

Future Global Nuclear Threats



**A report prepared for
the Advanced Systems and Concepts Office,
Defense Threat Reduction Agency,
Ft. Belvoir, Virginia**

**Greg Giles, Team Leader
Candice Cohen
Christy Razzano
Sara Whitaker**

4 June 2001



SPONSOR: Defense Threat Reduction Agency
Dr. Jay Davis, Director

Advanced Systems and Concepts Office
Dr. Randall S. Murch, Director

BACKGROUND: The Defense Threat Reduction Agency (DTRA) was founded in 1998 to integrate and focus the capabilities of the Department of Defense that address the weapons of mass destruction threat. To assist the Agency in its primary mission, the Advanced Systems and Concepts Office (ASCO) develops and maintains an evolving analytical vision of necessary and sufficient capabilities to protect United States and Allied forces and citizens from WMD attack. ASCO is also charged by DoD and by the U.S. Government generally to identify gaps in these capabilities and initiate programs to fill them. It also provides support to the Threat Reduction Advisory Committee (TRAC) and its Panels with timely, high quality research.

ASCO ANALYTICAL SUPPORT: SAIC has provided analytical support to DTRA since 1999 through a series of projects on nuclear, chemical, and biological issues. This work was performed for DTRA under contract DTRA01-00-D-0003, delivery order 0001.

SUPERVISING PROJECT OFFICER: Dr. William J. Durch, ASCO
Advanced Concepts and Technologies Division, (703) 767-5712.

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EXECUTIVE SUMMARY

This report provides a survey of assessments of the nuclear weapons environment out to the year 2020, as seen by three communities: academia and non-governmental organizations (A/NGO); international and foreign government perspectives (I/FG), encompassing foreign, foreign press, and international organizations; and the US Government (USG) as depicted in unclassified statements. Nearly 220 sources from these communities form the basis of this report.

VARIATIONS IN THE ASSESSMENTS

- *In many cases, it is difficult if not impossible to properly assess why projections of a country's nuclear and missile capabilities vary because the sources themselves do not make explicit their methodology or evidentiary base.*
- *Differences of opinion arise for apparently sound analytical reasons.*
- *Some communities are less willing to offer detailed explanations due to political and other sensitivities.*
- *Projections are particularly subject to variation where there is a weak baseline from which to project.*
- *Assessment standards for a given analytical source can change over time.*
- *Projections, by nature, are highly scenario dependent.*
- *Ideological differences can bias results.*
- *Perhaps the most common, and most influential, variable in the projection of future nuclear capabilities is the degree of foreign assistance provided.*

THE FUTURE NUCLEAR ENVIRONMENT: HIGHLIGHTS

Positive Trends

- *The majority of the NPT nuclear weapons states are significantly scaling back their nuclear arsenals.*
- *The number of nuclear proliferation problem countries has remained relatively stable – and low.*
- *Vertical nuclear proliferation remains a concern in a small number of countries, but the prospects for sudden and drastic nuclear build-ups appear low.*

Negative Trends

- *In some key cases, reliance on nuclear weapons and nuclear brinkmanship is increasing.*
- *US conventional military superiority and forward presence are encouraging regional powers to adopt asymmetric strategies based on nuclear, biological, and chemical (NBC) weapons.*
- *By 2020, the United States could face new ICBM threats from regional adversaries.*
- *Experts in and out of government agree that forecasting proliferation developments is becoming more difficult.*
- *The unique strategic personalities or cultures of emerging regional powers casts doubt on whether deterrence will prevail.*
- *The NBC terrorism threat is seen as likely to increase in the years ahead.*

US AND GLOBAL THREAT IMPACTS

- *Within the next 10-15 years, a greater number of countries could target the US homeland with NBC-armed ICBMs.*
- *Russian insecurity and questionable weapons surety could lead to precipitous nuclear escalation or accidental/unauthorized nuclear release.*
- *The proliferation of ballistic missiles with longer and longer ranges is putting more US overseas bases and allies at risk.*
- *The asymmetric NBC strategies being pursued by US adversaries will raise the costs of intervening in a regional crisis or conflict.*
- *Wider possession of nuclear weapons would likely increase the willingness of regional powers to confront the United States.*
- *Further NBC proliferation could undermine US efforts to form and maintain international coalitions.*
- *To further complicate US defense planning, China could respond to deployment of a US national missile defense by proliferating countermeasure technologies abroad.*
- *Increased expressions of interest in NBC weapons by terrorists raises the risks of NBC use against US interests and territory.*
- *Regional balances of power are being undermined as ballistic missiles and NBC weapons spread.*
- *Miscalculation by India and/or Pakistan could lead to another war and potentially nuclear escalation.*
- *Poor command and control arrangements in new nuclear powers pose a risk that nuclear explosions may occur by accident or unauthorized use.*
- *India and Pakistan's decision to cross the nuclear threshold in 1998 only serves to encourage other countries to obtain nuclear weapons.*
- *A unified Korea with a nuclear weapons capability would be seen as a serious threat by Japan.*
- *By targeting regional powers with nuclear weapons, the United States gives them justification to acquire nuclear weapons of their own.*
- *Nuclear weapons continue to be seen as the coin of international power.*

MOTIVATIONS TO PROLIFERATE

- *Regional powers view nuclear weapons and long-range missiles as a way to deter the United States from intervening in a crisis or conflict.*
- *Countries will be encouraged to expand their nuclear and ICBM capabilities to counter the deployment of US missile defenses.*
- *Countries see nuclear weapons and ICBMs as enhancing their prestige.*
- *Nuclear weapons are seen by some countries as force-multipliers that help to compensate for conventional force weaknesses.*
- *The sale of NBC and missile technologies, expertise, and materials is financially lucrative.*
- *Countries seek nuclear and missile capabilities to offset the NBC capabilities of their adversaries.*
- *Nuclear weapons provide a substitute for security guarantees.*
- *Nuclear weapons help ensure national/regime survival.*
- *Nuclear weapons provide a high-stakes bargaining chip.*

- *Nuclear weapons confer tremendous shock value and the ability to inflict mass casualties.*

US ABILITIES TO DISCOURAGE PROLIFERATION

- *Because many proliferation incentives are rooted in the anarchical character of the international system, there are pragmatic limits as to what the United States by itself can achieve in nonproliferation.*
- *Since states are usually proliferating for a variety of reasons, even where the United States has some influence, using it may not necessarily bring a halt to proliferation activities.*
- *Areas where the United States can help to discourage proliferation include the following:*
 - *Keep the Agreed Framework with North Korea on track.*
 - *Continue to work with Russia to improve controls over nuclear weapons materials.*
 - *Expedite deeper reductions in strategic nuclear weapons.*
 - *Engage India and Pakistan in crisis management activities.*
 - *Address more effectively international concerns that deployment of US missile defenses will ultimately have destabilizing consequences.*
 - *Ratify the Comprehensive Test Ban Treaty (CTBT).*
 - *Reinvigorate negotiations on a fissile material cutoff treaty (FMCT).*

I. INTRODUCTION

At the request of the Defense Threat Reduction Agency, Advanced Systems and Concepts Office (DTRA/ASCO), SAIC's Strategies Group surveyed assessments of the future nuclear threat environment from the perspectives of three communities: unclassified US Government (USG) sources, including the Congress and defense contractors; academia and non-governmental organizations (A/NGO); and international and foreign governments (I/FG). This category includes such sources as Ministry of Defense White Papers and foreign media reports. SAIC evaluated these assessments in the following seven areas, which form the organizational basis for this report:

- Sources and methods;
- Variations in the assessments;
- The future nuclear environment: highlights;
- Foreign nuclear capabilities to the year 2020
- US and global threat impacts;
- Motivations to proliferate; and
- US abilities to discourage proliferation.

Two key underlying assumptions in this survey, and indeed in the sources themselves, are that the Comprehensive Test Ban Treaty (CTBT) and the Nuclear Nonproliferation Treaty (NPT) remain fundamentally intact over the next 20 years.

II. SOURCES AND METHODS

A survey project of this nature is typically bounded by resource and time constraints rather than a lack of available data. The research strategy employed by SAIC maximized both time and funding resources by focusing on: 1) materials readily available over the Internet; 2) sources already in SAIC's specialized library; and 3) searches of limited access databases, including: the Defense Technical Information Service; the Foreign Broadcast Information Service; and Lexis-Nexis. In addition, SAIC researchers used the Library of Congress and University of Maryland databases to identify pertinent materials for subsequent collection and analysis.

The data identification and collection phase of this project commenced in early 2000. SAIC researchers focused on data published since 1995. This limit was set to preserve resources for the summary and analytical portions of the project, as well as to capture more current thinking. Some exceptions to this post-1995 focus were made to include material that was determined by SAIC to be particularly valuable to the reader. Data collection efforts were completed by mid-2000. A subsequent round of collection and analysis was made in early-to-mid 2001, during the DTRA/ASCO comment and revision phase of the project. This enabled the SAIC team to include new publications, such as the Defense Department's 2001 edition of *Proliferation: Threat and Response*.

To support this evaluation, SAIC reviewed nearly 220 sources from the three communities. While the full range of these sources can be found in the bibliography, highlights include the following:

- *International Security*
- *Survival*
- *Security Studies*
- *The Military Balance*
- *Strategic Survey*
- *Proliferation Issues* (Joint Publication Research Service)
- International Security Network (<http://www.isn.ethz.ch/>)
- Carnegie Endowment for International Peace (<http://ceip.org/npp>)
- Center for Nonproliferation Studies, Monterey Institute of International Studies

SAIC acknowledges gaps in its collection efforts. For example, Federally Funded Research and Development Corporations (FFRDC), may be under-represented in this report. SAIC searched DTIC for one such FFRDC, the Institute for Defense Analyses (IDA). No IDA publications pertaining to this project and published within the 1995-2001 timeframe were found in this manner, nor was a direct approach to IDA made. In other cases, SAIC may have overlooked particular articles in journals, as they or their indices were not available to us at the time.

The SAIC team vetted sources generally for their credibility. Scholarly works by well-known analysts and organizations, peer review journals, as well as the United States Government, thus make up the bulk of the sources cited. Moreover, the sources selected by SAIC are intended to represent a broad range of opinion. In some cases, there appears to be an expert consensus about future nuclear capabilities (e.g., Russia's downsizing), while other issues (e.g., China's nuclear modernization, and future ballistic missile threats to the United States) are much more contentious. (The multiple causes of these variations are addressed in Section III, below.) SAIC makes no judgment as to which opinions are "correct." Nor does SAIC use of these sources necessarily affirm their reliability. Often such judgments can only be made by referring to classified data, which was beyond the scope of this report. Rather, this report lays out a representative sampling of informed speculation about the nuclear future, from which readers can draw their own conclusions.

This approach also applies to the sources highlighted in Section V, Foreign Nuclear Capabilities to the Year 2020. The tables in this section are intended to give readers a sampling of the views expressed in the three communities. Where possible, assessments on a key issue, such as when a country is expected to acquire a nuclear weapons capability, are juxtaposed in the tables to facilitate cross comparisons. Similarly, assessments that reflected a high degree of variance, such as the 1998 Rumsfeld Commission Report and the 1999 National Intelligence Estimate on ballistic missile threats to the United States, are highlighted in the tables. Sources from adversaries of a subject country are also highlighted in the tables (e.g., Israeli views on Iran's nuclear timetable) for comparison purposes. Readers are cautioned that such adversarial sourcing can be subject to exaggeration, perhaps in direct correlation to the geographic proximity of the antagonists. Readers are encouraged to refer to the country profiles in the appendix, as well as the original sources themselves, for more detailed treatments of the subject matter.

In no case did SAIC exclude a source because of its political or ideological orientation. In some instances sources were not used because, despite promising titles, they were found to have little if any direct relevance to the subject matter.

In some cases, an author's *bona fides* could not be established by SAIC researchers (e.g., only a single article by an otherwise unknown author was found in a non-referred journal). Such works have been included in this report nonetheless, as they were determined to add substantively to a given country profile. SAIC made limited use of foreign press accounts. Readers are cautioned that such sources can have a tendency to exaggerate. They are included in the study to provide the reader with some sense of the hyperbole that can exacerbate a foreign nation's threat perceptions. Foreign media reporting also can have less accuracy than its western counterparts or more scholarly works. For example, foreign media often confuse missile designations and ranges. Where possible, SAIC has corrected for these mis-identifications.

SAIC structured this project in a three-step process:

- Step 1: An SAIC researcher was assigned a particular community (e.g., A/NGO, I/FG, USG) and collected from it nuclear weapons-related information pertaining to each of the 14 countries. To organize the data and facilitate comparison across diverse sources, SAIC adopted a common research template, which its researchers used to produce source abstracts. In turn, these abstracts were entered into an MS Access™ database (provided to DTRA/ASCO). The database enables analysts to conduct searches by various means, such as country-by-country profile, type of threat posed, projections of nuclear force posture, proliferation motivations, author, title, and date.
- Step 2: An SAIC researcher then was assigned a particular set of countries and tasked to create a consolidated profile using data from all three communities.
- Step 3: Having reviewed the individual abstracts and consolidated country profiles, the SAIC team leader assessed variations in the assessments of the future nuclear environment, motivations for the countries to acquire nuclear weapons, and possible steps the United States could take to reduce those motivations.

The SAIC team leader bears sole responsibility for any errors or omissions in this report. This report does not necessarily represent the views of SAIC, its sponsor, or the U.S. Government.

III. VARIATIONS IN THE ASSESSMENTS

In reviewing the sources for this project, a number of variations in the assessments of national nuclear capabilities came to light. This section provides a general evaluation of those variations and, by way of example, considers two case studies: the emerging ICBM threat to the United States, and projections of China's nuclear arsenal.

A. General Observations

- ***In many cases, it is difficult if not impossible to properly assess why projections of a country's nuclear and missile capabilities vary because the sources themselves do not make explicit their methodology or evidentiary base.*** This is often the case with foreign press reports, but extends to other communities as well.
- ***Differences of opinion arise for apparently sound analytical reasons.*** For example, in the case of whether China will MIRV its ICBMs, Richard Garwin stands out against the crowd by arguing that Beijing would be unlikely to do so. He believes that MIRVs, which make ICBMs a more tempting target to an adversary, would actually undermine China's long-held nuclear doctrine, which is based on ensuring the survivability of a retaliatory capability. Garwin further argues that MIRVing is not necessarily the best way for China to counter a US national missile defense system, since less costly and less technically demanding penetration aids (e.g., balloons) could be added to missiles instead. In another instance, Gen. Eugene Habiger, then Commander of the US Strategic Command, stood out in early 1998 by declaring that Russia's nuclear command and control arrangements were sufficient. Habiger's views were solidified later in the year following his visit to a number of nuclear weapon storage sites in Russia. Habiger's assessment was more optimistic than most other commentators on the subject, but it benefited from first-hand observations of the subject matter. Skeptics have countered that Habiger's trip was carefully staged by the Russians to avoid showing systems and facilities where controls were deficient.
- ***Some communities are less willing to offer detailed explanations due to political and other sensitivities.*** A case in point is South Asia. NGOs such as the Institute for Science and International Security have developed detailed methodologies for estimating the fissile material holdings in Pakistan and India. By comparison, unclassified USG sources are reticent to put forth specific numbers on the matter. This reluctance undoubtedly stems from the need to protect classified USG information. Yet, it may also be the case that the USG is trying not to inflame proliferation pressures in the region by drawing attention to any disparities between Indian and Pakistan nuclear capabilities.

- **Projections are particularly subject to variation where there is a weak baseline from which to project.** Because public confidence is low over the *current* number of nuclear weapons in China's arsenal, for example, analysts have a greater degree of leeway in forecasting future developments (see below). This situation is not likely to improve in light of DCI Tenet's warning that proliferators are becoming more adept at concealing their activities.
- **Assessment standards for a given analytical source can change over time.** This is a major criticism of US National Intelligence Estimates (NIE) of the emerging missile threat to the United States (see below).
- **Projections, by nature, are highly scenario dependent.** Such is the case, for example, with Alexei Arbatov's projections of the Russian nuclear arsenal. Arbatov includes such scenarios as: 1) higher than currently estimated production rates for the SS-27 ICBM, 2) a Russian decision to MIRV the SS-27, and 3) the timing of and limits set by START III and START IV. In contrast, many analysts do not specify their operating assumptions, which typically include the unchanging nature of the regime in question.
- **Ideological differences can bias results.** The issue of US national missile defenses is perhaps the best example of politicization of analysis (see below), with advocates and opponents taking opposite positions on the current and projected missile threat to the United States. For example, Russia, which opposes US missile defense for its own reasons, rejects the notion that the US homeland is or will be threatened by North Korean ICBMs.
- **Perhaps the most common, and most influential, variable in the projection of future nuclear capabilities is the degree of foreign assistance provided.** Central to nearly all projections of nuclear and missile programs in countries of proliferation concern is the degree to which foreign assistance might shorten development and deployment timelines. This variable could have the greatest potential impact, yet appears to be the most difficult to anticipate or quantify.

B. Case Studies

To illustrate some of the aforementioned observations, two case studies are briefly considered: the emerging ICBM threat to the United States and projections of China's nuclear arsenal.

The Emerging ICBM Threat to the United States.

One of the sources reviewed in this project was the Congressional testimony of Joseph Cirincione, Director of the Nonproliferation Project at the Carnegie Endowment for

International Peace, on the 1999 unclassified summary of the National Intelligence Estimate, “Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015.” In his critique of the 1999 NIE, Cirincione drew the following contrasts with the two previous NIEs on the subject (in 1993 and 1995):

- The 1999 NIE’ adopted ambiguous language (e.g., country X “could” develop missile Y) not used in the previous estimates;
- The 1999 NIE expanded the measure of threat from the 48 contiguous states to any part of the land mass of the 50 states (which shortened the required missile range by 5,000 km); and
- The 1999 NIE shifted the threat timeline from when a country would first deploy a long-range missile to when it could first test a long-range missile (a difference of 5 years)

According to Cirincione, the impact of these shifts in language, geography, and development milestones from previous estimates was to exaggerate the ballistic missile threat to the United States by lowering the standards for judging the threat. Cirincione’s critique underscores the significant variation that can result when an analytical source modifies its methodology mid-stream. That such modifications were made, Cirincione suggests, itself reflects the pressure brought upon the US Intelligence Community after the 1998 Rumsfeld Commission Report painted a more dire picture of emerging missile threats to the United States. Similarly, the origin of the Rumsfeld Commission lay in the dissatisfaction of congressional proponents of missile defenses with the 1995 NIE.

Projections of China’s Nuclear Arsenal

A number of sources reviewed in the project dealt with China’s nuclear weapons modernization efforts and presented a wide spectrum of projections as to the number of nuclear weapons China could end up deploying. A closer look at several of these sources highlights some of the difficulties in assessing the variations between assessments of the nuclear future.

Although the Natural Resources Defense Council (NRDC) sources reviewed for this project did not offer projections of future growth, they are included here for base-lining purposes. In 1999, NRDC estimated China’s nuclear arsenal to comprise about 400 nuclear weapons (250 “strategic” and 150 “tactical” weapons). The NRDC is generally seen as an authoritative NGO source on international nuclear stockpiles.

At the high end of the nuclear force projections, David Tanks, of the Institute for Foreign Policy Analysis, postulated in 1997 that China’s nuclear arsenal could comprise some 3,000 to 5,000 nuclear weapons by 2010, if it so desired. Tanks cited public estimates of the Chinese nuclear arsenal of 450 weapons, but then added that the actual number could be two to three times higher. In support of this uncertainty, Tanks cited a speculative 1995 account of a purportedly secret Chinese military document that showed an existing inventory of 2,350 weapons. Evidently, Tanks extrapolated from that number in some fashion to reach his 3,000 to 5,000 total weapons estimate.

Another IFPA analysis in 1999, this time by Jacquelyn Davis and Michael Sweeney, offered a different projection. Davis and Sweeney postulate that by 2025, China could have a total of 1,500 ICBM & SLBM warheads and, with a robust command and control system, could reach parity with US nuclear forces.

In February 2000, J. Stapleton Roy, Assistant Secretary for Intelligence and Research, US Department of State, testified that China could triple the number of nuclear warheads capable of reaching the United States to 100 by 2010 if it decided to MIRV its ICBMs. While this assessment is perhaps the most detailed publicly issued on China by a US official, it does not address the *total* number of nuclear weapons that China might deploy.

In July 2000, Tanks issued another report which stated that if China armed its DF-31s and JL-2s with three warheads each, and the DF-41s were armed with 8 or 9 warheads, it is plausible that China could have 400-600 warheads capable of striking the United States. Tanks adds that if the JL-2 carries 6 reentry vehicles, the number would increase by at least 200 warheads. Tanks cites Hong Kong and US press reports as the basis for his warhead estimates.

This brief review of sources ostensibly on the same topic demonstrates the challenges to effective cross-comparisons when: 1) uncertainties exist regarding the current baseline, 2) estimates made at different times project out over different time horizons, 3) methodologies are not specified, and 4) sources use unequal objects of analysis.

