

ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ОБРАЗОВАНИЮ  
ГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ  
ВЫСШЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ  
«САМАРСКИЙ ГОСУДАРСТВЕННЫЙ АЭРОКОСМИЧЕСКИЙ  
УНИВЕРСИТЕТ имени академика С.П. КОРОЛЕВА»

# ДВИГАТЕЛИ ЛЕТАТЕЛЬНЫХ АППАРАТОВ

## РАЗВИТИЕ НАВЫКОВ УСТНОЙ РЕЧИ

*Утверждено Редакционно-издательским советом университета  
в качестве методических указаний к лабораторным работам  
по английскому языку*

САМАРА  
Издательство СГАУ  
2007

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**ДВИГАТЕЛИ ЛЕТАТЕЛЬНЫХ АППАРАТОВ. Развитие навыков устной речи:** метод указания к лаб. работам по англ. языку / сост.: *О.И. Годяева, С.М. Ермишина, Н.Э. Кочурова*. – Самара: Изд-во Самар. гос. аэрокосм. ун-та, 2007. – 60 с.

Содержат 12 лабораторных работ, которые имеют целью способствовать развитию техники чтения, устных разговорных навыков и навыков аудирования. Выполнение лабораторной работы является составной частью подготовки студентом домашнего задания. Вся система упражнений направлена на усвоение специальной терминологической лексики, отличается разнообразными типами упражнений. Предусмотрена работа с фонозаписью лабораторных работ, сделанной носителями языка. Организация материала внутри каждой лабораторной работы предусматривает формирование речевых умений от первичных навыков употребления лексических единиц по данной теме до упражнений, подготавливающих студентов к диалогической или монологической речи.

Предназначены для студентов 1-го и 2-го курсов факультета «Двигатели летательных аппаратов» дневной формы обучения. Подготовлены на кафедре иностранных языков.

ББК Ш 143. 24-923

# Лабораторная работа 1

## Самарский государственный аэрокосмический университет

**Задание 1.** Прослушайте, повторите и запомните слова:

- |                              |                                  |
|------------------------------|----------------------------------|
| 1. aerospace                 | - аэрокосмический                |
| 2. training                  | - обучение                       |
| 3. related industries        | - смежные отрасли промышленности |
| 4. founder                   | - основатель                     |
| 5. faculty                   | - факультет                      |
| 6. aircraft                  | - самолет, авиация               |
| 7. engine                    | - двигатель                      |
| 8. engineering               | - техника                        |
| 9. economics                 | - экономика                      |
| 10. management               | - управление                     |
| 11. simultaneously           | - одновременно                   |
| 12. staff                    | - штат сотрудников               |
| 13. department               | - кафедра                        |
| 14. a yacht club             | - яхт-клуб                       |
| 15. a hostel                 | - общежитие                      |
| 16. facility                 | - удобства                       |
| 17. to be engaged            | - быть вовлеченным в             |
| 18. applied                  | - прикладной                     |
| 19. research and development | - исследование и развитие        |
| 20. specialization           | - специализация                  |
| 21. adherence to             | - приверженность                 |
| 22. provide for              | - обеспечивать                   |
| 23. bilingual                | - двуязычный                     |
| 24. management and marketing | - управление и маркетинг         |

**Задание 2.** Прочтите и догадайтесь о значении следующих слов и словосочетаний:

leading higher education institution; space-rocket construction industry; to be re-named; to include; a catering facility; distinctive feature; adherence to; education through research principle; to take part in; to develop cooperation with; cooperation agreements.

**Задание 3.** Прочтите и переведите текст.

### Samara State Aerospace University

Samara State **Aerospace** University (SSAU) is a leading higher education institution for the **training** of engineers for the aviation, space-rocket construction and radio-electronics and other **related industries**. It was established in 1942 as the

Kuibyshev Institute of Aviation. In 1966 it was renamed after S.P.Korolyov, the **founder** of cosmonautics, and in 1992 the institute became Samara State Aerospace University.

There are seven **faculties** at the University: Faculty of Aircraft Construction, Faculty of **Aircraft Engines**, Faculty of Aviation Transport Engineers, Faculty of Plastic Working of Metals, Faculty of **Radio-Engineering**, Faculty of Information Science, College of **Economics and Management**.

About 6000 students are **simultaneously** trained at the University, and its **staff** includes more than 7000 teachers. The University has 40 **departments**, laboratories, classrooms, computing centres, a well-stocked library, a sports club, a sports centre with a swimming-pool, a summer sports camp, a **yacht** club, a museum of aviation, a museum of aircraft engine history, a fitness and health centre, a catering **facility**, a print facility, seven student **hostels** and others.

The University is a large scientific centre **engaged in** theoretical and **applied research and development**. Now its seven faculties train students in 21 **specializations**. One distinctive feature of the University is **adherence to** the "education-through research" principle. Students have always taken an active part in research efforts. The University's strong scientific traditions and excellent facilities make it a leading institution for both state and regional scientific programmes. As a result of research and development carried out at the University a number of instruments, devices and systems have been developed, made, tested and commercially produced in small quantities.

In 1990 the University began to intensively develop cooperation with foreign partners. Cooperation agreements with foreign universities **provide for** training of **bilingual** specialists. The developments also help develop specialists in **management and marketing**.

The Aerospace University's foreign partners include Oxford Polytechnic (Great Britain), Munich Technical University (Germany), Bradley University and Dowling College (USA) and others.

**Задание 4.** Задайте к тексту письменно 3 специальных вопроса (1 вопрос к подлежащему), 2 общих вопроса, 1 альтернативный и 1 разделительный вопросы.

**Задание 5.** Дайте английские эквиваленты: ведущее высшее учебное заведение; предприятие; постоянно; специализация; готовить; одновременно; штат сотрудников; кафедра; общежитие; отличительная черта; верность чему-либо; предоставлять; управление; двуязычный.

**Задание 6.** Согласитесь или опровергните утверждение. Начинайте предложения с фраз: I'm afraid that's wrong; you are quite right/you are not quite right; that's not quite so; I think you are mistaken; as far as I know; I think so/I don't think so; according to the text.

1. SSAU is a leading higher education institution for the training of engineers for the aviation only.

2. It was established in 1942, wasn't it?
3. About 7000 students are simultaneously trained at the University.
4. The University is only a large educational centre.
5. Students have always taken an active part in research efforts.
6. The University's seven faculties train students in 15 specializations.
7. The University doesn't have any foreign partners.

**Задание 7.** Не глядя в текст, дополните предложения.

1. SSAU is .....
2. ....in 1942.
3. In 1966.....
4. There are ..... at the University.
5. .... are simultaneously trained at the University.
6. The University is a large scientific centre .....
7. Students have always taken an active part .....
8. .... for both state and regional scientific and technological programmes.
9. A number of instruments, devices and systems .....

**Задание 8.** Составьте из данных слов предложение: logical; the; was; establish-ment; the; needed; of; Institute; a; engineers; such; plants; the; during; and; hard; needed; time; as; planes; front.

**Задание 9.** Расскажите по-английски тему "SSAU".

**Задание 10.** Письменно переведите текст.

### How to Improve your English

Relax as you learn but learn as you relax. Even the playing of a game requires a certain amount of work. Learn carefully a definite period every day - two hours, an hour, even half an hour if that is all you can spare. But once you have decided upon the schedule, stick to it. Make your studying a daily habit and remember the old Roman adage: "*Make haste slowly*". Don't try to learn too much at one sitting. Knowledge like a food, must be chewed and swallowed a little at a time.

The best way to learn a new subject is to stop from time to time to ask yourself how much material has become firmly fixed in your mind. Learn to read with your memory as well as with your own words.

Unlike your money, your knowledge increases as you share it.

#### Notes:

- schedule – план  
 stick to – придерживаться  
 adage – пословица  
 haste – торопиться  
 chew – жевать

## Контрольная работа 1

### I. Чтение

**Задание 1.** Прочтите текст, поймите его содержание, вставьте вместо пропусков слова из рамочки.

facilities, provide, for, learning, computer, comfortable, range

#### The Oxford Polytechnic

Oxford is probably the greatest centre of ... 1.... in the world. It has been a place to study for seven hundred years.

The Oxford Polytechnic may only have existed ...2.... 20 years but its reputation throughout Britain and indeed throughout the world has become second to none. Over 5000 students are studying the widest ...3.... of subjects here. What strikes you most is the extraordinary range of equipment and .. 4.... .

There are a quarter of a million books on the premises for you to read in the library or to take away. Another thing is the .. 5.... . It works 24 hours a day and 7 days a week. If you have a problem with speaking English there's a language laboratory to teach you quickly and sympathetically. There's a doctor to ...6.... advice and treatment free to all students. There are all sorts of sports available here.

The Polytechnic does everything it can to make your life ...7.... . So wherever you come from you'll be made to feel that the Polytechnic is home.

**Задание 2.** Вам даны ответы. Задайте к ним вопросы.

1. For seven hundred years.
2. Yes, it does. It works 24 hours a day and 7 days a week.

**Задание 3.** Расположите предложения в логической последовательности.

1. Oxford and Cambridge, the oldest universities are world-known for their academic excellence.
2. The academic year is split into three terms.
3. There are 46 universities in Britain.
4. After three years of study a university graduate will leave with the Degree of Bachelor of Arts or Science.
5. They differ from one another in history, tradition, academic organization.
6. Formal teaching takes place in the first terms which last for twenty four weeks in total.
7. A university usually consists of colleges.
8. Universities teach in all major subject areas: arts, science, law, engineering, medicine, social sciences.
9. The third term is reserved for classes and examinations and last for six weeks.
10. He can continue to take his Master's Degree and then the Doctor's.

### II. Грамматика

**Задание 1.** Задайте вопрос к подчеркнутому слову.

It takes me 25 minutes to get to the office.

**Задание 2.** Найдите ошибку и исправьте ее.

A B C D

At the end of the day they all are hungry and Jack's aunt gives a big meal them.

**Задание 3.** Переведите на английский язык.

1. В моей библиотеке много прекрасных книг.
2. Посмотри в окно. Идет сильный дождь. Дождь идет уже 2 дня.
3. Мне жаль, но я не могу принять ваше предложение. У меня много работы.
4. Вы когда-нибудь пробовали (to taste/to try) японскую еду?
5. Когда я пришел в университет, то узнал, что профессор заболел.
6. Шел сильный снег, но мы надеялись, что скоро он прекратится.
7. Если вы немного подумаете, то дадите мне правильный ответ.
8. В этой ситуации есть что-то странное, не правда ли?

## Лабораторная работа 2

### С.П. Королёв

**Задание 1.** Прослушайте, повторите и запомните слова:

- |                         |                             |
|-------------------------|-----------------------------|
| 1. designer             | - конструктор               |
| 2. artificial           | - искусственный             |
| 3. to launch            | - запускать                 |
| 4. under the guidance   | - под руководством          |
| 5. acquaintance         | - знакомство                |
| 6. jet-propulsion       | - реактивное движение       |
| 7. participation        | - участие                   |
| 8. to devote oneself to | - посвятить себя чему-либо  |
| 9. to earn              | - зарабатывать, заслуживать |
| 10. to award            | - награждать                |

**Задание 2.** Прочтите и догадайтесь о значении следующих слов:

System, sphere, cosmic, academician, aero-mechanical, group, hero, prize, bureau, enthusiast, experimental, talent, organizer, ideas, spirit, satellite, industry, title, order.

**Задание 3.** Прочтите и переведите текст.

#### Sergey Korolyov

Academician Sergey Korolyov was an outstanding Soviet scientist and **designer** of space-rocket systems. The first **artificial** Earth satellites and spaceships in which man made his first cosmic flights were made **under S.P.Korolyov's guidance**.

Korolyov was born on January, the 12<sup>th</sup> 1907, in the city of Zhitomir into the family of a teacher. From 1927 he worked in the Aircraft industry. In 1930, without

leaving his job, he graduated from the aeromechanic department of the Moscow Bauman Higher Technical School and finished a flyer's school the same year.

After **acquaintance** with Konstantin Tsiolkovsky and his ideas Korolyov became an enthusiast and one of the founders of space-rocketry engineering.

In 1933 the Group for Studying **jet propulsion** was organized with his **participation**, and they made the first experimental rockets. From then on he **devoted himself** entirely to developing Soviet space-rocketry engineering.

