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BALLISTIC AND CRUISE MISSILE THREAT

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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.

Both India and Pakistan have new long-range ballistic missiles in development, and these missiles are capable of being armed with weapons of mass destruction.

North Korea is continuing to develop an intercontinental ballistic missile (ICBM) which could reach parts of the United States with a nuclear weapon-sized payload.

With continued foreign assistance, Iran could have an ICBM capable of reaching the United States before 2015.

Russia still has several thousand nuclear warheads deployed on ballistic missiles capable of reaching the United States. Although the size of the Russian strategic missile force is shrinking, development of new ICBM and submarine-launched ballistic missile (SLBM) systems is proceeding, and Russia is expected to retain the largest force of strategic ballistic missiles outside the United States.

China is continuing the development of the new road-mobile DF-31 ICBM as well as the longer range DF-31A. A new SLBM also is under development. The number of warheads on Chinese ICBMs capable of reaching the United States is expected to expand to 75-100 over the next 15 years.

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.

Front Cover Photo: Pakistani Ghauri MRBMs

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THREAT HISTORY

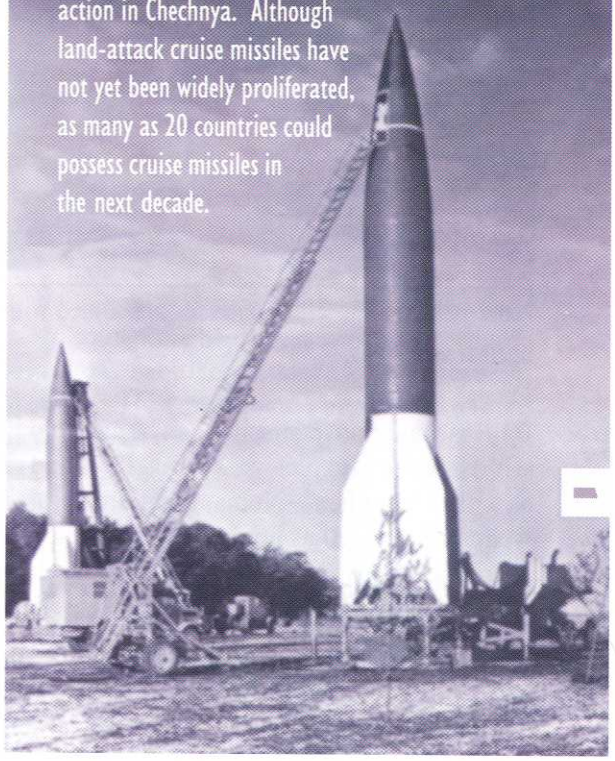
V-1 in Flight

V-1 about to impact in London.

V-2 damage; 160 people were killed in this attack.

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.

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 conflicts over the last 20 years, including the Iran-Iraq War, the Afghan Civil War, the war in Yemen, the 1991 Persian Gulf conflict, and the recent 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.



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. In addition, missiles can be used as a deterrent or an instrument of coercion. 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.

V-2 Ballistic Missiles

WARHEADS AND TARGETS

Many ballistic and cruise missiles are armed with nuclear warheads.

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

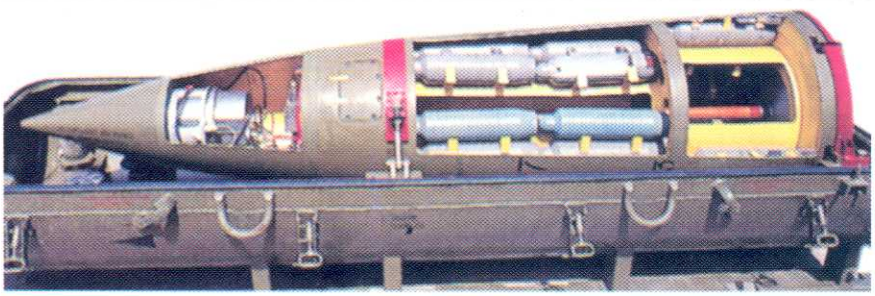
Ballistic and cruise missiles can be armed with conventional or nonconventional warheads. Conventional warheads are filled with a chemical explosive, such as TNT, and rely on the detonation of the explosive and the resulting metal casing fragmentation as kill mechanisms. Nonconventional warheads include 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).

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.

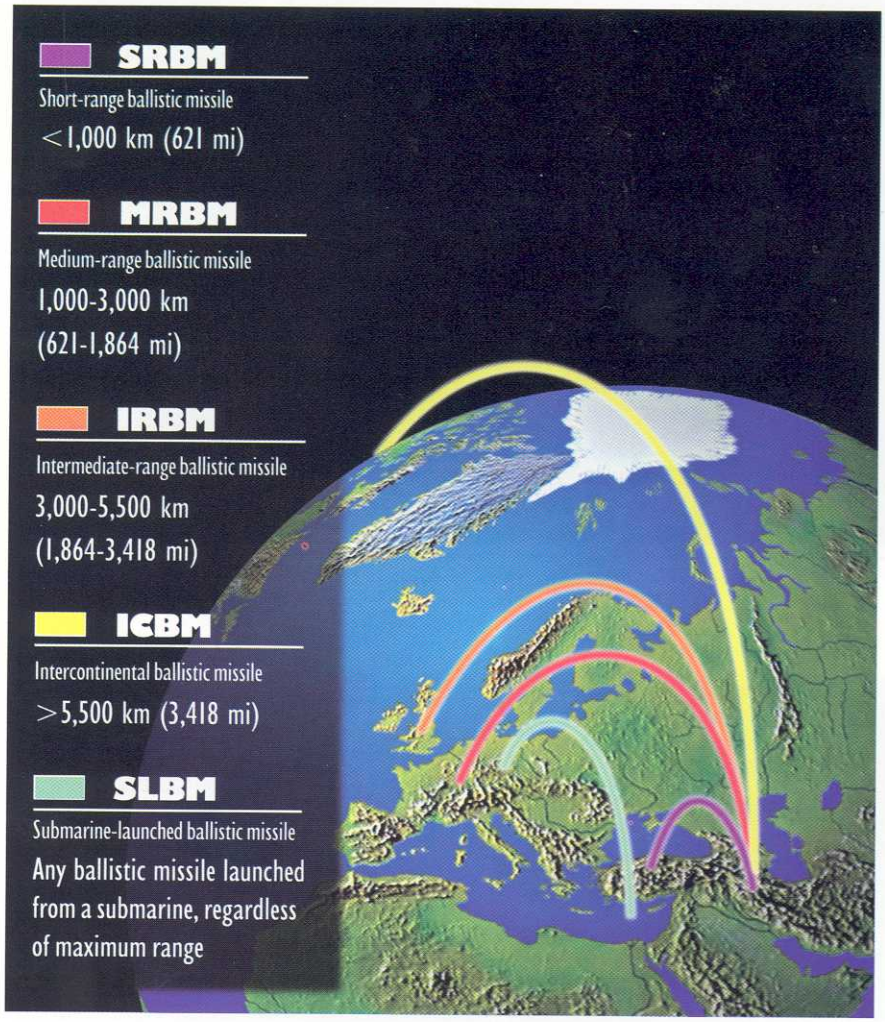
Almost all of the longer range ballistic missiles, and several types of land-attack cruise missiles, carry nuclear warheads. Most of these warheads have an explosive force that is tens to hundreds of times more powerful than the atomic bombs used in World War II.

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.

Ballistic Missile Warhead with Submunitions



BALLISTIC MISSILE CHARACTERISTICS



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.

