Nuclear Terrorism: Analysing the Debate

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DECLARATION

I declare that the dissertation entitled **"Nuclear Terrorism: Analysing the Debate"** submitted by me for the award of the degree of **Master of Philosophy** of Jawaharlal Nehru University is my own work. The dissertation has not been submitted for any other degree of this University or any other university.

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CERTIFICATE

We recommend that this dissertation be placed before the examiners for evaluation.

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Chapter One
INTRODUCTION

The issue of non-state actors and weapons of mass destruction (WMD) has been the focus of periodic scholarly research and policy analysis for decades. A major surge of research on chemical and biological weapons terrorism followed the 1995 sarin gas attack on the Tokyo subway by the Japanese doomsday cult Aum Shinrikyo, and an even greater and sustained level of international attention to all dimensions of WMD terrorism has occurred since 11 September 2001. With this attack, terrorists demonstrated their willingness to inflict catastrophic destruction. In the aftermath of the sophisticated attacks by Al Qaeda on United States, the issue of nuclear terrorism has generated particular attention as many analysts have revised their assessments about the readiness and ability of non-state actors to resort to different forms of nuclear violence.

This study concentrates almost entirely on just one part of nonconventional terrorism, nuclear terrorism which includes radiological terrorism. In the debate of nuclear terrorism there emerges a sharp divergence among scholars on the possibility of nuclear terrorism. On the one hand there are a few scholars who argue that nuclear terrorism is possible and it's just the matter of time (for example, Allison 2004, Ferguson and Potter 2005, Cameron 1999, Stern 1999, Sagan 2003, Gunatratna 2002, Lee 1999, Falkenrath 2004, Zaitseva 2007). On the other hand there are a few others who deny its possibility in the near future (for example, Frost 2005, Mueller 2005, 2007, 2008; Waltz 2003, O'Neil 2003, Langewiesche 2007, Strauss 2006). Examining these two sets of arguments is the task that this study seeks to undertake so that the threat emanating from nuclear terrorism can be ascertained. To test these arguments empirically it shall also include the study of Al Qaeda and nuclear terrorism.

Prior to September 11, the literature on nuclear terrorism dealt with the subject from two main perspectives: the means by which terrorists can go nuclear, and the reasons that might force them to use or to reject such a possibility. With the fall of World Trade Centre, the dynamics that underpinned the answers to both of these questions have altered significantly. Not only have the means by which non-state

actors could acquire fissile material changed, but the nature and motivations of terrorism itself have also changed. Moreover, revelations about A.Q. Khan's global nuclear black marketing and Osama Bin Laden's contact with Pakistani nuclear scientists have raised concerns about the prospects of terrorists acquiring a nuclear or radiological weapons capability. In several meetings with Osama Bin Laden, his Egyptian deputy Ayman al-Zawahiri and other Al Qaeda members, Bashirudin Mahmood and Abdul Majeed, earlier employed in Pakistani nuclear weapon program, discussed nuclear weapon technology (Allison 2004). The political turmoil and imposition of emergency rule in Pakistan on November 3, 2007, and the assassination of former Prime Minister Benazir Bhutto on December 27, 2007, has revived the world's attention to the issue of the security of Pakistan's nuclear weapons, and how the world can be assured they remain in safe hands during potential transitions of power. Some observers fear scenarios in which Pakistan's strategic nuclear assets are given to or stolen by Al Qaeda sympathisers or other terrorists (Kerr and Nikitin 2008).

It should be noted that international terrorism, over time, has become a complex phenomenon. The terrorist of the twenty-first century is characterised by the operatives who is part of a loose, yet sophisticated, transnational network whose objective is to overturn global trends that are deemed to be in profound clash with their core religious or political belief system. The ability of terrorist organisations to organise themselves into transnational networks, argues Andrew O'Neil (2003: 106-107), has significantly increased by the rapid globalisation of information technology. For example, the most well known of these groups, Al Qaeda, used encrypted e-mail communication and coded messages on various internet web sites to lecture his ideas of terror. Examples of the new terrorism include extremist fundamentalist organisations, millenarian and apocalyptic-inspired sects, and radical anti-government hate groups. In sharp contrast to the old terrorist organisations, who always justified violence as a tool of achieving a clear-cut political strategy, the violence perpetrated by new terrorist organisations is far less discriminating and a far more lethal as a result. If one looks at the history of recent terrorist attack what unfolds is the fact that terrorist organisations have become more determined to inflict catastrophic terror and have revised their tactics and strategy for the same. As Peter Chalk has opined:

> The prevalence of radical religious imperatives...has significant implications for the lethality of terrorism...the main objective is to inflict as much pain and suffering as possible, with the enemy typically denigrated as fundamentally evil and beyond all redemption (Cited in Neil 2004: 107).

Perils of catastrophic terrorism can best be explained by the introduction of religion in the sphere of terror. Bruce Hoffman has delved with this peculiar association of religion with terror. He argues that the religious explanation of terrorism is the most important characteristic of catastrophic terrorism. He mentions the Islamic Revolution of Iran as a major tipping point which has helped revolutionise the erstwhile notion of terrorism (1998, 2004, and 2006). He further argues that association of religion with terrorist activities has taken a transcendental dimension, and consequently its followers are unconstrained by the political, moral or practical constraints that might affect other terrorist outfits. His views can be seen as reflective of growing Islamisation and radicalisation of terrorism. As Ayatollah Baqer al-Sadr, Shi'a theologian, asserts, "the world as it is today is how others shaped it...we have two choices: either to accept it with submission, which means letting Islam die, or to *destroy* it, so that we can construct the world as Islam requires" (Cited in Hoffman 2006: 90, emphasis added). Similarly Benjamin Netanyahu (1995) has argued that the peril of militant Islam has exacerbated the terrorist threat coming from different terrorist organisations and Al Qaeda might be the next major threat to international peace and security.

William Potter (2006) has dealt with the issue of nuclear terrorism and argues that self-righteous conviction of terrorist organisations will increase the chances of nuclear terrorism. To him, apocalyptic terrorist organisations are more likely to use nuclear explosive because such an operation can enhance their status and prestige. Nadine Gurr and Benjamin Cole (2002) in their chapter on political and theological motivations to using NBC (nuclear, biological, chemical) focus particularly on religiously oriented groups. Starting from the history of Islamic fundamentalism, they try to locate the link between Islamic fundamentalists and NBC (Nuclear, Biological, and Chemical) weapons. One can further argue that the post 9/11 war on terror and resultant interventions in the major Islamic countries have exacerbated the whole question of religion. In the Muslim part of the world these interventions have been seen as an important challenge to their sovereignty and religious independence.

Inspired by such interventions and invasion today's terrorists have broken all the constraints which used to limit their lethality. Gavin Cameron (1999) devotes a chapter on religious terrorism which emphasises the importance of religion as a motivating factor for nascent acts of mass casualty terrorism or catastrophic terrorism. He further says that spate in religious terrorism, especially since 1988, is fuelled by the prevalent belief that the groups' respective religion lies at a vital historical tipping point. He also brings in the notion of globalisation and its harmful consequences on traditional values, along with widespread economic and political upheaval and inequality, leading to heightened feelings of fragility, uncertainty about the future. All these factors have contributed to the rise of new or religiously oriented terrorism.

Since many contemporary terrorist organisations operate independently of state support and there are no legitimacy crises which used to constrain their activities, resulting in moderate mass casualties. This can be taken as a major shift in terrorist's motivation and their willingness to inflict mass casualty. The recent incidents of mass casualty terrorism have sparked fear among the policy makers of the world that a nuclear attack is just the matter of time and there is an urgent need to deal with this threat which is so fanatically motivated that it does not discriminate in killing people. Examples of such concerns can be seen in the statements of President George W. Bush and Vice President Dick Cheney. Right after September 11 Bush "ordered his national security team to give nuclear terrorism importance over any other threat to the United States". Similar sentiments were echoed by Cheney who regarded detonation of a nuclear bomb by terrorists as a major threat to the United States (Ferguson and Potter 2005: 4).

Al Qaeda without any doubt is the best-known and, so far, the most dangerous terrorist organisation in the world. It psychological capacity for mass killing has been repeatedly demonstrated. It is an unquestionable fact that the overwhelming number of accomplished and attempted Al Qaeda-related attacks so far have been conventional in nature and are entirely unrelated to nuclear terrorism. There is little doubt, however, that the network has made determined efforts at researching WMD in order to develop a capacity for unconventional attacks, either with a crude radiological device or by crashing a hijacked airliner into a US nuclear facility. Evolution of Al Qaeda's attitude towards weapons of mass destruction, especially

nuclear weapon, has been a recurring theme in Laden's declaration and rhetoric. From time to time Osama and its associates have issued public declaration and letters expressing a strong inclination for nuclear weapon. Moreover, there have been many reported incidents of Al Qaeda's alleged involvement in many nuclear trafficking cases. With regards to Al Qaeda's plans for nuclear and radiological weapons there are witness reports from the trial following the Al Qaeda bombing of the US embassies in east Africa corroborating previous reports that Al Qaeda has been trying to acquire fissile material since the early 1990s (Lia 2005: 48, Hoffman 2006: 273). In an interview to Rahimullah Yusufzai in 1999 Osama showed his deep interest in nuclear weapons and stated: "Acquiring weapons for the defence of Muslims is a religious duty, if I have indeed acquired these weapon, I am carrying out a duty. It would be a sin for Muslims not to try to possess the weapons that would prevent the infidels from inflicting harms on Muslims (Cited in Gunaratna 2002: 48). There have been incidents such as in 2003 interrogations of senior Al Qaeda commanders, including Abu Zubayda that a dirty bomb plot was within Al Qaeda's grasp (Meyer 2003). Similarly Gary Ackerman and Jeffrey Bale (2004) have mentioned the case where CIA (Central Intelligence Agency) has found rudimentary diagrams of nuclear weapons inside a suspected Al Qaeda safehouse in Kabul. Moreover, Pakistan's close association with Al Qaeda is another area of concern for scholars. Vinod Saighal argues that Pakistan has been a very active supporter of Al Qaeda. To him Pakistan has been helping Al Qaeda to build WMD so that it can continue its proxy war in the subcontinent (2003).

The issue of proliferation is central to the notion of nuclear terrorism. Proliferation defines the means by which terrorists can have their access to nuclear explosives. There is a very vast body of literature which deals with the issue of nuclear proliferation, particularly in former Soviet Union. It has been said that the nuclear black market in the former Soviet Union is 'supply driven'- that there are more sellers than buyers (Schmid 2000: 113). If we browse this particular body of literature we come across a very interesting fact that all the works, dealing with the issue of nuclear terrorism, are highly concerned about the Russian nuclear material. Jon Wolfsthal and Tom Collina (2004) argue that there are many proliferation risks in the Russian territory and these include the poor weapons and material storage, weapon dismantlement etc. Joseph Foxell Jr. (2004) similarly expresses concern over

perils of Russian black market and its implications for nuclear terrorism. Brynjar Lia (2005) discusses the perils of nuclear proliferation and argues that there are several risks of nuclear proliferation to terrorist organisations in relation to state-run WMD programmes. He minimizes the possibility that states can transfer their nuclear arsenals to terrorist organisations on which they have very low control. However, he argues that the illicit trade in the nuclear technology and material might fuel the chances of terrorist organisations trapping into illicit trade and acquire technical know-how and material to produce a nuclear bomb.

Considering the stakes involved in such an attempt and the destruction that it could cause, Anders Corr (2005) has introduced his concept of "negligence doctrine" which can help deter states who may assist various terrorist organisations to fulfil their aspirations of weapons of mass destruction. There are many books and articles which emphasise the perils of global black market, in general, and Russian nuclear material, in particular, and its possible access to terrorist organisations. Though the concern of nuclear material being used for terrorists has been very important since the inception of the nuclear age but the disintegration of Soviet Union and its unsecured nuclear stock piles have, further, exacerbated the probability of nuclear terrorism. The sheer fact that the most terrorist organisations of the world have no definite location make them the most dangerous and invisible enemy which can not be deterred from massive retaliation. However, the issue of weapons of mass destruction is different in the case of state run WMD aspirations where they can be deterred by the international pressure and massive retaliation in case of any nuclear attack. Bernard Finel et al. (2003) argue that the post-modern terrorist organisations are immune to most existing nonproliferation arrangements, whether institutional or diplomatic, thus posing a very severe threat to the current nonproliferation regime.

Terrorism and Nuclear Terrorism

Jessica Stern in her *The Ultimate Terrorists* has given five interrelated developments that have compounded the threat of nuclear terrorism. Firstly, she argues that nuclear weapons are very precious to terrorist seeking to invoke a sense of "divine retribution" to display scientific ability, to kill large number of people, to invoke fear, or to get noticed. Terrorist motivated by goals like these rather than traditional

political objectives are growing in numbers and their resolve for catastrophic damage is clearly visible in their acts of terror. Secondly, she opines, terrorist motivations are changing and with this we are witnessing a new breed of terrorists-motivated by religious conviction or revenge. George Tenet, then director of the Central Intelligence Agency, echoed similar sentiments and warned in 1997 that "fanatical" terrorists and organisations pose an "unprecedented threat" to the United States, and that a growing number of groups are actively seeking to acquire nuclear and radiological weapons. Third, with the collapse of Soviet Union, the black market now offers weapons, material and expertise which could be exploited by terrorist organisation carrying the ominous vision of nuclear violence. Fourth, such weapons are proliferating, even to states known to sponsor terrorism. The possibility that such states might help terrorist in getting hold of WMD cannot be completely ruled out. Fifth, technological advances have facilitated the operation of terrorist organisation and have made terrorism with weapons of mass destruction easier to carry out (Stern 1999: 8, 9-10).

It is to be noted that a nuclear bomb, in its conventional sense, is not the only shape that a nuclear attack can take. There are several methods, as Charles Ferguson and William Potter argue, by which a nuclear terrorist attack can be launched and the results would be disastrous for the entire population of that area. Primarily, there exist four possible ways by which terrorists or terrorist organisations can cause nuclear terror viz. the theft and detonation of an intact nuclear weapon, the theft or purchase of fissile material (either highly enriched uranium or plutonium) leading to the construction of a crude nuclear weapon-an improvised nuclear device (IND), attacks against and sabotage of nuclear facilities so as to cause spread of radiation in the area, and the illegal acquisition of radioactive materials contributing to the engineering and detonation of a radiological dispersion device (RDD)-a "dirty bomb"-or radiation emission device (Cameron 1999, Ferguson and Potter 2005, Allison 1998, WMDC 2006). Among all the possible scenarios, the possibility that terrorist will spread nuclear violence with a practical nuclear device is very remote and the difficulties involved in the construction are enormous. However, the construction of a dirty bomb can be within their reach. Terrorist organisations most likely to pursue one or more types of nuclear violence may be organised in the following categories: apocalyptic groups, politico-religious organisations, traditional nationalist/separatist groups, and

single issue groups. Kurth Cronin (2002) has argued for four types of terrorist organisation viz. leftist, rightist, separatist and sacred. To him the fourth type of terrorist form is the most lethal and devastating.

Apocalyptic Groups

Apocalyptic groups are those who believe that the end of the world is very near. These sorts of groups also believe that they need to take some active role in promoting this event. And that this apocalyptic event is an imperative to be furthered with the use of violence (Ferguson and Potter 2005: 18). These types of groups, argues Kenneth Waltz, kill and destroy for the sake of doing so (2003: 128). These types of groups, driven by urgency and religious passion, often have characteristics-charismatic leadership, isolation, and alienation from the larger society, sense of paranoia, and grandiosity-that make them of great concern as potential nuclear terrorists (Waltz 2003: 130). Similarly, Hoffman has described apocalyptic groups as potential perpetrators of WMD terrorism. The contamination of salad bars of ten restaurants with salmonella bacteria by Shree Rajneesh or the release of deadly nerve gas on the Tokyo subway by Aum Shinrikyo are examples of unconventional terrorism by such groups (2006: 118-119).

Politico-Religious Groups

It is widely believed that religious extremist have the greatest potential for catastrophic terrorism because they lack many of the political and psychological constraints that might bear upon other groups (Frost 2005: 51). These are the terrorist groups who have come to dominate the post-9/11 dialogue on terrorism. These groups are sometimes called "new terrorists". For these types of terrorist groups-"objectives do not limit the means uses". It should be noted that their amount of destruction is limited less by the ends and more by the logistics. (Sagan 2003: 161, Waltz 2003: 128-129). As Hoffman suggests that "terrorism motivated either in whole or in part by a religious imperative, where violence is regarded by its practitioners as a divine duty or sacramental act, embraces markedly different means of legitimisation and justification than that committed by secular terrorists, and these distinguishing features lead, in turn, to yet greater bloodshed and destruction" (1998: 88). These groups are considered to be "hybrid" in the sense that they possess both political and religious motivations and objectives, which are strongly knotted with their rhetoric,

ideology and action. We have had the presence of such hybrid groups in history, but in contemporary time they have potential access to nuclear materials and to very high value targets, making the scope and destruction of their operations unprecedented (Ferguson and Potter 2005: 18-19). In the current circumstances, Al Qaeda is considered to be a terrorist organisation that is known to have an interest in inflicting mass casualty, and especially, in acquiring nuclear weapons and materials.

Nationalist/Separatist Groups

These groups are those groups whose existence is focused achieving some type of political objective for a given ethnic or tribal group. Waltz has argued that these groups have limited objectives and hence the objectives limit the means used (2003: 128). For their purpose nuclear weapons are irrelevant. These groups' motivation to resort to nuclear violence may be restricted by the values of their base area. Their location can also make them extremely vulnerable to massive nuclear retaliation or to concerns of harming their own people from a nuclear attack that took place too close to their geographical location (Ferguson and Potter: 19). Given their sensitivity to these factors, traditional nationalist/separatist groups are less likely to indulge in nuclear violence. As Robin Frost argues in both the Palestinian and Chechen cases "would be WMD terrorist would have to consider the threat of massive retaliation". He further denies the possibility that either of these groups would resort to nuclear violence since that would jeopardise their own existence (Frost 2005: 48-49). Hence, the argument that nationalist or separatist groups would resort to nuclear terrorism does not hold ground.

Single Issue Terrorists

A variety of single-issue groups have resorted to the terrorism to make their points, including eco-terrorists and other environmentalists, anti-nuclear movements, animal liberationists and right to life activists. These groups usually have a very clear set of social or political issues (Ferguson and Potter 2005: 20). The political objectives of such groups, argues Frost, state that they usually discriminate in their acts of violence and engineer operations with very limited objectives, targets and scale. The likelihood exists, however, that extreme groups might view an attack on a nuclear facility that resulted in radiation leak as a prime option for illustrating to the public the dangers of nuclear power (2005: 54).

Having said this, a task that this study sets for itself is to analyse the debate revolving around the prospects of nuclear terrorism. The important question that this study will ask is what does Al Qaeda's pursuit of nuclear weapon tells us about the two opposing arguments on nuclear terrorism. It will take cognizance of Al Qaeda's pursuit of nuclear technology so that the two opposing perspective on nuclear terrorism can be tested. In the final part of this study after analysing different arguments I shall also endeavour to analyse the implications coming out of my conclusion. This study only stands to gain from existing historical and empirical literature. It attempts at strategically using that literature to prepare a thematic framework to apply it on contemporary debate of nuclear terrorism. Strictly speaking, it is the interplay of all the arguments discussed above, after one acknowledges and gains from the present literature, one can find literature gaps. Reviews of the literature on WMD terrorism suggest that there is a need to rethink what we know and to revisit the ways in which we are interpreting what we know. The current security situation, including recent indications of terrorist interest in using WMD, makes it untenable to act leisurely in applying their insights to practical purposes.

The proposed study, limited as it is, attempts to deal with the issue of nonconventional terrorism, especially nuclear terrorism. I have taken up the issue of nuclear terrorism because it poses a very serious challenge to the notion of security in the post September 11 scenario. Nuclear terrorism becomes even more significant because it poses a very grave challenge to the nonproliferation arrangements. This study picks up the two broad arguments which characterise the notion of catastrophic terrorism. On the one hand there are scholars who argue in support of nuclear terrorism and those who deny it categorically. It also tests these two opposing perspective in the case of Al Qaeda and nuclear terrorism. As the above discussion of existing literature on catastrophic terrorism suggests, a study that accounts for the interplay of these two arguments and relates it with Al Qaeda appears to have not been taken up so far. Scholars, especially those who specialise in nonproliferation and WMD terrorism, have either cursorily or from disparate angles, addressed the implications of proliferation on nuclear terrorism. Most international arrangements and institutions, at the core of nonproliferation regime are designed to affect the decisions and policies of only one type of actor in the international community, that is, states. As such, current arrangements do not do enough to halt the spread of WMD

to nonstate actors in the international system. And, yet, it is commonly believed that WMD proliferation among nonstate actors will be critical nonproliferation challenge in the next twenty years. Using these issues to thematically address nuclear terrorism in the light of Al Qaeda may make a useful contribution to the field. It will borrow substantially form the existing literature on terrorism and proliferation. A major part of the study involves scanning the existing literature which deals with the process through which the prospects of nuclear terrorism can be appraised. For the first section (comprising chapter 2, 3, and 4 below) existing literature remains the focus. But rather than re-cycling the existing body of literature, which exists in abundance, the stress would be on identifying themes that connect it with the prospects of nuclear terrorism. This section will also utilise factual information, available in plenty, and its contribution in the prospects of nuclear terrorism. Also, this section of the study will be sensitive to not just broad convergences but also significant divergences and exceptionalities that may turn up while navigating the literature.

Given the second section's (Chapter 5, dealing with concluding remarks) engagement with the interplay of first section (comprising chapter 2, 3, and 4), the study will proceed by analysing the inferences drawn from the first section. It will arrange the contribution of the existing literature juxtapose the same with the evidence and factual analysis accruing from chapter 2, 3, and 4 to explore the result and possible inferences. The study will rely largely on published, secondary literature. Primary sources such as government reports, speeches etc. will be included in the study. It will also prioritise academic literature over journalistic, popular accounts. Contents of various international nonproliferation arrangements, institutions, and conventions will also be incorporated in the study to assess their utility in the prospects of nuclear terrorism. This study would be an inductive study where I would analyse the both existing arguments on nuclear terrorism. A brief case study of Al Qaeda would be included to test the two opposing arguments on nuclear terrorism.

Having outlined what we propose to study in the following pages and also having offered a sketch of the reason for such a study, we must briefly present a glimpse of how we proceed. Chapter 1 concentrate on Al Qaeda and nuclear terrorism. Here, the stress would be on two crucial issues-explaining nuclear rationales of Al Qaeda and tracking its pursuit of nuclear weapon and technology. It

will borrow from some of the more recognised old and recent accounts on Al Qaeda. Chief among these are the works of David Albright et al. (2002), Albright and Holly Higgins (2002), Peter Bergen (2003, 2005), Yonah Alexander and Michael Swetnam (2001), Bruce Hoffman (2006), Mohammad Mohamedou (2007), Rohan Gunaratna (2002), Walid Phares (2005), Clark A. et al. (2004), and Daniel Byman (2003).

Chapter 2 then discusses the dangerous nexus between terrorism, proliferation of nuclear material and technology, and illicit nuclear trafficking networks, and relies upon some of the most acknowledged ones, including Graham Allison (2004), Charles Ferguson and William Potter (2005), Stephen Blank (2006), Brian Jenkins (1998), Renesselaer Lee (1998, 2003, 2006), Jessica Stern (1999), and Lyudmila Zaitseva (2002, 2007). It shall ask an important question-how terrorist organisations can go nuclear-and how illicit nuclear trafficking networks increase the likelihood of nuclear terrorism. A detailed study of nuclear proliferation in Russia and newly independent states (NIS), along with supply and demand side of nuclear trade, would form the core of this chapter. Various statistics, involving nuclear trafficking, would be discussed to analyse the threat of nuclear terrorism. The chapter then discusses the contribution of A.Q. Khan and his proliferation network in promoting the cause of nuclear terrorism. Chapter 3 of this study would take a counter view prevalent in the literature on nuclear terrorism. It argues that the threat of nuclear terrorism, especially true nuclear terrorism employing bombs powered by nuclear fission, is exaggerated, and that popular wisdom on the topic is significantly flawed. There are technical, psychological, and strategic reasons for this assertion, and the chapter would deal with each of these arguments in turn. Potential likelihood of nuclear violence would be considered to make a case against literature which argues that nuclear terrorism is just the matter of time.

