

# BALLISTIC AND CRUISE MISSILE THRE

Photo credit: TommaX, Inc./Military Parade Ltd.



SS-27 Road-Mobile Launcher

National Air Intelligence Center  
Wright-Patterson Air Force Base, Ohio  
September 2000

## KEY FINDINGS

- Many countries view ballistic and cruise missile systems as cost-effective weapons and symbols of national power.
- Many ballistic and cruise missiles are armed with weapons of mass destruction.
- In 1999, both India and Pakistan flight-tested new ballistic missile systems. Both countries have longer range ballistic missiles in development, and all of these missiles are capable of being armed with weapons of mass destruction.
- North Korea is continuing to develop the Taepo Dong 2 intercontinental ballistic missile (ICBM) which could reach at least Alaska and Hawaii.
- With continued foreign assistance, Iran could have an ICBM capable of reaching the United States before 2015. Iraq probably will aggressively pursue long-range ballistic missile development if UN sanctions are lifted.
- Russia still has several thousand nuclear warheads deployed on ballistic missiles capable of reaching the United States. Development of new ICBM and SLBM systems is proceeding.
- China flight-tested the new DF-31 road-mobile ICBM for the first time in 1999. A longer range ICBM and a new submarine launched ballistic missile (SLBM) are in development.
- Land-attack cruise missiles are highly effective weapon systems that can present a major threat to military operations.
- At least nine foreign countries will be involved in land-attack cruise missile production during the next decade, and many missiles will be available for export.

Photo credit: TommaX, Inc./Military Parade Ltd.



SS-25 In Flight



Ballistic and cruise missiles present a significant threat to US and allied forces overseas, as well as to the United States and its territories. Missiles are attractive to many nations because they can be used effectively against an adversary with a formidable air defense system, where an attack with manned aircraft would be impractical or too costly. Missiles also have the advantage of fewer maintenance, training, and logistic requirements than manned aircraft. Even limited use of these weapons could be devastating, since missiles can be armed with chemical, biological, or nuclear warheads.

The US Air Force, in cooperation with the other services, is responsible for countering the ballistic and cruise missile threat through deterrence and, if necessary, active suppression. Threat suppression may include attacks on missile systems, both before launch and in flight, as well as attacks on their supporting infrastructure. This document includes information on some of the major current and projected ballistic and cruise missile threat systems.

Photo credit: Adapted from photo by J. Frank Durham



V-1

Guided cruise and ballistic missiles were first used when Germany attacked targets in England and Northern Europe with V-1 cruise missiles and V-2 ballistic missiles during World War II. Although these missiles were inaccurate, their use resulted in tens of thousands of Allied casualties.

Photo credit: German Museum, Munich



V-2

The ballistic and cruise missile threat continues to increase with the proliferation of missile technology. Over 25 countries have ballistic missile systems, and it is likely that missiles will be a threat in future conflicts involving US forces. Ballistic missiles have been used in several recent conflicts, including the Iran-Iraq War, the Afghan Civil War, the war in Yemen, the 1991 Persian Gulf conflict, and the 1999-2000 Russian military action in Chechnya. Although land-attack cruise missiles have not yet been widely proliferated, as many as 20 countries could possess cruise missiles in the next decade.



[Next]

Ballistic and cruise missiles can be armed with conventional or nonconventional warheads. Conventional warheads are filled with a chemical explosive, such as TNT, and rely on the detonation of the explosive and the resulting metal casing fragmentation as kill mechanisms. Nonconventional warheads include weapons of mass destruction (nuclear, biological, and chemical weapons), as well as nonlethal warheads, a relatively new class of warhead designed to disable equipment rather than harm personnel. Conventional, biological, and chemical weapons can be packaged in unitary (single) warheads and in submunitions (multiple small bomblets) that are released at altitude to disperse over a wide area.



Chemical and biological weapons can be packaged in submunitions to be dispersed over a wide area.

Conventional warheads can be optimized for specific types of targets. For example, submunitions can be used to create craters in an aircraft runway or destroy armored vehicles. A penetrator warhead, which uses a relatively small amount of explosive surrounded by a heavy metal casing, can pass through a hardened structure such as a bunker to destroy its contents.

[\[Back\]](#)

Almost all of the longer range ballistic missiles, and several types of land-attack cruise missiles, carry nuclear warheads. Most of these warheads have an explosive force that is tens to hundreds of times more powerful than the atomic bomb dropped on Hiroshima during World War II.

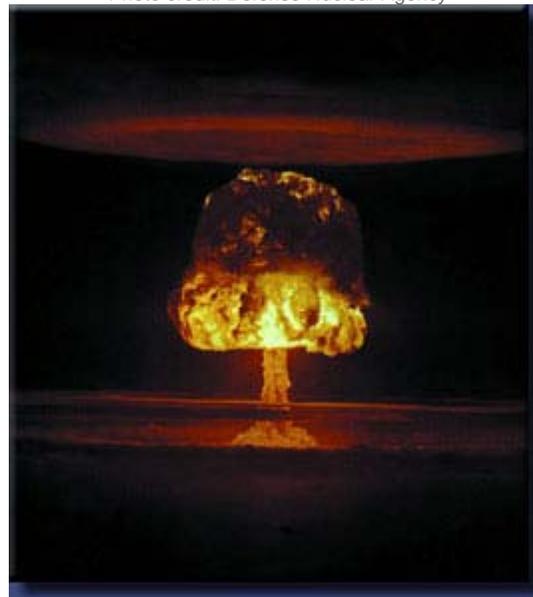
Chemical and biological weapons are attractive to many Third World countries because they are much easier to produce than nuclear weapons. Many countries with chemical and biological warfare programs also are equipped with ballistic and/or cruise missiles. Accuracy is not very important for these weapons when used against urban areas or large concentrations of military forces. Chemical and biological weapons are capable of producing massive casualties, inducing panic and chaos in civilian populations, and severely degrading military operations.

Photo credit: TommaX, Inc./  
Military Parade Ltd.



**Ballistic Missile Warhead  
with Submunitions**

Photo credit: Defense Nuclear Agency

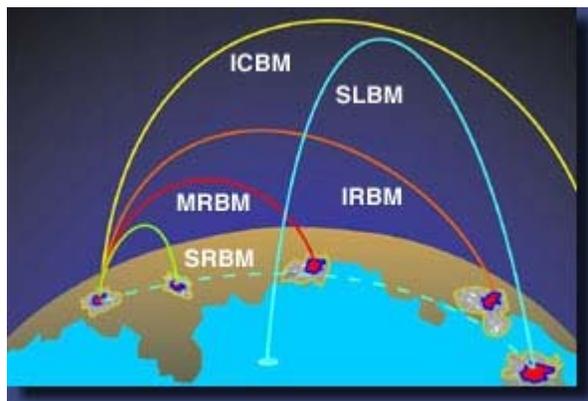


**Many ballistic and cruise missiles are  
armed with nuclear warheads.**



[Next]

Operational ballistic missiles are deployed in silos, on submarines, and on land-mobile launchers, including trucks and railcars. Mobile missiles are favored by many nations because they can be hidden, which greatly increases their survivability.



Relative Ranges of Ballistic Missiles

In many short-range ballistic missiles, the entire missile remains intact until the warhead detonates. In longer range ballistic missiles, warheads are contained in separating reentry vehicles. Some long-range ballistic missiles carry multiple independently targetable reentry vehicles (MIRVs), with up to 10 reentry vehicles (RVs) per missile. RVs reenter the Earth's atmosphere at very high velocities, on the order of 4-5 miles per second at ICBM ranges.