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.

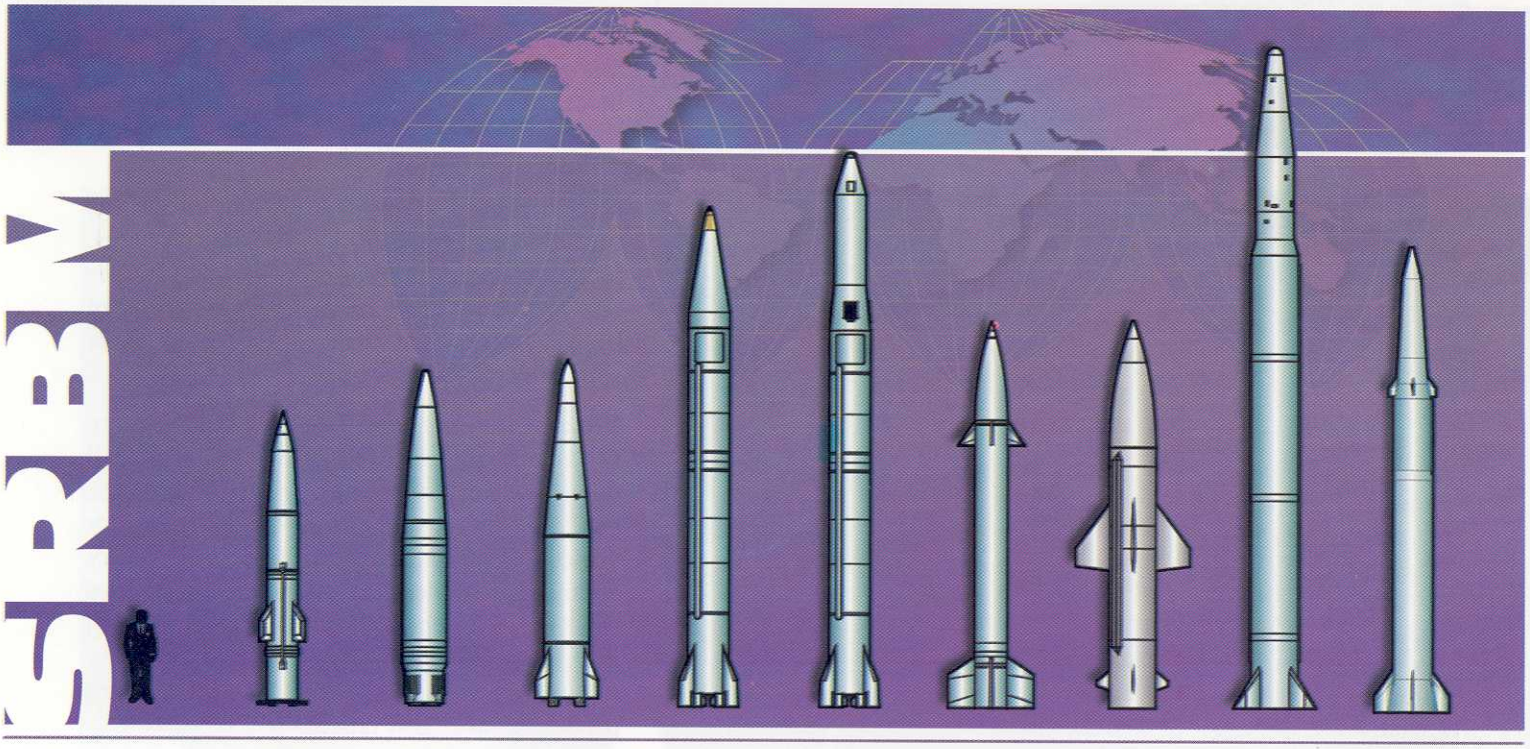
Ballistic missiles can use solid- or liquid-propellant rocket propulsion systems. The trend in modern missile systems has been toward the use of solid propellants because of their reduced logistical requirements and simplicity of operation. However, some Third World nations have greater access to liquid-propellant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

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 a guidance system only accurate enough to hit a large city 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.

Many ballistic missiles carry penetration aids to improve the chances of a reentry vehicle penetrating a ballistic missile defense system. Penetration aids are devices intended 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.

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

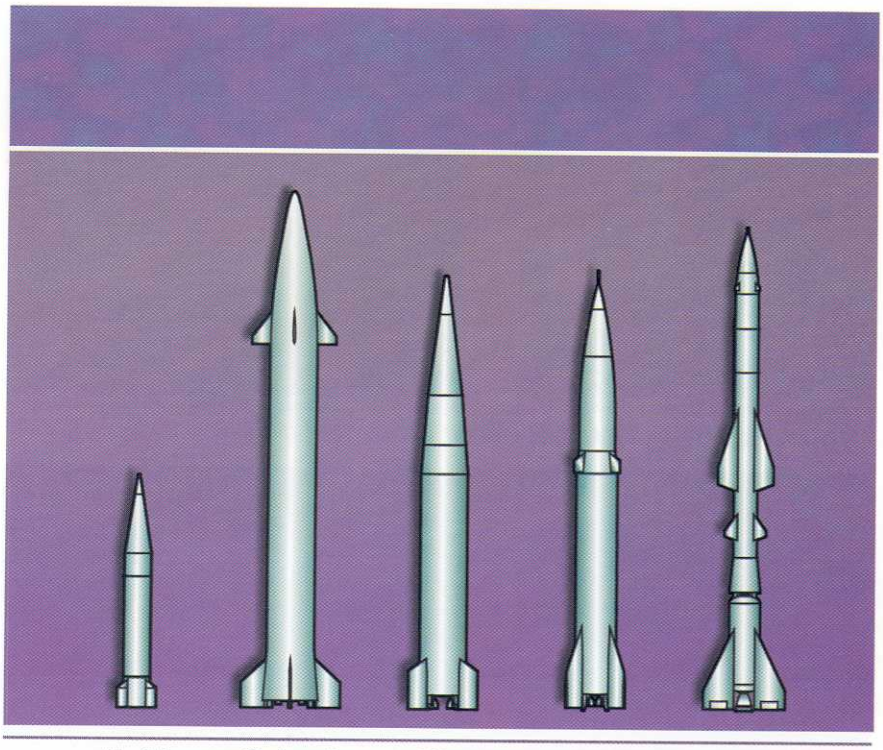


SRBM LAUNCHER ORDER OF BATTLE
SELECTED COUNTRIES

Country	Missile System	Number of Launchers*
Belarus		
	SCUD B	Fewer than 50
	SS-21	Fewer than 100
Bulgaria		
	SCUD B	Fewer than 50
China		
	CSS-6	Fewer than 50
	CSS-7	Fewer than 50
Egypt		
	SCUD B	Fewer than 50
	Vector	Not yet deployed
India		
	Prithvi	Fewer than 50
	Dhanush	Not yet deployed
	Agni I	Not yet deployed
Iran		
	CSS-8	Fewer than 50
	SCUD B	Fewer than 50
	SCUD C	Fewer than 50
	Fateh-110	Not yet deployed
Kazakhstan		
	SCUD B	Fewer than 50
	SS-21	Fewer than 50
Libya		
	SCUD B	Fewer than 100
North Korea		
	SCUD B	Fewer than 50
	SCUD C	Fewer than 50
Pakistan		
	Hatf-1	Undetermined
	CSS-7 (M-11)	Fewer than 50
	Shaheen I	Not yet deployed
Russia**		
	SS-1c Mod 2	Undetermined
	SS-21	More than 200
	SS-26	Fewer than 50
Slovakia		
	SS-21	Fewer than 50
Syria		
	SCUD B	Fewer than 50
	SCUD C	Fewer than 50
	SS-21	Fewer than 50
Turkmenistan		
	SCUD B	Fewer than 50
Ukraine		
	SCUD B	Fewer than 100
	SS-21	Fewer than 100
Vietnam		
	SCUD B	Fewer than 50
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 recent Russian military action in Chechnya.