Chapter Two

AI QAEDA AND NUCLEAR TERRORISM

The proliferation of nuclear weapon or material to terrorist groups is perhaps one of the most frightening threats to international security. It is beyond any doubt that the growing extremism and technical expertise of Al Qaeda makes it the most dangerous terrorist organisation in the world with unprecedented capability to inflict catastrophic destruction. It is a well established fact that the threat of nuclear terrorism is not a hypothetical possibility but a proven and recurring fact. There have been many incidents when terrorist organisations have conspired to strike the world with nuclear capability, and the most prominent among all is Al Qaeda. The sheer fact that terrorist organisations cannot be deterred from the fear of retaliation makes them the most dangerous, yet, invisible enemy of our times. Perils of nuclear terrorism can easily be seen in President W. Bush's recent *National Security Strategy* where he expressed his concern over the acquisition of weapons of mass destruction-nuclear, chemical, biological, and radiological-by terrorist organisations. He further opined the "crossroads of radicalism and technology" represent the gravest danger. (National Security Strategy 2002: 13). It is important to note that right after September 11 President Bush instructed his national security team to give nuclear terrorism precedence over every other threat to the United States (Ferguson and Potter 2005: 4).

Similar concerns were also echoed by former CIA Director George Tenet who argued that Al Qaeda has repeatedly sought to acquire nuclear material and weapon (Clarke et al. 2004: 134). More recently, Michael McConnell in his report to the *Annual Threat Assessment of the Director of National Intelligence for the Senate Select Committee on Intelligence* has talked about Al Qaeda and its ambition for weapons of mass destruction. In his report he argues that Al Qaeda has continuously sought to acquire chemical, biological, radiological, and nuclear weapons and materials (2008). Moreover, the rhetoric and growing sophistication of Al Qaeda can prove very grave for international peace and security (Bunn 2006). This chapter would try to investigate two basic questions pertaining to nuclear terrorism and Al Qaeda. Firstly, it will try to put forth the reasons, strategic and otherwise, which have

prompted a terrorist organisation such as Al Qaeda to engage in nuclear terror. Secondly, it will track Al Qaeda's pursuit of nuclear weapon or technologies.

It is to be noted that the contemporary acts of terrorism, characterised by the non-territorial dimension, has taken the security threat at an extreme level. In this new scenario geographic, legalistic, and jurisdictional notions are losing their meaning and relevance. This new warfare is well beyond the erstwhile understanding of terrorism which limits itself to guerrilla activities. In the changing scenario the terrorist organisations are looking forward to fundamentally transform the entire region (Sloan 2005: 22-23). The most prominent example of such phenomenon is Al Qaeda's understanding of terror where the goal is to fundamentally transform the face of Arabian Peninsula. Moreover, the brutalisation and internationalisation of contemporary acts of violence validates the point that we have entered into an age of "super" terrorism with its serious implications for national, regional, and global security (Alexander and Swetnam 2001: 6). Moreover, contrary to many analyses, the global war against terrorism has not resulted in the downfall of Al Qaeda and its leadership. The capability of Al Qaeda has increased in the recent years and it has been successful to reorganise itself and reorient its strategy to inflict catastrophic destruction, and thus acting as an epitome for other like minded groups (Garfield 2005: 101).

Al Qaeda's operations and tactics establish that its capability is unprecedented in the history of terrorism. One has to acknowledge the fact that Al Qaeda has been very successful in its adaptation to different strategies and has continually sought to bring more sophistication in its activities which explains in part why it has become a pressing concern for the future (Turbiville 2005: 13). In February 2002, the Al Qaeda-associated Interned magazine *Al-Ansar: For the Struggle Against the Crusader* War published a piece written by Ubeid Al-Qurashi, identified as a close Bin Laden aide. The western debates and discussions of the nature of future war- to include formulations like "Fourth Generation Warfare", "Deterrence", and others- were incorporated in the article, which concluded that the apparent imbalance of forces between Islamic movements and America was far from an indicator of future success, and cited the need for Islam to 'internalise the rules of fourth generation warfare' (Qurashi 2002). Similarly, Mohamedou has also talked about the birth of a "fourth

generation of war" and maintains that the end of the twentieth century and the beginning of the twenty-first century witnessed the erosion of Westphalian symmetrical conflict. He argues that this new war paradigm is characterised by two important factors: the disappearance of intra-state war and the emergence of new patterns of international war. This new international war, according to him is taking place between states and transnational terrorist groups (2007: 25). Moreover, Al Qaeda's WMD pursuit is an important catalyst in achieving its strategic objectives and at the same time gives a new form of legitimacy to the organisation. For Al Qaeda, in the final run, only organisations and states with nuclear weapon or capability are seen as capable of destroying the United States and its followers. This is why the weapons of mass destruction-terrorism-rogue state nexus is important. With the rise in the nuclear weapon states and the dispersion of nuclear material as well as scientific and technological capabilities following the collapse of the Soviet Union, Al Qaeda has the potential ability to acquire nuclear devices to go along with its will combined with capability that distinguishes Al Qaeda from other terrorist organisations, in addition its scope and organisational structure. Despite its utilisation of the tactic or terror, Al Qaeda believes that the final way of destroying the existing structure will be through the use of WMD, most notably nuclear weapon (Bergen 2003). Bergen's insights are important since they explain Al Qaeda's nuclear pursuit from strategic point of view.

Conceptualising Al Qaeda

Al Qaeda is a prominent face of Sunni Salafi Jihadi network with affiliated and supporters spread all over the world (Salma and Hansell 2005: 616). Makhtab al Khidemat is considered to be the starting point of Al Qaeda (Mockaitis 2007, Phares 2005). It began as a simple organisation with a single purpose. The organisation formed its base during the 1980s when Islamist ideologues such as Abdullah Azzam started to recruit fighters from the Muslim world to oppose the Soviet invasion of Afghanistan. When the Afghanistan war drew to a close both Osama Bin Laden and Abdullah Azzam wished to keep the organisation in existence to help other Muslims under threat around the world. In the years that followed and up to today, al-Qaeda has continued to attract supporters around the world with its international jihadist ideology (Mockaitis 2007: 54). Bergen (2003) in his essay "The Dense Web of Al

Qaeda" has conceptualised the operational framework of Al Qaeda as "concentric circles". According to him the inner circle consists of Al Qaeda organisation itself, composed of several hundred members who have expressed their total allegiance to Osama Bin Laden. The second rings consists of several thousands "holy worriers" who are trained in the terrorist camps of Afghanistan. The third ring consists of thousands of radical Muslims who trained in Afghanistan over the past ten years especially in 1979. Finally, the outer ring is represented by those Muslims around the world who are sympathetic to Osama's particular view of the West as the enemy of Islam and Islamic values. To Bergen all these characteristics enables Al Qaeda to represent Al Qaeda as a global revolutionary power that its strategic goals demand.

Another important aspect which needs to be focused while conceptualising Al Qaeda is its vast financial network across the globe. It has been successful in establishing a huge pool of financial resources and the prime reason for this has been the weaknesses and vulnerabilities of democratic and open societies. Liberal policies of democratic states have been a major factor in consolidating Al Qaeda's financial strength. Moreover, various mosques, state sponsorship, illegal enterprises, and religious charities of Al Qaeda work as innocuous means which enable it to generate such wealth (Roshandel and Chadha 2002). These charitable and non governmental organisations are, nevertheless, just for the camouflaging purpose. The money contributed through these charitable agencies goes straight to Al Qaeda and its affiliated terrorist organisations. Besides charities, the huge business investments of Al Qaeda and Osama Bin Laden's global financial network work as a support system to its terrorist operations and activities (Wechsler 2001). The possession of such wealth and resources certainly facilitate the terrorist aspirations and strategy of Al Qaeda.

In his book on Al Qaeda, *Inside Al Qaeda: Global Network of Terror,* Rohan Gunaratna maintains that Al Qaeda is the first "multinational" terrorist organisation of the twenty-first century and it confronts the world with a new kind of threat. He argues that "Al Qaeda has moved terrorism beyond the status of technique and resistance and turned it into a global instrument with which to compete with the challenge western influence in the Muslim world" (2002: 1). Gunaratna while commenting on Al Qaeda argues that its unprecedented mobility, motivation and

capacity to generate wealth pose multiple challenges to international security and can prove very dangerous to international security.

Al-Qaeda Affiliates Worldwide

It is important to note that the Al Qaeda is the only organisation in the history of terrorism which has managed to generate support from many like minded terrorist organisations across the globe. According to an estimate, Al Qaeda has links in some 55 countries and 31 terrorist organisations in the world, and is not restricted to a specific area of operation (Alexander and Swetnam 2001). Given the global reach of Al Qaeda, defining it as a single organisation will not be appropriate. It is a "network of network" which is responsible to link several organisations hidden within sympathetic populations (Mockaitis 2007: 55). It was evident in the operation of September 11 where many people, belonging to different, countries participated.

Nuclear Rationale of Al Qaeda

It is through the lens of Al Qaeda objectives that one can begin to analyse the nuclear aspirations of Al Qaeda. Evolution of al-Qaeda's attitude toward WMD acquisition has been a recurring theme in Bin Laden's rhetoric. From time to time Osama Bin Laden and its associates have issued public declaration and letter expressing a strong inclination for weapons of mass destruction. It is worth noting that all the Al Qaeda objectives are political in nature and as Byman notes are based on power and jihad (2003). It will be explained, in the due course of the chapter that the pursuit of nuclear weapon reflects the rational and strategic choice of the terrorists. What is even more dangerous is the fact that jihadi doctrines do not rule out the acquisition and possible use of weapons of mass destruction and have justified their activities on religious grounds.

Internal Debate within Al Qaeda Concerning WMD Acquisition

It was the formal union of Osama Bin Laden's Al Qaeda and Ayman al-Zawahiri's branch of the Egyptian Islamic Jihad in Afghanistan in 1998 that led to the creation of a more dangerous and radical Al Qaeda. This merger proved a major tipping point

in radicalising Al Qaeda and its operations and facilitated its resolve to engage in WMD terrorism. There are details of internal discussions which emphasise the inevitability of WMD for fighting the crusaders or infidels. According to Masri, an eyewitness of such meetings, in 2001, the Majlis al-Shura, Al Qaeda's ruling body, discussed in length the acquisition of WMD capability. He also mentions that in the initial sessions of WMD discussion the majority of the clerics wanted WMD capability as deterrence against American and Israeli WMD arsenals. In these meetings within Bin Laden's inner circle, members repeatedly raised the following questions: "Who will protect the Arab Mujahideen in their last abode on the face of the earth? How are they to be protected? Who is going to protect the people, the states, the wealth and the Islam of Central Asia, who have scarcely escaped the assault of the 'Red Satan', only to face a more sinister attack from Washington and Tel Aviv?" (Salma and Hansell 2005: 625). Inside Majlis al-Shura, the hawks frequently asked and discussed the issue of WMD in their strategy and operations and rationalised their operations on religious grounds,

> Who would protect the Muslims from them [the United States and Israel]? Is it the UN or the Security Council? Or is it America's friends and allies among the Arab regimes? What if Israel decided to use atomic bombs, chemical or biological weapons against an Arab or Muslim capital? What if America decided in the near future to lay siege on Afghanistan, with its dirty bombs and lethal weaponry? And what would be the Islamic reaction if Afghani cities were targeted from America or Israel with Atomic bombs? (Cited in Salma and Hansell 2005: 625)

If one is to believe Masri, all these internal discussions regarding weapons of mass destruction have encouraged Al Qaeda to change its strategy from conventional warfare to unconventional warfare. He allegedly claimed that though the views were of different opinions in the Majlis al-Shura it was finally agreed that the ultimate goal of the jihad would be the acquisition of an atomic bomb to deter infidel forces from future aggressions. Al Qaeda has also changed the concept of WMD in its thinking and strategy. There has been a shift in the strategy of Al Qaeda regarding the utility of weapons of mass destruction. WMD capabilities are now seen as offensive weapons which should be used as a first-strike option. It is worth mentioning that WMD were long considered deterrent to American aggression in Al Qaeda's strategy. Contemporary Al Qaeda can be seen as a reflection of its changed thinking. In Al Qaeda's rhetoric, attacking America is seen as a tool to bridge the gap between the United States and Arab allies (Sageman 2004). Therefore, Al Qaeda's final strategic

way of achieving its end is not dependent on conventional means but on the acquisition of weapons of mass destruction and the creation of Islamic states with Nuclear capability.

Furthermore, the unification of Arabian Peninsula has been a long cherished aim of Al Qaeda. The organisation has continued its conventional warfare but it has only acted as a mean to weaken the United States and enable Al Qaeda to hold over its areas of operation. Nuclear weapon and weapons of mass destruction act as a big technological jump whose hope of acquisition enables Al Qaeda to further adjust its perception of its ability to defeat the United States. Because Al Qaeda is a non-state terrorist organisation rather than a peer competitor state, the problem of understanding Al Qaeda as a global revolutionary power is exacerbated. This may explain why the United States in the 1990s treated Al Qaeda mainly as a law enforcement problem rather than as an enemy in war (Fishel 2005: 116-127).

What is even more disturbing is the fact that the culture of nuclear jihad is gaining a lot of currency among radical groups. Jihadists will use the nuclear weapon in offensive mode if they calculate that they can achieve their gaols through such a strike. Secondly, in the eyes of Al Qaeda it was the bombing of Hiroshima and Nagasaki which finally put an end to the World War II. Al Qaeda is in the state of war with infidels then certainly the use of nuclear weapon is a very near possibility (Phares 2005: 242-245). Moreover, in the recent years the strategy of Al Qaeda has been to push conflict from the low intensity and conventional domains into the high intensity realm through the acquisition of weapons of mass destruction. For the same it has been outstanding in generating wealth and support from friendly governments who are willing to provide it with aid sanctuary, and personnel (Fishel 2005: 124).

Paul Gilbert's (2003) notion of "privatised collective responsibility" helps explain Al Qaeda interest in nuclear terrorism. According to this argument, civilians are considered to be involved tangentially in the conflict, and seen as accessories to the fact of perceived political hostilities against the populations and interests for which the group claims to speak. It is clear that there is no civilian-military dichotomy in Al Qaeda's vocabulary. The implication of this depiction is that Al Qaeda estimates the citizens of the countries with whom it is at war bear a responsibility in the policies

of their government. This understanding was stated straightforwardly in an interview given by Osama Bin Laden to ABC journalist John Miller in May 1998:

> Any American who pays taxes to his government is our target because he is helping the American war machine against the Muslim nation...Terrorising oppressors and criminals and thieves and robbers is necessary for the safety of the people and for the protection of their property...They have compromised our honour and our dignity and dare we utter a single word of protest, we are called terrorists. This is compounded injustice (Cited in Berner 2007: 71)

In a 20 October 2001 interview with the Kabul correspondent of Al Jazeera, which was not released by the network (but subsequently aired partly by CNN on 31 January (2002) Bin Laden expressed the issue of targeting civilian at length:

> The killing of innocent civilian, as American and some intellectuals claim, is really strange talk. Who said that our children and civilians are not innocent and that shedding their blood is justified?...So we kill the innocents, this is valid both religiously and logically. Some of the people who talk about this issue discuss it from a religious point of view. They say that the killing of innocents is wrong and invalid, and for proof, they say that the Prophet forbade the killing of women and children, and this is true. It is valid and has been laid down by the Prophet in an authentic tradition. However, this prohibition of the killing of children and innocents is not absolute. There are other texts that restrict it...God's saying: And if you punish your enemy, O you believers in the Oneness of God, then punish them with the like of that with which you were afflicted' [Koran 16:126]...We treat others like they treat us. If they kill our women and our innocent people, we will their women and their innocent people until they stop doing so (Cited in Mohamaedou 2007: 42)

The said rational of Osama Bin Laden and Al Qaeda demonstrates the fact that the whole of the populations is its enemy. The stateless, globalised, deterritorialised, and untraceable, Al Qaeda is one such actor which can not be deterred from retaliation. It also proves the point that there is no moral constraint on Al Qaeda to limit its operations to battle field. As Bin Laden explained in a 24 November 1996 interview with the editor-in-chief of the London based Arabic daily newspaper, Al Qods al Arabi, Abdel Bari Atwan:

> Preparations for major operations take a certain amount of time, unlike minor operations. If we wanted small actions, the matter would have been carried out easily...The nature of the battle calls for operations of specific type that will make an impact on the enemy and this calls for excellent preparations (Cited in Mohamedou 2007:49).

In the declaration for war against the United States made by Al Qaeda four months earlier, such strategy, rooted in a tactical acknowledgment of the military imparity, was noted similarly:

> Due to the imbalance of power between our armed forces and the enemy forces, a suitable means of fighting must be adopted, namely using fast moving light forces that work under complete secrecy...It is wise in the present circumstances for the armed military forces not to be engaged in conventional fighting with the forces of the...enemy...unless a big advantage is likely to be achieved, and the great losses induced on the enemy side that would shake and destroy its foundations and infrastructure...spread rumours, fear, and discouraging among the member of the forces (Cited in Mohamedou 2007:50).

Such declaration from Al Qaeda tells us that the organisation is assiduously working on terrorist operations involving nonconventional means. This also highlights the in-depth analysis of the enemy's power. Planning operations properly and moving on the time continuum is a defining feature of the Al Qaeda's strategy. In his January 2006 message to the American people, Bin Laden explained thus the absence of attacks in the United States since September 2001: "as for the delay in carrying out similar operations in America, this was not due to failure to breach your security measure. Operations are under preparation, and you will see them on your ground once they are finished" (Cited in Mohamedou 2007: 50). This shows Al Qaeda's resolve to inflict catastrophic terror. In time, war was declared on America. Twice. On 23 August 1996, Bin Laden and supporters issued a Declaration of War against the Americans Occupying the Land of Two Holy Places. On 23 February 1998, Bin Laden issued a second declaration of war stating that to "kill Americans and their allies-civilian and military-is an individual duty for every Muslim who can do it in any country in which it is possible to do so, in order to liberate the Al Aqsa mosque and the holy Mosque, and in order for their armies to move out of the lands of Islam, defeated and unable to threaten any Muslim" (Williams 2006: 51). That statement was forwarded to the London based newspaper Al Qods al Arabi by Qaeda military committee leader Mohammad Atef for publication.

In an autumn 2001 book entitled Knights Under the Prophet's Banner- excerpts of which were published by the London-based, Arabic language daily Al Sharq al Awsat on 2 December 2001- Ayman al Zhawahiri (2001) had explained the approach and the cost effective rationale of these measures, namely "the need to inflict the maximum casualties against the opponent, for this is the language understood by the West, no matter how much time and effort such operations take...The targets as well as the type and method of weapons used must chosen to have an impact on the structure of the enemy and deter it enough to stop its brutality"

(Cited in Gunaratna 2002: 224). From this statement one can easily get hold of Al Qaeda's vision of catastrophic terror and Zhawahiri, being the second hand of Osama, certainly influences the strategy and operations of Al Qaeda.

On 10 November 2001, Osama Bin Laden declared in an interview in Dawn with Pakistani journalist Hamid Mir: "if American uses chemical or nuclear weapons against us, then we may retort with chemical and nuclear weapons as a deterrent" (Berner 2007: 128). The reciprocal nature of warfare is clearly evident from the above statements. Subsequently, a Saudi scholar, Sheikh Nasser Ibn Hamid al Fahd, authored an amicus curiae-like treatise justifying the potential use of weapons of mass destruction by Al Qaeda, noting that civilian casualties are acceptable if they are the by-product of an attack intended to defeat massively the enemy. All such kind of statements entrust Al Qaeda legitimacy to aspire for nuclear weapons. Al Fahd argued: "The situation in this regard is that if those engaged in jihad establish that the evils of the infidels can be repelled only by attacking them at night with weapons of mass destruction, they may be used even if they annihilate all the infidels". He added:

> Scholars have agreed that it is permissible to bombard an enemy with a catapult and similar things. As everyone knows, a catapult stone does not distinguish between women, children and others, it destroys anything that it hits, buildings or otherwise. This proves that the principle of destroying the infidels' lands and killing them if the Jihad requires it and those in authority over the Jihad decide so is legitimate (Cited in Mohamaedou 2007: 54).

On 30 October 2004, four days before the American presidential elections, Osama sent a videotaped message to the American people 'concerning the ideal way to prevent another Manhattan, and dealing with the war and its causes and consequences', in which he stated: "Your security in not in the hands of Kerry, nor Bush, nor Al Qaeda. No. Your security is in your own hands. And every state that does not play with our security has automatically guaranteed its own security" (Cited in Mohamaedou 2007: 58-59). In the declaration of War against the Americans Occupying the Land of the Two Holy Places of 23 August 1996, Al Qaeda indicated in relations to its reason to resort to war:

> We will list them, in order to remind everyone. First, for seven years, the United States has been occupying the lands of Islam in the holiest of places, the Arabian peninsula into a spearhead through which to fight the neighbouring Muslim peoples. Second...the great devastation inflicted on the Iraqi people...with the protracted blockade imposed after the war

> and the fragmentation and devastation. Third...the aim is also...to divert attention from the Jerusalem...all these crimes...committed by the Americans are a clear declaration of war...and scholars throughout Islamic history agreed unanimously that the Jihad is an individual duty if the enemy destroys Muslim countries (Cited in Mohamedou 2007: 70-71).

Two years later, in the Declaration of War by Osama Bin Laden and the leaders of the World Islamic Front (Al Jabha al Islamiya al 'Alamiya) of 23 February 1998, it is noted similarly that:

> For about seven years, the United States has been occupying the most sacred lands of Islam, stealing its resources, dictating to its rulers, humiliating its people, terrorising its neighbours and turning its bases in the peninsula into a spearhead through which to fight the neighbouring Muslim peoples...Terrorising you while you are carrying arms on our land is a legitimate and morally demanded duty. It is a legitimate right (Cited in Mohamedou 2007: 70-71).

On 21 January 1996, the New York Times featured a self-explanatory lead story entitled "Seeing Green: the Red Menace is Gone. But here's Islam", which constituted a sign of things to come after 2001. Mohamedou also mentions many background conditions which helped radicalise the notion of Islam. Statements such as those of nationally syndicated columnist Ann Coulter who opined that "we should invade their countries, kill their leaders, and convert them to Christianity", or former Italian Prime Minister Silvio Berlusconi's claim, on 28 September 2001, that western civilisation is 'superior' to Islamic one, or Reverend Jerry Falwell's 6 October 2002 remark that the Prophet Mohammad is "a terrorist", or indeed president George W. Bush's 15 September 2001 declaration that "this crusade is going to take a while" attest to the fact that reactions to the 11 September attacks were often along civilisational lines (Mohamedou 2007: 11). Islamic terrorism is not a "product of intellectual determination" (Gerteiny 2007: 33). The main driving force of radical Islam is inherent in its metaphysical vision of the world. It needs to be noted that to achieve those metaphysical objectives terrorist are using strategies which cannot be called irrational or metaphysical.

In his only post-9/11 interview, published in Urdu in the Pakistani daily, Ausuf, on November 7 2001, and in the Arabic-language London newspaper Al-Quds Al-Arabi on November 12, Osama Bin Laden, once again, showed his resolve for nuclear weapons. When asked about his alleged involvement to acquire nuclear weapon, Osama Bin Laden openly accepted that he will not mind using nuclear

weapon if the United States uses nuclear weapon against any Muslim country (Lawrence 2005: 142). In an open letter to Americans in 2002 Osama once again addressed the issue of nuclear weapon and rebuked America for supporting Israel with nuclear technology (169).

It is worth mentioning that there were two major tipping points in 1979 which marked the rise of new wave of Islamic movements. One was the Islamic revolution of Iran and the second been the Soviet invasion of Afghanistan. The aftermath of these two major events was the mushrooming of over one hundred contemporary Islamist movements in the Middle East, Asia, Africa, the Caucasus, the Balkan, and also in the Western Europe (Hoffman 2004, Gunaratna 2002). Moreover, association of religion with terrorist activities has taken a transcendental dimension, and consequently its followers are unconstrained by the political, moral or practical constraints that might affect other terrorist outfits. These views can be seen as reflective of growing Islamisation of terrorism (Netanyahu 1995). What comes out of all these scholarly analyses is the fact that the combination of religion and terrorism has strengthened terrorist resolve for catastrophic terrorism and to achieve their resolve nuclear terror is the natural choice. Moreover, the acquisition of nuclear weapons also increases prestige of the terrorist organisation.

Walid Phares in his book *Future Jihad* has traced the historical roots of jihad and relates them with the contemporary trends of Islamic terrorism. He also argues in his book that the smooth U.S. invasion of Afghanistan has proved an important catalyst and has changed the thinking of the Al Qaeda. The most important lesson that Al Qaeda has learnt is the recognition of the fact that they cannot stop any similar military advance anywhere or anytime unless they acquire a weapon that can deter the Americans. It is in this background that Phares has contended that one major goal of the jihadists now is to buy, steal or even manufacture some sort of weapon that can grant them mass destruction capability. He further says that Al Qaeda's next strategic objective in the region is power in Pakistan. Pakistan being a nuclear armed country may well serve the purpose of jihad by providing them with the ultimate weapon to terrorise the world (2005).

