



Too Risky for Business

Financial Institutions and Uranium Weapons

A briefing paper by ICBUW - Netwerk Vlaanderen - BankTrack,
november 2007



Credits

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Netwerk Vlaanderen is a member of BankTrack, an international movement for sustainability in the financial sector. www.banktrack.org

Other publications by Netwerk Vlaanderen on investments in the arms industry:

- Explosive Investments, Financial Institutions and Cluster Munitions, February 2007
- Explosive Portfolios – Bank Groups and Cluster Munitions, July 2006.
- Banks Disarm(ed) – An Overview of the Results of the Campaign 'My Money. Clear Conscience', April 2005.
- Cluster Bombs, Landmines, Nuclear Weapons and Depleted Uranium Weapons – A Report on the Financial Links between Banks and the Producers of Controversial Weapon Systems, April 2004.



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Executive Summary

Uranium weapons.¹ Despite the fact that weapons containing depleted uranium are not widely known, they have been produced and used on a massive scale. The health consequences of these weapons, which also continue after the end of the armed conflict in which they are used, are becoming clearer. Depleted uranium is a radioactive and chemically toxic waste product from the nuclear industry. It is used in anti-tank weapons and in the armour of tanks. The use of these weapons creates clouds of tiny metal particles that contaminate the battlefield and surrounding environment for millions of years. Scientific research has shown that depleted uranium causes cancer, birth defects, and other serious health problems. The effects have been recorded in both soldiers and civilians.

There is also a growing awareness that these weapons breach the most fundamental human rights. Military trade unions, human rights organisations and the environmental and peace movements are calling for a world-wide ban on the production of uranium weapons. The financing of these weapons has also been brought into question.

The companies who produce these weapons are readily supplied with capital by large financial groups- capital that makes the production of these weapons possible. This research report shows that more than 40 financial institutions are currently investing in producers of uranium weapons. Three US stockmarket listed companies: Alliant Techsystems, GenCorp and General Dynamics, are supported by financiers from Canada, the US, Japan, Great Britain, France, Germany, Taiwan, Singapore and Italy.

In the period July 2004 – June 2007, these institutions guaranteed credit facilities worth a total of at least 3 billion US \$. The financial institutions have also underwritten the issuing of 4.2 billion US \$ in bonds and 120 million US \$ in shares in these companies. Various financiers also hold significant shareholdings in the producers of uranium weapons.

This research is limited to 3 large companies, and the investment period 2004-2007. The total investments in this sector are therefore higher than the amounts revealed in this report. The figures form a worrying indication of the involvement of the financial sector in the proliferation of uranium weapons.

The civilian and military community calls on investors to act responsibly and put an end to their support for the production of uranium weapons. A number of investors have already taken this step. Others will hopefully follow. Governments also have an important role to play here. Just as with a ban on investments in weapons such as anti-personnel mines and cluster munitions, governments can ensure that banks are no longer legally able to invest in producers of uranium weapons.

Via actions in many countries, the International Coalition to Ban Uranium Weapons calls on the banks mentioned in this report to take a positive step and implement an investment policy that no longer allows this sort of investment.

November 2007



1. Investments in uranium weapons at a glance

Banks and other financial institutions provide various types of financial services to uranium weapons producers. The most important services are commercial banking, investment banking and asset management. This table gives in insight in the involvement in investments in three major producers; Alliant Techsystems, GenCorp and General Dynamics (US).

Importance in the financing of:		Alliant Techsystems	GenCorp	General Dynamics
Financial institution	Country			
Artis Capital Management	United States		X	
Atlantic Investment Management	United States		X	
Bank of America	United States	X		X
Bank of New York	United States	X	X	X
Bank of Tokyo-Mitsubishi UFJ	Japan	X		
Barclays	United Kingdom	X	X	
Bear Stearns	United States			X
Calyon	France	X		
Capital Group	United States			X
CIT Group Equipment Finance	United States		X	
Commerzbank	Germany	X		
Deutsche Bank	Germany		X	X
Fidelity	United States	X		X
Franklin Templeton	United States		X	
Gamco Investors	United States		X	
General Electric Capital	United States	X		
Goldman Sachs	United States	X		
Hua Nan Bank	Taiwan	X		
Intesa Sanpaolo	Italy			X

Importance in the financing of:

Alliant Techsystems

Gencorp

General Dynamics

Financial institution

Country

JP Morgan Chase	United States	X	X	X
Keeley Asset Management	United States		X	
Lehman Brothers	United States	X		
Longview Asset Management	United States			X
Marsico Capital Management	United States			X
Massachusetts Mutual	United States	X		
Merrill Lynch	United States	X		X
Mizuho Bank	Japan	X		
MR Beal	United States			X
National City Bank	United States	X	X	
Natixis	France	X		
Northern Trust	United States	X		
People's United Bank	United States	X		
Pinnacle Associates	United States		X	
QVT Financial	United States		X	
Regions Bank	United States	X		
Royal Bank of Scotland	United Kingdom	X		X
Sandell Asset Management	United States		X	
Scotiabank	Canada		X	
Sowood Capital Management	United States		X	
State Street	United States			X
Steel Partners	United States		X	
T. Rowe Price	United States	X		
United Overseas Bank	Singapore	X		
US Bank	United States	X		
Wachovia Bank	United States		X	X
Wellington Management	United States			X
Wells Fargo	United States		X	

2. Uranium weapons: too risky for business

risk:
- exposure to the chance
of injury or loss
- a hazard or dangerous
chance

Investors know a lot about risks. They calculate risk extensively, take steps to cover themselves against the risks, or make use of them. A broad range of financial, commercial and political risks are calculated and utilised in playing the financial markets. An exciting game of chance, with money circling the globe at a dizzying speed.

