~~Secret~~ [redacted] (b)(3)

Emerging Missile Threats to North America During the Next 15 Years [redacted] (b)(3)

NIE 95-19, November 1995

Scope Note

Emerging Missile Threats to North America During the Next 15 Years [redacted] (b)(3)

This Estimate is designed to support decision making on missile defense systems for North America. It contains our judgments about the potential emergence of new, long-range ballistic and cruise missile threats to North America over the next 15 years. The possible use of ship, air, or submarine platforms for forward deployment of shorter range missiles also is discussed. In the analysis, we considered the political motivation, technological capabilities, and underlying economic conditions of 18 countries; however, we did not attempt to account for alternative economic and political futures. In particular, we did not consider the effect of reunification of the Korean Peninsula. [redacted] (b)(3)

The Estimate excludes from consideration the declared nuclear powers-Russia, China, France, and the United Kingdom. However, in response to specific requests, we address the possibility of an unauthorized launch of strategic ballistic missiles from Russia and China. We also consider which countries are likely to be sources of missiles or missile technology. [redacted] (b)(3)

To bound the scope of this Estimate, we do not assess the following potential threats:

- Unmanned aerial vehicles (UAVs), or unmanned aircraft.
- Terrorist efforts to deliver weapons of mass destruction against the United States or other North American targets.
- Land-attack cruise missiles with maximum range capability less than 300 km and antiship cruise missiles.

Approved for Release: 2024/05/28 C06944017

- Missile launches from within the North American continent. [redacted] (b)(3)

Classification of Ballistic Missiles by Range [redacted] (b)(3)

Short Range (SRBM)
less than 1,000 km

Medium Range (MRBM)
1,000 km to 3,000 km

Intermediate Range (IRBM)
3,000 km to 5,500 km

Intercontinental (ICBM)
greater than 5,500 km

As with all projections of long-term developments, there are substantial uncertainties. We have tried to quantify these uncertainties, sometimes by describing separately our estimates for the most likely pace of developments, and for the most aggressive, but reasonable pace. [redacted] (b)(3)

Key Judgments

Emerging Missile Threats to North America During the Next 15 Years [redacted] (b)(3)

No country, other than the major declared nuclear powers, will develop or otherwise acquire a ballistic missile in the next 15 years that could threaten the contiguous 48 states or Canada.

Table 1. Projections for Indigenous ICBM Developments in the Next 15 Years [redacted] (b)(3)

- Among Third World countries hostile to the United States, North Korea has the most advanced ballistic missile program. One of its missiles in development, the Taepo Dong 2, is assessed to have a range of 4,000 to 6,000 km. A 6,000 km-range would be sufficient to strike portions of Alaska and the far western Hawaiian Islands-more than 1,000 km west of Honolulu.

- North Korea is unlikely to obtain the technological capability to develop a longer range, operational ICBM. North Korea would have to overcome significant hurdles to complete such a program, particularly given the political and economic uncertainties and technological challenges it faces. North Korea would have to develop new propulsion and improved guidance and control systems [redacted] (b)(1) (b)(3)

No other potentially hostile country has the technical capability to develop an ICBM in the next 15 years. Three countries not hostile to the United States-India, Israel, and Japan-could develop ICBMs within as few as five years if they were motivated, but we judge that they are unlikely to make the necessary investment during the period of this Estimate (see table 1). [redacted] (b)(1) (b)(3)

We are likely to detect any indigenous long-range ballistic missile development program many years before deployment. (b)(1) (b)(3)

[redacted]

- Foreign assistance is a wild card that can sometimes permit a country to solve difficult developmental problems relatively quickly, and thus hinder our ability to predict timelines. (b)(1) (b)(3)

- Because of the similarity of ICBMs and space launch vehicles (SLVs), SLV development by a potentially hostile state [redacted] indicator of a potential ICBM program. [redacted] (b)(3)

Export Controls. We project the Missile Technology Control Regime (MTCR) will continue to significantly limit international transfers of missiles, components, and related technology, but some leakage of components and critical technologies will likely continue. [redacted] (b)(3)

We expect no country with ICBMs will sell them. Each of these countries has agreed to adhere to the MTCR, and transfer of an ICBM would show blatant disregard for the Regime. Also, countries probably would be concerned that the missiles might be turned against them. [redacted] (b)(3)

Cruise Missiles. By 2005, several countries, including some hostile toward the United States, probably will acquire land-attack cruise missiles to support regional goals. A cruise missile attack on North America by a Third World country, using ships off the coast as launch platforms, would be technically feasible, but we think such an attack is unlikely because of the perceived difficulty of ensuring mission success. [redacted] (b)(3)

Unauthorized or Accidental Launch [redacted] (b)(3)

We conclude that the current threat to North America from unauthorized or accidental launch of Russian or Chinese strategic missiles remains remote and has not changed significantly from that of the past decade. However, we are less confident about the future, in view of the fluid political situations in both countries. If there were a severe political crisis in either country, control of the nuclear command structure could become less certain, increasing the possibility of an unauthorized launch. Nevertheless, the possibility would remain quite low. [redacted] (b)(3)

Discussion

Introduction

Several factors will determine whether any country (other than Russia, China, France and the United Kingdom) will develop, over the next 15 years, a ballistic or cruise missile that could threaten North America. These factors include political motivation, indigenous technological and economic capabilities, and the availability of foreign technical assistance. The 18 countries discussed in this Estimate either have ballistic or land-attack cruise missile (LACM) programs underway or have the technological capability to develop them. (1) [redacted] (b)(3)

To cover targets in North America, a missile launched from the countries discussed below (with the exception of Cuba) would have to be capable of ranges of 5,000 to 13,000 km, depending on the country and the target chosen. Figures 1 to 3 show range contours to the United States and Canada. With forward deployment of missile launchers, shorter range missiles could threaten North America. [redacted] (b)(3)