All these reasons compel us to believe that Al Qaeda will have no compunction about using chemical, biological, radiological, and nuclear weapons against population centres. Although the intelligence community reported in the late 1990 that Al Qaeda had acquired uranium in Khartoum and hired Egyptian and Pakistani physicist to research the development of unconventional weapons, it seems the group may have been duped. Intelligences sources now believe that criminals sold Al Qaeda irradiated canisters purporting to contain uranium stolen from Russian army bases, whereas in fact the contents would have had no military value whatsoever had it been passed on to rogue nuclear scientist. However, it does not mitigate the possibility that Al Qaeda has relinquished its nuclear aspirations. Al Qaeda's clandestine research into the CBNR (chemical, biological, nuclear, and radiological) option was instantiated with the support of the elements of the ruling National Islamic Front (NIF) and the Sudanese military. He further claims that its laboratory was housed in Khartoum. According to the CIA, Osama also purchased one kilogram of uranium from South Africa and hired an Egyptian nuclear scientist. Throughout Osama's stay in Afghanistan, the U.S. intelligence community received reports of Al Qaeda's attempts to develop an unconventional warfare capability in Sudan (Gunaratna 2002: 48). Meanwhile there were indications that the Sudanese government had provided assistance with laboratory facilities. Although intelligence on Al Qaeda's attempts to develop CBNR weapons while in Afghanistan was virtually non-existent, Osama various statements on such weapons, especially nuclear weapons, provided an insight into his intentions. In an interview to Rahimullah Yusufzai in 1999 Osama showed his deep interest in weapons of mass destruction:

> Acquiring weapons for the defence of Muslims is a religious duty. If I have indeed acquired these weapons, I am carrying out a duty. It would be a sin for Muslims not to try to posses the weapons that would prevent the infidels from inflicting harm on Muslims (Cited in Gunaratna 2002: 48).

The said statement clearly indicates the need for unconventional weapons. In his 1998 statement Osama Bin Laden can be seen calling upon all Muslim nations to prepare for jihad which should include a nuclear force (Gunaratna 2001: 49). Bilaala (2002), an expert in Islamic apocalyptic terrorism, acknowledged the reports that Al Qaeda is interested in chemical, biological, nuclear, and radiological weapons (Gunaratna 2002: 93). Tantawi while addressing a conference on nuclear strategy

remarked that "Islam calls for strength, but for logical and just strength that stands by the oppressed until he completely vanquished the oppressor". He in the same conference cited the will of Abu Bakr, the first "rightly guided Caliph", who is said to have advised the early Muslims to fight the enemy with the sword if that is what the enemy is using. Tantawi opined: "Had Abu Bakr lived today he would have said to Khaled ibn Al-Wahid: If they fight you with a nuclear bomb, fight them with a nuclear bomb" (Cited in Roshandel and Chadha 2006: 93).

While the United States was never able to definitively establish that Saddam was indeed collaborating with Al Qaeda to obtain weapons of mass destruction, in December of 2002, the Al-Azhar Religious Ruling Committee, perhaps the highest authority in Sunni Islam, made a resounding call to all Muslims that developing nuclear weapons was now be considered a "religious obligation" for the entire Islamic nations. The head of the Al-Azhar committee aired the rationale to a Kuwaiti newspaper:

> Current international circumstances confirm the need for this Fatwa, primarily at a time when Israel and the enemies of the Islamic nation have this weapon. The Islamic nation's nuclear weapon must be used for self-defense, and for demonstrating power, so that none will covetous aspirations about the nation. What is happening to the Muslims in all countries of the world is the result of weakness, and if the Muslims obtain this weapon, no one will conspire against them...Obtaining nuclear weapon is a religious obligation, and anyone who gives up on this weapon is a sinner, according to religious law. Preparation in the face of the enemies, and employing all possible means to defend land and honour, should be considered a religious obligation. (Cited in Roshandel and Chadha 2006: 94).

Similarly, in May 2003, a Saudi cleric, Nasir bin Hamid al-Fahd, issued a fatwa calling upon all the Muslims of the world to start their hunt for weapons of mass destruction. In his religious ruling he addressed the question of whether "Muslims engaged in jihad" are allowed to use weapons of mass destruction and under what circumstances (Cited in Roshandel and Chadha 2006" 94). In his statement he argues, "surely the effect of several kilograms of TNT can be considered mass destruction if you compare it to the effect of catapult stone of old" (95). This is an important landmark in the evolution of al-Qaeda's view of and quest for a WMD capability. As a religious organisation and movement, al-Qaeda has always sought to present itself as working within the limits of what is permissible in Islam and advocates that open jihad against unbelievers is the duty of true Muslims. Prior to

May 2003, Al- Qaeda leadership did not possess any religious justification to carry out a WMD attack on the West or Western interests in the Middle East. However, Shaykh Al-Fahd's fatwa has removed religious constraints and has empowered al-Qaeda-at least in theory-with justification to carry out such attacks even if they result in mass casualties among Western or Muslim civilians. These sentiments were echoed by another important jihadi thinker and operative, Mustafa Sit Maryam, Abu Musab al-Suri, who, in December 2004, published the manuscript, "The International Islamic Resistance Call". The publication of such material in internet led Bergen to comment that the first truly virtual books are produced not only by Silicon Valley but also by jihadists (Bergen 2005). In this 1,600-page global jihadi blueprint and in his "Letter of Reply to the U.S. State Department," al-Suri condemned Osama Bin Laden and his organisation for not utilising the devastating power of weapons of mass destruction in the September 11 attacks. He states, "If I were consulted in the case of that operation I would advise the use of planes in flights from outside the U.S. that would carry WMD. Hitting the U.S. with WMD was and is still very complicated. Yet, it is possible after all, with Allah's help, and more important than being possible-it is vital" (82). He further motivated the Islamic terrorists specially Al Qaeda to include weapons of mass destruction in the Muslim resistance movement (Paz 2005: 82).

It took Layth Islam (2005) no time to publish another important document to push terrorist organisation in the direction of weapons of mass destruction. In October 2005 he came up with a piece entitled-The Nuclear Preparation Encyclopedia-and pasted it on al-Firdaws Jihadi website. It is important to note that Layth al-Islam is considered to a staunch supporter of Al Qaeda. In this extensive multi-chapter document, the author argues that scientific discovery-namely mastery of nuclear technology-is the desired path for al-Qaeda to gain parity with the West and calls for the construction of jihadi nuclear weapons. He states, "I believe that the strategic balance of power on the battle field will not change for the Mujahideen without correct scientific progress". In the same piece while praising Osama Bin Laden for his indefatigable efforts he explained the basic specifications of a nuclear weapon. The author claimed- "I have been studying nuclear physics for two years on various scientific and Jihadi websites" and that his posting is "a present to the Amir [captain] of the Mujahideen Sheikh Osama bin Laden, God bless him, for the Jihad in the path

of god''. Ominously the piece carried basic information on how to make a nuclear weapon with gun and implosion techniques. The content of the material is very alarming because it updated Jihadi understanding of nuclear weapon and its design. This and such information on nuclear engineering equips Al Qaeda and like minded terrorist organisation with much needed information on how to make a nuclear weapon.

Pursuit of Nuclear Technology

It is an undeniable fact that the overwhelming number of accomplished and attempted Al Qaeda-related attacks so far have been conventional in nature and are entirely unrelated to nuclear terrorism. There is little doubt, however, that the network has made determined efforts at researching WMD in order to develop a capacity for unconventional attacks, either with a crude radiological device or by crashing a hijacked airliner into a US nuclear facility. In the case of Al Qaeda the concern is dual. On the one hand the group's extensive resources enable it to engage in WMD terrorism and on the other it has also expressed its desire to use weapons of mass destruction against its enemies. Al-Qaeda's interest in pursuing nuclear weapons is made obvious by statements posted on websites and testimonies from al-Qaeda operatives (Salma and Hansell 2005).

The group is actively seeking weapons of mass destruction (nuclear, chemical, and biological weapons) and on several occasions the group has tried to obtain enriched uranium (Alexander and Swetnam 2001: 32, Salma and Hansell 2005). With regards to Al Qaeda's plans for nuclear and radiological weapons that there are witness reports from the trial following the Al Qaeda bombing of the US embassies in east Africa corroborating previous reports that Al Qaeda has been trying to acquire fissile material since the early 1990s. This shows that Al Qaeda has been very keen in acquiring nuclear weapon (Lia 2005: 48). There has been detailed testimony of prosecution witness Jamal Ahmed Al-Fadl. Reading of testimony clearly indicates that Al Qaeda has always been interested in nuclear weapons and has made serious efforts to acquire nuclear material from various sources. It is important to note that when Al-Fadl was asked about his alleged association with Al Qaeda and its attempt to purchase uranium he disclosed very vital information about the nuclear aspirations

of Al Qaeda. He confessed that he, along with his accomplice Abu Fadhl al Makkee, went to Khartoum to shop for uranium. According to Al-Fadl the price of the uranium involved, excluding commission was $1500, 000 (Alexander and Swetnam 2001, Williams 2006: 27). Given the financial might of Al Qaeda it is beyond any doubt that the price quoted for the said material could have caused any obstacle in Osama's aspirations of nuclear terror. According to Williams, Osama also set up a laboratory in Hilat Koko within the Turkish-held region of northern Cyprus for the testing of nuclear material, including the enriched uranium that had been acquired by him by Jamal al-Fadl (2006: 62). The booming nuclear black market of Sudan is considered to be the place from where Al Qaeda and its operatives had started its nuclear aspirations. In the first three years after the collapse of the Soviet Union, the black Market in nuclear weapons and materials began to boom. Germany reported more than seven hundred attempted nuclear sales which might have been related to Al Qaeda (Barletta and Jorgenson 1999).

There have also been reports of close association between Al Qaeda and Chechens. According to one such report Chechen separatist had sold twenty suitcase bombs to Osama Bin Laden of $30 million in cash and two tons of choice Number Four heroin with a street value in excess of $700 million (Williams 2006: 92). There were several reports of alleged meeting between Osama Bin Laden and Chechens where the price of the nuclear warhead was negotiated. In the same article of *Al-Watan Al-Arabi* it was argued that in lieu of a nuclear warhead from Chechen organised crime figures in Grozny (Chechnya) Osama gave the contacts $30 million in cash and two tons of opium. In the later portion of the article it was argued that Osama Bin Laden was more interested in dismantling the warheads by his own team of scientists and later converting them into the suitcase nukes (McCloud and Osborne 2001). It is worth noting that all these reports came out in public after the declaration of war against infidels by Al Qaeda. It may well have been the case that it was after the declaration that Al Qaeda and its associates intensified their search for nuclear weapon and material. Kabbani, Chairman of the Islamic Supreme Council on American, testified before a committee of the US Department of State that Osama Bin Laden has already purchased the suitcase nukes from Chechens. Later in the same committee he proceeded with the claim that more than five thousand Al Qaeda operatives have been trained for the execution of American Hiroshima (Williams

2006: 94). Gunaratna (2002) has argued that both the terrorist organisations i.e. Al Qaeda and Chechens have had very strong ties and even they had fought "side by side in Azerbaijan from 1993 to 1994 to aid the Azeri mujahadeen in their struggle against Christian Armenia for control of disputed Nagorno-Karabakh enclave". Later in the same book Gunaratna argues that that it would have difficult for Chechens for find a more suitable buyer. Reports of the sale of the nukes to Osama was also corroborated by Calvin (1998) and several weeks later in such in such publications as the Jerusalem Report, Al-Watan Al-Arabi, Muslim Magazine, and Al-Majallah (Williams 2006: 92). All these reports regarding the sale of nuclear suitcase bombs to Al Qaeda were upheld by many international organisations and controlling agencies, including the United Nations. Hans Blix, former Director General of IAEA (International Atomic Energy Agency), told his colleagues in an IAEA meeting that the reports regarding the sale of twenty nuclear suitcase bombs to Al Qaeda were accurate (2004). Blix reportedly made his announcement after visiting Russia. International press including BBC (British Broadcast Company), the London Times, etc. also supported the reports. However, these claims that Al Qaeda had bought a suitcase nuke from the Kazakh state arsenal or from the Chechen militants are termed as spurious by Kimberly McCloud and Matthew Osborne. They argue that it may well have been the case that Al Qaeda was defrauded for large amounts of money (2001).

The *Al-Watan al-Arabi* has given vital information regarding Osama's nuclear aspirations. According to the report Osama Bin Laden is reported to have a team of five nuclear scientists. The chief of the team is considered to be a former employee of an atomic reactor of Iraq. The same report also stated that the scientist were working very hard to transform the fissionable material into a more active source, capable of producing a fission reaction from a very small quantity of material and be packed in a package smaller than the backpack. The same report also delves with the alleged link of former Soviet Union and Al Qaeda. According to the report Bin Laden had hired scientists from former Soviet Union and used to pay them $2,000 per month as salary (McCloud and Osborne 2001). Expanding on information in the October 6, 1998 article in *Al-Hayat,* the Arabic news magazine *Al-Watan Al-Arabi* reported that Osama Bin Laden was engaged in a covert plan to acquire nuclear weapon. Taking inputs from the Russian Intelligence Agency, the Federal Security Service, the report established the links between Osama Bin Laden and several organised crime members

in the former Soviet republics in Central Asia and the Caucasus (McCloud and Osborne 2001). *Al-Watan Al-Arabi* also reported that Bin Laden had tried a different source for obtaining nuclear weapon and material before coming in close contacts with Chechnya. It was reported that the original strategy of Al Qaeda was to engineer its own in house nuclear manufacturing base. The idea was to produce small tactical nuclear weapons which could be used as suitcase bombs and could prove very efficient in terms of mobility (McCloud and Osborne 2001).

Colvin in his article *Holy War with U.S. in his Sight* has also argued about the negotiations between Al Qaeda and Kazakhstan. According to his report there had been a deal between Kazakhstan and Bin Laden related to a suitcase nuclear bomb. In an attempt to thwart the deal from taking place, Israel is reported to have sent a cabinet minister to the republic to persuade the government of Kazakhstan to not help Bin Laden with his nuclear aspirations (McCloud and Osborne 2001). Joseph Farah has argued that Al Qaeda has also sought to acquire nuclear weapons already planted in the United States by the Soviet Union at the time of Cold War. Subsequently, the organisation has sought the support of former Russian Special Forces officers in locating nuclear weapons already planted in the United States by the Soviet Union during the peak of Cold War. In the same piece she has also maintained that Al Qaeda is paying nuclear scientists from Russia and Pakistan to maintain its existing tactical nuclear weapons (2005).

Al Qaeda has also tried to buy spent nuclear fuel. In September 2001, a Bulgarian businessman accepted the fact that one of the accomplices of Al Qaeda approached him to buy spent nuclear fuel form a local plant. However, the deal was not successful but the intentions of Al Qaeda can be seen in the effort. Al Qaeda has sought to acquire nuclear weapon material from every part of the world and seeing the global character of Al Qaeda it may well have been the case that in one of the occasions it might have got nuclear material. The businessman claimed that initially he came across a Saudi dissident. Subsequently, a young chemical engineer approached him to ask if he could serve as a facilitator for the deal. It is important to mention that the spent nuclear fuel can be used to produce both conventional nuclear weapon and radiological dispersal device. If it were to be used in nuclear weapons, it would require reprocessing. Spent fuel is reprocessed by separating neutron-absorbing

fission products from unused fissile uranium 235 and plutonium 239, and fertile uranium 238. This task requires extensive knowledge of chemical processes and reactions, access to various chemicals not commonly available in industry, laboratories with hot cells, shielding to protect against radioactivity, and other equipment to complete the task. Al Qaeda does not appear to have any of these. Spent fuel could be more easily used in a dirty bomb. In this case, the substance would be combined with a conventional explosive that when set off would spread highly radioactive material over a wide area (Boureston 2002).

Bodansky, Chairman of the Congressional Task Force on Terrorism and Unconventional Warfare in Washington DC, told a Congressional Committee about Bin Laden's aspirations for nuclear terrorism and confirmed: there is no longer much doubt that Bin Laden has succeeded in his quest for nuclear bombs". In the same Committee he acknowledged the fact that the Al Qaeda has both the logic and capacity for using nuclear weapon (Williams 2006: 93). The most alarming confirmation about Al Qaeda and nuclear suitcase nukes came form George Tenet (2001), then director of the CIA, who met with President Bush to convey the reports that al least two suitcase nukes had reached Al Qaeda operatives within the United States. He also gave him the information about the design and the material used in the bombs (Williams 2006: 94). It was the aftermath of all these confirmation that President ordered his national security team to give nuclear terrorism priority over every other threat to America (Williams 2006: 94).

There are also arguments which say that Al Qaeda is not capable of maintaining the nuclear weapons. Volynkin (2003) head of the Russian ministry's Twelfth Main Directorate, the agency responsible for storage and security of nuclear weapons, has argued about the lack of expertise among Al Qaeda operatives to maintain the nuclear suitcase bomb. To him the biggest hurdle in bomb's maintenance would be that the weapon must be disassembled every three months so that the nuclear cores can be recharged (Williams 2006: 98). However, the scientists at the Centre for Nonproliferation Studies have disputed this claim. They argue that the nuclear suitcase bombs, more likely, are uranium and plutonium devices that have been boosted with tritium, the tritium would compensate for the required amount of conventional explosives to compress the fissile core in the compact device". To

conclude they argue that neither the uranium nor the plutonium would need frequent maintenance (98). Jacquard (2002) has gone to the extent of saying that as soon as he acquired the weapon he paid an amount estimated to be between $60 and $100 million for the assistance of nuclear scientists from Russia, China, and Pakistan (Cited in Williams 2006: 99).

Another important case which corroborates Al Qaeda's interest in nuclear terror is of Jose Padilla. In May of 2002, the United States arrested one Jose Padilla, an alleged Al Qaeda operative and American citizen when he landed at Chicago's O' Hare Airport en route from Pakistan on suspicion that he intended to build and use a radiological bomb against the United States. The source of this particular information was a captured Al Qaeda leader, Abu Zubaydah, who told his interrogators that Al Qaeda was close to building a "dirty bomb" and was hoping to smuggle such a device into the United States (Roshandel and Chadha 2006: 92). However, interrogation of Jose Padilla and his alleged involvement in a dirty bomb plot cemented the statements of Bin Laden in which he had expressed the idea that Muslims had a religious duty to acquire and use weapons of mass destruction.

Moreover, the discovery of a house near Kabul is another instance which shows the dangerous plans of Al Qaeda. When the United States military searched the house they came across instructions, with many illustrations, for the construction of dirty nuclear bombs and a charred twenty-five page document. Written in Arabic, Urdu, German, and English, this document called "superbomb" showed how TNT could be used to compress plutonium into a critical mass, sparking a chain reaction that would lead to a thermonuclear explosion. David Albright, a former nuclear weapon inspector, examined the document and concluded that "the author understood shortcuts to making crude nuclear explosives" (Cited in Williams 2006: 76). There is another instance which shows Al Qaeda's interest in nuclear and radiological weapons. When United States military was marching???? the streets of Kandahar they discovered material which showed Osama's plans for the future: low grade uranium-238 in a lead-lined canister. Although not weapons grade and unsuitable for the use in the construction of a fission bomb, the uranium could be mixed with conventional explosives to produce a radiological dispersal device. The fact that the retreating Al Qaeda fighters were willing to leave behind such valuable nuclear material-worth

millions on the black market-gave rise to the suspicion that they must have taken their "crown jewels"-a small arsenal of tactical nuclear weapons with them (Williams 2006: 76-77). Similar conclusions were drawn from Mike Boettcher and Ingrid Arnesen who had come out with a complete report on Al Qaeda's nuclear weapon programme in Afghanistan. On the basis of the documents, recovered in Kabul house and considered to be from Al Qaeda, indicate that Al Qaeda was constructing a weapons program. The focus of this weapon programme is considered to be nuclear device. Just after the reports came out about Al Qaeda's weapons program, United States Undersecretary of State John Bolton told??? CNN-"I don't have any doubt that al Qaeda was pursuing nuclear, biological and chemical warfare capabilities. It's not our judgment at the moment that they were that far along, but I have no doubt that they were seeking to do so". The said statements express the sentiments of United States regarding the threat of weapons of mass destruction. Later Bolton acknowledged the fact that Al Qaeda was very close to acquiring nuclear and biological weapon (2002).

This conviction was corroborated by a confidential report from British intelligence that had the mention of two agents who, in 2001, had infiltrated an Al Qaeda training camp in Afghanistan by posing as recruits from a London mosque. The agents were given training in guerrilla warfare. They were also taught religious explanation of their acts, justifying the violence. The two agents swore the bayat, oath of allegiance, and were sent to Herat in Western Afghanistan for special operations. After reaching Herat, they visited an Al Qaeda laboratory where scientists and technicians were allegedly seen working on the construction and testing of sophisticated nuclear weapons that they had developed from radioactive isotopes. This weapon, let alone others that had been produced by the terrorist organisation, has never been discovered (Williams 2006).

It was also the arrest of Khalid Shaikh Mohammed, an accomplice of Al Qaeda, in Pakistan, on March 2002. After days of interrogation, the terrorist chief admitted that Osama was preparing to create a "nuclear hell storm" in the United States. Unlike other attacks that could be planned and conducted by lower-level Al Qaeda leaders, Khalid Mohammed said, the chain of command for the nuclear operation-"the American Hiroshima"-answered directly to Bin Laden, al-Zawahiri,

and a mysterious scientist called "Dr. X". (Williams 2006: 77-78). Subsequently, CNN appointed a team of experts to translate and comprehend the major findings of the document and the group, unequivocally, agreed that the Al Qaeda was exploring its options in the weapons of mass destruction. According to the findings of the experts it was a design for the construction of a nuclear weapon that would demand weapon grade plutonium. However, it was commonly agreed that the design could have helped Al Qaeda in the making of a radiological dispersal device. The group concluded, after reviewing and browsing several hundreds pages of documents that Al Qaeda was working on a serious nuclear program. What is even more ominous is the fact that in one of the meeting of Al Qaeda terrorist were displayed a cylinder like thing and it is believed by the United States intelligence officials that it had radiological material which could have been used in the construction of dirty bombs. As one of the member of the expert team commented-"And that's one of the things that has to give you pause, is that they have been thinking about this a long time". One of the documents in the bunch was reportedly having the mention of super bombs. The experts believe it to be the label for nuclear weapon. Albright et al. When called upon to review the reports of Al Qaeda alleged involvement with nuclear weapons concluded that neither Al Qaeda possesses nuclear weapons or sufficient fissile material to make them. However, they acknowledged the fact that the construction of a crude nuclear device cannot be overruled if they can obtain enough plutonium or highly enriched uranium. While summarising the findings of the team Albright commented-"It's not just a bunch of guys climbing along some jungle gym and going through tunnels and shooting their guns in the air," Albright said. "These are people who are thinking through problems in how to cause destruction, for a well-thought-through political strategy" (Albright: 2002).

Whitlock mentions the case of alleged attempt of Al Qaeda to purchase uranium in 2002. According to the report in January 2005, German authorities arrested suspected al- Qaeda member Ibrahim Muhammad K. for attempting to purchase roughly 48 grams of uranium. Muhammad had allegedly contacted an unspecified source in Luxembourg to facilitate the deal. Similarly, Arostegui (2003) has dealt with a case when an Al Qaeda affiliated group attempted to attack a French nuclear power plant at Cap de la Hague (Salma and Hansell 2005). The above discussion of the evidences clearly indicates that Al Qaeda has no hesitation in using

weapons of mass destruction, especially nuclear weapon, and the coming years will certainly witness the rigorous efforts from terrorist organisations to acquire nuclear weapon and material.

There were also alleged reports that Bin Laden has managed to engineer his own crude nuclear weapon from the highly enriched uranium and plutonium that he managed to acquire from the black market of Pakistan. The country (Pakistan) is home to thousands of radical mosques and madrassahs along with a host of terrorist organisations, including Jammaat-e-Islami, Jaish Mohammed, Ḥezb-ul-Muhahadeen etc. The hero like image of Bin Laden is an important reason to believe that the officials working within the Pakistani government might have helped Al Qaeda in stealing classified information regarding the construction of a nuclear bomb. The alleged meeting of A.Q. Khan and various members of his team with Osama Bin Laden has taken the issue of nuclear terrorism to extreme level (William 2006: 104). There is one well documented report involving Al Qaeda and Pakistani nuclear scientist exemplifies the point. This meeting is very important because it was the first concrete information on alleged involvement of Al Qaeda and Pakistani nuclear scientists. Corey Hinderstein have also expressed his concern over the alleged involvement of Al Qaeda with Pakistani scientists and argues that many Pakistanis, both in civilian and military fields, are vocal supporters of Taliban. According to him there are many militant Islamic clerics who oppose the government's cooperation with United States. He has tried to establish the links between militant Islam and Pakistani nuclear weapons. In his article he seems to be advising United States on how to handle the deteriorating situation in Pakistan. He seems to be quite confident about the links of Al Qaeda and certain factions of Pakistani army. He argues that the increased production of highly enriched uranium might lead to some security problems in Pakistan. He also highlights the nexus between Al Qaeda and the officials in Pakistan. In his assertion the possible link between Bin Laden and a small number of guards, sympathetic to Islamic Fundamentalist cause, can prove to be very fatal for the international security. He also considers the possible toppling down of government and argues that in that condition it would be very difficult to safeguard nuclear weapons and material capable of bringing catastrophe in the world (2001).