Hatf-I Shaheen I CSS-6 CSS-7 CSS-8

SCUD B on Road-Mobile Launcher

Indian Prithvi SRBM

Pakistani Shaheen I SRBM

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 1991 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.

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 1991 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.

The Russian SS-21 has been used extensively in the Chechen conflict.

Pakistani Shaheen I on Road-Mobile Launcher

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

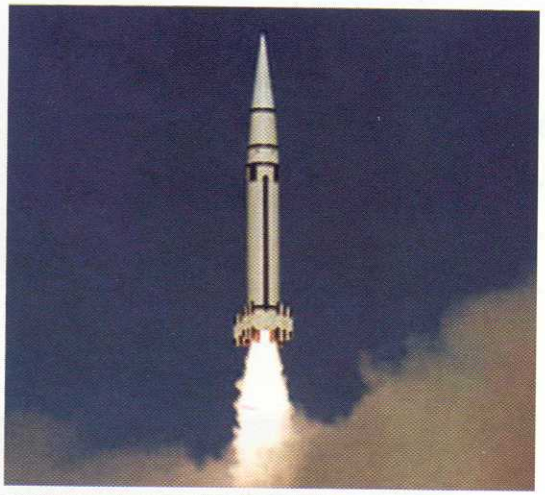
SRBM

Missile	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-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

Chinese CSS-6 on Road-Mobile Launcher

Chinese CSS-7

The Chinese CSS-8 has been exported to Iran.



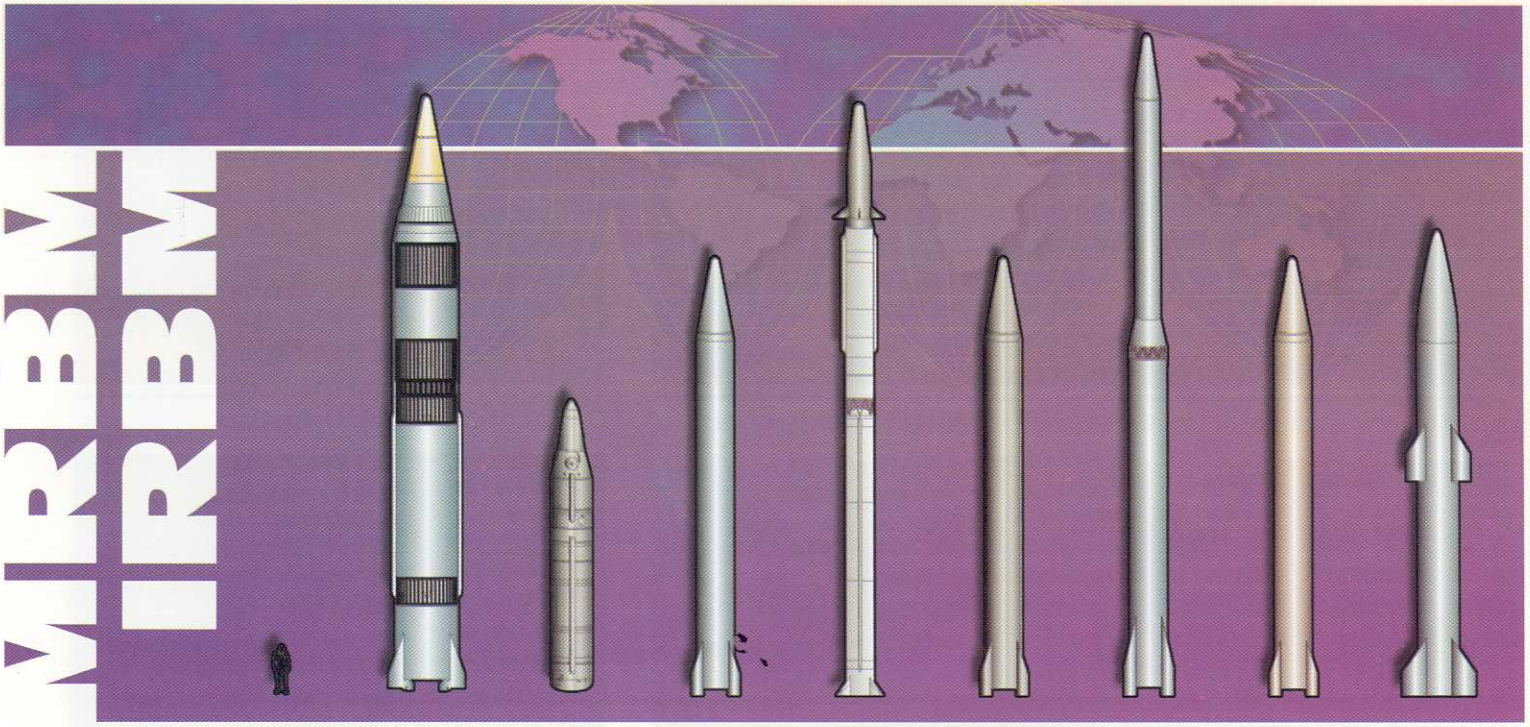
CSS-6 in Flight

CHARACTERISTICS

Missile	Producer	Propellant	Deployment Mode	Maximum Range (miles)
Prithvi I	India	Liquid	Road-mobile	93
Prithvi II	India	Liquid	Road-mobile	155
Dhanush	India	Liquid	Ship-based	155
Agni I	India	Solid	Road-mobile	435
Hatf-I	Pakistan	Solid	Road-mobile	50
Shaheen I	Pakistan	Solid	Road-mobile	280+
Vector**	Egypt	Solid	Road-mobile	425+
Fateh-110	Iran	Solid	Road-mobile	120+

Note: All ranges are approximate.

*No SS-23 missiles are deployed in Russia; some remain in Bulgaria.
**Missile has not yet been flight-tested.



CSS-2 | CSS-5 | Shahab 3 | Agni II | No Dong | Taepo Dong I | Ghauri | Shaheen II

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

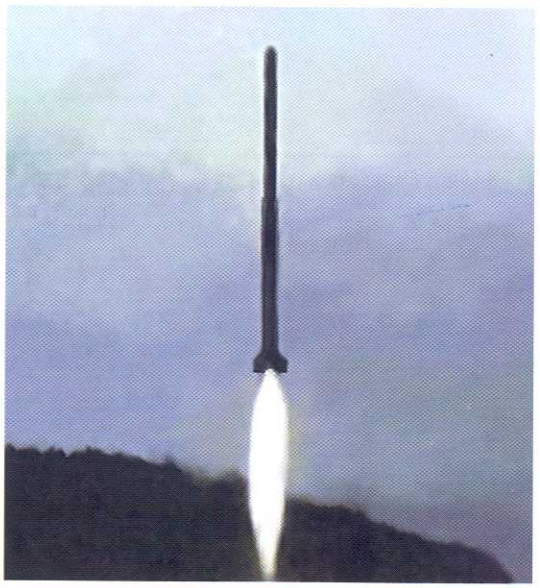
The Iranian Shahab 3 is a single-stage, liquid-propellant missile based on the North Korean No Dong MRBM.