Gerard Matthew knows the way this game ends. He fought for the US Army in what he still proudly refers to as "The War on Terror". He came back from Iraq with unexplained symptoms. His face was swollen, he had blurred vision, and chronic migraines. He thought at first that this was the result of extreme weather conditions, but the problems continued during sick leave, and after extensive treatment. In 2004 he discovered that his daughter had been born with birth defects. She has only 1 finger on her right hand, and she suffers from the same symptoms as her father. Medical research revealed depleted uranium in Gerard's urine. The US and British armies have both used thousands of pieces of ammunition in Iraq containing uranium. Weapons produced by companies such as General Dynamics, GenCorp and Alliant Techsystems, who have been provided with financing by the biggest names in the financial world.



US veteran Gerard D. Matthew together with his deformed daughter Victoria

Although many investors see their choices as neutral and impersonal, their decisions have a real impact on our society. By choosing whether or not to invest in a particular industry, they can actively stimulate certain activities or obstruct them.

Financiers have an incredible power. Unfortunately they are normally concerned primarily with maximising financial gain. The impact of their investment on human rights, environmental destruction or support for armed conflict are not taken into account. By neglecting these issues they run the real risk of losing the business of their customers.

Research shows that customers are very sensitive to the fact that their money is invested in the arms trade. Banks with vision are making use of this fact, and develop a policy that excludes investments in the arms trade.

The banks that lag behind are being shown the error of their ways. A broad network of human rights and environmental groups are targeting the complicity and accountability of banks. They claim that financing the weapon industry fuels human rights abuses.

"The financing of arms has direct consequences for people living in many countries, including the violation of their fundamental rights. Moreover, the defence industry is known for its lack of transparency and low sustainability standards. The arms trade is also often linked to other murky operations from the financial sector, like the extensive use of tax heavens. Consequently, any Financial Institution providing financial services to the defence sector takes serious risks of becoming involved in dubious transactions. Investments in the arms industry fuel armed conflict and can never be sustainable. BankTrack and its member organisations urge all banks to disinvest from arms producers and to provide full transparency on transactions and clients." BankTrack, 2007

3. Overview of investments in uranium weapons producers

Despite the controversy over the health impacts of the use of uranium weapons, investments in these weapons proceed unhindered.

Banks and other financial institutions provide various types of financial services to uranium weapons producers. The most important are commercial banking, investment banking and asset management.

In this section we describe concrete financial services delivered by a wide range of international financial groups to three producers based in the United States.

3.1. The producers

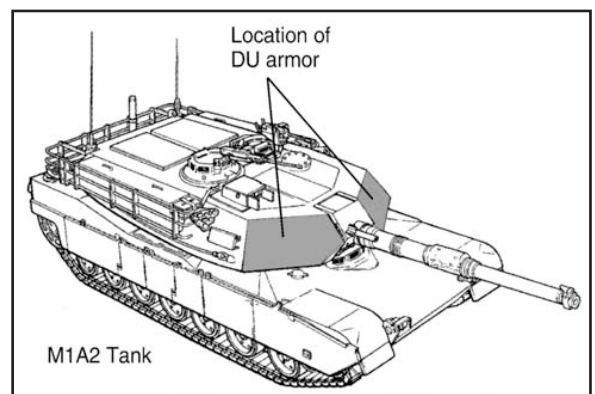
Ammunition containing depleted uranium is currently produced in the United States, France, Russia and Pakistan. Until recently, depleted uranium (DU) ammunition was also produced in the UK, however BAE Systems discontinued production in 2003.²

As this report is concerned primarily with share holdings in stock-market listed companies, the links with state-owned manufacturers in France, Russia and Pakistan have not been investigated. More information on the activities of these companies can be found on the ICBUW website.³

Three stock-market listed companies are currently involved in the production of ammunition containing depleted uranium, primarily for the US armed forces.⁴

Two US companies produce large calibre DU tank rounds: ATK Alliant Techsystems (120mm shells)⁵ and the former Primex Technologies, now General Dynamics Ordnance and Tactical Systems (105mm and 120mm shells)⁶. Apart from shielding, Aerojet Ordnance Tennessee Inc (part of the GenCorp group) also produces DU penetrators for assembling into anti-tank shells by the previously mentioned companies.⁷

In the Abrams M1A1 and M1A2 Main Battle Tanks part of the armour is reinforced with DU sandwiched between two steel plates. (drawing: Canadian Military Journal)



Three other companies – located in France, the former Soviet Union, and Pakistan – produce large calibre tank rounds. ATK Alliant Techsystems, the largest ammunition manufacturers in the US, produces small calibre rounds (25mm, 30mm) for guns on US aircraft and fighting vehicles.



Alliant Techsystems (ATK)

Alliant Techsystems is the world's largest manufacturer of ammunition, supplying military, law enforcement, sport and hunting markets. The company is also increasingly active in space and propulsion systems.

