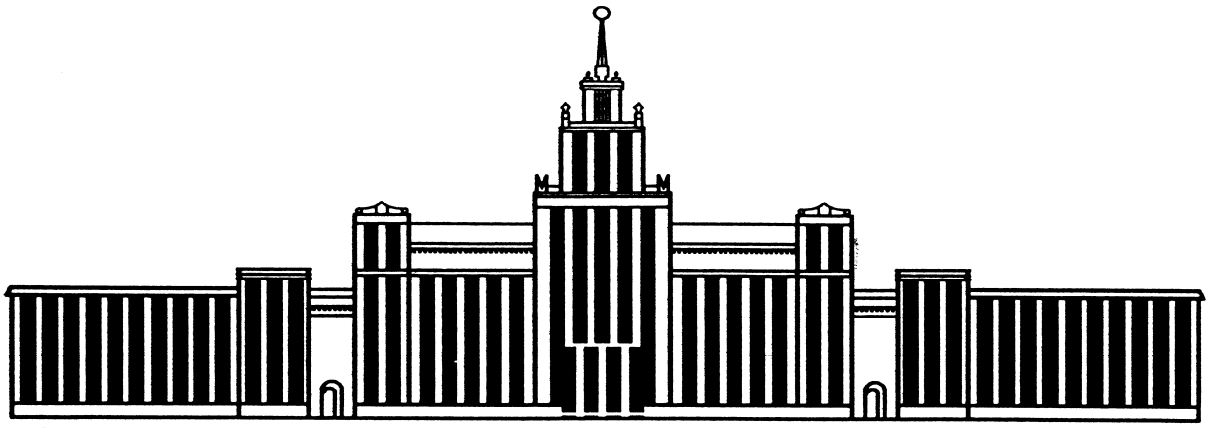
МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ



ЮЖНО-УРАЛЬСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

Ш143.21-9
С401

В.В. Сиреканян

АНГЛИЙСКИЙ ЯЗЫК

Учебное пособие

Челябинск
2012

Министерство образования и науки Российской Федерации
Южно-Уральский государственный университет
Филиал в г. Миассе

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Учебное пособие предназначено для развития навыков устной речи. В нем приведены оригинальные англоязычные тексты по ракетной тематике, терминологическая лексика для запоминания, вопросы для обсуждения, практические задания для фронтальной, индивидуальной работы, работы в парах, творческие задания, направленные на развитие и совершенствование навыков устной речи, расширение лексического запаса студентов, закрепление грамматических конструкций.

Предназначено для студентов 2 курса электротехнического факультета по специальности «Ракетостроение» и «Проектирование, производство и эксплуатация ракет и ракетно-космических комплексов» дневной формы обучения.

ББК Ш143.21-9

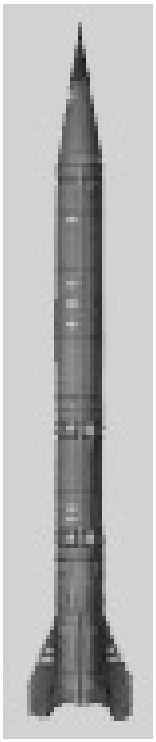
UNIT 1

SEA (MARINE, OFFSHORE) ROCKET

The 1st GENERATION

Text A

Read and translate the text.



R-11FM

The first Soviet liquid-single-stage ballistic missile, which placed on submarines (SLBMs) and 629 projects of the 611AV. It was constructed by OKB-1.

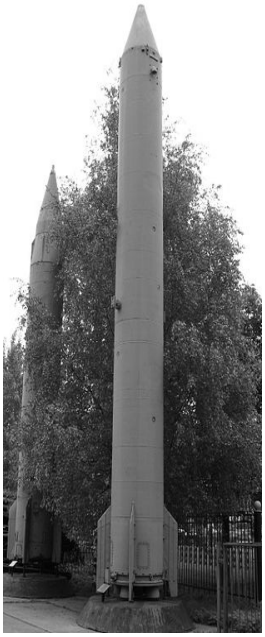
On the 26th of January decree of the CPSU Central Committee and USSR Council of Ministers was issued. It said: "Design and conduct experiments in ballistic missiles for provide them submarines and long-range development the technical design of the submarine with a big rocket armament on the basis of these studies."

On 11th of September, 1955, the first submarine with ballistic missiles B-67 was adopted into the Navy. There is a profound secrecy. At night from 14th to 15th September, the rocket was loaded on the board.

There are 77 launches of missiles R-11FM, of which 59 were deemed successful between 1958 and 1967. Missile system D-1 was removed from service in 1967

Text B

Read and translate the text.



R-13

This is a single-stage liquid-Soviet ballistic missile, which is composed of the missile complex D-2 was armed with submarines of Project 629 and 658. Development began at OKB-1 and continued in the SKB-385.

Only one Soviet launch of ballistic missiles with nuclear warheads from a submarine was performed with it. On 20 October 1961 missile launch F-13 in nuclear equipment was produced on the Novaya Zemlya during training exercises "Rainbow" submarine "K-102" test site. Rocket R-13 was a one-step ballistic missile with a one-piece detachable warhead. The head part and tail section of the missile is equipped with four stabilizers.

R-13 was equipped with a five-chamber liquid-propellant rocket engine (LRE) with a thrust of 25.7 tones.

LRE worked on toxic hypergolic propellants – fuel TG-02 (a mixture of xylidine and triethylamine) and AK-27I oxidizer (nitrogen tetroxide solution in concentrated nitric acid). Tanks, missiles were carrying. The tanks were divided to intermediate compartment. Consumption of the oxidant was carried out first from the lower forecastle, and then from the top. It is possible to reduce the overturning moment coefficient more than doubled. The tail portion of the block was also tapered and mounted on her plate edge to stabilize it during flight in the atmosphere. Nuclear warhead constructively aligned with the head of the body. **Between 1961 and 1973 311 launches of missiles was carried out, which 225 were successful.**

Text C

Read the text and translate it into English.

R-17

Designed for short range firing.

A single stage, liquid fuel, ballistic missile with an inseparable warhead. Put into service in 1962.

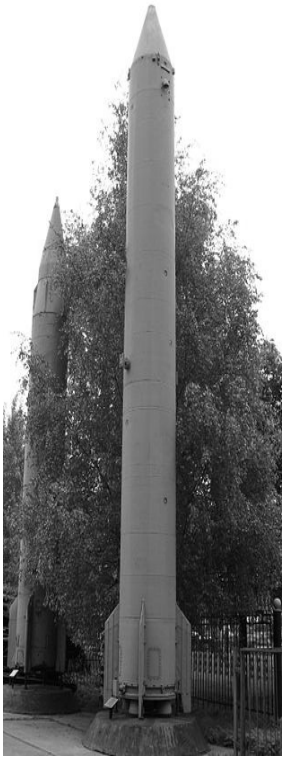
The missile is fired from tracked and wheeled launchers used to transport a fueled missile. On delivery of a missile to the firing site prelaunch tests, preparation procedures, targeting, fueling and launch are performed.

Basic characteristics	
Takeoff mass, t	5,8
Maximum range, km	300
Warhead	inseparable
Number of RVs	1
Guidance system	inertial
Number of stages	1
Length, m	11,2
Diameter, m	0,88
Propellant	liquid

Text D

Read the text and translate it into English.

R-21



The first Soviet single-stage battle ballistic missile with a submarine launch.

Development of the rocket was set OKB-586 Yangel Order of 20 March 1958. On 17th of March 1959 the development was submitted to the CSC-385 (chief designer VP Makeyev).

Between 1963 and 1989 228 launches F-21 was carried out, which 193 of them were successful.

Engine has a liquid and separates the head of the nuclear.

The missile body was carried from the all-welded stainless steel sheet. It consists of four sections: the instrument, the oxidizer tank, fuel tank and tail section with stabilizers.

Four-engine rocket, with a central turbopump assembly, the so-called "open circuit". Weight of separable warhead 1179 kg. The mass of the rocket-16 600 kg, length 12, 9m, diameter-1, 4m, the control system– inertial type of start – wet underwater.

Results of Development

- On September 16, 1955 for the first time in the world the R-11FM ballistic missile designed at S. Korolyov OKB-1 was launched from a submarine.
- A problem of paramount importance was solved – attainability of enemy's territory and targets with ballistic missiles was demonstrated.
- round-based missiles were modified and new missiles were designed to be launched from diesel and nuclear-powered submarines.
- Underwater launch was realized, the basic condition for conceal ability and invulnerability of submarines.
- A cooperation of ballistic missile developers, manufacturers and testing specialists was established.
- Deployment of sea-based strategic nuclear forces was initiated.
- In 1962 there was completed the development of the R-17 mobile tactical missile, well known as SCUD B, that was used by the armies of a number of countries over a period of a few decades.

Vocabulary

CPSU Central Committee– ЦК КПСС
Council of Ministers USSR – Совет Министров СССР
turbo pump assembly – турбонасосный агрегат
intermediate compartment – промежуточный отсек
overturning moment – опрокидывающий момент
armament – вооружение
adopt – утверждать
Navy – военно-морской флот
profound secrecy – глубокая тайна
deem – полагать
single-stage – одноступенчатый
rainbow – радуга
one-piece – цельный
detachable – съемный
chamber – камера
thrust – удар
hypergolic – самовоспламеняющиеся
propellant – топливо
consumption – потребление
forecastle – бак
decree – указ
invulnerability – неуязвимость
plate – пластинка
submarine – подводная лодка
edge – край
tapered – конический
align – выравнивать
was carried out – проводились
tracked – гусеничный
delivery – доставка
targeting – ориентация
submitted – представленный
all-welded – цельносварной
stainless – нержавеющая
steel sheet – стальной лист
conceal – скрывать
decade – десятилетие
separable – отделимый
paramount – первостепенная
attainability – достижимость
open circuit – разомкнутая цепь

EXERCISES

1. **Make up different types of questions to the texts A, B, C.**

2. **Match the English words and words combinations with the Russian ones.**

1. ballistic	a. assembly
2. nuclear	b. type
3. single-	c. submarines
4. liquid-	d. launchers
5. overturning	e. territory
6. wheeled	f. stage
7. prelaunch	j. tests
8. fuel	h. tank
9. turbo pump	m. warheads
10. nuclear-powered	l. missile
11. basic	g. condition
12. inertial	i. moment

3. **Agree or disagree with the statements below:**

1. On the 26th of January decree of the CPSU Central Committee and USSR Council of Ministers was issued (about R-11FM).
2. On 11th of September, 1955, the first submarine with ballistic missiles R-11FM B-67 was adopted into the ground forces.
3. There are 77 launches of missiles R-11FM, of which 69 were deemed successful between 1958 and 1967.
4. Only one Soviet launch of ballistic missiles R-13 with nuclear warheads from a submarine was performed with it.
5. Between 1961 and 1973 311 launches of missiles R-13 was carried out, which of 225 were successful.
6. R-17 is a single stage, solid fuel, theater ballistic missile with an inseparable warhead.
7. R-21's engine has a liquid and separates the head of the nuclear.
8. The mass of the R-21 – 14 600 kg.
9. Underwater launch was realized, the basic condition for conceal ability and invulnerability of submarines.
10. Deployment of sea-based strategic nuclear forces was finished.

4. **Find sentences with different kinds of tenses and write the verbs in the graph.**

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

5. **Render the texts B and D.**

***

The 2nd GENERATION

Text A

Read the text and translate it into English.

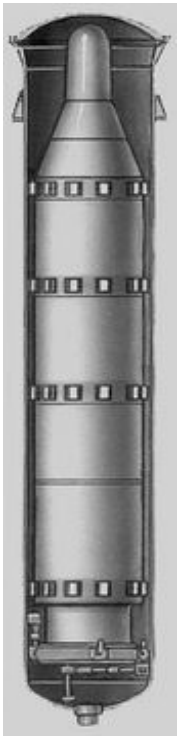
R-27, R-27U

Were designed to destroy medium-range strategic targets. Installed aboard 667A and 667AU submarines carrying 16 missiles. The D-5 complex was put into operation by the Navy in 1968, and D-5U, in 1974.

The R-27 (4K-10) ballistic missile had a single stage and burns liquid fuel. It was the first sea-based liquid-fuel missile in the world. The missile incorporated the following advanced design and engineering solutions used in the future for all liquid-fuel missiles:

- all-welded missile body;
- missile propulsion system was placed inside the fuel tank;
- use of metallized rubber shock absorbers and arrangement of the missile launch elements on its body;
- the missile tanks were filled with long-storable components and then encapsulated by the manufacturer;
- automated control of pre-launch operations and salvo firing were introduced.

These solutions allowed to radically reduce the missile size and minimize its readiness time (time of pre-launch operations – 10 min and time between launches – 8 s), as well as made the system operation and maintenance easier and less expensive. The enhanced D-5U/R-27U system was derived from its predecessor, D-5/R-27. Unlike R-27 the R-27U missile was equipped with two types of warheads: single and multiple (cluster) with 3 reentry vehicles. The firing range for a single warhead was increased to 3000 km, while that for a multiple one remained 2500 km.