(b)(1) (b)(3) Russia and China continue to maintain strategic forces that are similar in nature to those of the past decades. These forces are presently under secure command and control [redacted] (b)(1) (b)(3) the effectiveness of the measures in place to prevent an unauthorized launch. However, we are less confident about the future. If there were a severe political crisis, the nuclear command structures could splinter, increasing the possibility of unauthorized launch of strategic missiles. Nevertheless, the possibility would remain quite low (see inset on page 4). [redacted] (b)(3)

~~Secret~~ [redacted] (b)(3)

Intercontinental Ballistic Missile Development Programs

Motives
Over 30 countries have acquired ballistic missiles, and over a dozen have or have had indigenous programs. These programs are driven primarily by regional security goals, national prestige, and the quest for foreign sales. Short- or medium-range missiles have been adequate for these requirements. [redacted] (b)(3)

Over the next 15 years, however, the following incentives may cause countries to consider developing or obtaining intercontinental ballistic missiles (ICBMs). (2)

- ***Deterrence/Intimidation***. An ICBM with a nuclear warhead or other weapon of mass destruction (WMD) may be perceived as providing means to deter the United States or some other power from intervening in a regional conflict. During a crisis even a few nuclear-armed missiles would enable a country to threaten "unacceptable" damage.

(b)(3)

- ***Prestige***. A country could use an ICBM development capability to advertise its military strength and technical know-how, and to sell other weapons and technology. [redacted] (b)(3)

<u>Figure 1. Ranges to the United States and Canada</u>

<u>Figure 2. Ranges to the 48 Contiguous States</u>

<u>Figure 3. Ranges to Honolulu, Hawaii</u>

Such incentives will be measured against various disadvantages, including:

- ***Expense***. To develop an ICBM, a country would incur direct costs for design and manufacturing, construction of test facilities, development or purchase of expensive equipment for evaluating tests, manpower for analysis of data and modification of design, and test missiles.

- ***Disruption/Retaliation***. Adversaries might take action to disrupt the ICBM development program. If a missile were developed, the risk of retaliation would argue against its use.

- ***Sanctions***. The United States and others, including members of the MTCR, might impose sanctions. [redacted] (b)(3)

Developmental Approach
Economic, technological, and infrastructure constraints could lead a country to adopt minimal requirements for an ICBM weapon system to target North America. Potential shortcuts include:

- Developing a missile capable of reaching only a portion of the continent.

- Developing the most basic guidance and control system sufficient only to give reasonable

~~Secret~~ [redacted] (b)(3)

probability of hitting the target country.

- Developing relatively low-technology reentry vehicles (relatively large and blunt).
- Using a conservative design and limited testing.
- Converting an indigenous space launch vehicle (SLV) to an ICBM. [redacted] (b)(3)

There is an alternative view that a country would require an ICBM to be effective in holding specific area targets at risk, and therefore would establish more demanding requirements for accuracy, range, payload capability, and force size. (3) [redacted] (b)(3)

Potential Threat to North America From Unauthorized Launch of Russian or Chinese Missiles [redacted] (b)(3)

(b)(1) (b)(3) ***Russia.*** *We reaffirm our previous judgments regarding the potential for unauthorized missile launch.* [redacted] *As long as Moscow maintains current security practices, the possibility of an unauthorized launch of strategic nuclear missiles is remote.*

(b)(1) (b)(3) [redacted] (b)(1) (b)(3)

[redacted] *continuing analysis give us more confidence in our judgment* [redacted] (b)(1) (b)(3)

(b)(1)
(b)(3)

~~Secret~~ [redacted] (b)(3)

- *The Russian system is not absolutely fail-safe, however, and in the event of a severe political crisis in the future, particularly if widespread violence occurred, the* [redacted] *nuclear command structure could splinter* [redacted] *If Russian disintegration were to occur, its pace, breadth, and level of violence, as well as the character of the political and military leadership, would determine the stability of control over the nuclear arsenal and any incentives to launch missiles at North America.* [redacted] (b)(1) (b)(1) (b)(3) (b)(3)

China. [redacted] *While we believe China's strategic nuclear missiles are secure under current political conditions,* [redacted] *in the event of political upheaval or a splintering of the military. In these situations, the loyalty and cohesion of the strategic missile forces-the 2nd Artillery Corps-will be the decisive factor.* (b)(1) (b)(3) (b)(1) (b)(3) (b)(1) (b)(3)

- *Beijing has shown interest in acquiring US technology to improve the security of its weapons. However, its willingness to cooperate will be limited by the desire to keep secret the technical details of its programs.* [redacted] (b)(3)

(b)(3) [redacted]

Foreign Assistance
Foreign assistance could affect the pace and outcome of an ICBM development program by helping a country overcome major obstacles. China, France, Germany, Japan, Russia, Ukraine, the United Kingdom, and the United States (and companies in these countries) are prominent potential sources of technology and components. [redacted] (b)(3)

As the MTCR matures and membership grows, it will continue to slow the transfers of components and technology (see inset on MTCR). The Regime has helped to terminate ballistic missile programs in Argentina, Brazil, and South Africa. It continues to delay programs in Libya, India, and Pakistan by halting or intercepting transfers of critical components. It also forces potential suppliers and buyers to expend more resources to keep transfers and programs hidden. But as a practical matter, it cannot constrain transfers of knowledge by missile engineers, most dual-use technologies, or small components.

The Missile Technology Control Regime [redacted] (b)(3)

~~Secret~~ [redacted] (b)(3)

The MTCR, established in 1987, is the primary international regime aimed at stemming the proliferation of unmanned delivery systems and related technologies. The original goal of the MTCR was to stop the proliferation of unmanned vehicles that have the capability to deliver a payload of 500 kg to ranges beyond 300 km. In June 1993, the guidelines of the MTCR were expanded to cover unmanned delivery systems of any range and any payload if they are judged to be intended to carry weapons of mass destruction (WMD) such as nuclear, chemical, or biological warheads. Because significant portions of subsystems or technologies associated with certain classes of civilian vehicles are usable in missile delivery systems, the capability of the unmanned vehicle is critical regardless of its type. Therefore, MTCR includes-but is not limited to-SLVs, sounding rockets, drones, and remotely piloted vehicles, in addition to ballistic and cruise missiles. [redacted] (b)(3)