ATK's Ammunition Systems Group operates the Lake City Army Ammunition Plant in Independence, Missouri, where it has the capacity to produce 1.5 billion rounds of small-calibre ammunition annually. It also operates the Radford Army Ammunition Plant in Radford, Virginia, where it produces rocket and gun propellants. Amongst the group's products are a number of DU shells and bullets for use in U.S. tanks, armoured personnel carriers, aircraft and howitzers.⁸



Photograph: Armour piercing munition produced by ATK Alliant Techsystems (photograph: US Air Force/AP)

Alliant has produced over 15 million 30 mm PGU-14 shells used in the A10 aircraft's Gatling Gun, that was widely used in the former Yugoslavia.⁹

Alliant has also produced over a million 120mm M829 rounds for US Army tanks. The M829A1 was used by US tanks during Operation Desert Storm in Iraq. In February 2006, the U.S. Army placed an order for \$38 million of 120mm M829A3 rounds, the successor of the M829A1.¹⁰

Weapons containing DU produced by ATK have been exported to Greece, South Korea, Turkey and Taiwan, Thailand and Kuwait.¹¹

Financial Structure

At the end of March 2007, ATK owned total assets worth US\$ 2,875 million. These assets were being financed by the following stakeholders:¹²

Shareholders	US\$ 558 million	19%
Banks	US\$ 275 million	10%
Bondholders	US\$ 1,180 million	41%
Trade partners	US\$ 235 million	8%
Others	US\$ 627 million	22%

GenCorp

Aerojet Ordnance Tennessee, Inc. (AOT) is a wholly owned subsidiary of GenCorp. GenCorp is a major player in the US defence industry, specialising in the production of aerospace propulsion systems, tactical weapons systems, and warhead and munitions applications. Aerojet Ordnance Tennessee Inc. located in Jonesborough, Tennessee, manufactures the depleted uranium penetrators that form the core of both large and medium calibre depleted uranium ammunition.¹³

In 1994, a fire at the Jonesborough factory was responsible for the release of depleted uranium into the atmosphere.¹⁴ The former Aerojet testing ground at Chino Hills, California, is contaminated with depleted uranium as well as mustard gas, nerve gas, tear gas, explosive chemicals and other potentially dangerous materials (including perchlorate and TNT).¹⁵

Financial structure

At the end of 2006, GenCorp owned total assets worth US\$ 1.021 billion. These assets were being financed by the following stakeholders:¹⁶

Shareholders	-US\$ 96 million	-9%
Banks	US\$ 74 million	7%
Bondholders	US\$ 389 million	38%
Trading partners	US\$ 90 million	9%
Others	US\$ 565 million	55%

Due to continuing losses of the company the shareholders' equity has become negative.



General Dynamics

General Dynamics is the sixth largest defence contractor in the world. General Dynamics Ordnance and Tactical Systems was created following the purchase by General Dynamics of Primex Technology (formerly Olin Ordnance). It manufactures a wide range of DU ammunition for the US armed forces.

M919 25mm ammunition is used in the Bradley Fighting Vehicle. The Bradley Fighting vehicle fired DU ammunition during the war against Iraq in 2003.¹⁷

PGU-20/U 25mm ammunition is in use by the US Marines in Harrier jets. The equivalent of 10 tons of depleted uranium was used in the form of this ammunition during the first Gulf War.

M900A1 105mm ammunition is the primary anti-armour 105 mm tank ammunition in service with the United States Army and Marine Corps.¹⁸

M8292A2 120mm ammunition is the primary kinetic energy, anti-armour 120mm tank ammunition in service with the United States Army's main battle tank.¹⁹

General Dynamics also manufactures tanks for the US army that contain DU armour. Weapons containing DU produced by General Dynamics Ordnance and Tactical Systems (or its predecessors) have been exported to Bahrain, Israel, Jordan, Pakistan, Saudi-Arabia and Turkey.²⁰

Financial Structure

At the end of 2006, General Dynamics owned total assets worth US\$ 22.4 billion. These assets were being financed by the following stakeholders:²¹

Shareholders	US\$ 9.8 billion	44%
Banks	US\$ 0.0 billion	0%
Bondholders	US\$ 2.8 billion	13%
Trade partners	US\$ 4.9 billion	22%
Other	US\$ 4.9 billion	22%

3. 2. The investments

Banks, insurance companies, investment funds, pension funds, export credit agencies, multilateral financial institutions, government funds and many other investors play a crucial role in choosing where to invest their money. A large majority of companies depend on the international financial markets and these institutions to find their working capital.

This is also true for many weapon producers. The following list gives an overview of a number of important investments in the producers of uranium weapons by private financiers.

Commercial Banking

Commercial banking includes all types of corporate loans and credits, i.e. investment loans, working capital facilities, trade credits, etc.

These are some examples of commercial banking services to the three uranium weapons producers:

In March 2007 **Alliant Techsystems** renewed and adapted an existing revolving credit facility with an international banking syndicate. The original five year facility was secured in March 2004 and was split into two tranches: a US\$ 270 million five year loan and a US\$ 300 million revolving credit. At the end of 2006 US\$ 222.8 million of the loan and US\$ 125 million of the revolving credit were outstanding. The renewed and adapted facility is also split into two tranches: a US\$ 275 million five year loan and a US\$ 500 million five year revolving credit. ATK can also issue letters of credit under this facility for a total amount of US\$ 200 million. The facility was arranged by **Bank of America** (United States). The following nineteen banks participated in the banking syndicate.²²

Bank of America	United States
Bank of New York	United States
Bank of Tokyo-Mitsubishi	UFJ Japan
Calyon	France
Commerzbank	Germany
General Electric Capital	United States
Goldman Sachs	United States
Hua Nan Bank	Taiwan
JPMorgan Chase	United States
Merrill Lynch	United States
Mizuho Bank	Japan
National City Bank	United States
Northern Trust	United States
People's Bank, part of People's United Bank	United States
Regions Bank	United States
Royal Bank of Scotland	United Kingdom
United Overseas Bank	Singapore
US Bank	United States

In December 2004 **GenCorp** secured a new US\$ 180 million credit facility from a banking syndicate. The facility was split into three tranches: a US\$ 80 million five year revolving credit facility, a US\$ 25 million six year term loan facility and a US\$ 75 million letter of credit facility. The proceedings can be used to repay existing debts and for general corporate purposes. The facility was arranged by **Wachovia Bank** (United States) and **Scotiabank** (Canada). Apart



from the arranging banks, two more banks participated in the banking syndicate: **JP Morgan Chase** (United States) and **Bank of New York** (United States). The facility has been amended several times.²³