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.

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.

Iran has an extensive missile development program and has received support from entities in Russia, China, and North Korea. Iran's Shahab 3 MRBM is based on the North Korean No Dong, and Iran probably already has a few of these missiles available for use in a conflict. Several longer range Iranian ballistic missiles also are in development.

India and Pakistan are continuing development of MRBM systems capable of carrying weapons of mass destruction. India has indicated it plans to deploy the new solid-propellant Agni II MRBM. A longer range Agni III IRBM is also under development. Pakistan conducted several ballistic missile flight tests in May 2002, including flights of a Ghauri MRBM and two SRBMs. Pakistan is also developing a new two-stage, solid-propellant Shaheen II MRBM. The Shaheen II could have a range of 1,250 miles or more, in the same class as India's Agni II.



North Korean Taepo Dong I in Flight

Taepo Dong I

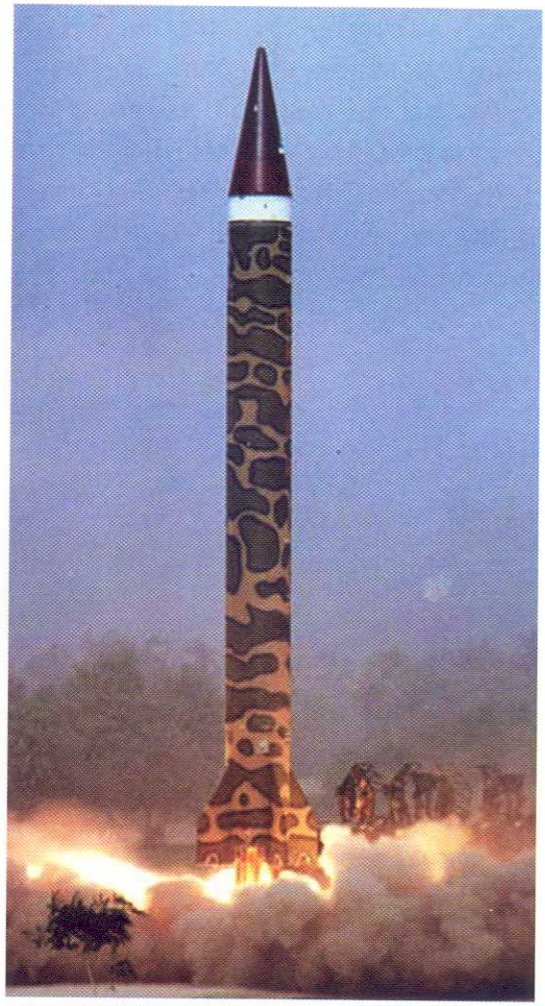
The Indian Agni II is a two-stage, solid-propellant MRBM.

MRBM and IRBM

Missile	Country	Number of Stages	Propellant	Deployment Mode	Maximum Range (miles)	Number 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 I***	North Korea	2	Liquid	Undetermined	1,250+	Not yet deployed
Agni II	India	2	Solid	Mobile	1,250+	Not yet deployed
Agni III****	India	2	Solid	Mobile	2,000+	Not yet deployed
Ghauri	Pakistan	1	Liquid	Road-mobile	800	Fewer than 50

Pakistani Ghauri Liquid-Propellant MRBM

Pakistani Shaheen II Solid-Propellant MRBM



Ghauri MRBM

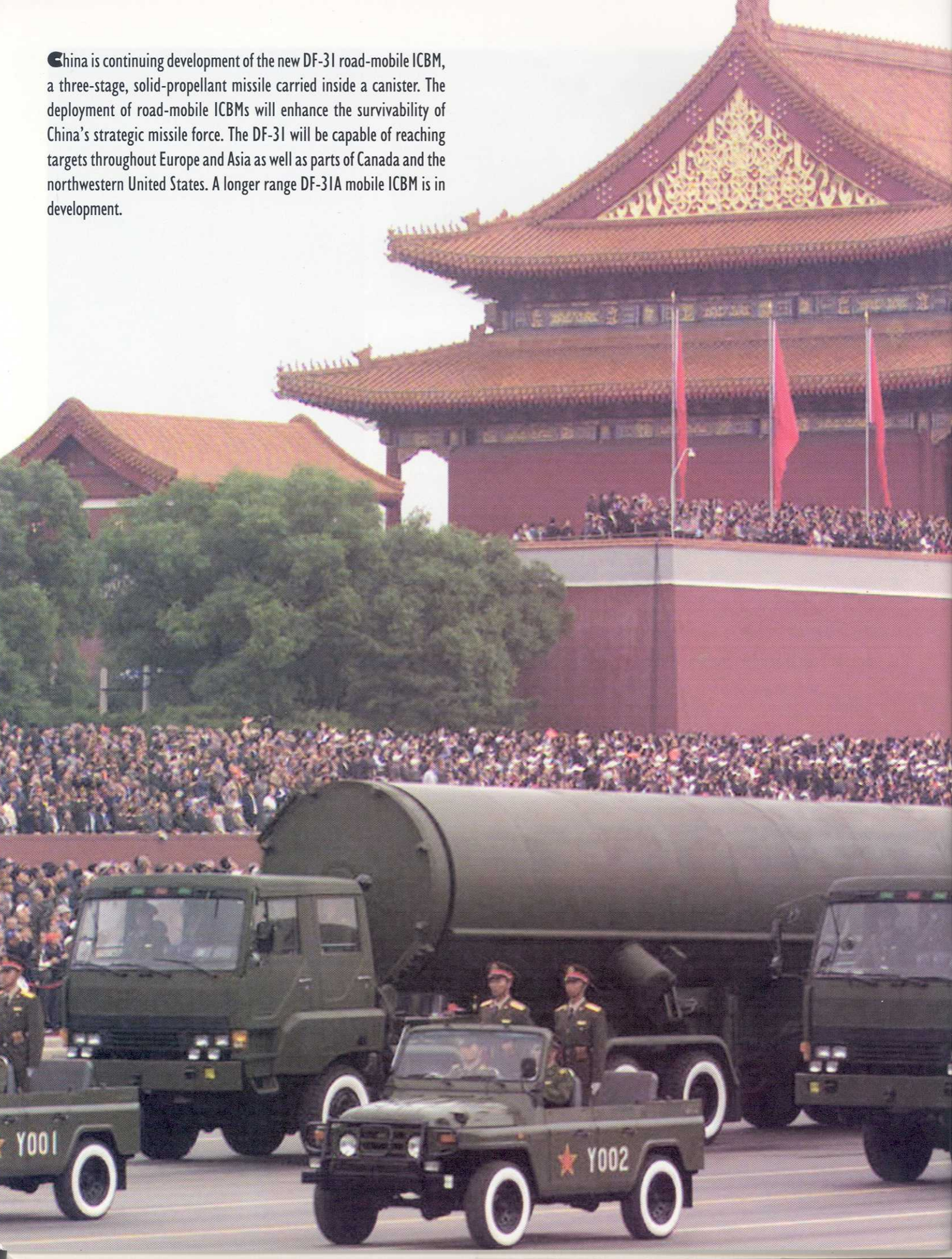
CHARACTERISTICS

Missile	Country	Number of Stages	Propellant	Deployment Mode	Maximum Range (miles)	Number of Launchers*
Shaheen II****	Pakistan	2	Solid	Road-mobile	1,250+	Not yet deployed
Shahab 3	Iran	1	Liquid	Road-mobile	800	Fewer than 20
New MRBM (Shahab 4?)****	Iran	Undetermined	Liquid	Undetermined	1,200+	Not yet deployed
New MRBM/IRBM/ICBM (Shahab 5?)****	Iran	Undetermined	Undetermined	Undetermined	Undetermined	Not yet deployed

Note: All ranges are approximate.

