

**THE INTERNATIONAL UNIVERSITY VIENNA**

**Preventing nuclear terrorism – preventing a nuclear  
catastrophe**

**Seminar: Universal Compliance**

**A strategy for nuclear security and combating nuclear  
terrorism**

**Prof. Dr. rer. nat. Karl-Heinz Czock**

**Vienna**

**- 2007 -**

## Table of contents

<b>I. Introduction</b> .....	3
<b>II. The aspects of nuclear terrorism</b> .....	4
<b>III. Who could be planning a nuclear attack?</b> .....	7
<b>1. Al Qaeda</b> .....	7
<b>2. Jemaah Islamiyah</b> .....	9
<b>3. Chechnya</b> .....	9
<b>4. Hezbollah</b> .....	10
<b>5. Pakistan</b> .....	11
<b>6. Aum Shinrikyo</b> .....	11
<b>IV. Acquiring nuclear materials</b> .....	12
<b>1. Considering the materials</b> .....	12
<b>2. Points of acquisition</b> .....	14
2.1. Russia.....	14
2.2. United States .....	14
2.3. North Korea .....	15
2.4. Pakistan .....	17
2.5. Libya, Iran and Iraq.....	17
<b>V. Securing the nuclear material: signs to be considered</b> .....	19
<b>1. What should Russia do?</b> .....	20
<b>2. The need to secure HEU</b> .....	23
<b>3. Removing vulnerable nuclear material</b> .....	24
<b>4. Steps of a new accommodation</b> .....	24
<b>VI. Smuggling nuclear material</b> .....	26
<b>1. Facts on illicit trafficking</b> .....	28
<b>2. Interview within the IAEA</b> .....	29
<b>VI. Conclusions</b> .....	32
<b>Bibliography</b> .....	34

## **I. Introduction**

The threat represented by the proliferation of nuclear weapons or access to fissile material has increased; therefore measures must be developed in order to combat the possibility of nuclear terrorism and in the same time to provide new security measures which should be imposed. The use of weapon-grade material by unauthorized party or attacks on nuclear reactors are just some of the incidents which could be regarded as nuclear terrorism.

The first chapter looks at the four faces of terrorism, while in the same time emphasizing on the devastating effects a nuclear terrorist attack would have.

The second chapter looks at who might represent a possible threat from the point of view of terrorist groups, focusing on the ones who might pose a real threat. The analysis is made by considering the goals and objectives of each group, the support the groups receive, stating the motives for which the groups are a danger of the international security.

The third chapter is concern with looking at the possible points from which the terrorist groups would acquire nuclear weapons or the material necessary to build such a bomb. On the other hand is presenting the materials necessary for building a nuclear bomb and the process through each these elements are obtained.

The next chapter is presenting the signs which should be considered in order to prevent a nuclear terrorist attack to happen, looking at the responsibilities Russia has and possible ways of combating nuclear terrorism.

The fifth chapter looks at the problems rose by smuggling nuclear material in a country and the role that the International Atomic Energy Agency has.

The last chapter is focusing on the conclusions.

## **II. The aspects of nuclear terrorism**

The threat of terrorism exists, as does the threat of nuclear terrorism. One month after the 9/11 attack on the World Trade Center, CIA informed President George W. Bush that one of their agents reported that a ten-kiloton nuclear bomb, smuggled from the Russian arsenal and belonging to Al Qaeda terrorists was in New York. In the end, the alarm proved to be false, but questions were raised, concerning how such a nuclear weapon would enter undetected into the country.

CIA concluded that a terrorist group would focus on intensive planning, training and rehearsal of the schemes and tactics in order to ensure the success of its operations. Terrorists will always prefer symbolic targets in order to get attention.

Nuclear and radioactive materials are a benefit for the society but in the same time they could harm it. The terrible results of the Second World War lead to the appearance of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1970. However, the number of states which possess nuclear weapons has increased, these states representing a possible point of acquisition of such weapons for terrorists.

There is no clearly accepted definition of terrorism. Therefore, nuclear terrorism is hard to define. At the proceedings held in Stockholm in May 2001, on “Measures to Prevent, Intercept and Respond to Illicit Uses of Nuclear Material and Radioactive Sources” organized by the International Atomic Energy Agency, the following definition was given: “The use, or credible threat of use, of destructive force against non-combatant/civilian targets for purposes of propaganda, blackmail/extortion or intimidation of a target audience, whereby

- a) the perpetrator has managed to trigger a fission (or fission/fusion) of nuclear material, or
- b) is credibly held to be in possession of weapon-grade nuclear (U, Pu) material and signals intent of first use; or

c) is attacking or sabotaging nuclear reactors or vital support systems (e.g. cooling system) at power stations or nuclear materials (e.g. reactor rods or high-radiation level waste) in transport or at storage sites in order to produce, then or later, an accident or a controlled release/ explosion of radioactive substances, or  
d) disperses in water, soil or air radioactive waste or isotopes, etc. by conventional explosion or dispersion/diffusion.”

According to Brian M. Jenkins, nuclear terrorism like any other terrorist act focuses on three elements:

1. a group’s decision to obtain the nuclear capability
2. the knowledge not only to design a nuclear device but to build it at the same time
3. the actual nuclear material<sup>1</sup>

The access the design for a nuclear weapon does not represent an actual problem. The open literature provides enough information in order to actually build a bomb. In this respect, Graham Allison in his book *Nuclear Terrorism – The Ultimate Preventable Catastrophe* gives the example of a case that happened in 1977, when a Princeton graduate named John Aristotle Phillips managed to build a beach ball ten-kiloton size bomb using the available open literature without having access to any secret papers. That proved that anyone without having extensive knowledge in the field of nuclear materials would be able to build a nuclear bomb which could be used to achieve the own goals. Nowadays, the Internet proves itself to be a reliable source of information, easily accessed and at hand. As one part of the equation seems to be solved, the most important part remains under a question mark. The issue the terrorists are faced with is the procurement of the nuclear material.

There are 4 possibilities<sup>2</sup> to use nuclear assets, which are related to the four faces of terrorism. The first one consists of stealing an already existing weapon and detonating it.

---

<sup>1</sup> Brian M. Jenkins. International Cooperation in Locating and Recovering Stolen Nuclear Materials. *Terrorism: An International Journal*, Vol. 6, No. 4, p. 569

The following approach refers to the acquisition of fissile material, either through theft or purchase, which will lead to creating and detonation the nuclear device. The third face of terrorism refers to attacks on nuclear plants, while the last possibility looks at the dirty bombs.

