



Aftermath of an airstrike on Maghazi
refugee camp, November 2023.
(UNRWA/Ashraf Amra)

PALESTINIAN
YOUTH
MOVEMENT



حركة
الشباب
الفلسطيني

MOVEMENT
RESEARCH
UNIT

SWI Shadow World
Investigations

THE MISSING INGREDIENT

POLISH TNT

18 November 2025

Revised 19 June 2026

Palestinian Youth Movement

peoplesembargoforpalestine@protonmail.com

www.embargoforpalestine.com

Table of Contents

Executive Summary	1
Introduction	3
MK-80 series and BLU-109 bombs	4
MK-80 series bombs.....	4
MK-84: enormous destructive power.....	6
Accuracy comes at a price: guided vs. unguided bombs.....	9
BLU-109 bombs.....	11
MK-80 series and BLU-109 in the Gaza genocide	12
The civilian punishment campaign.....	12
Intentional destruction of infrastructure.....	13
Example strike with MK-80 series bombs: Jabalia Refugee Camp.....	15
U.S. bomb exports to Israel	17
The flow of weapons	17
Law without enforcement	24
MK-80 production and the TNT bottleneck	26
The Garland Operations facility.....	26
Making the bomb: from contract to assembly.....	27
The missing component.....	28
From Nazi Germany to Warsaw Pact to NATO: Nitro- Chem’s history	29
The last source.....	29
National security, restricted access	30
TNT production’s environmental impact in Poland	31
The production of TNT.....	31
Environmental contamination by Nitro-Chem.....	32
Zachem.....	33
TNT across the Atlantic: Nitro-Chem and the U.S. Military	34
Supply the ‘Global War on Terror’.....	34
‘The only qualified TNT source for U.S. bomb programs’.....	35
The iron-clad partnership.....	39
TNT for artillery shells	42
155 mm artillery shells: from obsolete to urgent.....	42
Indiscriminate attacks with 155 mm shells	43
Nitro-Chem’s direct sales to Israel	45
Appendix	49

Executive Summary

This report reveals Poland's crucial role in supplying trinitrotoluene (TNT) for Israel's genocide in Gaza.

The Polish state-owned company **Nitro-Chem** is the largest producer of TNT among NATO and EU members.¹ For more than a decade, it has been the main supplier of the explosive to the U.S. military-industrial complex. **90% of TNT imported by the U.S. – where there is currently no domestic production – comes from Poland**, according to a statement made in April 2025 by a Polish deputy defense minister, Cezary Tomczyk.² As of November 2023, Poland had sent at least 45,000 tonnes of TNT to U.S. weapons companies.³

This TNT has been mainly used in the production of general-purpose aerial Mark (MK) 80 series and other large aerial bombs, as well as artillery shells. These munitions have been exported in their tens of thousands by the U.S. to Israel, where they have been widely deployed in the densely populated Gaza Strip. **Nitro-Chem has also been selling explosives, including TNT and RDX, directly to Israel.**⁴

Israel has relied heavily on MK-80 series bombs, both guided and unguided, as a primary instrument of war since October 2023. During the first six days of the assault on Gaza, Israeli pilots dropped on average 1,000 bombs a day.⁵ By April 2024, they had dropped an estimated **75,000 tonnes of explosives on Gaza** – exceeding the combined yield of the atomic bombs dropped on Hiroshima and Nagasaki.^{6,7}

The supply of Polish TNT for U.S. bomb and artillery production is detailed in multiple contracts between a host of key actors, spanning over a decade and involving numerous facilities, all laid out in this report.

Crucially, **this supply is ongoing.** In April 2024 Nitro-Chem signed a contract with Paramount Enterprises International to supply TNT for MK-80 series bombs⁸ – shortly after the U.S. government approved the transfer of 1,800 MK-84 bombs to Israel⁹. Most recently, in April 2025, the company signed what appears to be Nitro-Chem's largest publicly reported contract to date, worth \$310 million, and covering the delivery of 18,000 tonnes of TNT in 2027–2029.¹⁰

1 [“Special Report: How the Ukraine crisis revealed the big flaw in the West’s military-industrial strategy,”](#) Reuters, accessed May 26, 2025

2 [“Nitro-Chem z umową na dostawę trotylu dla armii amerykańskiej o wartości 1,2 mld zł”](#) (“Nitro-Chem signs contract worth PLN 1.2 billion to supply TNT to the US Army”), PAP, September 4, 2025, accessed 28 August, 2025 ([Archived](#))

3 [“Nitro-Chem z kolejnym sukcesem w USA”](#) ([Nitro-Chem achieves another success in the USA](#)), (Nitro-Chem achieves another success in the USA), Defence24, November 13, 2023, accessed June 1, 2026.

4 “Podsumowanie roczne za 2018” (“Annual Summary for 2018”), Nitro-Chem, March 15, 2019, p. 15. Nitro-Chem’s annual reports can be found on the Polish Ministry of Justice’s National Court Register [portal](#) by searching “0000006791”, Nitro-Chem’s registration number.

5 [“Israel dropped more bombs on Gaza in 6 days than the US-led coalition dropped in any month fighting ISIS,”](#) Business Insider, 13 October, 2023, accessed August 16, 2025 ([Archived](#))

6 [“200 days of Israel’s war on Gaza,”](#) April 23, 2024, *Al Jazeera*, accessed August 25, 2025 ([Archived](#))

7 [“Hiroshima, Nagasaki, and Subsequent Weapons Testing,”](#) World Nuclear Association, April 29, 2024, accessed August 26, 2025 ([Archived](#))

8 [“Nitro-Chem z nowym zamówieniem na trotyl dla USA”](#) (“Nitro-Chem Secures a New TNT Contract for the US”), Polska Zbrojna, April 24, 2024, accessed August 28, 2025 ([Archived](#))

9 [“U.S. signs off on more bombs, warplanes for Israel,”](#) *The Washington Post*, March 29, 2024, accessed August 28, 2025, ([Archived](#))

10 [“Poland’s Nitro-Chem signs \\$310 mln deal to supply TNT for US military,”](#) Reuters, April 9, 2025, accessed August 28, 2025 ([Archived](#))

Without Polish-made TNT, the unprecedented scale and intensity of aerial bombardment that has killed tens of thousands of Palestinians and destroyed Gaza's life-sustaining infrastructure – including hospitals, schools, markets, and refugee camps – would not be possible.

We call on Nitro-Chem and the Polish authorities to immediately cease the supply of TNT for the production of MK-80 series bombs and artillery used by Israel, as well as direct supplies of explosives to Israel. Continuation of the current policy may meet the legal criteria for aiding and abetting genocide and other international and domestic crimes.

Introduction

On the morning of Saturday July 13th, 2024, 14-year-old Tala Mahmoud went to a food distribution point in the al-Mawasi area of the southern Gaza Strip. Al-Mawasi was one of the so-called “humanitarian zones” to which Israel had forcibly expelled Palestinians in Gaza. While Tala was waiting in line, Israeli pilots dropped multiple 2,000-pound bombs on a nearby building. Her mother later recalled in an interview how she had collected her daughter’s body parts. She first found Tala’s hand next to a plate of lentils, her foot nearby, and some of her remains in a tree.¹¹

That morning, Israeli pilots dropped between five¹² and eight¹³ 900 kg bombs on an area near a water distribution point, a soup kitchen, and a market. They killed at least 90 Palestinians and injured nearly 300. Baha Abu Rukba, a paramedic at the scene, described it as a “slaughterhouse.”¹⁴ Scott Anderson, director of UNRWA¹⁵ Affairs in Gaza, said that at Khan Younis Nasser hospital, where the wounded were brought, he witnessed “some of the most horrific scenes [he had] seen in [his] nine months in Gaza.”¹⁶ The 907 kg (2,000-pound) bombs that killed Tala Mahmoud were most probably either U.S.-made Mark 84 (MK-84) general-purpose warheads or BLU-109 penetrator bombs.

The MK-84 and BLU-109 warheads are referred to as 2000 lb or “one-ton” bombs because of their weight,¹⁷ or as “triton bombs” because they are typically filled with an explosive mixture of TNT and aluminum called triton. The MK-84’s blast and fragmentation effects make it one of the most destructive conventional bombs in modern arsenals, while the BLU-109 is a high-capacity penetrator bomb, designed to pierce reinforced concrete and fortified structures before detonating. Israel has dropped tens of thousands of one-ton bombs on the small and densely populated Gaza Strip.

Based on information provided by the Mk 80 series bomb’s U.S. manufacturer, General Dynamics Ordnance and Tactical Systems (GD-OTS), the Polish company Nitro-Chem, and U.S. government databases, we can conclude that there is a high probability that a significant proportion of the triton bombs, particularly MK-84s, that Israel has dropped on the Gaza Strip since October 2023 are filled with Polish-made TNT.

Nitro-Chem declined to comment on the report’s findings, referring to the “sensitive nature of our company’s operations,” and emphasized that all its activities “comply with applicable international law.”¹⁸

11 “Survivors Tell of al-Mawasi Massacre Horror,” *Electronic Intifada*, July 17, 2024, accessed May 26, 2025 ([Archived](#))

12 “Israel airstrike targets Mohammed Deif in Khan Younis,” *Axios*, July 13, 2024, accessed May 26, 2025 ([Archived](#))

13 “To Target a Top Militant, Israel Rained Down Eight Tons of Bombs,” *The Wall Street Journal*, July 16, 2024, accessed May 26, 2025 ([Archived](#))

14 *Ibid.*

15 United Nations Relief and Works Agency for Palestine Refugees in the Near East

16 “Statement by Scott Anderson, Deputy Humanitarian Coordinator and Director of UNRWA Affairs, Gaza,” UN Office for the Coordination of Humanitarian Affairs – Occupied Palestinian Territory, July 14, 2024, accessed May 26, 2025

17 An Mk 84 bomb weighs 907kg, which is the US short ton weight; and BLU-109 weighs 874 kg.

18 “NATO Facing TNT Shortage,” *The Telegraph*, November 18, 2025, accessed Saturday 13, 2026.

MK-80 series and BLU-109 bombs

MK-80 series bombs

Israel's bombing campaign in Gaza has relied primarily on large aerial bombs supplied by the United States. The most widely used have been one-ton bombs.¹⁹ Palestinian journalists and monitoring and human rights groups point to the regular use of the MK-80 series warheads and other types including the BLU-109 penetrating bomb,²⁰ which is produced in the U.S. as part of the tritonal bomb program.

The MK-80 series bombs are among the most common air-dropped weapons in the world. They are used by at least 24 countries,²¹ mostly NATO members²² as well as other U.S. allies such as Saudi Arabia, Bahrain, and Israel.²³ They were developed in the 1950s in response to limitations faced by the U.S. Air Force (USAF) during its bombing campaign against North Korea. In this campaign, U.S. pilots obliterated at least half of the buildings in eighteen out of twenty-two major North Korean cities. The war served as a testing ground for new weapons systems. A large share of the bombings were carried out by fighter-bombers and jet fighters, at the time a relatively new type of aircraft. These aircraft were designed to be sleek and maneuverable, and did not have large internal bomb bays. Instead they carried the bombs externally.²⁴

However, the general-purpose bombs then used by the USAF had poor aerodynamic properties. For the Air Force, this posed a problem because high-drag bombs reduced aircraft speed, range, and maneuverability. To solve this, engineers from the Bureau of Ordnance were tasked with developing a new bomb body with improved aerodynamic performance.²⁵ The result was the MK-80 series, with a shape known as the Aero 1A. It has a length-to-diameter ratio of about 8.3:1, which minimizes drag when the bomb is carried externally.²⁶

The new design met the military's goals. It was relatively inexpensive to produce, adaptable to new technologies, and well-suited to jet aircraft with external bomb mounts, which soon dominated air forces worldwide. It quickly replaced most earlier general-purpose bombs. The MK-80 series bombs became NATO standard weapons, and U.S. and European military aircraft are by default designed to carry them. As a result, they are widely used by militaries that operate Western aircraft.²⁷

Since the purpose of the MK-80 series design was to optimize aerodynamic drag, it is defined primarily by its streamlined bomb body – a standardized metal casing. This casing can be filled

19 ["Without U.S. aid, Israel would have struggled to fight in Gaza beyond a few months."](#) Haaretz, September 2, 2024, accessed May 26, 2025

20 See for example: ["Israel and Gaza,"](#) Airwars; [Open Source Munition Portal](#)

21 ["Specific details for the Mark 80 series and Paveway attachments,"](#) Action on Armed Violence, January 23, 2016, accessed May 26, 2025

22 ["L-168 Recent Developments in IM Bombs,"](#) Munitions Safety Information Analysis Center (MSIAC), January 2011, accessed May 26, 2025

23 ["Department of Defense Arms Sales Notification \(Transmittal No. 17-37\)"](#) (Government of Bahrain – Munitions), Federal Register, July 31, 2018, accessed February 14, 2025 ([Archived](#)); ["Flooding the region with arms is adding fuel to the fire in Yemen,"](#) Amnesty International, March 27, 2016, accessed February 14, 2025

24 Crane, Conrad C., *American Airpower Strategy in Korea*, University Press of Kansas, 2000, pp. 9, 168

25 DeMarco R. J., *Design and Development History of U.S. Aircraft Bombs With Applications for Development of Advanced Bomb Systems*, Naval Weapons Center, 1990, vol. 1, pp. 142-157

26 Friedman, N., *U.S. Naval Weapons: Every Gun, Missile, Mine, and Torpedo Used by the U.S. Navy from 1883 to the Present Day*. Annapolis: Naval Institute Press, 1983, p. 196

27 *Jane's Air-Launched Weapons*. Issue 41, Surrey, UK: Jane's Information Group, 2003, p. 555

with different types of explosives depending on the intended use. While various explosive materials are used for different applications, **by far the most common filling is tritonal,²⁸ a mixture of 80% TNT and 20% aluminum powder.²⁹** The aluminum makes the charge more destructive, increasing the total heat output. Tritonal produces a stronger and longer-lasting blast wave and is 7% to 64% more powerful than pure TNT, depending on the method of measurement.³⁰ All MK-80s are fragmentation bombs, meaning they cause damage both through the explosive blast and the shrapnel generated by their thick metal casings.³¹

The MK in MK-80 series stands for “Mark”, a term used by the U.S. military to uniquely designate specific types of equipment, and the number 80 designates the family of the Aero 1A bombs.

The bombs from the MK-80 series come in four different sizes:

- **MK-81** – nominal weight: **250 pounds (113 kg)**
- **MK-82** – nominal weight: **500 pounds (227 kg)**
- **MK-83** – nominal weight: **1,000 pounds (454 kg)**
- **MK-84** – nominal weight: **2,000 pounds (907 kg)³²**

The largest of the series, the MK-84, is one of the biggest and most destructive aerial bombs used by the U.S. and its allies. At 3.28 meters long, or 3.84 in its guided version, it stands almost twice the height of an average adult. The standard unguided MK-84 carries approximately 428 kg of tritonal.³³ Due to its heavy steel casing and the high velocity it reaches when dropped from altitude, it can punch through up to 38 centimeters of metal or 3.5 meters of concrete before detonating.³⁴

Since their first use by the USAF in air strikes in the Vietnam War, MK-80 series bombs have been widely used in many bombing campaigns.³⁵ In 1992, it was reported that the USAF inventory of MK-81, MK-82 and MK-84 bombs was 1.13 million from which more than 110,000 were dropped by the U.S. in the Gulf War.³⁶ They were then used in the NATO bombing campaign against Yugoslavia in 1999,³⁷ and the invasions of Afghanistan³⁸ and Iraq³⁹ in the early 2000s. More recently, USA has used those bombs in attacks on Iran.⁴⁰ Saudi Arabia has deployed them in its ongoing bombing campaign in Yemen,⁴¹ which has killed thousands of civilians. Israel has

28 “[Aircraft Bombs](#),” Rheinmetall, accessed August 26, 2025 ([Archived](#))

29 “[Tritonal](#),” Nitro-Chem, accessed August 26, 2025 ([Archived](#))

30 Maienschein, J. L., “[Estimating Equivalency Of Explosives Through A Thermochemical Approach](#),” Lawrence Livermore National Laboratory, July 8, 2002, UCRL-JC-147683

31 “[Wide Area Impact: Explosive Weapons in Populated Areas](#),” Action on Armed Violence, February 2016, p. 1, accessed May 26, 2025

32 *Jane’s Air-Launched Weapons*, p. 555

33 *Ibid.*, p. 556

34 “[MK-84 Conical Bomb Assembly](#),” Air Combat Command, accessed August 26, 2025 ([Archived](#))

35 DeMarco R. J., *Design and Development*, p. 160

36 *Jane’s Air-Launched Weapons*, p. 557

37 “[EVO KOJA BOMBA SE UKLANJA U NIŠU!](#),” Blic, April 20, 2024 ([Archived](#))

38 “[The US Navy in Operation Enduring Freedom, 2001-2002](#),” Naval History and Heritage Command, 2016, accessed August 26, 2025

39 “[Ammo airmen build munitions for war](#),” Air Force, March 23, 2003, accessed August 25, 2025 ([Archived](#))

40 “[Operation Epic Fury: Unmatched Power, Unrelenting Force of America’s Warriors](#),” The White House, March 3, 2026, accessed June 1, 2026

41 “[Yemen: US Bombs Used in Deadliest Market Strike](#),” Human Rights Watch, April 7, 2016, accessed August 25, 2025

used them in the October War in 1973,⁴² consecutive invasions of Lebanon,⁴³ airstrikes in Syria since the early 2010s, bombings of Yemen⁴⁴ and offensives against Gaza in 2008,⁴⁵ 2014,⁴⁶ and 2021.⁴⁷ Documented cases of the likely use of MK-80 series bombs and BLU-109 bombs used in the Gaza Strip from 2014 onwards are listed in the **Appendix** of this report.

Between October 2023 and November 2024, Israel dropped more than 85,000 tonnes of bombs on the Gaza Strip.⁴⁸ Military experts estimate that the intensity of Israel's bombing during the first month of its war on Gaza has not been seen since the Vietnam War.⁴⁹

MK-84: enormous destructive power

Mk 80 series bombs are classified as high explosive weapons with a wide area effect. This means that they have large destructive radius and limited precision and accuracy. Their impact has been analyzed in-depth by expert non-governmental organisations, advocating for a ban on the use of this type of munition in populated areas.⁵⁰ These bombs cause destruction, injury, or death through three main mechanisms: blast (shock waves), fragmentation and thermal effects.

When a high explosive bomb detonates, an extremely rapid chemical reaction converts the explosive fill, for example tritonal, into very hot, high-pressure gases. These gases expand violently outward. The sudden expansion pushes against the surrounding air and compresses it, creating a blast wave with pressure higher than normal atmospheric pressure; this excess pressure is called overpressure. The leading edge of the blast wave is the shock front: a very thin, outward-moving layer where the surrounding air is abruptly compressed and pressure, temperature, and density rise almost instantaneously. The shock front propagates at supersonic speed. Behind it, the pressure drops, but the displaced air continues moving outward as a blast wind, exerting force on people, objects, debris, and structures.⁵¹

In open terrain, a blast wave expands outward and weakens with distance. In a dense urban environment, it hits the ground, building façades, roofs, walls, alleys, and other hard surfaces. These surfaces can reflect the wave back, increasing the pressure acting on nearby buildings and people. If the explosion occurs above the ground, the blast may bounce off the ground and intensify the pressure near the surface. If it occurs at or near ground level, the ground prevents the blast from expanding downward, so more force is directed outward and upward.

42 [“Assessment of the Weapons and Tactics Used in the October 1973 Middle East War,”](#) Central Intelligence Agency, 1974. Declassified Intelligence Memorandum, LOC-HAK-480-3-1-4, pp. 80-82, accessed August 26, 2025 ([Archived](#))

43 For the 1982 war see [“The Bekaa Valley War,”](#) Air & Space Forces Magazine, June 1, 2002, accessed August 26, 2025. For the 2006 war see Lambeth, B. S., *Air Operations in Israel's War Against Hezbollah*, Santa Monica 2011, p. 83

44 [“OSMP1515,”](#) Open Source Munitions Portal. Accessed May 13, 2026

45 [“Fuelling Conflict: Foreign Arms Supplies to Israel/Gaza,”](#) Amnesty International, 2009, p. 7

46 [“Black Friday: Carnage in Rafah during 2014 Israel/Gaza Conflict,”](#) Amnesty International, 2015, p. 23

47 [“Gaza: Apparent War Crimes During May Fighting,”](#) Human Rights Watch, July 27, 2021, accessed August 25, 2025

48 [“The occupation dropped more than 85 thousand tons of bombs on the Gaza Strip,”](#) Environment Quality Authority, November 6, 2024, accessed August 25, 2025

49 [“‘Not seen since Vietnam’: Israel dropped hundreds of 2,000-pound bombs on Gaza,”](#) CNN, December 22, 2023, accessed August 25, 2025

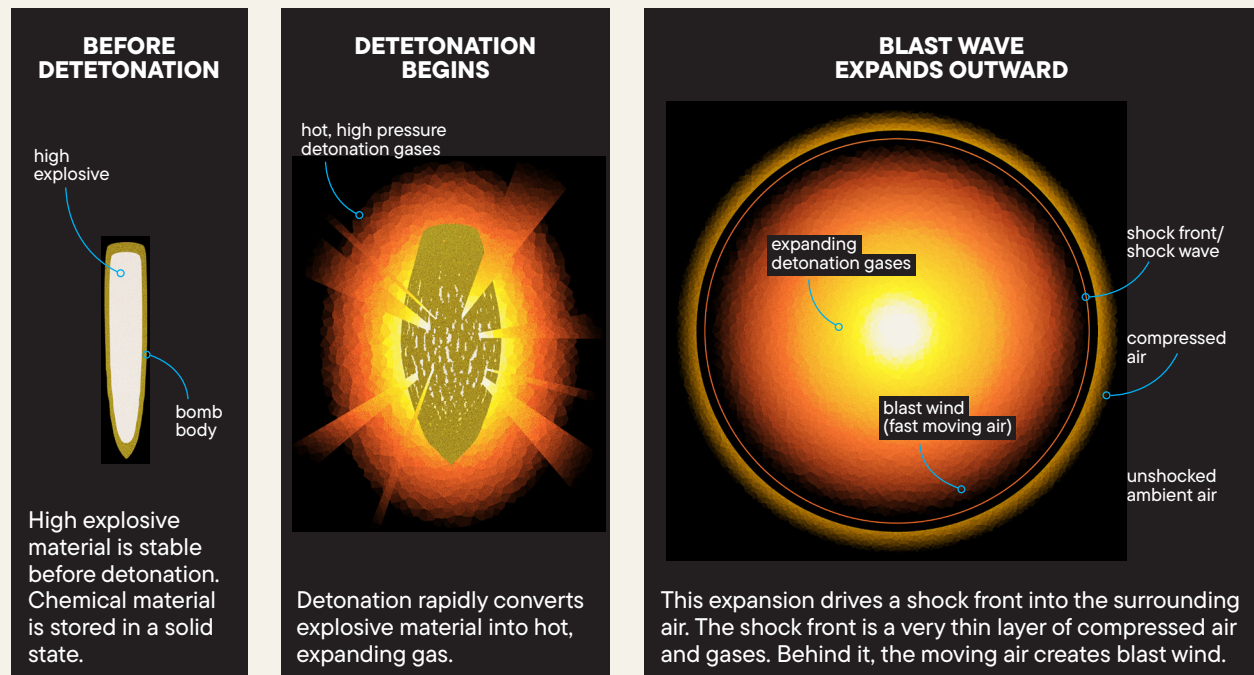
50 See: [“Explosive Weapon Effects,”](#) Geneva International Centre for Humanitarian Demining, February 2017, [“Wide Area Impact: Explosive Weapons in Populated Areas,”](#) Action on Armed Violence, February 2016. Cross, Kenneth, Ove Dullum, N.R. Jenzen-Jones, and Marc Garlasco, [“Explosive Weapons in Populated Areas: Technical Considerations Relevant to Their Use and Effects,”](#) Armament Research Services (ARES), May 2016.

51 [“Explosive Weapon Effects,”](#) Geneva International Centre for Humanitarian Demining, February 2017, p. 44

In narrow streets, courtyards, and between closely spaced buildings, the wave can reflect repeatedly and be channelled through openings, making the damage pattern more complex and sometimes more severe than in open terrain.⁵²

How a high explosive detonation creates a blast wave

A high explosive rapidly converts solid material into hot gas. The gas expands violently, driving a shock wave into the surrounding air.



Overpressure causes damage because the blast wave suddenly raises the pressure of the air above normal atmospheric pressure. When this compressed air reaches a person or structure, it imposes a rapid force on the surfaces it strikes. In the human body, the most vulnerable areas are air-filled organs and cavities, such as the ears, lungs, and the gastrointestinal tract, where sudden pressure differences can rupture delicate tissues. In buildings, the same pressure load can shatter windows and damage or deform walls, roofs and doors. Windows often fail first because glass is brittle and cannot flex much. Once windows or walls fail, fragments are thrown inward, causing secondary injuries.

One way to measure overpressure is to look at its peak values at a specific distance from the detonation point. Below, see selected data from one of the aforementioned studies:⁵³

- 7 kPa overpressure will cause windows to shatter resulting in light injuries from fragmentation;
- 21 kPa overpressure will cause residential structures to collapse and cause serious injuries, with possible fatalities;

⁵² Karlos, Vasilis, and George Solomos, "Calculation of Blast Loads for Application to Structural Components", Joint Research Centre, Administrative Arrangement No. JRC 32253-2011 with DG-HOME, Activity A5 – Blast Simulation Technology Development, 2013.