Basic Characteristics	
Mass, t: • takeoff • maximum throw	 • 14,2 • 0,65
Maximum firing range, km • R-27 • R-27U	 • 2500 • Up to 3000
Type of warhead: • R-27 • R-27U	 • single • single and multiple
Guidance	inertial
Missile length, m	9.0
Missile diameter, m	1.5
Propellant	liquid

Text B

Read the text and translate it into English.

R-29

Was designed to destroy strategic targets at intercontinental ranges. Adopted for operation by the Navy in 1974. Accommodated on the 667B nuclear submarines in number of 12 missiles and on the 667BD submarines in number of 16 missiles.

High combat and operating characteristics of the missile along with minimum weight and dimensions were achieved due to adoption of fundamentally new layout and design solutions on the missile, propulsion systems, onboard control system, ship-borne control system and launcher, as well as due to automation of pre-launch procedures, launch and overall scheduled checks of all missiles aboard the submarine.

The main solutions:

- the missile has two tandem stages of the same diameter with load-carrying fuel tanks having double dividing bottoms;
- high-density layout of missile stages was achieved due to accommodation of the 1st and 2nd stage engines inside the propellant tanks, the upper bottom of the 2nd stage fuel tank was made in the

shape of a cone where an “upside down” (relative to flight direction) warhead was accommodated;

- absence of interstage and intertank sections;
- use of an all-welded missile body with completely sealed engine components and tanks fueled and encapsulated at the manufacturing plant; use of azimuthal astro-correction of missile flight by navigation stars and the Sun;
- use of an on-board computer in the control system;
- arrangement of the instrumentation section in the missile nose to provide star sighting and the possibility of replacement of the instrumentation section and warhead without unloading the missile from the submarine launch tube;
- creation of a launcher with rubber-metallic shock absorbers mounted on the submarine launch tube walls that made them reusable and improved the operational capabilities of the complex;
- use of an independent submarine-borne computer in the submarine missile control system;
- launches of missiles from under-water and above-water positions.

The control system with azimuthal astro-correction had no native or foreign counterparts and was used on ballistic missiles for the first time in the world. Even at great errors made by the navigation system in submarine heading, the astro-correction provided high accuracy in the intercontinental range firing.

The 1st stage propulsion system includes main and steering engines. Two steering chambers mounted by means of gimbals are used for control.

The 2nd stage propulsion system consists of a gimbaled single – chamber engine.

The missile stages are separated after destruction of the missile body by an extended circular explosive charge due to the pressurized gases energy.

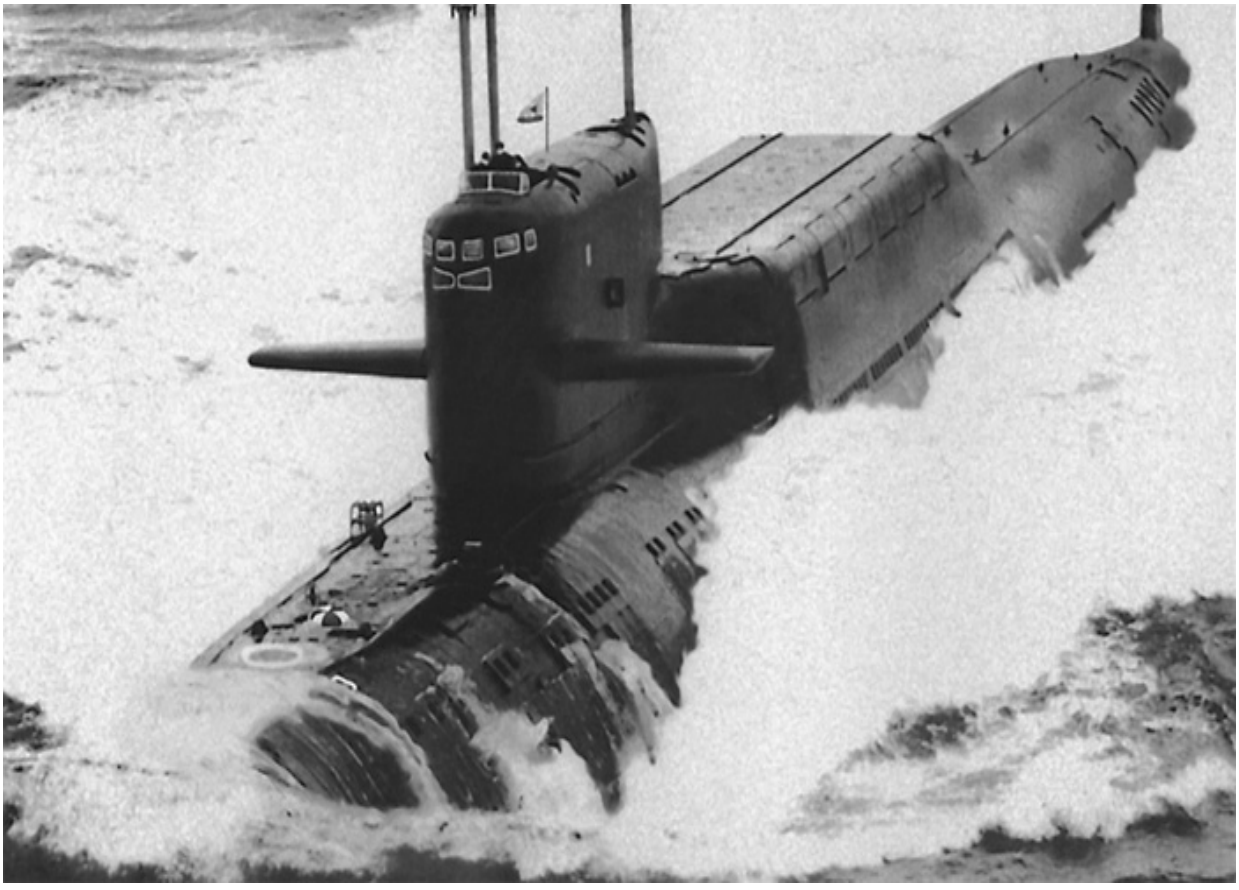
Application of an independent computer in the submarine-borne missile control system, of on-board missile computers together with the astro-correction system, high-degree automation of pre-launch and launch operations, control of these operations from a single control panel ensured high combat readiness of the missile system, reduced the time of pre-launch operations and allowed salvo firing of all the submarine-borne missiles.

The missiles can be launched from an under-water position of the submarine at a seaway of up to 8, i.e. they can be fired practically in any weather.

A possibility to launch missiles from a surfaced submarine and the intercontinental range of firing allows to make launches directly from the submarine bases.

Basic Characteristics	
Mass, t: • takeoff • maximum throw	 • 33,3 • 1,1
Maximum firing range	intercontinental
Warhead	single
Guidance	Astro-inertial
Number of stages	2
Missile length, m	13,0
Missile diameter, m	1,8
Propellant	liquid

SS-N-8 missile submarine



SS-N-6 missile submarine

Results of Development

- A great qualitative advance in the sea-based rocketry was achieved with the development of small missiles and launchers, automated servicing of missiles aboard a submarine, any-weather launching. The missile operating characteristics were fundamentally improved due to factory-made ampulization of fueled tanks.
- Cluster warheads were put into service.
- The SS-NX-13 ballistic missile with warhead targeting to mobile sea objects was designed.
- Intercontinental range of firing and celestial correction for sea-based missiles was realized that made it possible to improve submarine combat efficiency, invulnerability and operational capability and to compensate geostrategic features of Russia.
- A domestic school of sea-based rocketry was founded.

Vocabulary

absence – отсутствие
accommodate – приспособить
accuracy – точность
application – применение
upside down - вверх ногами
celestial – небесный
dimensions – размеры
due to adoption – в связи с принятием
enhance – расширять
error – ошибка
absorbers– амортизаторы
accommodation – жилье
all-welded – цельносварной
arrangement – расположение
capabilities – возможности
derive – производить
domestic – внутренний
efficiency – эффективность
ensured – обеспечена
explosive – взрывные

gimbals – карданов подвес
high combat readiness – высокую боевую готовность
install – устанавливать
long-storable – долго хранимые

medium-range – средней дальности
overall scheduled checks – общие плановые проверки
propulsion – двигатель
reusable – многоразовый
salvo – залп
separate – разделять
steering – рулевое управление

incorporate – включен
increase – увеличивать
invulnerability – неуязвимость
layout – расположение
maintenance – техническое обслуживание
multiple – множественный
plant – завод
predecessor– предшественник
remain – оставаться
rubber – резиновый
sealed – герметичный
ship-borne – корабельных
unloading – разгрузка

EXERCISES

1. **Make up different types of questions to the texts A, B.**

2. **Match the English words and words combinations with the Russian ones.**

1. Strategic	a. position
2. Single	b. astro-correction
3. Liquid	c. vehicles
4. Engineering	d. ranges
5. Propulsion	e. targets
6. Rubber	f. system
7. Automated	g. solutions
8. Reentry	h. launching
9. Intercontinental	i. stage
10. Multiple (cluster)	j. engines
11. Azimuthal	k. control
12. Steering	l. warheads
13. On-board	m. shock
14. Any-weather	n. missile
15. Under-water	o. fuel

1. **Agree or disagree with the statements below:**

1. The D-3 complex was put into operation by the Navy in 1968, and D-5U, in 1974.
2. R-27 was the first sea-based liquid-fuel missile in the world.
3. R-27U missile was equipped with four types of warheads.
4. R-29 was designed to create strategic targets at intercontinental ranges.

5. R-29 has two tandem stages of the same diameter with load-carrying fuel tanks having double dividing bottoms.

6. R-29 use of azimuthal astro-correction of missile flight by navigation stars and the Sun.

7. The 1st stage propulsion system on the R-29 includes main and a steering engines.

8. The 2nd stage propulsion system consists of a gimbaled double-chamber engine.

9. The missiles of the second generation can be launched from an under-water position of the submarine at a seaway of up to 8.

10. A domestic school of sea-based rocketry was founded during the time between 1968 and 1974.

2. Find sentences with different kinds of tenses and write the verbs in the graph.

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

3. Retell the texts A and B

***

The 3d GENERATION

Text A

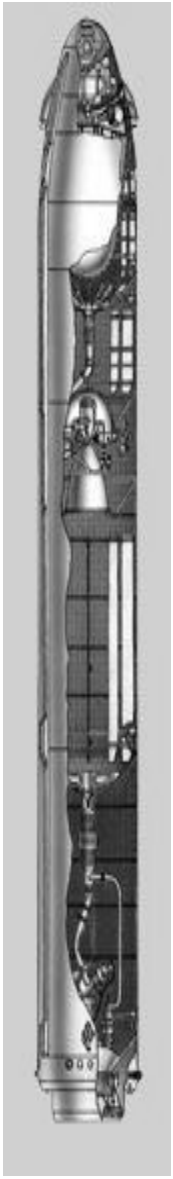
Read the text and translate it into English.

R-29R
R-29RKU2
RSM-50

Designed to destroy strategic targets at intercontinental ranges. Adopted for operation by the Navy in 1977. The missile was installed aboard the 667BDR nuclear submarines (16 missiles per submarine).

The missile comprised a number of new technical solutions:

- a warhead with multiple independently targetable reentry vehicles (MIRV) was created;
- possibility to equip the missiles with warheads of different configurations was realized;
- a complete astro-correction system was introduced and the firing accuracy was significantly improved;
- small high-velocity reentry vehicles with low radius of dispersion at atmospheric phase of trajectory.



The R-29R missile has a two-stage configuration, with stages having the same diameter. It has liquid-fuel engines on the 1st and 2nd stages "submerged" in the fuel tanks and a warhead which allows using any of three replaceable warheads (single, with three and with seven reentry vehicles).

At present, as prescribed by Strategic Arms Reduction Treaty 1 (START 1), the missiles carry a three-RV warhead.

The cases of the 1st and 2nd stages consist of wafer-type tank shells made of aluminum-magnesium alloy, a two-layer intermediate and single-layer rear and front bottoms.

The first-stage propulsion system comprises a two-unit engine consisting of a stationary main unit and two gimbaled chambers of the steering system. On the second stage there is a gimbaled single-chamber engine. Pitch and yaw control is provided by swinging the engine in a corresponding plane, whereas roll control is accomplished by redistribution of the pump turbine exhaust gases through the roll control nozzles. The missile stages are separated by the energy of the 1st stage pressurization gases, and rigid connections between the

stages are destroyed by the extended explosive charge. The filling and encapsulation of the missile tanks are made at the factory.

The upper stage of the missile consists of an instrument, engine and warhead sections.