Korolyov reared many leading scientists and engineers who are now working in research and design bureaus in the sphere of space-rocketry engineering.

S.P.Korolyov was a talented research worker, a brilliant organizer and a man of high spiritual qualities. In 1967 our university was named after academician S.P.Korolyov.

Sergey Korolyov's fruitful work **earned** him the gratitude of the people and he received high government **awards**. He was twice awarded the title of Hero of Socialist Labour, and received the Lenin Prize, and Orders and Medals of the Soviet Union.

**Задание 4.** Дайте русские эквиваленты:

designer of space-rocket systems, artificial Earth satellites, aircraft industry, jet propulsion, space-rocketry engineering, design bureau, research worker, spiritual qualities, high government awards.

**Задание 5.** Найдите в тексте английские эквиваленты русских словосочетаний:

выдающийся советский ученый и конструктор, космические корабли, под руководством Королева, без отрыва от работы, летная школа, после знакомства с К.Э. Циолковским, основоположник ракетно-космической техники, полностью посвятил себя, талантливый исследователь.

**Задание 6.** Переведите производные:

- to design - design - designer
- to lead - leader - leading
- to found - founder - foundation
- to organize - organizer - organization
- to acquaint - acquaintance
- to participate - participant - participation
- science - scientist - scientific

**Задание 7.** Подберите синонимы:

- |                           |                       |
|---------------------------|-----------------------|
| 1. to design              | 1. to take part       |
| 2. to launch              | 2. to meet somebody   |
| 3. to participate         | 3. to construct       |
| 4. to devote oneself to   | 4. to start           |
| 5. to award               | 5. famous             |
| 6. artificial             | 6. to give oneself to |
| 7. outstanding            | 7. man-made           |
| 8. to get acquainted with | 8. to reward          |



**Задание 8.** Задайте вопросы к выделенным словам:

In 1933 the Group for Studying Jet Propulsion was organized with Korolyov's participation.

**Задание 9.** Согласитесь или опровергните утверждение. Начинайте предложение с фраз: I'm afraid that's wrong; you are quite right/ you are not quite right; that's not quite so; I think you are mistaken; as far as I know; I think so; according to the text.

1. The first artificial Earth satellites were made under Tsiolkovsky's guidance.
2. S.P. Korolyov graduated from the Engine Design Department of Samara State Aerospace University.
3. After acquaintance with Tsiolkovsky Korolyov became an enthusiast of space-rocketry engineering.
4. S.P.Korolyov devoted himself entirely to developing radio-engineering.
5. In 1992 our University was named after academician S.P.Korolyov.
6. S.P.Korolyov reared many leading scientists and engineers who are now working in the sphere of space-rocketry engineering.

**Задание 10.** Задайте к тексту 7 вопросов: общий, альтернативный, разделительный, специальный вопрос к подлежащему и 3 специальных вопроса к остальным членам предложения.

**Задание 11.** Расскажите по-английски тему "S.P.Korolyov".

**Задание 12.** Письменно переведите текст.

### **К.Е. Tsiolkovsky**

K.E.Tsiolkovsky, the founder of the modern theory of jet propulsion was born in 1857 in the little town of Izhevskoye in the Ryasan region. At the age of nine he fell seriously ill and became almost deaf. He could not go to school and continued to study at home, and books became his only teachers. At the age of 16 Tsiolkovsky was sent by his father to Moscow to study. He studied hard and three years later he came back home and earned his living by teaching mathematics at school.

K.E.Tsiolkovsky made a great contribution to the theory of rocket flight. In his paper "The Aeroplane or Bird-like Flying Machine", Tsiolkovsky suggested a design which is like the modern aeroplane. He foresaw that internal combustion engine would become the chief form of propulsive power for aircraft. It was Tsiolkovsky who proposed the idea of creating artificial satellites of the Earth, the principle of multistaged rocket.

## **Контрольная работа 2**

### **I. Чтение**

**Задание 1.** Прочтите текст и поймите его содержание. Заполните пропуски словами из рамочки:

pioneer, researcher, science, designed, founder, devote, development, aircraft, aviation, investigated
--

Since the early nineties Zhukovsky turned to ...1.... a new branch of engineering, which held out new horizons for the ...2.... The Moscow University Laboratory of Applied Mechanics headed by Zhukovsky, began to ...3.... increasing attention to the subject. Models of ...4.... and aerodynamic instruments were ...5...., built and tested, and various aerohydrodynamic problems ...6....

In 1898, the X Congress of Naturalists and Physicians was held in Kiev. In a report to the Congress entitled "On Aeronautics" Zhukovsky outlined the future ...7.... of heavier-than-air craft.

The reports "On the Soaring of Birds" and "On Aeronautics" marked the beginning of Zhukovsky's work as a ...8.... of aviation in Russia and a ...9.... of aeronautical ...10.... From then on his interest in aviation clearly predominated over his other scientific interests.

**Задание 2.** Выберите номера предложений, которые соответствуют содержанию текста:

1. At the end of the 19<sup>th</sup> century the Laboratory of Applied Mechanics was headed by K.E.Tsiolkovsky.
2. Since the early nineties Zhukovsky devoted himself to aviation.
3. He designed, built and tested models of aircraft and aerodynamic instruments.
4. The report "On Aeronautics" was made by Zhukovsky at the X congress of Naturalists and Physicians in Kiev.
5. Well before the first aeroplanes Nikolai Zhukovsky turned to the construction of dirigible balloons.
6. Zhukovsky's interest in aviation predominated over his other scientific interests.

**Задание 3.** Вам даны ответы. Задайте к ним по 2 специальных вопроса.

1. At the end of the 19<sup>th</sup> century Zhukovsky was the most popular professor at the University and the leading figure in aeronautics.
2. This outstanding event in the history of aviation took place in Petersburg in 1913.

## II. Грамматика

**Задание 1.** Употребите нужную форму сравнения:

1. Hydrogen was the (light) gas man knew.
2. Airplane can fly at (high) speed than helicopter.
3. This aeroplane can carry (many) passengers than that one.
4. The (powerful) the engine, the (great) distance the plane can cover.

**Задание 2.** Найдите ошибку и исправьте ее.

A

The airplane principle was regarded the better one because the airplane

B

C

was easier and less expensive in comparison to dirigible.

**Задание 3.** Переведите предложения.

1. Чем мощнее двигатель, тем выше скорость летательного аппарата.

2. Его доклад на конференции был самым лучшим.
3. Характеристики этой силовой установки хуже.
4. Дальнейшее развитие авиации зависит от совершенствования двигателей.
5. Чтобы сделать эту работу, мне нужно больше данных.

## Лабораторная работа 3

### Россия

**Задание 1.** Прослушайте, повторите и запомните слова:

- |                                   |   |
|-----------------------------------|---|
| 1. vast territory                 | - обширная территория                     |
| 2. to lie                         | - лежать, находиться                      |
| 3. to be washed by                | - омываться                               |
| 4. to border on                   | - граничить с                             |
| 5. to vary from smth. to smth.    | - изменяться от чего-либо до чего-либо    |
| 6. a desert                       | - пустыня                                 |
| 7. a valley                       | - долина                                  |
| 8. a mountain chain               | - горная цепь                             |
| 9. to be rich in                  | - быть богатым чем-либо                   |
| 10. natural and mineral resources | - природные ресурсы и полезные ископаемые |
| 11. a deposit of smth.            | - месторождение чего-либо                 |
| 12. the current population        | - население в настоящий момент            |
| 13. a parliamentary republic      | - парламентская республика                |
| 14. Head of State                 | - глава государства                       |
| 15. a branch                      | - власть (как часть правительства)        |
| 16. legislative                   | - законодательный                         |
| 17. executive                     | - исполнительный                          |
| 18. judicial                      | - судебный                                |
| 19. to be exercised by            | - осуществляться (кем-либо, чем-либо)     |
| 20. the Federal Assembly          | - Федеральное собрание                    |
| 21. a chamber                     | - палата                                  |
| 22. the Council of Federation     | - Совет Федерации                         |
| 23. the State Duma                | - Государственная дума                    |
| 24. to be headed by               | - возглавляться кем-либо                  |
| 25. to be elected by              | - избираться кем-либо                     |
| 26. the Cabinet of Ministers      | - кабинет министров                       |
| 27. a system of courts            | - система судов                           |
| 28. the Constitutional Court      | - Конституционный суд                     |
| 29. the Supreme Court             | - Верховный суд                           |

**Задание 2.** Прочтите и переведите текст.

### Russia

The **vast territory** of Russia **lies** in the eastern part of Europe and the northern part of Asia. Russia **is washed by** twelve seas and three oceans. The oceans are: the Arctic, the Atlantic, the Pacific. The seas are: the White Sea, The Black Sea, the Baltic Sea and others.

Russia **borders on** many countries, such as Mongolia and China in the south-east, Finland and Norway in the north-west and so on.

The land of Russia **varies** very much **from** forests **to** deserts, from high mountains to deep **valleys**. The main **mountain chains** are the Urals, the Caucasus and the Altai. There are a lot of great rivers and deep lakes on its territory. The longest rivers are the Volga in Europe and the Ob, the Yenisei and the Lena in Asia. The largest lakes are Ladoga and Baikal.

The Russian Federation is **rich in natural and mineral resources**. It has **deposits of** gas, oil, coal, iron, gold and many others.

The **current population** of Russia is more than 150 million people.

Russia is a **parliamentary republic**. Head of the State in this country is the President. The government consists of three **branches: legislative, executive and judicial**. The **President** controls each of them.

The legislative power is **exercised by the Federal Assembly**. It consists of two **chambers: The Council of Federation and The State Duma**. Each chamber is **headed by the Speaker**. The members of the Federal Assembly **are elected by** the people for four years.

The executive power belongs to the Government, or **the Cabinet of Ministers**. The government is headed by the Prime Minister.

The judicial power belongs to the **system of courts**. It consists of **the Constitutional Court, the Supreme Court** and other courts.

The national symbol of Russia is a white-blue-and-red banner.

**Задание 3.** Ответьте на вопросы:

1. Where does the vast territory of Russia lie?
2. What mineral resources are there in Russia?
3. What is the form of government in Russia and who is it headed by?
4. What is the national symbol of Russia?

**Задание 4.** Подберите из "B" подходящие по смыслу слова к "A".

**A:**

1. presidential
2. vast
3. supreme
4. federal
5. mountain
6. national
7. legislative

**B:**

- a) assembly
- b) court
- c) symbol
- d) chains
- e) power
- f) territory
- g) republic

**Задание 5.** Переведите производные:

- to vary – variety – various – variable – varied  
nature – natural – naturally  
to elect – election – elective – elector – electoral

**Задание 6.** Дайте английские эквиваленты: обширная территория; омываться чем-либо; граничить с; меняться; пустыня; долина; горная цепь; глубокие озера; быть богатым чем-то; минеральные ресурсы; месторождения; парламентская республика; состоять из; совет федерации; избираться; возглавляться кем-либо.

**Задание 7.** Переведите на английский язык.

- а) Байкал – самое большое и глубокое озеро в мире.
- б) На обширной территории России много лесов, высоких горных цепей, долин, рек и озер.
- в) Едва ли есть какая-нибудь другая страна в мире, которая так богата природными ресурсами и полезными ископаемыми.
- д) Президент является главой государства.
- е) Законопроект (a bill) должен быть одобрен (to approve) и подписан (to sign) президентом.

**Задание 8.** Письменно переведите текст, начиная со слов “The legislative power” и до конца.

**Задание 9.** Задайте вопросы.

1. Russia borders on many countries. ( yes/ no question)
2. There are a lot of great rivers and deep lakes in Russia. ( tail question)
3. The President controls each of them. (wh-question to the subject)
4. The members of the Federal Assembly are elected by people for four years. (2 wh-questions)

**Задание 10.** Расскажите по-английски тему “Russia”.

**Задание 11.** Прочтите текст. В первой части текста найдите ошибки (5) и исправьте их. Вторую часть текста переведите письменно. Слова после текста помогут вам перевести текст.

### **Moscow (part 1)**

Moscow is the capital of the Russian Federation, it administrative, economic, political and educational centre with the population of about 9 millions people. Its total area is about 900 thousand square kilometres.