⁵³ Explosive Weapons Effects, Geneva International Centre for Humanitarian Demining, p. 46-47

- 34.5 kPa overpressure will cause most buildings to collapse, and cause numerous injuries and fatalities.
- 138 kPa overpressure will cause damage or demolition of concrete buildings and fatalities will approach 100%.

According to a Geneva International Centre for Humanitarian Demining (GICHD) study, at 16 meters from the point of an Mk 82 bomb (227 kg) detonation, peak overpressure reaches 117 kPa, and at 31 meters, pressure reaches 34 kPa. This means that within the circle of 31 meters radius from the detonation point (around 3000m² area) - there is high probability that most buildings will collapse, heavy concrete structures will be damaged, all people exposed will be most likely injured, and majority of them killed.

Blast effects are compounded by the fragmentation of the bomb casing, which in this case is made of forged steel. Forged metals tend to break into larger shrapnel than cast ones. The speed of the fragments depends on their size and the type of explosives used; with high explosives it can initially reach 2.5 km per second.⁵⁴

Finally, thermal effects are part of the primary destructive mechanisms. Heat released during the explosion can ignite fires and cause serious burns; however, their impact is usually more localized than that of the blast and fragmentation. Still, in an urban environment, there is a greater risk of secondary impact, such as firebrands: fragments of burning materials ignited by the explosion, thrown away by the blast, which can spread fire far away from the point of detonation.

Blast and fragmentation effects are the principal mechanisms used to estimate a bomb's destructive effects on exposed personnel, including probabilistic measures such as lethal radius and casualty or severe-injury radius.

These represent the approximate distances from the point of detonation within which a person is **highly likely** (in military terms - more than 50% risk⁵⁵) to be killed or seriously injured. These values are estimates rather than exact limits, as actual effects can vary depending on factors such as terrain, obstacles, and the height of the explosion.

Using these measures, the Mk 84 bomb has enormous destructive capacity. **Its lethal fragmentation radius is about 360 meters, and its severe injury radius (caused by the blast wave) can extend up to 800 meters from the point of detonation.**⁵⁶ Severe injury in this context means injuries such as ruptured lungs, burst sinus cavities, or torn-off limbs. This level of damage results from both the high-velocity fragmentation and the powerful shock wave. When the steel casing of an Mk 84 bomb shatters, it sends more than **450 kg of white-hot steel fragments in all directions at speeds of up to 1.8 km per second.** The shock wave generated by Mk 84 is so powerful that it can displace up to 4,500 kilograms of earth and the bomb's strike can create a crater up to 15 meters wide and 11 meters deep.⁵⁷ These large craters are formed primarily when the bomb's fuze is set for a delayed detonation, allowing it

⁵⁴ Ibidem, p. 60

⁵⁵ U.S. Navy. Gunner's Mate 3 & 2. NAVEDTRA 14109. Nonresident Training Course. Pensacola, FL: Naval Education and Training Professional Development and Technology Center, November 1996. Appendix I, "Glossary." ([Archived](#))

⁵⁶ "Wide Area Impact," Action on Armed Violence, p. 3

⁵⁷ Kunichoff, Dennis, et al. "[Are hospitals collateral damage? Assessing geospatial proximity of 2000 lb bomb detonations to hospital facilities in the Gaza Strip from October 7 to November 17, 2023.](#)" PLOS Global Public Health 4, no. 10 (2024): e0003178

to penetrate soft ground before exploding. They are clearly visible in satellite imagery; CNN⁵⁸ and The New York Times⁵⁹ counted these craters to estimate the minimum number of “one-ton” bombs dropped on the Gaza Strip by Israeli pilots between October and December 2023.



Satellite image of Al-Shati Refugee Camp from November 2023, showing craters 12 meters in diameter and larger, caused by explosions of one-ton bombs.⁶⁰

Israel’s massive reliance on MK-84s, despite their enormous destructive power and high risk of numerous casualties, is unprecedented in modern warfare.⁶¹ **By the end of August 2024 the Israeli Air Force (IAF) “dropped 50,000 bombs, rockets and missiles [on Gaza]. About two-thirds of this onslaught came in the form of one-ton bombs”,** *Haaretz* reported based on interviews with IAF officers.⁶²

Accuracy comes at a price: guided vs. unguided bombs

Over the years the MK-80 series have undergone several minor modification programmes but remained relatively unchanged.⁶³ The main development has been the addition of guidance kits.

In the Vietnam War, the USAF struggled with the bombs’ inaccuracy; only a small percentage hit close to their intended targets, and U.S. aircraft sometimes accidentally dropped them on their own soldiers. To address this, guidance kits were developed: add-on systems that turn standard bombs into guided weapons. The first guidance system for the MK-80 series bombs was Paveway, developed in the late 1960s. Bombs equipped with Paveway have laser seekers

58 “Not seen since Vietnam,” *CNN*

59 [“A Times Investigation Tracked Israel’s Use of One of Its Most Destructive Bombs in South Gaza”](#), *The New York Times*, December 21, 2023, accessed August 25, 2025

60 “Not seen since Vietnam,” *CNN*

61 [“Israel’s Gaza bombing campaign is the most destructive of this century, analysts say,”](#) *CBC*, December 30, 2023, accessed August 25, 2025

62 [“Without U.S. aid, Israel would have struggled to fight in Gaza beyond a few months,”](#) *Haaretz*, September 2, 2024, accessed May 26, 2025

63 *Jane’s Air-Launched Weapons*, p. 555

on their noses. The aircraft crew or a ground unit points at the target with a laser, and the bomb guides itself toward it. The Paveway was later improved into the Paveway II and III versions.⁶⁴

However, Paveway required constant “lasing” of the target and did not work well when clouds, smoke, or dust obscured the laser beam. To overcome this limitation, another manufacturer, Boeing, developed the Joint Direct Attack Munition (JDAM) system in the 1990s.⁶⁵ Like Paveway, JDAM is an add-on kit for standard bombs but it uses GPS guidance instead of laser targeting. JDAM was less accurate than Paveway but the bomb guided itself to pre-programmed coordinates, allowing the aircraft to immediately fly away from the target area.⁶⁶

The latest development came when GPS was added to Paveway’s laser kit (Enhanced Paveway)⁶⁷ and a laser seeker was added to JDAM’s GPS base (Laser JDAM).⁶⁸ As a result both systems evolved into dual-mode weapons combining laser guidance with GPS guidance. Bombs equipped with dual-mode kits are initially guided by GPS, followed by the more accurate laser seekers in the final phase of the flight.

Today, all types of MK-80 series bombs remain in use and in production, with the exception of the MK-81, which the U.S. military discontinued after deeming it too small to be effective. Existing versions include models fitted with laser guidance kits, GPS guidance kits, and dual-mode kits, as well as the unguided ‘dumb’ versions that simply follow a ballistic trajectory once released. The wide range of guidance kits across different generations, combined with the various sizes of MK-80 series bombs, has created dozens of different guided versions that are generally referred to as Guided Bomb Units (GBU), each with its own designation. For example, an MK-81 with an Enhanced Paveway kit is a GBU-59, an MK-84 with a JDAM kit becomes a GBU-31, and the same version covered with protective thermal coating becomes GBU-31(V)2/B. All these variations are fundamentally the same MK-80 series bomb bodies designed in the 1950s and usually filled with tritonal charge.⁶⁹

MK-80 series warhead	JDAM bomb designation	Paveway bomb designation
Mk 82 (500 lb)	GBU-38 JDAM	GBU-12 Paveway II; GBU-22 Paveway III; EGBU-12 Enhanced Paveway II
Mk 83 (1000 lb)	GBU-32 JDAM	GBU-16 Paveway II; EGBU-16 Enhanced Paveway II
Mk 84 (2000 lb)	GBU-31	GBU-10 Paveway II; GBU-24 Paveway III; EGBU-10 Enhanced Paveway II

64 “Texas Instruments Paveway I & Pave Storm,” Designation-Systems, accessed August 25, 2025

65 “The B-2’s Little-Known GAM Weapon Was The First Satellite-Guided Bomb,” TWZ, January 5, 2023, accessed August 25, 2025

66 “Boeing (McDonnell Douglas) JDAM,” Designation-Systems, accessed August 25, 2025

67 “Raytheon Demonstrates Enhanced Paveway II Data Link Capability,” RTX, accessed August 25, 2025 ([Archived](#))

68 “Laser JDAM,” Boeing, accessed August 25, 2025 ([Archived](#))

69 “GBU Index,” Designation-Systems, accessed August 25, 2025

The difference between guided and unguided versions comes down to cost and accuracy. Weapons prices are often classified and vary widely, but fitting them with a modern guidance kit can double or triple the cost. The last publicly available data for unguided MK-84 bombs dates back to 2001, when they cost \$16,600 each. At that time, a JDAM kit added nearly \$21,000 to the price.⁷⁰

The difference in accuracy between guided and unguided bombs is striking. When a precision-guided bomb is dropped, it is expected to hit within 1 to 5 meters of its target, depending on the guidance system.⁷¹ Unguided bombs are far less accurate. The design priority for the MK-80 series was minimizing drag to improve aircraft performance, not maximizing the precision of the strike.

Bombing precision is measured using the Circular Error Probable (CEP). To calculate the CEP, a number of bombs are dropped at a target. The impact coordinates of each bomb are recorded and then the mean impact point is determined. Around this point a circle is drawn, big enough to enclose exactly 50% of all impact points. The radius of this circle is the CEP.⁷²

The CEP for the unguided MK-82 bombs is 94.5 meters. This means they are not a precise weapon: half of the bombs will fall within 94.5 meters of the average impact point, while the rest can land even farther away, sometimes by hundreds of meters. There are no publicly available figures for the CEP of other unguided MK-80 series bombs, but since they share the same “Aero 1A” design, their CEP would fall within a similar range.⁷³

Over the past four decades, Western coalition forces have steadily reduced the use of unguided munitions in populated areas. In the aerial bombing campaign against Iraq in 1991, 95% of the weapons expended were unguided.⁷⁴ By the opening phase of the Iraq invasion in 2003, 68% were guided,⁷⁵ and by NATO’s intervention in Libya in 2011, only guided munitions were used.⁷⁶ Even then, civilian casualties remained high. **Israel’s U.S.-backed war on Gaza has departed from this reduction in the use of unguided munitions, with more than 10,000 unguided bombs dropped on the densely populated Gaza Strip in just the first two months of the assault.**⁷⁷

BLU-109 bombs

Unlike the MK-84, which is a general-purpose bomb, the BLU-109 is a hardened penetrator bomb designed to destroy underground and heavily fortified targets. It was developed in the 1980s after U.S. intelligence determined that Eastern Bloc countries were placing key military facilities deep inside reinforced concrete bunkers.

70 [“Committee Staff Procurement Backup Book FY 2002. Amended Budget Submission.”](#) Department of the Air Force, June 2021, accessed August 25, 2025 ([Archived](#))

71 For JDAM see: [“Joint Direct Attack Munition GBU-31/32/38.”](#) U.S. Air Force, accessed August 27, 2025 ([Archived](#)); for Paveway see [“Raytheon’s Enhanced Paveway II Remains Right on Target in Danish Tests.”](#) RTX, accessed August 27, 2025 ([Archived](#))

72 [“Circular Error Probable”](#), Department of Defense Dictionary of Military and Associated Terms, accessed August 25, 2025

73 [“Explosive Weapon Effects.”](#) Geneva International Centre for Humanitarian Demining, February 2017, p. 38

74 [“Operation Desert Storm. Evaluation of the Air Campaign.”](#) United States General Accounting Office, June 1997, accessed August 25, 2025, p. 69 ([Archived](#))

75 [“2003 - Operation Iraqi Freedom.”](#) Air Force Historical Support Division, accessed August 26, 2025 ([Archived](#))

76 [“Libya, Use of Explosive Weapons in Populated Areas.”](#) International Committee of the Red Cross, accessed August 25, 2025

77 [“Nearly half of the Israeli munitions dropped on Gaza are imprecise ‘dumb bombs,’ US intelligence assessment finds.”](#) CNN, December 14, 2023, accessed August 25, 2025

The BLU-109 weighs about the same as the MK-84, roughly 2,000 pounds (907 kg), but its explosive fill is smaller at around 550 pounds (250 kg) of tritonal under current U.S. contracts. What sets it apart is its casing: forged steel, nearly twice as thick as the MK-84's, which enables the bomb to pierce up to 1.8 meters of reinforced concrete. It is equipped with a delayed-action fuze, meaning it penetrates a structure first and detonates only afterward. Unlike the MK-84, the BLU-109 is usually deployed with guidance kits.⁷⁸

The BLU-109 leaves large, deep craters, similar to those created by MK-84s with fuzes set for a delayed detonation. These craters are clearly visible in satellite imagery. As previously mentioned, *CNN* and the *New York Times* counted these craters to estimate the minimum number of 2000-pound bombs used in strikes that Israel carried out in the Gaza Strip between October and December 2023.⁷⁹

MK-80 series and BLU-109 in the Gaza genocide

The “civilian punishment campaign”

The IAF has relied on MK-80 series bombs since the late 1960s and early 1970s, when the U.S. became Israel's main arms supplier. Their first documented use was during the October War in 1973. A declassified CIA document from that year recorded nearly 70,000 MK-80 series bombs in Israeli stock just days after the war began, showing the scale of Israel's arsenal.⁸⁰ Israel has continued to use them in repeated bombing campaigns, but the scale of their use in the assault that began in October 2023 is unprecedented in modern warfare.⁸¹

During the first six days of the U.S.-backed assault on the Gaza Strip, Israeli pilots dropped on average 1,000 bombs a day.⁸² By April 2024 the tonnage of munitions dropped on Gaza had exceeded 70,000 tonnes – more than the combined tonnage dropped on Dresden, Hamburg, and London during World War II.⁸³ In another comparison, the 75,000 tonnes of explosives dropped on Gaza⁸⁴ exceed the combined yield of the atomic bombs dropped on Hiroshima and Nagasaki.⁸⁵ The vast majority of deaths in Gaza have been caused by aerial bombs. Robert Pape, a U.S. military historian specializing in 20th-century bombing campaigns, described Israel's assault on Gaza as “by any measure, already a high civilian punishment campaign.”⁸⁶

The IAF has carried out airstrikes in Gaza using both guided and unguided munitions. In the first two months of the 2023 assault, it dropped an estimated 29,000 air-to-ground munitions on the densely populated Strip. Of these, more than 10,000 were unguided, including many

78 [“BLU-109/B Hard-target Warhead.”](#) Hill Airforce Base, accessed August 25, 2025 ([Archived](#))

79 “Not seen since Vietnam,” *CNN*; “A Times Investigation Tracked Israel's Use of One of Its Most Destructive Bombs in South Gaza,” *The New York Times*

80 “Assessment of the Weapons and Tactics,” CIA, pp. 80-82

81 “Israel's Gaza bombing campaign,” *CBC*

82 [“Israel dropped more bombs on Gaza in 6 days than the US-led coalition dropped in any month fighting ISIS.”](#) *Business Insider*, October 13, 2023, accessed August 26, 2025

83 [“Amount of Israeli bombs dropped on Gaza surpasses that of World War II.”](#) *TRT Global*, June 4, 2024, accessed August 25, 2025

84 [“200 days of Israel's war on Gaza”](#), *Al Jazeera*, April 23, 2024, accessed August 25, 2025

85 [“Hiroshima, Nagasaki, and Subsequent Weapons Testing”](#), *World Nuclear Association*, April 29, 2024, accessed August 26, 2025

86 [“Military briefing: the Israeli Bombs Raining on Gaza”](#), *Financial Times*, December 6, 2023, accessed August 25, 2025

MK-80 bombs whose CEP is so large that they often land as far as a football field away from their intended targets.⁸⁷

Intentional destruction of infrastructure

Israel also carried out massive destruction of infrastructure in Gaza, utilizing various tools. Among them, one-ton bombs like the MK-84 and BLU-109 played key roles because of their large destructive radius. In the first 13 months of the assault, more than 95% of schools were partially or completely destroyed.⁸⁸ By early 2024, 84% of health facilities had been damaged or destroyed.⁸⁹ In a highly illustrative article from December 2023, *The Washington Post* analyzed some of the destruction:

“The Post reviewed nearly 100 satellite images taken between Oct. 8 and Dec. 10 and found about three dozen apparent craters within 180 meters of 17 of the 28 hospitals in northern Gaza. At The Post’s request, five satellite imagery analysts reviewed images of each crater large enough to suggest the use of a bomb weighing 2,000 pounds or more. While The Post’s findings represent a conservative undercount of the actual number of bombs dropped near Gaza’s hospitals, the imagery shows that hardly a hospital in the north has been left untouched.”⁹⁰

By October 2025, approximately 83% of all structures in Gaza had sustained damage – including 17,734 destroyed structures, 4,345 severely damaged structures, 11,201 moderately damaged structures, and 7,941 possibly damaged structures.⁹¹ Nearly 372,000 homes or 76.6% of all housing units in the Gaza Strip – have been directly affected, and 88.6% of those – completely destroyed, according to data from April 2026.⁹² This widespread destruction has generated more than 61 million tonnes of debris, equivalent to about 169 kg of debris per square metre of the Strip.⁹³ In addition, 77% of the total road network across Gaza is also damaged (destroyed, affected, or blocked by obstacles).⁹⁴

In the months preceding the October 2025 “ceasefire,” the Israeli military increased the pace of destruction, especially in the Gaza City. Amnesty International investigation analyzed aerial bombardment of 13 “towers” (multi-story buildings) in the city, finding that “the buildings

87 “Nearly half of the Israeli munitions dropped on Gaza”, *CNN*

88 “Regular attacks put Gaza schools-turned-shelters on the ‘frontlines of war.’” UNICEF, November 8, 2024, accessed August 27, 2025

89 “Gaza Strip Interim Damage Assessment. Summary Note March 29, 2024,” World Bank, European Union, United Nations, March 29, 2024, p. 1

90 “Israel has waged one of this century’s most destructive wars in Gaza”, *The Washington Post*, December 23, 2023, accessed August 26, 2025

91 “UNOSAT Gaza Governorate Comprehensive Damage Assessment,” United Nations Satellite Centre (UNOSAT), October 7, 2023, accessed November 15, 2025

92 “Gaza Strip Rapid Damage and Needs Assessment”, The World Bank, the European Union and United Nations, April 20, 2026, accessed June 1, 2026

93 “Environmental damage in Gaza Strip harming human health, threatening long-term food and water security – new UNEP report,” United Nations Environment Programme, September 23, 2025

94 “UNOSAT Gaza Strip Road Network Comprehensive Damage Assessment”, United Nations Satellite Centre (UNOSAT), September 12, 2025

were not destroyed for reasons of imperative military necessity but rather to inflict collective punishment and widespread devastation on the civilian population as means of exerting political pressure on Hamas and as part of a mass forced displacement campaign.”⁹⁵

While it is unclear exactly how much of the destruction was caused by the “one-ton” bombs and other bombs from the MK-80 series – because Israel targets and kills Palestinian journalists and humanitarian workers, and denies access of international investigators to the Gaza Strip – it is certain that a large share of the bombardment involved these weapons, as they are standard munitions of the IAF. Their widespread use was confirmed by an Independent International Commission of Inquiry - UN Human Rights Council report⁹⁶ and a thematic report of the Office of the UN High Commissioner for Human Rights (OHCHR), both from June 2024.⁹⁷

The Commission’s report clearly states that Israeli Air Force uses US-made aircraft, such as F35s, F15s and F16s, which are “armed with the US-manufactured MK80 series of bombs (...) and also Bomb Live Unit (BLU) series [...]. These munitions are extremely powerful with a large destructive capacity when used in populated areas [...]. Visuals of large impact craters consistent with the MK84 bombs have been observed in neighbourhoods such as Jabalia and in southern Gaza. Given the wide-area impact, **the Commission notes that use of these bombs in urban settings, especially in densely populated areas like Gaza City, is incompatible with international humanitarian law** as they cannot adequately or accurately discriminate between intended military targets and civilian objects.”⁹⁸ [emphasis added]. The Commission analyzed over dozen Israeli airstrikes on Gaza, in three cases it determined that Mk 80 bombs were used.

Given the vast scale of the bombardments and the lack of access to Gaza, the authors of the thematic report selected and analyzed six emblematic Israeli airstrikes between October and December 2023. These selected attacks targeted residential buildings, a market, and a school. In four of the six strikes, various versions of the MK-80 series bombs were used.⁹⁹

Both reports analyzed the Israeli bombardment of Jabalia camp on October 31, 2023.

95 “[Israel/OPT: Israel’s systemic destruction of high-rise buildings must be investigated as war crimes of wanton destruction and collective punishment](#)”, Amnesty International, May 12, 2026

96 “[Detailed findings on the military operations and attacks carried out in the Occupied Palestine Territory from 7 October to 31 December 2023](#)” A/HRC/56/CPR.4, Independent International Commission of Inquiry on the Occupied Palestinian Territory, including East Jerusalem, and Israel, UN Human Rights Council, June 10, 2024, accessed June 1, 2026.

97 “[Thematic Report. Indiscriminate and disproportionate attacks during the conflict in Gaza \(October – December 2023\)](#),” United Nations Human Rights of the High Commissioner, June 19, 2024, accessed August 28, 2025

98 “Detailed findings on the military operations and attacks”, A/HRC/56/CPR.4, UN Human Rights Council, par. 78-79

99 “Thematic Report. Indiscriminate and disproportionate attacks,” OHCHR



Photo by Anas al-Sharif. The aftermath of the 31 October 2023 Israeli airstrike on the Jabalia Refugee Camp.¹⁰⁰

Example strike with MK-80 series bombs: Jabalia Refugee Camp

“I was waiting in line to buy bread when suddenly and without any prior warning seven to eight missiles fell (...). There were seven to eight huge holes in the ground, full of killed people, body parts all over the place. It felt like the end of the world.”

—Mohammad Ibrahim, eyewitness, *CNN*¹⁰¹

One of the most horrific examples of Israel’s use of MK-80 series bombs is the Israeli strike on the Jabalia Refugee Camp on 31 October 2023. Around 2:20pm, Israeli pilots dropped multiple bombs on residential buildings located in Block 6 in Jabalia refugee camp – an extremely densely populated area. The destruction was massive: in total 30 buildings were either destroyed or damaged,¹⁰² an area of 2,500m² was flattened, and at least ten buildings were completely destroyed.¹⁰³ The bombs were fitted with delayed fuses to penetrate below buildings before exploding, which can cause the buildings to collapse on themselves.¹⁰⁴

100 [“Israel strikes dense Gaza camp, says it kills Hamas commander,”](#) Reuters, October 31, 2023, accessed November 10, 2025

101 [“Israel strike on Gaza’s Jabalya refugee camp flattens residential blocks, many dead,”](#) CNN, October 31, 2023, accessed September 1, 2025

102 [“What Happened in One of Israel’s Deadliest Attacks in Gaza,”](#) The New York Times, December 28, 2023, accessed August 28, 2025

103 “Thematic Report. Indiscriminate and disproportionate attacks,” OHCHR

104 “What Happened,” The New York Times

The total number of casualties is not clear but at least 126 Palestinians were killed, including 68 children. 280 Palestinians were reported injured. There were ten cases involving the death of more than one member of the same family. In three of these cases, families were reportedly killed in their entirety.¹⁰⁵ Many of the survivors of this attack took shelter in one of neighbour's houses, which was targeted the following day by the Israeli army.¹⁰⁶

According to an annual report prepared by the UN High Commissioner for Human Rights, as a result of this bombing there was “widespread damage to roads and essential infrastructure indispensable to the survival of the population such as power systems and distribution networks, water storage tanks, pipes, supply networks and drainage channels, as well as bakeries and water wells. In combination with the extreme restrictions on humanitarian access, these attacks led to a rapid deterioration in access to food and water and the beginning of a breakdown of sanitation and other essential services.”¹⁰⁷

The UN thematic report also notes that “[b]ased on the level of damage and the crater sizes, the strike likely involved four GBU-32s, although the larger GBU-31 cannot be ruled out.”¹⁰⁸ The GBU-31 is a “one-ton” MK-84 or BLU-109, and the GBU-32 is a 454 kg MK-83; both are equipped with JDAM guidance kits. According to an article by The Guardian on the Jabalia bombing, the GBU-31 bombs are typically filled with “an explosive mix of TNT and aluminium powder, used commonly in air-dropped bombs. The Israeli air force recently posted images of dozens of GBU-31 being loaded on planes. ‘This fits our analysis. You can see the size of the bomb and guidance straps, which are the signature of the GBU-31,’ added Garlasco,”¹⁰⁹ who is a former high-ranking Pentagon official.

105 [“Airwars assessment ISPT0783,”](#) Airwars, 31 October, 2023, accessed May 26, 2025

106 [“Airwars assessment ISPT0803,”](#) Airwars, 1 November, 2023, accessed May 26, 2025

107 [“Human rights situation in the Occupied Palestinian Territory, including East Jerusalem, and the obligation to ensure accountability and justice,”](#) UN Doc. A/HRC/55/28, United Nations High Commissioner for Human Rights, February 2025, p. 7, para. 19.

108 “Thematic Report. Indiscriminate and disproportionate attacks,” OHCHR, pp. 6-7

109 [“Cratered ground and destroyed lives: piecing together the Jabalia camp airstrike,”](#) *The Guardian*, November 1, 2023, accessed August 26, 2025

U.S. bomb exports to Israel

The flow of weapons

“H.R. 3565 is an historic bill introduced to block bombs to Israel. It seeks to prohibit the President from selling, transferring, or authorizing export license for seven types of weapons to the Israeli government. If this bill is passed, it would block the shipment of BLU-109 bunker busting bombs, MK80 series bomb variants, GBU-39 small diameter bomb variants, Joint Direct Attack Munition (JDAM) assemblies, SPICE gliding bomb assemblies, 120mm tank ammunition, and 155mm artillery ammunition, including white phosphorus munitions.”