The autonomous inertial control system with the flight trajectory astro-correction equipment is located in the missile nose in a sealed instrument section with an astro-dome jettisoned in flight. Application of the complete astro-correction system which calculates and compensates all the submarine navigation complex errors in determination of both the direction and position of the submarine substantially improved the firing accuracy.

Structurally, the instrument section is divided into two subsections by a sealed bottom. The first subsection houses a three-axis gyrostabilizer with an astro-sighting device. The control system equipment is mounted on a frame without individual shock absorbers for its elements and the frame is attached to the instrument section ring with shock absorbers. Such method of installation of the control system devices allowed to densify their configuration in the instrumentation section.

The engine section of the upper stage includes four-chamber liquid-fuel engine, propellant tanks and a case and provides for individual targeting of each reentry vehicle within a large-radius zone. On the outside surface of the case engine combustion chambers and nozzles are mounted and inside there are propellant tanks shaped as toroid parts. The engine automatic control elements and the steering actuator are arranged in the central part of the section.

The engine has an open-loop configuration with a turbine-pump fuel supply system. Pitch and roll control is provided by redistribution of thrusts of the pairs of chambers placed in corresponding stabilization planes.

In the warhead section there are reentry vehicles, a frame, cables and a reentry vehicle fixing- release device. It occupies the area formed by the concave upper bottom of the 2nd stage fuel tank. The reentry vehicles are mounted on the frame and separated in flight by the control system command.

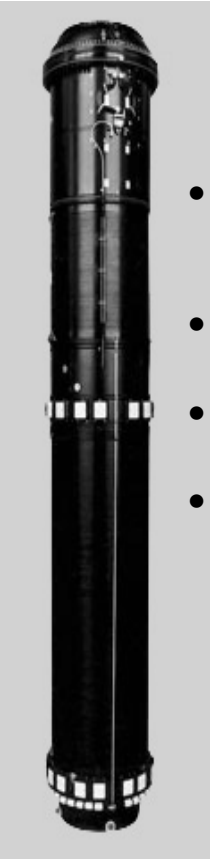
The instrument section containing a control system is replaceable. If necessary, the reentry vehicles and instrument section can be replaced without unloading the missile from the launch tube. The missiles can be launched from a submerged and surfaced submarine.

Basic characteristics	
Mass, t: • takeoff • maximum throw	 • 35.3 • 1.65
Maximum firing range	intercontinental
Warhead	Warhead
Number of re-entry vehicles.	3
Control system	Astroinertial
Number of stages	2
Missile length, m	14,1
Missile diameter, m	1,8
Propellant	Liquid

Text B

Read the text and translate it into English.

R-39
RSM-52



Designed to destroy strategic targets at intercontinental ranges. Adopted for service by the Navy in 1983.

The missile is installed on the strategic missile-carrying submarines (project 941) having a basic load of 20 missiles.

- The missile involves a number of new designs: rocket engines burn high-energy solid propellant and are made of new structural materials;
- the control system uses the principle of generalized astro-correction;
- high-velocity small reentry vehicles of increased specific power are used;
- a shock-mounted launch system provides for missile storage, transportation and launch; the ground support equipment mounted on railway cars allows transloading of missiles without cranes and the loading devices provide safe operation of missiles.

The missile includes a three-stage solid-propellant carrier, a shock-mounted missile launch system (SMLS) and a MIRVed warhead. The warhead comprises ten reentry vehicles, control system equipment and a liquid-propellant rocket engine allowing individual targeting of reentry vehicles.

In the launch tube the missile is kept suspended and supported by the launch pad (bearing ring) placed in the upper part of the launch tube. The SMLS damps the missile, seals the launch tube and ensures missile safety in the submarine, allowing dipping of the submarine to a great depth with the open launch tube cover. All load-bearing elements of the missile needed for its operation both on the ground and aboard a submarine, except for the middle support belt, are located on the SMLS and in the tail section, which are jettisoned at the initial phase of flight just after the missile escapes the water.

The missile is ejected from a "dry" launch tube by the cartridge pressure accumulator placed on the launch tube bottom in the 1st stage engine nozzle. At missile liftoff the special solid-propellant charges located on the SMLS provide for protection in the form of a gas-jet cavern that considerably reduces the hydrodynamic loads acting on the missile. The command to start the 1st stage engine is generated at the instant the missile leaves the launch tube. If the 1st stage engine fails to start up, the missile, after its appearance on the water surface, is moved away from the submarine for the safety purposes. The launch system is separated from the missile in flight by special engines and is also moved away.

The instrument section covered by a dome is located in the missile nose. It is joined with the dispensing stage through a flange. They both form a MIRVed warhead. The instrument section consists of two sealed sections divided by an intermediate bottom: a section comprising a free gyro with an astro-sighting device covered with a dome jettisoned in flight and a control system instrumentation arranged on a shock-mounted frame.

The dispensing stage is joined with the instrument section. It contains reentry vehicles. A dual-mode liquid-propellant dispensing propulsion system and separable 3rd stage engine are mounted on the dispensing stage body.

Basic characteristics	
Mass, t: • takeoff • maximum throw	 • 90 • 2,55
Maximum firing range	intercontinental
Warhead	MIRVed
Number of re-entry vehicles.	10
Control system	Astroinertial
Number of stages	3
Missile length, m	26,0
Diameter of 1st and 2nd stages, m	2,4
Propellant	solid

Text C

Read the text and translate it into English.

R-29RM
P-29RMU1
P-29RMU2
RSM-54

Designed to destroy strategic targets at intercontinental ranges.

Adopted for service with the Navy in 1986. Installed on the strategic missile-carrying submarines project (667BDRM) having a basic load of 16 missiles.

The missile comprises a number of new technical designs:

- three-stage missile of silo-limited dimensions;
- application of a high-accuracy astro-inertial control system and "GLONASS" navigation satellite radio correction system substantially increased the firing accuracy;
- various flight trajectories at minimum and intermediate firing ranges and dispensing of re-entry vehicles within an arbitrary zone can be realized ;
- operational capabilities of missiles were improved due to the possibility of launching from high latitudes of Arctic.

Two-stage liquid-fuel sustainers are "submerged" in the missile fuel tanks.

The design feature of the missile is integration of the 3rd stage propulsion systems and the warhead into a single unit with common tanks.

The front section of the missile houses an instrument section with the missile control system, which includes: equipment for astro-correction of the flight trajectory according to the results of measurement of navigation star coordinates, devices for radio correction according to the results of exchanging information with navigational satellites and reentry vehicles.

The all-welded missile body is made of an aluminum-magnesium alloy.

The 1st stage engine consists of two units: main (single-chamber) and steering (four-chamber) engines. Pitch, yaw and roll control is provided by turning the combustion chambers of the steering unit.

The 2nd stage body consists of an oxidizer tank connected with the 1st stage body and a fuel tank whose front bottom is of a conidial shape used for accommodation of the reentry vehicles and 3rd stage engine.

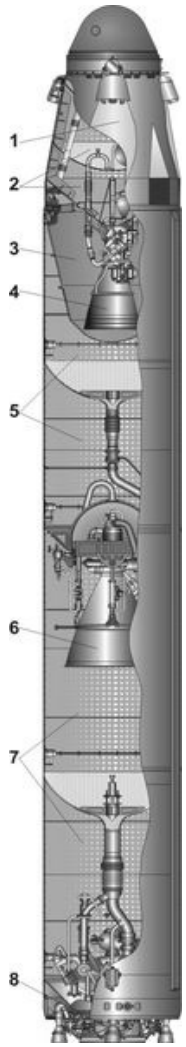
The 2nd stage engine is a single-chamber one. Its main components are accommodated in the 1st stage oxidizer tank, pitch and yaw control is provided by turning the gimbaled combustion chamber, and roll control, by the roll unit.

The 3rd stage engine is a single-chamber one. The 3rd stage control in all channels is provided by the dual-mode reentry vehicle dispensing engine operating concurrently with the 3rd stage engine.

The 1/2 and 2/3 stages separation is accomplished by the extended explosive charges.

To mate the missile with the launcher the tail section of the missile is provided with the load-bearing belt (adapter).

After missile takeoff the adapter remains on the launch pad.



1. РГЧ; 2. топливные баки III ступени и РГЧ; 3. отсек боевых блоков; 4. двигатель III ступени; 5. топливные баки II ступени; 6. двигатель II ступени; 7. топливные баки I ступени; 8. двигатель I ступени.

Basic characteristics	
Mass, t: • takeoff • maximum throw	 • 40,3 • 2,8
Maximum firing range	intercontinental
Warhead	MIRVed
Number of re-entry vehicles.	4
Control system	Astro – radio - inertial
Number of stages	3
Missile length, m	14,8
Diameter of 1st and 2nd stages, m	1,9
Diameter of 3rd stage, m	1,85

Results of Development

- Premises have been built up for renovation of the sea-based strategic forces.
- Multiple independently targetable re-entry vehicles (MIRV) were put into service, sea-based missile firing accuracy became similar to that of ground-based missiles, collective firing of the basic load of missiles was introduced, combat characteristics similar to those of the best foreign and home analogues were achieved.
- The first sea-launched intercontinental solid-propellant missile SS-N-20 was put into service by the Navy.
- The liquid-fuel SS-N-23 technical characteristics became the best in comparison with those of the modern ground- and sea-based missiles, navigation satellite correction was realized.
- The development works on the 3-rd generation liquid-fuel missiles (STANTSIA, SINEVA, STANTSIA-2) updating were completed in 2002 - 2005. This created the necessary prerequisites for submarines 667BDR and 667BDRM operation before their maximum service life period expiration. Necessary conditions have been built up for the maintenance of fighting readiness of sea-based strategic nuclear forces.

Vocabulary

gimbale – карданов подвес
range – диапазон
adopted for – принято для
application – применение
cavern – пещера
sustainer – маршевый
renovation – ремонт
force – сила
prerequisite – предпосылка
expiration – истечение
damp – затухать
conoidal – конойдный
comparison – сравнение
comprise – составлять
reentry – спускаемые
significantly – существенно
dispersion – дисперсия
prescribe – предписать
wafer-type – пластиковый тип
submerge – погружаться
accomplish – выполнять
redistribution – перераспределение
pump turbine – турбонасос
exhaust – выхлопной
seal – запечатывать
is mounted – монтируется
allowed to densify – позволило уплотнить
shape – форма
suspend – приостановиться
actuator – привод
are arranged – расположены
open-loop – разомкнуты
concave – вогнутый
generalized – обобщенный
railway – железная дорога
transloading – перегрузочный
propulsion system –силовая установка
comprise – включать в себя
steering system – система управления

astro-dome – астро-купол
jettison – отбрасывать
alloy – сплав
rear –задний
swing – качаться
whereas – в то время как
roll – рулон
pitch – шаг
yaw – рыскание

EXERCISES

1. **Make up different types of questions to the texts A, B, C.**

2. **Match the English words and words combinations with the Russian ones.**

1. Technical	a. vehicles
2. Astros-sighting	b. warheads
3. Maximum	c. solutions
4. Reentry	d. device
5. Replaceable	e. throw

3. **Agree or disagree with the statements below:**

1. R-29R adopted for operation by the Navy in 1977.
2. The first-stage propulsion system of the R-29R comprises a two-unit engine consisting of a stationary main unit and two gimbaled chambers of the steering system.
3. The missile R-39 is installed on the strategic missile-carrying submarines (project 941) having a basic load of 10 missiles.
4. The missile R – 39 is ejected from a “wet” launch tube by the cartridge pressure accumulator placed on the launch tube bottom in the 1st stage engine nozzle.
5. The 3st stage engine of the R-29RM consists of two units: main (single-chamber) and steering (four-chamber) engines.

4. Find sentences with different kinds of tenses and write the verbs in the graph.

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

5 Read and translate '*The results of development*' into Russian.

6. Render the texts A, B and C.

7. Find English equivalents

1. РГЧ; 2. топливные баки III ступени и РГЧ; 3. отсек боевых блоков; 4. двигатель III ступени; 5. топливные баки II ступени; 6. двигатель II ступени; 7. топливные баки I ступени; 8. двигатель I ступени.

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UNIT 2

CLASSIFICATION OF MISSILES

Text

1. Read the text and translate it into English.

Nowadays the rocket had reached a great development, diversity, and improvement. They are used for different purposes. All types of missiles can be classified into different groups.

Classification depends on appointment:

1. Fireworks (intended to inform the Land about automatic observations of the upper atmosphere, or passengers, who flight beyond Earth's atmosphere into space):

a) Signal or report rockets. They are rising to the height, burst and produce a loud sound.

b) luminous - to cover the area.

c) with the stars.

d) a vortex.

e) Hermes wand.