Ballistic Missile Category	Maximum Range
Short-range ballistic missile (SRBM)	<1,000 km (621 mi)
Medium-range ballistic missile (MRBM)	1,000-3,000 km (621-1,864 mi)
Intermediate-range ballistic missile (IRBM)	3,000-5,500 km (1,864 - 3,418 mi)
Intercontinental ballistic missile (ICBM)	>5,500 km (3,418 mi)
Submarine-launched ballistic missile (SLBM)	Any ballistic missile launched from a submarine, regardless of maximum range

Ballistic missiles can use solid- or liquid-propellant rocket propulsion systems. The trend in modern missile systems has been toward the use of solid propellants because of their reduced logistical requirements and simplicity of operation. However, some Third World nations have greater access to liquid-propellant technology and therefore continue to develop new liquid-propellant missiles.



[\[Back\]](#)

Multiple-stage missiles, with each stage having its own independent propulsion system, are more efficient for longer range missions. ICBMs typically have two or three stages, with powerful liquid-propellant engines or solid-propellant motors to propel the payload toward its target, in addition to a post-boost vehicle (PBV) with a much smaller propulsion system. A post-boost vehicle can be used to improve the RV deployment accuracy for a single-RV missile. For a missile with a MIRV payload, the PBV is used to release reentry vehicles so that they follow different trajectories, allowing them to hit targets that may be separated by over a thousand miles.

A ballistic missile with a high-quality inertial guidance system is capable of delivering a reentry vehicle within a few hundred feet of the target after a flight of over 6,000 miles. For many missiles, accuracy can be greatly improved by utilizing satellite-aided navigation. As more modern guidance technology is proliferated, countries will be able to improve the accuracy and lethality of their missile forces. However, even a missile with an inaccurate guidance system is capable of inflicting massive casualties when armed with a weapon of mass destruction. Therefore, many Third World ballistic missiles, although inaccurate, have the potential to pose a serious threat to urban targets.

Photo credit: TommaX, Inc./Military Parade Ltd.



Mobile missiles can move frequently to avoid being targeted by hostile forces.

Many ballistic missiles carry penetration aids to improve the chances of a reentry vehicle penetrating a ballistic missile defense system. Penetration aids are devices that attempt to deceive or jam sensors used to detect and track missiles and RVs. Penetration aids are of increasing importance to countries developing and operating ballistic missiles.



[NEXT]

Several countries are now producing and/or developing SRBM systems, while many other countries have purchased missiles or missile technologies from one or more of the missile producers. New SRBM systems are in development in several countries.

The Russian SS-1c Mod 1, also called the SCUD B, has been exported to more countries than any other type of guided ballistic missile and has proven to be a versatile and adaptable weapon. For example, the Iraqi SCUDs used during the Persian Gulf War had been modified to double their range. North Korea has produced its own version of the SCUD B, as well as the SCUD C, an extended-range version of the SCUD B.



SRBM Comparison

[\[BACK\]](#)[\[NEXT\]](#)

Photo credit: National Air Intelligence Center



Seventeen countries possess the SCUD B missile system.

Although the SCUD was originally designed as a tactical battlefield support weapon, many countries view it and other SRBM systems as strategic weapons to be used against urban areas. The Iraqis used extended-range SCUDs as strategic weapons during both the Iran-Iraq War and the Persian Gulf War. In the future, other countries could modify SCUDs to significantly improve their accuracy and use them against high-value military targets as well as cities.



[BACK] [NEXT]

#### SRBM Characteristics

Missiles	Producer	Propellant	Deployment Mode	Maximum Range (miles)
SCUD B (SS-1c Mod 1)	Russia	Liquid	Road-mobile	185
SS-1c Mod 2	Russia	Liquid	Road-mobile	150+
SS-21 Mod 2	Russia	Solid	Road-mobile	43
SS-21 Mod 3	Russia	Solid	Road-mobile	75
SS-23	Russia*	Solid	Road-mobile	185+
SS-X-26	Russia	Solid	Road-mobile	185+
Iskander-E	Russia	Solid	Road-mobile	170+
CSS-6	China	Solid	Road-mobile	370
CSS-7	China	Solid	Road-mobile	185
CSS-8	China	First stage: solid Second stage: liquid	Road-mobile	93
SCUD B	North Korea	Liquid	Road-mobile	185
SCUD C	North Korea	Liquid	Road-mobile	310
Prithvi I	India	Liquid	Road-mobile	93
Prithvi II	India	Liquid	Road-mobile	155
Dhanush	India	Liquid	Ship-based	155
Hatf-1	Pakistan	Solid	Road-mobile	50
Shaheen	Pakistan	Solid	Road-mobile	280+
Vector **	Egypt	Solid	Road-mobile	425+
Al Hussein	Iraq	Liquid	Road-mobile	350+
Al Samoud	Iraq	Liquid	Road-mobile	90+

\*No SS-23 missiles are deployed in Russia; some remain in Bulgaria and Slovakia.

\*\*Missile has not yet been flight-tested.

Note: All ranges are approximate.



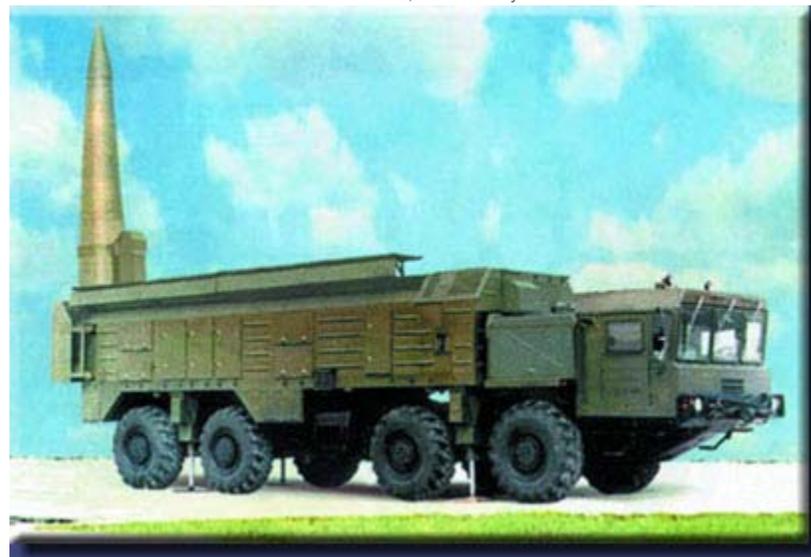
[BACK] [NEXT]

Photo credit: EPA News



The SS-21 has been used extensively during the 1999-2000 Russian military action in Chechnya.

Photo credit: TommaX, Inc./Military Parade Ltd.



Russia is offering the advanced new Iskander-E missile system for export.

Photo credit: TommaX, Inc./Military Parade Ltd.



