the U.S. Army and was deployed in the 1991 Gulf War. It reportedly used not only its TOW missiles to destroy Iraqi tanks, but also its M242 chain gun, which can fire M919 DU rounds. During Operation Iraqi Freedom (2003-2011), the M2 Bradley proved to be vulnerable to Iraqi attacks and up to 150 units might have been destroyed, hundreds more damaged.¹³ The amount of DU contamination resulting from the destroyed tanks remains unclear.

¹² <https://www.military.com/equipment/m2-m3-bradley-fighting-vehicle>, last visited 25. March 2024.

¹³ <https://tankhistoria.com/modern-day/m2-bradley/>, last visited 25. March 2024.

The US have so far delivered 186 Bradleys to the Ukraine¹⁴ and their use has been reported many time from the battle field. Along with the Bradley the US delivered 500 TOW anti-tank missiles and 250.000 25mm rounds for its M242 Bushmaster cannon¹⁵. It remains unclear whether these rounds are M919 APFSDS depleted uranium rounds, M791 APDS tungsten core rounds or M792 high explosive rounds.

Future Use / Prospects

The current US Bradley fleet is being upgraded to either 'A3' or ODS (Operation Desert Storm) standard. Both standards are still equipped with the M242 gun, and the Bradley is expected to remain in the US arsenal for the foreseeable future. The U.S. Army released a summary and conceptual image of the M2 Bradleys planned successor, the XM30 Infantry Fighting Vehicle (IMV)¹⁶.

¹⁴ <https://english.nv.ua/nation/us-already-delivered-186-bradley-ifvs-to-ukraine-worth-372-million-news-50356992.html>, last visited 21. March 2024.

¹⁵ <https://www.nytimes.com/2023/01/06/world/europe/us-ukraine-aid-bradley-fighting-vehicle.html>, last visited 24. March 2024.

¹⁶ <https://essanews.com/m2-bradley-in-a-new-version-the-pentagon-has-unveiled-a-concept,6963060768454785a>, last visited 24. March 2024.

3. M1 / M1A1 / M1A2 Abrams Tank

- US main battle tank since 1980
- Platform for large DU rounds, either 105mm (M68) or 120mm (M256) cannon
- Available with DU armour (not exported)
- M829 DU round for 120mm M256 cannon

Overview

The Abrams Tank is the US main battle tank since 1980 and the platform for large depleted uranium (DU) ammunitions. Different versions of the tank can either fire 105mm or 120mm rounds. Some versions also have DU armor in the turret, but this version is apparently not exported to any other countries due to DOE¹⁷ regulations¹⁸. Exports include Australia, Egypt, Iraq, Kuwait, Taiwan, Poland¹⁹, and Saudi Arabia.

After 1992, the M1A2 Abrams was produced, it is believed that most, if not all M1A2 tanks are fitted with DU armor. The M1A2 and further upgrades such as the M1A2 SEP (Special Enhancement Program) have focused on improving internal systems. The US Abrams fleet is undergoing a renovation program to bring all tanks up to the M1A1 or M1A2 SEP standard. This means that the M1 tank with the 105mm cannon is no longer in service.²⁰



Source:
<https://www.military.com/equipment/m1a2-abrams-main-battle-tank>

Armament and Ammunition

Although the original M1 was fitted with the same M68 105mm cannon as the earlier M60 Patton tanks, it was replaced by the larger 120mm caliber gun in the mid 1980s with the production of the M1A1.²¹ This 120mm Smooth Bore gun is an adapted

¹⁷ U.S. Department of Energy, the depleted uranium in the M1A2s armor falls under their purview.

¹⁸ <https://www.forbes.com/sites/davidaxe/2023/01/27/the-tungsten-m-1-how-ukraines-tanks-will-differ-from-americas/?sh=3d57f5bc26b3>, last visited 24. March 2024.

¹⁹ <https://www.reuters.com/business/aerospace-defense/us-oks-potential-sale-m1a1-abrams-tanks-equipment-poland-estimated-375-billion-2022-12-06/>, last visited 24. March 2024.

²⁰ <https://www.military.com/equipment/m1a2-abrams-main-battle-tank>, last visited 24. March 2024.

²¹ <https://www.fdmuseum.org/exhibit/m1-abrams-tank/>, last visited 24. March 2024.

version of the Rheinmetall L44 with the designation M256. Both versions can fire DU APFSDS-T rounds, the earlier 105mm M774 / M833 / M900 and the more recent 120mm M829 round. In addition to the main cannon, the tanks are equipped with a 7.62mm coaxial machine gun and a .50 cal M2 Machine gun²².

As well as the M829 DU round, a number of other 120mm US rounds are available to fire from the M256 cannon:

- M830 High Explosive, Anti-Tank, Multi-Purpose Tracer round - an upgraded M830A1 version is also available.
- M865 Target Practice, Cone Stabilized, Discarding Sabot round - a steel core practice version of the M829.
- M831 / M1003 Target Practice Tracer round - older, and updated practice versions of the M830
- M1028 Canister round - an anti-personnel round which expels a spray of tungsten ball-bearings.
- M908 High Explosive Obstacle Reduction (HE-OR-T) to reduce obstacles into rubble that is small enough to be cleared.²³

Impact and Deployment

The M1A1 Abrams tank was first deployed into battle in the 1991 Gulf War, and was extremely effective against the aging Soviet tanks used by Iraq. Only eight Abrams tanks were damaged during the conflict and no crew members were killed by enemy fire. The superlative reputation of uranium-based ammunition is largely due to the performance of US tanks during this conflict, but the success of the M1A2 Abrams was due to several factors, including thermal imaging systems.²⁴

The US has pledged to deliver Ukraine with 31 advanced M1A2 Abrams tanks,²⁵ the first delivery took place in September 2023. Reportedly all 31 Abrams Tanks have been delivered to Ukraine by 10. October 2023. These exported tanks do not contain the highly classified DU armor, since it is not exported even to major allies.²⁶

Future Use / Prospects

The U.S. army announced its plan for the modernization of the Abrams tank in September 2023. The M1E3 Abrams will be modernized and have its mobility and survivability on the battlefield increased. The M1E3 is expected to be operational starting in the early 2030s.²⁷

²² <https://www.military.com/equipment/m1a2-abrams-main-battle-tank>, last visited 24. March 2024.

²³ <https://www.inetres.com/gp/military/cv/weapon/M256.html>, last visited 24 March 2024.

²⁴ <https://www.history.com/news/tanks-abrams-persian-gulf-war>, last visited 25. March 2024.

²⁵ <https://www.reuters.com/world/ukrainian-soldiers-heartened-by-delivery-us-abrams-tanks-2023-09-29/>, last visited 21. March 2024; <https://www.forbes.com/sites/davidaxe/2023/01/27/the-tungsten-m-1-how-ukraines-tanks-will-differ-from-americas/?sh=3d57f5bc26b3>, last visited 24. March 2024.

²⁶ <https://www.twz.com/m1-abrams-tanks-in-u-s-inventory-have-armor-too-secret-to-send-to-ukraine>, last visited 21. March 2024; <https://bulgarianmilitary.com/2023/01/26/ukrainian-abrams-will-be-neutered-due-to-highly-classified-armor/>, last visited 21. March 2024; <https://www.politico.com/news/2023/01/26/us-sends-ukraine-advanced-abrams-tanks-00079648>, last visited 24. March 2024.

²⁷ <https://www.defensenews.com/land/2023/09/06/us-army-scraps-abrams-tank-upgrade-unveils-new-modernization-plan/>, last visited 25. March 2024.

4. M1128 Stryker Mobile Gun System (MGS)

- Modern US weapons system, equipped with the M68 105mm cannon.
- Firing M900 105mm DU rounds
- Deployed to Iraq and Afghanistan
- All MGS divested by end of fiscal year 2022.

Overview

The M1128 Stryker Mobile Gun System is used to create openings in walls, destroy bunkers and machine nests, defeat sniper positions and light armored threats. It uses the M68 cannon and fires 105mm rounds (the same as the original M1 Abrams tank).



Source: Sgt. William Tanner,
<https://www.dvidshub.net/image/1726626/exercise-allied-spirit-day-5>

Armament and Ammunition

With its M68 105mm cannon, the MGS can fire four types of 105mm ammunition:

- High explosive / high explosive plastic ammunition will destroy hardened enemy bunkers
- KE kinetic energy ammunition to destroy a variety of Level II armored vehicles.
- HEAT explosive anti-tank ammunition
- Anti-personnel ammunition

It can also fire the M900 105mm DU APFSDS-T round²⁸, which is the primary 105mm anti-tank armor and the successor to the M774.

Impact and Deployment

The M1128 Stryker Mobile Gun System has first been deployed to Iraq in early 2007. Furthermore it was used during the War in Afghanistan, which ended in 2021.²⁹

Future Use / Prospects

In May 2021, US Army officials made the decision to divest all Stryker Mobile Gun Systems by the end of fiscal year 2022 due to design and operational deficiencies.³⁰

²⁸ <https://web.archive.org/web/20160330223512/http://www.bandedpleteduranium.org/en/a/312.html>, last visited 21. March 2024.

²⁹ https://en.wikipedia.org/wiki/M1128_Mobile_Gun_System#cite_note-Foss_2017-5, last visited 26. March 2024.

³⁰ <https://www.globalsecurity.org/military/systems/ground/iav-mgs.htm>, last visited 21. March 2024; <https://www.defensenews.com/land/2021/05/12/us-army-scrap-stryker-mobile-gun-systems-in-favor-of-new-lethality-upgrades/>, last visited 26. March 2024.

5. M60 Patton Tanks

- First introduced in 1959, replaced by the M1 Abrams Tank
- Equipped with the 105mm M68 cannon.
- Exported to numerous countries (Egypt, Turkiye, Morocco, Taiwan, Greece, Jordan, Bahrain, Oman)

Overview

The M60 tank was first introduced in 1959, it was developed from the M48 Patton tank.



Source:
<https://nationalinterest.org/blog/buzz/m60-patton-us-armys-best-tank-ever-208427>, last visited 26. March 2024.

Armament and Ammunition

The M60 tank is equipped with the 105mm M68 tank cannon. It is based in the British designed L7 gun tube.³¹ It can fire the M833 105mm APFSDS-T DU round. This round was designed to be fitted to the M60 Patton and the original M1 Abrams Tank.

Impact and Deployment

The M60 Patton Tank has been replaced in the U.S. army by the Abrams Tank. However, the M60 in different versions has been exported to numerous countries and is still in service in many of them. Among the largest current operators are the following countries: Egypt (1.700 units), Turkiye (900 units), Morocco (120), Taiwan (1.000) and Greece (400)³². The tank was also exported to Jordan³³, Bahrain³⁴ and Oman and is still in service in these countries.

³¹ <https://www.fdmuseum.org/exhibit/m60-patton-tank/>, last visited 26. March 2024.

³² <https://www.deagel.com/Armies/M60/a000725>, last visited 26. March 2024.

³³ <https://www.marines.mil/News/News-Display/Article/589400/us-marines-wrap-up-exercise-in-jordan/>, last visited 26. March 2024.

³⁴ <https://web.archive.org/web/20180609062606/https://2009-2017.state.gov/r/pa/ei/bgn/26414.htm>, last visited 26. March 2024.

b. Weapons

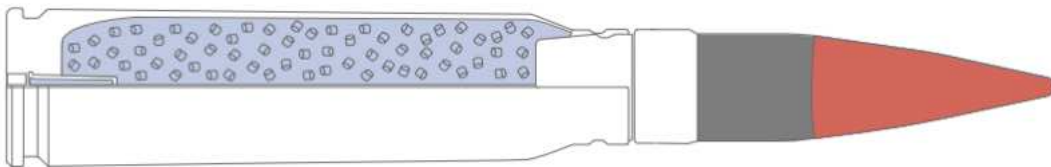
1. PGU-14/B 30mm Armor Piercing (API) DU Round

- Fired by the A-10 Thunderbolt Aircraft, typically in a 5 DU to 1 HEI ratio.
- Therefore estimated to be the most frequently fired DU ammunition.
- Presumably a large part of US stockpiles has been dismantled and disposed since 2019.