2. Military rockets (Intended for national defense):

a) affecting,

b) stirring,

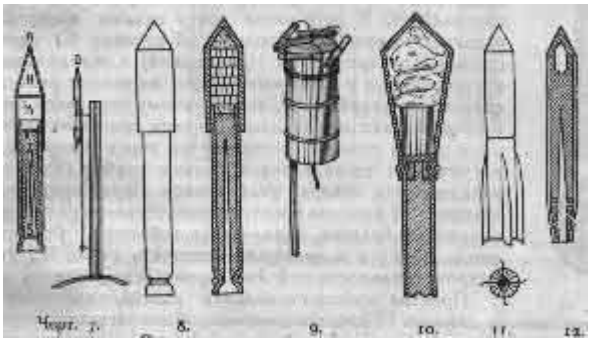
c) luminous.

3. Saving or shore (intended for supplying a thin rope from shore to ship).

4. To research the upper atmosphere.

5. Fotorockets (for delivery pictures on Earth quickly).

6. Passenger (now only in the project).



There are different types of missiles.

7. Signaling.
8. Feerverochnaya with asterisks.
9. Vortex.
10. With the parachute.
11. Rotating missile with wings.
12. Same with TV.

Classification depends on the devices:

1. Simple.
2. Composite - lift or double complex, etc.
3. Parachute.
4. Revolver.
5. Rotary or screw.

Classification depends on the nature of the explosive:

1. Powder
2. With liquid fuel (oxygen, hydrogen, alcohol).

Vocabulary

Affecting – затрагивающий
Asterisk – звездочка
Defense – защита
Delivery – доставка
Luminous – светящийся
Observation – наблюдение
Report – отчет
Rope – веревка
Upper atmosphere – верхние слои атмосферы
Hermes wand – (от греч. «дающий богатство»)
Appointment - назначение
Burst – взрыв
Diversity – разнообразие
Vortex – вихревой
Screw – винт
Powder - порошок
Rising – повышение
Rotary – вращающийся
Stirring – перемешивание
Explosive – взрывчатое вещество

EXERCISES

1. **Make up different types of questions to the texts A, B, C.**
2. **Match the English words and words combinations with the Russian ones.**

1. great
2. different
3. depends on
4. automatic

5. upper
6. loud
7. Hermes
8. Military
9. national
10. from shore
11. delivery
12. Rotating
13. double
14. on the nature
15. liquid

a. to ship
b. missile
c. development
d. wand
e. of the explosive
f. observations
g. fuel
h. defense
i. appointment
j. complex
k. atmosphere
l. rockets
m. sound
n. pictures
o. purposes

1. Agree or disagree with the statements below:

1. Rockets are used for different purposes.
2. Single rockets are intended to inform the land about automatic observations of the upper atmosphere.
3. Luminous rockets cover the area.
4. Military rockets are intended for national defense.
5. Military rockets are defined into four groups.
6. Only saving rockets are intended for supplying a thin rope from shore to ship.
7. Fotorockets are used for delivery pictures on Earth quickly.
8. Passenger rockets have been used for five years.
9. There are five types classification depends on the devices: Simple, Composite, Parachute, Revolver and Rotary or screw.
10. Liquid fuel can be oxygen or hydrogen.

2. Find sentences with different kinds of tenses and write the verbs in the graph.

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

3. Render the text

4. Find English equivalents

Все виды ракет могут быть классифицированы

По назначению:

1. Фейерверочные
2. Боевые
3.Спасательные или береговые
4. Для научных исследований верхних слоев атмосферы.
5. Фоторакеты
6. Пассажирские.
7. Сигнальные.
8. Феерверочная со звездочками.
9. Вихревая.
10. С парашютом,
11. Вращающаяся ракета с крыльями.

По устройству:

1. Простые.
2. Составные – подъемная или двойная сложная и пр.
3. Парашютные.
4. Револьверные.
5. Вращающиеся или винтовые.

По роду взрывчатого вещества:

1. Пороховые
2. С жидким топливом (кислород, водород, спирт).

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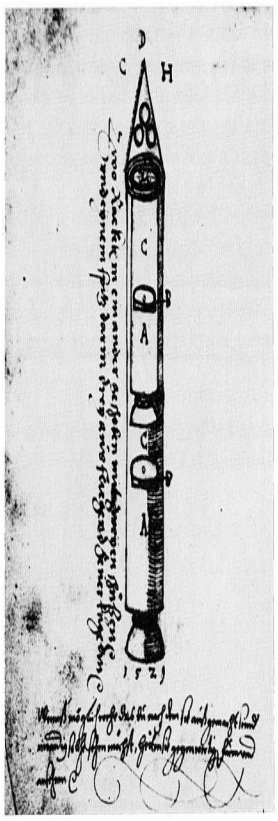
HISTORY of the CREATION MISSILES

Text A

Read the text and translate it into English.

Development of the missiles can be divided into several periods

1. 206 BC. edm-220 AD. Oe. (the Chinese Han Dynasty). At this time the powder was discovered. It has been used for fireworks and entertainment. The force arising in the explosion of gunpowder charge was sufficient to move various items. The shells of gunpowder weapons could fly on long distances, but they did not have its own fuel supplies. Description of Flying "fire arrows" is used by the Chinese shows that these arrows were rockets. They attached tube of compacted paper open only to the rear end and filled with combustible composition. This charge is ignited and then boom produced by the bow. These arrows were used in a number of cases during the siege of fortifications against the vessels of the cavalry.



2. In the XIII century missiles hit in Europe with the Mongol invaders, and in 1248 the English philosopher and scientist Roger Bacon published his work on their application.

3. In the XVI–XVII centuries missiles were used by Zaporizhzhya Cossacks. In XVII century the Belarusian military engineer, Kazimir Semenovich described a multistage rocket.

4. At the end of the XVIII century missiles used in India in fighting with British troops. Rocket arm-shells were a tube with a charge of combustible material.

Text B

Read the text and translate it into English.

Two-stage rocket of the sixteenth century

5. At the beginning of the XIX century Russian officer Alexander Zasyadko developed the theory of missiles. He tried to calculate how much powder you need to run rocket to the moon. Russian general of artillery Konstantin Konstantinov reached great success in improving the missile in the middle of the last century .

6. Until the end of the XIX century rockets were lighter and more mobile than the big guns. But in the second half of XIX century there were rifled cannon, providing greater precision and accuracy of fire and rocket artillery was everywhere removed from service. Preserved only fireworks and flares.

7. At the end of the XIX century were attempts to mathematically explain the jet propulsion and create a more effective missile weapons. In Russia, one of the first took up the matter Nikolai Tikhomirov in 1894.

8. Konstantin Tsiolkovsky engaged theory of jet propulsion. He put forward the idea of using rockets for space flight and claimed that the most efficient fuel for them would be a combination of liquid oxygen and hydrogen. He designed rocket for interplanetary travel in 1903.

9. The German scientist Hermann Oberth in the 1920s also set forth the principles of interplanetary flight. In addition, he conducted benchmark tests of rocket engines.

10.American scientist Robert Goddard in 1923 began to develop a liquid rocket engine and a working prototype was created by the end of 1925 March 16, 1926 he launched the first liquid rocket as the fuel for which used gasoline and liquid oxygen.

11.The works of Tsiolkovsky, Oberth, and Goddard continued rocketry enthusiast groups in the U.S., USSR and Germany. In the USSR the research work conducted Panel Study of Reactive Motion (Moscow) and Gasdynamic Laboratory (Leningrad). In 1933, on their basis has been created Reactive Institute (RNII). It is well begun was completed in 1929 creating a fundamentally new weapons - rockets, set to run that later acquired the nickname "Katyusha".

12.In Germany, such work has led the German Society of interplanetary (VfR). March 14, 1931 member VfR Johannes Winkler performed the first successful launch in Europe a liquid rocket.

13.In VfR worked Wernher von Braun, who began the development of rocket engines in December 1932 for the German Army artillery range in Kummersdorf. He created the engine was used on an experimental rocket-2, successfully launched from the island of Borkum December 19, 1934 after the Nazis came to power in Germany was allocated for the development of missile weapons, and in the spring of 1936 has been approved the construction of rocket center in Peenemunde, headed by Walter Dornberger was appointed, and the technical director - von Braun. It was developed ballistic missile A-4 with a range of 320 km. During the Second World War, October 3, 1942, the first successful launch of the rocket and in 1944 began its combat application, called the V-2.

14.Military applications of V-2 shows great possibilities of missile technology, and the most powerful post-war powers – the United States and the Soviet Union - also began to develop ballistic missiles.

15.In 1957 the Soviet Union under the leadership of Sergei Korolev as a means of delivering nuclear weapons was the world's first intercontinental ballistic missile R-7, which is in the same year, was used to launch the world's first artificial satellite. Thus began the use of rockets for space flight.

Vocabulary

application – применение
attempt – попытка
allocate – выделять
appointe – назначать
boom – стрела
combustible composition – горючий состав
conducte benchmark – проводить тесты
siege of fortifications – осада креплений
explosion – взрыв
fire arrow – огненная стрела
gasoline – бензин
gunpowder – порох
invader – захватчик
matter – вопрос
powder – порошок
propulsion – двигатель
rear – задний
rifled cannon – нарезная пушка
shell – оболочка
troop – войско
arising – возникающий
acquire – получить
approve – утверждать
artificial – искусственный
bow – лук
claime – утверждать
engage – заниматься
fighting – борьба
gun – оружие
ignite – зажигать
led – привело
multistage – многоступенчатый
precision – точность
put forward – выдвигать
remove – удалять
set forth – изложенный
vessels of the cavalry – суда кавалерии

EXERCISES

1. **Make up different types of questions to the texts A, B, C.**

2. **Match the English words and words combinations with the Russian ones.**

1. several	a) cannon
2. Chinese	b) satellite
3. gunpowder	c) Borkum
4. fuel	d) weapons
5. fire	e) propulsion
6. combustible	f) periods
7. Mongol	g) arrows
8. multistage	h) oxygen and hydrogen
9. rifled	i) supplies
10. fire and rocket	j) Han Dynasty
11. jet	k) artillery
12. liquid	l) composition
13. island of	m) invaders
14. combat	n) rocket
15. artificial	o) application

1. **Agree or disagree with the statements below:**

1. At the 206 BC. edm-220 AD. Oe. (the Chinese Han Dynasty) the powder was discovered.

2. The shells of gunpowder weapons at the first historic period could fly on short distances, but they did not have its own fuel supplies.

3. In the XIII century missiles hit in England with the Mongol invaders.

4. In XVII century the Belarusian military engineer, Kazimir Semenovich described a single stage rocket.

5. At the beginning of the XIX century Russian officer Alexander Zasyadko developed the theory of missiles, where he tried to calculate how much powder you need to run rocket to the moon.

6. One of the first took up the matter about the creating a more effective missile weapons Nikolai Tikhomirov in 1894.

7. The German scientist Hermann Oberth in the 1920s also set forth the principles of short distance flight.

8. American scientist Robert Goddard in 1923 began to develop a liquid rocket engine.

9. The works of Tsiolkovsky, Oberth, and Goddard continued rocketry enthusiast groups in the USSR. The research work conducted Panel Study only of the Gasdynamic Laboratory (Leningrad).

10.In 1957 the Soviet Union under the leadership of Sergei Korolev as a means of delivering nuclear weapons was the world's first intercontinental ballistic missile R-7.

2. Find sentences with different kinds of tenses and write the verbs in the graph.

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

3. Render the texts A and B.

4. Find English equivalents

1. Сила, возникающая при взрыве порохового заряда была достаточной, чтобы двигать различные предметы. Снаряды порохового оружия могли летать на далёкие расстояния, однако они не имели собственных запасов топлива.

2. Ракетные стрелы-снаряды, представляли собой трубки с зарядом горючего вещества.

3. Теорией реактивного движения занимался Константин Циолковский. Ракету для межпланетных сообщений он спроектировал в 1903 г.

4. Американский учёный в 1923 году начал разрабатывать жидкостный ракетный двигатель, и работающий прототип был создан к концу 1925 г.

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Text C

National Missile Defense (NMD)

Read the text and translate it into English.

National missile defense (NMD) intended to shield an entire country against incoming missiles, such as intercontinental ballistic missile (ICBMs) or other ballistic missiles. Interception might be by anti-ballistic missiles or directed-energy weapons such as lasers. Interception might occur near the launch point (boost phase), during flight through space (mid-course phase), or during atmospheric descent (terminal phase).

There are a lot of projects

Project Defender

The Nike-Zeus use of nuclear warheads was necessary given the available missile technology. However, it had significant technical limitations such as blinding defensive radars to subsequent missiles. Also, exploding nuclear warheads over friendly territory (albeit in space) was not ideal. In the 1960s Project Defender and the Ballistic Missile Boost Intercept (BAMBI) concept replaced land-launched Nike missiles with missiles to be launched from satellite platforms orbiting directly above the USSR. Instead of nuclear warheads, the BAMBI missiles would deploy huge wire meshes designed to disable Soviet ICBMs in their early launch phase (the "boost phase"). No solution to the problem of how to protect the proposed satellite platforms against attack was found, however, and the program was canceled in 1968.