Iskander-E Missile



[BACK] [NEXT]

SRBM Order of Battle---Selected Countries

Country	Missile System	No. of Launchers*	Country	Missile System	No. of Launchers*
Afghanistan	SCUD B	Fewer than 50	North Korea	SCUD B	Fewer than 50
Belarus	SCUD B	Fewer than 50		SCUD C	Fewer than 50
	SS-21	Fewer than 100	Pakistan	Haf-1	Undetermined
Bulgaria	SCUD B	Fewer than 50		CSS-7 (M-11)	Fewer than 50
	SS-23	Fewer than 50		Shaheen	Not yet deployed
China	CSS-6	Fewer than 50	Russia**	SS-1c Mod 2	Undetermined
	CSS-7	Not yet deployed		SS-21	More than 200
Egypt	SCUD B	Fewer than 50		SS-X-26	Not yet deployed
	Vector	Not yet deployed	Slovakia	SS-21	Fewer than 50
India	Prithvi	Fewer than 50		SS-23	Fewer than 50
Iran	CSS-8	Fewer than 50	Syria	SCUD B	Fewer than 50
	SCUD B	Fewer than 50		SCUD C	Fewer than 50
	SCUD C	Fewer than 50		SS-21	Fewer than 50
Iraq	Al Hussein	Undetermined	Turkmenistan	SCUD B	Fewer than 50
	Al Samoud	Not yet deployed	Ukraine	SCUD B	Fewer than 100
Kazakhstan	SCUD B	Fewer than 50		SS-21	Fewer than 100
	SS-21	Fewer than 50	Vietnam	SCUD B	Fewer than 50
Libya	SCUD B	Fewer than 100	Yemen	SCUD B	Fewer than 50
				SS-21	Fewer than 50

\*The missile inventory may be much larger than the number of launchers, since launchers can be re-used to fire additional missiles.

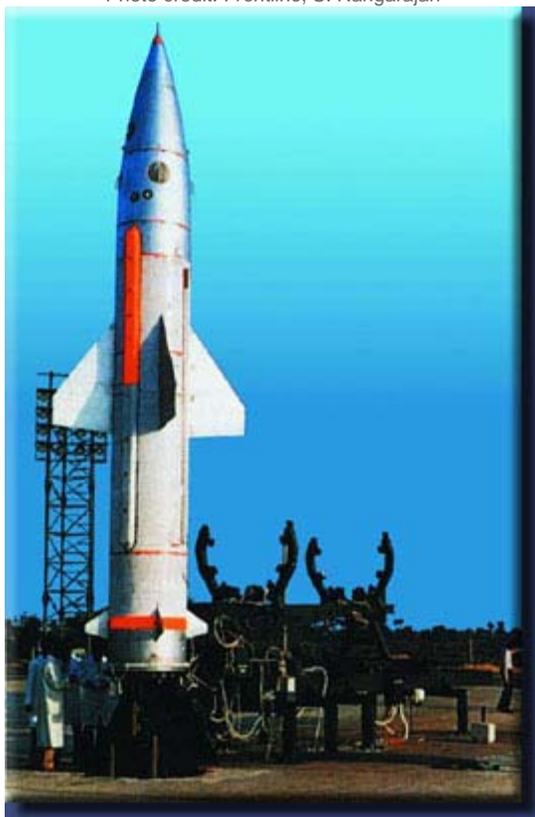
\*\*The SCUD B was recently withdrawn from operational service in Russia, but some SCUD launchers and missiles have been reactivated and used in the Russian military action against Chechnya in 1999-2000.



[BACK]

[NEXT]

Photo credit: *Frontline*, S. Rangarajan



Prithvi

Photo credit: Associated Press/Defense Ministry



Shaheen



[BACK]

[NEXT]

Photo credit: Associated Press



CSS-6 Missile on its Road-Mobile Launcher



[BACK]

Photo credit: Military Friendship and Literature Press



CSS-6 missiles have been fired at target areas near the coast of Taiwan in a demonstration of Chinese military strength.

Photo credit: Xiao Yuan, Xiao Hui, Li Xi, and Jin Haishan



CSS-7 Missile on its Road-Mobile Launcher

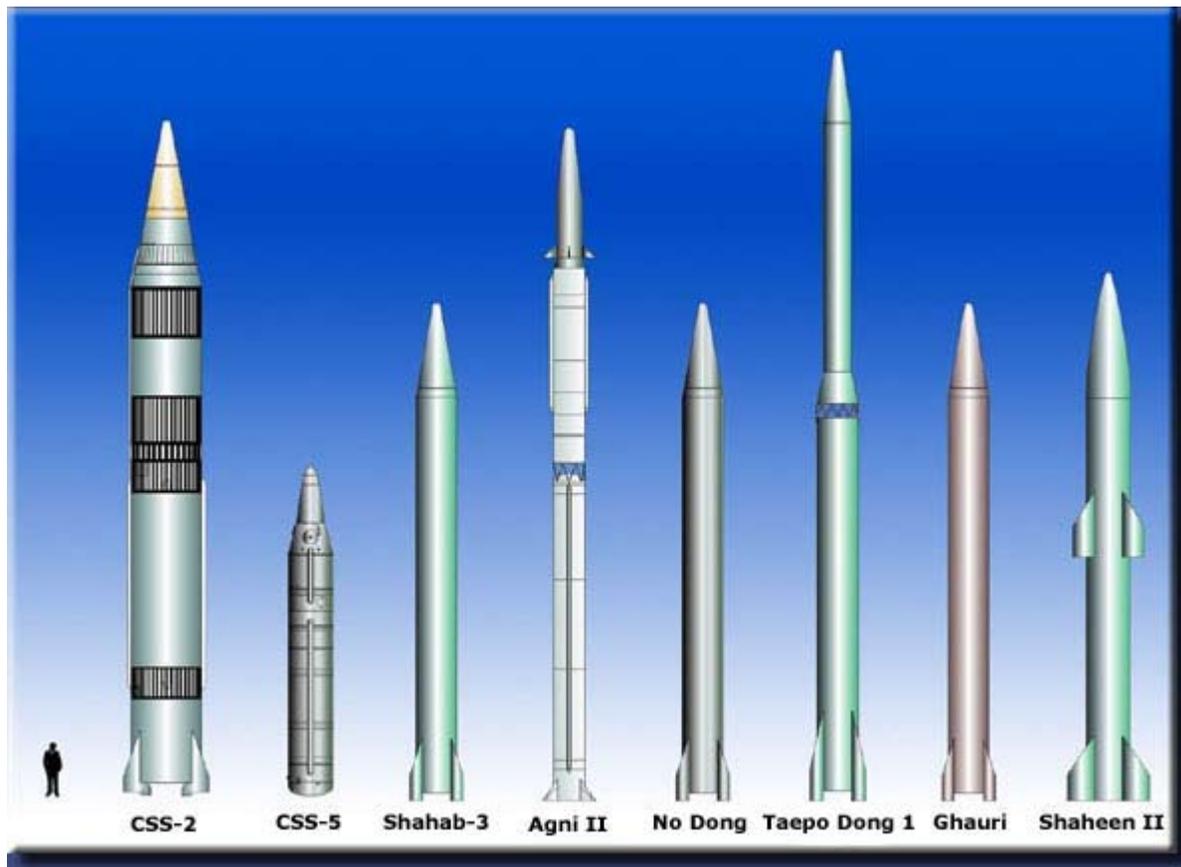
Photo credit: Xiao Yuan, Xiao Hui, Li Xi, and Jin Haishan



The Chinese CSS-8 has been exported to Iran.

# MRBMs AND IRBMs

[NEXT]



New MRBM and/or IRBM systems are in development in China, North Korea, Iran, India, and Pakistan. These are strategic systems, and most will be armed with nonconventional warheads. (Both India and Pakistan tested nuclear weapons in 1998.) Russia no longer produces or retains any MRBM or IRBM systems, since they are banned by the Intermediate-Range Nuclear Forces (INF) Treaty, which entered into force in 1988.