Overview

The PGU-14/B Armor Piercing (API) DU round is, among other, used by GAU-8/A cannon on the A-10 Thunderbolt Aircraft. It is typically fired in a ratio of 5 PGU-14/B API DU rounds to 1 PGU-13/B High Explosive Incendiary (HEI) rounds.

The PGU-14/B API DU round contains a penetrator made with uranium alloy and it was developed with the intention to be able to penetrate tank armor.³⁵



PGU-14/B API

Source: <https://www.gd-ots.com/wp-content/uploads/2023/10/400002543->

Impact and Deployment

The PGU-14/B API DU round developed until the mid 1970s and first deployed to NATO forces in Europe in 1978, its known to have been fired in Iraq, Kosovo Serbia, and Bosnia. Since it was fired in large amounts from the A-10 Thunderbolt Aircraft³⁶, it can be estimated to be the most frequently fired type of DU ammunition.

The round has been developed for the A-10 thunderbolt aircraft and its part of a family of 30x173mm ammunition. More guns to shoot rounds of this caliber include:

- GAU-8/A, found in the A-10 Thunderbolt Aircraft and used in the Goalkeeper close in Weapons System on numerous ships.
- MK44 Bushmaster II, found in the Bionix II Armoured Fighting Vehicle, and planned for the US Marines Expeditionary Fighting Vehicle (EFV)
- Mauser MK30, found on German and Italian Ships

However, the PGU-14/B is only thought to have been fired by the A-10. It is produced by both General Dynamics-Ordnance Tactical Systems in Marion, Illinois, and Alliant

³⁵ <https://nation.time.com/wp-content/uploads/sites/8/2011/03/30mmgau2.pdf>, last visited 26. March 2024.

³⁶ See Zecevic, Berko & Terzic, Jasmin & Catovic, Alan & Serdarevic-Kadic, Sabina. (2010). Dispersion of PGU-14 ammunition during air strikes by combat aircrafts A-10 near urban areas, P. 789.

Techsystems in New Brighton, Minnesota. General Dynamics reported that they produced more than one hundred million rounds of the PGU-14/B API DU round, PGU-13 HEI, and the PGU-15/B Target Practice Round. Figures for the total number produced by Alliant Techsystems are not known.

Future Use / Prospects

In 2018, the U.S Air Force reportedly began to evaluate the future ammunition for the GAU-8/A cannon and to look into the possibility of replacing the current DU rounds with a tungsten penetrator instead.³⁷ Since 2019, the U.S. military was investigating possible methods and costs of dismantling and disposing of more than 35.000.000 rounds of ammunition containing depleted uranium. This ammunition is predominantly made up of 30mm shells for the GAU-8/A cannon, but also includes 105mm and 120mm shells.³⁸ Recently in 2021, the U.S. Army has awarded a contract to General Dynamics for the demilitarization and disposal of DU ammunition.³⁹

The rounds have become too old to be safe to use, the oldest stockpiles have been in service since the 1970s. As of 2018, the average age of these rounds was 32 years, sparking concerns whether the primers and propellants in the cartridges would perform as expected. The discussion whether with the replacement shell depleted uranium will be used again or whether they will be replaced by tungsten penetrators is still ongoing.⁴⁰

³⁷ <https://www.twz.com/20875/a-10-warhogs-may-stop-firing-controversial-depleted-uranium-ammunition-for-good>, last visited 24. March 2024.

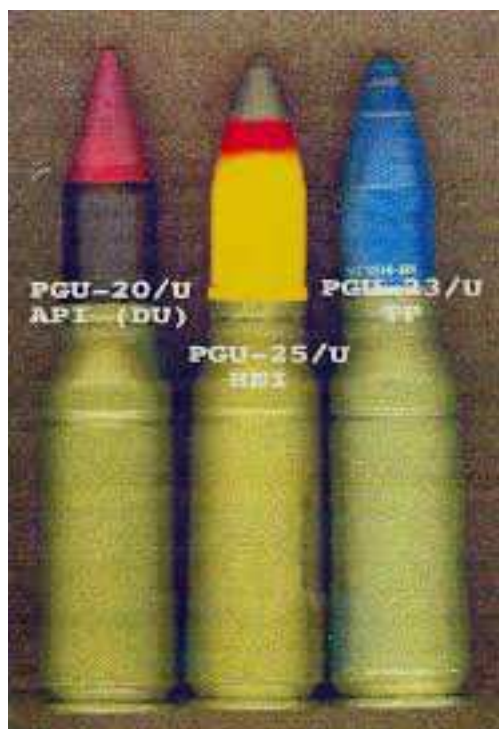
³⁸ <https://www.twz.com/30045/pentagon-may-scrap-35-million-depleted-uranium-rounds-used-by-the-a-10-warhogs-gun>, last visited 25. March 2024. See Article for a full list of rounds of each type that could be broken down.

³⁹ <https://defence-blog.com/us-army-awards-contract-to-general-dynamics-for-disposal-of-depleted-uranium/>, last visited 25. March 2024.

⁴⁰ <https://www.twz.com/30045/pentagon-may-scrap-35-million-depleted-uranium-rounds-used-by-the-a-10-warhogs-gun>, last visited 18.03.2024.

2. PGU-20 25mm Ammunition

- Fired by the AV-8B Harrier Close Air Support System
- Phased out of use
- Fired in a 1:1 mix of DU and High Explosive Rounds
- US Navy fired 67,436 25mm PGU-20 DU rounds in the Gulf War
- Each unit: 150 grams DU penetrator⁴¹



PGU-20 U API Ammunition

Source:

<https://www.secnav.navy.mil/foia/readingroom/CaseFiles/Depleted%20Uranium/Jun%201999%20NRSC%20Briefing%20on%20Depleted%20Uranium.pdf>

Expenditure of Depleted Uranium Rounds at Vieques Inner Training Range, Puerto Rico:

On February 19th, 1999, 2 USMC Harrier Aircraft expended 263 PGU-20 DU rounds and the Vieques Inner Training Range in Puerto Rico. ⁴²

⁴¹ <https://www.globalsecurity.org/military/systems/munitions/pgu-20.htm>, last visited 24. Mai 2024.

⁴² <https://www.nrc.gov/docs/ML0036/ML003677595.pdf>, last visited 20 June 2024;
<https://www.secnav.navy.mil/foia/readingroom/CaseFiles/Depleted%20Uranium/Jun%201999%20NRSC%20Briefing%20on%20Depleted%20Uranium.pdf>, last visited 20 June 2024.

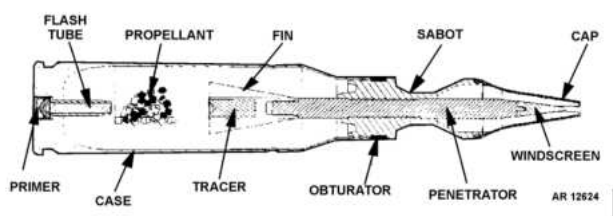
3. M919 APFSDS 25mm DU Round

- Brought into service in 1996, replacing the M791 as service armor piercing round for the Bradley.
- Fired by M242 25mm Bushmaster Cannon on Bradley Fighting Vehicle
- Manufactured by Olin Ordnance⁴³

Overview

The M919 Armour Piercing, Fin Stabilised, Discarding Sabot (APFSDS) 25mm DU round is used by the US military in the Bradley Fighting Vehicle and its 25mm M242 Bushmaster cannon⁴⁴. It was brought into service in 1996 and is manufactured by General Dynamics-Ordnance Tactical Systems. It was developed as a replacement for the M719 APDS-T round (tungsten penetrator).

The M919 weights 454g and the long rod uranium penetrator itself weighs 98g. There is also a version available with a tungsten penetrator.



M919 25mm

Source: Army Ammunition Date Sheets Small Caliber Ammunition, FSC 1305, 15-15, access: <https://www.bulletpicker.com/pdf>



M919 25mm Cartridge

Source: <https://www.globalsecurity.org/military/systems/munitions/m919.htm>

The M919 is part of a large family of 25 x 137 mm rounds. Rounds with these dimensions can be fired from a number of different cannons:

- M242 Bushmaster, found on the M2/ M3 Bradley Fighting Vehicle
- Oerlikon KBA Cannon, found on ships, or as an anti aircraft gun, the Italian Dardo IFV, and the Romanian ML1-84 IFV
- GAU-12/U Bushmaster, found in the US AV-8 Harrier II aircraft, the US AC-130U Spooky Gunship aircraft, and several versions of US Light Assault Vehicle (LAV)
- GAU-22/A, which will be introduced into the F-35 Joint Strike Fighter Aircraft
- Maser Model E -Rheinmetall Rh206
- Giat 25M811

⁴³ <https://www.globalsecurity.org/military/systems/munitions/m919.htm>, last visited 27. April 2024.

⁴⁴ Army Ammunition Date Sheets Small Caliber Ammunition, FSC 1305, 15-15, access: <https://www.bulletpicker.com/pdf/TM-43-0001-27.pdf#page=302>

However, in practice, each weapons platform is usually deployed with rounds manufactured specifically to them. The M919 is known to be the standard ammunition for the M2/M3 Bradley Fighting Vehicle, but is not thought to be commonly fired from the other listed platforms which share the same caliber.

Impact and Deployment

Being the standard ammunition for the M2/ M3 Bradley fighting vehicle, the M919 APFSDS-T round was used extensively in the 1991 Gulf War and during Operation Iraqi Freedom (2003-2011).

Along with the 186 Bradley Armored Vehicles delivered by the US to Ukraine, the US has also delivered 500 TOW anti-tank missiles and 250,000 25mm rounds for the M242 Bushmaster cannon on the Bradley. US officials refused to say whether they would send Ukraine tungsten core M791 armor piercing rounds or uranium core M919 rounds⁴⁵.

Future Use / Prospects

In early 2010, ICBUW broke the story that the United States was moving away from using uranium medium calibre rounds. As the Bradley is intended to remain in service until the mid 21st century, it is unclear whether a different round will be brought into service, or whether the US has sufficient stockpiles of the M919 for all future scenarios. Nevertheless, at the time of writing, the range used for test firing the M919 was much of the way through an extensive decontamination programme, and the round is unlikely to be manufactured again in the future.

⁴⁵ <https://www.kyivpost.com/post/21417>, last visited 22. March 2023.

4. M829 120mm APFSDS-T round

- Largest DU round in the US arsenal, brought into service in 1984.
- Fired from the M1A1 and M1A2 Abrams tanks equipped with the M256 120mm cannon.
- Like other DU munitions, these are identifiable by their black color with white markings on the projectile (pointed) end.⁴⁶

Overview

The M829 120mm APFSDS-T round is the largest DU round in the US arsenal and it is fired from the M1A1 and M1A2 Abrams tanks which are equipped with a 120mm M256 sooth bore cannon⁴⁷, instead of the 105mm M68 on the original M1 Abrams. The US Army was already using 105mm DU rounds in the M1 tank and the M829 was developed as a new DU round for the M1A1 Abrams.

It was brought into service in 1984 and is manufactured by Alliant Techsystems and General Dynamics. There are several versions of this round: M829, M829A1 (nicknamed 'Silver Bullet' during Operation Desert Storm), M829A2 and M829A3. Most recently in 2015, the Full Rate Production decision was taken by the US Army for the latest version M829A4⁴⁸.

Information on all versions of the round is limited, but it is known that earlier versions of the M829 had a range of over 3.000 meters, and at the time of the 1991 Gulf War, the standard combat load of an Abrams tank was 37 M829 rounds, and 3 High Explosive Anti-Tank rounds. The 684mm penetrator alone reportedly weighs 4,6kg.

Impact and Deployment

The available information from reliable sources is still quite rare concerning the use of M829 DU ammunition in past and present conflicts.