When talking about biological weapons, one must keep in mind that these weapons refer to “munitions, equipment or other means of delivery including bombs, aircraft spray tanks and other devices, intended for use in the dissemination of biological agents and toxins for hostile purposes.” (Jeanne Guillemin, (2005), *Biological weapons – from the invention of state sponsored program to contemporary bioterrorism*, Columbia University Press, New York, pp. 131-166). Also fearing a biological attack, the United States simulated biological, chemical, radiological (dirty bombs) attacks in such a way as to increase the awareness of the public of the threat of such an attack. Compared to the explosion of a chemical attack which would be immediately localized, the consequences of a biological attack are more difficult to determine.

Without any doubt, nuclear terrorism can cause fear. In the same way, from the consequences it would have on society it cannot be graded, as the psychological effects will be devastating. Still, a nuclear attack could be graded from the point of view of the destructions it could cause. The first two classes of possible incidents will have as consequence a nuclear explosion, resulting in the lost of lives of hundreds of thousands of people and a high cost for the destructions caused.

Graham Allison describes the consequences of a nuclear explosion in his book. He supports that fact that the principal consequences of such an explosion are the high levels of heat and radiation which result from the blast. The temperature which could reach a value of 10 million degrees Fahrenheit would vaporize the bomb's content, the metal case together with the entire infrastructure on a distance of a quarter mile. The first circle will have the most severe consequences. The fireball will continue expanding, resulting in a

---

<sup>2</sup> William C.Ferguson, (May/June 2004), The Four Faces of Nuclear Terror, *Foreign Affairs*, Vol.83, Issue 3, pp. 130-132

second circle. The main characteristic of this circle is a temperature of 13 500 degrees Fahrenheit. Due to the high temperature, the wave will suck all the oxygen into the fire, making the expansion possible. People exposed to the second wave will die not due to fire, but due to asphyxiation and lung burns or overpressure. The radiations of such an explosion will exist for years to come.

### **III. Who could be planning a nuclear attack?**

The ultimate nightmare of all the countries, not only the United States would be a nuclear bomb attack. The question to the question “would terrorists use the nuclear bomb if they had it?” is very simple: yes. Enough nuclear material is available in the world, and the problem is the weak security of the nuclear facilities and of the nuclear weapons.

Still, there is no clear evidence that any terrorist group has acquired a nuclear bomb or the necessary materials to manufacture one. Warning signs do exist and must be considered. Graham Allison provides more information on these terrorist groups in his book.

#### **1. Al Qaeda**

The biggest threat comes from Al Qaeda which is believed to us the bomb should the group possess it. The interest for nuclear material that the group has is well known. Back in 1990s, the group was said to possess a budget of around \$200 million. Its network extended in 6 countries, having more than 60 000 recruits in training camps within Afghanistan. The group not only has a large number of members, but in the same time created affiliations with other terrorist groups around the world.

Al Qaeda had a first attack on the World Trade Center in February 1993, followed by other attacks on the US embassies in Tanzania and Kenya in 1998, while in October 2000

it launched a bombing on the warship USS Cole. The attacks of the group showed an extended capacity toward planning, coordinating and implementation. According to the former CIA director Tenet, Al Qaeda's attack on World Trade Center was "professionally conceived and executed – it showed patience, thoughtfulness and expertise".

But the group moved beyond the attack on 9/11. The interest moved toward nuclear weapons. The headquarters buildings, safe houses, training camps, documents, plans, equipments owned by the group were considered as being proofs for assessing the group as a nuclear threat. In this respect, in December 2001, a proof was offered by Wall Street Journal after it acquired a computer used by the members of Al Qaeda. The information retrieved from the computer pointed in the direction that the group had already acquired chemical and biological weapons which were tested on animals. Within the same field, another proof was given. The plan of what was called the superbomb was found in a house in Kabul belonging to one of the senior Al Qaeda official. The conclusion reached was that "the author understood shortcuts to making crude nuclear explosives". More important, "Al Qaeda was intensifying its long-term goal to acquire nuclear weapons and would likely have succeeded, if it had remained powerful in Afghanistan for several more years" (David Albright – former nuclear weapons inspector).

Al Qaeda believes that " we have the right to kill 4 million Americans – 2 million of them children – and to exile twice as many and wound and cripple hundreds of thousands"<sup>3</sup> "

Although no proof was given regarding the fact the Al Qaeda already possesses nuclear bomb or not, the United States intelligence community sustains the idea that several other types of experiments were already made by the group, such as chemical weapons experiments (including nerve gas), biological weapons (anthrax), and nuclear radiological dispersal devices (dirty bombs). It must be taken into consideration the fact that the groups will not stop until it will have the real thing.

---

<sup>3</sup> Graham Allison, (2005), *Nuclear terrorism – the ultimate preventable catastrophe*, Times Books Henry Holt and Company, New York

Looking further, there are other terrorist groups which should be regarded as a threat to the international security.

## **2. Jemaah Islamiyah**

This group proved itself to be the most active affiliate Al Qaeda has in Southeast Asia. The group focuses on planning and operating in the Philippines, Indonesia and Singapore.

There are two examples which prove the characteristics of the group. The first one dates back in October 2002 when an attack took place at a club in Bali and killed 202 people, mostly westerners. For the attack, two bombs were employed: a 2.2 pounds of TNT in order to create panic and a 330 pounds of ammonium nitrate used to destroy the surroundings. The second example is of the attack which took place in August 2003 on the Marriott Hotel in Jakarta, Indonesia. Twelve people were killed. This attack proved to be an attack on America, as the hotel was the most visible American building in Jakarta.

The goal of this terrorist group is to create a pan-Islamic nation which will encompass Indonesia, Malaysia, Singapore and a portion of the Philippines

## **3. Chechnya**

Another nuclear threat could come from Chechnya. Although the only confirmed nuclear terrorism in Russia happened in November 1995 when a 70 pounds mixture of cesium 137 and dynamite was used, the danger still exists. As the target is Russia, Chechnya is fighting for its independence from Russia. In order to make its voice heard, 800 people were taken hostages at Dubrovka Theater in Moscow. In return for their freedom, the terrorist groups demanded that the Russian troops will withdraw immediately from Chechnya. This event ended with the death of the terrorists together with the loss of 100 civilians.

The Chechen rebels are known for the extreme ruthlessness, such as tortures, executions and beheadings. The Chechen separatism is characterized by ransom kidnappings, robberies, drug and arms trade. As a result, Chechens could be considered a terrorist group, acknowledging the fact that they might have an interest in acquiring and using nuclear weapons and material against their campaign with Russia. There is also a connection between the Chechens and Al Qaeda and other Islamic organizations, which financially support this group.