*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.

China is continuing development of the new DF-31 road-mobile ICBM, a three-stage, solid-propellant missile carried inside a canister. The deployment of road-mobile ICBMs will enhance the survivability of China's strategic missile force. The DF-31 will be capable of reaching targets throughout Europe and Asia as well as parts of Canada and the northwestern United States. A longer range DF-31A mobile ICBM is in development.

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Chinese CSS-4 Launch

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 continue to decrease as a result of arms control agreements, aging missiles, and resource constraints, Russia probably will retain the largest ICBM force outside the United States. Efforts to maintain and modernize the force are underway. Russia's new SS-27 ICBM, a missile designed with countermeasures to ballistic missile defense systems, is now deployed in silos in three regiments (30 missiles). The road-mobile version of the SS-27 was flight-tested for the first time in 2000. A new strategic missile that could be deployed in both land-based and sea-based versions may also be under development.

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). The 2002 Moscow Treaty on Strategic Offensive Reductions limits Russia and the United States to no more than 1,700-2,200 warheads each by the end of 2012.

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, the DF-31A, also is under development. The number of warheads on Chinese ICBMs capable of threatening the United States is expected to expand to 75-100 over the next 15 years.

Russia's road-mobile SS-27 is carried in a canister on a new eight-axle transporter-erector-launcher.

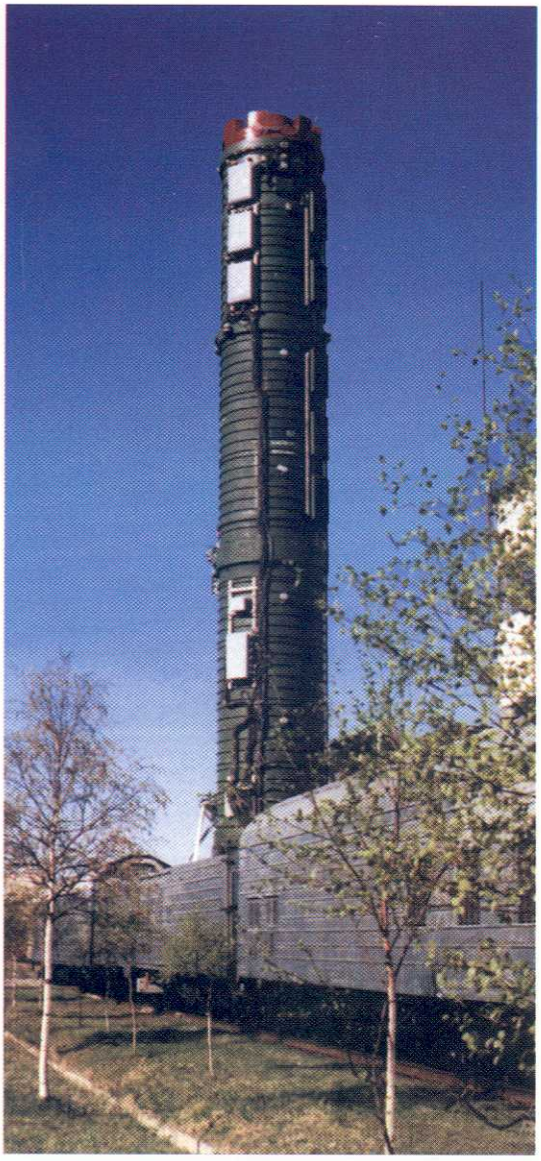
SS-27 Launch

North Korea is developing the Taepo Dong 2 ICBM which could reach at least Alaska and Hawaii from North Korea. The missile could be flight-tested soon after a political decision to do so. The Taepo Dong 2 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.

The Russian SS-25 missile is launched from a canister carried on a seven-axle transporter-erector-launcher.