The MTCR is governed by guidelines covering items in two categories. Category I covers complete unmanned delivery systems that have the 300 km/500-kg capability, production facilities specially designed for these systems, and complete subsystems usable in Category I systems. The list of subsystems includes RVs and associated equipment; solid- or liquid-propellant rocket engines; guidance sets; thrust vector control devices; and warhead safing, arming, fuzing, and firing mechanisms. The MTCR members have agreed to exercise restraint in the consideration of Category I items, and there will be a strong presumption to deny such transfers. If an MTCR nation approves a transfer of such items, then, according to the guidelines, that nation's government is to take all steps necessary to ensure that the item is put only to its stated end use. No member is to authorize the transfer of production facilities. [redacted] (b)(3)

Category II systems include those that can deliver a payload less than 500kg to a range of at least 300 km. These systems can be exported if it is determined by the MTCR member that the importing country is not planning to use the system with a WMD warhead or to divert components or technology to a Category I missile development program. Category II also covers a long list of components and production equipment that are potentially dual-use items; in some cases, by setting thresholds on specific technical parameters. For example, Category II includes numerically-controlled machines that can be used for civilian applications as well as missile production. [redacted] (b)(3)

Membership in the MTCR has grown to 28 nations-including recently Russia, South Africa, and Brazil. A broad invitation has gone to all nations to join the MTCR or abide by MTCR guidelines. Of primary concern are the current or potential suppliers to the Third World who are not MTCR members-China, North Korea, Israel, Indonesia, India, Ukraine, and Kazakstan. In March 1992 and again in October 1994, China pledged to Washington that it would adhere to the original MTCR guidelines. Other countries might agree to abide by MTCR guidelines-as Israel has done-but it does not necessarily follow that a country will become an MTCR member, particularly if its export control laws or willingness to enforce these laws are not viewed by MTCR members as adequate. [redacted] (b)(3)

(b)(1)
(b)(3)

- ***Technologies and components***. The MTCR calls for nations to control dual-use missile-related items but does not ban all such exports. China, an MTCR adherent, continues to transfer [redacted] technologies that could contribute to development of missiles capable of delivering WMD. The Russian Government may not be able to prevent its aerospace industry from selling abroad because of economic pressures and a weak export control system. We assess that countries wanting to develop long-range missiles over the next 15 years will be able to acquire technologies [redacted] (b)(1) (b)(3)
- ***Missiles***. North Korea, which is not an MTCR member, has been exporting Scud B and C missiles and production technology to Syria and Iran [redacted] (b)(1) (b)(3)
- ***ICBMs.*** We expect countries that currently have ICBMs will not sell them. Each of these countries either is an MTCR member or has agreed to abide by its terms and recognizes that transfer of an intercontinental-range missile would show blatant disregard for the Regime. Also, countries probably would be concerned that any missiles sold might some day be turned against them. [redacted] (b)(3)

Propulsion Technology

From the standpoint of technologies, propulsion (including airframe construction and design of multistage missiles) most limits a Third World country from developing an ICBM. Specifically, achieving intercontinental range requires a level of propulsion technology significantly different from that for Scuds and short-range solid- propellant missiles.There is an alternative view that guidance and control poses a greater challenge than propulsion, especially if guidance and control systems are unavailable from foreign suppliers. (4) [redacted] (b)(3)

Most countries have access to the theoretical concepts for designs of ICBM-class rocket propulsion, but few countries have experience in or access to high-quality materials, manufacturing capability, and test equipment needed to develop ICBM-class propulsion systems. Companies that produce ICBMs hold critical aspects of propulsion design and production as proprietary information. [redacted] (b)(3)

To achieve ICBM capability, missiles must incorporate certain levels of propulsion and structural technology (see figure 4 and annex A). Countries would need to develop new rocket propulsion systems using higher energy storable liquid or solid propellants. [redacted] (b)(1) (b)(3)

~~Secret~~ [redacted] (b)(3)

[redacted] (b)(1) (b)(3)

Some countries are obtaining foreign assistance to develop new solid propellants. [redacted] (b)(1) (b)(3)

We doubt that any potentially hostile country will develop indigenously solid-propellant rocket motors meeting ICBM requirements before 2010. Successfully fabricating solid-propellant motors usually evolves from years of experience, and the larger the motor the harder the problem (see annex A). Development times would be shorter if a foreign supplier provided technology and assistance significantly beyond levels we anticipate. [redacted] (b)(3)

[redacted] (b)(1) (b)(3)

(b)(1) (b)(3)

Reentry Vehicles

Information on [redacted] heat shield material is widely available. Technologies for the design of reentry vehicles, including aerodynamic features, also are likely to be available. Therefore, countries that can meet the other challenges of developing an ICBM should have minimal difficulty achieving a low technology reentry vehicle (RV). [redacted] (b)(3)

We believe the goals of any ICBM program would include a nuclear warhead. [redacted] Obtaining a nuclear warhead compatible with an ICBM, however, is a difficult problem. First generation nuclear weapons [redacted] are likely to limit missile range because of their weight. [redacted] (b)(1) (b)(3) (b)(1) (b)(3)

Guidance and Control (b)(3)

(b)(1) (b)(3)

Impact accuracy of tens of kilometers may suffice for development of an ICBM with a nuclear warhead. However, reliability will be a high priority to minimize the chance of wasting the considerable developmental work for both the missile and the warhead. [redacted] (b)(3)

~~Secret~~ [redacted] (b)(3)

Figure 4. Propulsion Capability [redacted] (b)(3)

[redacted] development of an indigenous guidance system for longer range missiles might require ten or more years. Countries seeking ICBMs are more likely to attempt to purchase guidance systems from foreign suppliers. Despite MTCR, we expect a determined country could acquire one within five years. [redacted] (b)(1) (b)(3) (b)(1) (b)(3)

Use of Space Launch Vehicles (SLVs) as Ballistic Missiles

Technologically advanced countries that have successful space programs-Japan, Israel, and India-have designed and produced advanced propulsion systems, most using solid or storable liquid propellants. If so motivated, they could apply the same technology to develop and produce ICBMs. Other countries also have had programs to develop SLVs, most relying heavily on foreign assistance. [redacted] (b)(3)

