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WMD Terrorism: No Longer a Question of If, but When?

Gavin Cameron

The death and destruction inflicted on 9/11 aboard the four hijacked airliners and in New York City and Washington D.C. was unprecedented in the history of terrorism. In comparison, prior to 9/11, the most destructive act of terrorism in terms of human lives lost was the 1985 Air India bombing. Without seeking to minimize the extent of those losses, fatalities from that earlier incident were 328,[1] or roughly one-tenth of the 3000 fatalities experienced in the 2001 attacks. Following that slaughter, the world was confronted by increasing evidence that al-Qa'ida, the group responsible for 9/11, had also made considerable efforts to acquire chemical, biological, radiological and nuclear (CBRN) weapons with which to perpetuate their campaign. These acquisition attempts appear to be continuing still, and throughout 2002 additional proof became evident of such efforts, and also of numerous plots to use CBRN weapons against Western targets in both North America and Europe. Al-Qa'ida's campaign represents the most concerted effort to acquire, weaponize, and use such materials since Aum Shinrikyo's in the early and mid-1990s. Concern over the potential use of CBRN weapons in a WMD attack has become the ultimate nightmare scenario for government officials. Speaking in November 2002, Prime Minister Tony Blair of Great Britain stated: "terrorism and WMD have the potential, at least, to be directly linked. Would al-Qa'ida buy WMD if it could? Certainly. Do they have the financial resources? Probably. Would they use them? Definitely."[2] Given al-Qa'ida's willingness to inflict mass casualties in addition to their financial depth, organizational strengths, contacts, and motivation to acquire CBRN weapons, this paper considers whether the terrorist use of such weapons has become inevitable, or is the product of overreaction in the wake of the 9/11 attacks.

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Before addressing this, it is necessary to clarify one definitional issue. For the purposes of this article, Weapons of Mass Destruction will mean not only chemical, biological, radiological, and nuclear weapons, but also "massive" conventional weapons. The reason for such a distinction is obvious in the wake of the 9/11 attacks: mass destruction and mass casualties can be inflicted with conventional weapons just as effectively as with CBRN weapons. Conversely, the majority of sub-state or "multi-centric" uses of CBRN weapons by terrorists have occurred at very localized and small-scale levels. To describe such events as examples of WMD use, which implies a scale of enormity in devastation, is not only illogical but also analytically problematic. WMD and CBRN are not synonymous. For the purposes of this article, incidents involving CBRN materials serve as a "type" of attack rather than as a "scale" of attack, and thus the terrorist use of CBRN will include both low- and high-level weapons.

In order to address whether WMD terrorism, meaning devastation on a scale similar to 11 September, has become inevitable, this article initially considers the indicators from al-Qa'ida's attacks on 9/11, noting in particular that it was an assault that utilized a variety of traditional terrorist tactics, rather than the much feared CBRN materials. The ramifications of 9/11 for the future of al-Qa'ida and other terrorist groups are then considered by evaluating the past terrorist employment of CBRN weapons. While continuing attempts at CBRN acquisition by al-Qa'ida and others offers a considerable threat that absolutely must be addressed because of the nature of CBRN weapons, and while future acts of high casualty or mass destructive terrorism are certainly possible, the evidence available indicates that conventional weapons remain the most plausible means to inflict WMD attacks.

Terrorism and WMD

The 11 September terrorists used two "traditional" terrorist tactics in perpetuating their attacks: hijacking, and crashing a vehicle into a building. Their innovation was to combine these tactics and to use planes rather than trucks as the delivery vehicle. In doing so, the 11 September terrorists killed some 3,000 people using nothing more exotic than conventional weapons. By comparison, the most notable terrorist use of CBRN weapons, Aum Shinrikyo's March 1995 attack on the Tokyo subway, killed twelve people and injured thousands. This may suggest that 9/11 is indicative of further acts of "high-casualty terrorism," rather than of terrorism with CBRN weapons. The two types of attack and their means are not synonymous. Despite the attempts to acquire CBRN weapons by groups such as Aum Shinrikyo and al-Qa'ida and the actual use of such weapons by several other groups, no terrorist organization has perpetrated a WMD high

casualty incident using CBRN weapons. If fatalities are the key factor in defining a terrorist incident as "mass-destructive," then we have yet to see a clear-cut example involving non-conventional weapons. When terrorist groups seek to cause high levels of casualties, they traditionally do so using conventional weapons such as explosives. The threat from high-end CBRN terrorism has arisen because groups such as al-Qa'ida seek such weapons not only for their potential destructive power, per se, but because of the status and symbolism possessing and using such weapons would bring to the group (who are increasingly apocalyptic in nature).

In addition, the 9/11 attacks certainly revealed al-Qa'ida's organizational abilities and the group's willingness to commit attacks that resulted in mass casualties. In that respect, the attacks of 11 September were unprecedented, causing numbers of casualties that exceeded any previous terrorist attack by several orders of magnitude. The political and social effect of the attacks could scarcely have been greater if the group had used a CBRN weapon such as a "nuke." While the attacks had a variety of motivations, one of those was certainly symbolic: to strike the United States at its military and economic centres in full view of the world's media. The attacks of 11 September against the Pentagon and particularly against the World Trade Center towers has undoubtedly raised the bar in achieving "shock and awe" for future terrorists. It is now exceptionally more difficult for other groups to match al-Qa'ida's impact, and groups that regard themselves as rivals to al-Qa'ida for attention, leverage, or resources may believe themselves compelled to consider alternative strategies for their campaigns: possibly employing new and more terrifying types of weaponry. This dynamic of "one-upmanship" ironically occurs when the 11 September attacks have created an unprecedented, worldwide backlash against terrorism of any sort whatsoever. It is likely to be increasingly difficult, at least in the short term, for groups to find overtly sympathetic sponsors of significant means because of this backlash. In such circumstances, groups may find themselves resorting to one of two opposing strategies: a "quietist" approach where terrorist violence is temporarily minimized (although criminal activity to generate funding will certainly continue unabated), or a campaign of more extreme coercion where new types of weapon and levels of violence are perpetuated.

However, terrorism as a behaviour or strategy cannot be viewed as a linear process. The most obvious proof of this is the aftermath of Aum Shinrikyo's 1995 sarin attack in Tokyo. Although not the first use of a chemical or biological weapon by a terrorist group, Aum's attack seemed different, using a high-end agent to cause indiscriminate casualties. So disturbing was the Tokyo attack that most analysts and

those charged with countering terrorism assumed that Aum's attack represented a harbinger of the future; that other, increasingly lethal attacks with CBRN weapons would follow, putting terrorism on an escalatory spiral of scale and scope. Such assessments, however, were not supported by the experience of the following years, as no wave of similar attempts manifested anywhere in the world, particularly now that authorities were ready for the previously unthinkable. This in spite of the increasing "know-how" regarding CBRN weapons and the availability of "weapons-usable technologies" from a range of sources. [3] Moreover, the increasing fear and "terror" of such attacks on the part of officials in many countries, that terrorists might use these apocalyptic weapons, increased the coercive power available to any terrorist group willing and able to make a convincing threat about using CBRN weapons, and thus encourage their pursuit.

Interestingly, and refuting the idea of a linear path of development, al-Qa'ida's 11 September attacks, far from relying on CBRN weapons, used a technologically conservative weapon and depended on variants of familiar tactics: hijacking and vehicle bombing. Although al-Qa'ida was and remains undoubtedly interested in the full range of CBRN weapons, and clearly investigated each for their potential value in committing an attack, the organization ultimately chose a different route from the one implied by Aum's 1995 attack. The precise reason for this tactical choice is not entirely certain, but it seems likely that al-Qa'ida decided to use methods that were well tested and reliable over the more uncertain and complicated use of CBRN. Although CBRN weapons have supposedly grown increasingly accessible in the past ten years, according to the "tabloid" doomsday scenarios, there remain major challenges in successfully acquiring, weaponizing, and delivering an effective CBRN weapon. While the wealth, resources, and contacts of an organization such as al-Qa'ida would have helped to reduce this complication, the example of Aum Shinrikyo, also wealthy and well connected but unable to deliver a significant or large-scale attack with chemical or biological weapons, shows that considerable problems still exist with this choice. Al-Qa'ida therefore, appears to have chosen a method that, in addition to being cheaper and technologically less sophisticated, also had a better probability of causing WMD-scale casualties than an attack using CBRN weapons. [4]

The central question then becomes what, if anything, changed on 11 September with respect to the likelihood of CBRN terrorism? There are two conclusions to be drawn from the attacks of 11 September and its aftermath; both should have been evident before then, but both now have a clear bearing on al-Qa'ida's future operations. First, and most obviously, al-Qa'ida is willing to inflict high levels of casualties on a WMD-scale, and second, the organization has a long-standing and

active interest in CBRN weapons. Although the attacks of 11 September were unprecedented as terrorist incidents because the number of fatalities exceeded any previous attack by several orders of magnitude, the willingness of many terrorist groups to use high levels of violence has been clear for years and is not new. Several such attacks against the United States, Israel, the West, and "corrupt" Islamic regimes were intended to result in heavy casualties, or actually did so. Ramzi Yousef's attack on the World Trade Center in 1993 is one such example; others include the destruction of American military facilities in Saudi Arabia in the mid-1990s, and the 1998 East African Embassy bombings. Ahmed Ressam's plot to attack Los Angeles International Airport around the millennium is an example of a similarly destructive plot, although one of the few we know about that was intercepted. Such a trend of high-casualty incidents or attempts to cause high-casualty events supports the supposition that al-Qa'ida or its associated groups would be willing to use any means, including CBRN weapons if possible, to create mass destruction or casualties. Such a supposition is credible because information captured in the aftermath of operations in Afghanistan from al-Qa'ida training camps confirmed the organization has a long-standing interest in CBRN weapons. Due to their accessibility, officials cannot afford to doubt that al-Qa'ida sought and continues to seek such weaponry. In late May 2002, United States Secretary of State Colin Powell, speaking in general about terrorist groups, said that he believed that "groups are trying every way they can to get their hands on weapons of mass destruction, whether radiological, chemical, biological, or nuclear." [5] Secretary of Defense Donald Rumsfeld said he believed it "inevitable" that terrorists would acquire weapons of mass destruction, and that "they would not hesitate one minute to use them." [6]

Obviously, al-Qa'ida is not the only group to either seek or attempt to use CBRN. An ominous, small-scale type of attack occurred shortly after 11 September, when America was confronted by an anthrax attack via the posting of contaminated letters through the United States mail; five people died from anthrax inhalation and a further eighteen were infected. Although there have been hundreds of isolated incidents in the United States since 1998 involving threats or hoaxes of packages containing anthrax, these attacks were the first actual use of the pathogen. More worrisome still, the anthrax had been expertly milled to a fine powder and processed with great sophistication with chemical additives to make them more readily airborne and easily inhaled into the lungs of victims. This suggests that the perpetrators had access to specialized knowledge and technology relating to the weaponization of anthrax. It is even plausible, as no one has yet been apprehended for the attack, that the perpetrators may

have acquired a small quantity of the powder on the black market.[8] A distressing alternative scenario is that the still unidentified perpetrators have developed the means of manufacturing high-quality anthrax as a dried powder and could therefore launch further, possibly more widespread or more effectively delivered, attacks against the millions of people who rely on the United States postal service.[9] Thus, while a WMD attack may shock and cause despair, even the potential for a CBRN attack causes terror.

Although these attacks were small-scale, they were indicative of an extremely troubling potential for further large-scale action and the inducement of literal, widespread terror. The letters accompanying the anthrax warned that an attack had occurred and stated the agent involved to induce panic and reaction.[10] The primary intention of the attacks, therefore, was not mass casualties like the 9/11 al-Qa'ida attacks, but to cause fear and disruption; an objective in which they were successful. Moreover, the attacks had a significant economic, but especially psychological, impact on American society, and as with government officials after 1995, it is that power through fear which may encourage other unrelated groups to identify CBRN agents as the best means of attaining their goals.[11] The attacks were particularly effective psychologically, coming, as they did, so soon after the immensely traumatic attacks of 11 September, and the possibility of further high-casualty terrorism could have provided considerable political leverage. The violence was indiscriminate and gruesome as the letters affected not only the intended recipient but anyone – a researcher responsible for opening mail or a postal worker – who simply handled the letter in transit. In two cases, victims were fatally exposed to anthrax through cross-contamination of their post in the mailroom sorting office.[12] Therefore, the number of people who might have been exposed to anthrax was much higher than could have been expected from a crude conventional form of weapon delivery. The public fear reflected that, not only the uncertainty over who could have been exposed, but also the concern over the number of packages which could have been tainted, and who might be the next recipient of such a letter. The disruption was increased because the heightened public fears multiplied the number of false alarms of further anthrax attacks. Apart from the fear, these caused millions of dollars and tens of thousands of man-hours to be wasted, as each unknown had to be thoroughly checked and investigated.[13]

Other significant incidents involving chemical or biological agents include the Rajneeshees, a religious cult that used salmonella to contaminate salad bars in Dalles, Oregon in 1984, with the intention of influencing a local election. In the process, the group sickened some 751 people.[14] The Covenant, the Sword, and the Arm of the Lord (CSA)

an American group influenced by Christian Identity beliefs, in the mid-1980s acquired a barrel of potassium cyanide, which is a toxin with widespread industrial uses. Their intention was to poison United States urban water supplies to further the group's ideological and religious objectives. However, the CSA's members were detained by the FBI before such an attack could occur.[15] On 28 March 1992, the PKK (Kurdistan Workers' Party) poisoned three water tanks at a Turkish Air Force base outside Istanbul. The water appeared foamy, however, and when tested, was found to be contaminated with cyanide. The tanks contained fifty milligrams of cyanide per litre – a lethal dose.[16] On 27 August 1996, detectives discovered a container of Sarin and twenty containers of mustard gas in Istanbul. Emin Ekinci, a member of the PKK, was arrested for having the agents in his possession.[17] The Liberation Tigers of Tamil Eelam (LTTE) have also resorted to non-conventional weapons. On 18 June 1990, the Sri Lankan Army reported that the group had attacked a Sri Lankan Army encampment with canisters filled with an unidentified poison gas, later identified as chlorine.[18]

However, the most important sub-state, or "Sovereignty-Free Actor," usage of CBRN material occurred on 23 November 1995 when Chechen guerrilla leader Shamyl Basayev informed the Russian television network, NTV, that four cases of radioactive cesium had been hidden around Moscow. Russian officials largely dismissed the nuclear threat, claiming that the material was only cesium 137.[19] Basayev was, however, intent on displaying his capability and on ensuring that his threats – to launch further attacks against Moscow unless Russia withdrew from Chechnya – were taken seriously.[20] His warning was plausible because the state of the Russian nuclear industry made it impossible to rule out the possibility that the Chechens had indeed acquired dangerously radioactive material. It is important to note, though, that in each case the use of non-conventional weapons was intended for a small-scale, "tactical" attack to induce panic and not to attempt an act of strategic, mass-destructive terrorism. But these incidents do demonstrate the utility of even threatening the use of CBRN, and the necessity for government officials to react every and any time such a threat is made. It is this psychological leverage that motivates terrorists to pursue not only CBRN weapons but also true WMDs, as officials can take no chance of being wrong and therefore must react, granting the group greater authority.

Aum Shinrikyo's attempted acquisition of a nuclear capability involved mining uranium in western Australia and attempting to enrich the natural uranium using lasers; a technical choice that owed more to Shoko Asahara's fascination with such devices than to a rational decision regarding the most effective technique for a nascent

proliferator. The cult initially sought to acquire an intact weapon from the former Soviet Union. It also attempted to purchase dual-use equipment in the United States; actively recruited physicists from Moscow State University and employees of Russia's premier nuclear research facility – the I.V. Kurchatov Institute (although Russian authorities deny that either of the known Aum members at the Institute had classified knowledge about nuclear weapons design)[21] – to join the Cult; and in 1993, sought, but were denied a meeting with Russian Energy Minister Viktor Mikhailov to discuss the purchase of a nuclear warhead.[22] Aum failed to acquire a nuclear bomb, although it is possible that they negotiated with intermediaries for such a purchase. This is suggested by numerous entries in the diary of Kiyohide Hayakawa, who made several trips to Russia on weapons-buying expeditions.[23] The cult also developed links with Russia's military, political, and scientific elite. During 1992 and 1993, they also approached Russian scientists for help with both their laser and nuclear programmes.[24]

Al-Qa'ida and Aum Shinrikyo are by no means the only terrorist organizations to seek, or claim to possess, nuclear weapons. Of the incidents that involve weapons, rather than simply CBRN material, the overwhelming majority have been hoaxes. The United States Department of Energy's Nuclear Emergency Search Team (NEST) has dealt with hundreds of such hoaxes in the thirty years since its creation. However, aside from plans to acquire WMD or threatening the use of CBRN weapons and hoaxes, very few incidents have involved any such weapons. Such occurrences remain the exception.

Difficulties Acquiring, Weaponizing, and Delivering CBRN Weapons

There are two main reasons for the relative paucity in examples of major incidents involving terrorist use of CBRN weapons. First, prior to the "WMD" assault of 9/11, many groups had simply not felt the need to acquire such weapons or felt moral constraints in using such devices. Second, and most importantly, have been the problems associated with acquiring and using such devices; challenges that continue to exist. For example, mass destruction is not guaranteed, even if sought, from the terrorist employment of a CBRN capability, as Aum Shinrikyo's experience demonstrated. The cult was well financed, organized, and connected, yet it largely failed in its objectives. As well as the sarin used in the attacks of June 1994 in Matsumoto and March 1995 in Tokyo, the cult also sought to acquire a range of other chemical and biological agents including anthrax, botulinum toxin, Q-fever, Ebola virus, VX and hydrogen cyanide.[25] Aum had difficulties developing virulent batches of the pathogens, and then in effectively

delivering the agents. The sarin used in the March attacks was contained in plastic bags that were placed on the floor of the subway car and then pierced with the sharpened point of an umbrella. The impurity of the sarin and the crude delivery method were both crucial in undermining the efficacy, fortunately, of Aum's attack.

One of the central challenges to effective deployment of either chemical or biological weapons specifically is the weaponization and delivery stages. Chemical weapons would be relatively easy to deliver in an enclosed space, but much harder to disperse in a way so as to cause high levels of casualties in an open space. The effective delivery of biological agents is even more problematic. To be effective, biological agents would need to be dispersed in an aerosol cloud consisting of particles small enough – one to five microns – to be easily inhaled and retained in the lungs. This requirement poses significant hurdles for the terrorist attempting to use such pathogens to cause high casualties.[26] The efficacy of a biological agent would depend on several factors: the agent itself, the delivery system, the quantity of agent used, the efficacy of the aerosolization of the agent, and the weather conditions at the time of release. For example, strong winds may affect the dispersal of the agent; bright light and significant heat or dryness may all adversely affect the time effectiveness of the pathogen. However, the degree to which a biological agent is affected by these factors varies widely: anthrax, for example, is relatively hardy.

The acquisition of chemical and biological agents also vary enormously in difficulty. For example, while smallpox is supposedly held by just two guarded facilities in the world, some other biological pathogens are easier to acquire, notably ricin. The main ingredient for ricin is beans from the castor plant, and a plethora of publications (many originating with the radical right in the United States) provide instructions regarding its production.[27] Both plague and anthrax are naturally available in some areas of the world in which they are endemic. Moreover, although ricin is a highly lethal pathogen and the raw materials and production methods for making it are relatively straightforward, this does not mean that producing a weapon capable of causing mass casualties is equally simple: there remains the issue of effective delivery. Several of the groups (the Minnesota Patriots' Council, for example) that have produced ricin in this way have also managed to produce only a very impure version of the pathogen.[28]

Both chemical and biological agents can be produced using "dual-use technology," methods and equipment that have legitimate as well as illegitimate purposes. Fermenters can be used to grow pathogens but are also widely available for production in a range of legitimate industries, from brewing and pharmaceuticals to

biotechnology. Freeze-drying and milling machines, extremely helpful in the conversion of agents into a dry, finely ground powder ideal for dispersion, are widely used in the pharmaceutical industry. Legitimate and common usages make it difficult for law enforcement to impose meaningful restrictions on access to weapons-usable equipment, particularly if the terrorist organization operates behind a front company to make its purchases.

Chemical agents, being compounds, may be acquired as a series of "precursors" rather than as an entire or complete agent. Acquiring precursors is an easier route, although tighter controls now exist for some of these as well, through the Chemical Weapons Convention and the Australia Group. Despite this, groups seeking such precursors can use front companies and other evasive measures to circumvent such restrictions, particularly if a complicit supplier can be found. In other cases, though, constituent chemicals are used so widely in industry that controlling them is all but impossible. Such chemicals can then be used to produce the chemical precursors or, ultimately, the chemical agent itself. Here, the problem for the terrorist lays not so much in acquiring most of the key ingredients, but in the process of manufacturing an effective agent from those ingredients. Although many "recipes" are readily available, either in the open literature or on the Internet, the reliability of these recipes is often limited and poses an equal hazard to the handler.[29]

A "radiological device" is likely to be the easiest type of CBRN weapon for terrorists to acquire. At its simplest, it demands no more than conventional explosives and a radioactive source, such as cesium-137 from a hospital X-ray machine. Such radioactive sources remain widespread and poorly protected, certainly compared to other types of nuclear materials. In spite of this, the disruptive potential of a radioactive weapon, or "dirty bomb," is considerable. In a press release dated 24 June 2002, the International Atomic Energy Agency (IAEA) reported that the "materials needed to build a dirty bomb can be found in almost any country in the world, and more than 100 countries may have inadequate control and monitoring programs necessary to prevent or even detect the theft of these materials."[30] Abel Gonzalez, the IAEA's Director of Radiation and Waste Safety, reported in October 2001 that "Security of radioactive materials has traditionally been relatively light ... There are few security precautions on radiotherapy equipment and a large source could be removed quite easily, especially if those involved have no regard for their own health."[31] Many such sources are presently without any regulatory control and are in fact unaccounted for.

A nuclear weapon, by contrast, is likely to be the hardest type of CBRN device for terrorists to acquire. Terrorists intent on acquiring a

nuclear-yield device have three options: steal or purchase an intact weapon; steal or purchase a sufficient quantity of weapons-usable materials and build a crude nuclear-yield device; or enrich enough weapons-grade material to build a device. In reality, the second option, to acquire enough weapons-usable material to build a nuclear-yield weapon, is widely regarded as the only likely option of the three. Most terrorist groups seem unlikely to follow the example of Aum Shinrikyo in attempting to enrich material to a weapons-usable state. The process is lengthy, costly, and for many of the cruder forms of enrichment, very easily discovered. Success is also far from assured: many state programs spend millions and take years trying to enrich enough material for a viable nuclear weapons programme.

A group unwilling or unable to enrich its own weapons-usable nuclear material would have to rely on buying or stealing enough material, despite the incredible array of security surrounding such material. Acquiring sufficient nuclear material to manufacture a weapon is likely to prove difficult. In spite of reports of "nuclear leakage" in the former Soviet Union, only a handful of cases involving weapons significant materials are known, and never was the quantity involved sufficient to build a weapon. In late 2001, the IAEA stated it knew of 175 incidents involving weapons significant material, but of those, only 18 involved highly enriched uranium or plutonium. Moreover, the need to acquire a considerable quantity of fissile material would seem to preclude all but the most affluent of state-sponsored groups.

However, to continue the exploration of possibilities, assuming enough material for a weapon could be acquired, terrorists seeking to build a nuclear weapon then have a number of design options: constructing a gun-type weapon using highly enriched uranium (HEU), or developing an implosion device using either HEU or plutonium. In terms of design, the crude gun-type device is significantly the easier of the two, requiring between 50 and 60 kilograms of HEU. An implosion device would require around 8 kilograms of plutonium. Despite the relatively smaller amount of necessary material, the difficulties of this device stem from its nature: the sphere of plutonium needs to be exactingly engineered, such that the shock wave from the trigger has to be simultaneous to within millionths of a second. If this condition is not met, there is a substantial risk of a comparably minor nuclear yield, or more likely, a failure to reach super-criticality at all. A gun-type assembly would have a high probability of achieving some nuclear yield without requiring the testing of components and using little more than the open literature available on the subject. An implosion device is more sophisticated, requiring a higher degree of technical competence. However, in each case, the crucial barrier remains the acquisition of enough nuclear material for the device.[32]

The only remaining possibility for terrorists to acquire a nuclear-yield device is thus to steal or purchase an intact weapon. Concerns over nuclear-yield terrorism heightened significantly after the Soviet Union's collapse, owing largely to fears regarding "loose nukes" and the opportunities for nuclear materials and nuclear expertise to leave the country and be exploited by rogue states or terrorists. That terrorists could acquire an intact nuclear weapon seems farfetched, given the elaborate security forces that surround them, and their possession by highly trained professionals alone. States obviously have a considerable stake in protecting their mass-destructive weapons generally, if not out of fear that their own WMDs would be used against them, then that other states would intervene and secure them to eliminate an unacceptable risk to their security.

Al-Qa'ida and Its Pursuit of WMD/CBRN

Al-Qa'ida appears to have actively pursued an "all-options strategy" in its attempts to acquire CBRN and WMD, simultaneously seeking chemical, biological, radiological, and nuclear weapon options. Osama bin Laden purportedly went to contacts in the former Soviet Union to attempt to acquire an intact nuclear weapon, although his contacts were in Ukraine [33] and the Central Asian republics. Israeli military intelligence claims that he paid around two million pounds to an intermediary in Kazakhstan, believing that, because of its substantial Muslim population, he had a better likelihood of acquiring a weapon there. This knowledge stems from a 1998 United States federal indictment, which claims that, "at various times from at least as early as 1993, Osama bin Laden and others known and unknown, made efforts to obtain the components of nuclear weapons." [34]

Like Aum, bin Laden's group also appears to have sought to build a nuclear-yield weapon. [35] In 1993, bin Laden's deputy, Mamdouh Mahmud Salim, approved the attempted purchase of enriched uranium "for the purpose of developing nuclear weapons," according to the criminal complaint lodged against Salim on 25 September 1998, although it is unclear whether the group succeeded in buying any nuclear material. [36] As with several other prospective buyers of nuclear materials, al-Qa'ida became the object of a fraudulent scheme to supply them with useless nuclear material that the vendors would claim was weapons usable. In the case of al-Qa'ida, the offered "red mercury" turned out to be radioactive rubbish. They were also offered "enriched uranium" that was really low-grade reactor fuel, unusable in a nuclear-yield weapon without extensive further enrichment. [37] This failure to acquire useful nuclear material is likely to have been a critical factor in al-Qa'ida's increased short-term focus on CBRN means as their weapon of choice.