SS-25 Launch

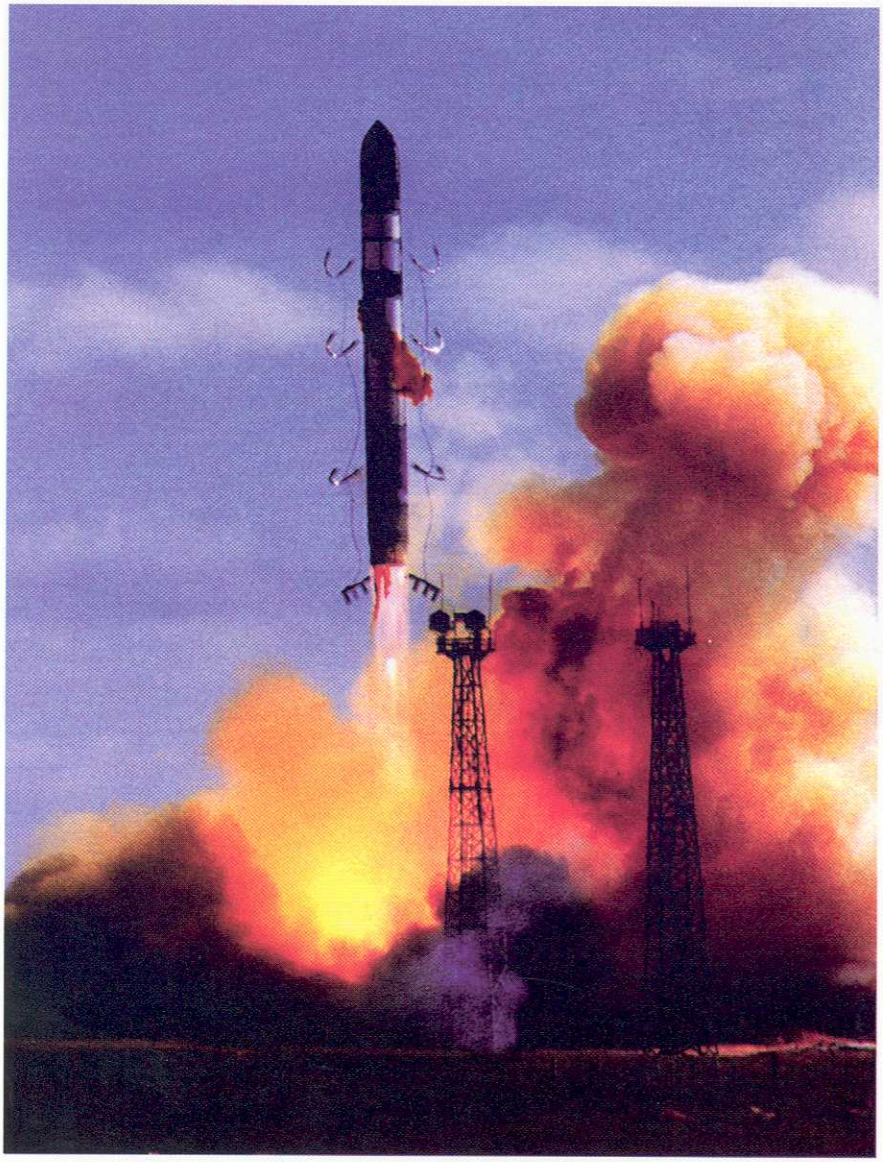


Russian SS-24 Train with Missile Canister Erect

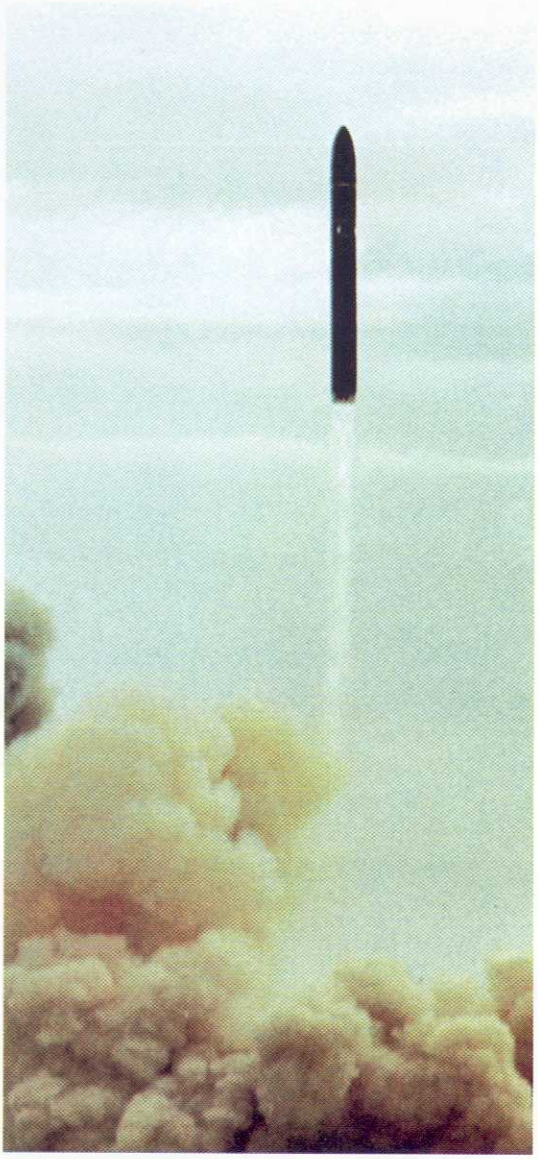
Post-Launch View of a Russian SS-25 Transporter-Erector-Launcher

ICBM

Missile	Country	Number of Stages	Warheads per Missile	Booster Propellant	Deployment Mode	Maximum Range* (miles)	Number of Launchers
SS-18 Mod 4	Russia	2 + PBV	10	Liquid	Silo	5,500+	144 (total for
SS-18 Mod 5	Russia	2 + PBV	10	Liquid	Silo	6,000+	Mods 4 and 5)
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-25	Russia	3 + PBV	1	Solid	Road-mobile	7,000+	342
SS-27	Russia	3 + PBV	1	Solid	Silo and road-mobile	7,000+	30
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
SS-4 Mod 1	China	2	1	Liquid	Silo	8,000+	About 20