The city was founded by Prince Yuri Dolgoruky and was first mentioned in the chronicles in 1147. At that time it was a small frontier settlement. By the 15<sup>th</sup> century Moscow has grown into a wealthy city.

In the 16<sup>th</sup> century under Ivan the Terrible, Moscow became capital of the state of Moscovy. In the 18<sup>th</sup> century Peter the Great has transferred the capital to St.Petersburg, but Moscow remained the heart of Russian. That is why it became the

main target of Napoleon's attack in 1812. During the war of 1812 three quarters of the city were destroyed by fire, but by the middle of the 19<sup>th</sup> century Moscow was complete rebuilt.

The present-day Moscow is the seat of the government of the Russian Federation.

Moscow is a major industry city. Its leading industries are engineering, chemical and light industries.

### (part 2)

Moscow attracts tourists from all over the world. It is known for its beautiful old cathedrals, churches and monasteries. Some of them date from the 15<sup>th</sup> to the 17<sup>th</sup> centuries. Moscow is also noted for its many historical buildings, for the famous Bolshoi, Maly and Art theatres as well as for its art museums. There are more than 80 museums in Moscow, and the most popular of them are the Tretyakov Gallery and the Pushkin Museum of Fine Arts. The Tretyakov Gallery houses a unique collection of Russian painters. Almost all famous Russian painters are represented there. The Pushkin Museum of Fine Arts contains a vast collection of antiquities and a well-known collection of modern foreign painters including Impressionists.

The oldest part of Moscow is the Kremlin. This the main tourist attraction in Moscow. In 1156 a small settlement of Moscow was surrounded by a wooden wall, and became a Kremlin. The word "Kremlin" means "fortress", and it used to be a fortress until the 17<sup>th</sup> century. There are 20 towers in the Kremlin. The Spasskaya Tower is the symbol of Russia and Moscow. It has a famous clock which was installed in the middle of the 19<sup>th</sup> century.

Moscow is a city of science and learning. There are over 80 higher education institutions in the city, including a number of universities.

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total area	- общая площадь
to be first mentioned in the chronicles	- быть впервые упомянутым в летописях
frontier settlement	- пограничный поселок
to grow into a wealthy city	- превратиться в процветающий город
to transfer the capital to	- перенести столицу в
to become the main target	- стать главной целью
engineering	- машиностроение
chemical industry	- химическая промышленность
light industry	- легкая промышленность
to attract tourists	- привлекать туристов
to be known for	- быть известным чем-либо
a cathedral	- собор
a church	- церковь
a monastery	- монастырь
date from	- относиться к
to be noted for smth.	- быть известным чем-либо

an art museum	- художественный музей
to house	- вмещать
a unique collection of smth.	- уникальная коллекция чего-либо
to be represented	- быть представленным
to contain smth.	- содержать что-либо
a vast collection of smth	- большая коллекция чего-либо
antiquities	- древности
the main tourist attraction	- основной предмет интереса туристов
a fortress	- крепость
to be surrounded by	- быть окруженным
to cease to be a fortress	- перестать быть крепостью
to be installed	- быть установленным
science and learning	- наука и образование
a higher education institution	- высшее учебное заведение

### Контрольная работа 3

#### I. Чтение

**Задание 1.** Прочтите текст, поймите его содержание, вставьте вместо пропусков слова из рамочки.

developed, confluence, frontiers, banks, including, mention, scientific

#### Samara

The Samara **region** lies along the **picturesque** ...1.... of the Volga.

The city of Samara is the region's administrative center, **stretching** along the left bank from the ...2.... of the Volga with the Samara river, from which the city takes its name. The population of Samara is currently over one million, placing it within the **ranks** of the first ten Russian cities.

The first ...3.... of Samara in Russian historical **manuscripts** goes back to the XVI century; when military **strongholds** were **erected** along the Volga to guard Russia's eastern ... 4.... ; the Samara fortress was built in 1586.

By the beginning of the XX century Samara was the most **populous** of the cities along the Volga, and it was one of the most highly-...5.... provinces in Russia. The city **boasted** its own theatre, library, museum and **local** newspaper. Large **detached** houses and **public** buildings, many of which have **survived** to this day, were erected in **variety** of **architectural** styles.

During World War II, Samara was "the second capital" of our country, and many large plants and factories were brought to Samara.

Now Samara is one of the largest ...6.... and educational centres of Russia. In the city there are 12 universities, ...7.... the Aerospace State University, The Technical University and the Economics University.

region	- область, регион, край
picturesque	- живописный, колоритный
to stretch	- тянуться
confluence	- слияние
rank	- ряд
manuscript	- рукопись
go back to	- брать начало
stronghold	- крепость, цитадель
to erect	- воздвигать
to guard	- охранять
populous	- густонаселенный
to boast	- гордиться
local	- местный
increasingly	- все более, в большей степени
attractive	- привлекательный
detached	- отдельный
public	- общественный
to survive	- выжить, уцелеть
variety	- разнообразие
architectural	- архитектурный

**Задание 2.** Задайте вопросы к данным ответам.

1. It is currently over one million.
2. No, they don't. They go back to the XVI century.
3. To guard Russia's eastern frontiers.
4. By the beginning of the XX century.
5. Its own theatre, library, museum and local newspaper.

**Задание 3.** Напишите данные предложения в правильной последовательности.

1. With time, the city became increasingly attractive.
2. Welcome to our **hospitable** (гостеприимный) city located in the centre of Russia.
3. 1851 saw the official establishment of the Samara Province, which later developed into the Mid-Volga Region and then into the Samara Territory.
4. The Samara of today is an **amalgam** (сочетание) of the old and the new, it is **constantly** (постоянно) in motion.
5. The **roots** (корни) of Samara's current dynamic industrial development go back into the middle of the XIX century.
6. Samara was founded in 1586 to be followed by those of Syzran and Stavropol (nowadays – Togliatti).

## II. Грамматика

**Задание 1.** Задайте вопросы к подчеркнутым словам.

The students of our group had to go to the plant last week.



**Задание 2.** Раскройте скобки, употребляя нужную форму модального глагола.

1. When the fog lifts we (can, could, will be able to, are able to) see where we are.
2. You (must, have to, had to, has to, will have to) read this book. It's really useful.
3. He (can't leave, couldn't have left, couldn't leave, needn't leave), he is ill.
4. At five years old she (could, can, will be able to) read English very well.
5. Mr. Brown (must, have to, had to, has to, will have to) cook his meals because his wife is away.
6. The buses were all full. I (must, have to, had to, has to, will have to) get a taxi.
7. (Can, may, must, should, have to) you show me the way to Trafalgar Square, please?
8. I (can't, couldn't, am able to) find my bag anywhere.
9. You (might have left, must leave, needn't have left, may leave) it in the shop.
10. I phoned him but nobody answered. They (must, had to, must have gone) already.
11. When I first went to Spain I (can, could, was able to) read Spanish, but I (could, can, can't, couldn't, was unable to) speak it.

## Лабораторная работа 4

### Великобритания

**Задание 1.** Прослушайте, повторите и запомните слова:

- |                              |                                 |
|------------------------------|---------------------------------|
| 1. political unity           | - политическое единство         |
| 2. decline                   | - упадок, спад                  |
| 3. chalk and limestone hills | - меловые и известняковые холмы |
| 4. major                     | - основной, главный             |
| 5. to rely upon imports      | - полагаться на импорт          |
| 6. raw materials             | - сырье                         |
| 7. to be responsible for     | - быть ответственным            |
| 8. to submit to              | - представлять на рассмотрение  |
| 9. the party in power        | - правящая партия               |
| 10. the party out of power   | - оппозиционная партия          |
| 11. to supplant              | - вытеснить, занять место       |
| 12. to elect                 | - выбирать                      |
| 13. to appoint               | - назначать                     |
| 14. hereditary               | - наследственный                |
| 15. consumer goods           | - потребительские товары        |
| 16. duration                 | - срок, продолжительность       |
| 17. national affairs         | - внутренние дела               |

**Задание 2.** Прочтите и догадайтесь о значении следующих слов:

the United Kingdom, Northern Ireland, England, Wales, population, port, industry, export, import, textile, product, monarchy, parliament, leader, to criticize, motor vehicles, civil, military aircraft, helicopters.

**Задание 3.** Прочтите и переведите текст.

### Great Britain

The United Kingdom of Great Britain and Northern Ireland is the **political unity** of England, Scotland, Wales, Northern Ireland. It is one of the most powerful countries in the world though its importance has shown a marked **decline**.

In mid-1990 the population of Britain was about 58,8 million people and its territory is 245 thousand square kilometers.

In geographical descriptions, Britain is usually divided into two **major** regions: Highland Britain and Lowland Britain. Highland Britain includes Scotland, Lake District, almost the whole of Wales and the **counties** of Devon and Cornwall. Lowland Britain is a rich plain with **chalk and limestone hills**.

The largest cities of Great Britain are: London, Birmingham, Glasgow, Liverpool, Bristol and Cardiff.

Britain's major industries include iron and steel, engineering, including motor vehicles and aircraft, textiles and chemicals. As a result of this Britain's main exports are: **manufactured goods** such as machinery, vehicles, aircraft, metal manufactures, electrical apparatus. Britain's aerospace industry is well known for producing civil and military aircraft, helicopters and space vehicles. However, it should be remembered that Britain **relies heavily upon imports** of metal and ores, textile **raw materials** and many other products.

Great Britain is a monarchy, but the power of the Queen is not absolute, but constitutional. The power of the Queen is **hereditary**, and not **elective**. Her powers are limited by Parliament. Parliament consists of two Houses: the House of Commons and the House of Lords. Parliament **has a maximum duration** of five years. The House of Lords is hereditary. The House of Commons is elected and consists of 635 Members of Parliament. The leader of the party that has majority in the House of Commons becomes the Prime Minister of Great Britain. The Prime Minister is appointed by the Queen and all other ministers of the Government are **appointed** on the recommendation of the Prime Minister. He is the virtual ruler of the country, **responsible for every measure submitted** to Parliament. Opposition is the name given in British politics to **the party out of power** whose aim is to criticize and, if possible, **supplant the party in power**.

Among the political parties we can mention the Conservative Party, the Labour Party, the Communist Party and the recently formed Social Democratic Party.

**Задание 4.** Задайте к тексту письменно 3 специальных вопроса, 2 общих вопроса, 1 альтернативный и 1 разделительный вопросы.

**Задание 5.** Найдите в тексте английские эквиваленты русских словосочетаний: одна из наиболее развитых стран в мире, в географических описаниях, равнина с меловыми и известняковыми холмами, основные отрасли промышленности,

следует помнить, сильно зависит от импорта, сырье для текстильной промышленности, вытеснить правящую партию, наследственная власть, палата общин, палата лордов.

**Задание 6.** Переведите производные:

- politics-politician-political
- produce-product-production
- constitute-constitution- constitutional
- major-majority
- lead-leader
- rule-ruler-ruling
- power-powerful
- response-responsible-responsibility

**Задание 7.** Вставьте пропущенные слова:

1. Counties ..... London are mainly industrial.
2. Newer industries ..... vehicle manufacture, aircraft building, manufacture of a ..... consumer goods.
3. Engineering remains a ..... industry in Scotland.
4. Parliament ..... two Houses.
5. The House of Commons is .....
6. The Government is the body of ministers ..... the administration of national affairs.

---

include, responsible for, wide range of, major, elected, surrounding, consists of.

**Задание 8.** Согласитесь или опровергните утверждение. Начинайте предложения с фраз: I'm afraid that's wrong; you are quite right/ you are not quite right; that's not quite so; I think you are mistaken; as far as I know; I think so/ I don't think so; according to the text.

1. Great Britain is the most powerful country in the world.
2. England comprises Wales, Scotland and Northern Ireland.
3. England is a highland country.
4. The largest cities of Great Britain are Glasgow, Bombay, Columbus and Dallas.
5. Great Britain exports metal and ores, textile raw materials.
6. Great Britain is an absolute monarchy.
7. Opposition is the party out of power, whose aim is to criticize the Government.

**Задание 9.** Не глядя в текст, закончите предложения.

1. Britain's major industries include .....
2. Britain relies heavily upon .....
3. Great Britain is a monarchy, but .....
4. The Prime Minister is the leader of .....
5. Parliament consists of .....