In February 2001, Jamal Ahmed Fadl testified in the trial of the 1998 African embassy bombers that al-Qa'ida was trying to acquire nuclear material from the early 1990s onwards. Fadl said that a bin Laden lieutenant ordered him to buy uranium from a former Sudanese Army officer, who offered to sell ore from South Africa for $1.5 million. However, Fadl was unsure whether the material was authentic, although it was shipped to Afghanistan all the same. [38] However, as discussed, even a barely plausible threat of WMD or CBRN attacks forces officials to react, thus providing the claimant with leverage. In November 2001, bin Laden told a Pakistani journalist from the Urdu-language Ausaf paper that his movement already had chemical and nuclear weapons. He stated: "I wish to declare that if America used chemical or nuclear weapons against us, then we may retort with chemical and nuclear weapons ... We have the weapons as a deterrent." [39]

The discoveries made in Afghanistan after 11 September demonstrate, however, that al-Qa'ida continued to prioritize CBRN for use as WMDs. In August 2001, an Arab delegation met scientists from Kabul University and offered them financial assistance in exchange for help and advice in locating and mining uranium within Afghanistan. [40] Although al-Qa'ida appears to have gained some material usable in a nuclear-yield device, both the British and American governments believe that the organization is incapable of producing such a weapon at present. However, they believe that al-Qa'ida may have experimented with crude chemical weapons in Afghanistan. [41] In November, President Bush asserted that al-Qa'ida continued to seek chemical, biological and radiological weapons. [42]

Al-Qa'ida's agents are supposed to have spent over £1 million in the search for enough material with which to build a radiological weapon. [43] United States intelligence reports noted a meeting in which an associate of bin Laden's wielded a canister allegedly containing radioactive material that could be disseminated via a conventional explosive. However, conclusive evidence that al-Qa'ida has a radiological capability remains elusive. Although diagrams and documents relating to radiological weapons were found in Afghanistan, these were of a type readily available via the Internet and were apparently of an extremely poor quality that would be unlikely to work. [44] Likewise, detailed plans for a nuclear-yield device were discovered in one of the Kabul buildings abandoned by al-Qa'ida. Written in Arabic, German, Urdu, and English, the documents contained descriptions of how to use TNT to compress a sphere of plutonium into a critical mass, sparking a chain reaction. [45] However, these documents, though clearly indicating an interest in nuclear-yield WMDs, also contain information that is readily available in open literature. The theory of such a weapon design is well known, but like

CBRN weapons, the practical application of that information is substantially more difficult, even assuming that the group could acquire the requisite quantity of fissile material.

In the wake of the 11 September attacks in the United States, it has emerged that al-Qa'ida may have sought the means to build a "dirty bomb."[46] Although there have been previous allegations relating to the organization's attempts to acquire material to build a nuclear-yield bomb, claims regarding a radiological weapon represent a significant departure. British intelligence forces are currently investigating allegations made by Bulgarian businessman Ivan Ivanov that he was approached in April 2001 by a middleman for bin Laden who sought to obtain radiological material. Ivanov allegedly had a series of meetings near the Pakistani border with Afghanistan, including one with bin Laden himself. He then met with a supposed "chemical engineer" near Rawalpindi, and was offered $200,000 to help the scientist acquire spent nuclear fuel rods from the Kozlodui nuclear electricity plant in Bulgaria. The plan would have involved buying the rods legally through a newly established environmental front company that would deal with nuclear waste. Ivanov declined the opportunity and reported the contact once he returned to Europe.[47]

In 2001, customs officials seized ten lead-lined containers on the border between Uzbekistan and Kazakhstan. The containers held a substantial quantity of radioactive material, ostensibly intended for a company in Quetta, Pakistan. The precise type of materials remains unclear, but it seems unlikely to have been a legitimate shipment, raising the alarming possibility that bin Laden's al-Qa'ida was a potential end-user." There must also be concerns that the main threat in this respect may not be "leakage" from the former Soviet Union, but assistance offered to al-Qa'ida by Pakistani elements. In October, two key former members of Pakistan's nuclear program were detained owing to their connections to the Taliban. Bashiruddin Mahmood was project director before Pakistan's 1998 tests and has since been running a relief organization, Ummah Tameer-I-Nau (UTN), sympathetic to the Afghan regime. Abdul Majid was a director of the Pakistan Atomic Energy Commission in 1999.[49] Allegedly, they planned to use finely milled uranium obtained from Pakistan around a core of explosives to create a dirty bomb that could be delivered either as an artillery shell or a mortar round. However, there was no evidence that either Mahmood and Majid, or al-Qa'ida more generally, had been able to acquire such radioactive material.[50] Another apparently unsuccessful attempt to acquire radiological materials occurred when al-Qa'ida tried to buy eleven pounds of thallium measuring devices from decommissioned Russian submarines, but were prevented from doing so by the Federal Security Service of the Russian Federation (FSB).[51]

In January 2003, the British Government alleged that al-Qa'ida had prioritized the development of a radiological device as early as 1999, and had acquired not only the expertise but also the materials to do so in Herat, Afghanistan well prior to 9/11.[52] Although the evidence about this is not certain, the discovery of the so-called "super-bomb" manual found outside Kabul in November 2001 adds weight to such a belief. The manual discusses not only radiological devices but also the construction of nuclear weapons, although the information, particularly in the case of the latter type of weapon, is partial.[53]

The threat of a terrorist acquisition of a radiological device extends beyond Afghanistan. On 10 June 2002, United States Attorney-General John Ashcroft announced the arrest of Jose Padilla for his involvement with al-Qa'ida in planning a radiological bomb attack on the United States. Pedilla, arrested in Chicago on 8 May, allegedly planned to build a uranium-enhanced device and had trained at an al-Qa'ida facility in Pakistan. The plot was in its early stages; no timeline had been set and the radiological material had not yet been stolen from sources in the United States.[54] Just two months earlier, Abu Zubayda, a captured leader of the group, claimed that al-Qa'ida not only had the expertise to build a radiological weapon, but also had developed one that was already inside the United States.[55] However, the credibility of this claim is highly dubious.

In addition to WMDs and radiological devices, al-Qa'ida appears to have attempted to acquire both chemical and biological weapons in addition to manufacturing their own. In March 1999, the London-based paper *Al-Sharq alAwsat* revealed that associates of bin Laden, on trial in Egypt as part of the "Albanian Arabs" case, had allegedly been offered anthrax and other biological agents from a factory in East Asia for $3,695 plus freight charges. They also supposedly received an offer from a laboratory in the Czech Republic to supply a deadly gas for $7,500 per sample.[56] Ahmad Salama Mabrouk, a member of al Jihad, the group to which the defendants belonged and part of bin Laden's coalition of organizations, gave an interview to the London paper *al-Hayat*. In it, Mabrouk claimed that over the past two years, the group had acquired chemical and biological agents from Eastern Europe and the former Soviet Union, and that al-Jihad planned to use them against American and Israeli targets.[57] Although the specific claims have been unverifiable, their general point was supported in June 1999 by anonymous American intelligence sources that told ABC News that "there is mounting evidence that bin Laden's network has acquired ingredients for chemical or biological weapons through countries that were once part of the Soviet Union." The same sources further claimed that bin Laden had set up two crude weapons laboratories in Afghanistan, one near Khoust and the other near Jalalabad.[58]

In the aftermath of 11 September, it has become increasingly obvious that al-Qa'ida's interest in CBRN weaponry has continued unabated. Amongst the finds have been: material relating to chemical, biological, and nuclear weapons from the Tarnak Farms site near Kandahar;[59] information on the dispersal of anthrax in a UTN house in Kabul;[60] information found on producing ricin in another house in Kabul;[61] and the discovery of an al-Qa'ida volume, distributed on a CD-Rom, that contained chapters detailing the production methods for a range of chemical agents and the biological agents botulinum and ricin.[62] The eleventh edition of the group's *Encyclopaedia of Jihad* was devoted to the production of CBRN.[63] The organization had maintained a series of laboratories in Afghanistan that were dedicated to the development of chemical and biological weapons. These used equipment that had been purchased abroad and then shipped to Afghanistan from countries such as the United Arab Emirates and Ukraine.[64] The organization appears also to have sought the help of scientists within Afghanistan to promote its pursuit of such weapons. Delegations of Pakistani scientists visited Kabul University six times since 1998, offering to provide funding for chemical weapons-related research and asking for help to obtain large quantities of sodium cyanide and thionyl chloride; both dual-use chemicals capable of being used to create crude chemical weapons. For example, thionyl chloride is a possible precursor for mustard gas and several nerve agents, and sodium cyanide is usable in the formation of a cyanide weapon.[65] Most incidents however, are tabloid-like rumours such as the supposed discovery of thirty boxes, each containing ten phials of a colourless liquid, with "Sarin/V-Gas" marked in Cyrillic lettering on the side of each box.[66] There have also been reports that al-Qaeda operatives continued to purchase low-level chemical agents such as cyanide in the wake of 9/11.[67] Though al-Qa'ida's interest in chemical and biological weapons is clear, the extent of the group's success in acquiring such agents is far less so.

There have been regular claims that al-Qa'ida has received help in its CBW programmes, most notably from Iraq. Such claims existed well before 9/11: the Paris-based Arabic paper *Al Watan al-Arabi* suggested that bin Laden made contact with Qusayy, Saddam Hussein's younger son, and that Iraq was co-operating with al-Qa'ida's efforts to acquire both chemical and biological weapons.[68] However, the linkage between Iraq and al-Qa'ida has received fresh impetus since 11 September and serves as a major component of the current drive to war. From 1997 through 1998, al-Qa'ida members supposedly were trained in secret camps near Baghdad in how to use CBRN by instructors from a cadre of secret Iraqi military intelligence officers: Unit 999.[69] A similar claim was made that Iraqi military instructors allegedly trained al-Qa'ida fighters in northern Iraq in the use of CBW agents during the summer of 2001, and possibly also in the handling of nuclear devices. Between

150 and 250 al-Qa'ida trainees purportedly passed through these training facilities.[70] Again, however, the validity of this last claim is questionable, given that the source was *DEBKA*, a newsletter that relies heavily on hawkish Israeli intelligence sources. Nonetheless, accusations and tabloid fantasy do not constitute actionable threats.

Yet ominously, other groups linked to al-Qa'ida and operating in Europe appear to have been plotting to use chemical or biological weapons in their attacks for tactical purposes. In December 2000, German police intervened in an alleged plot by GSPC, an Algerian-based group operating in Europe and associated with al-Qa'ida. It supposedly planned to attack the European Parliament in Strasbourg with sarin.[71] In 2001, an Italian-based cell planned to launch an attack in France before being interdicted by the Italian security services. They discussed using "a suffocating gas" for this attack, though precise plans, including the attack's location, were never clarified. One possibility was Notre Dame in Paris, as the group discussed "La Dame" as a potential target. The surveillance tapes made by the Italian security services reveal the cell's leader, "Saber," explaining his desire to acquire chemical weapons because plastic explosives were outmoded, and gas was more effective. On 20 February 2002, Italian police arrested nine Moroccan nationals for allegedly plotting a chemical terrorist attack on the American embassy in Rome. The suspects were apprehended with maps detailing the location of the water pipes that serve the United States embassy as well as approximately nine pounds of a cyanide compound – potassium ferrocyanide – in their possession. More plots followed: in November 2002, British security officials arrested three men reportedly plotting a cyanide attack on the London underground.[72]

In early January 2003, British authorities arrested seven North African men suspected of producing ricin in their north London flat.[73] There, authorities found castor oil beans and equipment that could be used to process those raw elements along with trace amounts of ricin.[74] Other arrests followed: six in Bournemouth and five in Manchester, which were tied to the ricin plot.[75] American officials have stated that four of the Islamists originally arrested in their north London flat were "associates" of a fugitive al-Qa'ida leader and chemical warfare specialist, Abu Mus'ab al Zarqawi.[76] Such a link would tie the ricin plot in London to al-Qa'ida, and to Ansar al-Islam in Iraq, and to the Pankisi Gorge in Georgia, from where terrorist cells moved into Western Europe, as Viktoriya Topalova discusses in her article, Lessons of the "Nord-Ost." The British Security Service and police forces involved in the north London investigation had been tipped off by French intelligence after several members of a French Islamist cell were arrested in December 2002 by the Direction de la Surveillance du Territoire (DST). These were part of the same network as those later arrested in London,

and although the French detainees were planning conventional attacks, they also possessed protective biochemical suits and had links to the Pankisi Gorge area.[78] From autumn 2003, the DST had been receiving reports of al-Qa'ida leaders based in the Caucasus plotting a chemical weapons campaign. The agency suspected that ricin and potassium cyanide might be being smuggled into Europe, and issued a warning to other European intelligence agencies.[79] Based on this information, British police searched the Finsbury Park Mosque in London where they discovered a range of weapons and nuclear, biological, and chemical (NBC) suits.[80] Further arrests followed, and many of the suspects were charged, as were the original detainees, with conspiring to develop or produce chemical weapons.[81] The British arrests were followed by other arrests across Europe, including in Italy and Spain.[82] There is an increased interest in chemical and biological weapons by al-Qa'ida and associated groups, as shown by the finds in Afghanistan and the plots to attack targets in Europe. However, and without wishing to appear complacent, there still appears to be a major disconnect between the current small-scale tactical attempts and an immediate threat of mass destruction with CBRN. The evidence listed above suggests interest in such agents and plots for the possible use of CBRN, and also suggests a growing willingness to risk handling such pathogens. However, ricin in particular, although highly toxic, would be difficult to use as a weapon to cause "mass casualties," partly because it would be difficult to disseminate in an effective way. Instead, it is a highly potent means of assassination, is easily produced using readily available raw materials and equipment, and as such is much more accessible than most other types of chemical or biological weapons. Given these characteristics, it is an attractive and plausible weapon of terror, in the literal sense, as much as a weapon of mass destruction. As already described, because of the terror and loathing of such weapons and their consequent political leverage, it would be extremely unwise to dismiss the possibility that a well-organized, well-funded, and well-connected group such as al-Qa'ida could successfully acquire chemical and biological weapons and keep the fact hidden, especially given the diffuse global nature of the group. However, the evidence that they have acquired employable CBRN, or more importantly, any form of WMD-capable CBRN weapon is, even at its most pessimistic, unlikely. If the group seeks mass destruction rather than causing public fear and chaos with the resultant political leverage that would ensue, then the most plausible, likely, and imminent threat remains the use of conventional weapons.

Rohan Gunaratna, one of the leading scholars on al-Qa'ida, suggests that the group and many of its affiliates are turning to "kitchen table" terrorism, relying on readily available materials for its attacks. This is partly the product of the splintering process that is

occurring at the moment within al-Qa'ida, as it increasingly relies on its affiliates to commit attacks, and also of the need to maximize the impact of such attacks with the limited resources available to individual cells.[83] The pursuit of low-level CBW certainly fits into this pattern of kitchen-table terrorism, particularly if it is directed against the plethora of "soft targets" Western societies provide. Gunaratna suggests that, although al-Qa'ida will remain interested in CBRN, "suicide terrorism" using explosives remains its preferred means of maximizing its impact because of the greater likelihood of success in completing a conventional WMD attack over those of completing a CBRN attack.[84] It is certainly the most plausible means by which al-Qa'ida might cause mass casualties at present.

CONCLUSION

The likelihood of terrorist use of CBRN weapons in the wake of 9/11 remains all too possible, but highly unlikely because of the difficulties surrounding obtaining, deploying and using such a weapon. The overarching issue, as it relates to terrorism with CBRN materials, is that we still do not really understand the motivational side of WMD, meaning "mass-casualty" terrorism: the killing of large numbers of people just for the sake of killing. Why do groups seek mass casualties and why do they use specific tactics to achieve that goal? Will groups use further mass attacks simultaneously with low technology weapons, as they did on 9/11? If conventional weapons are a viable alternative, are high-level CBRN attacks necessary? Given the disruption caused by, and the ease of achieving such tactics, are low-level CBRN attacks more likely than WMD attacks? Why are some vulnerable targets, such as agriculture or facilities other than reactors, that seem attractive rarely targeted by terrorists?[85] By answering some of these questions, as well as tying these answers to knowledge of specific terrorist organizations, it might be possible to better answer whether WMD terrorism using CBRN is a matter of if or when.

The scale of the attacks suggests that mass destructive terrorism is now a fact; it thus seems unlikely that, given the option, al Qaeda would avoid using CBRN weapons to cause mass casualties. However, although discoveries in Afghanistan and the disruption of plots in Europe continue to show that al-Qa'ida and its associated groups are interested in CBRN weapons, these discoveries do not indicate that the organisation has successfully acquired such weapons and now has the capability to use them successfully. Rather, the evidence suggests that al Qaeda has simply being trying to develop any type of weapon that might help its cause, including chemical or biological agents such as ricin that are an effective weapon of terror, more than of mass casualties.

The suggestion, therefore, would be that CBRN weapons are being pursued simply as part of a range of options, for instrumental purposes, rather than as an end in itself. Such an attack itself, rather than the means, remains the focus of the enterprise. The attacks of 11 September demonstrate however that CBRN weapons are not necessary to cause mass casualties or constitute a WMD attack. CBRN weapons and WMD are not synonymous. Given the difficulty and expense of acquiring and effectively using such weapons, along with the uncertain outcome of any such attempt, al-Qa'ida may continue to seek CBRN weapons because of their special status and leverage, but is likely not going to rely on doing so successfully. The attacks of 11 September and the subsequent discoveries in Afghanistan suggest a group that is pragmatic and has an instrumental approach to CBRN acquisition. If mass casualties are the goal of the group, then conventional weapons remain the most viable option. Conversely, scholars such as Rohan Gunaratna suggest that al-Qa'ida may be moving into a phase where it seeks to achieve "high-impact terrorism," such as that carried out most recently in Spain, but without necessarily engaging in the same operational scale that 9/11 demonstrated.[86] In this scenario, pathogens such as ricin offer a relatively accessible means of achieving such an effect without necessarily resorting to mass casualties.

The implications of 11 September on other groups seeking CBRN weapons remains to be seen. Clearly, the level of fear and awareness of potential attacks with such weapons has risen to unprecedented levels. However, this does not necessarily equate to an increased likelihood of CBRN weapons being used by sub-state actors, except for disruptive purposes. The 11 September attacks raised the bar for terrorist violence, but they also demonstrated that the innovative use of conventional weapons can achieve this purpose more reliably and efficiently than CBRNs. Owing to the technical challenges posed in successfully using CBRN weapons, conventional weapons remain more probable instruments for terrorists intent on causing mass destruction. In terms of terrorists using CBRNs as a means of delivering a CBRN attack, the question remains one of "if," rather than "when." However, to ensure the question retains this answer and remains one of academic speculation, vigilance must be truly eternal. In terms of whether terrorists will ever successfully mount another attack on the scale of WMDs, as the recent attacks in Spain have demonstrated all too painfully, the question tragically remains one of "when."

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Calculating Costs: A Critical Assessment of Verification Costs for a Fissile Material Cutoff Treaty

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Introduction

One of the most important yet neglected aspects relating to a proposed fissile material cutoff is the cost of its verification. Although verification expenses are crucial for the viability of the fissile material cutoff regime, few such estimates are available. To that end, this article examines in an independent manner the estimated costs of the cutoff, including analyses of configurations of the cutoff itself and the various verification systems that may be put in place. It also itemizes some of the prominent matters that must be taken into account for the creation of such a verification regime.

In March 1995, the Geneva-based Conference on Disarmament reached a consensus on establishing an Ad Hoc Committee to study the mandate of a proposed convention on a ban on the production of fissile material for nuclear weapons or other nuclear explosive devices. The consensus was based on United Nations General Assembly Resolution 48/75L, which read, in part:

> The General Assembly ...
>
> 1. Recommends the negotiation in the most appropriate international forum of a non-discriminatory, multilateral and internationally and effectively verifiable treaty banning the production of fissile material for nuclear weapons or other nuclear explosive devices;

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2. Requests the International Atomic Energy Agency to provide assistance for examination of verification arrangements for such a treaty as required;

3. Calls upon all states to demonstrate their commitment to the objectives [of such a treaty].

In short, the treaty is to be non-discriminatory, multilateral, and internationally and effectively verifiable, and may involve the IAEA (International Atomic Energy Agency) for verification of compliance. The resolution specifically does not mention fissile material stockpiles[1] and deals with production only. Although consensus was reached on the requirement for the negotiating committee, it did not come about effortlessly, and the central mandate of the proposed treaty remains a controversial topic. One main point of contention was the inclusion of stocks in the cutoff treaty. This polarized the nuclear possessing states against some nuclear threshold states and the non-aligned movement. Resolving this controversy is the linchpin for the success of the cutoff treaty talks. To be clear, the assumptions of this report are that existing stocks (including "grandfathered" holdings of HEU and plutonium, spent fuel, or civilian material) will not be included in any preliminary agreement. The material in question herein refers to new production of explosive fissile material only.

The Conference on Disarmament chose UNGA 48/75L as its starting position, owing to the level of unanimity on the central purpose of that resolution. While stocks would not be part of the official mandate, the proposed convention would not "preclude any delegation from raising for consideration" the issue of stockpiles. However, notwithstanding the inclusion of stocks as an item for discussion, the most likely direction for a cutoff treaty would be to deal with new production of fissile material first, and perhaps make reference to the need to deal with stocks at a future date. With this in mind, the analysis presented here is concerned with the issues and costs surrounding an initial production ban (stockpile cap) agreement.

OUTLINE OF EXISTING ANALYSES: ASSUMPTIONS, SCOPE, AND OPTIONS

Two reasonably comprehensive analyses of the costs attributed to a verification strategy for a cutoff treaty have been prepared by the IAEA and by the United States Department of Energy. The IAEA Secretariat working paper is entitled "A Cutoff Treaty and Associated Costs," by Vilmos Cserveny (henceforth referred to as Cserveny, or IAEA),[2] and the Energy Department document is entitled "Routine Inspection Effort Required for Verification of a Nuclear Material Production Cutoff

Convention," by Leslie Fishbone and Jonathan Sanborn of the Brookhaven National Laboratory (henceforth referred to as Fishbone and Sanborn, or Brookhaven).[3] These two studies raise concerns that are vital for a verification regime because they determine the scope of verification, and by extrapolation, its effectiveness.

Cserveny/IAEA

The Cserveny piece considers some of the anticipated costs of a verification programme by the IAEA Secretariat. Its basic assumptions are:

> – that the cutoff treaty would adhere to the guidelines of the Nuclear Non-Proliferation Treaty (NPT), as signatory states would not undertake fissile materials development and also would not assist others in pursuing such a programme;
>
> – that the technical objective of the agency (IAEA or other) charged with the verification of the regime would be to guard against increasing existing nuclear weapon arsenals and the creation of new weapons arsenals;
>
> – that the cutoff would pertain to new production of strategic fissile material after the date of the entry into force of the treaty.[4]

Cserveny's summary also poses some issues requiring clarification before an effective verification regime may be put in place, including:

> – whether or not verification will include coverage of existing stockpiles of material that could be directed towards military programmes;
>
> – the possible inclusion of military material that is not currently used in weapons programmes (for example, HEU in submarines, research material, and other non-proscribed military purposes);
>
> – the need to distinguish between military and civilian nuclear material (the "dual use" issue), especially because countries have different interpretations regarding the relationship of these typologies;
>
> – how the verification mechanism might attend to the matter of undeclared nuclear facilities and material.[5]

The IAEA study outlines four alternatives for verification (discussed in greater detail later), including:

> 1) comprehensive verification, including all nuclear material possessed by a state, aside from that in military stockpiles at the time of the agreement's entry into force;

2) limited verification of separated fissile material;

3) full verification of separated material and associated production facilities;

4) full verification of separated and irradiated fissile material.

It also outlines some of the resource requirement issues relating to verification, particularly those relating to declared and undeclared facilities. Finally, the data are based on up to 995 facilities that would require verification. Importantly, costs calculated in this study are not based on current IAEA average "person days of inspection," or PDI; cost per person day of inspection ($/PDI) are estimated. As discussed below, the basic criteria outlining how the IAEA calculates PDI are not included in the agency's analysis, and in fact, several suggestions are made regarding what the costs per PDI would be, and the number of PDI required each year (PDI/yr) is estimated for the verification process.

FISHBONE AND SANBORN/BROOKHAVEN

The Brookhaven study was undertaken under the auspices of a United States Department of Energy contract. It assumes that:

– the IAEA would be the agency likely to undertake verification;

– implemented verification arrangements would be modelled along the lines of established NPT procedures;

– primary attention should be paid to eight states: the declared nuclear weapon states, India, Pakistan, and Israel;

– undeclared sites and activities, while important for a truly comprehensive verification plan, are beyond the scope of an initial study;

– the material involved includes production for explosive use, or outside of international safeguards, allowing for continued production of HEU and Pu in a non-proscribed manner.[6]

Furthermore, the Brookhaven study outlines three verification options available:

1) broad inspection, similar to NPT requirements and patterned closely after INFCIRC/153. The model involves:

i) the prevention of material diversion;

ii) all peaceful activities involving fissile material; and

iii) materials accountancy supplemented by containment and surveillance.

2) NPT-like requirements, but with a scope restricted to certain facility types, particularly enrichment and reprocessing sites. The main concerns here would be the detection of undeclared facilities and to stop the diversion of material; and

3) less intensive verification involving greatly reduced inspections but with a strong emphasis on declaration.

The Brookhaven study suggests that verification would apply to up to 655 facilities worldwide, and uses $/PDI for its calculation.

Estimates: Costs Outlined by the Studies

The costs of verifying a fissile materials production cutoff will fall on a number of actors. Obviously, some costs will be associated with the operation of a verification agency, most likely the IAEA. Both studies focus on these costs. Omitted, then, are the costs that might fall on other actors, such as state agencies implementing the cutoff provisions domestically (for example, State Systems of Accounting and Control, discussed later) and facility operators affected by verification activities and requirements. If, for example, the Russian SSAC needs substantial improvement, as is feared, or there are others also needing assistance in some affected states, there could be significant one-time costs in addition to recurring state costs.[7] As well, although the problem of guarding against undeclared activities must be addressed, the focus on the verification agency as such either could imply (as we shall see, wrongly) that these costs are entirely included in the capabilities of that agency and its activities, or that they are assigned to state agencies that might normally undertake national intelligence and monitoring functions. If the costs fall to state agencies, they are ignored in these two studies. Thus, only agency costs are covered, and to that extent, both these studies understate the total costs of verification.