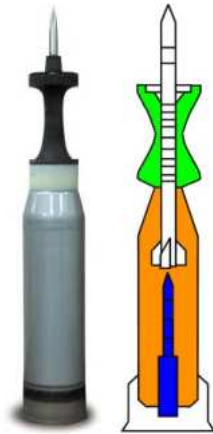
However the news outlet Reuters reported on September 7th, 2023, that according to the Pentagon, the US will be sending a new Security Assistance Package to Ukraine, including depleted uranium ammunition for the Abrams Tank.⁴⁹ Although no further confirmation has been made, the only available depleted uranium ammunition for the Abrams is the M829 APFSDS-T round.

⁴⁶ <https://www.globalsecurity.org/military/systems/munitions/m829a1.htm>, last visited 27. April 2024.

⁴⁷ Army Ammunition Data Sheets, 2-109, access: <https://www.militarynewbie.com/wp-content/uploads/2013/11/TM-43-0001-28-Army-Ammunition-Data-Sheets.pdf> 2-109

⁴⁸ <https://www.dote.osd.mil/Portals/97/pub/reports/FY2015/army/2015m829a4.pdf?ver=2019-08-22-105950-793>, last visited 24. March 2024.

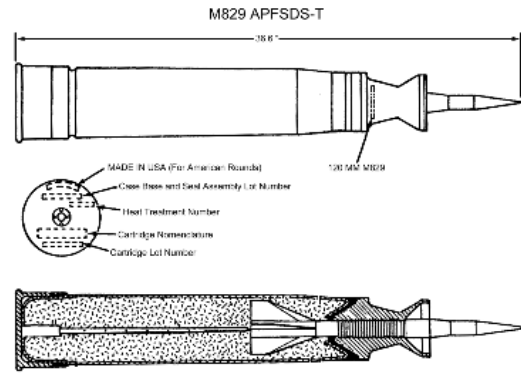
⁴⁹ <https://www.reuters.com/world/europe/us-announces-new-military-aid-ukraine-including-depleted-uranium-munitions-2023-09-06/>, last visited 26. March 2024.



- electric primer
- propellant
- sabot
- DU penetrator

M829 120mm, APFSDS-T

Source: <https://military-history.fandom.com/wiki/M829>
last visited 24. March 2024.



M829 120mm, APFSDS-T

Source: Army Ammunition Data Sheets, 2-109, access: <https://www.militarynewbie.com/wp-content/uploads/2013/11/TM-43-0001-28-Army-Ammunition-Data-Sheets.pdf>



M829 120mm, APFSDS-T

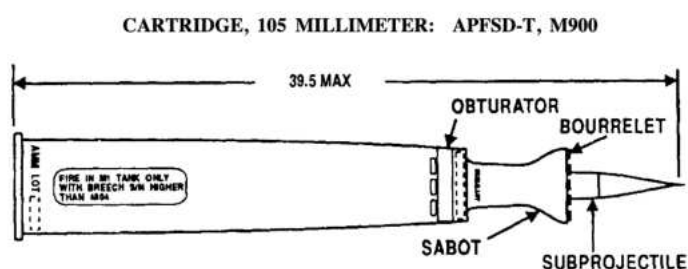
Source: <https://www.globalsecurity.org/military/systems/munitions/m829a1.htm>

5. M900 105mm APFSDS-T Round

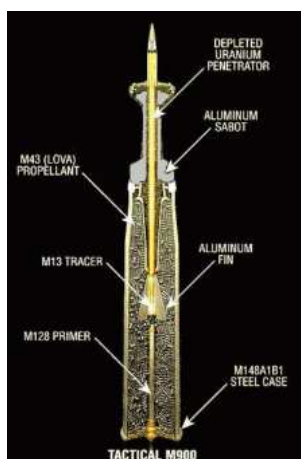
- Brought into service in 1989, designed as a replacement for M833 round.
- Used in the original M1 Abrams (M68 cannon, no longer in service)
- Used in the more modern M1128 Stryker Mobile Gun System (divested by 2022)

Overview

The M900 APFSDS-T DU 105mm round was used in the original A1 Abrams and its M68 cannon as well as in the M1128 Stryker Mobile Gun System. It was brought into service in 1989 as a replacement for the M833 round. The original M1 Abrams tank is no longer in service in the US, the round can nowadays only be fired from the M1128 Stryker Mobile Gun System. However, in 2021 the decision has been taken by U.S. Army officials to divest all M1128 Stryker Mobile gun Systems by the end of fiscal year 2022 due to design and operational deficiencies⁵⁰.



Source: Army Ammunition Data Sheets, 2-75, access: <https://www.militarynewbie.com/wp-content/uploads/2013/11/TM-43-0001-28-Army-Ammunition-Data-Sheets.pdf>



M900 105mm APFSDS-T round Source: <https://www.globalsecurity.org/jhtml/jframe.html#https://www.globalsecurity.org/military/systems/munitions/images/m900.jpg> | |

The M900 cannot be used in earlier M60 series tanks because of the force of its recoil. When the later Versions of the Abrams (M1A1 and M1A2 Abrams) were fitted with the larger 120mm L44 Rheinmetall cannon, the US was left with significant stocks of the M900. The introduction of the M1128 Stryker Mobile Gun System in 2005 provided a use of this ammunition, although the platform has been divested in 2022. Consequently, the M900 is not thought to be currently in production.

⁵⁰ https://en.wikipedia.org/wiki/M1128_Mobile_Gun_System#cite_note-Foss_2017-5, last visited 26. March 2024.

It is claimed that the M900 is capable of penetrating all frontal armour and all current armour systems, as is the M829, the US' main 120mm DU round for its M1A1 and M1A2 Abrams tanks.

As with earlier 105mm rounds, the M900 is in theory capable of being fired from the following guns:

- L7, a rifled British Gun used on the Centurian tank, and also used in the German Leopard 1, Japanese Type 74, Swedish Stridsvagn 103, Indian T-55A, and the Israeli Merkava. The M68 is actually a US licensed version of the L7. It has been reported that the L7 has also been adapted to fit Soviet built T-54 and T-55 tanks by Israel, Egypt and Iraq, and Chinese Type 79 tanks.
- Rh 105 smoothbore gun, developed privately by Rheinmetal of Germany, and not known to be fitted to any vehicle. The ammunition designed to work with this gun is a scaled down version of Rheinmetals 120mm rounds, and consists of a high explosive round, and an APFSDS-T round with a tungsten penetrator
- CN105F1, manufactured by Nexter, fitted to the Giat Industries AMX-30 French tank. The AMX-30 has been superseded by the Leclerc fighting vehicle and is no longer in service.

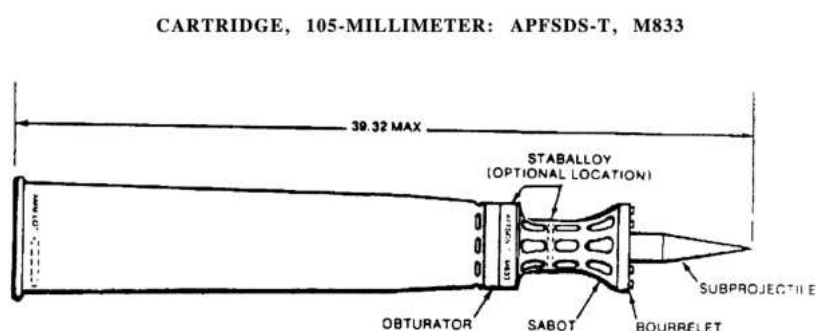
6. M833 105mm APFSDS-T round

- Brought into service in 1983, produced until 1989.
- 105mm round, replaced the M774, replaced by the M900.
- Used in the M60 Patton series and M1 Abrams tanks.
- Not currently thought to be in service

Overview

The M833 105mm APFSDS-T round was used in the M60 Patton series of tanks, and the original M1 Abrams. Both are fitted with the 105mm M68 gun.

It was brought into service in 1983 and produced until 1989. It replaced the M744 and was replaced by the M900. M1 Abrams and M60 Patton tanks are no longer in service in the US as of today, consequently the M833 rounds is not currently thought to be in service or production.



Source: Army Ammunition Data Sheets, 2-105, access: <https://www.militarynewbie.com/wp-content/uploads/2013/11/TM-43-0001-28-Army-Ammunition-Data-Sheets.pdf>

In 1994 sales of the M833 to Bahrain were authorized. Sales to Israel (300 rounds), Jordan (2.130), Pakistan (10.025), Saudi Arabia (320) and Turkiye (22.920) are also recorded. The M60 Patton tank was exported to numerous countries and is still in service in many of them. Among them are Egypt, Iran, Jordan⁵¹, Bahrain⁵² and Oman.

Although the M833 is only thought to have been fired from the M60 and M1 tanks, in theory it is also capable of being fired from the following guns:

- L7, a rifled British Gun used on the Centurian Tank, and also used in the German Leopard 1, Japanese Type 74, Swedish Stridsvagn 103, Indian T-55A, and the Israeli Merkava. The M68 is actually a US licensed version of the L7. It has been reported that the L7 has also been adapted to fit Soviet built T-54 and T-55 tanks by Israel, Egypt and Iraq, and Chinese Type 79 tanks.
- Rh 105 smoothbore gun, developed privately by Rheinmetal of Germany, and not known to be fitted to any vehicle. The ammunition designed to work with this gun is a scaled down version of Rheinmetals 120mm rounds, and consists of a high explosive round, and an APFSDS-T round with a tungsten penetrator

⁵¹ <https://www.marines.mil/News/News-Display/Article/589400/us-marines-wrap-up-exercise-in-jordan/>, last visited 26. March 2024.

⁵² <https://web.archive.org/web/20180609062606/https://2009-2017.state.gov/r/pa/ei/bgn/26414.htm>, last visited 26. March 2024.

- CN105F1, manufactured by Nexter, fitted to the Giat Industries AMX-30 French tank. The AMX-30 has been largely superseded by the Leclerc.
- GT7, manufactured by Denel of South Africa, and fitted to the Rooikat 105 Armoured fighting vehicle.

The M68 cannon has also been fitted to the M1128 Stryker Mobile Gun System, which fires a number of rounds, including the M900, successor to the M833.

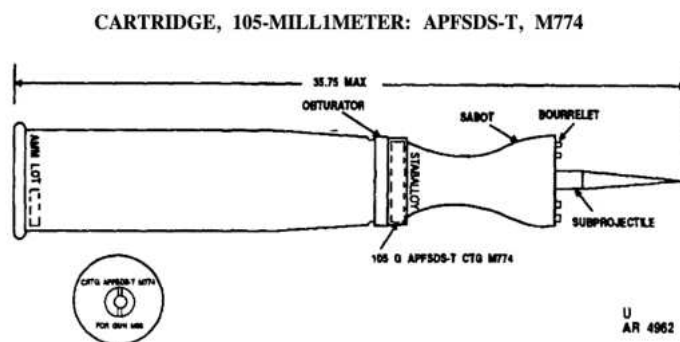
7. M774 105mm APFSDS-T round

- DU round, developed for M60 Patton tanks, also used in original M1 Abrams
- Replaced by the M833 105mm DU round.

Overview

The 105mm APFSDS-T DU round was developed for the M60 Patton tanks and was also used in the original M1 Abrams, it was later replaced by the M833. It was manufactured in the US, most likely by General Dynamics and also under license by Mecar in Belgium and the Heliopolis Company in Egypt. It was brought into service around 1975, following a development program which tested an alloy with the same mix of titanium and DU as the PGU-14/B.

The M774 is no longer produced in the US and is not thought to be currently in service. Both the M60 Patton series of tanks and the M1 Abrams are out of service in the US, although the M60 was exported to numerous countries and is still in service in many of them.



Source: Army Ammunition Data Sheets, 2-103, access: <https://www.militarynewbie.com/wp-content/uploads/2013/11/TM-43-0001-28-Army-Ammunition-Data-Sheets.pdf>



Source: <https://forum.cartridgecollectors.org/t/us-105mm-m774-apfsds-t-tank-round-sectioned/54827/2>, last accessed 26. March 2024.

Foreign sales of the M774 to Taiwan, China⁵³ (1.000 shells), Bahrain and Turkiye (85.451) have been reported.

