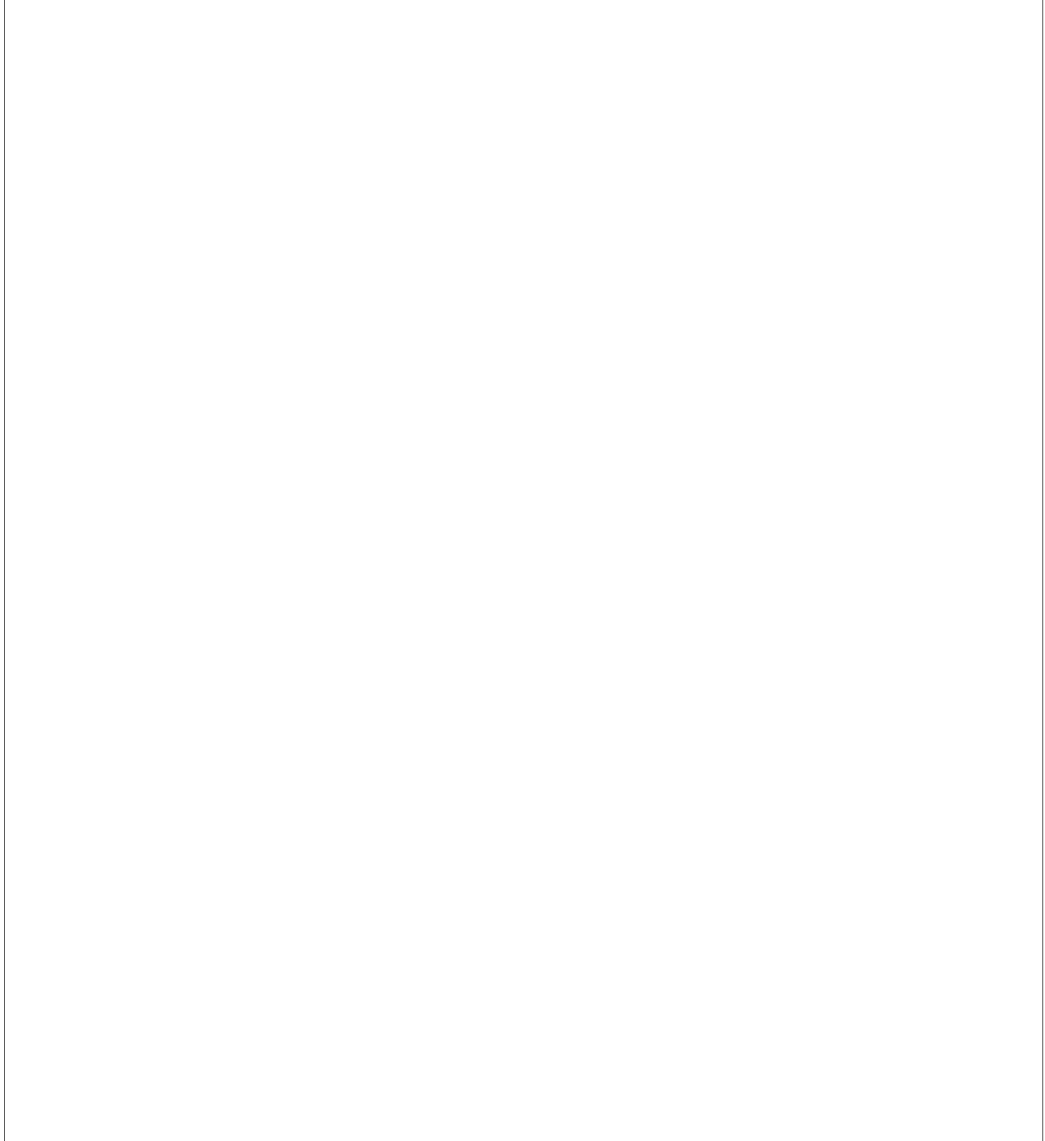


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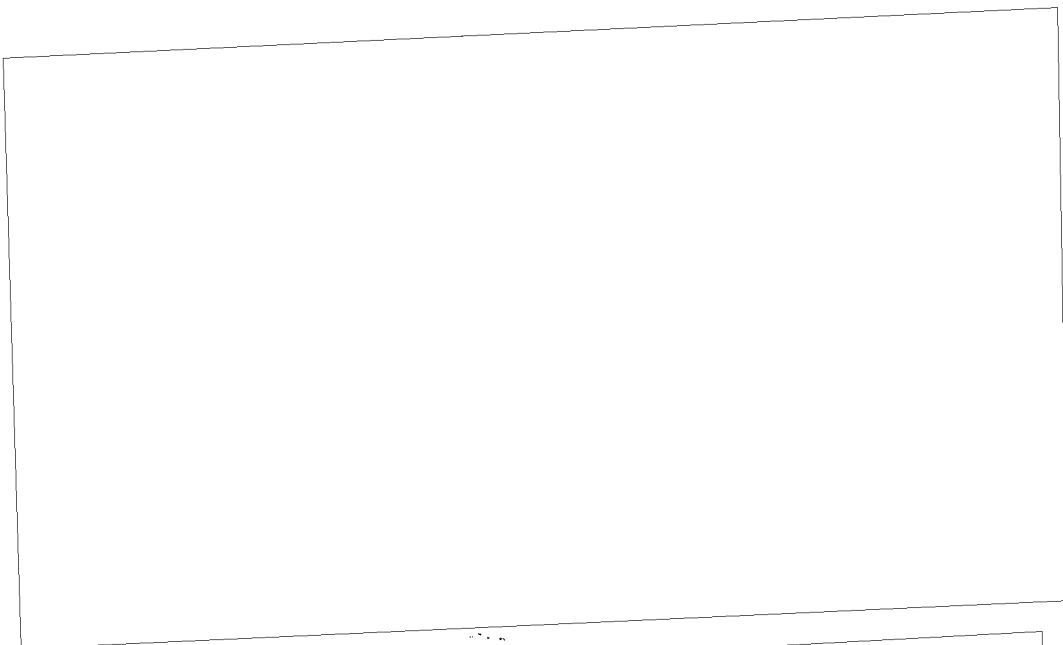


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India perceives Pakistan as its most immediate military threat, the primary factor that will drive Agni/MRBM production is the need for a ballistic missile capable of striking targets in China. Production of the Agni or a future version of the missile is possible by 1993.