COMPARISON OF SELECTED SOURCES ON CHINA’S NUCLEAR STOCKPILE

Source (Type) Date	Object of Analysis	1999	Projection for 2010	Projection for 2015	Projection for 2025
D. Tanks (A/NGO) 1997	Total weapons stockpile	NA	3,000-5,000	NA	NA
J. Davis & M. Sweeney (A/NGO) 1999	ICBM/SLBM warheads	NA	NA	NA	1,500
NRDC (A/NGO) 1999	Total weapons stockpile	400	NA	NA	NA
J. Stapleton Roy (USG) Feb. 2000	ICBM warheads	NA	100	NA	NA
D. Tanks (A/NGO) July 2000	ICBM/SLBM warheads	NA	NA	400-800	NA

IV. THE FUTURE NUCLEAR ENVIRONMENT: HIGHLIGHTS

The results of the survey show that all three communities agree that nuclear weapons will continue to play a central role in international affairs throughout the next two decades. The sources also convey a dynamic nuclear environment, with positive and negative trends, risks and opportunities. Some of the key themes that emerge in this regard are as follows:

A. Positive Trends

- ***The majority of the NPT nuclear weapons states are significantly scaling back their nuclear arsenals.*** The United Kingdom and France have drastically downsized their nuclear forces in recent years, eliminating entire classes of delivery systems, ceasing fissile material production for weapons, and making their remaining nuclear holdings more transparent. Russia, driven largely by intense economic pressures, seems eager to scrap various nuclear systems even beyond treaty requirements, while focusing on a relatively modest modernization program. The United States, for its part, is increasingly transitioning from Cold War nuclear force levels, strategies, and practices to a new paradigm and force posture that gives greater prominence to missile defenses. China's nuclear modernization program, however, remains a cause for concern (see below).
- ***The number of proliferation problem countries has remained relatively stable – and low.*** While India and Pakistan crossed the nuclear weapons threshold in 1998, they had been on proliferation watch lists for decades. Israel, for its part, has remained quiet about its nuclear capabilities, despite provocations from Iraq during the Gulf War. The sources tend to agree that the main horizontal proliferation threat today and in the near future stems from Iran, Iraq, and North Korea. A number of sources suggest that South Korea, Taiwan, and Japan would require a major shock (e.g., loss of the U.S. security umbrella) to shake them from their current nonproliferation stances. The sources typically did not rate Syria or Libya a serious nuclear proliferation threat, absent the diversion of nuclear weapons from the former Soviet Union.
- ***Vertical nuclear proliferation remains a concern in a small number of countries, but the prospects of sudden and drastic nuclear build-ups appear low.*** Much attention has been focused on the potential for a nuclear arms race between India and Pakistan, as well as India's stated interest in developing a triad of nuclear delivery systems. Various estimates for each country's *eventual* nuclear stockpile have been advanced, from 100-500 weapons for India by 2030 to 60-100 weapons for Pakistan over roughly the same timeframe. The sources point out, however, the gradual nature of any such build-up, presumably enabling political influences to help attenuate the process. Similarly, some sources voice their concern over the potential extent of China's current nuclear modernization program, warning that China might attain nuclear parity with the United States by 2025. Other sources, including the U.S. Government, tend to downplay the prospects for a sudden or massive Chinese nuclear build-up.

B. Negative Trends

- ***In some key cases, reliance on nuclear weapons and nuclear brinkmanship is increasing.*** Many of the sources expressed concern about Russia's new defense doctrine, which discards Moscow's long-standing no first-use pledge in order to bolster the country's declining conventional forces. China, for its part, used the threat of nuclear strikes against the United States to deter US intervention in Taiwan. In South Asia, the Kargil conflict only reinforced concerns that India and Pakistan may miscalculate and stumble into a nuclear war. Such a war would not only have disastrous consequences for South Asia, but would lower the threshold to nuclear use generally.
- ***US conventional military superiority and forward presence are encouraging regional powers to adopt asymmetric strategies based on nuclear, biological, and chemical weapons.*** This view is expressed by US intelligence officials, senior military officers, and academics alike. Indeed, then-Director of the Defense Intelligence Agency, Lt. Gen. Patrick Hughes commented in 1999 that regional NBC proliferation poses "the greatest direct threat to US forces deployed and engaged worldwide." Other US actions could provide further proliferation incentives. Most often, this argument is raised by US and foreign opponents of US national and theater missile defenses, who contend that such defenses only encourage countries like China and Russia to pursue offensive countermeasures.
- ***By 2020, the United States could face new ICBM threats from regional adversaries.*** While the issue of new ICBM threats to the United States is contentious in US and international circles, few would dispute that by 2020, the spread of technology and expertise could enable countries such as North Korea, Iran, and Iraq to field ICBMs capable of delivering NBC payloads to the US homeland. The US intelligence community believes such countries could be motivated to acquire ICBMs in order to deter further the United States from intervening abroad.
- ***Experts in and out of government agree that forecasting proliferation developments is becoming more difficult.*** DCI George Tenet has publicly warned that proliferators are becoming increasingly proficient in deception and denial practices, raising the risk that the United States will be caught by surprise. Other experts within and out of government similarly warn that given China's deception and denial skills, we should treat estimates of Beijing's current nuclear posture with skepticism. They also warn that we may not know for sure how extensive China's nuclear modernization program may be.
- ***The unique strategic personalities or cultures of emerging regional powers casts doubt on whether deterrence will prevail.*** This view is typically expressed by US experts in and out of government with regard to

Iran and North Korea. At issue is whether such regimes have a higher propensity to run risks and accept losses.

- ***The threat of NBC terrorism is seen as likely to increase in the years ahead.*** In 1997, the US Defense Science Board concluded that transnational groups have both access to, and motivation to use, NBC weapons. In 1999, DCI Tenet publicly stated that nearly a dozen terrorist organizations, including Osama bin Ladin, have indicated interest in or have sought NBC weapons. The Institute for National Security Studies at the US National Defense University warns that such organizations could be more motivated to use NBC weapons out of religious fanaticism or pure malice.

V. FOREIGN NUCLEAR CAPABILITIES TO THE YEAR 2020

This section contains a series of charts that summarize the assessments of current and future foreign nuclear capabilities, as seen by the A/NGO, USG (unclassified), and I/FG communities represented in the project data set (see Appendix for supporting profiles). Given the diversity of sources and their varying level of detail, side-by-side comparisons of specific issues were not possible in all cases. Nonetheless, the tables provide a useful summary of the key themes raised by each of the three communities. The tables are organized in the following manner:

- Principal threats to the United States (Russia, China)
- Regional adversaries to the United States (North Korea, Iran, Iraq)
- Other nuclear weapons states (India, Pakistan, Israel)
- Aspiring proliferators (Libya, Syria)
- Potential proliferators (Japan, Taiwan)
- Nuclear allies (United Kingdom, France)

A. Principal Threats to the United States

The sources acknowledge that despite the end of the Cold War, **Russia** remains the country most capable of inflicting nuclear devastation upon the United States. The sources capture the paradox of Russia's current nuclear posture. Namely, due to weaknesses in its conventional forces following the collapse of the Soviet Union, Moscow is forced to rely more heavily on nuclear forces at the same time that economic pressures are driving it to retire numerous strategic nuclear weapons. Official USG estimates put Russia's strategic nuclear weapons at less than 2,000 by the year 2010. Experts in the United States and Russia generally concur with this strategic draw down.

RUSSIA: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Sokov (2000): <ul style="list-style-type: none"> ⇒ Limited triad modernization underway: 1 new ICBM, 1 new SSBN, & 1 new heavy bomber(?) ⇒ ICBMs will remain core of Russian strategic forces ⇒ By 2025, only 300-1,500 warheads possible ⇒ By 2010, only 2 new SSBNs added ⇒ New subs will carry 50-100 total warheads • Cirincione (2000): <ul style="list-style-type: none"> ⇒ By 2010, Russia will field less than 2,000 strategic nuclear warheads on missiles and bombers, possibly no more than several hundred, depending on economic factors 	<ul style="list-style-type: none"> • Russian Lt. Gen. Medvedev (ret.) (1998): <ul style="list-style-type: none"> ⇒ By 2010, expect to have several hundred single-warhead Topol-M ICBMs, 105 RS-18 ICBMs, and certain number of SLBMs • Russian TV (2000): <ul style="list-style-type: none"> ⇒ Topol-M ICBMs will replace all Russian ICBMs in next few years ⇒ Topol-M will carry 300 KT warhead ⇒ Topol-M will be deployed in silos and on mobile launchers by 2002-2003 • Mozgovoy (2000) <ul style="list-style-type: none"> ⇒ New SSBN operational by 2007 	<ul style="list-style-type: none"> • NIC (1999): <ul style="list-style-type: none"> ⇒ By 2015, Russia will keep as many nuclear weapons and missiles as its economy permits, but well short of START I or II limits ⇒ After START II ratification, Russia likely to maintain only about half of the weapons it could possess prior to the agreement
<ul style="list-style-type: none"> • Podvig (1998): <ul style="list-style-type: none"> ⇒ 3,500-4,000 warheads maintainable by 2008, half deployed on MIRVed ICBMs. Under START II, drops to 2,100 warheads by 2008. ⇒ Forces under START II in 2008: 105 SS-19, 45 SS-25, 110 SS-27 ICBMs; 10 SSBNs with 164 SLBMs/ 1,016 warheads; 69 bombers/800 weapons • Wilkening (1998): <ul style="list-style-type: none"> ⇒ Under START II, 1,800-2,500 strategic warheads maintained ⇒ START II modernization “low” option: 90 silo-based, 110 mobile ICBMs ⇒ START II “medium” option: 195 silo-based, 205 mobile ICBMs ⇒ START II “high” option: 195 silo-based, 350 mobile ICBMs ⇒ 64 bombers/734 weapons from 2005-2015, 24 bombers/223 weapons by 2020 ⇒ By 2025, 10 Borey-class SSBNs possible 	<ul style="list-style-type: none"> • Alexei Arbatov (1999): <ul style="list-style-type: none"> ⇒ By 2003, 3,216-4,336 warheads, absent START II & depending on assumptions ⇒ By 2010, 442-4086 warheads, absent START II & depending on assumptions ⇒ Under START II, 592-2,526 warheads by 2010 ⇒ Under START III, 1,446-2,000 warheads by 2010 ⇒ Under START IV, 442-529 warheads by 2010 	

After Russia, **China** poses the next greatest nuclear threat to the United States. Most of the sources across the three communities concur that China’s current nuclear modernization program is driven mainly by concerns about the survivability of its nuclear deterrent. Most of the sources similarly agree that if the United States deploys a national missile defense, the scope of China’s modernization efforts could expand. One

senior State Department official estimates that in such an event, China could triple its ICBM warheads to 100 by 2010.

CHINA: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Mack (1996): ⇒In 1990s, China had 450 weapons, of which 350 were deployed ⇒May include 150 tactical weapons ⇒Actual number of total weapons could be 2-3 times larger due to deception and denial ⇒JL-2 SLBMs could be deployed by 2005 ⇒6 SSBNs possible by 2015, each w/ 16 JL-2 SLBMs • Diamond (1999): ⇒DF-31 could be deployed by 2002 • Tanks (2000): ⇒DF-41 could be deployed 2002-2004 	<ul style="list-style-type: none"> • Chinese Maj. Gen. Jianguo (2000) reviews proposals for new Chinese weapons: ⇒.01 KT ground-penetrator ⇒.1 KT ABM warhead ⇒1KT SSM/ASM warhead • Chinese Gen. Mi Zhenyu (2000): ⇒Asserts that tactical nuclear weapons are an effective battlefield weapon with clear battlefield utility 	<ul style="list-style-type: none"> • INSS <i>Strategic Assessment</i> (1998): ⇒Currently, 17 single-warhead ICBMs (7 CSS-4, 10 CSS-3) operational • Khalilzad, et al. (1999): ⇒DF-31 mobile ICBM being flight-tested ⇒DF-41 ICBM in development • NIC (1999): ⇒MRV or MIRV for CSS-4 possible in a “few years” ⇒MIRVing of mobile ICBM “many years off”
<ul style="list-style-type: none"> • Garwin (1999): ⇒China not likely to pursue MIRVs or neutron bombs • Ferguson (2000): ⇒China not likely to build MIRVs 	<ul style="list-style-type: none"> • <i>Hindustan Times</i> (1999): ⇒China could deploy a neutron bomb in 2001 ⇒Efforts to miniaturize warheads • Nalapat (2000): ⇒6 DF-31s operational ⇒36 IRBMs capable of reaching Europe • Sidhu (1999): ⇒China could respond to US N/TMD by adding 200 ICBMs 	<ul style="list-style-type: none"> • LTG Hughes (1999): ⇒Upgrading nuclear/missile command, control, and communications ⇒Modernization motivated by concern over survivability of deterrent • U.S. DCI (1999): ⇒China not likely to commit resources to reach nuclear force levels of US or Russia
<ul style="list-style-type: none"> • Tanks (1997): ⇒Could have 3,000-5,000 nuclear weapons by 2010 • Davis, Sweeny (1999): ⇒Could approach parity (1,500 weapons) w/ US by 2025. • Tanks (2000): ⇒400-800 ICBM/SLBM warheads possible by 2015 	<ul style="list-style-type: none"> • Presidium of Russian Academy of Sciences (2000): ⇒By 2010, China could have up to 80 ICBMs • Vinogradov (2000): ⇒China will allocate \$9.6 billion to nuclear/missile build up ⇒Efforts to miniaturize warheads 	<ul style="list-style-type: none"> • Roy (2000): ⇒If China decides to MIRV, could triple its ICBM warheads to 100 by 2010

B. Regional Adversaries to the United States

Most of the sources accept the public US position that prior to the 1994 Framework Agreement, **North Korea** probably separated enough plutonium to fabricate 1-2 nuclear devices. Suspicions linger that Pyongyang may be continuing its nuclear program in secret. Estimates vary as to North Korea’s nuclear breakout potential. A US Congressional advisory board estimated in 1999 that North Korea could produce as

NORTH KOREA: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Tanks (1997, 2000): ⇒N. Korea producing No Dong-I at rate of 30-50 per year ⇒Taepo Dong-II could be fielded by 2005 at rate of 4-8 per year 	<ul style="list-style-type: none"> • South Korean MOD (1999): ⇒North Korea could possibly assemble 1-2 crude nuclear weapons • Yi (2000): ⇒The two light water reactors provided under the Agreed Framework will leave North Korea "with the capacity to produce annually enough fissile material for 100 nuclear bombs...." ⇒North Korea may be producing new nuclear weapons in addition to the possible two that already exist. 	<ul style="list-style-type: none"> • US Congressional Advisory Board (1999): ⇒Prior to freezing its nuclear program in 1994, N. Korea separated 6-12 kg of plutonium, enough for 1-2 nuclear weapons ⇒If N. Korea withdrew from or violated NPT, it could produce enough fissile material for nearly 100 nuclear weapons annually • Sherman (2000): ⇒If Agreed Framework aborted, could begin plutonium production in a few months. Spent fuel on hand now could yield half-dozen weapons. • Perry Testimony (1999): ⇒If Agreed Framework collapses, N. Korea could produce "significant number of nuclear weapons per year."
<ul style="list-style-type: none"> • Mack (1996): ⇒North Korea has 23 tons of weapons-usable plutonium in its spent reactor fuel 	<ul style="list-style-type: none"> • Nam (2000): ⇒North Korea could have 10,000 km-range ICBM within 10 years 	<ul style="list-style-type: none"> • NIC (1999): ⇒After Russia & China, N. Korea most likely to develop ICBM threat to US during next 15 yrs. ⇒Converted Taepo Dong-I space launcher could deliver a light payload to US ⇒2-stage Taepo Dong-II could deliver several-hundred kg payload to Alaska & Hawaii, and a lighter payload to western half of US ⇒3-stage Taepo Dong-II could deliver several-hundred kg payload anywhere in US
	<ul style="list-style-type: none"> • Pak (1999): ⇒North Korea will develop an ICBM capable of reaching the US within five years. 	<ul style="list-style-type: none"> • Rumsfeld Report (1998): ⇒By 2010, N. Korea could have: 150-200 Taepo Dong-I missiles (2,000 km-range), 50-75 Taepo Dong-II missiles (3,500-6,000 km-range), and 25-50 ICBMs (9,000-10,000 km-range)
		<ul style="list-style-type: none"> • Bennett (2000): ⇒By 2010, N. Korea could have 10-20 nuclear weapons and 25-50 ICBMs

many as 100 nuclear weapons per year, if it decided to abrogate the Framework Agreement and the NPT. A senior State Department official estimated in March 2000 that the spent fuel at the allegedly frozen nuclear facilities at Yongbyon and Taechon could be enough for a half-dozen weapons. Many of the sources focused on North Korea's missile program and how soon it could pose a direct threat to the United States.

IRAN: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Albright (1995): ⇒Iran could indigenously develop nuclear weapons by 2010-2015, by 2005 with outside assistance 	<ul style="list-style-type: none"> • Senior Israeli Defense Forces Officer (1999): ⇒Iran will have nuclear weapons by 2005-2010 • Ben (2000): ⇒Iran will have nuclear weapons by 2007 	<ul style="list-style-type: none"> • DoD (2001): ⇒Iran has an organized structure dedicated to developing nuclear weapons by trying to establish the capability for producing both plutonium and highly enriched uranium • LTG Hughes (1999): ⇒Over the next two decades, Iran expected to acquire a full range of WMD capabilities, field substantial numbers of ballistic and cruise missiles--including some with intercontinental range
<ul style="list-style-type: none"> • Tanks (1997, 2000): ⇒Iran could have a nuclear weapon by 2000 ⇒Could test Shahab-IV 2,000 km-range missile by 2001 ⇒Could be developing Shahab-V ⇒Could be developing Shahab-VI 10,000 km-range missile ⇒Iran could target the US by 2010 • Cordesman (1998) ⇒If Iran can purchase fissile material, it has the design capability and could produce nuclear weapons in 1-2 years ⇒If must produce fissile material on its own, then 5-10 years needed to build the bomb 	<ul style="list-style-type: none"> • Quiring (1998): ⇒Shahab-IV 2,000 km-range missile expected to be operational in 2005 ⇒Shahab-V 10,000 km-range ICBM in development which can carry NBC warheads 	<ul style="list-style-type: none"> • NIC (1999): ⇒Iran could test an ICBM capable of delivering a several-hundred kg payload to many parts of the US in the latter half of the next decade, using Russian technology & assistance ⇒Iran could test a Taepo Dong-type ICBM in the next few years, possibly w/ N. Korean assistance ⇒Iran likely to test a space launcher by 2010 that could be converted to an ICBM capable of delivering a several-hundred kg payload to the US
<ul style="list-style-type: none"> • Eisenstadt (1999): ⇒Domestic political struggles in Iran could trigger a regional crisis that escalates to the nuclear level, with unpredictable impacts on deterrence 		<ul style="list-style-type: none"> • Rumsfeld Report (1998): ⇒Within 5 years of deciding to do so, Iran could acquire an ICBM capability

The three communities were in agreement that **Iran** is actively seeking nuclear weapons. Indeed, DCI Tenet publicly stated that conservatives and reformists alike in Iran believed that NBC weapons were a high national priority. The sources also concurred that Iran could attain a nuclear weapons capability by 2010, or sooner if it receives foreign assistance. Iran was also seen as interested in developing a 10,000 km-range ICBM, also within the 2010 timeframe.

The sources similarly agreed that Saddam Hussein remained committed to acquiring nuclear weapons and long-range missiles for **Iraq**. Many sources expressed concern that with the end of UN monitoring in Iraq, it was impossible to assess the extent of Saddam Hussein’s progress in reconstituting his NBC and missile programs. USG and A/NGO sources concurred that Iraq could produce enough fissile material for a nuclear device in about five years, once sanctions are lifted.

IRAQ: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Tanks (2000): ⇒ Within 5 years of lifting UN sanctions, Iraq could have nuclear capable, medium-range missiles 	<ul style="list-style-type: none"> • Hamza (1999): ⇒ Iraq planned an eventual production of 6 nuclear bombs over 5-10 years 	<ul style="list-style-type: none"> • DoD (2001): ⇒ Retains scientists, engineers, and nuclear weapons design information ⇒ Without fissile material, would need five or more years and significant foreign assistance to rebuild program and produce nuclear devices ⇒ Less time would be needed if sufficient fissile material were acquired illicitly
<ul style="list-style-type: none"> • Rodney Jones, et al (1998) ⇒ When UN sanctions are lifted, Iraq will certainly attempt to reconstitute its WMD programs and ballistic missiles 		<ul style="list-style-type: none"> • NIC (1999): ⇒ Iraq could test an ICBM capable of reaching the US during the next 15 years ⇒ Iraq would most likely pursue a Taepo Dong-II approach to an ICBM, which could deliver a several-hundred kg payload to parts of the US. This approach could yield an ICBM in months if Iraq made an outright purchase or a few years if only engines were purchased from N. Korea
		<ul style="list-style-type: none"> • Rumsfeld Report (1998): ⇒ Within 10 years of deciding to do so, Iraq could have an ICBM capability

C. Other Nuclear Weapons States

Much of the source material dealt with the prospects for nuclear proliferation in South Asia. Following the series of nuclear weapons tests by **India** and **Pakistan** in 1998, this attention shifted to estimates of the nuclear force postures the two sides would subsequently pursue. While USG sources were reluctant to publicly estimate each side’s holdings and potential, A/NGO and foreign media made their own projections, typically in the 100-plus range for India and less than 100 weapons for Pakistan. While

much more limited in number, particularly among the US Government, the sources addressing **Israel** continued to portray its nuclear capability as very advanced and still evolving, specifically, in the direction of a sea-based nuclear deterrent capability.

INDIA: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Tanks (2000): ⇒India developing 8,000 km-12,000 km-range ICBM (Surya), and an 8,000 km-12,000 km-range SLBM (Sagarika), which could be ready by 2006 ⇒India is developing MIRVs for its ballistic missiles • Heisbourg (1998): ⇒India may have enough plutonium for 70-80 weapons ⇒It could have enough material for 400 weapons if plutonium for 6 CANDU reactors is also utilized ⇒India is getting close to deploying operational nuclear forces 	<ul style="list-style-type: none"> • Draft Indian nuclear doctrine (1999): ⇒Based on concept of minimum credible deterrence ⇒Nuclear forces to comprise triad of aircraft, mobile land-based missiles, and sea-based assets ⇒Survivability of forces to be enhanced by redundancy, mobility, dispersion, and deception • Sandesh News Service (1999): ⇒12,000 km-range Surya ICBM to be ready by 2003 • <i>Deccan Herald</i> (1999): ⇒India developing a 5,000 km-range "ICBM" w/ 1,000 kg payload • <i>Daily Excelsior</i> (2000): ⇒Indian Navy considering nuclear-armed missiles for surface ships 	<ul style="list-style-type: none"> • Roy (2000): ⇒India (and Pakistan) will possess nuclear weapons for the foreseeable future. Such weapons will grow more entrenched as the military develops doctrine and command and control procedures. India will continue to develop its missile capabilities and more ballistic missile tests can be expected • LePoer (1998): ⇒India believed to possess enough fissile material for 75 or more nuclear weapons • INSS <i>Strategic Assessment</i> (1999): ⇒Some analysts estimate that Pakistan could produce about 100 weapons, and India as many as 500 weapons, but neither country is thought likely to deploy such large numbers in the next 5 to 10 years. The chances of nuclear rollback in South Asia look dim.
<ul style="list-style-type: none"> • Albright (1998a): ⇒By 2005, India could have 106 nuclear weapons, assuming it continues to produce 20 kg of plutonium per yr. 	<ul style="list-style-type: none"> • <i>The Muslim</i> (1998): ⇒By 2030, India's nuclear force will comprise 40 aircraft, 40 IRBMs, 25 ICBMs, and 25 atomic demolition munitions 	<ul style="list-style-type: none"> • NIC (1999): ⇒India has Prithvi I SRBMs and recently began testing the Agni II MRBM. ⇒These missiles may have nuclear roles.