Russian SS-18 Mod 4 Launch



Russian SS-18 Mod 5 Launch

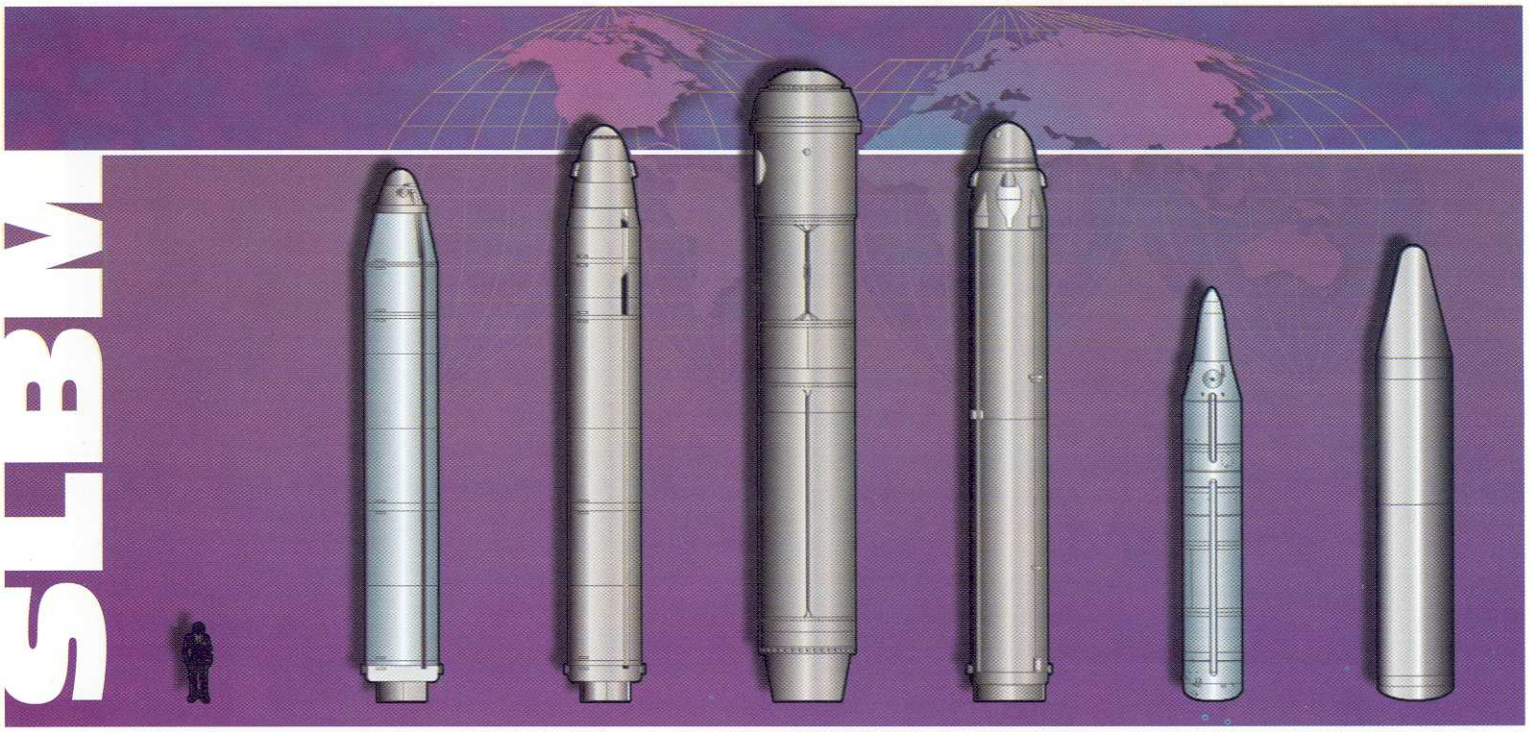
CHARACTERISTICS

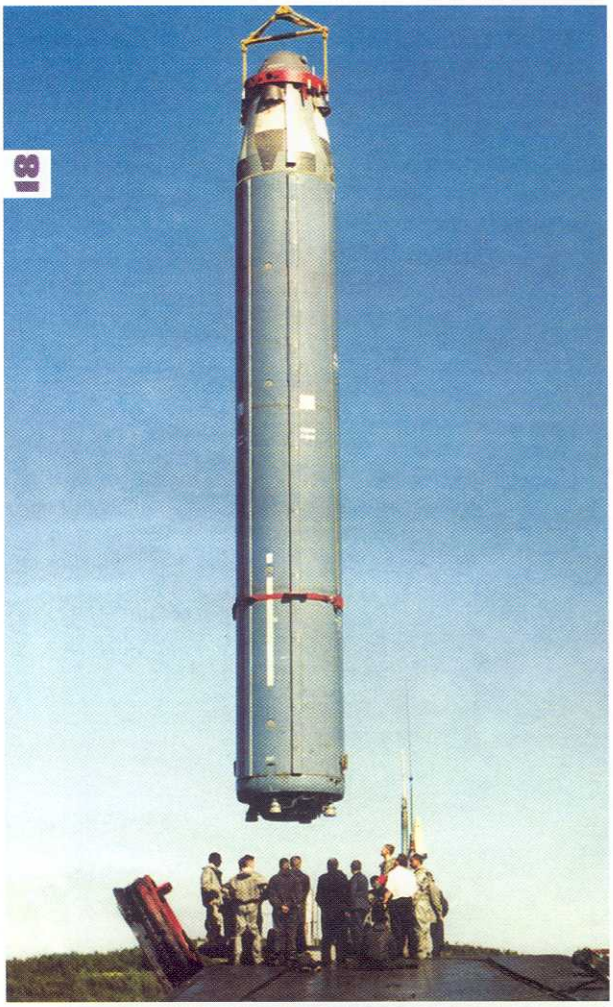
Missile	Country	Number of Stages	Warheads per Missile	Booster Propellant	Deployment Mode	Maximum Range* (miles)	Number of Launchers
CCSS-4 Mod 2	China	2	1	Liquid	Silo	8,000+	(total for Mods 1 and 2)
DF-31	China	3	1	Solid	Road-mobile	4,500+	Not yet deployed
DF-31A**	China	3	1	Solid	Mobile	7,000+	Not yet deployed
Taepo Dong 2**	North Korea	2	1	Liquid	Undetermined	3,400+	Not yet deployed

Note: All ranges are approximate.

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

**Missile has not yet been flight-tested.





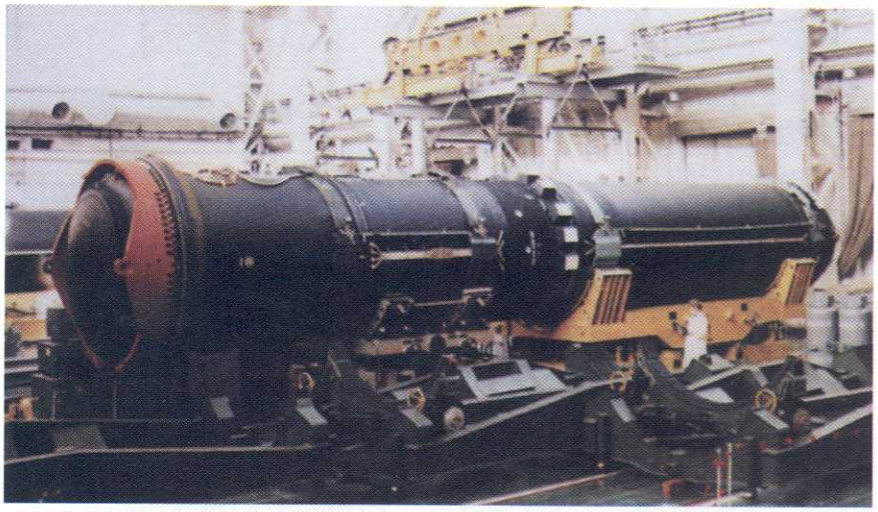
Russian SS-N-23 SLBM

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 an improved version of the liquid-propellant SS-N-23, the SS-N-23 Sineva, and a new solid-propellant SLBM, the Bulava-30, which will be deployed on the new DOLGORUKIY-class 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.

Each Russian DELTA IV SSBN can carry 16 SS-N-23 missiles.

Russian TYPHOON SSBN with Launch Tube Doors Open

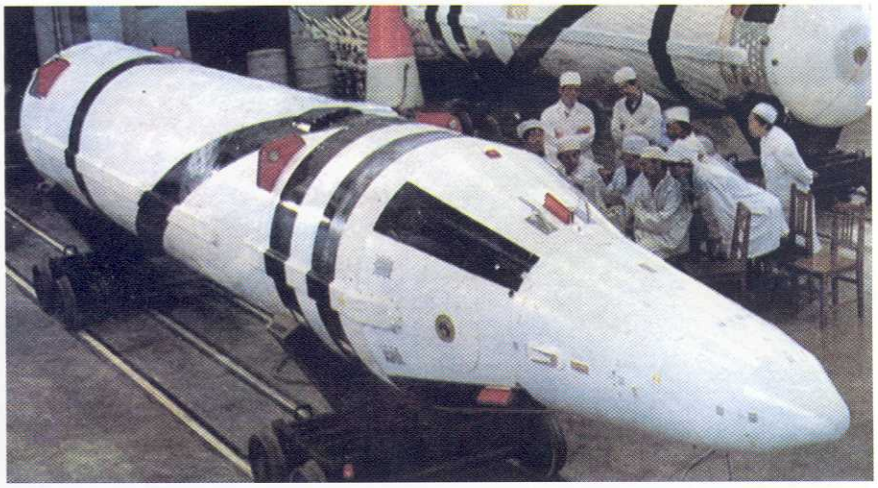


Russian SS-N-20 SLBM

Each TYPHOON SSBN can carry 20 SS-N-20 missiles.