—Amnesty International, Block the Bombs campaign¹¹⁰

The U.S. became Israel’s main arms supplier after the 1967 war. Among other military equipment, it started providing advanced combat aircraft, including the F-4 Phantom II, along with standard munitions such as MK-80-series bombs.¹¹¹ These bombs became a standard weapon of the IAF and remain a regular part of U.S. arms exports to Israel.

There are no publicly available sources of information that make it possible to determine the exact number of bombs or artillery shells transferred from the U.S. to Israel, nor how many of those were live munitions, specifically filled with Polish TNT. As explained later on in this section, weapons transfers that fall below certain values do not require congressional approval, while direct sales are often revealed with a delay and without details.

However, based on investigative media reporting and public records of Israel’s requests for specific weapons systems, it can be confirmed that thousands of bombs filled with Polish TNT have been transferred to Israel.

While some analysts claimed that Israel produces its own large aerial bombs (including Mk 84/BLU-109 equivalent),¹¹² the discussion over Israel’s dependence on the U.S. military support and a number of new contracts given to Elbit to establish large aerial bomb production since then show that even if Israel had capacity to produce those munitions, it was very limited.

Or, as *Ynet* claims in its article from December 2023 – it did not exist: “The Defense Ministry is working toward Israeli independence in the production of munitions. **For the first time, aerial munitions – aircraft bombs – will be produced in Israel; until now, these had been purchased entirely from abroad**, as *Ynet* and *Mamon* have learned. This is part of the lessons drawn from the war, during which the IDF required the airlift of munitions from the

¹¹⁰ “Congress Must Co-Sponsor the Block the Bombs Act.” Amnesty International USA, July 15, 2025, accessed September 1, 2025

¹¹¹ “U.S.-Israel Strategic Cooperation: The 1968 Sale of Phantom Jets to Israel.” Jewish Virtual Library, accessed August 27, 2025 ([Archived](#))

¹¹² “Made in the USA: How American-Built Weapons Have Wrought Destruction in Gaza,” *Bellingcat*, February 4, 2026, accessed May 12, 2026.

United States due to the rate of use in the Gaza war.”¹¹³ [emphasis added] Another Ynet article quotes a Knesset member who claims that most domestic production lines, including for aerial bombs, had been shut down in Israel, and Yoav Gallant supposedly said in December 2022 that “not even a single bullet is produced here.”¹¹⁴

Furthermore, while the use by IAF of Israeli-made MPR 500 bomb (230 kg) has been confirmed in Gaza, Iran¹¹⁵ and Lebanon¹¹⁶ since at least 2012,¹¹⁷ there are almost no traces of the deployment of larger Israeli-made bombs. Two years after 2014 Israel’s assault on Gaza, during which MPR 500 bombs were used, Israeli Military Industries (IMI), then a state-owned company, announced it will produce three more MPR bombs - 250, 1000 and 2000 (numbers signifying bombs’ weight in pounds), with one of their main features being smaller blast and fragmentation radius than the Mk 80 series.¹¹⁸ In 2018, IMI was sold to Elbit, whose recent product catalogs list both MPR and Mk 80 bombs.¹¹⁹ Still, there is no evidence that there has been a large-scale production of those bombs in Israel in the last two decades, possibly with the exception of MPR 500.

Israel’s military dependence on the U.S. became a major topic of discussion in 2024, when Biden withheld one shipment of MK-84 and MK-82 bombs to Israel. According to Israeli media commentators, Israel is not capable of “standing alone.”¹²⁰ Yaakov Lifshitz, the former Director General of the Ministry of Finance and Chairman of IMI, said at the time: “Even the United States has a problem producing that amount of shells and bombs. In certain munitions, it is possible to increase outputs, but the quantities are such that it is doubtful whether we can reach the required stockpile in a realistic timeframe.”¹²¹

However, soon after the hold up of shipment of the bombs, the Israeli Ministry of Defense (IMOD) announced increased procurement of munitions from Elbit.¹²² More such contracts followed. In January 2025, IMOD signed two deals with Elbit worth \$275 million: “Under one agreement, Elbit will supply the military with thousands of heavy air munitions. The second deal would establish a plant to produce raw materials previously sourced mainly from abroad. The ministry did not specify the raw materials but suggested they were used to make munitions,” *Reuters* reported.¹²³ Eyal Zamir, at the time director general at the IMOD, commented that those moves will strengthen “manufacturing independence” for the Israeli army.

Experts pointed out that this deal confirms that Israel needs to import explosives from abroad, and that based on time-consuming US attempts to increase production of artillery shells,

113 Navit Zomer, “לארשיב יריווא שומיח לש רוצייל לעופ ונחטיבה דרשמ” [“The Defense Ministry Is Working to Produce Aerial Munitions in Israel”], *Ynet / Mamon*, December 19, 2023, accessed May 12, 2026.

114 Nir Cohen, “רוצייה לע ספ ומש” [“They ignored production”], *Ynet / Yedioth*, May 2, 2024.

115 “Israel Used Elbit-Made MRP-500 Bomb in Strike on Iran,” *Israel Defense*, June 15, 2025, accessed May 12, 2026.

116 “Israel: US Arms Used in Strike that Killed Lebanon Aid Workers,” *Human Rights Watch*, May 7, 2024, accessed May 12, 2026.

117 “Israel opts for indiscriminate Vietnam-era bombs in Gaza,” *Middle East Eye*, August 17, 2021, accessed May 12, 2026.

118 “Israel Military Industries expanding range of air-to-ground bombs,” *The Jerusalem Post*, January 31, 2016, updated February 1, 2016, accessed May 12, 2026.

119 Elbit Systems, “Air Solutions”, product catalogue, February 2025, p. 11, archived March 23, 2025, accessed May 12, 2026.

120 “Independence from the United States Is a Dangerous Fantasy,” *Arutz 7* (Israel National News), January 21, 2024, accessed February 15, 2025.

121 “Don’t say ‘no favors’: Israel will not be able to produce all the weapons it needs on its own”, *TheMarker*, August 12, 2024, accessed August 27, 2025.

122 “Israel Ministry of Defense to Purchase Ammunition Systems Worth Approximately \$340 Million from Elbit Systems,” Israel Ministry of Defense, August 1, 2024, accessed August 26, 2025 (Archived)

123 “Israel signs deals with defence firm Elbit to make bombs domestically,” *Reuters*, January 7, 2025, accessed August 31, 2025.

Israel will not achieve self-sufficiency anytime soon.¹²⁴ In terms of producing the equivalent of Mk-84 bombs, it was expected to take two to three years, according to a report in Israel Hayom from August 2024.¹²⁵

However, judging by the tens of thousands of bomb casings that Israel has been requesting to purchase from the United States since at least 2023, it is highly likely that the capability to equip these bombs with explosive charges has been developed and that the bombs are now being manufactured.¹²⁶ According to the report "Bullets, Bombs & Mortars: Maersk's Shipments of Munition Components to Israel," "Between October 2023 and June 2024, over 1.1 million kg of bomb bodies were delivered to Israel by Maersk. These shipments included more than 235 tonnes of MK-84 bomb bodies from the General Dynamics facility in Garland, Texas, and 925 tonnes of MPR family bomb bodies from Elbit America in Ladson, South Carolina. The cargo was delivered to the Israeli arms manufacturer Elbit Systems at its Ramat HaSharon facility (IMI Systems) and its Soltam Land plant in Yokneam Illit (Elbit Systems Land)."¹²⁷

In January and April 2026, the IMOD signed at least two more deals with Elbit to produce aerial munitions worth nearly \$400 million, the stated goal being to strengthen Israeli independence and replenishing the stockpiles.¹²⁸

Just in the first year of genocide, between the 7th October 2023 and September 2024, the U.S. government had authorized at least \$17.9 billion in security assistance for Israel.¹²⁹ Since 1948, the U.S. military aid to Israel has exceeded \$200 billion.¹³⁰

The Center for International Policy calculated, based on export data from U.S. ports, that the U.S. sent weapons worth nearly \$4.2 billion to Israel within first 20 months of the genocide.¹³¹ As they write, this figure "only captures weapons exported from the United States during this time frame, but does not include any that have been authorized and not yet delivered. As of April 2025, the State Department's Bureau of Political Military Affairs reported there were 751 active Foreign Military Sales cases with Israel, valued at 39.2 billion USD...It also likely does not include some weapons transferred through the Excess Defense Articles service, nor weapons withdrawn from the War Stockpiles Reserve-Israel. The weapons Israel purchases through offshore procurement, using U.S. taxpayer dollars to buy arms from Israeli companies are also not captured."¹³²

Even these figures do not reflect the full scale of U.S. support to Israel. The Washington Post revealed in May 2024 that the Biden administration made at least 100 arms deals with Israel since October 2023 that fell below the congressional notification thresholds. For NATO

124 ["Israel Moves to Make Heavy Bombs, but U.S. Reliance Hard to Shake, Experts Say,"](#) *The Washington Post*, January 12, 2025

125 ["Amid US tensions, Israel pivots to self-reliance on homegrown arms"](#), Israel Hayom, August 13, 2024

126 This is also indicated by the aluminium shipments described in the report "Bullets, Bombs, and Mortars: Maersk's Shipments of Munition Components to Israel" on pages 19–20.

127 ["Bullets, Bombs, and Mortars: Maersk's Shipments of Munition Components to Israel,"](#) p. 15, Palestinian Youth Movement and Oxfam Denmark, June 8, 2026, accessed June 10, 2026

128 ["Defense Ministry, Elbit Systems Sign \\$183 Million Air Munitions Procurement Deal,"](#) The Jerusalem Post, February 2, 2026, updated February 14, 2026, accessed May 13, 2026.; ["Israel MOD Procures Over \\$200M Elbit Systems Aerial Munitions,"](#) Israel Ministry of Defense, April 23, 2026, accessed May 13, 2026.

129 ["Costs of War. United States Spending on Israel's Military Operations and Related U.S. Operations in the Region, October 7, 2023 – September 30, 2024,"](#) Brown University Costs of War Project, October 7, 2024, accessed August 27, 2025

130 ["What to Know about U.S. Military Support for Israel after a Year of War,"](#) *The Washington Post*, October 14, 2024

131 ["SAM Special Report: Arming Israel's Atrocities in Gaza,"](#) Center for International Policy, August 7, 2025, accessed November 15, 2025

132 *Ibid.*, p. 1

countries, and couple other states, including Israel, these thresholds are higher than for the rest of the world: \$25 million for major defense equipment, \$100 million for defense articles or services and \$300 million for design and construction services.¹³³ Additionally, some equipment deliveries from the U.S. to Israel since October 7 were based on sales agreements made in previous years. As a result, the \$17.9 billion estimated U.S. support to Israel within first year of genocide represents only a portion of the full extent.¹³⁴

MK-80 tritonal bombs have been a substantial part of these transfers, whether through Foreign Military Sales or Direct Commercial Sales. The publication of the latter is often delayed by months, or even years. For example, a direct sale of an unknown number of tritonal-filled MK-84 bombs from September 2017 was revealed only in April 2018.¹³⁵

Here is a list of all known approved purchases and transfers from the US to Israel of Mk 80 and BLU-109 tritonal bombs since Nitro-Chem signed the contract in 2016 to provide TNT for their production. However, as noted by Costs of War Project researchers - information related to quantities and types of munitions transferred are based mostly on media reports, because unlike in the case of Ukraine, the U.S. government agencies have not provided a comprehensive list.

- September 2017: Direct Commercial Sale of tritonal-filled Mk 84 bombs, worth at least \$25 million,¹³⁶ based on data from U.S. Air Force budget documents¹³⁷ we can estimate cost of one bomb as \$15,000, which means Israel bought at least 1,500 of those bombs;
- October 2023 - July 2024: at least 14,000 Mk 84 bombs, 6,500 500lbs bombs (most likely Mk 82), and 1,000 “bunker buster” bombs (likely BLU-109, which is a penetrator bomb often misnamed as a bunker buster) - according to a Reuters investigation;¹³⁸
- October 2023 - September 2024: 8,700 Mk 82 bombs according to the “Costs of War Project” report,¹³⁹ however these most likely include the 6,500 mentioned by Reuters and possibly 1,700 Mk 82 bombs held up by Biden and released in July 2024;
- February 2025: 1,800 Mk 84 bombs “released” by Trump delivered to Israel;¹⁴⁰
- February 2025: Israel has requested to buy four thousand BLU-109 bombs, also named I-2000 Penetrator warheads,¹⁴¹ and according to the U.S. Air Force

133 “Security Assistance Management Manual (SAMM), [Appendix 5-1: Congressional Notification Requirements](#), table entry for AECA § 36(b)(1), Defense Security Cooperation Agency, accessed June 11, 2026. See 22 C.F.R. § 120.31, defining “defense article” as any item or technical data designated in § 121.1; 22 C.F.R. § 121.1, U.S. Munitions List, Category III (“Ammunition and Ordnance”) and Category IV (“Launch Vehicles, Guided Missiles, Ballistic Missiles, Rockets, Torpedoes, Bombs, and Mines”); Defense Security Cooperation Agency, Security Assistance Management Manual (SAMM), Appendix 5-1: Congressional Notification Requirements, item 20, AECA § 36(b)(1)

134 “Costs of War,” Brown University, p. 5.

135 “[Notifications of Proposed Export Licenses to the Congress](#),” Federal Register, April 5, 2018 (Archived)

136 Ibid.

137 U.S. Department of the Air Force, *Fiscal Year (FY) 2023 Budget Estimates: Ammunition Procurement*, Air Force, April 2022.

138 “Exclusive: US has sent Israel thousands of 2,000-pound bombs since Oct. 7,” Reuters, 29 June, 2024, accessed August 28, 2025

139 “Costs of War,” Brown University, p. 2

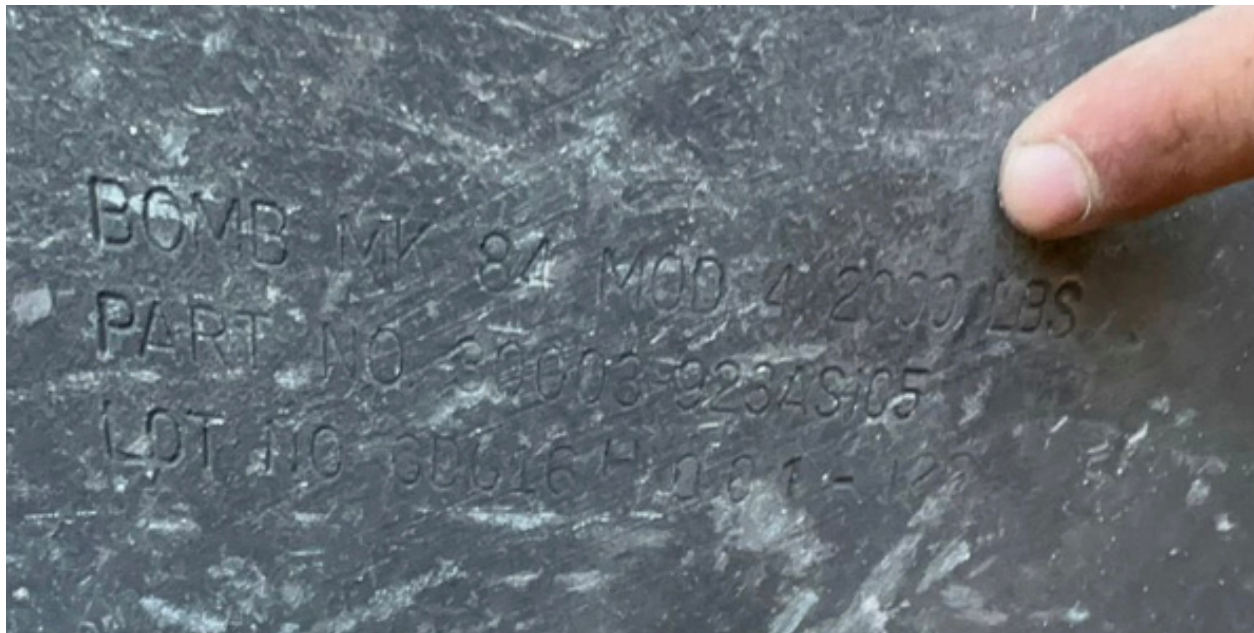
140 “[US shipment of heavy bombs held up by Biden administration arrives in Israel](#),” Times of Israel, February 16, 2025, accessed August 26, 2025

141 “[Israel – Munitions and Munitions Support](#),” Defense Security Cooperation Agency, February 28, 2025, accessed August 28, 2025 (Archived)

2024 documents this bomb “can be filled with tritonal or with a more Insensitive munitions (IM) compliant fill.”¹⁴²

By analyzing markings on shrapnel or unexploded bombs, we can confirm that Israel has received from the U.S. and deployed in likely war crimes Mk 84 bombs and/or BLU-109 bombs filled most likely with Polish TNT. While the available contract analysis suggests that the explosive material in this bomb may have originated from the Polish factory, this cannot be definitively confirmed without further investigation. Verifying this hypothesis would require a thorough inquiry, including the potential collection and analysis of samples from the explosives.

Case 1: Attack on Khan Yunis refugee camp, 17 October 2023



Adham Abu Selmiya X account,¹⁴³ 17 October 2023, OSMP.¹⁴⁴

On October 17, at 4:30 am, an Israeli pilot dropped this particular Mk 84 warhead on Khan Yunis refugee camp, killing between 15 and 40 civilians – according to estimates quoted by Airwars.¹⁴⁵ Based on the Open Source Munitions Portal analysis,¹⁴⁶ it may have been an unguided bomb. If we apply the CEP known for Mk 82, it would mean that there was a 50% chance it fell within 94.5 meters from the intended target, and 50% chance it fell even further away.¹⁴⁷

Dima al-Lamdani, an 18-year-old at the time, lost all of her immediate family – parents and seven siblings, except for one brother. In the media interviews she explained that “together with several generations of her extended family” on October 13th, she had evacuated from the Shati refugee camp in the north after the forced displacement orders issued by the Israeli military. The family took shelter in Khan Yunis refugee camp. Dima and her aunt were drinking

¹⁴² U.S. Department of the Air Force, *Fiscal Year (FY) 2024 Budget Estimates: Procurement of Ammunition*, Air Force, March 2023.

¹⁴³ Adham Abu Selmiya X account, post from October 17, 2023. ([Archived](#)).

¹⁴⁴ [OSMP 505](#), Open Source Munitions Portal, accessed May 10, 2026.

¹⁴⁵ “[ISPT0283 – October 17, 2023](#)”, Airwars, accessed May 10, 2026.

¹⁴⁶ [OSMP 505](#), Open Source Munitions Portal, accessed May 10, 2026.

¹⁴⁷ “Explosive Weapons Effect”. Geneva International Center for Humanitarian Demining, February 2017. page 27 for Circular Error Probe meaning, and page 38 for CEP of Mk 82.

coffee in the early morning hours, when suddenly she found herself in the ruins of their bombed shelter and heard a lot of screaming. When the bomb struck, there were 50 people in the building, 17 of them from the Lamdani family. There were only four survivors: Dima, her brother, and two young cousins, whom she took under her care.¹⁴⁸ According to Airwars analysis of social media posts by the surviving relatives, five nuclear families (related to each other) were killed in that one airstrike, parents (in two cases one parent) and their children.

The above image depicts a large piece of shrapnel with full, visible markings on the bomb, including the following code:

**BOMB MK 84 MOD 4 2000 LBS
PART NO 30003-923AS105
LOT NO GDG16 H 0 0 1 ???**

The first line is self-explanatory, except for “MOD 4,” which stands for “modification” and denotes a specific variant of the bomb. This is the variant that was specified in the US government contract for the Mk 84 tritonal bomb kits in its 2016, awarded to General Dynamics OTS.¹⁴⁹

The second line contains two sets of information. First is the Commercial and Government Entity code or CAGE code – a five-character unique identifier assigned to entities in the procurement and logistics records. In this case CAGE code is 30003, which means that Naval Air Systems Command (NAVAIR) designed, engineered or controls the technical data for the part (Mk 84-4 bomb body), but is not a manufacturer or supplier of the parts.¹⁵⁰ The second part - “923AS105” appears in U.S. procurement documentation as the part number for the Mk 84 MOD 4 bomb body.¹⁵¹

Crucially, the third line identifies the company responsible for the production, the location of the factory and the year and month of the production. This interpretation is based on the MIL-STD-1168C document, which is the official U.S. DoD standard for ammunition lot numbering and ammunition data cards.¹⁵² GD stands for General Dynamics, the following letter G stands for Garland factory, the only U.S. facility where bomb bodies for Mk 80 series bombs were produced at the time.¹⁵³ Number “16” is the last two digits of the year of production, meaning in this case 2016 and the letter H stands for the month, the eighth letter of the English alphabet stands for the eighth month, August.

Finally, “0 0 1” is an interfix number, which “is designed to identify those lots in a series which have been produced or assembled by the same manufacturing activity at the same location for the same item, made according to a specific design and manufacturing process using like materials in accordance with certain administrative procedures.”¹⁵⁴

In this case “001” could indicate that this specific bomb was part of the first interfix series, and although the lot number alone is not enough to confirm under which specific contract a bomb

148 “‘Why Didn’t We Die Together?’: The Last Survivors of Three Gaza Families Speak,” *The Guardian*, November 8, 2023, accessed May 13, 2026.; “Gaza Teenager Sees Parents, Siblings Killed After Seeking Safety in South,” *Reuters*, October 23, 2023, accessed May 13, 2026.

149 “[MK84-4 Tritonal Bomb Kit](#)”, sam.gov, accessed May 13, 2026

150 LogiQuest Lite, “[CAGE Code 30003 – Naval Air Systems Command Managed Original Design Activity Not Material/Parts Supplier.](#)” Terabase Corporation, accessed May 13, 2026

151 See for example the 2011 U.S. government solicitation for the Mk 80 bomb bodies: <https://govtribe.com/opportunity/federal-contract-opportunity/mk80-bomb-body-series-mk82-1-mk82-6-mk83-4-mk83-7-mk84-4-and-mk84-10-w52p1j10r0146>

152 U.S. Department of Defense. [Ammunition Lot Numbering and Ammunition Data Card. MIL-STD-1168C.](#) Washington, DC: Department of Defense, March 11, 2014

153 See “Justification Review Document for Justification and Approval for Other than Full and Open Competition” for MK 84-4 Tritonal Bomb Kit Program, can be found at: <https://sam.gov/workspace/contract/opp/7da8187988c3025fb815c324b372fa75/view>

154 U.S. Department of Defense. [Ammunition Lot Numbering and Ammunition Data Card. MIL-STD-1168C.](#) Washington, DC: Department of Defense, March 11, 2014

was produced, looking at the timeline of the GD-OTS contracts offers the only logical conclusion: this bomb was produced under exclusive GD-OTS contract for Mk 84 tritonal bomb kits in August 2016. The exclusive provider of TNT for this contract was the Polish company Nitro-Chem, which is confirmed both by the official GD-OTS presentation¹⁵⁵ and by Nitro-Chem's CEO's statements.¹⁵⁶

Case 2: Attack on Sanaa Airport, Yemen, 6 May 2025

On May 6, 2025, between 3:10pm and 3:45, dozens of Israeli aircrafts dropped a total of 50 munitions on Sanaa Airport in Yemen,¹⁵⁷ in what Human Rights Watch described as “apparently unlawful indiscriminate or disproportionate attacks on civilian objects”, which “should be investigated as war crimes.”¹⁵⁸ HRW refers to two Israeli attacks on Sanaa airport - the one that took place on May 6th, and second one on May 28, 2025.

Even after the first attack, damage was serious enough to paralyze the airport; damaged or destroyed were eight aircrafts, airport terminals, supply building, and runway.



Photo: Yemen Executive Mine Action Center (YEMAC),¹⁵⁹ OSMP¹⁶⁰

“The Sanaa airport is a critical lifeline for Yemeni civilians, many of whom rely on the airport as their only means to access needed medical care. The Israeli military has now severed that lifeline, leaving many Yemenis without their primary point of access to the outside world,” HRW

¹⁵⁵ “[‘The Eye of the Storm’: Addressing the Dramatic Increase in Explosive Requirements.](#)” Industry- Government Panel Munitions Executive Summit, April 17, 2018, accessed August 29, 2025 ([Archived](#))

¹⁵⁶ “[‘Polska firma jedynym certyfikowanym producentem trotylu na świecie. Jakie ma dalsze plany?’](#) ISBnews.TV, September 13, 2019 [interview with Krzysztof Kozłowski, CEO of Nitro-Chem at the time].

¹⁵⁷ “[‘Within 15 Minutes: The IAF Struck Dozens of Houthi Terror Targets Using Dozens of Aircraft and 50 Munitions, Disabling the Main Airport in Sanaa.’](#) Israel Defense Forces, May 6, 2025, accessed May 13, 2026.

¹⁵⁸ “[‘Israel, Yemen: Investigate Airport Attacks as War Crimes.’](#) Human Rights Watch, June 3, 2025, accessed May 13, 2026

¹⁵⁹ [Yemen Executive Mine Action Center \(YEMAC\): ‘The emergency team of the center witnessed the defusing/disposal of a GBU-31\(V\)1B \(Mk-84\) JDAM missile at \[#Sanaa Airport\] on May 13, 2025.’](#) Youtube.