We see little benefit to India of developing an ICBM-class (more than 5,500 km) missile. A missile with considerably less range would be able to strike any target in China. India's long-term plans for ballistic missile development more likely involve developing Agni technology into a dependable, 2,000- to 3,000-km-range missile.

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**Table**

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Comparison of Hatf I and II With Possible Pakistani Purchases

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**Outlook—Retreat Unlikely**

New Delhi and Islamabad are fully committed to their ballistic missile development programs. The efforts of both countries have survived recent changes in government

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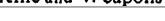
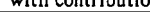
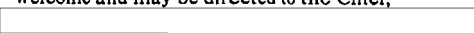

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# Ballistic Missiles in India and Pakistan



An Intelligence Assessment

This paper was prepared by   
 Office of Scientific and Weapons Research,  
with contributions from   
 OSWR. Comments and queries are  
welcome and may be directed to the Chief,  
  




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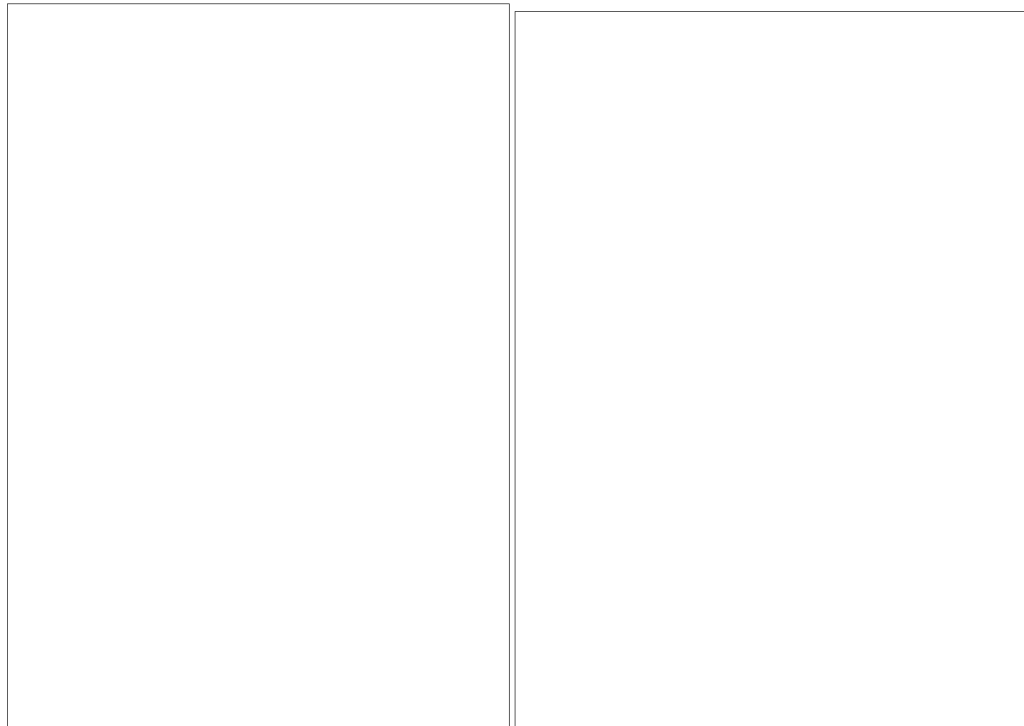
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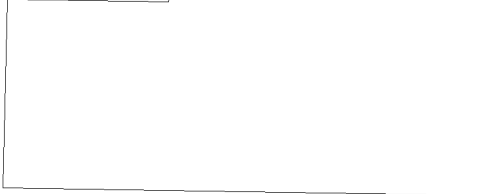
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The Prithvi probably is not designed to carry a nuclear warhead.



*Program Status.* New Delhi is probably capable of beginning production of the Prithvi as early as 1991. India's stated goal is to begin producing the Prithvi by the middle of 1992, but Indian officials have claimed production of the missile could begin after as few as five field tests of the entire system. Barring circumstances such as a war with Pakistan, the five flight tests could be concluded by early 1991. As is the case with many Third World missile programs, extensive flight-testing is often considered a waste of limited resources. Further, as tensions on the subcontinent continue to rise, the impetus to shorten the development phase of the program and rush the missile to deployment will grow.

The ground support equipment (GSE) for the Prithvi has been developed and may already be in limited production.

<sup>1</sup> Strapdown inertial guidance is an inertial guidance scheme in which the gyroscopes are tied to the rocket body rather than being placed on an inertial platform. This type of guidance is easier to manufacture but is less accurate.