In August 2001, the Washington Post came with a report which claimed that a meeting was being held between Osama and two key former officials from Pakistan's nuclear weapons program. Over the course of three days of intense discussion, he and Ayman al-Zawahri quizzed Sultan Bashiruddin Mahmood and Abdul Majeed about CBNR weapons. Al Qaeda had sought out Mahmood, one of Pakistan's leading specialists in uranium enrichment, for his capabilities, his convictions, and his connections (Albright and Higgins 2002). Mahmood was a former employee at Pakistani Atomic Energy Commission and had been a key figure at the Kahuta Plant that had developed Pakistan's first nuclear bomb in 1998. Because of his close association with various radical elements he was forced to leave the Pakistani's Atomic Energy in 1999. After leaving the agency Mahmood founded a charitable agency with Majeed, who had rendered his services to Pakistan's Atomic Energy Commission as a director. Ominously, Mahmood predicted in a piece that "by 2002, millions may die through mass destruction weapons, terrorist attacks and suicide" (Clarke et al. 2004: 134-135). Fortunately, Mahmood and Majeed were arrested in October of 2003 and interrogated by joint Pakistani-CIA team. According to Mahmood, Bin Laden was particularly interested in the nuclear weapons. Bin Laden's colleague told the Pakistani scientist that Al Qaeda had succeeded in acquiring nuclear material for a bomb from the Islamic Movement of Uzbekistan. In his meeting with Laden Mahmood subsequently told him that the material could only be used in a radiological dispersal device. His assertion was based on his examination of the uranium which was not enriched enough to help in the construction of a nuclear bomb. Al-Zawahri and others then asked Mahmood to look for a Pakistani scientist who could supply uranium of the required purity, as well as help in manufacturing a nuclear device. Pakistani officials acknowledged the fact that Mahmood and Majeed "spoke extensively about weapons of mass destruction" and solved every query which sprang from Osama regarding the construction of nuclear weapon. In the end, United States intelligence agencies while summarising the findings of the investigation claimed that Mahmood and Majeed had given Osama with a blue print for constructing a nuclear weapon (Clarke et al. 2004: 135).

To conclude the discussion so far, the chapter has emphasised the nuclear pursuit of Al Qaeda. It has also tried to delve with the reasons which have prompted a terrorist organisation to engage in the acts of catastrophic terrorism using nuclear

weapons and materials. It can be argued that the two main facilitators of its outreach have been its expanding global network and its expressed willingness to inflict mass casualties in the world. Moreover the importance of reviewing group's own literature and manuals in unearthing the group's rationale for weapons of mass destruction needs to be stressed. It is true that the group's efforts to build nuclear weapon and radiological dispersal device have not been successful. Nevertheless, one has to acknowledge that the Al Qaeda has made continuous effort to manufacture and obtain radiological material.

Chapter Three

NUCLEAR PROLIFERATION, ILLICIT NUCLEAR NETWORKS, AND NUCLEAR TERRORISM: HOW TERRORISTS CAN GO NUCLEAR

The nexus between international terrorism, proliferation of nuclear material and technology, and illicit nuclear trafficking networks has emerged as one of the most troubling security issue of the twenty first century. This chapter addresses a crucial international concern of the contemporary time and beyond-the illegal trade in nuclear materials and technology-and raises the central issue of whether such traffic poses a threat of consequences to international security and stability. It will ask an important question-how terrorist organisation can go nuclear-and how illicit nuclear trafficking networks increase capability of terrorist organisations to engage in catastrophic terrorism.

Contemporary incidents of proliferation clearly suggest that proliferation is no longer restricted to states. The revelations of Khan's illicit nuclear trafficking[1] network transcend the alarming possibility that nuclear proliferators, suppliers, and consumers could have a "one-stop shopping mart" where they could covertly buy and sell nuclear technology and material, allegedly without government knowing what is transpiring (Blank 2006: 16). What is even more disturbing is the fact that a few terrorist organisations such as Al Qaeda and Chechens have already expressed their desire for nuclear weapons and are actively seeking to acquire them (Bunn 2006, Joyner 2007). The possibility that a terrorist group will resort to nuclear terror has increased because of unrestricted and indiscriminate use of military forces against the Afghan and Iraqi people and outburst of anti-Americanism in the Muslim World (Kokoshin 2006, Nair 2007).

[1] According to IISS (2007) the term illicit nuclear trafficking "denotes the trade in nuclear related expertise, technologies, components or material that is being pursued for non-peaceful purposes and most often by covert or secretive means. Often the trade is not explicitly illegal, but exploits loopholes in national export regulations. Black, in this case, means shades of grey, particularly when the complicity of the suppliers is not apparent. This definition thus expands on the term nuclear black market as it was popularised in the 1990s to refer to the illicit trade of fissile material or loose nukes from the former Soviet Union" (9).

There have been concerns of nuclear proliferation to terrorist organisations in relation to state run WMD programmes. Although the chances that states intentionally will provide terrorist groups with nuclear weapons are very bleak, state controlled WMD programmes however pose a serious proliferation risk to terrorist groups. One reason for this to believe is that states, when pursuing internationally banned weapons programmes, must seek the technology and material they need covertly and must often rely upon various shadowy trafficking networks and thus vulnerable to double cross and diversion. The demand for an illicit underground proliferation market is thus created, involving international criminal networks where state control is almost minimal. It is possible that certain terrorist organisations will continue efforts to tap into this illicit trade and acquire material, technical know how and expertise, which ultimately will bring them closer to acquiring a practical nuclear weapon (cf. Jenkins 1998, Lia 2005). The example of illicit nuclear trafficking network of A. Q. Khan is a case in point. Due to international restriction on sales and nuclear and dual-use technologies, the Pakistani nuclear weapon programme was pursued in a clandestine, without much state oversight.

Nuclear Proliferation in Russia and Newly Independent States (NIS)

Illicit trafficking of nuclear and other radioactive material emerged as a serious international concern after the collapse of the Soviet Union in 1991 and has made nuclear arsenal, material and technologies more accessible to proliferant nations and terrorist groups alike (O'Neill 1997). Easier access to fissile material is largely attributed to the collapse of the former Soviet Union and the growth of illicit nuclear trafficking that originated from it (Cameron 1999). Thousands of weapons and tens of thousands of potential weapons (stocks of highly enriched uranium and plutonium) remain today in over 50 unsecured storage facilities in Russia, vulnerable to theft by determined criminals who could then sell them to terrorists (Allison 2004: 9, Wolfsthal and Collina 2004: 297). The degradation of economic and social conditions in the newly independent states (NIS) that followed the collapse left open poorly guarded nuclear and radioactive material vulnerable to an improved and criminalised that saw it as yet another commodity for trade (cf. Ferguson and Potter 2005, Zaitseva 2002, Lee 1998, Cirincione 2005, Gressang 2001, Stern 1999, Perkovich 2005). In 1994, Interpol conducted an analytical study of cases of illicit trafficking in

radioactive material covering Eastern and Western Europe. In most of the cases the origin of the substances, although not possible to determine, were mainly from countries of the former Soviet Union (IAEA 2007). Speaking on the deteriorating situation in former Soviet Union, former Senator Sam Nunn opined in 1994 hearing:

> Today in the Former Soviet Union we have a situation where literally thousands of nuclear scientists do not know where their next pay check is coming from or how their families will be fed. Today in the former Soviet Union we have a situation where thousands of military personnel who have access to highly sophisticated conventional weapons, and even nuclear warheads, are faced with drastic reductions in their standard of living. Under these conditions it is no longer too fantastic an idea to imagine a scenario in which chemical or biological weapons, missile technology, nuclear materials or know-how, or even nuclear weapons themselves could fall into the hands of criminal elements (Cited in Lee 1998: 71).

In March 1996, former Director of Central Intelligence John Deutch warned that the Soviet collapse has brought about "the chilling reality ... that nuclear materials and technologies are more accessible now than at any other time in history" According to U.S. intelligence, the deteriorating economic situation, low pay and poor morale among Russian military personnel "could undermine the [nuclear weapons] stockpile's security, making theft of warheads or subcomponents possible" (Cited in O'Neill 1997: 4). Lee (1998) also echoed similar concern and attributed deteriorating economic situation in the former Soviet Union for nuclear proliferation. Lax security arrangements in Russia led one Russian special investigator to comment with some exaggeration- "potatoes are guarded better than radioactive materials" (Taylor and Horgan 2000: 117). There are many reasons which compel analyst to make such statements. In a very dangerous and astonishing case the government of Kazakhstan found a half-ton cache of highly enriched uranium that had been abandoned at Ulba Metallurgical Plant. In 1993 the government of Kazakhstan requested the United States for help in disposing the material. When United States officials visited Ulba, they found nearly 600 kg of weapons-grade uranium was stored behind wooden doors protected only with padlocks. It is to be noted that the quantity and quality of the material was enough to produce some two dozen nuclear weapons. Fortunately the material was brought to United States where it was converted into low enriched uranium suitable for commercial power reactors. In another case the government of Georgia found a cache of highly enriched uranium and spent fuel at an obsolete nuclear reactor outside Tbilisi, and requested United States help in disposing of it. Both the cases reflect the security of nuclear material in newly independent states. It is very likely that other forgotten caches of highly enriched uranium are scattered

about the former Soviet Union. In both the cases the government of Kazakhstan and Georgia acted in a responsible manner and averted a big catastrophe to come (Stern 1999: 132, 96).

The security of the nuclear assets in the Soviet successor states has been a constant threat to international security. The weakened controlling and monitoring ability of NIS have increased the possibility that nuclear material and even complete nuclear weapons could be stolen and sold to terrorist organisations. Several factors highlight the significance of this threat. Firstly, the huge quantity of former Soviet fissile material has been stored outside of weapons. According to an estimate some 600 to 650 tons of fissile material are scattered among 300 buildings at more than 50 nuclear facilities. Even a single weak link in any of these facilities can prove very dangerous and can provide a major "proliferation catastrophe". Secondly, the lax security arrangements and accounting system at many nuclear weapons facilities can prove to be a potential target for terrorist organisations. Thirdly, the deteriorating economic situation of employees in the nuclear complex can be a motivating factor for theft and criminal engagements. A fourth concern is that Al Qaeda has made some serious efforts to acquire weapons or sufficient quantity of fissile material and expertise to manufacture them from Soviet successor states. It is quite easy to comprehend that Russia's vast and troubled nuclear complex has been a potential target of such malicious attempts. Additionally, the extraordinary length of Russia's border with neighbouring countries which runs some 12,000 miles, underscores the immense challenge of preventing clandestine exports of nuclear goods from that country (Lee 2003).

It has been argued that nuclear black market in the former Soviet Union is "supply driven"-that there are more sellers than buyers (Taylor and Horgan 2000: 113). Fresh concerns over the control of nuclear arsenals and fissile material throughout the former Soviet Union have emerged as the more immediate and urgent security threat (Finel et al. 2003: 45). In 2001, Howard Baker and Lloyd Cutler came up with a report on proliferation of weapons of mass destruction. In their report they hailed use of weapons of mass destruction as "the most urgent unmet national security threat to the United States" and opined that the former Soviet arsenal of weapons of mass destruction threatens to become a "goldmine for would-be proliferators". In the

same report they described Russian proliferation as a clear danger to international security and feared the possibility that weapons of mass destruction in Russia could be stolen and sold to terrorists and used against America or its allies (Baker and Cutler 2000).

Thefts of weapons-usable material and attempts to steal nuclear weapons are not a hypothetical possibility, but a proven and recurring fact in Russia. In February 2002, the US intelligence community confirmed to Congress about the theft of weapon-grade nuclear material from some Russian institutes. Viktor Yerastov, chief of Minatom's Nuclear Materials Accounting and Control Department in Russia, opined that sufficient quantity to produce a nuclear weapon was stolen from Chelyabinsk administrative region in 1998 (Wolfsthal and Collina 2004: 291). In Ecuador in December 2002, thieves held five stolen radioactive sources ransom but returned only three, after the ransom was paid, suggesting the other two are now available on the black marked, perhaps accessible to terrorist buyers or their intermediaries. In another recent case, a radioactive source stolen in a carefully planned operation in Nigeria later turned up in Western Europe, again highlighting the growing scale of illicit trafficking in these materials. Most dangerous of all the cases that have come to light, however, was the theft in 2003 of three of the world's most potent radioactive sources-Russian "nuclear batteries"-each potentially containing enough radioactivity to make an urban area the size of the District of Columbia uninhabitable (Ferguson and Potter 2005: 1-3).

Nuclear Black Market Players in Russia and NIS

Supply Side

The supply side of the black market in nuclear materials consists of individuals who have access to nuclear materials (i.e., insiders) or those who can gain such access unlawfully (i.e., outsiders). It also includes intermediaries, who search for buyers, negotiate deals and deliver the material to the end user, the majority of known diversions from nuclear facilities have been committed by insiders, such as operating personnel and security guards, working independently or as a group. Thefts involving insiders are most common, especially for nuclear material. For example, out of seven known thefts or attempted diversions of weapons-usable fissile material (Podolsk in

1992, Andreeva Guba in 1993, Sevmorput in 1993, Electrostal in 1994 and 1995, Sukhumi in 1992-1997, and the Chelyabinsk region in 1998), six were committed by insiders (Zaiteseva and Hand 2003).

Two reasons can be attributed for this phenomenon. Firstly, insiders are generally better suited for carrying out any illicit activity at their own facilities, as they are sufficiently familiar with the security systems to be in a position to exploit their vulnerabilities. They also have the access to sensitive areas of a nuclear facility. Secondly, the physical security systems at nuclear facilities in the FSU (Former Soviet Union), where most nuclear materials theft have been recorded, were designed to protect against a threat from outside the country, rather than from security violations by their own personnel (IISS 2007: 131). As Wolfsthal and Collina (2004) argue that the current security arrangements may not be sufficient to address today's challenge of a knowledgeable insider collaborating with a criminal or terrorist group (194).

It was only after the collapse of the Soviet Union that the major drawbacks in the nuclear security began to surface. Before the break-up of the Soviet Union the security of the nuclear weapons and materials were in the hands of KGB (Komityet Gosvdarstbennoy Bezopasnost, Committee for State Security) and the nuclear workers usually had to undergo a strict selection criteria. Another important thing which dissuaded workers to indulge in any illicit activity was the social prestige which they used to enjoy in the Soviet society. Associated with this was the lack of financial motivations which prevented them from carrying out any illegal operation (IISS: 131). However, with the collapse of the Soviet Union, the situations transformed very drastically and the once pampered nuclear scientists were faced with a loss of status and low, often delayed, pay. The tight KGB control over the personnel of nuclear facilities was significantly diminished (Zaitseva and Hand 2003). The situation created favourable conditions for successful diversions of nuclear materials, both by those driven by new financial hardships, and those merely tempted by the possibility of making quick and fast money. The first known Russian nuclear thief, Leonid Smirnov, who diverted 1.5kg of weapons-grade uranium from a research facility in Podolsk in 1992, was representative of the former category. He confessed that his motivation was to get enough money to buy a new refrigerator and a stove.

Other thieves and their accomplices were more ambitious, and often tried to sell material for hundreds of thousands of dollars. Therefore it is quite evident that the insiders successfully exploited gaps in both physical protection systems and accounting practice to gain petty benefits (IISS: 132).

It is worth mentioning that the incidents of nuclear trafficking have always come to light when material was still in the possession of would-be suppliers and the most reliable information is restricted to those parties who were unsuccessful in selling the material (Potter 1995). These suppliers are usually held because of their ill-concealed efforts to advertise their illicit wares (IISS 2007: 131). The first and most notorious insider theft occurred at the Luch Scientific Production Association in Podolsk in 1992, when deteriorating economic conditions caused an employee to steal 1.5 kg of uranium enriched to 90% (Cockburn & Cockburn 1997). The most recent attempted diversion of 18.5 kg of highly enriched uranium (HEU), foiled by the Russian Federal Security Service (FSB), and was a result of conspiracy between the employees of one of the Chelyabinsk region's nuclear facilities. Had the Russian intelligence service failed to prevent this diversion, it might have led to the most severe consequences because the amount of material was probably enough to build a nuclear weapon (Zaitseva and Hand 2003). This was also the only credible incident involving weapons-usable material that took place in a closed nuclear city. Other confirmed thefts of weapons-usable material have occurred either at civilian research and production facilities or at military naval sites.

It has been maintained that in Russia there are two different markets for nuclear materials-the disorganised, supply-driven, opportunistic, and amateurish traffic pattern that is visible to Western analyst and policy makers, and a shadow market organised by professionals and intermediated by criminals and or corrupt officials (Lee 1998, Emily 1998, Hynes 2006). The involvement of organised crime in the trafficking of nuclear and other radioactive material has been a continuous security threat ever since the problem of nuclear smuggling began to surface in the early 1990s. It should be noted that it is the presence of shadow market that poses an urgent proliferation danger and a threat to international peace and security. This shadow market consists of members of organised crime groups, since they are best positioned to mediate illegal nuclear deals between suppliers and end users. Three are

only a few incidents where the evidence of their involvement in nuclear trafficking cannot be refuted. For example, in two cases recorded in March and December 2001, which involved members of the well-known Balashikha criminal organisation operating in Greater Moscow in Russia trying to sell cesium-137 and low-enriched uranium (Zaitseva 2007). Earlier in 1998, several members of an Italian mafia family were arrested in Rome in connection with the seizure of a LEU fuel rod, stolen from the research reactor in Kinshasa (IISS 2007: 132). In an another case in 1993 a Volgograd businessman offered 2.5kg of HEU to a criminal group located in the Central Volga region to repay his debt. However, due to paucity of any potential buyer for the material the deal could not be finalised and the group refused to accept the material as payment for the debt (Cameron 1999: 8). It is important to mention that this scenario would be different in the contemporary time where several terrorist organisations are searching places to acquire nuclear material and weapons.

There are many factors which makes organised crime groups more dangerous, ranging from the vast financial resources available to organised crime groups and their experience in smuggling almost any illicit product across international borders undetected, to their growing links with the international terrorist networks. It can be said that this type of infrastructure and well established trafficking networks are best suited for either trafficking nuclear fissile or other radioactive material to the interested customers or supplying weapons engineered with these material to the end users (Zaitseva 2007). For example, the underground tunnels used for smuggling drugs and illegal immigrants into the United States from both Mexico and Canada can be used as a safe route to smuggle nuclear fissile material or radioactive material (Petersen 2005). These kinds of vulnerabilities can prove very useful for terrorist organisations for the pursuit of their cause. There is nothing which can stop them from trafficking nuclear material or weapon if they chose to do so through underground tunnels.

Besides, organised crime groups can also resort to nuclear smuggling upon a specific demand by a potential buyer. This scenario can prove very dangerous due to its high plausibility and low chances of detection. Most likely buyer is likely to be either states with aspirations of nuclear weapon or a terrorist organisation bent on acquiring or building a nuclear weapon or radiological dispersal device. Secondly,

such customer have already established links to organised crime groups and trafficking network, stemming from their other illicit activities, such as drugs smuggling and weapons deliveries. These kinds of customers also have sufficient financial means to pay the supplier (Zaitseva 2007). Moreover, with the growing availability of weapons-grade fissile materials and the presence of end users in the nuclear market place, such as Al Qaeda, have changed the dynamics of illicit nuclear trafficking considerably (Lee 1998). The experts such as David Albright and Corey Hinderstein note that the existing U.S. counter-proliferation efforts in Russia and other affected states are 'not designed to counter such operations, which in any case are likely to be well-concealed'. Just how well one can conceal such covert efforts, was demonstrated by the A. Q. Khan network exposed in 2004, which had organised supply of nuclear technologies and fissile material to several countries through a number of players and front companies in Asia, Africa, Europe and the Middle East (Albright and Hinderstein 2006). This example makes it imperative to continue studying the involvement of organised crime in the nuclear black market (Zaitseva 2007).

Organised crime may be more involved in nuclear trafficking than has been observed so far. Detecting fissile materials at borders, especially uranium, presents a particular challenge because they can be easily concealed. This serves to explain why the majority of uranium seizures stem from police and intelligence activities, rather than from border inspections. At the same time, establish organised crime groups may only engage in nuclear trafficking if they already have a buyer for the materials. Targeted, demand-driven smuggling would be difficult to intercept once the material had been stolen and handed over to the network, because the criminals would avoid the dangerous process of advertising their wares in an attempt to find a buyer. The next step-the trafficking itself, across borders-would not be a cumbersome task for a professional smuggling ring (IISS 2007).

The most alarming phenomenon is the growing association of Al Qaeda and Russian organised crime groups. It has widely been maintained that Al Qaeda has even sought to acquire intact nuclear weapons from Russian organised crime networks. More frighteningly, on October 6, 2000, at a conference on nuclear nonproliferation in Moscow, Russian Security Council official Raisa Vdovichenko

reported that Taliban envoys had sought to recruit at least one Russian nuclear expert. While the recruitment target did not agree to offer his services to Taliban, three of his colleagues had left his institute for foreign countries and Russian officials did not know where they had gone. Chechnya-based terrorist leaders can also hope that al Qaeda, which maintains ties with the Islamist strain of radical separatists in the North Caucasus and has had Chechen members, will supply them with nuclear weapons for the holy war against the Russian infidels if it manages, for instance, to overthrow the government of Pakistan.

Having demonstrated that Chechnya-based radical separatists and some of their allies are both capable and motivated to attempt acts of catastrophic nuclear terrorism, we can only imagine how they would take advantage of flaws in Russia's existing nuclear security system (Saradzhyan 2006). The two persons, who have raised most serious concerns regarding nexus of organised crime groups and terrorist organisations, are Victor Bout, a former Soviet military officer accused of large-scale arms-trafficking activities, and Semyon Mogilevich, an Israeli businessman of Ukrainian origin suspected of drug smuggling from Afghanistan and having ties with al Qaeda. In the summer of 2001, European intelligence services came up with reports claiming that Bout made $50 million in profit on weapons sales to the Taliban and possibly bin Laden. Later that year, European sources reported that Mogilevichwas approached by al Qaeda representatives with a request to acquire nuclear material. Although both men have denied any involvement with bin Laden and his network, the concern that any of their networks, or any other organised crime groups in Russia, could in principle supply the terrorists with nuclear material if they wanted to do so remains (Zaitseva and Hand 2003). Ties between organised crime and former and active intelligence officials exacerbate the risk of undetected nuclear smuggling (Lee, 1999, pp. 69-71).

Demand Side

Although suppliers and traffickers may divert or obtain material based on a real or perceived market demand, ultimately the concern and threat lies in the end-user of the smuggled material. The potential end users of smuggled nuclear materials include threshold states, terrorist organisations, ethnic separatist movements and extremist

religious sects, however, little hard evidence of their direct complicity in any nuclear trafficking cases has come to light so far. In general, the data on buyers of nuclear material are the weakest element of any illicit nuclear trafficking database. If the material is not intercepted before it makes it to the end user, the probability of discovering such a successful transfer is very low (Emily 1998). Obvious links to the end user could not be established in any of the database reports on intercepted cases. As Barry Kellman and David Gualtierti have noted, "the crucial truth about nuclear smuggling is that most of what is happening is covert, and inferring the magnitude of the flow or the intentions of the actors from a small share of the known picture is very likely is misleading" (Cited in Lee 1998: 25). It is worth mentioning that in illicit nuclear trafficking the potential buyers are fewer in number and they are less likely to be caught (IISS 2007: 131).

Lee (2003) has given a complete chain of events in the case of a demand driven smuggling scenario. In a demand driven nuclear smuggling scenario the end-user, such as terrorist organisation, or its associates need to shortlist the target from where the supply of the desired material can be made. In addition to finding what materials are stored where, the planner needs to have some sort of idea about the economic conditions and the state of security controls at different target site (information on unpaid wages and morale problems, prior histories of nuclear theft, and susceptibility of individual employees to bribes or blackmail would be of use here). The next step is to engineer an approach to the target. It is to be noted that if this is a sensitive nuclear facility, a legitimate pretext and probably an official invitation would be required to gain entry. Thirdly, and most importantly the planners need to recruit insiders who would collaborate during the entire operation of smuggling. For this purpose high-level officials from the region or the superordinate ministry can be included into the scheme. At the end, a well-designed support structure would be required to transport the stolen materials from the target facility to their final destination. Experienced middlemen, such as organised crime groups, could be employed for this purpose. An array of sophisticated smuggling techniques is available; for example, interspersing the material with legally tradable radioactive isotopes, using false customs documentation, concealing it in bulk metal cargo, or shipping it out in diplomatic luggage, which is seldom checked by the authorities. Consignees outside the NIS (Newly Independent States) might take possession of the

material and then re-export it a terrorist organisation. It would not be an exaggeration to say that the events of September 11, 2001, clearly brought world's attention on the scope and capabilities of terrorist groups. It would not be incorrect to suggest that the contemporary terrorist organisation have no restrain in inflicting catastrophic damage. The planning and coordination of September 11 kingpins leave little doubt that if such planning and deliberation were directed to the acquisition of nuclear weapons, the attempts could have been successful (Zaitseva and Hand 2003). There have been various reports of attempted purchase of both nuclear material and actual warheads by terrorist groups, although none of these appear to have been successful. Chechen separatist have clearly demonstrated their interest in nuclear and radiological material, with rebels planning in 2002 both to hijack a Russian nuclear submarine and to seize control of the Kurchatov Institute, a nuclear design centre in Moscow containing 26 operating nuclear reactors and enough HEU to construct thousands of nuclear weapons. To date, the only confirmed case of nuclear terrorism occurred in November 1995, when Chechen terrorist placed a radioactive dispersal device containing caesium-137 mixed with explosives in Moscow's Ismailovsky Park (Allison 2004: 31).