**Задание 10.** Переведите на английский язык.

1. Великобритания - высокоразвитая индустриальная страна, крупный поставщик промышленной продукции и экспортер капитала.
2. Старейшая отрасль английской промышленности - текстильная - утратила прежнее значение.
3. Консервативная партия, крупнейшая политическая партия, образована в 1867 году и насчитывает 3 млн. человек.
4. Лейбористская партия основана в 1900 году. Эта партия насчитывает более 6 млн. человек.

**Задание 11.** Расскажите по-английски тему "Great Britain".

**Задание 12.** Письменно переведите текст.

The original basis of British industry was coalmining. The early factories grew up not far from the mining areas. Glasgow and Newcastle-upon-Tyne, each on a river, became centers of engineering and shipbuilding. Lancashire produced cotton goods and southwest Yorkshire woollens. Sheffield was concentrating on iron and steel. Birmingham and the other towns of the midlands developed light engineering, and later became the chief center for making vehicles. Britain's main exports are: manufactured goods such as machinery, vehicles, aircraft, metal manufactures.

#### Контрольная работа 4

##### 1. Чтение

**Задание 1.** Прочтите текст и поймите его содержание. Заполните пропуски словами из рамочки:

major, counties, lowland, population, areas, vehicle, goods, engineering, hills, occupiers

England is predominantly a ...1.... country. London, its surrounding ...2.... and the West Midlands generally benefited from the newer industries. These included chemicals, electrical and electronic ...3...., ...4.... manufacture, aircraft building, manufacture of a wide range of ...5...., including food, drink and tobacco products.

Wales is a country of ...6.... and mountains. The country has its own language, spoken by 19% of the ...7.... Agriculture ...8.... about 80% of the land area.

Scotland may be divided into three ...9.... . Engineering remains its ...10.... industry, but there has been a significant trend towards expansion in electronics.

**Задание 2.** Вам даны ответы. Задайте к ним вопросы.

1. 19 % of the population.
2. 80 % of the land area.

**Задание 3.** Выберите номера предложений, которые соответствуют содержанию текста:

1. There are upland regions in the North of England.

2. England's major industries include chemicals, electrical and electronic engineering.
3. London and surrounding counties benefited from manufacture of a wide range of consumer goods.
4. Wales is a country of mountains.
5. Wales has its own language.
6. The chief cities of Scotland are Edinburgh, Glasgow and Aberdeen.
7. Electronics is the major industry of Scotland.

## III. Грамматика

**Задание 1.** Замените следующие действительные обороты страдательными:

1. The Queen appoints the Prime Minister.
2. Lancashire produced cotton goods.

**Задание 2.** Укажите предложения, перевод которых следует начинать с предлога:

1. They were listened to with great interest.
2. He is often referred to as the founder of this school.
3. He has never been laughed at before.
4. The visitors were shown new types of machinery.
5. The students have been asked to take part in the discussion.
6. Such difficulties are often met with.
7. The results of this scientific work have been often referred to.

**Задание 3.** Поставьте глаголы, стоящие в скобках, в нужном времени в страдательном залоге:

Festivals of music and other arts (to held) every year in many cities in Britain.

London's most famous theatre (to build) in 1662.

The House of Commons (to elect) by the British people next year.

## Лабораторная работа 5

### Силовая установка

**Задание 1.** Прослушайте, повторите и запомните слова:

- |                |  |
|----------------|--|
| 1. power plant | - силовая установка                            |
| 2. kind        | - вид, тип                                     |
| 3. vehicle     | - аппарат для движения,<br>летательный аппарат |
| 4. amount      | - величина, количество                         |
| 5. ability     | - способность                                  |
| 6. to demand   | - требовать                                    |
| 7. engine      | - двигатель                                    |
| 8. thrust      | - тяга   |

9. weight	- вес
10. ratio	- отношение, коэффициент
11. to define	- определять
12. pound	- фунт
13. output	- выход, продукция
14. important	- важный
15. fuel	- топливо
16. consumption	- потребление
17. to try	- пытаться
18. to increase	- увеличивать
19. excess	- излишек
20. propulsion	- движение
21. overhaul	- ремонт
22. flexibility	- маневренность, приспособляемость, гибкость

**Задание 2.** Подберите синонимы.

1. power plant	1. thrust
2. decrease	2. require
3. consume	3. develop
4. ratio	4. product
5. output	5. reduce
6. receive	6. coefficient
7. create	7. get
8. demand	8. use
9. power	9. engine

**Задание 3.** Подберите антонимы.

1. increase	1. maximum
2. advantage	2. decrease
3. consume	3. increased
4. possible	4. disadvantage
5. reduced	5. provide
6. minimum	6. impossible
7. low	7. high

**Задание 4.** Прочтите и переведите следующие словосочетания:

any kind of vehicle; the ability to move; maximum power for minimum weight; horse power output; weight/power ratio; decreasing fuel consumption; the ability to run smoothly; carry its full load; carrying away excess heat; a means of propulsion; as low as possible; to meet the requirements.

**Задание 5.** Прочтите и переведите предложения.

1. This kind of power plants may be used in our vehicle.
2. Without a power plant there is no thrust.
3. The weight of every engine must be as little as possible.
4. Weight power ratio is a very important factor.

5. The designers try to decrease fuel consumption.
6. They also want to increase thrust.
7. During overhaul periods the engines must be well repaired.
8. In work the engines become hot. The excess heat is harmful.
9. Power plant is a means of propulsion.

**Задание 6.** Вставьте недостающие слова. Предложения переведите.

1. A machine that produces power is called a .....
2. Fuel ..... must be low.
3. The ..... must be high.
4. A power plant is a means of .....
5. They try to ..... the amount of power.
6. The designers want to ..... fuel consumption.

---

to decrease, to increase, power plant, consumption, propulsion, thrust

**Задание 7.** Переведите производные:

- able - unable - ability
- produce - producer- production - produced
- to require - required - requirement
- to define - defined - definite - definition
- to consume - consumption
- flexible - inflexible - flexibility
- to vary - variable - variation
- to necessitate - necessity - necessary - necessarily

**Задание 8.** Дайте русские значения следующих интернациональных слов:

machine, mechanism, problems, reduced, period, atmospheric, start, diesel, rocket, form.

**Задание 9.** Прослушайте, прочтите и переведите текст.

### Power Plant

Any **kind** of **vehicle** must move. The **ability** to move demands power. A machine that produces mechanical power or energy is called an **engine** or a power plant. Every engine must meet a number of requirements. First of all the engine must have the maximum power (or **thrust**) for minimum **weight**. Therefore every engine is to have the reduced weight per horse power of the engine. The weight in **pounds** per horse power **output** may be **defined** as weight/power **ratio**.

Then the **fuel consumption** must be as low as possible. And on the contrary the **amount** of power produced from consumed fuel for a given period of time must be as high as possible.

Another demand is the proper engine **flexibility**. Flexibility is the ability to run smoothly and perform properly at all speeds and through all variations of atmospheric conditions.

One more **important** requirement is the engine reliability. The engine is to have a long life with maximum of time between **overhaul** periods.

Besides, any engine must be started easily and carry its full load in a few minutes.

The necessity of carrying away **excess** heat developed by the engine has always been a problem of first importance too.

As mentioned before the power plant is a means of **propulsion**. Nowadays there exist many types of engines used for various purposes. There are gasoline engines, diesel engines, gas turbines, steam turbines, jet engines and rocket engines. Each of them has certain advantages and disadvantages over other forms of power plants.

**Задание 10.** Ответьте на вопросы.

1. What machine produces thrust?
2. What must the weight of any engine be?
3. Is it important to decrease the fuel consumption of the power plant?
4. What is the engine flexibility?
5. What must the period between engine overhauls be?
6. What necessity arises due to excess heat of the power plant?
7. How can you characterise the aviation power plant?
8. What types of engines do there exist nowadays?
9. Are all the engines equal in their (operation) qualities?

**Задание 11.** Переведите на английский язык.

1. Что называется силовой установкой?
2. Расход топлива должен быть как можно меньше.
3. Каждый двигатель должен работать как можно дольше без ремонта.
4. Двигатель должен запускаться легко и быстро достигать полную мощность.
5. Почему важной проблемой является необходимость устранения избытка тепла?
6. Сегодня существует много видов двигателей, не так ли?
7. Есть ли у двигателей недостатки?

**Задание 12.** Расскажите по-английски тему "Power Plant".

**Задание 13.** Составьте аннотацию текста, используя следующие ключевые фразы:

Примечание:

Аннотирование

Аннотирование – вторичная обработка письменной информации. Аннотация – (Abstract or Summary) краткая справка о статье, книге и т.п. с точки зрения содержания. Материал излагается в предельно сжатой форме.



### Требования к аннотации.

1. Лаконичность языка, т.е. использование простых предложений (глаголы употребляются всегда в настоящем времени в действительном или страдательном залоге. Модальные глаголы отсутствуют).
2. Строгая логическая структура текста аннотации.
3. Обязательное введение в текст английских безличных конструкций, с помощью которых происходит введение и описание текста оригинала.

### **Key-patterns**

1. The article ( text) deals with ...
2. As the title implies the article describes ...
3. It is specially noted ...
4. A mention should be made ...
5. It is spoken in detail ...
6. It is reported ...
7. The text gives a valuable information on ...
8. Much attention is given to ...
9. The article gives a detailed analysis of ...
10. It should be stressed (emphasized) that ...
11. The title (name, head line, heading) of the article is ...
12. The article consists of (contains, includes, falls into) ... (3) parts, sections.
13. The subject (topic, theme) of the article (text) is ...
14. The article provides the reader with some data on ... (some material/information on) ...
15. The purpose (aim, object) of the article (text) is to provide ...

The development of the aircraft engine was more rapid than that of the airplane itself. The demand for increased speed was met by the development of engines of higher power rather than the marked improvement in aerodynamics.

Many of the petrol engines used in the early planes were patterned upon those designed for motorcars. The aircraft development was influenced by World War I. The designers were faced with the problem dealing with the power of engines, in conjunction with the decrease in their weight per horsepower. Great attention was paid to the efficiency of various types of engines. But when one is told that an aircraft engine is efficient, it must be realized that it is efficient as compared with other aircraft engines. As compared with an electric motor it is really very inefficient.

For the first forty years of powered flight the piston engine was used almost exclusively as a source of power as it could produce power enough to develop a higher speed compared with other types of engines then existing.

Nowadays there are many types of engines in use for various purposes. These engine types have one thing in common. The energy is derived from a chemical reaction which takes place inside the engine itself. Therefore all the engines used in aircraft can be classed as internal combustion engines. In general, internal combustion engines may be divided into piston and jet engines.

## Контрольная работа 5

**Задание 1.** Найдите в тексте 5 грамматических ошибок.

The term "internal combustion piston engine" refer to engines in which air and gasoline are burn inside the metal cylinders and which drive rotating crankshaft by means of piston and connecting rods. Since a great deal of heat produced when the gasoline mixture burns or explodes, some means must be provided to carrying away the excessive heat. According to the cooling system employed the piston engines may class as air-cooled engines and liquid-cooled ones.

**Задание 2.** Задайте к тексту 2 yes/no questions, 2 wh-questions and 1 tag question.

**Задание 3.** Дайте русские эквиваленты: term; refer to; gasoline; to burn; to drive; to rotate; by means of; piston; connecting rod; to produce; mixture; to explode; to provide; to carry away; excessive heat; according to; to employ.

**Задание 4.** Поставьте сказуемое в правильном залоге.

1. Since it is a machine that (to produce) power, it ( to call) an engine.
2. These problems (to work at) by Russian scientists.
3. Russia (to launch) more than 2,300 space vehicles which (to design) to perform a variety of functions.
4. In space such cooling system could (to increase) the life of future space station refueling ports by cooling the large liquid-hydrogen fuel tanks.
5. In future earth applications it could (to use) for cooling hydrogen-powered cars and planes.
6. Today's aircraft (to replace) with a new form of supersonic transport.
7. The steam engine (to invent) in 1825.
8. The future of mankind (to depend) on the direction in which scientific and technological progress (to develop).
9. At the moment a directed research (to carry out) to use underground hot water for heating houses.