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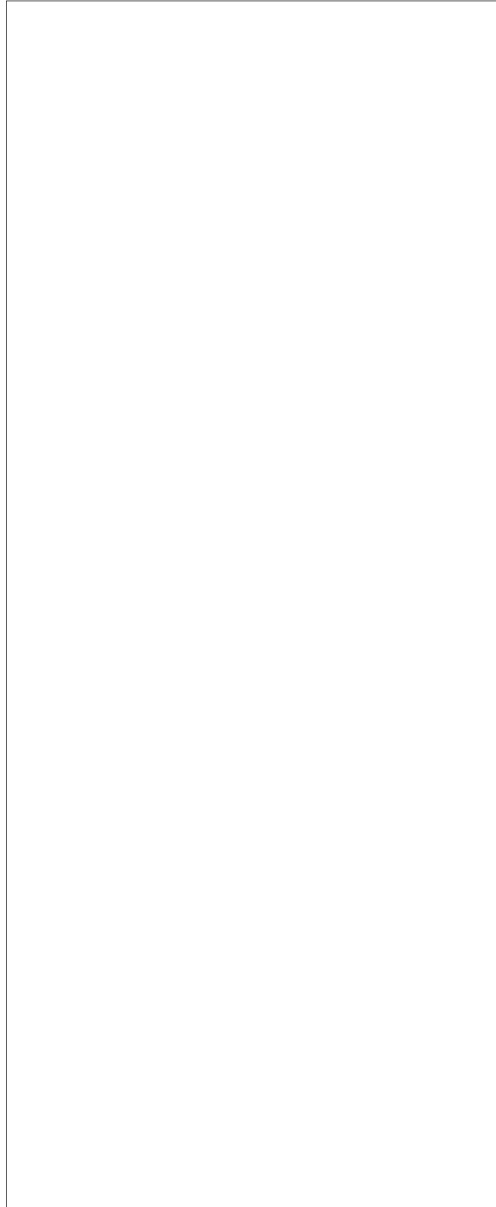
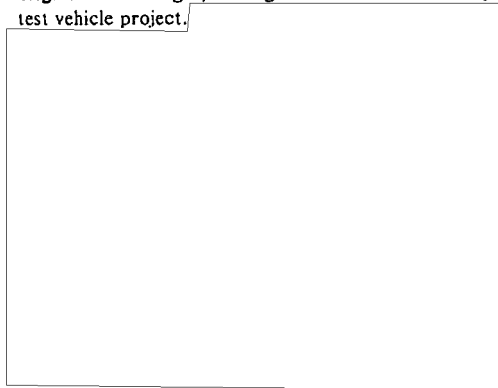
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**Agni MRBM**

*History.* Development of the Agni (Hindi for fire) started in 1983 as part of India's IGMDP. In the original 1983 budget, the Agni was listed as a reentry test vehicle project.



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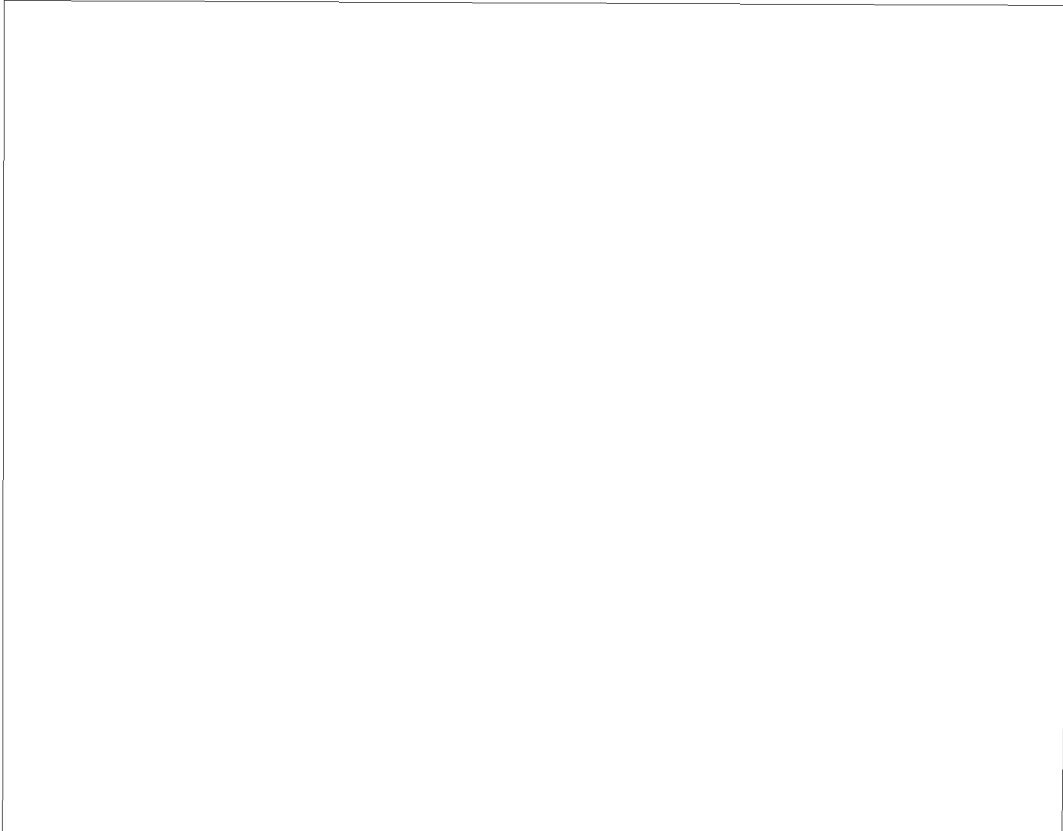
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**Program Status.** The future of the Agni is less certain than that of the Prithvi. Indian officials have repeatedly claimed that the Agni is a "technology demonstrator" not intended for production and deployment. They have further indicated that after four test flights these technologies will have been adequately tested and that the Agni program will cease. These statements are consistent with previous reporting on the budget allotments for the Agni. [Redacted]

Although the Agni, as it is now configured, may not be produced, [Redacted]

range system using Agni technology. Even though

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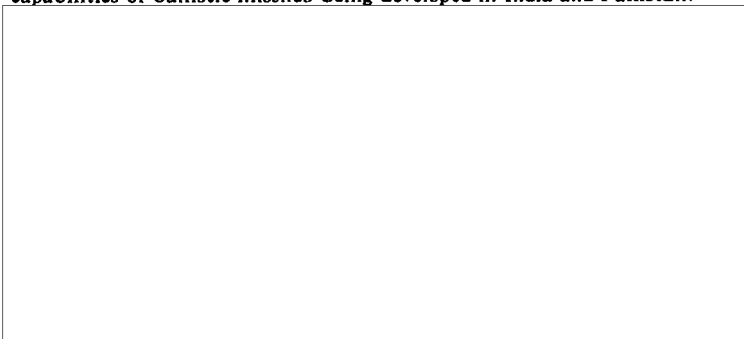


**Ballistic Missiles in  
India and Pakistan**

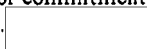


**Scope Note**

This paper—another in a continuing series of CIA Intelligence Assessments on missile proliferation in the Third World—assesses the status and capabilities of ballistic missiles being developed in India and Pakistan.