MRBM and IRBM Comparison

## MRBMs AND IRBMs

[\[BACK\]](#)[\[NEXT\]](#)

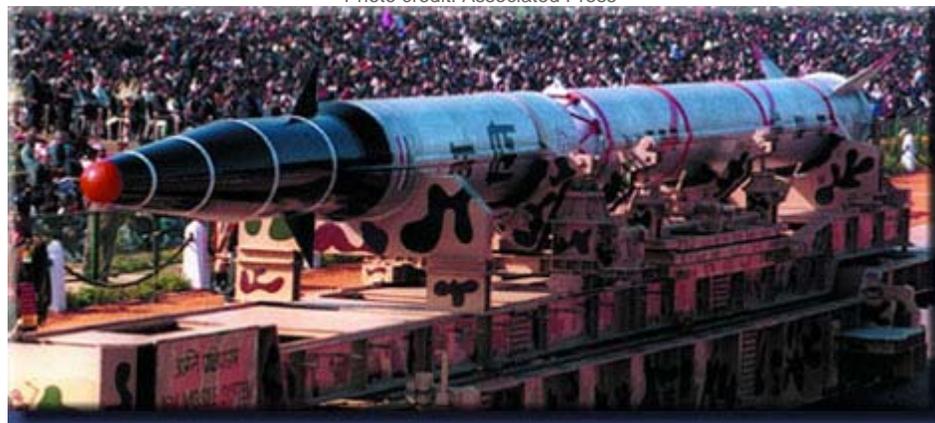
Photo credit: Frontline



Agni II on Launcher

North Korea has an ambitious ballistic missile development program and has exported missile technology to other countries, including Iran and Pakistan. The North Korean Taepo Dong 1 MRBM booster was used in an attempt to orbit a satellite in August 1998. Although a small third stage failed to place the satellite in orbit, the two-stage missile booster apparently performed successfully.

Photo credit: Associated Press



The Agni II is India's new two-stage, solid-propellant MRBM.

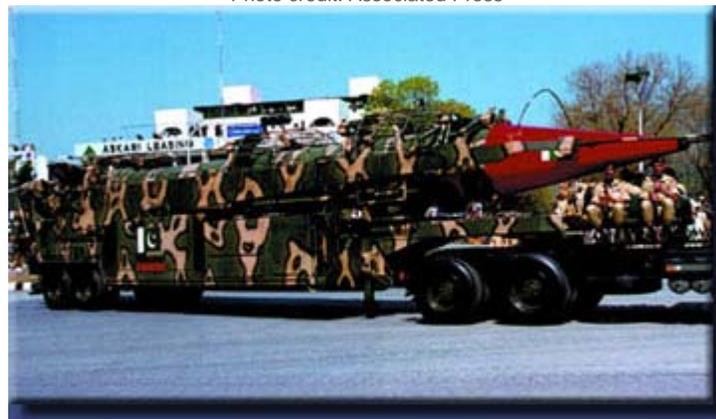

[\[BACK\]](#)
[\[NEXT\]](#)

Photo credit: Reuters, archive photos



Pakistan's Ghauri MRBM has been flight-tested twice.

Photo credit: Associated Press



Ghauri Missile on its Road-Mobile Launcher

Iran is working on the development of at least two new MRBMs/IRBMs, the Shahab 3 and Shahab 4. The Shahab 3 MRBM is based on the North Korean No Dong and was developed with Russian assistance. The Iranian Defense Minister has also stated that a Shahab 5 is in development. The Shahab 5 probably will have a longer range than the Shahab 4 and may be an IRBM or ICBM.

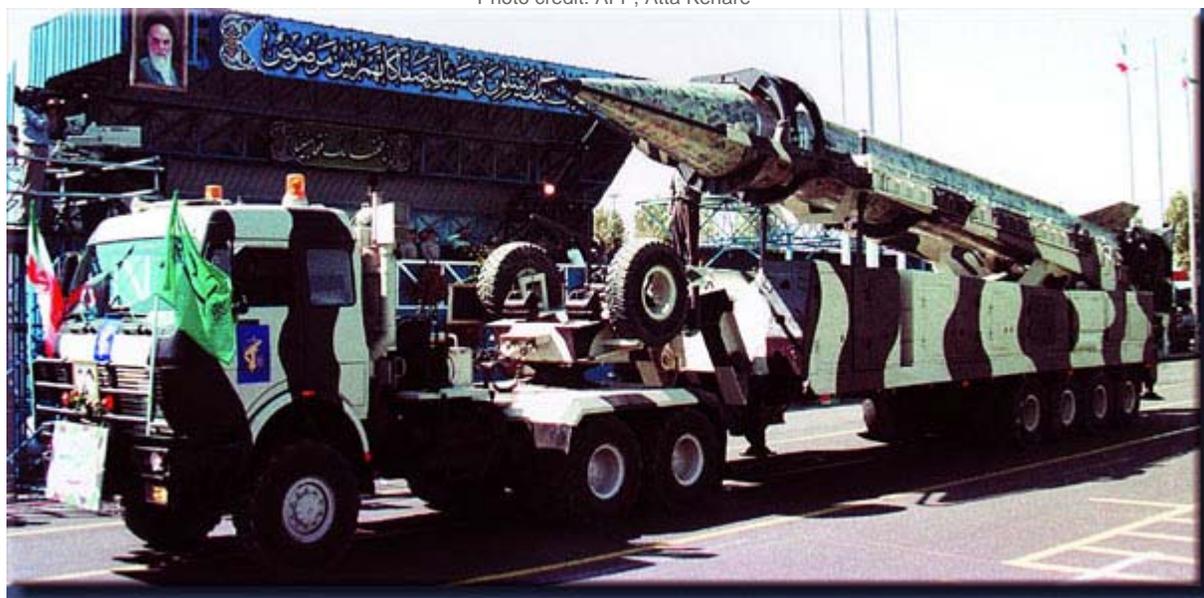
India and Pakistan are developing new MRBM systems capable of carrying weapons of mass destruction. Pakistan conducted the second flight test of the Ghauri MRBM on 14 April 1999 after the Indians launched the Agni II MRBM for the first time on 11 April 1999. Pakistan also displayed its new Shaheen II solid-propellant MRBM in the Pakistan Day parade in Islamabad in March 2000.



[BACK]

[NEXT]

Photo credit: AFP, Atta Kenare



Shahab 3 Missile on its Road-Mobile Launcher



[BACK]

[NEXT]

## MRBM and IRBM Characteristics

Missiles	Country	No. of Stages	Propellant	Deployment Mode	Maximum Range (miles)	No. of Launchers*
CSS-2	China	1	Liquid	Transportable (limited mobility)	1,750	Fewer than 50
CSS-2**	Saudi Arabia (Chinese-produced)	1	Liquid	Transportable (limited mobility)	1,500+	Fewer than 50
CSS-5 Mod 1	China	2	Solid	Road-mobile	1,100+	Fewer than 50
CSS-5 Mod 2	China	2	Solid	Road-mobile	1,100+	Fewer than 50
No Dong	North Korea	1	Liquid	Road-mobile	800	Fewer than 50
Taepo Dong 1***	North Korea	2	Liquid	Undetermined	1,250+	Not yet deployed
Agni II	India	2	Solid	Mobile	1,250+	Not yet deployed
New IRBM****	India	2	Solid	Mobile	2,000+	Not yet deployed
Ghauri	Pakistan	1	Liquid	Road-mobile	800	Not yet deployed
Shaheen II	Pakistan	2	Solid	Road-mobile	1,250+	Not yet deployed
New MRBM****	Pakistan	Undetermined	Undetermined	Undetermined	1,500+	Not yet deployed
Shahab 3	Iran	1	Liquid	Road-mobile	800	Not yet deployed
Shahab 4****	Iran	Undetermined	Liquid	Undetermined	1,200+	Not yet deployed
Shahab 5****	Iran	Undetermined	Undetermined	Undetermined	Undetermined	Not yet deployed

\*There may be several missiles available for each launcher.