⁵³ Reflecting United Nations Terminology.

Although the M774 is only thought to have been fired from the M60 and M1 tanks, in theory it is also capable of being fired from the following guns:

- L7, a rifled British Gun used on the Centurian Tank, and also used in the German Leopard 1, Japanese Type 74, Sweedish Stridsvagn 103, Indian T-55A, and the Israeli Merkava. The M68 is actually a US licensed version of the L7. It has been reported that the L7 has also been adapted to fit Soviet built T-54 and T-55 tanks by Israel, Eqypt and Iraq, and Chinese Type 79 tanks.
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- GT7, manufactured by Denel of South Africa, and fitted to the Rooikat 105 Armoured fighting vehicle

The M68 cannon has also been fitted to the M1128 Stryker Mobile Gun System, which fires a number of rounds, including the M900, successor to the M833 (which replaced the M774)

8. M101 20mm Davy Crockett Spotting Round

- A historical DU round, used by the US to estimate firing trajectory on the Davy Crockett nuclear rifle. No longer in use.
- Produced between 1956 and 1963
- Used in practice on US bases until the late 1960s, or early 1970s
- Contamination of bases uncovered in 2006



The M101 was fired from a small 20mm rifle attached to a larger barrel, as part of the Davy Crockett weapons system. The Davy Crockett was a battlefield nuclear weapons system, fired from the ground by either the M28 or M29 freestanding tripod launcher. The M101 was not the main round for this weapon, but a spotting round.

The purpose of the Davy Crockett was to prevent the advance of oncoming enemy troops, by the power of the explosion, and the deterrent effect of irradiating an area. The Davy Crockett projectile, the M388, could carry either conventional explosives, or the W54 nuclear warhead. The W54 had an explosive yield of 0.01 kilotonnes, according to most sources, although some state that the operator could select a yield of between 0.01 and 0.25 kilotonnes. Either way, the short range of the weapon meant that those firing it would have also received a substantial radiation dose.

The Davy Crockett was produced between 1954 and 1963, but remained in service until 1971. It was never fired in anger, but was fired in two tests on the Nevada Test Range in 1962. The second test was part of 'Operation Ivy Flatts', which involved a nuclear exercise as part of a battle simulation involving live troops. This was the last atmospheric nuclear test carried out by the US.



Of the two launchers, only the M28 fired the 20mm M101 DU Spotting round. The M29 launcher had a longer range, and the spotting round was a 37mm non-DU round. On the M28, the M101 was fired from a smaller barrel, below the main one (visible right), and would follow a similar trajectory to the warhead. Therefore, it was used to estimate the targetting and range of the gun. The M101 weighed around 450g, and measured about 20cm long. Each round is estimated to contain around 192g of uranium.

During its service life, the existence of the Davy Crockett was a closely held military secret, and little was known about its deployment, or the use of the M101 in practice. Despite the longstanding claims of campaigners, the US military denied that it had used DU on its bases in Hawaii. However, in 2005, information came to light which drew attention to the past use of the M101 on the Schofield Barracks on Oahu Island, between 1962 and 1968.

Military fieldwork confirmed the presence of spent M101 rounds, and of uranium contamination, and the army was obliged to apply for a site license under the US Nuclear Regulatory Commission (NRC) for the Schofield Barracks and Pohakuloa Training Area. All sites connected with radioactive materials require such licenses under US law, including sites with historic contamination of the ground.

Other sites where M101 fragments have been found include: Fort Hood, Texas; Fort Benning, Georgia; Fort Campbell and Fort Knox, Kentucky; Fort Carson, Colorado; Fort Lewis, Washington; and Fort Riley, Kansas. Use of the M101 is also suspected in the Aberdeen Proving Ground, Maryland; Fort Dix, New Jersey; and Makua Military Reservation, Hawaii.

In total 75,318 M101 rounds were produced, according to the NRC. Of these, around 44,000 are known to have been decommissioned in the 1970s, and around 2,000 are known to have been fired at the Lake City Army Ammunition Plant in the 1960s. As such, approximately 29,318 M101 rounds are not accounted for, and are likely to have been fired in the bases where the Davy Crockett was based. Aside from the sites listed above, upon production the M101 was also shipped to the following locations: Frankfurt , Germany; Inchon, South Korea; Pirmasens, Germany; Ryukus Island, Okinawa, Japan. It is not known whether these locations were the final destinations of the rounds, or whether they were then moved elsewhere.

II. Russian / Soviet produced weapons and platforms

a. Platforms

1. T-14 Armata

- Russia's most recent development and most advanced tank yet
- Estimated cost: between \$5 – 9\$ million, making it very expensive.
- 2A82-1M 125mm cannon.

Overview

The T-14 Armata is Russia's most recent development and their most advanced tank yet. It was first unveiled in 2015. It is estimated to cost between 5 and 9 million USD per unit, making it their most expensive tank yet.⁵⁴ Russian news outlets have confirmed in March 2024 that the Armata is already in service with the Russian armed forces.⁵⁵

Compared to other tank models like the T-90 or the T-82, the T-14 Armata is expensive. Therefore, according to the General Director of the state corporation "Rostec" Sergey Chemezov, the Russian Armed Forces will not use the T-14 much yet and preferable buy cheaper, older T-90 tanks.⁵⁶ It can therefore not be expected to be seen much in deployment.



T-14 Armata

Source: Vitaly V. Kuzmin, <http://vitalykuzmin.net/?q=no+de/654>

⁵⁴ <https://www.businessinsider.com/russia-unlikely-using-best-tank-ukraine-too-costly-weapons-maker-2024-3>, last visited 01. April 2024.

⁵⁵ <https://ria.ru/20240304/armata-1930909542.html?in=t>, last visited 01. April 2024.

⁵⁶ <https://ria.ru/20240304/armata-1930916994.html>, last visited 01. April 2024.

Armament and Ammunition

The T-14 is equipped with a new unmanned remote weapon station turret.⁵⁷ The T-14s main cannon is the 125mm 2A82-1M.⁵⁸ This is a smoothbore gun, with an automatic loader and 32 rounds.⁵⁹

The T-14 Armata's 125mm 2A82-1M cannon is reportedly capable of firing the following types of DU ammunition:

- Svinet-2 3BM-60 125mm DU round
- 3BM69 Vacuum 1 or 3BM-70 Vacuum 2

It remains unclear whether the new Armata tank will also be equipped with the older Soviet/Russian DU ammunition listed below.

⁵⁷ https://armyrecognition.com/russia_russian_army_tank_heavy_armoured_vehicles_u/t-14_armata_russian_main_battle_tank_technical_data_sheet_specifications_information_description_pictures.html, last visited 01. April 2024.

⁵⁸ <https://ria.ru/20240304/armata-1930909542.html?in=t>, last visited 01. April 2024.

⁵⁹ https://armyrecognition.com/russia_russian_army_tank_heavy_armoured_vehicles_u/t-14_armata_russian_main_battle_tank_technical_data_sheet_specifications_information_description_pictures.html, last visited 01. April 2024.

2. Russian T-90 Main Battle Tank

- Russia most recent tank series that is currently in service
- 125mm 2A46 cannon
- T-90 tanks are also being assembled in India.

Overview

The T-90 was Russia's most recent tank currently in service until the T-14 Armata was deployed⁶⁰, and it came into service in 1992. It is an upgrade of the T-72 tank and it is fitted with an updated version of the same 125mm 2A46 cannon as its predecessor. The updated T-90A Obr. 2005 is equipped with a 2A46M 125mm smoothbore gun, which is compatible with better ammunition types compared to the older 2A45M-4 and previous 2A45M models. The most recent version is the T-90M which was introduced in 2017 and features improved French optics.⁶¹

The T-90As have only been produced in limited numbers, 300 T-90A Obr. 2006 and few dozen Obr. 2004 and Obr. 2005 versions). The most recent upgrade, the T-90M, has been mass produced since 2017.

The older T-90 versions have not only been produced in Russia, but since 1999 they are also shipped to India in kit-form and assembled there.⁶²



Source:
Vitaly
Kuzmin,
<https://www.vitalykuzmin.net/>.

⁶⁰ <https://ria.ru/20240304/armata-1930909542.html?in=t>, last visited 01. April 2024.

⁶¹ <https://www.forbes.com/sites/davidaxe/2023/11/15/russias-t-90a-tank-is-an-endangered-species/?sh=7ca78cfaf0e5>, last visited 28 March 2024.

⁶² <https://www.forbes.com/sites/davidaxe/2023/11/15/russias-t-90a-tank-is-an-endangered-species/?sh=7ca78cfaf0e5>, last visited 28 March 2024.

Armament and Ammunition

The T-90 tank series is armed with an improved version of the 2A46 cannon, which is also featured in its predecessor, the T-72 tank. The T-90M also features an improved cannon, the 2A46M-4 which has a longer range and an increased accuracy.⁶³

Compatible DU rounds for the T-90 tank series include:

- 3VBM APFSDS
- 3BK-17 HEAT-FS
- Svinet-2, but only the updated T-90A features an updated autoloader, capable of accommodating the larger ammunition. The original production model of the T-90 reportedly does not have this capability.⁶⁴

⁶³ <https://www.militarytoday.com/tanks/t90m.htm>, last visited 29. March 2023.

⁶⁴ <https://below-the-turret-ring.blogspot.com/2016/10/russia-is-mass-producing-improved.html>, last visited 31. March 2024.

3. Soviet T-80 Main Battle Tank

- First produced 1976, still in use today and continues to be updated.
- Updated for the latest Russian DU-ammunition.
- More than 5.000 T-80 tanks have been produced at the Omsk Transport Machine-Building Plant
- 125mm 2A46 tank cannon

Overview

The T-80 was first produced in 1976 and was equipped with a 125mm cannon. There are several variants available, including the T-80U upgrade dating from 1985. According to the Russian news agency TASS, T-80BV tanks have been modernized to be able to fire modern Svinet-2 DU rounds,⁶⁵ which are reportedly being mass produced⁶⁶. The tank still continues to be updated today.⁶⁷

Armament and Ammunition

Along with other modern Soviet and Russian tanks, it is fitted with the 125mm 2A46 gun. As such it is capable of firing Russian 125mm DU rounds such as the 3VBM-13 APFSDS and the 3BK-17 HEAT-FS round. Only the T-80BV version has been adapted to fire the modern Svinet-2 DU ammunition.⁶⁸



Russian T-80 series tank

Source:
<https://nationalinterest.org/blog/buzz/russia-may-restart-production-old-t-80-tank-would-be-mistake-208384>

⁶⁵ <https://tass.com/defense/1036958>, last visited 29. March 2024.

⁶⁶ <https://below-the-turret-ring.blogspot.com/2016/10/russia-is-mass-producing-improved.html>, last visited 29. March 2024.

⁶⁷ <https://bulgarianmilitary.com/2024/02/15/russian-army-expands-t-80bvm-v-23-tank-fleet-numbers-rising/>, last visited 31. March 2024.

⁶⁸ <https://tass.com/defense/1036958>, last visited 31. March 2024.

4. Soviet T-72 Main Battle Tank

- Came into service in 1973, fitted with the 125mm 2A46 gun.
- Capable of firing Russian 3VBM-13 APFSDS and 3BK-17 HEAT-FS DU rounds.
- More than 1200 T-72s in Service in Russia
- Wildly exported to Warsaw Pact states, many local versions exist.
- Approx.. 25.000 built units.

Overview

The Soviet T-72 tank was first produced in 1972, it is produced in Nizhny Tagil, Russia. It has been manufactured in six countries, is in service with the armies of 35 nations and has fought in all the major wars of the last 20 years.⁶⁹ There are several local versions, e.g. the Bulgarian T-72M2, the Croatian M-95 Degman, the Czech T-72M and T-72M4, Georgian T-72 SIM-1, Indian Ajeya Mk.1/MK.2, Iraqi Saddam/Asad Babil, several Polish versions, the Romanian TR-125, etc.

The T-72BZ is a heavily upgraded version of the T-72 tank, also capable of firing 125mm DU rounds.