## Лабораторная работа 6

### Конструкция двигателей

**Задание 1.** Прослушайте, повторите и запомните слова:

- |                       |                               |
|-----------------------|-------------------------------|
| 1. performance        | - летные характеристики       |
| 2. wide-body airliner | - широкофюзеляжный авиалайнер |
| 3. surpass            | - превосходить                |
| 4. create             | - создавать                   |
| 5. contradictory      | - противоречивый              |
| 6. determination      | - определение                 |
| 7. convert            | - превращать                  |
| 8. accomplish         | - совершать, выполнять        |
| 9. strength           | - прочность                   |

10. loss	- потери
11. facility	- вспомогательные средства
12. steam	- пар
13. influence	- оказывать влияние
14. advancement	- усовершенствование
15. melting point	- точка плавления
16. development	- развитие
17. achievement	- достижение
18. contaminate	- загрязнять
19. solve	- решать
20. environment	- окружающая среда

**Задание 2.** Найдите слова, одинаковые по значению:

- |               |                |
|---------------|----------------|
| 1. movement   | 1. develop     |
| 2. create     | 2. transform   |
| 3. convert    | 3. propulsion  |
| 4. accomplish | 4. because of  |
| 5. evolution  | 5. expert      |
| 6. due to     | 6. perform     |
| 7. specialist | 7. development |

**Задание 3.** Найдите слова, противоположные по значению:

- |                |                |
|----------------|----------------|
| 1. home-made   | 1. low         |
| 2. result from | 2. ineffective |
| 3. high        | 3. result in   |
| 4. effective   | 4. foreign     |
| 5. move        | 5. finish      |
| 6. begin       | 6. stand       |

**Задание 4.** Прочтите и догадайтесь о значении следующих слов:

mechanical power, constant engine evolution, aircraft performance, up-to-date supersonic airliners, wide-body airliners, automatic control, measuring and information systems, to meet modern requirements, exotic engines, engine complexity, propulsion of a vehicle, weight and strength characteristics, constructional material, aircraft engine development, rocket propulsion unit.

**Задание 5.** Прочтите предложения, вставляя пропущенные слова.

1. TU 154 is a ..... airliner.
2. Modern ..... are necessary in this work.
3. Very soon we shall .... nuclear, plasma, ion and other engines.
4. Engine ..... influences the aircraft building.
5. The main purpose of the engine is ..... the fuel energy into the energy of .....
6. This engine meets all modern .....

requirements, to convert, wide-body, to create, development, facilities, propulsion.

**Задание 6.** Прочтите и переведите предложения:

1. Any engine can be called a propulsion unit.

2. The engine greatly influences the aircraft performance.
3. The first power plants were steam units.
4. This problem is very complex and contradictory.
5. The engine must work without loss.
6. Our engines surpass foreign units in economics and strength.
7. The melting point of the constructional material is very high.

**Задание 7.** Прслушайте, прочтите и переведите текст.

### **Engine Designing**

To move and fly any aircraft demands power. A machine that produces mechanical power necessary for propulsion of a vehicle is called an engine. It is constant engine evolution that decidedly **influences** the aircraft **performance**.

From the first Mozhaisky's aircraft to up-to-date supersonic and **wide-body airliners** the aviation success mostly resulted from the aircraft engine **advancement**. Our **achievements** in cosmos are also connected with the aircraft engine **development**.

The first power plants were **steam** units but the aircraft engines have been constantly changing and finally turned into gas-turbine and rocket propulsion units. At present our home-made engines **surpass** foreign units in safety, economics and especially in weight and **strength** characteristics.

The main purpose of every engine is to **convert** the fuel energy into the propulsion one. The higher the temperature, the more effective this process is. And the temperature to be reached in the operation is much higher than the **melting point** of the constructional material. Therefore **creating** engines begins with **solving** very complex and **contradictory** problems - **determination** of the most optimum parameters permitted by modern science in the engine operating process. Then the designers work at developing such engine constructions that could **accomplish** this process without unnecessary **loss** and would have the long life and the high **strength**.

Experts in the field of automatic control, measuring and information systems also take part in developing engines. They make every effort to get units that could meet all modern requirements.

Today we speak about the necessity to **create** nuclear, plasma, ion and other exotic engines. Besides, it is quite necessary to have "clean" aircraft power plants, that is, aviation engines which do not **contaminate** the **environment** due to usage of hydrogen as the main fuel.

Aircraft-engine building is a fast developing branch of industry. The engine complexity doubles every 15 years. Aircraft engine designers must be well educated and able to **solve** the most difficult problems by using all modern knowledge, techniques and **facilities**.

**Задание 7.** Дайте английские эквиваленты:

совершенствование двигателей, паровые двигатели, ракетные силовые установки, точка плавления конструкционных материалов, определение оптимальных параметров, загрязнять окружающую среду, быстро развивающаяся от-

расль промышленности, сложность двигателей удваивается, конструкторы двигателей.

**Задание 9.** Согласитесь или опровергните утверждение. Начиная предложения с фраз: I'm afraid that's wrong; you are quite right/ you are not quite right; that's not quite so; I think you are mistaken; as far as I know; I think so; according to the text.

1. The aviation success results from the aircraft engine development.
2. The first power plants were gas-turbine units.
3. Today nuclear, plasma and ion engines are most widely used in our aviation.
4. "Clean" aircraft power plants do not contaminate the environment.
5. Aircraft-engine building is the fastest developing branch of industry.
6. The engine complexity doubles every year.

**Задание 10.** Не глядя в текст, дополните предложения.

1. Our home-made engines surpass foreign units in .....
2. The main purpose of every engine is to .....
3. Creating engines begins with .....
4. Experts in the field of ..... take part in developing engines.
5. Aircraft engine designers must be .....
6. "Clean" aircraft power plants use .....

**Задание 11.** Задайте письменно 5 специальных вопросов к тексту "Engine Designing".

**Задание 12.** Расскажите по-английски тему "Engine Designing".

**Задание 13.** Письменно переведите текст.

### 90 Years of Propulsion

Without the tremendous advances in propulsion technology, the achievements of other sectors of aviation would count for little.

Throughout the 19<sup>th</sup> century would-be aviators tried to get flying machines airborne under the power of some kind of engine. As all they needed was a modest thrust for perhaps a minute, the simple answer would have been to use two or three small-size rockets, fired in succession. Instead, they invariably chose steam power. Sir Hiram Maxim's huge in 1894 test rig actually left the ground carrying three burly stokers shoveling coke!

The successful aeroplane had to await the petrol-burning internal-combustion engine. Paris, the centre of high-tech innovation at the turn of the century, generated a «chauffeur» mentality, in which every would-be aviator thought he could climb into his aeroplane and take off, without bothering to learn to fly first.

#### Notes:

- |                   |                                       |
|-------------------|---------------------------------------|
| would-be aviators | - люди, мечтающие стать летчиками     |
| to get airborne   | - оторваться от земли, быть в воздухе |
| test rig          | - испытательный стенд                 |

burly stokers	- огромные топки
shoveling coke	- перелопачивающие кокс

## Контрольная работа 6

### I. Чтение

**Задание 1.** Прочтите текст и поймите его содержание. Заполните пропуски словами из рамочки.

developing, create, surpass, requirements, strength, propulsive system, steam, converting, advancements, performance

The means for ...1... the energy to thrust power is called the ...2... . Before World War II all aircraft were powered by ...3... engines. They could not meet all the ...4... . Fantastic ...5... have been made during the past decade in the ...6... of aircraft power plants. Today's engines ...7... several thousand horse power ...8... those used 50 years ago in safety, economics and especially in weight and ...9... characteristics. Very soon we shall ...10... nuclear, plasma, ion and other exotic engines.

**Задание 2.** Вам даны ответы. Задайте к ним вопросы.

1. 50 years ago all the aircraft were powered by steam engines.
2. Several thousand horse power.
3. Ion, nuclear, plasma engines.

**Задание 3.** Поставьте вопросы в правильной последовательности, соответствующей содержанию текста.

1. Could steam engines meet all modern requirements?
2. What is the thrust of today's engines?
3. When were fantastic advancements in the field of aircraft power plants made?
4. In what characteristics do today's engines surpass those used 50 years ago?
5. What is propulsive system?
6. What engines will be soon created?
7. What engines powered the aircraft before World War II?

### II Грамматика.

**Задание 1.** Укажите, чем является в предложении слово «provided»

а) союзом;

б) глаголом.

1. Provided the temperature were maintained constant, we should obtain the necessary data.
2. Lomonosov's helicopter was provided with two propellers.
3. The engineer informed us that the aircraft would be provided with additional fuel tanks.
4. When provided with two seats in the cockpit the aircraft may be used for instructive flights.

**Задание 2.** Выберите подходящий союз:

a) if;

б) unless.

1. ... treated properly, the material will not be a good insulator.

2. ... we use this new method, we shall obtain better results.

**Задание 3.** Переведите предложения.

1. The engine would be put into mass production in a month, provided its tests were successfully accomplished.

2. Provided this airplane had carried more fuel its period of flight could have been longer.

3. Their flight would have started unless the wind had been so strong.

4. Test flights would have been followed by mass production of the craft provided they had been successful.

## Лабораторная работа 7

### Компоненты газотурбинного двигателя

**Задание 1.** Прослушайте, повторите и запомните следующие слова:

- |                                       |   |
|---------------------------------------|---|
| 1. rotary air compressor              | - роторный компрессор<br>(центробежного или осевого типа)   |
| 2. air intake                         | - воздухозаборник компрессора   |
| 3. exhaust outlet                     | - выходное отверстие  |
| 4. centrifugal compressor             | - центробежный компрессор   |
| 5. axial compressor                   | - осевой компрессор   |
| 6. impeller                           | - рабочее колесо центробежного компрессора; крыльчатка  |
| 7. diffuser                           | - диффузор, расширяющийся газоздушный тракт, в котором происходит торможение потока и нарастание давления |
| 8. alternate rows                     | - попеременные, перемежающиеся ряды направляющих или статорных лопаток или роторных лопаток               |
| 9. multiple combustion chamber layout | - трубчатая конструкция камеры сгорания   |
| 10. annular combustion chamber        | - кольцевая камера сгорания   |
| 11. acceleration                      | - вспомогательные агрегаты двигателя  |

12. exhaust system

- выхлопное устройство, выхлопная система двигателя

13. discharge gases

- выхлопные газы

14. resultant thrust

- результирующая тяга

**Задание 2.** Прочтите и переведите следующие предложения.

1. The gas turbine engine consists of a rotary air compressor, one or more combustion chambers, a turbine and an exhaust outlet.
2. There are two main types of rotary air compressors: a centrifugal flow compressor and an axial flow one.
3. The centrifugal compressor has an impeller to accelerate the air.
4. The function of a diffuser is to produce the required pressure rise.
5. The axial flow compressor is a multi-stage unit with alternate rows of rotating and stationary blades.
6. The turbine provides the power to drive the compressor and accessories.
7. The function of the combustion chamber is to expand the air passing through the engine by burning in the air stream.
8. The turbine may consist of some stages with stationary guide vanes and moving blades.
9. The exhaust system discharges gases to atmosphere thus providing the resultant thrust.

**Задание 3.** Подберите:

а) синонимы:

- |               |                |
|---------------|----------------|
| 1. component  | 1. motor       |
| 2. main       | 2. aim         |
| 3. engine     | 3. major       |
| 4. flow       | 4. to operate  |
| 5. to produce | 5. stream      |
| 6. to rise    | 6. to generate |
| 7. task       | 7. to increase |
| 8. to work    | 8. part        |

б) антонимы:

- |                  |                  |
|------------------|------------------|
| 1. to accelerate | 1. cold          |
| 2. multi-stage   | 2. to release    |
| 3. hot           | 3. low           |
| 4. to absorb     | 4. moving        |
| 5. high          | 5. single-stage  |
| 6. stationary    | 6. to decelerate |

**Задание 4.** Закончите предложения, вставляя пропущенные слова.

1. Annular combustion chambers are used with engines having .....compressors.
2. The turbine extracts ..... from hot gases released from the ..... system and expands them to a lower ..... and temperature.
3. The centrifugal flow compressor has an ..... to accelerate the .....



4. The task of the combustion chamber is to ..... the air passing through the ..... by burning ..... in the air.....
5. The turbine may consist of several ..... ,each using one ..... of stationary guide ..... and one row of ..... blades.

moving, pressure, axial, energy, row, impeller, combustion, stages, stream, fuel, air, engine, expand.