Sentinel Program

In 1963, U.S. Defense Secretary Robert McNamara announced the Sentinel Program, providing a defense against attack for most of the continental United States. The system consisted of a long range Spartan missile, the short range Sprint missile, and associated radar and computer system.

Current NMD program

Goals

The logo of the Missile Defense division of the U.S. National Guard, part of the modern American missile defense system.

In the 1990s and early 21st century, the stated mission of NMD has changed to the more modest goal of preventing the United States from being subject to nuclear blackmail or nuclear terrorism by a so-called rogue state. The feasibility of this more limited goal remains somewhat controversial. Under President Bill Clinton some testing continued, but the project received little funding despite

Clinton's supportive remarks on 5 September 2000 that "such a system, if it worked properly, could give us an extra dimension of insurance in a world where proliferation has complicated the task of preserving peace."

The system is administered by the Missile Defense Agency. There are several other agencies and military commands which play a role, such as the United States Army Space and Missile Defense Command.

Text D

Components

Read the text and translate it into English.

The current NMD system consists of several components.

Ground-based interceptor missiles

One major component is Ground-Based Midcourse Defense (GMD), consisting of ground-based interceptor missiles and radar in the United States in Alaska, which would intercept incoming warheads in space. A limited number of interceptor missiles (about 10) are operational as of 2006. These would possibly be later augmented by mid-course SM-3 interceptors fired from Navy ships. Currently some GMD missiles are located at Vandenberg AFB in California. The Missile Defense Agency hopes to have 30 operational missiles.

Officially, the final deployment goal is the "C3" phase, intended to counter tens of complex warheads from two GMD locations utilizing 200 ABMs "or more". The system design permits further expansion and upgrades beyond the C3 level.

Aegis Ballistic Missile Defense System

A major component is a ship-based system, the Aegis Ballistic Missile Defense System. This was given major new importance by President Obama in September 2009, when he announced plans to scrap the plans for a missile defense site in Poland, in favor of missile defense systems located on US Navy warships. On 18 September 2009, Russian Prime Minister Putin welcomed Obama's plans for missile defense which may include stationing American Aegis armed warships in the Black Sea.

In 2009, several US Navy ships were fitted with SM-3 missiles to serve this function, which complements the Patriot systems already deployed by American units. Also, warships of Japan and Australia have been given weapons and technology to enable them to participate in the American defense plan as well.

On November 12, 2009, the Missile Defense Agency announced that six additional US Navy destroyers would be upgraded to participate in the program. In fiscal 2012, USS Carney (DDG-64), USS Ross (DDG-71), and USS Donald Cook

(DDG-75) will be upgraded. USS Cole (DDG-67), USS McFaul (DDG-74) and USS Porter (DDG-78) will be upgraded in fiscal 2013. The goal of the program is to have 21 ships upgraded by the end of 2010; 24 in 2012; and 27 around 2013.

All ships equipped with the Aegis combat system possess the SM-2 surface to air missile which, through recent upgrades, has terminal stage ballistic missile defense capabilities.

Text E

Read the text and translate it into English.

Terminal High-Altitude Area Defense

Terminal High-Altitude Area Defense (THAAD) is a program of the US Army, utilizing ground-based interceptor missiles which can intercept missiles in the upper part of the atmosphere.

Airborne systems

Several airborne systems are being examined, which would then be utilized by the US Air Force. One major object of study is a boost-phase defense, meaning a system to intercept missiles while they are in their boost phase. One potential system for this use might be an airborne laser, being tested on the Boeing YAL-1. Other ideas are also being studied.

As of 2009, the only anti-ballistic missile defense system with a boost-phase capability is the Aegis Ballistic Missile Defense System. There are several benefits to a sea-based boost-phase system, as it is fully mobile and has greater security by operating in international waters.

Shorter-range anti-ballistic missiles

Four shorter range tactical anti-ballistic missile systems are operational currently: the U.S. Army Patriot, U.S. Navy Aegis combat system/Standard SM-3, U.S. Navy Aegis combat system/SM-2 missile, and the Israeli Arrow missile. In general short-range tactical ABMs cannot intercept ICBMs, even if within range. The tactical ABM radar and performance characteristics do not allow it, as an incoming ICBM warhead moves much faster than a tactical missile warhead. However it is possible the better-performance Terminal High Altitude Area Defense missile could be upgraded to intercept ICBMs. The SM-3 missile may have some capability against ICBMs, as demonstrated by the 2008 satellite shootdown.

Latest versions of the U.S. Hawk missile have a limited capability against tactical ballistic missiles, but is not usually described as an ABM. Similar claims have been made about the Russian long-range surface-to-air S-300 and S-400 series.

Multilateral and international participation

Several aspects of the defense program have either sought or achieved participation and assistance from other nations. Several foreign navies are participating in the Aegis Ballistic Missile Defense, including Japan and Australia. Also, the United States has considered establishing radar sites and missile sites in other nations as part of the Ground-Based Midcourse Defense. A missile defense site in Poland received much media attention when it was cancelled in favor of the Aegis BMD. A radar site in the United Kingdom is being upgraded, and another one is being built in Greenland. Other countries have contributed technological developments and various locations.

Taiwan has indicated that it is willing to host national missile defense radars to be tied into the American system, but is unwilling to pay for any further cost overruns in the systems.

Vocabulary

further cost overruns – дальнейший перерасход средств
are being examined - изучаются
augmented – расширенные, дополнять
boost-phase defense – активный участок траектории
boost phase – стартовый участок траектории
claim – претензия
defense – защита
deploy – развертывание
dimension of insurance – размер страховки
division – деление
establishing radar sites – установление радарами сторон
feasibility – осуществимость
ground-based interceptor missiles – наземные ракеты – перехватчики
intercept incoming warheads – перехват входящих боеголовок
multilateral – многосторонний
midcourse – маршевый участок траектории
support - поддержка
willing – готовый
permits further expansion – позволяет дальнейшее расширение
national Guard – национальная гвардия
national missile defense – национальная противоракетная оборона
goal – цель
occur – происходить
preserving peace – сохранение мира
preventing – предупреждение
Project Defender – проект защиты
rogue state – изгой
Sentinel Program – программа Стражи
announce – объявлять
blackmail – шантаж
descent – спуск
blinding – ослепление
capability – возможность
controversial – спорный
defensive – оборонительный
despite – несмотря на
Navy – флот
enable – позволять

exploding – взрыв
funding – финансирование
wire meshes – металлические сетки
upgrades – модернизация
interception – перехват
stationing – размещение
subsequent – последующий
shield – щит
host – хозяин
participate – участвовать
scrap – лом
shootdown – сбивание
proliferation – распространение
significant – значительный

EXERCISES

1. **Make up different types of questions to the texts A, B, C.**

2. **Match the English words and words combinations with the Russian ones.**

1. National missile	a. Guard
2. directed-energy	b. Systems
3. atmospheric	c. Program
4. defensive	d. the plans
5. friendly	e. defense
6. Soviet	f. Defense Agency
7. Sentinel	g. radars
8. U.S. National	h. peace
9. extra	i. Sea
10.preserving	j. descent
11.to scrap	k. ICBMs
12.Black	l. Force
13.Missile	m. Dimension
14.Airborne	n. territory
15.US Air	o. weapons

1. **Agree or disagree with the statements below:**

1. Interception might be by anti-ballistic missiles or directed-energy weapons such as lasers.

2. Project Defender had significant technical limitations such as blinding defensive radars to subsequent missiles.

3. In the 1970s and early 21st century, the stated mission of NMD has changed to the more modest goal of preventing the United States from being subject to nuclear blackmail or nuclear terrorism by a so-called rogue state.

4. There are several other agencies and military commands which play a role, such as the United States Army Space and Missile Defense Command.

5. One major component is Ground-Based Midcourse Defense (GMD), consisting of ground-based interceptor missiles and radar in the United States in Alaska, which would intercept incoming warheads in space.

6. On November 12, 2009, the Missile Defense Agency announced that six additional US Navy creators would be upgraded to participate in the program.

7. Terminal High-Altitude Area Defense (THAAD) is a program of the US Army, utilizing ground-based interceptor missiles which can intercept missiles in the upper part of the atmosphere.

8. One major object of study is a passive part of the trajectory defense, meaning a system to intercept missiles while they are in their boost phase

9. The tactical ABM radar and performance characteristics allow it, as an incoming ICBM warhead moves much faster than a tactical missile warhead. However it is possible the better-performance Terminal High Altitude Area Defense missile could be upgraded to intercept ICBMs.

10.The United States has considered establishing radar sites and missile sites in other nations as part of the Flight Midcourse Defense.

2. Find sentences with different kinds of tenses and write the verbs in the graph.

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

3. Render the text E

4. Find English equivalents

Расширение, проект защиты, сбивание, поддержка, размещение, сохранение мира, предупреждение, распространение, лом, металлические сетки, щит, дальнейший перерасход средств, значительный, модернизация , участвовать, объявлять, изучать дополнять.

***

UNIT 3

TEST CENTRE

Text A

The GRTs TEST CENTRE

Read the text and translate it into English.

At the GRTs Test Center there are conducted studies and tests of space-rocket hardware, products of transport, power engineering, building and chemical industries, medical equipment and household goods. The Test Center is accredited in the GOST R, FSS KT, SSPB certification system and disposed in ten industrial buildings equipped with present-day test facilities.

The space-rocket activities performed at the Test Center include full-scale tests of GRTs-designed missiles and systems, among them there are tests for all kinds of ground and flight loads under simulated vacuum and zero-G conditions.

The field of accreditation of the Test Center for civilian products is formed according to the demands of Ural enterprises and at present includes more than 400 items. In the course of 2008 certification tests of 220 products were performed. The traditional customers of tests are enterprises of Chelyabinsk, Sverdlovsk, Perm and Orenburg regions and Bashkortostan. The most "fascinating" tests are strength tests of metro tubing, 28-m trussed arches, testing of various types of electrical equipment designed by PO "Mayak" for nuclear power stations.

The tests conducted at the test facilities:

- strength tests (static loads, dynamic loads, bending, tension, compression, torque, cycling);
- leak-tightness test;
- mechanical test (dimensions, surface shape and positioning tolerances, surface roughness, coating hardness, moving element clearances, lever opening forces, tensile and compression forces, tightening torque etc.);
- vibration and noise tests;
- functional tests of automatics, control and safety systems;
- impact loads (shock strength, shock resistance, single impacts, repeated impacts);
- vibration loads (vibration strength, vibration resistance, harmonic actions, broad-band random vibration);
- seismic resistance test;

- electrical safety (leakage currents, insulation resistance, insulation strength, earthing, short-circuit current resistance, overlap spans, leakage paths and insulation distances, overload protection, tracking, blocking etc.);
- electrical characteristics of products (consumed power, current, voltage, volume resistivity, making and interrupting capacities, voltage waveform distortion factor etc.);
- check of paint and other non-metallic coatings;
- check of the product component heating temperature in various-mode operations;
- environmental resistance (heat resistance, cold endurance, temperature cycling, humidity resistance, hoarfrost and dew effects, sun effect, salt mist impact, corrosion stability);
- fire safety (direct flame effect, check for misconnections, hot wire test, test for thermal resistance and fire endurance);
- check of charge and discharge characteristics of power supply units and accumulators;
- check of the level of protection against penetration of foreign matters and water;
- transverse stability of trucks and tractors (tilting test);
- electromagnetic compatibility testing;
- radiographic, ultrasonic and electromagnetic inspection;
- testing of space rockets under vacuum and zero-g conditions;
- testing of space rocket control systems on the comprehensive simulation stand;
- hydrodynamic simulation tests in hydrodynamic tunnels and water tank;
- test of pneudraulic units and systems;
- test of cold water meters.

Text B

BASIC CHARACTERISTICS OF TEST COMPLEXES

Read the text and translate it into English.

Strength test complex.

The complex is dedicated for static and cyclic tests. The tests are conducted on strength test stands, reinforced floor and wall.

The complex comprises:

- Test room. The room dimensions are 66x30 m. It has reinforced floor and wall and equipped with two traveling cranes, each of 10/50-tf lift capacity.

- Strength test stands. The strength test stands have a reinforced floor and two reinforced walls each. The peak load per each meter of any joint is up to 100 tf. The floor dimensions are 5900x4400 mm and 5000x3800 mm, the wall height is 5300 mm.

- Strength test equipment. The hydraulic power cylinders available provide single forces of up to 100 tf. The number of single force points is up to 20. The loading conditions are static. Quasidynamic loading of up to 75 tf, 0.1-10 Hz is possible. Mobile pumping stations allow to conduct tests at customer's premises.

- The high-pressure balloons enable to load units of up to 3m in diameter and 10m high with an external water pressure of up to 7.5 MPa.