Russian T-72 tank in 2016

Source: Vitaly V. Kuzmin, <https://www.vitalykuzmin.net/Military/Rehearsal-in-Alabino-05April2017>

ICBUW is not aware of any evidence that DU ammunition has been exported to these countries, however it seems likely that the armed forces of ex-Soviet states are still equipped with Soviet era ammunition for tank forces, which may include DU rounds.

Armament and Ammunition

As with other modern Russian and Soviet era tanks, it is fitted with the 125mm 2A46 gun. It is capable of firing the following Russian made DU rounds:

- 3VBM-13 APFSDS and the
- 3BK-17 HEAT-FS rounds.

⁶⁹ <https://tankmuseum.org/tank-nuts/tank-collection/t-72>, last visited 31. March 2024.

5. Soviet T-64 Main Battle Tank

- Came into service in 1966 till today.
- Early versions with 115mm cannon, later upgraded to 125mm.
- Soviet tank, manufactured in Kharkiv, Ukraine.
- Russia has an estimated 4000 T-64 tanks in storage.
- 100 modernized T-64BM Bulat variant in Ukraine, more in storage

Overview

The T-64 is a Soviet made tank which first came into service in 1966. There are thought to be only 100 T-64s left in Russian service, but that around 4,000 are kept in storage. It seems likely that the armed forces of ex-Soviet states are still equipped with Soviet era ammunition for tank forces, which may include DU rounds.



T-64 Tank in 2021

Source:
https://en.wikipedia.org/wiki/T-64#/media/File:T-64BV_mod_2017,_Kyiv_2021,_16.jpg

Armament and Ammunition

Early versions of the tank were fitted with a 115mm D-68 gun. From 1969 onwards, this gun was replaced by the 125mm 2A46 gun which is also found on modern era Russian and Soviet tanks.

For the 125mm 2A46 cannon, the following types of DU ammunition are available:

- 3VBM-13 APFSDS and the
- 3BK-17 HEAT-FS rounds.

6. Soviet T-62 Battle Tank

- First produced in 1962
- Equipped with 115mm 2A20 cannon.
- Standard main battle tank is Russian Armed forces and Warsaw Pact during the cold war.
- Mostly replaced by the 1980s, only 100 left in Russian service, thousands kept in storage.

Overview

The Soviet made T-62 tank was first produced in 1962, it is a development from the earlier T-54 and T-55 series of tanks. The T-62 was mostly replaced by the 1980s and there are thought to be only 100 left in Russian service, but that around several thousand are kept in storage. Several variants of the T-62 have been produced.⁷⁰



T-62 Tank

Source: Russian Museum of Military History,
<https://www.kskdivniy.ru/museum/>

The T-62 has been very widely exported, and is still in service in a number of countries as the standard main battle tank⁷¹. ICBUW is not aware of any evidence that DU ammunition has been exported to these countries, however it seems likely that the armed forces of ex-Soviet states are still equipped with Soviet era ammunition for tank forces, which may include DU rounds.

Armament and Ammunition

The T-62 tank was equipped with a 115mm 2A20 cannon, it was the first production tank to be armed with a smoothbore gun. This gun is compatible with the 115mm 3UBM-13 APFSDS DU round, as well as a range of non-DU ammunition.

⁷⁰ See https://armyrecognition.com/russia_russian_army_tank_heavy_armoured_vehicles_u/t-62_main_battle_tank_technical_data_sheet_specifications_information_description_pictures_video.html, last visited 31. March 2024, for a list of variants.

⁷¹ https://armyrecognition.com/russia_russian_army_tank_heavy_armoured_vehicles_u/t-62_main_battle_tank_technical_data_sheet_specifications_information_description_pictures_video.html, last visited 31. March 2024.

b. Weapons

1. 3BM-60 Svinet-2 125mm DU round

Disclaimer: Reliable and consistent information and details regarding the Russian Svinet-1 and Svinet-2 is not readily available. Denominations of different ammo types vary and remain unclear.

- Russian made DU penetrator for modified T-80BV and new T-90A tanks.
- Mass produced since 2002 or 2005.
- Does not fit older, unmodified tanks.

The development for the original Svinet ammunition reportedly started in 1985 and lasted until at least 1991, but neither of the several original variants have entered into service with the Russian Army.⁷² 3BM59 Svinet-1 and 3BM60 Svinet-2 DU APFSDS Ammunition has most probably been developed since the late 1990s or early 2000. Some sources report that the ammunition has been ready for series production since 2002 or 2005.⁷³

According to concurrent reports by various sources, the 3BM59 Svinet-1 uses a tungsten core and the 3BM60 Svinet-2 uses a core made out of depleted uranium.⁷⁴



Russian 3BM-60 Svinet-2

Source: <https://cat-uxo.com/explosive-hazards/projectiles/125mm-bm60-svinets-2-projectile>

The newly developed Svinets-1 and Svinet-2 rounds are too long for the autoloader of the average T-72 and T-80 tank, only the newer T-90A tank reportedly features an upgraded autoloader capable of handling ammunition parts longer than approx. 640mm.⁷⁵ At least the T-80BV tank has been upgraded to be able to fire the newly developed DU shells.⁷⁶

⁷² <https://below-the-turret-ring.blogspot.com/2016/10/russia-is-mass-producing-improved.html>, last visited 29. March 2024.

⁷³ <https://below-the-turret-ring.blogspot.com/2016/10/russia-is-mass-producing-improved.html>, last visited 29. March 2024.

⁷⁴ <https://nationalinterest.org/blog/buzz/russia-arming-its-tanks-controversial-new-bullet-39682>, last visited 30. March 2024; <https://below-the-turret-ring.blogspot.com/2016/10/russia-is-mass-producing-improved.html>, last visited 30. March 2024.

⁷⁵ <https://below-the-turret-ring.blogspot.com/2016/10/russia-is-mass-producing-improved.html>, last visited 29. March 2024.

⁷⁶ <https://tass.com/defense/1036958>, last visited 29. March 2024.

Russian Newspapers have reported that T-72 and T-90 tanks have been upgraded to use Russian DU Ammunition, similar to the T-90BV tank. However, these reports have not been confirmed by official sources.

There is no concrete evidence of Russia deploying DU Ammunition in the war against Ukraine, however, it only seems logical for Russia to be deploying them since they form a key part of their armory.⁷⁷

2. 3BM69 Vacuum-1 and 3BM-70 Vacuum 2 sabot shells.

***Disclaimer:** Reliable and consistent information and details regarding the recently developed Russian Vacuum-1 and Vacuum-2 is not readily available. Denominations of different ammo types vary and remain unclear.*

- Newly developed shells for the new 2A82 152mm cannon
- 900mm penetrator rod
- To upgrade older T-72s and T-90 tanks, and the next generation T-14 Armata tank

Russian engineers have been improving the 125mm tank canon, called the 2A82, intended to upgrade older T-72 and T-90 tanks and for the next generation T-14 Armata tank. The new 2A82 cannon will be able to fire the newly developed 3BM69 Vacuum-1 and 3BM-70 Vacuum 2 sabot shells, which feature an **extra-long 900mm penetrator rod**.⁷⁸

However, it seems like due to production capability problems and design limits of the T-72 and T-90 tanks being unable to accommodate an autoloader for the near meter long vacuum rounds, **the 2A82 cannon will only be featured on the new T-14 tanks**. Therefore, **the T-14 tank will be the only platform able to fire the new Vacuum rounds**.⁷⁹

At this time, it only seems safe to report that one the new Vacuum-Rounds feature a DU penetrator, it remains unclear which one since there is conflicting information available.

⁷⁷ <https://www.newsweek.com/russia-depleted-uranium-munitions-uk-military-aid-tank-armor-1790756>, last visited 05. July 2024.

⁷⁸ <https://nationalinterest.org/blog/reboot/russia-has-amazing-tank-ammunition-not-many-tanks-can-use-it-192506>, last visited 30. March 2024.

⁷⁹ <https://nationalinterest.org/blog/reboot/russia-has-amazing-tank-ammunition-not-many-tanks-can-use-it-192506>, last visited 30. March 2024.

Introduction: Russian 125mm tank ammunition

The family of Russian 125mm tank ammunition is made out of a separate projectile assembly and charge. For the following example, the 3BM-32 VANT is the projectile, while 3VBM-13 is the name of the complete round. For this reason, one round might be available in a version with or without a DU penetrator, still using the same name (e.g. the 3VBK-17).

Since these rounds have been manufactured with and without containing a DU-penetrator, it is important that these rounds are correctly identified and not mistaken for other APFSDS rounds. These rounds should not be destroyed by explosive means due to the sinters that can result. These rounds should be removed for specialized industrial processing.⁸⁰

3. 3BM-32 VANT projectile for 125mm 3VBM-13 round.

- Designed for a Soviet 125mm cannon in 1985.
- Refinement of the 3BM29 round
- Reportedly produced in large quantities, principal anti-tank ammunition for the Soviet Union until the end of the Cold War.

The 3BM-32 Vant, which was designed for a Soviet 125mm cannon in 1985, contains a DU core⁸¹ and is shorter than the more recent Russian produced Svinet-2. The DU penetrator in the 3BM VANT APFSDS is 380mm long. It is reported to have entered service in 1988⁸².

The round is a further refinement of the 3BM29 round with an improved aluminum sabot and a slimmer depleted uranium/nickel-zinc monoblock penetrator, resulting in a 15% power increase over its predecessor.⁸³ It is reportedly 480mm long.

The 3BM-32 projectile is for the 3VBM-13 round, which was first put into service in 1985.⁸⁴ Earlier Versions were produced with tungsten and steel penetrators. The penetrator from the 3BM-32 VANT was re-used to make the 115mm 3BM-36 ammunition.

When the BM-32 projectile is used with dual propellant cartridges the round is designated 3VBM-13.⁸⁵

The round was reportedly produced in large quantities and served together with the 3BM42 (non-DU) as the principal anti-armor round for the Soviet Union until the end of

⁸⁰ See:

https://www.gichd.org/fileadmin/uploads/gichd/Publications/GICHD_Ukraine_Guide_2022_Second_Edition_web.pdf, P. 109, last visited 27. April 2024.

⁸¹ http://www.russianarmor.info/Tanks/ARM/apfsds/ammo_r.html, last visited 31. March 2024.

⁸² <http://fofanov.free.fr/Tanks/ARM/ammo.html>, last visited 31. March 2021.

⁸³ <https://cat-uxo.com/explosive-hazards/projectiles/125mm-bm32-vant-projectile>, last visited 31. March 2024.

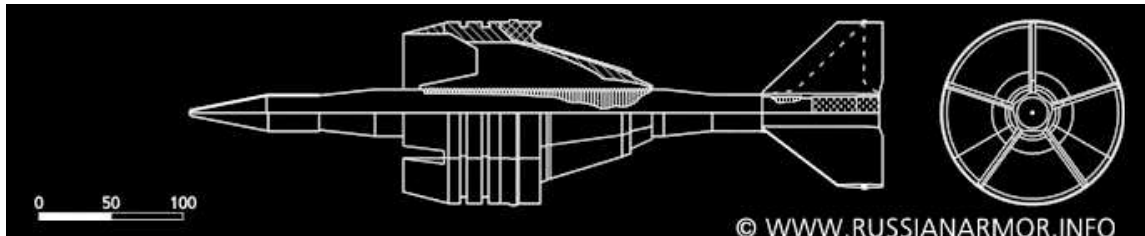
⁸⁴ <http://fofanov.armor.kiev.ua/Tanks/ARM/apfsds/ammo.html>, last visited 31. March 2024.

⁸⁵ See:

https://www.gichd.org/fileadmin/uploads/gichd/Publications/GICHD_Ukraine_Guide_2022_Second_Edition_web.pdf, P. 109.

the Cold War. It reportedly also was used in the Chechen and Georgian conflicts as well as in the recent War in Donbass.

The use of 3BM-32 VANT depleted uranium ammunition in the Ukraine War has been confirmed by GICHD, as this type of ammunition is listed in their Ordnance Guide for Ukraine (Second Edition).⁸⁶



Russian 3BM-32 VANT 125mm DU Ammunition.