In June 2007 this credit facility to **GenCorp** was replaced by a new revolving credit facility with a total amount of US\$ 280 million, consisting of an US\$ 80 million revolving credit facility maturing in June 2012 and a US\$ 200 million credit-linked facility maturing in April 2013. The new facility was arranged by **Wachovia Bank** (United States) and **JP Morgan Chase** (United States). The following banks participated in this syndicate:²⁴

CIT Group Equipment Finance	United States
JP Morgan Chase	United States
National City Bank	United States
Wachovia Bank	United States
Wells Fargo	United States

In July 2004 **General Dynamics** secured a US\$ 1 billion five year revolving credit facility from an international banking syndicate. The proceedings can be used to back up the issue of commercial paper and for general corporate purposes. The facility was arranged by **JPMorgan Chase** (United States) and **Bank of America** (United States). Apart from the arranging banks, three more banks participated in the banking syndicate: **Bear Stearns** (United States), **Royal Bank of Scotland** (United Kingdom) and **Wachovia Bank** (United States). At the end of 2006 no amounts were outstanding under this facility.²⁵

In December 2005 **General Dynamics** secured a second US\$ 1 billion 364 days revolving credit facility from an international banking syndicate. The proceedings can be used to back up the issue of commercial paper and for general corporate purposes. The facility was arranged by **JPMorgan Chase** (United States) and **Bank of America** (United States). Apart from the arranging banks, three more banks participated in the banking syndicate: **Bear Stearns** (United States), **Royal Bank of Scotland** (United Kingdom) and **Wachovia Bank** (United States).²⁶ At the end of 2006 this facility was replaced by a US\$ 975 million five year revolving credit facility. No information has been found on which banks were involved in this new facility, but it is likely that the same banks were involved. At the end of 2006 no amounts were outstanding under this facility.²⁷

Investment Banking

Investment banking services include helping clients to sell shares and bonds to investors (asset managers, insurance companies, et cetera), as well as financial advisory services.

These are some examples of Investment banking services to three uranium weapons producers:

In March 2006 **ATK** issued ten-year bonds with a total value of US\$ 400 million. The proceedings were used to refinance outstanding bonds due in 2011. The sole manager and underwriter of this issuance was **Bank of America** (United States).²⁸

In September 2006 **ATK** issued five-year bonds with a total value of US\$ 300 million. The proceedings were used to purchase shares of **ATK** common stock, to contribute to the company's benefit pension plan and for general corporate purposes. The lead manager of the issuing syndicate was **Bank of America** (United States). Six banks underwrote this issue and participated for at least the following amounts:

Bank of America	United States	US\$ 216.00 million
Bank of New York	United States	US\$ 11.25 million
Bank of Tokyo-Mitsubishi UFJ	Japan	US\$ 6.75 million
Calyon	France	US\$ 18.00 million
National City Bank	United States	US\$ 6.75 million
US Bank	United States	US\$ 11.25 million

In August 2003, **GenCorp** issued 9.5% subordinated bonds which are due in 2013 for a total value of US\$ 150 million in a private placement. Exchange agent of the deal was the **Bank of New York** (United States). The initial purchasers of the bonds were:²⁹

Bank of New York	United States
Deutsche Bank	Germany
National City Bank	United States
Scotiabank	Canada
Wachovia Bank	United States
Wells Fargo	United States

In January 2004, **GenCorp** exchanged the outstanding subordinated 9.5% bonds with new, publicly tradable 9.5% subordinated bonds.³⁰

In January 2004, **GenCorp** issued 4% convertible bonds maturing in 2024 for a total value of US\$ 125 million. The following banks were the initial purchasers of the bonds:³¹

Bank of New York	United States
Deutsche Bank	Germany
National City Bank	United States
Scotiabank	Canada
Wachovia Bank	United States
Wells Fargo	United States

In November and December 2004, **GenCorp** issued 2.25% convertible bonds maturing in 2024 for a total value of US\$ 146.4 million. The initial purchasing banks were:³²

JP Morgan Chase	United States
Scotiabank	Canada
Wachovia Bank	United States

In November 2004, **GenCorp** issued 8.625 million new shares, of which 7.5 million shares - with a total value of US\$ 120 million - were underwritten by three major banks:³³

Bank of New York	United States	US\$ 3.0 million
JP Morgan Chase	United States	US\$ 68.4 million
Wachovia Bank	United States	US\$ 48.6 million

Net proceeds of the offering for the company were US\$ 131.1 million³⁴



In May 2003 **General Dynamics** issued bonds with a total value of US\$ 2 billion. The issue was split into three tranches: a US\$ 500 million three year notes issue, a US\$ 500 million five year notes issue and a US\$ 1 billion ten year notes issue. The proceedings were used to repay debt acquired for the US\$ 1.1 billion purchase of General Motors Defence. The lead managers of the issuing syndicate were **Bank of America** (United States) and **Bear Stearns** (United States). Nine banks underwrote this issuance and participated for the following amounts:³⁵

Bank of America	United States	US\$ 500 million
Bank of New York	United States	US\$ 40 million
Bank One, which is part of JPMorgan Chase	United States	US\$ 225 million
Bear Stearns	United States	US\$ 500 million
Deutsche Bank	Germany	US\$ 225 million
Fleet Securities, part of Bank of America	United States	US\$ 40 million
Merrill Lynch	United States	US\$ 225 million
MR Beal	United States	US\$ 20 million
Wachovia Bank	United States	US\$ 225 million