¹⁶⁰ “[OSMP1515](#)”. Open Source Munitions Portal. Accessed May 13, 2026

researcher Niku Jafarnia commented. **“Israeli forces have repeatedly carried out unlawful attacks on critical civilian infrastructure in Yemen, Gaza, and Lebanon with impunity. Countries still arming Israel risk being complicit in these brazen attacks and share responsibility for the grave harm to Yemeni and other civilians that has resulted”**¹⁶¹ [emphasis added].

The above image depicts a still from a video of an excavation of an unexploded bomb; full markings with the following code are visible on it:

**BOMB MK 84 MOD 4 2000 LBS
PART NO 3003-923AS105
LOT NO GOT17????**

Excavation of the bomb was done on May 14, 2025 by the Yemen Executive Mine Action Center (YEMAC), with ICRC’s support.¹⁶² The full video documentation can be found at YEMAC’s YouTube channel.¹⁶³

ARES (Armament Research Service) provided their interpretation of the markings on that particular bomb: ““GDT 17” in the lot number indicates that this munition was produced by General Dynamics Ordnance and Tactical Systems, an American company, in 2017. The Israeli Air Force announced they carried out the specific strike associated with this image, which indicates that this specific bomb was transferred to the Israeli Air Force.”¹⁶⁴ Alternatively, the first three letters of LOT NO, which indicate the factory or manufacturer, could be “GOT” – standing either for Garland Operations Texas or for GD-OTS. The official U.S. governmental list of manufacturers’ symbols to be used in markings on munitions has not been updated or the updated version has not been made available publicly, since April 1999.¹⁶⁵ But either way – the symbols points to Garland factory.

As in the previous case, an Mk 84 bomb produced by GD-OTS in 2017 and bought by Israel must have been filled with Polish TNT. The same data as cited above confirms that in 2017 there was only one factory in the U.S. producing those bombs, and only one company with certification to provide military-grade TNT for the elaboration of Mk 84s.

Law without enforcement

Under U.S. law, arms transfers are supposed to be conditional on the recipient respecting human rights and international humanitarian law. In practice, these conditions have never been enforced, and no planned weapons sales to Israel have been blocked by Congress. Both Democratic and Republican parties have consistently prioritized “standing with Israel no matter what.”¹⁶⁶

The U.S. statutes and regulations governing arms transfers had been in the past complemented

¹⁶¹ Ibid.

¹⁶² [“Executive Mine Action Center \(EMAC\) Extracts Unexploded JDAM Missile from Sana’a Airport,”](#) SABA, May 14, 2025, accessed May 13, 2026.

¹⁶³ [“شاهد فريق الطوارئ للمركز التقني للتعامل مع الألغام بنزع صاروخ من نوع GBU-31\(V\)1B \(Mk-84\) JDAM من مطار صنعاء”](#) YouTube video, accessed May 13, 2026, “The emergency team of the center witnessed the defusing/disposal of a GBU-31(V)1B (Mk-84) JDAM missile at [#Sanaa_Airport] on May 13, 2025”

¹⁶⁴ [“OSMP1515,”](#) Open Source Munitions Portal. Accessed May 13, 2026.

¹⁶⁵ U.S. Department of Defense, MIL-HDBK-1461A: Ammunition Manufacturers and Their Symbols, 1 April 1999.

¹⁶⁶ [“Under Primacy, Weapons Sales Will Always Supersede Human Rights,”](#) Quincy Institute for Responsible Statecraft, April 9, 2025, accessed August 27, 2025

by Conventional Arms Transfer (CAT), which outlines guidelines for selling weapons to other countries. While not legally binding, these policies have been issued by multiple presidents since Jimmy Carter in 1977. President Biden lowered the bar for stopping arms sales. Previously, the U.S. would only consider stopping a transfer if there was “actual knowledge” that the weapons would be used to commit international crimes. Biden changed this to a “more likely than not” standard, making it theoretically easier to block arms sales to those in violation of IHL.¹⁶⁷ Despite these stricter rules, the Biden administration continued to provide substantial military and financial support to Israel, demonstrating a disconnect between the stated policy and its application.¹⁶⁸

The Biden administration’s review of the U.S. arms transfers to Israel highlighted this contradiction in U.S. policy. In the official document submitted to Congress, the U.S. government acknowledged the strong possibility that U.S. weapons in Gaza were being “used by Israeli security forces since October 7 in instances inconsistent with its IHL obligations or with established best practices for mitigating civilian harm.”¹⁶⁹ Despite this assessment, the administration chose to continue the arms transfers. The official justification was that there was insufficient specific information on individual cases of misuse.¹⁷⁰ In March 2025, President Trump revoked Biden’s guidelines and did not introduce his own CAT policy.

The only restriction on weapons transfers to Israel was imposed by Biden in May 2024, when he paused a shipment of 1,800 MK-84 bombs, 1,700 MK-82 bombs, and some MK-83 bombs. However, in July 2024, Biden released the delivery of MK-83 bombs,¹⁷¹ and in January 2025 Trump lifted Biden’s hold on the shipment of MK-84 bombs to Israel,¹⁷² which arrived in February 2025.¹⁷³

Also in February 2025, Congress received three major notifications of planned Foreign Military Sales to Israel. With an exception of 4,000 I-2000 Penetrator warheads, other items – although worth mentioning – do not appear to be munitions filled with TNT. Those three notifications included requests to buy thousands of 500lbs- and 1000lbs bomb bodies (including Mk 82, Mk 83, BLU-110), almost 19,000 various guidance kits, more than 17,000 fuzes and more than 35,000 Mk 84 or BLU-117 bomb bodies.^{174,175} BLU-117 is identical to Mk 84 except instead of tritonal, it is filled with insensitive munitions explosives. Since then, Trump’s administration has bypassed Congress five times to push through weapons transfers to Israel, with one sale in March 2026 which included 20,000 bomb bodies.¹⁷⁶

167 [“Unpacking Biden’s Conventional Arms Transfer Policy,”](#) Lawfare, March 1, 2023, accessed August 28, 2025

168 “Under Primacy,” Quincy Institute for Responsible Statecraft

169 [“Report to Congress under Section 2 of the National Security Memorandum on Safeguards and Accountability with Respect to Transferred Defense Articles and Defense Services \(NSM-20\),”](#) p. 22, accessed August 27, 2025

170 [“Statement on Biden Administration’s NSM-20 Finding on Israel,”](#) Arms Control Association, May 10, 2024, accessed August 28, 2025

171 [“US to resume sending 500lb bombs to Israel while withholding 2,000lb bombs, official says,”](#) *The Guardian*, July 10, 2023, accessed August 28, 2025

172 [“Trump approves Israel bomb shipment that Biden had put on hold over Gaza,”](#) *Axios*, January 25, 2025, accessed August 26, 2025

173 [“US shipment of heavy bombs held up by Biden administration arrives in Israel,”](#) *Times of Israel*, February 16, 2025, accessed August 26, 2025

174 [“Israel – Munitions, Guidance Kits, Fuzes, and Munitions Support,”](#) Defense Security Cooperation Agency, February 7, 2025, accessed May 12, 2025 ([Archived](#)).

175 [“Israel – Munitions and Munitions Support,”](#) Defense Security Cooperation Agency, February 28, 2025, accessed August 28, 2025 ([Archived](#)).

176 [“State Department Bypasses Congress to Send Israel More Than 20,000 Bombs,”](#) *New York Times*, March 24, 2026, access May 13, 2026.

MK-80 production and the TNT bottleneck

The Garland Operations facility

Tritonal MK-80 series and BLU-109 bombs are produced at the Garland Operations facility, a 15-hectare manufacturing site north of Dallas, Texas, which specializes in manufacturing metal parts for defense and aerospace applications.¹⁷⁷ The long-time owner of this facility was General Dynamics (GD), the fifth-largest defense company in the world by sales, with revenue exceeding the GDP of some European states. In 2024, GD reported \$47.7 billion in revenue,¹⁷⁸ and in 2025, it was \$52.6 billion, up 10%.¹⁷⁹ Nearly two-thirds of its yearly revenue comes from U.S. government contracts.¹⁸⁰

GD had been producing MK-80 series bombs in Garland through various divisions and subsidiaries since the Vietnam War era.¹⁸¹ In the last decades the subsidiary responsible for their production was General Dynamics Ordnance and Tactical Systems (GD-OTS). This changed in April 2025, when the Garland facility was acquired by Repkon USA, a U.S. subsidiary of the Turkish defense company Repkon.¹⁸² Repkon USA took over the facility, likely along with the contracts and production obligations previously held by GD-OTS. Nearly a year after the takeover, in March 2026, protests took place both in Istanbul (at Repkon's offices and factory) and in Garland, Texas, against company's role in supplying bombs for Israel.¹⁸³ Soon after, Repkon USA announced a name change to Paligen Technologies.¹⁸⁴

Repkon USA strives to become a major supplier to the U.S. military and in recent years has been rapidly expanding its presence in the U.S. defense market.¹⁸⁵ In 2024, it was awarded contracts to build and operate a new TNT factory in Kentucky and to construct a production line for artillery cartridges in Texas.¹⁸⁶ It also acquired McCormick Stevenson Corporation, an engineering firm specializing in armament systems.¹⁸⁷ In this context, the acquisition of the Garland Operations facility is a key part of Repkon USA's strategy. Garland has long been and remains the only U.S. plant capable of producing MK-80 series bomb bodies.¹⁸⁸

This report examines MK-80 and BLU-109 production prior to the 2025 acquisition, when all relevant contracts were still held by GD-OTS at the Garland facility.

177 "[Vital partners: McAlester Army Ammunition Plant and GD-OTS Garland](#)," U.S. Army, December 13, 2021, accessed August 28, 2025 ([Archived](#))

178 "[General Dynamics Board Declares Dividend](#)," General Dynamics, August 6, 2025, accessed August 28, 2025 ([Archived](#))

179 "[General Dynamics Reports Fourth-Quarter and Full-Year 2025 Financial Results](#)", General Dynamics, January 28, 2026, accessed June 1, 2026.

180 "[Revenue of General Dynamics from the U.S. Government from 2008 to 2023](#)," Statista ([Archived](#))

181 "Vital partners," U.S. Army

182 "[REPkon USA Announces Acquisition of GD-OTS Garland Operations](#)," *PR Newswire*, April 2, 2025, accessed August 28, 2025 ([Archived](#))

183 "[TIP Members Chain Themselves to the Factory Gate of Repkon, Which Sells Bombs to Israel](#)," Sözcü, March 13, 2026, accessed May 18, 2026; "[Protests Reach Repkon's Door: Brazen Defence from the Supplier of Genocide](#)," *Yeni Akit*, March 8, 2026, accessed May 18, 2026; "[No War on Iran Protest at Garland Bomb Factory](#)," *Fight Back! News*, March 18, 2026, accessed May 18, 2026.

184 "[Turkish Arms Subsidiary Rebrands after Sales to Israel amid Iran War Backlash](#)," *Middle East Eye*, March 11, 2026, accessed May 18, 2026

185 "[Turkish firm Repkon expands presence in US with \\$435 million army contract](#)," *TRT Global*, November 13, 2024, accessed August 28, 2025

186 *Ibid.*

187 "[REPkon USA Announces Acquisition of McCormick Stevenson Corporation](#)," *PR Newswire*, March 17, 2025, accessed August 28, 2025 ([Archived](#))

188 "[MK80 Series General Purpose Bomb Bodies](#)," SAM.gov, accessed August 28, 2025

Making the bomb: from contract to assembly

In cases where only one qualified supplier can meet the government's requirements, the U.S. Department of Defense (DoD) awards contracts without competitive bidding. This is done through a special non-competitive procedure under the Federal Acquisition Regulation.¹⁸⁹ Over the past ten years, GD-OTS has received multiple contracts through this procedure for bomb bodies and ingredients for bomb charges. These contracts are administered by the U.S. Army and can serve the USAF as well as other end users, including allied nations¹⁹⁰ such as Israel.¹⁹¹ GD-OTS has been awarded both definitive contracts with fixed quantities¹⁹² and indefinite ones¹⁹³ that leave room for additional orders. Using both types of contracts at the same time is a policy the Army employs to adjust to changing demand.¹⁹⁴

The contracts awarded to GD-OTS fell into two categories: some were for the production of empty bomb bodies, while others included the supply of bomb bodies along with the materials used to make the explosive charge – aluminum powder and TNT. This report focuses on the TNT supply chain, and as such it does not examine contracts for bomb bodies alone but concentrates on deals for bomb kits.

Bomb kits are not yet complete bombs; they still require final assembly. This happens at the McAlester Army Ammunition Plant (MCAAP) in Oklahoma, a government-owned and operated facility that produces ammunition for the DoD. At MCAAP, aluminum powder is mixed with TNT to produce tritonal, which is used to fill the bomb bodies. The bombs are then completed with fuzes, tail kits, and other components, making them fully assembled and ready for use.¹⁹⁵

In the last ten years, GD-OTS was awarded two major contracts for tritonal kits: a definitive one in July 2016 worth \$309.9 million, and an indefinite one in December 2018¹⁹⁶ which allowed the government to set purchase quantities within a range of preset minimums and maximums. The total value of deliveries under the 2018 indefinite contract amounted to \$672.6 million.¹⁹⁷

189 Federal Acquisition Regulation 48 C.F.R. § 6.302-1, Acquisition.GOV, 2025 (Archived)

190 "[MK80 Series General Purpose and BLU-109 Tritonal Bomb Kits](#)," HigherGov, December 6, 2018, accessed August 29, 2025 (Archived)

191 "[Israel - Munitions and Munitions Support](#)," ASD News, February 28, 2025, accessed August 29, 2025

192 "[MK80 series General Purpose Bomb Bodies](#)," HigherGov, November 20, 2024, accessed August 29, 2025 (Archived)

193 "[IDV to GENERAL DYNAMICS ORDNANCE AND TACTICAL SYSTEMS, INC. – Indefinite Delivery / Indefinite Quantity \(IDIQ\) Contract, PIID W52P1J19D0015](#)," USAspending, May 5, 2025, accessed August 29, 2025

194 "IDIQs and other indefinite-delivery contracts provide flexibility for repeated purchases, allowing agencies to place orders as needs arise without having to renegotiate a new contract each time." in "[Understanding the FAR: A Beginner's Guide to Government Contracting](#)," FedBiz Access, October 4, 2024, accessed August 29, 2025 (Archived)

195 "Vital partners", U.S. Army; "[MK80 Series General Purpose and BLU-109 Tritonal Bomb Kits](#)," SAM.gov, accessed November 15, 2025

196 "[Definitive Contract, PIID W52P1J16C0058](#)," USAspending, last modified July 28, 2016, accessed August 29, 2025

197 "[IDV to GENERAL DYNAMICS ORDNANCE AND TACTICAL SYSTEMS, INC. – Indefinite Delivery / Indefinite Quantity \(IDIQ\) Contract PIID W52P1J19D0015](#)," USAspending, last modified December 20, 2024, accessed August 29, 2025

Evidence of U.S.-made MK-84s in Gaza has recently been obtained through examination of unexploded ordnance. The image at right shows an unexploded MK-84 bomb with markings indicating that the bomb was produced by General Dynamics in January 2025. These findings indicate that not only are U.S.-made MK-84s actively used in Gaza, but that the production of these bombs had been ongoing at least until 2025.

The missing component

For GD-OTS or Repkon USA, most components of a bomb kit are relatively easy to source. The Garland Operations facility manufactures the bomb bodies and, although it does not produce aluminum powder, that material is readily available on the U.S. market.¹⁹⁹ **TNT, however, presents a challenge, as there is no active TNT production in the United States.**²⁰⁰

Historically, TNT was produced at many facilities across the U.S. and Western Europe. Compared to other explosive materials like HMX and RDX, TNT is significantly cheaper and easier to manufacture. It is synthesized from toluene through a straightforward nitration process, making it highly scalable for mass production. Due to its relative stability, low sensitivity, and low melting point which makes it easier to handle, transport, and manufacture, TNT remains the preferred explosive for general-purpose munitions.²⁰¹

However, TNT is a toxic substance, and its production has serious environmental impacts. In the U.S., it is classified by the Environmental Protection Agency as a possible carcinogen.²⁰² During manufacturing, TNT is purified through a sulphitation process that produces large volumes of hazardous wastewater, commonly referred to as “red water” and “yellow water.” These byproducts are highly toxic and extremely difficult to dispose of safely. The process of remediation and the clean-up of the affected military and factory sites is ongoing.²⁰³ Because of these environmental and health hazards, large-scale TNT production has been largely phased out in the United States.

As a result, GD-OTS has had to import TNT for their bomb kits. Since at least 2016, it has been sourcing TNT for MK-80 bomb production from the Polish company **Zakłady Chemiczne “Nitro-Chem” S.A. (Nitro-Chem).**²⁰⁴



Still from a video showing an unexploded MK-84 bomb with markings indicating that the bomb was produced by General Dynamics in January 2025.¹⁹⁵ Since at least 2016, General Dynamics has been sourcing TNT for MK-80 series bomb production from the Polish company Nitro-Chem.

198 Alaraby TV (@AlarabyTV), “Unexploded ordnance threatens the lives of residents inside their homes in #Gaza, amid calls to allow the entry of the necessary equipment and technical teams capable of removing it”, X (formerly Twitter), October 30, 2025, <https://x.com/AlarabyTV/status/1983806918423421307>

199 “North America Aluminium Powder Market Size, Share, Trends and Forecast by Technology, Raw Material, End-Use, and Country, 2025-2033,” imarc, January 2025, accessed August 29, 2025 ([Archived](#))

200 “Army Awards Contract for First Domestic TNT Production in 38 Years,” *National Defense*, September 12, 2024, accessed August 29, 2025

201 “Technical Fact Sheet – 2.4.6-Trinitrotoluene (TNT),” United States Environmental Protection Agency, January 2024, accessed August 29, 2025 ([Archived](#))

202 *Ibid.*

203 “U.S. Army Environmental Command, Installation Action Plan for Iowa Army Ammunition Plant, FY 2024”, Army Environmental Command, 2024, accessed June 1, 2026

204 “Sprawozdanie Zarządu z działalności Zakładów Chemicznych “Nitro-Chem” S.A. za rok obrotowy 2017” (“Management Report on



The gate of the Nitro-Chem facility in Bydgoszcz, Poland.²⁰⁵

From Nazi Germany to Warsaw Pact to NATO: Nitro-Chem's history

The last source

The U.S. ceased domestic TNT production when its last factory closed in 1986.²⁰⁶ After the Cold War, when demand for explosive materials plummeted, most European explosives manufacturers also closed or significantly scaled back their operations. **As a result, the Polish company Nitro-Chem remains the only large-scale producer of TNT within both NATO and the European Union.**²⁰⁷ The importance of Nitro-Chem's role in supplying TNT was pointed out by the Polish Deputy Defense Minister Cezary Tomczyk who stated in April 2025 that **90% of the TNT imported by the United States comes from Poland.**²⁰⁸ Other NATO countries, including Italy, France, Sweden, Portugal, and the United Kingdom, also rely on Nitro-Chem for their explosives supply.²⁰⁹

the Activities of Zakłady Chemiczne "Nitro-Chem" S.A. for the Financial Year 2017"), Nitro-Chem via Polish Ministry of Justice National Court Register [portal](#), April 27, 2018, p. 16; "[Polish-American cooperation under the MK-84 programme](#)", Targi Kielce, accessed May 26, 2025 ([Archived](#))

205 "[Poland's Nitro-Chem signs \\$310 mln deal to supply TNT for US military](#)," Reuters, April 9, 2025, accessed August 28, 2025

206 "[Army says the US will restart domestic TNT production at plant to be built in Kentucky](#)," AP News, November 9, 2024, accessed August 29, 2025

207 "[TNT wanted: Europe's ammunition push is missing its explosive core](#)," Euractiv, July 4, 2025, accessed August 29, 2025

208 "[Nitro-Chem z umową na dostawę trotylu dla armii amerykańskiej o wartości 1,2 mld zł](#)" ("Nitro-Chem signs contract worth PLN 1.2 billion to supply TNT to the US Army"), PAP, September 4, 2025, accessed August 28, 2025

209 "[Polish company Nitro-Chem signs major deal to deliver TNT for U.S. artillery ammunition production](#)," Defence Industry Europe, April 9, 2025, accessed August 29, 2025

Nitro-Chem manufactures explosives and chemicals at its facility in the forests outside Bydgoszcz, in northwestern Poland. The site was originally built by Nazi Germany as DAG Fabrik Bromberg, one of the largest German arms factories in occupied Europe. The complex was constructed and expanded between 1940 and 1944 and produced explosives and ammunition for the Nazi Germany's war effort. During the war, the Germans built around 1,500 buildings and laid hundreds of kilometers of roads and railway tracks at the site. The Polish resistance infiltrated the plant and carried out acts of sabotage.²¹⁰

After the war, the Red Army dismantled most of the factory equipment and transported it to the Soviet Union. The government of the Polish People's Republic established a new plant using parts of the remaining infrastructure. Over time, this plant, eventually named Zachem, expanded its operations to include the production of various industrial chemicals both for civilian use as well as for the Polish People's Army and the Red Army.²¹¹ After the fall of communism, Zachem was broken up into several separate companies. The core company eventually went bankrupt, leaving behind one of the most heavily polluted industrial sites in Europe.²¹² The part of the business responsible for manufacturing explosives for military use became an independent entity under the name Nitro-Chem.²¹³

National security, restricted access

Today, Nitro-Chem is a state-owned joint-stock company. Its largest shareholder is Mesko S.A., another state-owned arms and ammunition manufacturer, which holds 46.47% of the shares.²¹⁴ The State Treasury holds another 26.73%. Both Nitro-Chem and Mesko are part of the Polish Armaments Group (PGZ), a holding established by the Polish government to unite Polish state-owned defense industry companies. PGZ comprises more than 50 companies.

Nitro-chem has been producing up to 10,000 tonnes of TNT annually. In March 2026, the Polish government and the company's management announced that second production line is going to be built, which will double the amount of TNT produced.²¹⁵

In addition to TNT, Nitro-Chem produces other explosives such as RDX (hexogen), HMX (octogen), and compound formulations based on them, including Composition B, a mixture of RDX and TNT used in missile warheads and explosive charges.²¹⁶ It also manufactures tritonal (80% TNT, 20% aluminum) and has developed K-43, a low-sensitivity explosive designed for artillery munitions, further expanding its role in supplying advanced military-grade materials.²¹⁷

Nitro-Chem is considered strategically important for Polish national security, and the government emphasizes its role in the country's defense. Polish investigative journalists with ties to the defense sector, who report on massive environmental damage caused by the company and opaque leadership reshuffles, find that no one wants to be named as their

210 "Exploseum," Muzeum Okręgowe im. Leona Wyczółkowskiego w Bydgoszczy, accessed August 29, 2025

211 Kamosiński, S. "Miasta przemysłowe dolnej Wisły" ("Industrial cities of the Lower Vistula"), *Historia polskich okręgów i rejonów przemysłowych*, v 1., Warszawa 2015, p. 192.

212 "Mamy największą bombę ekologiczną w Europie. Milion ton trucizny," *Gazeta Wyborcza Bydgoszcz*, March 9, 2018, accessed May 26, 2025.

213 "Historia" ("History"), Nitro-Chem, accessed August 29, 2025 ([Archived](#))

214 "Ownership Structure," Nitro-Chem, accessed August 29, 2025, <https://nitrochem.com.pl/en/cms/ownership-structure> ([Archived](#))

215 "Nawet 20 000 ton trotylu rocznie. Nitro-Chem podwoi produkcję," *Defence24*, March 17, 2026, accessed May 18, 2026

216 "Nitro-Chem Explosives – Products," Nitro-Chem, accessed November 15, 2025 ([Archived](#)); "Nitro-Chem, a producer of explosives and ammunition, presents its portfolio at MSPO," Targi Kielce, accessed November 15, 2025 ([Archived](#))

217 "Nitro-Chem: Lider bezpieczeństwa państwa," Nitro-Chem, accessed November 15, 2025 ([Archived](#))

source and face lawsuits from the company.²¹⁸

Journalists from the Polish news website Onet reported that, while investigating Nitro-Chem's TNT deals, they approached sources within the Polish military. Even their otherwise reliable high-ranking contacts refused to discuss the company or the U.S. intermediary PEI. "I know too much to talk about it – it's not very safe," one general remarked, while another added, "This is a business involving big money, intelligence services, and global interests. Better not to get involved."²¹⁹

TNT production's environmental impact in Poland

Nitro-Chem's TNT contributes to environmental destruction, both in Gaza²²⁰ and in Poland.²²¹ Israel's intentional targeting of olive groves, farms, greenhouses, agricultural land, and agricultural infrastructure, which will have long-term impacts on Gaza's ecosystems and biodiversity, constitutes "a deliberate act of ecocide," according to researchers and environmental organisations who have called for it to be investigated as a possible war crime.²²²

A report by the United Nations Environment Programme (UNEP) on the environmental impact of Israel's genocide in Gaza specifically discusses the danger of heavy metal contamination from tritonal and the danger of cancer, liver damage, and kidney damage from TNT found in soils where munitions were used.²²³ This destruction, a result of Israel's unprecedented aerial bombing campaign, was facilitated by the Polish TNT. In addition to this destruction, this section explores the impact of TNT production on the environment in Poland.