#### **4. Hezbollah**

The world's attention is also drawn by this very powerful and active group in the Middle east. Former CIA director Tenet considered this group as being Al Qaeda's "equal, if not a far more capable organization".

In 1982, after the Israeli army moved in the south part of Lebanon in order to expel the Palestine Liberation Organization from that region, it decided to remain there. As a consequence, Hezbollah launched a sustained guerrilla war against the Israeli. The withdrawal of the Israeli army took place in 2000.

A CIA report stated that it "would likely react to an attack against it, Syria or Iran with attacks against US and Israeli targets worldwide". Would the group be motivated enough to launch an attack on America? Considering the fact that the group's manifesto in 1985 was "death to America was, is and will stay our slogan", more attention should be given in assessing the threat this group represents.

Like any other terrorist group, Hezbollah receives support. Iran gives \$100 mil yearly, offering in the same time, trainings, weapons, explosives, political, diplomatic and organizational aid. Another possible threat could come from within the group, when a splinter group could make the move toward nuclear terrorism. The group could increase

its power, by joining forces with Al Qaeda like it did in 1996 when it launched an attack on a US military installation in Saudi Arabia.

## **5. Pakistan**

The case of Pakistan offers more information on possible terrorists groups. The MMA or Muttahida Majlis –e- Amal group is the 3<sup>rd</sup> largest groups in Pakistan, known to be pro-Taliban, anti-American, opposing the idea of Pakistan fighting next to the United States in the war on terror. The group could be a possible hiding place for Osama bin Laden.

The Kashmir dispute with India made some terrorist organizations to operate beyond president Musharraf's control. One of these groups is Jaish-e-Mohammed (JEM). The group has the power to start pursuing nuclear terrorism and it also has the reasons to do that, such as to express anger for the fact that the Pakistani president is considered to be a puppet of the United States, to send the American infidel out of the country and in the same time to answer bin Laden's call "to prepare as much force as possible to terrorize the enemies of God".

## **6. Aum Shinrikyo**

Last, but not least, the attention is drawn by the group called Aum Shinrikyo or the Supreme Truth, founded in 1987 by Shoko Asahara who predicted that the world's end would come in 2000 through a nuclear apocalypse. The group started to gather physicists, chemists, biologists and engineers to build a nuclear arsenal.

It began experimenting with sarin, VX, phosgene, sodium cyanide, biological weapons such as anthrax, botulism, Q fever. The sarin gas attack from 1995 which took place in trains entering subway stations in central Tokyo had as goal the destabilization of the Japanese government. Although the attack did not reach the desired outcome, it proved that the groups could be considered a serious threat, being capable of pursuing nuclear

weapons to be used for a future attack. The group benefits from large resources such as \$ 1 billion in bank accounts, more than 60 000 adherents, chemical weapons in Tokyo and a farm in Australia where it tested its weapons on sheep. Although they “were not on anybody’s radar screen”, they proved to be a potential threat to national and international security.

#### **IV. Acquiring nuclear materials**

*Nuclear Terrorism – The Ultimate Preventable Catastrophe* written by Graham Allison looks at the countries from where terrorists could acquire a nuclear bomb or the material necessary to build one. The author argues that the global inventory of nuclear bombs counts up to 20 000 offering a variety of models. Although, a wide category of models is available, it is believed that nuclear terrorist will use a small weapon coming from the arsenal of one of the countries which has them or stolen HEU which is used to manufacture a simple nuclear bomb.

##### **1. Considering the materials**

There is a significant quantity of weapons-grade fissile in the world and such material is produced on a continuous basis. For the type of fuel needed for nuclear weapons there are only two options: plutonium or highly enriched uranium<sup>4</sup>. Both elements require a high level of financial resources in order to obtain the form necessary for nuclear use.

Plutonium results from a process called reprocessing. Through this procedure, a nuclear reaction is created, and as a consequence a slow-moving neutron strikes a uranium 238 atom which will absorb the neutron and thus plutonium 239 results.

---

<sup>4</sup> William Langewiesche, (December 2006), How to get a nuclear bomb, *Atlantic Monthly*, Vol. 298, Issue 5, pp. 80-98

Armies prefer this element for its advantage of going critical in very small quantities. Still, the disadvantage of it is the fact that cannot be employed in a basic canon-type bomb, as it rather has better results in a Nagasaki-type of implosion device. It is argued<sup>5</sup> that plutonium is a difficult element to work with, as it produces complexities which are better to be avoided without a proper place and time for testing. It has a high level of radioactivity which requires shielding, dangerous even in small quantities, can be transported without setting off radiation detectors.

Uranium is the second element which can be used in fabricating nuclear weapons. Uranium has three isotopes: 234, 235 and 238. Only isotope 235 can be used to obtain the nuclear bomb. In order to obtain uranium 235, an extensive process is necessary. This method is named enriching. During processing, it transforms itself many times until it reaches the final form. It starts by being an invisible gas, transforms into a liquid, a powder and finally a dull grey material. From the point of view of toxicity it resembles the lead, sicken the workers who would swallow or breath it in the dust. Another characteristic which makes this element so easily to be smuggled in a country is the low level of radioactivity. It can be transported without any protection, using bare hands, while in the same time it will underpass many radiation monitors with little shield protection. Although it does not require a special protection, it represents a danger as the atoms of U-235 “occasionally split apart spontaneously, and in doing so fire off neutrons, which within a sufficient mass of material could split enough other atoms to cause a chain reaction<sup>6</sup>.”

If the terrorist would not have enough available material to build a nuclear bomb, such as HEU or plutonium, they could turn to another option, the one of the “implosion type” weapon<sup>7</sup>. This weapon will use a set of precise shaped explosives which will be arranged around a less-than critical mass of elements, such as HEU or plutonium in order to crush the atoms of material closer together, resulting in a chain reaction.

---

<sup>5</sup> Ibid 4

<sup>6</sup> Ibid 4

<sup>7</sup> Graham Allison, (2005), *Nuclear terrorism: the ultimate preventable catastrophe*, Times Books Henry Holt and Company, New York

## **2. Points of acquisition**

The following part of the paper will look at the countries which own the nuclear materials and why they are possible points of acquisition and in the same time represent a threat.

### **2.1. Russia**

Russia has the largest nuclear arsenal in the world. According to Graham Allison, the Cold War left 22 000 tactical weapons in no less than 14 out of the 15 newly independent states of the former Soviet Union. But most of these weapons or fissile materials are exposed to theft, due to low security standards.