In August 2003 **General Dynamics** issued bonds with a total value of US\$ 1.1 billion. The issue was split into two tranches: a US\$ 700 million seven year notes issue and a US\$ 400 million twelve year notes issue. The proceedings were used to repay existing debts, tied to the purchase of homeland security technology provider Veridian Corp. The lead managers of the issuing syndicate were **Bank of America** (United States) and **Bear Stearns** (United States). Nine banks underwrote this issue and participated for the following amounts:³⁶

Banca IMI, part of Intesa Sanpaolo	Italy	US\$ 22.00 million
Bank of America	United States	US\$ 330.00 million
Bank One, part of JPMorgan Chase	United States	US\$ 24.75 million
Bear Stearns	United States	US\$ 605.00 million
Deutsche Bank	Germany	US\$ 24.75 million
Fleet Securities, part of Bank of America	United States	US\$ 22.00 million
Merrill Lynch	United States	US\$ 24.75 million
MR Beal	United States	US\$ 22.00 million
Wachovia Bank	United States	US\$ 24.75 million

Asset Management

Asset management means investing in shares and bonds of companies and governments, on behalf of investment funds (which in turn are owned by many private investors), wealthy private clients and financial institutions such as pension funds and insurance companies. Asset management can result in a direct and indirect involvement of Financial Institutions (FI) in uranium weapons producers.

Indirect involvement means that the FI buys shares and bonds of a company on behalf of a third party. Most of the time this means the third party, a person or an institution, is buying one or more shares of an investment fund offered on the market by the FI. This fund is managed by asset managers of the FI following a certain investment policy. Nothing stops these FIs from avoiding the inclusion of uranium weapons producers in the portfolio of their funds.

Direct involvement means that the FI is buying shares and bonds of a company on their own behalf (for their own account). This means the FI itself is becoming shareholder or bondholder of this company. Again nothing stops FIs from avoiding including uranium weapons producers in their own portfolio.

These are some examples of asset management resulting in significant shareholdings by financial institutions in three uranium weapons producers.
 In October 2007 the following financial institutions owned more than 3% of the shares of **ATK**:³⁷

T. Rowe Price	United States	7.2%
Neuberger Berman (Lehman Brothers)	United States	6.5%
Fidelity	United States	6.1%
Harris Associates (Natixis)	France	5.3%
JP Morgan Chase	United States	4.8%
Oppenheimer Funds (Massachusetts Mutual)	United States	4.7%
Goldman Sachs	United States	4.6%
Barclays	United Kingdom	3.1%

In June 2007 the following financial institutions owned more than 3% of the shares of **GenCorp**:³⁸

Steel Partners	United States	14.2%
Sandell Asset Management	United States	9.4%
Gamco Investors	United States	7.4%
Sowood Capital Management	United States	5.3%
QVT Financial	United States	5.2%
Keeley Asset Management	United States	5.1%
Franklin Templeton	United States	4.9%
Barclays	United Kingdom	4.8%
Artis Capital Management	United States	4.2%
Pinnacle Associates	United States	3.1%
Atlantic Investment Management	United States	3.1%

In June 2007 the following financial institutions owned more than 3% of the shares of **General Dynamics**:³⁹

Longview Asset Management	United States	8.2%
Capital Group	United States	7.8%
Marsico Capital Management	United States	5.4%
Wellington Management	United States	4.1%
Fidelity	United States	3.6%
State Street	United States	3.1%



4. Why are uranium weapons a problem?

While it is already established that the use and effects of uranium weapons breach principles of international environmental, humanitarian and human rights law, until now only one country has banned uranium weapons. In part this is due to the fact that army spokesmen have denied harmful effects to citizens from using these weapons, and have downplayed the toxicity of DU in order to maintain the weapons in the arsenals and to mitigate long-term disability payments and health care costs.

Meanwhile peer reviewed scientific reports demonstrating the hazardous effects of depleted uranium, have continued to pile up. This briefing gives an overview of the use of uranium weapons and its risks for people and their environment.

4.1. What is depleted uranium and how is it used in weapons?

Depleted uranium itself is a chemically toxic and radioactive compound, which is used in armour piercing munitions because of its very high density. Traditionally the military use the non-radioactive metal tungsten in their anti-tank munitions. But the United States military discovered that the nuclear waste product called 'depleted uranium' (DU) is as heavy as tungsten. In the solid metal form a depleted uranium anti-tank shell showed a self-sharpening effect while piercing armour of an enemy battle tank. Depleted uranium munitions belong to a class of weapons called 'kinetic energy penetrators'.

The part of the munition that is made of DU is called a penetrator. The penetrator is usually an alloy of DU and a small amount of another metal such as titanium and molybdenum. These give it extra strength and resistance to corrosion. Depleted uranium properties that made it of interest to the military were its high density and strength, relative low cost of machining, and availability. With 730,000 tonnes of stored DU waste, the US stockpiles half of the world supply. One of the reasons the US already used depleted uranium in numerous civil products in the 1950s, was the fact that stockpiling DU waste is very expensive. Unlike tungsten, a scarce and expensive import product, DU was a cheap alternative, and largely available. In 1974 the first types of anti-tank shells containing DU came into mass production.

In addition to this, DU is also used in small amounts in some types of landmine (M86 Pursuit Denial Munition and Area Denial Artillery Munition). Both types contain 0,101 grammes of DU, and remain in the US stockpiles.⁴⁰

Depleted uranium (DU) is nuclear waste. Uranium naturally occurs as three different isotopes U234, U235 and U238. Isotopes are atoms of the same element that have different numbers of neutrons but the same number of protons. This means that they behave in the same way chemically, but different isotopes release different amounts and types of radiation.