SLVs and ballistic missiles have similar propulsion and guidance systems [redacted] Even with substantial foreign assistance, almost all countries now seeking to develop nuclear weapons are unlikely to have the capability to develop SLVs during the next 15 years. Development of an SLV [redacted] indicator of a potential ICBM program. [redacted] (b)(1) (b)(3) (b)(3)

(b)(1) (b)(3) The MTCR controls SLV related transfers, but guidelines state that controls are not intended to impede space programs. The regime effectively gives some latitude for SLV related transfers among members. However, for transfers to nonmembers there is an obligation to ensure that SLV related sales do not assist programs for WMD delivery. [redacted] (b)(1) (b)(3)

Land-Attack Cruise Missile Development

(b)(1) (b)(3) No country has developed an intercontinental cruise missile. Russia and the United States have LACMs with range capability over 3,000 km, and Russia is developing at least one new cruise missile expected to have a range of 4,000 to 5,000 km. We are almost certain [redacted] no country will develop an intercontinental cruise missile during the next 15 years. [redacted] (b)(3)

We expect LACMs with ranges of 300 to 1,000 km will proliferate in the next 15 years. As countries recognize the utility and cost effectiveness of highly accurate cruise missiles using the US Global Positioning System (GPS) or Russian GLONASS satellite navigation system for navigation, some will develop or purchase them to address regional security concerns. [redacted] (b)(3)

What About a Purchased SLV? [redacted] (b)(3)

(b)(1) (b)(3) [redacted] *Russia and Ukraine will be able to move ICBMs or SLBMs reconfigured into SLVs to facilities outside their national territory to provide commercial space launch services. Both countries have stated specifically that they will retain ownership and control of these systems.* [redacted] (b)(3)

Even if a country were to obtain an SLV it would face technological obstacles roughly as challenging as those involved in an indigenous ICBM program. At a minimum, a country wanting to convert an SLV to an ICBM must perform complex processes [redacted] (b)(1) (b)(3)

Without significant technical assistance from the producer, even a technologically advanced country would find it difficult to reliably integrate new guidance and reentry systems into an unfamiliar SLV. A country would need to purchase a number of vehicles to test and evaluate the guidance and reentry system modifications. An SLV conversion may shorten the ICBM acquisition timeline, particularly propulsion development time, but probably not significantly. [redacted] (b)(3)

(b)(1) (b)(3) Secret [redacted] (b)(3)

[redacted] countries (excluding the United States) are developing LACMs with ranges of 300 km or more, and we project most will become operational within 15 years (see table 2). We anticipate that other countries, including those potentially hostile to the United States, will embark on LACM programs by developing them indigenously, modifying existing systems, or purchasing them from foreign suppliers [redacted] (b)(1) (b)(3) An alternative view holds that potentially hostile countries are unlikely to develop systems indigenously because of substantial existing investments in ballistic missile procurement, development, and production infrastructure. They may purchase LACMs in small numbers to meet special military requirements. (6) [redacted] (b)(3)

Several factors will contribute to the proliferation of cruise missiles:

- The cost of developing or purchasing LACMs is likely to be less than for ballistic missiles with the same range.

[redacted] (b)(1) (b)(3)

Cruise missiles have some shortcomings that may discourage their widespread acquisition.

- Without signature reduction and a low-altitude terrain-following flight profile, LACMs are more vulnerable to existing air defenses than are ballistic missiles.

- LACM flight time is longer than for ballistic missiles, although the military significance of longer flight time probably is not great in many scenarios.

- LACM payloads tend to be smaller than those of ballistic missiles and may not be sufficient for some first generation nuclear weapons. [redacted] (b)(3)

The MTCR attempts to control cruise missiles and related technologies in the same manner as it controls ballistic missiles. (7) However, because of the relatively greater dual-use nature of most cruise missile technologies and the difficulty of capturing cruise missile systems under Category I criteria, we expect more leakage. [redacted] (b)(1) (b)(3)

A cruise missile attack against North America from a forward launch platform would be technically feasible, but we judge this scenario is unlikely. [redacted] (b)(1) (b)(3)

- A surface ship (naval ship or a freighter) could carry cruise missiles and launchers [redacted] (b)(1) (b)(3)

- Cruise missiles could be launched from fighters, bombers, or, theoretically, from transport aircraft. We judge it unlikely any Third World country would choose this delivery method because of the limited range capability of Third World bombers and fighters, and the technical difficulty of missile integration on transports.

- A cruise missile launched from a submarine torpedo tube would have the advantage of covertness. This approach is unlikely for Third World countries because of the technological sophistication required, the current lack of suitable launch platforms [redacted] (b)(1) (b)(3)

Table 2
Worldwide Developmental and Operational Land-Attack Cruise Missiles [redacted] (b)(3)

Secret [redacted] (b)(3)

Country	System	IOC	Maximum Range (km)	Launch Mode
China	SRCM (Modified HY-4)	2000	200 to 500	L,A
	LRCM	2005	1,000 to 3,000	L,A
France	Apache-AI	1999	250 to 400	A, Possibly S
	Apache-C (SCALP)	2002	500 to 800	A, Possibly S, U
	ASMP	1986	400	A
	ASMP-C (ASURA)	Proposal	400+	A, Possibly S, L
	ASLP	2005	800 to 1,500	A
	Hypersonic CM	2010+	?	A, Possibly S
Germany/ Sweden	KEPD-250/350	1998-2002	250/350	A, Possibly L
Israel	Delilah 2	1993	250 to 400	A, L
	STAR-1	1996	400	A, Possibly L
	Popeye LACM Variant	Development	500	A
Italy	Teseo Mk3	Post-2000	300+	S, L

[redacted] (b)(1) (b)(3)

Secret [redacted] (b)(3)

Secret [redacted] (b)(3)