The production of TNT

The production of TNT is harmful to the natural environment. As mentioned earlier, during industrial production, TNT is purified in a sulphitation process, which produces toxic and difficult-to-dispose-of wastewaters known as "red water" and "yellow water." The disposal of these wastewaters is expensive and complicated, because they are not easily degradable. One of the reasons why there is worldwide shortage of TNT is the fact that TNT production is so harmful to the environment that most western countries choose to import it rather than produce it. TNT has largely not been manufactured in the United States since 1986.²²⁴ Only recently, in November 2024, the US decided to invest in the domestic production of TNT.²²⁵

218 "Prezes zbrojeniowego giganta w zorganizowanej grupie przestępczej. W tle poparzeni żołnierze i skażone poligony" ("President of an arms industry giant in an organized crime group. In the background: burned soldiers and contaminated training grounds"), *Onet*, November 13, 2024, accessed August 29, 2025 ([Archived](#))

219 "[Wojna, służby specjalne, polityka i trotyl z Polski. To już jest mocno podejrzane](#)" ("War, Secret Services, Politics, and TNT from Poland. This is Highly Suspicious"), *Onet*, June 30, 2025, accessed August 28, 2025

220 "[The Toxic Blowback of Israel's Bombs](#)," *New Lines Magazine*, July 29, 2025, accessed May 26, 2025

221 "[Superwizjer: Waters contaminated with TNT – an ecological bomb in Bydgoszcz](#)," *TVN24*, accessed May 26, 2025

222 "[Ecocide in Gaza: does scale of environmental destruction amount to a war crime?](#)," *The Guardian*, March 29, 2024

223 "[Environmental Impact of the Conflict in Gaza: Preliminary Assessment of Environmental Impacts](#)," UNEP - UN Environment Programme, June 18, 2024

224 "[Years of U.S., NATO miscalculations left Ukraine massively outgunned](#)," *Reuters*, July 19, 2024

225 "[US to re-establish TNT production with new Kentucky-based factory](#)," *Army Technology*, November 11, 2024

Environmental contamination by Nitro-Chem

The Pollution of Rivers

Documented environmental pollution by Nitro-Chem dates back to 2015.²²⁶ The Supreme Audit Office (pol. Naczelna Izba Kontroli - NIK) reported in 2019 that Nitro-Chem discharged wastewater containing TNT as well as other hazardous substances into the sewage system.²²⁷

Chemwik Sp. z o.o. is a municipal company in Bydgoszcz, Poland, operating the “Kapuściska” wastewater treatment plant. This facility provides water supply and wastewater treatment services to various enterprises, including Nitro-Chem. According to the tests conducted by Chemwik, in 2019 Nitro-Chem’s emissions of DNT and TNT into wastewater would exceed U.S. standards by 162 times and 14,500 times, respectively.²²⁸ According to Polish law it is forbidden to introduce any amounts of explosive substances into sewage.²²⁹

In 2023, 4 years after the audit was conducted by NIK, Polish media reported that the situation had worsened: “Based on the results of research conducted between January 2023 and the end of August 2023, at monitoring point 198, we can conclude that the level of key pollutants for the Chemwik treatment plant [...] has risen by an average of 40% compared to the average for the previous year.”²³⁰

Water contaminated with TNT and DNT compounds flowed directly into the Vistula River (Wisła), Poland’s largest and most ecologically significant river, which supports key ecosystems.²³¹ In September 2024 toxic substances were again detected in the sewage.²³²

Illegal Dumping Sites

In 2023, Polish media revealed that there were illegal dumps all over Poland for the yellow and red water produced when making TNT, some of which was labelled as waste from the Nitro-Chem factory.²³³ According to the investigators, organised crime groups were made responsible for the disposal and storage of this waste.²³⁴ According to media reports, toxic water was found in at least 9 different locations across Poland.²³⁵ Independent estimates by Onet (a news website that published an investigative report on the issue), based on calculations derived from reported prices per tonne of waste, put the estimated volume of waste distributed to the dumps at between 4,000 and 5,000 tonnes.²³⁶

226 [“Zaostrzył się spór o ścieki bydgoskiego Nitro-Chemu”](#), (Dispute over wastewater from Bydgoszcz-based Nitro-Chem escalates), Onet, November 30, 2016, accessed June 1, 2026.

227 [“I/18/004/LBY - Emisja substancji szkodliwych, w tym TNT i DNT z działalności Zakładów Chemicznych NITRO-CHEM S.A. i jej wpływ na wybrane elementy środowiska naturalnego”](#) (“I/18/004/LBY - Emission of harmful substances, including TNT and DNT from the operations of NITRO-CHEM S.A. Chemical Works and its impact on selected elements of the natural environment”), Najwyższa Izba Kontroli, 2019

228 [“Nitro-Chem wylewa do Wisły rakotwórcze odpady. Pomógł wpływowy polityk PiS”](#) (“Nitro-Chem dumps carcinogenic waste into the Vistula. Influential PiS politician helped”), Onet, September 28, 2023, accessed March 27, 2025

229 Act of 7 June 2001 on Collective Water Supply and Collective Sewage Disposal, Article 9(2)(3), Journal of Laws 2001 No. 72, item 747, as amended.

230 [“Nitro-Chem wylewa do Wisły rakotwórcze odpady. Pomógł wpływowy polityk PiS”](#) (“Nitro-Chem dumps carcinogenic waste into the Vistula. Influential PiS politician helped”), Onet, September 28, 2023, accessed March 27, 2025

231 Ibid.

232 Ibid.

233 TVN24. (2023, December 9). [“Stanowią śmiertelne zagrożenie, trafiają w ręce gangsterów, którzy zarabiają na tym miliony złotych”](#) (“They pose a deadly threat, they end up in the hands of gangsters who earn millions from it”), TVN24, December 9, 2023, accessed March 27, 2025

234 Ibid.

235 [“Kolejne miejsce z odpadami z Nitro-Chemu. Przyszła minister zapowiada zdecydowane działania”](#) (“Another site with waste from Nitro-Chem. Incoming climate minister promises decisive action”), TVN24, December 11, 2023, accessed March 27, 2025

236 Żemła, E., & Wyrwał, M. (2023, July 24). [“Afera odpadów: Jak handlarz bronił z akwarystą wywozili toksyczne odpady z Nitro-Chemu”](#)

Discharging toxic compounds directly into water and soil

According to official documents from May 2020,²³⁷ one of Nitro-Chem's partners, Craft Chemical Group, accepted waste for disposal and then transported it to illegal dumping sites, poured it into public waters or buried it in the ground.²³⁸

Illegal waste disposal during military exercises

Piotr Kasprzak, former president of Nitro-Chem, as well as others, were accused of illegally detonating Nitro-Chem production waste, as a result of which Polish soldiers were seriously injured.²³⁹ The soldiers were unaware of the materials used in the detonations and the danger it carries, and were told the detonations were needed for the purposes of scientific research. The scandal became public because of the fainting spells and burns of the soldiers.²⁴⁰

Zachem

Nitro-Chem was separated from Zachem in 1992. Despite this, Nitro-Chem claims a certain continuity on its website: "More than 75 years of experience in the production of explosives and the provision of ammunition elaboration services gives us an extensive knowledge of their production technologies and the needs of the defense and mining markets."²⁴¹

Nitro-Chem embraces the legacy of Zachem's decades of experience, and operates on some of Zachem's lands – without claiming responsibility for the pollution left by its predecessor. According to scientists from the Mining and Metallurgical Academy in Krakow (AGH), the land left by Zachem was one of the most polluted industrial areas in Europe, and possibly in the world.²⁴²

After decades of ignoring the possible environmental impacts of Zachem and Nitro-Chem's operations, in 2018 the Polish Supreme Audit Office investigated the situation, triggered by the AGH report. This included investigating whether Nitro-Chem had contributed to this pollution.²⁴³

Immediately, former deputy minister of defense Bartosz Kownacki (from PiS, the ruling party at the time), went to Bydgoszcz to defend Nitro-Chem's name. A local newspaper reported from the press conference:

"I would like to deny that Nitro-Chem discharged directly into the soil or the Vistula substances that could endanger human life or health," began Kownacki, who, by virtue of his position, oversaw the company's activities. "Nitro-Chem has the most modern

("Waste scandal: How an arms dealer and an aquarium trader smuggled toxic waste from Nitro-Chem"), *Onet*, July 24, 2023, accessed March 27, 2025

237 ["Arrests in the Case of Illegal Storage of Hazardous Waste \(case of the District Prosecutor's Office in Płock, ref. no. PO I Ds. 24.2020\)"](#), District Prosecutor's Office in Płock, 5 May 2020.

238 ["Toksyczne odpady z Nitro-Chemu były wylewane do wód i zakopywane w ziemi"](#) ("Toxic waste from Nitro-Chem was dumped into waters and buried in the ground"), *Onet*, August 9, 2023, accessed March 27, 2025

239 ["Prezes zbrojeniowego giganta w zorganizowanej grupie przestępczej. W tle poparzeni żołnierze i skażone poligony"](#) ("Arms industry CEO in organized crime group. Burned soldiers and contaminated training grounds in the background"), *Onet*, November 13, 2024, accessed March 27, 2025

240 *Ibid.*

241 ["Yesterday and Today"](#), Nitro-Chem S.A., accessed August 30, 2025 ([Archived](#))

242 ["We Have the Biggest Ecological Bomb in Europe. A Million Tons of Poison in Zachem."](#) *Gazeta Wyborcza Bydgoszcz*, February 1, 2018

243 ["Who Is Polluting in Łęgnowo? The Area of the Former Bydgoszcz Chemical Plant Zachem"](#), Supreme Audit Office (NIK), accessed August 30, 2025 ([Archived](#))

wastewater treatment facility in the region, and pollutants are monitored online, in real time. All wastewater that flows from Nitro-Chem to Chemwik is of ‘better quality’ than municipal wastewater,” he emphasized.²⁴⁴

The NIK’s audit²⁴⁵ and journalistic investigations²⁴⁶ proved him wrong.

It is worth noting that Nitro-Chem responded to stories published in the Polish media concerning the environmental pollution with lawsuits. In August 2023, Polish Armament Group (which Nitro-Chem is part of) announced that they were filing a complaint against Onet and requesting 10 million zloty (2,5 mln euros) compensation for tarnishing Nitro-Chem’s reputation.²⁴⁷

TNT across the Atlantic: Nitro-Chem and the U.S. Military

Supplying the ‘Global War on Terror’

The cooperation between Nitro-Chem and the U.S. defense companies can be traced back to the early 2000s. When the U.S. invaded Afghanistan and Iraq, the military quickly depleted its existing TNT inventories. With no domestic production capacity available, the DoD launched an emergency acquisition plan.²⁴⁸

In February 2003, the DoD awarded a contract to Alliant Techsystems Inc. (ATK), a major U.S. aerospace and arms manufacturer. Under the agreement, ATK was tasked with establishing and operating a new large-scale TNT production facility in the United States. In the meantime, the company was authorized to procure TNT from foreign suppliers or reclaim it from decommissioned munitions.²⁴⁹ Eventually, ATK resumed TNT production only for several years at the Radford Army Ammunition Plant.²⁵⁰ One outcome of this effort was enduring cooperation between U.S. defense companies and Nitro-Chem.

The surge in demand for TNT caused by the wars coincided with Nitro-Chem’s push to find new international buyers for its TNT. Poland had been a NATO member since 1999 and, in the early 2000s, Nitro-Chem was actively trying to establish a relationship with ATK.²⁵¹ These efforts gained momentum when the Polish government signed a major deal to purchase 48 F-16 fighter jets from Lockheed Martin.

As part of that contract, Lockheed entered into an offset agreement requiring the company to invest in the Polish economy through industrial cooperation, joint ventures, and technology transfers. Within this framework, the Polish government helped Nitro-Chem secure ATK as a

244 “Kownacki: atak na Nitro-chem to działanie na szkodę Bydgoszczy,” Tygodnik Bydgoski, October 17, 2018

245 “Who Is Polluting in Łęgnowo? The Area of the Former Bydgoszcz Chemical Plant Zachem,” Supreme Audit Office (NIK), accessed August 30, 2025 ([Archived](#))

246 “Nitro-Chem wylewa do Wisły rakotwórcze odpady. Pomógł wpływowi polityk PiS” (“Nitro-Chem dumps carcinogenic waste into the Vistula. Influential PiS politician helped”), *Onet*, September 28, 2023, accessed March 27, 2025

247 “PGZ: In Response to Onet’s Attack on the Good Name of Nitro-Chem,” *Polish Press Agency (PAP)*, accessed August 30, 2025

248 “FY03 AFSC JMC AHS Executive Summary,” US Army Joint Munitions Command, accessed May 26, 2025 ([Archived](#))

249 “Annual Command History – Executive Summary Fiscal Year 2003,” History Office, Headquarters, U.S. Army Field Support Command, Joint Munitions Command, pp. 13-14, accessed August 29, 2025 ([Archived](#))

250 “Radford Army Ammunition Plant” *GlobalSecurity.org*, accessed May 15, 2026.

251 “Wystąpienie pokontrolne (Post-audit report) P/08/050, LBY-41016-1/08,” Najwyższa Izba Kontroli, Delegatura w Bydgoszczy (Supreme Audit Office, Regional Office in Bydgoszcz), p. 2, accessed May 26, 2025 ([Archived](#))

client and facilitated the sale of TNT as part of the offset deal.²⁵² The contract was worth \$14 million, and the TNT was used in bombs for the USAF.²⁵³

It is also possible that some of this Polish TNT was used in the production of MOAB bombs.²⁵⁴ MOAB stands for Massive Ordnance Air Blast, unofficially known as the “Mother of All Bombs.” Each MOAB weighs roughly 10 tons and may contain various explosive compositions, including tritonal or RDX mixed with TNT and aluminum. The bomb was first used in combat in 2017, when a version of this bomb filled with approximately 18,000 pounds of TNT was dropped in Afghanistan.²⁵⁵

In 2009, Nitro-Chem signed another contract with ATK, this time worth \$55 million.²⁵⁶ At the time, the company was selling around 6,000 tons of TNT annually. Two years later, in 2011, ATK signed an agreement to become the official distributor of Nitro-Chem’s TNT and other explosives in the United States.²⁵⁷

“The only qualified TNT source for U.S. bomb programs”

In July 2016, when GD-OTS was awarded the bomb kit contract and knew it would need to import TNT, the ties between Nitro-Chem and U.S. arms manufacturers were already well established. However, ATK, formerly the main importer of Polish TNT, had undergone restructuring and mergers and was no longer involved in TNT procurement. GD-OTS decided to source TNT from Poland but lacked the necessary expertise and specialized licenses required for handling the international shipment of explosives. To manage this part of the supply chain, GD-OTS partnered with Paramount Enterprises International (PEI).²⁵⁸

PEI is a private defense logistics company specializing in the transportation of munitions and explosives. It holds all the required licenses for cross-border shipments of Class 1 hazardous materials. Among other services, PEI manages ocean shipments on certified vessels capable of carrying such cargo. These vessels sail between Europe and North America 12 to 14 times per year.²⁵⁹ The company’s leadership also has connections with Israel, as PEI’s CEO, Michael Kelsen, serves on the board of the Philadelphia-Israel Chamber of Commerce.²⁶⁰ In Poland PEI’s agent is the company Pol-Mare, which coordinates transport from the Bydgoszcz plant to the United States.²⁶¹

252 Ibid.

253 “[Nitro-Chem na czele eksporterów polskiej broni](#)” (“Nitro-Chem at the forefront of Polish arms exporters”), *Rzeczpospolita*, February 2, 2011, accessed August 29, 2025; “Annual Command History,” History Office, p. 13.

254 “Annual Command History,” History Office, p. 12

255 “[It felt like the heavens were falling: Afghans reel from Moab impact](#),” *The Guardian*, April 14, 2017, accessed August 29, 2025

256 “Nitro-Chem na czele eksporterów polskiej broni”, *Rzeczpospolita*

257 “[ATK Signs International Distribution Agreement with Polish Energetics Manufacturer Nitro-Chem](#),” PR Newswire, September 12, 2011, accessed May 26, 2025

258 “[Event Recap](#)”, Paramount Enterprises International, September 4, 2019, accessed August 29, 2025 ([Archived](#))

259 “[Paramount Enterprises International, Inc.](#)”, LinkedIn, accessed August 29, 2025

<https://www.linkedin.com/company/paramount-enterprises-international-inc> ([Archived](#))

260 “[Community Briefs: Honors, Appointments, More](#),” *Philadelphia Jewish Exponent*, February 17, 2021, accessed August 29, 2025 ([Archived](#))

261 “[NITRO-CHEM SA has received new orders to supply TNT to the USA](#),” Nitro-Chem, April 24, 2025, accessed November 15, 2025 ([Archived](#)). Pol-mare’s capacity is further detailed here: “[POL-MARE – specjaliści od transportów specjalnych](#)” (“POL-MARE – specialists in special transport”), *Defence24*, October 3, 2024

Key actors

- **Nitro-Chem:** TNT production
- **Pol-Mare:** logistics in Poland; shipment of TNT from Nitro-Chem’s plant to Gdańsk cargo loading;
- **Paramount Enterprises International (PEI):** intermediary; buys TNT from Nitro-Chem, organizes shipment from Poland to the U.S., and sells it to GD-OTS
- **General Dynamics Ordnance and Tactical Systems (GD-OTS):** manufactured bomb casings at the Garland Operations facility; bomb kits supplier for the U.S. military; bought TNT from PEI for its bomb kits
- **Repkon USA:** successor to GD-OTS as bomb casing manufacturer; acquired Garland Operations facility in April 2025; in March 2026 Repkon USA changed its name to **Paligen Technologies**
- **McAlester Army Ammunition Plant (MCAAP):** government-owned facility in Oklahoma; assembles bombs using bomb kits delivered by GD-OTS

In October 2016, three months after GD-OTS was awarded the \$309.9 million contract for MK-80 tritonal kits, PEI signed its first agreement with Nitro-Chem to supply TNT for the U.S. market.²⁶² The agreement was facilitated by the Israeli defense company ELUL,²⁶³ which had also assisted Nitro-Chem in securing contracts to supply explosives directly to Israeli clients.

Under the terms of the October 2016 contract between Nitro-Chem and PEI, from 2017 to 2019 Nitro-Chem sold 20,000 tonnes of TNT to the United States for \$100 million. These deliveries were intended mainly for GD-OTS’s production of bomb kits for the 900-kilogram MK-84 bombs.²⁶⁴

The evidence that Nitro-Chem’s explosives were meant for this specific purpose includes:

- **Official statements by Nitro-Chem’s management** in the company’s 2017 annual report, which states:

*...the company has secured a major multi-year contract to supply TNT for the elaboration of aerial bombs in the US.*²⁶⁵

- **Statements by GD-OTS management.** In September 2019, David Dunavin, General Manager at GD-OTS, stated at a press conference at a military fair in Kielce, Poland:

The previous two-year contract, which terminates in 2019,

262 “[20 tys. ton trotylu dostarczone do USA](#)” (“20,000 tons of TNT delivered to the USA”), *Defence 24*, September 7, 2019, accessed August 29, 2025

263 “Sprawozdanie Zarządu z działalności Zakładów Chemicznych “Nitro-Chem” S.A. za rok obrotowy 2017” (“Management report on the activities of Zakłady Chemiczne “Nitro-Chem” S.A. for the financial year 2017”), Nitro-Chem, April 27, 2018, p. 16. Nitro-Chem’s reports can be found on the Polish Ministry of Justice’s National Court Register [portal](#) by searching “0000006791”, Nitro-Chem’s registration number. The document notes: “An excellent example of this is the highly beneficial cooperation with an entity in Israel – the company ELUL – through which the company secured a significant contract for long-term TNT deliveries for the assembly of aerial bombs in the USA, as well as orders for the supply of several hundred tonnes of TNT and eight tonnes of RDX for customers in Israel.”

264 “[Polish-American Cooperation Under the MK-84 Programme](#),” Targi Kielce, September 6, 2019, accessed August 29, 2025 ([Archived](#))

265 “Sprawozdanie Zarządu z działalności,” Nitro-Chem, p. 16

for the supply of missiles under the MK-84 programme for the United States Air Force was successful. Polish partners had a key contribution. Thus we want to continue cooperation.²⁶⁶

- **Official records** of GD-OTS's subcontractors for the 2016 Tritonal kits contract, which list PEI as the TNT supplier.²⁶⁷
- **Official presentation by GD-OTS.** In April 2018, GD-OTS prepared a presentation for the Munitions Executive Summit, an annual event organized by the National Defense Industrial Association. In this presentation, GD-OTS confirmed that Nitro-Chem was the sole supplier of TNT for MK-84 bomb production. Of the total quantity delivered by Nitro-Chem, 31,800,000 pounds (14,424 tons) were designated for the production of 40,000 MK-84 bombs during 2017–2019.

NDIA
National Defense Industrial Association

TNT Requirements Surge Background

- Nitro Chem in Bydgoszcz, Poland is currently the only qualified TNT source for U.S. Bomb Programs
- As one of the world's largest producers with maximum annual production up to 22,000,000 pounds of military grade TNT per year, Nitro Chem is facilitated to support sustainment of large, long-term production programs
- In 2016, the USG released a requirement for 40,000 MK-84 Tritonal Bombs requiring 31,800,000 lbs. of TNT from Poland for all 2017 – 2019 contracted deliveries
- A multi-year agreement was established in 2016 to support the MK-84 Bomb Kit Program with TNT deliveries from Poland directly to load, assemble, pack facility for production
- The GD-OTS U.S. TNT Distribution Agreement contains minimum and maximum TNT production capacity options for 2019 – 2022 to support the USG Tritonal Bomb Program Sources Sought, to which GD-OTS responded in 2016. Additional options have since been added to the Agreement to support other Programs

GENERAL DYNAMICS
Ordnance and Tactical Systems

AFET NSA PS&A

A slide from the GD-OTS presentation for the Munitions Executive Summit in April 2018, discussing the sourcing of TNT from Nitro-chem.²⁶⁸

The October 2016 contract marked the beginning of a long-term partnership between GD-OTS, Pol-Mare, and Nitro-Chem – a collaboration that all these companies repeatedly highlighted in official statements and at industry events. **In September 2018, Nitro-Chem's**

²⁶⁶ "Polish-American Cooperation", Targi Kielce

²⁶⁷ "IDV to GENERAL DYNAMICS ORDNANCE AND TACTICAL SYSTEMS, INC. – Indefinite Delivery / Indefinite Quantity (IDIQ) Contract PIID W52P1J21D0024," USAspending, accessed November 15, 2025

²⁶⁸ "The Eye of the Storm', Addressing the Dramatic Increase in Explosive Requirements," Industry-Government Panel Munitions Executive Summit, April 17, 2018, accessed August 29, 2025 ([Archived](#))

management publicly thanked GD-OTS and PEI as its “largest customers.”²⁶⁹ At the time, Nitro-Chem was the only TNT manufacturer in the world certified for use by the U.S. Armed Forces.²⁷⁰

Timeline of contracts related to aerial bombs production

- **July 2016:** GD-OTS is awarded a government contract for MK-80 bomb kits
- **October 2016:** PEI signs a contract with Nitro-Chem for TNT supply
- **December 2018:** GD-OTS is awarded an indefinite contract for MK-80 bomb kits; between 2018 and 2025, GD-OTS receives five orders under this contract, the last one ongoing
- **December 2019:** The contract between Nitro-Chem and PEI is extended
- **November 2023:** Nitro-Chem’s TNT shipments to the U.S. delivered through PEI reaches 45,000 tons
- **April 2024:** Nitro-Chem and PEI sign a contract for TNT for MK-80 series bombs and artillery shells
- **April 2025:** Nitro-Chem and PEI sign their most valuable contract so far for the delivery of 18,000 tonnes of TNT worth \$310 million during 2027–2029

The 2016 government contract awarded to GD-OTS for bomb kits expired in the fall of 2019, but the company continued to receive new orders. In fact, already in December 2018, nearly a year before the previous contract ended, GD-OTS secured another contract for MK-80 series bomb kits. This time the contract was indefinite and allowed the government to order quantities within a specified range.²⁷¹ This ensured a steady flow of orders for GD-OTS and, in turn, a continuous demand for TNT.