The radioactive properties of DU, which is chiefly uranium 238, differ from those of uranium 235. Unlike U238, U235 is fissionable. This means that it is so unstable that firing neutrons at it can produce a self-sustaining series of nuclear reactions, releasing huge amounts of energy. This is the basis of nuclear weapons and nuclear power. However, before U235 is used, it needs to be concentrated as it only makes up a small proportion of naturally occurring uranium, around 0.7%. U238 makes up more than 99% of 'natural uranium' and

is less radioactive. 'Natural uranium' is an industrial concentrated product that should not be confused with 'naturally occurring uranium' which contributes to the background radiation. After natural uranium has had most of the U235 removed from it, it is called 'depleted uranium' i.e. uranium depleted in the isotope U235. Each kilo of reactor ready enriched uranium produced leaves you with 7 kilos of DU.

4. 2. Where has depleted uranium been used and who uses it?

Governments have often initially denied using DU because of public health concerns. It is now clear that DU was used on a large scale by the US and the UK in the Gulf War in 1991, then in Bosnia, Serbia and Kosovo, and again in the war in Iraq by the US and the UK in 2003. It is suspected that the US also used DU in Afghanistan in 2001, although both the US and UK governments have denied using it there. However, leaked US transport documents suggest that US forces in Afghanistan had DU weapons and it is thought that A10 Tankbuster aircraft continue to use it there in support of NATO ground troops.⁴¹

Location	Armed force shooting DU	Year	Number of rounds	Quantity of DU
At sea off the Israeli coast	Israeli Navy	1985	Unknown	Unknown
Iraq, Kuwait	US Air Force US Army US Marine Corps UK Royal Army	1991	Tanks: >9,640 Jets: 850,950	Tanks: >39,631 Jets: 246,602 Total: >286,233
Bosnia	US Air Force	1994-1995	Jets: 10,800	Jets: 3,260
Kosovo, Serbia, Montenegro	US Air Force	1999	Jets: 31,300	Jets: 9,450
Afghanistan	US – use not confirmed	2001-	Unknown	Unknown
Iraq	US Air Force US Army US Marine Corps UK Royal Army	2003-	Tanks: >2,650 Bradleys: ~121,000 Jets: ~309,000	Tanks: >12,000 Bradleys: ~10,300 Jets: ~93,400
				Total (estimated): 118,000 to 136,000

Table: Known and suspected uses of DU in warfare.⁴²

At least 19 countries are thought to have weapon systems with DU in their arsenals. These include: UK, US, France, Russia, Greece, Oman, Turkey, Israel, Saudi Arabia, Bahrain, Egypt, Kuwait, Jordan, Pakistan, Oman, Thailand, China, India and Taiwan. Many of them were sold DU ammunition by the US while others, including France, Russia, Pakistan and India are thought to have developed it independently.

4. 3. What are the dangers?

The DU oxide dust produced when DU munitions burn has no natural or historical analogue. This toxic and radioactive dust is composed of two oxides: one insoluble, the other sparingly soluble. The distribution of particle sizes includes sub-micron particles that are readily inhaled into and retained by the lungs. From the lungs uranium compounds are deposited in the lymph nodes, bones, brain and testes. Hard targets hit by DU penetrators are surrounded by this dust and surveys suggest that it can travel many kilometres when re-suspended, as is likely in arid climates. The dust can then be inhaled or ingested by civilians and the military alike.



It is thought that DU is the cause of a sharp increase in the incidence rates of some cancers, such as breast cancer and lymphoma, in areas of Iraq following 1991 and 2003. It has also been implicated in a rise in birth defects from areas adjacent to the main Gulf War battlefields.

Photograph by Naomi Toyoda

Upon impact on an armour-clad target tiny DU particles are created, sized up to 5 millionth of a metre. These particles are dispersed within a radius of fifty metres around the hit target, and can be inhaled or ingested by every human being in the vicinity of the event.

Soft target impacts, typical of aircraft strikes, tend to leave the penetrators partially intact as the vast majority miss their targets. In the Balkans more than 31,000 30mm penetrators were fired; UNEP reported that these corroding penetrators were likely to contaminate groundwater and drinking water supplies and should be removed.⁴³

The US has consistently refused to release data on the locations of DU strikes to UNEP and post-conflict instability has made assessing the true extent of contamination virtually impossible.

DU munitions were used only by the US and the UK forces during the 1991 Gulf War, but their use led to DU fragment injuries among coalition forces as a result of 'friendly fire incidents'.

American M1A1 tank having been hit with DU by its own troops ("friendly fire incident")



Other personnel were exposed via inhalation and ingestion after working around vehicles struck by DU munitions. Such exposures were not considered especially dangerous at the time, because numerous epidemiological studies of uranium miners and millers working with natural uranium had shown few concrete health effects from exposure. However, the exposure of wounded personnel to uranium as embedded fragments had no medical precedent, so the earlier studies dealing primarily with inhalation or ingestion exposures in miners were of uncertain utility. As a result, questions were soon raised as to whether it was wise to leave in place fragments possessing the unique radiological and toxicological properties of DU, especially when considering that exposures might extend as long as the 40-50 years remaining of a person's life span. As these treatment questions were being addressed, a growing public concern about the long-term health and environmental impact of using a radioactive metal like DU on the battlefield fuelled forceful national and international efforts to ban the use of DU munitions.⁴⁴



Scientific team looking for DU contamination in Kosovo. (photograph: AP)