Furthermore, only some agency activities are covered. Both focus on routine inspection efforts, using IAEA estimates of effort as a foundation. This covers the running costs of a verification system, but it omits certain other activities. The ad hoc, initial, or baseline inspections necessary to implement a verification system and the costs of acquiring and installing appropriate equipment are apparently omitted. These could be quite substantial initially, though tapering off to a much lower proportion of expenses as the verification system is phased in. Costs associated with special inspections or challenge inspections are not noted, though they might be relatively small unless such rights were vigorously exercised.

Both studies focus on the five declared nuclear weapon states and the three threshold states (Israel, Pakistan, and India). Both focus on the production of highly-enriched uranium (HEU) and plutonium – neither thorium nor tritium are of particular concern. While the estimates do not explicitly state (yet both strongly suggest) that the IAEA is the verifying agency, both use IAEA-based data. Neither covers the start-up costs for a new agency, and particularly in the case of the Cserveny study, one could assume that IAEA implementation is the basic assumption. Both survey a range of options (three in the Brookhaven study and four in the Cserveny study) varying between INFCIRC/153-style verification arrangements at the high end, and much more limited arrangements for the low end of their estimates.

Beyond this, however, there are a number of substantial differences. Tables 1 and 2 give comparable numerical data for the Brookhaven and the Cserveny studies, respectively.

Table 1.
Summary Data for the Brookhaven Study

	Option 1	Option 2	Option 3
Total PDI	28975	22875	8296
Cost ($ million)	230	184	66
Number of Facilities	655	approx. 300?	approx. 300?

Table 2.
Summary Data for the IAEA Study

	Alternative A	Alternative B	Alternative C	Alternative D
Total PDI	4629	16271	22113	25398
Cost ($ million)	40	90	120	140
Number of Facilities	195	195	645	995

The differences between the two sets of data are particularly striking at the high end of their comprehensive safeguards estimates (Option 1 and Alternative D), but they are evident throughout.

Cserveny's cost and PDI figures are noticeably lower than those in the Brookhaven study, yet his comprehensive alternative appears to cover half again as many facilities as the Brookhaven estimate. It could be, of course, that different facility counting rules explain some of this.

Upon inspection, further differences between the two studies become apparent. The Fishbone-Sanborn study calculates the number of facilities of a given type in each of the eight states covered and estimates the number of PDIs per year necessary for routine inspection for each type of facility, whether operational or shut down. It then totals the PDI figures for each option and multiplies that figure by an estimate of $8,000/PDI as a surrogate for total costs. The figure of $8,000/PDI is based on the IAEA's 1993 budget estimate and PDI output. (Actual regular expenditures on safeguards were somewhat lower, and the actual PDI figure was also a bit lower, but the effects on their final cost figures are not problematic.) The options vary in the facilities covered and the degree of inspection effort needed to meet the specific verification objectives under each option. The resulting numbers seem internally consistent but include, as they note, a number of assumptions and simplifications. The numbers presented are thus subject to significant uncertainties; in fact, they actually serve as illustrations of alternative assumptions rather than as predictions.[8]

The Fishbone-Sanborn study does not really provide firm numbers, but it does outline the basis for its results. The Cserveny study, in contrast, although at best a preliminary estimate, merely notes that it draws on IAEA data and calculations and then presents only its final figures. Like the Fishbone-Sanborn study, Cserveny reports a $/PDI figure, but his numbers assuredly are not based on a simple multiplication of PDI estimates by a $/PDI rate. This can be demonstrated quite simply. If we take the only $/PDI figure Cserveny reports, $7200/PDI, and multiply it by his PDI estimates, we get estimates for Alternatives A through D of $33M, $117M, $159M, and $182M, respectively, and these amounts are significantly higher than the figures he actually reports.[9] Quite clearly, if Cserveny's $/PDI figure is to be taken seriously, there must be other factors at work to generate his reported costs. There is no basis given, however, for identifying or estimating either the effects or the roots of these factors.

Comparative Review of Composite Alternatives/Options

It is instructive to compare the IAEA and Brookhaven categories (regarding their Alternatives/Options) to get a stronger sense of some of the factors generating their different estimates of the cost of

verifying a fissile materials production cutoff. Doing so gives us a foundation for the examination of cutoff verification issues that follow and provides a clearer understanding of their respective assumptions. This comparison is tentative, however, since the terms in which they present their results are neither fully detailed nor readily available. For reference, tables 1 and 2 provide comparable summary data for the two studies; tables 3 and 4 provide broad and specific breakdowns of the categories themselves.

The differences between the two sets of options are quite striking. The Brookhaven study, in its most comprehensive option, covers 655 facilities at 28975 PDI, arriving at a cost of US$230 million, while the IAEA, for 995 facilities, suggests 25398 PDI for a cost of US$140 million. Therefore, the IAEA study submits that it can cover 53 per cent more facilities with 90 per cent of the PDI and only 60 per cent of the Brookhaven cost.

Table 4, which attempts to group the studies' various options in comparable sub-categories of facility types, provides somewhat greater detail. It suggests some general conclusions that hold across the two studies. Reprocessing is by far the most significant area of verification. Enrichment takes up perhaps surprisingly little effort as compared to, for example, verification at fuel fabrication and conversion plants. However, the differences between the two studies are even more striking when broken down, and they are overwhelmingly driven by their differing estimates in reprocessing verification. Outside of this factor, it is notable that, except for Alternative A as compared to Option 3 in the category "Enrichment" and Alternative B as compared to option 2 in "Other" (see table 4), the IAEA study otherwise suggests the larger PDI figures. Four very broad sets of differences, acting individually and collectively, possibly generate the differences in these more detailed estimates within and between the two studies:

1) differences in the sorts of facilities to be verified;

2) differences in estimates of the number of operating facilities of a given type that would have to be covered;

3) differences in the level of verification required; and

4) differences in the estimated PDI necessary to verify at a given level.

In their broadest logic, the two studies move from the least to the most comprehensive categories in similar terms. Alternative A and Option 3 focus narrowly on the immediate production of fissile

material, particularly at reprocessing and enrichment plants and at other facilities directly associated with such material (for example, fuel fabrication and conversion plants using plutonium or HEU). These two options also adopt a lower standard of verification activity than that found in "full" IAEA verification. The most demanding options, Alternative D and Option 1, call for comprehensive safeguarding along lines similar to INFCIRC/153 and full coverage (within the limits of the cutoff) of the peaceful fuel cycle, with the full panoply of IAEA verification activities. Option 2 and Alternative B do not expand the range of facilities as compared to Option 3 and Alternative B, but they do move to "IAEA standards" of verification in the Brookhaven study and to verification of the complete material balance in the IAEA study (there is some ambiguity here, however). The IAEA study's Alternative C further expands the list of facility types to be verified, and in particular, adds verification of spent fuel (which is only included in the Brookhaven study in Option 1). In the broadest terms, for both the level of verification and the sorts of facilities included, the following seem roughly comparable: Option 3 and Alternative A; Option 2 and Alternative B (Alternative C, somewhat less so); and Option 1 and Alternative D (for reference, see table 3).

Differences in facility types listed in roughly comparable options do not carry enough of the burden of explanation for the discrepancies between the two studies. The aggregate differences in PDI estimates are significant – on the order of 3600 PDI – for both Option 3/Alternative A and Option 1/Alternative D. They are greatest, at roughly 6600 PDI, however, for the Option 2/Alternative B pair. It would take considerable discrepancies in estimates of the actual number of facilities to be covered to account for some of these differences. While Alternative C introduces spent fuel verification, Option 2 does not. Verification of temporary storage at reactor sites might account for some of the PDI difference in the "power reactor" category between Alternative C and Option 2, but there is insufficient detail to confirm this. As well, while the Brookhaven study gives broad estimates of numbers of facilities (for instance, thirty-four reprocessing plants and twenty-four enrichment plants), it does not provide further detail, while the IAEA study does not offer even this breakdown.

Levels of verification required for a given option explains some of the difference. In the Option 3/Alternative A pair, the IAEA study calls only for input-output verification and does not include process verification. This can generate very significant savings, particularly in verification at enrichment and reprocessing plants. The Brookhaven

study, however, assumes some reduction in inventory verification in Option 3, but still calls for some flow verification. This could explain some of its higher PDI estimates for enrichment and reprocessing in this pair. However, this broad explanation fails in the Option 2/ Alternative B coupling, where Brookhaven calls for "IAEA standards" and the IAEA study calls for "complete material balance" verification. Assuming these have the same meaning, and that the facilities' types and numbers are roughly comparable, Brookhaven estimates 7000 PDI more for reprocessing than Alternative B (and the same amount for Alternative C), but 600–700 PDI less for enrichment. The differences here seem far more likely to arise either from differing estimates for verification at a given level, or from vastly different estimates of the number of facilities, especially reprocessing plants, to be verified.

In general, then, the two studies view reprocessing verification requirements quite differently, and this difference accounts for the aggregate higher Brookhaven estimates. However, in virtually every other category, the IAEA study in fact sees the PDI demands as greater than the Brookhaven study. Without more detail than the studies provide, further explanations/explorations of these differences are not readily available.

Table 3.
Broad IAEA and Brookhaven Category Comparison

Category	IAEA Facilities	Brookhaven Facilities	IAEA PDI	Brookhaven PDI	IAEA Cost ($ million)	Brookhaven Cost ($ million)
Comprehensive: IAEA Alternative D; Brookhaven Option 1	995	655	25398	28975	140	230
Restricted A: IAEA Alternative C; Brookhaven Option 2	645	300	22113	22875	120	184
Restricted B: IAEA Alternative B; Brookhaven Option 2	195	300	16271	22875	90	184
Narrow: IAEA Alternative A; Brookhaven Option 3	195	300	4629	8296	40	66

Table 4.
Specified Grouping of IAEA and Brookhaven Options in Comparable Categories

	Reprocessing	Enrichment	Power & Plutonium Production Reactors *	Other **
IAEA: Alt. A	1626	310	240	2453
(4626 PDI, in %)	35.1	6.7	5.2	53.1
IAEA: Alt. B	8681	1946	240	5405
(16271 PDI, in %)	53.4	14.7	1.5	33.2
IAEA: Alt. C	8681	2051	4656	6725
(22113 PDI, in %)	39.3	9.3	21.1	30.4
IAEA: Alt. D	8681	2051	4656	10010
(25398 PDI, in %)	34.2	8.1	18.3	39.4
Brookhaven: Opt. 3	5290	756	– – –	2250
(8296 PDI, in %)	63.8	9.1		27.1
Brookhaven: Opt. 2	15715	1290	– – –	5870
(22875 PDI, in %)	68.7	5.6		25.7
Brookhaven: Opt. 1	15715	1290	3868	8102
(28975 PDI, in %)	54.2	4.4	13.5	28.0

Notes: Numbers on the first line of each cell indicate PDI for each component of the Alternatives/Options; Indented numbers on the second line of each cell indicate the percentage of total PDI for that Alternative/Option.

* Brookhaven simply bring together power and plutonium production reactors. The IAEA study at times differentiates between types of power reactors, Alternatives A and B include only LEU-MOX reactors, while Alternative C includes all power reactors (LEU-MOX and others).

** The IAEA lists a number of other specific facility types and gives PDI numbers and percentages. Brookhaven note some facility types, but estimates of PDI numbers group these together.

Problems Pertaining to the Use of PDI as a Surrogate for Costs

Another conclusion we reach is the need for more data on at least some of the issues noted above, as well as greater clarity regarding the estimating process. In the case of Fishbone and Sanborn, we have an admittedly preliminary estimate based on an extremely simple, fundamental calculation: PDI x $/PDI. [10] In the IAEA study, cost estimates and some limited breakdowns are given, but we have no basis with which to discover the method used or on how the criteria that produce these final figures are chosen. Fishbone and Sanborn provide estimates of PDI requirements for different facilities, but IAEA data is necessary for comparative purposes. Brookhaven estimates 9 PDI/yr for a light water reactor (LWR), [11] but a separate IAEA study that included one of Brookhaven's principal researchers estimated 6.5 PDI/yr for an "average" LWR. [12] The Brookhaven estimate could be "double-counting" some PDIs, if a single inspector can under some circumstances, perform two tasks on a given day.

PDI as a surrogate for costs is inconvenient, as the actual expenditures of the IAEA versus PDI calculations vary from year to year. The following table bears this out.

Table 5.
IAEA PDI Calculations (1989-1994)

Year	PDI Expenditures	Actual (in $)	$/PDI
1989	10132	50,462,307	4980
1990	10381	61,180,091	5893
1991	9442	56,382,190	5971
1992	8385	58,637,003	6993
1993	8153	63,715,708	7815
1994	9152	65,483,281	7155
mean	9274.2		6467.8

Source: IAEA; not arranged by individual IAEA Division estimates.

As can be seen, there is considerable variation from year to year. Aside from establishing a standard deviation, which is problematic given the range of activities and facilities that may be included, PDI and $/PDI do not provide a fully operable tool for study. Furthermore, as table 6 shows, IAEA figures relating to PDI are indeterminate

because they are based on "adjusted" or "estimated" amounts, and these vary within divisions of the Safeguards Department itself. This is particularly significant because overviews of projected costs for verifying a cutoff treaty that present an argument based on IAEA PDI calculations (such as the two cases examined here) are necessarily vague. The $/PDI figures we have run across merely take the entire Safeguards Department budget and divide by the number of PDI produced to provide $/PDI for a given year as a surrogate for verification costs. Aside from the problem of defining and calculating PDI itself, this is also questionable as a basis for estimating routine inspection costs, since it is not clear what PDI would be for various initial inspections or whether the reported PDI were only for routine inspections, and because at least some of the total expenditures used for the calculation may not be readily assignable to routine inspections. The various budgets and $/PDI figures in table 6 attend to some of these concerns. The variability in PDI produced and in $/PDI figures from year to year could also make it very0 difficult to use PDI from any specific year, rather than an average figure. Also notable is the very considerable differences in the alternative $/PDI figures from one column to the next. Table 6 details some of the variations of PDI estimates for IAEA verification activities on a year to year basis as well as an explanation of the numbers and their implication for this study.

Table 6.
Alternative Calculations of IAEA 4/PDI Figures - Basic Amounts (1990–1995)

		Column 1	Column 2	Column 3	Column 4	Column 5
Year	Reported PDI	Adjusted Safeguard Dept. Budget	Adjusted OPs Division Budget	Adjusted OPs A, B, & C Budget	Adjusted OPs A, B, & C Verif. Budget	Estimated OPs A, B, & C Verif. Budget
1990	10381	54189000	39037000	28258000	n/a	n/a
1991	9442	65118000	46094000	34208000	n/a	25365000
1992	8385	59707000	41462000	29709000	n/a	30344000
1993	8153	65075000	46214000	35911000	n/a	31875000
1994	9152	68294000	52059000	38887000	34974000	34864000
1995	10167	72422000	56033000	42202000	38157000	38157000

Notes - **Column 1:** The adjusted Safeguards Department budget and the corresponding $/PDI figure would correspond broadly to the other general figures used in calculations by the Brookhaven study.
- **Column 2:** This reports only the adjusted Operations Division budgets. This is the division actually carrying out inspections. Thus, these figures exclude the Support and Development[13] and Management divisions within the Safeguards Department.
- **Column 3:** These figures report costs only from the adjusted budgets for Operations Divisions A, B, and C, which would be the sections actually carrying out inspections, excluding others such as development and technical support, and safeguards information treatment. The latter could be a significant component of routine inspection activities.
- **Columns 4 and 5:** These numbers report the adjusted or estimated budget for verification activities by the three Operations Divisions (A, B, and C). They thus exclude activities such as negotiation and liaison, safeguarding excess nuclear weapons material, nuclear material accountancy, and equipment management and sample analysis. Again, these figures may be significant for routine inspection; they may also give a "truer" figure for the actual cost of inspection activities as such, but they omit back-office and support costs that might be associated with them. As well, no distinctions are made for various types of inspections.
- It is notable that the $/PDI figures for columns 4 and 5 vary roughly between 40–50 per cent of the $/PDI figures for column 1. Even if other activities besides verification are assigned to the cost assessments, it could be that the actual $/PDI figures for routine inspections are still substantially below the $/PDI figure which is based on the entire Safeguards budget.

Table 7 interprets the data in table 6 as PDI. What is particularly striking here is the variance of PDI figures; this variance demonstrates the extent of the potential and actual problems that stem from using surrogate costing tools such as $/PDI.

Table 7.
Alternative Calculations of IAEA $/PDI Figures/Budgets Calculated to PDI (1990–1995)

Year	Column 1/PDI	Column 2/PDI	Column 3/PDI	Column 4/PDI	Column 5/PDI
1990	5220	3760	2722	n/a	n/a
1991	6897	4882	3623	n/a	2686
1992	7121	4945	3543	n/a	3619
1993	7982	5668	4405	n/a	3910
1994	7462	5688	4249	3821	3809
1995	7123	5521	4151	3753	3753

Source: IAEA

Given the variation in costs and activities as borne out by tables 6 and 7, the use of $/PDI as a "surrogate" for real costs may illustrate the "fallacy of the indicator": the use of convenient though unreliable numbers if more meaningful figures are not available. As a result, it may not present a useful estimate given the variation attributable to facilities and verification procedures and to the individual issues relating to specific sites. What all of this indicates is an essential criticism of the existing analyses (based on inaccurate PDI calculations): variances of between 50–100 per cent demonstrate at best a very rough estimate of costs; indeed, the variance may result in tens of millions of dollars. In short, ambiguities in estimates produce serious variations where specifics regarding verification systems and scope (indeed, the entire category of issues presented in this report: scope, location, participation, range, and character) are not adequately detailed.

CRITIQUE OF THE TWO REPORTS: DISCREPANCIES AND INCONSISTENCIES DISCOVERED

Despite the fact that both the IAEA and Brookhaven studies are based on IAEA data, it is striking that their respective estimates – notably their most comprehensive figures – are so disparate. Broad inspections, according to the Brookhaven study, would cover 655 facilities at 28,975

PDI for a total cost of US$230 million; on the other hand, the IAEA suggests that 995 facilities would be included in a comprehensive verification programme, calculated at 25,398 PDI for a total cost of US$140 million. Therefore, the IAEA study suggests that, with 53 per cent more facilities to inspect, total costs would be only 60 per cent of what the Brookhaven analysis estimates. Furthermore, the IAEA figures indicate significantly lower PDI costs than those of the Brookhaven study (US$7200 versus US$8000).

Despite the questions concerning the Cserveny study's figures, it is the Fishbone-Sanborn study that indicates the factors that could affect their calculations. Taking these into account, and noting some others and some features of their methods of calculation, we could reasonably suggest that their cost estimates and PDI estimates may be too high.[14] To that extent, the Fishbone-Sanborn study may serve as an outside estimate of costs. Without further information about the Cserveny study's figures, assumptions, and methods of calculation, we cannot say whether or to what degree this is more likely to be a more accurate set of estimates.

Aside from the confusion regarding calculated PDI in these studies, there are some issues raised by or within these two studies, including:

1) *The effect of the New Partnership Arrangement (NPA) with EURATOM on IAEA costs.* The IAEA expects to realize substantial savings in PDIs through this arrangement. One estimate suggests that as much as 2100 of a current 3100 PDI could be saved.[15] As Fishbone and Sanborn estimate that some 183 affected facilities (of a total of up to 655) and up to 11,000 PDI of inspection effort could be in Britain and France, savings under this arrangement, if not already taken into account, could be significant.[16]

2) *The number of facilities coming under a cutoff which are currently under INFCIRC/66 Rev. 2 safeguards.* India and Pakistan account for up to forty facilities in the Fishbone-Sanborn estimate, and up to roughly 3,400 PDI of inspection effort. A small number of these facilities are under INFCIRC/66 Rev. 2 safeguards, thus generating another saving. Facilities currently under INFCIRC/66 or other non-NPT safeguards in India, Pakistan, and Israel include:

- India: two power reactors, two fuel fabrication plants, one reprocessor;
- Pakistan: one power reactor, two research reactors or critical assemblies, one separate storage facility; and
- Israel: one research reactor or critical assembly.[17]

3) *The status of facilities associated with plutonium production for weapons purposes.* It would be reasonable to assume that many facilities – at least military plutonium production reactors and possibly some military reprocessors – would be shut down or even decommissioned after a cutoff came into force. Fishbone and Sanborn estimate that an operational plutonium reprocessing plant could take 935 PDI of inspection, while a shut-down plant could take as little as 30. Some of these, not being designed with safeguards in mind, might call for a larger-than-usual effort. Potentially significant reductions might thus be possible here, depending on the status of these facilities.

4) *The status of facilities associated with the civilian plutonium economy, and of civilian reprocessing plants and facilities producing or using MOX fuel.* Both seem to absorb a significant proportion of the inspection effort. State plans for the civilian use of plutonium would thus have a significant effect on any verification costs.

5) *The effects of the IAEA's "93+2" programme and of specific techniques which might reduce the inspection burden.* Neither study makes any reference to the IAEA's "93+2" programme of safeguards, which sought to achieve greater efficiency in resource use. It is likely the case that the efforts estimated are based on current rather than possibly lower future values. As an example, although a separate IAEA study reported 6.5 PDI/yr for a LWR, it also suggested that this could be reduced to 4.5 PDI/yr through the mailing-in of television data.[18] This is a saving of almost a third, and saves half again over the Brookhaven analysis figures.

6) *Efficiency in the use of inspectors as well as efforts to raise this.* Brookhaven suggests that in 1993, roughly 200 IAEA inspectors produced about 8,100 PDI of inspection, thus approximately 40 PDI/inspector/year.[19] This seems broadly in line with a Los Alamos Laboratory estimate that the average IAEA inspector spends about 90 days/year on field duty, of which about 50 are inspection duty.[20] Anything that could increase the number of PDI/inspector/year would entail obvious cost savings by reducing the number of additional personnel to support the verification effort. For most of the "P5+3" states in a cutoff, the number of facilities within their borders could justify country, or at least regional, offices. This could reduce both travel costs and time and thus increase the efficiency of inspectors within these states. Estimates of savings from the IAEA's Toronto and Tokyo offices could be useful in this regard.

7) *The general set of affected facilities.* The difference in facility numbers reported by Brookhaven on the one hand and by the IAEA study on the other could be due to mere counting differences. It would be useful to draw up a clear list of facilities that could be affected under varying configurations of a verification system. This would both reduce this possible source of difference and offer a more accurate estimate of the actual set of facilities to be included.

In general, and bearing in mind that Brookhaven includes safeguards for reactors only in Option 3, the two estimates agree at least on the rough order of which areas require the most effort. Both focus above all on reprocessing, while "other" facilities come next. Enrichment verification accounts for surprisingly little PDI. For reprocessing and enrichment, the IAEA's Alternatives B, C, and D are effectively the same. For power and production reactors, Alternatives C and D are very similar. For the Brookhaven study, Options 1 and 2 are the same for reprocessing and enrichment, though Option 2 would see a higher overall emphasis on these requirements. For power and plutonium reactors, general PDI comparison shows that the IAEA's Alternatives C and D and Brookhaven's Option 1 are relatively similar in enrichment (the Brookhaven estimate is lower), while for "other" facilities, similarities exist between B)srookhaven's Option 3 and IAEA's Alternative A; Brookhaven's Option 2 and IAEA's Alternatives B and C; and Brookhaven's Option 1 and IAEA's Alternative D. It should be noted, however, that Brookhaven's estimates for PDIs for reprocessing are nearly double those of the IAEA, and Brookhaven's estimates of enrichment PDI are either approximately double for Brookhaven's Option 1/IAEA's Alternative A, or (for Brookhaven's Options 1 and 2), and 60 per cent of IAEA estimates for Alternatives B, C, or D. The IAEA's "other" estimates are somewhat above the Brookhaven figures. From all of this, three very broad questions are raised:

1) Why are IAEA estimates for reprocessing substantially lower than Brookhaven's?

2) Why are Brookhaven's estimates (except for Option 3) for enrichment so much lower than the IAEA's?

3) What accounts for the approximately 20 per cent difference between the two studies on power reactors and plutonium production reactors? The IAEA's reprocessing figures are well below Brookhaven's, but are actually greater than Brookhaven's in almost all other instances, except some Alternative A/ Option 3 comparisons.

Some of these concerns are particularly relevant. The large discrepancies in the more detailed estimates of PDI for both studies could account for much of the excess of the Brookhaven study over the IAEA version (for example, Alternative A versus Option 3 for reprocessing; and Alternatives B and C and Options 1 and 2). This is notable, given that most other IAEA estimates are either roughly comparable or greater than those of the Brookhaven study.

OVERVIEW OF ISSUES PERTAINING TO DECLARATION AND VERIFICATION

There are several issues relating to declaration and verification that must be taken into account. First, regarding the fissile material itself, a production ban treaty would obligate the verification programme to focus on the cessation of new production. Second, isotopic levels of uranium and plutonium are a controversial issue. As a benchmark, military uranium production is usually depicted as the point where the fissile isotope U-235 moves beyond 20 weight per cent (w/o).[21] For plutonium, "production" is when plutonium is converted from uranium in a reactor, or when plutonium is separated from fission products. However, actual weapons have been manufactured with a fissile isotopic level as low as 12 w/o U-235 (what is commonly referred to as "slightly" enriched uranium [SEU]). For plutonium, any w/o level of the fissile isotope Pu-239 would facilitate weapons development.

A third concern has to do with the facilities targeted for verification. For uranium, separation and enrichment facilities would be necessary. It would also be necessary to monitor new production of plutonium in nuclear reactors. Plutonium manufacturing is unavoidable in reactors, where U-238 is transmuted to create plutonium. However extensive verification is necessary to govern activities at reprocessing plants where plutonium is separated from fission products, creating an explosive strategic material.[22] We need also to address the more complicated issue of attempting to account for undeclared facilities and the dual use problem[23] (assuming a "wide scope" verification regime). Ignoring civilian-only facilities might lead to the transfer of clandestine military activities to civilian facilities. Further complicating the dual use consideration is the fact that production of plutonium and HEU may be for civilian purposes, such as laboratory use, research reactors, critical assemblies, or research into mixed oxide (MOX).[24]

Once the material and facilities are identified, the scope of the verification regime must also be stipulated, including technical requirements and material types, quantities that would qualify for inspection, and sources of information sought – states, facilities, and

non-state facility outsiders (that is, criminal activity). A comprehensive verification regime would also require the identification of the proper agency or organization to carry it out – the IAEA, national bodies, another multilateral system, a regional system (for instance, Euratom) – and the degree of autonomy given to that agency. In short, cessation of production of fissile material would necessitate verifying the following:

– closing military production plants;

– monitoring other production plants that remain for civilian fuel cycle and research purposes;

– monitoring reprocessing within plants that remain open; and

– monitoring to guard against new illicit operations.