In September 2019, a press conference in Poland was attended by members of Nitro-Chem’s management board, Krzysztof Pałucha, co-owner of Pol-Mare, and the U.S. Ambassador to Poland, Georgette Mosbacher. At the event, David Dunavin, General Manager at GD-OTS, announced that the partnership between Nitro-Chem, PEI, and GD-OTS would continue.²⁷² Two months later, in December 2019, the original contract between Nitro-Chem and PEI for TNT supply was amended. Its scope was extended for the coming years and the new terms included clauses granting Nitro-Chem exclusive rights to supply PEI during 2021–2022.²⁷³ Shipments continued, and **by November 2023, PEI announced that Nitro-Chem’s TNT deliveries to the United States had exceeded 45,000 tons.**²⁷⁴

While Polish TNT kept arriving, GD-OTS continued to receive delivery orders for MK-80 series tritonal kits under the 2018 framework contract. Below is a list of these subawards (known as

269 “GD-OTS dostarcza uzbrojenie Siłom Powietrznym Stanów Zjednoczonych” (“GD-OTS Supplies Weapons to the United States Air Force”), *VIP Magazyn*, August 27, 2019, accessed August 29, 2025

270 “20 tys. ton trotylu dostarczone do USA,” *Defence24*; “GD-OTS dostarcza uzbrojenie Siłom Powietrznym Stanów Zjednoczonych,” *VIP Magazyn*

271 “Indefinite Delivery / Indefinite Quantity (IDIQ) Contract, PIID W52P1J19D0015,” USAspending

272 “Polish-American Cooperation Under the MK-84 Programme,” Targi Kielce

273 “Afera w Nitro-Chemie. Jak wyparowały pieniądze firmie zbrojeniowej w Bydgoszczy” (“Scandal at Nitro-Chem: How Money Vanished from the Arms Company in Bydgoszcz”), *Gazeta Wyborcza*, July 7, 2023, accessed August 29, 2025

274 “Produkują 24 h na dobę, na trzy zmiany. Polski zakład podbił świat” (“They Produce 24 Hours a Day, in Three Shifts. The Polish Plant Has Conquered the World”), *money.pl*, November 13, 2023, accessed August 29, 2025

“child award orders”), with footnotes indicating when official records confirm that GD-OTS purchased TNT from PEI under each arrangement:

- **December 2018 – August 2024**, value: \$308.8 million; two TNT purchases from PEI, in October 2020 and February 2021, worth more than \$15.6 million combined.²⁷⁵
- **February 2021 – February 2023**, value: \$105 million.²⁷⁶
- **June 2022 – October 2024**, value: \$130.2 million; TNT purchase from PEI in July 2022 worth \$34.5 million.²⁷⁷
- **August 2022 – December 2025**, value: \$91.8 million; only one TNT purchase from PEI in May 2023 worth \$645,168.²⁷⁸
- **March 2023 – December 2025**, value: \$36.3 million; only one TNT purchase from PEI with the same purchase order number, date, and value as the one for the August 2022 – December 2025 delivery; it appears these two child award orders share this purchase.²⁷⁹

The iron-clad partnership

The partnership among Nitro-Chem, PEI, and GD-OTS is well-established, and the contracts for TNT for MK-80 series bombs are regularly renewed. In November 2023, John Coney, Director General of PEI stated that:

“Nitro-Chem S.A. is a key partner of PEI and, by extension, the U.S. government when it comes to providing the highest quality TNT for U.S. government weapons programs. For many years, Polish TNT was the only certified explosive used in the programs of the U.S. Air Force, Navy, Land Forces and Special Forces units. By maintaining the rational cooperation between Nitro-Chem S.A. and PEI, we are well positioned to support major U.S. government TNT supply programs for the next 5-7 years.”²⁸⁰

Soon after, new contracts followed. In October 2023, Nitro-Chem signed a contract to supply TNT for the increased production of 155mm artillery ammunition.²⁸¹ According to initial reports, this ammunition was supposed to be destined for Ukraine,²⁸² but in December 2023, the U.S. government announced that shells worth \$147 million would also be sold to Israel.²⁸³

The ceremonial signing of the agreement between Nitro-Chem and PEI took place in November

275 PEI subaward IDs: P0091827 and P0092923, [“CONTRACT to GENERAL DYNAMICS ORDNANCE AND TACTICAL SYSTEMS, INC. – Delivery Order W52P1J19F0062.”](#) USAspending, accessed August 29, 2025

276 [“CONTRACT to GENERAL DYNAMICS ORDNANCE AND TACTICAL SYSTEMS, INC. – Delivery Order W52P1J21F0104.”](#) USAspending, accessed August 29, 2025

277 PEI subaward ID P0097959, [“CONTRACT to GENERAL DYNAMICS ORDNANCE AND TACTICAL SYSTEMS, INC. – Delivery Order W52P1J22F0208.”](#) USAspending, accessed August 29, 2025

278 PEI subaward ID: PO100843, [“CONTRACT to GENERAL DYNAMICS ORDNANCE AND TACTICAL SYSTEMS, INC. – Delivery Order Order W52P1J22F0335.”](#) USAspending, accessed August 29, 2025

279 [“CONTRACT to GENERAL DYNAMICS ORDNANCE AND TACTICAL SYSTEMS, INC. – Delivery Order W519TC23F0047.”](#) USAspending, accessed August 29, 2025

280 [“NITRO-CHEM SA has received further orders to supply TNT to the USA.”](#) Nitro-Chem, November 8, 2023, accessed August 28, 2025 ([Archived](#))

281 [“Army making significant strides in artillery production as fiscal year ends.”](#) U.S. Army, October 5, 2023, accessed August 28, 2025 ([Archived](#))

282 [“Scoop: U.S. to Send Israel Artillery Shells Initially Destined for Ukraine.”](#) Axios, October 19, 2023, accessed August 28, 2025

283 [“Department of Defense Arms Sales Notification \(Transmittal No. 24-16\)”](#) (Israel – 155 mm Artillery; Document No. 2024-30635), Ammunition Federal Register, December 29, 2024, accessed August 28, 2025 ([Archived](#))

2023. During the ceremony, the Americans revealed that **Nitro-Chem has for years been the largest supplier of TNT to the U.S. defense industry.**²⁸⁴ According to their calculations, about **45,000 tonnes of Polish TNT have been shipped to the U.S. arms market over the past dozen years.**²⁸⁵

Another contract between Nitro-Chem and PEI for TNT for MK-80 series bombs was signed in April 2024,²⁸⁶ shortly after the U.S. government approved the transfer²⁸⁷ of 1,800 MK-84 bombs to Israel and the Senate passed a large military aid package for Israel and Ukraine.²⁸⁸

A year later, **in April 2025, the two companies signed their largest deal yet,** worth \$310 million, covering the delivery of 18,000 tonnes of TNT during 2027–2029.²⁸⁹ The agreement was signed in Poland by the CEOs of PEI and Nitro-Chem, in the presence of Poland’s Deputy Defense Minister, Cezary Tomczyk, who stated that **Poland’s deals with the U.S. concerning TNT exports are “iron-clad.”**²⁹⁰

The underlying mechanism of this partnership was detailed by *Onet* which in June 2025 investigated why Poland, despite an ongoing war on its eastern border for over three years, has been unable to produce basic artillery shells for its own military, while at the same time the country’s only NATO TNT producer, Nitro-Chem, sells enormous quantities of TNT to the United States at very low prices.²⁹¹

The article quotes an anonymous military source, who said: “Polish politicians were told that if Poland wants the American security umbrella, we must continue selling them TNT. Breaking this contract was portrayed as an act against American companies in Poland.”²⁹²

284 [“Polski trotyl rządzi na zbrojeniowych rynkach”](#) (“Polish TNT dominates the arms markets”), *Rzeczpospolita*, November 13, 2023, accessed August 28, 2025

285 [“Nitro-Chem z kolejnym sukcesem w USA”](#) (Nitro-Chem achieves another success in the USA), *Defence24*, November 13, 2023, accessed June 1, 2026

286 [“Nitro-Chem z nowym zamówieniem na trotyl dla USA”](#) (“Nitro-Chem Secures a New TNT Contract for the US”), *Polska Zbrojna*, April 24, 2024, accessed August 28, 2025

287 [“U.S. signs off on more bombs, warplanes for Israel.”](#) *The Washington Post*, March 29, 2024, accessed August 28, 2025

288 [“US House approves aid package worth billions for Ukraine, Israel.”](#) *Al Jazeera*, April 20, 2024, accessed August 28, 2025

289 [“Poland’s Nitro-Chem signs \\$310 mln deal to supply TNT for US military.”](#) *Reuters*, April 9, 2025, accessed August 28, 2025

290 [“Nitro-Chem z umową na dostawę trotylu dla armii amerykańskiej o wartości 1,2 mld zł”](#) (“Nitro-Chem Secures TNT Supply Contract for U.S. Military Worth 1.2 Billion PLN”), *PAP*, September 4, 2025, accessed August 28, 2025

291 [“Wojna, służby specjalne, polityka i trotyl z Polski. To już jest mocno podejrzane”](#) (“War, Secret Services, Politics, and TNT from Poland. This is Highly Suspicious”), *Onet*, June 30, 2025, accessed August 28, 2025

292 Ibid.

Year	Value (EUR)
2002	199,828
2003	124,146
2004	6,409,040
2005	3,740,602
2006	4,079,273
2007	6,832,006
2008	3,793,176
2009	151,716
2010	377,770
2011	5,190,674
2012	3,397,852
2013	4,869,614
2014	643,584
2015	8,347,011
2016	10,480,121
2017	35,375,382
2018	36,583,814
2019	46,041,079
2020	45,321,388
2021	38,002,840
2022	23,899,416
2023	34,531,127
2024	43,989,320
2025	53,569,543

Table 1. Export value of TNT (HS Category 29042000) from Poland to U.S., by Year.
Source: *EU Customs Database*

TNT for artillery shells

155 mm artillery shells: from obsolete to urgent

After the Cold War, NATO states largely neglected artillery shell production. During the invasion of Iraq, the U.S. military relied little on artillery, reinforcing the belief among planners that the weapon was becoming obsolete. From summer 2014 to fall 2015, manufacturing of 155 mm shells declined so sharply that no new rounds were added to U.S. stockpiles. Repeated shutdowns due to defects and safety violations, along with cracked shells discovered in 2021, further reduced production, halving capacity for months. A *Reuters* analysis showed that annual U.S. output remained below 20,000 shells between 2018 and 2023.²⁹³

The standard fill for 155 mm artillery shells has long been TNT. At one point, the U.S. Army attempted to replace TNT with alternative explosives, but the effort was brief. In 2014, it began filling 155 mm shells with IMX-101, citing lower sensitivity and environmental benefits. By July 2023, however, production of IMX-101 for these rounds was halted — as revealed by the *Reuters* investigation. The Army reverted to TNT, explaining that costs were lower and output about 25% higher. Although less toxic, IMX also presented environmental drawbacks.²⁹⁴

Even though volumes were small, the need for TNT for artillery never disappeared, and just as with aerial bombs, the source was Poland's Nitro-Chem. In 2017, the company secured a \$28.5 million (105 million PLN)²⁹⁵ contract to supply TNT to American Ordnance for the production of M795 155 mm artillery shells. The deliveries were due by September 2019.²⁹⁶ The deal was modified in August 2018 to include additional TNT deliveries for artillery shell production, scheduled through December 2021.²⁹⁷ According to the DoD, the modification, worth \$30.9 million, covered TNT for the load, assemble, and pack process of the M795 155 mm projectile, to be carried out in Middletown, Iowa; Mineola, New York; and Bydgoszcz, Poland.²⁹⁸

The dynamics of the artillery shells production and supply changed drastically with Russia's invasion of Ukraine. In August 2022, the U.S. Army issued a market-research notice seeking U.S. and Canadian suppliers capable of loading, assembling, packing, and delivering the 155 mm M795 High Explosive projectile with two explosive-fill options, TNT or IMX-101, each paired with a supplementary charge (TNT for the TNT-filled version, PBXN-9 for the IMX-101 version).²⁹⁹ Bulk TNT had to be procured by the offeror.

The survey led to two main contracts for the loading, assembling, packing, and delivery of 155 mm M795 shells, one with American Ordnance and the other with General Dynamics OTS, both signed in February 2023. American Ordnance was to establish a LAP production line at

293 "[Years of U.S., NATO Miscalculations Left Ukraine Massively Outgunned](#)," *Reuters Investigates*, July 19, 2024, accessed August 30, 2025

294 *Ibid.*

295 "[Nitro-Chem S.A. z kontraktem Departamentu Obrony](#)," *Zespół Badań i Analiz Militarnych*, September 30, 2017, accessed August 29, 2025

296 "The projectile consists of a High Fragmentation Steel (HF-1) body filled with 23.8 pounds of TNT explosive or 23.8 pounds of IMX-101 insensitive explosive." from "[Portfolio Book](#)," Joint Program Executive Office for Armaments & Ammunition, U.S. Army, February 27, 2017, p. 40 ("155mm M795 High Explosive Projectile"), accessed August 29, 2025 ([Archived](#))

297 "[Polski trotyl do USA](#)," MILMAG, 2 September, 2018, accessed August 29, 2025

298 "[Contracts for Aug. 31, 2018](#)," Defense.gov, August 31, 2018, accessed August 29, 2025 ([Archived](#))

299 "[155mm M795 Market Survey](#)," SAM.gov, September 7, 2022, accessed August 29, 2025

its parent company, Day and Zimmerman, in Kansas,³⁰⁰ while GD-OTS set up a LAP production line at its Camden, Arkansas facility.³⁰¹ **GD-OTS's contract included two subawards to PEI for TNT, confirming Poland's Nitro-Chem as the source.** The first subaward, dated late July 2023, was worth nearly \$7.7 million, and the second, dated October 2023, was valued at over \$18 million.³⁰² In September 2024, both GD-OTS and American Ordnance received subcontracts for the production of 346,678 155 mm M795 TNT-loaded projectiles.

To increase U.S. production to 80,000 projectiles per month within two years, the military signed contracts in September 2023 with nine companies, worth a total of \$1.5 billion.³⁰³ According to the U.S. Army website, “the awards procure 14.2 million pounds of bulk energetics (TNT and IMX-104), 270,000 primers, 678,000 fuses, 2.7 million Modular Artillery Charge System combustible cartridge cases, load, assemble, and pack of 1.6 million MACS propellant increments, and load, assemble, and pack of 451,000 M795/M1128 projectiles.”³⁰⁴ One of the companies was Nitro-chem.³⁰⁵

The ceremonial signing of the agreement between Nitro-Chem and Paramount Enterprises International took place in November 2023. Peter Burke, Deputy Project Manager at Combat Ammunition Systems (CAS) in the U.S. Armed Forces, stated at the ceremony: “The cooperation between Nitro-Chem S.A. and PEI is essential to meet the current and anticipated future demand of the U.S. Armed Forces and our associated partners for artillery ammunition.”³⁰⁶

Metal bodies for 155 mm shells are currently produced in two U.S. Army-owned plants operated by General Dynamics, one in Scranton and the other in nearby Wilkes-Barre, Pennsylvania.³⁰⁷ Additionally, the Army has signed new contracts with manufacturing facilities in Texas and Canada to further increase production capacity. These efforts are part of a broader initiative to acquire the large machinery needed for expanded shell production.³⁰⁸

As in the case of the MK-80 series bombs, Israel is also trying to develop domestic production of the artillery shells. Since Elbit bought in 2018 IMI Systems (previously state-owned), the company became the sole Israeli producer of tank and artillery shells. In August 2023, Elbit was granted a government contract worth \$60 million to produce tens of thousands of 155mm shells.³⁰⁹ By the end of the year, the IMOD ordered in total \$760 million worth of different ammunition from Elbit.³¹⁰

It appears that some if not all Israeli-produced shells are elaborated with TNT.³¹¹ In the last two

300 [“CONTRACT to AMERICAN ORDINANCE LLC – Delivery Order PIID W519TC23F0107”](#) (under IDV W519TC-23-D-0014), USAspending, accessed August 29, 2025

301 [“CONTRACT to GENERAL DYNAMICS OTS \(NICEVILLE\), INC. – Delivery Order PIID W519TC23F0108”](#) (under IDV W519TC-23-D-0015), USAspending, accessed August 29, 2025

302 Ibid.

303 [“US military signs TNT supply contract with Polish company,”](#) PAP, October 19, 2023, accessed May 26, 2025; “Army making significant strides in artillery production as fiscal year ends,” U.S. Army, October 5, 2023, accessed May 26, 2025 (Archived)

304 [“Army Making Significant Strides,”](#) U.S. Army

305 Ibid.

306 [“NITRO-CHEM SA Has Received Further Orders to Supply TNT to the USA,”](#) Nitro-Chem, November 8, 2023, accessed August 30, 2025 (Archived)

307 [“Strengthened Army industrial base doubles artillery production,”](#) U.S. Army, November 14, 2023, accessed August 30, 2025 (Archived)

308 [“Long war in Ukraine highlights need for U.S. Army to modernize ammo production,”](#) PBS, April 23, 2023, accessed August 30, 2025

309 [“Israel Orders Tens of Thousands of 155mm Artillery Shells from Elbit,”](#) Defense News, August 4, 2023

310 [“Israel Ordered \\$760M in Ammunition from Elbit Systems in 2023,”](#) Breaking Defense, May 22, 2024

311 Ibid. (see photo in the article)

years, Israel has mainly imported TNT and other explosives from Vietnam and India, according to the Volza database, which shows only partial records (between 10-30% of all shipments).

Indiscriminate attacks with 155 mm shells

“Our form of combat at the moment is unusually wasteful. You could term it ‘a war of cruel rich people.’ We’re attacking innumerable targets, without asking whether it’s worth attacking them, and artillery is being used in places where it’s not really obligatory.”

—Former ranking Israeli military officer, *Haaretz*³¹²

In December 2023, the U.S. government announced a planned sale of 155 mm shells to Israel, valued at over \$147 million,³¹³ and by December 29 it had shipped 57,000 shells.^{314,315} The original Foreign Military Sale was valued at \$96.5 million and therefore did not require notification to Congress. This meant that the public would not normally have been aware of it. Additional requests from the Israeli government, however, raised the total amount above the \$100 million notification threshold.³¹⁶

The use of 155 mm artillery shells in Gaza is well documented and frequently acknowledged by the Israeli military. Just within the first seven weeks of the onslaught, Israeli soldiers fired 90,000 artillery shells on the Gaza Strip.³¹⁷ Considering how small and densely populated the Palestinian enclave is, those numbers show complete lack of consideration for Gaza’s population.

Multiple humanitarian organizations have called for a halt to the transfer of artillery munitions to Israel due to their indiscriminate nature and the potential violations of international humanitarian law. In November 2023, the American Near East Refugee Aid (ANERA) published a letter, signed by 33 human rights and humanitarian groups, urging the United States to cease shipments of artillery shells to Israel. The letter referenced a policy paper from Oxfam, which highlighted the **indiscriminate nature of 155mm artillery shells in densely populated areas such as Gaza:**

In Gaza, one of the world’s most densely populated places, 155mm artillery shells are inherently indiscriminate. These munitions are unguided and have a high error radius, often landing 25 meters away from the intended target. Upon impact, 155mm shells expel 2,000 sharp metal fragments in every direction, risking injury, death, and permanent disability to civilians within 300 meters of the blast. Simply put, it is difficult to imagine a scenario in which high explosive 155mm artillery shells could be used in Gaza in compliance with IHL.³¹⁸

312 [“It’s a War of Cruel Rich People. Israel’s Form of Combat in Gaza Is Unusually Wasteful,”](#) *Haaretz*, March 7, 2024, accessed September 1, 2025

313 [“Department of Defense Arms Sales Notification \(Transmittal No. 24-16\),”](#) Ammunition Federal Register, December 29, 2024, accessed August 28, 2025 ([Archived](#))

314 [“Defense Security Cooperation Agency News Release: Israel – 155mm Artillery Ammunition \(Transmittal No. 24-16\),”](#) Defense Security Cooperation Agency, December 29, 2023, accessed August 30, 2025 ([Archived](#))

315 [“US Is Quietly Sending Israel More Ammunition, Missiles,”](#) *Bloomberg*, November 14, 2023, accessed August 30, 2025

316 [“U.S. floods arms into Israel despite mounting alarm over war’s conduct,”](#) *The Washington Post*, March 6, 2024, accessed August 30, 2024

317 [“IDF Fires 100,000 Shells in Israel-Hamas War,”](#) *The Jerusalem Post*, November 28, 2023

318 [“Joint open letter on transfer of 155mm artillery shells to Israel,”](#) ANERA, November 13, 2023, accessed August 30, 2025.

In August 2025, the Israeli military prepared for a ground offensive in Gaza, with plans to forcibly expel the city's population, approximately 1.2 million people, southward to Mawasi and refugee camps in the central Gaza Strip. The army planned to issue evacuation notices but anticipated that many Palestinians would choose to stay. In response, the Israeli military stated that **troops would use artillery fire in nearby areas to “encourage” residents to evacuate.**³¹⁹ In September 2025, Israel launched the plan to invade Gaza City and forcibly displace its residents after weeks of heavy bombardment.³²⁰

Airwars has documented 76 cases of attacks on Palestinian civilians and infrastructure through artillery use in the Gaza Strip since October 2023.³²¹

Nitro-Chem's direct sales to Israel

In addition to its sales to the U.S., Nitro-Chem has also supplied explosives directly to Israel. In September 2018, Nitro-Chem celebrated its 70th anniversary by presenting an award to Israeli company Rafael Advanced Defence Systems for its long-standing cooperation.³²² Some of these transactions are reflected in the official annual management's reports on the company's operations.³²³ Since 2017, every year, Israel has been listed in the descriptive part of those reports as one of the regular customers of Nitro-Chem.³²⁴ The following are selected examples of such sales, though they do not represent a complete record of the trade.

- **RDX and TNT direct sales in 2017:** Nitro-Chem collaborated with the Israeli company ELUL. As a result of this collaboration, “the company secured a significant multi-year contract for the supply of TNT for the elaboration of aerial bombs in the US and an order for the supply of several hundred tonnes of TNT as well as eight tonnes of hexogen for customers in Israel.”³²⁵
- **NGu direct sales in 2018:** Nitro-Chem sold 40 tonnes of nitroguanidine (NGu)³²⁶ to IMI Israel, a state-owned manufacturer of weapons, particularly firearms, ammunition and military technology. At the end of 2018, IMI was acquired by Elbit Systems.³²⁷
- **TNT direct sales in 2019:** Nitro-Chem received orders for TNT from the “Israeli manufacturers of large-calibre ammunition, IMI and Elbit Systems.”³²⁸
- **RDX and HMX direct sales in 2020:** Nitro-chem received orders for RDX and

319 “‘Gates of Hell Will Open’: Israel’s Defense Minister Vows to Level Gaza City After IDF Takeover Plan Approved,” *Haaretz*, August 22, 2025, accessed August 30, 2025.

320 “Gaza City under relentless bombardment as Israel launches ground invasion,” *Al Jazeera*, September 16, 2025.

321 [Israel and Gaza – Artillery incidents](#), Airwars, accessed November 15, 2025.

322 “Jubileusz 70-lecia NITRO-CHEMU,” Nitro-Chem, September 14, 2018, accessed August 26, 2025 ([Archived](#))

323 Documents can be accessed at <https://rdf-przegladarka.ms.gov.pl/>

324 “Sprawozdanie zarządu z działalności zakładów chemicznych “Nitro-Chem” S.A. za rok obrotowy 2023” (“Report of the management board on the activity of the chemical plant “Nitro-Chem” S.A. for the financial year 2023”), Nitro-Chem, April 18, 2024, p. 6

325 “Podsumowanie Roczne za 2017” (“Annual Summary for 2017”), Nitro-Chem, April 27, 2018, p. 16. Nitro-Chem’s reports can be found on the Polish Ministry of Justice’s National Court Register [portal](#) by searching “0000006791”, Nitro-Chem’s registration number.

326 “Podsumowanie Roczne za 2018” (“Annual Summary for 2018”), Nitro-Chem, March 15, 2019, p. 14. Nitroguanidine is used in military applications, primarily as a component in triple-base propellants for artillery shells, tank ammunition, and rocket motors, as well as in insensitive munitions (IM) to enhance safety and stability.

327 “[Elbit Systems Completes the Acquisition of IMI Systems](#),” Elbit Systems, November 25, 2018, ([Archived](#)).

328 “Sprawozdanie Zarządu z działalności Zakładów Chemicznych Nitro-Chem S.A. za rok obrotowy 2019” (“Management Report on the Activities of Zakłady Chemiczne Nitro-Chem S.A. for the 2019 Financial Year”), Nitro-Chem, March 16, 2020, p. 53.

HMX from Rafael Advanced Defense Systems Ltd.³²⁹ According to the board, “it is also important to maintain a high level of cooperation with Israeli large-caliber ammunition manufacturers IMI Systems and Rafael Advanced Defense Systems Ltd.”

Direct sales of explosives are reflected in the EU export data.³³⁰ However, TNT is not exported as an explosive material, but as an organic chemical (section VI, chapter 29 of HS codes: “Sulphonated, nitrated or nitrosated derivatives of hydrocarbons, whether or not halogenated”), and belongs to subcategory of “derivatives containing only nitro or only nitroso groups”. Its HS code is 29042020. As shown below, the values of annual exports are not that significant (especially in comparison to the export to the US), but what is significant is the fact that they have taken place at least since 2006 and continued during the genocide.