Source: http://www.russianarmor.info/Tanks/ARM/apfsds/ammo_r.html



Source: <https://cat-uxo.com/explosive-hazards/projectiles/125-mm-bm32-vant-projectile>

⁸⁶

https://www.gichd.org/fileadmin/uploads/gichd/Publications/GICHD_Ukraine_Guide_2022_Second_Edition_www.pdf, last visited 17.07.2024.

4. 3BK-21B HEAT-FS Projectile for 125mm 3VBK-17 round

- 3BK-21B as DU projectile for 125mm 3VBK-17 round.
- In service since 1982

Overview

The 3BK-21B High Explosive Anti-Tank Fin Stabilised (HEAT-FS) DU projectile is part of a round designed for Soviet and Russian tanks. Russian Ammunition of the 125mm family is comprised of two parts: a projectile assembly and a separate charge. This type of ammunition can be fired from T90-, T-80, T-72, T-64, and T-62 tanks with a 125mm gun.



The name of the complete round – **3VBK-17**- appears to be used for two different projectile assemblies. Firstly the **3BK-21 with a copper liner**, introduced in 1980 and secondly, **3BK21B with a DU liner** for improved performance⁸⁷. Therefore, it cannot be assumed that every 3VBK-17 round contains a projectile made with depleted uranium.

Image: Russian 3BK-18M round, which features a copper liner and appears similar to the 3BK-21B projectile.

Source:

<http://fofanov.armor.kiev.ua/Tanks/ARM/heat/ammo.html>

Unlike most other DU weapons, the 3BK-21B is not a kinetic energy penetrator. HEAT rounds utilise a shaped explosive charge detonates very close to the target. The cone shape in the charge concentrates the explosion, and the metal lining the cone is heated up to a state of superplasticity and forms into a jet of metal, moving at an extremely fast speed, which then punches through armour.

Subsequent 125mm HEAT-FS rounds have been produced for this range of tanks, but no information is available about the material used in the liner. These include the 3VBK-21, 3VBK-25 and 3VBK-27⁸⁸. One innovation in the later rounds is the inclusion of multiple charges to defeat explosive reactive armour.

Because of the uncertainties surrounding the composition of these later rounds, and whether they have superseded the 3VBK-17 with a 3BK-21B projectile, it is not clear whether current Russian HEAT-FS ammunition is likely to contain DU.

⁸⁷ <http://fofanov.armor.kiev.ua/Tanks/ARM/heat/ammo.html>, last visited 31. March 2024.

⁸⁸ <http://fofanov.armor.kiev.ua/Tanks/ARM/heat/ammo.html>, last visited 31. March 2024.

ICBUW is not aware of any evidence that DU ammunition has been exported to the countries which field Russian or Soviet-made tanks. However it seems likely that the armed forces of ex-Soviet states are still equipped with Soviet era ammunition for tank forces, which may include DU rounds.

5. 3UBM-13 DU penetrator for 3BM-28 115mm APFSDS-T round

Disclaimer: Although the 3UBM-13 115mm APFSDS-T round is no new development, reliable and consistent information is not readily available.

- Designed for the T-62 Tank with the 115mm D-68 cannon.
- Rounds probably kept in storage and can be put back into service.
- Forces of Ex-Soviet states most likely still equipped.

Overview:

The 3UBM-13 115mm APFSDS-T round was designed for the T-62 tank with the 2A20 / U5TS cannon and the early T-64 tanks with the 115mm D-68 cannon. The projectile assembly is called the **3BM-28** with the **3UBM-13** being the DU penetrator. It was introduced in 1978.

The 3UBM-13 was the last round to be designed for the 115mm gun on the T-62 and T-64 tanks. Most armour piercing rounds designed for this tank were made with hardened steel penetrators.



Russian 3UBM-9 round with a tungsten penetrator, similar to be described DU based 3UBM-13 round.

Source: <https://www.generalequipment.info/115MM%20TANK%20SHELL.htm>

The non-DU variant, the above pictured 3UBM-9, is probably the current production armour piercing round for the 115mm tank cannons, rather than the 3UBM-13. It is manufactured by the Engineering Research Institute (NIMI) in Moscow.

While the T-62 and T-64 tanks have largely been replaced by their successors in the Russian Armed forces, an estimated number of 100 of each model are thought to still be in service and thousands kept in storage. Therefore it is probable that the 3UBM-13 rounds are still kept in storage as well and can be put back in service.

The armed forces of ex-Soviet Union states are likely also still equipped with 3UBM-13 rounds for their T-62 and T-64 tanks, however it seems unlikely that these rounds have been exported.

6. 3BM-36 115mm DU Penetrator

- Produced together with the 3BM-32 VANT 125mm, same DU penetrator rod.

Hardly any information is available about the 3BM-36 115mm. It was reportedly developed together with the 3BM-32 VANT 125mm ammunition, uses the same DU penetrator rod and was first introduced into service in 1988.

7. BM29 Nadfil-2 round

Predecessor to the BM32 VANT APFSDS-T penetrator projectile. It is a DU nickel-iron alloy penetrator projectile using the 3BM10 penetrator cartridge, it is a further development of the BM29.⁸⁹



125mm BM29 Nadfil 2

Source: <https://cat-uxo.com/explosive-hazards/projectiles/125mm-bm29-nadfil-2-projectile>

8. BM48 125mm APFSDS-T Svinets

This projectile uses the 3BM48 penetrator cartridge and is designated the VBM20 projectile assembly. It entered into service in 1991 and is a largely unknown version with the sabot being made of a light composite material.

The length of the projectile has reached the maximum possible length for use in the automatic loaders of the T-72 and T-80 tanks.⁹⁰



125mm BM46 Svinet

Source: <https://cat-uxo.com/explosive-hazards/projectiles/125mm-bm46-svinets-projectile>

⁸⁹ <https://cat-uxo.com/explosive-hazards/projectiles/125mm-bm29-nadfil-2-projectile>, last visited 31. March 2024.

⁹⁰ <https://cat-uxo.com/explosive-hazards/projectiles/125mm-bm46-svinets-projectile>, last visited 31. March 2024.

9. AA-8 Aphid (R-60 Missile)

The Russian AA-8 Aphid, Russian designation R-60 is a Short-Range (SR), Solid-Propellant (SP), Passive-Infrared (PIR), High-Explosive (HE), guided Air-to-Air Missile (AAM), an improved version, R-60TM, developed in the early 1980s.⁹¹ The AA-8 Aphid was first introduced in the 1970s.⁹²

The Missile is 2.08m long, as a diameter of 130mm, a wingspan of 0.43m and a weight of 63kg. The 3kg HE-Fragmentation (HE-Frag) warhead contains 1.6kg of Depleted-Uranium (DU).⁹³



AA-8 Aphid (R-60 Missile)

Source: <https://cat-uxo.com/explosive-hazards/missiles/aa-8-aphid-r-60-missile>

⁹¹ <https://cat-uxo.com/explosive-hazards/missiles/aa-8-aphid-r-60-missile>, last visited 05. July 2024.

⁹² <https://www.britannica.com/technology/AA-8-Aphid>.

⁹³ <https://cat-uxo.com/explosive-hazards/missiles/aa-8-aphid-r-60-missile>, last visited 05. July 2024.

III. UK produced DU weapons and Platforms.

a. Platforms

1. Challenger 1 Tank

- In service since 1983 until 2001, first UK Platform to fire DU round.
- Equipped with the rifled 120mm L11 cannon.
- Capable of firing L26 APFSDS DU round (CHARM 1) – reportedly not provided to Jordan along with the tanks themselves.

Overview

The Challenger 1 Tank came into service in 1983 and was the first UK platform to fire DU rounds. A total of 420 units were purchased by the British Army. It was in service until 2001 and the majority of the Challenger 1 fleet was sold to Jordan.⁹⁴ They were retired by the Royal Jordanian Army in February 2023; they were replaced with French Leclerc tanks.⁹⁵



Challenger 1 Tank

Source: SGT. Brian Gavin, USA,
https://en.wikipedia.org/wiki/Challenger_1#/media/File:Challenger1MBT.JPG

Armament and Ammunition

The Challenger 1 tank is equipped with the rifled 120mm L11 cannon. The following types of ammunition can be fired from the Challenger 1:

- L15 armor piercing discarding sabot (APDS) round with a tungsten penetrator **(discontinued)**
- L20 discarding sabot training (DS/T) round
- L23 armor piercing fin stabilized Discarding Sabot (APFSDS) round with a tungsten penetrator.

⁹⁴https://armyrecognition.com/united_kingdom_british_army_heavy_armoured_tank_uk/challenger_1_mbt_main_battle_tank_uk_technical_data_fact_sheet.html, last visited 23. April 2024.

⁹⁵ https://en.defence-ua.com/news/ukraine_will_get_challenger_1_tanks_from_great_britain_what_kind_of_vehicle_it_is_and_how_many_expected-7368.html, last visited 23. April 2024.

- L26 APFSDS round with a depleted uranium penetrator (also known as **CHARM 1**, it has been discontinued)
- L31 High Explosive Squash Head (HESH) round
- L32 Squash Head Practice (SH/Prac) round
- L34 White Phosphorus (WP) smoke round

2. Challenger 2 Tank

- Came into service in 1998 and replaces the Challenger 1 tank.
- Only modern era tank which uses a rifled barrel (L30, 120mm)
- L26 APFSDS CHARM 1 and L27 APFSDS CHARM 3 DU Ammunition available

Overview

The Challenger 2 replaces the Challenger 1 fleet in the UK. It came into service in 1998 and replaced the Challenger 1 completely by 2001. 38 Challenger 2s were sold to Oman in the 1990s, but they were not supplied with the L27 nor the L26 DU ammunition. It is the only modern era tank to use a rifled barrel, which makes it far more accurate than any of its competitors. 386 units have been delivered to the British Army.⁹⁶ Although the Challenger 2 is a redesign of the Challenger 1 and they appear similar, only around 3% of parts are interchangeable. It was produced between 1993 and 2002.⁹⁷



British Challenger 2 Tank

Source: <https://www.defenceimagery.mod.uk/Home/Search?Query=AHQSSGT-OFFICIAL-20230725-005-388.jpg&Type=Filename>

Armament and Ammunition

The Challenger 2 is equipped with a rifled 120mm L30 main gun.⁹⁸ One of its distinct features is that its ammunition is comprised of a separate projectile and charge, similar to the Russian and Soviet developments.

⁹⁶https://armyrecognition.com/united_kingdom_british_army_heavy_armoured_tank_uk/challenger_2_main_battle_tank_technical_data_sheet_description_information_specifications_uk.html, last visited 23. April 2024

⁹⁷ <https://royaltankregiment.com/vehicle/cr2/>, last visited 24. April 2024.

⁹⁸https://armyrecognition.com/united_kingdom_british_army_heavy_armoured_tank_uk/challenger_2_main_battle_tank_technical_data_sheet_description_information_specifications_uk.html, last visited 23. April 2024.

The following types of ammunition can be fired from the Challenger 2s L30 cannon:

- L20 Discarding Sabot Training (DS/T) round.
- L23 Armor Piercing Fin Stabilized Discarding Sabot (APFSDS) round with a tungsten penetrator.
- L26 APFSDS round with a depleted uranium penetrator (also known as **CHARM 1**, it has been discontinued)
- L27 APFSDS round with a depleted uranium penetrator (also known as **CHARM 3**)
- L28 APFSDS round - this is a tungsten version of the L27, not thought to have been produced in bulk.
- L31 High Explosive Squash Head (HESH) round
- L32 Squash Head Practice (SH/Prac) round
- L34 White Phosphorus (WP) smoke round

Impact and Deployment

Since its introduction in 1998, the Challenger 2 tank has been used in the Kosovo War, Bosnian War, and Iraq War. The UK has also provided the Ukraine with 14 Challenger 2 tanks in the present Russo – Ukraine War. There have also been reports of various destroyed Challenger 2 tanks on the battlefield, raising concern and fear about possible DU contamination.⁹⁹

Future Use / Prospects

The Challenger 2s are currently undergoing an upgrade program to Challenger 3. One of the most important features will be the upgrade to the modern 120mm L55A1 Rheinmetal canon. It is unlikely that this new cannon will use DU ammunition since Rheinmetal does not manufacture any APFSDS ammunition with DU penetrators and there are no plans to do so. This new L55A1 cannon is optimized for German produced ammunition, so that the UK can use standard NATO ammunition (DM33, DM43, DM53 und DM63) without DU.¹⁰⁰

⁹⁹ <https://www.declassifieduk.org/contamination-fears-after-ukraine-loses-british-tank/>, last visited 22. March 2024.