In this paper, we examine the capabilities and status of ballistic missiles under development in India and Pakistan, including the technical characteristics, range, and status of each missile. Although this paper addresses whether the missiles involved may carry chemical or nuclear warheads, it does not address the chemical or nuclear weapons programs of either country. We also project future developments in each country and discuss the level of commitment by New Delhi and Islamabad to ballistic missile programs.



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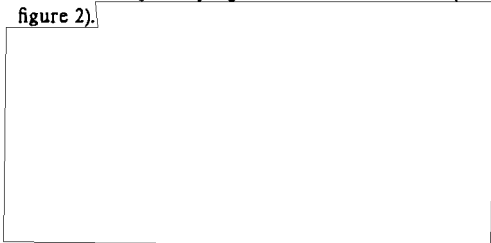


### Ballistic Missiles in India and Pakistan



#### Introduction

India and Pakistan have two of the most active ballistic missile development programs in the Third World (see figure 2).



Defense (MOD). The IGMDP is overseen by the Defense Research and Development Organization (DRDO), the research arm of the MOD. Under the DRDO, the development and testing of ballistic and tactical missiles is the project of the Defense Research and Development Laboratory (DRDL), which is located in Hyderabad. The DRDL is supervised by Dr. A. P. J. Abdul Kalam, who is acknowledged as the designer of India's space launch vehicles and ballistic missiles.



#### Background

The ballistic missile programs of India and Pakistan have their origins in separate efforts to develop and acquire space launch vehicles and sounding rockets. India began its space launch program in the early 1960s and by 1979 had attempted its first launch of a satellite aboard an indigenously produced space launch vehicle. Pakistan began launching sounding rockets obtained from the United States and France in the 1960s, and by the early 1970s Pakistan had produced and launched an indigenously built sounding rocket based on French design. As will be detailed later, the space launch vehicles and sounding rockets developed in both of these space programs were precursors of the ballistic missiles that both countries have tested in the past year.



Also, Bharat Dynamics Limited, a government-owned defense contractor in Hyderabad, operates a plant that according to open sources will produce the Prithvi short-range ballistic missile (SRBM). Other facilities in India that play a key role are the Sriharikota space launch center, the interim test range near Balasore, and the solid-fuel production facilities at Itarsi and Pune.

#### Prithvi SRBM

**History.** The first indications of the Prithvi (Hindi for Earth) program were seen in 1980. Documents of the Indian MOD referred to the study of a 150-km-range, liquid-propellant missile called the SS-150. This reference was followed by additional documentary reporting on a program to develop a 150- to 250-km-range surface-to-surface missile (SSM)—with a projected start of the program in 1981 or 1982. In 1987, the Indian Government formally announced that the DRDL had been developing the Prithvi since 1983 as part of the IGMDP. The Prithvi was described at that time as a liquid-propellant, inertially guided SSM with a range of 150 km and a payload of 1,000 kg.



#### India's Ballistic Missile Program

##### Organization and Facilities

India's ballistic missile program—the Integrated Guided Missile Development Program (IGMDP)—began in 1983 as a project of the Indian Ministry of



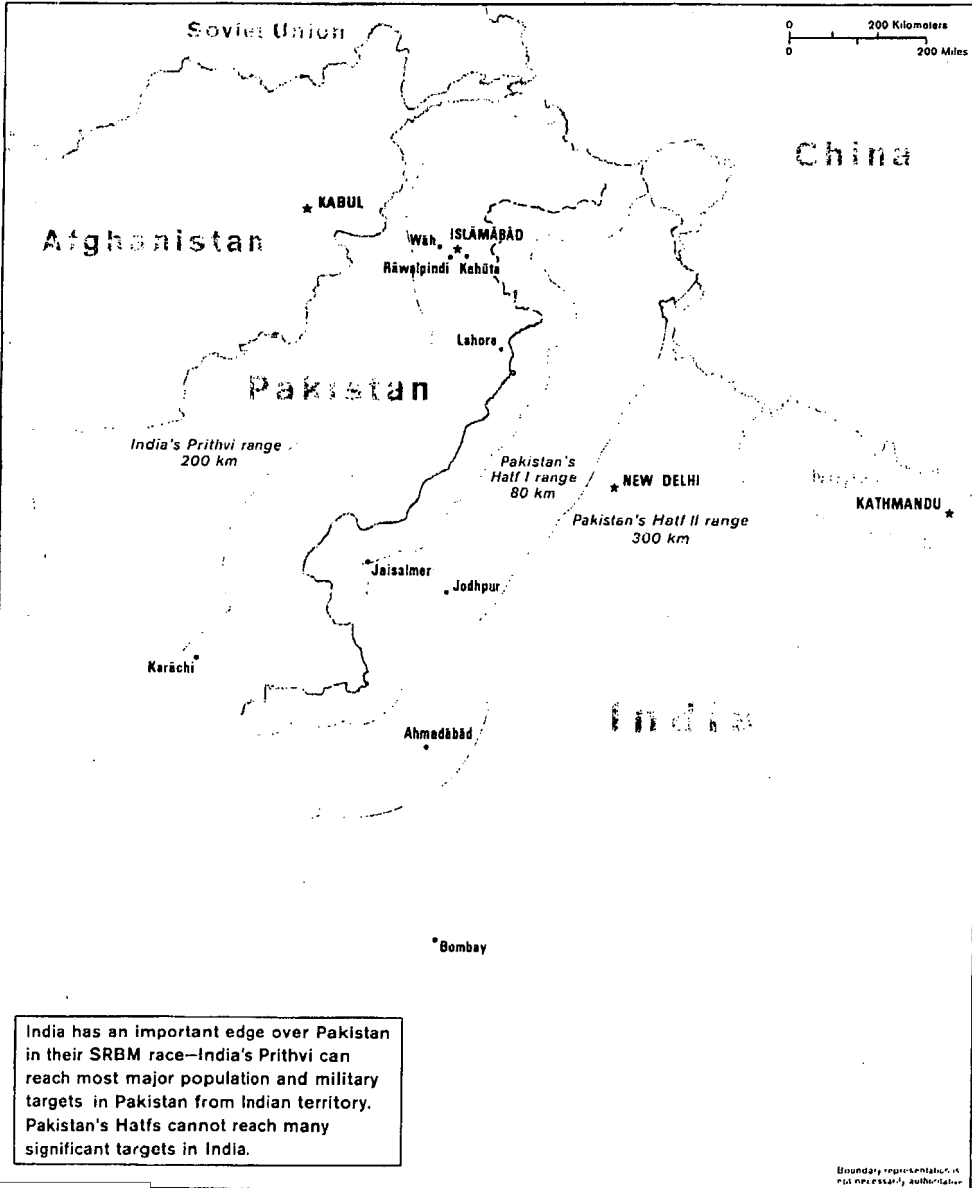
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Figure 1  
Ranges of Indian and Pakistani Missiles