329 “Sprawozdanie zarządu z działalności zakładów chemicznych “Nitro-Chem” S.A. za rok obrotowy 2020” (“Report of the management board on the activity of the chemical plant “Nitro-Chem” S.A. for the financial year 2020”), Nitro-Chem, March 8, 2021, p. 54

330 Eurostat, “[International trade of EU and non-EU countries since 2002 by HS2-4-6](#),” data code: DS-059341

Year	Value (EUR) of TNT Exports (HS Code 290420)	Value (EUR) of Other Explosives Exports (HS Code 360200)
2006	360,151	453,398
2007	419,244	784,601
2008	25,365	341,719
2009	–	1,908,997
2010	–	950,165
2011	–	1,525,348
2012	–	–
2013	–	–
2014	–	–
2015	–	–
2016	924,360	–
2017	–	–
2018	1,361,965	180,229
2019	392,584	144,630
2020	–	409,948
2021	–	865,766
2022	2,745,073	–
2023	–	–
2024	282,933	–
2025	–	–
TOTAL	6,511,675	7,564,801

Table 2. Export value of TNT and Other Explosives from Poland to Israel, by Year.
Source: EU Customs Database

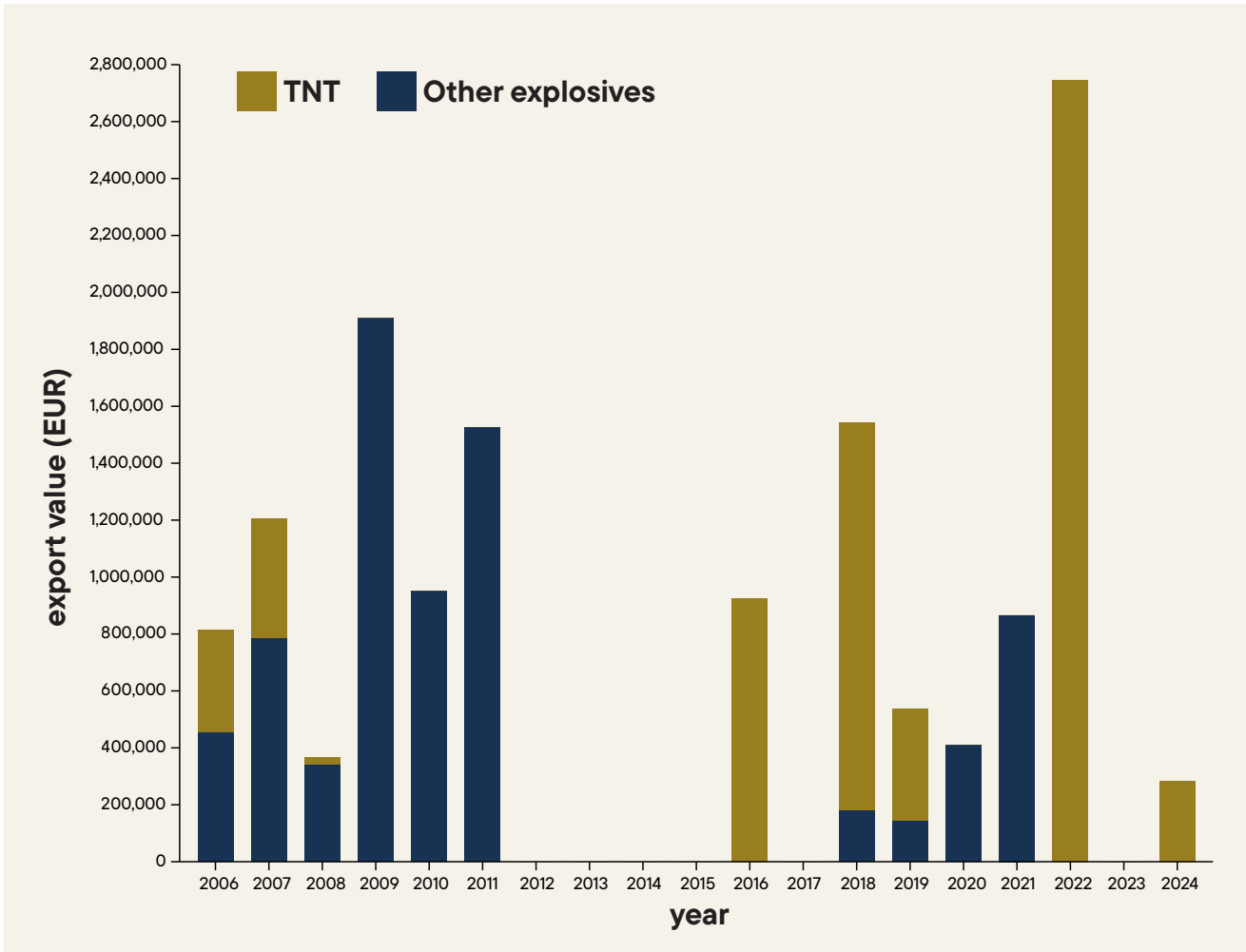


Chart 1. Export value of TNT and Other Explosives from Poland to Israel, by Year.
 Source: EU Customs Database

APPENDIX

The following Appendix contains a list of described and documented cases of the use of bombs with a nominal weight of 227 kg (500 lbs, MK-82), 454 kg (1,000 lbs, MK-83) and 907 kg (2,000 lbs, MK-84/BLU-109/BLU-117) by the Israeli army in Gaza.

Their actual weight depends on the weight of the fins, fuse, and other devices, as well as JDAM guidance systems, if used in a given bombing.

These bombs can also be described as GBU bombs: GBU-38 is MK-82 with JDAM, GBU-32 is MK-83 with JDAM, and GBU-31 is MK-84/BLU-117/BLU-109 with JDAM. JDAM is a Joint Direct Attack Munition guidance kit.

In this Appendix, the type of weapon, where specified, follows the original source of information, preserving both the unit of measurement (lbs/kg) and the method of categorisation.

This list is by no means exhaustive of all instances of MK-80/BLU series bomb use by the Israeli army in Gaza. It merely documents a handful of cases investigated to date of their use between 2014 and 2025.

2014

In 2014, Gaza was subjected to an intensive Israeli bombardment and land offensive. The attack lasted from July 7 until August 26, 2014, and was the deadliest in Gaza's history until Israel's accelerated campaign of genocide in Gaza since October 7, 2023. In 2014, Israel carried out more than 6,000 air strikes,¹ many of which targeted residential buildings and critical infrastructure. According to the UN, more than 2,200 Palestinians were killed.² More than 1,500 Palestinian children were orphaned and 142 Palestinian families lost three or more members in the same incident.³

1 [“Key Figures on the 2014 Hostilities.”](#) UN Office for the Coordination of Humanitarian Affairs - Occupied Palestinian Territory, June 23, 2015.

2 Ibid.

3 Ibid.

July 10, 2014, Al Hajj family, Khan Younis

Source: [Report by the UN Independent Commission of Inquiry](#) (par. 115-120), [Al Mezan, B'tselem, Obliterated Families](#)

Killed: 8 members of Al Hajj family, including 3 men, 3 women and 2 children

Injured: 20 people

Type of weapon: JDAM-guided bomb, either MK-83 or MK-82⁴

Infrastructural damage: One two-story 135 square meter building completely destroyed, and 20 buildings damaged

Families directly affected by the bombing: Al Hajj, Al Athamna, Abu Libda, Al Halbi and Shakshak



Source: *Obliterated Families*

The airstrike took place at around 2 a.m., killing all eight members of the Al Hajj family who were inside their house at the time. The two-story building was completely destroyed, and 20 neighbouring houses in the surrounding area were damaged.

UN investigators interviewed members of the Al Athamna family, who lived opposite the Al Hajj family home. They described a “fireball” hitting the house; the impact was so destructive that it reached the Al Athamna family’s house. Rajaa Al Athamna, who was 29 years old at the time, was trapped under the rubble for half an hour. Following the attack, she suffered from amnesia and could not recognise any of her family members.

⁴ [“Report of the detailed findings of the independent commission of inquiry established pursuant to Human Rights Council resolution S-21/1.”](#) UN Human Rights Council, June 22, 2015, p. 33.

Muhammad Shahin, also a neighbor of the al-Hajj family, described the airstrike:

Suddenly I heard a very loud blast. I felt my bed move and I almost flew out of it. It felt like the explosion had been in our house, or right next door. The windows flew out of their frames. The window by my head was simply torn out of place along with its frame, and fell in the middle of the room. I thank God it didn't hit my daughter, who was sleeping in the room. Thick smoke filled the house. The power didn't get cut off so there was light, but I could hardly see through the smoke. There was a feeling of dread throughout the house. I heard screaming from my neighbors' homes.

I made sure all my kids were okay and gathered them up to leave the house. I didn't yet understand which house had been bombed. We went outside and so did my brothers and other relatives who live nearby. We tried to figure out which house had been bombed and realized it wasn't any of our family's homes. It was the al-Haj family home, which is very close to ours.

We reached the house that had been bombed. I know it well. There was hardly anything left. It was totally destroyed. Bits of bodies were scattered on the road. The house next door to the al-Hajs belonged to the Shakshak family. It was also destroyed, but it wasn't a direct hit and they got out alive.⁵

5 ["Bombing of al-Haj home, Khan Yunis R.C.; 8 members of the family killed, 10 July 2014,"](#) B'Tselem, January 28, 2015.

July 26, 2014, Al Najjar Family, Khan Younis

Source: [Report by the UN Independent Commission of Inquiry](#) (par. 126-131), [The Guardian](#), [Al Mezan](#), [Obliterated Families](#)

Killed: 19 members of al Najjar family, including 3 men, 5 women (two of them pregnant) and 11 children

Injured: 5 people

Type of weapon: Likely a 1000-lb or 2000-lb bomb⁶

Infrastructural damage: At least one building completely destroyed, neighbouring buildings damaged, and a distinctive, large crater at the site of the bombing



Source: *Obliterated Families*

The bombing took place around 3 a.m., a few minutes after the family woke up to prepare *suhhur*, the last meal before the start of the Ramadan fast. Nineteen members of the same family were killed, the youngest being eight months old. There was no warning or evacuation order before the bombing.⁷

⁶ "Report of the detailed findings," UN Human Rights Council.

⁷ "[Gaza counts the cost of war: 'Whole families smashed under the rubble'](#)," *The Guardian*, 2014, August 15, 2014.

July 29, 2014, Abu Jabr family, Al Buraij refugee camp

Source: [Report by the UN Independent Commission of Inquiry](#) (par. 132-136), [B'tselem](#), [Al Mezan](#)

Killed: 19 people, including 7 men, 6 women and 6 children

Injured: 7 people, including 4 women and 3 children

Type of weapon: either a GBU-31 JDAM equipped 2000-lb bomb or a GBU-32 JDAM-equipped 1000-lb bomb⁸

Infrastructural damage: One two-story building of 120 square meters completely destroyed, 7-meter crater where the house had been



Source: Al Mezan

On 29 July, the Abu Jabr family home was bombed in the Al Buraij refugee camp. 19 people were killed, including 6 children, the youngest being one year old and the oldest four years old, as well as a pregnant woman.

Most of the people's bodies had been cut into pieces or pulverized by the bombing. A witness described to UN researchers:

I found the decapitated bodies of my uncle and daughter. My cousin was alive but died on the way to hospital. Another cousin's body was found sliced in two. We had ten corpses in the first ambulances. No other survivors were found. [...] After having removed the cement I identified my cousin Dina's body. What I witnessed was horrible. She was 9 months pregnant and she had come from her home to her parents' house to have her baby. We could not imagine that she had passed away. Her stomach was ripped open and the unborn baby was lying there with the skull shattered. We kept searching for other corpses and found my uncle's wife. We had great difficulty removing all the pieces of cement from her body.⁹

⁸ "Report of the detailed findings," UN Human Rights Council.

⁹ Ibid., par. 134

July 29, 2014, Khan Younis

Source: [Report by the UN Independent Commission of Inquiry](#) (par. 153-157), [Amnesty International](#), [AOAV](#), [B'tselem](#), [Obliterated Families](#)

Killed: 36 people

Injured: At least 21 people

Type of weapon: most likely a JDAM equipped 2000-lb bomb¹⁰

Infrastructural damage: three-storey apartment building completely destroyed

Families directly affected by the bombing: Abu Amer, Breika, al-Najjar, Mu'ammr, al-Ramlawi, Abu Sitta



Photos of the 14 members of the Abu Amer family who were killed, displayed in their parents' home in Bani Suheila, east of Khan Younis. Source: Obliterated Families

In the early hours of Tuesday July 29th, an Israeli aircraft dropped a one-tonne bomb on the al-Dali building in the town of Khan Younis, home to the Mu'ammr, al-Najjar, Abu Amer and Breika families, without any prior warning or evacuation order.

A single strike caused the entire three-storey building to collapse, killing 16 members of the Abu Amer family, seven members of the Breika family, seven members of the Al-Najjar family and four members of the Mu'ammr family.

¹⁰ "Report of the detailed findings," UN Human Rights Council.

The attack was so devastating that Palestinians from the Al-Ramlawli and Abu Sitta families, who were in neighbouring houses, were also killed. Hana' al-Najjar, who survived the attack, lost all her children and her husband:

We didn't know what happened. I was sleeping beside my children. Suddenly we woke up and the entire house collapsed on top of us. I started yelling and screaming, I have five children, three daughters, and my son's daughter. They all died. I have no one left. I said, "Just save my children, save them, get them out – leave me and pull them out." Nothing is left for me. My husband is dead.¹¹

This bombardment resulted in the highest number of casualties in a single attack in 2014 in Gaza Strip. Amnesty International stated that: "The impact of an attack using such highly explosive munitions on a civilian building housing at least 40 civilians should have been clearly foreseeable and considered manifestly disproportionate."¹²

¹¹ ["Families under the Rubble: Israeli attacks on inhabited homes,"](#) Amnesty International, November 5, 2014, p. 20.

¹² *Ibid.*, p. 22.

2021

In 2021, Israel launched another intensive attack on the Gaza Strip. The bombing began on May 10, 2021 and lasted for 11 days. During this time, 256 Palestinians were killed.¹³

¹³ "Protection of Civilians Report: 24-31 May 2021," UN Office for the Coordination of Humanitarian Affairs - Occupied Palestinian Territory, June 4, 2024, accessed May 26, 2025

May 16, 2021, Al-Wahda Street in Gaza City

Source: [Human Rights Watch](#), [Middle East Eye](#), [New York Times](#)

Killed: 44 people

Injured: 50 people

Type of weapon: at least four GBU-31, 2000-lb MK-84 with JDAM¹⁴

Infrastructural damage: 3 multi-story buildings collapsed and destroyed, with visible craters on the street in front of the bombed building

Families directly affected by the bombing: al-Qoulaq, Abu al-Awf, Eshkontana, al-Franji, al-Qamaa

Around 1:00 am, within four minutes, the Israeli military launched between 18 and 34 strikes in a 0.7 square km area. At least 11 of those strikes were along al-Wahda street in Rimal, a central neighborhood in Gaza City.¹⁵ An investigation by the *New York Times* showed that among the bombs used were MK-84 warheads with JDAM.¹⁶



Still from a video investigation by the New York Times on the bombings of al-Wahda street. It shows the Gaza police office, with posters detailing different types of bombs used by the Israeli Air Force. Source: New York Times¹⁷

Three apartment buildings collapsed immediately as a result of nearby explosions. Two of the collapsed buildings belonged to the Qulaq family, of whom 22 members between the ages of 6 months and 90 years old were killed. Another 22 people were killed as a result of the collapse of a third building, 15 of whom were members of Abu al-Awf family, including Ayman

¹⁴ "Gaza's Deadly Night: How Israeli Airstrikes Killed 44 People," *New York Times*, June 24, 2021, accessed May 26, 2025.

¹⁵ "Gaza: Apparent War Crimes During May Fighting," Human Rights Watch, July 27, 2021.

¹⁶ "Gaza's Deadly Night," *New York Times*.

¹⁷ *Ibid.*

al-Awf, “a doctor and head of internal medicine at al-Shifa hospital, where he oversaw the coronavirus response”, as reported by the Times.

His son – the only survivor from the family – recounted what happened in testimony collected by Human Rights Watch:

At about 1 a.m., I was sitting with my family in the living room. My father, a doctor, had just come back from work at al-Shifa hospital. Then we heard loud explosions. After the first, my mother wanted to flee the building, but my father refused and said they couldn't possibly be attacking us as we live in a civilian area. Then four explosions shook our house. They all happened in about five seconds. The house swayed and I thought it was going to collapse. After the second, the house started shaking. I caught my sister's hand, pulled her to the corridor, and hugged her in an attempt to protect her. Then I heard another bomb and saw fire outside the window and the wall of the corridor collapsed and suddenly the floor disappeared, and everything started falling down on us. Then the final bomb came. It devastated us.¹⁸

¹⁸ “Gaza: Apparent War Crimes,” Human Rights Watch.

May 20, 2021, Khan Younis

Source: [Airwars](#), [Al Mezan](#)

Injured: 3 people, including 2 children

Type of weapon: 2000-lb bomb, likely MK-84¹⁹

Infrastructural damage: Significant damage to a three-story house

Families directly affected by the bombing: Muhareb

At around 10 a.m. on May 20, 2021, an Israeli missile struck the home of Muhammad and Munis Muhareb. The missile landed inside the house without exploding and also penetrated a nearby house, injuring three civilians, including two children.



An unexploded Israeli missile landed in the home of Muhammad and Munis Muhareb east of Ma'an area on May 20, 2021. (Image posted by @RealEmanAyad). Source: Airwars



Crews work to remove the unexploded Israeli missile that landed in the home of Muhammad and Munis Muhareb east of Ma'an area on May 20, 2021. (Image posted by @PalinfoAr). Source: Airwars

¹⁹ [“Airwars Assessment – Incident M21ISPT130,”](#) Airwars, last updated December 15, 2024. As is corroborated by the photographs, the Airwars Assessment notes that a source stated that the bomb weighed one ton – i.e. a 2,000-lb (likely MK-84) bomb.

2023-2025

May 12, 2023, Al-Matayna, Deir Al-Balah

Source: [Amnesty International](#)

Type of weapon: GBU-32/31 bomb (MK-83/84)²⁰

Infrastructural damage: 23 residential buildings damaged or destroyed, including the targeted two-storey building and medical facility in the area

The airstrike was at 8:30p.m. in al-Matayna neighbourhood in Deir al-Balah, central Gaza.

The attack destroyed the district's infrastructure, including medical facilities and 23 residential buildings, whose residents had been evacuated.

Issa Sarsour, a resident of al-Matayna neighbourhood, described the bombardment to Amnesty International: "It wasn't just a strike; it was an earthquake. It shook the whole area; it smashed everything: stones, glass, windows, walls."²¹

Another resident of the neighbourhood, Thuraya Abu Bakra, added: "I returned after the ceasefire to see that everything in my house was broken to pieces, the windows, the furniture, the doors. The little olive orchard I had outside my house, it is my only companion, was completely destroyed."²²

20 ["Investigate possible war crimes during Israel's military offensive on Gaza in May 2023,"](#) Amnesty International, June 13, 2023, accessed May 24, 2025.

21 Ibid.

22 Ibid.

October 9, 2023, Main market in Jabalia Refugee Camp

Source: [OHCHR](#), [Amnesty International](#), [Airwars](#), [New York Times](#), [BBC](#)

Killed: At least 70 people²³ including at least 15 children²⁴

Injured: 100-200 people²⁵

Type of weapon: One or two GBU-31 bombs²⁶

Infrastructural damage: Complete destruction of two (OHCHR²⁷) or at least three (Amnesty International²⁸) multi-story buildings and damage to several neighboring properties

Families directly affected by the bombing: Al-Amouri, Ashkian, Atallah, Abu Baid, Darabeya, Daraj, Abu Al-Eish, Hajjaj, Al-Kafarna, Al-Khaldi, Al-Kurdi, Musleh, Abu Odeh, Rabaa, Saadat, Abu Shouqfa, Al-Sidawi, al-Tatri, Wahdan, Al-Zwaidi



Source: Mohammed Abed/Agence France-Presse – Getty Images

The bombing took place between 10:30 and 11:30 a.m. in one of the main commercial centers in Northern Gaza, at the heart of one of the biggest markets in Jabalia. It was a very densely populated area, which at that time was even more crowded because so many internally displaced people were looking for essential products there. Among them, as reported by Amnesty International, was 19-year-old Imad Hamad, whose family had been ordered to

²³ [“You Feel Like You Are Subhuman”: Israel’s Genocide Against Palestinians in Gaza.](#) Amnesty International, December 4, 2024, accessed May 26, 2025, p. 107.

²⁴ [“Israeli Airstrikes Kill at Least 140 Palestinian Children in Gaza.”](#) Defense for Children International – Palestine, October 10, 2023, accessed August 22, 2025.

²⁵ [“Airwars Assessment: Incident ISPT0044.”](#) Airwars, last updated June 20, 2025.

²⁶ [“Thematic report – Indiscriminate and disproportionate attacks during the conflict in Gaza \(October – December 2023\).”](#) United Nations Office of the High Commissioner for Human Rights, June 19, 2024, accessed August 22, 2025.

²⁷ *Ibid.*, p. 9.

²⁸ [“Damning evidence of war crimes as Israeli attacks wipe out entire families in Gaza.”](#) Amnesty International, October 22, 2024.

evacuate from Beit Hanoun in the north by the Israeli army the day before.²⁹ They were staying in Jabalia at the UNRWA school, which had been very short on basic supplies. Imad had gone to the market to buy bread and mattresses for his family, according to his father.³⁰

Israeli pilots dropped one or two GBU-31 bombs,³¹ killing at least 70 people, including Imad. The bodies of those killed were so badly disfigured and burned that Imad's father could only recognise his son by his trousers.

Videos of the aftermath and satellite imagery reviewed by Amnesty International show at least three multi-storey buildings completely destroyed and several structures in the surrounding area heavily damaged.³²

29 "Damning evidence of war crimes," Amnesty International.

30 "Damning evidence of war crimes," Amnesty International.

31 "Thematic report – Indiscriminate and disproportionate attacks," United Nations Office of the High Commissioner for Human Rights.

32 "Damning evidence of war crimes," Amnesty International.

October 10, 2023, Al Najjar family, Deir al-Balah

Source: [Amnesty International](#), [Al Mezan](#)

Killed: 24 people

Injured: At least 23 people³³

Type of weapon: 2,000lb and 1000lb bombs with JDAM³⁴

Infrastructural damage: One building completely destroyed

Families directly affected by the bombing: Najjar, Abu Traya, al-A'war

The bombing took place at 8:30p.m. Twenty-one members of the al-Najjar family were killed, including Safa al-Najjar who was 17 months old. Suleiman al-Najjar, who lost his wife and four children, was in al-Aqsa hospital at the time of the attack. When he came back home, he tried to find the bodies of his loved ones under the rubble. He recalled: “Only the body of my son Nadim was recovered. My baby girl, Safa, we only found her hand... Now, me and my two surviving sons live in a tent by the ruins of our home. Our lives have been destroyed in a moment. Our family has been destroyed. Something that was unthinkable is now our reality.”³⁵

The neighbors of al-Najjar’s family, among them 7 year old Jana Hani al-A’war, were also killed in the strike.



Members of the Al-Najjar family who were killed in the strike.
Source: Amnesty International

³³ [“Airwars Assessment: Incident ISPT0096.”](#) Airwars, last updated September 25, 2025.

³⁴ [“Israel/OPT: US-made munitions killed 43 civilians in two documented Israeli air strikes in Gaza – new investigation.”](#) Amnesty International, 5 December 2023, accessed 22 August 2025.

³⁵ [“US-made munitions killed 43 civilians in two documented Israeli air strikes in Gaza – new investigation.”](#) Amnesty International, December 5, 2023, accessed 22 August 2025.

October 17, 2023, Al-Lamdani family, Khan Younis

Source: [Airwars](#), [The Guardian](#), [Reuters](#)

Killed: 15-41 people³⁶

Injured: At least 12 people

Type of weapon: At least two MK-84s³⁷

Infrastructural damage: One building completely destroyed



Dima al-Lamdani on October 22, 2023. Source: Mohammed Salem/Reuters

The al-Lamdani family were forcibly displaced from the Shati refugee camp in the north of Gaza to Khan Younis and had taken refuge in the home of a family friend. The bombing took place at 4:30 a.m. and killed at least 23 members of the al-Lamdani family. Among them were the parents of 18 year old Dima al-Lamdani, who survived along with her brother and two younger cousins. The Guardian confirmed, having spoken to Dima, that “nearly 50 people were in the residential building, including 17 members of Lamdani’s family.”³⁸

In another interview Dima said: “I had a sister, 16. They wrote my name on the white sheet they wrapped her body in, they thought it was me.”³⁹

³⁶ [“Airwars Assessment: Incident ISPT0283,”](#) Airwars, last updated December 15, 2024.

³⁷ Ibid.

³⁸ [“Why didn’t we die together?: the last survivors of three Gaza families speak,”](#) *The Guardian*, November 8, 2023, accessed August 22, 2025.

³⁹ [“Gaza teenager sees parents, siblings killed after seeking safety south,”](#) *Reuters*, October 23, 2023, accessed August 22, 2025.

October 22, 2023, Mu'eileq family, Khan Younis

Source: [Amnesty International](#)

Killed: 19 people, including 7 women and 12 children

Injured: At least 12 people

Type of weapon: 1,000lb⁴⁰

Infrastructural damage: One building completely destroyed

The bombing took place at 12 p.m. and 18 members of the Mu'eileq family were killed. Rajab Ghazi Mezyed, who was the neighbor of the Mu'eileq family, was also killed in the attack.

The survivor Samaher Abu Mu'eileq told Amnesty International:

I was thrown against the door by the force of the explosion and was injured in my face and neck. I can't understand why the house was bombed. My sisters-in-law and their children and my stepmother were killed, all of them women and children... Others were injured. What is the reason for such crime against civilians?⁴¹



Members of the Abu Mu'eileq family who were killed in the strike.
Source: Amnesty International.

⁴⁰ "US-made munitions killed 43," Amnesty International.

⁴¹ Ibid.

October 25, 2023, Al-Taj 3 Tower, Gaza City

Source: [OHCHR report](#), [Der Spiegel](#), [Airwars](#)

Killed: 129 people⁴² including at least 48 children⁴³

Injured: 100–260 people⁴⁴

Type of weapon: Several GBU-31 bombs (OHCHR⁴⁵); 20 bombs, likely GBU-31 (*Spiegel*⁴⁶)

Infrastructural damage: 5,700 square meter area was reduced to rubble; seven-story residential building completely destroyed; 10 other residential buildings and a bakery damaged or destroyed

Families directly affected by the bombing: Bakhit, Jarada, Mahdi, Mansour, Muhanna, Radwan, Al-Ramlawi, Sharaf



Source: Hamdan Dahdouh

Al-Taj 3 Tower, or Crown Tower in English, was a seven-story residential building with 30 spacious apartments and an underground garage. On the day of the bombing, according to *Der Spiegel*, there were about 300 people inside – many of them displaced and seeking shelter with relatives.⁴⁷

The bombing was part of a wider campaign of the complete destruction of the Yarmouk Square in Gaza City. Salama Marouf, the head of the government media office in Gaza, told *Al Jazeera* that “Israel is using munitions that cause massive destruction to infrastructure, and that there are many indications that Israel is using internationally banned explosives, pointing to the melting limbs of some of the wounded.”⁴⁸

Around 4:30 p.m., the Israeli Air Force dropped multiple bombs on the area. In the video released by the Israeli army, identified by *Spiegel*, there are nine or ten explosions visible. But according to the research conducted by the *Spiegel* journalists, “around 20 bombs struck the immediate surroundings of the Crown Tower, and presumably the structure itself, at 4:25 p.m. on October 25, causing it to collapse.