It has widely been reported that Al Qaeda has expressed an interest in either acquiring fissile material or a nuclear weapon "off the shelf". Osama has himself declared that the acquisition of nuclear weapons is a "religious duty" (Gunaratna 2002: 48). As was demonstrated with by his conversations with Pakistani scientists, Bin Laden appreciated that for the purpose of his organisation it was far more plausible to procure weapons grade material or an intact nuclear warhead than to attempt to produce fissile materials. Al Qaeda apparently began his quest for nuclear materials in the early 1990s, but was the victim of various scams, apparently being sold low-grade reactor fuel or fictitious material such as red mercury. There has also been a great deal of speculation that Al Qaeda has sought, or even purchased, a nuclear weapon from the FSU. There is no evidence to suggest that any such attempts, if they even occurred, were close to proving successful. However, it is reasonable to assume that Al Qaeda or related extremist groups remain a potential threat to international security (IISS 2007: 127-135). It is inevitable for us to use the time we have to focus more deliberately on the demand side of the nuclear and radioactive materials so as to mitigate the danger of nuclear terrorism.

Organised Crime Groups: DSTO Case Study (2001-2005)

Database on Nuclear Smuggling, Theft, and Orphan Radiation Sources (DSTO) offers valuable insights on the nature of illicit nuclear smuggling. From January 2001 to December 2005 forty illicit nuclear trafficking incidents were reported by DSTO which can be associated with organised crime groups. These forty cases represent roughly 10% of the 426 illicit nuclear trafficking incidents involving criminal intent (e.g., thefts, seizures) complied in DSTO for that fiver year period. The forty incidents were chosen on the basis of following principles: (1) they had to involve an actual seizure of radioactive substances, as opposed to an alleged claim that such material could be obtained or delivered; (2) they had to involve participation of at least three actors so that they can be called a group; (3) the group had to be involved in continuous illicit activity; (4) profit making had to be the ultimate objective, explicitly or implicitly. According to DSTO thirty one incidents fulfilled all the above conditions. In remaining nine cases the number of actors was less than three, but the incidents had the strong indications of the possible presence of larger criminal network behind those arrested (Zaitseva 2007). Table 1 shows the extent of involvement of organised crime groups in illicit nuclear trafficking.

Table 1: Countries and nationals involved in nuclear trafficking incidents with the suspected involvement of organised crime in the period 2001 to 2005.

Countries	Number of Cases	Number of Nationals
Ukraine	9	33
Russian Federation	7	38
Georgia	5	15
Belarus	3	27
Kazakhstan	2	2
India	2	4
Tajikistan	2	6
Bulgaria	1	3
Congo	1	1
France	1	1

Kenya	1	3
Namibia	1	3
Portugal	1	4
South Africa	1	5
Tanzania	1	4
Thailand	1	7
Turkey	1	2
Uzbekistan	-	3
Cameroon	-	2
Armenia	-	1
Ethiopia	-	1
Moldova	-	1
Romania	-	1
Uganda	-	1
Zaire	-	1

Source: Zaitseva, Lyudmila (2007), "Organised Crime, Terrorism, and Nuclear Trafficking", *Strategic Insights*, 6(5), [Online: web] Accessed 17 February 2008 URL: http://www.ccc.nps.navy.mil/si/2007/Aug/zaitsevaAug07.asp.

A careful look at the number of both seizers and actors involved reveals the fact that the former Soviet Union still stands out as a major trafficking area for criminals trading in radioactive material, with Ukraine, Russia, Georgia, and Belarus taking the lead. Given the crime scene and the abundance of still poorly protected nuclear material and radioactive substances in these countries and their neighbouring states, this is hardly surprising. Ukraine, which tops the list with the highest number of incidents, appears to have a suppliers' nuclear black market, which trades mostly in ionising radioactive sources. The actual number of nuclear trafficking cases involving organised crime within the last five years is likely to be higher than what is discussed here for two reasons. First, like with any kind of illicit trafficking, the detection rate in nuclear smuggling is very unlikely to be one-hundred percent, which means that some incidents, probably the better concealed ones, remain below the radar screen. The control and accounting of both nuclear and radiological materials in many countries of

the world range from stringent to non-existent. The exact amounts of fissile nuclear material are often kept secret by the states. This makes it difficult to assess how much of the material is missing. If the smuggled material has reached the final destination, probably the only way to find out what type of material and how much of it has been acquired by the customer, would be its use in a radiological terrorist act or for building a crude nuclear device, unless intelligence services disclosed and foiled the planned attack before. Since neither a nuclear nor a radiological terrorist attack has taken place yet, this permits to assume that terrorists have not yet obtained the needed material. However, this could also mean that they haven't been able to design and build the weapon yet. Second, due to various definitions of organised crime adopted by different countries criminal groups involved in some of the recorded trafficking incidents may not be considered to be of organised nature by the local authorities. Thus, French prosecutors were not able to conclusively link the three smugglers involved in the HEU seizure in Paris in 2001 to an organised criminal network selling enriched uranium from Eastern Europe, despite all the evidence indicating that such a link had indeed existed. In many cases the apprehended criminals are dismissed by the local authorities as 'amateurish' and 'primitive', which can lead to the incorrect conclusion that 'primitive' criminals cannot possibly be part of an organised crime group (Zaitseva 2007).

Statistics on Illicit Trafficking Incidents

The International Atomic Energy Agency's Illicit Trafficking Database (ITDB) is probably the most potent source of information on the topic. The International Atomic Energy Agency (IAEA) established an Illicit Trafficking Database (ITDB) in 1995 in response to increased reports of nuclear material theft form facilities in the former Soviet Union (FSU) and a series of high profile seizures of FSU weapons-usable fissile material in Europe. It is to be noted that ITDB is the only collection of State confirmed information on incidents of illicit trafficking and other unauthorized activities involving nuclear and other radioactive material. By December 2006, 95 Member States were participating in the ITDB programme and reporting incidents. The scope of information in the ITDB covers incidents "involving unauthorised acquisition, provision, possession, use, transfer or disposal of nuclear and other radioactive material, whether intentional or unintentional, and with or without

crossing international borders". It also includes unsuccessful or thwarted acts of the above type, the loss of material and the discovery of uncontrolled material (IAEA 2007). The database also covers the broadest possible range of radioactive materials, including substances merely contaminated with radiation. It is worth noting that the preparation of ITDB database is completely dependent on the cooperation of member states. Some states, for various reasons, prefer not to divulge their cases of diversion with the ITDB, while others fail to report owing to the inefficiency of their designated authorise or the lack of national inter-agency communication (IISS 2007). As of 31 December 2006, States had reported a total of 1080 incidents of illicit trafficking and other unauthorized activities involving nuclear and other radioactive material to the ITDB. Of the 1080 confirmed incidents, 275 incidents involved unauthorised possession and related criminal activity, 332 incidents involved theft or loss of nuclear or other radioactive materials, 398 incidents involved other unauthorised activities, and in 75 incidents the reported information was not sufficient to determine the category of incident. Information reported to the ITDB shows a persistent problem with the illicit trafficking in nuclear and other radioactive materials, thefts, losses and other unauthorised activities (IAEA 2006). Of these, about 25% involved nuclear material and about 70% other radioactive material, mainly sealed radioactive sources. The remainder involved radioactively contaminated and other material (IAEA: 2007). Figure 1 and 2 show the distribution of incidents reported to the ITDB between 1993 and 2006 (2005 in Figure 2) by types of material. In addition, there are numerous incidents reported in open sources which have not yet been confirmed or otherwise commented on to the ITDB by the States concerned.

Incidents Involving Criminal Activity

Of the incidents reported by States, about 54% show evidence of criminal activity, such as theft, illegal possession and attempts to sell or smuggle nuclear or radioactive material across national borders. The number of such incidents reported declined sharply between 1994 and 1996, but since then it has been gradually increasing. Thefts have involved primarily sealed industrial radioactive sources, e.g. sources used in gauges or radiography devices.

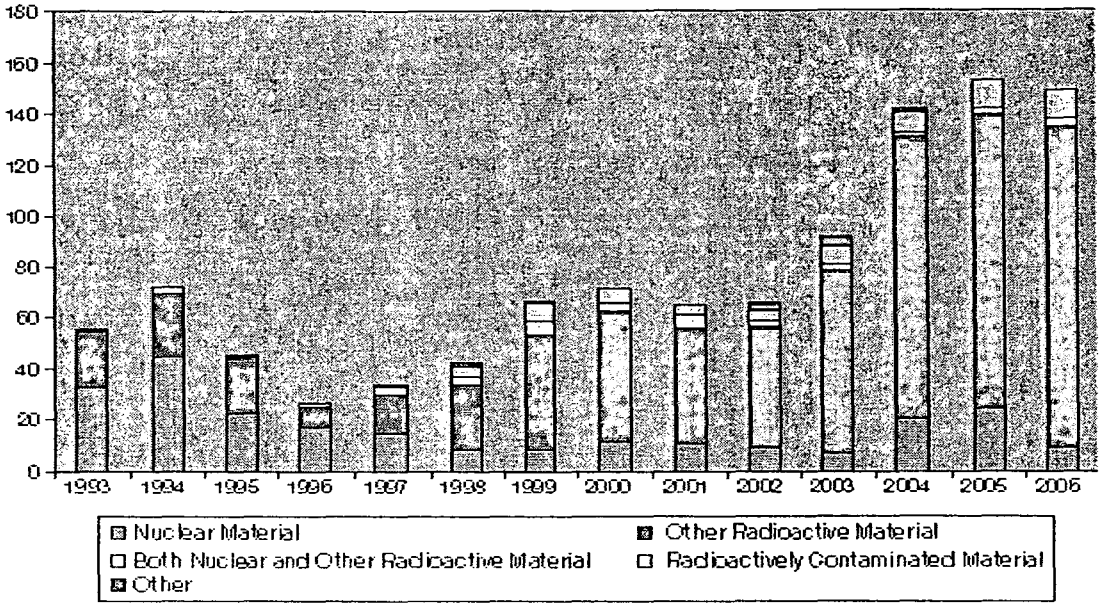
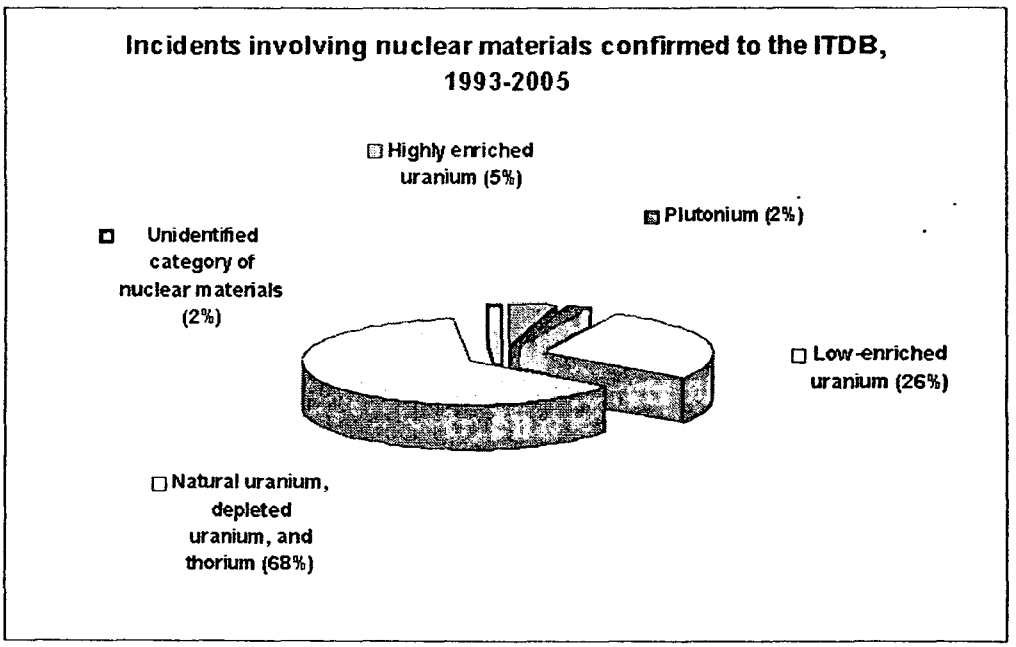


Figure 1: Incidents Confirmed to the ITDB (1993-2006)

Source: International Atomic Energy Agency (2007), *Combating Illicit Trafficking in Nuclear and other Radioactive Material*, IAEA Nuclear Security Series (6) December 2007, [Online: web] Accessed 22 February 2008 URL: http://www-pub.iaea.org/MTCD/publications/PDF/pub1309_web.pdf.



Note: The total is higher than 100% because some incidents involved more than one category of nuclear materials.

Figure 2

Source: International Atomic Energy Agency (2005), *Illicit Trafficking and Other Unauthorized Activities involving Nuclear and Radioactive Materials Fact Sheet*, [Online: web] Accessed 21 February 2008 URL: http://www.iaea.org/NewsCenter/Features/RadSources/PDF/fact_figures2005.pdf.

It is to be noted that reports of theft have been gradually increasing since 1998 (see Figure 1). The intentions and motives behind the thefts are very difficult to establish. Sealed sources and the devices in which they are used are attractive to thieves both because of their intrinsic value and because of the value of the shielding and encapsulating metals used to protect the user against radiation. It is noteworthy that in about 60% of the cases the stolen material was not subsequently reported as recovered.

Information on incidents involving illegal possession shows predominantly opportunistic and amateurish activities. As a result of unprofessional methods usually used to smuggle and offer the material for sale, such activities are more susceptible to detection. Well-organised trafficking networks using established channels for smuggling in other illegal goods will be more difficult to detect and interdict (IISS 2007). Nuclear trafficking activities reported to the ITDB appear to have been mainly supply driven. In other words, the trafficking process was initiated by sellers with no pre-identified buyer. Cases show that traffickers become very vulnerable to interdiction when soliciting buyers, hence law enforcement and intelligence authorities were able to detect and foil trafficking operations in many cases. Trafficking with a pre-identified buyer would be less susceptible to detection.

There is clearly a demand for nuclear and other radioactive material. In most of the trafficking incidents for which information was available, the perpetrators believed that the material they sought to sell had high value and thus could be sold on the illegal market for a substantial amount of money. In the overwhelming majority of such cases, however, this perception proved to be unfounded. Only a few cases have been reported where buyers existed. The small number of such cases limits the potential for drawing broader conclusions. It is note worthy, however, that malicious use and attempts to acquire nuclear and radioactive material for such purposes have been recorded. There have also been cases when perpetrators intentionally distorted information on the material offered for sale, hoping to profit from the naivety and technical incompetence of a potential buyer. Such hoaxes or confidence tricks have, over the years, involved a broad variety of material, from LEU fuel pellets to non-radioactive material, which were offered for sale as weapons grade HEU or plutonium.

Incidents Involving HEU and Plutonium

Trafficking in highly enriched uranium and plutonium is the most prominent security concern of the contemporary times. In the hands of terrorists or other criminals, such weapons usable material may contribute to the construction of an IND (Improvised Nuclear Device). What is even more disturbing is the fact that various terrorist organisation have sought to acquire these materials and have shown their keen interest in the nuclear catastrophe.

As of 31 December 2006, Member States had reported a total of 13 incidents involving HEU to the ITDB. In addition, in January 2007, Georgia reported the seizure of 79.5 g of 89% HEU in Tbilisi in February 2006. Table 2 summarises the reported incidents involving HEU. The majority of these incidents involved illegal possession of HEU often accompanied by smuggling activities and attempts or intent to sell the material. Although, the number of the reported incidents involving HEU has been relatively small and the quantities seized have been below one SQ[2], there is a possibility that in some cases the seized HEU could symbolise samples of larger quantities available for purchase or at risk of theft. These larger quantities may still remain in movement and available for illegal deals or be in the possession of groups with dangerous intent.

In most cases, the seized HEU had not been previously reported as stolen. If a failure to detect the theft was the reason, this may indicate that more HEU has been stolen than recovered. The additional HEU may remain in illegal circulation. In the majority of incidents, Pu was in the form of fabricated sources, such as smoke detectors or Pu/Be neutron sources which contain trace amounts of 239Pu. While Pu used in such sources is not directly suitable for use in an IND, trafficking in this material still warrants attention. In several cases, Pu sources were offered for sale. This may point to a real black-market demand for Pu, or nuclear material in general, which the perpetrators attempted to service with material of lesser consequence.

[2] Significant quantity: the amount of nuclear material sufficient to make a nuclear explosive device.

TABLE 2. INCIDENTS INVOLVING HEU AND Pu CONFIRMED TO THE ITDB, 1993–2006

Incidents involving HEU			
Date	Location	Material involved/ quantity	Incident description
1993-05-24	Vilnius, Lithuania	HEU/150 g	4.4 t of beryllium, including 140 kg contaminated with HEU, were discovered in the storage area of a bank.
1994-03	St. Petersburg, Russian Federation	HEU/2.972 kg	An individual was arrested in possession of HEU, which he had previously stolen from a nuclear facility. The material was intended for illegal sale.
1994-06-13	Landshut, Germany	HEU/0.795 g	A group of individuals was arrested for illegal possession of HEU.
1994-12-14	Prague, Czech Republic	HEU/2.73 kg	HEU was seized by police in Prague. The material was intended for illegal sale.
1995-06	Moscow, Russian Federation	HEU/1.7 kg	An individual was arrested in possession of HEU, which he had previously stolen from a nuclear facility. The material was intended for illegal sale.
1995-06-06	Prague, Czech Republic	HEU/0.415 g	An HEU sample was seized by police in Prague.
Incidents involving HEU and Pu			
Date	Location	Material involved/ quantity	Incident description
1995-06-08	Ceske Budejovice, Czech Republic	HEU/16.9 g	An HEU sample was seized by police in Ceske Budejovice.
1999-05-29	Rousse, Bulgaria	HEU/10 g	Customs officials arrested a man trying to smuggle HEU at the Rousse customs border checkpoint.

TABLE 2. INCIDENTS INVOLVING HEU AND Pu CONFIRMED TO THE ITDB, 1993–2006 (cont.)

Incidents involving HEU			
Date	Location	Material involved/ quantity	Incident description
2001-07-16	Paris, France	HEU/0.5 g	Three individuals trafficking in HEU were arrested in Paris. The perpetrators were seeking buyers for the material.
2003-06-26	Sadahlo, Georgia	HEU/~170 g	An individual was arrested in possession of HEU while attempting to illegally transport the material across the border.
2005-03 to 2005-04	New Jersey, USA	HEU/3.3 g	A package containing 3.3 g of HEU was inadvertently disposed of.
2005-06-24	Fukui, Japan	HEU/0.0017 g	A neutron flux detector was reported lost at a nuclear power plant.
2006-02-01	Tbilisi, Georgia	HEU/79.5 g	A group of individuals was arrested trying to illegally sell HEU.
2006-03-30	Hennigsdorf, Germany	HEU/47.5 g	Authorities discovered trace amounts of HEU on a piece of tube found amidst scrap metal entering a steel mill.

Source: International Atomic Energy Agency (2007), *Combating Illicit Trafficking in Nuclear and other Radioactive Material*, IAEA Nuclear Security Series (6) December 2007, [Online: web] Accessed 22 February 2008 URL: http://www-pub.iaea.org/MTCD/publications/PDF/pub1309_web.pdf.

Loose Russian Tactical Nuclear Weapons[3]: Terrorists' Favourites

One of the most important sources of concern in the field of nuclear terrorism has been the security of the former Soviet Union's arsenal of tactical (that is sub- or non-strategic) nuclear warheads. At the end of the Cold War, the Soviet Union reportedly had almost 22,000 warheads for non-strategic weapons. Today Russia has 3,000-4,000 operational tactical nuclear weapons (WMDC 2006: 97). Although the existing Russian command and control structure and safety and security measures place tight

[3] "Tactical nuclear weapons refers to weapons with a tactical role on the battlefield and that are not intended to use against an enemy' nuclear missiles or population centres" (WMDC 2006: 96)

central control over tactical nuclear weapons, the large numbers of weapons and storage sites involved have given rise to fears over their long-term security. Also, because different types of tactical nuclear weapons (that is land-based or sea-based) employ different locking systems, many have expressed concerns about possible breaches in security or unauthorised use (Woolf 1996). Testifying before the Senate Foreign Relation Committee, former Senator Sam Nunn expressed his concern regarding tactical weapons in Russia and opined

> Tactical nuclear weapons are another piece of unfinished business. These weapons have never been covered in arms control treaties. We can only guess at the numbers in each other's inventories as well as the locations. Yet these are the nuclear weapons most attractive to terrorist-even more valuable to them than fissile material and much more portable than strategic warheads (Cited in Ferguson and Potter 2005: 46).

An important incident corroborates weak security of tactical nuclear weapon had come from General Alexander Lebed, a former chief of the Russian Security Council, who claimed in 1997 that he could account only 48 of 100 (or 132, account differ) backpack-sized nuclear weapon or "suitcase" nuclear weapons. These weapons are small nuclear devices (0.1 to 1 kiloton), small enough to fit into a suitcase carried by a single individual. The Russian government, however, denied the existence of such weapon in its nuclear arsenal. Shortly after Labed's remarks, the Russian spokesperson maintained that no such weapon ever existed and all the weapons which could be called as tactical nuclear weapons had been destroyed. The Russian government reiterated its claim that all Russian weapons were secured, well accounted for and it was impossible that the Russian government could lose a nuclear weapon. However, there are reasons to doubt Russian claims. Firstly, it is beyond any doubt that during Cold War period United States nuclear arsenal has included Special Atomic Demolition Munitions (SADMs) that could be carried in a backpack. For the same reason it is quite practical to envisage that Soviet nuclear program might have followed the same pattern. Secondly, tactical nuclear weapon or sub-strategic nuclear weapon had an important place in Soviet war fighting strategies (Allison 2004).

It is to be noted that tactical nuclear weapons are considered to be terrorist organisations' favourite because of a combination of their physical properties and "policies for their deployment and employment". The "relative portability" of tactical nuclear weapons makes them more vulnerable to terrorist seizure and use. In

particular, nuclear warheads based on ballistic missiles either sea-based or land-based ballistic missiles, such as ICBMs (Intercontinental Ballistic Missiles)-would not be considered portable or accessible to terrorists while these warheads are meted to missiles. In contrast bombs designated for either strategic or tactical aircraft would be far more portable (Ferguson and Potter 2005: 48). The security and safety systems of tactical nuclear weapons, or permissive action links (PALs), are less advanced than strategic nuclear weapons. This means that they are easier for outsiders to use, such as a terrorist organisation (WMDC 2006: 97). Another important reason which increases the perils of tactical nuclear weapons has been the lack of any arms control effort to control the proliferation to terrorist organisations, despite that these 'uncovered nukes' pose dangers equal to or above those of strategic nukes. US and Russian Presidential initiative undertaken in 1991 and 1992 have yielded some reductions, but have not done enough to address the dangers posed by these weapons (Millar and Brian 2002). Moreover, the true extent of the implementation of the 1991-92 informal Bush-Gorbachev and Bush-Yeltsin initiative to withdraw from active service and destroy large number of sub-strategic nuclear weapons is not known. Secondly the unilateral measures undertaken by some nuclear weapon state (NWS) are not codified in legally binding agreements and thus there can be no surety that they have actually taken place (Zarimpas 2006).