PAKISTAN: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Albright (1998a, b): <ul style="list-style-type: none"> ⇒By 2005, Pakistan could have 63 nuclear weapons, assuming it had produced 300 kg HEU by 1998 and continued to produce 110 kg per year thereafter ⇒Pakistan will have the ability to produce plutonium in significant quantities within a few years ⇒Pakistan can produce 15-20 kg of unsafeguarded plutonium per year • Rodney Jones, et al (1998): <ul style="list-style-type: none"> ⇒By 1995, Pakistan may have produced enough HEU for 10-25 weapons ⇒Pakistan may be seeking to develop “boosted” nuclear weapons 	<ul style="list-style-type: none"> • <i>Pakistan Observer</i> (2000): <ul style="list-style-type: none"> ⇒Pakistan’s Khushab reactor can produce 10-14 kg of plutonium per year, enough for 2-3 bombs 	<ul style="list-style-type: none"> • Roy (2000): <ul style="list-style-type: none"> ⇒Pakistan (and India) will possess nuclear weapons for the foreseeable future. Such weapons will grow more entrenched as the military develops doctrine and command and control procedures. Pakistan will continue to develop its missile capabilities and more ballistic missile tests can be expected • LePoer (1998): <ul style="list-style-type: none"> ⇒Pakistan is believed to possess enough HEU for 10-15 nuclear weapons • <i>INSS Strategic Assessment</i> (1999): <ul style="list-style-type: none"> ⇒Some analysts estimate that Pakistan could produce about 100 weapons, and India as many as 500 weapons, but neither country is thought likely to deploy such large numbers in the next 5 to 10 years. The chances of nuclear rollback in South Asia look dim.
<ul style="list-style-type: none"> • Heisbourg (1998-1999): <ul style="list-style-type: none"> ⇒Since 1981, Pakistan may have produced enough HEU for 20-30 weapons ⇒May have separated weapons-grade plutonium 		<ul style="list-style-type: none"> • Gregory Jones (2000): <ul style="list-style-type: none"> ⇒Pakistan has started operation of the Khushab reactor, which may be capable of producing enough plutonium for 2 nuclear weapons per year

ISRAEL: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • IISS (1999): <ul style="list-style-type: none"> ⇒Israel has up to 100 nuclear weapons capable of delivery by aircraft or missiles • Jones, et al (1998) <ul style="list-style-type: none"> ⇒Israel may have 70-80 nuclear weapons 	<ul style="list-style-type: none"> • <i>Jerusalem Post</i> (1999): <ul style="list-style-type: none"> ⇒Experts claim that Israel’s new Dolphin submarine can carry small cruise missiles with nuclear warheads. ⇒“If Israel were attacked with nuclear weapons, missiles aboard the Dolphin would be unharmed and ready or retaliation, according to foreign weapons experts. ⇒With Iran and Iraq trying to acquire nuclear weapons, Israel saw the need for a second-strike capability, the experts said.” 	<ul style="list-style-type: none"> • Khalilzad (RAND, 1996): <ul style="list-style-type: none"> ⇒Israel’s relatively advanced nuclear and missile programs might stimulate a regional arms race by encouraging its adversaries to pursue WMD and ballistic missile capabilities.
	<ul style="list-style-type: none"> • Hough (1997) <ul style="list-style-type: none"> ⇒Israel may possess up to 400 nuclear weapons 	

D. Aspiring Proliferators

Libya and **Syria** fall into the ranks of countries that are believed to harbor interests in nuclear weapons but lack the necessary technical and/or financial resources to acquire or develop them.

LIBYA: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Jones, et al (1998): ⇒ Libya first attempted to acquire nuclear weapons directly from China in 1970 ⇒ Libya apparently has not abandoned its nuclear ambitions ⇒ Libya would undoubtedly purchase black market fissile material, if available, to accelerate its weapons program 	<ul style="list-style-type: none"> • Rufford (2000): ⇒ According to Ben Sheppard, editor of <i>Jane's Sentinel</i>, Libya could have an operational nuclear weapon by 2005 • Sinai (1997): ⇒ Libya reportedly seeks to purchase weapons-grade fissile material 	<ul style="list-style-type: none"> • DoD (2001): ⇒ Libya has long intended to develop or acquire nuclear weapons but has made little progress ⇒ Libya lacks well-developed plans, expertise, consistent financial support, and adequate foreign suppliers ⇒ Russian nuclear cooperation could provide opportunities for weapons-related research • DCI Tenet (2000): ⇒ Libya needs significant foreign assistance to further develop its nuclear weapons program

SYRIA: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Cordesman (2000): ⇒ Syria has an on-going nuclear technology research effort and continues to seek larger reactors • Tanks (1997, 2000): ⇒ Syria does not have a nuclear weapons program, however they may produce Chinese DF-15 missiles. ⇒ Possible Chinese assistance could be a proliferation "wild card" ⇒ Syria has an active missile development program assisted by Russia, Iran, China, and Pakistan • CNS (1998): ⇒ Syria does not have a nuclear weapons program 	<ul style="list-style-type: none"> • Venter (2000): ⇒ No evidence of a Syrian nuclear weapons program ⇒ Nuclear technological development remains at the research stage ⇒ Syria's only nuclear research reactor remains under close International Atomic Energy Agency scrutiny 	<ul style="list-style-type: none"> • DoD (2001): ⇒ Syria is not pursuing nuclear weapons ⇒ Syria lacks the infrastructure and trained personnel to establish a nuclear weapons program ⇒ Syria retains an interest in nuclear technology and has a small Chinese-supplied research reactor, which is under IAEA safeguards ⇒ In 1999, Russia signed broad nuclear cooperation agreement with Syria

E. Potential Proliferators

A small number of sources discussed the proliferation potential of **Taiwan** and **Japan**. While the sources provide an insufficient basis to draw conclusions, they do highlight concerns that instability in East Asia, be it from China-Taiwan tensions or North Korea's proliferation activities, could encourage Taipei and Tokyo to reexamine their current non-nuclear stance.

TAIWAN: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Albright and Gay (1998): ⇒Taiwan has no nuclear weapons and seems to have no plans to develop them but only because of US and IAEA influence/scrutiny • Mack (1996): ⇒Taiwan's interest in acquiring nuclear weapons dates back to the 1960s ⇒US pressure has prevented Taiwan from moving forward in this area but US influence could wane as Taiwanese scientists improve their skills, thus removing technical obstacles ⇒Taiwan has the technical capacity to manufacture nuclear weapons but lacks unsafeguarded fissile material 	<ul style="list-style-type: none"> • Chen (1999): ⇒Taiwan has expressed an interest in building-up its offensive forces in order to cope with Chinese threats, and a possible invasion ⇒Taiwan has covertly developed nuclear weapons ⇒Taiwan has enough raw materials to make more than 10 atomic bombs 	<ul style="list-style-type: none"> • DoD (1999): ⇒Taiwan views its success in deterring potential Chinese aggression on its continued acquisition of modern arms, technology, and equipment

JAPAN: VIEWS FROM THREE COMMUNITIES

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Mack (1996): ⇒Cites a 1993 secret UK government report claiming that Japan had all the components needed to make nuclear weapons, including electronic triggers. All that was missing was the plutonium for the cores, of which Japan had enough stockpiled for hundreds of nuclear weapons. ⇒A November 1994 report by Japan's Atomic Energy commission revealed that there were 4.7 tons of separated plutonium in Japan with an additional 6 tons in storage in Europe. 	<ul style="list-style-type: none"> • Japan MoD (1996): ⇒Despite the restraining effect of the U.S.-DPRK Framework Agreement, Japan will continue to watch developments in this area carefully. ⇒North Korea's missile developments are placing a greater part of Japan within range. ⇒Expresses "serious concern" about North Korea's missile developments, especially in light of Pyongyang's suspected nuclear weapons efforts. 	<ul style="list-style-type: none"> • INSS <i>Strategic Assessment</i> (1998): ⇒Should Japan find US nuclear guarantees to no longer be credible, it might pursue its own nuclear weapons, heightening threat perceptions across Asia.

JAPAN: VIEWS FROM THREE COMMUNITIES (cont.)

A/NGO	I/FG	USG Unclassified
<ul style="list-style-type: none"> • Tanks (1997): <ul style="list-style-type: none"> ⇒Regional missile and WMD capabilities will play a major role in Japan's future security situation. Japan is reconsidering its nuclear options 	<ul style="list-style-type: none"> • North Korean Radio (1999): <ul style="list-style-type: none"> ⇒Japan has aspirations to become a nuclear power ⇒Japan plans to acquire 100 tons of plutonium in the next 10 years, and increase the amount to 400 tons by 2020 	

F. Nuclear Allies

This final section summarizes recent developments in the nuclear postures of the **United Kingdom** and **France**. These countries are included in as much as they, too, will help characterize the future nuclear environment. Official MOD statements from each country underscore the dramatic changes brought about by the collapse of the Soviet Union and the end of the Cold War. Both the UK and France have significantly scaled back the number of nuclear weapons they maintain, have ceased the production of fissile material for new weapons, and have reduced the operational tempo of their nuclear forces. At the same time, Britain, in particular, has indicated that any further reductions in its nuclear capabilities would require considerable further reductions in the arsenals of other nuclear powers.

THE UNITED KINGDOM: VIEWS FROM TWO COMMUNITIES

A/NGO	I/FG
<ul style="list-style-type: none"> • SIPRI (1999): <ul style="list-style-type: none"> ⇒UK would require 192 warheads if all 4 SSBNs are fully loaded ⇒With each SSBN carrying 36-44 warheads, UK would deploy about 160 total warheads ⇒UK will probably keep another 15% in spares, bringing total estimated stockpile to 185 warheads • Arkin (1998): <ul style="list-style-type: none"> ⇒Depending on future plans, UK will produce another 40-115 warheads above its estimated current deployment level of 160. 	<ul style="list-style-type: none"> • UK MoD, <i>Strategic Defence Review</i> (1998): <ul style="list-style-type: none"> ⇒UK's deterrence requirements do "not depend on the size of other nations arsenals but on the minimum necessary to deter any threat to our vital interests" ⇒As of March 1998, the Trident SLBM is Britain's only remaining type of nuclear weapon ⇒Britain requires that Trident remain an effective deterrent for up to 30 years. That force will comprise four submarines and a total of 58 missiles ⇒As a hedge, Trident must also be able to perform limited nuclear strike missions in a "sub-strategic" role ⇒Britain requires a Trident warhead stockpile of less than 200 operationally active weapons (a one-third reduction from the previous government's maximum of 300). ⇒Britain will continuously maintain only one submarine on patrol at a time, carrying a reduced load of 48 warheads (this is a reduction from 96 under the previous government) ⇒The missiles on board the patrol submarine will not be targeted and it will normally take several days notice to fire

FRANCE: VIEWS FROM TWO COMMUNITIES

A/NGO	I/FG
<ul style="list-style-type: none"> • Davis (2000): <ul style="list-style-type: none"> ⇒ Current French stockpile is 350 warheads, totaling 57 megatons ⇒ France is developing the TNN thermonuclear warhead for the M51 SLBM (expected to enter service in 2015) and the TNA for the ASMP-1 (expected to enter service by 2008) • Boniface (1999): <ul style="list-style-type: none"> ⇒ From 1990-1997, French nuclear forces budget decreased over 50% • Arkin (1998): <ul style="list-style-type: none"> ⇒ French nuclear stockpile estimated at 450 warheads • Rauf (1995): <ul style="list-style-type: none"> ⇒ French nuclear stockpile being reduced 15%, stemming from 75% cut in Hades missile, early retirement of Pluton missile, deactivation of gravity bombs, and lower production of missile submarines and bombers ⇒ France planning to build new hydronuclear testing facility and intends to develop a nuclear test simulation computer program 	<ul style="list-style-type: none"> • French MoD (1997, 2000): <ul style="list-style-type: none"> ⇒ France has dismantled its nuclear weapons test sites in the Pacific and has provided independent access to international experts for verification purposes ⇒ Since 1992, France no longer produces weapons-grade plutonium ⇒ In 1997, France closed its Marcoule plutonium processing facility. It also closed its Pierrelatte uranium enrichment facility. Both of these plants are being dismantled ⇒ France implemented nuclear de-alerting measures in 1992 and 1996 ⇒ In 1997, France de-targeted all of its nuclear deterrent forces ⇒ The land-based S45 IRBM has been withdrawn from service and will not be replaced ⇒ The Pluton missile and AN-52 gravity bombs are being withdrawn from service on an accelerated schedule ⇒ The number of SSBNs in service will be reduced from 6 to 4, with only 3 maintained in the operational cycle ⇒ The Hades missile program has been decreased from 120 to 30, and the missiles have been placed in storage rather than deployed

VI. US AND GLOBAL THREAT IMPACTS

Based on the individual country profiles, this section summarizes – to the extent possible given the variation in sources – the views of the unclassified literature on the impacts of the future nuclear environment on US and global security.

A. US Threat Impacts

As reflected across the A/NGO, I/FG, and USG (unclassified) communities, the principal impact of current and future nuclear proliferation on the United States is as follows:

- ***Within the next 10-15 years, a greater number of countries could target the US homeland with NBC-armed ICBMs.*** Chief among these countries is North Korea, Iran, and Iraq. In addition, depending on the action-reaction cycle to a deployment of a US missile defense system, the number of Chinese nuclear warheads capable of reaching the United States could increase three-fold to 100 by 2010. The impact of these developments could

be to dissuade the United States from intervening in regional crises and conflicts.

- ***Russian insecurity and questionable weapons surety could lead to precipitous nuclear escalation or accidental/unauthorized nuclear release.*** Russia's nuclear forces pose, by far, the most lethal threat to the United States, despite the end of the Cold War. Concern has been expressed that Russia is relying more on its nuclear forces to bolster its national security at a time when its early warning system is decaying. This could lead Moscow to misinterpret events as an attack and unleash a nuclear "response." Russia came close to just such a scenario in 1995 when a civilian research rocket launched from Norway was initially misread as an attack, prompting then-Russian President Boris Yeltsin to activate his nuclear "briefcase" containing launch codes. Similarly, experts have raised fears that Russia's nuclear forces are not under the tightest possible controls and that accidental or unauthorized nuclear release is possible. This view is not universally held, however.
- ***The proliferation of ballistic missiles with longer and longer ranges is putting more US overseas bases and allies at risk.*** A key example in this regard is North Korea's No Dong missile, which has a range of 1,300 km and can reach all of Japan, including facilities essential to the US defense of South Korea. North Korea's Taepo Dong II missile would give Pyongyang the ability to reach Guam. More worrisome still is that North Korea is sharing its missile technology and expertise with Iran and others.
- ***The asymmetric NBC strategies being pursued by US adversaries will raise the costs of intervening in a regional crisis or conflict.*** Numerous commentators have observed that such strategies are explicitly aimed at nullifying the US advantage in high-technology conventional weapons. North Korea's NBC capabilities, for example, are already acknowledged by the US Department of Defense (DOD) as posing a serious threat to US and allied forces in the event of another Korean war. The Institute for National Strategic Studies at the US National Defense University warns that North Korea's NBC capabilities could fundamentally alter the military balance on the Korean Peninsula.
- ***Wider possession of nuclear weapons would likely increase the willingness of regional powers to confront the United States.*** This is the expressed view of the US DOD as it pertains to Iran. Other US experts similarly caution that nuclear weapons could embolden Tehran to confront the United States. This problem is compounded by the view that the United States will find it difficult to deter Iran due to the latter's perceived advantage in running risks and accepting losses.
- ***Further NBC proliferation could undermine US efforts to form and maintain international coalitions.*** In particular, a RAND study concluded

that a nuclear-armed Iraq would make it more difficult and costly for the United States and its coalition partners to actively defend shared regional interests.

- ***To further complicate US defense planning, China could respond to deployment of a US national missile defense by proliferating countermeasure technology abroad.*** This was the conclusion reached by a roundtable jointly sponsored by the Council on Foreign Relations, the US National Defense University, and the Institute for Defense Analyses.
- ***Increased expressions of interest in NBC weapons by terrorists raises the risks of NBC use against US interests and territory.*** Problems associated with securing nuclear materials in Russia only raise the chances that terrorists could get their hands on a nuclear device.

B. Global Threat Impacts

- ***Regional balances of power are being undermined as ballistic missiles and NBC weapons spread.*** For example, Iran's development of the 1,300 km-range Shahab-III missile extends Iran's reach over Israel and Turkey, further complicating defense planning for all three. The Shahab-IV will further extend Iran's reach into Europe.
- ***Miscalculation by India and/or Pakistan could lead to another war and potentially nuclear escalation.*** Nuclear war in South Asia would not only produce staggering losses but would lower the threshold to nuclear weapons use globally. Moreover, it has been argued in the United States that neither country can afford to devote the resources necessary to produce stable nuclear deterrents, raising fears that one side may attempt to preempt the other in a crisis. At a minimum, experts warn that a three-way nuclear arms race with India on the one hand and Pakistan and China on the other can be expected.
- ***Poor command and control arrangements in new nuclear powers pose a risk that nuclear explosions may occur by accident or unauthorized use.*** This view has been expressed with particular reference to India and Pakistan.
- ***India and Pakistan's decision to cross the nuclear threshold in 1998 only serves to encourage other countries to obtain nuclear weapons.*** This is the view expressed, for example, by the Institute for National Strategic Studies at the US National Defense University.
- ***A unified Korea with a nuclear weapons capability would be seen by Japan as a serious threat.*** Reunification of the Korean Peninsula thus could have unintended destabilizing consequences for Asia unless it was

accompanied by verifiable dismantlement of the North's nuclear weapons program.

- ***By targeting regional powers with nuclear weapons, the United States gives them justification to acquire nuclear weapons of their own.*** It also indicates that the nuclear weapons states have no intention of eliminating their nuclear arsenals, as called for under the NPT. This is the view expressed by the British American Security Information Council.
- ***Nuclear weapons continue to be seen as the coin of international power and prestige.*** Numerous sources cite India as an example of a country that has used its nuclear weapons program to gain international recognition and respect. They also point to Russia's growing reliance on nuclear weapons as a desperate attempt by a former superpower to retain its international standing.

VII. MOTIVATIONS TO PROLIFERATE

The review of sources for this project turned up a wide range of motivations for states and non-state actors to acquire nuclear weapons and long-range missiles. These motivations may be summarized as follows:

- ***Regional powers view nuclear weapons and long-range missiles as a way to deter the United States from intervening in a crisis or conflict.*** There is debate across the communities as to whether such proliferators may have more warfighting-oriented purposes in mind. Such capabilities also provide a means by which to engage in coercive diplomacy more generally and to drive a wedge between coalition members. This range of motives is typically ascribed to Iran, Iraq, North Korea, and Libya. Past US victories with precision conventional weaponry in the Persian Gulf and Serbia are seen as motivating countries to acquire (or enhance) nuclear capabilities as a countermeasure.
- ***Countries will be encouraged to expand their nuclear and ICBM capabilities to counter the deployment of US missile defenses.*** This argument tends to be advanced by opponents of missile defense and is most prevalent in the case of China. As noted above, however, the view that China will automatically MIRV its ICBMs in response to a US missile defense deployment is not universally held.
- ***Countries see nuclear weapons and ICBMs as enhancing their prestige.*** India stands out as a country pursuing nuclear weapons largely out of a desire for international recognition and status. The sources reviewed also attribute China's nuclear capability, in part, to this motive. One Chinese General went so far as to describe nuclear weapons as an important symbol of Chinese military modernization. Lately, Russia has been added to this category, as it increasingly relies on its nuclear capability to retain some

measure of international status. In the Middle East, both Iraq and Iran are believed to be seeking nuclear weapons to bolster their claims to regional leadership.

- ***Nuclear weapons are seen by some countries as force-multipliers that help to compensate for conventional force weaknesses.*** Most sources agree that concern about India's superiority in conventional forces is a main motivation for Pakistan to develop its nuclear capability. More recently, Russia has fallen into this category in the eyes of most observers due to its deteriorating conventional forces. A number of sources also ascribe this motive to China as a hedge to its own conventional force deficiencies.
- ***The sale of NBC and missile technologies, expertise, and materials is financially lucrative.*** Such sales provided much-needed hard currency for the deteriorating economic situation in Russia and North Korea, which helps explain their dealings with Iran and others in this regard. In China's case, NBC-related trade helps offset its sagging conventional weapons exports.
- ***Countries seek nuclear and missile capabilities to offset the NBC capabilities of their adversaries.*** Concerns in Iran about Iraqi nuclear reconstitution appear to be a main driver behind Tehran's quest for nuclear weapons, for example. Pakistan's nuclear weapons program similarly is driven by developments in India's nuclear weapons program.
- ***Nuclear weapons provide a substitute for security guarantees.*** In the absence of great power protection, a number of countries see nuclear weapons as the ultimate expression of self-sufficiency. Countries that fall into this category include Israel, Pakistan, and India. The collapse of the Soviet Union also meant the loss of military assistance and protection for such countries as North Korea, Syria, and Libya. Similarly, a number of sources warn that should Japan sense a weakening of US defense commitments, it could be expected to develop nuclear weapons in short order.
- ***Nuclear weapons help ensure national/regime survival.*** Closely linked with the self-help argument, countries as diverse as Israel and North Korea are seen as motivated to acquire nuclear weapons to ensure their very existence as nation-states.
- ***Nuclear weapons provide a high-stakes bargaining chip.*** A number of sources suggest that North Korea is exploiting international fears about its nuclear weapons program to extract major concessions from the United States and others, such as the provision of heavy oil and nuclear power reactors.
- ***Nuclear weapons confer tremendous shock value and the ability to inflict mass casualties.*** These psychological and physical characteristics

are seen as increasingly attractive to a new breed of terrorist, motivated solely by a desire to inflict maximum punishment.

VIII. US ABILITIES TO DISCOURAGE PROLIFERATION

The sources provide a mixed picture as to the degree to which the United States can discourage the process of nuclear proliferation. Clearly, the foregoing review of proliferation motives underscores the systemic nature of the incentives to acquire nuclear weapons. Because many of those incentives are rooted in the anarchical character of the international system, there are pragmatic limits as to what the United States by itself can achieve.

Moreover, because states are driven by multiple motivations, even where the United States has some influence, exercising that influence may not necessarily bring a halt to proliferation activities. Michael Eisenstadt (1999) argues that even if the United States manages to mitigate Iran's threat perceptions through some sort of regional confidence-building process, "...in the end there may not be much the West can do to influence the *entire* range of motivations that underpin Iran's efforts to acquire nuclear weapons."