\*\*The exported CSS-2 has a conventional warhead.

\*\*\*Booster was used in an attempted satellite launch.

\*\*\*\*Missile has not yet been flight-tested.

Note: All ranges are approximate.

**MRBMs AND IRBMs**



[BACK]

[NEXT]

Photo credit: North Korean Television



Taepo Dong 1

Photo credit: North Korean Television



Taepo Dong 1 Launch

Photo credit: EPA News



CSS-2 being Prepared for Launch

Photo credit: PLA Pictorial



CSS-2 Launch

# MRBMs AND IRBMs

[BACK]

[NEXT]

Photo credit: Associated Press



The CSS-5 is a two-stage, solid-propellant MRBM capable of reaching targets in the Pacific theater and most of Asia. The missile is carried in a canister on a towed erector-launcher.

**MRBMs AND IRBMs**[\[BACK\]](#)

Photo credit: Associated Press



Pakistan's new two-stage, solid-propellant Shaheen II MRBM was publicly displayed for the first time in the Pakistan Day parade in March 2000. The missile, which has not yet been flight-tested, could have a range of 1,250 miles or more, in the same class as India's new Agni II MRBM. The chassis for the launcher (front vehicle) and missile transporter (rear vehicle) were produced in Belarus by MAZ, which also produces the launcher chassis for the Russian SS-25 and SS-27 ICBMs.



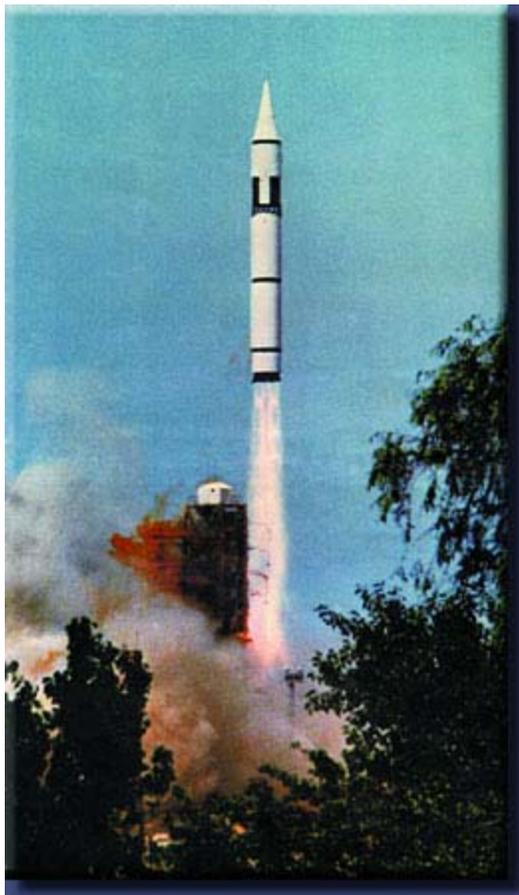
[NEXT]



ICBM Comparison

[\[BACK\]](#)[\[NEXT\]](#)

Photo credit: China Pictorial



CSS-4 Launch

Russia will continue to present the largest ballistic missile threat to the United States. Russia retains thousands of nuclear warheads on ICBMs and most of these missiles are maintained on alert, capable of being launched within minutes of receiving a launch order. Although the size of the Russian ICBM force will decrease as a result of arms control agreements, aging missiles, and resource constraints, Russia probably will retain the largest ICBM force in the world. Efforts to maintain and modernize the force are underway. Russia's new silo-based SS-27 ICBM, a missile designed with countermeasures to ballistic missile defense systems, is now deployed in two regiments (20 missiles). The road-mobile version of the SS-27 probably will be flight-tested for the first time in 2000. A new strategic missile that may be deployed in both land-based and sea-based versions also is under development.

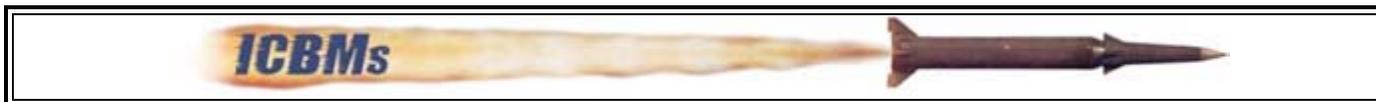
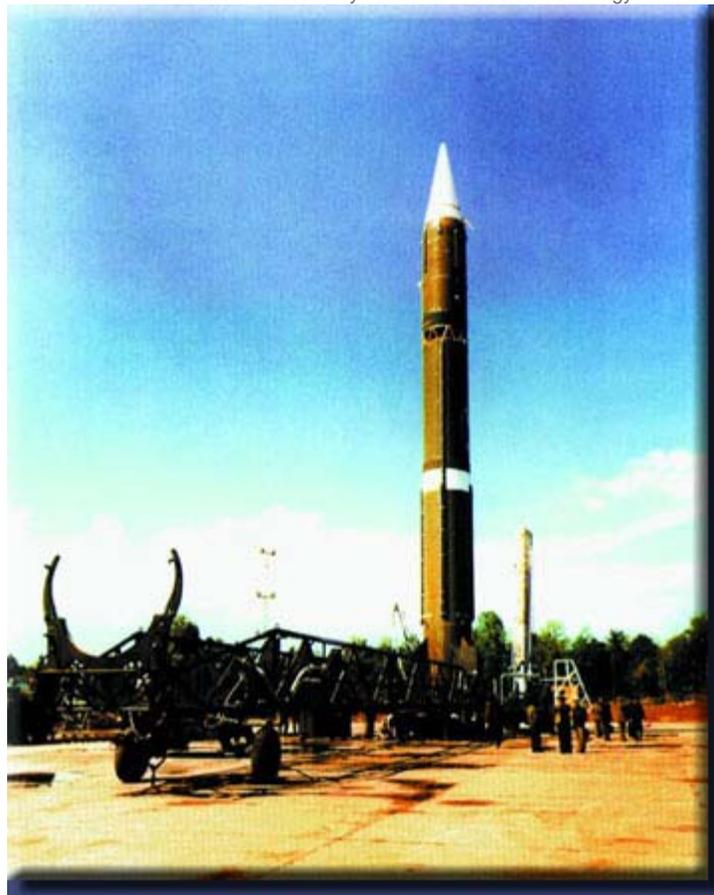
[\[BACK\]](#)[\[NEXT\]](#)

Photo credit: China Academy of Launch Vehicle Technology



CSS-3 being Prepared for Launch

The Strategic Arms Reduction Talks (START I) treaty, which entered into force in December 1994, limits the United States and Russia to no more than 6,000 warheads each (including those on ICBMs, SLBMs, and heavy bombers) by December 2001. If the START II treaty and the associated New York protocols enter into force, the United States and Russia will each be limited to no more than 3,500 warheads, and ICBMs with MIRV payloads will be banned after 2007.

[\[BACK\]](#)[\[NEXT\]](#)

China has a relatively small force of nuclear-armed, liquid-propellant ICBMs capable of reaching the United States. China is now developing advanced new mobile, solid-propellant ICBMs including the DF-31 which was flight-tested for the first time in August 1999. A longer range mobile ICBM also is under development.

Photo credit: Defence International, Bih-Chuan Hwang



China displayed the new DF-31 ICBM road-mobile launcher during the October 1999 parade to celebrate the 50th anniversary of Communist rule in China. The missile is carried inside a canister.