Furthermore, there is the issue of how a verification process might be modelled. One inspection pattern based on INFCIRC/153 involves:

i) the prevention of material diversion;

ii) all peaceful activities; and

iii) materials accountancy being supplemented by containment and surveillance.

Another is based on INFCIRC/66, which is less inclusive and would pertain directly to plants, facilities, and materials subject to the agreement. One option that could prove more workable under a production ban agreement involves safeguards, which would closely follow the spirit of a CBM. [25] A commitment to safeguards would involve three primary procedures:

1) nuclear material accounting, involving quantities of nuclear material present and changes in inventory;

2) containment and surveillance measures, restricting or controlling access to, or movement of, fissile material; and

3) inspections, whether on-site (OSI) or by other means.

In sum, the verification/safeguards issue as it pertains to a production ban may be demarcated in the following manner:

1) the "wide scope" alternative, applying safeguards to all nuclear facilities and materials in the NWS and UNWS. The two primary issues for consideration here are:

i) how this might achieve a degree of consensus at the CD; and

ii) how the IAEA might meet these comprehensive requirements (possible model – IAEA INFCIRC/153).

2) The "limited scope" alternative – less effective but politically malleable – where verification/safeguards are applied only to those facilities and nuclear materials of greatest proliferation risk: enrichment and reprocessing facilities involving plutonium and HEU, but not LEU (possible model – IAEA INFCIRC/66).

Linking these to the existing IAEA/Brookhaven analyses, "wide scope" is most closely related to the "comprehensive" category, while "limited scope" pertains to the "restricted" and "narrow" categories.

SUMMARY AND CONCLUSIONS

Among the more striking conclusions of this project is something on which the two existing studies agree. By far the greatest single factor in any estimate of routine inspection costs associated with verifying a fissile materials production cutoff is the number of operational reprocessing plants. Reprocessing plants account for 34–53 per cent of Cserveny's PDI estimates and about half of the Fishbone-Sanborn PDI estimates.[26] This is true whether the verification system is limited or comprehensive. It thus follows that, regardless of the choice of verification system, a very large cost factor in verifying the cutoff would simply be the number of reprocessing facilities to be safeguarded.

This highlights a related issue: the costs associated with a plutonium economy. If the use of plutonium (that is, production in reprocessors and use in MOX fuel) is limited or even reduced, the costs associated with the cutoff could fall very substantially. If, however, plutonium use were to rise, at least in the eight states covered in the estimates, the cost of verifying the cutoff would also increase appreciably.

The two studies are of value as much for the questions they raise as for the answers they try to provide, and for what they exclude as much as for what they include. A close examination of each and a comparison of the two raise a number of issues that would need additional information and more detail concerning their calculations to resolve. Absent further information along the lines noted below, the estimates provided in the two studies are ambiguous rather than firm, and are not necessarily reliable guides to routine verification costs of a verifying international agency, much less to the total cost to all actors of a verifying cutoff treaty. The ambiguity originates in the following:

1) which verifying activities and associated actors are not included in the studies' estimates;

2) problems associated with the use of PDI and $/PDI as a base for calculations;

3) assumptions concerning the extent of the use of plutonium and HEU under a cutoff regime;

4) the question of grandfathered civilian stocks of plutonium and HEU; and

5) the possible operation of other factors that could affect the burden and the cost of verification that an international agency would be responsible for.

The two studies refer only to routine verification costs by an international agency. They therefore omit other verification costs (for example, non-routine inspections; devising inspection strategies for specific facilities; and acquiring, placing, and maintaining equipment) faced by such an agency, and they ignore verification-related costs that might be paid by other actors, such as SSACs and facility operators.

In addition, the use of PDI and PDI-based figures entails a number of problems. First, the reported PDI produced is not broken down by inspection activity, thus associating this simply with routine inspection is misleading. Second, the amount of PDI produced per year can vary considerably. Third, the use of $/PDI to generate a basis for verification estimates is not satisfactory. Aside from ambiguity about what the Safeguards Department's PDI figures cover in inspection activity and their variability from year to year, the $/PDI figure itself can vary substantially on a yearly basis. Fourth, the PDI requirements for routine verification of a facility of any given type are either ambiguous or not given at all. Fifth, the two studies vary quite substantially in their PDI estimates for various classes of facilities, even if some allowance is made for differences among paired options in the sorts of facilities included and the degree or standard of verification. This is particularly striking for PDI estimated for reprocessing.

Estimates are quite sensitive to assumptions about the number, type, and operational status of facilities to be covered. Reprocessing facilities in particular absorb a very large portion of the estimated verification effort, while enrichment facilities, HEU and plutonium conversion facilities, and their fuel fabrication are also important. Any "hard" estimate of routine inspection costs must thus be founded on reasonably "hard" estimates of the extent of actual production and use of plutonium and HEU within the bounds of a cutoff regime. If HEU production and use is cut back, the associated verification load will be reduced. If plutonium production facilities (production reactors,

reprocessing, conversion, etc.) are cut back under a cutoff, the load on a verification system will also be substantially reduced. Conversely, if a civilian plutonium economy should develop under the cutoff, the verification load would increase. A first step in devising a tighter estimate would therefore be to list in greater detail the specific facilities (not just facility types) that would be affected under a cutoff, their assumed operational status, and the associated verification burden.

Related to this is the "grandfathering" issue. If existing civilian stocks are exempted from verification and if they are widely used, the option of a "comprehensive" verification system along the lines of INFCIRC/153 makes no immediate sense. Instead, facilities associated with the exempted material would themselves not be safeguarded while that material was in them – an INFCIRC/66-style situation. Only as the exempted stocks were used up over time could a truly "comprehensive" system of verification be put in place.

Various other factors could affect the extent of the burden and the cost an international agency would incur to implement such a verification system. These include:

1) the effects of a New Partnership Arrangement between EURATOM and the IAEA, since many affected facilities would be within the European Union;

2) the possible inclusion of some facilities in threshold states which may be currently under INFCIRC/66 safeguards;

3) the possible effects of the IAEA's "93+2" programme for strengthening its safeguards; and

4) possible measures to increase the efficiency of how inspectors are used.

Verifying a production cutoff treaty will represent the single most crucial element for a cutoff regime. Given this level of importance, it is essential that a clear and comprehensive understanding be accorded to the matter of verification costs and to the issues that will contribute to them. Existing analyses of verification costs are incomplete and ambiguous. This is particularly serious in light of the attention given to the studies as a foundation for verification costs; clearly, our research shows that these costs are inaccurate. This report benefits those interested in establishing a verification programme by detailing and exploring the primary concerns that will directly affect costs and by providing a critical review of some existing proposals. To that end, this project contributes to our general understanding of the panoply of

verification issues, and also acts as something of a "caution" for those charged with the task of launching what will serve to be an immensely important contribution to non-proliferation and global security.

Notes

This paper is based on "Calculating Costs: An Independent Critique of Expense Analyses for a Fissile Materials Production Cutoff Treaty and Overview of Associated Salient Verification Issues," a report produced for the Non-Proliferation, Disarmament, and Arms Control Division, Department of Foreign Affairs and International Trade. The report was presented at the 1996 Canadian Non-Proliferation Workshop, "Non-Proliferation Agreement, Arrangements and Responses," 6–7 Nov. 1996. The original report was not completed in time for publication in that workshop's proceedings. The views contained in this paper, as well as responsibility for all statements and any errors, are the authors' alone and should not be taken as a reflection of the position of the Government of Canada.

1. Stockpiled material might include: completed nuclear weapons; unprocessed or partially processed material in different stages of the weapons production or dismantling process; civilian, military, and submarine reactor fuel in service, in production, in storage, or in a waste management facility; material for civilian power reactors, research reactors, or particle accelerator isotope production processes; and stored fissile material.

2. Vilmos Cserveny, "A Cutoff Treaty and Associated Costs," an IAEA Secretariat Working Paper on Different Alternatives for the Verification of a Fissile Material Production Cutoff Treaty and Preliminary Cost Estimates Required for the Verification of These Alternatives," presented at the Workshop on a Cutoff Treaty, Toronto, 17–18 Jan. 1995.

3. Leslie G. Fishbone and Jonathan Sanborn, "Routine Inspection Effort Required for Verification of Nuclear Material Production Cutoff Convention," (Upton, NY: Safeguards, Safety and Nonproliferation Division, Department of Advanced Technology, Brookhaven National Library, Dec. 1994).

4. Cserveny, 2–3.

5. Ibid, 4.

6. Fishbone and Sanborn, 1–2.

7. Two sources of information regarding SSAC upgrades are Sven Thorstensen, "Nuclear Material Accounting and Control: Co-ordinated Assistance to Newly Independent States," *IAEA Bulletin,* 37 (Mar. 1995); Herbert L. Abrams and Daniel Pollak, "Security Issues in the Handling and Disposition of Fissionable Material," *Contemporary Security Policy,* no. 15 (Dec. 1994).

8. Fishbone and Sanborn, 8.

9. Cserveny, 17. Cserveny presents the $7200/PDI figure as an average, but does not indicate how it was calculated. He reports approximately 8200 PDI for 1993 and a 1993 safeguards budget of nearly $67.5M, which gives a result of about $8200/PDI. For his total estimates to be based on a simple PDI x $/PDI calculation, the $/PDI figure for alternatives B through D would have to be in the range of $5000–$6000/PDI. If one examines actual IAEA safeguards expenditures and PDI production over the years since roughly 1990, there are substantial variations in both PDI per year and in $/PDI. Although $/PDI may be an easy, if crude, surrogate for overall verification cost, it may not be a particularly stable measure from year to year. We cannot determine the other factors Cserveny takes into account to generate his total sums.

10. As a surrogate for expenses, the IAEA equates one "PDI" with one person doing eight hours of work. The roots of the PDI may lie in the IAEA reference to "man-day": "A day during which a single inspector has access to a facility at any time for a total of not more than eight hours." This legal definition does not necessarily coincide with a calendar day. During a calendar day, an inspector may produce several man-days (via continuous inspection or visiting several facilities). On the other hand, circumstances (for example, travel conditions or type of inspection activities required) may limit inspection work (and thereby access) to a small part of a calendar day only. The fact that a single individual could fulfil more than one PDI by inspecting two facilities in the same day, or that three inspectors in a single facility would equal three PDI affects cost estimates based on total PDI. That is, the number of inspectors and time taken to perform the verification may lead to discrepancy and a margin of variance. In sum, PDI, first developed in INFCIRC/153 as a measure of inspection effort, may be less than adequate as a measure of cost (for which it has been used by existing studies). See "IAEA/SG/INF/1 (Rev. 1), *IAEA Safeguards Glossary* (Vienna: IAEA, 1987), 65.

11. Fishbone and Sanborn, 5, 12.

12. Fishbone, et al., "Procedural Field Test of State Mail-In of Closed Circuit Television Data," in *International Nuclear Safeguards 1994: Vision for the Future, Volume 2* (Vienna: IAEA, 1994), 282.

13. Support and Development covers activities such as the development of instruments and field support, planning safeguard systems for facilities, data processing, systems studies, standardization, analysis, training, and safeguards strengthening. Some of these activities would be applicable to routine inspection activities (for example, data processing, statistical analysis), but others might be more appropriate for initial implementation of safeguards (for example, designing systems for use in specific facilities, which could be a substantial initial expense for implementing a cutoff verification programme).

14. These are, of course, estimates of routine inspection only.

15. S. Thorstensen and K. Chitumbo, "Increased Co-operation Between the IAEA and EURATOM: The New Partnership Approach," in *International Nuclear Safeguards 1994: Vision for the Future, Volume 1* (Vienna: IAEA, 1994), 271–83. It should be noted, however, that a very large proportion of the estimated 1000 PDI saved by the arrangement to date seems to be associated with one low-enriched uranium fuel fabrication plant and two MOX fuel fabrication plants (278–79).

16. Facilities in the United Kingdom and France not currently covered by IAEA safeguards are reviewed by EURATOM only on a voluntary basis. However, the United Kingdom has effectively placed all of its facilities under EURATOM safeguards, except for specific exclusions (hence the voluntary basis), and has also dealt with co-processing military and civilian material. The French, on the other hand, have only designated specific facilities for the voluntary offer to the IAEA under the NPT. In 1990, only the La Hague reprocessor was open to safeguards by the IAEA. See Darryl Howlett, *EURATOM and Nuclear Safeguards* (London: Macmillan, 1990), 185–89.

17. IAEA, *Annual Report for 1995,* GC 8 (40), July 1996.

18. Fishbone, et al., "Procedural Field Test," 282.

19. Fishbone and Sanborn, 8.

20. Lawrence Scheinman and Myron Kratzer, *INF and IAEA: A Comparative Analysis of Verification Strategy* (Los Alamos: Los Alamos National Laboratory, July 1992), 23.

21. Purified uranium hexafluoride (UF6) contains approximately 0.711 w/o U-235, suitable to fuel either deuterium (heavy water) uranium reactors such as the CANDU (a pressurized heavy water reactor, United Kingdom–PHWR) or graphite-moderated, gas-cooled reactors such as those used in the United Kingdom. However, this level of enrichment is too low to run more than 90 per cent of the world's reactors – the conventional

light water (LWR) version – and is also useless from a military standpoint. The balance of the isotopic uranium material in the UF6 is largely U-238, the target material, incidentally, for producing plutonium. The U-235 in UF6 typically must be enriched to between 3.0 and 5.0 w/o (low enriched uranium–LEU) U-235 in order to be fabricated into LWR fuel pellets as uranium dioxide (UO2). The process used to enhance the concentration of U-235 is measured in quantities of enrichment services, called separative work units, or SWUs. To produce weapons grade uranium or HEU, LEU typically must be enriched to a level between 90 and 95 w/o U-235; however, some weapons programmes have used a significantly lower weight per cent level.

22. It is important to note that only the most comprehensive options posited by the studies monitor spent fuel factors.

23. Dual use here refers to the civilian and military use for uranium and plutonium in weapons and power generation. "There will still be allowed production of Pu for civilian purposes. While HEU is not currently being produced, its production is not banned absolutely by this agreement. Since Pu produced in civil reactors can be used for weapons purposes, and HEU can be produced in any enrichment plant (in some cases with reconfiguring), it will be necessary to consider civilian as well as military facilities under this agreement." Mary Anne Yates, et al, "Options for Verification of an SNM *[sic]* Production Cutoff," Institute of Nuclear Materials Management 35th Annual Meetings Proceedings, 17–24 July 1994, 512.

24. MOX fuel, which is utilized in power reactors, uses plutonium and uranium (mixed oxide) that might otherwise be used in weapons programmes.

25. See R. B. Byers, S. Larrabee, and A. Lynch, eds., *Confidence-Building Measures and International Security, 4* (Institute for East-West Security Studies, 1987), 1. A production ban, while constraining armament programmes where future production would be required, creates a multilateral CBM in that states would be more aware of, and secure in, the intentions of the other states' nuclear programmes.

26. Cserveny, tables; Fishbone and Sanborn, 9.

International Maritime Law and the Interdiction of Movements of Weapons of Mass Destruction by Sea

James Keeley

Executive Summary

This paper examines the situation in current international maritime law regarding the possible interdiction of shipments by sea of weapons of mass destruction (WMD) or of WMD-related items. Using the Proliferation Security Initiative's (PSI) "Statement of Interdiction Principles" as its starting point, it poses three questions:

1. What are the possibilities and difficulties under existing international maritime law and under relevant national legislation for the interdiction of WMD-related shipments?

2. What are the possibilities for strengthening the applicability of existing international and national laws, for example, through improved co-operation among states?

3. In what areas might it be necessary or desirable to develop additional international legal instruments to deal with complexities or to fill gaps in the existing legal system; what might be the means of doing so; and what possible implications might this have for other international norms in the field of non-proliferation, arms control, and disarmament (NACD)?

The first issue is examined in the paper's second and third sections in relation to two sets of jurisdictional zones under the Law of the Sea: the territorial sea and beyond, and the internal waters of a coastal state. The second and third issues are dealt with in the last section of the paper. The overall problem is approached in terms of three basic tasks and four basic cases.

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2004. Research Report for the International Security Research and Outreach Program, Compliance and Verification Working Group, Department of Foreign Affairs. Available online from <http://www. dfait-maeci.gc.ca/arms/isrop/research/keeley_2004/psi_wmd_keeley.pdf>.

The tasks are:

1. obtaining accurate supply chain knowledge: that is, knowing who is shipping what to whom, and where, and where those goods might be at any given time;

2. ensuring supply chain integrity: that is, making sure that the appropriate goods are moved to the appropriate destination and end-user via the appropriate route;

3. being able to interrupt the supply chain as required.

The cases are:

1. cargo of concern being moved overtly;

2. "Trojan Horse" cargo, in which some deception is being employed regarding the nature of the cargo, the intended route, the intended end use, and/or the intended end-user. The exporting firm, exporting state, and/or carrier, etc., may or may not be party to this deception;

3. cargo tampering – diversion: that is, when an otherwise overt and legitimate cargo is diverted at some point along the supply chain. This may or may not involve the shipper, the receiver, forwarding agents, etc.;

4. cargo tampering – smuggling: that is, an otherwise overt and legitimate cargo is illicitly opened in order to insert an item for covert delivery to a party further along the supply chain or a weapon/device is inserted for detonation/release further along the supply chain.

In the territorial sea and beyond, the rights of flag states over their own vessels are not particularly problematic. They may exercise jurisdiction over these vessels (in some cases concurrently with other states). They may board these vessels and consent to their boarding by others. Where the PSI Principles also call on states not to permit their nationals to assist in the transport of WMD-related cargoes, this is also not problematic: states have jurisdiction over the activities of their nationals, even abroad, and also over the activities of aliens within their territory. This can extend state law to cover owners of non-flag vessels' activities, for example. The rights of non-coastal states against foreign vessels are much more limited. The legal power of non-flag warships to stop and board other vessels is quite limited in favour of the general principle of exclusive flag state jurisdiction on the high seas. Exceptions exist in time of war, under United Nations mandate, and for certain offences, but not merely on suspicion of carrying a WMD-related cargo.

Fish resources conservation conventions may give rights to states parties to board the vessels of non-parties in case of non-compliance, but no similar provisions are found in the three major WMD non-proliferation conventions (the Non-Proliferation Treaty [NPT], the Chemical Weapons Convention [CWC], and the Biological Weapons Convention [BWC]), or in the various nuclear-weapon-free zone treaties. Coastal states may have rights with respect to violations of rules within specific zones of their territorial seas, but these are limited in the Law of the Sea by the principle of innocent passage and by the rules governing transit rights in international straits. The Law of the Sea does contain provisions governing nuclear-powered vessels and vessels carrying nuclear and other inherently dangerous and noxious substances, but these provisions do not include a general right to interdict. Some leverage over such vessels could possibly be gained through the Basel Convention on the Transboundary Movement of Hazardous Wastes or perhaps by implementing other rules governing dangerous cargoes, if the items of concern here overlapped with lists of WMD-related items. The Basel Convention creates a system of prior notifications and permissions for exporting, importing, and transit states.

In the internal waters of states, the international legal situation is far more favourable to interdiction, since foreign merchant vessels entering a port subject themselves to the laws of that state (the flag state may have concurrent jurisdiction). Port states may deny permission to enter and may also place conditions upon entry. The Americans have made extensive use of this in their Container Security Initiative, among other things, by requiring containers to be screened at foreign ports before entering the United States. A generalization of this system combined with the development of broader export-import and transit regulations, could give a port state (whether the state be transit or transshipment, exporting or importing) extensive information about cargoes and extensive powers to inspect and interdict. These sorts of powers could be linked to broader efforts in international maritime trade to strengthen the management of the supply chain, especially for containerized traffic at sea, and to increase knowledge of actors, cargoes, and activities throughout that supply chain.

With respect to improved coordination in the use of existing legal instruments, a primary example would be the development of coordinated consent provisions for foreign boarding, of the sort that the United States recently signed with Liberia. Such agreements, if generalized beyond the purely bilateral, could go far in addressing the inherent fragmentation of jurisdiction on the high seas created by the basic rule of exclusive flag state jurisdiction.

With respect to more general legal instruments to cut through this fragmentation, at least with respect to shipments of WMD-related items, there are several possible avenues of approach – for example, creating new conventions, amending existing conventions, passing United Nations Security Council resolutions, and seeking authorization from the relevant regional international organizations. All present problems, however. Both new and amended conventions would have to be negotiated, creating opportunities for bargaining and linkages to non-proliferation, arms control, and disarmament obligations. The problem also arises that the existing major conventions (NPT, CWC, and BWC) all permit legitimate trade in possible WMD-related items. In addition, with respect to amending treaties, a party to the original treaty which did not consent to the amendment would not be automatically bound by it. Existing WMD non-proliferation treaties, while possessing or at least implying obligations on individual states to control the trade, do not explicitly authorize interdiction to block it. The Security Council route, if taken through a general resolution, would substantially alter an ancient and basic principle of the Law of the Sea regarding flag state jurisdiction, through the action of a small group of states. This would be politically (and possibly legally) very problematic. A more specifically targeted resolution – dealing with one state, for example – might be much more acceptable, but it would still need to be negotiated. Even if regional international organizations might have the power to authorize interdictions under certain circumstances, an appropriate and tractable organization might not always be available.

On the other hand, legal authorities – and technical systems – based on port state rights and on trade management schemes seem to present far greater and less problematic possibilities. They may be presented as based on existing, already powerful, legal rights of port states, and as defending trade security. One might potentially look for the development of a "controlled trade" approach, with any cargoes not permitted under such an approch being illegal and subject to interception within a more developed system of cargo tracking and inspection.

Finally, the role of national legislation cannot be ignored. This would cover not only the activities of state nationals, but also the activities of port states.

Existing and potential legal authorities for interdiction present both problems and possibilities for other norms and obligations in existing non-proliferation agreements. An interdiction scheme, it must be emphasized, cannot effectively replace monitoring or pre-existing verification and safeguard mechanisms in the NPT, CWC, and BWC,

since it could not cover existing or indigenously developed capabilities within states. Focusing purely on trade, such a scheme might also create problems with respect to obligations in the three conventions regarding peaceful use, trade, and development. Furthermore, efforts either to amend these conventions directly or to seek broad legal authorities for interdiction elsewhere would readily invite linkages to other obligations with respect to these conventions. An approach by way of trade management, port state rights, and "controlled trade," however, might strengthen mechanisms to deal with both legitimate and covert trade.

I. INTRODUCTION

The American-led Proliferation Security Initiative (PSI) [1] attempts to block the international movement of goods related to weapons of mass destruction (WMD). Two sorts of potential producers or possessors of WMD are of concern: states and non-state actors. Questions have been raised, however, about the legal basis in international maritime law for the interception of such shipments. The United States has repeatedly stated that existing international and national laws provide authority for this, and that efforts might be made to develop further legal authorities. [2] Using the PSI's "Statement of Interdiction Principles" [3] as its starting point, this paper addresses three broad issues:

1. What are the possibilities and difficulties under existing international maritime law and relevant national legislation for the interdiction of WMD-related shipments? [4]

2. What are the possibilities for strengthening the applicability of existing international and national laws, for example, through improved co-operation among states?

3. In what areas might it be necessary or desirable to develop additional international legal instruments to deal with complexities or to fill gaps in the existing legal system; What might be the means of doing so; and What would be some implications of this for other international norms in the field of non-proliferation, arms control, and disarmament (NACD)?

The basic body of relevant international law is the Law of the Sea. This paper uses the United Nations Third Convention on the Law of the Sea (UNCLOS III) as its primary source, as many of its relevant provisions, with some variation in detail, are based on customary international law and so would be binding even on states not party to the convention. Other international conventions bearing on the movement of goods by sea will also be drawn upon, owing to their applicability or because they may be of interest.

The Law of the Sea performs the basic function of assigning jurisdictions in maritime areas, primarily to flag states (states in which a vessel is registered) and coastal states. This assignment provides guidance as to where, with respect to what, and under what conditions a state may regulate and enforce its regulations, and with respect to whom. This assignment of competencies may also be combined with other, broader jurisdictional bases, notably state jurisdiction based on actions performed within its territory (whether or not by its nationals), jurisdiction based on nationality, and universal jurisdiction, under which any state might be able to apprehend an offender in certain circumstances.

The first issue is examined in the second and third sections of this paper in relation to two sets of jurisdictional zones under the Law of the Sea: the territorial sea and beyond, and the internal waters of a coastal state. The second and third issues are addressed in the paper's fourth section. The overall problem to be dealt with is approached in terms of three basic tasks and four basic cases, all arising within the overall concept of an international maritime trade supply chain connecting the point of origin of a good with its ultimate destination, and possibly passing through one or more transit or transshipment ports.

The tasks are:

1. obtaining accurate supply chain knowledge: that is, knowing who is shipping what to whom, and where, and where those goods might be at any given time;

2. ensuring supply chain integrity: that is, making sure that the appropriate goods are moved to the appropriate destination and end-user, via the appropriate route;

3. being able to interrupt the supply chain as required;.

4. the four basic cases cover the threat of acquisition of WMD-related goods by a state or by a non-state actor, with the additional concern that the latter in particular might use cargoes and ships as weapons and delivery systems.

The cases are:

1. cargo of concern being moved overtly;

2. "Trojan Horse" cargo, in which some deception is employed regarding the nature of the cargo, the intended route, the intended end use, and/or the intended end-user. The exporting firm, exporting state, and/or carrier, etc., may or may not be party to this deception;[6]

3. cargo tampering – diversion: that is, when an otherwise overt and legitimate cargo is diverted at some point along the supply chain. This may or may not involve the help of the shipper, the receiver, forwarding agents, etc.;

4. cargo tampering – smuggling: that is, an otherwise overt and legitimate cargo is illicitly opened in order to insert an item for covert delivery to a party further along the supply chain, or a weapon/device is inserted for detonation/release further along the supply chain.

A final consideration should also be noted. Although schemes to interdict trade in WMD-related items may slow proliferation, they will not have a direct effect on the development of indigenous WMD capabilities.

II. INTERDICTION IN THE TERRITORIAL SEA AND BEYOND

Two fundamental rules of the Law of the Sea are freedom of navigation – any state's vessels may sail the high seas – and the exclusive jurisdiction of the flag state (the state of registry) on the high seas. Even within other maritime zones outside of a state's internal waters, the Law of the Sea is strongly concerned with promoting and protecting the right of navigation free from non-flag state interference. For our purposes, therefore, three types of cases arise in the territorial sea and beyond:[7]

1. the rights of a state over its own vessels (and also over its nationals even beyond its territory and the acts of all persons within its territory);

2. the rights of warships of one state to stop, board, search, or even seize foreign-flag vessels on the high seas or beyond the territorial sea;

3. the rights of coastal states to stop, board, search, or even seize foreign-flagged vessels within their coastal maritime zones.