In 1991, both Russia and United States agreed to the fact that methods to prevent a nuclear threat must be taken, and as a consequence, both countries committed to remove all tactical weapons. It was estimated by the US experts that Russia owns more than 2 million pounds of weapons usable material, which finds itself easily accessible by terrorists, as the facilities where such weapons are located do not have a strong security system, nor trained employees. Before enforcing the security measures, the following issues should be considered: the inadequate resources of the security systems, the low morale of the nuclear workers and military forces, which combined with the low pay lead to selling nuclear weapons or materials for additional benefits. A clear example in this respect is the case of Admiral Igor Khnelnov, who sold items belonging to bases, fleets and divisions in return for benefits.

### **2.2. United States**

United States possesses ten major sites holding enough weapons grade plutonium or HEU to produce nuclear weapons. The quantity amounts to a total of 1.27 million pound HEU and 20 000 pounds plutonium. Like any other country, the human element must be considered, as greed and espionage could prove to be the weak link in the security lines.

### 2.3. North Korea

It has been interested in nuclear technology starting with 1967 when it acquired basic nuclear technology when the former Soviet Union supplied a small research. It pursued this direction of action until 1979 when it build a 30-megawatt thermal reactor which had the capacity of generating plutonium necessary to manufacture one nuclear bomb yearly.

A violation of the Nuclear Non-Proliferation Treaty followed in 1990, when North Korea began reprocessing enough material nuclear for 1-2 bombs. (Graham Allison)

North Korea was already named by the Bush administration a member of the “Axis of Evil” together with Iran and Iraq. After the Assistant Secretary of State James Kelly accused North Korea in 2002 that it engaged in HEU program in order to manufacture nuclear weapons and confronted the officials with “incontrovertible evidence”, the second US-North Korean nuclear crisis followed. The spent fuel from the nuclear power plant in Yongbyon and the possibility North Korea had in producing weapons, created a strong issue between the United States and North Korea in 1994. Diplomacy proved to be the answer for Washington, as the war was not an option.

Compared to US, Russia, China and Japan were more flexible and accommodating toward the Democratic People’s Republic of Korea (DPRK). As a result of talks, an agreement was signed in 2005 between the six parties. Although the agreement was quite vague in details, it offered both sides the possibility to obtain what each was interested in: China, the United States, Russia, Japan and South Korea agreed to provide North Korea with energy assistance; Japan and the United States supported the idea of taking steps in order to normalize relations with the DPRK, while North Korea promised to dismantle the nuclear program it was running.

After the Unites States impounded North Korea bank accounts in Macau, the official refused to return to the talks. In addition, it tested several ballistic missiles in July 2006. Although the tests were not so successful, it brought the world’s attention on North

Korea. In October 2005, the country announced that it had exploded a nuclear device, using most likely plutonium extracted from the Yongbyon reactor.

A new step was reached on February 13, 2007 when a new agreement which reaffirmed the points from September 2005 together with few more details was signed between the six parties. As a result, North Korea agreed to shut down the nuclear facility at Yongbyon and in the same time to allow monitoring and verifications from the International Atomic Energy Agency within a period of 60 days.

As a respond for these actions, North Korea would receive energy and humanitarian assistance from the United States and Japan, including an initial shipment of 50 000 tons of fuel oil. The second phase of the agreement covered important topics: North Korea would dismantle all its existing nuclear facilities, while ways to promote security and trust in northeast Asia would try to be reached by all the six parties. As a consequence, the reactor was shut down in July 2007.

Still, there is no assurance which could be given that North Korea would completely give up its nuclear weapons. Many issues remain to be solved, but a step-by-step approach gives the possibility for further analysis<sup>8</sup>.

But the former Soviet Union although is the largest potential source of nuclear weapons or fissile materials is not the only one. Pakistan has an arsenal of about fifty nuclear weapons and in the same time it possesses the material to produce much more. Fissile material capabilities are said to exist in North Korea, Iran and Libya<sup>9</sup>.

---

<sup>8</sup> Armstrong, Charles K., North Korea taken on the World, *Current History*, September 2007, Vol. 107, Issue 701, pp. 263-267

<sup>9</sup> Graham Allison, (2005), *Nuclear terrorism – the ultimate preventable catastrophe*, Times Books Henry Holt and Company, New York

## 2.4. Pakistan

It was hard to believe in 1977 that a country with such limited scientific but also industrial possibilities like Pakistan would enrich uranium with gas centrifuges. Still, Khan's success supported the world's technological advance which allowed designers to change the high speed rotation of centrifuges.

Pakistan does not have a large quantity of nuclear stockpile, and in the same time the nuclear weapons that it does possess are well guarded. Still, this is not a guarantee that theft might not occur. The danger comes from Al Qaeda which is still operating in the area and from inside the country's nuclear establishment. One example in this direction is Abdul Qadeer Khan, the former head of the Pakistani nuclear weapons program, considered to be the father of the Pakistan bomb, who was ready to build a black market on which the plans for building a nuclear centrifuge were to be found. This example proves the importance of urging the process of security the nuclear material.

## 2.5. Libya, Iran and Iraq

During the years, it was demonstrated that states will consider buying a bomb or the materials necessary to manufacture one if they believe that this will cut the costs and time to implement their own nuclear material production<sup>10</sup>. This is the case of Iraq, which decided to acquire weapons-usable nuclear material from sources which will have access to material coming from the former Soviet Union. After the invasion of Iraq, it was clear for Iraq that there will be an answer from the United States. It was the moment when it decided to launch a "crash program", meaning manufacturing one bomb very quickly, by using the HEU available from the research reactors.

Iran was also sought to acquire nuclear material. It implemented a wide network for acquiring different technologies and materials, including from the former Soviet Union.

---

<sup>10</sup> Bunn, Matthew & Wier, Anthony ( April 2005), The seven myths of nuclear terrorism, *Current History*, pp. 153 - 161

Libya made several attempts to acquire a nuclear weapon once it realized that it did not possess enough technology or scientific base in that respect. An unsuccessful attempt was also made with China.

There is no clear evidence that Iran could be seen as holding a nuclear weapons, as all the cooperation possibilities with the International Atomic Energy Agency failed and no clear conclusion was reached on this matter. Still, an Iranian dissident group announced that Iran possessed nuclear facilities near cities such as Arak and Natanz, 200 miles from Tehran<sup>11</sup>.

Evidence toward supporting this point is represented by the traces of bomb-grade uranium found in August 2003 by the inspectors from the International Atomic Energy Agency (IAEA) at a newly-constructed nuclear site in Natanz. Contamination with highly enriched uranium was found at other locations in Iran, although the Iranian official argued that the traces come from imported components, without offering a clear indication for the origin of the materials<sup>12</sup>. Iran, Libya and Iraq were supplying themselves from A.Q.Khan, the Pakistani scientist who started a black market for centrifuge technology for uranium enrichment. Therefore, the materials could have come from Pakistan. Another option for the acquisition point of the materials could be China. Reports coming from Iranian dissidents, American intelligence and the IAEA showed that the mullahs acquired centrifuges or parts of centrifuges from China. Beryllium, an element used to trigger nuclear weapons, was secretly sent to Iran in 2004. It was shown that Chinese specialists worked in Iran until the end of 2003.