[\[BACK\]](#)[\[NEXT\]](#)

North Korea is developing the Taepo Dong 2 ICBM which could reach at least Alaska and Hawaii from North Korea. The missile may be exported to other countries in the future.

Iran has an ambitious ballistic missile development program, and with continued foreign assistance, Iran could have an ICBM capable of reaching the United States before 2015. Iraq probably desires an ICBM capability, but Iraq is behind Iran in ballistic missile development because of damage inflicted during the 1991 Persian Gulf War and subsequent conflicts as well as the imposition of UN sanctions. Iraq probably will aggressively pursue long-range ballistic missile development if UN sanctions are lifted.

Photo credit: TommaX, Inc./Military Parade Ltd.



SS-18 Mod 4 Launch

Photo credit: TommaX, Inc./Military Parade Ltd.



SS-24 Launcher and Launch Canister



[BACK]

[NEXT]

## ICBM Characteristics

Missiles	Country	No. of Stages	Warheads per Missile	Booster Propellant	Deployment Mode	Maximum Range* (miles)	No. of Launchers
SS-18 Mod 4	Russia	2 + PBV	10	Liquid	Silo	5,500+	180 (total for Mods 4 and 5)
SS-18 Mod 5	Russia	2 + PBV	10	Liquid	Silo	6,000+	
SS-19 Mod 3	Russia	2 + PBV	6	Liquid	Silo	5,500+	150
SS-24 Mod 1	Russia	3 + PBV	10	Solid	Rail-mobile	5,500+	36
SS-24 Mod 2**	Russia	3 + PBV	10	Solid	Silo	5,500+	10
SS-25	Russia	3 + PBV	1	Solid	Road-mobile	7,000+	360
SS-27	Russia	3 + PBV	1	Solid	Silo and road-mobile	7,000+	20
New ICBM***	Russia	Undetermined	Undetermined	Solid	Silo and/or mobile	5,500+	Not yet deployed
CSS-3	China	2	1	Liquid	Silo and transportable	3,400+	Fewer than 25
CSS-4 Mod 1	China	2	1	Liquid	Silo	8,000+	About 20 (total for Mods 1 and 2)
CSS-4 Mod 2	China	2	1	Liquid	Silo	8,000+	
DF-31	China	3	1	Solid	Road-mobile	4,500+	Not yet deployed
New ICBM***	China	3	1	Solid	Mobile	7,000+	Not yet deployed
Taepo Dong 2***	North Korea	2	1	Liquid	Undetermined	3,400+	Not yet deployed

\*These estimates do not include range extension from the PBV; some PBVs provide substantial range extension.

\*\*SS-24 Mod 2 silos are now being converted for use by the new SS-27.

\*\*\*Missile has not yet been flight-tested.

Note: All ranges are approximate.



[BACK]

[NEXT]

Photo credit: TommaX, Inc./Military Parade Ltd.



There are 360 SS-25 missiles deployed, more than any other type of foreign ICBM. The missile is launched from a canister carried on a seven-axle transporter-erector-launcher.



[BACK]

[NEXT]

Photo credit: TommaX, Inc./Military Parade Ltd.

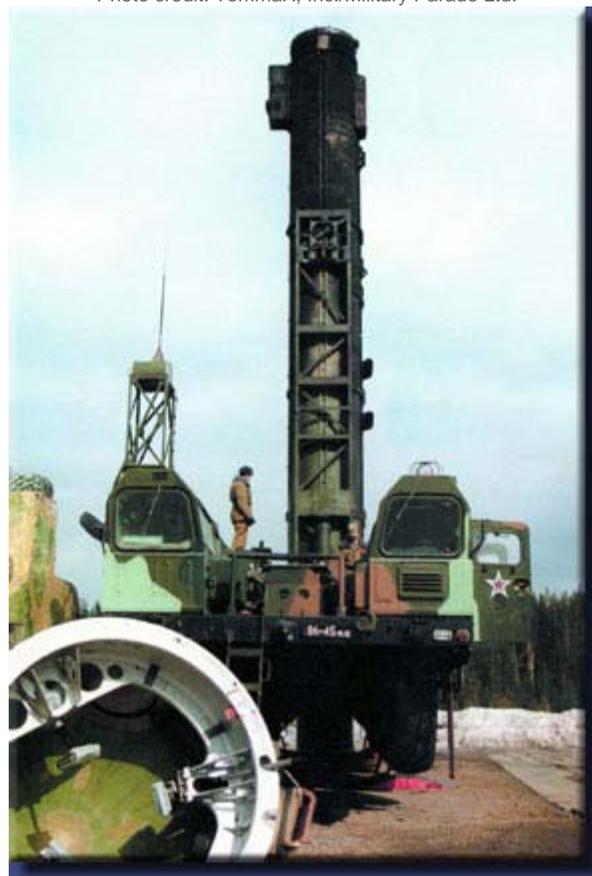


The road-mobile SS-27 ICBM will be carried in a canister on a new eight-axle transporter-erector-launcher.



[BACK]

Photo credit: TommaX, Inc./Military Parade Ltd.



Post-Launch View of SS-25  
Transporter-Erector-Launcher



[NEXT]



SLBM Comparison

[\[BACK\]](#)[\[NEXT\]](#)

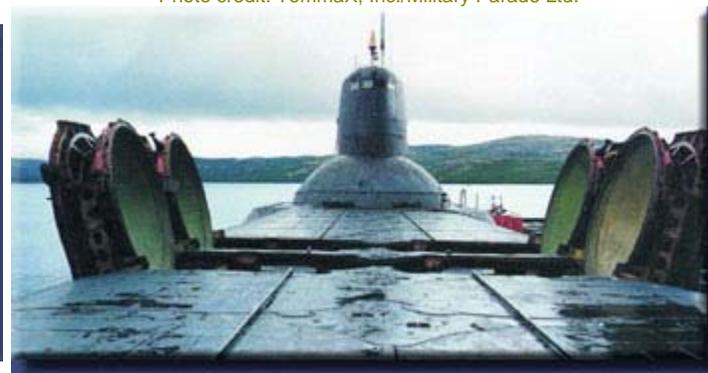
Russia still maintains a substantial force of nuclear-powered ballistic missile submarines (SSBNs) with intercontinental-range missiles. However, the number of SSBNs will decrease over the next several years because of START reductions and submarines reaching the end of their service lives. Russia plans to supplement and modernize its future naval strategic force with the introduction of the new developmental Bulava-30 SLBM and the new DOLGORUKIY-class SSBN.

Photo credit: TommaX, Inc./Military Parade Ltd.



Russian TYPHOON SSBN

Photo credit: TommaX, Inc./Military Parade Ltd.



TYPHOON SSBN with Launch Tube Doors Open



[BACK]

[NEXT]

Photo credit: TommaX, Inc./Military Parade Ltd.



SS-N-20 SLBM

Photo credit: TommaX, Inc./Military Parade Ltd.



SS-N-23 SLBM

Photo credit: TommaX, Inc./Military Parade Ltd.



Russian DELTA IV SSBN

China currently has a single XIA-class SSBN which is intended to carry 12 CSS-NX-3 missiles. In addition, the Chinese are designing a new SSBN that will carry the new JL-2 ballistic missile. This missile will, for the first time, allow Chinese SSBNs to target portions of the United States from operating areas located near the Chinese coast. India is also developing a new SLBM known as the Sagarika, which could become operational after 2010.