Still, a number of sources suggest that US defense and foreign policies are exacerbating international tensions and revaluing nuclear weapons. Michael May (2000) contends that the United States would be wise to stop trying to expand its post-Cold War zones of influence and forward military presence or else risk triggering a great power crisis and potential backlash that pushes more countries to acquire nuclear weapons.

Along these lines, a number of sources would agree that the United States should forego deployment of national missile defenses as a gesture to reassure China and dissuade it from greatly expanding its nuclear arsenal. Others would contend that to keep South Korea, Taiwan, and Japan firmly within the non-nuclear camp, Washington needs to solidify its political and military ties with those countries. How the United States can do so without unintentionally inflaming insecurities in North Korea and China underscores the delicate balancing act expected of US nonproliferation policies.

Other areas where the United States can help discourage proliferation include the following:

- ***Keep the Agreed Framework with North Korea on track.*** This may be the surest means of convincing Pyongyang that it stands to gain more from nuclear restraint and international engagement than from nuclear proliferation and international isolation.
- ***Continue to work with Russia to improve controls over nuclear weapons materials.*** This cooperation is essential to fostering closer ties with Russia as it struggles through a painful transition period and acts to close a potentially major opening for terrorists and rogue states to acquire nuclear materials.

- ***Expedite deeper reductions in strategic nuclear forces.*** Now that START II has been ratified by the Russian Duma, there are compelling reasons to proceed quickly with negotiation of START III. Such movement would provide a structured framework to further downsize strategic nuclear forces, which both militaries appear eager to do. In addition, START III would expedite the evolution of bilateral nuclear arms reduction into a multilateral process involving the United Kingdom, France, and potentially China. All five nations would benefit by being seen as making real progress toward fulfillment of their NPT obligations. This, in turn, helps send a message to key non-nuclear states, such as Germany and Japan, that nuclear weapons have diminishing importance in international affairs.
- ***Engage India and Pakistan in crisis management activities.*** The United States can help allay concerns expressed by many sources that the two sides will stumble into a nuclear war by facilitating a political-military dialogue in South Asia. Re-energizing confidence-building processes may lower the prospects that nuclear weapons get used in South Asia and erode the nuclear taboo globally.
- ***Address more effectively international concerns that deployment of US missile defenses will have ultimately destabilizing consequences.*** Judging by the review of sources alone, it appears that United States has not convincingly made the case for how a US national missile defense can be deployed without undermining the security of other countries.
- ***Ratify the CTBT.*** While not explicitly addressed in the sources reviewed in this project, the CTBT marks an important new cornerstone in the global nuclear nonproliferation regime. US abstinence from the CTBT erodes US nonproliferation leadership and sets a poor example for countries like India and Pakistan. At a minimum, the United States should continue to encourage global nuclear testing restraints.
- ***Reinvigorate negotiations on a Fissile Material Cutoff Treaty (FMCT).*** Following closely on the heels of the CTBT, the FMCT marks another key step in the process of containing nuclear proliferation, by proscribing the production of fissile material for weapons purposes. The US should demonstrate leadership within the UN Conference of Disarmament and elsewhere to get FMCT negotiations begun in earnest.

APPENDIX: Country Profiles

CHINA

Description of Sources

In reviewing China, a total of 67 sources were utilized. They include 28 academic/non-governmental organization (A/NGO) documents, 16 international and foreign government (I/FG) documents and 23 unclassified United States Government (USG) documents. Many of the A/NGO articles were derived from newsletters and bulletins, including *Arms Control Today* and *The Bulletin of Atomic Scientists*. The I/FG sources include white papers from regional ministries of defense (MoD), regional press (particularly India and Hong Kong), European press, information from PRC state organizations, and Russian scientific and academic documents. All US Government (USG) articles reviewed were obtained from unclassified official sources such as the Office of the Secretary of Defense, the Institute for National Strategic Studies at the National Defense University, and the Congressional Research Service.

Nuclear Force Characteristics

Officially, China's defense policy consists of the following:

1. Consolidating national defense, resisting aggression, curbing armed subversion and defending state sovereignty, unity, territorial integrity and security;
2. Building and consolidating national defense independently and through self-reliance;
3. Implementing the military strategy of active defense;
4. Building a lean and strong military force the "Chinese way" (PRC 2000).

China emphasizes that it also wants to modernize its military forces:

China adheres to building the armed forces by enhancing their quality, strengthening the armed forces by relying on science and technology, and managing the armed forces according to law, and its endeavoring to transform its armed forces from a numerically superior to a qualitatively superior type, and from a manpower-intensive to a technology-intensive type, as well as to train high-quality military personnel and improve the modernization level of weaponry (PRC 2000).

However, in Congressional testimony by DCI George Tenet (Senate Armed Services Committee 2000b), Tenet states he does not believe China will commit the resources necessary to approach nuclear force levels of the United States or Russia.

USG sources, including federally funded contractor studies, note that China prefers to keep its nuclear capabilities and intentions opaque. Because of its reticence over its force mix, targeting doctrine, and force balances with other nuclear powers, Jonathan Pollack (1996) claims China's nuclear weapons inventory is larger than generally estimated. These sources also suggest that China has far more extensive missile

forces than public estimates indicate because those estimates reflect deployed launchers rather than actual missiles.

Andrew Mack (1996) estimates that China's inventory comprises 450 warheads, of which 350 are deployed. This number may include 150 "tactical" or battlefield nuclear weapons. Mack is also quick to note that because of China's deception and denial policies, its nuclear arsenal could be two to three times larger. The US government provides a vague estimate stating that China "currently has over 100 nuclear warheads and is increasing the size, accuracy, and survivability of its nuclear missile force (US Department of Defense 2001).

Other nuclear weapons, deployment methods, and developments of interest include the development of a neutron bomb and nuclear miniaturization. One article reports that actual deployment of China's neutron bomb could occur as early as 2001 (*Hindustan Times* 1999). Major General Wu Jianguo (2000), a former Associate Professor and Dean of the Chinese Antichemical Warfare Academy, gives several proposals for new kinds of Chinese nuclear weapons, including a ground-penetrating nuclear weapon with an equivalent of 10 tons of TNT, an anti-missile nuclear weapon with an equivalent of 100 tons of TNT, and a ground-to-ground or air-to-ground nuclear weapon with an equivalent of 1,000 tons of TNT.

The three communities point out important developments in China's ballistic missile programs. The missiles are divided into three categories: ICBMs; submarine-launched ballistic missiles (SLBMs); and theater missile systems including medium range ballistic missiles (MRBMs) and short range ballistic missiles (SRBMs).

In the I/FG community, the Indian and South Korean reports refer to Dong Feng-31 with an 8,000 km-range (Nalapat 2000; Ministry of Defense of South Korea 1999). In October 1999, the Hong Kong press reported four versions of the Dong Feng, which are allegedly built from stolen US technology: Dong Feng-2 (1,800 km-range); Dong Feng-3 (4,000 km-range); Dong Feng-4 (7,000 km-range); and Dong Feng-5 (13,000 km-range) (Chen 1999). However, the A/NGO sources claim the DF-2 has recently been removed from service. The Hong Kong article also cites longer ranges for the DF-3 and DF-4 than the US A/NGO sources (see Table 1). Given that the source is Chinese press, the longer ranges may be exaggerated to magnify China's regional capabilities. *The Times of India* (2000) reports six of the Dong Feng-31 are in operational readiness along with three dozen intermediate-range versions capable of reaching Europe. The Indian paper concludes that with the PLA's capability to attack the US West Coast and all European capitals, an effective NATO military response toward the PLA in the region is unlikely (Nalapat 2000). *The Indian Express* (1999) also reports that one of China's preferred ways to counter the TMD would be to enlarge its arsenal with an additional 200 ICBMs, presumably of the Dong Feng family. This number seems exaggerated in terms of the actual cost and time frame of producing such missiles (Sidhu 1999). The Indian press may be trying to bolster support for its own nuclear program as well as draw closer alliances with Western powers by inflating the actual threat from China. A March 2000 report from an Academy of Sciences Session on Russian National Security postulates that by "2010 China should have up to 80 ICBMs capable of reaching any point in the US."

TABLE 1: US-Based A/NGO and USG Appraisals of Chinese Weapons Systems

Type	Designation	Description	Range	Payload	Yield
ICBM	DF5/DF-5A (CSS-4)	<ul style="list-style-type: none"> 2-stage storable liquid propellant (N2O4/UDMG) gyro-platform with onboard computer 30-60 minute launch preparation time 	13,000+ km.	3,200 kg	1 x 4-5 MT
ICBM	DF-31 (CSS-X-9)	<ul style="list-style-type: none"> 3-stage solid propellant possible MRV/MIRV capability tested and under development with its warhead awaiting certification same missile as the JL-1 	8,000 km	700 kg	1 x 200-300 kt
ICBM	DF-41 (CSS-X-10)	<ul style="list-style-type: none"> 3-stage solid propellant possible MRV/MIRV capability under development expect 3-5 minute launch preparation time 	12,000 km	800 kg	1 x 200-300 kt
SLBM	JL-1 (CSS-N-3)	<ul style="list-style-type: none"> 2-stage solid propellant gyro-platform inertial guidance with onboard computer Same missile as the DF-21/DF-21A 	1,700 km	600 kg	1 x 200-300 kt
SLBM	JL-2 (CSS-NX-5)	<ul style="list-style-type: none"> 3-stage solid propellant possible MRV/MIRV capability tested and under development with its warhead awaiting certification same missile as the DF-31 	8,000 km	700 kg	1 x 200-300 kt
MRBM	DF-2 (CSS-1)	<ul style="list-style-type: none"> recently taken out of service 	1,250 km		
MRBM	DF-3/DF-3A (CSS-2)	<ul style="list-style-type: none"> 1-stage storable liquid propellant (AK27/UDMH) fully inertial strap-down guidance system 120-150 minute launch preparation time 	2,800 km	2,150 kg	1 x 1-5 MT
MRBM	DF-4 (CSS-3)	<ul style="list-style-type: none"> 2-stage non-storable liquid propellant 60-120 minute launch preparation time 	4,750 km	2,200 kg	1 x 1-5 MT
MRBM	DF-21/DF-21A (CSS-5)	<ul style="list-style-type: none"> 2-stage solid propellant gyro-platform inertial guidance system with onboard computer 10-15 minute launch preparation time Same missile as the JL-1 	1,800 km	600 kg	1 x 200-300 kt

TABLE 1: US-Based A/NGO and USG Appraisals of Chinese Weapons Systems (cont.)

Type	Designation	Description	Range	Payload	Yield
SRBM	DF-11/M-11 (CSS-7)	<ul style="list-style-type: none"> • 2-stage • solid propellant • strap-down inertial computer digitized guidance system with terminal control • 30-45 minute launch preparation time • M-11 version designed explicitly for export 	300 km	800 kg	1 x 350 kt
SRBM	DF-15/M-9 (CSS-6)	<ul style="list-style-type: none"> • 1-stage • solid propellant • strap-down inertial computer digitized guidance system with terminal control • trying to enhance accuracy with GPS technology • 30 minute launch preparation time • M-9 version designed explicitly for export 	600 km	950 kg	1 x 50-350 kt

DF- Dong Feng
 JL – Julang
 (CSS) – US designation

Sources: Cordesman 2001; IISS 1999, table 53; Jane’s Strategic Weapons Systems 1998; CNS 1999; US DoD 2001.

The A/NGO community claims the DF missiles, as seen in Table 1, are a major part of China's modernization plan. China plans to replace the DF-3 with medium-range DF-21 ballistic missiles and longer-range DF-21A, which are near deployment. The modernization program also includes the development and deployment of new DF-31 and DF-41 MIRVed missiles. China may have obtained valuable information to build smaller, more lethal warheads. The DF-31 mobile (8,000-km) ICBM could be deployed by 2002 and the DF-41 mobile (12,000-km) ICBM will be deployed between 2002-2004 (Mack 1996).

As of 1997, China possessed a modest capability of 17 ICBMs, seven of which were DF-5 intercontinental-range missiles tested with MIRVs, and ten were older DF-4 single-warhead ICBMs. The PRC plans to supplement its silo-based DF-5 ICBMs targeted on US cities with mobile ICBMs (as early as 2002) and SLBMs (INSS 1998). A RAND publication adds that China's Second Artillery Corps fields between 10 to 20 DF-4 and DF-5 ICBMs. The mobile, solid-fueled DF-31 ICBM is being flight-tested, while the DF-41 is in development. It is unclear whether China's DF-41 will possess multiple independently-targeted re-entry vehicle (MIRV) capability (Khalilzad, et al. 1999).

The Japanese MoD cites 100 intermediate-range ballistic missiles (IRBMs) and 120 medium-range TU-15 bombers. It also mentions the deployment of the new CSS-5 IRBMs and the development of SLBMs (Japan, Ministry of Defense 1996). The South Korea MoD figures differ from the Japanese MoD regarding IRBMs. The South Korea MoD cites 46+ IRBMs and 17 ICBMs in China (South Korea, Ministry of Defense 1999). Neither paper cites their source information. The Japanese MoD, Russian Global Security Center for Scientific Research, and the Indian press highlight China’s research

efforts to create downsized and lighter nuclear warheads (Japan, Ministry of Defense 1996; Vinogradov 2000).

While China's main focus appears to be developing its ICBM capabilities, the three communities also note a greater array of sea-based capabilities. One source reports the development of the 12,000 km-range SLBM Julang-2 (JL-2). The new missile has an expected deployment date of 2002-2004. In relation to its fleet, China could have six Type 094 SSBNs by 2015, which will carry 16 JL-2 missiles with a striking range of 5,000 miles (Mack 1996). The I/FG community also discusses the JL-2. Russian sources note that the modernization program will be aimed at developing the naval component to its nuclear forces, specifically "the missile armed Submarine *Xia* is being refitted for Julang-2 missiles with an increased flight range (to 8,000-km) and increased accuracy in delivering the warhead to the target" (Vinogradov 2000). USG sources claim that while the submarine is ready, it has yet to go on an operational patrol (Khalilzad, et al. 1999).

The communities remain fairly consistent with one another on weapons capabilities. The I/FG community provides the most information regarding actual missile types and inventory speculation. The only major contradiction throughout the communities is regarding MIRV capabilities. Within the communities, there is debate as to whether China will pursue or already has MIRV abilities. Within the A/NGO community, articles say that building MIRVed missiles is counter to China's nuclear deterrence policy because it makes Chinese retaliatory forces a more tempting target (Garwin 1999; Ferguson 2000). Contradictory sources claim China's nuclear testing program appears to have been designed to be more flexible, particularly in the development and deployment of small MRVed and MIRVed warheads (Mack 1996; Sun 1997). USG sources state China could use a DF-31-type RV to develop and deploy a simple MRV or MIRV for the CSS-4 in a few years, but MIRVing a future mobile missile is assessed to be "many years off" (NIC 1999).

Nuclear Force Projections

The three communities express several common themes regarding their nuclear projections. They all discuss China's approach to nuclear weapons as a strategic deterrent, its modernization of the nuclear program, and its military aid to aspiring proliferators. Additionally, each community also highlights specific themes relating to capabilities and intentions of the Chinese nuclear weapons program.

Most sources acknowledge China's claim that its nuclear force is meant as a strategic deterrent, not as an offensive capability. China is seen as adhering to its self-stated policy of maintaining a minimum credible deterrent with sufficient second-strike resources. China itself maintains that it strongly supports non-proliferation efforts and even drafted UN proposals against nuclear first-use. In May 2000, China signed a joint statement declaring that its nuclear weapons are not targeted at any country (PRC 2000).

The modernization of China's weapons program is closely scrutinized in the three communities. The prevailing view is that China's top military priority is to update its

nuclear expertise and equipment in order to stay on par with the other major nuclear powers. Russian Lieutenant General (Retired) Mikhail Sergeevich Vinogradov (2000), director of the Committee of Scientists for Global Security Center for Scientific Research reports that China “will allocate approximately \$9.6 billion for building up and modernizing its missile/nuclear potential.”

According to then-Director of DIA LTG Patrick Hughes (Senate Armed Services Committee 1999a), “numerous new missile systems are under development [in China], along with upgrade programs for existing missiles, and for associated command, control, communications and other related strategic force capabilities.” Specifically, China is seeking modern, solid-fueled missiles. These new nuclear missiles will be second and third generation technology and will be stored in tunnels. The Office of the US Secretary of Defense (US Department of Defense 2001) claims that, through this modernization program, China will have tens of missiles capable of reaching the US by 2015.

An ANGO article by Richard Garwin (1999) rates the prospect that China will pursue sophisticated nuclear warheads such as the US W-88 and neutron bombs as unlikely. In Garwin’s view, these weapons would be inconsistent with Chinese nuclear doctrine. A study by Jaquelyn Davis and Michael Sweeney (1999) postulates that if China continues on its current path of modernization, it could deploy some 1,500 warheads by 2025, approaching nuclear parity with the US.

The I/FG and the USG communities also note China’s significant aid to aspiring nuclear weapons programs, most notably Pakistan and Iran. I/FG and USG sources report the latest Dong Feng missiles benefit from dual-use technology and technology stolen from the US.

The I/FG community, in particular, focuses much attention on US Theater Missile Defenses (TMD) and their connection with Taiwan. When discussing the TMD system, most sources agree that such a move will motivate the Chinese to increase activity in their nuclear weapons program. The Chinese government stated that including Taiwan in a TMD system would be a “grave encroachment” on China’s sovereignty and will meet with “strong opposition” from the PRC (PRC 1999).

Ambassador Chas Freeman (1999), a former assistant secretary of defense and member of the U.S. diplomatic corps in Beijing, shed some light on the famous quote regarding the Beijing bomb threat against Los Angeles. Freeman explained that the October 1995 statement stemmed from a five-hour debate regarding military maneuvers the Central Military Commission had authorized in the Taiwan Straits and the subsequent US reaction. According to Freeman, *The New York Times* distorted the original quote, which stated:

And finally, you do not have the strategic leverage that you had in the 1950’s when you threatened nuclear strikes on us. You were able to do that because we could not hit back. But if you hit us now, we can hit back. So you will not make those threats. In the end you care more about Los Angeles than you do about Taipei.

He points out that the quote, in its full context, reinforces China's policy of no first use. The official does not overtly threaten Los Angeles but rather frames the scenario in a deterrent context. However, the text begs the question of what level of interference elicits a nuclear response. Although the "Los Angeles" quote may have been taken out of context, other examples of threatening rhetoric exist. A Hong Kong newspaper cites a PRC military journal claiming that armed US intervention in Taiwan will result in nuclear war and warns that the United States could "suffer five major, disastrous blows" (*Sing Tao Jih Pao* 2000). However, given the source and how they reached a public forum, both statements may be classified as propaganda to both deter the United States and to rally the Chinese people on the Taiwan issue.

The USG community places particular emphasis on China's modernization efforts, noting that China is increasing the size and survivability of its nuclear missile forces designated for retaliation. The sources also reveal the discrepancy between these activities and China's desire to maintain a minimal credible deterrent force. The community is also critical of China's adherence to non-proliferation norms despite China's rhetoric.

Motivations

Several motivations appear to be driving China to expand its nuclear capabilities. The major motivation is the impact US missile defenses will have on the retaliating credibility of China's nuclear deterrent. China is particularly sensitive about the extension of US missile defenses to Taiwan as that could limit China's ability to coerce Taipei.

China has a clear interest in preventing potential adversaries in the region from acquiring nuclear "equalizers" (Mack 1996). It also perceives a nuclear threat from India due to its 1998 nuclear tests and sees itself as a potential target. Furthermore, Ming Zhang (1999), director of research at IHS International, cites additional threats include India's plan to develop a new longer-range Agni II missile and Japan's military potential.

China's latest defense white paper also mentions the need to level the security playing field, using emerging nuclear countries to temper the US military advantage (PRC 2000). This statement could explain China's support of foreign weapons programs. Furthermore, China's defense industries rely on WMD technology related sales to Iran and Pakistan as a way to make profits and recover losses from falling conventional weapons sales (Kan 1998).

Global and US Threats

The sources concur that the latest research and developments in Chinese missile and warhead technology increases China's ability to strike US mainland territory. Predictions on a truly global targeting ability for China only vary by a few years. Depending on the number of US TMD interceptors and firing doctrines, China could deploy 10-250 additional ICBMs capable of hitting US targets. More disconcerting are

claims that China could have between 400-800 warheads capable of striking the US by 2015 (Tanks 2000).

The sources agree that the greatest regional threat from China falls on Taiwan. China has stated that it will take action against the US should it intervene militarily in a China-Taiwan conflict. China is unlikely to destabilize regional peace outside of the Taiwan issue. As its market grows, economic prosperity may hinder its willingness to engage in conflict, since it would negatively effect the market and the country's economic well being.

One final element of concern is China's alleged transfer of nuclear technology to Pakistan, Iran, and Algeria. By supplying technology, capital and expertise to such states, China acts as a secondary threat to global security.

FRANCE

Description of Sources

A total of 18 sources were reviewed for France, 14 from the A/NGO community and two from the international and foreign government (I/FG) community. The A/NGO documents encompass articles from the Institut de Relations Internationales et Stratégiques (IRIS) - Paris, Center for Global Security and Cooperation, the Henry L. Stimson Center, Carnegie Endowment for International Peace, Stockholm International Peace Research Institute (SIPRI), Monterey Institute of International Studies (MIIS), Natural Resources Defense Council (NRDC), the International Institute for Strategic Studies (IISS), the Federation of American Scientists (FAS) and the Bulletin of the Atomic Scientists. The I/FG articles were published by the French MoD and outline its nuclear disarmament actions.

Nuclear Force Characteristics

The A/NGO sources note a 15-30% reduction in the French stockpile of deployed warheads, depending on time frames and measurement criteria. According to Tariq Rauf (1995), the reductions stem from a 75% cut in Hades missile production and non-deployment, early retirement of the Pluton missile, and the deactivation of the AN-52 (low-yield) gravity bomb along with lower production limits on missile submarines and bombers. This assessment was consistent with figures put out by the Institut de Relations Internationales et Stratégiques (IRIS 1998), which also noted that France dismantled its ICBM sites on Plateau d'Albion and closed the fissile material plants at Pierrelatte and Marcoule.