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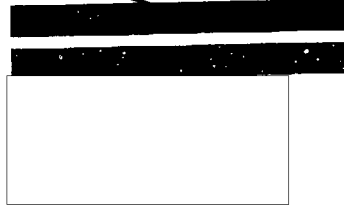
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# Ballistic Missiles in India and Pakistan



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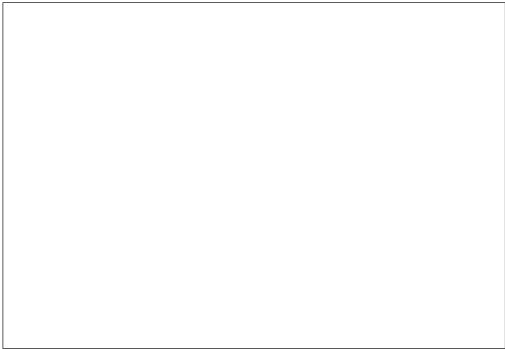
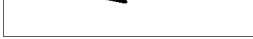
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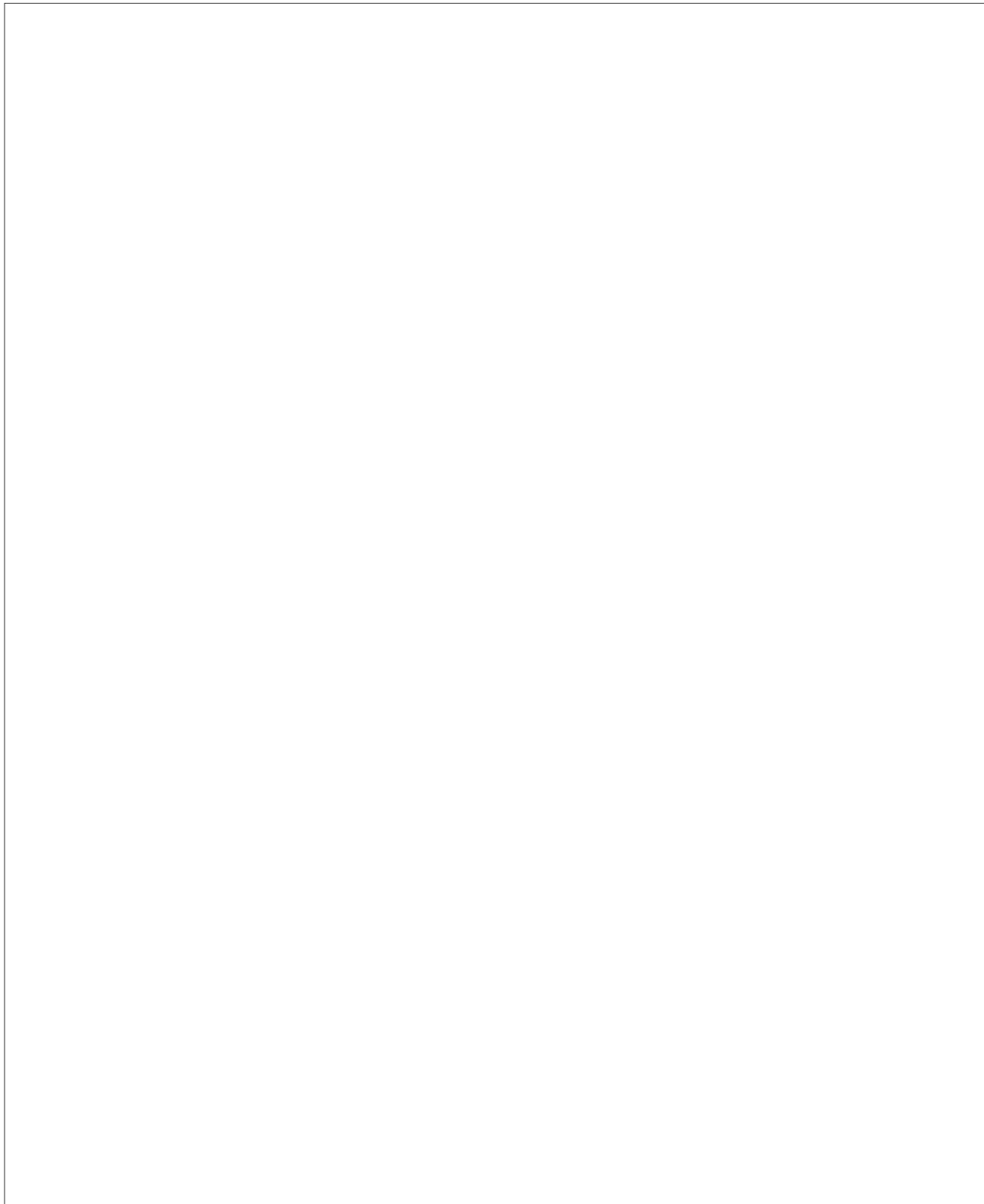
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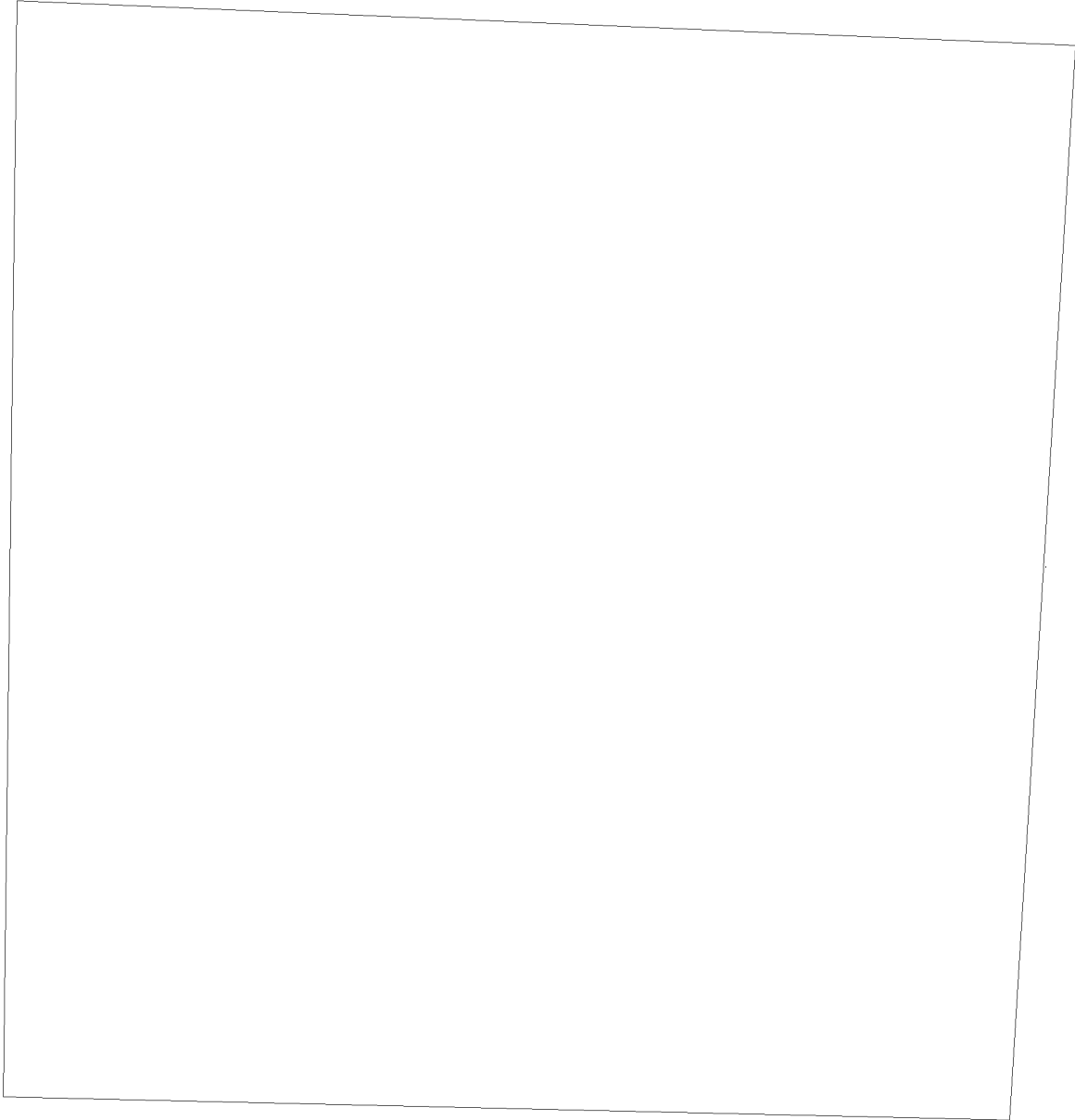