**Задание 5.** Переведите следующие словосочетания:

in the required direction; a multi-stage unit; the air passing through the engine; the required pressure rise; the multiple combustion chamber layout; stationary guide vanes; gas turbine engine components; the turbine discharge gases.

**Задание 6.** Прочтите и догадайтесь о значении следующих слов:

component; turbine; compressor; basic; type; diffuser; principle; energy; temperature; gas; resultant.

**Задание 7.** Прослушайте, прочтите и переведите текст.

### Gas Turbine Engine Components

The gas turbine engine consists of a **rotary air compressor** with an **air intake**, one or more combustion chambers, a turbine and an **exhaust outlet**.

There are two basic types of rotary air compressors: a **centrifugal flow compressor** and an **axial flow** one.

The centrifugal flow compressor is a single or two-stage unit which has an **impeller** to accelerate the air and a **diffuser** to produce the required pressure rise. The axial flow compressor is a multi-stage unit with **alternate rows** of rotating and stationary blades to accelerate and diffuse the air until the required pressure rise is obtained.

The combustion chamber has the difficult task that is to expand the air passing through the engine by burning fuel in the air stream. Although all combustion chambers work on the same principles, they may be installed in the engine in some different ways. The **multiple combustion chamber layout** is often used with engines having centrifugal compressors. **Annular combustion chambers** are used with engines having axial compressors.

The turbine provides the power to drive the compressor and **accessories**. It extracts energy from the hot gases released from the combustion system and expands them to a lower pressure and temperature. The turbine may consist of several stages, each using one row of stationary guide vanes and row of moving blades.

The **exhaust system** passes the turbine **discharge** gases to atmosphere at a velocity, and in the required direction, to provide the **resultant thrust**.

**Задание 8.** Исправьте утверждения, если они не соответствуют действительности, используя следующие фразы: I agree (don't agree). I think you are mistaken. That's right (wrong).

1. The axial flow compressor is a single-stage unit with alternate rows of rotating and stationary blades.
2. There are many different types of rotary air compressors.

3. The multiple combustion chamber layout is often used with engines having centrifugal compressors.
4. The turbine provides the power to drive the impeller and accessories.
5. The turbine consists of one stage of stationary guide vanes and moving blades.
6. The exhaust system passes the turbine discharge gases to atmosphere to provide the resultant thrust.

**Задание 9.** Прочтите и переведите предложения.

1. The centrifugal-type compressor produces a high-pressure rise in a single stage.
2. Most gas turbines of the centrifugal type use the double-sided impeller to reduce the diameter of the engine.
3. The number of stages in an axial compressor depends on the engine design.
4. The function of the diffuser assembly is to direct air from the compressor to the combustion chamber and to change air pressure and velocity.
5. In general, an annular combustion chamber is a single chamber completely surrounding the engine.

**Задание 10.** Переведите следующие вопросы на английский язык и ответьте на них.

1. Из каких компонентов состоит газотурбинный двигатель?
2. Сколько основных типов роторного компрессора вы знаете?
3. Какова функция диффузора?
4. Какие типы лопаток у осевого компрессора?
5. Где сжигается топливо?
6. В каких двигателях часто используется трубчатая конструкция камеры сгорания?
7. Как турбина создает мощность для того, чтобы приводить в движение компрессор и вспомогательные агрегаты двигателя?
8. Из каких ступеней (каскадов) может состоять турбина?
9. Какова функция выхлопного устройства?

**Задание 11.** Прочтите и письменно переведите текст без словаря.

The gas turbine engine takes air from the atmosphere and, after compressing and heating, it uses some of its energy to drive the turbine that powers the compressor. The mechanical arrangement of the gas turbine engine is simple. It consists of two main rotating parts, a compressor and turbine, and one or a number of combustion chambers. The turbojet engine is most suitable for high forward speeds. At aircraft speeds below 450 miles per hour the jet engine is less efficient than a propeller-type engine. The development of **high-speed propellers** and **propfan engines** provides further improvement in the **propulsive efficiency** of modern aircraft engines. At its normal cruising speed, for example, the propfan engines provide between 75 and 85 per cent propulsive efficiency.

Notes:

1. high-speed propeller – высокооборотный воздушный винт
2. propfan engine – винтовентиляторный двигатель (тяга такого двигателя создается в основном за счет воздушного винта)

3. propulsive efficiency – тяговый КПД двигателя, характеризующий его способность преобразовывать тепловую энергию топлива в тягу

Задание 12. Расскажите по-английски тему “Gas Turbine Engine Components”

Задание 13. Составьте аннотацию текста, используя ключевые фразы.

### The First Gas Turbine

The earliest application of the gas turbine for aircraft use was to drive a **supercharger** for reciprocating engines.

The **turbosupercharger** has emphasized the development of materials capable of operating at high temperatures. This emphasis has been a very important factor in making possible the gas turbine as a power plant for aircraft.

The first jet-propelled flight was made on August 27, 1939, in aircraft produced by the Heinkel Aircraft Company in Germany. The power plant was an early Heinkel turbojet, the HeS 3B with a thrust of 880 to 1,100 lb. It was an engine of the centrifugal-flow type and was mounted in the fuselage, with the air intake in the nose of the aircraft.

Since the advent of the gas-turbine engine as an aircraft power plant, literally hundreds of different models and types of aircraft gas-turbine engines have been designed and built. Many of these have been used successfully in operational aircraft: however the number accepted for service is considerably less than the number rejected. This ratio is due to a tendency of the engine-development programme to exceed the time period for effective use, and it does not mean that the rejected engines were poorly designed.

From the many designs of turbine engines which have been built, two types have evolved as being the most practical: the **axial type with dual rotor or split compressor**: and the **axial type with bypass**.

#### Notes:

1. a supercharger – нагнетатель
2. a turbosupercharger – турбонагнетатель
3. axial type with dual rotor or split compressor – двигатель осевого типа с двойным ротором или двухкаскадным компрессором
4. axial type with bypass – осевой, двухконтурный двигатель

### Контрольная работа 7

#### I. Чтение

Задание 1. Заполните пропуски словами из рамки

engine, is limited, thrust, result in, increased

It is interesting to note that the ...1.... of a gas-turbine engine can be ...2.... either by increasing the mass flow of air through the ...3.... or by increasing the jet

velocity. Increases in mass may be obtained by utilizing **water-injection systems** and by the use of an **afterburner**. The afterburner also increases jet velocity. Jet velocity may also be increased by reducing the area of the jet nozzle, but this method ...4.... because reducing the nozzle area will ...5.... higher temperatures and pressures within the engine.

Notes:

1. water-injection system – система впрыска (впрыскивания) воды
2. afterburner – форсажная камера

**Задание 2.** Вам даны ответы, задайте к ним вопросы.

1. Either by increasing the mass flow of air through the engine or by increasing the jet velocity.
2. The afterburner does.
3. Yes, it does. It also increases jet velocity.

**Задание 3.** Напишите английские эквиваленты: тяга; или...или; масса воздушного потока; скорость истечения струи; использование; увеличивать; уменьшать; реактивное сопло; ограничивать; давление внутри двигателя; кончатся чем-то.

## II. Грамматика

**Задание 1.** Спишите предложения, подчеркните неличные формы. Предложения переведите на русский язык.

1. The air passing through the compressor is heated.
2. There is a means for forcing the chemicals into the rocket.
3. There is the jet consisting of heated compressed, atmospheric air, admixed with the products of the combustion produced by burning a fuel in that air.
4. The principal formula used was the familiar Newton's law.
5. The hollow blade (полая лопатка турбины) offers the advantage of being adopted to cooling by blowing cold air through its interior (внутренняя поверхность) and reducing weight.

## Лабораторная работа 8

### Реактивные двигатели

**Задание 1.** Прослушайте, повторите и запомните слова:

- |                               |                                  |
|-------------------------------|----------------------------------|
| 1. jet                        | - 1) реактивный; 2) струя        |
| 2. combustion                 | - горение                        |
| 3. internal combustion engine | - двигатель внутреннего сгорания |
| 4. burn (burnt, burnt)        | - сжигать, гореть                |
| 5. inside                     | - внутри                         |
| 6. rather than                | - а не                           |
| 7. refer to                   | - относиться, ссылаться          |

8. utilize	- использовать
9. propulsion	- движение вперед
10. reaction	- противодействие, действие
11. produce	- вырабатывать, производить
12. eject	- выбрасывать, извергать
13. rearwards	- назад, позади
14. thrust	- тяга
15. supply	- обеспечивать
16. mount	- устанавливать
17. suck	- всасывать
18. extensive	- обширный
19. application	- использование, применение
20. term	- термин
21. rear	- задняя (тыльная) сторона

**Задание 2.** Подберите слова, одинаковые по значению.

1. to use	1. power plant
2. basic	2. use
3. rearwards	3. to install
4. application	4. backwards
5. engine	5. to supply
6. to mount	6. main
7. to provide	7. to utilize

**Задание 3.** Подберите слова, противоположные по значению.

1. internal	1. latter
2. inside	2. rear
3. former	3. outside
4. front	4. to eject
5. possible	5. external
6. to suck	6. impossible

**Задание 4.** Прочтите и догадайтесь о значении следующих слов:

internal-combustion engine, piston engine, reaction principle, basic idea, high temperature gas jet, to eject rearwards, compressed air, atmospheric air, front opening, extensive use, the speed of sound, jet propulsion device.

**Задание 5.** Прочтите предложения и вставьте слова.

1. We must ..... this type of engines rather than any other.
2. The jet is produced by ..... the gas rearwards.
3. The jet is ejected ..... with great force named ... .
4. The jet engine must ..... the high pressure and high temperature gas jet.
5. By means of a compressor the air is ..... and .....
6. The ..... of jet power plants is very extensive.

---

thrust, produce, utilize, application, compressed, rearwards, sucked, ejecting.

**Задание 6.** Переведите предложения.

1. Jet airplanes are quite modern, fast and convenient.
2. A fuel must be burnt in the combustion chamber.
3. In internal-combustion engines the fuel is burnt inside the engines.
4. The rocket engines rather than the jet engines will be used for space exploration.
5. Jet propulsion is a result of the reaction of the hot gas jet.
6. A compressor is mounted in the front opening. It must supply air.

**Задание 7.** Прочтите и переведите текст "Jet Engines".

### Jet Engines

Most of the engines used today are called internal-combustion engines. They are called so because the fuel is **burnt inside** the engine. There exist several types of **internal-combustion engines**: gasoline and diesel piston types, gas turbines and jet types. The jet engine is an advance on the other types of engines. Jet engines work on the reaction principle. They use the **reaction force rather than** the action force of **combustion**.

The **term** "jet engines" **refers to** any jet **propulsion** device which **utilizes** air from the atmosphere together with the combustion of a fuel and **produces** the jet for propulsion purposes.

The basic idea of a jet engine is to produce the high pressure and high temperature gas jet. The jet is **ejected rearwards** with great force named **thrust**. The thrust is the reaction of the jet of hot gases ejected from the **rear**. The jet is produced by combustion of the fuel in the compressed air. The latter is **supplied** by the atmospheric air that enters through the front opening where a compressor is **mounted**. It must provide the combustion chamber with the required air. Air is **sucked**, compressed and then used to burn the fuel. Jet engines find **extensive** use. The **application** of jet power plants to aircraft has made flying faster than the speed of sound, which was once considered impossible.

**Задание 8.** Дайте английские эквиваленты:

потому что топливо сжигается внутри двигателя; сила обратного действия; относится к любой реактивной двигательной установке; в целях движения вперед выбрасывает струю; струя газа под высоким давлением и высокой температуры; струя выбрасывается назад; тяга - это противодействие струи; струя вырабатывается сжиганием топлива в сжатом воздухе; атмосферный воздух входит через переднее отверстие; компрессор должен обеспечивать камеру сгорания воздухом; воздух всасывается и сжимается.

**Задание 9.** Согласитесь или опровергните утверждение. Начиная предложения с фраз: I'm afraid that's wrong; you are quite right/ you are not quite right; that's not quite so; I think you are mistaken; as far as I know; I think so; according to the text.

1. There are many types of internal-combustion engines.
2. When the jet is ejected rearwards it produces thrust.
3. The speed of a jet aircraft is less than that of sound.