Some of the reasons why criticisms emerged, were the fact that the US and UK military had neglected to inform their troops about the health hazards of the use of DU weapons on the battlefield, and the fact that US Army officials had ignored their own safety standards. The following quotation from the US Army Environmental Policy Institute seems to admit, albeit unintentionally, the long-term health hazards of the military use of DU weaponry:

"It would be fiscally prudent to develop a more comprehensive understanding of exposure potential and the concomitant medical implications. When DU is indicted as a causative agent for Desert Storm illness, the Army must have sufficient data to separate fiction from reality. Without forethought and data, the financial implications of long-term disability payments and health care costs would be excessive."⁴⁵



4. 4. The health effects of depleted uranium: radioactivity

The chief radiological hazard from uranium 238 is alpha radiation. When inhaled or ingested, alpha radiation is the most damaging form of ionising radiation. However, as U238 decays into its daughter products thorium and protactinium, both beta and gamma radiation are released, increasing the radiation burden further. Therefore DU particles must be considered as a dynamic mixture of radioactive isotopes.

Inside the body alpha radiation is incredibly disruptive, it is estimated that chromosome damage from alpha particles is about 100 times greater than that caused by an equivalent amount of other radiation. The heavy, highly charged particles can punch holes in DNA and leave a trail of ionised free radicals in their wake, disrupting finely tuned cellular processes. In one day, one microgram, (one millionth of a gram), of pure DU can release 107,000 alpha particles. Each particle is charged with more than four million electron volts of energy; this goes directly into whichever organ or tissue it is lodged in. It only requires 6 to 10 electron volts to break a DNA strand in a cell and these emissions cover a sphere with a radius of between 7 and 20 cells.⁴⁶

Novel effects from internal emitters are highlighting the hazards posed by exposure to internal alpha radiation.⁴⁷ These include the Bystander Effect - whereby cells adjacent to those struck by alpha particles also exhibit signs of radiation damage, and Genomic Instability, where the descendants of radiation damaged cells show increased rates of mutations: the precursor to cancer growth. Ionizing radiation is a human carcinogen at every dose-level, not just at high doses; there is no threshold dose and any alpha particle can cause irreparable genetic damage.

4. 5. The health effects of depleted uranium: chemical toxicity

Detailed research into uranium's chemical toxicity began in the 1940s. Since then it has become clear that, like many other heavy metals, such as lead, chromium, nickel and mercury, uranium exposure can be damaging to health. While many studies have only investigated the possibility of kidney damage, since 1991, and triggered by concerns over DU, dozens of papers have highlighted other, more worrying effects of uranium toxicity. Repeated cellular and animal studies have shown that uranium is a kidney toxin, neurotoxin, immunotoxin, mutagen (induces mutations), carcinogen and teratogen (causes birth defects).

Compared to the uranium naturally present in the environment, DU dust is a concentrated form of uranium, which is vastly more bioavailable than naturally present uranium. In recent studies in hamsters, uranium has been shown to bind to DNA strands, where it causes oxidative damage through the generation of free radicals, while in rats,⁴⁸ it has been shown to irreparably damage white blood cells and alter gene expression⁴⁹. In 2007 DU compounds were shown to damage human lung cells⁵⁰ and disrupt DNA repair and duplication proteins.⁵¹

Belgium outlawed the use and production of Uranium Weapons

On June the 20th, 2007, the Belgian State Monitor published a law that bans the use of uranium weapons on the Belgian territory. In the federal Parliament there was no single vote against the approval of this law. With this legislation Belgium is the first country in the world that complied with the repeated call of the European Parliament on the European Member States to implement a moratorium on the use of DU munitions.

In a Resolution dated November 17, 2005, the European Parliament "reiterated its call for a moratorium – with a view to the introduction of a total ban on the use of so-called depleted uranium munitions". Acknowledging the Precautionary Principle, Belgium agreed that the manufacture, use, storage, sale, acquisition, supply and transit of these "inert munitions and armour plates containing DU or any other industrially manufactured uranium" should be prohibited.⁵²

The vote represents a growing awareness of the issue among European countries, thanks in no small part to the European Parliament's repeated calls for a ban on the use of uranium weapons. Already in February 2003 the EP "called on the European Council and the EU Member States, as well as on NATO and the Members thereof which are not EU Member States, to make a public declaration guaranteeing that they will not use weapons or weapons systems that have been banned or are deemed to be illegal under international law in present or future armed conflicts."⁵³



5. Banks refusing to fund uranium weapons

It is not only governments who are taking initiatives to stop the use of uranium weapons. Some banks are also taking up their social responsibility and are ending investments in producers of these weapons. A number of them have also been playing a pioneering role by ending their investments in the arms industry in general.

Triodos Bank

Triodos Bank is an ethical bank active in Belgium, the Netherlands, Germany, Spain and UK. The bank completely excludes involvement in the arms industry for both investments and financing. Moreover Triodos offers transparency regarding its investment universe and financing transactions on their websites.⁵⁴

ASN Bank

In the Netherlands ASN Bank has a total exclusion criterion for arms producers, both for financing and asset management. Moreover ASN Bank is offering complete control tools for their ethical policies. They publish their complete investment universe on their website, with a short description for each company. The annual report of the bank includes not only the investment criteria, but also a description of the companies that are allowed, not allowed, and removed from possible investment.⁵⁵

Co-operative Bank

The British Co-op Bank, managing £ 11.9 billion on savings accounts, does not invest in companies that supply arms to 'oppressive regimes'. The Co-op Bank also has some subsidiary positions regarding arms industry, excluding investments in cluster munition or nuclear weapon producers.⁵⁶

KBC

KBC is a Belgium-based bank-insurance group. In response to the Belgian campaign 'My Money. Clear conscience?' by Netwerk Vlaanderen and some peace organisations, KBC has implemented a restrictive arms policy to all its investments (including indirect investments). In 2004 the company worked out a policy on investments in the arms industry. KBC decided to stop any investments in anti-personnel mines, chemical weapons, uranium weapons and cluster munitions. KBC argues "these weapons have caused great suffering to innocent civilians".