[BACK]

[NEXT]

## SLBM Characteristics

Missiles	Country	No. of Stages	Warheads per Missile	Booster Propellant	Submarine Class	Maximum Range (miles)	Total No. of Launch Tubes
SS-N-8	Russia	2	1	Liquid	DELTA I	5,000+	48
SS-N-18	Russia	2 + PBV	3	Liquid	DELTA III	3,500+	176
SS-N-20	Russia	3 + PBV	10	Solid	TYPHOON	5,500+	120
SS-N-23	Russia	3 + PBV	4	Liquid	DELTA IV	5,000+	112
Bulava-30*	Russia	Undetermined	Undetermined	Solid	DOLGORUKIY	5,000+	Not yet deployed
CSS-NX-3	China	2	1	Solid	XIA	1,000+	12; not yet deployed
JL-2*	China	3	1	Solid	Type 094	4,500+	Not yet deployed
Sagarika*	India	Undetermined	Undetermined	Undetermined	Undetermined	180+	Not yet deployed

\*Missile has not yet been flight-tested.

Note: All ranges are approximate.



[BACK]

Photo credit: Military Friendship and Literature Press



Chinese XIA SSBN

Photo credit: PLA Pictorial



The CSS-NX-3 SLBM is a two-stage, solid-propellant missile.

Photo credit: PLA Pictorial



The Chinese XIA SSBN can carry 12 CSS-NX-3 missiles.

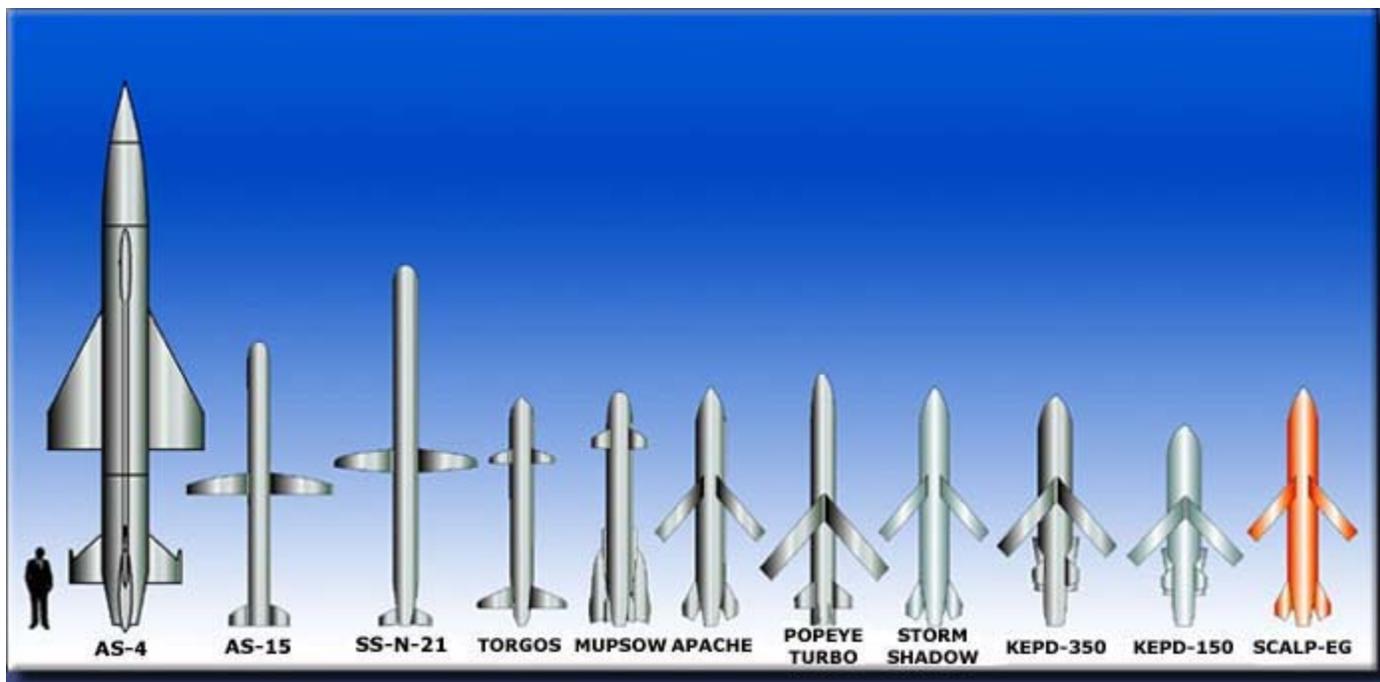
Photo credit: Military Friendship and Literature Press



CSS-NX-3 Launch



[NEXT]



Cruise Missile Comparison

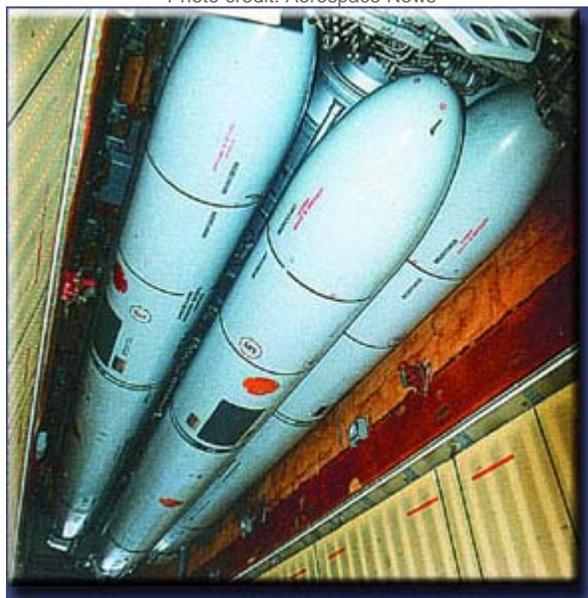
## LAND-ATTACK CRUISE MISSILES

[\[BACK\]](#)[\[NEXT\]](#)

Unlike ballistic missiles, cruise missiles are usually categorized by intended mission and launch mode (instead of maximum range). The two broadest categories are land-attack cruise missiles (LACMs) and antishipping cruise missiles (ASCMs). Each type can be launched from an aircraft, ship, submarine, or ground-based launcher. LACMs are addressed in this document.

A LACM is an unmanned, armed aerial vehicle designed to attack a fixed or mobile ground-based target. It spends the majority of its mission in level flight, as it flies a preprogrammed path to a predetermined target. Propulsion is usually provided by a small jet engine.

Photo credit: Aerospace News



AS-15 Cruise Missiles on a Rotary Launcher in a Tu-160 Bomber

Because of highly accurate guidance systems that can place the missile within a few feet of the intended target, the most advanced LACMs can be used effectively against very small targets, even when armed with conventional warheads. LACM guidance usually occurs in three phases: launch, midcourse, and terminal. During the launch phase, a missile is guided using only the inertial navigation system (INS). In the midcourse phase, a missile is guided by the INS updated by one or more of the following systems: a radar-based terrain contour matching (TERCOM) system, a radar or optical scene matching system, and/or a satellite navigation system, such as the US Global Positioning System (GPS) or the Russian Global Navigation Satellite System (GLONASS). The terminal guidance phase begins when a missile enters the target area and uses either more accurate scene matching or a terminal seeker--usually an optical or radar-based sensor.



[BACK]

[NEXT]

Photo credit: Anatoly Andreyev



An AS-15 cruise missile is dropped from a Tu-160 bomber. The AS-15 is also carried in Tu-95 bombers.

Photo credit: Piotr Butowski



The AS-4 cruise missile, which can be used in both anti-ship and land-attack roles, can be carried on Tu-22 bombers.