Russia	AS-4c	1967	480	A
	AS-15 MOD 1	1984	2,700	A
	AS-15 MOD 2	1988	3,500	A
	SS-N-21	1987	2,800	U
	SS-N-21 Follow-On	1998-2000	600+	U
	VA-14 [Classified Designator]	2005+	4,000+	A
	AS-15 Conventional Variant	Proposal	1,000+	A
	AS-15 Follow-On	2005	4,500+	A
	Stealth Cruise Missile	2003	Unknown	Unknown
S Africa	HTD Follow-On	2000+	500 to 800	L
	MUPSOW	1998?	150 to 400	A
	Flowchart 2 (Low Observable Cruise Missile Simulator)	Proposal	500 to 800	L
S Korea	Ch'ongryong	?	?	L

[redacted] (b)(1) (b)(3)

Note: L= Land-launched
A= Air-launched
S= Ship-launched
U= Submarine-launched

This table is [redacted] (b)(3)

Secret [redacted] (b)(3)

Missile Programs of Selected Countries

The likelihood of indigenous development of an ICBM by each of 18 countries is indicated in table 1, which also portrays the technical capability, economic resources, and motivation.

- This section addresses six potentially hostile countries we judge could be motivated in the next 15 years to acquire missiles that could threaten North America. These countries are all unlikely to develop an ICBM that could reach the contiguous 48 states or Canada. However, among these countries, North Korea, Iran, and Iraq are the most capable of doing so. We also consider potential use of LACMs.

Unconventional Missile Threats [redacted] (b)(3)

A motivated country might also consider other technically less feasible options for missile attack.

- *Launching a short- or medium-range ballistic missile from a ship is possible but difficult because of requirements related to missile guidance and the launch operation itself. Launch of a ballistic missile from an aircraft, though possible, would pose nearly insurmountable difficulties for a Third World country in the time period of this Estimate.*

- *Placing a nuclear warhead and reentry vehicle into orbit for targeting at a later time is an unattractive option. Controlling the reentry location (impossible without a global tracking and communication net), and achieving sufficient reliability with minimal or no testing are both difficult requirements to meet. Any country capable of meeting these requirements would likely have the technical capabilities to pursue the more conventional approach of ballistic missile development.* [redacted] (b)(3)

- Countries with the technical capability to develop ICBMs during the period of this estimate, but unlikely to be motivated to do so, are discussed in annex C. We judge that India, Israel, and Japan could develop an ICBM within five years but are unlikely to do so. LACM programs for these countries are discussed as appropriate.

- Countries with the least technical capability and little motivation are discussed inannex D. [redacted] (b)(3)

North Korea
North Korea is developing two new multistage ballistic missiles, the Taepo Dong 1(TD-1) and TD-2, with range capabilities greater than that of the single-stage No Dong missile it tested in

Secret [redacted] (b)(3)

May 1993. [redacted] (b)(1) (b)(3)

- **TD-1**. This two-stage missile apparently combines the No Dong as a first stage with a Scud as the second stage, but with a payload section different from that of the Scud. We assess the TD-1 could carry a payload of 500 to 1,500 kg to ranges of 1,500 to 3,000 km. There is one view in the Community that this missile could be flight tested at any time and could be ready for deployment within one or two years after a successful test. (8) Another view holds that the first TD-1 flight test could occur around 1997 and that the missile may be a technology demonstrator-to test missile staging and other design features. According to this view, if the missile is intended for deployment, it could be operational after 2000. (9) (b)(1) (b)(3)

- **TD-2**. This missile also has two stages, apparently combining the No Dong as a second stage with a much larger first stage. [redacted] the TD-2 would have a range of 4,000 to 6,000 km. [redacted] (b)(1) (b)(3) With a range of 5,000 km or more, the TD-2 could cover portions of Alaska and the far western Hawaiian Island chain from near Midway Island eastward, but not within 1,000 km of Honolulu (see figure 6). Estimates for the earliest time period this missile could be operational range from 2000 to 2005. In one view, TD-2 flight tests are unlikely before 2000 and if tests soon thereafter are successful, a missile would be operational no earlier than 2005. (10) Another view holds that a first flight test could occur as early as 1996, and should this happen, the missile could be operational by 2000. (11) [redacted] (b)(1) (b)(3)

[redacted] A possible motivation for North Korea to develop such an ICBM might be to deter US involvement in any conflict on the peninsula. [redacted] (b)(3)

Figure 5. North Korean Missiles [redacted] (b)(3)

There is one view that the [redacted] (b)(1) (b)(3)

North Koreans will continue missile development and will try to make the program appear to be as active as possible in order to enhance their negotiating position. [redacted] (b)(1) (b)(3)

(b)(1) (b)(3)

Secret [redacted]

(b)(3)

[redacted] (b)(3)

To develop a longer range (beyond TD-2) ICBM, North Korea would have to [redacted] overcome significant technological hurdles. [redacted] and if resources are available, it could have an operational longer range ICBM after the period of this Estimate. Should a more aggressive program exist than we think is likely, and should it progress faster than we think is possible for the North Koreans, they might be able to develop an operational 8,000 to 10,000-km ICBM as early as 2010. [redacted] (b)(1) (b)(3)

Substantial foreign technical assistance could make the more aggressive pace more likely. [redacted] (b)(1) (b)(3)

[redacted] (b)(1) (b)(3)

Figure 6. Ranges From North Korea

[redacted] (b)(1) (b)(3)

~~Secret~~ [redacted] (b)(3)

[redacted] (b)(1) (b)(3)

Guidance and Control. North Korean produced guidance and control systems will continue to lag far behind Western, Russian, and even Chinese systems for at least the next decade.

(b)(1) (b)(3) [redacted] (b)(1) (b)(3)

RVs. [redacted] we assess needed improvements- [redacted] would take North Korea no more than five years to develop. [redacted] (b)(1) (b)(3)

Test and Instrumentation Infrastructure. A flight test program is essential to the development of an ICBM. North Korea, however, because of its geographic location and land mass area is severely constrained in options for test ranges for missiles with medium and long ranges. [redacted] (b)(3)

P'yongyang cannot test missiles [redacted] without overflying Russian, South Korean, Japanese, or Chinese territory.