SS-N-20 Launch

CSS-NX-3 Launch



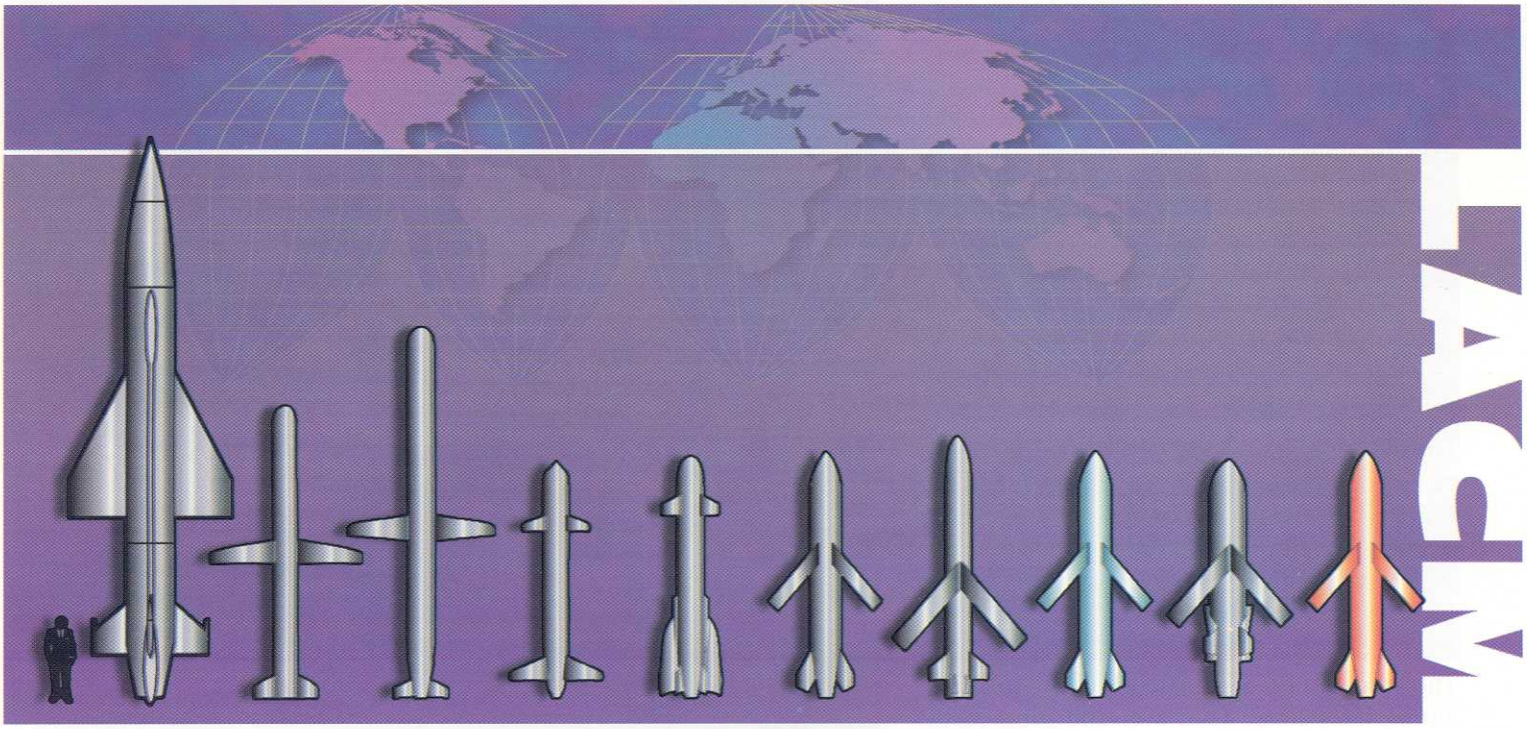
Chinese CSS-NX-3 SLBM

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

SLBM CHARACTERISTICS

Missile	Country	Number of Stages	Warheads per Missile	Booster Propellant	Submarine Class	Maximum Range (miles)	Total Number of Launch Tubes
SS-N-8	Russia	2	1	Liquid	DELTA I	5,000+	12
SS-N-18	Russia	2 + PBV	3	Liquid	DELTA III	3,500+	112
SS-N-20	Russia	3 + PBV	10	Solid	TYPHOON	5,500+	100
SS-N-23	Russia	3 + PBV	4	Liquid	DELTA IV	5,000+	96
Sineva*	Russia	Undetermined	10	Liquid	Undetermined	Undetermined	Not yet deployed
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

Note: All ranges are approximate.
*Missile has not yet been flight-tested.

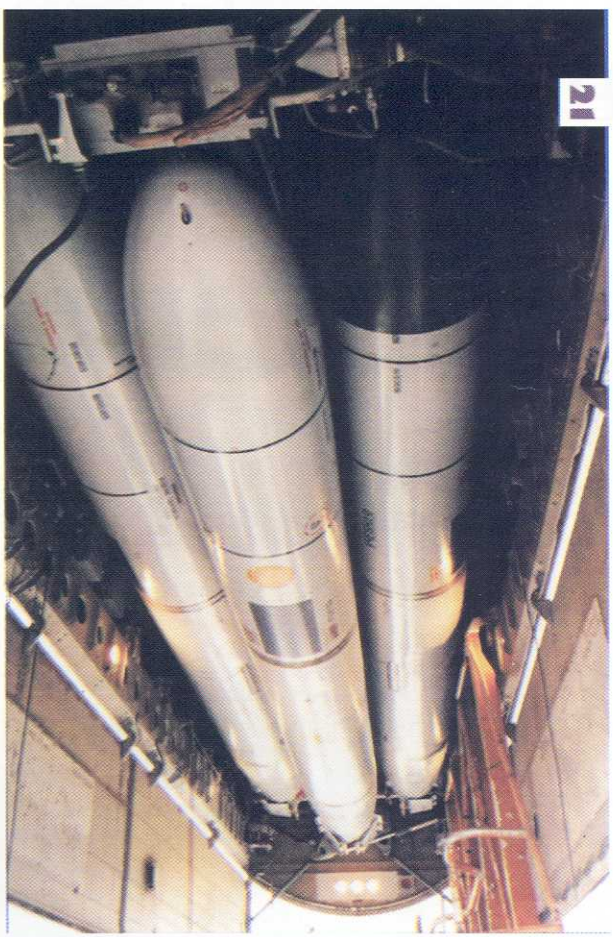


Unlike ballistic missiles, cruise missiles are usually categorized by intended mission and launch mode (instead of maximum range). The two broadest categories are land-attack cruise missiles (LACMs) and antishipping cruise missiles (ASCMs). Each type can be launched from an aircraft, ship, submarine,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

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.

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



Russian AS-15 Cruise Missiles on a Rotary Launcher

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.

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.

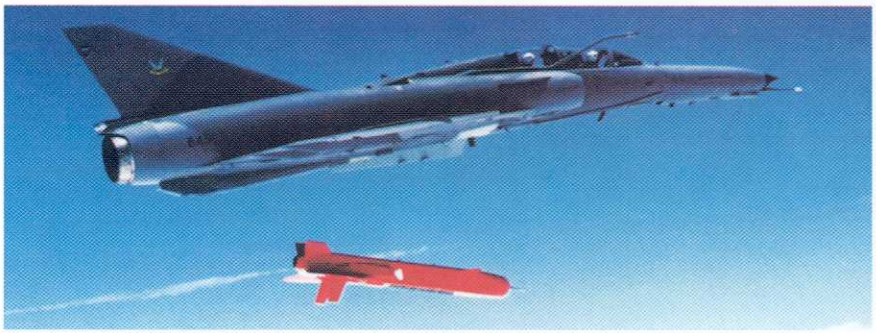
AS-15 Cruise Missile Dropped from a Russian Tu-160 Bomber

Russian AS-15 Cruise Missile

LACM

System	Country	Launch Mode	Warhead Type	Maximum Range (miles)	Initial Operational Capability
New cruise missile	China	Undetermined	Conventional or nuclear	Undetermined	Undetermined
APACHE-AP	France	Air	Conventional/submunitions	100+	2002
SCALP-EG	France	Air and ship	Conventional/penetrator	300+	2003
BLACK SHAHEEN*	UAE	Air	Conventional/penetrator	250+	2003+
KEPD-350	Germany/ Sweden/Italy	Air and ground	Conventional/penetrator/ submunitions	220+	2004
POPEYE TURBO	Israel	Air	Conventional/unitary	200+	2002
AS-4	Russia	Air	Conventional or nuclear	185+	Operational

Russian AS-4 Cruise Missile on a Tu-22 Bomber



South African MUPSOW Cruise Missile Dropped from a Cheetah D Aircraft

Proposed Naval Version of SCALP-EG Cruise Missile

CHARACTERISTICS

System	Country	Launch Mode	Warhead Type	Maximum Range (miles)	Initial Operational Capability
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+	2003

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

APACHE Cruise Missile Dropped from a Mirage 2000 Aircraft

KEPD-350 Cruise Missiles Carried on Tornado Aircraft

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

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

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 retain the largest force of strategic ballistic missiles outside the United States. The development of new ballistic missile systems such as the road-mobile SS-27 ICBM and the Sineva and Bulava-30 SLBMs 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 ICBM has been flight-tested and probably will be deployed in the next few years. The DF-31A ICBM, which will have a longer range than the DF-31, and the JL-2 SLBM are in development.

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.

Iskander-E SRBM

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.

Back Cover Photos:
MUPSOW Cruise Missile (top left)
SS-25 ICBM Launch (top right)
SCUD SRBM Launcher (center)
CSS-2 MRBM Launch (bottom left)
Typhoon Submarine (bottom center)
Ghauri MRBM (bottom right)

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