¹⁰⁰ <https://www.army-technology.com/news/uk-to-develop-more-lethal-ammunition-for-challenger-3/>, last visited 23. April 2024.

b. Weapons

1. L26 CHARM 1 DU Ammunition

- 120mm DU round
- Compatible with both the Challenger 1s (L11) and the Challenger 2s (L30) 120mm tank guns
- No longer available in the UKs arsenal

L26 CHARM 1 DU Ammunition was originally being developed for the new Challenger 2 Main Battle tank, which is equipped with a more powerful gun. During Operation Granby (code name given to the British Military Operations during the 1991 Gulf War), it became apparent that the existing tungsten round for the Challenger 1 was not powerful enough. Therefore, CHARM 1 was modified during its development to fit the existing L11 gun on the Challenger 1 tank.¹⁰¹

L26 CHARM 1 can be used with the L11 and the L30 120mm rifled tank guns. CHARM 1 is reportedly no longer available in the UKs arsenal, making CHARM 3 the only available DU ammunition.¹⁰²

¹⁰¹ <https://www.globalsecurity.org/military/world/europe/challenger1.htm>, last visited 23. April 2024.

¹⁰² [https://hansard.parliament.uk/Commons/2012-07-12/debates/12071237000019/Charm-3\(LegalReview\)](https://hansard.parliament.uk/Commons/2012-07-12/debates/12071237000019/Charm-3(LegalReview)), last visited 23. April 2024.

2. L27 CHARM 3 DU Ammunition

- Only DU Ammunition available in the UKs arsenal.¹⁰³
- Expiry Date for propellant charges reportedly in 2015

The L27 CHARM 3 ammunition is also used with the L30 rifled tank gun on the Challenger 2. The Conflict and Environment Observatory reported that this type of ammunition is also no longer in production, its production facilities have been closed and that the expiry date for its propellant charges was in 2015.¹⁰⁴



DU penetrator of the CHARM 3

Source: Conflict and Environment Observatory,
https://twitter.com/ceobs_org/status/1638223265653989391

L27 CHARM 3 DU Ammunition in Ukraine

UK parliament officials have confirmed that alongside with the delivery of 14 Challenger 2 tanks, they have also sent L27 CHARM 3 DU ammunition to Ukraine: *“Alongside our granting of a squadron of Challenger 2 main battle tanks to Ukraine, we will be providing ammunition including armour piercing rounds which contain depleted uranium. Such rounds are highly effective in defeating modern tanks and armoured vehicles”*¹⁰⁵ The exact number of DU ammunition sent to Ukraine remains unclear.¹⁰⁶

There have also been reports of various destroyed Challenger 2 tanks on the battlefield, raising concern and fear about possible DU contamination.¹⁰⁷

¹⁰³ [https://hansard.parliament.uk/Commons/2012-07-12/debates/12071237000019/Charm-3\(LegalReview\)](https://hansard.parliament.uk/Commons/2012-07-12/debates/12071237000019/Charm-3(LegalReview)), last visited 23. April 2024.

¹⁰⁴ https://twitter.com/ceobs_org/status/1638223265653989391, last visited 22. March 2024.

¹⁰⁵ <https://questions-statements.parliament.uk/written-questions/detail/2023-03-06/hl6144>, last visited 22. March 2024.

¹⁰⁶ <https://questions-statements.parliament.uk/written-questions/detail/2023-04-18/181335>, last visited 22. March 2024.

¹⁰⁷ <https://www.declassifieduk.org/contamination-fears-after-ukraine-loses-british-tank/>, last visited 22. March 2024.

IV. France

a. Platforms

1. Leclerc series tanks

- In service with the French Army (406 Units) and the United Arab Emirates Army (388 Units)
- CN120-26 120mm smoothbore cannon
- OFL F2 120mm APFSDS DU Ammunition

The French Leclerc Tank entered into service in 1992 to replace the AMX-30 tank. Currently there are 406 Units in service with the French Army and 388 units in service with the United Arab Emirates Army.¹⁰⁸



Leclerc Tank

Source: Daniel Steger,
https://en.wikipedia.org/wiki/Leclerc_tank#/media/File:Leclerc-openphotonet_PICT6015.JPG

The main armament is a GIAT (Nexter) CN120-26 120mm smoothbore cannon. Its chamber has the same size as that of the 120mm smoothbore gun of the Leopard 2, M1A1 and M1A2 Abrams tank. Therefore it can also fire ammunition conforming to NATO standard Stanag 4385.

The cannon can use OFL F2 120mm APFSDS DU ammunition and HEAT ammunition, there is also a tungsten based armoured piercing round available.

¹⁰⁸https://armyrecognition.com/main_battle_tank_heavy_armoured_france_french_army/leclerc_main_battle_tank_heavy_armoured_data_sheet_specifications_description_pictures_video.html, last visited 23. April 2024.

It has been reported in February 2024 that the Leclerc tank is planned to be modernized to the modern Leclerc XLR standard. This includes improved optics and stabilization systems.¹⁰⁹

There have been reports about the development of a new type of DU ammunition, the PROCIPAC APFSDS-T Round. The status and official name of this development remains unclear, PROCIPAC has been codename during development.¹¹⁰

¹⁰⁹ <https://bulgarianmilitary.com/2024/02/10/france-enhances-its-leclerc-battle-tank-with-advanced-optics/>, last visited 23. April 2024.

¹¹⁰ <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 23. April 2024.

2. AMX-30 series tanks

- Decommissioned in 2011, first delivered in 1966.
- Was capable of firing OFL 105 F2 APFSDS DU rounds.

The first AMX-30 tank was delivered to the French Army in 1966 and the tank was also built under license in Spain. It is equipped with the CN-105-F1 Giat Industries 105mm smoothbore tank gun.¹¹¹

The AMX-30 series tanks have been decommissioned in 2011, resulting in the Leclerc being the only French platform capable of firing DU ammunition.



AMX-30 Tank

Source:
https://armyrecognition.com/main_battle_tank_heavy_armoured_france_french_army/amx-30_main_battle_tank_heavy_armoured_vehicle_technical_data_sheet_information_description_uk.html

¹¹¹ https://armyrecognition.com/main_battle_tank_heavy_armoured_france_french_army/amx-30_main_battle_tank_heavy_armoured_vehicle_technical_data_sheet_information_description_uk.html, last visited 23. April 2024.

b. Weapons

1. OFL 120 F2 APFSDS-T.

- First introduced in 1996, most likely still in service
- 120mm ammunition for Leclerc tanks, theoretically compatible with other guns that conform with NATO Stanag 4385 standard.
- 60.000 units produced.

The OFL 120 F2 APFSDS-T round is a DU round available for the 120mm cannon on the Leclerc Tank, produced by France.¹¹² It was reportedly first introduced in 1996 and the French parliament confirmed in 2013 that OFL 120 F2 APFSDS-T for the Leclerc tanks was still in service .¹¹³

It is designed to be fired from the 120 mm smoothbore F1 gun of the Leclerc tank, but is theoretically compatible with other guns that conform to the NATO Stanag 4385 standard, such as the M256 on the US Abrams tank, or the L55 on the German Leopard 2. There is no indication that the F2 has been used in any other vehicle, however.

The F2 is part of a family of 120mm ammunition for the Leclerc Tank, including the OFL F1 and F1-A tungsten APFSDS-T rounds, the OECC 120 F1 High Explosive Anti-Tank Multi-Purpose Tracer (HEAT-MP-T) round, and the OE 120 F1 High Explosive (HE) round. The reasons for fielding both a tungsten and uranium armour piercing round are not clear - the choice of ammunition may depend on the armour of the target, or there may be rules about the circumstances where uranium can be used.

The depleted uranium used for the penetrator is reportedly made from material imported from the United States, despite France having over 250.000 tones of DU from their own production. It is not exactly known why France did not use domestic DU, but the most likely explanations are that domestic DU contained impurities or that France lacked the domestic facilities to successfully manufacture the DU alloy that is used for penetrators.

The OFL 120 F2 was manufactured by Giat Industries, now Nexter, at their Salbris plant. As far as ICBUW is aware, there is no ongoing production of the round, but France has a successor 120 mm DU round, the PROCIPAC, under development.

¹¹² <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 23. April 2024.

¹¹³ <https://questions.assemblee-nationale.fr/q14/14-30865QE.htm>, last visited 23. April 2024.

2. OFL 105 F2 APFSDS-T

- 105mm DU Round used in the AMX-30 tank.
- No longer in service in France, may have been exported.

The AMX-30 series tanks were equipped with the OFL 105 F2 APFSDS-T rounds until they were decommissioned in 2011. Therefore, the OFL 105mm is not thought to be longer in service in France¹¹⁴, however, it is may have been exported alongside with the AMX-30 tank.

It is designed to be fired from the CN105 F1 gun fitted to the French AMX-30 tank. This gun is not thought to be fitted to any other tanks, but it can also fire ammunition designed for the L7 or M68 cannon, so the F2 round may also be compatible with tanks that fitted with these guns, such as the US M60 or the Japanese Type 74.

The F2 is part of a family of ammunition for the AMX-30, which includes the OFL 105 F1 and OFL 105 G2, both tungsten based APFSDS-T rounds, as well as the NR 133 High Explosive Squash Head and NR 132 High Explosive Anti-Tank rounds. The reasons for fielding both a tungsten and uranium armour piercing rounds are not clear - the choice of ammunition may depend on the armour of the target, or there may be rules about the circumstances where uranium can be used.

Although the AMX-30 was first produced in 1966, the development of the uranium round is believed to have started much later, and the F2 is not thought to have been in use when France deployed AMX-30s in the 1991 Gulf War.

The AMX-30 has been exported to a number of countries: Bosnia & Herzegovina, Chile, Cyprus, Greece, Saudi Arabia, Qatar, Venezuela and the United Arab Emirates. It has also been built under license in Spain. However there is no indication that the OFL 105 F2 was exported to these countries.

The depleted uranium used for the penetrator is reportedly made from material imported from the United States, despite France having over 250.000 tones of DU from their own production. It is not exactly known why France did not use domestic DU, but the most likely explanations are that domestic DU contained impurities or that France lacked the domestic facilities to successfully manufacture the DU alloy that is used for penetrators.

¹¹⁴ <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 23. April 2024.

V. China

Considering the different platforms and types of ammunition in use, the Peoples Republic of China most likely possesses the largest arsenal of DU weapons worldwide.

a. Platforms

1. Type 15 / ZTQ-15 Chinese Light Main Battle Tank

- Modern Chinese lightweight main battle tank, in service since 2018
- Fitted with an improved rifled 105mm cannon and new 105mm ammunition.
- 105mm rifled gun most likely HEAT rounds, not APFSDS DU rounds
- DU rounds most likely to be also available.



Type 15 Tank

Source:
<https://www.vermilionchina.com/p/type-15-light-tank>

The Type 15 / ZTQ-15 tank is a Chinese Third Generation lightweight main battle tank. It is a replacement for the older type 62 light tank which was introduced in 1963. It is designed to fulfill the requirement from the Chinese Army for a lighter, mobile tank where the heavier Type 99 tanks have difficulties.

It was confirmed to be in service since 2018 and was showcased in the 70th National Day Parade in October 2019.