Thus, in the present circumstances the proliferation of tactical nuclear weapons to terrorist organisation looms large. For instance, according to media reports, Osama Bin Laden possesses 20 Russian suitcase nuclear bombs. The Afghan Taliban regime supposedly has been offered small tactical Russian nuclear weapons (Maerli 2001). Similarly, in the mid-1990s several stories published in Russian newspapers describing the purchase of two 30 kg rucksack nuclear devices by Chechens in Lithuania in November 1991-Janurary 1992. In an another instance London-based daily, *Al-Watan Al-Arabi,*, published a report saying that Chechens acquired approximately 20 tactical nuclear weapons from Russian facilities. It further argued that these tactical nuclear weapons were subsequently transferred to Osama Bin Laden for a sum of $30 million cash plus two tons of opium. On February 8, a London-based Arab newspaper, *Al-Hayat*, reported that in 1998, in Kandahar, Afghanistan, Al Qaeda had purchased nuclear weapons of Ukrainian origin, exploiting the services of a Ukrainian scientist called Viktor. Shortly, multiple news

channels and newspapers linked this story to the 1997 statement by the late General Alexander Lebed, who claimed that a special commission established by the Russian government in 1996 could not locate for about 100 sub-strategic nuclear weapons (Sokov 2004). According to an unattributed account in the book *One Point Safe*, the Chechen government of Dzhokar Dudayev reportedly gave a warning to the United States government in 1994 that it had acquired two sub-strategic nuclear weapons and that they would transfer them to Libya if the United States did not recognise Chechnya's independence. It was also reported that Dudayev provided sufficiently credible technical details that the United States sent an undercover team to visit Chechnya, where they were to be shown the weapons. After the weapons failed to materialise, however, the team departed. If this account is to be believed it clearly demonstrates US government concern over possible warhead theft, and foreshadowed subsequent reports of a "Chechen bomb". Similar report also appeared in an extremist newspaper Zavtra in October 1995 which published an interview with an alleged former Chechen intelligence agent who claimed to have bought two tactical nuclear weapons from Estonia in 1992 (Parrish 1997). However, the authenticity of these media reports could not be established.

Pakistan and A. Q. Khan and Illicit Nuclear Trafficking Networks: Proliferation Slippery Slope

The security of Pakistani nuclear arsenal and materials has been a very dangerous phenomenon ever since the Pakistani nuclear program came into force. The alleged association of Pakistan with Taliban and Al Qaeda has put up an important question about the security of its nuclear arsenals (Nair 2007). The political turmoil and imposition of emergency rule in Pakistan on November 3, 2007, and the assassination of former Prime Minister Benazir Bhutto on December 27, 2007, has revived the world's attention to the issue of the security of Pakistan's nuclear weapons, and how the world can be assured they remain in safe hands during potential transitions of power. Some observers fear scenarios in which Pakistan's strategic nuclear assets are given to or stolen by Al Qaeda sympathisers or other terrorists (Kerr and Nikitin 2008). In an interview on November 5 2007, former Prime Minister of Pakistan, late Benazir Bhutto, opined that the internal instability of the country can jeopardise the

security and safety of nuclear weapons. U.S. military officials have also expressed concern about the security of Pakistan's nuclear weapons. Director General of the International Atomic Energy Agency, Mohamed El Baradei, has stated his view that a radical regime could take power in Pakistan, and thereby acquire nuclear weapons (Kerr and Nikitin 2008).

One of the most prominent faces of illicit nuclear trafficking is Abdul Qadeer Khan. On 31 January 2004, Pakistani nuclear scientist was arrested for his central role in the black marked network that had sold Pakistani nuclear weapons technology to Iran, North Korea, and Libya and had offered the technology to Iraq and possibly others, as yet unknown, terrorist organisations. After a television confession on 4 February in which he claimed sole responsibility for his proliferations activities, Khan, who is regarded as a national hero, was officially pardoned by President Pervez Musharraf. The network, which had tentacles in over 20 countries and sold Pakistan's nuclear technology for at least 16 years was finally exposed by the 2003 interdiction of the German-registered ship BBC China, with its cargo of uranium enrichment equipment bound for Libya's nuclear weapons programme. In addition to putting Khan under house arrest, Pakistan detained over two dozen of his associates for questioning. The last one was freed on May 2006, when Pakistan declared the case closed (IISS 2007).

In the words of then CIA (Central Intelligence Agency) Director George Tenet, A. Q. Khan was "at least as dangerous as Osama Bin Laden" (Cited in IISS 2007: 7). Ackerman has described Khan's proliferation racket as "Home Depot" for nuclear materials and technology (2007). There were also reports that Khan had prepared a menu of nuclear materials from where potential buyers could chose, with price reportedly ranging from millions to hundreds of dollars (IISS 2007: 69). Illegal networks, such as of Khan's, are selling nuclear technologies to the highest bidder on the black market. It is an extraordinary problem, and it is posing a great threat, especially with Pakistan building a nuclear reactor that could very well be used to produce weapons-grade plutonium. Khan and his cronies were so successful in selling their stolen technology secrets throughout the world that it has almost become public domain, or at the very least available to whoever has the money (Scott 2007). What makes the situation more dangerous is the fact that there are many terrorist

organisations that have the capability and financial resources to exploit such illicit nuclear trafficking networks.

When asked about the network's current status during a July 25, 2007 Senate Foreign Relations Committee hearing, Undersecretary for Political Affairs Nicholas Burns replied that: "I cannot assert that no part of that network exists, but it's my understanding based on our conversations with the Pakistanis that the network has been fundamentally dismantled. But to say that there are no elements in Pakistan, I'm not sure I could say that" (Cited in Kerr and Nikitin 2008).

Similarly, the London-based International Institute for Strategic Studies (2007) concluded- "at least some of Khan's associates appear to have escaped law enforcement attention and could ... resume their black-market business" (159). Edward Royce (2007) has also doubted the assertion that the Khan network has been rolled up. It is true that Khan was the kingpin of all the illicit nuclear activities but there were others who acted were located outside Pakistan and acted with autonomy. Pakistan nevertheless bears especially close watching as it will continue with attempts to acquire sensitive technology for its own nuclear program.

Pakistan still has a nuclear program that operates largely without either international scrutiny or voluntary transparency, and because Pakistan is not a signatory to the NPT, it will still have to procure nuclear-related materials and technology clandestinely in order to sustain that program. All the incentives and missing safeguards that led the government of Pakistan to encourage A.Q. Khan in the first place, still exist. This program is very troubling given radical sympathies that exist within some elements of the Pakistani population. There is always a danger that Khan's network might be operating under new management rather than truly out of the business (Ackerman 2007). Similar sentiments have been echoed by Mark Fitzpatrick who argues that some of Khan's co-conspirator, after a period of hibernation, could resume their activities (2007).

Despite his arrest, shutting down the Khan network has by no means brought a halt to nuclear smuggling, even by Pakistan. A key European corporate official said that after Khan's arrest in 2004, he saw no change in the pace of Pakistan's illicit

orders for its own nuclear weapons program. Mohammed El-Baradei, the Director General of the IAEA, has warned that the Khan network is just the tip of the iceberg. There is no reason to believe that illicit nuclear trade and the threat it poses have diminished significantly. The Khan network operated in 30 to 40 countries, according to some estimates, but few of those affected countries have launched any prosecutions of members of the network. There remains a global black market in nuclear weapons technology that is larger, more dangerous and more difficult to stop than is currently understood. Networks similar to the Khan network may already exist or may emerge in coming years. In the future hostile groups in quasi failed states could buy the facilities to make nuclear explosive material and fashion a crude atomic bomb. According to Tenet, in the current marketplace if you have $100 million, you can be your own nuclear power (Albright 2007).

Khan Network

It is to be noted that the Khan network was not a representation of hierarchically structured enterprise, but rather a collection of connected nodes in various countries, which sometimes operated in league with Khan and at other times operated independently. At least 30 companies and middlemen sold nuclear-related goods through the network. As Ashok Kapur has noted, "A.Q. Khan's approach was innovative...viz. to get bits and pieces (components) of enrichment technology and equipment from small, high technology Western firms, who deal with individual components, to bring the components together so as to achieve mastery over the enrichment cycle" (Cited in Clary 2006: 96). The vast majority of individuals involved in the Khan's proliferation network have had a long experience in procuring and selling items for the Pakistani nuclear weapons programme. And when Khan managed to shift his primary business operations from imports to much more lucrative exports, many of his European and South African accomplices stayed with him. Huge financial gains also contributed to the success of Khan's network. The new business model orientation offered the European members of the network much more money in comparison to what they had previously got from Pakistan's secret nuclear programme offers, and they were asked to carry on with the very same expertise in manufacturing, logistics and finances that they had developed to such perfection in aiding the Pakistani nuclear weapons effort (IISS 2007: 80).

A.Q. Khan's proliferation activities were not the only source of international concern about the security of Pakistan's nuclear assets. For instance, reports have surfaced of contacts between Osama Bin Laden and Pakistani nuclear scientists Sultan Bashiruddin Mahmoud and Abdul Majid in which "long discussions" about nuclear, chemical, and biological weapons were held. During those meetings bin Laden reportedly said that he had acquired some type of radiological material from the Islamic Movement of Uzbekistan and wanted to know how to use it. The discussions, though, are described by Pakistani authorities as "academic"—i.e., not yielding information that resulted in "creation or production of any type of weapon". Yet the observed reality of the nuclear traffic may not accurately reflect the pattern of the traffic as a whole. The elements of a true market, so far undetected by Western observers, may, in fact, already be in place (Lee 2003).

It is to be noted that both the scientist had held crucial positions in Pakistani nuclear weapons program. Majid was a nuclear fuels expert at the Pakistan Institute of Nuclear Science and Technology (PINSTECH), from which he retired in 2000. Mahmood, until he resigned in 1999, was director for nuclear power at the Pakistan Atomic Energy Commission (PAEC) and the self professed chief designer and director of Pakistan's Khushab atomic reactor. Mahmood had also been a pioneer in setting up Pakistan's uranium enrichment programme before Khan took it over. Upon leaving PAEC (having been demoted for supporting militant Islamic groups and opposing Pakistan arms control policy), Mahmood founded the Ummah Temeer-e Nau (UTN, a loose translation of which is Islamic revival) charity relief agency, which he used as a front to help the Taliban. UTN included a number of Pakistan's radicalised elite, including engineers, physicists, chemist, military officers and ISI members.

In several meetings with Osama Bin Laden, his Egyptian deputy Ayman al-Zawahiri and other Al Qaeda members, Mahmood and Majid discussed nuclear weapons technology. According to the head of Libyan intelligence Musa Kousa, UTN also approached Libya to offer help in the construction of a nuclear bomb. Mahmood made clear in public speeches his view that Pakistan's nuclear capability was the property of the global Muslim community. Shortly after receiving intelligence information form the US, the ISI (Inter Services Intelligence) arrested Mahmood and

Majid on 23 October 2001 on suspicion and called in several other members of the UTN for questioning. In late January 2002, the scientists were released from detention (although placed under house arrest) on the grounds that a trial would cause embarrassment for the government and risk the disclosure of nuclear secrets. Mahmood, who failed several polygraph tests, said he explained to Laden the difficulty of setting up a uranium enrichment plant, whereupon Bin Laden asked, "what if you already have the enriched uranium?" When senior US officials read the debriefing, they became convinced that the US needed to do what it could to help Pakistan keep its nuclear assets from falling into terrorists hands. (ISSS 2007: 107).

After the 2004 revelations of an extensive international nuclear proliferation network run by Pakistan's Abdul Qadeer Khan, as well as possible connections between Pakistani nuclear scientists and Al Qaeda, the Pakistani government has made additional efforts to improve export controls and monitor nuclear personnel. The main security challenges for Pakistan's nuclear arsenal are keeping the integrity of the command structure, ensuring physical security, and preventing illicit proliferation from insiders. Most observers estimate that Pakistan has enough nuclear material (highly enriched uranium and a small amount of plutonium) for about 60 nuclear weapons. Al-Qaeda has also sought assistance from the Khan network. According to former Director of Central Intelligence Agency George Tenet, the United States "received fragmentary information from an intelligence service" that in 1998 Osama bin Laden had "sent emissaries to establish contact" with the network (Cited in Kerr and Nikitin 2008). Other Pakistani sources could also provide nuclear material to terrorist organisations. According to a 2005 report by the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction, al-Qaeda "had established contact with Pakistani scientists who discussed development of nuclear devices that would require hard-to-obtain materials like uranium to create a nuclear explosion:. Tenet explains that these scientists were affiliated with a different organisation than the Khan network (Kerr and Nikitin 2008). At the end it can be argued that the smuggling in or illicit trafficking of fissile material is the most dangerous security threat of twenty first century. The only possible way through which a terrorist organisation can engineer a practical nuclear weapon is the procurement of weapon-usable fissile material. Therefore, the incidents of illicit nuclear trafficking should be taken very seriously and all the efforts should

be directed towards securing fissile material from getting into the hands of the illicit trafficking networks.

Chapter Four

IMPLAUSIBILITY OF NUCLEAR TERRORISM

Jessica Stern, in *The Ultimate Terrorists*, opens her consideration of the likelihood of terrorist use of WMD by outlining the potential death and destruction that would be brought about by terrorist use of a simple, homemade nuclear device. With New York City's Empire State Building as the imagined ground zero, Stern notes that such a crude device would likely create a 300ft diameter fireball, destroying the building and leaving in its place a 120ft wide crater. The roughly 20,000 people who work in the building or its immediate environs would be vaporised. Buildings within 600 feet would collapse, as would the area's underground infrastructure, including subway tunnels, killing countless more. In her scenario, such a blast would bring the immediate death of not just those in the immediate area, but of all the individuals up to a quarter of a mile away. Beyond the range of immediate death, a lethal dose of fallout, measuring a quarter of a mile by nine miles, would kill those affected within two weeks. As far as 18 miles away, there would be enough radiation from the device to cause radiation sickness, with greater incidence of cancer for years hundreds of miles away. According to Stern, the eventual toll in terms of dead, injured, and sickened, could easily reach 100,000 to 200,000 persons (1999: 1-2).

It should be noted that it is not, however, just Stern's vision since such literary devices and scenarios, used to paint a picture of the potential outcome of terrorist use of WMD, have become prevalent in the related literature. Graham Allison, in his *Nuclear Terrorism: The Ultimate Preventable Catastrophe*, similarly, foresee the detonation of a nuclear weapon in the heart of America, the Times Square (2004: 3). Similar visions of worst-case scenarios and horrific what-if considerations resonate in the entire literature on nuclear terrorism. However, the literature produced in the past decade has done little to efficiently address or corroborate such popular notions (Gressang 2000). Most of the general observations about nuclear terrorism are based on a few historical cases of terrorist interest in and acquisition of nuclear weapons and materials. It should be noted that the details of many of these cases in often found to be sketchy and ambiguous. With these uncertainties, many people will understandably

hedge against the unknown and err on the side of finding the threat potential high (Parachini 2003: 38). This chapter takes a position that runs counter to the prevalent views on nuclear terrorism. It argues that the threat of nuclear terrorism, especially true nuclear terrorism employing bombs powered by nuclear fission, is exaggerated, and that popular wisdom on the topic is significantly flawed. There are technical, psychological, and strategic reasons for this assertion, and the chapter would deal with each of these arguments in turn.

Most of the literature on nuclear terrorism hails Al Qaeda as a terrorist organisation who has the potential to engage in possible acts of nuclear terrorism (e.g. Allison 2004, Ferguson and Potter 2005). Though Al Qaeda's interest in and willingness to use unconventional weapons is beyond the scope of any doubt but evidence of Al Qaeda's capabilities is fragmentary and reveals the difficulty of finding convincing proof of a threatening capability (Albright et al. 2002). Expressing interest in something (here nuclear weapons) is far different both from, first, experimenting with it, second, acquiring the expertise and procedures to carry out an attack.

Moreover, the use of unconventional weapons by terrorist organisations has fortunately been rare. In the last 25 years, only four significant terrorist attacks, using poison, disease or radioactive materials as weapons have occurred. The first incident was in 1984 in Oregon when a religious cult tried to upset voter turnout in a local election by covertly contaminating restaurant salad with salmonella, effecting at least 751 people. Second attack had occurred in 1990, in northern Sri Lanka, when the Liberation Tigers of Tamil Eelam (LTTE) attacked a Sri Lankan Armed Forces (SLAF) base with chlorine gas, suffering more than 60 military personnel. The other two recent terrorist attacks which are alleged to have changed the dynamics of terrorism are attack on the Tokyo subway with liquid sarin gas in 1995 and the 2001 anthrax attacks in the United States. The most famous case among all was the March 1995 attack by Aum Shinrikyo on the Tokyo subway using liquid sarin gas. It should be noted that sarin gas attack is considered to be a major tipping point which ushered and catapulted concern about terrorist use of unconventional weapons to the front burner of United States security policymaking. The Tokyo subway attack occurred at a time marked by significant concerns about loose nuclear weapons and materials in

the former Soviet Union. It also coincided with the revelations of covert unconventional weapons programs in Iraq, the 1993 terrorist attack on the World Trade Center, and the April 1995 Oklahoma City bombing. Since then the nature of terrorism is believed to have changed fundamentally (Parachini 2003). Terrorists no longer seemed bound by previous limits, when they sought attention to their cause, not deaths. By the 1990s, terrorists sought mass and indiscriminate killing and justified it by invoking higher, religious authorities. Bruce Hoffman, a well-known terrorist expert, noted in 1993 that, because "[r]eligious terrorist violence inevitably assumes a transcendent purpose and therefore becomes a sacramental or divine duty, [it] arguably results in a significant loosening of the constraints on the commission of mass murder" (Hoffman 1993: 7834). Similarly, Falkenrath predicted in 1998 that "[i]t is certain that more and more non-state actors will become capable of NBC (nuclear, biological, and chemical weapons) acquisition and use" (1998: 53). More recently, the U.S. National Strategy for Homeland Security warned that the "expertise, technology, and material needed to build the most deadly weapons known to mankind—including chemical, biological, radiological, and nuclear weapons—are spreading inexorably" (2002: 9). Two former senior government counterterrorism officials echoed similar concerns and argued that the confluence of religiously inspired terrorism and technological diffusion "will impel terrorists to overcome technical, organisational and logistical obstacles to WMD use" (Benjamin and Simon 2000: 72). If the arguments by these policymakers and scholars are correct, why have terrorists not yet attacked the United States with unconventional weapons? Although evidence exists that some terrorists are willing to attack the United States, some are willing to kill indiscriminately, some are willing to use WMD, and some are even able to do so (with limited success), combining these trends into one coherent threat conflates a series of loosely related events in the 1990s. It is not unreasonable to draw such conclusions, but these insights are best gauged against a systematic examination of the historical—albeit surprisingly small—record of terrorist cases involving unconventional weapons.

The extreme form of exaggeration can be seen in Graham Allison's book where he equates Al Qaeda's pursuit of nuclear technology with American Manhattan project (Allison 2004: 24). However, he forgets the fact that thousands of scientists and ancillary staff contributed through the Manhattan project to the creation of the

first crude nuclear explosive device. Moreover, the American government recruited best scientists and devoted massive logistical and financial resources to the effort (Schapper 2003). Envisaging such mammoth effort from a terrorist organisation is very unrealistic and reflects the imaginative wit of the author.

A series of 28 case studies, sponsored by the Monterey Institute's Center for Nonproliferation Studies, spanning the last 50 years and compiled by more than a dozen researchers provides an empirical foundation to assess the motivations, behaviour, and patterns related to terrorist interest, or alleged interest, in unconventional weapons. It should be noted that the findings of the group were based on rigorous research, and strongly emphasised primary source material. When feasible, the authors interviewed the perpetrators and arresting officials, reviewed court documents, and read the writings of the perpetrating groups. Upon this scrupulous inspection, several of the empirical cases frequently cited in the media and scholarly literature proved to be fictional. The initial set of case studies raised doubts about the alleged claims of terrorist interest in, or use of, chemical and biological weapons. New evidence and a more thorough investigation of old evidence still underscored the difficulty of assessing incomplete and complicated data of sensitive security cases (Parachini 2003: 41).

Another important fact which restrain terrorist organisation to pursue nuclear aspirations is the way a terrorist organisation functions. Most of the terrorists live unstable lives and even the sponsors, who finance, train and hide them, cannot trust them completely. In terrorist operations secrecy is safety, yet to acquire and maintain nuclear weapons would demand enlarging the terrorist organisation to include suppliers, transporters, technicians, and guardians. Inspiring devotion, instilling discipline, and ensuring secrecy become impossible to achieve as numbers grow. Those who want to punish others have to maintain their organisation so that they can continue to administer their perverted justice (Sagan and Waltz 2003: 129).

Sometimes internet has been regarded as a guide for engineering a nuclear device. However, it should be noted that these sources of information vary in their reliability and detail, and might include errors. However, they are based on

information that has been declassified and that can be used to reveal and understand the relevant physical facts. Declassification should be understood merely a result of the inevitable scientific progress that has been made since the beginning of the nuclear age. Since those beginnings, the subject nuclear physics has been established, many textbooks written, numerous nuclear plants designed and the functioning of nuclear weapons further researched. But there is still information that is secret, especially in relation to engineering of the nuclear weapon. Many laborious steps separate the basic understanding of the operating principles and an actual technical blueprint. Terrorist organisations would have to acquire special abilities and techniques in order to build even a simple nuclear explosive device. These include, for example, the generation of shock waves with the aid of high explosives, the handling of fuel and radioactive material, electronics, radiochemistry, and the precision mechanics of metallic uranium or plutonium. Even these subjects are covered in detailed specialist publications that are available not only in libraries but also on the Internet. It is possible to study these publications and use them as a basis for acquiring the relevant capabilities. However, many crucial details are secret, especially those that are based on experimental measurements rather than theory. Development work would be necessary to figure these out (Schapper 2003).

Cosmic Alarmism

According to John Mueller (2005) the members of "terrorism industry" are dedicated in pouring out, and poring over, worst case scenarios. Similarly, Bernard Brodie (1978: 68) has termed these scenarios, as "worst case fantasies". "Many academic terrorism analyses," argues Bruce Hoffman, "are self-limited to mostly lurid hypotheses of worst-case scenarios, almost exclusively involving CBRN (chemical, biological, radiological, or nuclear) weapons, as opposed to trying to understand why--with the exception of September 11--terrorists have only rarely realized their true killing potential". That is, if terrorism is so easy to carry out and terrorist so efficient, why isn't there more of it? For example, why don't they target industrial or chemical plants with conventional explosives in hopes of replicating a Bhopal with thousand dead or permanently injured (2002, 311-12).

Retaining his worst case perspective, however, Joshua Goldstein (2004) fears about terrorists detonating nuclear weapons in the United States in a crowded area and declares this to be "not impossible" or the likelihood "not negligible". But there are, of course, all sorts of things that are "not impossible". Thus, a colliding meteor or comet could destroy the earth, India and Pakistan could wage war involving nuclear weapons, Iran can bomb United States, George Bush could decide to bomb Pakistan, an underwater volcano could erupt to cause a civilisation-ending tidal wave, Bin Laden could convert to Judaism, declare himself to the Messiah, and hire a group of Roman mafiosi to have himself publicly crucified (Mueller 2005). Meanwhile, to generate alarm about such dangers and to reshape policy to deal with them, Graham Allison's recent book opens by grimly (and completely irrelevantly) recycling Einstein's failed half-century-old prediction about all-out nuclear war: "Since the advent of the Nuclear Age, everything has changed except our modes of thinking and we thus drift toward unparalleled catastrophe" (2004: 1). Both of these members of the terrorism industry want to massively increase expenditures to hedge against these "not impossible" scenarios, and Allison designates the North Korean problem a "supreme priority" and is fully prepared if necessary to launch a war, potentially costing a million lives, against that country (and presumably another against Iran) to reduce the likelihood that his worst case fantasy will materialise (2004: 171).

Some eminent commentators, like David Gergen, have argued that the United States has become "vulnerable," even "fragile". Others, like Indiana senator Richard Lugar are given to proclaiming that terrorists armed with weapons of mass destruction present an "existential" threat to the United States, or even, in columnist Charles Krauthammer's view, to "civilisation itself." Allison, too, thinks that nuclear terrorists could "destroy civilisation as we know it" while Goldstein is convinced they could "destroy our society" and that a single small nuclear detonation in Manhattan would "overwhelm the nation" (Mueller 2005: 35). Matthew Bunn in his book Securing the Bomb hails nuclear terrorism as a real danger and that "detonation of a terrorist nuclear bomb in a major city would represent a catastrophe of historic proportions" (Bunn 2007: 3). Not to be outdone, Michael Ignatieff warns that "a group of only a few individuals equipped with lethal technologies" threaten "the ascendancy of the modern state" (2004b). Two counterterrorism officials from the Clinton administration contend that a small nuclear detonation "would necessitate the

suspension of civil liberties," halt or even reverse "the process of globalisation," and "could be the defeat that precipitates America's decline," while a single explosion of any sort of weapon of mass destruction would "trigger an existential crisis for the United States and its allies" (Benjamin and Simon 2002: 398-99). A recent best-selling book by a once-anonymous CIA official repeatedly assures us that our "survival" is at stake and that we are engaged in a "war to the death". New Republic editor Peter Beinart is convinced that if any sort of "weapon of mass destruction" were be set off in the United States, "the consequences for individual rights will be terrifying". Even the thoughtful (and rare) Homeland Security skeptic, Benjamin Friedman, may have joined the chorus: a tactical nuclear weapon set off in Washington, he thinks, would transform the country "by fear and death into a police state". Apocalyptic alarmism by the terrorism industry reached a kind of pinnacle during the Orange Alert at the end of 2003. At the time Homeland Security czar Tom Ridge was given bravely to declaring that "America is a country that will not be bent by terror. America is a country that will not be broken by fear." Meanwhile, however, General Richard Myers, chairman of the Joint Chiefs of Staff, was assuring a television audience that if terrorists were able to engineer a catastrophic event which killed 10,000 people, they would successfully "do away with our way of life" (Kerr and Nikitin 2003). The fact that terrorists subsequently managed to ram airplanes into three buildings on a sunny September morning does not render this "self-evident" point less sound, and "reiteration" continues to be required (Mueller 2005).