The first case is relatively unproblematic. The second presents fundamental difficulties save under very specific circumstances. The third presents both some possibilities and some limitations.

STATES AND THEIR OWN VESSELS

The PSI interdiction principles call on states not to assist in the transport of WMD-related cargoes or permit their nationals to do so, and to board and search their own vessels, including at the request of

another state, in their waters or on the high seas beyond the territorial sea of another state.

States have jurisdiction over vessels registered with them. Even where another state may have a specific jurisdiction under a particular maritime zone (or even internal waters), the flag state will potentially have concurrent jurisdiction. A flag state may thus stop, board, search, and seize its own vessel, whether it be on the high seas or outside the internal waters and territorial sea of another state.

States also have the ability to regulate the activities of their own nationals wherever they may be, and to regulate the activities of aliens within their territories. Thus, even in the case of a vessel formally registered to another state, a state might be able to prosecute its own nationals if, for example, they were the owners or otherwise involved in suspect activities. Similarly, aliens within their jurisdiction could also be prosecuted. Such controls could, of course, extend beyond ship-owners, for example, and include involvement through other activities, such as brokering. The question here is whether states have criminalized the relevant activities under consideration when perpetrated by anyone within their territory or by their nationals even beyond their territory. While states parties to various NACD conventions typically bind themselves not to acquire the relevant weapons, or not to engage in such trade, it is the state's export control apparatus and its relevant national legislation – if any – that are responsible for preventing private parties from knowingly or unknowingly abetting WMD proliferation. An NACD convention might also require states to criminalize relevant activities by private persons (whether nationals or others in their territory).[8] This requirement, however, often seems unfulfilled.[9] France has recently suggested that pathogens under the Biological Weapons Convention might be controlled through the same legislation as narcotics (international narcotics conventions permit a control trade).[10] The United States is proposing a United Nations Security Council resolution calling, among other things, for states to criminalize proliferation activities by their nationals, but the resolution reportedly does not call for making such activities an international offence.[11]

RIGHTS OF NON-COASTAL STATES AGAINST FOREIGN VESSELS

The PSI interdiction principles call upon states to consider consenting to allowing others to board and search their vessels. A state may agree to allow another state to board its vessels, whether on a case-by-case basis, by advance agreement, or under a broader international convention. The United States, for example, has agreements with other

states that may permit it to stop their vessels in order to combat the narcotics trade and illegal immigration. In its campaign against the slave trade in the nineteenth century, Britain reached agreements with various states granting mutual rights of search. The United States has recently reached a PSI-related boarding agreement with Liberia, [12] while the British Foreign Secretary has noted that such agreements with the ten most important flag states would cover about 70 per cent of maritime trade. [13] In UNCLOS III, for the purposes of fighting the narcotics traffic and under the narcotics conventions, flag states are supposed to co-operate with others to suppress this traffic. This may include granting permission to board when it is requested. Who precisely must grant permission – the master of the vessel or the state of registry, etc. – may vary in national legislation.

The PSI principles do not call for the interdiction on the high seas of foreign-flagged vessels without the consent of the state of registry. This constitutes a very significant gap in the ability to interdict along the supply chain. However, under certain circumstances, a warship of one state may be able to intercept a vessel flagged to another state. In time of war, belligerents may attack each others' merchant vessels anywhere outside of the internal and territorial waters of neutral states, and also neutral shipping under some circumstances. [14] Interdictions may also be conducted under a Security Council mandate. Some Security Council anti-terrorism resolutions may give rights of interdiction, as may arms embargoes and the like.

Other than in these circumstances, the Law of the Sea does permit a warship of one state to stop and board a foreign vessel in certain cases (the "right of visit"): if it suspects the other vessel is engaged in piracy, the slave trade, unauthorized broadcasting, is really of the same nationality though showing a different flag, or is of no nationality. If the other vessel is suspected of narcotics trafficking, its flag state may request the co-operation of others to suppress the traffic. No international rule, however, seems to permit the stopping, etc., of foreign vessels on grounds of suspicion of participation in the WMD-related trade. Claims of self-defence would likely be very limited in applicability, while arguments based on the January 1992 Security Council Presidential Statement would be mistaken. [15] Nothing would stop a flag state, however, from consenting to boarding by another.

Under rules governing arrangements to implement conservation measures for certain fish stocks, it is also possible for states not party to such an arrangement to have their vessels boarded by states parties in cases of possible non-compliance. [16] No such provisions, however,

are found in or derived from the Non-Proliferation Treaty, the Chemical Weapons Convention, or the Biological Weapons Convention. Nor are analogous provisions found in the various nuclear-weapon-free zones conventions.[17] The parties to these latter agreements do not claim a right to block transit in maritime areas by nuclear-armed vessels, much less by commercial vessels carrying nuclear-related cargoes. Instead, while the states parties are free to refuse entry into their ports and other internal waters to such vessels, passage is otherwise governed by the more general Law of the Sea.

RIGHTS OF COASTAL STATES

The PSI's interdiction principles call on states to stop and search vessels in their territorial seas and contiguous zones. Under certain circumstances, a coastal state may arrest a foreign-flagged vessel. If that vessel is breaking certain rules under UNCLOS III in respect to a particular zone, the coastal state may be able to arrest it and even pursue it into the high seas (though not into another state's territorial sea) and arrest it there – the "right of hot pursuit" (Article 111). For example, a coastal state would be able to arrest foreign vessels engaged in smuggling within its contiguous zone or territorial sea and to engage in appropriate hot pursuit if necessary. Similar possibilities would exist for the exclusive economic zone for relevant rules there.

Coastal states have sovereignty over their territorial seas and can take various measures to regulate navigation, but the right of innocent passage limits their jurisdiction over foreign vessels – including warships – within their territorial seas, especially if such a vessel does not call at a port in the coastal state. This right can only be temporarily suspended, and only on a non-discriminatory basis, in the territorial sea. It cannot be suspended in international straits. Although passage, to be considered innocent, should "not prejudice ... the peace, good order or security of the coastal State,"[18] the activities which would be considered prejudicial are apparently exhaustively defined in Article 19.2; the nature of the cargo is itself not sufficient. If innocent passage covers foreign warships potentially armed with WMD, why should it not also permit commercial vessels carrying merely WMD-related goods? Indeed, the interpretation placed on this article by the United States and the Soviet Union supports such a reading.[19]

Article 23 of UNCLOS III does require that "foreign nuclear-powered vessels and vessels carrying nuclear or other inherently dangerous or noxious substances" should carry appropriate documents and observe special precautions. This might have a bearing

on ships with undocumented cargoes or ships that are behaving dangerously if there is some overlap between such cargoes and WMD-related goods, but not on vessels that are observing the required rules and/or those with their paperwork in good order. [20] The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, [21] however, requires a system of notifications by exporting states to both transit and importing states, and these may deny permission for the movement. The 1996 Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movement of Hazardous Wastes and their Disposal prohibited transit through territorial seas. British and Japanese vessels carrying radioactive cargoes have tended to try to avoid territorial seas and exclusive economic zones of littoral states, but it is not clear that this has been done out of a sense of legal obligation rather than political expediency. The whole issue of prior notification, prior authorization, and denial of permission under the Basel Convention seems difficult to square with the provisions of UNCLOS III, save perhaps as a very specific exception. [22] Some combination of UNCLOS III (Article 23), the Basel Convention, and International Maritime Organization rules governing dangerous cargoes and nuclear ships could provide some leverage for coastal states, providing there is significant overlap in the items covered with current or amended WMD-related export control lists.

SUMMARY

The fundamental principles of the Law of the Sea clearly favour ocean commerce and the rights of flag states over other concerns, as evidenced by the limited and exceptional cases in which warships may board foreign-flagged vessels on the high seas and the effect of the right of innocent passage in a territorial sea. Although there are actual and debatable exceptions in both areas which could be of interest for the interdiction of WMD-related shipments, it is apparent that the PSI would depend on flag states policing their own vessels or co-operating with PSI participants. Nothing, however, forbids a state from taking action using its own legislation against its own nationals, even abroad, or against aliens within its territory, for assisting in the proliferation of WMD and ballistic missiles.

Interdiction in the territorial sea and beyond could potentially cover all four of the identified cases of concern. The greatest limit would be precisely obtaining permission to board a foreign-flagged vessel – the fundamental requirement under current international law. While this might be available from various states – whether those

"officially" part of the PSI or those merely indicating general support for it – the hardest case would be that of a foreign-flagged vessel for which permission to board was denied. This could cover any of the four cases, but especially could be a problem for the cargo carried overtly by a foreign-flag vessel which was not even indirectly subject to pressure – such as the case of a ship-owner of a different nationality than the ship's state of registry.[24]

One limitation of a focus on interdiction in the territorial sea or beyond, however, is precisely that it leaves aside the two other tasks noted in the introduction: obtaining appropriate supply chain knowledge and ensuring supply chain integrity. At the same time, an effective interdiction strategy – wherever pursued – requires the successful performance of these two other tasks.

III. INTERDICTION IN PORT STATES

The PSI Interdiction Principles call on port states to stop and search suspect vessels in their internal waters and to enforce appropriate conditions on suspect vessels entering or leaving their internal waters. It also calls on port states to prevent their facilities from being used as transshipment points for WMD-related cargoes.

The rights of states over their internal waters, including their ports, are very substantial in international law. With relatively minor exceptions, there is no right of innocent passage in internal waters. Moreover, a port state is free in most cases to deny entry to any vessel if it so chooses. While foreign warships are, of course, immune to assertion of local jurisdiction, foreign commercial vessels clearly come under local jurisdiction once they enter a coastal state's internal waters; at best, the flag state might have concurrent jurisdiction. Malanczuk thus concludes that "broadly speaking, the coastal state may apply and enforce its laws in full against foreign merchant ships in its internal waters."[25]

On this basis, port states may create a variety of requirements and regulations to govern trade entering and leaving their ports. While this might be seen to threaten trade, the strong role of a relatively small number of very important port states helps to simplify this problem, assuming these states can agree amongst themselves. In addition, and as a stimulus to co-operation, states are increasingly aware not only of terrorism as a threat to trade (if for example, shipping is attacked or ports are attacked), but also that there may be a threat from trade, if merchant vessels were to become delivery systems for a terrorist attack.[26] The desire to avoid disruptions to trade as a result of terrorist

attacks on or using trade seems to be providing a considerable and positive incentive for preventive measures which could possibly be adapted to the larger question of the interdiction of WMD-related items. Efforts are underway to develop systems to track containers from source to destination.[27]

In this section, the American Container Security Initiative[28] will be briefly noted as a simple, initial indicator of the possibilities of this approach. Second, we shall turn to possibilities in port state and import/export control regulations, and finally to international legal and other efforts to develop a multilateralized system of supply chain management which could be adaptable to the blocking of WMD-related trade.

THE CONTAINER SECURITY INITIATIVE (CSI)

This initiative was developed to counter the threat of a terrorist attack on the United States using containerized cargoes. High-risk containers are to be identified and pre-screened by local authorities in co-operation with United States Customs and Border Protection Agency officials at their last port of departure before entering the United States. Cargo moving through CSI ports will be expedited through customs upon entering the United States. The program is also attempting to develop "smart" and tamper-proof containers. A number of ports were identified as high-volume and as significant in terms of containerized cargoes shipped to the United States. So far, twenty-eight ports are either involved in the program or could be involved in the future.[29]

A basic limitation of the program is that, although it is reciprocal (that is, importers from the United States may create a similar system for American ports, as Canada has), it is also bilateral. Thus, it does not constitute, formally at least, more than an American-centred network. However, as a broad system, it is generalizable to any port and to all containerized trade between any involved ports. It thus constitutes, in a sense, an initial step towards a potentially global system. Methods of ensuring the security of containerized cargoes throughout the supply chain (of direct relevance to cases three and four) are currently a matter of interest to the International Maritime Organization, and to customs officers worldwide.[30]

PORT STATE REGULATIONS

Port states may apply a variety of requirements to vessels wishing to enter, as well as to cargoes entering and leaving, their ports. So, for example, the United States and others now require vessels to give

increased advance notice of their intention to arrive in a port, and may also require more detailed advance supply of information about the vessel and its crew, passengers, and cargo. The United States and others are in fact trying to develop "partnerships" with various private actors involved in the movement of cargoes, such that those who meet certain standards might receive expedited treatment. In the United States, this is the C-TPAT (Customs-Trade Partnership Against Terrorism) program.[31] The British suggestion to deny port rights to carriers found to be transporting WMD-related items would also be within the rights of a coastal state.

A comprehensive system of export/import regulations – as distinct from the licensing system of export controls – may also be developed and applied to regulate the movement of traffic through a port. Australian Customs now requires that all in-transit cargo be reported, as well as cargo discharged at Australian ports. All cargoes are to be assessed. As well, it is now authorized to seize an in-transit cargo if there are grounds to suspect that it is "connected with the carrying out of a terrorist act or the presence of the cargo presents a threat to Australia's defence or security, or international peace or security."[32]

Singapore's Chemical Weapons (Prohibition) Act criminalizes activities by any person involving the use, production, stockpiling, or transfer of chemical weapons, while its Strategic Goods (Control) Act covers the transshipment and transit of goods used for nuclear, biological, or chemical weapons, and of missiles capable of delivering them.[33] Hong Kong also presents an interesting case. Its non-proliferation export control system has been termed "one of the finest ... in the world." Even goods imported only to be exported again require both an import and an export license. Carriers must obtain both valid import licenses from an importer and a copy of the export license from the exporter before accepting goods for export, and must return copies to the government for checking. Moreover, a service provider may be liable under the relevant regulations regardless of where – even outside of Hong Kong – the development of WMD might occur.[34] Canada's revised export control system constitutes, it has been suggested, "perhaps the most comprehensive system of controlled goods registration in the world."[35] Recent actions to amend Canadian legislation will implement the BWC domestically, but also will cover transportation through Canada, as well as importation and exportation of various explosives to and from Canada,. Transfers of goods under the Export and Import Permits Act will also be covered.[36]

MULTILATERAL SUPPLY CHAIN MANAGEMENT

Various efforts are underway both formally and informally, bilaterally, multilaterally, and through international organizations, to strengthen management of portions or all of the maritime supply chain. The United States Department of Commerce, Bureau of Industry and Security, has developed various relevant programs of out-reach and co-operation with foreign counterparts.[37] Various meetings have been held to deal with the transshipment problem.[38] Japan has hosted various seminars[39] and has recently been reported to be about to sign an agreement with Singapore regarding transshipment.[40] The 1998 ASEAN Framework Agreement on the Facilitation of Goods in Transit provides, under Article 20, that "dangerous goods," as specified in a protocol, shall not be permitted transit transportation without a special permit of the transit state.[41] Further information about the contents of that protocol (number 9) would be desirable.

The World Customs Organization has also taken a strong interest in the problem of supply chain security and management,[42] paying particular attention to the development of models and procedures for the global management of trade. The combination of a system for trade modelling, tracking, and information-sharing, the harmonization of customs processes, a consolidated list of WMD-related items of interest (based, probably, on existing export control regime lists and the like), and legal authorities – whether PSI-related or on the basis of national legislation – to inspect and seize cargoes and vessels would go a very long way towards addressing all three tasks and all four cases noted in the introduction of this paper.

SUMMARY

As compared to the interdiction problem in the territorial sea of a coastal state and beyond, the possibilities for interdiction – and for other and broader-scope control efforts – are much greater within the internal waters of states. States' legal authority within their internal waters is much stronger, though the requisite national legislation to assert it may need to be developed. Substantial efforts are underway both unilaterally and multilaterally to develop mechanisms to track and to obtain information about cargoes and to develop methods of inspection. As long as a merchant vessel carrying WMD-related cargo calls at a port state in transit, or touches in at a port in the destination state of the cargo if it is smuggling, interdiction is possible. The primary difficulties here would seem to be less legal (but for the

problem of adequate national authority) than the will to develop adequate national legal authorities and the technical problems of acquiring and using the necessary information – control lists and cargo-tracking and licensing systems.

IV. CO-ORDINATION IN THE USE OF EXISTING LEGAL INSTRUMENTS AND THE DEVELOPMENT OF ADDITIONAL LEGAL INSTRUMENTS

The existing Law of the Sea as applied in the territorial sea and beyond creates considerable problems for schemes such as the PSI precisely because the strong emphasis given to the jurisdiction of the flag state creates fragmented and limited jurisdictions for any other states. In particular, a potentially huge gap in the ability to interdict exists in the case of foreign-flagged vessels on the high seas. Two broad classes of approaches to management and simplification seem to have arisen. First, coordinated consent schemes among flag states through boarding agreements might overcome the fragmentation. Secondly, simplifying devices might be sought to cut through the mass of fragmented authority and override the strong jurisdictional position of flag states on both the high and the territorial seas. The examination of the situation with respect to internal waters and ports, however, demonstrates a third approach: control could be based on movements and points with a network or chain of supply. Finally, of course, national legislation could be developed, whether required by international conventions or not, as a necessary or useful supplement to the international legal instruments.[43]

COORDINATED CONSENT

Coordinated consent schemes offer a relatively straightforward response to the fragmentation of jurisdiction. However, actually coordinating such agreements in a timely manner, whether in advance or on a case-by-case basis, could be challenging. While the possibility of reaching bilateral agreements is obvious, this would again create coordination problems. If a single agreement or a model agreement could be reached (and if approached bilaterally, this could include rights extendable to other states likely to be active in interdiction – a sort of "most-favoured-nation" approach) and then agreements struck with states of registry, this would be one way to handle the problem. Given the concentration in the distribution of flags (roughly 70 per cent with ten states of registry), only a few such agreements would be needed to have considerable effect. However, the problem of the remaining 30 per cent of shipping – or that which was not covered by

PSI states – would continue. Inevitably, some states would refuse, and these hardest cases would have to be dealt with some other way.

Available public reports suggest that PSI members are presently still examining their various legal authorities. These reports also suggest that no boarding agreement has as yet been reached among PSI states.[44] No public information discovered in the course of this research indicated either the precise nature of the boarding agreements being sought, or the nature of any difficulties in reaching it. One might anticipate, however, some variation among states in their interpretation of their legal rights (and thus in what rights they are willing to concede to others), as well as some possible variance in their national legislation and regulations (and similar difficulties, perhaps, with each other's legislation) which might prove difficult.

"MAGIC BULLETS"

An apparently attractive mechanism to overcome especially the consent problem (other than by negotiating consent agreements) is to prohibit the WMD-related trade at the international level in a way that could authorize even boarding without flag-state permission – along the lines of rules dealing with piracy or the slave trade. Various possibilities could exist here, in either the creation of new international conventions or the amendment of existing conventions. Other possibilities suggested include obtaining a United Nations Security Council (UNSC) resolution, or claiming legal authority on the basis of prior Security Council statements or on the basis of endorsement by an appropriate regional organization. One final possible argument would be to claim a self-defence exception under Article 51 of the United Nations Charter. Some of these have merit, but all present difficulties, and some seem to be unlikely as legal authorities in most applicable circumstances.

One potential route would be either to create a new treaty outlawing the trade in WMD-related items and permitting boarding, etc., on the high seas – perhaps under universal jurisdiction – and in territorial seas by the coastal state. The precise specification of such a treaty could be fairly complex: exactly what items would be covered? How would such a list be updated? Would some trade be regarded as legitimate? What information would be regarded as justification for a boarding? Who would actually carry out the boarding? and so on. In addition, one could anticipate such a treaty, aside from being difficult to negotiate both in its own right and in relation to the Law of the Sea, potentially becoming linked very readily to quids pro quo in the disarmament and other fields. Progress here could readily be held

hostage to progress in other areas (for example, Article VI of the Non-Proliferation Treaty), whether these areas were in the broad NACD field or not.

Amending an existing treaty could present similar difficulties. An effort is currently underway to add a number of new offenses to the Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation (SUA). These primarily focus on activities on board or threatening to a vessel, but two of them focus on the use of vessels to transport substances to be used for weapons of mass destruction. Such amendments would eventually be raised at a future diplomatic conference. [45] While an amendment strategy could avoid some of the difficulties of starting from the first step, two disadvantages are also apparent. First, such conventions have amending formulas: in the case of SUA, an amending conference may be requested by ten states parties or one-third of the membership, whichever is the higher number, and presumably would have to be accepted by a majority. Second, a party which does not consent to the amendment would not be bound by it. [46]

A similar idea would be to amend the relevant NACD treaties – the Non-Proliferation Treaty (NPT), the Biological Weapons Convention (BWC), and the Chemical Weapons Convention (CWC) – to try to provide specific authority for interdiction. No treaty covers the case of ballistic missiles, only a multilateral export control regime. None of these provide strong support for an interpretation that they authorize interdiction (as opposed to the exercise of export controls) in support of their objectives. Such an interdiction possibility may be desirable, of course, but that does not mean that the provisions of these treaties may be understood to include it already.

The NPT has provisions requiring safeguards (Article III) and upholding "the inalienable right" to use nuclear energy for peaceful purposes (Article IV). Although non-nuclear weapons states agree not to receive, acquire, or produce nuclear explosives, and nuclear weapons states agree not to transfer nuclear weapons to others (Articles I and II), there are no other provisions that particularly bear on trade or that support interdiction. The Zangger Committee, which operates in terms of Article III, covers safeguarding requirements. The Nuclear Suppliers Group (NSG), which has in the past been a vehicle to deny the supply of certain technologies, is a multilateral export control regime; it claims no right of interdiction beyond those possibilities found in national export control legislation.

The BWC includes an undertaking not to transfer to and not to assist others (Article III); however, under Article X it also states a right of peaceful uses and calls for exchanges and for the implementation of the convention in a way that does not hamper the economic or technological development of states parties. While parties are to adopt the national legislation necessary to implement the convention, there is no provision for interdiction other than through national means. The Australia Group, like the NSG, may try to control exports, but with similar limitations.

The CWC again prohibits the direct or indirect transfer of chemical weapons (Article I). It permits states to acquire toxic chemicals for non-prohibited purposes, and like the BWC, ensures that the economic and technological development of states should not be hampered (Articles VI, XI). It is more explicit in its requirements for national legislation (Article VII). It does have verification provisions covering permitted transfers to non-party states (Annex on Implementation and Verification, Part VII.C and Part VIII.C). Again, however, nothing specifically permits interdiction of the sort contemplated under the PSI.

Both the possibilities and the problems of amendment would exist for all of these conventions. Again, one could expect bargaining for quids pro quo, which could complicate both an effort to gain explicit interdiction authority and progress on other issues regarding these conventions. Additionally, there would be strains in reconciling the attempt to insert provisions permitting interdiction with existing requirements supporting peaceful trade and use.

The UNSC route could be superficially attractive on the basis that such resolutions under chapter 7 of the Charter are binding on United Nations member states, and the Charter overrides other international treaties in this regard.[47] Seeking a blanket resolution of this sort, however, poses some substantial political difficulties. The rules that would be overridden – the exclusive jurisdiction of the flag state on the high seas and the concept of innocent passage – are so central to the Law of the Sea and so long-standing that one inevitable outcome even of the attempt (much less a successful attempt) would be to raise the question of the status of the UNSC – a body of fifteen states – as a creator of international law. Political protest, and perhaps even an attempt to bring the issue to the International Court of Justice, could follow. If such a resolution was sought on a case-by-case basis, this difficulty might be avoided. However, each such resolution would need to be negotiated in the Council, with attendant bargaining and

loss of time. Issues such as the duration of such a resolution, and the circumstances under which it might be lifted, of who would do the intercepting and on what basis, etc., would likely have to be addressed. While examples exist of such resolutions, even such a relatively limited authority might be difficult to obtain in a timely and workable way. It is interesting that available public reports about the draft United States resolution before the UNSC suggest that it wishes states to criminalize WMD-related activities in their national legislation, but not that it would do so at the international level. [48]

Authorization by a regional organization is yet another route. Possibly this has the Cuban Missile Crisis in mind, in which a resolution approving the "quarantine" of Cuba was adopted by the Organization of American States and was argued to fall under chapter 8 of the United Nations Charter. [49] Leaving aside the question of whether such an argument is valid, an appropriate and tractable regional organization might not always be available. Similarly, adopting an approach such as in the fish stocks convention would require an appropriate organization. While the various nuclear-weapon-free zone treaties could be a nucleus for this in the case of nuclear weapons and a source for zones aimed at other weapons (or more general WMD-free zones), their reluctance to assert such rights now in addition to the difficulties which nuclear-weapon states would have in accepting these rights as applied to their own warships should give us pause. As is the case for the territorial sea, if the passage by a WMD-armed vessel is deemed acceptable in law, on what basis could the passage of a merchant vessel carrying WMD-related items be intercepted?

Another possible UNSC reference has been suggested as a basis for interdiction – the January 1992 Presidential Statement – but this seems a weak reed. A mere presidential statement, particularly one couched in very general terms, could not provide legal authority for the claim of the right in question, given above all the ancient and fundamental rights to the contrary in the Law of the Sea.

Self-defence under the United Nations Charter is similarly unlikely – at least in most probable circumstances. If the presence of a foreign NBC-armed warship in one's territorial sea without prior notice or authorization is not necessarily a threat to one's security or a violation of innocent passage, it is hard to see how a shipment of WMD-related items on a merchant vessel, possibly far from one's shores and possibly to a destination far from one's territory, could meet the requirements of a self-defence claim. The case of a terrorist shipment destined for one's port would be more likely, however.

NETWORK-BASED CONTROL

All three of the WMD conventions are also committed to allowing trade in many items, some dual-use. This would have to be carried over, perhaps into a scheme for the development of a controlled trade. With respect to that possibility, both the Basel Convention on Hazardous Wastes – with its debated relationship to innocent passage – and the narcotics control conventions could conceivably serve as models.

Under the Basel Convention, exporting states are to inform in advance both the destination state and any transit state concerned of the movements of hazardous wastes; these, in turn, may either consent or deny permission, or seek additional information. The trade in a consolidated list of special-purpose and dual-use items drawn from existing WMD-related lists could possibly be subjected to a similar regime of notifications and permissions, with the added proviso that vessels could be inspected to assure compliance, and that any items not duly notified in advance and receiving permission would be deemed ipso facto illegal transfers and subject to seizure.