France's nuclear warheads in service include the TN71, TN75, and TN81. The TN71s have a yield of 150 kt and weigh 120 kg. They are the warheads for M4 SLBMs. There are a total of 192 warheads carried by 32 M4 missiles each with six multiple independently-targeted reentry vehicle (MIRV) warheads. The *L'Inflexible* and *L'Indomptable* carry 16 missiles per SSBN (Davis 2000). The TN75 is a "miniaturized, hardened thermonuclear warhead, lighter than the current TN71" (Arkin, et al. 1998). The TN75s have a yield of 100 kt. They are the warheads for the M45 SLBMs. Between 1996-2000, there were 96 TN75 warheads for the M45 missiles, each missile with six MIRV warheads. *Le Téméraire* took on an additional 96 TN75s in May 2000 (Davis, 2000), bringing the total number of TN75 warheads to 192. The TN81s are the warheads for ASMP missiles of the air force and naval air arm. They have a yield of 100-300 kt. There are a total of 62 TN81 warheads for ASMPs (Davis 2000).

Two 1996 estimates placed the French stockpile at 482 warheads (Cirincione and von Hippel 1996, Carnegie Endowment 1996), and a 1998 report estimated 450 warheads (Arkin, et al. 1998). Current A/NGO estimates claim the French nuclear stockpile in early 2000 consisted of 350 warheads with 57 megatons in total power (Davis 2000). The reduction may be attributed to increased efforts to dismantle warheads.

France is currently upgrading from the M4 SLBM to the M45 SLBM. The M45 (4000+ km-range) differs from the M4 by the number of TN75 nuclear warheads it carries and by a sophisticated penetration assistance system. The TN75 warheads are stealthier than the TN71 warheads carried by the M4. Plans are already underway to replace the M45 with the M51 (6000 km-range) by 2008 (Carnegie Endowment 2001a).

The airborne component of the French nuclear force consists of 45 Mirage 2000N divided into three squadrons equipped with 60 ASMP missiles (80 km-range at low altitude – 300 km-range at high altitude) and 42 TN81 warheads. The aircraft carrier *Charles de Gaulle*, which replaced the *Foch* in October 2000, will have two squadrons of Super Etendards (24 total) also equipped with 24 ASMP missiles. There are 20 TN81 warheads available for these missiles, suggesting that four of the ASMPs are spares (Davis 2000; SIPRI 1999a; Carnegie Endowment 2001a).

Nuclear Force Projections

Both communities point out the dramatic decline in French nuclear weapons systems, noting that France is moving toward a smaller, more efficient force that still has deterrent potential. However, the communities differ in their analysis of the reasons for the cuts.

The A/NGO sources cite budgetary pressures as a main contributor to significant reductions in France's deployed and planned nuclear forces. While France claims the reductions are evidence of its commitment to arms control, one source notes that "some of the retired systems were already obsolete and due for deactivation and that economic considerations played a significant role in reduced defense expenditures (leading to both cutbacks and cancellations). Further, continued deployment of Pluton and Hades, became politically unacceptable as their range only extended to reach parts of unified Germany" (Rauf 1995). From 1990-1997, the defense budget allotment for nuclear activities was decreased over 50% from 38.8 billion francs to 16 billion francs, thereby making it impossible to retain all the projected programs and to renew all components (Boniface 1999).

The French Ministry of Defense (2000) points out that France has "consistently sought to maintain its nuclear arsenal at the lowest level required to ensure its own security," citing that France showed restraint rather than equipping itself with more advanced nuclear weapons systems even though the technology was available.

As an example of this restraint, the French MoD provided information regarding France's disarmament initiatives. France has renounced developing the land-based S45 strategic missile program intended to replace the S3D missiles, while at the same time, accelerating the withdrawal of its Pluton missile and AN-52 nuclear bombs carried by the Jaguar and Mirage III aircraft. It has also decreased its nuclear programs including its next generation SSBNs, Mirage 2000N and ASMP missiles, and Hades missiles. It reduced the number of SSBNs in service from six to five and extended the production timetable for next generation SSBNs. France plans to reduce its SSBNs down to four, with only three maintained in the operational cycle. The Hades missile program has been decreased from 120 to 30 and the missiles have been placed in

storage rather than deployed (France, Ministry of Defense 2000). France only has two remaining nuclear weapons systems: submarine-launched ballistic missiles, and the Mirage 2000N and Super Etendard aircraft armed with air-to-surface missiles. In 1997, France announced that upon dismantling of its IRBMs at Plateau d'Albion, "No component of the French nuclear deterrent force remained aimed at designated targets" (France, Ministry of Defense 2000).

France has also dismantled all its test site facilities and given independent experts access to nuclear test sites. France has ceased all production of fissile materials as well as closing down and dismantling its Marcoule reprocessing plant that produced plutonium. It also shut down the Pierrelatte enrichment plant that produced weapons grade uranium (France, Ministry of Defense 1997). However, France has a 50-year supply of fissile material in storage together with the fissile material from dismantled weapons (Boniface 1999).

However, Tariq Rauf (1995) reported France was planning to build PALEN (Préparation à la Limitation des Essais Nucleaires), a new hydronuclear testing facility that utilizes high-energy lasers, and also intends to develop a test simulation computer program. The other sources do not mention the PALEN facility.

The A/NGO sources also disclose several new French nuclear weapons systems initiatives, including warheads, naval components, air components, and missiles. France is currently developing the TNN warhead, also referred to as the TNO. The TNN/O will be a thermonuclear warhead but its yield is as yet unknown. It will be used as the warhead for the SSBN-NG M51 missiles. It is expected to enter service in 2015. A TNA warhead is also under development. Details were not available, but it will be used with the ASMP 1 and is expected to be in service by 2008 (Davis 2000).

Future naval projections include only four SSBNs by 2002, three of which will be new generation. The strategic submarine force, FOST, currently has five SSBNs, of which four are operational and two are permanently at sea. Each submarine has 16 M4 missiles equipped with six nuclear weapons. The submarines will carry a total of 384 nuclear weapons (Boniface 1999). The first two new generation submarines, *Le Triomphant* and *Le Téméraire*, were admitted to service in September 1996 and April 1999 respectively. The third, *Le Vigilant*, will be deployed in 2004. The final submarine has yet to be named and its expected active service date is mid-2008 - 2010 (Institut de Relations Internationales et Strategiques 1998; Bulletin of the Atomic Scientists 2000; Davis 2000). France indicated that it would phase out the older Redoubtable-class submarines when the new Triomphant-class entered service; however, by mid-2000, France had made no announcement of submarines being decommissioned (Carnegie Endowment 2001a).

In the airborne divisions, the ASMP missile will be replaced with the ASMP 1 (also referred to as ASMP+, ASMP A, or ASMP Improved) after 2008. This new missile will have a 100 km-range at low altitude to 500 km-range at high altitude and will be adapted to the Mirage 2000N and then to the new Rafales, which will replace the Super Etendard aircraft in 2008 (IRIS1998; Davis 2000). The Rafale will be France's multi-purpose fighter/bomber for both the Navy and Air Force. It will provide "conventional

ground attack, air defense, air superiority and nuclear delivery of the ASMP and/or ASMP+” (SIPRI 1999a). The Navy version, Rafale M, will be introduced in 2002, then the Air Force version, Rafale D, will assume its nuclear role around 2005. The Navy plans to buy 60 Rafale Ms. The Air Force plans to buy 234 Rafale Ds (NRDC 2000, SIPRI 1999a).

Motivations

France appears to be reacting to the changing international environment and public pressure. The use of nuclear or biological weaponry by hostile third world states has discouraged France from making fundamental revisions that would cast doubt on the potency of its nuclear force (Dunn 1997). However, the new threat does not require a large arsenal and budgetary restrictions also make some revisions to the nuclear force necessary.

No motivations are cited in the French MoD materials.

Global Threats

According to A/NGO documentation, France is re-evaluating the types and sources of potential threats it will face. France views emerging global threats stemming from hostile third world states and their potential to use nuclear or biological weaponry (Dunn 1997).

Both the A/NGO and I/FG communities agree on the nature of new threats to Europe. The threats will not come as direct attacks by military equals, but from terrorist or rogue states, particularly from the Middle East. The Middle East countries are quickly obtaining missile technology that will make European targets more accessible. They are also gaining the capacity to strike Western allied targets within the Middle East region (Dunn 1997; France, Ministry of Defense 1997).

INDIA

Description of Sources

A total of 33 sources were identified and reviewed for information about India's nuclear status, future projections, possible motivations, and potential US/global threat impacts. Eight sources were identified as international and foreign government (I/FG) sources covering Indian, Pakistani, and European press. A total of 14 academic and non-governmental organization (A/NGO) sources were identified. These sources were articles that appeared in *Arms Control Today*, *Survival* and *The Bulletin of Atomic Scientists*, in addition to papers published by the Institute for Foreign Policy Analysis (IFPA). Ten sources were identified as United States Government (USG) and USG contractor studies.

Nuclear Force Characteristics

India's *Daily Excelsior* (2000) states that the Indian Navy is considering placing the new Dhanush surface-to-surface missile on coastal ships because of its nuclear applications. This weapon would have a range of 250 km and carry up to a one ton payload. The same source claims that missiles onboard some current warships could be tipped with nuclear warheads.

The *Deccan Herald* (1999) reports that India will develop an ICBM with a range of 5,000 km. This ICBM will be a solid fuelled three-stage missile, with a 1,000 kg payload. This coincides with Kornelius (2000) who claims India has the technical capability for producing a 5,000 km range ICBM.

The A/NGO sources offered additional insights into India's nuclear capabilities. Noted Indian hawk Brahma Chellany (1998) proudly proclaimed that, "no country has ever displayed such a range of weapons capabilities at the same time" as India did during its 1998 nuclear tests. Francois Heisbourg (1998-1999) noted that India had produced 400 kg of plutonium, and therefore has enough material for 70-80 nuclear weapons. If India were to use plutonium derived from its 6 unsafeguarded CANDU nuclear reactors, New Delhi could have enough fissile material for more than 400 warheads. Heisbourg warns that India is getting closer to deploying operational nuclear forces. Delpeche (1998) observed that India's nuclear program is completely civilian controlled.

According to *Strategic Assessment 1999* (INSS 1999), experts estimate that Pakistan could produce about 100 weapons, and India as many as 500 weapons. Neither country is likely to deploy such large numbers of weapons or engage in an arms race in the next 5 to 10 years. Gregory Jones (2000) notes that while India's draft nuclear doctrine calls for "a triad of aircraft, mobile land-based missiles and sea-based assets, it would take India "at least 10, probably 20, years" to develop an SSBN (Jones 2000).

J. Stapleton Roy, Assistant Secretary for Intelligence and Research, US Department of State, before the Senate Select Committee on Intelligence (2000) notes that both India and Pakistan will possess nuclear weapons for the foreseeable future. Such weapons will grow more entrenched in both countries as their militaries develop a doctrine, and command and control procedures for their use. India and Pakistan have stated clearly that they will continue to develop their nuclear weapons and the missiles capable of delivering them. More ballistic missile tests can be expected in the region.

Nuclear Force Projections

The A/NGO sources concurred that India will continue to develop an arsenal of medium- and short-range nuclear missiles. Although India has a “no first use” policy, it intends to continue seeking and developing ICBM capabilities (Diamond 1999b). Chellany (1998) and Tanks (2000) note that India’s AGNI II will have a 2,000-3,000 km-range compared with the existing Agni 1, which has a 1,500 km-range. Albright (1998a) speculated that India could have 106 nuclear weapons by 2005, under the assumption that India maintained a plutonium production rate of 20 kg a year. In relation to advanced missile technology, Tanks (2000) documents that India is developing the Surya (8,000-12,000 km-range) ICBM. *The Bulletin of the Atomic Scientists* (1998a) claims that India is developing the Sagarika (8,000-12,000 km-range) SLBM, which may be ready by 2006. Tanks (2000) provides insight into the Agni III, which has been claimed by some Indian military officers to have a range of 5,000 km. India also wants to produce a seaborne missile but does not currently have a submarine with a launch platform (Heisbourg 1998-1999). Lastly, Tanks (2000) claims that India is also developing MIRVed warheads for its ballistic missiles.

India's draft nuclear doctrine claims that its nuclear forces will be "effective, enduring, diverse, flexible, and responsive to the requirements in accordance with the concept of credible minimum deterrence." Additionally, the doctrine notes New Delhi's desire to create a survivable nuclear arsenal with a credible minimum deterrent while trying to avoid an arms race with China or Pakistan (India, National Security Advisory Board 1999).

The Pakistani press contains numerous forecasts of India's nuclear forces. For example, *Dawn* (2000) asserts that India seeks a “triad of land, air and sea-based short and medium-range ballistic missiles, 450 nuclear warheads and a satellite surveillance system aimed at a redundant second strike capability and a policy of ‘no first use’ of nuclear weapons.” *The Muslim* (1998) predicts that by 2030, the Indian nuclear force will consist of 40 Sukhois, with 40 bombs and ASMs, 40 IRBMs, 25 ICBMs, and 25 ADMs.

Evidently seeking to justify New Delhi's nuclear weapons program, India's Sandesh News Service (1999) claims that China has some 200 ICBMs, which are targeted against the United States and India. The dubious nature of both assertions underscore the potential for journalistic exaggeration of nuclear threats. The report goes on to assert that India is developing the Surya ICBM with a range of 12,000 km, to be ready by 2003.

Finally, in a report requested by the US Congress, the US Director of Central Intelligence states that India is thought to possess enough fissile material in sufficient quantities for 75 or more nuclear weapons (DCI/NPC 2000). LaPoer (1998) notes that India's 1998 nuclear tests confirmed that it had previously conducted a wide array of nuclear weapons research spanning several decades.

Motivations

All three communities agree that international prestige, power, regional tensions with Pakistan and threats from China motivate India. More specifically, Indian Prime Minister Atal Bihari Vajpayee said, "we have an overt nuclear weapons state on our borders, a state which committed armed aggression against India in 1962. To add to the distrust, that country has materially helped another neighbor of ours to become a covert nuclear-weapons state" (Chellany 1998).

Global and US Threats

A Pakistani news source, *The Muslim* (1998), concludes that by 2030, India's strategic nuclear force will be able to target Beijing and other commercial and strategic sites in South China.

One other potential threat involves China's present nuclear forces modernization policy, which could increase India's threat perception, hence forcing a 3-way nuclear arms race in Asia. This situation would be greatly amplified if China continues to aid Pakistan with its nuclear weapons program (BASIC 1999).

After reviewing Indian and Pakistani force postures, geo-politics, and various technical issues, Heisbourg (1998-1999) concludes that while deliberate nuclear war in South Asia is unlikely, the risk of inadvertent nuclear war is "unacceptably high."

The *Strategic Assessment 1999* (INSS 1999) notes that the possible threat of terrorism in either India or Pakistan could place nuclear stockpiles at risk, particularly given the unstable domestic environments in both countries. Moreover, both countries may find it difficult to prevent accidents, theft, or unauthorized use of nuclear weapons. These factors make deployment of nuclear weapons by either country "a threat to the whole world" (Jones 2000).

IRAN

Description of Sources

A total of 39 sources were reviewed for information concerning Iran's nuclear status, future projections, possible motivations, and potential US/global threat impacts. Nine of the articles were derived from academic and non-governmental organizations (A/NGO) sources such as, the Arms Control Association and the Institute for Foreign Policy Analysis (IFPA). Fourteen International and foreign government (I/FG) sources were reviewed which involve mainly press reports from Iran, Germany, Israel, Azerbaijan, and Turkey. The remaining materials reviewed originated from unclassified US Government (USG) sources.

Nuclear Force Projections

Although Iran has yet to acquire nuclear weapons, European media sources warn that Iran is trying to "master the [nuclear] fuel cycle" and purchase a plutonium reactor, in addition to working towards producing more advanced Shahab missiles, which will be used to neutralize threats from Iraq, Israel, and the US (*Frankfurter Rundschau* 2000). Israeli press sources believe that Iran currently has the potential to develop a nuclear bomb and is trying to complete the process by 2010. They also expect functional ICBMs capable of delivering warheads in that same timeframe. There is a consensus among all the foreign sources reviewed that Russia is significantly involved in Iran's nuclear program. More specifically, a source notes, "with Russia's assistance at Bushehr, Iran will be able to produce plutonium for a nuclear weapon" (*Azadlyg* 2000).

The A/NGO sources offer various timetables for Iran's acquisition of nuclear weapons. Writing in 1998, Anthony Cordesman noted that if Iran can buy fissile material, it has the design capability and can produce nuclear weapons in 1-2 years. However if it must develop the capability to re-process plutonium or enrich uranium, it is likely to be 5-10 years. David Albright (1995) concluded that Iran could develop nuclear weapons capabilities indigenously by 2010-15, and by 2005 with continued foreign assistance. All A/NGO sources reviewed agree that continued aid from Russia, China, and North Korea can accelerate Iran's program and make their projections a reality.

All of the USG sources concur that Iran's attempt to obtain or accelerate the development of nuclear weapons poses the greatest concern. According to Lesser and Tellis (1996) Iranian reformists and conservatives alike agree that WMD are a high defense priority. USG analysts postulate that Iran could have nuclear weapon capabilities in the next ten years with the assistance of foreign expertise and technology. This assessment coincides with foreign and A/NGO sources.

Sources also focus attention on Iran's missile programs. For the I/FG sources, the most prevalent discussion revolves around the Shahab missile series. Iran has acknowledged the Shahab-III 1,000 km–1,300 km-range missile, which will not be deployable until 2005. The Shahab-IV 2,000 km-range missile has a targeted completion date of 2005. The Shahab-V missile, with expected range of 10,000 km-range and the ability to hit US targets, is already in the developmental stages (Quiring

1998). However, no completion or deployment dates have been revealed for the Shahab-V. An Israeli article allegedly based on a CIA report also predicts the development of the Kowsar 4,000-5,000 km-range missile by 2010 (Fishman 2000).

The A/NGO community also provides some additional detail concerning specific weapons that Iran may be in the process of acquiring. According to Tanks (1997, 2000), a completion date for the Shahab-IV will be 2001, earlier than foreign sources anticipated. Tanks also notes that Iran may be developing the Zelal-3 1,000-1,500 km long-range ballistic missile.

Some discrepancies exist among the USG sources in relation to whether Iran could deploy a missile capable of reaching the US. The 1998 Rumsfeld Commission Report estimates a five-year time frame for Iran to develop a long-range ballistic missile, while the US Intelligence Community notes that if Iran follows the pattern similar to the Shahab-III timetable, then it would take many years for them to develop a 10,000 km-range ICBM capable of reaching the US (Congressional Record July 15, 1998). Furthermore, the *Proliferation: Threat and Response* (US DoD 2001) speculates that Iran could test a space launch vehicle, which would have ICBM applications, within the next fifteen years. However, if Tehran purchased an ICBM from North Korea the situation would change dramatically. The *1999 Strategic Assessment* by the Institute of National Strategic Studies at National Defense University also notes that Iran is seeking to purchase the 1,000-1,300 km-range No Dong missile from North Korea, as well as an MRBM that can threaten targets to a distance of 3,000 km.

Motivations

The I/FG sources reviewed had some discrepancies in their evaluation of Iran's nuclear intentions. For instance, the Iranian press implies that Iran intends to play a regional security role and is attempting to build up the necessary weapons to be taken seriously (IRNA 1998).

The Iranian press sources reviewed dealt mainly with Iran's missile program. The sources generally agree that Iran was seeking the Shahab missile for deterrence purposes. An Iranian press report claimed that the development of the Shahab missile is also a tool "for defending Muslim Ummah and the oppressed nations" (IRNA 1998). This statement suggests that Iran may be willing to sell its missiles to terrorist groups or rogue states or to extend nuclear protection to them. Still, the foreign sources indicate that Iran's motivations to acquire nuclear weapons may be hindered by the reaction it will receive from the international community. According to Me'ir Stieglitz (2000), if Iran feels that pursuing nuclear weapons will garner merely diplomatic condemnation, then it will continue. However, if it believes it will earn the "Iraqi treatment" (military strikes, sanctions) then Tehran will opt to avoid going nuclear.

Most of the A/NGO sources reviewed take a more generalized view by noting that motivations for Iran may include its attempt to dominate the Persian Gulf or lessons learned from the Iran-Iraq war. Other motives put forth include deterring aggressors, countering a possible US development and deployment of NMD/TMD.

One A/NGO source, however, mapped out several possible motives that Iran may possess. According to noted Iran expert Shahram Chubin (1995), Iran will seek nuclear weapons for general political reasons and as a response to specific threats. Chubin believed that Iran's decision to acquire them is not firm and could be reversed.

According to Chubin (1995), Iran's specific security motives are not urgent or overwhelming. First is a large-scale U.S. intervention and constraining U.S. ability to intervene. Iran also harbors concerns that its oil installations are vulnerable and could be destroyed by long-range missile or air attacks. Iran's leaders seem to believe that even acquiring a few nuclear weapons would change U.S. policy.

Second is Iran's desire to play an extensive regional role and the risks this would entail from Israel. Basically, Iran feels vulnerable to the use or threat of use of Israeli weapons whether it is through direct confrontation with Israel or through a third party. Iran's intention behind its program is to increase its international standing and eliminate Israel as the regional 'bully.'

Chubin's third motive for Iran to acquire nuclear weapons comes from Iraq, a more proximate and concrete threat. Iran is skeptical about the international community's ability to monitor this threat or effectively respond should it materialize.

Michael Eisenstadt (1999) highlights Iran's numerous motivations in relation to perceived threats, but also determines that Iran's regional power aspirations play a central role in its quest for nuclear weapons. According to Eisenstadt, the benefits of Iran obtaining nuclear weapons might include: bolstering the standing of the regime in the eyes of the Iranian people and throughout the Arab and Muslim world; intimidating the Arab Gulf states and undermining their confidence in American security guarantees; threatening US allies in order to gain leverage in Washington; and intimidating Afghanistan or Azerbaijan during a crisis or war.

The USG sources offer the broadest spectrum of Iranian motivations. Iran's primary national objectives are ensuring the survival of its Islamic government, limiting foreign influence in the Middle East, deterring Iraq, and spreading Islamic fundamentalism abroad (Khalilzad, et al. 1999, US DoD 2001). The USG sources also note the Iran-Iraq war and that it has partially fueled Iran's interest in a nuclear program. WMD would reinforce Tehran's ability to claim regional great power status and strengthen its role as the leading state in a conflict with Israel, in addition to intimidating and coercing neighboring states. Finally, Iran's potential possession of ICBMs could complicate and raise the cost of future US intervention, strengthen deterrence, garner prestige, and augment Iran's ability to engage in coercive diplomacy (Senate Foreign Relations Committee 2000).