42 “Gaza City: Possible War Crime – Why Did Israel Bomb This Residential Building?,” *Der Spiegel*, July 1, 2024, accessed August 23, 2025.

43 “Airwars Assessment: Incident ISPT0587,” *Airwars*, last updated July 8, 2025.

44 *Ibid.*

45 “Thematic report – Indiscriminate and disproportionate attacks during the conflict in Gaza (October – December 2023),” United Nations Office of the High Commissioner for Human Rights, June 19, 2024, accessed August 22, 2025.

46 “Gaza City: Possible War Crime,” *Der Spiegel*.

47 *Ibid.*

48 “Israeli bombing levels a residential square on Gaza City’s Jalaa Street,” *Al Jazeera*, October 27, 2023, accessed August 23, 2025.

The precise number cannot be determined from the army video and from an additional video of the strike. Because of the clouds of smoke, it is also difficult to see precisely where exactly the bombs struck.”⁴⁹

The OHCHR thematic report concludes that “[a]n area of 5,700 square metres was essentially flattened, with at least seven structures, including Taj 3 Tower, completely destroyed and three other structures showing signs of significant damage.”⁵⁰ Spiegel also reported on the destruction of “ten residential buildings and a bakery.”⁵¹

Among those killed were entire families, as listed by Airwars.⁵² These include at least:

- 39 members from three generations of the Sharaf family
- 15 members from three generations of the Radwan family
- 17 members from three generations of the Jarada family
- 19 members of the al-Ramlawi family
- 5 members of the Muhanna family
- 7 members of the Mahdi family
- 17 members of the Bakhit family
- 5 members of the Mansour family

49 Ibid.

50 “Thematic report – Indiscriminate and disproportionate attacks,” United Nations Office of the High Commissioner for Human Rights.

51 Ibid.

52 “[Airwars Assessment: Incident ISPT0587](#),” Airwars, last updated July 8, 2025.

October 31, 2023, Jabalia refugee camp

Sources: [OHCHR report](#), [Airwars](#), [New York Times](#), [US Task Force on NSM-20 Israel](#)

Killed: 126 people, including 68 children⁵³

Injured: 280 people⁵⁴

Type of weapon: At least two 2000-lb bombs (*New York Times*⁵⁵) / at least four GBU-32 or two GBU-31 (OHCHR⁵⁶)

Infrastructural damage: Two craters about 40 feet wide,⁵⁷ 30 buildings either destroyed or damaged, an area of 2,500 square meters flattened and at least 10 buildings completely destroyed; roads and essential infrastructure destroyed including power systems, distribution networks, water storage tanks, pipes, supply networks and drainage channels, bakeries, and water wells

Families directly affected by the bombing: Abu Al Qoumsan, Abu Sultan, Alyan, Hamad, Khudair Ali, Masoud, Okasha, Omrain, Rayyan, Al-Tanani



Source: Anas al-Shareef/Reuters

Around 2:20 p.m., Israeli pilots dropped multiple bombs on residential buildings located in Block 6 in Jabalia refugee camp, a very densely populated area. The destruction was massive: in total, 30 buildings were either destroyed or damaged,⁵⁸ an area of 2,500 square meters was flattened and at least 10 buildings were completely destroyed.⁵⁹ The bombs were fitted with “delayed fuse to penetrate below buildings before exploding” which can cause the buildings to collapse on themselves according to an expert quoted by the *Times*.⁶⁰

This case was mentioned in the report by the Independent Task Force on the Application of National Security Memorandum-20 to Israel.⁶¹ The report was prepared by a group of independent experts in order to provide information to the U.S. government and members of Congress and the Senate on the use of American weapons by Israel in Gaza in violation of International Humanitarian Law (IHL).

53 [“UN rights office says Israeli attacks on Jabalia could be war crime,”](#) *Al Jazeera*, November 2, 2023, accessed May 26, 2025.

54 [“Airwars Assessment: Incident ISPT0783,”](#) Airwars, last updated October 29, 2025.

55 [“Israel Used 2,000-Pound Bombs in Strike on Jabaliya, Analysis Shows,”](#) *New York Times*, November 3, 2023, accessed 23 August 2025.

56 “Thematic report – Indiscriminate and disproportionate attacks,” United Nations Office of the High Commissioner for Human Rights.

57 “Israel Used 2,000-Pound Bombs,” *New York Times*.

58 [“When Warfare Moves Underground,”](#) *New York Times*, December 28, 2023, accessed May 26, 2025.

59 [“Anatomy of a Genocide: Report on Israel’s Acts of Genocide Against Palestinians in Gaza,”](#) Report of the Special Rapporteur on the situation of human rights in the Palestinian territory occupied since 1967 Francesca Albanese, July 1, 2024.

60 “Israel Used 2,000-Pound Bombs,” *New York Times*.

61 [“Report of the Independent Task Force on the Application of National Security Memorandum-20 to Israel,”](#) Independent Task Force on the Application of National Security Memorandum-20 to Israel, April 18, 2024, accessed May 26, 2025.

The report notes:

There was widespread damage to roads and essential infrastructure indispensable to the survival of the population such as power systems and distribution networks, water storage tanks, pipes, supply networks and drainage channels, as well as bakeries and water wells. In combination with the extreme restrictions on humanitarian access, these attacks led to a rapid deterioration in access to food and water and the beginning of a breakdown of sanitation and other essential services.⁶²

Many of the survivors of this attack took shelter in one of neighbour's houses, which was targeted the following day by the Israeli army.⁶³

Among those killed on October 31 were entire families, as listed by Airwars.⁶⁴ These include at least:

- 21 members of Abu Al Qoumsan family
- 9 members of The Khudair Ali family
- 6 members of The Masoud family
- 9 members of the Abu Sultan family, “which one source said was killed in its entirety”⁶⁵
- 2 members of the Hamad family
- 2 members of the Al-Tanani family
- 33 members of the Okasha family
- 3 members of the Alyan family
- 5 members of the the Omrain family
- 15 members of the Rayyan family.



Satellite images taken before and after the attack on Jabalia refugee camp, showing entire housing blocks that were leveled. Source: Maxar via Christiaan Triebert (@trbrtc on X)

⁶² “Thematic report – Indiscriminate and disproportionate attacks,” United Nations Office of the High Commissioner for Human Rights.

⁶³ “[Airwars Assessment: Incident ISPT0803](#),” Airwars, last updated March 4, 2025, accessed May 26, 2025.

⁶⁴ “[Airwars Assessment: Incident ISPT0783](#),” Airwars, last updated October 29, 2025.

⁶⁵ Ibid.

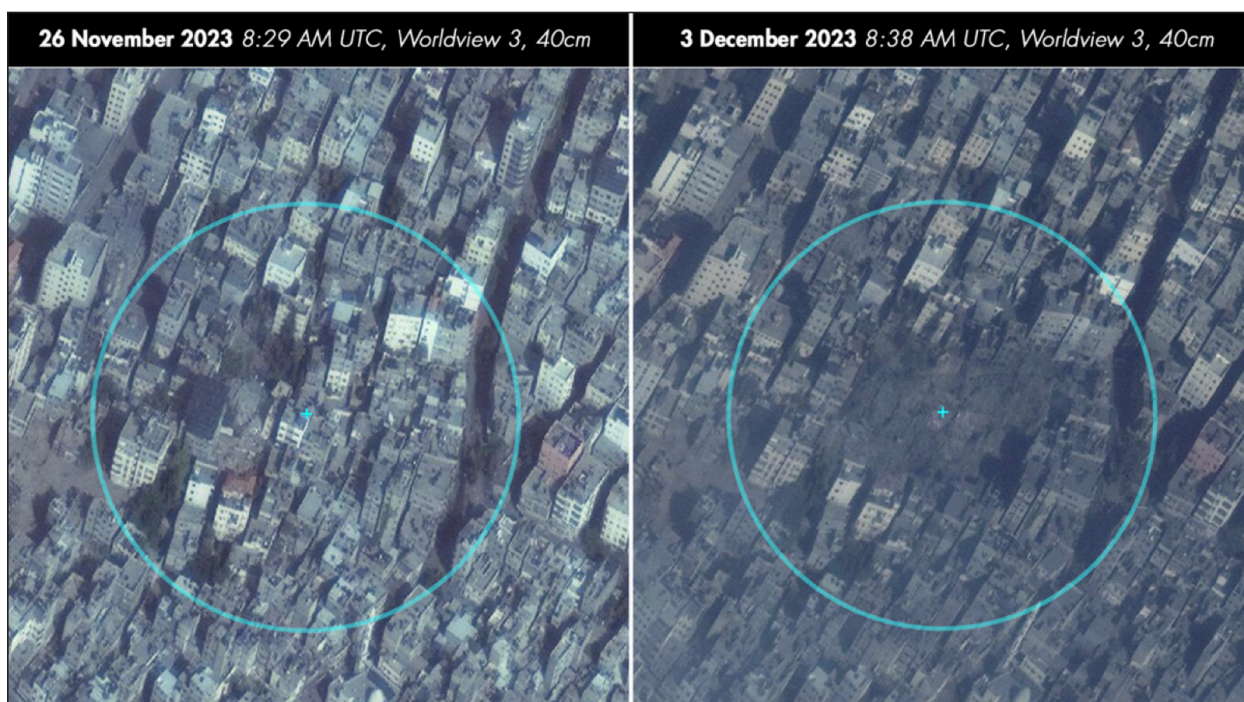
December 2, 2023, Shuja'iya, Gaza City

Source: OHCHR

Killed: Unknown number – 300-500 estimated by Airwars⁶⁶; at least 60 according to the OHCHR⁶⁷

Type of weapon: 9 GBU-31 bombs⁶⁸

Infrastructural damage: A 130 square meter area, including 15 buildings completely destroyed and 14 more damaged



Shuja'iya neighbourhood before and after the attack. Source: Maxar via OHCHR

Abu Al Atham Street in Gaza City is one of the most densely populated streets in the entire Gaza Strip. Nine GBU-31s bombs were used to bomb two apartment blocks, completely destroying 15 buildings and damaging another 14. The Palestinians killed in this attack have not been identified.

⁶⁶ ["Airwars Assessment: Incident ISPT1390,"](#) Airwars, last updated December 15, 2024.

⁶⁷ "Thematic report – Indiscriminate and disproportionate attacks," United Nations Office of the High Commissioner for Human Rights.

⁶⁸ Ibid.

January 10, 2024, Al-Aqsa Martyrs Hospital, Deir al Balah

Sources: [OHCHR](#), [Al Jazeera Arabic](#)

Killed: at least 12 people, including a journalist⁶⁹

Injured: 35 people⁷⁰

Type of weapon: MK-83 or GBU-32 bomb⁷¹

Infrastructural damage: Residential house, hospital, medical vehicles, tents

The airstrike hit a house in front of the entrance gate of Al Aqsa Martyrs Hospital in Deir al Balah. It caused damage to the hospital's walls and medical vehicles, as well as the tents of internally displaced persons (IDPs).

As the OHCHR reports states:

The impact of these attacks was entirely foreseeable for the IDF, with clearly available information on the location of hospitals and the concentration of civilian persons within, including IDPs, medical staff and injured and sick patients, and information on the impact of previous attacks using similar means and methods would also have been available.⁷²



Journalist Ahmed Badir's mother after Israel killed her son in the strike at the entrance to Shuhada Al-Aqsa Hospital. Source: Ramy Abdu (@RamAbdu on X)

⁶⁹ ["Thematic Report – Attacks on hospitals during the escalation of hostilities in Gaza \(7 October 2023 – 30 June 2024\),"](#) 31 December 2024, accessed 23 August 2025, United Nations Office of the High Commissioner for Human Rights, December 31, 2024.

⁷⁰ Ibid.

⁷¹ Ibid.

⁷² Ibid.

January 18, 2024, Al-Mawasi

Source: [Medical Aid for Palestinians](#)

Injured: Several Medical Aid for Palestinians team members

Type of weapon: GBU-32 (MK-83) bomb⁷³

Infrastructural damage: Residential compound housing of Emergency Medical Team destroyed

Al-Mawasi is a small strip of land west of Khan Younis. It was designated a so-called “humanitarian zone” by the Israeli army in December 2023. Many Palestinians were told to evacuate to al-Mawasi and were promised safety there.

On January 18, 2024, around 6 a.m., the residential compound housing International Rescue Committee (IRC) and Medical Aid for Palestinians (MAP) staff was targeted in an airstrike. The building was damaged and some of the workers were injured. As a result of this attack, the medical team was unable to continue their work for the Nasser Hospital in Khan Younis.

According to the MAP statement issued in January 2024, the attack was related to the general targeting of the Nasser Hospital:

As a result of the attack, the EMT – comprising MAP and IRC surgeons and other essential staff – was forced to suspend its life-saving medical work at Nasser Hospital in Khan Yunis. Nasser Hospital is one of the few remaining functioning hospitals in Gaza, and is currently encircled by the Israeli military; access for medical teams and wounded civilians is nearly impossible. We remain concerned for the continued safety of MAP’s colleagues in Gaza, many of whom have been displaced again in recent days.⁷⁴

⁷³ [“IRC and MAP condemn Israeli airstrike on Gaza compound housing Emergency Medical Team.”](#) Medical Aid for Palestinians, January 31, 2024, accessed August 23, 2025.

⁷⁴ Ibid.

July 13, 2024, Al-Mawasi

Source: [UN Human Rights Office](#), [Al Jazeera](#), [Airwars](#)

Killed: Up to 150 people⁷⁵

Injured: Up to 300 people⁷⁶

Type of weapon: Between five⁷⁷ and eight⁷⁸ 2000-lb bombs

Infrastructural damage: Multiple craters up to 18 meters wide; complete obliteration of the water distribution point, cutting civilians off from safe drinking water; destruction of the soup kitchen, depriving displaced families of a critical source of meals; destruction of the market area, eliminating access to food and basic supplies; severe blast and shrapnel damage to surrounding humanitarian facilities; impairment of access routes, hindering ambulance and Civil Defence operations



Large craters at the site of the strike on al-Mawasi. Source: Haitham Imad/EPA

This devastating attack occurred in the so-called “humanitarian zone” of al-Mawasi. Despite its “humanitarian” designation, Israeli warplanes reportedly dropped between five⁷⁹ and eight⁸⁰ MK-84 bombs on the area. The New York Times reported that, according to an aerial image of the first strike released by the Israeli military, the resulting crater was approximately 18 meters in diameter, suggesting the use of a 900-kilogram bomb.⁸¹

75 [“Airwars Assessment: Incident ISPT130724e,”](#) Airwars, last updated April 15, 2025.

76 Ibid.

77 [“Israel conducts deadly airstrike targeting Hamas’ top military leader,”](#) Axios, July 13, 2024.

78 [“To Target a Top Militant, Israel Rained Down Eight Tons of Bombs,”](#) *The Wall Street Journal*, 16 July 2024, accessed 23 August 2025.

79 “Israel conducts deadly airstrike,” *Axios*.

80 “To Target a Top Militant,” *The Wall Street Journal*.

81 [“Israeli Vehicles Converge on Area After Gaza Strike, Video Shows,”](#) *New York Times*, July 14, 2024, accessed May 26, 2025.

The attack targeted a location near civilian infrastructure critical for survival, including a water distribution point, a soup kitchen, and a market. Survivors of the al-Mawasi massacre described the scene as one of utter devastation and anguish.⁸² Tala Mahmoud, a 14-year-old girl, was at a food distribution point when the bombs hit. Her mother, Naglaa, recounted the horror: “I found pieces of my daughter’s body on a tree. I started screaming in terror.”⁸³

The Israeli military, with the use of quadcopters, also attacked the rescuers, killing at least one Civil Defense worker and injuring others.⁸⁴

82 [“Survivors tell of al-Mawasi massacre horror,”](#) *The Electronic Intifada*, July 17, 2024, accessed August 23, 2025.

83 Ibid.

84 [“UN Human Rights Office condemns IDF’s strikes on Gaza humanitarian zones,”](#) UN Human Rights Office OPT Ramallah, July 13, 2024, accessed May 26, 2025.

September 10, 2024, Al-Mawasi

Source: [New York Times](#), [UN](#), [NRC](#), [Al Mezan](#), [CNN](#)

Killed: at least 40 people⁸⁵

Injured: 60 people⁸⁶

Weapons used: MK-84 bomb⁸⁷

At around half past midnight, the Israeli army bombed IDP's tents located next to the Osman bin Affan Mosque, about 500 meters from the British field hospital. The use of such a large bomb in an area covered with makeshift tents led to a situation where it was impossible to count the exact number of people killed because the explosion resulted in the human bodies losing their recognizable form.

According to Al-Mezan:

The attack resulted in the destruction of dozens of tents and agricultural greenhouses sheltering IDPs, creating craters over ten meters deep and more than 20 meters in diameter; the explosions caused several tents to be buried under rubble and dirt for some distance.⁸⁸

According to Euro-Med Human Monitor:

On 10 September, after midnight, Israeli aircraft dropped three American-made MK-84 bombs on a group of sleeping displaced people in the Mawasi neighbourhood of Khan Yunis. The bombs created three craters several meters deep and wide, burying roughly twenty tents with the families inside. Since there were no evacuation warnings prior to the bombing, the Israeli army's intent to kill as many civilians as possible is evidenced by the use of American bombs, which have a wide destructive effect in an area crowded with tents and displaced people, leading to an initial death toll of over 60, including the dead and wounded.⁸⁹

⁸⁵ ["Gaza civil defence says 40 dead, dozens injured in Israeli strike on humanitarian zone,"](#) France 24, September 10, 2024, accessed May 26, 2025.

⁸⁶ Ibid.

⁸⁷ ["What bombs did Israel use against the al-Mawasi 'safe zone' in Gaza?"](#) Al Jazeera, September 12, 2024, accessed May 26, 2025; ["Gaza: Israeli army burns displaced people alive in Mawasi Khan Yunis displacement tents,"](#) Euro-Mediterranean Human Rights Monitor, December 5, 2024, accessed May 26, 2025.

⁸⁸ ["Field Report: 10 September 2024 Attack at Al-Shaer Land, South of Al-Mawasi Khan Yunis,"](#) Al Mezan Center for Human Rights, accessed May 26, 2025.

⁸⁹ Ibid.

June 30, 2025, Al Baqa Cafe

Source: [The Guardian](#), [CNN](#), [NOS](#)

Killed: At least 41 people⁹⁰

Injured: At least 75 people⁹¹

Type of weapon: MK-82⁹²



A crater at the scene of the airstrike. Source: Mahmoud Issa/Reuters

The bombing took place on June 30, 2025 in the early afternoon. The Al-Baqa café, which was located on the coast of Gaza City, was completely destroyed. An MK-82 bomb was used, leaving a crater at the site.⁹³

The café served sweet drinks, coffee, and pastries, and offered internet access. It was regularly visited by young Gazans, including journalists, artists and athletes. For those tired of the ongoing genocide and occupation, it offered an illusion of normality. On the day of the attack, a birthday party for children and their families was taking place in the café. Among those visiting Al-Baqa at the time were filmmaker and photojournalist Ismail Abu Hatab, journalist Omar Zaino, visual artist Frans al-Salmi, footballer Mustafa Abu Amireh, and Malak Musleh, the youngest Palestinian female boxer. All of them were killed in this attack.⁹⁴ Bayan Abu Sultan, a prominent journalist, was among those injured.

⁹⁰ [“Israeli strike on waterfront cafe in Gaza City kills dozens.”](#) *CNN*, June 30, 2025, accessed August 23, 2025.

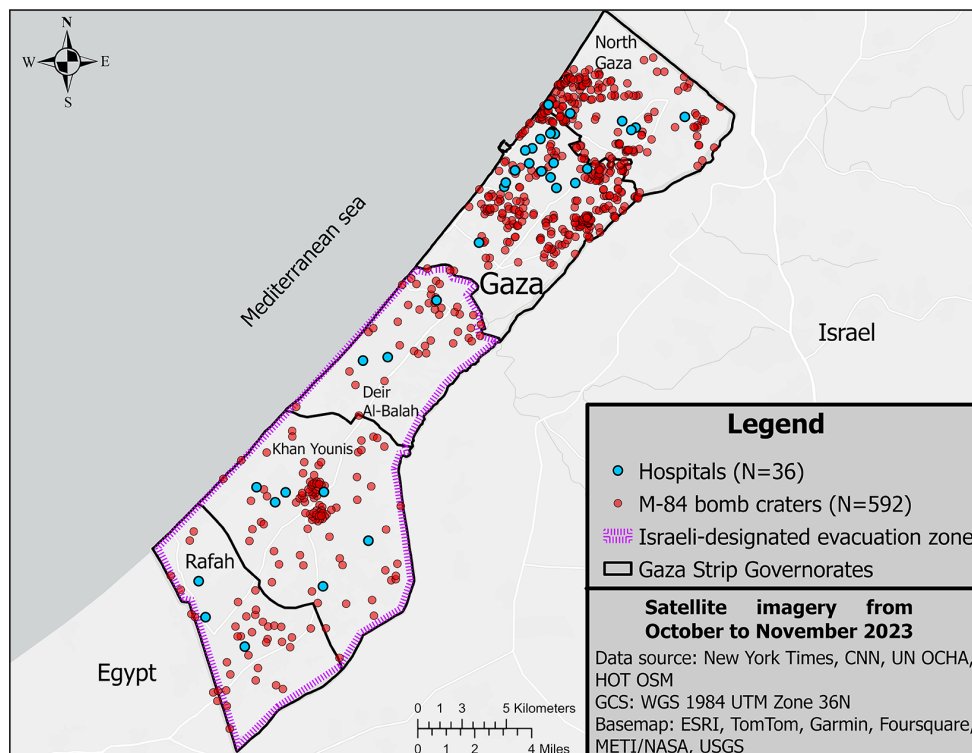
⁹¹ *Ibid.*

⁹² [“Israeli military used 500 lb bomb in strike on Gaza café, fragments reveal.”](#) *The Guardian*, July 2, 2025, accessed August 23, 2025.

⁹³ *Ibid.*

⁹⁴ [“In café Al-Baqa, waar tientallen mensen werden gedood, kwam jong Gaza samen.”](#) *NOS*, July 2, 2025, accessed August 23, 2025.

October–November 2023, attacks on Gaza’s healthcare



Proximity of MK-84 bomb craters to hospitals in Gaza between October 7 and November 17, 2023. Source: Kunichoff, D. et al., “Are hospitals collateral damage?”

There were nearly 600 documented cases of MK-84 bomb usage during the first six weeks of Israel’s offensive which fell within lethal or damage and injury range from health facilities in Gaza.

These were identified by researchers at the Public Library of Science Global Public Health,⁹⁵ an American non-profit within The Palestine Program for Health and Human Rights, which is “a collaboration between the FXB Center for Health and Human Rights at Harvard University and the Institute of Community and Public Health at Birzeit University, engaging in the study of Palestinian health through knowledge production, education, and multidisciplinary community engagement.”⁹⁶

The analysis revealed 592 craters⁹⁷ caused by MK-84 bombs, used between 7 October and 17 November 2023. “Of the 36 hospitals across the Gaza Strip, 25% (n = 9) had at least one bomb crater within the lethal range (360 m) and 83.3% (n = 30) within the infrastructure damage and injury range (800 m) of their facilities. The shortest distance of a bomb crater from a hospital was 14.7 meters. Two hospitals had as many as 21 to 23 bomb craters within 800 meters of their facilities, and one hospital had seven bomb craters within 360 meters.”⁹⁸

95 Kunichoff, D. et al., “[Are hospitals collateral damage? Assessing geospatial proximity of 2000 lb bomb detonations to hospital facilities in the Gaza Strip from October 7 to November 17, 2023.](#)” PLOS Global Public Health, October 10, 2024 .

96 “[Press Release: New study shows Israel air-dropped 2000lb bombs within lethal and damage ranges of hospitals in Gaza.](#)” FXB Center for Health and Human Rights at Harvard University, October 10, 2024.

97 Kunichoff, D. et al., “Are hospitals collateral damage?”

98 Ibid.

It is crucial to note that nearly all the hospitals in the Gaza Strip had sheltered thousands (and in some cases tens of thousands) of internally displaced persons on their grounds. Hence, the use of the MK-84 bombs in the hospitals' vicinity posed a threat not only to the facilities, but also to people who were living in tents around them.

Below are some of the instances of the use of MK-84s in the vicinity of hospitals in Gaza:

- **Al Awda Hospital** in Nuseirat, Deir Al-Balah, experienced eight MK-84 bomb explosions within 800 meters, with one as close as 124 meters.⁹⁹
- **The Turkish Friendship Hospital**, housing Gaza's only cancer treatment center, had two MK-84 bombs land within 'lethal' range and three more within 'damage and injury' range.¹⁰⁰
- **Al-Quds Hospital** had six MK-84 bomb impacts within 'damage and injury' range, including one that was just 398 meters away.¹⁰¹
- **Al-Shifa Hospital**, Gaza's largest medical facility and a shelter for thousands of Palestinians, faced two MK-84 bomb explosions within 'damage and injury' range.¹⁰²
- **Nasser and European Hospitals** in Khan Younis, designated evacuation sites for patients, were also affected: an MK-84 bomb detonated 464 meters from Nasser Hospital (Gaza's second-largest hospital) and 500 meters from the European Hospital.¹⁰³

99 Ibid.

100 Ibid.

101 Ibid.

102 Ibid.

103 Ibid.



Research compiled by
Palestinian Youth Movement (PYM)
Movement Research Unit
Shadow World Investigations

The **Palestinian Youth Movement (PYM)** is a transnational, independent, grassroots movement of Palestinian and Arab youth struggling for the liberation of our homeland

instagram @palestiniayouthmovement
website palestiniayouthmovement.com