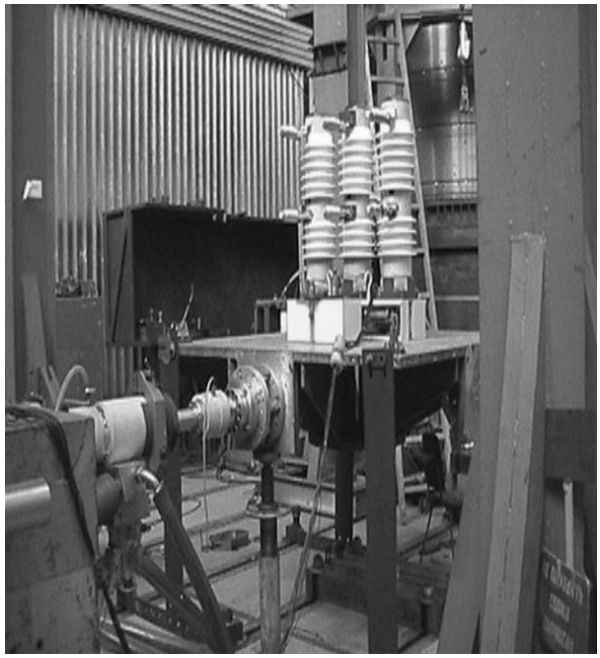
- Instrumentation system. The instrumentation system provides measurement of forces, pressures, displacements, relative strains, accelerations, temperatures. Application of special modules ensures operation in static and quasidynamic modes.

Tubing strength test
Vibration and impact test complex.
Intended for vibration and impact tests of products of up to 100 tons in a wide load range.

Text C

The COMPLEX

Read the text and translate it into English.



The complex includes:

Test halls and laboratories, vibration and impact test stands, technological equipment, multi-purpose instrumentation complex.

The basic stands:

- «Hydropulse» vibration test complex consisting of 6 stands of 12.5 tf and 4 stands of 25 tf, travel ± 125 mm, 0-200 Hz;
- electrohydraulic stands of up to 60 tf, 0-10 Hz;
- electrodynamic stands from 1.5 to 20 tf, 5- 2000 Hz;
- drop and pendulum impact test stands with a shock pulse amplitude of up to 10 000m/s2 and duration of 1-6 ms for objects of up to 300kg and 1000 m/s2 for objects of up to 2 tons;
- test stands to determine frequency and dynamic characteristics of the objects;
- centrifuga of 50-kg lift capacity and maximum acceleration of up to 1500 m/s2

Corrosion-climatic test complex.

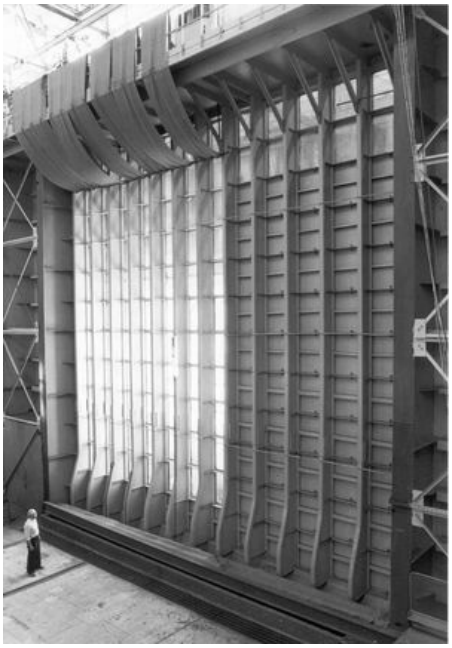
Dedicated for accelerated climatic and corrosion tests of products.

The basic characteristics of climatic chambers:

- Chamber volume - 0.25– 320 m3.
- Dimensions of heat and humidity test chambers: 20x4x4 m; cold test chambers: volume – 60 m3, gates – 3x3 m and 30 m3, gates 2x2 m. 20 heat and

humidity, cold, water and salt mist testing chambers from 1 m3 to 8 m3 in volume.

- Temperature, from – (70±3)°C to +(120±3)°C.
- Relative humidity at 40-60°C is 20-98 %.
- Chamber pressure – from 10 mm Hg up to atmospheric one.
- Water mist (distilled water).
- Salt mist (NaCl solution), 0.001- 5%.
- The climatic chambers



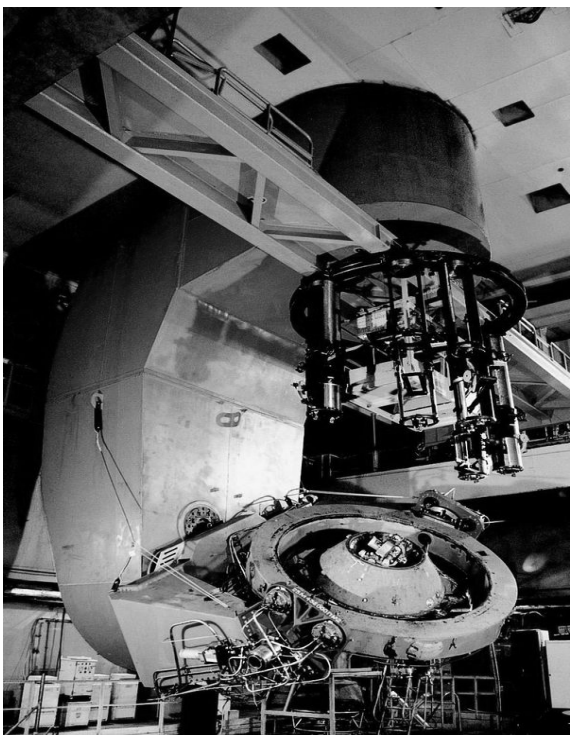
Vacuum-dynamic and acoustic test complex

Intended for vacuum and zero-g tests of rocket stage separation systems, spacecraft separation, equipment dynamic testing and acoustic tests.

The complex comprises:

- Vacuum-dynamic stand. Vacuum chamber diameter – 10 m, working section height – 60 m, vacuum – up to 0.001 mm Hg, test object mass – up to 30 tons.
- Small vacuum chamber. Chamber volume – 5 m3, vacuum – up to 10– 5 mm Hg.
- Acoustic reverberation chamber. Chamber volume - 120 m3, acoustic pressure –158 dB.

The vacuum-dynamic stand



Hydrodynamic test complex.

Intended for hydrodynamic simulation tests in hydrodynamic tunnels and water tank, pneudraulic tests of assemblies and systems in a deep-water tank.

The complex consists of:

- Large high-speed hydrodynamic tunnels with vertical and horizontal working sections. The working section diameter is 1.2 m, length – 4 m, working section velocity – up to 30 m/s, specified incidence angles of test models – up to ± 18 degrees.
- Open hydrodynamic tank. Tank dimensions – 3x12x27 m, velocity of self-propelled models - up to 40 m/s, model mass – up to 100 kg.

- Deep-water tank. Tank volume – 3.2 m, height - 10 m, pressure - up to 56 kgf/cm2.
- The water tank
- The large high-speed hydrodynamic tunnel with a horizontal working section
- The large high-speed hydrodynamic tunnel with a vertical working section

Comprehensive simulation stand.

Destined for physico-mathematical flight simulation. Allows to conduct repeated tests and debugging of control systems together with aircraft assemblies and subassemblies under conditions close to flight. Implements real angular motion of a vehicle, vibration effect on the equipment, simulation of astro-navigational conditions, pointing of vehicle antennae to navigation artificial Earth satellites, space effects and physical simulation of the influence of sea disturbance on the control system.

Vocabulary

acceleration – ускорение
angle – угол
bending – изгиб
capacity – мощность
comprehensive simulation – всеобъемлющее моделирование
civilian – гражданский
compression – сжатие покрытия
clearance – растяжение
coating – покрытие
current – текущий
debugging – отладка
demand – запрос
dimension – размер
distortion – сигнал
enable – позволяют
ensure operation – обеспечивать работу
facility – средство
gates – ворота
hoarfrost – иней
humidity – влажность
impact – маятник
inspection – осмотр
joint – совместный
leak-tightness – герметичность
making and interrupting capacities – решения и возможности прерывания
wire – проволка
measurement of forces – изменение силы
overload protection – защита от перегрузки
pendulum – воздействие
premise – помещение
implement – реализовывать
reinforced floor and wall – усиленный пол и стены
relative strain – относительная деформация
resistance – сопротивление
roughness – шероховатость
salt mist impact – воздействие соляного тумана
short-circuit current – ток короткого замыкания
spacecraft separation – разделение космического аппарата
tension – напряженность
tightening torque – момент затяжки

tracking – отслеживание
transverse – поперечные
trussed arch – шпренгельная (трехшарнирная) арка
volume resistivity – объемное сопротивление
among – среди
assembly – сборка
broad-band – широкополосные
compatibility – совместимость
coating hardness – твердость
consumed power – потребляемая мощность
disturbance – нарушение
dedicate – посвящать
dew – роса
dispose – средства
earthing – заземление
endurance – выносливость
enterprise – предприятие
full-scale – полномасштабный
hardware – аппаратные средства
household goods – хозяйственные товары
humidity resistance – влагостойкость
insulation – изоляция
leakage – утечка
load – нагрузка
mode – режим
overlap span – перекрытие пролета
paint – краска
penetration – проникновение
random – случайный
reverberation – отражение
single impacts – одиночные удары
strength – прочность
tensile – растяжение
tolerance – допуск
torque – крутящий момент
waveform – сигнал
truck – грузовик
voltage – напряжение

EXERCISES

1. Make up different types of questions to the texts A, B, C.

2. Match the English words and words combinations with the Russian ones.

1. GRTs	a. loads
2. power	b. resistivity
3. test	c. Test Center
4. civilian	d. loading
5. impact	e. resistance
6. electrical	f. facilities
7. overlap	g. pressure
8. volume	h. products
9. non-metallic	i. engineering
10. environmental	j. spans
11. direct flame	k. chamber
12. hydraulic	l. coatings
13. Quasidynamic	m. power
14. Chamber	n. safety
15. Acoustic reverberation	o. effect

1. **Agree or disagree with the statements below:**

1. The GRTs Test Center is accredited in the GOST R, FSS KT, SSPB certification system and disposed in ten industrial buildings equipped with present-day test facilities.

2. In the course of 2008 certification tests of 220 products were performed.

3. The tests conducted at the 24 test facilities.

4. Impact loads include: shock strength, single impacts and repeated impacts.

5. Check of the product component heating temperature in various-mode operations is very necessary for check the rocket.

6. Strength test complex is dedicated for static and cyclic tests.

7. Strength test complex include the high-pressure balloons enable to load units of up to 10m in diameter and 25m high with an external water pressure of up to 7.5 MPa.

8. Corrosion-climatic test complex is dedicated for accelerated climatic and corrosion tests of products.

9. Vacuum-dynamic stand include vacuum chamber diameter – 25 m, working section height – 60 m, vacuum – up to 0.001 mm Hg, test object mass – up to 60 tons.

10.Comprehensive simulation stand is destined for physico-mathematical flight.

2. **Find sentences with different kinds of tenses and write the verbs in the graph.**

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

3. **Render the texts A, B and C.**

4. **Describe the complexes and make up 5 different questions.**

5. **Find English equivalents.**

1. ***В состав испытательного центра входят комплексы:***

- статических испытаний на прочность;

- вибрационных и динамических испытаний;
- вакуумно-динамический стенд (ВДС) и акустическая камера;
- ускоренных коррозионно-климатических испытаний;
- гидродинамический комплекс;
- комплексный моделирующий стенд для отработки системы управления;
- испытаний антенн, антенно-фидерных и антенно-волноводных устройств;
- испытаний изделий на радиационные и электромагнитные воздействия;
- испытаний изделий на ЭМС.

2. ***В состав комплекса входят:***

Большие скоростные гидродинамические трубы с вертикальным и горизонтальным рабочими участками; гидродинамический бассейн открытого типа; глубоководный стенд; гидробассейн; большая скоростная гидродинамическая труба с горизонтальным рабочим участком; большая скоростная гидродинамическая труба с вертикальным рабочим участком; комплексный моделирующий стенд.

- Имитатор магнитного поля промышленной частоты ИМППЧ-1000 с индукционной катушкой ИК-1.
- Имитатор импульсных магнитных полей ИМП-1000 с индукционной катушкой ИК-1.
- Оборудование и средства измерений для испытаний на устойчивость изделий к воздействию радиочастотных полей.
- Измеритель гармоник, колебаний напряжения и фликера ИГКФ-1.

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UNIT 4

Text A

MISSILE COMPLEXES DEVELOPED by ACADEMICIAN V.P. MAKEYEV. SRC (State Rocket Centre)

Read the text and translate it into English.

On September 16, 1955 for the first time in the world the R-11FM ballistic missile was launched from a submarine. The launch of this missile designed at S.Korolyov OKB-1 laid the foundation for the development of sea-based missile nuclear forces of the USSR.

In 1959-1960 test launching of the R-13 missile (complex D-2) was made from a submarine and in 1962-1963 flight tests of the R-21 (complex D-4), the first underwater-launch ballistic missile, were performed. The D-2 and D-4 missile complexes demonstrated attainability of enemy's territory and targets with ballistic missiles that was of significant importance for the strategic balance in the 1960's.