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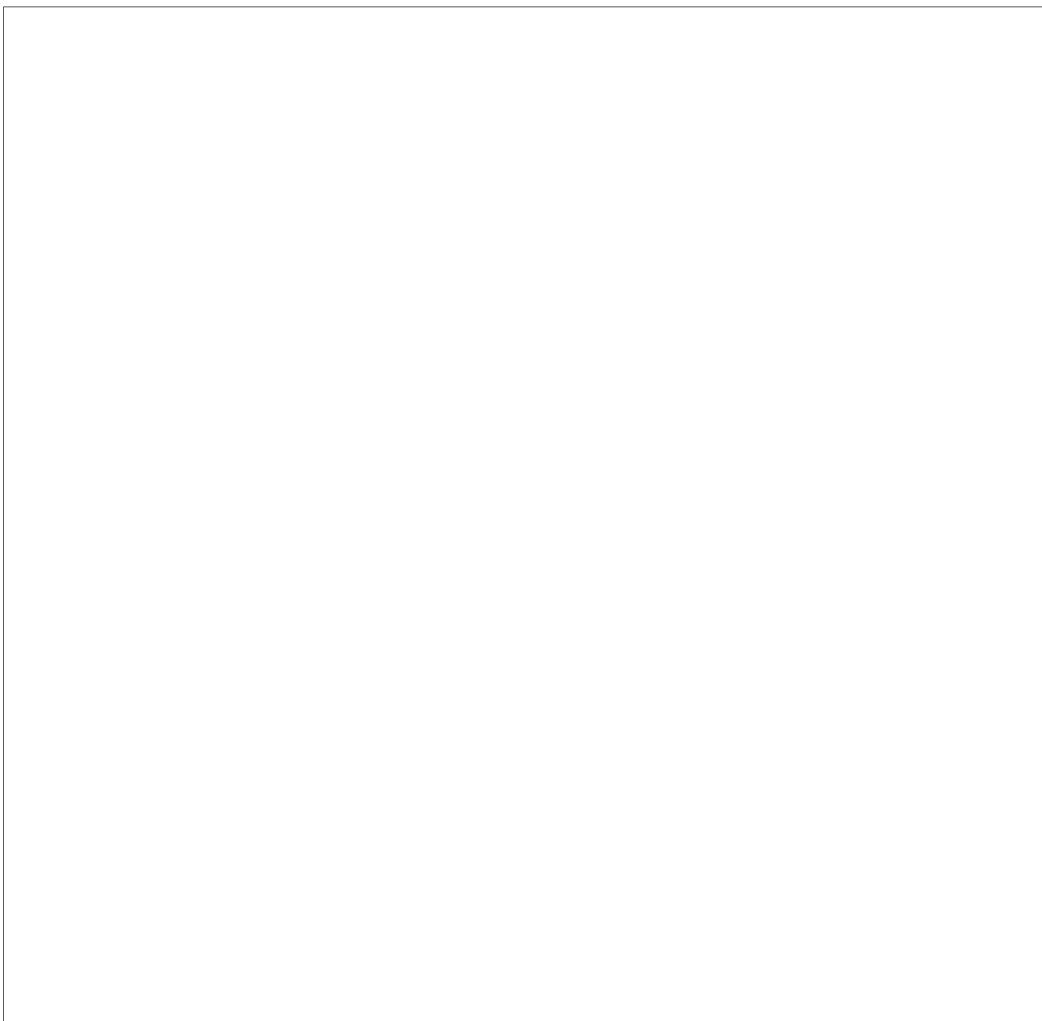
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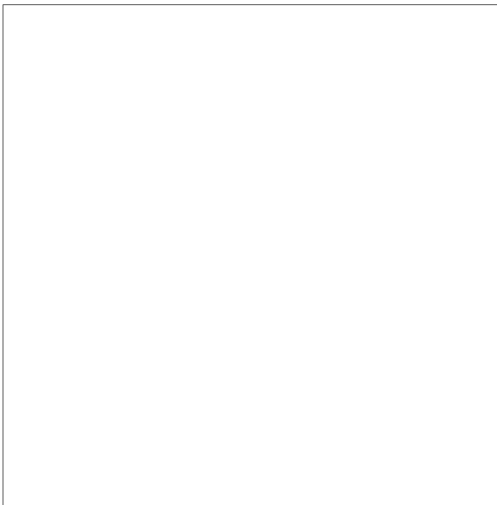


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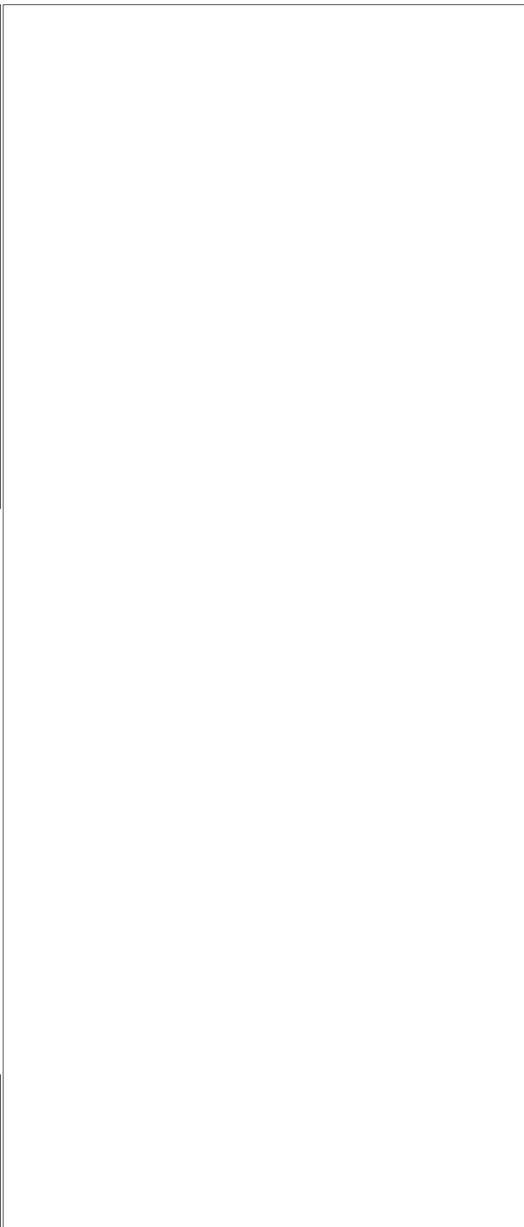
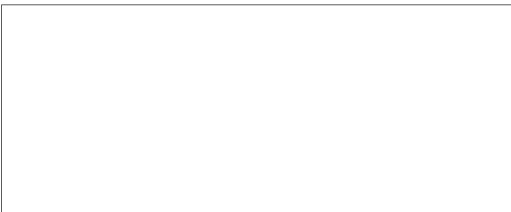
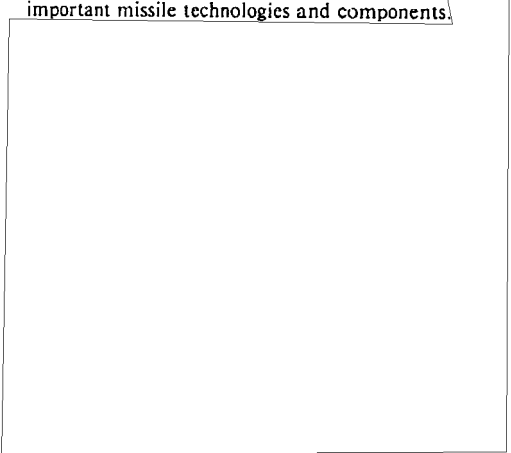