[redacted] (b)(1) (b)(3)

North Korea could try to solve this test range problem by seeking facilities in another country, though P'yongyang would have difficulty finding a country both willing to oblige and having enough room to conduct such a test. [redacted] (b)(1) (b)(3)

SLBMs. North Korea does not have an SLBM and we believe it is not capable of developing one. [redacted] (b)(3)

Funding. Although missile development programs strain its already weakened economy, North Korea will likely continue funding them. North Korea has obtained partial funding for its programs with foreign currency earned through missile sales. [redacted] (b)(1) (b)(3)

Cruise Missiles. [redacted] We assess (b)(1) (b)(3)

~~Secret~~ [redacted] (b)(3)

North Korea is unlikely to develop a LACM with a range greater than 300 km because of its lack of success in developing advanced ASCMs and other precision guided munitions. However, North Korea may try to buy LACMs, components, and related technology. [redacted] (b)(3)

(b)(1)
(b)(3)

Iran

[redacted] we assess that limitations in Iran's technological infrastructure and economic constraints would preclude development of an ICBM in less than 15 years. [redacted] (b)(3)

(b)(3)

Iran is trying to acquire a regional ballistic missile capability to project power throughout the Middle East. It also wants to counter ballistic missile threats from such neighbors as Iraq, Israel, and Saudi Arabia. [redacted]

Tehran is advancing its ballistic missile development programs to achieve an MRBM capability over the next decade with substantial assistance from North Korea, Russia, and China. [redacted]

[redacted] (b)(1) (b)(3)

<u>Figure 7. Ranges From Iran and Iraq</u>

Without substantial foreign assistance, however, Iran's technological infrastructure lacks the depth to move from SRBMs or MRBMs to ICBMs. [redacted] (b)(1) (b)(3) A missile launched from Iran would need a 10,000-km range capability to reach North America (see figure 7). [redacted] (b)(3)

(b)(3)

Warheads. Iran is pursuing the acquisition of nuclear and biological weapons. We assess that without major setbacks Iran may develop a centrifuge process for uranium enrichment and produce sufficient material for a nuclear device sometime after 2000. A warhead for an ICBM RV would take longer. [redacted] (b)(3)

Cruise Missiles. We assess Tehran eventually will develop or purchase LACMs for regional use, given the increasing availability of the technology. Iran now has land-, sea-, and air-launched ASCMs that it acquired from China, and standoff air-to-surface missiles from Russia. It also has an indigenous UAV production capability [redacted] potentially applicable to LACM development. [redacted] (b)(1) (b)(3)

(b)(3)

[redacted] (b)(3)

Iraq

Without international sanctions and intrusive inspections and monitoring, Baghdad could put together the economic resources and technical infrastructure for an ICBM program. But even with substantial foreign assistance, it would require at least 15 years to develop an operational ICBM. It could use experience with Scud technology as a foundation, but would need to go well beyond Scud propulsion, guidance, and control systems. Figure 7 depicts the range capability needed for various potential targets. [redacted] (b)(3)

(b)(3) Iraq remains intent on pushing its financial and technical resources to the limit to attempt to obtain nuclear weapons and delivery systems. Baghdad views the possession of nuclear weapons as crucial to its goal of establishing regional political and military dominance. It reasons that Israel's nuclear weapons and the potential Iranian nuclear capability justify its efforts. [redacted] (b)(3)

Iraq retains a substantial technological infrastructure that could support long-term ballistic missile development.

- Iraq has both the skilled personnel-scientists, technicians, and engineers-and the information required to design long-range ballistic missiles.

- Iraq has nearly completed reconstruction of its military-related industries [redacted] (b)(1) (b)(3)

- It is developing a liquid-propellant version of the Ababil SRBM with an expected range of about 150 km. A solid-propellant program has been abandoned. Before Desert Storm it built, and unsuccessfully tested, rocket engines using UDMH and IRFNA (inhibited red fuming nitric acid-the oxidizer used in the Scud missiles).

- Iraq continues to seek technology and components from foreign sources, has good connections to foreign markets, and, if sanctions are removed, will have more resources to apply to its acquisition efforts. [redacted] (b)(3)

Cruise Missiles. Iraq has stated a desire to develop an indigenous LACM. Baghdad has bought Russian, Chinese, and French ASCMs (with ranges less than 100 km) and has attempted to modify some of them for extended range. [redacted] (b)(1) (b)(3) Baghdad probably will continue trying to develop or purchase a LACM with at least a 300-km range, and could be successful in deploying such a system within 10 years after sanctions end. [redacted] (b)(1) [redacted] Iraq [redacted] intended to fit biological weapons on UAVs or unmanned aircraft. (b)(3) Such a weapon also would be applicable to cruise missiles. [redacted] (b)(3)

(b)(1) (b)(3) (b)(1) (b)(3)

Libya

Libyan leader Qadhafi on one occasion publicly espoused an interest in an ICBM "to attack New York." However, he has no capability to make good the threat during the period of this Estimate. Libya almost totally depends on foreign assistance for all phases of its WMD and missile delivery programs. It lacks the required infrastructure, trained engineers, and other scientific personnel. Libya's attempts to buy systems, technology, and expertise have been largely unsuccessful because of UN sanctions, US political and economic pressures, and the MTCR. [redacted] (b)(3)

Libya's attempts to develop an SRBM, begun in the 1970s by a German company, have been unsuccessful. Despite ongoing technical assistance, the program has yielded only unguided liquid-fuel rockets-with a maximum range of approximately 200 km. [redacted] (b)(1) (b)(3)

(b)(1) (b)(3)

Syria

We are virtually certain [redacted] that in the next 15 years Syria will not have the expertise or infrastructure to develop ICBMs indigenously. Syria is acquiring short-range ballistic missiles for regional requirements. [redacted] (b)(3)

Syria is developing a missile production infrastructure that eventually could yield both liquid and solid propellant ballistic missiles, if sufficient foreign assistance can be obtained.