**LAND-ATTACK CRUISE MISSILES**

[BACK]

[NEXT]

Photo credit: National Air Intelligence Center



The BLACK SHAHEEN is an export version of the SCALP-EG.



[BACK]

[NEXT]

Photo credit: Kentron Division of Denel (Pty) Ltd.



The TORGOS is a new cruise missile being offered for export by South Africa.

**LAND-ATTACK CRUISE MISSILES**[\[BACK\]](#)[\[NEXT\]](#)

Photo credit: Matra Defense



APACHE Cruise Missile Dropped  
from a Mirage 2000 Aircraft

Photo credit: Aviation Week and Space Technology



KEPD-350 Cruise Missiles Carried on Tornado Aircraft

Defending against LACMs will stress air defense systems. Cruise missiles can fly at low altitudes to stay below enemy radar and, in some cases, hide behind terrain features. Newer missiles are incorporating stealth features to make them even less visible to radars and infrared detectors. Modern cruise missiles also can be programmed to approach and attack a target in the most efficient manner. For example, multiple missiles can attack a target simultaneously from different directions, overwhelming air defenses at their weakest points. Furthermore, the LACMs may fly circuitous routes to get to the target, thereby avoiding radar and air defense installations. Some developmental systems may incorporate chaff or decoys as an added layer of protection, although concealment will remain a cruise missile's main defense.

[\[BACK\]](#)[\[NEXT\]](#)

Photo credit: Kentron Division of Denel (Pty) Ltd



MUPSOW Cruise Missile Dropped from a Cheetah D Aircraft

The cruise missile threat to US forces will increase over the next decade. At least nine foreign countries will be involved in LACM production during the next decade, and several of the LACM producers will make their missiles available for export.

The success of US Tomahawk cruise missiles during the Persian Gulf War and subsequent conflicts has heightened interest in cruise missile acquisition in many countries. Many cruise missiles available for purchase will have the potential to perform precision-strike missions. Many of these missiles will have similar features: a modular design, allowing them to be manufactured with a choice of navigational suites and conventional warhead options; the incorporation of stealth technology; the ability to be launched from fighter-size aircraft; and the capability to fly high-subsonic, low-altitude, terrain-following flight profiles.



[BACK]

[NEXT]

Land-Attack Cruise Missile Characteristics

System	Country	Launch Mode	Warhead Type	Maximum Range (miles)	Initial Operational Capability
New cruise missile	China	Undetermined	Conventional or nuclear	Undetermined	Undetermined
APACHE-A	France	Air	Conventional/submunitions	100+	2001+
SCALP-EG	France	Air and ship	Conventional/penetrator	300+	2002
BLACK SHAHEEN*	UAE	Air	Conventional/penetrator	250+	2002+
KEPD-350	Germany/ Sweden/Italy	Air and ground	Conventional/penetrator/ submunitions	220+	2002
KEPD-150	Germany/ Sweden/Italy	Air and ship	Conventional/unitary or submunitions	100+	2002
POPEYE TURBO	Israel	Air	Conventional/unitary	200+	2002
AS-4	Russia	Air	Conventional or nuclear	185+	Operational
AS-15	Russia	Air	Nuclear	1,500+	Operational
SS-N-21	Russia	Submarine	Nuclear	1,500+	Operational
New conventional cruise missile	Russia	Undetermined	Conventional/unitary or submunitions	Undetermined	Undetermined
MUPSOW	South Africa	Air and ground	Conventional/unitary or submunitions	125+	2002
TORGOS	South Africa	Air and ground	Conventional/unitary or submunitions	185+	2004+
STORM SHADOW	United Kingdom	Air	Conventional/penetrator	300+	2002

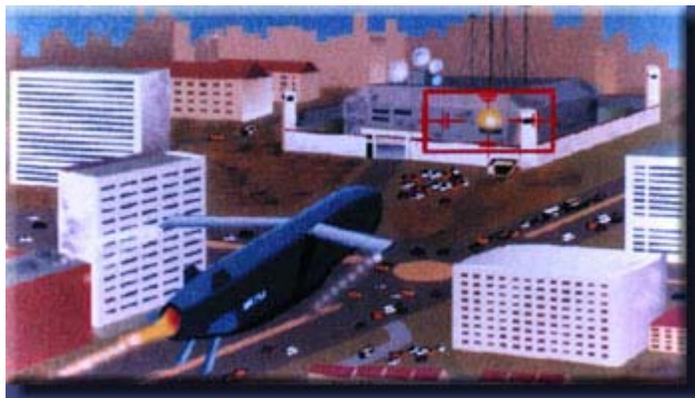
\*The BLACK SHAHEEN is an export version of the SCALP-EG/STORM SHADOW.

Note: All ranges are approximate and represent the range of the missile only. The effective system range may be greatly increased by the range of the launch platform.



[BACK]

Photo credit: Matra Defense



Cruise Missile Imaging Target

Photo credit: Matra Defense



Cruise Missile Releasing Submunitions

## Summary

Ballistic missiles are already in widespread use and will continue to increase in number and variety. The availability of weapons of mass destruction for use on ballistic missiles vastly increases the significance of this threat.

Despite an ongoing reduction in the size of the Russian strategic missile force, Russia will continue to present the largest ballistic missile threat to the United States. The development of new ballistic missile systems such as the road-mobile SS-27 ICBM and the Bulava-30 SLBM is a high priority for Russia. Russia is also offering the advanced new Iskander-E SRBM for export.

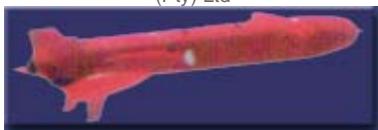
China is capable of producing technologically advanced ballistic missiles and has sold ballistic missile technology to other countries. China can already target the United States with a relatively small force of liquid-propellant ICBMs. The DF-31, China's new solid-propellant, road-mobile ICBM, was flight-tested for the first time in 1999, and a longer range road-mobile ICBM and a new SLBM are in development.

Photo credit: National Air Intelligence Center



SCUD Missile on Launcher

Photo credit: Kentron Division of Denel  
(Pty) Ltd



MUPSOW Cruise Missile

Photo credit: BOFORS-Celsius Group and  
Daimler-Benz Aerospace AG-LFK



KEPD-350 Cruise Missile

North Korea is continuing the development of the Taepo Dong 2 ICBM. Like other North Korean ballistic missiles, the Taepo Dong 2 may be exported to other countries in the future. With continued foreign assistance, Iran also could have an ICBM capable of reaching the United States before 2015.

Proliferation of land-attack cruise missiles will expand in the next decade. At least nine countries will be involved in producing these weapons. The majority of new LACMs will be very accurate, conventionally armed, and available for export. The high accuracy of many LACMs will allow them to inflict serious damage on important targets, even when the missiles are armed only with conventional warheads. US defense systems could be severely stressed by low-flying stealthy cruise missiles that can simultaneously attack a target from several directions.

Ballistic and cruise missiles, with their relatively low operating costs, their high probability of penetrating existing defense systems, and their value as a symbol of national power, will continue to be the offensive weapons of choice for many nations. As such, they are threats that must be carefully considered in future military planning and operations.

Photo credit: Associated Press



SS-25 Launch

**NAIC-1031-0985-00  
September 2000**

NAIC Customer Support Office

NAIC/PO  
4180 Watson Way  
Wright-Patterson AFB, OH 45433-5625  
DSN 787-2378  
(937) 257-2378

The Office of Naval Intelligence and Defense Intelligence Agency Missile and Space Intelligence Center assisted in the preparation of this document.