Development and commissioning to the Navy of the D-5 complex with a R-27 single reentry vehicle (SRV) missile (1968) and advanced D-5U missile with SRV and MIRV (3 warheads) (1974) laid the foundation for modern sea-based rocketry. In this complex a number of pioneer designs were realized: fuel-submerged engine, on-plant fueling, new type of launcher with elastomeric cushioning, automatic on-pad procedures, etc.

Commissioning of the D-9 (1974) and D-9K (1977) complexes and modifications far more increased the combat capabilities of the Navy weapons. The intercontinental range of firing was achieved with an increased payload mass, the firing accuracy was improved and independent and any-weather firing of missiles was assured.

In 1983 the Navy put into service the D-19 complex with the first submarine-launched three-stage solid-fuel R-39 missile. It has a multiple independently targetable reentry vehicle (MIRV) with ten warheads and intercontinental range of firing.

Development of the D-9RM complex with the R-29RM missile having four middle-class warheads (1987) became the consequent continuation of the work on updating the naval strategic weapons that substantially improved the capabilities due to increase in number and power of warheads, extended the maximum range of firing, improved the firing accuracy and made the reentry vehicles independently targetable within an arbitrary shaped zone.

Among the measures for further improvement of the performance of the missile complexes a task to fire missiles from high latitudes was set and successfully implemented. To confirm this in 1985 two R-29R missiles were fired from a "Kalmar" submarine from a polar region and in 1987 two R-29RMU

missiles were fired from the North Pole. In September, 2006, within the framework of the maneuvers of the naval strategic nuclear forces of the Russian Federation, the R-29PMU missile was successfully launched from the "Yekaterinburg" submarine cruiser from the North Pole. According to the Decree dated October 3, 2007 a team of SRCs specialists were awarded Orders of Services for Motherland.

In August 1991 for the first time in the world salvo firing of sixteen intercontinental ballistic missiles (full ammunition load) was made from a submerged submarine.

At present the SRCs contribute to further development of sea-launched missiles, participating in creation of new rocket complexes and improving the operational ones. In the middle of 2004 governmental flight tests of the "Sineva" submarine-launched missile, RSM-54 modification, was successfully carried out and in 2007 it was adopted by the Navy. The "Sineva" missile is of great potentials and it will remain effective for many years.

For more than sixty years the SRCs and cooperating enterprises have developed three generations of rocket complexes, eight base missiles and sixteen modifications which formed and form the basis of the strategic nuclear forces of the USSR and Russia. In all there have been manufactured about 4000 up-to-date serial submarine-launched missiles and more than 1200 of them have been fired.

Vocabulary

domestic – отечественный
to perform – выполнять
enemy – враг
target – цель
significant – важный
commissioning – ввод в эксплуатацию
Navy – военно-морской флот
single reentry vehicle – моноблочная ракета
submerged – погружённый
on-plant – на заводе
cushioning – амортизация
on-pad – на месте, перед стартом
range – дальность
stage – ступень
targetable – прицеливание
latitude – широта
salvo – залп
cooperating enterprise – смежное предприятие

EXERCISES

1. Make up different types of questions to the texts A, B, C.

2. Match the English words and words combinations with the Russian ones.

1) R11 FM — a) The first underwater-launch
2) R-21 — b) The first domestic solid-fuel missile
3) R-27 — c) Was achieved the intercontinental range of firing

4) R-29 d) The first time in the world was launched from a submarine
5) R-39 e) Fuel-submerged engine

1. **Agree or disagree with the statements below:**

1. The first sea-based missile was designed by State Rocket Centre.
2. In the D-5 complex first were realized fuel-submerged engine.
3. Three R-11 missiles were fired from the North Pole
4. The first domestic solid-propellant sea-based ballistic missile has ten MIRVs.
5. SRCs have developed three generations of sea-based missiles for the Russian strategic nuclear forces.

2. **Find sentences with different kinds of tenses and write the verbs in the graph.**

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

3. **Render the text**

***

Text B

MISSILE'S CONTROL SYSTEMS

Read the text and translate it into English.

Missile control system (CS) is designed to control the missile flight to a given program, the stabilization of the boost phase, as well as to improve the accuracy of shooting through a series of corrections to the rocket boost phase.

Estimated parameters of the trajectory are introduced into the CS before the start, and in-flight CS determines the current value of the orbital parameters and the change in thrust main engine gives the actual velocity of the rocket in accordance with the calculated one. With the help of control devices (small steering engines or deviation (swing) of the main engine directly) adjusts the spatial position of the missile.

As is known, for hitting the target must be accurately sustain the speed and angle of the missile velocity vector to the local horizon at the end of the boost phase. The required values of these quantities are determined by calculation on the site launch.

In case of deviation values of the velocity of the rocket and the angle of inclination of the velocity vector from the values in an error in the shooting accuracy for range. If errors are added to them in the direction of the shooting, they lead to a deviation from the warhead aiming points in the lateral direction the larger the longer range.

On ballistic missiles used an inertial control system.

It includes several accelerometers that measure acceleration of the rocket in three mutually perpendicular directions. Determination of the transfer of the vehicle occurs after double integration these accelerations (determination of the apparent velocity occurs after one integration), after that CS compares these values with the calculated values and issues commands to the main engine and the steering gears.

If the missile launched from the carrier mobility, it adds additional errors due to inaccurate knowledge of the start point and the speed of the carrier mobility. These errors can be reduced by use astroinertial control system.

In addition to the main (inertial) control system is installed star-endorse device, that previously directed to the selected navigational stars. This device can specify the line of fire for one star and two stars - the location of the vehicle.

Together with the use of navigational stars, attached to a rocket of equipment, can be further improve the accuracy of fire, using the navigation satellites. Such a control system called astro-radio-inertial.

Vocabulary

boost phase – активный участок полёта
estimated – расчётный, планируемый
determine – определять
value - значение
current – текущий, действующий
deviation - отклонение
swing - качание
spatial – пространственный
sustain – выдержать, поддерживать
angle – угол
site – местонахождение
to specify – уточнять
endorse – визирующий
steering – рулевой
to issue – выдавать
to compare – сравнивать
apparent – кажущийся
mutually – взаимно
to measure – измерять

EXERCISES

1. Make up different types of questions to the texts A, B, C.

2. Match the English words and words combinations with the Russian ones.

1) improve the accuracy of shooting	a) swing for control of missile
2) steering engines	b) device for qualification of rocket location
3) accelerometer	c) corrections to the rocket boost phase
4) star-endorse device	d) adjusts the position of the missile
5) main engine	e) device for calculation of velocity

1. Agree or disagree with the statements below:

1. Estimated parameters of the trajectory are introduced into the CS during boost phase.
2. Launch missile from the carrier mobility adds more accuracy of shooting.
3. Small steering engines are used to control the direction velocity vector.
4. On ballistic missiles used an inertial control system.
5. Star-endorse device can specify the line of fire for one star.

2. Find sentences with different kinds of tenses and write the verbs in the graph.

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

3. Render the text

4. Find English equivalents.

В случае отклонения значения скорости движения ракеты и угла наклона вектора скорости от указанных значений появляются ошибки в точности стрельбы по дальности

На баллистических ракетах используется инерциальная система управления.

Если ракета стартует с подвижного носителя, то добавляются дополнительные ошибки за счёт неточного знания места старта и скорости подвижного носителя.

В дополнение к основной системе управления на ракете устанавливается астровизир

Вместе с использованием навигационных светил, при установке на ракете соответствующего оборудования, можно ещё больше повысить точность стрельбы

Такая система управления называется астрорадиоинерциальной.

Text C

AIR LAUNCH

Read the text and translate it into English.

The unique airborne space-rocket complex is designed by leading aviation and space companies of Russia and Ukraine under order of the “Air Launch” corporation.

The complex is intended to deliver payloads into various near-earth orbits, including geostationarye.

A two-stage booster-equipped rocket burning liquid oxygen and kerosene is accommodated in a transportation-launch container aboard the AN-124-100VS carrier aircraft.

The 100-t launch vehicle is able to inject up-to-3900-kg spacecraft into low orbits, 1500-kg, into geotransfer orbit and 650-kg, into geastationary orbits.

A payload is located under the nose fairing. The total payload area is about 30 m3.

The AN-124-100VS carrier aircraft affords a nonstop flight to the launch region and return to the landing airdrome within 4500 km,that allows performing launches to various-inclination orbits from the regions specified.

The launch point and flight route are selected to ensure safe launch and LV separable elements drift trajectories.

Such engineering solutions allow injecting satellites into orbits of various altitudes and inclinations without construction of expensive ground launch facilities. In this case, when the rocket is ejected in the low-density atmosphere and due to an additional airplane velocity the rocket can inject a 30-40% more payload than when launched from a ground launcher.

Vocabulary

deliver – доставка

to accommodate – размещать

nose fairing – головной обтекатель

inclination – наклонение

drift trajectorie – траектория падения

inclination – наклонение

EXERCISES

1. Make up different types of questions to the text.

2. Match the English words and words combinations with the Russian ones.

1. carrier aircraft	a. used liquid oxygen and kerosene as propellants
2. two-stage rocket	b. is accommodated in a transportation-launch container
3. a payload	c. are selected to ensure safe launch
4. additional airplane velocity	d. injecting a 30-40% more payload
5. the launch point	e. is located under the nose fairing

3. Agree or disagree with the statements below:

1. Rocket complex "Air Launch" posted on a airship
2. The airborne space-rocket complex is designed by the best American aviation companies
3. The use of carrier aircraft provides an opportunity launches to various-inclination orbits
4. Required the establishment of spaceports for the use of "Air Launch"
5. Propellant components for rocket are liquid oxygen and hydrogen?

4. Find sentences with different kinds of tenses and write the verbs in the graph.

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

5. Retell the texts A, B and C.

6. Find English equivalents.

Разработка уникального авиационного ракетного комплекса космического назначения .

Комплекс предназначен для доставки полезных грузов на различные околоземные орбиты, включая геостационарную.

Полезная нагрузка размещается под головным обтекателем с общим объемом ~ 30 м^3.

Выбор точки старта и безопасной трассы полета проводится с учетом обеспечения безопасности пуска и траекторий падения отделяемых частей ракеты.

Выбор таких технических решений по комплексу позволяет обеспечивать запуски спутников в широком диапазоне высот и наклонений орбит без строительства дорогостоящих наземных стартовых сооружений.

Ракета массой 100 т обеспечивает запуск космического аппарата массой до 3900 кг на низкую орбиту.

Двухступенчатая ракета с разгонным блоком размещается в транспортно-пусковом контейнере на самолете-носителе АН-124-100ВС.

***

Text D

LGM-30 Minuteman III

Read the text and translate it into English.

1. Five hundred Minuteman III missiles are deployed at four bases in the north- central United States. Operational since 1968, the model "G" differs from the "F" in the third stage and reentry system. The third stage is larger and provides more thrust for a heavier payload. The payload consists of a payload mounting platform, penetration aids, three reentry vehicles (RVs) and an aerodynamic shroud. The shroud protects the RVs during the early phases of flight. The mounting platform is also a "payload bus" and contains a restartable hypergolic rocket engine powered by hydrazine and nitrogen tetroxide. With this configuration, the RVs can be independently aimed at different targets within the missile's overall target area or "footprint". This concept is known as Multiple Independently Targeted Reentry Vehicles (MIRV).

2. The LGM-30 Minuteman missiles are dispersed in hardened silos to protect against attack and connected to an underground launch control center through a system of hardened cables. Launch crews, consisting of two officers, perform around-the-clock alert in the launch control center.

3. The Minuteman weapon system was conceived in the late 1950s and deployed in the early 1960s. From the beginning, Minuteman missiles have provided a quick-reacting, inertially guided, highly survivable component to America's nuclear Triad.

4. To ensure the reliability and maintainability of the Minuteman force into the next century, the Air Force initiated a major Minuteman upgrade and modification program.

5. Modernization programs have resulted in new versions of the missile, expanded targeting options, significantly improved accuracy and survivability. Today's Minuteman weapon system is the product of almost 35 years of continuous enhancement.

Vocabulary

reentry system – система обеспечения входа атмосферу
penetration aids – средства преодоление
mounting – монтаж
launch crew – расчёт
survivable – выживаемость
inertial -инерционный
reliability – надёжность
maintainability – ремонтопригодность
upgrade – усовершенствование
targeting – целееуказание
restartable – перезапускаемый
tetroxide – четырехокиси

EXERCISES

1. Make up different types of questions to the texts A, B, C.

5. Match the English words and words combinations with the Russian ones.

1) distinction the model "G" from “F”	a)protection the RVs
2) a payload mounting platform	b)propellant component
3) aerodynamic shroud	c)hit region of warheads
4) target area	d)“payload bus”
5) hydrazine	e)differs in reentry system

1. Agree or disagree with the statements below:

1) Minuteman III missiles are deployed at bases in France.
2) This missile can inject satellites into various orbits.
3) Minuteman III has the unguided reentry vehicle.
4) Launch crews on duty for eighteen hours a day.
5) Minuteman III has a inertional guidance.