In the case of the various narcotics and related conventions, there are provisions for trading under license, including through transshipment or transit states.[50] The 1988 United Nations Convention against Illicit Traffic in Narcotic Drugs and Psychotropic Substances outlines detailed steps available to states to combat that traffic, including criminalization of involvement through "brokering, dispatch, dispatch in transit, transport" (Article 3) by actors under their jurisdiction, including commercial carriers (Articles 4, 15). It provides for assistance to transit states (Article 10) and application to free trade zones and free ports (Article 18). It permits a controlled trade, building on the earlier conventions (Article 16). Article 17 explicitly covers interdiction at sea, but only with the permission of the flag state of the suspect vessel.

For both of these possibilities, however, the actual effectiveness of their measures would need to be considered. In the case of narcotics, for example, one might keep in mind the caustic observation that "it is sometimes said that the easiest way to bring nuclear material into the United States would be to hide it in a bale of marijuana."[51]

Other possibilities could exist based on efforts to regulate the trade in toxic chemicals. These have included the development of consolidated lists, adoption of guidelines by UNEP, regulation by the European Union, and other efforts. Such a system might be adaptable not only to the requirements of the CWC but also to the other WMD conventions.[52]

Efforts under the International Maritime Organization to increase security both on ships and at ports (the International Ship and Port Facility Security Code) may also be relevant, not only with respect to port authorities' powers with respect to ships but also as bearing on efforts to deal with smuggling possibilities by crew or shore-based personnel.

Using the supply chain concept and seeing trade as an activity involving the movement of goods through a network connecting various points (including port of origin, transit or transshipment state, and port of destination), a network approach seeks to manage the entire network. It therefore addresses all three identified tasks and can supplement interception in ports with interception at sea under one or the other of the first two approaches. The coordination problem is still considerable, but systematic efforts to resolve it are underway, as noted in the previous section of this paper.

An approach to control based on port states' rights under international law and the Law of the Sea thus seems prima facie to present certain great advantages over one which focuses above all on interdiction in the territorial sea and beyond:

1. Instead of potentially attacking the fundamental principle of flag state jurisdiction – while still leaving a very large gap on the high seas – it draws on well-established and powerful coastal state authority for potential assessment and interception of cargoes where that authority is well-established. It is thus better able to address the four cases noted in the introduction.

2. It presents itself as a facilitator of trade rather than as a basic challenge to the principle of exclusive flag state jurisdiction and engages state interest positively, not negatively. It may still, of course, be combined with interdiction at sea.

3. It directs attention to the network of trade in terms of the movement of vessels and cargoes between nodes in that network. It thus more fully addresses the three tasks noted in the introduction.

4. It draws upon existing as well as developing networks of co-operation among export control systems, international organizations, and customs officers and other local authorities.

While there are numerous challenges to be met in building on these strengths, the ultimate advantage is that they seem to be working with possibilities in both international and domestic law, rather than against existing law. In the words of one analyst,

> At the end of the day, there is an extraordinary opportunity for real overlap between the homeland-security imperative to transform conventional border-management practices and the goal of the nonproliferation community of preventing the spread of weapons of mass destruction.[53]

National Legislation

Appropriate national legislation, as noted above, may be required in some NACD treaties, at least as far as a state party's nationals (and aliens on its territory) may be required. This requirement, however, seems much honoured in the breach. It is therefore unlikely that merely adding yet another international requirement for such legislation would be particularly useful. It would seem far better to pursue the fulfillment, and possible improvement, of existing NACD obligations of this type. Multilateral export control regimes could also present an avenue for such efforts – or at least for "harmonizing" national export control regimes around something other than a lowest common denominator.

Aside from covering activities by nationals (and aliens on one's territory), desirable national legislation should also cover the transfer, directly or indirectly, of WMD-related materials without a license, and should also cover such activities as brokering and such actors in the supply chain as shippers or ship-owners which come under national jurisdiction. In some cases at least, ship-owners have apparently been approached by their national governments to divert suspect vessels to ports where their cargoes could be checked. For those companies which do not co-operate or which otherwise participate in the trade, the British Foreign Secretary's suggestion that shipping lines could be denied port privileges – a penalty that would be applicable to foreign vessels – could be useful, and is well within a port state's current international legal authority. The Hong Kong approach of involving shippers in the documentation chain – in effect, to enlist them in verifying the existence of appropriate export and import licenses – is also of interest. In any case, having some ability to acquire knowledge about and to control – even for the transit trade or transshipment – what cargoes are entering or leaving one's ports (for example, along the lines of Australia's regulations or Hong Kong's) would seem highly desirable. In this way, even if a shipment was legitimate in the law of the exporting state, it might prove difficult for a carrier to take it to its destination, either openly if it has to avoid touching at ports where the cargo would be open to seizure, or covertly if discrepancies in

documentation or other information could indicate grounds for legitimate search by port authorities.

One clear requirement of this, however, is a coherent and reasonably exhaustive list of items which would have to be reported and which would be either controlled or banned. Such a list – essentially a compendium across all the WMD fields, one which would need to include dual-use items and ballistic missile items – would have to be consistent across states as well. An additional requirement that would be highly desirable would be adequate end-use and end-user verification on the part of exporter states. This requirement does not seem to be a part of all the multilateral export control regimes. Even where required, whether by national controls or by a multilateral system, the state of this seems to be quite inadequate.[54] Bringing both national and multilateral regimes up to the mark in this respect could be a considerable undertaking.

A final and crucial requirement, of course, would be adequate mechanisms for the timely development and sharing of intelligence among states, and for providing it to those specific states (whether port states or because of their naval dispositions on the high seas) which would be best able to act upon it in accordance with international and national law.

IMPLICATIONS FOR EXISTING WMD NON-PROLIFERATION TREATIES

Plans to interdict WMD-related shipments in maritime trade cannot substitute for or replace the three major existing conventions – the NPT, CWC, or BWC. An interdiction scheme cannot deal with existing facilities or the indigenous development of capabilities; it also lacks the monitoring, verification, and safeguarding mechanisms generated under those treaties. Interdiction schemes can provide a useful supplement to, and development of, mechanisms intended to check WMD proliferation, however, in tandem with existing – or improved – multilateral and national export control mechanisms. In particular, they may help to build on obligations for national control legislation, assuming that such obligations are met. This can be done not simply by criminalizing activities in defiance of national obligations under these treaties but also by extending national and international control and co-operation more effectively into the actual supply chain and into the actual movement of WMD-related goods.

Attempts to create ambitious international legal authorities for interdiction, especially on the high seas, by creating new treaties, amending existing treaties, or relying on UN Security Council

resolutions could fill an existing major gap caused by fundamental rules of the Law of the Sea. However, such moves would also present political and legal difficulties, not only in technical and legal details concerning processes of amendment or the rights of states parties not agreeing to amendments, for example, but also in the political bargaining that would readily accompany such a set of approaches. Some of this could create undesirable linkages with respect to existing WMD non-proliferation treaties. In the case of Security Council resolutions, the prospect of a limited group of states creating sweeping new law overriding well-established and widely accepted flag state rights on the high seas and in territorial seas would undoubtedly cause considerable concern.

As the histories of the various multilateral export control regimes suggest, efforts to develop interdiction mechanisms could be seen as an attack on peaceful use, trade, and development rights recognized in the WMD non-proliferation treaties. A more positive approach linking interdiction to trade security concerns could build upon both strong port state rights in international law and developing measures to provide both port state security against terrorist attacks and upon stronger maritime supply chain monitoring and management systems. These could be linked to efforts to develop more of a "controlled trade" approach for permitted movements of WMD-related items (in keeping with trade and development clauses in the WMD non-proliferation treaties), while also providing greater leverage on covert trade in WMD-related items.

SUMMARY

Coordinated consent arrangements among states give leverage on the interdiction problem on the high seas as long as such consent is forthcoming in a timely manner. Interdiction in a territorial sea by a coastal state is a little different, since presumably, the coastal state is likely to do the interdicting. The legal basis for interdiction would be limited by the right of innocent passage, as noted in section II of this paper. Efforts to overcome the "high seas gap" created by the rule of exclusive flag-state jurisdiction could be based on a number of devices, but all could present potential dangers in addition to opportunities. They would, in general, be difficult in the sense of negotiating means to align them with the states' trade and development rights under existing NACD agreements. Building on port state authority, however, although technically daunting, seems less problematic on the international legal level, and would be at least potentially more complete in terms of the tasks and cases noted in the introduction. This could be linked to existing treaties on WMD proliferation through, for

example, non-transfer obligations and the development of appropriate national legislation. Were it portrayed as securing trade, moreover, it might strike a more positive note than would a focus purely on boarding. It could be carried out in a manner consistent with trade obligations under the three WMD treaties, perhaps in the manner of a controlled trade regime. Finally, of course, states would need to develop national legislation, both to provide leverage over activities of their nationals – including abroad – or to develop their potentials as port states regarding any WMD-related maritime traffic.

CONCLUSION

The goal of interdicting the flow of WMD-related items in maritime traffic raises a wide variety of legal issues. In some cases – flag states governing their own vessels and nationals or consenting to be boarded by others, or in the case of port states, developing and exercising their rights in their own internal waters – the basic legal issues do not present immense obstacles. The real issue would be developing the appropriate mechanisms and national authorities. Only the case of non-consent boarding on the high seas presents absolutely fundamental problems. While these could be overcome through various mechanisms – including new treaties, amendment of existing treaties, resort to the Security Council, and so on – all would present fairly substantial legal and/or political problems as well, not least in trying to square them with trade-related obligations in the relevant WMD treaties. In particular, the development of port state rights already permitted under existing international law (through the adoption of appropriate national legislation) and the marrying of these to mechanisms to consolidate control lists, identify and track trade, harmonize customs requirements, and coordinate across states (including in customs processes), could have considerable potential, though the technical issues are significant. The result could be a system of controlled trade – though the model of the narcotics conventions may not be, under current circumstances, the happiest comparison. As noted, however, even success in this regard would leave the problem of the indigenous development of WMD-related capabilities still on the table.

DISCLAIMERS

The views and opinions expressed in this paper are those of the author, and do not necessarily reflect the views and positions of the Government of Canada, the Department of Foreign Affairs and International Trade, or any agency or division of these, or of the Government of Canada, or of any other government or international body.

As this piece was first published in 2004, some of the URLs cited are no longer operational. It was not possible to update all of them.

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NOTES

1. The number of PSI core members varies. The initial eleven were Australia, France, Germany, Italy, Japan, the Netherlands, Poland, Portugal, Spain, Britain, and the United States. Since then, Canada, Denmark, Norway, Singapore, and Turkey have been reported as joining, though some reports mention only Canada, Norway, and Singapore. In addition, between fifty and sixty more unidentified states are commonly said to have indicated their support.

2. For example: United States, Department of State, International Information Programs, "U.S. to Host 5th Meeting on Proliferation Security Initiative," 2 Dec. 2003.

3. Australia, Department of Foreign Affairs and Trade, "Proliferation Security Initiative: Statement of Interdiction Principles," Paris, 4 Sept. 2003.

4. The PSI also targets shipments by aircraft. This engages aerospace law, a different and largely separate legal realm not addressed in this paper.

5. The concept of a supply chain is developed in UN/CEFACT/TBG – International Trade Procedures and Business Process Analysis Group, "Reference Model of the International Supply Chain with Special Reference to Trade Facilitation and Trade Security," Meeting on International Trade Security and Facilitation, Geneva, 13–14 Nov. 2003, <http://www.unece.org/trade/security_conf03/> [hereafter Geneva Meeting].

6. The term "Trojan Horse" and the basic idea for this categorization was developed from Philippe Crist's "The Case of Containerised Cargoes," Geneva Meeting.

7. The physical difficulties of searching especially containerized cargoes at sea will mean that vessels will likely have to be taken into a port. That particular issue is ignored here for simplicity's sake.

8. For an example of model legislation, see the Organization for the Prohibition of Chemical Weapons, "Extraterritorial Application to Nationals (Natural Persons)," <http://www.opcw.nl/html/db/imp_kit/measure_05.htm>.

9. Angela Woodward, "National Implementing Laws for Arms Control and Disarmament Treaties," in *Verification Yearbook 2003*, ed. T. Findlay (London: VERTIC, 2003), 151–68.

10. France, "National Mechanisms to Establish and Maintain Surveillance of Microorganisms and Toxins, and Prospects for International Cooperation," Meeting of the States Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, BWC/MSP.2003/MX/WP.18, 7 Aug. 2003, 2–3.

11. Colum Lynch, "Targeting Spread of Deadliest Arms," *Washington Post*, 17 Dec. 2003, <http://www.washingtonpost.com>.

12. United States, Department of State, "Proliferation Security Initiative Ship Boarding Agreement Signed with Liberia," *Press Release* 2004/153, 12 Feb. 2004. Whether this should be regarded as an advance in the development of the PSI or a reflection of difficulty because of its bilateral nature is not clear. There has apparently been some delay in securing agreement among the main PSI states on boarding arrangements. See Wade Boese, "Interdiction Initiative Participants Agree on End, Differ on Means," *Arms Control Today* 33, no. 9 (Nov. 2003): 38; and Center for Nonproliferation Studies, Monterey Institute of International Studies, *NIS Export Control Observer* (Dec. 2003/Jan. 2004): 26. For more on the Liberian agreement, see "U.S. Signs Ship Boarding Pact with Liberia," MarineLog.com, 12 Feb. 2004, <http://www.marinelog.com>.

13. United Kingdom, Foreign and Commonwealth Office, "Countering the Proliferation of Weapons of Mass Destruction," Written ministerial statement by Foreign Secretary Jack Straw, 25 Feb. 2004.

14. *San Remo Manual on International Law Applicable to Armed Conflict at Sea,* <http://www.icrc.org>. This forms the basis for Canada's understanding of the law of armed conflict at sea. See Canada, Department of National Defence, Office of the Judge Advocate General, "Law Relating to the Conduct of Hostilities at Sea," in *The Law of Armed Conflict at the Operational and Tactical Level,* Annotated, B-GG-005-027/AF-021, 5 Sept. 2001, chap. 8.

15. Robert Chesney, "The Proliferation Security Initiative and WMD Interdiction on the High Seas," *National Strategy Forum,* 13, no. 1 (Fall 2003).

16. United Nations, General Assembly, "Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks," A/CONF.164/37, 8 Sept. 1995.

17. Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Treaty of Tlatelolco), 1967; South Pacific Nuclear-Free Zone Treaty (Treaty of Rarotonga), 1985, Article 2.2; South East Asian Nuclear-Weapon-Free Zone Treaty (Treaty of Bangkok), 1995, Article 2.2; and African Nuclear-Weapon-Free-Zone Treaty (Treaty of Pelindaba), 1996, Article 2.2.

18. UNCLOS III, Article. 19.1. A right of innocent passage also exists through archipelagic waters, or through waters which have become enclosed as internal waters by a shift from a low-tidewater mark to a straight baseline system.

19. Union of Soviet Socialist Republics-United States, "Joint Statement with Attached Uniform Interpretation of Rules of International Law Governing Innocent Passage," (23 Sept. 1989):

> 2. All ships – including warships – regardless of cargo, armament, or means of propulsion, enjoy the right of innocent passage through the territorial sea in accordance with international law, for which neither prior notification nor authorization are required.
>
> 3. Article 19 of the Convention of 1982 sets out in paragraph 2 an exhaustive list of activities that would render passage not innocent. A ship passing through the territorial sea that does not engage in any of those activities is in innocent passage.
>
> *International Legal Materials* 28, no. 6 (Nov. 1989): 1446

20. Roscini thus argues that "a ship carrying nuclear substances cannot be denied entry into the territorial waters, but may only be directed to take a safe route." Marco Roscini, "The Navigational Rights of Nuclear Ships," *Leiden Journal of International Law* 15, no. 1 (2002): 252.

21. United Nations Environment Programme, Secretariat of the Basel Convention, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 22 Mar. 1989, <http://www.basel.int/>.

22. For examples, see Roscini, "Navigational Rights"; Jon M. Van Dyke, "The Legitimacy of Unilateral Actions to Protest the Ocean Shipment of Ultrahazardous Radioactive Materials," Nuclear Control Institute, <http://www.nci.org>; Jon M. Van Dyke, "Applying the Precautionary Principle to Ocean Shipments of Radioactive Materials," *Ocean Development and International Law* 27 (1996): 379–97; Fabio Spadi, "Navigation in Marine Protected Areas: National and International Law," *Ocean Development and International Law* 31 (2000): 285–302; and Malaysian Institute for Nuclear Technology Research, "Issues in the Maritime Shipment of High-Level Nuclear Waste and Fuel between Europe and Japan," 2 Feb. 2001, <http://www.mint.gov.my/policy/nuc_transport/issue_nuclearshipments. htm>.

23. See, for example, chapters 7 and 8 of the Safety of Life at Sea Convention, and International Maritime Organization, "International Maritime Dangerous Goods Code," <http://www. imo.org>.

24. In the International Maritime Organization, efforts are also being made to strengthen rules governing the transparency of vessel ownership and control. International Maritime Organization, *Newsroom,* Legal Committee, 84th Session, 22–26 Apr. 2002, <http:// www.imo.org>.

25. Peter Malanczuk, *Akehurst's Modern Introduction to International Law,* (London: Routledge, 1997), 175.

26. United Nations, Economic and Social Council, Economic Commission for Europe, "Proposal for Standards Development in Support of Trade Facilitation and Security: A Collaborative Approach," Geneva Meeting, <http://www.unece.org/ trade/security_conf03/>. The current state of affairs is presented by the Stanford Study Group in the following terms:

    Hard intelligence information that a nuclear or radiological weapon has been loaded onto a ship headed for the United States in the current maritime security system is not at present actionable because there is no way to identify and track down the specific ship or container, or to know when or where it is scheduled to arrive. For instance, the container in

question could be transferred to another ship at an intermediate port without the knowledge of American authorities.

Center for International Security and Cooperation, Stanford University, *Container Security Report* (Palo Alto, CA: Stanford University, Jan. 2003), 13

27. See, for example, Maarten van de Voort and Kevin A. O'Brien with Adnan Rahman and Lorenzo Valeri, *"Seacurity:" Improving the Security of the Global Sea-Container Shipping System*, MR-1695-JRC (RAND Europe, 2003); "ConTraffic: Container Traffic Monitoring System" (Ispra: RAND, Oct. 2002), <http://www.jrc.org>; and UN/ CEFACT/TBG, "Reference Model." ConTraffic was under development by the European Commission Joint Research Centre and the European Anti-Fraud Office.

28. Basic information on the CSI is available on the United States Department of Homeland Security Customs and Border Protection website, <http://www.cbp.gov/xp/cgov/enforcement/international_activities/csi>. Some information is also available in Stephen E. Flynn, "Potential Strange Bedfellows? Homeland Security and Nonproliferation in the Post-9/11 World," *The Monitor* 9, no. 3 (Fall 2003): 11–12.

29. As of March 2004, the ports involved were: Vancouver, Montreal, and Halifax (Canada); Felixstowe (UK); Antwerp (Belgium); Rotterdam (Netherlands); Goteborg (Sweden); Hamburg and Bremerhaven (Germany); Genoa and La Spezia (Italy), Le Havre (France); Port Kelang (Malaysia); Singapore; Hong Kong; Busan (South Korea); Yokohama (Japan); and Durban (South Africa). Ports involved later were: Algeciras (Spain); Columbo (Sri Lanka); Tanjong Pelepas (Malaysia); Laem Chebang (Thailand); Shenzhen and Shanghai (China); and Kobe, Osaka, Nagoya, and Tokyo (Japan).

30. Thomas J. Schoenbaum and Jessica C. Langston, "An All Hands Evolution: Port Security in the Wake of September 11th," *Tulane Law Review* 77 (2002–2003): 1336–38.

31. United States Customs and Border Protection website, <http://www.cbp.gov/xp/cgov/enforcement/international_activities/csi>.

32. Australian Customs Service, "Australian Customs Contribution to Container Security and Facilitation of Trade," Geneva Meeting, p. 3.

33. Statement by Ambassador A. Selverajah, Permanent Representative of the Republic of Singapore to the Organization for the Prohibition of Chemical Weapons, at the First Review of the States Parties of the Organization for the Prohibition of Chemical Weapons, 28 Apr. 2003.

34. Richard T. Cupitt, "Nonproliferation Export Controls in the Hong Kong Special Administrative Region" (Athens, GA: Center for International Trade and Security, University of Georgia), <http://www.uga.edu/cits>; Edward Yau, "The Role of Transshipment Centres in International Cooperation Against Proliferation," in *2nd International Seminar on the Role of Export Controls in Nuclear Non-Proliferation* (New York: Nuclear Suppliers Group, 8–9 Apr. 1999), 68–72; and Hong Kong, "Weapons of Mass Destruction (Control of Provision of Services) Ordinance," <http://www.justice.gov.hk>.

35. Scott A. Jones, "Nonproliferation Export Controls in Canada 2002," (Athens, GA: Center for International Trade and Security, University of Georgia), 1. <http://www.uga.edu/cits>.

36. Ibid., 19–20.

37. United States Department of Commerce, Bureau of Industry and Security website, <http://www.bis.doc.gov>.

38. For example, twenty states met in Sydney, Australia in July 2003, including Australia, Fiji, Jordan, Latvia, Malaysia, Singapore, Turkey, the United Arab Emirates, and the United States. International Institute for Strategic Studies, "The Proliferation Security Initiative: An Interdiction Strategy," *Strategic Comments* 9, no. 6 (2003).

39. Scott A. Jones, "Current and Future Challenges for Asian Nonproliferation Export Controls," *East Asian Review* 15, no. 2 (Summer 2003): 452–80; and Opening Statement by Ambassador Yukiyu Amano, Director-General for Arms Control and Scientific Affairs, Ministry of Foreign Affairs of Japan, on the Occasion of Asian Senior-level Talks on Non-Proliferation (ASTOP), 13 Nov. 2003.

40. Kwan Weng Kin, "Japan, Singapore to Ink Pact on WMDs," *The Straits Times*, 10 Jan. 2004.

41. ASEAN Framework Agreement on the Facilitation of Goods in Transit, 1998.

42. Geneva Meeting.

43. Some of the more specific suggestions are briefly discussed in Chesney, "Proliferation Security Initiative." See also Benjamin Friedman, "The Proliferation Security Initiative: The Legal Challenge," *Bipartisan Security Group Policy Brief*, Sept. 2003, <http://www.gsinstitute.org>.

44. Andreas Persbo, "The Proliferation Security Initiative: Dead in the Water or Steaming Ahead?" *BASIC Notes*, 12 Dec. 2003, <http://www.basicint.org>.

45. International Maritime Organization, *Newsroom*, Legal Committee, 85th Session, 21–25 Oct. 2002; 86th Session, 28 Apr.–2 May 2003; and 87th Session, 13–17 Oct. 2003, <http://www.imo.org>.

46. M.N. Shaw, *International Law* (Cambridge: Grotius Publications, 1986), 478.

47. International Court of Justice, *Reports of Judgements, Advisory Opinions and Orders, Case Concerning Questions of Interpretation and Application of the 1971 Montreal Convention Arising from the Aerial Incident at Lockerbie (Libyan Arab Jamahiriya v. United States of America): Request for the Indication of Provisional Measures, Order of 14 April 1992, ICJ Reports 1992*, paras. 42, 43.

48. Lynch, "Deadliest Arms"; and "U.S. Circulates Draft UN Resolution to Prevent Proliferation," *Arms Control Today* 34, no. 1 (Jan./Feb. 2004): 43.

49. Joseph M. Sweeney, Covey T. Oliver and Noyes E. Leech, *The International Legal System: Cases and Materials* (Mineola, NY: Foundation Press, 1981), 1240–47.

50. Single Convention on Narcotic Drugs, 1961, Article 31; and Convention on Psychotropic Substances, 1971, Article 2.

51. Nuclear Threat Initiative, "Controlling Nuclear Warheads and Materials: Interdicting Nuclear Smuggling: Introduction," <http://www.nti.org>.

52. Graham S. Pearson, "Toxic Chemicals: A Multilateral Export-Import System," *Chemical Weapons Convention Bulletin*, no. 34 (Dec. 1996): 1, 3–8.

53. Flynn, "Strange Bedfellows," 13.

54. United States, General Accounting Office, *Export Controls: Post-Shipment Verification Provides Limited Assurance that Dual-Use Items are Being Properly Used*, GAO-04-357 (Washington: US General Accounting Office, Jan. 2004). On page 8 it reports that, of 26,340 export licenses issued by the Department of Commerce in 2000–2002, 7,680 were to "countries of concern." Of these, there were 428 post-shipment verifications checks. Numerous problems existed in the checks that were performed.

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Terrorism, Self-Defence, and International Law: Movement Under Pressure?

James Keeley

Great and terrible events generate a variety of responses. Initially, these may be largely expressive or even cathartic displays or emotional states: shock and horror, joy, feelings of solidarity or of distance, a desire for revenge or urgings of caution, casting about for blame or pleadings of innocence, and so on. But catharsis, however understandable as a human response, is a poor guide to understanding and a worse guide to policy. For these, we must turn to more analytical, if also more cold-blooded, consideration.

In considering the American response to the events of 11 September 2001, we are drawn into a complex mix of issues – of legality, political wisdom, military feasibility, and morality. Politics as a high art requires that all of these be considered jointly. The quality of politics that makes it the "noblest of callings and the vilest of trades" is the necessity of balancing demands, relevant and pressing in their separate ways, but at times only conditionally converging, at best, and at worst, directly contradictory. In the often unforgiving realm of foreign affairs, a well-intentioned policy that does not work – that is, does not achieve its objectives – is first and foremost, a failed policy. Policy therefore cannot be based on moral considerations alone. This does not excuse moral laxity, but rather underlines the tragic aspect of hard decisions. Conversely, a morally dubious policy may be, as a direct consequence, politically vulnerable.

In the case of 11 September, this mix of morality, legality, politics, and military power is captured in the question of how the United States – and the world – should respond to international terrorism on this scale. Up to this time, acts of international terrorism have largely

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been approached from the perspective of criminal proceedings. Several international conventions address various aspects of the problem. All of these, however, are based on the co-operation of states, and thus on trust. If that co-operation is seen as inadequate, and if at least some states cannot be trusted to rein in terrorists unless under extreme pressure, existing, more conventional, avenues of approach to control will not be trusted. The scale of 11 September, its part in a pattern of activity, the nature of the group involved, and the American response, all put severely into question the adequacy of this legal apparatus. This is especially true if even more ambitious and dangerous acts of terrorism are feared in the future. In addition, from the American perspective, it must be understood that a principle of fundamental political importance is likely seen to be at stake. This is a political principle of prudence: prudent actors should not do this sort of thing to the United States. Unless the United States establishes this principle, it could be the start of hunting season.