4. Jet power plants have not yet found extensive application.
5. By means of a compressor the air is ejected rearwards.

**Задание 10.** Не глядя в текст, дополните предложения.

1. Internal-combustion engines are called so because .....
2. The jet engine is an advance on .....
3. The basic idea of a jet engine is .....
4. The jet is ejected .....
5. The thrust is .....
6. There exist several types of .....
7. A compressor is mounted in .....
8. The jet engine must produce .....

**Задание 11.** Переведите данные вопросы на английский язык и ответьте на них.

1. Как называется большинство двигателей, используемых в наше время?
2. Почему они так называются?
3. Какие типы двигателей внутреннего сгорания Вы знаете?
4. На каком принципе работают реактивные двигатели?
5. Какую силу они используют?
6. Какие двигатели могут быть названы реактивными?
7. В чем состоит основная идея реактивного двигателя?
8. Что такое тяга в реактивном двигателе?
9. За счет чего вырабатывается реактивная струя ?
10. Где устанавливается компрессор?
11. Для чего служит компрессор?
12. Какова скорость реактивного самолета?

**Задание 12.** Расскажите по-английски тему "Jet Engines".

**Задание 13.** Письменно переведите текст.

The jet engine works on the principle of Newton's Third Law of Motion. A good example of this law is the toy balloon. When its outlet is closed, equal pressure is spread throughout the balloon.

If the outlet is opened, some of the air will immediately escape at high velocity, causing the balloon to move forward. This forward motion is a result of thrust (reaction).

The jet engine functions by taking air, compressing it, injecting fuel into the compressed air and igniting the mixture which then expands through a turbine which drives the compressor.

The standard fuel for jet engines is a kerosene-type fuel. Kerosene burns at a hotter temperature than gasoline and it has a higher viscosity.

A typical jet fuel system consists of fuel pump, fuel filter, fuel regulators, shut-off valve, fuel manifold and discharge nozzles.

### Notes:

outlet	- насадок, штуцер
viscosity	- вязкость
shut-off valve	- отсечный клапан
manifold	- коллектор

## Контрольная работа 8

### I. Чтение

**Задание 1.** Прочтите текст и поймите его содержание. Заполните пропуски словами из рамочки:

additional, propulsion, design thrust, powered flight, advances, testing, jet, support, research, developed, start

Jet ...1... for airplanes is generally considered a recent development, but its theory is as old as ...2... having been proposed as early as 1908. But the real ...3... of the jet engine dates from 1930, the year a 23-year-old flying officer named Frank Whittle filed a patent for a ...4... power plant. But he could not get financial ...5... . During the next 2 years Whittle did ...6... turbine ...7... and studied the latest ...8... in aviation. Whittle had his first engine ready for laboratory ...9... in April, 1937. The engine ...10... less than its 1,400-pound ...11... .

**Задание 2.** Вам даны ответы. Задайте к ним вопросы.

1. From 1930.
2. It was Frank Whittle.

**Задание 3.** Расположите предложения в логической последовательности :

1. He filed a patent for a jet engine.
2. Frank Whittle was a flying officer.
3. The design thrust of his engine was 1,400 pounds.
4. The real start of jet propulsion dates from 1930.
5. The first engine was ready for laboratory testing in 1937.
6. Its theory began in 1908.
7. He had no financial support.

### II. Грамматика

**Задание 1.** Определите, чем является выделенное слово:

- а) Participle II ; б) глаголом в Past Indefinite.
1. A group of young scientists tested their new device.
  2. The methods discussed are very interesting.
  3. They discussed the problems at the conference.

**Задание 2.** Переведите предложения, обращая внимание на перевод независимого причастного оборота.

1. The work having been finished, they could have a short rest.



2. New engines were brought to the plant, all of them being in good order.
3. The plane's weight having been decreased, the most difficult problem was solved.
4. It being late, we decided to stop working.
5. Newton discovered the laws of motion, these laws being the basis of practical mechanics.
6. The lesson being over, I'll be free.
7. The lecturer spoke on the problem of space exploration, his lecture being illustrated by diagrams.

## Лабораторная работа 9

### Турбореактивные двигатели

**Задание 1.** Прослушайте, повторите и запомните слова:

- |                        |                          |
|------------------------|--------------------------|
| 1. turbojet            | - турбореактивный        |
| 2. turbofan            | - турбовентиляторный     |
| 3. turboprop           | - турбовинтовой          |
| 4. turboshaft          | - турбовальный           |
| 5. to derive           | - извлекать, получать    |
| 6. thrust              | - тяга                   |
| 7. nozzle              | - сопло, форсунка        |
| 8. to rise             | - повышать, увеличивать  |
| 9. to deliver          | - поставлять, доставлять |
| 10. to feed (fed, fed) | - снабжать, подавать     |
| 11. to expand          | - расширять(ся)          |
| 12. to provide         | - снабжать, обеспечивать |
| 13. auxiliary          | - вспомогательный        |
| 14. to eject           | - выбрасывать            |
| 15. amount             | - количество, величина   |
| 16. excess             | - избыток                |
| 17. afterburner        | - форсажная камера       |

**Задание 2.** Прочтите и переведите предложения.

1. The turbojet, turbofan and turboprop engines are gas turbine engines.
2. Engines produce thrust.
3. Every turbojet has nozzles.
4. The diffuser delivers the air to the compressor.
5. Fuel nozzles provide fuel.
6. The gases are expanded.
7. The gases are ejected from the nozzle.
8. The auxiliary apparatus is necessary for the work.
9. Afterburner provides additional thrust.

**Задание 3.** Прочтите предложения, вставляя недостающие слова.

1. Every engine produces .....
2. The gases ..... the turbine.
3. The gases are ejected through the .....
4. The main ..... of the turbine is to provide power for the compressor.
5. Turbojets are ..... into two groups.

---

to classify, thrust, nozzle, function, to enter

**Задание 4.** Подберите слова, одинаковые по значению.

- |               |             |
|---------------|-------------|
| 1. speed      | 1. exhaust  |
| 2. aft        | 2. movement |
| 3. propulsion | 3. increase |
| 4. feed       | 4. velocity |
| 5. eject      | 5. back     |
| 6. rise       | 6. deliver  |
| 7. produce    | 7. develop  |

**Задание 5.** Подберите слова, противоположные по значению.

- |               |               |
|---------------|---------------|
| 1. provide    | 1. leave      |
| 2. constant   | 2. low        |
| 3. downstream | 3. consume    |
| 4. high       | 4. upstream   |
| 5. enter      | 5. inconstant |
| 6. aft        | 6. main       |
| 7. auxiliary  | 7. forward    |

**Задание 6.** Переведите следующие словосочетания:

derives its thrust by ...; accelerating a small mass of air; at approximately constant pressure; high temperature and high pressure gases; exhaust nozzle; auxiliary apparatus; velocity greater than the flight velocity; turbine material limitations; the exhaust products downstream of the turbine; the centrifugal-flow compressor; the axial-flow compressor.

**Задание 7.** Прочтите и переведите интернациональные слова:

turbine; classify; mechanical; compressor; function; transform; diffuser; temperature; absorb; gas; material; product; type; operation.

**Задание 8.** Прослушайте, прочтите и переведите текст.

### Turbojet Engines

Gas turbine engines may be classified into the following groups: turbojet engines, turbofan engines, turboprop engines, turboshaft engines.

A turbojet **derives** its **thrust** by highly accelerating a small mass of air, which goes through the engine. This engine consists of a diffuser, a mechanical compressor, a combustion chamber, a mechanical turbine and an exhaust **nozzle**.

The function of a diffuser is to transform the kinetic energy of the entering air into a static pressure rise. The diffuser **delivers** its air to the mechanical compressor which further compresses the air and delivers it to the combustion chamber. There

fuel nozzles feed fuel continuously, and continuous combustion takes place at approximately constant pressure. The high temperature and high pressure gases then enter the turbine, where they expand to provide power for the turbine.

The turbine is directly connected to the compressor, and all the power developed by the turbine is absorbed by the compressor and the auxiliary apparatus. The main function of the turbine is to provide power for the mechanical compressor. After the gases leave the turbine, they expand further in the exhaust nozzle and are ejected with a velocity greater than the flight-velocity to produce thrust for propulsion.

Because of turbine material limitations, only a relatively small amount of fuel can be burnt in the combustion chamber. The exhaust products downstream of the turbine still contain a considerable amount of excess oxygen. Additional thrust can therefore be obtained from the turbojet engine by providing an afterburner aft of the turbine. There additional fuel can be burned. Afterburning greatly increases the temperature and hence the velocity of the exhaust gases, providing greater thrust.

According to the type of compressor used turbojets are classified into two general types. These types are the centrifugal-flow compressor and the axial-flow compressor.

According to this principle the turbojets' names are centrifugal-flow turbojets and axial-flow turbojets, respectively. The operation of both types is basically the same.

Since introduction of turbojets the performance of aircraft engine has been increased phenomenally. They are best for high-speed, high-altitude, long-distance flights. The turbojet engines are now in mass production for various aircraft.

**Задание 9.** Переведите вопросы на английский язык и ответьте на них.

1. Какие типы газотурбинных двигателей вы знаете?
2. Из каких компонентов состоит турбореактивный двигатель?
3. Какова функция диффузора?
4. Где сжимается воздух?
5. Какая форсунка подает топливо?
6. Какие газы поступают в турбину?
7. Какова функция турбины?
8. Какое количество топлива может быть сожжено в камере сгорания?
9. Как может быть получена дополнительная тяга?
10. Как действует форсажная камера?
11. Какие типы турбореактивных двигателей вы знаете?
12. К чему привело создание турбореактивных двигателей?

**Задание 10.** Переведите письменно текст.

Turbojet engines have been built in many sizes, ranging from a few hundred pounds of thrust to many thousands of pounds. The smaller engines are suitable for liaison and training type aircraft, while the large engines are installed in high-performance fighter aircraft, bombers, transport, tankers, and commercial air liners.

The turbine supplies the power that drives the compressor: that is its main function in this type of engine.

In practice, this simple system is modified for various reasons. The more the pressure of the air is raised by the compressor, the higher the efficiency of the engine. Engines designed for the greatest economy have therefore tended towards higher compression ratios. This has led to splitting the compressor and turbine into two groups: a low-speed compressor driven by a low-speed turbine, and a separate high-speed compressor driven by a high-speed turbine, the two driving shafts being co-axial. This arrangement incorporates what is called a two-spool compressor.

**Задание 11.** Расскажите по-английски тему "Turbojet Engines".

### Контрольная работа 9

**Задание 1.** Найдите предложения с независимым причастным оборотом, напишите их, переведите.

1. The first engines appeared in the 17-th century and people began using them to operate factories, irrigate land, supply water to towns, etc. 2. The steam engine having been invented in 1825, a self-propelled vehicle was built. 3. The supply of steam in the car lasting only 15 minutes, the vehicle had to stop every 100 yards to make more steam. 4. After the German engineer N. Otto had invented the gasoline engine, the application of this engine in motor cars began in many countries. 5. The cars at that time were very small, the engine being placed under the seat. 6. Motorists had to carry a supply of fuel, because there were no service stations. 7. Brakes having become more efficient, cars achieved greater reliability. 8. Cars with internal combustion engines having appeared, the automobile industry began developing rapidly. 9. By 1960 the number of cars in the world had reached 60 million, no other industry having ever developed so quickly.

**Задание 2.** Найдите герундий в следующих парах предложений. Предложения переведите.

1. Overcoming these difficulties is not so easy as it may seem. Overcoming these difficulties the designers can increase the fuel efficiency. 2. Setting a problem the scientist makes the first step to its solution. Setting a problem is the first step to its solution. 3. Covering the distance between Tokyo and Moscow is less than two hours this superliner develops a speed five times above the speed of sound. Covering the distance between Tokyo and Moscow on board a superliner requires about two hours. 4. Putting the discovery into practice the engineers will solve a complicated technological task. Putting the discovery into practice sometimes requires more effort than making it.

**Задание 3.** Замените придаточные предложения причастными оборотами.

1. When the object is moving through the air, it pushes the air aside.
2. After they had obtained valuable information on aircraft with a pilot, they began to send up un-manned airplanes.