2. **Find sentences with different kinds of tenses and write the verbs in the graph.**

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

3. **Retell the texts C and D.**

4. **Find English equivalents.**

Третья ступень больше и обеспечивает большую тягу для большей полезной нагрузки. Полезная нагрузка состоит из монтажной платформы, средств преодоления, трёх боевых блоков (ББ)

Монтажная платформа также называется "автобусом" и содержит перезапускаемый самозапускающийся ракетный двигатель на гидразине и тетраоксиде диазота.

Эта концепция известна как разделяющаяся головная часть (РГЧ).

С самого начала ракеты Минитмен обеспечили быстрое реагирование, инерциальное управление, высокую выживаемость компоненты ядерной триады США.

Модернизация программ привели к новой версии ракеты, расширены параметры целеуказания, значительно улучшили точность и живучесть. Сегодня система вооружения Минитмен является продуктом почти 35 лет непрерывного улучшения.

***

Text A

SOYUZ ROCKET

Read the text and translate it into English.

The Soyuz rocket is a series of space craft first developed by the Soviet Space Program as a successor craft to the Vostok rocket.

The Soyuz craft was designed as a manned space craft that would expand on the capabilities of its predecessor making for more reliable maneuverability in space, docking, and reentry at the end of each mission. The Soyuz rocket is also the longest running rocket. While it has had various upgrades over the years it has proven to be one of the safest and most reliable long term space craft in the world.

The first Soyuz rocket was unmanned and it was launched in 1968. The craft was designed by the OKB-1. The structure of the craft is pretty simple. The Soyuz consists of three modules. There are the launch/reentry module, also known as the descent module, the orbital module, and the instrumentation and propulsion module. The descent module is where cosmonauts operated for launch and reentry of the Soyuz space craft. This module would separate on reentry from the others and would have its own heat resistant coating. The orbital module was the habitation module for early missions and is still used for that purpose as well as a space for performing experiments. The last module is the propulsion and instrumentation module. This module holds not only the propulsion drive but also holds the instrumentation needed for the mission.

As mentioned before the Soyuz rocket is a very reliable craft. Like the U.S. Space Shuttle it has only had two incidents in its long and storied career. The first

incident occurred in 1967 with the first manned mission of the Soyuz space craft. The reentry parachute failed to deploy causing the death of the mission's cosmonaut upon impact of the craft. The second incident occurred in 1971 when the three cosmonauts died from depressurization of the cabin of the reentry module. Both of these cases were attributed to lack of proper preparation and testing due to the competitive nature of the space race with the NASA program. Otherwise the Soyuz rocket has a strong safety record.

One of the most remarkable facts is that the Russian space program has used the Soyuz space craft to start the first private space company Space Adventures. This company allowed wealthy customers to visit first the Mir space station then International space station. With the end of the Space Shuttle program, The Soyuz spacecraft will ferry astronauts until the successful testing of the Space X Dragon capsule.

Vocabulary

manned – пилотируемый
predecessor – предшественник
successor – преемник
proven – доказанный, проверенный
docking – стыковка
running – работающий
maneuverability – манёвренность
coating – покрытие
habitation – жильё
depressurization – разгерметизация
compartment – отсек

EXERCISES

1. Make up different types of questions to the texts A, B, C.

2. Match the English words and words combinations with the Russian ones.

1) space docking	a)compartment with engines
2) propulsion module	b)space mission involving human
3) manned space flight	c)compartment for space experiments
4) orbital module	d)joining of space crafts
5) depressurization	e)loss of integrity of module

3. Agree or disagree with the statements below:

1) The Soyuz craft was designed as a manned space craft.
2) The Soyuz rocket is very powerful vehicle but its reliably is poor.

3) This vehicle is the longest running rocket.
4) The Vostok rocket is a successor craft to the Soyuz.
5) The Soyuz consists of ten modules.

4. Find sentences with different kinds of tenses and write the verbs in the graph:

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

5. Render the text A.

***

UNIT 5

Text A

THE TRIDENT NUCLEAR MISSILE SYSTEM

Read the text and translate it into English.

The Trident missile, named after the trident, is an intercontinental ballistic missile (ICBM) which is armed with nuclear warheads and is launched from submarines (SSBNs), making it a SLBM.

The Trident was built in two variants:

Trident I (C4) UGM-96A. Its range was 7400 km at mass 33142 kg and length 10,2 m. Trident I had nuclear multiple independently targetable reentry vehicles (MIRV). It was deployed in 1979.

Trident II (D5) UGM-133A. The second variant of the Trident is more sophisticated and can carry a heavier payload. It is accurate enough to be a first strike weapon. All three stages of the Trident II are made of graphite epoxy, making the missile much lighter.

Both Trident versions are three-stage, solid-propellant, inertially guided missiles whose range is increased by an aerospike, a telescoping outward extension that halves frontal drag.

The Trident is carried by fourteen active US *Ohio* class submarines and (with British warheads) four UK *Vanguard* class submarines.

The launch from the submarine occurs below the ocean surface. The missiles are ejected from their tubes by gas pressure created by a "gas generator", a solid-fuel rocket motor attached to the bottom of the missile tube which heats a pool of water creating steam. After the missile leaves the tube and rises through the water over the submarine, the first stage motor ignites, the aerospike extends, and the boost stage begins. Ideally, the missile is "sheathed" in gas bubbles for its entire time in the water, so liquid never touches its fuselage. Within about two minutes, after the third stage motor fires, the missile is traveling faster than 20,000 ft/s (6,000 m/s).

Trident I (C4) was deployed in 1979 and phased out in the 1990s and early 2000s. Trident II (D5) was deployed in 1990; it is planned to be in service past 2020.

Vocabulary

ignite – зажигание, запуск двигателя
boost – набор скорости, разгон
sheathed – оболочка
entire – весь
phased oute – свёрнут
sub – подводная лодка
range –дальность
graphite epoxy – углепластик
case – корпус
sub – подводная лодка

EXERCISES

1. Make up different types of questions to the texts A, B, C.

2. Match the English words and words combinations with the Russian ones.

1) graphite epoxy	a) device to generate steam
2) gas generator	b) composite material for rocket case
3) submarine	c) carrier of Trident missile
4) multiple independently targetable reentry vehicles	d) the resistance of the environment
5) frontal drag	e) a payload, including several warheads

3. Agree or disagree with the statements below

1. Trident is a two-stage missile.
2. Trident system are used underwater launch.
3. Trident I is used in present time.
4. Liquid never touches missile's fuselage during the launch.
5. The Trident is carried by fourteen active US *Ohio* class submarines.

4. Find sentences with different kinds of times and write the verbs in the graph:

	Simple	Progressive	Perfect	Perfect Progressive
Present				
Past				
Future				

4. Render the text B.

5. Find English equivalents.

Ракетно-ядерная система; межконтинентальная баллистическая ракета (МБР); трехступенчатая, твердотопливная ракета; инерциально-управляемые ракеты.

Запуск с подводной лодки происходит ниже поверхности океана.

В идеале, ракета находится в оболочке пузырьков газа в течении всего времени нахождения в воде, так что жидкость никогда не касается его фюзеляжа.

Trident I (C4) была развернута в 1979 году и свёрнута в 1990-х и начале 2000-х. Trident II (D5) была развернута в 1990 году, планируется эксплуатировать и после 2020 года.

Text B

TREATY between the USA and the RF on MEASURES for the FURTHER REDUCTION and LIMITATION of STRATEGIC OFFENSIVE ARMS. NEW START

Read the text and translate it into English.

Article I

1. Each Party shall reduce and limit its strategic offensive arms in accordance with the provisions of this Treaty and shall carry out the other obligations set forth in this Treaty and its Protocol.

2. Definitions of terms used in this Treaty and its Protocol are provided in Part One of the Protocol.

Article II

1. Each Party shall reduce and limit its ICBMs[1] and ICBM launchers, SLBMs[2] and SLBM launchers, heavy bombers, ICBM warheads, SLBM warheads, and heavy bomber nuclear armaments,

so that seven years after entry into force of this Treaty and thereafter, the aggregate numbers do not exceed:

(a) 700, for deployed ICBMs, deployed SLBMs, and deployed heavy bombers;

(b) 1550, for warheads on deployed ICBMs, warheads on deployed SLBMs, and nuclear warheads counted for deployed heavy bombers;

(c) 800, for deployed and non-deployed ICBM launchers, deployed and non-deployed SLBM launchers, and deployed and non-deployed heavy bombers.

2. Each Party shall have the right to determine for itself the composition and structure of its strategic offensive arms.

Article IV

11. Strategic offensive arms subject to this Treaty shall not be based outside the national territory of each Party. The obligations provided for in this paragraph shall not affect the Parties' rights in accordance with generally recognized principles and rules of international law relating to the passage of submarines or flights of aircraft, or relating to visits of submarines to ports of third States. [...]

Article V

1. Subject to the provisions of this Treaty, modernization and replacement of strategic offensive arms may be carried out.

2. When a Party believes that a new kind of strategic offensive arm is emerging, that Party shall have the right to raise the question of such a strategic offensive arm for consideration in the Bilateral Consultative Commission.

3. Each Party shall not convert and shall not use ICBM launchers and SLBM launchers for placement of missile defense interceptors therein. Each Party further shall not convert and shall not use launchers of missile defense interceptors for placement of ICBMs and SLBMs therein. This provision shall not apply to ICBM launchers that were converted prior to signature of this Treaty for placement of missile defense interceptors therein.

Article VII

[...] 5. The Parties shall hold consultations within the framework of the Bilateral Consultative Commission on releasing to the public data and information obtained during the implementation of this Treaty.[...]

Article IX

By mutual agreement of the Parties, telemetric information on launches of ICBMs and SLBMs shall be exchanged on a parity basis. The Parties shall agree on the amount of exchange of such telemetric information.

Article XI

2. Each Party shall have the right to conduct inspections at ICBM bases, submarine bases, and air bases.[...]

Article XIII

To ensure the viability and effectiveness of this Treaty, each Party shall not assume any international obligations or undertakings that would conflict with its provisions. The Parties shall not transfer strategic offensive arms subject to this Treaty to third parties.[...]

Article XIV

2. This Treaty shall remain in force for 10 years unless it is superseded earlier by a subsequent agreement on the reduction and limitation of strategic offensive arms.[...]

Article XVI

[...] Made in Prague on April 08, 2010 in dublicate, each in Russian and English languages, and both texts being equally authentic.

Notes:

[1] Intercontinental Ballistic Missiles

[2] Submarine-launched ballistic missile

Source: http://www.state.gov/documents/organization/140035.pdf

Vocabulary

Deployed – Развёрнутый
Placement – размещение
Convert – переоборудовать
Missile defense interceptors – ракеты-перехватчики
Armaments – вооружения
Parity – паритет
Viability – жизнеспособность

EXERCISES

1. Make up different types of questions to the texts.

2. Match the English words and words combinations with the Russian ones.

1) ceiling amount of deployed carries is	a) land-based weapons
2) ceiling amount of warheads is	b) eight hundred units
3) parity basis	c) seven hundred units
4) Intercontinental Ballistic Missiles	d) sea-based weapons
5) Submarine-Launched Ballistic Missiles.	e) competitive conditions

3. Agree or disagree with the statements below:

1) Strategic offensive arms shall be based outside the national territory of each Party.

2) Some Party shall be able use launchers of missile for placement of missile defense interceptors.

3) This Threaty is for twenty years.

4) Heavy bombers are not covered by this Threaty.

5) Each Party shall have the right to determine for itself the composition and structure of its strategic offensive arms.

4. Find English equivalents.

Каждая из Сторон имеет право самостоятельно определять состав и структуру своих стратегических наступательных вооружений.

Стратегические наступательные вооружения, подпадающие под действие настоящего Договора, не базируются за пределами национальной территории каждой из Сторон.

С учетом положений настоящего Договора могут производиться модернизация и замена стратегических наступательных вооружений.

Каждая из Сторон не переоборудует и не использует пусковые установки МБР и пусковые установки БРПЛ для размещения в них противоракет.

Каждая из Сторон также не переоборудует и не использует пусковые установки противоракет для размещения в них МБР и БРПЛ.

Каждая из Сторон имеет право проводить инспекции на базах МБР, базах подводных лодок и на авиационных базах.

Настоящий Договор остается в силе в течение 10 лет, если только он не будет заменен ранее этого срока последующим соглашением о сокращении и ограничении стратегических наступательных вооружений.

5. **Read the articles and translate them into Russian.**

6. Retell the text A

***

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АНГЛИЙСКИЙ ЯЗЫК

Учебное пособие

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