It is armed with a 105mm rifled gun with new 105mm ammunition which is superior to the older 105mm gun fitted to the Type 88 and Type 59 tank.¹¹⁵ Since the 105mm gun fitted to the Type 15 tank is a rifled gun, it will most probably primarily be firing anti-tank missiles and High Explosive Anti-Tank rounds and not APFSDS DU rounds.

¹¹⁵ [https://odin.tradoc.army.mil/WEG/Asset/Type_15_\(ZTQ-15\)_Chinese_Light_Main_Battle_Tank_\(MBT\)](https://odin.tradoc.army.mil/WEG/Asset/Type_15_(ZTQ-15)_Chinese_Light_Main_Battle_Tank_(MBT)), last visited 25. April 2024.

1. Type 99 tanks

- Entry into service: 2001, many upgrades like the Type 99A2
- Equipped with the 125mm ZPT-89 Smoothbore gun, firing APFSDS-T DU ammunition.
- Nearly 500 Type 99 and 124 Type 99As so far.
- Not thought to be exported

While the majority of Beijing's tanks are old designs, like the Type 59 and Type 69 that are almost direct copies of the Soviet T-59 tanks, the Type 99 is a new development and entered into service in 2001. At least 500 units of the Type 99 and more than 124 units of the improved Type 99A series have been produced.¹¹⁶



Chinese Type 99 tank

Source:
https://en.wikipedia.org/wiki/Type_99_tank#/media/File:ZTZ-99A_MBT_20170716.jpg

It is equipped with a 125mm ZPT-89 Smoothbore gun¹¹⁷ using autoloaders descended from Soviet era designs. The new Type 99A2 reportedly features a longer barrel main gun and it is planned to install a larger 140mm gun on the newest model. It is capable of firing 125mm APFSDS-T Ammunition with a depleted uranium penetrator.¹¹⁸

¹¹⁶ <https://nationalinterest.org/blog/buzz/chinas-type-99-tank-serious-business-89621>, last visited 25. April 2024.

¹¹⁷ [https://odin.tradoc.army.mil/WEG/Asset/Type_99A2_\(ZTZ-99A2\)_Chinese_Main_Battle_Tank_\(MBT\)](https://odin.tradoc.army.mil/WEG/Asset/Type_99A2_(ZTZ-99A2)_Chinese_Main_Battle_Tank_(MBT)), last visited 25. April 2024.

¹¹⁸ [https://odin.tradoc.army.mil/WEG/Asset/Type_99A2_\(ZTZ-99A2\)_Chinese_Main_Battle_Tank_\(MBT\)](https://odin.tradoc.army.mil/WEG/Asset/Type_99A2_(ZTZ-99A2)_Chinese_Main_Battle_Tank_(MBT)), last visited 25. April 2024; <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 25. April 2024.

2. Type 98 tanks

- Revealed in 1998 as third generation tank of the T-90 family, developed since the 1970s.
- Entered service for operational tests and evaluation but never entered full scale production or service → replaced by improved T-99 tank.
- Capable of firing 125mm DU ammunition

The Type 98 tank was developed as an upgrade for the older generation T-90 family tanks. It was revealed to the public in 1998 and a small number of units entered into service for operational tests and evaluation.¹¹⁹



Type 98 Tank

Source: <https://en.topwar.ru/27386-osnovnoy-boevoy-tank-tip-98-wz-123.html>

It is armed with a fully stabilized Chinese designed 125mm smoothbore gun with autoloader. Available Ammunitions include APFSDS, HEAT and HE-FRAG projectiles. Reportedly, there is also the Russian manufactures A-11 laser guided anti-tank missile available.¹²⁰ Furthermore, it is most probably equipped with Chinese manufactures 125mm DU ammunition.¹²¹

The T-98 tank never entered full scale service at the Chinese army and a further improved variant, the Type 99 tank was selected for mass production.¹²²

¹¹⁹ <http://www.army-guide.com/eng/product2387.html>, last visited 25. April 2024.

¹²⁰ <http://www.army-guide.com/eng/product2387.html>, last visited 25. April 2024.

¹²¹ <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 25. April 2024;
<https://rusi.org/publication/pla-armour-modernization-type-98-mbt>, last visited 25. April 2024.

¹²² https://www.militarytoday.com/tanks/type_98.htm, last visited 25. April 2024.

3. Type 90-II tanks

- Export model for Pakistan, MBT-2000 Al-Khalid developed based on the Type 90
- Rejected for Chinese service.
- Development from type 80 and type 85 tanks, introduced in 1991.
- 2A46M / 2A46M-5 Smoothbore gun ¹²³
- Capable of firing 125mm DU Ammunition¹²⁴



Type 90-11 Main Battle Tank

Source: <https://tank-afv.com/modern/China/Type-90-II.php>

4. Type 85-III series tanks

- Sources suggest that the Type 85-III is equipped with a different type of 125mm DU Ammunition¹²⁵
- Type 85 is a series of export tanks based in the Type 80, fitted with a 125mm smoothbore cannon, capable of firing DU ammunition.
- Type 85-III: Export version for Pakistan¹²⁶



Type 85 Series tank

Source: <https://tank-afv.com/coldwar/China/type-85-mbt.php>

¹²³ [https://odin.tradoc.army.mil/WEG/Asset/Type_90-II_Chinese_Main_Battle_Tank_\(MBT\)](https://odin.tradoc.army.mil/WEG/Asset/Type_90-II_Chinese_Main_Battle_Tank_(MBT)), last visited 25. April 2024.

¹²⁴ <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 24. April 2024.

¹²⁵ <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 24. April 2024.

¹²⁶ <https://tank-afv.com/coldwar/China/type-85-mbt.php>, last visited 24. April 2024.

5. Type 85 II

- Also an export version for Pakistan
- Equipped with a 105mm hand loaded main gun.
- Capable of firing all NATO standard rounds (HE, HAP, Frag, HEAT, APFSDS and
- APDSFS-T DU rounds with DU penetrator for the latter)¹²⁷



Type 85-II AP (Pakistan)

Source: <https://tank-afv.com/coldwar/China/type-85-mbt.php>

6. Type 80

- Also known as ZTZ80 tanks, development began in 1978
- Equipped with 105mm rifled gun, capable of shooting 105mm APFSDS-T DU round¹²⁸
- Reportedly more than 3500 units have been built



Type 80-I Tank

Source: <https://tank-afv.com/coldwar/China/type-80-88.php>

¹²⁷ <https://tank-afv.com/coldwar/China/type-85-mbt.php>, last visited 25. April 2024; 105mm DU Ammunition confirmed also confirmed by <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 25. April 2024.

¹²⁸ <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 19. Mai 2024.

7. Type 79

- Chinese first-generation main battle tank, PLA designation of the Type 69-III, which is an improved model of the earlier Type 69 Tank¹²⁹
- Development of the Type 59 Medium Battle Tank
- First produced in 1984¹³⁰
- Equipped with 105mm rifled gun, capable of shooting 105mm APFSDS-T DU round¹³¹



Type 79 Tank

Source: <https://fighting-vehicles.com/type-79-tank/>

8. Type 59

Chinese produced version of the Soviet T-54A tank

Over 10.000 units produced until production ended in 1985, forming the backbone of the Chinese PLA until the early 2000s

Equipped with 105mm rifled gun, capable of shooting 105mm APFSDS-T DU round¹³²



Type 59 Tank

Source:
https://en.wikipedia.org/wiki/Type_59_tank#/media/File:Type_59_tank_in_Military_Museum_of_the_Chinese_People's_Revolution_20180219.jpg

¹²⁹ <https://fighting-vehicles.com/type-79-tank/>, last visited 19. Mai 2024.

¹³⁰ <https://fighting-vehicles.com/type-79-tank/>, last visited 19. Mai 2024.

¹³¹ <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 19. Mai 2024.

¹³² <https://www.mineactionstandards.org/standards/09-30-02/>, last visited 19. Mai 2024.

b. Weapons

1. 125-mm APFSDS-T

China has reportedly in addition to 105mm DU Ammunition also developed 125mm DU Ammunition for its more modern tanks.

The 125mm armoured piercing ammunition could be available for the following platforms:

The Norinco Type 98 tank is fitted with a 125mm smoothbore gun and a chassis based on the Soviet T-72 tank. The Type 99 (pictured) has replaced the Type 98, but it is thought that the gun is the same.

The Norinco Type 90-II tank was built in collaboration with Pakistan and the Ukraine. It is fitted with a 125mm gun and is thought to mainly be produced for export. ICBUW is not aware of any evidence that China has exported any of its DU ammunition, but both nations are thought to already be in possession of DU ammunition.

The Norinco Type 85-III and 85-IIM tanks appear to share common ammunition specifications, and are said to both be compatible with T-72 ammunition. This may mean that these tank models are not compatible with APFSDS rounds for the Types 98, 99 and 90. About 300 Type 85-IIM tanks are thought to have been exported to Pakistan. This model is also said to field a tungsten based APFSDS-T round.

The new Type 99 tank is most likely going to be able to fire Chinese made 125mm DU ammunition.

2. 105-mm APFSDS-T

There have been numerous reports that Chinese has developed DU based 105mm armour piercing DU rounds. It is difficult to confirm these reports, but ICBUW believes that they are credible.

According to these reports, the 105mm DU Ammunition can be fired from the Norinco Type 85-II tanks, which features a 105mm rifled gun. This gun, presumably named Type 83, is thought to be similar to the L7/M68 gun of the original M1 Abrams tank and predecessors to the UKs Challenger Tanks.

The Norinco Type 80 and Type 79 tanks are fitted with the same gun as the Type 85-III tanks. There are also Tungsten based APFSDS-T rounds available for this gun. Although the Type 59 tanks are equipped with the same 105mm gun, there is also an upgraded version available with a 120mm smoothbore gun. There is no evidence and no reports that there is DU ammunition available for this 120mm gun.

VI. India

1. T-90S Bhisma

- Modified version of the Russian T-90 tank, first produced in 1992
- T-90S Bhisma remain in Indian Service, will be made in India until 2028¹³³



Indian T-90s Bhisma

Source:
<https://byjus.com/current-affairs/t-90-bhisma/>

2. T-72 Ajeya

- Modified version of the Russian T-72 tank, chosen in 1981 for the Indian Army
- 2,418 T-72s bought of the Soviet Union.
- Since 2020: “Improved Ajeya” program, mid 2021: 250 T72M Ajeya tanks have been upgraded to new CI Ajeya Standard

Both tanks are capable of firing Russian made 3BM-46 Svinets DU rounds, which contain a depleted uranium penetrator. There are reports that India is developing its own production of DU ammunition, but no reliable information is publicly available.

¹³³ <https://byjus.com/current-affairs/t-90-bhisma/>, last visited 19.05.2024.

VII. Pakistan

1. Al-Zarrar tanks

- In service since 2004, Main Battle Tank of the Pakistani Army
- Developed and produced by Pakistan's Heavy Industries Taxila (HIT)
- Operated by Pakistan and Bangladesh Army¹³⁴
- 125mm Smoothbore Gun



Al-Zarrar Main Battle Tank

Source: <https://www.army-technology.com/projects/alzarrarmianbattleta/>

2. T-80UD

- Variant of the T-90 U tank produced by the Soviet Union, introduced in 1985.
- 125mm Smoothbore gun
- 320 units exported to Pakistan by Ukraine in the late 1990s¹³⁵



T-80 DU Tank

Source: <https://www.militarytoday.com/tanks/t80ud.htm>

¹³⁴ <https://www.army-technology.com/projects/alzarrarmianbattleta/>, last visited 19. Mai 2024.

¹³⁵ <https://www.militarytoday.com/tanks/t80ud.htm>, last visited 19. Mai 2024.

Pakistan has reportedly developed its own kind of 105mm and Naiza 125mm armor piercing ammunition with depleted uranium penetrators for their Al-Zarrar and T-80UD tanks. The number of produced shells remains secret and unknown, they are manufactured by the National Development Complex and are most probably in service since the mid 2000s. The most recent reports confirming that these weapons are still in use date back to 2016.

However, considering that the Al-Zarrar and T-80UD tanks are still considered up to date for the Pakistani Army, it is unlikely that the rounds have been decommissioned.