Their policy is applicable to all their activities including commercial banking, asset management and investment banking. KBC has not only worked out a clear and concrete policy, it has also implemented this policy in a strict and thorough way.

In 2006 they updated their black list resulting in a publicly available list of nineteen weapon producers. KBC mentions seventeen of them: Aerostar, Alliant Techsystems, Aselsan, BAE Systems, EADS, Finmeccanica, GenCorp, General Dynamics, Honeywell, L-3 Communications, Lockheed Martin, Magellan Aerospace, Northrop Grumman, Poongsan, Raytheon, Rheinmetall and Thales. Singapore Technologies Engineering and Textron are excluded on the grounds of involvement in anti-personnel mines.

Statements by civil and military society

ICBUW - The International Coalition to Ban Uranium Weapons

With more than 90 member organisations in 25 countries, ICBUW represents the best opportunity yet to achieve a global ban on the use of all types of uranium in weapons. Even though the use of weapons containing uranium should already be illegal under International Humanitarian, Human Rights and Environmental Laws, an explicit treaty, as has been seen with chemical and biological weapons, landmines and more recently, cluster bombs, has proved the best solution for confirming their illegality. Such a treaty would not only outlaw the use of uranium weapons, but would include the prohibition of their production, the destruction of stockpiles, the decontamination of battlefields and rules on compensation for victims.

ICBUW has prepared a draft treaty for such a convention. Our Draft Convention contains a general and comprehensive prohibition of the development, production, transport, storage, possession, transfer and use of uranium ammunition, uranium armour-plate and of any other military use of uranium. The Convention also outlines obligations concerning the abolition of uranium weapons and the destruction of uranium weapons construction facilities. In addition it obliges states to ensure a rapid decontamination of radioactive battlefields and test ranges, emphasising the protection of, and assistance to, civilians living in these areas and obliges states to compensate the victims.

In propagating a Draft Convention for a ban on uranium weapons, ICBUW is following the successful example of the International Campaign to Ban Landmines. ICBUW's grassroots member organisations lobby at a national level, while ICBUW itself works with supranational bodies such as the European Parliament and the United Nations. Its work is supported by Euromil - the European Military Union.⁵⁸

European military union EUROMIL

The European Union for military personnel recognizes that there may be long-term implications for the health of soldiers performing duties in areas where DU weapons were used. To counteract any such effects governments should ensure that measures are put in place that guarantee the safety and protection of troops during their missions in areas contaminated as a result of the use of DU. According to EUROMIL these protective measures should include the full medical screening of troops prior to departure, at regular interval during the mission, on immediate return from the mission area and at regular intervals for the ten years post-mission. Areas in which uranium weapons were used should be clearly identified. Briefings should be pre-posted to troops on the known dangers resulting from uranium weapons use. EUROMIL demands also regular environmental impact assessment of contaminated areas, e.g. ground water testing and soil analysis.

EUROMIL also recognizes that there may be long-term implications for the health of the population in the area where uranium weapons were used. Besides, the impact on the environment has a negative influence on the living and working conditions in the contaminated area, both during the military operation and for many decades after the attack with DU ammunition. Therefore EUROMIL strongly urges governments to ban the use of uranium weapons and to use their influence to appeal to their worldwide partners to abandon the use of these weapons.⁵⁹





BankTrack and Network Vlaanderen

BankTrack is a network of civil society organisations and individuals from all over the world, tracking the operations of the private financial sector (commercial banks, investors, insurance companies, pension funds) and its effect on people and the planet.

Network Vlaanderen, the co-author of this dossier, is the Belgian member of this Network. BankTrack calls on the financial institutions not to fund producers of uranium weapons.

The Collevocchio Declaration on Financial Institutions and Sustainability calls on financial institutions to take a positive role in advancing environmental and social sustainability.⁶⁰

... "Finance and commerce have been at the centre of a historic detachment between the world's natural resource base, production and consumption. As we reach the boundaries of the ecological limits upon which all commerce relies, the financial sector should take its share of responsibility for reversing the effects this detachment has produced. Thus, an appropriate goal of financial institutions should be the advancement of environmental protection and social justice rather than solely the maximization of financial return." ... Collevocchio Declaration, 2003

Legal developments

Although no sole treaty explicitly banning the use of DU is yet in force, it is clear that using DU runs counter to the basic rules and principles enshrined in written and customary International Humanitarian Law.

Additionally both Humanitarian Law and Environmental Law are based on the principle of precaution and proportionality to which at the very least states should adhere. Two resolutions of the Sub-Commission to the UN Commission on Human Rights (1996/16 and 1997/36) state that the use of uranium ammunition is not in conformity with existing International and Human Rights Law.⁶¹

There is increasing support worldwide for a treaty banning the use of DU in weapons. In 2006, the European Parliament strengthened its previous three calls for a moratorium by calling for the introduction of a total ban, classifying DU along with white phosphorous as inhumane.⁶² Meanwhile individual states are working on their own domestic laws to outlaw its use. On March 22nd 2007, and acknowledging the Precautionary Principle, the Belgian Parliament voted unanimously for a domestic ban on the manufacture, use, storage, sale, acquisition, supply and transit of uranium weapons and armour - the first country in the world to do so⁶³. In the United States, increasing concern over DU's health effects has caused individual states to implement testing regimes for returning soldiers.⁶⁴

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