The focus of this essay, however, is more specifically on some potential implications of the American argument of self-defence as a justification of their response. Their legal and military responses are likely to generate a shift in the range of the acceptable reactions to at least large-scale and persistent terrorism. Where, how, and with what potential implications such a shift could occur are the foci of this essay. It offers a brief and limited examination of the American argument for self-defence as a justification for its response to 11 September. International law is not well designed to deal with a case like this, and efforts to adapt it may well result in stretching the law or changing it. This is what is happening here,[1] giving rise to concerns not only over this case but also about the stretching of law beyond this case. Whether, therefore, we are seeing an inevitable or even desirable adaptation of existing law or a dangerous stretching of its categories is an underlying question here. This argument is sympathetic to the United States. It is nonetheless fair to note areas of controversy and concern. Even a justifiable claim of self-defence does not dispose of all legal concerns, nor does it free the United States, or others, from all legal limits. The intention here is to provide some initial clarifications which might assist a more knowledgeable debate, not to give definitive answers in a highly disputed terrain.

THE POLITICO-LEGAL CHARACTER OF INTERNATIONAL LAW

Before examining the specifics of the self-defence argument, it is useful to turn to broader characteristics of the international legal system to set the context within which the potential impact of the American response can be understood.

There is a temptation either to dismiss international law out of hand or to assume implicitly that international law functions in the same way as our domestic system. Both views are inadequate and inaccurate. The first could lead, for example, to a focus on revenge as a justification for the Americans, or to apparent suggestions that they should stop fighting after some number of Afghan civilians have been killed. These are at best perversions of the law. The second fails to understand the role of states in the creation and evolution of the law, and thus also fails to appreciate why the American position might be of broader concern even if it is accepted for this specific case.

The international political system is a decentralized system, a system without a strong, authoritative centre: we do not have a world government. International law does not transcend states. In political-military terms, we have a self-help system, depending on the very states that the law wishes to regulate to enforce that law. That may strike some as the same as having the inmates in charge of the asylum. We may wish it were otherwise, but wishing does not make it so. Thus, while international law attempts to regulate and to some degree to constrain the actions of states, in so doing it must ultimately appeal to their self-interest. It must, therefore, also give them the means to pursue what they see as their legitimate interests in a way that they judge effective and adequate, even as it seeks to shape, channel, and sometimes constrain their choices of objectives and their selection of means.

The United Nations cannot stand in for a world government. It also cannot transcend states, but is better seen as an association of sovereign states. It faces very substantial limitations on its legal, political, and material capabilities, and enjoys only such means and such freedom of action as an organization as its members permit it. It cannot rise above international politics, though it can play a vital role within international politics. Understanding this is crucial to the development and the appreciation of any contribution which the United Nations, as a collectivity of states, can make to dealing with the problem of terrorism. Neither vague invocations of the United Nations as a solution, nor grand schemes for United Nations action which ignore its limitations, can serve as useful starting-points for a serious discussion of policy alternatives.

Within the international legal system, law arises from many sources. Above all, however, the law is what states say it is, whether in their practices or in their treaties. The practice of states – both their actions and their responses to the actions of others – plays a central role. While much of international law is codified into treaties, a significant amount is still governed by custom, the body of practices which states have come, over time, to accept as legally binding or as

legally permissible. Even in the case of treaty law, state practice may play a significant role in filling in the details of how specific rules are to be understood and applied. In the case of both customary and treaty law, if an existing rule is effectively disregarded for a long enough time, and frequently enough, and without substantial protest from other states, then that rule could fall into disuse or be replaced by another. Changes in state practice over time will be reflected in the law.

Some unsettling conclusions follow from these characteristics. Attempts to use international law to stop states – especially powerful states – from pursuing what they consider to be their legitimate interests by adequate and effective means may not work unless other state interests can be successfully invoked. The law will otherwise be reshaped. Attempts to constrain states by appeals to excessively artful, formalistic, or legalistic interpretations are unlikely to be successful when great issues are at stake. Any attempts we make to constrain states through law must deal with this. If we want to head off this line of development, we must therefore develop other means that render it unnecessary, and so offer states other mechanisms that will be adequate. Without such machinery and the will to use it, or while waiting for its creation, we would be like Canute bidding the tide not to come in to ask states to forego their rights – however unwisely they might be used in some cases – to defend themselves. Nor could we necessarily blame them for being unwilling to let their vital interests depend on the kindness and the will of strangers if they have a choice.

FOUR ISSUES OF SELF-DEFENCE

Various possible lines of response were open to the United States, including dependence on existing laws oriented along criminal prosecution of private groups, application of sanctions to Afghanistan, and the fielding of a United Nations force in Afghanistan. Instead, the United States responded another way, using military action under a claim of self-defence. These alternatives to self-defence are not considered here.[2] They neither preclude nor are precluded by a viable self-defence argument. If self-defence is unconvincing, of course, other consequences follow. Neither does this essay judge whether the American response, if it is within the law, is necessarily the best response; that depends on other factors besides legality.

The claim of self-defence raises a number of issues – some trivial or misunderstood, and some with far-reaching implications. The lawyers are hard at these.[3] Four broad issues are briefly noted here: (a) the American invocation of Article 51 of the Charter of the United Nations; (b) the question of whether an "armed attack" occurred

within the meaning of Article 51; (c) the responsibility of Afghanistan; and (d) the limits on American action taken under the heading of self-defence. Of these, the last two are of particular importance.

(A) SELF-DEFENCE UNDER ARTICLE 51

In a letter to the Security Council dated 7 October 2001, the United States invoked Article 51 of the Charter and reported its action against Afghanistan as required under that article.[4] Article 51 reads as follows:

> Nothing in the present Charter shall impair the inherent right of individual or collective self-defence if an armed attack occurs against a Member of the United Nations, until the Security Council has taken measures necessary to maintain international peace and security. Measures taken by Members in the exercise of this right of self-defence shall immediately be reported to the Security Council and shall not in any way affect the authority and responsibility of the Security Council ... to take at any time such action as it deems necessary in order to maintain or restore international peace and security.

As an inherent right, self-defence does not depend on the United Nations Charter, though it is limited to some degree within Article 51 and in broader international law. Nor does it require prior Security Council approval, though a resolution affirming it could be politically and legally useful.

The Council could see fit, after the fact, to challenge a claim of self-defence, including any specific target of such a claim or elements of the response. This seems the only real check on what is otherwise an act of judgement by the attacked state; there is no substantial authoritative means of regulating self-defence in advance. Without a very different United Nations, and thus a very different world in which state powers were remarkably limited, states would be unlikely to accept anything but their own judgement in this matter of vital interest. Given the veto, a Council challenge is effectively impossible for the case of the United States, but an otherwise adverse vote would be politically telling. The Council could also express approval of the American claim. It is not at all clear that it has specifically done so, but even after-the-fact approval is not necessary for the right of self-defence. The community of states, in general terms, does not seem to have challenged the American claim, though there is obvious unease in some quarters about the nature of the response, its implications, and its possible extension beyond Afghanistan.

Article 51 permits a state to defend itself from attack until the Security Council takes the necessary measures to restore peace and security. Once the Security Council does act effectively, this seems to override self-defence. Security Council resolutions following 11 September do not fulfill this requirement.

(B) AN "ARMED ATTACK"?

Was the United States subject to an armed attack within the meaning of Article 51? Though the article does not go into detail, it is not clear that it covers non-state attackers. For the sake of argument, it is fair to assume that it was written with inter-state, conventional conflicts in mind. The nature of the attackers will be noted under point (c). As for the means of attack, obviously these were highly unconventional. Assuming that other requirements were met, it would be curious to give an exemption on the grounds of creativity, especially given the scale of the losses. Had the attacks been mounted by identifiable armed forces of another state, the unusual means selected would not weigh for much in opposition. In any event, this issue is readily overshadowed by point (c), the question of attributing responsibility to Afghanistan.

(C) THE RESPONSIBILITY OF AFGHANISTAN

International law is, above all, a law between states. Private war, which is what al-Qa'ida may essentially have been engaged in, does not fall readily into this system – indeed, it has essentially been legally removed from the system. Only states may wage war on each other. The United States was attacked by a private group, but its response was to attack the state of Afghanistan. The American letter to the Security Council gave the nub of their position:

> The attacks on September 11, 2001, and the ongoing threat to the United States and its nationals posed by the al-Qa'ida organization have been made possible by the decision of the Taliban regime to allow the parts of Afghanistan that it controls to be used by this organization as a base of operation.[5]

Taking for granted the attribution of the attack initially to al-Qa'ida, how might the responsibility of Afghanistan and its Taliban government become engaged? The Taliban regime's status as a government unrecognized by most of the world is not a particular issue, since it was clearly in control of most of the state territory and thus functioned effectively as a government in at least the area under its control.

State responsibility for the actions of private groups may arise under a variety of circumstances. For example, when Iranian students seized the United States embassy in Tehran in 1979, the Iranian state became responsible for their actions once it expressed its approval of their actions, though the Iranian government was not itself apparently behind the seizure. The Taliban regime did not express approval of the 11 September attacks, but it was associated in some degree with al-Qa'ida. Is this link sufficient? Ironically, some guidance is available from American involvement with the Contras against the government of Nicaragua in the 1980s. In the Nicaragua case, the International Court of Justice, while noting the United States' role in "financing, organizing, training, supplying, and equipping" the Contras, was still unwilling to impute full responsibility for their actions within Nicaragua to the United States as such, questioning whether they had sufficient control on the ground to assign that responsibility.[6]

The al-Qa'ida organization existed and operated openly in Afghanistan. It appears to have had strong informal ties, at least, to the Taliban regime, and to have been a main prop of that regime, including on the battlefield against Northern Alliance forces prior to 11 September. It is not clear that the Taliban as such had a directing or controlling influence over al-Qa'ida, but our usual model of well-organized governments could be inadequate here. The Taliban seem to have ruled as one dominating group among many in Afghanistan, with al-Qa'ida being one very significant group in the coalition supporting it – in the ruling group in effect, though not formally in the government.[7] This may provide the necessary distinction between this case and the Nicaragua case.

In the 1974 Definition of Aggression, a resolution passed by the United Nations General Assembly to help give (non-binding) guidance to the Security Council, one illustration of aggressive action was given in Article 3(g):

> The sending by or on behalf of a State of armed bands, groups, irregulars or mercenaries, which carry out acts of armed force against another State of such gravity as to amount to the acts listed above, or its substantial involvement therein.[8]

Article 3(f) deals with permitting the use of territory. A commentary by the Canadian delegation to the United Nations noted that a state may not have full knowledge of, or control over, actions on its territory, so this factor would have to be considered carefully. Regarding Article 3(g), however, the commentary saw this as directly related to the problem of terrorism, and suggested that it was a movement towards a notion of "indirect aggression." It stated:

> The acquiescence in or indeed encouragement by one state of attacks of armed bands against a second state is rejected by the world community in this paragraph. State complicity in acts of international terrorism is a problem with which the world community has yet to come to grips. This paragraph is an encouraging sign of movement in the right direction.[9]

If such actions may be seen as a form of aggression by one state against another, the right of self-defence, it would seem, could be invoked. The United States and some others have argued a right to target states "harboring" terrorist organizations, on the grounds that these were accomplices of such organizations, but other states did not share this view. This case may point to some movement towards the American view.[10] This would mark a shifting (to some degree, possibly a relaxing) of requirements for attributing the actions of a group to an associated state.

(D) PERMISSIBLE ACTION UNDER SELF-DEFENCE

Even within the bounds of permissible self-defence, the responding state is not unlimited in what it can do. The classic statement of the right of self-defence is found in the nineteenth century *Caroline* case, in which United States Secretary of State Daniel Webster argued that the state claiming such a justification must show a necessity of self-defense, instant, overwhelming, leaving no choice of means, and no moment for deliberation.[11]

The response must also be proportionate. What actions are permissible under these criteria is a matter of debate, in which the range of difference is considerable.[12] A very narrow reading of these requirements restricts self-defence to an on-the-spot application, proportionate to the immediate threat, and directed at the immediate attackers alone. This, perhaps, is a little too restrictive, to the point of potentially nullifying the right in the circumstances we may now face. On the other hand, a broadly interpreted right could lead to disproportionate responses even to isolated incidents, a delayed right of response, even perhaps to anticipatory self-defence and a right to target a wide range of states. All of these lead readily to abuse.

State practice provides some leeway in how criteria such as those in *Caroline* might be applied. When Argentina invaded the Falkland Islands, the British took some weeks to mobilize and position their forces before they launched their counterattack, yet the applicability of self-defence seems unimpeachable. The American use of force was almost one month after 11 September. Bearing in mind the necessity of

moving large forces long distances and preparing the diplomatic ground, this may not be excessive. Had the United States delayed longer, for example, to "give diplomacy a chance," its self-defence claim could have diminished.

As for proportionality, suggesting that rough equivalence in casualties and damage is an appropriate criterion risks perverting the laws of combat, if it implies a right purposefully to inflict comparable civilian casualties. Others suggest that damage could be proportionate to meeting a deterrence criterion, or to the purpose of the responding attack.[13] Full scale attacks or invasions under the claim of self-defence are properly a touchy point. Most writers are clearly very uncomfortable with any military response that goes beyond that needed to repel an attack, and would be unlikely to favour any more extensive use of force. Cassese suggests limited circumstances that could be applicable here: he argues, as one limit on self-defence, that

> The victim of aggression must not occupy the aggressor State's territory, unless this is strictly required by the need to hold the aggressor in check and prevent him from continuing the aggression by other means.[14]

In this case, one could present the American operations as militarily similar to clearing a base area for guerrillas, thus destroying a sanctuary that facilitated their activities.[15]

The *Caroline* criteria apply most readily where incidents are infrequent, small-scale, and local, and where they can be dealt with effectively one at a time. A very strict reading of *Caroline* would reduce the United States to largely passive and locally reactive defences, giving most of the initiative to its opponent. Given the potential resources of modern terrorists, as revealed both on 11 September and in the aftermath, this is asking a lot. Further, there is a credible argument that 11 September was merely the most recent of a series of incidents, including the attack on the *USS Cole* and the East African bombings in which 224 people were killed and almost 5000 were injured,[16] almost all not American. September 11 could still justify in itself a very strong response, other elements being satisfied. However, beyond this one event, the United States could argue, or is arguing, a pattern or series of events which gives rise to a reasonable expectation of further attacks in the future. At this point, these incidents could essentially merge into a continuous or on-going armed attack.

When Israel attacked the headquarters of the Palestine Liberation Organization in Tunis in 1985, the United States abstained on a Security Council resolution condemning the attack, but also warned that

> We ... recognize and strongly support the principle that a state subjected to continuing terrorist attacks may respond with appropriate use of force to defend against further attacks. This is an aspect of the inherent right of self-defense recognized in the United Nations Charter.[17]

Other states might not accept this interpretation, but this does give clear warning of the American reading. The United States also presented a self-defence argument for its attack on Libya in 1986, vetoing a United Nations Security Council resolution criticizing it. (The General Assembly, however, passed a resolution criticizing the United States' actions.)[18] In the case of the 11 September attack and its precursors, the self-defence argument is invoked not against an isolated or sporadic incident, but against a series of acts that the United States might argue engage the responsibility of the Taliban government of Afghanistan.

THE CANADIAN RESPONSE

Canadian territory was not attacked on 11 September, although Canadians were among the casualties. Canada has associated itself with the American military action against al-Qa'ida and the Taliban regime, providing armed forces for various combat and related roles within Afghanistan and in the region. This implies that, despite some possible differences on issues of policy and law, Canada accepts as legitimate at least the broad lines of the self-defence argument.

Under Article 51 of the United Nations Charter, collective self-defence is permitted in response to an armed attack. Representatives of the North Atlantic Treaty Organization responded quickly to events by invoking Article 5 of that treaty. This reads in part:

> The parties agree that an armed attack against one or more of them in Europe or North America shall be considered an attack against them all; and consequently they agree that, if such an armed attack occurs, each of them, in exercise of the individual or collective right of self-defence recognized by Article 51 of the Charter of the United Nations, will assist the party or parties so attacked by taking forthwith, individually and in concert with the other parties, such action as it deems necessary, including the use of armed force, to restore and maintain the security of the North Atlantic area.

This article does not commit Canada to any particular response, leaving that to our discretion. Whether or not our current form and extent of contribution are desirable becomes, if we accept the basic

legal case, a question of policy. The mere invocation of Article 5 does not in itself definitively answer the basic legal question of whether the American action is justified under self-defence. However, as a formal expression of the opinion of a number of states in the world, it will carry some weight as an indicator of their judgement, as will various other statements by individual states and groups of states.

Repercussions

Within this discussion, at least two sets of concerns might arise even if the American response is accepted as legitimate self-defence. These concern, first, the application of the argument to different cases, and second, the stretching of the acceptable range of the self-defence argument.

At least some people have attempted to link actions against Iraq with actions against terrorism, in general and specifically in the case of 11 September. There may be independent grounds, both legally and politically, for action against Iraq, but that is a different question. Arguing a linkage with 11 September, however, would require a clear and significant connection between Iraq and those events, sufficient to establish state responsibility, or at least clear evidence of a similar, impending threat (raising the problem of anticipatory self-defence, at best a controversial notion in international law). Other states have sought to use the American response to justify their handling of their own security problems, as well. However, a narrow view of this would seem to require the demonstration of substantial parallels with the American situation. Simply to point and say, "there are terrorists, so we can do likewise" would be a political argument, not in itself a sufficient legal argument.

Some fear that the American response moves us towards a broader reading of self-defence. Possible shifts – a loosening of criteria and limits – in the self-defence argument have been noted above, with respect to the attribution of responsibility and to the permissible response. The shift of responsibility from al-Qa'ida to Afghanistan, and the military overthrow of the Taliban regime as a result, may reduce some significant constraints on self-defence, in that they allow a looser association between a state and a group before state responsibility is engaged, and they permit action well beyond what narrower interpretations of self-defence would find acceptable. If that is the case, there is a danger that lesser events could then lead to more aggressive responses. This problem, we should note, could exist quite separately from what we might consider appropriate in this particular case.

In general, one could note the extreme and provocative events that generated the American response, and argue that only circumstances of this order could possibly justify a similar reaction. The clear potential for abuse is present, however, as other states with their own problems with terrorism seek to use these events, politically, to justify a harder line. At this point, two considerations intrude. On the one hand, even if the legal limits on action soften, political and military realities may have a constraining effect. On the other, it may be desirable if states which are too closely associated with terrorist groups have strong cause to rethink that association.

However that may be, the series of al-Qa'ida attacks, the apparent interest of al-Qa'ida (and possibly other groups) in using very dangerous methods of attack, and the nature of the American response point us towards a much more troubled and dangerous world. If we are concerned with both the action and the reaction – and both must be addressed, not simply the latter – then the only medium- and longer-term alternatives to current lines of action would be precisely to strengthen multilateral efforts against terrorism – to dampen down the danger, addressing causes as well as symptoms, and to provide viable and effective alternatives for states which see themselves as under attack.

NOTES

This paper draws in considerable part on a panel presentation for the Equality Committee of the Faculty of Law, University of Calgary, "Bringing It Home: Legal, Political and Social Implications of the September 11 Incidents," 7 Nov. 2001.

Because this piece was first published in 2002, some of the URLs cited are no longer operational. It was not possible to update all of them.

1. Antonio Cassese, "Terrorism is Also Disrupting Some Crucial Legal Categories of International Law," *European Journal of International Law,* WTC Forum, <http://www.ejil.org>.

2. All alternatives, including self-defence, have their defects. While some might argue that the acts of September 11 constitute international crimes – crimes against humanity, for example – no international tribunal yet exists to prosecute individuals for them. The International Criminal Court does not yet actually exist, and it is not clear that it would apply to actions before it comes into existence. Prosecution by the Taliban regime in Afghanistan could not be trusted, but neither was that regime willing to turn over

members of al-Qa'ida to others: aside from the last American demand, Afghanistan had ignored two Security Council resolutions (1267 [1999] and 1333 [2000]) demanding that bin Laden be turned over to appropriate authorities. Afghanistan was already under sanction, with little result. Fielding a United Nations force in Afghanistan would have been subject to inevitable delays and compromises, and if enforcement action were to be taken by the Security Council, this would likely entail extensive American participation in any event, and substantial American influence over the nature of that action.

3. For accessible debate on the Internet, see, for example, *European Journal of International Law*, WTC Forum, <http://www.ejil.org>; *Crimes of War Project*, <http://www.crimesofwar.org/>; and Frederic L. Kirgis, et al., "Terrorist Attacks on the World Trade Center and the Pentagon," *ASIL Insights*, no. 77, American Society of International Law, <http://www.asil.org/insights/insigh77.htm>.

4. Letter of the Representative of the United States of America to the United Nations, 7 Oct. 2001, <http://www.usinfo.state.gov/topical/pol/terror/01100813.htm>.

5. Ibid.

6. Noted in John Currie, *Public International Law* (Toronto: Irwin Law, 2001), 397–98. On the problems of non-state actors and state responsibility more generally, see pp. 396–99.

7. See the discussion in Carl Conetta, "Strange Victory: A Critical Appraisal of Operation Enduring Freedom and the Afghanistan War," *Project on Defense Alternatives Research Monograph # 6*, 30 Jan. 2002, <http://www.comw.org/pda/0201strangevic.html>, especially app. 3, "The Rise and Fall of the Taliban: A Note on Their Strategy and Power."

8. J.-G. Castel, *International Law, Chiefly as Interpreted and Applied in Canada* (Toronto: Butterworth's, 1976), 58–61.

9. Ibid., 62–63. "Comments by Canadian Delegation," *Press Release* No. 14, 10 Oct. 1974.

10. Cassese, "Terrorism is Also Disrupting."

11. In the Rebellion of 1837, the American vessel *Caroline* assisted the rebels in Upper Canada from across the Niagara River. One night, a party of Canadian militia under British command crossed to the American side, seized the vessel, cut it loose, set it on fire, and sent

it over the falls. One person on board was killed. When the United States protested, the British responded by claiming self-defence.

Webster's reply is considered a classic statement of the requirements for such a claim. See. Ellery C. Stowell and Henry F. Munro, *International Law: Arbitrations and Incidents Illustrative of International Law as Practiced by Independent States* (Boston: Houghton Mifflin, 1916), 121–22.

12. See, for example, Anthony Clark Arend and Robert J. Beck, *International Law and the Use of Force* (London: Routledge, 1993), chap. 9, 138–73.

13. Ibid., 165–66.

14. Antonio Cassese, *International Law* (Oxford: Oxford University Press, 2001), 305.

15. Conetta, "Strange Victory," questions this comparison.

16. "Responsibility for the Terrorist Atrocities in the United States, 11 September 2001," Website of the British Prime Minister, <http://www.fas.org/irp/news/2001/10/ukreport.html>.

17. Marian Nash (Leich), *Cumulative Digest of United States Practice in International Law, 1981–1988, Book III* (Washington: Office of the Legal Adviser, Department of State), 3404–05.

18. Ibid., 3405–28.

The Biggest Force Multiplier?: Knowledge, Information, and Warfare in the 21st Century

John Ferris

Ideas about a Revolution in Military Affairs (RMA) arose in the 1990s, a time when a "new economy" emerged, information technology boomed, and slogans about e-business abounded. This context shaped discussions on military policy. That firms should make profits was just too old economy, that wars might involve costly battles and tough foes seemed too old strategy. E-businesses needed flat hierarchies? E-armies should abandon every level of command between sensor, shooter, and perhaps, commander. Any management system suited to business should fit armies, although Microsoft competes on cost and pricing without shooting its rivals. Of course, one hesitates to suggest this option to Bill Gates. Again, a failure of "just in time" logistics costs firms money, but it costs armies battles. The British Army used a similar method to resupply riflemen at Isandhlwana in 1878; no customer survived to complain. The recent techwreck raises questions about many assumptions in recent military debates. Are virtual strategies viable? Like the new economy, will the Joint Visions defined by the Pentagon rest on bubbles? Will armed forces be transformed into boo.com or Enron?

Advocates of the RMA assumed that information (as technology or superhighway or revolution or age) would transform the knowledge available to armed forces, and thus their nature and that of war. Joint Visions 2010 and 2020 treated information technology as first among equals among the drivers for revolution. Colonel John Warden, USAF planner and theorist of airpower, held that "Information will become a prominent, if not predominant, part of war to the extent that whole wars may well revolve around seizing or manipulating the enemy's datasphere." [See the list of principle sources used in the Notes segment.] This paper will assess these assumptions and three

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2003. In *Airpower in the Twenty-First Century*, ed. Ian MacLachlan (Canberra: Australian Defence Forces Academy).

concepts stemming from them: "IO" (information operations), "netcentric warfare" (NCW), and "C4ISR" (command, control, communications, computers, intelligence, surveillance, and reconnaissance; loosely speaking, how armed forces gather, interpret, and act on information). It will view these issues of strategy, command, and intelligence through the lens of praxis, a combination of theory and practice. I may seem a luddite, but that is not entirely so. The foundations of power clearly are changing, as they always do. Information (as system, technology, and content) is central to those alterations. Armed forces should adapt to changing times; attempts to do so will take them somewhere, if not necessarily where they thought they wanted to go. Adaptation can take armies to useful places, sometimes even to the space they wanted to reach, or beyond. Often, however, one cannot get there from here, to the destination one likes. Armed forces' planned adaptations do not always succeed. Efforts to force the pace of events can misfire. A revolution is not a road one takes to a certain destination. Attempts to ride the road will have unexpected results – efforts to take the lead may cause a second party to nudge a third into the path and force you to kill a fourth, or fall behind the pack.

The relationship between knowing and doing during a military revolution is by nature a complex matter. It has been made doubly so by nurture. Writers on the topic describe different matters with the same words, sometimes changing their definitions or the things terms describe. Some such confusion is hard to avoid. Only scholastics can define the words "information" and "intelligence" in a watertight fashion. Most folk use them loosely, blurring their meanings and the meaning of "knowledge" as well. So too, in the debate on information in the RMA, one word can have many meanings, without warning. The concepts of C4ISR and IO have the virtue of placing their individual components in a process, each affecting and affected by each other (or "fused"); unfortunately, they also have eroded useful boundaries of meaning maintained by older concepts. Thus, "information" means different things for IO and intelligence. Where the *Joint Doctrine Encyclopedia* distinguishes "data," "information," and various categories of "intelligence," the Joint Chiefs of Staff's doctrine on IO defines information to mean all of these things, along with "understanding" and "knowledge": "1. Facts, data, or instructions in any medium or form, and 2. The meaning that a human assigns to data by means of the known conventions used in their representation." In IO, information means everything which stems from or affects knowing and its relationship to doing, in your adversary and yourself. This definition follows those in the unofficial literature about "Information Warfare" (IW) and the USAF variant of IO, which defined "information" as "data and instructions," or what one perceives and how one perceives it.[1] In 1995, one IW theorist, George

Stein, wrote, "Information warfare, in its essence, is about ideas and epistemology – big words meaning that information warfare is about the way humans think and, more important, the way humans make decisions ... It is about influencing human beings and the decisions they make." Another, Colonel Szafranski, spoke of "targeting epistemology."[2] The same word means raw data, filtered information, processed intelligence, and considered knowledge. Ambiguity has its advantages and its dangers.