September 11: harbinger or aberration?

Most of the commentators on nuclear terrorism have come up with the thesis that, essentially, argues that the September 11 attack have corroborated the notion of mass casualty terrorism (Ferguson and Potter 2005, Allison 2004). It should be noted that 9/11 was an extreme event. Until then no more than 329 people had ever been killed in a single terrorist attack-in a 1985 Air India explosion (Mueller 2005). Moreover, during the entire twentieth century fewer than 15 terrorist attacks resulted in the deaths of more than 100 people at one time (Hoffman 2002: 304). There is no doubt that the economic destruction of September 11 was unprecedented. However, contrary to many expectations, September 11 was never followed by second shoe. In 2004 Charles Krauthammer characterised the post-9-11 period as "three years in which the

second shoe never dropped" (2004a). The years following September 11 also falsified Allison's imagination and prediction of "second shoe" which he had talked extensively about. No one believed that the attacks on the World Trade Center and the Pentagon were an isolated occurrence" (2004: 6).

There is no doubt that such popular expectations, prediction, and belief will continue to resonate in the terrorism literature but extreme events of terrorism often remain aberration rather than harbinger (Mueller 2005). The alarming release of sarin gas in the Tokyo subway in 1995 by Aum Shinrikyo was once hailed "a turning point in the history of terrorism" (Gilmore 1999: 55). Yet, the apocalyptic group appears to have since abandoned the terrorism business, and its example has not been followed. The events of September 11, 2001, have, of course, greatly (if irrelevantly) elevated concerns about atomic terrorism. "Nothing is really new about these perils," notes Bill Keller, but 9/11 turned "a theoretical possibility into a felt danger," giving "our nightmares legs" (Keller 2002). Moreover, although there have been many terrorist incidents in the world since 2001, all (thus far, at least) have relied on conventional methods (Mueller 2005). William Arkin, a national security analyst and online columnist for the *Washington Post*, offers an alternative viewpoint. Arkin contends that exaggerated fears of a nuclear 9/11 are precisely what enabled the invasion of Iraq. Peace activists and arms control advocates, he says, share part of the blame for this state of affairs by relentlessly hyping nuclear terrorism to advance their own agendas. "A more accurate picture of the state of WMD five years after 9/11 is that the threat has indeed diminished," he concludes (Strauss 2006).

The Implausibility of Nuclear Terrorism

It is beyond the scope of any doubt that nuclear weapons are capable of inflicting catastrophic destruction and it is reasonable to assume that a nuclear weapon in the hand of a terrorist could kill tens of thousand of people. But it may also be worthwhile to note that making such a weapon is an extraordinary difficult task. As the Gilmore Commission stresses, "Building a nuclear device capable of producing mass destruction presents Herculean challenges...A successful program hinges on obtaining enough fissile material;...arriving at a weapon design that will bring that mass

together in a tiny fraction of a second, before the heat from early fission blows the material apart; and designing a working device small and light enough to be carried by a given delivery vehicle" (1999: 31). Warnings about the possibility that small groups, terrorists, and errant states could fabricate nuclear weapons have been repeatedly uttered at least since 1947 (Allison, 2004:104) and especially since the 1950s when the "suitcase bomb" appeared to become a practical possibility. People have been led, or have led themselves, to develop what Leif Wenar of the University of Sheffield has aptly labeled a "false sense of insecurity" (Mueller 2005). The implications of such sense of insecurities are recent books by Graham Allison and Joshua Goldstein issuing ominous warnings about nuclear terrorism. Of particular concern in this are Russia's supposedly missing suitcase bombs even though a careful assessment by the Center for Nonproliferation Studies has concluded that it is unlikely that any of these devices have indeed been lost and that, regardless, their effectiveness would be very low or even non-existent because they require continual maintenance (2002). And in 2004 testimony, CIA adviser and arms inspector Charles Duelfer stresses that "nuclear weapons development requires thousands of knowledgeable scientists as well as a large physical plant" (Cited in Mueller 2005: 28). It is also worth noting that, although nuclear weapons have been around now for well over half a century, no state has ever given another state--even a close ally--much less a terrorist group, a nuclear weapon that the recipient could use independently. There is always the danger the weapon would be used in a manner the donor would not approve--or even, potentially, on the donor itself. Allison thinks a dedicated terrorist group could get around these problems in time and eventually produce or procure a "crude" bomb itself, but it would be one that, by Allison's own admission, would be "large, cumbersome, unsafe, unreliable, unpredictable, and inefficient" (2004: 97).

The Atomic Terrorist: Likelihood

Concern about the possibility that non-state actors could engineer nuclear weapons have been reiterated at least since 1946 when atomic bomb maker J. Robert Oppenheimer accepted the fact that three or four men could smuggle atomic bomb units into New York and devastate the entire city (Allison 2004: 104), a massive and absurd exaggeration of the capacity of atomic bombs of the time (Mueller 2008). Such assertions permeated after the 1950s when the tactical nuclear weapons appeared to

become a practical and feasible proposition. Brian Jenkins in his 1975 essay published his warning about the "widespread distribution of increasingly sophisticated and increasingly powerful man-portable weapons will greatly add to the terrorist's arsenal and about how " the world's increasing dependence on nuclear power may provide terrorists with weapons of mass destruction" (1975: 33). Similar sentiments were also echoed by John McPhee who ominously stated that "to many people have participated in the advancement of the nuclear age, it seem not just possible but more and more apparent that nuclear explosions will again take place in cities" (1974: 3). We continue to wait for such catastrophe to happen.

It is worth noting, however, that making a bomb is an extraordinary difficult task. Thus, a group of counterterrorism and nuclear experts interviewed in 2004 by Dafna Linzer for the Washington Post pointed to the "enormous technical and logistical obstacles confronting would-be-nuclear terrorists, and to the fact that neither Al Qaeda nor any other group has come close to demonstrating the means to overcome them" (Cited in Mueller 2008). Allison, however, opines that a sophisticated and dedicated terrorist organisation, Al Qaeda in particular, could get around all the problems in time and ultimately steal, produce, or procure a crude nuclear weapon or device, one that he nonetheless, acknowledges would be a "large, cumbersome, unsafe, unreliable, unpredictable, and inefficient" (2004: 97). In his recent book, *Atomic Bazaar: The Rise of the Nuclear Poor*, William Langewiesche spends a great deal of time and effort evaluating the process by means of which a terrorist organisation could come up with a nuclear weapon. Unlike Allison he concludes that it (terrorist getting hold of nuclear weapon) "remains very, very unlikely. It is possibility, but unlikely". He further opines that:

> The best information is that no one has gotten anywhere near this. I mean, if you look carefully and practically at this process, you see that it is an enormous undertaking full of risks for the would-be terrorists. And so far there is no public case, at least known, of any appreciable amount of weapons-grade HEU [highly enriched uranium] disappearing. And that's the first step. If you don't have that, you don't have anything (Langewiesche 2007: 69).

If the prospects that terrorists might come up with a bomb are "not impossible," how close to impossible are they? Langewiesche's discussion, as well as other material, helps us assess the many ways such a quest--in his words, "an

enormous undertaking full of risks"--could fail. The odds, indeed, are stacked against the terrorists, perhaps massively so.

Assistance by a State

It is sometimes speculated, by imaginative alarmist, that a newly nuclear country might actively or passively palm off a nuclear weapon or two to friendly terrorist organisations for delivery abroad. It is almost inconceivable, however, that any state, of any kind, would knowingly allow a nuclear weapon in it territory in the possession of actors that are outside its control (Frost 2005: 64). Similarly, Langewiesche has remarked that this transfer would be highly improbable because there would be too much risk, even for a country led by extremists, that the ultimate source of the weapon would be discovered (2007: 20). Moreover, there would always be a danger that the weapon might be used against itself along with the possibility that the bomb and its donor would be discovered even before delivery or that it would be detonated in a manner and on a target the donor would not approve (Mueller 2008).

It is true that the terrorist organisations cannot be deterred from the possibility of retaliation but the chances that a terrorist weapon could be traced back to the host country should still be too high in relation to the worst possible consequences-nuclear annihilation-for a state to sponsor or even knowingly to host nuclear terrorists. Even passive assistance by a state might face retaliation if it could be argued that they should have known about the terrorists on their territory. All nuclear weapon states-establish, rogue and clandestine proliferators alike-have the strongest possible interest in making sure that terrorist organisations do not acquire nuclear weapon or material and, therefore, in maintaining control of their nuclear material and technology (Frost 2005: 64). This is especially true at a time when the so called Bush Doctrine is in operation, in which United States president George W. Bush has clearly promulgated that the US would "make no distinction between the terrorists who committed (the September 11 attacks) and those who harbour them" (NSS 2002: 5). Considering the stakes, it is difficult to imagine any state actively or passively sponsoring nuclear terrorism. Both the obvious potential candidates, Iran and North Korea, have engaged in risky nuclear brinkmanship, but it is highly improbable that either would sponsor a terrorist organisation in bombing another state. It is highly unlikely that North Korea

would launch a nuclear attack of any sort unless facing an imminent invasion by the combined forces of the United States and South Korea. For Iran, the probable quest of a nuclear-weapon programme has amplified international pressure and promoted hints of military intervention, sponsoring a nuclear attack would simply seal the country's fate. The risk is compounded by the fact that the wounded party might not be over-concerned with proof of sponsorship. The most likely target, the United States, has already invaded two countries and the entire world has seen what has happened to them. How might it respond to a nuclear attack that killed perhaps half a million citizen, can easily be imagined (Frost 2005: 65).

It is also worth noting that, although nuclear weapons have been around now for well over half a century, no state has ever given another state--even a close ally, much less a terrorist group--a nuclear weapon (or chemical, biological, or radiological one either, for that matter) that the recipient could use independently. For example, during the Cold War, North Korea tried to acquire nuclear weapons from its close ally, China, and was firmly refused (Oberdorfer 2005). There could be some danger from private (or semi-private) profiteers, like the network established by Pakistani scientist A. Q. Khan. However, its activities were rather easily penetrated by intelligence agencies (the CIA, it is very likely, had agents within the network), and the operation was abruptly closed down when it seemed to be the right time (Langewiesche 2007: 169-72). In addition, al-Qaeda--the chief demon group and one of the few terrorist groups to see value in striking the United States--is unlikely to be trusted by just about anyone. As Peter Bergen (2007) has pointed out, the terrorist group's explicit enemies list includes not only Christians and Jews, but all Middle Eastern regimes; Muslims who don't share its views; most Western countries; the governments of India, Pakistan, Afghanistan, and Russia; most news organisations; the United Nations; and international NGOs. Most of the time it didn't get along all that well even with its host in Afghanistan, the Taliban government.

Another issue which deters states from assisting terrorist organisations is the fear of nuclear forensic (or the process of determining the source of the bomb). This would be a difficult and complex task, though known and tested techniques would at least considerably narrow the range of possibilities. A detailed chemical and radiological analysis of the fallout would reveal a good deal about the fissile material

and bomb components. Such efforts are already under way. For example, by 1995, Lawrence Livermore Laboratories had begun developing techniques for tracing terrorist nuclear weapons back to their origins. These include mass spectrometry of fissile material and bomb fragments, which would reveal components or impurities, including tritium, U-240, neptunium, americium, gadolinium, curium, and promethium, found in the plutonium or HEU core the weapon. Along with this, IAEA keeps detailed records, including the ratio and types of isotopes present in each batch, of fissile material produced under its safeguards, and these would definitely help in forensic work. However, these records do not include production by the five original nuclear powers, as well as by non-signatories to the NPT (Nuclear Proliferation Treaty), such as Pakistan, India, Israel, and North Korea. Still, as David Rothberg opines, IAEA records, as well as any information supplied by the P5 (five established nuclear powers), would be helpful in excluding certain sources, while other techniques could help in analysing how the material was enriched and, probably, where the original uranium had been mined (Frost 2005: 65).

Any country that did not quickly give its records, or claimed not to have any, would immediately come under the threat of massive nuclear retaliation. While terrorist organisations might consider themselves somewhat unaffected from direct nuclear retribution, terrorists would still have to think about the consequences to them of any attack. On the one hand, no state, whether nuclear or non-nuclear, could possibly risk being branded as a host of the attackers, especially if a nuclear power or a state under the protection of one had been targeted, and so would be obliged to make the most capable efforts to throw out the attackers, as Pakistan did right after September 11 attacks. Even emerging nuclear states with no love for the West, such as Iran and Iraq, would surely not be willing to risk annihilation as the cost of protecting terrorists.

Stealing or Buying a Bomb: Loose Nukes

One of the more important sources of concern in the field of nuclear terrorism has been the disposition and security of the former Soviet Union's arsenal of tactical nuclear weapons (sometimes also referred as sub-or non-strategic). Commentators, writing on nuclear terrorism, regularly raise the issue of loose nuclear weapons

making their way from the Russian stockpile into the hand of terrorist organisations, although they are seldom precise in their numbers. For example, as Benjamin Friedman (2003) noted: Strewn across Russia, there are tens of thousands of strategic nuclear weapons and components, thousands of small tactical nuclear weapons, and stores of fissile material (plutonium or highly enriched uranium), which could be used to construct a crude nuclear device". Or this: "Thousand of these arms are scattered throughout Russia,...these explosives are more likely than those of any other country to fall into the hands of terrorists or "rogue" states, say Western government officials and independent experts (Cited in Frost 2005: 17).

However, when asked, Russian nuclear officials and experts on the Russian nuclear programs "adamantly deny that al Qaeda or any other terrorist group could have bought Soviet-made suitcase nukes". They further point out that the bombs, all built before 1991, are difficult to maintain and have a lifespan of one to three years after which they become "radioactive scrap metal" (Badkhen 2004). Probably the most convincing evidence is the fact that no terrorist group has used such a device or even credibly threatened its use. Similarly, a careful assessment of the concern conducted by the Center for Nonproliferation Studies has concluded that it is unlikely that any of these devices have actually been lost and that, regardless, their effectiveness would be very low or even non-existent because they require continual maintenance (2002). By 2007, even such alarmists at Anna Pluta and Peter Zimmerman were concluding that "It is probably true that there are no 'loose nukes', transportable nuclear weapons missing from their proper storage locations and available for purchase in some way (2007: 56). It can also be argued that Russian has an inherent interest in controlling any weapon on its soul since it is likely to be a prime target of any illicit weapon by terrorist organisations, particularly, Chechens ones whom it has been fighting a prolonged on-and-off war for over a decade (Mueller 2008: 6). Officials there insist that all the weapons, tactical or sub-strategic, have either been destroyed or are secured. Moreover, security features of Russian nuclear arsenal cannot be completely ruled out. As Linzer notes that "it would be very difficult for terrorists to figure out on their own how to work a Russian or Pakistani bomb" even if they did acquire one because simplest of these "has some security features that would have to be surpassed before it could be used for detonation" (2004).

Officials there insist that all weapons have either been destroyed or are secured, and the experts polled by Linzer (2004) point out that "it would be very difficult for terrorists to figure out on their own how to work a Russian or Pakistani bomb" even if they did obtain one because even the simplest of these "has some security features that would have to be defeated before it could be used". Moreover, continues Linzer, most bombs that could conceivably be stolen use plutonium which emits a great deal of radiation that could relatively easily be detected by passive sensors at ports and other points of transmission. One of the experts, Charles Ferguson, views arguments of nuclear alarmist with scepticism and argues that there has to be a symphony of specific sequence of events, including change in temperature, pressure, and environmental conditions before the weapon would allow itself to be armed (2005). Furthermore, the popular argument that nuclear weapons of Pakistan are most vulnerable to diversion is very problematic. It should be noted that the government of Pakistan, which has been continuously threatened by Al Qaeda, has a very strong incentive in controlling its nuclear arsenal, material and scientific expertise. In the words of Stephen Younger, former head of nuclear weapons research and development at Los Alamos and director of the Defense Department's Defense Threat Reduction Agency from 2001 to 2004, "regardless of what is reported in the news, all nuclear nations take the security of their weapons very seriously" (2007: 93). It is plausible that stolen bombs, even if no longer workable as weapons, would be useful for the fissile material that could be harvested from them. However, Christoph Wirz and Emmanuel Egger, two senior physicists in charge of nuclear issues at Switzerland's Spiez Laboratory, point out that even if a weapon is not completely destroyed when it is opened, its fissile material yield would not be adequate for a primitive design, and therefore several weapons would have to be stolen and then opened successfully (2005, 502). Moreover, those weapons use (or used) plutonium, a substance that is not only problematic to transport, but far more difficult and dangerous to work with than is highly enriched uranium (Mueller 2008).

Building a bomb of one's own

Since terrorist organisation are unlikely to be able to buy or steal a usable nuclear weapon and since they are further unlikely to have one handed off to them by an established or emerging nuclear power, terrorist organisation would need to engineer

the device themselves. It has been generally agreed, among experts of nuclear field, that because of the dangers and difficulties of transporting and operating with plutonium, a committed terrorist organisation, would choose to try to use highly enriched uranium (Allison 2004: 96-97, Linzer 2004, Langewiesche 2007, Bunn and Weir 2006: 135). If a terrorist organisation does decide to involve in nuclear catastrophe using highly enriched uranium then the immediate goal would be to procure as much of this material as necessary (more than 100 pounds is needed to reach critical mass) and then fashion it into an explosive. The weapon thus created would not be a bomb that can be dropped or hurled, but rather an "improvised nuclear device" (IND) that would be set off at the target by a suicidal detonation group (Mueller 2008). It is worth mentioning that the entire procedure of building a nuclear device would be daunting one, and would need that a whole "chain of causations" click perfectly and in sequence. Should any event in this chain be a failure, the entire nuclear terrorist aspiration for a nuclear weapon would be demolished (Ferguson and Potter: 6). This is a key issue in the entire debate on nuclear terrorism. Those, like Allison, who warn about the likelihood of a terrorist bomb, argue that a terrorist group could, if often with great difficulty, surmount each obstacle--that doing so in each case is "not impossible." But it is vital to point out that while it may be "not impossible" to surmount each individual step, the likelihood that a group could surmount a series of them rather quickly does approach impossibility. There are so many problems associated with the construction of a nuclear device. Let us assess the problem.

Procuring Fissile Material

This is a much more serious hurdle, especially for the home-made bomb maker. Uranium-235 is not available in the open marked, and even natural uranium in the quantities which are needed (tonnes) is not easily procured without detection. Although the literature on nuclear terrorism is full of incidents (or stories) of the theft of such material, especially from the FSU, most of these 'thefts' involve less than one critical mass of material, and are attempts by non-expert individuals to make some fast money. In a large number of cases, they are caught. The Russian authorities are rather confident that no Russian material of military significance is now unaccounted for (Watson 2003). To begin with, non-state actors are simply incompetent of

manufacturing the required fissile material for a bomb since the process requires a mammoth effort on an industrial scale (Allison 2004, Cameron 2004: 83, Bunn and Wier 2006: 136-37, Langewiesche 2007). Moreover, they are unlikely to be supplied with the material by a state for the same reasons a state is unlikely to give them a workable bomb. Thus, they would need to steal or illicitly purchase this crucial material (Mueller 2008).

Equipment for separating uranium isotopes (and in effect the centrifuge option is probably the only feasible one) is rather carefully controlled under the London Convention on dual-use technology. Evasion of those controls is possible (as the cases of Iraq and Pakistan show) but it is difficult, and there is always a risk of detection. Once the equipment has been procured, there is a non-trivial industrial-scale process to be set up and operated, which takes time and expertise, and is somewhat vulnerable to satellite detection. So the tendency is to assume that the terrorist wishing to procure U-235 will try to steal it. The potential sources are research reactors (of which there are about 1000 world-wide, many of which use highly enriched fuel), those few (about 10) nuclear submarines which use HEU (the best known examples are the Russian Alpha class subs) or nuclear weapons themselves (or stockpiles of weapons material). It cannot be claimed that the current level of protection of these sources are as good as might be desired, but there is a rapidly growing awareness of the need to address this problem.

The other nuclear weapon option – plutonium- has different problems. The material is not available in nature and it has to be produced in a reactor, so the terrorist has either to build and operate a reactor for some years, or to have access to material from a reactor operator. Ideally, a weapon uses 'weapons-grade' plutonium, typically material with >93% Pu-239, and this requires the reactor to be operated in a non-standard mode. However any material with more than about 20% Pu-239 (and that includes material from a conventional civil nuclear reactor) can make a 'fizzle-yield' weapon of over one kiloton yield. The plutonium does however need to be free of the fission products with which it is associated in a spent nuclear reactor fuel assembly. This implies a chemical plant which can separate off the plutonium and convert it to metallic form. So the terrorist either has to create such a facility, or steal the product from someone who does. Although the chemistry is not very

sophisticated, spent fuel is very highly radioactive, so the facility has to be shielded to protect the operators, and the material has to be handled remotely. Once the fissile material has been procured there is the task of weapon manufacture. This is more difficult than making a uranium-235 weapon, because of the need for implosion of the core using carefully shaped charges. For all these reasons, this option is likely to be possible (Watson 2003).

Contrary to popular assumptions, access to fissile materials, which have already been prepared in an existing weapons programme, is subject to quite strong security arrangements. Weapons and fissile material stockpiles are protected by armed guards trained to cope with a determined attack. Moreover, transport of fissile material outside such protective sites is normally limited so that quantities less than the critical mass are on the move at any time. Where this is not possible, armed escort teams are used. By contrast, access to radioactive materials for a dirty bomb is relatively easy. The most widely distributed material is in the form of nuclear 'sealed sources', which are widely used in medicine (~25 KCi each for radiotherapy), in marine transport (~100 KCi each, as power sources for un-manned lighthouses), in the food industry (~ 10 MCi each, for sterilisation plants), in the oil & gas industry (~10 Ci each, for down-hole monitoring) and in the engineering industry (~ 100 Ci each, for weld inspection etc). According to a recent US GAO survey there are some 8 million such sources in circulation worldwide, and that 745 have been lost (and 510 not recovered) since 1998. In addition to this material, the existing nuclear countries now have many millions of tons of radioactive waste material (at various different levels of activity) and much of it is stored in facilities with relatively limited safeguards. The relatively low level of attention which has been given to the safeguarding of all this radioactive material is partially because such material is regarded as being to some extent 'self-protecting' (Watson 2003).

Although there is valid concern that some material, particularly in Russia, may be somewhat poorly secured (though things have improved considerably), it is under lock and key, and even sleepy, drunken guards, notes Langewiesche, will react with hostility (and noise) to a raiding party. Thieves also need to know exactly what they want and where it is, and this presumably means trusting bribed, but not necessarily dependable, insiders. And to even begin to pull off such a heist, they need to develop

a highly nuanced "sense for streets" in foreign lands filled with people who are often congenitally suspicious of strangers (Langewiesche 2007: 33-48). As Mueller argues that corruption or mismanagement in some areas may offer an opportunity to buy the needed material, but buyers of illicit goods and services would have to bribe a host of greedy confederates, any one of whom could turn on them, either out of trickery or incompetence, furnish them material that is phoney, as happened to Al Qaeda in 1993 when it tried to obtain highly enriched uranium from Sudan (Mueller 2008).

It is equally important to mention that in the entire operation of exchange, involving nuclear technology and material, the stakes would be very high. Not only could the exchange prove to be a scam, it could also prove to be part of a sting--or become one. Although there may be dissatisfied and much underpaid scientists in places like Russia, they would have to think about the costs of exposure. For example, A. Q. Khan, the Pakistani nuclear scientist was once a national hero for his lead work on his country's atomic bomb. But when he was brought down for selling atomic secrets to other governments, he was placed under severe house arrest, allowed no outside communication or contact, including telephone, newspapers, or internet, and is reportedly in declining health (Langewiesche 2007, 75-76). Added to this, traitor Russian scientists who are not national heroes could anticipate a punishment that would be very unpleasant. Once it comes to the attention that some quantity of uranium is missing, the authorities would scrutinise the few people who might have been able to help the thieves, and one who seems abruptly to have become affluent is likely to arrest their attention from the scratch. It is also relevant to note that in the last ten years or so, there have been 15 known thefts of highly enriched uranium--in total less than 16 pounds or so, far less than required for an atomic explosion (IAEA 2007). Most importantly, notes Linzer, "the thieves--none of whom was connected to al Qaeda--had no buyers lined up, and nearly all were caught while trying to peddle their acquisitions" (Linzer 2004). Though, of course, there may have been additional thefts that went undiscovered (Bunn and Wier 2006: 137). If terrorist organisations were somehow succeed at acquiring a critical mass of relevant material, they would then have to ship it hundreds of miles out of the country over unfamiliar soil and probably being chased by security forces (Langewiesche 2007, 48-50).