It is not only these countries which are interested in acquiring nuclear bombs. According to former CIA president George Tenet, “The ‘domino theory’ of the 21<sup>st</sup> century may well be nuclear.” Soon every country will be interested in possessing a nuclear bomb. If

---

<sup>11</sup> Jeffrey Lewis, A crisis of confidence, *Bulletin of the Atomic Scientists*, January/February 2007, Vol. 63, Issue 1, pp. 13-15

<sup>12</sup> Chang, Gordon G., (June 2007), How China and Russia threaten the world, *Commentary*, Vol. 123, Issue 6, pp. 24-29

the countries have the chance of obtaining one, we might as well consider that terrorist groups will have one.

## **V. Securing the nuclear material: signs to be considered**

The Nonproliferation Treaty was aimed at Western Germany and Japan. No one expected that the proliferation threat would come from Arab countries, Africa or South America.

The first thing which should be considered when talking about nuclear materials and nuclear bombs is security. If all these material and nuclear weapons would be secured in an effective way, nuclear terrorism would fall in the category of prevention. Still, the security turns to be a issue for all the states. Although there is no clear proof that any terrorist group was successful in acquiring a nuclear bomb or the necessary material to create one, the possibility of a nuclear threat remains and there are signs which should be considered.

The first one refers to the pressure Al Qaeda puts on the international security. This terrorist group made it clear that it is interested in acquiring nuclear weapons. The group had several attempts in trying to acquire nuclear material. In order to achieve its “religious duty” of acquiring nuclear weapons, the groups approached two Pakistani nuclear weapons scientists. As showed, the documents recovered from Afghanistan showed a significant effort in acquiring the necessary material and building an elementary nuclear bomb.

Secondly, after acquiring the HEU or plutonium, a terrorist group would be interested in manufacturing a nuclear bomb. The open literature provides enough relevant information in this respect. The former Office of Technology Assessment conducted a study which showed that “A small group of people, none of whom have ever had access to the classified literature, could possibly design and build a crude nuclear explosive

device...Only modest machine-shop facilities that could be contracted for without arousing suspicion would be required<sup>13</sup>.”

The third point which must be considered is the security level at the nuclear facilities. Theft is an existing and recurring fact. The International Atomic Energy Agency (IAEA) documented 18 cases involving the theft of weapons-usable plutonium or HEU<sup>14</sup>.

A fourth point talks about the possibility that even if terrorist groups manage to steal, buy or manufacture a nuclear bomb, there is no clear guarantee of the fact that they will not be able to smuggle it into a country, despite all the security measures which are implemented. The ease to introduce such weapons in a country is supported by the fact that a nuclear bomb could fit into a briefcase and also by the fact that both plutonium and HEU emit a small level of radiations which could make them undetected.

Last, but not least, the financial consequences a nuclear attack would have on a country are high.

## **1. What should Russia do?**

The United States fears a nuclear attack; therefore it made a priority of preventing such an attack to happen. In 1993 it launched a complex cooperation program<sup>15</sup> with the former Soviet states in order to diminish the chance that nuclear weapons or fissile material will end up in the wrong hands. Two main efforts were made by the United States in this direction. The first one refers to making Russia consolidate, secure and to some extent even destroy nuclear warheads together with the missiles, aircraft equipment and submarines used to carry them. Another effort was made towards securing the stocks.

---

<sup>13</sup> Bunn, Matthew, (2005), Preventing a nuclear 9/11, *Science and Technology*, Vol. 21, Issue 2, pp. 55-62

<sup>14</sup> Ibid 11

<sup>15</sup> William Langewiesche, (December 2006), How to get a nuclear bomb, *Atlantic Monthly*, Vol. 298, Issue 5, pp.80-98

The responsibility of securing these stocks was given to the U.S. Department of Energy, especially to the National Nuclear Security Administration or NNSA. Since it started its activity, the NNSA identifies 220 buildings at 52 Russian sites which require security measures. In this case, the NNSA uses two strategies. The first strategy is basically a “rapid upgrade”, consisting of securing the warehouse windows, using stronger locks, better fences, and more guards. The second strategy refers to a “comprehensive upgrade”. In this case, the strategy for securing the stocks is closer to the American model, meaning crash-resistant fences, bombproof buildings, specialized security equipment such as remote cameras and electronic sensors, bar-coded inventory which will make it harder for employees to smuggle materials outside the building, trained and armed guards.

Still, these types of security measures require constant updating, monitoring and control from both sides. The motivation for keeping the measures up-to-date relies on the human element which sometimes proves to be the weak link.

In his paper “How to get a nuclear bomb”, William Langewiesche, refers to the area of the Siberian side of the Urals, close to Ekaterinburg, Russia, where five of the ten closed nuclear cities exist. The author argues that these sites are production sites, containing nuclear warheads at different levels of assembly, together with several hundred tons of fissile material. During the Soviet times, the cities together with the vicinities were closed for outsiders. The cities were protected with different layers of defence. Even the residents of the cities were expected to be alert to any intruders. The respective paper offers the declaration of one of the Russian plant manager, “All nuclear material was secret. *State* secret! Anyone stealing nuclear material in Soviet Union was committing state crime. He became state criminal! So there was fear. Real fear. If something got lost somewhere - maybe a piece of paper, pr materials, or there was a mismatch in balance of plutonium – a person understood that he would be exiled forever.”

The nuclear cities around Ekaterinburg were subject to the security upgrades made by NNSA. Still, there is a great amount of concern from the independent critics in the United States regarding the fact that these cities are still subject to theft. They take as example

the closed city of Ozersk. During Soviet time, the city was only referred to as No.40, according to its post office box number. Sometimes the city is called Mayak, after the nuclear production area. Mayak is an industrial complex, part of the city perimeter. According to William Langewiesche, the production area employed around 14,500 people as of 2001, producing since 1945 HEU, plutonium and tritium for nuclear warheads. The site is warehousing tons of highly-quality weapons-grade HEU and plutonium.

Mayak is also known as the “Plutonium Palace”, \$350 million warehouse, paid by the U.S. Congress and highly advertised. It was designed to hold around 40 percent of Russia’s military excess fissile material. For different reasons, Russia has not yet used this warehouse for its fissile material.