Confusion occurs because terminology is both too loose and too precise. The civilians and soldiers who originated the concept "IW" meant it to indicate something between the poles defined by John Arquilla and David Runfeldt: "netwar" (non-state actors using techno-political means on the Internet to further their objectives, for example, by enhancing their propaganda) or "cyberwar" (state sponsored hacking against any adversary and defence against the same).[3] In American doctrine, however, "CNA" or "CNA/E" (Computer Network Action/Exploitation) means "cyberwar," while "IW" means a struggle by a state in time of war over data, information, and knowledge using all methods, ranging from CNA to deception to jamming a radio frequency to bombing a headquarters. "IW" is just one form of "IO," which can occur in peace and war. The defined applications of IO, "command and control warfare" (C2W), in both civil and public affairs, fall short of "netwar," but that is partly an artifact of bureaucracy. Though civilian agencies and intelligence services conduct many functions of IO (for example, black propaganda in peacetime), the American literature focuses on those matters controlled by armed forces. The Pentagon cannot write doctrine for the CIA, nor is the latter likely to be published; one should not forget the context merely because it is unspoken. Even more, many extant publications use the terms IW and IO in superceded ways, while the USAF defines IO rather as the JCS does IW.[4] Those problems can be overcome with time and the harmonization of terminology. For convenience sake, I will generally use contemporary American terminology but will aim for precision in my use of the words data, information, intelligence, and knowledge.

Faith in knowledge is central to military doctrine. It is expressed in formulas like Information Superiority or the Joint Visions which guide strategic policy, the concepts of war pursued by each service and the overarching idea of NCW (that armed forces will adopt flat organisational structures for command, units working in nets on the net, sensors linked to shooters, data processing systems at home serving as staff for the sharp end through "reachback"). Joint Visions 2010 and 2020 predict forces with "dominant battlespace awareness," possessing better knowledge than, and a "frictional imbalance" and "decision superiority" over, an enemy, as well as unprecedented flexibility of command: the ability to combine freedom for units with

power for the top and to pursue "parallel, not sequential planning and real-time, not prearranged, decisionmaking."[5] These and other official documents agree that friction and uncertainty will continue to shape combat, but they will do so *sotto voce;* they place these matters more in the theory of war than in its practice. The revolutionary literature goes further still. Colonel Jensen holds that one cannot merely "thicken the fog of war for our enemy"; he also holds that we must, "lift the fog of war for ourselves to create a "transparent battlefield ... The enemy completely and forever loses the element of surprise. We watch him, we hear him, we seek out his hiding places."[6] The Air Force 2025 project wrote, "Knowledge is the biggest force multiplier." Its contributors predicted a C4ISR system with the self-awareness of a man or a god: "a series of intelligent microprocessor 'brains ... ' all-knowing, all-sensing with regard to changes in the target environment, system status, sensor status, access, information demands, user needs, people skills, and expertise, as well as detecting sophisticated hackers violating the system"; "an intelligence architecture with human-like characteristics. It will simultaneously sense and evaluate the earth in much the same way you remain aware of your day-to-day surroundings"; "thousands of widely distributed nodes performing the full range of collection, data fusion, analysis, and command functions – all linked together through a robust networking system. Data will be collected, organized into usable information, analyzed and assimilated, and displayed in a form that enhances the military decision-maker's understanding of the situation. The architecture will also apply modelling, simulation, and forecasting tools to help commanders make sound choices for employing military force."[7] Such statements admittedly come from enthusiasts, but they are indicative. A key group assumes that C4ISR will function in a system in precisely the same way a person sees the world, turns data into knowledge, and acts on it. Anthropomorphism is a costly fallacy – one misinterprets animals when likening them to humans; So it is with systems. Enthusiasts, including senior officials, assume armed forces can comprehend an enemy and a battle perfectly and then act on Dominant Battlespace Knowledge (DBK) without friction through NCW. David Alperts, the Pentagon official in charge of developing NCW, holds that

> we will effectively move from a situation in which we are preoccupied with reducing the fog of war to the extent possible and with designing approaches needed to accommodate any residual fog that exists to a situation in which we are preoccupied with optimizing a response to a particular situation.
>
> In short, we will move from a situation in which decision-making takes place under "uncertainty" or in the presence of incomplete and erroneously *[sic]* information, to a situation in which decisions are made with near "perfect" information.[8]

Mainstream officials do not go that far in theory, but still approach these views in their predictions of practice. Even more: in moving from RMA to DBK, war has been conceptualized as game and strategy as shooting. The revolutionary literature and Joint Visions alike assume that to be seen is to be shot, to be shot is to be killed, and to be fast is to win. As Colonel Warden wrote, "a very simple rule for how to go about producing the effect: do it very fast – the essence of success in future war will certainly be to make everything happen you want to happen in a very short period of time – instantly if possible."[9] These tendencies are reinforced by the routine use of Colonel John Boyd's OODA cycle – Observe, Orient, Decide, Act – as the means to conceptualize all forms of conflict on all levels of war, with the aim usually defined as being to move through the cycle faster than one's opponent. Wiser heads urge that this edge be used to think more, rather than simply act faster. This model, derived from Boyd's reflections on his experience as a fighter pilot in the Korean War, is a good way to conceptualize any form of one-on-one combat. It is less useful for war. In a boxing match, speed of decision may equal quality of decision; Strategically, cries of "faster! harder!" produce premature ejaculation. In contemporary military theory, the focus on the OODA cycle, "sensors to shooters," "one shot, one kill" weapons, and the idea that armed forces can act almost without friction on near-perfect knowledge has led to a fetishization of speed and the tacticization of strategy. These assumptions are especially seductive to airmen, because they reinforce long-standing characteristics in the Anglo-American tradition of air warfare: the tendencies to generalize about a looming RMA and then to treat one's guesses as facts and a future as if it were the present; to confuse the process involved in achieving an object for its significance – what Colin Gray calls "the world is my dartboard view of aerial strategists ... To the air strategist, targeting is strategy";[10] to overcentralize C2 and to pursue knock-outs through one precise blow against a vital target without engaging the enemies' forces. Airmen are great problem solvers, but they are prone to view conditions as problems.

The faith in the military value of knowledge is multiplied by a tendency to mistake the rarest achievements of intelligence for its norms. In 1995, for example, USAF Chief General Ronald Fogleman discussed triumphs like ULTRA and said, "Throughout history, soldiers, sailors, Marines and airmen have learned one valuable lesson. If you can analyze, act and assess faster than your opponent, you will win!" – unless, of course, your opponent is stronger or smarter or luckier than you.[12] Where intelligence once was undervalued, now it is oversold, a situation which is also oversimplified. The assumptions are that it will be entirely reliable, understood, useful, and usable. One can learn exactly what one wants to know when one needs to do so and can then verify its accuracy with certainty and speed. The truth and only

the truth can be known. It will show what should be done and what would be the consequences of so doing. Actions taken on knowledge will have the effect one intended – nothing more or less.

Of course, intelligence is valuable. Often it is a powerful force multiplier, rarely does it strike like lightening. It reduces friction and uncertainty. It maximizes the efficiency of the use of one's resources, while minimizing that of any opponent. All of this, however, occurs in the context of a balance of intelligence, of a reciprocal struggle between actors, where every action shapes all of them in anticipated ways and unexpected ones, where two good intelligence services can negate each other and gain less than a mediocre bureau might against a bad one. Intelligence also has limits. It is marked by frictions, pathologies, and uncertainty. The quality of intelligence varies from case to case, and its value is unpredictable in advance. No method can always lead to truth (which often is useless), nor is intelligence easy to assess. An event may have an unambiguous meaning; evidence about it rarely has an unambiguous interpretation. Decision-makers are reluctant to change their minds, and they tend to interpret bits of information on the basis of preconception. Good intelligence may be unusable or it may invalidate itself. If one determines another side's intentions and forestalls them, one may force it towards unexpected action. Intelligence can fail by succeeding. It is as important to know what intelligence cannot do as what it can.

In order to understand these matters, one must embrace paradoxes, not dismiss them; they embody the unresolvable dilemmas without linear solutions which epitomize the relationship between strategy, intelligence, decision-making, and war. Failure to appreciate this point cripples the case that NCW and C4ISR will overcome uncertainty. They merely will create a new kind – what Michael Handel called "Type B uncertainty"– the problem of decision-making in a context of too much and too constantly changing information.[13] Uncertainty is not merely about what is seen, but about how we see; not just what we know, but how we know that we know what we know; because of too few facts – and too many. Uncertainty is a condition associated with problems. The problems can be solved, though attempts to end one often create another, and probably it is impossible to eliminate all of them at any one time; the condition can only be endured. One can increase one's certainty and reduce that of an adversary or gain a relative advantage over it, and these gains may be great, but none of this is easy to achieve. Usually, uncertainty will remain sizable. It never can vanish – chess players, knowing their foe's dispositions, remain uncertain about their intentions and the clash of their own strategies. C4ISR and DBK will increase uncertainty precisely through the way they reduce it; so, too, friction. In time of

routine, they will provide more data than a general needs. In time of crisis, they will produce less. How far will the ability to collect and process information under routine circumstances affect ideas of what intelligence can do when it matters? Will such a routine not merely hide pathologies and paradoxes and make them even more debilitating when they strike? – which will be when it matters. What will a machine relying on the receipt of facts in hosts do if deprived of them? how will information junkies behave when thrown into cold turkey – exactly at that moment when battle starts?

One can reduce these new forms of uncertainty through old-fashioned means. One must start by dismissing the idealist fallacy from strategy and put information and intelligence and knowledge in their place. They do not make or execute decisions, people do, and more fundamental issues – their education, intuition, doctrine, character, courage, openness of mind, wisdom, attitudes towards risk – determine how they understand and apply it. Knowledge is only as useful as the action it inspires. Decision-makers should listen to intelligence and consider whether their perceptions are accurate, whether they are pursuing the best means to achieve their ends or noting all the salient points; yet they must also remember that intelligence cannot answer every question. They cannot wait for the last bit of information to be received and for data processing to make their decisions. They must know when to act without intelligence or knowledge – that is why they are leaders. Soldiers are not scholars – they do not need to know everything about something, or more and more about less and less. They simply need to know well enough so they can act well enough when they must, and they need to understand when that moment is – no more, no less. The key questions are: What do you need to know? When and how can you know that you know enough to act, or know that you know all you can use?

The answers stem from the training of commanders and the techniques of C4I. The Command, Control, Communications, and Intelligence Office at the Pentagon defines the aim of information superiority as "ensuring that the right people, and only the right people, have access to the right information at the right time in the right forms." [14] That is the correct aim, but it is easier said than done. Many records in the public domain indicate it has not yet been achieved. Experience in the Kosovo campaign led Air Commodore Stuart Peach to sombre conclusions: "The drive to streamline procedures and handle ever more data has had an important side effect; airmen have become driven by process not strategy,"; "In reality, theory, doctrine and practice collide with process. Airmen claim one thing (centralized command and decentralized execution) and in fact practice another (centralized command and centralized execution)"; and "Refining the process of airspace control orders, air tasking orders and air task

messages became the performance criteria, rather than creative and bold operational ideas or campaign plans." [15] The USN's "Global 2000" war games tested the application of NCW. It found both the power of C3I and its classic problems multiplied; for example, with every member of the net able to post notes and edit orders and reports, information overload paralyzed command – officers had so much data that they could use little of it, and bad coin drove out good. One witness questioned the validity of "visions of a command-and-control structure akin to the civilian internet ... that the natural creativity, spontaneity, and adaptability of war fighters can be unleashed by freedom from constraint analogous to that of the civilian Internet in commercial settings." [16] All shades of opinion recognize that the move toward C4ISR has magnified problems such as information overload, micromanagement, and the fruitless search for certainty, for which they share many proposed solutions (changing the culture of command being but one). Nonetheless, major differences have emerged between revolutionaries and others, between those who see only problems and those who also see conditions. The USMC's draft doctrine on IO denounces the idea that technology can solve all problems and emphasizes the need to retain "our timeless fighting principles"; Army doctrine shares this view. [17] Enthusiasts, conversely, perceive solutions through revolutionary changes to command, such as war like Nintendo or by swarms. Either commanders will have instantaneous and simultaneous control over all of their pieces, or units will operate with complete independence while still achieving a harmony of the whole. [18] One revolutionary theorist, Thomas K. Adams, notes that

> our endless quest for certainty is creating an "information pathology" ... Increasing complexity has led to increasing specialization that has led to increasing demands for information at all levels. This spawns new organizations and expands old ones to satisfy the demand for information, which in turn creates still more demand which in turn creates more complexity and so on. This cycle quickly becomes debilitating and [leads], at best, to severe information congestion and overload.

He concludes, "Future generations may come to regard tactical warfare as properly the business of machines and not appropriate for people at all." [19] Instead, only digital, automatic, nonhuman, and inhuman means can allow a true C4I and NCW and S2S system to work.

The conditions of command for humans cannot be solved, but the problems may be. Technology can transform some matters, for good and ill. Between 1898 and 1945, radio enabled a revolution in command and also created a new source of intelligence and insecurity. Efforts to deal with jamming, interception, and physical attack reduced the theoretical efficiency of the military use of radio by perhaps 90 per cent. In recent years, communication technology may have reduced these

problems but multiplied those of information overload, just as computers increase one's ability to process data while swamping one in it. Meanwhile, institutional solutions can turn some problems of intelligence into those of information processing, and of strategy into tactics. From 1912 to 1945, battleships had data processing displays which represented the adjacent battlespace with power and in real time, as have fighter aircraft since 1975, though during those years, the space represented expanded from two dimensions to three and in diameter from ten to five-hundred miles. Strategic air defence systems and general staffs allowed military institutions to handle extraordinary problems of collection, analysis, and action with great efficiency. Even in 1918, British air defence was able to collect and correlate reports on enemy air raids from thousands of sources over a 2,500 square mile area and convert them into an accurate and real-time picture for its commander within 90 seconds, and then to launch fighters to act on this information within another 90.[20] In order to create a fluid but hardened information and command system under present circumstances, one must determine how C4I will function and how each level or unit will interact when at work in war. This will determine how far armed forces can fight in nets on the net and how flat or fat their hierarchy can be. Possibly one or another layer of command may safely be eliminated; certainly, forms of middle management and hierarchy will still be needed to let units fight effectively when under attack. Then one can devise organizational short cuts, such as "push" or "pull" techniques to distribute information to units, or "directed telescopes" to let commanders learn with immediacy and effect about whatever matters concern them, or drills to link sensor and shooter. The aims must be to simplify the flood of data and direct it where needed, thus avoiding the classic problem with satellite imagery, when one knew what to look for only after the start of the crisis when that knowledge was needed. It will be hard to gain full access to data about known unknowns and impossible about most unknown unknowns. Nor can any such systems be effective unless doctrine and training prepares people to use it. Units must be able to operate in harmony without command, through some new version of "marching to the sound of the guns." Commanders must learn to act when they have a good enough picture of events, even when it clearly is imperfect and new information is constantly arriving, and to understand when they have achieved that condition. Sometimes this process is called "to opticize"; Clausewitz termed a similar process the "imperative principle."[21] When combined, these means have power and limits. They can solve many problems of command, perhaps most of them, but not all, and conditions will remain. C4ISR will be a function of a complex system manned by many people. It will suffer from all of the things natural to humans and complex systems, including uncertainty and friction, unachieved intentions, unintended consequences, and unexpected failures and successes.

If so, how likely are the claims for DBK and NCW to be realized by 2020? They can most easily be fostered for diplomacy and strategy in peace – too easily. This, alas, will reinforce attempts by figures at home to control all tactical details abroad – increasing friction, micromanagement, and information overload – as politicians become entangled with their privates. In war, DBK and NCW may work as hoped, but only when one belligerent absolutely outclasses its adversary. They probably cannot function in a serious clash between peer competitors, because each would simultaneously attack the other's ability to fight at this level, forcing both into the classic downward spiral which degrades the power of C3I. For the strategic level in war, the case is uncertain but important: how will generals act when they can command any, but not every, individual soldier? or soldiers when they can seize the prerogatives of command? or armed forces when all these things happen simultaneously? Again, without middle management, armed forces have no operational need for officers between major and brigadier. What would this do to career structures? how will captains learn to be generals? For this reason, the officers of elite forces question NCW. At the operational level, DBK and NCW will work far less well for armies than for air forces and navies, which over past generations often have used a C3I system structurally similar to that assumed by NCW, if the shooting platform, warship or aircraft, is treated as the unit, rather than the individual members of a cruiser, fighter base, or infantry battalion. Some forms of platformcentric warfare also were netcentric. NCW may work well against some conventional enemies, perhaps many of them, and the ability to deter or defeat such a source of challenge is a major advantage, but it has its limits. NCW and DBK will always be vulnerable to any technologically competent foe. GPS was essential to the left hook which flattened the Iraqi army, and such channels are easily jammed; what if this had occurred in 1991? NCW will be irrelevant in irregular warfare, including struggles against terrorists. If NCW fails in any instance on which it is relied, disaster will be redoubled precisely because of that fact; and fail NCW must, sooner or later. If successful, it will force one's adversaries to find solutions by evading your strength or by making you play to your weaknesses. It is always convenient when one's enemy chooses to be foolish or weak, or foolish and weak, but sometimes it does not choose to be, and you will be a fool to assume it must be one. A smart but weak foe may simply refuse to play any game where you can apply your strengths, and make you play another one, such as terrorism. A tough and able foe might turn the characteristics of your game and machine into a strength of its own, by attacking any precondition for DBK and NCW and then by imposing its rules on you. By doing what suits them in the context of our power, they will change their strengths and weaknesses – and yours, too.

Compared to C4ISR and NCW, IO is a less novel and less problematical concept. IO is a new term, perhaps adopted because IW had already acquired conflicting meanings. It embraces many "disciplines" – deception, operational security, electronic warfare (EW), and psychological operations. With the significant exception of CNA, however, IO does not involve pouring old wine into new bottles, merely placing new labels on old bottles. Functions which intelligence officers once might have conducted in a general staff (perhaps with operations, security, and signals personnel in secondary roles) are now treated as a combat arm, controlled by the senior operations officer, with intelligence personnel first among equals of specialist elements. This rise of Operations and decline of Intelligence is marginal and reasonable; IO are operational matters, but they need a close relationship with intelligence and other elements. The basic doctrine for IO is sound, and it is close to the best practices of the best practitioners of two world wars. IO should be controlled by an officer directly responsible to a commander, guided by a small "cell" of specialists able to provide expertise and liaison; the various "disciplines" of IO should be "fused"; not merely coordinated, but combined.[22]

American doctrine on deception, for example, rests on intelligent consideration of the analyses of the best practitioners and scholars. It defines all aspects of intelligence as force multipliers to be integrated into every aspect of planning and operations. Intelligence, psychological warfare, and operations security have a dynamic relationship with deception, the attempt to "deliberately mislead adversary military decision makers as to friendly military capabilities, intentions, and operations, thereby causing the adversary to take specific actions that will contribute to the accomplishment of the friendly mission." This doctrine for deception defines sound principles: "centralized control" and "security"; "timeliness" in planning and execution; "integration" of deceit with an operation; and above all, "focus" and "objective," aiming to influence the right decision-makers and to affect their actions – to treat the manipulation of intelligence and ideas merely as means to an end. In order to achieve these ends, practitioners must understand their foe's psychology, "possess fertile imaginations and the ability to be creative while using and understanding each component of deception and C2W capabilities." They must pass a story through many sources which an adversary will find believable, ideally by reinforcing its expectations. This doctrine is powerful, but it has weaknesses which stem from the roots of its strength, the influence of the British tradition of deception, reflected through the campaigns of 1943–44 and culminating in FORTITUDE, the cover for the invasion of Normandy. The latter stems from so many unique circumstances that it is a poor guide to the average. To treat it as normal is to assume that deception is precise and

predictable, that one will have edges equivalent to ULTRA and the "double cross system," while the enemy's intelligence is castrated. These are tall assumptions. Again, "focus" and "objective" are fine principles, but in order to make key decision-makers act as one wishes, one must know who they are, what they expect, how to reach them, and how to know whether one has succeeded. This is not easy. Deceivers wrestle with uncertainties and pull strings they hope are attached to levers in a complex system they do not understand. Deception rarely has just the effect one wants and no other. The unintended cannot be avoided. American doctrine urges that this difficulty and others be resolved through risk assessment, but that is to mistake a condition for a problem. Reason is good, war games are fun; when assessment concludes, risks remain. Never when one deceives will one know all the unintended consequences in advance. Rarely will one know if deception has worked when one must act. [23]

What can one expect from IO? They have a proven track record. During the First World War, psychological operations achieved remarkable successes, as did deception and operational security in 1917–18, though EW remained primitive. IO had even greater effect in the Second World War. Perhaps the greatest change was in deception, which was applied to more and greater matters – to cover German and Japanese surprise attacks in 1941 and to mislead Germany about the capabilities and intentions of every ally between 1942–45; meanwhile, EW became mature. During the Cold War, these matters were practiced constantly and often with significance, though the full story no doubt has not been told. IO are powerful tools, but they do not necessarily work as one hopes, and they can also be used by one's adversary. Defence matters as much as attack; it simply is harder. Their power will be multiplied in an unpredictable way by the rise of a new discipline. Unclassified material rarely refers to CNA, but the topic has not been ignored, simply treated with secrecy, just as armies did deception and signals intelligence between 1919–39. One USAF intelligence officer notes the following: "offensive IO weapons ... remain shrouded in limited-access programs"; the JCS's doctrine on IO discusses CNA in a classified annex; in 2000–01, the USAF sponsored research into specialist "Cyber-Warfare Forces," "potential targeting issues," and "how to mitigate or minimize collateral damage effects," how CNA would affect "the full-spectrum of Information Attacks" and create new "broadly defined multi-disciplinary activities, such as: cyber-based deception, Electro-Magnetic Interference (EMI), Web Security, Perception Management. How do we integrate/fuse input and provide a COA (Course of Action)?" [24] The Pentagon's Command and Control Research Program describes CNA as, "a rapidly evolving field of study with its own concepts and technology." [25] Sooner or later, some state

will let slip the bytes of cyberwar with uncertain effect. CNA may revolutionize IO by incapacitating computer systems or by replacing true data with false, or it may prove Y2K revisited. So too, the nature of power in CNA is unknown: "How do you measure IO power?" asks the USAF's Institute for National Security Studies; "How would one calculate Correlation of Forces á la past Soviet/Russian approaches?"; "What are the 'units of IW force' or their structure, e.g., squadrons of IW computers?" [26]

The literature on IW and IO has been Americentric, focusing on how the United States should exploit the information revolution. In fact, IW may multiply the power of other states more than that of the United States, which might not be a hyperpower in this area. It has the greatest potential ability to conduct cyberwar, but this position has been sapped by the NSA's feud with the American computing community, its greater power in and reliance on computers increases the United State's vulnerability to cyberwar, while anyone can exploit for free the massive American investment in the Internet. Anyone able to employ a hacker for love or money can hope to gain from cyberwar, while attack somewhere is easier than defence everywhere. The entry costs for cyberwar are small, the potential payoff large, and the consequences uncertain. Defence of vital sites and recovery from onslaught may prove easy. Cyberwar may be treated as a weapon of mass destruction and never used for attack, though adding a new twist to deterrence. A first strike in IW may be so advantageous that it creates an imperative to move first. If CNA proves significant, that fact alone may raise the average of IO to its top level of the twentieth century.

Despite its power, the idea of IO has its problems. In American doctrine, its main role is to support C2W, perhaps the main form of conventional operations that the United States plans to fight and one which targets epistemology. The aim is "to deny information to, influence, degrade, or destroy" the "information dependent process, whether human or automated" of enemy C2 by attacking "all the capabilities, thought processes, and actions that allow a commander to correctly observe the AOI; assess what these observations imply about the operation; use assessments to make timely, effective decisions; and communicate these decisions as orders to subordinate commanders in order to control the course of an operation"; "causing hesitation, confusion, and misdirection among adversary commanders contributes to slowing the adversary's operational tempo." [27] C2W is an effective way to conceptualize conventional warfare and to bring intelligence and IO to battle. This end is worth pursuing but it is not easy to reach. In order to do so, an armed force requires relative superiority in it and a high, absolute level of intelligence and IO; while the latter have an excellent track record in attritional struggles, they matter less to them than to mind games. One can win

decisively in attritional or maneouvre warfare without first doing so in intelligence or IO; a draw in intelligence precludes victory in C2W. This idea also suffers from flaws like those of C4ISR and NCW. It overstates the significance of intelligence and knowledge in battle. It assumes one can always play to one's strengths and ignore one's weaknesses and impose one's will on an enemy and stamp one's rules on war. Drawing from Sun Tzu, Basil Liddell Hart, J.F.C. Fuller, Guilio Douhet, Hugh Trenchard, and colonels Boyd and Warden, C2W rests on the assumption one can shatter an enemy's will or command or key nodes of power while evading its strength, whether that is used on the defence or the attack. Sometimes such ends can be achieved, but not always, nor often. C2W can succeed when one has a great edge over one's enemy in IO, C4ISR, and power, and when precise attacks against key nodes are possible. When both sides are closely matched or the enemy is strong and tough, then combat of a more conventional kind will occur; attrition is a natural form of warfare – perish the thought. The doctrine of C2W does not discuss these possibilities. Indeed, it masks their existence, because its definition includes physical attack on the enemy, through which means C2W may easily turn into more conventional combat. So long as those planning for C2W appreciate how easily it can be transformed and prepare for such an event, however, they can gain from the effort. Even if C2W fails to work entirely as planned, partial success will bolster one's position in other forms of conventional combat for which IO and intelligence will be valuable. The watchword for war in 2020 should be: Play mind games; Prepare for body blows.

NOTES

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Because this piece was first published in 2003, some of the URLs cited are no longer operational. It was not possible to update all of them. Remaining non-functioning links are italicized.

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