Global and US Threats

Although the I/FG sources do not pinpoint any direct threats against US territory for at least a decade, the sources note that Iran's missile development program does endanger US interests in the Middle East and Europe. Foreign sources also focus on the possibility of weapons sales to terrorist organizations.

The A/NGO sources also agree that Iran's acquisition of nuclear weapons could pose a threat to US interests in the Persian Gulf. In contrast to the I/FG sources, A/NGO assessments do raise the prospect of a direct weapons threat to US homeland by 2010 (Tanks 2000).

USG sources tend to provide more specific information in relation to Iran as a regional threat by noting that Iran's test flight of the Shahab-III 1,300 km-range missile has the potential to strike US interests, military forces, and regional allies such as Saudi Arabia, Kuwait, and most of Turkey (Walpole 1998).

IRAQ

Description of Sources

A total of 29 sources were reviewed for information concerning Iraq's nuclear status, future projections, possible motivations, and potential US/global threat impacts. Some articles were derived from academic and non-governmental organizations (A/NGO). More specifically, some of the sources that were utilized were papers published by the Institute for Foreign Policy Analysis (IFPA), in addition to remarks made to the 7th Carnegie International Non-proliferation Conference. Five foreign government (I/FG) sources were reviewed which originated from the European and Israeli media. The remaining materials reviewed originated from unclassified US Government (USG) sources.

Nuclear Force Projections

The five I/FG sources reviewed offered the least amount of information regarding Iraq's potential, capabilities, and intentions. These sources indicate that Iraq obtains its weapons technology through covert channels and that Iraqi missiles have Russian origins. Each report agrees that Iraq intends to pursue nuclear weapons development and delivery methods. In fact, one article interviewing a defecting Iraqi engineer states that "[O]n a scale of one to ten, Saddam's bomb is at six" (*El Mundo* 2000). According to Khidhir Hamza (1999), the former head of the Iraqi nuclear weapons program, Iraq has plans to produce a nuclear bomb weighing 100 kg and could easily have six of these bombs in five to ten years.

The USG sources state that Iraq has the capability to reconstitute its nuclear weapons program, with the speed being dependent on the availability of fissile material. US intelligence sources also attest that Iraq continues to hide important WMD production equipment and material. The *Proliferation: Threat and Response* (2001) report issued by the Department of Defense stated that Baghdad could manufacture enough fissile material for a nuclear device in five or more years. However, this time limit would be shortened significantly if a foreign source assisted Iraq in acquiring fissile material.

Most of the commentary across the three communities focused on Iraq's missile program. The European and Israeli media reports agreed that by 2005, Iraq could have medium-range missile capabilities. These sources also noted that a nuclear warhead would soon follow, although no timeframes were mentioned.

According to David Tanks (1997), Iraq was working on a design for a missile system with a 3,200 km-range. However, no expected completion date was provided. Tanks (1997) also noted a background conversation with a UNSCOM team member who claimed that he had seen proof that Russian defense firms had signed contracts with Iraqi firms to acquire missile-related technology. Tanks (2000) indicated that Iraq may have a cooperative missile development program with Libya.

As for USG sources, the 1998 Rumsfeld report assessed that it would take Iraq five years from the decision to develop an ICBM to deployment. The 1999 National

Intelligence Estimate (NIE) on ballistic missile threats to the United States provided an alternative view. According to the 1999 NIE, Iraq could test an ICBM capable of reaching the United States during the next 15 years (US DCI/NIC 1999).

After observing North Korean activities, Iraq would pursue a three-stage Taepo Dong-2 approach to an ICBM (or SLV), which could deliver a several-hundred kilogram payload to parts of the United States. If Iraq could buy a Taepo Dong-2 from North Korea, it could have a launch capability within months of the purchase; if it bought Taepo Dong engines, it could test an ICBM by the middle of the next decade. Iraq probably would take until the end of the next decade to develop the system domestically (US DCI/NIC 1999). Other highlights from the NIE include the following:

“Although much less likely, most analysts believe that if Iraq were to begin development today, it could test a much less capable ICBM in a few years using Scud components and based on its prior SLV experience or on the Taepo Dong-1” (US DCI/NIC 1999). If it could acquire No Dongs from North Korea, Iraq could test a more capable ICBM along the same lines within a few years of the No Dong acquisition (US DCI/NIC 1999).

Analysts differ on the likely timing of Iraq’s first flight test of an ICBM that could threaten the United States. Assessments include “unlikely before 2015; likely before 2015, possibly before 2010—foreign assistance would affect the capability and timing” (US DCI/NIC 1999).

Motivations

The I/FG sources reviewed made no reference to Iraqi motivations to pursue WMD technology while the A/NGO sources seem to view Iraq’s motives as deterrent-based, specifically concerning Israel and hegemony in the Middle East. Other external motivating factors include the possibility of Iraq’s water flow being controlled by Syria and Turkey, in addition to oil flow out of Iraq being controlled by Iran (Hamza 1999). Other motivations put forth by A/NGO sources include Iran being a direct military threat to Iraq, Iraq’s perception of its own political isolation, and a possible US development and deployment of NMD/TMD.

The USG sources essentially relayed the same information but in a manner that portrayed Iraq as the potential instigator. These sources noted that Iraq might view NBC weapons as tools to help it control access to oil supplies, and to retain its territorial aspirations on Kuwait and the Shatt al Arab waterway (US DoD 1997). One additional motive suggested by USG sources is that Iraq may view WMD as a way to deter US involvement in a conflict, or perhaps, to even neutralize US conventional superiority (Khalilzad, et al. 1999).

Global and US Threats

I/FG sources determined that Iraq’s nuclear weapons program threatens to destabilize the Middle East, while insisting that no direct threat to US territory exists in the near future.

A A/NGO article contradicts this, Iraq's motivations to acquire an advanced missile technology program denotes that the US could face an ICBM threat from Iraq with 15 years, depending on the level of foreign assistance it receives (Diamond 1999c).

A USG source notes that "many of the countries developing longer-range missiles probably conclude that the threat of use would complicate US crisis decision-making, potentially deterring Washington from pursuing certain objectives. Apart from its likely perceived value as strategic weapons of deterrence and coercive diplomacy, [Iraq] may view longer-range ballistic missiles as a source of prestige" (US DCI/NIC1999).

ISRAEL

Description of Sources

Nineteen sources were reviewed for information concerning Israel's nuclear status, future projections, possible motivations, and potential US/global threat impacts. Two articles were identified as international and foreign government (I/FG) sources: one from *The Jerusalem Post* and one from an Arabic paper. One source was a USG contractor study, and the remaining 16 sources were academic/non-governmental organizations (A/NGO).

Nuclear Force Characteristics

According to Khalilzad (1996), by regional standards, Israel possesses advanced biological, chemical, and nuclear capabilities and has a number of different missiles to deliver nuclear warheads to any country in the region, from Morocco to Iran.

The estimated size of Israel's nuclear weapons stockpile varies among the A/NGO sources. However, the general consensus among academics is that Israel has between 100-200 nuclear weapons. According to Harold Hough, the Israeli arsenal could contain up to 400 nuclear weapons. It is believed that these weapons are stored in bunkers at Zachariah, just a few miles from Tel Aviv. (Hough 1997, Cordesman 1998)

According to various sources, it is unclear whether Israel has definitely conducted nuclear tests. In 1979, an American 'Vela' satellite detected a distinctive double flash off the southern coast of Africa. This flash is believed to have been a nuclear explosion conducted by Israel and/or South Africa but according to *Tracking Nuclear Proliferation* (Jones, et al. 1998), "there has been no conclusive proof that Israel has ever conducted a full scale nuclear test". However, the Institute for Strategic and International Studies (ISIS 2001) notes that scientists at the Los Alamos National Laboratory (LANL) in New Mexico successfully re-constructed "a plausible model for a low-yield nuclear explosion that could have produced the [the 1979 Vela signal]." This revelation does not definitively establish Israeli complicity in the 1979 event, but underscores a plausible nuclear origin.

As for delivery systems, Rodney Jones, et al. note that "Israel currently deploys two nuclear-capable ballistic missile systems: the Jericho I and the Jericho II." It is believed that they are located in facilities somewhere between Jerusalem and the Mediterranean (Jones, et al. 1998). The Jericho I was based on the French missile MD-600 developed in the 1960's and built by Dassault. The Jericho I is believed to be nicknamed *Luz* and designated YA-1 by Israel. The Jericho I has a range of 500 km and a payload of 500 kg (FAS 1997). The Jericho II began development soon after the Jericho 1 and has a much longer range. The Jericho II has a range of 1,500 km and a payload of 1,000 kg (FAS 1997). The Jericho II production facility is located at Be'er Yakov (Cordesman 1998).

Cordesman (1998) elaborates on Israel's delivery systems. The F-15, F-16, F-4E and Phantom 2000 fighter bombers are capable of carrying nuclear and chemical bombs.

Israel also possesses 130 km-range Lance missiles and Popeye air-to-surface missiles capable of carrying nuclear warheads.

According to the Russian Federation Intelligence Service (1995), Hough (1997), and Cordesman (1998), the most important nuclear-related facilities in Israel are:

- Soreq--center for research and development of nuclear weapons;
- Dimona--plant for producing weapons-grade plutonium;
- Yodfat--installation for assembling and dismantling nuclear weapons;
- Kfar Zekharya--nuclear missile base and atomic bomb storehouse;
- Ilabun--tactical nuclear weapons storehouse;
- Palmikim- missile test facility;
- Yodfar- nuclear weapons assembly facility;

Nuclear Force Projections

The sources reviewed did not make detailed projections about Israel's future nuclear capabilities. However, *The Jerusalem Post* (1999) reported that Israel is seeking to add a nuclear armed cruise missile capability to its recently purchased *Dolphin*-class submarines. The *Dolphin* has a range of 4,500 km, a maximum speed of 20 knots and a maximum depth of only 200m. This source also states that Israel plans to install nuclear warhead cruise missiles on the *Dolphins* at an unspecified future date.

According to A/NGO sources, Israel is widely recognized as an advanced, albeit officially unacknowledged nuclear weapons state (The Risk Report 1996). Khalilzad (1996) echoes this view. *The Jerusalem Post* (1999) states that Israel must enhance its second strike capability due to Iran and Iraq's continuing development of their nuclear weapon capabilities.

Motivations

Both the USG contractor study and the Israeli press agree that Israel is expanding its nuclear weapon capabilities as a deterrent, to stay competitive in the region, for security purposes, and for its national survival. According to Hough (1997), Israeli officials have implied that any usage of chemical weapons by their enemies will evoke a nuclear reaction. *Jane's Intelligence Review* (2000) states that Israel believes the possession of nuclear weapons would serve as the ultimate deterrent against any combined Arab threat against Israel. Another notable motivation stems from the Holocaust. In essence, "the [Israeli] nuclear program was the ultimate Zionist project" as it would ensure that there would be a continued Jewish state for immigration and settlement (Cohen 1998).

Global Threats

Khalilzad (1996) states that Israel's nuclear and missile programs might stimulate regional adversaries to pursue WMD and ballistic missile capabilities as a way to compensate for their strategic inferiority.

JAPAN

Description of Sources

A total of eight sources were identified and reviewed for information about Japan's nuclear status, future projections, possible motivations, and potential US/global threat impacts. Two international and foreign government (I/FG) sources were utilized, a Japanese Ministry of Defense white paper, and a report from North Korea's official state radio, "Korean Central Broadcasting Network". Four sources were derived from academic and non-governmental (A/NGO) sources: Selig Harrison's 1996 book, David R. Tanks' April 1997 paper, Ming Zhang's 1999 book, and Andrew Mack's July 1996 article. Two sources were derived from unclassified United States Government (USG) contractor studies.

Nuclear Force Projections

The I/FG source and the USG sources both agree that Japan is not currently seeking to build nuclear weapons. However, Tanks (1997) projects Japan's intentions to consider missile and nuclear capabilities as a major factor in its future security situation. For example, two reasons Japan might decide to proliferate their nuclear capabilities are the increase of military capabilities of China and Korea, and the political instability in Russia. Tanks states that Japan has actually begun to discuss the "possibility of amending, rewriting, or reinterpreting their constitution to allow for military action". This implies Japan's desire and potential for military nuclear development.

The I/FG source does not speculate on Japanese nuclear weapons systems or development plans.

According to the A/NGO and USG sources, Japan has a highly developed civilian nuclear program, but no weapon-oriented activities are believed to exist. However, Japan's stockpile of near-weapons-grade plutonium would allow it to become a nuclear power in short order if a decision were made to do so (Khalilzad and Lesser 1998).

Tanks (1997) states that Japan's civilian nuclear devices are developed so that Japan may only need to add plutonium to have a usable weapon. The source also speculates that Japan is concealing a covert nuclear weapons program. The reason for this speculation is that some of Japan's plutonium stocks are unaccounted for, but there is no solid proof of this, or that Japan has a covert nuclear operation. However, it is important to note that Japan does have the technology and the capabilities to become a nuclear state.

Ming Zhang, author of *China's Changing Nuclear Posture* (1999) states that Japan has a very advanced space program and this could easily be "converted into a missile development program. They have successfully tested the J-1 and M-5 solid fueled rocket systems," which are equivalent in payload and range to US ICBM's. These missiles have potential ground-to-ground ranges of approximately 12,000 km.

Motivations

Even though the I/FG source did not mention Japanese nuclear motivations, the A/NGO and USG sources agree that Japan might be motivated to acquire missile and nuclear capabilities depending upon the military capabilities of China and North Korea. Other incentives for Japan's pursuit to expand its nuclear potential include Russia's instability and fear of decline in US power. Seleg Harrison (1996) notes three possible motivations for Japan to acquire nuclear weapons. First, Japan might decide to proliferate if the other five nuclear powers do not reduce their nuclear arsenal. Second, a military or security threat to Japan from Russia, China or North Korea might motivate Japan to proliferate. Third, Japan might develop nuclear weapons if they were no longer included under the US "nuclear umbrella." However, as long as the US-Japan relationship remains strong and stable, and the United States nuclear deterrent remains credible, Harrison concludes that there will be no reason for Japan to acquire nuclear weapons.

Global and US Threats

According to *Strategic Assessment 1998* (INSS 1998), if Japan were to build nuclear weapons, it would heighten threat perceptions across the region. According to Zhang (1999), China is concerned with Japan's nuclear weapons potential and capabilities. For example, if Japan joins with the US to build a TMD, then Japan might have the capabilities and desire to pursue a nuclear weapons program. This could result in an Asian arms race.

LIBYA

Description of Sources

A total of 22 sources were identified and reviewed for information regarding Libya's nuclear status. Thirteen academic and non-governmental organizations (A/NGO) sources, six USG sources and three international and foreign government (I/FG) sources were examined. The A/NGO articles included newsletters and bulletins collected and published by the Institute for Foreign Policy Analysis (IFPA), and other articles published by academics. The USG sources are from the CIA, the Office of the Secretary of Defense, the Institute for National Strategic Studies at the National Defense University, and USG-funded contractor studies. Three I/FG sources are European publications.

Nuclear Force Projections

As noted in the A/NGO community, Libya has been trying to acquire nuclear weapons since the 1970s, including from the Soviet Union and China. Due mainly to international sanctions and the lack of domestic resources, Libya's nuclear capabilities appear to be archaic and rudimentary. For Libya to acquire nuclear capabilities and build a nuclear infrastructure, it would take a great deal of foreign assistance (Jones 1998; Sinai 1997).

According to Bowen (1999), Russia has financially assisted Libya with the renovation of the Tajura nuclear research center in Tripoli. The Tajura nuclear research center has a "10 mega-watt research reactor " and "reportedly seeks to purchase weapons-grade fissile material" to build its nuclear weapons facility (Sinai 1997). Writing for *The Times of London*, Rufford (2000) cites Ben Sheppard, editor of *Jane's Sentinel*, as forecasting that Libya could have an operational nuclear weapon by 2005. The basis for Sheppard's estimate is not explained in the article and is not supported by other sources reviewed on the subject. Schneider (1996) reports that Libya has also attempted to help Pakistan increase its nuclear capabilities in order to reap the benefits of Pakistan's knowledge.

While the USG articles do not provide a specific time frame, they correspond with the A/NGO analysis. In the *Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions* (2000), DCI George Tenet reports that Libya needs "significant foreign assistance" to further develop its nuclear weapons program; however, it continues to devote significant resources to civilian nuclear power projects. The USG sources agree that Libya is not likely to curb its nuclear weapons program in favor of acceptance into the international community.

According to an I/FG source, by 2006, Libya could possess and develop medium range ballistic missiles with a 1,000 to 3,000 km-range. These weapons could have the ability to carry nuclear warheads (Deutsche Press-Agentur 1996).

Tanks (1997) notes that Libya is developing the Al Fattah, a 950-km range missile. Tanks (2000) later notes that North Korea is providing assistance to Libya's missile program. Furthermore, in 1998, the CIA had reportedly detected multiple signs of Iranian involvement in building missile plants and underground launch sites in Libya (Tanks 2000). Anthony Cordesman (1998) identifies two delivery systems with potential relevance to a future Libyan nuclear force: Tu-22 bombers and Su-24 long range strike fighters.

Motivations

No specific motivations were addressed in the A/NGO documents regarding Libya's pursuit of nuclear capabilities. However, the USG documents provide an insightful analysis of potential motivating factors. Lesser and Tellis (1996) observe that Libya may intend to deter US and Western military interventions by using WMD to threaten their military personnel stationed regionally. Libya wants to be taken seriously as a regional military power. It may also value the international prestige and attention it will command as well as the coercive diplomacy it can conduct after nuclear weapons have been obtained. Finally, from an I/FG source, Libya encouraged Arab countries to acquire nuclear weapons "after hearing Israel's rightwing opposition leader [say] the Jewish state would never give up its nuclear capability even in peace time" (Agence France Press 1996).

Global and US Threats

Both the USG and A/NGO documents agree that the acceleration of Libya's missile program produces a potential regional threat. The weapons could be used to threaten US and Western military installations or forces in the Middle East and Southern Europe. Facilities at particularly high risk would be those supporting US/Western-sponsored actions in the Middle East.

NORTH KOREA

Description of Sources

A total of 41 sources were identified and reviewed for information about North Korea's nuclear status, future projections, possible motivations, and potential US/global threat impacts. The ten academic and non-governmental (A/NGO) sources came from newsletters and bulletins such as *Arms Control Today*, as well as papers published by the Institute for Foreign Policy Analysis (IFPA) and academics. There were nine international and foreign government (I/FG) sources, which included South Korean and Russian press articles, as well as white papers from the South Korean and Japanese MoDs. Of the unclassified USG sources, twenty-nine were reviewed. These sources were drawn from the Office of the Secretary of Defense, the Institute for National Security Studies at the National Defense University, and the Congressional Research Service.

Nuclear Force Projections

North Korea's nuclear ambitions are widely discussed by the A/NGO community. Andrew Mack (1996) notes that, "concerns that North Korea might be building nuclear weapons were revived in the late 1980s, when US surveillance satellites revealed the construction of a large fuel reprocessing plant and a series of what were assumed to be nuclear weapon detonator tests". Mack claimed that by 2000 North Korea could have some 23 tons of weapons-usable plutonium in its spent reactor fuel, which could be separated out in the North's Yongbyon reprocessing plant. Mack further cites US analysts who believe North Korea may have extracted 12 kg of plutonium from spent fuel, enough for one or possibly two nuclear devices.

More recently, former Defense Secretary, William J. Perry (1999), warned that if the Agreed Framework were to collapse, the North could reprocess enough plutonium from Yongbyon to produce "a significant number of nuclear weapons per year".

The I/FG sources discuss North Korea's uranium reserves, its missile arsenal, and its nuclear weapons capabilities. According to the South Korean Ministry of Defense (1997), North Korea has mines containing four million tons of uranium ore and its ongoing efforts to obtain uranium enrichment technologies will enhance its nuclear weapons research. It has a large nuclear research complex in Yongbyon with an atomic reactor imported from the Soviet Union. In 1989, it built a 200 MW reactor and large reprocessing facility in Taechon and Yongbyon, respectively.

The South Korean Ministry of Defense (1999) mirrors US government projections (US DCI/NIC1999) that North Korea could possibly assemble and produce 1-2 crude nuclear weapons. However, Seoul doubts that Pyongyang has done so, due to the complexity of developing detonation devices and delivery systems (Ministry of Defense of South Korea 1997). Another South Korean source states that North Korea obtained nuclear-related technologies from contacts in Russia, Europe and Japan (Yi 2000). North Korea has also been cited as selling Scud missiles to the Middle East (Ministry of Defense of Japan 1996). South Korea fears that North Korea will use its nuclear capabilities against

it for coercive diplomacy.

As for the USG, unclassified reports from the Intelligence Community and Congress routinely cite the estimate that North Korea may have enough nuclear material for one or perhaps two nuclear weapons and that Pyongyang may be continuing to develop its nuclear weapons program. According to the North Korea Advisory Group (1999), a bipartisan congressional panel, if North Korea violated the NPT, it could produce enough fissile material annually for nearly 100 nuclear bombs, using two projected light water reactors,

Nuclear Force Characteristics

North Korea's missile programs received considerable attention from all three communities. In testimony before the U.S. Congress, Joseph Cirincione, Senior Associate and Director of the Carnegie Non-Proliferation Project, stated that North Korea did not flight test the Taepo Dong-2. Furthermore, if that country can be further persuaded not to export missiles or related technology, Pyongyang's ICBM threat to the United States would be diminished (Senate Governmental Affairs Committee 2000).

According to the South Korean MoD (1999), North Korea's missile arsenal contains domestically produced Scud-C missiles (500 km-range), No Dong-I missiles (1,300 km-range based on Scud), Taepo Dong-I missiles (2,000-2,500 km-range), and Taepo Dong-II missiles (6,700 km-range). The South Korean MoD (1999) also noted that North Korea was building a missile launch site in the area bordering China. *The Korea Times* (2000) stated that the three-stage Taepo Dong-II missile is in development to deliver a payload anywhere in the United States. Another South Korean newspaper, the *Seoul Yonhap* (2000), speculates that North Korea's satellite launcher, the Kwangmyongsong-1 missile, could be used to deliver nuclear warheads possibly reaching Alaska or Hawaii.

Tanks (2000) states that North Korea is producing No Dong-I missiles at a rate of approximately 30-50 per year. North Korea could have produced 100-150 No Dong-I missiles by now. And North Korea is in the process of developing the Taepo Dong I. The Taepo Dong II (10,000 km), North Korea's ICBM, could be fielded by 2005 and have a production rate of 4-8 per year (Tanks 2000).