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Pakistan is still dependent on foreign suppliers for several important missile technologies and components.



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Using the experience derived from work on both the Prithvi and the Agni, India could possibly develop new SRBMs with ranges greater than the Prithvi. Such missiles would allow New Delhi the option of launching against targets in Pakistan from sites much farther away from the Indo-Pakistani border—making the missiles less vulnerable to airstrikes. We have no evidence of plans for such missile systems, but a possible option could involve using the first stage of the Agni as a single-stage SRBM. The development of such a missile could begin at any time, and flight-testing and deployment could follow in one to three years.

SRBMs (Hatf is the name of one of the swords of the prophet Mohammed).

**Pakistan's Ballistic Missile Program**

**Organization and Facilities**

Islamabad's ballistic missile program is supervised by the Pakistan Space and Upper Atmosphere Research Committee (SUPARCO). In addition to the ballistic missile program, SUPARCO supervises satellite development and the construction of sounding rockets for Islamabad. SUPARCO headquarters in Karachi coordinates all aspects of the missile program, and

**Booster and Range.** Pakistan is developing two solid-propellant SRBMs—the single-stage Hatf I and the two-stage Hatf II.

the maximum range of the Hatf I is 80 km, and the maximum range of the Hatf II is 300 km

In addition to SUPARCO, a small number of other government organizations are involved in the ballistic missile program

**Guidance Systems and Accuracy.** Both the Hatf I and Hatf II are unguided and, in fact, are better described as long-range artillery rockets than ballistic missiles.

**Warhead Configuration and Options.** The Hatfs carry conventional warheads

**Hatf I and Hatf II SRBMs**

**History.** Pakistan has been attempting to convert sounding rockets into SRBMs and this effort eventually led to the creation of the Hatf

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**Ballistic Missiles in  
India and Pakistan**

**Key Judgments**

*Information available  
as of 25 June 1990  
was used in this report.*

India and Pakistan have two of the most active ballistic missile programs in the Third World.

At least two ballistic missiles are currently under development in India—the Prithvi and the Agni. The Prithvi is a mobile, single-stage, liquid-fueled, short-range ballistic missile (SRBM) whose engines are based on the Soviet SA-2 SAM. The Prithvi has a range of 150 to 200 km with a 1,000-kg payload.

Indian Ministry of Defense officials have stated that the Prithvi is scheduled to enter production by 1992. We believe that production of the Prithvi, with conventional warheads, could begin as early as 1991.

India's Agni is a two-stage, medium-range ballistic missile (MRBM). It uses the solid-propellant first stage of an Indian space launch vehicle as its first stage and liquid-propellant engines derived from the Prithvi as its second stage.

A primary objective of the Agni program is evaluation of its highly sophisticated warhead. The Agni will probably carry an Indian nuclear warhead, and such a development is likely in the mid-1990s. India has claimed that the Agni is a "technology demonstrator" that is not intended for production. However, production of the Agni, or an MRBM based on the Agni, is possible by 1993. India has the capability, based on its development of space launch vehicles, to build missiles with ranges longer than Agni.

Pakistan began converting sounding rockets into military missiles in the mid-1980s and has developed two SRBMs based on that work. The single-stage Hatf I and two-stage Hatf II are solid-propellant missiles based on Pakistani-produced versions of French sounding rockets. The maximum range of the Hatf I is 80 km, and the maximum range of the Hatf II is

<sup>1</sup> CEP is a method of measuring missile accuracy. The CEP is the radius of a circle within which 50 percent of all missile warheads aimed at a given target would fall.

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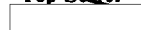


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300 km—both missiles have a payload capacity of 450 kg. Since January 1989, the Hatf I has been flight-tested five times, and the Hatf II has been flight-tested three times. [redacted]

Both Hatfs are flawed by the lack of a guidance system and, hence, have very poor accuracy. Both Hatfs have CEPs on the order of several kilometers and cannot carry a Pakistani-produced nuclear device. Pakistan may have begun deploying the Hatf I in 1990, but production and deployment of the Hatf II may be delayed until 1992 because of its accuracy problems. Islamabad recognizes the shortcomings of the Hatfs and has concluded an agreement with Beijing to purchase the more accurate, 300-km-range SC-05 (M-11) SRBM. In addition, Pakistan is attempting to obtain Scud missile technology from North Korea and is developing the LD—a probable longer range system. Pakistani officials have also been in contact with representatives of the European consortium that supervised the development of the 750- to 1,000-km-range Condor II in Argentina. Production of the Condor II or another missile with a range longer than the Hatf II is likely in Pakistan by the mid-to-late 1990s.

[redacted]

New Delhi and Islamabad are fully committed to their ballistic missile programs. As a result, both India and Pakistan will possess ballistic missiles by the middle of the 1990s that could turn a future Indo-Pakistani war into another “war of the cities” (see figure 1). [redacted]

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