- Through contracts with North Korea, it is assembling Scud missiles and attempting to develop an indigenous production capability for Scud missiles.
- It contracted with the Chinese for [redacted] (b)(1) (b)(3) a supply of ammonium perchlorate-a common solid-propellant oxidizer. [redacted] (b)(3)

Damascus continues to show interest in acquiring nuclear technology but is unlikely to have a nuclear weapon during the period of this estimate, owing to resource and technical constraints. [redacted] (b)(3)

Cruise Missiles. [redacted] (b)(1) (b)(3)
Damascus has acquired and fielded Russian supersonic ASCMs (the 500 km SSC-1b) for coastal defense and long-range UAVs (DR-3) for reconnaissance. It is possible the Syrians could convert the SSC-1b or DR-3 for land attack, or they could purchase LACMs outright for use in regional scenarios. [redacted] (b)(3)

Cuba: Close, But No Cigar [redacted] (b)(3)

The likelihood of a missile threat emerging from Cuba is remote under Castro and would be even more so under a successor government. We see no indication that Havana has a ballistic or land attack cruise missile program and assess economic difficulties and technological limitations will preclude such programs for the foreseeable future. [redacted] (b)(1) (b)(3)

Implications

The likelihood of any Third World country developing an ICBM by 2010 is low, as is the likelihood of an attack against North America with cruise missiles. Some countries, however, could *threaten* an attack in an attempt to influence--if not deter--specific US policies. [redacted] (b)(1) (b)(3) Foreign assistance, though, is a wild card that can sometimes permit a country to solve difficult developmental problems relatively quickly. [redacted] (b)(1) (b)(3)

The pressure for international sales of missiles and components demonstrates the importance of the MTCR as the principal international means to limit proliferation of ballistic and cruise missiles, and associated technologies-particularly to pariah states or oil-rich countries. Ultimately the effectiveness of the MTCR, and other such regimes, in constraining the spread of ICBM or LACM technologies will depend on the cooperation of key supplier countries and their enforcement capabilities. [redacted] (b)(3)

We have noted the *technical* feasibility but low likelihood of using ships (including freighters) or possibly aircraft as cruise missile launch platforms for attacking North America. [redacted] (b)(1) (b)(3)

[redacted]

(b)(1)
(b)(3)

Annex A

Ballistic MissilePropulsion [redacted] (b)(3)

Concepts in Missile Design

The range of a ballistic missile is directly related to the velocity it achieves. The "ideal velocity gain" of each missile stage varies directly with the specific impulse (Isp) of the propellant (explained below), and the natural logarithm of the ratio of initial weight of the stage to its final weight, assuming the change in weight is due solely to the use of its propellant. (The actual velocity gain is less because of air friction and gravity.) The mathematical expression is:

Mathmatical Expression

Specific impulse (Isp) is a measurement of the momentum (Newton-seconds) imparted to the missile per kilogram of expended propellant, and is used to compare the energy of various propellant combinations. [redacted] (b)(3)

Structure factor is the percentage of weight that is not payload and not propellant-essentially, propellant tanks, rocket engine, guidance and control systems, and airframe. For a solid propellant missile, there is no rocket engine and less hardware, but the motor case must be stronger and therefore heavier to withstand the high pressure caused by the solid propellant combustion. [redacted] (b)(3)

Multistage missiles are used to reduce the weight devoted to structure and other inert mass during flight. Without staging, a large (relatively heavy) propellant tank would need to be carried long after most of its propellants had been used, when a much smaller tank would suffice. [redacted] (b)(3) a multistage missile requires a more complex design to ensure smooth jettison of one stage, ignition of the next, and programming of all missile components. [redacted] (b)(3)

Rocket Propulsion Options

Liquid Propellants. Historically, pursuit of higher energy propellants drove missile designers to cryogenic liquids such as liquid oxygen (-183_ C) and liquid hydrogen (-253_ C). These propellant combinations provide the highest specific impulse but are impractical for missiles that are to be kept fueled for long periods of time or for use with mobile launchers. Because of the fuel storage problem, cryogenic fuel is now used only in space launch vehicles. [redacted] (b)(3)

[redacted] (b)(3)

Solid Propellants. The military advantages of solid propellants, such as mobility and instant readiness, will make them attractive to ambitious countries, even those that already have liquid-propellant missile programs. Production of solid propellant motors requires unique raw materials and a myriad of specialized, dedicated, and hazardous facilities [redacted] (b)(3) Successfully fabricating large solid-propellant motors that will not crack and fail during launch is an art that usually evolves only from years of experience, and the larger the motor, the harder the problem. Likewise, a task as basic as stopping the motor's thrust when the velocity required to hit a desired target is achieved requires complex engineering of the entire missile. [redacted] (b)(3)

Secret (b)(3)

(b)(1)
(b)(3)

Secret (b)(3)

Secret (b)(3)

(b)(1)
(b)(3)

Secret (b)(3)

~~Secret~~ [redacted] (b)(3)

[redacted]

(b)(1)
(b)(3)

(b)(3)

~~Secret~~ [redacted]

[redacted]

(b)(1)
(b)(3)

~~Secret~~ [redacted]

(b)(3)

Annex C

Countries WithCapabilities But No Motivation [redacted] (b)(3)

Brazil
Brazil has become in the 1990s a regional proponent of nuclear weapons control and a new MTCR member. A reversal in these policies would result only from a dramatic change in Brazil's domestic political environment or security perception. Brazil has the technical expertise to build ballistic missiles as a result of its continued efforts to develop a space launch vehicle. Brazil believes membership in the MTCR will facilitate its SLV programs. [redacted] (b)(3)

Germany
Germany has the technology, infrastructure, and experience to develop ICBMs and long-range LACMs. It has produced liquid-fuel SLV stages for the European Space Agency Ariane booster family and has been a codevelopment partner with France in the Apache LACM program, and with Sweden in the Taurus family of cruise missiles. Germany is one of the original members of the MTCR and, as a signatory to the Nuclear Non-Proliferation Treaty (NPT), has renounced development, production, and possession of nuclear weapons. [redacted] (b)(3)

India
India perceives its greatest threats to be China and Pakistan, both of which are within the range of its projected Agni follow-on, with a range capability of 2,000 to 2,500 km. India has the capability-inherent in its SLV program-to build an ICBM. [redacted]