The need to secure such sites should be a priority for all countries, especially for Russia and the United States. Matthew Bunn in his paper “Preventing a nuclear 9/11” discusses some possibilities for strengthening the security measures which Russia could implement. Before further security strategies would be discussed, an assessment of all sites should be made; exploring the vulnerabilities such sites would have and make proper recommendations for each case scenario. Rapid and dramatic improvement of such measures could be implemented through the active participation of the United States, which could share its experience and advice on implementing different strategies.

One of the strategies discussed is called nuclear terrorism war games. Exercises similar to war games could be proven helpful in making the policymakers in different countries to think in more depth and analyze such a situation from different points of view in order to secure the nuclear stockpiles.

Another available option is represented by U.S. – Russian threat briefing, in which experts from both countries could exploit the possibility through which terrorist could acquire a nuclear weapons and also look at how once such materials are acquired a nuclear bomb may be manufactured.

A third option looks at the national requirements to meet a specified threat. Regular reviews of the vulnerabilities would provide Russia with a clear image of the situation, make it easier to detect the weak points and work in the direction of improving them.

## **2. The need to secure HEU**

Acquiring less than 100 kilograms of highly enriched uranium (HEU) could be sufficient for building and detonating an elementary nuclear bomb. States which are interested in developing nuclear weapons without testing them might also be interested in acquiring HEU. In order to acquire HEU, methods like theft and the black market are used. During the Cold War, both the United States and the Soviet Union produced HEU, 1,800 tons of HEU said to exist nowadays in the world<sup>16</sup>.

HEU is to be found not only at military sites but at civilian sites as well. As could be expected, the civilian sites where HEU could be found are less secure. In the world exists 50 tons of HEU used for non-military related purposes at about 140 reactors used for scientific or industrial reactors or used to manufacture radioactive isotopes for medical purposes.

The recovered quantity of HEU should be diluted with uranium 238 in order to produce low enriched uranium, which will contain less than 20 percent uranium 235, making it unusable for manufacturing nuclear weapons. But collecting all the HEU in the world requires time, and the more time is necessary for the actions to be successfully implemented, the more the chances will the terrorist have in acquiring a nuclear bomb or the necessary material to use.

---

<sup>16</sup> Glaser, A., von Hippel, Frank N., (February 2006), Thwarting Nuclear Terrorism, *Scientific American*, pp.56-63

### **3. Removing vulnerable nuclear material**

As shown, many nuclear facilities are still subject to thefts due to the low level of the security. An option in ensuring that the nuclear material will not be removed from the site by terrorists is to remove it.

But this is not an easy task, as it requires flexibility and creativity in offering the right incentives targeted at the needs of each facility.

An appropriate strategy would be to provide these sites with incentive to shut them down. In order to do that, the direction which should be considered is funding for decommissioning and also for offering the scientists in the productive research new employment possibility once the reactor shuts down.

It is not enough to remove the available nuclear material from various nuclear sites. A cooperation with countries like Pakistan, Israel, India, and China will help improve the security of the nuclear stockpiles. But such a cooperation has its weak points, as the countries may be reluctant in revealing the exact location of the nuclear sites, therefore considerable creativity will be required in order to provide the information, advice and equipment necessary to secure the nuclear materials without compromising state secrets.

### **4. Steps of a new accommodation**

It all starts from the elements required to produce a nuclear bomb: HEU and plutonium. Neither of these elements can be found in a pure shape in nature, therefore extensive and costly processes are required in order to extract the needed elements. Therefore, it is impossible for terrorists to obtain the elements in such a way. Should the nuclear weapons and the fissile material be kept away from terrorist groups, there will not be any material available, and as a consequence no bomb. Therefore, keeping the elements out of reach, nuclear terrorism could be prevented.

The United States together with Russia, made it clear that focusing on international nuclear security should be the main point of focus for all countries. The countries are interested in pursuing “the necessary steps with all who share our views to prevent the acquisition, transport, or use by terrorists of nuclear materials and radioactive substances or improvised explosive devices using such materials as well as hostile actions against nuclear facilities<sup>17</sup>.”

As stated by President George W. Bush, the United States is committed to working closely with the International Atomic Energy Agency (IAEA) in order to strengthen the following points: accounting, control and physical protection of nuclear material; securing the nuclear sites; identify and exterminate illicit trafficking which would involve nuclear materials; implementing measures in order to prevent terrorist groups to acquire such materials; ensure the law enforcement.

The problems in implementing all these measures are of a more bureaucratic and political nature than a budgetary one. Access to the nuclear sites of the countries which possess nuclear weapons and fissile material, exemption from tax payment for threat reduction assistance, determining the responsible party in case of an accident, together with a number of other points are just some of the issues which make the process of strengthening international nuclear security slow.

This process could be accelerated using three directions. The first one refers to the Global Threat Reduction Initiative (GTRI) program implemented by the United States and Russia. As the main concern of this program is the removal of all potential bomb material from facilities around the world, the actions taken in this direction should be implemented in the shortest time frame possible in a flexible, fast and comprehensive manner. Removing such materials as soon as possible will diminish the chances for terrorist groups to acquire nuclear weapons of materials.

---

<sup>17</sup> Joint statement by President George W. Bush and President Vladimir V. Putin of Russia announcing the Global Initiative to combat nuclear terrorism, *Administration of George W. Bush*, July 15, 2006

The second direction line refers to a closer collaboration between the United States and Russia regarding the effort to secure Russia's nuclear stockpiles. Extended access to US and Russian nuclear sites will facilitate the implementation of this process. The problem existing between the two countries refers to the liability issue in case an accident would happen. In the same time, if Russia concentrates its efforts towards consolidating the existing nuclear materials in fewer locations, on one hand will manage to cut costs and on the other hand will be able to reduce the risk of theft.

The issue of a global cooperation is discussed in the third direction. The focus is on a global effort towards locking down all the vulnerable nuclear stockpiles and improving the safeguards against threats.

## **VI. Smuggling nuclear material**

Smuggling seems to be a growing problem for every country. It represents a threat because "is in fact a type of transnational organized crime and organized crime is a threat to national and international security. (...) it denies and destabilizes the existing national legal and social order." (Iztok Prezelj & Marija Gaber, (December 2005), *Smuggling as a threat to national and international security: Slovenian and the Balkan route*, Partnership for peace consortium of defence academies and security studies institutes (PfPC), Athena Papers Series No.5, pp. 5-13)

Smuggling covers a wide variety of materials, such as drugs, weapons, chemical, nuclear, biological and radiological substances. A black market was created in which highly enriched uranium, plutonium, beryllium, radium, palladium and lithium could be acquired. State and non-state actors are interested in the acquisition of such materials; therefore the security of nuclear sites is of primary importance.