The I/FG sources portray North Korea as having the capabilities to expand its missile programs. For example, Kwang-si Nam (2000) from a South Korean news agency speculates that North Korea will have a 10,000 km-range ICBM within 10 years. While Lidiya Andrusenko (2000), from a Russian periodical, predicts a 4,000-6,000-km ICBM within the same time frame.

As for unclassified USG sources, the 1998 Rumsfeld Commission warned that North Korea would be able to field an ICBM capable of reaching the United States five years after its initial decision to do so. The Commission speculates that by 2010, Pyongyang could have 150-200 Taepo Dong I missiles (2,000 km-range), 50-75 Taepo Dong II missiles (3,500-6,000 km-range), and 25-50 ICBMs (9,000-10,000 km-range). North

Korea exported 10-12 No Dong missiles to Iran and Pakistan in 1996 and 1997, respectively (US DoD 1998).

In sum, all three communities agree that North Korea is proliferating and has the capabilities to produce strategic missiles. The communities agree with the unclassified summary of the 1999 NIE on "Foreign Missile Developments and the Ballistic Missile Threat to the United States through 2015" that North Korea is the most technologically advanced among countries seeking longer-range missiles. The Taepo Dong-I was assessed as being capable of delivering a small payload to intercontinental ranges, provided that an important technical issue can be resolved. The Taepo Dong-II, yet to be flight-tested, would be able to deliver larger payloads to Alaska and Hawaii, and smaller payloads to parts of CONUS (DCI/NIC 1999).

Motivations

According to the A/NGO sources, nuclear weapons offer North Korea a countervailing deterrent against the perceived threat of US nuclear weapons. Other motivations include a strategic "equalizer" to balance the growing military power of South Korea, and strategic compensation for the effective loss of Russian and Chinese alliances (Mack 1996).

According to the South Korean MoD (1999), North Korea wants to reunite the peninsula, and will do so through force if given the opportunity. Nuclear weapons enhance Pyongyang's options for militarily reunifying the Peninsula.

The DCI stated before Congress that countries such as North Korea, Iran and Iraq might conclude that possession of ICBMs would enable them to strengthen deterrence, garner prestige, and augment their ability to engage in coercive diplomacy (Senate Foreign Relations Committee 2000). In an unclassified USG contractor study, North Korea's WMD arsenal is of questionable military value and should be seen primarily as a bargaining chip. Moreover, North Korea's sale of proscribed nuclear and missile-related products and assistance to countries of proliferation concern is partly motivated by its need to generate revenue as its economy declines (Lee 2000).

Global and US Threats

Tanks (2000) raises the possibility that North Korea could acquire nuclear weapons and then choose to sell them. The 1999 National Intelligence Estimate concludes that North Korea's missile program could produce the capability for striking US territory by 2005, mainly meaning Alaska and Hawaii. A North Korean threat to the continental US is expected to be anywhere from 10-15 years off. (DCI/NIC 1999) However, regional threats to US military establishments in the Pacific are currently within the scope of North Korea's reach. Cirincione notes that North Korea is "the greatest source of an additional ICBM threat to the United States" (Senate Governmental Affairs Committee 2000).

Dr. William J. Perry, before the Subcommittee on East Asian and Pacific Affairs of the Senate Foreign Relations Committee, said that North Korea's introduction of nuclear

weapons could undermine military stability on the Korean Peninsula (Senate Foreign Relations Committee 1999). Another serious international threat stems from North Korea's NBC weapons setting off destabilizing arms races and heightening regional tensions. For example, if Pyongyang continues to emphasize WMD capabilities, South Korea and Japan would seriously consider their own WMD programs, including delivery vehicles (US DoD 1997). Furthermore, North Korea's sales of WMD products and technology over the years have dramatically increased the missile capabilities of Iran and Pakistan (Lauder 1999).

PAKISTAN

Description of Sources

A total of 27 sources were identified and reviewed for information about Pakistan's nuclear status, future projections, possible motivations, and potential US/global threat impacts. The academic and non-governmental organization (A/NGO) sources came from *Arms Control Today* and *The Bulletin of Atomic Scientists*, in addition to papers published by the Institute for Foreign Policy Analysis (IFPA). The international and foreign government (I/FG) sources consisted primarily of Pakistani news sources but also include a German news source. Finally, unclassified United States Government (USG) sources from the Office of the Secretary of Defense, the Institute for National Security Studies at the National Defense University, and the Congressional Research Service were reviewed.

Nuclear Force Characteristics

In its *Proliferation: Threat and Response 2001* report, the USG notes that, "Pakistan has a small stockpile of nuclear weapons and can probably assemble some weapons fairly quickly. It can deliver them with fighter aircraft and possibly missiles." The source further notes that the nuclear weapons program has long been dominated by the Pakistani military (US DoD 2001). Decisions about the development and employment of nuclear weapons in Pakistan are made by the country's Chief Executive, General Musharraf. Testimony by J. Stapleton Roy, the U.S. State Department's Assistant Secretary for Intelligence and Research (Senate Select Committee on Intelligence 2000) noted that Pakistan and India have indicated that they will continue to develop their nuclear weapons and the missiles capable of delivering them. Therefore, more ballistic missile tests can probably be expected in the region.

In terms of delivery system details, the USG notes that Pakistan has developed and tested both liquid- and solid-fueled missiles. In the former category is the Shaheen SRBM, which, according to Pakistani officials, has a 750-km range and can carry a nuclear warhead. In the latter category is the Ghauri MRBM. According to Pakistani officials, the Ghauri has a range of 1,500 km and can deliver a nuclear payload. The Ghauri is based on North Korea's No Dong MRBM (US DoD 2001).

North Korean assistance to Pakistan's missile program is openly acknowledged in the Pakistani press (*Pakistan Observer* 2000).

Nuclear Force Projections

Islamabad's nuclear weapons tests in 1998 triggered considerable discussion in all three communities as to the eventual size of a Pakistani nuclear arsenal. In the A/NGO community, Albright (1998a) noted that Pakistan could have approximately 63 nuclear weapons by the end of 2005. This figured assumes that Pakistan had produced 300 kg of highly enriched uranium (HEU) in 1998 (equivalent to about 30 weapons) and continued to produce 110 kg of HEU (equivalent to about 5 weapons) annually. Albright (1998b) also estimated that Pakistan's new reactor at Khushab could produce 15-20 kg of unsafeguarded plutonium per year. Rodney Jones, et al. (1998), cite conservative

estimates of Pakistan's nuclear stockpile comprising about 10 weapons; other estimates put the 1995 figure at 15-25. Jones notes that Pakistan might use the Khushab reactor to produce lithium-6, a material used to "boost" the yield-to-weight efficiency of nuclear weapons. Heisbourg (1998-1999) estimates Pakistan's HEU holdings at 400-600 kg, enough for 20-30 weapons. Heisbourg notes that Pakistan may also have extracted weapon-grade plutonium, but does not specify an amount.

The Khushab reactor was discussed in the Pakistani press as well, with the *Pakistan Observer* (2000) stating that the reactor can produce 10-14 kg of plutonium or enough for 2-3 bombs annually.

In terms of USG sources, a Congressional Research Service report (LePoer 1998) estimated that Pakistan had enough HEU for 10-15 weapons. A RAND report (Gregory Jones 2000) estimated that the Khushab reactor was capable of producing some 2.2 weapons a year. *Strategic Assessment 1999* (INSS 1999) notes that some analysts estimate that Pakistan could produce as many as 100 nuclear weapons. However, INSS concludes that Pakistan is not likely to deploy such large numbers of weapons over the next 5-10 years. INSS is pessimistic that Pakistan or India will relinquish their nuclear weapons capabilities in the foreseeable future.

Motivations

All the categories of sources agree that Pakistan is motivated to build and enhance its nuclear capabilities, to be used as a military deterrent and to keep up with India's nuclear program.

Global and US Threats

After reviewing Indian and Pakistani force postures, geo-politics, and various technical issues, Heisbourg (1998-1999) concludes that while deliberate nuclear war in South Asia is unlikely, the risk of inadvertent nuclear war is "unacceptably high."

Strategic Assessment 1999 (INSS 1999) notes that the possible threat of terrorism in either India or Pakistan could place nuclear stockpiles at risk, particularly given the unstable domestic environments in both countries. Moreover, both countries may find it difficult to prevent accidents, theft, or unauthorized use of nuclear weapons. These factors make deployment of nuclear weapons by either country "a threat to the whole world" (Jones 2000).

RUSSIA

Description of Sources

A total of 54 sources were reviewed for information concerning Russia's nuclear status, future projections, possible motivations, and potential US/global threat impacts. Fourteen of the articles were derived from academic and non-governmental (A/NGO) newsletters, bulletins and books. More specifically, some of the sources utilized were papers that appeared in *Arms Control Today* and *The Bulletin of Atomic Scientists*. Eighteen international and foreign government (I/FG) sources were reviewed which consist of Russian press, Russian military and government documents, Chinese Military press, and Japanese and South Korean MoD white papers. The remaining materials reviewed originated from unclassified US government (USG) sources.

Nuclear Force Characteristics

The I/FG sources, in conjunction with the A/NGO and USG sources, concur that one of the top priorities of the General Staff Plan for the Organizational Development of the Russian Federation Armed Forces in 2000-05 is to maintain the Russian forces nuclear lethality (Aleksin 2000).

The A/NGO sources offer more detail on Russia's current force structure. In an overview of Russia's active systems, Povdig (1998) gives the following statistics, which only vary slightly among the A/NGO community. The number of Russian ICBMs includes 180 SS-18s; 160 SS-19s; 46 SS-24s; 360 SS-25s; and 1 SS-27. The total number of ICBMs is 747 with the total number of ICBM warheads reaching 3,635. Povdig notes that deployed SSBNs/SLBM combinations include Delta III/SS-N-18: 11/176; Delta IV/SS-N-23: 7/112; and Typhoon/SS-N-20: 4/80 for a total of 22 SSBNs and 368 SLBMs, carrying 1,776 warheads. Lastly, the number of Russian bombers includes 63 Tu-95MS and 6 Tu-160 carrying 800 ALCMs. Povdig concludes that Russia possesses a total of 1,184 delivery systems and 6,211 warheads. Cirincione (2000) stated that Russia has nearly 5,200 missile warheads deployed on approximately 1,100 strategic missiles.

The USG-related sources concur with the I/FG sources in that Russia continues to invest in its nuclear infrastructure, especially in its command and control facilities and nuclear weapons production complex (Joseph and Lehman 1998). According to the *Proliferation: Threat and Response* (US DoD 2001), Russian strategic and tactical warheads numbered "well under" 25,000, a reduction of 11,000 warheads since 1992. Moscow retains a missile force of about 1,130 operational ICBM/SLBM launchers. Russia began a serious elimination of strategic warheads in 1994 and it is believed to be dismantling warheads. However, Moscow has not disclosed specific information on warhead reductions. The source also notes that the economic situation in the country probably has slowed the reduction effort.

Nuclear Force Projections

The I/FG sources reflect Russia's growing reliance on nuclear weapons. For example, a number of senior Russian officers predict that Russia will rely heavily on its nuclear weapons until at least 2010, when the Russian Armed Forces will be able to afford precision guided conventional munitions (Levshin, et al. 1999). At the same time, financial pressures are bearing down on Russia's nuclear forces. *Kommersant* (2000) notes that Russia will not have the finances to maintain a nuclear force over 1500.

I/FG sources not based in Russia draw attention to Russia's role in proliferating weapons and technology. These sources focus on Russia's struggling economy, scientific "brain drain", state-coordinated weapons transfers, and how selling scientific knowledge and military technology can be very lucrative for Russia.

The Topol-M is expected to replace all Russian ICBMs in the next few years. Russian experts claim that the Topol-M missiles are "smart" missiles with a self-setting flight trajectory to the target. These experts also assessed that the most advanced anti-missile defense systems will be unable to withstand the Topol. Topol missiles will rely on two kinds of launchers: fixed silos and mobile. Mobile Topol-M missiles carry a yield of 300 kilotons. Russian Public Television sources also predict that the mobile Topol-M missile will be ready by 2002-03 (Russian Public Television ORT1 2000).

Lt. General Vladimir Medvedev (Ret.) (1998) claims that, "by the end of the next decade it is possible to count on having several hundred single-warhead (silo and mobile) Topol RS-12M ICBM's [SS-25 "Sickle"]...up to 105 RS-18 ICBM's [SS-19]...and a certain number of naval SLBMs in the composition of the Russian Strategic Nuclear Forces." Furthermore, Lt. General Mikhail Sergeyevich Vinogradov (Ret.) (2000) reveals that Russia is also working on a new generation of air-launched 5,500 km-range cruise missiles used for arming strategic bombers.

All of the I/FG reports acknowledged that Russia is striving for quality rather than quantity in its nuclear arsenal. This consensus reflects Russia's lack of funds to maintain its forces and modernize at the same time. Hence, Russia is looking to retire its older systems in the context of arms control agreements, while focusing its resources on selectively introducing new systems.

The A/NGO sources coincide with I/FG sources by stating that Russia has reserved the right to use nuclear weapons to repulse armed aggression if all other means of resolving crises have been exhausted. However, these sources do predict that Russia's nuclear forces, although remaining its centerpiece for defense planning, will be much smaller by 2025, due to the weak economy. Furthermore, projections are made that Russia will need to carry out substantial strategic-force modernization over the next ten years if it is to remain a major nuclear power.

Nikolai Sokov (2000), a leading expert on Russian nuclear forces, reiterates that funding capabilities will remain a major hurdle for Russia's nuclear forces: "the modernization programs lag behind the size and shape of the strategic force required by START II or even the projected START III." Sokov adds that, "from the Russian perspective, the

modernization effort is already below the minimum, and without it, Russia will lose its nuclear status in 10-15 years.” He also notes that the Russian government paid only about half the money officially allocated to the top-priority Topol-M program and only 10-20 percent for SLBM and SSBN programs.

The A/NGO sources offer the most amount of detail regarding Russia’s nuclear weapons capabilities compared to the I/FG and USG sources. The results vary significantly depending on whether the future analyses are being made under the assumption of START I, START II, or a potential START III.

According to Sokov (2000), modernization efforts in Russia span across all three legs of the triad - ICBMs, SLBMs, and heavy bombers, but are not being conducted simultaneously. At this point, one new type of ICBM is being developed and deployed, one type of SSBN is planned for deployment, and research on one new type of heavy bomber is probably underway. Still, ICBMs will certainly remain the core of the Soviet strategic potential. Russia could have a warhead stockpile ranging from 300 (single warheads) to 1500 (MIRVed warheads) by 2025.

Sokov (2000) notes that a new SLBM program has begun. Conservative estimates put the number of new ballistic missile submarines at just two by the year 2010. The whole program is reportedly seven, but its implementation will take a long time. Ultimately, Sokov believes that the sea-based leg of the triad will consist of a mixture of submarines including Project 667 BDRM (Delta IV), 941 (Typhoon), and 935 (Borey). The next generation submarines will have a lower number of warheads than Typhoons, which could vary between approximately 50 and 100. Sokov notes that this is consistent with a long-term policy of reducing concentration of warheads on delivery vehicles. According to Dean Wilkening (1998), the estimated launch date of the Borey SSBN is 2002, with an initial operational capability projected for 2004 or 2005. Wilkening believes that Russia could have 10 next-generation Borey-class SSBNs by 2025, depending on funding.

Sokov (2000) also estimates that Russian Air Force goals include transferring the remaining Tu-160 (Blackjack) and Tu-95MS heavy bombers from Ukraine to Russia, resuming modernization of the existing heavy bombers, and developing long-range aircraft with low probability of detection that would be capable of using weapons of all ranges.

According to Sokov (2001), substrategic forces have not received serious attention with one exception: Russia has completed the Iskander tactical land-based missile program (300 km-range). Russia currently has an arsenal of about 8,000-8,500 tactical nuclear warheads. Of those, about 3,000 are deployed gravity bombs and short-range missile warheads. The rest of the tactical nuclear weapons are kept at central storage facilities. Warheads for land-based missiles have apparently all been eliminated, so Iskander cannot be equipped with nuclear warheads in the foreseeable future. However, NATO enlargement might trigger Russia to rely on tactical nuclear weapons more heavily, so it cannot be ruled out that sometime in the distant future Iskander missiles will be equipped with nuclear warheads.

According to Joseph Cirincione (2000), Director of the Nonproliferation Project Carnegie Endowment for International Peace, "Russia is expected to field fewer than 2,000 strategic nuclear warheads on missiles and bombers, possibly no more than several hundred, depending on political and economic factors." He also notes that Russia's nuclear forces continue to receive high priority in terms of manpower, training and other resources.

Wilkening (1998) elaborates on Russia's ICBMs, noting that START will have little impact on the SS-24s, since all of them will be retired by 2000. The SS-25 ICBMs should begin retirement and be out of the force by 2010. Russia's main ICBM modernization program is the SS-27 (Topol M). The road-mobile version of the SS-27, a follow-on to the SS-25, is expected to be deployed soon after 2000. Assuming adequate funding, Wilkening concludes that the maximum deployment rate for the SS-27 should be 60 missiles per year. David Tanks (2000) is more conservative and claims that Russia will produce 10 to 30 SS-27 missiles a year. The new ICBMs are reportedly able to carry a very large load of decoys and defense penetration aids. The A/NGO sources concur with I/FG sources, stating that the mainstay Russian ICBM will be the Topol-M (SS-27). However, the number to be deployed depends on the allocation of funds from the government. A conservative estimate for the production of Topol-Ms by 2010 is 300 missiles, which assumes the rate of production of 25 missiles per year (Sokov 2000).

Wilkening (1998) offers several projections using a variety of different scenarios. Without ratification of START II (Wilkening's article predates the April 2000 ratification of START II by the Russian Duma), Russia might maintain a strategic force of some 4,000 nuclear warheads. Once START II is implemented, Russia's likely force of 1,800-2,500 warheads would remain markedly inferior to the 3,500 potential US warheads. The current Bear H heavy-bomber force should remain operational until around 2015.

Wilkening (1998) notes that START II strategic force modernization plans include options for modernizing only the ICBM and SLBM parts of the Russian strategic triad. Under the low option, Russia would have 90 silo-based missiles, and 110 road-mobile. The total production would be 200 with 18 missiles deployed per year. The medium option has 195 silo-based, and 205 road-mobile, the total production being 400 and 35 missiles deployed per year. Lastly, the high option for Russia would have 195 silo-based, and 350 road-mobile, a total production of 545 with 50 missiles deployed per year. The deployment period is assumed to be 1999-2012 for silo-based SS-27s and 2001-10 for road-mobile SS-27s. Furthermore, with START II ratification by the Russian Duma, only 105 SS-19s will remain in the force as single-warhead missiles after 31 December 2007, and all SS-19s will be retired by 2009.

In relation to Soviet/Russian strategic bombers, Wilkening (1998) estimates the number deployed at 64 from 2005-15, 24 in 2020. The estimate of deployed Soviet/Russian bomber warheads would stand at 734 from 2005-15, 223 in 2020. However, financial constraints are likely to be the dominant factor in limiting Russian force modernization, forcing early retirement for some strategic systems, creating maintenance problems for others and causing delays in the replacement of aging systems – the majority of which will become obsolete soon after the turn of the century.

A third A/NGO source reviewed, Paul Podvig (1998), also addresses Russia's capabilities in terms of the potential scenarios under different treaties. Podvig states that Russia has a realistic technical capability to keep 3,500-4,000 warheads deployed by 2008. However, almost half of these warheads would be deployed on silo-based MIRVed missiles. These would have to be eliminated now that Russia has ratified the START II Treaty, which bans MIRVed land-based missiles. This would bring the number down to 2,076 by 2008.

Podvig (1998) estimates the number of active systems under START I as of January 2008. The number of SS-18 ICBMs would stand at 128; SS-19: 130; SS-24: 0; SS-25: 45; and SS-27: 110. The total number of ICBMs would be 413 and the total number of ICBM warheads would be 2,215. As for SSBNs/SLBMs, the Delta III/SS-N-18 would diminish to 0/0; Delta IV/SS-N-23: 5/80; Typhoon/SS-N-20: 3/60; and the Borey: 2/24. The total number of SSBNs/SLBMs would be 10/164 and the total SLBM warheads would reach 1,016. Lastly, the number of bombers under START I would be 63 Tu-95MS, 6 Tu-160 (Blackjack), which could stay in service until at least 2010, bringing the total number of bombers to 69 and the total number of ALCMs to 800. Overall under START I the total number of delivery systems would be 700 and the total number of warheads would equal 4,031.

Podvig (1998) also makes January 2008 estimates on Russia's nuclear forces under START II. The number of SS-18 ICBMs would be 0; SS-19: 105; SS-24: 0; SS-25: 45; and SS-27: 110. The total number of ICBMs would be 260 under this scenario and the total number of ICBM warheads would also equal 260. Some additional comments made by the author include that the R-36M2 (SS-18) could be kept in Russian arsenal until at least 2004-2006, however, the extension of their operational life could keep the missiles in service until 2009-2011. As for the number of SSBNs/SLBMs and bombers, their numbers would remain the same as the above projected active systems under START I. Overall for this scenario, the total number of delivery systems would shrink to 547 and the total number of warheads would be 2,076. The source also claims that the *Yuri Dolgorukii* will be the first in a series of Project 935 strategic submarines equipped with a new solid-propellant missile. It will have 12 missiles with four warheads each. Current plans call for the construction of the ship to be completed in 2002, but may be more along the lines of 2004. The Russians may also have three submarines of the Project 935 type by 2007.

Another A/NGO source, noted Russian analyst Alexei Arbatov (1998), outlines ten potential scenarios that could alter the number of projected nuclear weapons arsenal that Russia will have by 2003 and 2010. The first scenario, allowing natural degradation to occur, would probably bring these forces down to 40 SS-18, 120 SS-19, 46 SS-24 and 220 SS-25 ICBMs by 2003, which is the original deadline for the START II implementation. The strategic ballistic missile submarine force would be down to 3 Typhoon, 7 Delta-IV SSBNs, and 3 Delta-III SSBNs, and the bomber force may be expected to comprise no more than 20 airplanes, of which 8 would be Tu-160s (Blackjacks). This would result in a baseline force of 666 launcher and 3,216 warheads. This is all based on the present level of funding, which is currently insufficient for adequate maintenance and timely overhaul or life-extension measures. By 2010 the

baseline force under the same conditions, would go down to 50 SS-25 ICBMs, 1 Typhoon SSBN, 3 Delta-IV SSBNs, and no bombers, with a total of 118 launchers and 442 warheads.