(b)(1)
(b)(3)

Israel
With its highly capable research, development, and production infrastructure, Israel could develop an ICBM. However, Israel's primary objective for pursuing [redacted] ballistic and cruise missile delivery systems, is to maintain regional military superiority, and thus assure national survival. Israel has developed an SLV and deployed an SRBM and IRBM. Its cruise missile development programs include a LACM with a range of approximately 500 km. It is likely to pursue development of longer range LACMs to cover more targets in the region. [redacted] (b)(3)

(b)(1)
(b)(3)
(b)(3)

Japan
Japan's advanced industrial infrastructure and SLV program would enable it to develop ballistic missiles in all range classes. Japan also produces indigenous ASCMs [redacted]

(b)(1)
(b)(3)

[redacted] Its civilian nuclear power-generation program based on breeder reactors would readily support development of a nuclear weapon. However, we assess the development of ballistic missiles, long-range LACMs, and nuclear weapons are unlikely in the time frame of this estimate. Only a major power realignment along the Pacific Rim, a collapse of the US-Japan security alliance, and a perception of a significantly increased threat to national security would lead Japan to develop such weapons. [redacted] (b)(1) (b)(3) (b)(3)

South Africa

We doubt South Africa will resume a ballistic missile program in the next 15 years, although it will retain the capability to do so. In 1993, Pretoria terminated its successful SRBM program, probably as the result of changed threat perceptions and a need to cut defense expenditures. South Africa also apparently has decided to cancel its SLV program, given the worldwide availability of launch services. [redacted] (b)(3)

South Africa is a new MTCR member and a signatory of the NPT. Pretoria eliminated its nuclear weapons, terminated its development program [redacted] (b)(1) (b)(3)

South Africa is developing a 150 to 400 km-range LACM called MUPSOW [redacted] As a new MTCR member, Pretoria has agreed to control sales of these missiles. [redacted] (b)(1) (b)(3)

South Korea

(b)(3)

Seoul has a strong economic base and is actively seeking foreign technology to improve its growing production capability for short range ballistic missiles. [redacted] South Korea abandoned its nuclear weapons development program in the 1970s under US pressure. With a focus largely on regional security, we doubt South Korea would seek to develop an ICBM. [redacted] (b)(1) (b)(3) (b)(3)

Taiwan

Taiwan is not likely to acquire a ballistic or cruise missile with range greater than 1,000 km. Taipei developed and tested SRBMs in the early 1980s and has the capability to produce ballistic missiles. It has deployed indigenous ASCMs and could develop or purchase LACMs. We estimate these systems would be of a range to provide at least a limited response to a threat from China. [redacted] (b)(3)

[redacted] (b)(1) (b)(3)

Ukraine

Barring a sharp change in its foreign policy, Ukraine will not constitute a missile threat to North America, but it could supply ballistic missile related technology or components that would assist development programs in other nations. [redacted] (b)(3)

Ukraine is scheduled to return all nuclear warheads (including ALCM warheads) to Russia by mid-1996. The Trilateral Accord requires all strategic weapons to be either returned to Russia or eliminated by the end of the decade. [redacted] (b)(1) (b)(3) Ukraine has signed agreements not to sell strategic weapons to any other country. [redacted] (b)(1) (b)(3)

(b)(1) (b)(3)

Ukraine has manufactured SS-18 and SS-24 ICBMs [redacted] (b)(1) (b)(3) It intends to continue to produce SLVs and to modify some ICBMs to SLVs to compete in the space-launch-services market. [redacted] (b)(1) (b)(3) We assess that transfer of complete systems-either ballistic missiles or SLVs-is highly unlikely. Kiev has signed a memorandum of understanding with the United States committing itself to adhere to the MTCR guidelines and wants to become a member. It also is a signatory of the NPT. [redacted] (b)(3)

Annex D

Countries with No Motivation, Limited Capability [redacted] (b)(3)

Argentina
We assess Argentina has neither the technological infrastructure nor the desire for an ICBM development program. Although it once participated in developing an SRBM, it has destroyed most of its missile production infrastructure and became a member of the MTCR in 1993. Argentina [redacted] (b)(1) (b)(3) supports the gamut of nonproliferation initiatives and pursues regional and international security cooperation. Its nuclear facilities are under international safeguards. [redacted] (b)(3)

Egypt
Egypt is seeking ballistic missiles to help preserve its status as a regional power and to enhance its security. [redacted] (b)(3) President Mubarak is opposed to a nuclear weapons program. Cairo ratified the NPT in 1981 and has a full-scope safeguards agreement with the IAEA. If Egypt decided to abrogate these agreements or to engage in a clandestine program, it would need significant financial and technical assistance. It would require more than 15 years to develop an ICBM even with such assistance. [redacted] (b)(3)

(b)(1) (b)(3)

[redacted] (b)(1) (b)(3)

(b)(3)

(b)(3)

~~Secret~~ [redacted]

[redacted] (b)(1) (b)(3)

Pakistan

Pakistan is acquiring ballistic missiles principally to counter India's substantial conventional military advantage and to respond to India's perceived nuclear capability. To some degree, Pakistan also seeks to gain greater stature in the Islamic world through its missile and nuclear weapons programs. Pakistan's indigenous SRBM programs have had minimal success to date, but with on-going Chinese assistance, Pakistan may be able to produce a 1,000 to 2,000 km-range solid-propellant missile over the period of this estimate. [redacted] (b)(1) (b)(3) Pakistan has acquired M-11 SRBMs from China. Pakistan periodically has entertained the idea of developing SLVs, but we assess it has insufficient engineering, technological, and other resources to complete indigenous SLV or ICBM development in the next 15 years. [redacted] (b)(3)

[redacted] (b)(3)

~~Secret~~ [redacted] (b)(3)

~~Secret~~ [redacted] (b)(3)

[redacted] (b)(3)

[redacted] (b)(1) (b)(3)

~~Secret~~ [redacted] (b)(3)

[redacted] (b)(3)

~~Secret~~ [redacted] (b)(3)