The methods of smuggling nuclear materials are very diverse. The terrorists may be using a freight forwarder. Although X-ray and VACIS – a cargo inspection system which uses gamma radiation, are being used, it is not possible to verify all the cargos which arrive in harbours, as it will stop the traffic and it is important to make the trade moving efficiently. FedEx or UPS services could also be used in delivering nuclear materials, if they will be properly shielded and protected in such a way that will not start the radiation alarm.

When talking about the borders, other weaknesses appear. The length of the United States allows enough space for smuggling, as the entire length of the borders is not properly secured. The Canadian border indicates a lack of human resources and no clear delimitation of the border.

Since the 9/11 attack, millions of cargo containers, representing a large proportion of the imports in the United States, therefore more focus was put on this issue.

A relevant example in emphasising the low level of security at harbours is the incident from Jakarta, when 15 pounds of nuclear material placed in a suitcase was successfully smuggled in the Port of LA. The incident proved to be only an exercise organized by a reporter from ABC news, who wanted to show how easy nuclear material could be smuggled within the United States, despite the security measures. The nuclear material which was used was depleted uranium, placed in a Samsonite suitcase and into a container. A door-to-door delivery company from Jakarta was used to have the container delivered at the Port of LA. The container was scanned with X-rays, but this type of scanning only offers a two-dimensional picture providing information over the density of the scanned object and not about what is inside.

When talking about cargos and ships, two points should be considered<sup>18</sup>. The first one refers to the fact that controlling the cargo containers arriving into ports is not an enough

---

<sup>18</sup> Bunn, Matthew & Wier, Anthony (April 2005), The seven myths of nuclear terrorism, *Current History*, pp. 153 - 161

measure. In this respect, many of the initiatives taken after the attack on World Trade Center involved installing detectors at foreign ports which had as destination point the United States. This is an extensive measure, which will require a lot of time to be implemented and in the same time to continue the efforts of ensuring that the measures are implemented by the human factor. The second point refers to the fact that intelligent adversaries will always find a way to smuggle nuclear material in the country by taking the least undefended way.

The level of radiation produced by HEU and plutonium is low and makes the detection more difficult if the elements are shielded. The existing technology requires improvement of a continuous basis in order to detect nuclear materials which could be smuggled in the country, from airline luggage to cargo containers.

### **1. Facts on illicit trafficking**

The International Conference on Illicit Trafficking organized by the International Atomic Energy Agency and held in Edinburgh in November 2007, covered topics such as the threat of illicit trafficking, establishing capabilities to combat illicit trafficking, implementing security measures, security of transport<sup>19</sup>.

Statistics<sup>20</sup> provided by the International Atomic Energy Agency (IAEA) shows that 275 incidents involving illicit trafficking of nuclear material took place between January 1993 and December 2006. Illicit trafficking refers to illegal possession, transportation or attempts to trade these materials. Fourteen of such incidents appear in the Illicit Trafficking Database (ITDB) of the IAEA to have taken place in 2006 alone. Out of the total of 275 cases, 55 percent refer to nuclear material possession, while the rest of 45 percent is represented by incidents referring to radioactive sources. Illegal possession of

---

<sup>19</sup> Retrieved on December 3, 2007 from [www.pub.iaea.org/MTCD/Meetings/Announcements.asp?ConfID=154](http://www.pub.iaea.org/MTCD/Meetings/Announcements.asp?ConfID=154)

<sup>20</sup> Retrieved on December 3, 2007 from [www.iaea.org/NewsCenter/News/2007/itdb.html](http://www.iaea.org/NewsCenter/News/2007/itdb.html)

highly enriched uranium and plutonium was proved in 15 percent of the cases regarding nuclear materials.

The incidents on nuclear materials are not the only ones. The theft or loss of nuclear or radioactive materials was reported in 332 cases. Out of these numbers, 86 occurred only in 2006. In the same time, a number of 398 unauthorized activities took place, being related to disposal or radioactive materials and discovery of “orphan sources”, out of which 51 were registered in 2006. The International Atomic Energy Agency declares that high-risk “dangerous” sources, such as caesium-137 and cobalt-60 were involved in most if these type of incidents. The categorization of such elements as defined by the IAEA Categorization of radioactive sources, RS-G 1.9, refers to the fact that radioactive sources from Categories 1, 2 and 3 are listed as “dangerous”, consider to have the capacity to have consequences on health unless controlled. Although these incidents are categorized and reported, there are some weaknesses in these reporting. It was noticed that 67 percent of the lost or stolen materials were not recovered at the time of reporting, while 75 incidents occurring between 1993-2006 could not be categorized according to the type of incident, as not enough information was available.

In order to keep these incidents under a strict control and supervision, the ITDB was created in 1995. It represents the information system on incidents of illicit trafficking and activities with nuclear and radioactive materials. The system also provides information on intentional or unintentional incidents, either within a country’s borders or outside the borders.

## **2. Interview within the IAEA**

International cooperation is needed in order to prevent nuclear weapons spread. The mission of the International Atomic Energy Agency (IAEA) is to make sure that countries that signed the safeguards agreements implement the measures with respect to the non-proliferation treaty.

According to the definition given by the International Atomic Energy Agency, the safeguards “are measures through which the IAEA seeks to verify that nuclear material is not diverted from peaceful uses.”

Preventing the further spread of nuclear weapons is represented by the Non-Proliferation Treaty (NPT). The treaty entered into force in March 1970, after 40 states ratified it together with the three depositaries: the former Soviet Union, the United Kingdom, and the United States. Today, 190 States signed the treaty and the duration of the treaty was extended indefinitely since 1995. Under the Article III of the treaty, each non-nuclear-weapon State must sign an agreement in accordance with the IAEA safeguards system which will offer the Agency the right to verify if the State met the requirements of not developing, producing or acquire nuclear weapons.

I had the opportunity of interviewing an employee of the International Atomic Energy Agency, working in the Department of Nuclear Safety and Security, within the Division of Radiation, Transport and Waste Safety who provided me with more in-depth information regarding the smuggling of nuclear materials. The objective of this division within the Agency is “To obtain consensus on standards for the safe transport of radioactive material, to keep those standards up-to-date, and to provide appropriate supporting guidance<sup>21</sup>.”

The first question of the interview was related to the way the Agency tries to prevent illicit trafficking. The answer I received was related to the IAEA Safeguards system together with measures that the agency is seeking to implement. Some of these measures refer to securing the radioactive material cargo and increase the security measures taken at different ports in order to minimize the risk that nuclear or radioactive material is illegally transported between States.