The second scenario takes into account the previous circumstances plus the current deployment rate. Continuation of present rates of procurement and deployment of SS-25 ICBMs and in a few years the follow-on SS-27 ICBM (RT-UTTH Topol- M) would add 70 missiles and warheads to the baseline force by 2003 and 150 by 2010 (Arbatov 1999).

The third scenario adds on adequate maintenance capabilities. Better maintenance, overhaul, and life extension programs with increased funding could add to the baseline-plus-new-development-force (BPNDF) 50 SS-25 ICBMs, 2 Typhoon SSBNs, and 15 Tu-95 bombers (Bear) by 2003. By 2010, the forces could have an additional 70 SS-25 missiles, 2 Typhoon, 4 Delta-IV SSBNs, and 8 Tu-160 (Blackjack) bombers (Arbatov 1999).

A higher deployment rate is another added factor in the fourth scenario. An increased procurement rate of the SS-27 ICBMs coupled with the introduction of the new SSBN class (which may be called Delta-V) would add to the force about 100 SS-25/27 missiles by 2003, and 240 by 2010. Deployment of Delta-V SSBNs would add 240 SLBM warheads in 2003 and 840 in 2010 (Arbatov 1999).

The fifth scenario takes into consideration the new MIRVed ICBMs. If the decision is made to equip the SS-27 with MIRV warheads by 2010, a Russian total enhanced force could be as large as 4,100 warheads. However, as the remaining scenarios portray, the greatest difference in the arsenal will be made by the presence or absence of START II and START III (Arbatov 1999).

Arbatov's (1999) sixth scenario incorporates START II. Matching START II would bring the Russian force arsenal to 1,806 warheads.

The seventh scenario incorporates the third scenario plus an extended START II. Assuming a 5 year extension agreement by 2008, Russian strategic forces could consist of 300 SS-25/27 ICBMs, 3 Typhoons, 7 Delta-IV SSBNs, and about 20 Tu-95/160 (Bear/Blackjack) bombers, which would add up to 1,668 warheads (Arbatov 1999).

The eighth scenario is based on the fourth scenario plus an extended START II. If Russian doctrine insists on closer parity with the US, one would go for higher ICBM and SSBN deployment and reach a force of about 2,500 warhead in 2008 (Arbatov 1999).

The ninth scenario utilizes the third scenario plus START III. This option would be to move directly to START III, with an aggregate ceiling down to 1,500-2,000 warheads (Arbatov 1999).

Lastly, Arbatov's (1999) tenth scenario is a radical reduction under START III or START IV. For Russia, the peculiarity of START III, in contrast with START II, is that it will not

require force reductions beyond natural attrition, but rather will affect the scale of maintenance efforts and the rate and system types of new deployment programs. Arbatov concludes that after 2010, the parties could go to a level as low as 1,000 or even 500 nuclear warheads.

While all of the above authors have offered numerous scenarios, the numbers do not vary greatly. Each author has provided the method used to obtain his projection by assessing weapon retirement dates, deployment rates, and/or financial circumstances.

In concert with I/FG and A/NGO sources, the majority of the USG sources agree that Russia will continue to reduce its strategic arsenal, but will maintain many of hundreds of nuclear warheads and modern delivery platforms capable of striking the US. The USG sources also seem to agree that Russia's forces will drop to below START II levels, unless Moscow deploys an expensive new weapons system. According to the 1999 National Intelligence Estimate, by 2015 Russia will keep as many nuclear weapons and ballistic missiles as its economy will permit, but well short of START I or II limitations. Russia's strategic forces will remain formidable beyond 2015, but the size of the force will decrease dramatically--well below current arms control limits--mainly due to budget constraints. Following Russia's ratification of START II, which bans multiple warheads on ICBMs, Moscow would probably be able to maintain only about half of the weapons it could possess prior to the agreement (US DCI/NIC 1999).

Motivations

Lt. General Vladimir Medvedev (Ret.) (1998) highlights Russia's motivational factors for maintaining nuclear weapons capabilities. These factors include Russia's deteriorating conventional capability, the expansion of China's nuclear arsenal, non-declared nuclear weapons states possessing nuclear weapons, and the US ability to continue development efforts in relation to TMD and naval fields. Each of these circumstances effects Russia's strategic balance of power and its ability to remain a "superpower."

Tanks (1997) assesses Russia's motivations to range from encouraging military balance in East Asia and exercising hegemony over Central Asia, to seeking former international status and maintaining a level of parity with the United States. Tanks (2000) also notes that Russia will continue to strive to deter US hegemony, and wider NATO expansion, while currently developing missile designs to defeat the US NMD system. Another motivation, according to Sokov (2000), is that Russia remains threatened by China's national defense modernization plan.

Sokov (2001) adds that the development of a US NMD program can be seen as both a threat and an opportunity and plays a key role in the future size and composition of the Russian nuclear arsenal. For instance, an NMD system might reduce the value of the Russian arsenal and open Russia to American political domination. Furthermore, under the protection of defense systems, the US will be able to use its conventional force against Russia in the same way that force was used against Yugoslavia in 1999. Lastly, China may increase its nuclear arsenal so much while reacting to NMD that it reaches the rough level of parity with Russia. If Russia anticipates any of these scenarios

becoming a reality due the development of a US NMD, then it will take the appropriate steps to counteract them.

The USG sources state that several major motivational factors for Russia to maintain nuclear weapons capabilities include deterring US intervention, while upholding its international prestige, as well as its coercive diplomacy. Mounting financial pressures and the lure of transferring sensitive nuclear and missile technologies abroad as a source of revenue are enticing incentives for Russia to maintain its program (Armed Services Committee of the United States Senate 1999). Other sources mention Russia's declining conventional forces and its increasing reliance on its nuclear arsenal, which coincided with I/FG source statements.

Global and US Threats

The I/FG community tended to focus more on the wide-range of internal threats that plague Russia, instead of the external threats that the country could generate. One issue that did surface, however, dealt with Russia's proliferation tendencies and the selling of its conventional weapons to Iran, which could ultimately produce a threat to the United States and its allies (*Frankfurter Rundschau* 2000).

Many of the A/NGO sources took the stance that Russia will be perceived as less of a threat to the United States than previously believed. One A/NGO source states that the greatest risks lie in the involvement of other countries. Under extreme circumstances, Russia may lend large-scale assistance to China to help it create a robust defense-penetration capability. Or, in another example, to offset possible impacts on its own security, Russia might decide to upgrade its relationship with India and even pay the price of recognizing it as a nuclear state and providing nuclear and missile assistance (Sokov 2001). Another potential threat that continues to loom is Russia's inability to keep effective controls on nuclear warheads and nuclear weapons material (Dunn 1997).

Vice Admiral Thomas Wilson, Director of the Defense Intelligence Agency, argued that Russia continues to possess an abundance of strategic nuclear weapons capable of striking the United States (Senate Armed Services Committee 2000). The testimony of former-DCI James R. Woolsey (House Committee on International Security 1998) asserts that Russia has become the most serious source of proliferation, both in terms of material (possible fissile) and in export control.

With regard to the safety and security of Russian nuclear forces, General Eugene Habiger (1998a), Commander of US Strategic Command, asserted that there were no "serious concerns" about Russia's security and control over its nuclear weapons facilities. Joseph Cirincione (2000) Director of the Nonproliferation Project Carnegie Endowment for International Peace, remained concerned, however, that a continuing Russian decline could weaken command and control safeguards on nuclear weapons and increase the risk of accidental launches.

SYRIA

Description of Sources

Twelve sources that were reviewed speculate on Syria's nuclear future. Six of the sources are from academic and non-governmental organizations (A/NGO), such as the Institute for Foreign Policy Analysis (IFPA) and the Monterey Institute of International Studies. One international and foreign government (I/FG) source was reviewed. The remaining five are unclassified US government (USG) sources.

Nuclear Force Projections

According to USG sources, Syria has no known nuclear weapons program (US DoD 2001). However, monitoring of Syria's embryonic nuclear research and development program for possible expansion continues. It is speculated that Moscow could aid Syria's program since both countries agreed in 1999 to cooperate on peaceful uses of nuclear energy in a wide area of disciplines (US DCI/NPC 1999).

The Center for Nonproliferation Studies (CNS) at Monterey Institute of International Studies (1998a) notes that Syria does not have a nuclear weapons program. Syria's nuclear technological development remains at the research stage and the one reactor in Damascus is under International Atomic Energy Association (IAEA) safeguards.

According to A/NGO sources, Syria is not known to have any serious nuclear aspirations, nor is it known to have any uranium resources or fuel cycle facilities. These sources provide the following arguments in relation to Syria's lack of interest in acquiring nuclear capabilities. First, the authors determine that Syria's relatively weak domestic industrial output would not allow Damascus to undertake WMD activities with a high level of autonomy. Second, although Syria continues to be interested in nuclear technology, and Damascus has established a basic nuclear research capability, it has maintained a long-term relationship with the IAEA, hampering the possibility of conducting a clandestine program. Through an IAEA technical assistance project, Syria has also obtained a small, safeguarded research reactor from China thought to be of no direct proliferation risk (Lesser and Tellis 1996). Cordesman (2000) notes that Syria does have an on-going nuclear technology research effort and does, in fact, continue to seek larger reactors. However, Cordesman does not specify if the technology is weapons-oriented.

Because Syria has no known nuclear weapons capability, the source focused on other aspects of Syria's WMD capabilities, including delivery systems. During the second half of 1999, Damascus continued work on establishing a solid-propellant rocket motor development and production capability with help from outside countries. Foreign equipment and assistance to its liquid-propellant missile program, primarily from North Korean entities, but also from firms in Russia, have been and will continue to be essential for Syria's effort. Damascus continued its efforts to assemble—probably with considerable North Korean assistance—liquid-fueled Scud C missiles (US DCI/NPC 1999).

In relation to ballistic missiles, Syria has 60-120 Scud-C ballistic missiles with 550-600km-range and 500kg payload; up to 200 Scud-B missiles with 300 km-range and 985 kg payload and 200 SS-21 Scarab with 70 km-range and 480 kg payload. It is also developing an indigenous production capability for Chinese-origin M-9 [CSS-6 or DF-15] missiles with 600 km-range and 500 kg payload (CNS 1998 and Cordesman 2000). Despite reliance on other states, Syria has improved its missile production facilities and can now build both the entire Scud B and Scud C missiles (Cordesman 2000).

As for cruise missiles, Syria has the SS-N-3b Sepal with 450 km-range and 1,000 kg payload; SS-N-2c Styx with 80 km-range and 513kg payload; Tupolev Tu-243 unmanned aerial vehicle (UAV) with 360 km-range and unknown payload; and Malachite UAV with 120 km-range and 130 kg payload (CNS 1998).

Syria is also slowly acquiring a significant long-range air strike capability. It already has 20 SU-24 strike attack aircraft (CNS 1998).

Motivations

According to Lesser and Tellis (1996), Syria's motives for WMD acquisition include deterring an attack by Israel or Turkey in response to Damascus' support for insurgents and terrorists opposed to those regimes. The argument is that Syria views itself vulnerable to an attack and must take necessary, protective measures. Lesser and Tellis also relay that the decline of military assistance from Soviet successor states has further motivated Syria, in addition to the lure of obtaining international prestige and attention.

The A/NGO sources, on the other hand, take a slightly different stance by stating that Syria's motives for WMD acquisition is a deterrent against Israel to curb its perceived aggression or expansionism (Tanks 1997). Syria also views its missiles as a strategic counterweight to Israel's nuclear forces and maintaining its rivalry with Iraq (The Risk Report 1997).

Global and US Threats

The USG sources that were reviewed do not consider Syria to be a nuclear threat due since it has no known nuclear weapons program, and does not seem to be harboring any serious nuclear aspirations.

Still, A/NGO sources argue that Syria's active missile program assisted by Russia, Iran, China, and Pakistan can be interpreted as a potential regional threat (Tanks 2000). Israel certainly considers Syria's missiles to be a threat, as they can cover all of the Jewish state. Another source notes that Damascus is also determined to acquire or build its own missiles that can also threaten the capitals of Turkey and Iraq (The Risk Report 1997).

TAIWAN

Description of Sources

A total of six sources were reviewed for information concerning Taiwan's nuclear status, future projections, possible motivations, and potential US/global threat impacts. One of the sources is an international and foreign government (I/FG) article from *Zhongguo Qingnian Bao*, a Beijing daily newspaper sponsored by the China Youth League of the Chinese Party Central Committee. Four are academic and non-government (A/NGO) sources. The remaining source reviewed originated from an unclassified US government (USG) source.

Nuclear Force Projections

Taiwan's attempt to acquire nuclear weapons dates back to the 1960s. According to Mack (1996), for more than two decades, Taiwan has made repeated attempts to acquire facilities necessary to produce fissile material. Nuclear weapons remain the ultimate "strategic equalizer" for states that perceive themselves to be outgunned by more powerful adversaries, and Taiwan is a prime example of this. Still, Albright and Gay (1998) state that Taiwan has no nuclear weapons and seems to have no plans to develop them, but only because the United States and the International Atomic Energy Agency convinced Taiwan otherwise. However, as Taiwan's technical expertise grows US pressures and interventions, which have been so successful in the past for intercepting nuclear weapons-related transfers, will prove to be less effective in the future. Mack (1996) concludes that the greater Taiwan's confidence that it can defend its vital national interests with conventional weapons, the less incentive it will have to seek nuclear weapons.

In contrast Chen (1999) claims that Taiwan has an active nuclear weapons program with enough material to develop 10 nuclear warheads. Beijing presumably espouses this view for propaganda purposes. It is included here because of its unusual level of detail.

Mack (1996) notes that there is little doubt that Taiwan's scientists and engineers have the technical ability to build nuclear weapons. Not only does the country rely on nuclear power for more than a third of its energy needs; it also has a major nuclear research capability. Taiwan, however, does not have indigenous uranium reserves, nor does it have enrichment technologies. The clandestine acquisition of fissile material from overseas, most likely from one of the Soviet successor states, does remain a possibility.

Motivations

As for potential motivational factors for Taiwan to obtain nuclear weapons capabilities, Mack (1996) cites a Taiwanese Democratic Progressive Party legislator in 1994, calling for Taiwan to build its own nuclear weapon as a deterrent against China. This is the basis of Taiwan's motives since it perceives itself to be under threat from both the conventional and nuclear forces of China. Mack also mentions that this perceived threat

is amplified since Taiwan believes that it cannot depend on military assistance from the US. Albright and Gay (1998) reiterate this by stating that “many officials at high levels in Taiwan continue to believe that a nuclear capability will provide [an] independent deterrent in the event security arrangements with the US are unsatisfactory.”

The USG source states that Taiwan remains concerned over the continuing modernization of China's People's Liberation Army (PLA) and the potential threat that it poses to the island's security. Taiwan views its success in deterring potential Chinese aggression on its continued acquisition of modern arms, technology and equipment and its ability to deal with a number of systemic problems (US DoD 1999).

Global and US Threats

According to Mack (1996), Taiwan's acquisition of nuclear weapons would prompt China to use force against the island, giving rise to regional unrest. Chen (1999), although indicating no global or direct US threats, warns that tensions between Taiwan and China have a direct impact on regional stability and US deployment in Asia.

UNITED KINGDOM

Description of Sources

In reviewing the United Kingdom (UK), a total of 16 sources were utilized, including 12 academic and non-governmental organization (A/NGO) documents and four international and foreign government (I/FG) documents. The A/NGO sources include articles from the Henry L. Stimson Center, Carnegie Endowment for International Peace, the Stockholm International Peace Research Institute (SIPRI), the Monterey Institute of International Studies (MIIS), the Natural Resources Defense Council (NRDC), the International Institute for Strategic Studies (IISS), the Federation of American Scientists (FAS), and the British American Security Information Council (BASIC). The I/FG sources consist of UK press and MoD documents.

Nuclear Force Characteristics

The UK's nuclear force is consolidated in its four *Vanguard*-class submarines. *Vanguard* made its initial patrol in December 1994, *Victorious* entered service in December 1995, and *Vigilant*, in 1998. The fourth submarine, *Vengeance*, was expected to enter service in late 2000 or early 2001 (SIPRI 1999b). The government has stated that only one ballistic missile submarine will patrol at a time, with the other three in various stages of readiness.

Each SSBN carries 16 Trident II (D-5) submarine-launched ballistic missiles (SLBMs). The Trident II is a three-stage solid-fuel missile with a 6,000 km-range and an accuracy that can be measured in meters (Royal Navy 2001c). Each Trident II SLBM can carry up to eight multiple independent reentry vehicles, for a maximum of 128 warheads per boat; however the 1998 Strategic Defense Review (SDR) stipulates that all Tridents would be downgraded to three MIRVs (48 warheads/boat) (Carnegie Endowment 2001b). One source also points out that of the 58 available SLBMs, six have already been test-fired, with plans for eight more tests, and four are set aside for a processing margin, leaving only 40 SLBMs for actual deployment (Butcher, et al. 1998).

The UK will also be upgrading ten nuclear-powered submarines in the *Trafalgar*- and *Swiftsure*-classes. They are scheduled to receive upgrades to carry US Tomahawk cruise missiles by 2008. The *Splendid*, the first submarine to be upgraded, fired the Tomahawk during Operation Allied Force. The *Triumph's* upgrade was completed at the end of 1999 (NRDC 2000).

The United Kingdom's Atomic Weapons Establishment (AWE) produced warheads for the Trident II SLBM. The warheads are designed similar to the US Trident warhead, W76, and have a yield of approximately 100 kt. (Butcher, et al. 1998).

A/NGO sources assume that the UK will only produce enough warheads to stock three submarines since this was common practice with the Polaris. Since future projections state that the UK will have fewer than 200 operationally available warheads and no more than 48 warheads per SSBN, the total warhead needed would be approximately 192 warheads if all four SSBNs had the capacity to be fully loaded (SIPRI 1999b).

However, given the strategic and sub-strategic roles of the SSBNs, each will carry approximately 36-44 warheads while on patrol, meaning the total warheads used would be approximately 160. The UK will probably keep an additional 15% in spares, making the total estimated stockpile 185 warheads (SIPRI 1999b). It should be noted that the SDR excludes "missile warheads held as a necessary processing margin or for technical surveillance purposes" from the 200 warhead limit (Butcher, et al.1998). A 1998 source claims that, depending on future plans, 40-115 more warheads will be produced in addition to the 160 to be deployed (Arkin 1998).

The 1998 Defense Review claimed the total fissile material stockpile for the UK includes 7.6 tons of plutonium, 21.9 tons of highly enriched uranium, and 15,000 tons of other forms of uranium. Since most of the material is no longer required for defense purposes, 4.4 tons of plutonium, including 0.3 tons of weapons-grade plutonium, and over 9,000 tons of non-highly enriched uranium was placed under European Atomic Energy Community (EURATOM) safeguards. The material is now available for inspection by the International Atomic Energy Agency (IAEA) (Butcher, et al.1998).

The UK MoD documents confirmed the A/NGO information on the UK's current nuclear arsenal. The UK is focusing most of its efforts on its naval nuclear capacity. With the withdrawal of the RAF WE177 bombs, the Trident submarine is the UK's only nuclear weapon. Trident submarines carry only 48 warheads. Only one submarine will be on patrol at any given time. It will be on a reduced state of alert with its missiles detargeted (United Kingdom 1998b).

Nuclear Force Projections

The A/NGO sources cite budgetary pressures as a main contributor to significant reductions in Britain's deployed and planned nuclear forces. The cutbacks will result in a 70% decrease in the total fire power of the operationally available force. For example, each Trident submarine will have 1/3 less explosive power than the Chevaline-armed Polaris submarines (SIPRI 1999b; Jane's Defense Weekly 1998). In March 1998, the Royal Air Force (RAF) ceased nuclear activities upon the operational withdrawal of the remaining WE177 warheads and terminated the Tornado aircraft's nuclear mission. The WE177 bombs had all been dismantled by August 1998 (SIPRI 1999b). By phasing out the RAF nuclear role, the UK will centralize and manage its nuclear capabilities through its submarine force. The Navy will now be responsible for both the strategic and sub-strategic missions. A MoD official described a sub-strategic strike as "the limited and highly selective use of nuclear weapons in a manner that fell demonstrably short of a strategic strike, but with a sufficient level of violence to convince an aggressor who had already miscalculated our resolve and attacked us that he should halt his aggression..." (SIPRI 1999b).

The I/FG documents come directly from the UK MoD. The UK is diminishing its nuclear forces to the minimum credible deterrent while maximizing its nuclear potential. Its plans are to create a reduced, more potent and portable nuclear force that will allow the UK to keep its arsenal at smaller, but more readily available levels (United Kingdom 1998a, 1998b).

The Labor government published the Strategic Defense Review in 1998. This document contained several key decisions regarding the UK's nuclear programs:

- Only one British submarine will patrol at any given time, and that boat will carry a reduced load of 48 warheads.
- The submarine will patrol at a reduced state of alert; its missiles detargeted. It will be capable of firing its missiles within days, not minutes as during the Cold War. It will also carry out a range of secondary tasks.
- Britain will maintain fewer than 200 operationally available warheads.
- Britain will purchase a total of 58 rather than 65 Trident II (D-5) missiles (United Kingdom 1998b, NRDC 2000).

Several A/NGO sources point out that while this program is laudable, the British forces are continuing current practices when it comes to patrolling. The Strategic Defense Review also does not define exactly what a "reduced state of alert" means.

Motivations

The A/NGO sources report that the use of nuclear or biological weaponry by hostile third world proliferators has discouraged the UK from making fundamental revisions that would cast doubt on the potency of its nuclear force (Dunn 1997). It is attempting to address these new threats in the sub-strategic framework. The weapons carried on the SSBNs will serve to deter against strategic and sub-strategic threats.

The UK MoD itself declares that it is downsizing its forces as it sees no compelling nuclear threat, but potential biological or chemical threats from developing proliferators require the maintenance of a limited nuclear defense.

Global and US Threats

While the UK deterrent is not officially directed at any specific country, the existence of Russia as a preeminent military power and nuclear superpower in Europe continues to be a determining factor in the UK's future force structure and policies (WEU Parliamentary Assembly 1994).

The UK MoD notes that "any risk to Britain from the ballistic missiles of nations of concern in terms of proliferation is many years off, but the risk to some of our NATO allies is less distant; and British forces must be able to operate in regions, such as the Gulf, where they might face these risks" (United Kingdom 1998a).

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