There have been arguments about terrorist organisation using smuggling routes and taking the tested and reliable assistance of opium traders, for example (Zaitseva 2007). But the routes are not as vulnerable as they appear and are often under the watchful eyes of a handful of criminal and congenitally suspicious and careful regulators (Langewiesche 2007: 54). If they became suspicious of the commodity being smuggled, some of these traders might find it in their interest to disturb the entire exchange. Moreover, it is not rational to assume that people engaged in the routine, if illicit, business of smuggling would necessarily be so immoral that, even for considerable benefit, they would willingly join a plot that might end up killing tens of thousand of innocent people (Mueller 2008).

Constructing an Atomic Device

It is widely accepted that construction of a nuclear device requires a certain minimum level of scientific and technical competence. It would be irrational to assume that the terrorist organisation possess the technical know-how or the crucial aspects of engineering a nuclear weapons. Construction of an atomic bomb still calls for information which exists only within the nuclear weapons states (Watson 2003). There are arguments that construction of a home made nuclear device is comparatively easy and is within the reach of a sophisticated terrorist organisation. But it should be noted that it is most improbable that any terrorist organisation could become a do-it-yourself nuclear power. Unlike rough conceptual outlines, the detailed procedures and engineering drawings necessary to build a nuclear weapon are not available in the open literature (Frost 2005: 9). As former Manhattan Project scientist, Canadian J. Carson Mark argues that while "schematic drawings" for nuclear weapons have proliferated and have indeed been widely available in open literature for years, the detailed design drawings that are mandatory before it is feasible to plan the engineering of actual parts are not available. It is worth mentioning that preparing these drawings demand a large number of man-hours and the direct involvement of individuals having expertise in several quite distinct areas such as physical, chemical and metallurgical properties of the various materials to be used, as well as the characteristics affecting their fabrication, neutronic properties, radiation effects, both nuclear and biological, technology concerning high explosives, and/or chemical propellants, some hydrodynamics, electrical circuitry, and others (1987: 26).

Allison, however, insisted that it would be "easy" for a terrorist organisation to engineer a crude bomb if they could get hold of enough fissile material (Allison et al. 1996, 12). Atomic scientists, perhaps labouring under the concern, in Langewiesche's words, that "a declaration of safety can at any time be proved spectacularly wrong" (2007, 49), have been comparatively restrained in cataloguing the difficulties terrorists would face in constructing a bomb. The findings of physicist Christoph Wirz and Emmanuel Egger have also concluded that the task "could hardly be accomplished by a sub-national group" (2005). They point out that accurate blueprints are mandatory, not just sketches and general ideas, and that even with a good blueprint they "would most certainly be forced to redesign" (2005). The process could take months or even a year or more (Pluta and Zimmerman 2006: 62), and in distinct contrast with Allison, Wirz and Egger argue that the work, far from being "easy," is difficult, dangerous, and extremely exacting, and that the technical requirements "in several fields verge on the unfeasible." They conclude that "it takes much more than knowledge of the workings of nuclear weapons and access to fissile material to successfully manufacture a usable weapon" (2005). These problems are also emphasized in an earlier report by five Los Alamos scientists: "although schematic drawings showing the principles of bomb design in a qualitative way are widely available:

> the detailed design drawings and specifications that are essential before it is possible to plan the fabrication of actual parts are not available. The preparation of these drawings requires a large number of man-hours and the direct participation of individuals thoroughly informed in several quite distinct areas: the physical, chemical, and metallurgical properties of the various materials to be used, as well as the characteristics affecting their fabrication; neutronic properties; radiation effects, both nuclear and biological; technology concerning high explosives and/or chemical propellants; some hydrodynamics; electrical circuitry; and others" (Mark et al 1987: 58).

Moreover, opines physicist David Albright, the process would also require "good managers and organisation people" (Keller 2002). Although they (Los Alamos scientists) think the problems can be dealt with "provided adequate provisions have been made," they also stress that "there are a number of obvious potential hazards in any such operation, among them those arising in the handling of a high explosive, the possibility of inadvertently inducing a critical configuration of the fissile material at some stage in the procedure; and the chemical toxicity or radiological hazards nherent in the materials used. In their study they conclude that "failure to foresee all

the needs on these points could bring the operation to a close" (Mark et al. 1987: 62). Younger has more recently made a similar argument: it would be wrong to assume that nuclear weapons are now easy to make....I am constantly amazed when self-declared "nuclear weapons experts," many of whom have never seen a real nuclear weapon, hold forth on how easy it is to make a functioning nuclear explosive....While it is true that one can obtain the general idea behind a rudimentary nuclear explosive from articles on the Internet, none of these sources has enough detail to enable the confident assembly of a real nuclear explosive (2007: 86- 88).

Moreover, all the work, related to the construction of nuclear weapon, have to be done in a covert manner, keeping every detail of the operation an utter secret. "In addition to all the usual intelligence methods," opines the Los Alamos scientists, "the most sensitive technical detection equipment available would be at their disposal, and effective airborne detectors used to prospect for uranium have been around for decades and "great improvement in such equipment have been realised since" (Mark et al. 1987: 60). Waltz (2003) has made similar assertion and argues that secrecy would be a difficult to achieve while pursuing such mammoth effort of constructing a nuclear weapon. Langewiesche has echoed same sentiments and argues that the people in the area may become suspicious of constant coming and going of technicians (2007: 65-69). In addition, the bomb makers would not be able to test the product to be sure they were on the right track (Linzer 2004, Mark et al. 1987: 64).

The entire process of engineering an IND demands, then, the effective recruitment of people who at once have great technical skills and will remain completely devoted to the cause. In addition, corrupted co-conspirators, many of them foreign, must remain utterly reliable, no curious outsider must get wind of the project over the months or even years it takes to pull off, and international and local security services must be kept perpetually in the dark.

Transporting and Detonating the Device

Excluding the cases where the radioactive material is to be dispersed directly from its place or storage or use, the terrorist organisation has to devise a mode of delivery to the desired target. The possible options of delivery are rocket or aircraft delivery

system which pass above national defences or covert delivery by land or sea at ground level through any border security controls that are in place. Of particular concern are rogue state which possess (or are developing) rockets with a cross border range. There are widespread fears that any of these might sponsor terrorism by making their rocketry available for the execution of the plan. The manifestation of this threat can easily be seen in the current interest in limited-scope missile defence systems. From the terrorist perspective, one of the disadvantages of this delivery method is that the payload of many rocket systems is rather small, and this may restrict the practicality of delivering a home-made bomb. Therefore, the alternative option of clandestine delivery at ground level through the national border controls becomes attractive. This would presumably require trusting it to the tender mercies of the commercial transportation system, supplying a return address, and hoping that the employees and policing agencies, alerted to the dangers by news of the purloined uranium, would remain oblivious. Or the atomic terrorists could try to use established smuggling routes, an approach that, again, would require the completely reliable complicity of a considerable number of criminals. While doing this they would have to hope, and fervently pray, that the machine shop work has been perfect, that there have been no significant shake-ups in the treacherous process of transportation, and that the thing, after all this effort, will not be a dud (Mueller 2008).

The quality of the radiation detection equipment at such borders ranges from the excellent to the non-existent. However, if the material to be used is highly radioactive then the chances of detection become very high. The following trivial calculation will indicate the nature of the problem. Suppose that the terrorist wishes to threaten an action which would require a government to evacuate an area of (say) one square kilometre in the centre of London, by claiming that he has the capability to disperse enough radioactive waste to do so. For Caesium-137, one of the more active components of much radioactive waste, a layer uniformly distributed at ground level at a density of say 30 Curies per square km, would give rise to a dose at a height of 1 metre of 2 micro-Sieverts per hour – ie 18 milli-Sieverts per year. Since the maximum permissible dose to a radiation worker is currently 20 milli-Sieverts a year, it might perhaps be a reasonable act of public policy for a government following an act of terrorism to evacuate the population from a region contaminated above a level of about 30 Curie per square km. The quantity of Caesium-137 required to do this is

minuscule – about 3 grams. However if that whole amount were held unshielded by the terrorist at a distance of 30cm, he would get a dose of order 1 Sievert per hour – i.e. a lethal dose within a few hours. So he needs both to keep it within a thickly shielded container at all times until he is ready to use it, and then distribute it reasonably evenly over a square kilometre. The manufacture of the required mixture of Caesium-137 and explosive under fully-shielded conditions, and the transport of the bomb (again in a shielded container) to the target area would not be easy (Watson 2003).

Assessing the Financial Costs

Generally, most of the literature on nuclear terrorism ignores the question of financial cost of the extended operation. However, it is worth noting that during any such operation the terrorists have to make a huge investment. There would be expensive equipment to buy, smuggle, and set up, and people to pay--or pay off. It is plausible to assume that some of the operative might work for free, in the name of Islam, for example, but the vast operation requires in addition the subversion of a considerable array of criminals and opportunist, each of whom has every incentive to push the asking price of cooperation as high as possible.

Moreover, the terrorist organisation would be required to reveal their intention to at least some of the corrupted, and at that point there is always a possibility that they would become potential extortion victims. They could not afford to dump untrustworthy people who know their ultimate goal (though they could attempt to kill them), and such people would now enjoy essentially control powers ever to escalate their price (Mueller 2008).

Evaluating the Likelihood

While evaluating the prospects of nuclear terrorism one has to remember the fact that even if there is desire for the nuclear weapon by the terrorist organisations, fulfilment of that desire is another matter. Even alarmists Matthew Bunn and Anthony Wier contend that the atomic terrorists' task "would clearly be among the most difficult types of attack to carry out" or "one of the most difficult missions a terrorist group

could hope to try" (2006, 133-34, 147). It might be useful to take a stab at estimating just how "difficult" or "not impossible their task is, or how distant the "realm of possibility" might be. After all, lots of things are "not impossible".

Addressing the question of whether terrorist organisations would consider going nuclear is an all-but impossible task. There are no cases to study to unearth the real prospects of nuclear terrorism. Neither terrorist organisations nor those who fight them are particularly interested in keeping information in the public realm. We are in the end left with "what if", and "best guess" thinking. There are many lessons to be learnt from the Japanese apocalyptic group, Aum Shinrikyo, who tried in the early 1990s to pursue nuclear aspiration but ultimately fell to the ground. Unlike al-Qaeda, it was not under siege, and it had money, expertise, a remote and secluded haven in which to set up shop, even a private uranium mine. But it made dozens of mistakes in judgment, planning, and execution (Linzer 2004). Irked, it turned to biological weapons which, as it happened, didn't work either, and finally to chemical ones, resulting eventually in a somewhat failed release of sarin gas in a Tokyo subway that managed to kill a total of 12 people.

Appraising the Barriers

As noted earlier, most discussions of nuclear terrorism deal rather piecemeal with the subject--focusing separately on individual tasks such as procuring HEU or assembling a device or transporting it. But, as the Gilmore Commission, a special advisory panel to the President and Congress, stresses, building a nuclear device capable of producing mass destruction presents "Herculean challenges" and requires that a whole series of steps be accomplished. The process requires obtaining enough fissile material, designing a weapon "that will bring that mass together in a tiny fraction of a second, before the heat from early fission blows the material apart," and figuring out some way to deliver the thing. And it emphasizes that these merely constitute "the *minimum* requirements." If each is not fully met, the result is not simply a less powerful weapon, but one that can't produce any significant nuclear yield at all or can't be delivered (Gilmore 1999: 31, emphasis in the original). Mueller has come up with a detailed list of the barriers that a terrorist organisation has to face in order to carry out the operation of producing, transporting, and then successfully detonating a

nuclear device. Table 1 attempt to do this, and it enumerates some 20 of these--*all* of which must be defeated by the atomic aspirant. It is to be noted that in assembling the list, Mueller has sought to make the various obstruction independent from each other, although they are, of course, related in the sense that they are sequential or as Ferguson and Potter (2005) have called chain of event. However, while the terrorists must locate an inadequately-secured supply of HEU to even begin the project. This discovery will have little bearing on whether they will be successful at securing an adequate quantity of the material, even though, obviously, they can't do the second task before accomplishing the first. Similarly, assembling and supplying an adequately equipped machine shop is effectively an independent task from the job of recruiting a team of scientists and technicians to work within it. Moreover, members of this group must display two qualities that, although combined in hurdle 9, are essentially independent of each other: they must be *both* technically skilled *and* absolutely loyal to the project (2008).

Assessing the Probabilities

In order to bring nuclear catastrophe, would-be atomic terrorists effectively *must* go though an exercise that looks much like this, as elaborated in the discussion. If and when they do so, they are likely to find their prospects discouraging and accordingly uninspiring or even dispiriting. To bias the case in their favour, one might begin by assuming that they have a fighting chance of 50 percent of overcoming each of these obstacles (mentioned by Mueller) even though for many barriers, probably almost all, the odds against them are much worse than that. Even with that generous bias, the chances they could successfully pull off the mission come out to be worse than one in a million, specifically they are one in 1,048,567. Indeed, the odds of overcoming even seven of the twenty hurdles at that unrealistically, even absurdly, high presumptive success rate is considerably less than one in a hundred. If one assumes, somewhat more realistically, that their chances at each barrier are one in three, the cumulative odds they will be able to pull off the deed drop to one in well over three billion--specifically 3,486,784,401. What they would be at the (entirely realistic) level one in ten boggles the mind (Mueller 2008).

It is to be noted that one could also make specific estimates for each of the impediment, but the cumulative probability statistics are likely to come out pretty much the same--or even smaller. For example there may be a few barriers, such as number 13, where one might plausibly conclude the terrorists' chances are better than 50/50. However, there are many in which the likelihood of success is almost certainly going to be exceedingly small--for example, numbers 4, 5, 9, and 12, and, increasingly, the (obviously) crucial number 1.

Those would be the odds for a single attempt by a single group, and there could be multiple attempts by multiple groups, of course. Although Allison considers al-Qaeda to be "the most probable perpetrator" on the nuclear front (2004: 29), he is also concerned about the potential atomic exploits of other organisations such as Indonesia's Jemaah Islamiyah, Chechen gangsters, Lebanon's Hezbollah, and various doomsday cults (2004: 29-42).21 Putting aside the observation that few, if any, of these appear to have interest in hitting the United States except for al-Qaeda (to be discussed more fully below), the odds would remain long even with multiple attempts. If there were a hundred determined efforts over a period of time, the chance at least one of these would be successful comes in at less than one one-hundredth of one percent at the one chance in two level. At the far more realistic level of one chance in three it would be about one in 50 million. If there were 1000 dedicated attempts, presumably over several decades, the chance of success would be less than one percent at the 50/50 level and about one in 50,000 at the one in three levels.

These odds are for the most plausible scenario by means of which a terrorist group might gain a bomb: constructing one from HEU obtained through illicit means. As noted, there are other routes to a bomb: stealing a fully constructed one (or the HEU needed to make one) or being given one as a gift by a nuclear state. However, as also noted, those routes are generally conceded, even by most alarmists, to be considerably *less* likely than the one outlined in Table 1 to be successful for the terrorists.

Additionally, if there were a large number of concerted efforts, policing and protecting would presumably become easier because the aspirants would be exposing themselves repeatedly and would likely be stepping all over each other in their quest

to access the right stuff. Also, the difficulties for the atomic terrorists are likely to *increase* over time because of much enhanced protective and policing efforts by self-interested governments--there is considerable agreement, for example, that Russian nuclear materials are much more adequately secured than they were ten or fifteen years ago (Pluta and Zimmerman 2006: 257).

Moreover, all this focuses on the effort to deliver a single bomb. If the requirement were to deliver several, the odds become, of course, even more prohibitive.

Table 3: The atomic terrorist's task in the most likely scenario:

1. An inadequately-secured source of adequate quantities of highly-enriched uranium (HEU) must be found.
2. The area must be entered while avoiding detection by local police and by locals wary of strangers.
3. Several insiders who seem to know what they are doing must be corrupted.
4. All the insiders must remain loyal throughout the long process of planning and executing the heist, and there must be no consequential leaks.
5. The insiders must successfully seize and transfer the HEU, and the transferred HEU must not be a scam or part of a sting and it must not be of inadequate quality due to insider incompetence.
6. The HEU must be transported across the country over unfamiliar turf while its possessors are being pursued.
7. To get the HEU across one or more international borders smugglers must be employed, and they must remain loyal despite the temptations of massive reward money even while no consequential suspicion must be generated in other smugglers using the same routes who may be interested in the same money.
8. A machine shop must be set up in an obscure area with imported, sophisticated equipment without anyone becoming suspicious.
9. A team of highly skilled scientists and technicians must be assembled, and during production all members of the team must remain absolutely loyal to the cause and develop no misgivings or severe interpersonal or financial conflicts.
10. The complete team must be transported to the machine shop, probably from several countries, without suspicion and without consequential leaks from relatives, friends, and colleagues about the missing.
11. The team must have precise technical blueprints to work from (not general sketches) and must be able to modify these appropriately for the precise purpose at hand over months (or even years) of labour, and without being able to test.
12. Nothing significant must go wrong during the long process of manufacture and assembly of the improvised nuclear device (IND).
13. There must be no inadvertent leaks from the team.

14. Local and international police, on high (even desperate) alert, must not be able to detect the project using traditional policing methods as well as the most advanced technical detection equipment.

15. No locals must sense that something out of the ordinary is going on in the machine shop with the constant coming and going of non-local people.

16. The IND, weighing in a ton or more, must be smuggled without detection out of the machine shop to an international border.

17. The IND must be transported to the target country either by trusting the commercial process filled with people on the alert for cargo of this sort or by clandestine means which requires trusting corrupt co-conspirators who also know about the reward money.

18. A team of completely loyal and technically accomplished co-conspirators must be assembled within, or infiltrated into, the target country.

19. The IND must successfully enter the target country and be received by the in-country co-conspirators.

20. A detonation team must transport the IND to the target place and set it off without anybody noticing and interfering, and the untested and much-traveled IND must not prove to be a dud.

Chapter Five

CONCLUSION

We live in the age of terrorism. Of all forms of terrorism, nuclear terrorism is the most horrendous phenomenon. For decades we consoled ourselves with acceptance of the observation made famous by Brian Jenkins, "that nuclear terrorism is neither imminent nor inevitable...terrorist were more interested in publicity than killing and therefore had neither the need nor the interest in annihilating large number of people (Jenkins 1975: 10, 15). Twenty three years later, Jenkins revisited his conclusion and expressed doubts over his previous thesis (Jenkins 1998). He now argued that 'self imposed constraints' that used to limit terrorists' operations are eroding. In the same paper he also argued that the prospects of catastrophic destruction, involving nuclear terrorism, are soaring high. Jenkins revised his conclusion in the light of events in former Soviet Union and the increasing destructiveness of new breed of terrorists. The shadow of Jenkins' later observation is ubiquitous in the entire literature of nuclear terrorism. There is no denying that contemporary terrorist organisations are immune to self imposed constraints which used to limit the lethality of their operations and no home scenario make them the most prominent threat of our times. One of the most prevalent features in mainstream discussions of nuclear terrorism has been the conflation of motive and capability. All too often observers assume that simply because terrorist organisations are motivated to acquire nuclear weapons they will be successful in doing so. Given the high stakes involved, it is all too easy to exaggerate possible scenarios involving terrorists using nuclear violence. Yet it is equally easy to dismiss possible threat scenarios as being unduly alarmist. Although, nuclear terrorism remains a real prospect, the ease with which such attacks can be carried out has been exaggerated. As John Parachini, a CBNR terrorism expert, had argued,

> Demonstrating interest in something is far different both from, first, experimenting with it and, second, mastering the procedures to execute an attack. Gaining access to materials is certainly a major barrier, but it is not the only one. Delivering toxic materials to targets in sufficient quantities to kill in the same fashion as explosives is not easy (2003: 39).

Our chief conclusion, which must also be seen as a rationale for this study, is that we are, in the end, left with 'what if' and 'best guess' thinking: speculation in a word. Or to say, in analysing the threat of nuclear terrorism, we manoeuvre on the

terrain of uncertainty and conjecture. There are no cases to study and there is no historical evidence to unearth. There is considerable evidence that must inform this hypothetical possibility and narrow its range. First, there are many technical difficulties. Assembling sufficient quantity of fissile material for even the crudest nuclear device would be a Herculean task and probably extremely expensive for a terrorist organisation. Moreover, the theoretical knowledge and practical skills needed to design and engineer a nuclear device are of a high order, while setting up, equipping and successfully operating an undetectable covert weapons laboratory would be difficult and expensive, even for the best funded and resourceful terrorist organisation of the world. Secondly, commentators writing on nuclear terrorism regularly raise the issue of loose nuclear weapons making their way from the Russian stockpile into the hand of terrorist organisations, although they are seldom precise in their numbers. Scholarship on nuclear terrorism, for example Friedman (2003), ignores that nuclear weapons are guarded like national treasures and it is very unlikely that any government, whether weak or strong, would compromise with the security of its nuclear weapons. For example, Aum Shinrikyo (Japanese doomsday cult) despite its independence, had to give up the attempt to develop a nuclear weapon very early in the process, preferring to work with chemical and biological agents instead which ultimately culminated in sarin gas attack on Tokyo subway in 1995. It was the first known unconventional terrorist attack by any terrorist organisation and it led to plethora of books on nonconventional terrorism with imaginative speculations. Since then, many observers of nuclear terrorism have revised their assessment and have gone to the extent of saying that detonation of nuclear device is *inevitable* (Allison 2004: 203, emphasis added). It was in the light of this (and such) statements that this study has attempted to assess the inevitability of such assertion. However, most of the literature on nuclear terrorism underestimates these reasons. The prevalence of this approach has meant that insufficient attention has been paid to addressing the key issue of accessibility to nuclear weapons on the part of terrorist groups and the likelihood of such groups actually using them. Consequently, the challenging nature of assessing the threat of nuclear terrorism has frequently been overlooked in much of academic literature. Simply accepting at face value the hypothesis that nuclear terrorism is only a "matter of time", as Allison has argued, is no substitute for detailed and measured threat assessment.

This research has primarily been trying to better understand the issue of nonconventional terrorism, especially nuclear terrorism. While doing so, we chose the study of Al Qaeda as a case study since it has shown a keen interest in inflicting nuclear violence and, is considered to be the most capable organisation of the world. Using scholarship associated with Al Qaeda and Jihad, we attempted to demystify the nuclear rationale of Al Qaeda along with its efforts to accomplish its long coveted desire for nuclear capability. It is equally important to mention here that information about Al Qaeda's nuclear activities derives from a wide array of sources whose reliability of quite variable. Among those sources are the public pronouncements of Al Qaeda leaders, the testimony of imprisoned Al Qaeda members, statements by public officials from numerous government, leaks from unnamed intelligence sources, claim made by more or less dubious individuals, uncorroborated and often biased journalistic accounts, and-most reliably-captured Al Qaeda documents (including video tapes- or tangibly physical evidence in the form of abandoned Al Qaeda safe houses and laboratory facilities.

However, this is not to say that the possibility of such attacks can (should) be ruled out. The rise of "new" brand of terrorism the operates across borders and whose operations aim to inflict catastrophic damage, coupled with the destructive threshold crossed on 11 September 2001, mean that terrorist attacks using nonconventional means will continue to be a realistic prospect in the future. However, the news is not that bad as some alarmist would have us believed. As the head of United Nation's Terrorism Prevention Branch has aptly remarked, the greatest challenge in analysing the WMD terrorist threat is "walking the fine line between fear and paranoia on the one hand, and prudence and disbelief on the other" (Schmid 2000: 108). On the one hand, I have demonstrated (in chapter 4) that it remains very difficult for all but the most technologically terrorist organisations to successfully weaponise nuclear material for delivery against targets. Overall, acquiring nuclear capabilities for delivery against targets is a lot harder for terrorist organisations than is generally acknowledged in the literature. On the other hand, however, it is clear that contemporary terrorist organisations have no moral constraints about initiating catastrophic attacks targeting civilian populations (as shown in chapter 2) than the terrorist of yesteryears. Since the end of the Cold War (and especially after September 11) terrorists and terrorists' operations have become more lethal in its scope due to the

increasingly indiscriminate religiously oriented violence perpetrated by new terrorist groups such as Al Qaeda. In short, contrary to the view held in some quarters, terrorists of today are far more likely to use nuclear terrorism than those in the past. However, the probability of terrorists' attacks, using nuclear weapon or material is, still, very low.

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