---

<sup>21</sup> Retrieved on December 3, 2007 from [www-ns.iaea.org/tech-areas/radiation-safety/transport.htm](http://www-ns.iaea.org/tech-areas/radiation-safety/transport.htm)

In order to implement such measures, different instruments such as conventions, codes of conduct, resolutions and guidance are created. The Convention on the Physical Protection of Nuclear Material (CPPNM) requires the States to categorize any carrying, sending or moving of nuclear material without the state's approval as an act punishable under the national law. In addition, under the UN Security Council resolution 1540 all States are required to develop and maintain effective border controls in order to detect, deter, prevent and diminish illicit trafficking.

I was also interested in the type of materials which are subject to the Safeguards. Different types of materials are subject to the Safeguards system such as highly enriched uranium, plutonium and uranium 233, elements which could be used in manufacturing a nuclear weapon. Natural and depleted uranium are also subject to the Safeguards. To another extend, radioactive sources that do not contain nuclear material do not need to be reported to the Agency under a safeguard agreement.

My third question referred to the consequence in case the Agency detected that nuclear materials were not transported according to the requested standards. The answer was clear: the only measure that the IAEA would take is to make recommendation towards a better transportation of the materials. As the role of the Agency is among others to advise the States which measures should be implemented, it does not have the authority to impose more strict rules.

The answer led me to my fourth question, referring to whether or not the Safeguards are subject to change and if so in what direction. The interviewee answered that the measures within the Safeguard system consists of activities related to verification of the nuclear material at nuclear sites. During the years, the Agency understood the limitations that the system had and modified it in such a way as to increase the authority of the Agency<sup>22</sup>. In the same time it provides inputs regarding the safety transportation of the nuclear material.

---

<sup>22</sup> IAEA Safeguards: Staying ahead of the game, July 2007

The interview apart from providing me specialized information emphasised the fact that there is a continuous need to improve the Safeguards, as they are not a guarantee that nuclear material is not diverted from peaceful meaning. In addition another point to be considered is the human element. Although the Agency is working towards implementing the standards at the highest level, the possibility that a mistake from the people side might occur still exists.

## **VII. Conclusions**

The end of the Cold War placed a lot of pressure on the international security, as nuclear material and nuclear weapons proved to be a threat, due to the possibility that they could be subject to theft. The low level of the security measures left the terrorist groups throughout the world with increased chances to acquire such materials. The proliferation of nuclear weapons proved to be a serious threat for the United States.

There is a global effort made towards strengthening and preventing the global regime for combating nuclear terrorism and “the handful of proliferation problem countries<sup>23</sup>.”

One hypothesis could be made: if all the nuclear materials and bombs would be kept under a strict control and surveillance, then the illicit transportation will be strongly diminished. More accurate information on the exact status of these nuclear materials and weapons would be provided if all the documents will contain exact and complete information regarding quantities, locations or transportation.

Preventing nuclear terrorism starts with protection and safeguards. The third important element to be considered is the nuclear safety. The main focus is to ensure the safe operation of the nuclear weapons and material which in return will provide a higher level

---

<sup>23</sup> Peter A. Clausen , (1993), *Non-proliferation and the national interest – America’s response to the spread of nuclear weapons*, Harper Collins College Publishers, pp. 198-203

of stability and order. As one of the smuggling methods is through carrier, strong export controls represent a measure of combating illicit trafficking<sup>24</sup>.

Nuclear terrorism is preventable by taking the necessary safety measures and focusing on securing the global nuclear stockpiles. The most efficient way in preventing a nuclear catastrophe from taking place is securing the fissile material around the world and working towards stricter regulations from preventing non-nuclear states from acquiring nuclear weapons or materials to manufacture them, and from preventing nuclear states to produce more nuclear weapons.

---

<sup>24</sup> Adapted from *Measures to Prevent, Intercept and Respond to Illicit Uses of Nuclear Material and Radioactive Sources* (2002), IAEA, Vienna

## Bibliography

Allison, Graham, (2005), *Nuclear terrorism – the ultimate preventable catastrophe*, Times Books Henry Holt and Company, New York

Armstrong, Charles K., (September 2007), North Korea taken on the World, *Current History*, Vol. 107, Issue 701, pp. 263-267

Brian M. Jenkins, International Cooperation in Locating and Recovering Stolen Nuclear Materials, *Terrorism: An International Journal*, Vol. 6, No. 4, p. 569

Bunn, Matthew and Wier, Anthony, ( April 2005), The seven myths of nuclear terrorism, *Current History*, pp. 153 - 161

Chang, Gordon G., (June 2007), How China and Russia threaten the world, *Commentary*, Vol. 123, Issue 6, pp. 24-29

Clausen, Peter A., (1993), *Non-proliferation and the national interest – America's response to the spread of nuclear weapons*, Harper Collins College Publishers, pp. 198-203

Ferguson, William C., (May/June 2004), The Four Faces of Nuclear Terror, *Foreign Affairs*, Vol.83, Issue 3, pp. 130-132

Glaser, A., von Hippel, Frank N., (February 2006), Thwarting Nuclear Terrorism, *Scientific American*, pp.56-63

Langewiesche, William, (December 2006), How to get a nuclear bomb, *Atlantic Monthly*, Vol. 298, Issue 5, pp. 80-98

Lewis, Jeffrey, A crisis of confidence, *Bulletin of the Atomic Scientists*, January/February 2007, Vol. 63, Issue 1, pp. 13-15

Joint statement by President George W. Bush and President Vladimir V. Putin of Russia announcing the Global Initiative to combat nuclear terrorism, *Administration of George W. Bush*, July 15, 2006

IAEA Safeguards: Staying ahead of the game, July 2007, IAEA

Adapted from *Measures to Prevent, Intercept and Respond to Illicit Uses of Nuclear Material and Radioactive Sources (2002)*, IAEA, Vienna

Prezelj, Iztok and Gaber, Marija, (December 2005), *Smuggling as a threat to national and international security: Slovenian and the Balkan route*, Partnership for peace consortium of defence academies and security studies institutes (PfPC), Athena Papers Series No.5, pp. 5-13

#### *Online sources*

Retrieved December 3, 2007 from

[wwwpub.iaea.org/MTCD/Meetings/Announcements.asp?ConfID=154](http://wwwpub.iaea.org/MTCD/Meetings/Announcements.asp?ConfID=154)

Retrieved on December 3, 2007 from [www.iaea.org/NewsCenter/News/2007/itdb.html](http://www.iaea.org/NewsCenter/News/2007/itdb.html)

Retrieved on December 3, 2007 from [www-ns.iaea.org/tech-areas/radiation-safety/transport.htm](http://www-ns.iaea.org/tech-areas/radiation-safety/transport.htm)