# Лабораторная работа 10

## Турбовинтовые двигатели

**Задание 1.** Прослушайте, повторите и запомните слова:

- |                                  |                           |
|----------------------------------|---------------------------|
| 1. turboprop                     | - турбовинтовой           |
| 2. propulsive thrust             | - тяга(как движущая сила) |
| 3. exhaust nozzle                | - выхлопное сопло         |
| 4. reduction gear                | - редуктор                |
| 5. similar                       | - похожий, подобный       |
| 6. provide                       | - снабжать, обеспечивать  |
| 7. derive                        | - выводить, получать      |
| 8. approximately                 | - приблизительно          |
| 9. place                         | - помещать                |
| 10. enable                       | - делать возможным        |
| 11. rpm (revolutions per minute) | - оборотов в минуту       |
| 12. shaft                        | - вал                     |
| 13. ratio                        | - отношение               |
| 14. momentum                     | - количество движения     |
| 15. overall                      | - полный, общий           |
| 16. turboshaft                   | - турбовальный            |

**Задание 2.** Подберите слова, одинаковые по значению.

- |                |               |
|----------------|---------------|
| 1. power       | 1. velocity   |
| 2. part        | 2. different  |
| 3. various     | 3. to place   |
| 4. speed       | 4. portion    |
| 5. to locate   | 5. to operate |
| 6. to function | 6. currently  |
| 7. airscrew    | 7. energy     |
| 8. nowadays    | 8. propeller  |

**Задание 3.** Подберите слова, противоположные по значению.

- |                  |                |
|------------------|----------------|
| 1. similar       | 1. efficiently |
| 2. maximum       | 2. internal    |
| 3. low           | 3. to increase |
| 4. external      | 4. minimum     |
| 5. inefficiently | 5. last        |
| 6. to reduce     | 6. different   |
| 7. first         | 7. high        |

**Задание 4.** Прочтите и догадайтесь о значении следующих слов:

mechanical compressor, diffuser, helicopter, marine application, propeller, to extract power, rotation speed, to operate efficiently, dual momentum change, internal momentum increase, total thrust, to adapt, single-engine aircraft, a variation of the turboprop engine.

**Задание 5.** Прочтите предложения, вставляя пропущенные слова. Предложения переведите.

1. The .... engine is very similar to the turbojet engine.
2. In the turboprop engine one of the turbines drives the ....., while the other drives the .....
3. The shaft rotation is 12,000 .....
4. The turboprop engine derives most of its ..... from the propeller.
5. In the turboprop engine the turbine ..... much more power than it does in the turbojet engine.
6. The ..... rotation speed of gas turbine engines is very high.
7. The propeller increases the air .....

---

shaft, rpm, turboprop, momentum, propeller, to extract, propulsive thrust, compressor.

**Задание 6.** Прочтите и переведите предложения.

1. A turboprop engine is a gas turbine driving a propeller.
2. The diffuser delivers air to the mechanical compressor.
3. The compressor compresses the air and delivers to the combustion chamber.
4. The reduction gear must be placed between the turbine shaft and the propeller.
5. Little power is derived from the exhaust nozzle.

**Задание 7.** Прочтите и переведите текст.

### Turboprop Engines

In principle, this engine is very **similar** to the turbojet engine, differing only in that it uses a propeller to **provide** most of the **propulsive thrust**.

The engine consists of a diffuser, a mechanical compressor, a combustion chamber, a turbine, an **exhaust nozzle**, a **reduction gear** and a propeller. The diffuser, mechanical compressor and combustion chamber function in the same manner as in the turbojet engine. However, in the **turboprop** engine, the turbine **extracts** much more power than it does in the turbojet engine, because the turbine provides power for both the compressor and the propeller. When all of this energy is extracted from the high temperature gases, there is little energy left for producing jet thrust. Thus, the turboprop engine **derives** most of its propulsive thrust from the propeller and derives only a small portion (10 to 25 % depending on the flight velocity) from the exhaust nozzle.

Since the **shaft** rotation speed of gas turbine engines is very high (approximately 12,000 **rpm**), a reduction gear must be placed between the turbine shaft and the propeller to operate efficiently. The turboprop engine is essentially a gas turbine power plant because, as pointed out before, little power is derived from the exhaust nozzle; still as flight speeds are increased, the **ratio** of nozzle power to propeller power for maximum thrust tends to become higher. The propulsive thrust is provided by a dual **momentum** change of the air. First, the propeller increases the air momentum, and second, the **over-all** engine from diffuser to nozzle, provides an internal momentum increase. The sum of these thrusts is the total thrust developed by the engine.

The turboprop engine is often used in transport aircraft, but can be adapted for use in single-engine aircraft. A variation of the turboprop engine known as the **turboshaft engine**, is a gas turbine power plant in which all delivered power is in the form of shaft power. Turboshaft engines are currently used both to power helicopters and for various land and marine applications.

**Задание 8.** Дайте английские эквиваленты:

в зависимости от скорости полета, как указывалось выше, мощность на валу, раскаленный газ, во-первых, известный как, в настоящее время, как ... так и.

**Задание 9.** Согласитесь или опровергните утверждение. Начиная предложения с фраз: I'm afraid that's wrong. You are quite right/ you are not quite right (you are wrong). That's not quite so. I think you are mistaken. As far as I know. I think so. According to the text.

1. In principle, the turbojet engine is similar to turboprop engine.
2. In the turboprop engine the turbine extracts less power than it does in the turbojet engine.
3. The turboprop engine derives most of its propulsive thrust from the exhaust nozzle.
4. The shaft rotation speed of gas turbine engines is not very high.
5. The turboprop engine is seldom used in transport aircraft.
6. The turboprop engine is often used in single-engine aircraft.

**Задание 10.** Не глядя в текст, дополните предложения.

1. The turboprop engine consists of .....
2. The diffuser, mechanical compressor and combustion chamber of the turbojet engine function .....
3. The turboprop engine derives most of its propulsive thrust from .....
4. A reduction gear is placed .....
5. The propulsive thrust is provided by .....
6. The turboprop engine is used .....
7. The turboshaft engine is .....

**Задание 11.** Переведите на английский язык:

1. Турбовинтовой двигатель находит в авиации широкое применение.
2. Что общего имеют турбовинтовые и турбореактивные двигатели?
3. Основное отличие состоит в том, что турбина приводит во вращение воздушный винт. Только незначительная часть тяги создается за счет реактивной струи.
4. Турбовинтовой двигатель используется для полета на скоростях до 900 км в час.

**Задание 12.** Расскажите по-английски тему "Turboprop Engines".

**Задание 13.** Письменно переведите текст:

Turboprop engines having two independently rotating turbines have proved quite successful. One of the turbines drives the compressor, while the other drives the propeller. The independent turbine has some advantages over the direct con-

nected type. Both the propeller and the compressor may be operated at rotational speeds that produce the best respective efficiencies. This allows the propeller to operate at high speed during take-off and climb, thus reducing the tendency of the propeller to stall. Propeller speed can be lowered at altitude, with a subsequent reduction in tip compressibility losses.

## Контрольная работа 10

### I. Чтение

**Задание 1.** Прочтите текст и поймите его содержание. Заполните пропуски словами из рамочки:

amount, placed, propeller, similar, thrust, promising, shaft power, turbo-prop, reduction gear, essential, approximately

A gas turbine driving a ...1..., called a ...2... engine, is a ...3... power plant for the propelling of aircraft intended to operate at speeds up to ...4... 500 mph. The ...5... features of the turboprop engine are ...6... to those of the turbojet engine, the major difference being that the turbine is designed so that it develops ...7... for driving a propeller and only a small ...8... of jet ...9... is produced. The ...10... must be ...11... between the turbine shaft and the propeller.

**Задание 2.** Вам даны ответы. Задайте к ним вопросы.

1. Approximately 500 mph.
2. For driving a propeller.

**Задание 3.** Расположите предложения в логической последовательности.

1. The turbine drives the propeller.
2. Little energy is left to produce jet thrust.
3. Turboprop engines propel the aircraft intended for speeds up to about 500 mph.
4. The main difference between the turboprop and turbojet engines is the design of the turbine.
5. A turboprop engine is a promising power plant.
6. A turboprop engine is essentially a gas turbine power plant.
7. Turboprop engines are similar to turbojet engines.

### II. Грамматика

**Задание 1.** Определите функцию инфинитива и переведите предложения:

1. To land the airplane at night is rather difficult.
2. Our task is to determine the shape of the fuel tank.
3. To find the answer to these questions a number of research rockets were sent into space.
4. There are a number of problems still to be considered.
5. The Russian scientist K.E.Tsiolkovsky was the first to understand the use of rockets in space travel.



**Задание 2.** Укажите номера предложений, которые переводятся, начиная со слов: «Говорят, что ...», «Известно, что ...».

1. Wood is said to be one of the oldest materials.
2. He said that the principle of jet propulsion is based on the reaction principle.
3. My chief is said to have finished his experiment last week.
4. The engineer said he had finished the experiment.
5. We know this machine very well.

## Лабораторная работа 11

### Турбовентиляторный двигатель (двухконтурный турбореактивный двигатель)

**Задание 1.** Прослушайте, повторите и запомните следующие слова:

- |                                 |   |
|---------------------------------|---|
| 1. fan                          | - вентилятор                                  |
| 2. turbofan                     | - турбовентиляторный двигатель                |
| 3. feature                      | - особенность, признак, характерная черта     |
| 4. performance                  | - летные данные (качества, характеристики)    |
| 5. to comprise                  | - включать, заключать в себе, состоять из ... |
| 6. duct                         | - канал, труба, трубопровод                   |
| 7. bypass duct                  | - воздухопровод второго контура               |
| 8. to convert                   | - превращать, преобразовывать                 |
| 9. to split (split, split)      | - разделять, раскалывать                      |
| 10. portion                     | - часть                                       |
| 11. remainder                   | - оставшая часть                              |
| 12. ratio                       | - отношение, соотношение                      |
| 13. bypass ratio                | - коэффициент двухконтурности                 |
| 14. to define                   | - определять                                  |
| 15. to add                      | - увеличивать, добавлять                      |
| 16. additional (thrust, energy) | - добавочные, дополнительный                  |
| 17. to derive                   | - получать, производить                       |
| 18. to locate                   | - располагать                                 |
| to be located                   | - располагаться                               |
| 19. to install                  | - устанавливать                               |
| 20. installation                | - установка                                   |

**Задание 2.** Подберите синонимы:

- |                  |                    |
|------------------|--------------------|
| 1. performance   | 1. to be situated  |
| 2. to comprise   | 2. to increase     |
| 3. to convert    | 3. characteristics |
| 4. to split      | 4. relation        |
| 5. portion       | 5. to consist of   |
| 6. to be located | 6. to transform    |

- |           |                |
|-----------|----------------|
| 7. ratio  | 7. part        |
| 8. to add | 8. to separate |

**Задание 3.** Подберите антонимы:

- |                 |                |
|-----------------|----------------|
| 1. to enter     | 1. high        |
| 2. low          | 2. to stop     |
| 3. down-stream  | 3. uneconomic  |
| 4. to continue  | 4. to leave    |
| 5. efficient    | 5. heavier     |
| 6. to expand    | 6. inefficient |
| 7. lighter      | 7. to compress |
| 8. economic(al) | 8. up-stream   |

**Задание 4.** Прочтите и переведите следующие предложения.

- The turbofan engine combines features of both the turbojet and turboprop engines.
- A gas turbine comprises 3 main sections: the compressor section, the combustion section and the turbine section.
- The size of the combustion chamber often defines the maximum diameter of the engine.
- The function of a diffuser is to convert kinetic energy of the entering air into a pressure rise.
- The combustion chamber is located on the outside of the engine behind the compressor.
- In turbofan engines the entering air flow is split into two portions: one portion enters the bypass duct and the remainder flows through the compressor, combustion chamber and turbine.
- In a turboprop engine a portion of the potential energy is derived by additional turbine engines.
- The bypass ratio is the ratio of the air flow through the bypass duct to the air flow through the gas generator.
- The turbofan engine has performance characteristics somewhere between the turbojet and turboprop engines.
- The turbofan engines can practically be used for most types of airplane installations.

**Задание 5.** Прочтите предложения, вставляя пропущенные слова. Предложения переведите.

- In the turbofan engine the fan may be ..... behind the gas generator turbine.
- The exhaust gases are expanded in the ..... to a velocity greater than the .....
- The function of the diffuser is ..... the kinetic energy of the entering air into a static ..... rise.
- The ..... provides the power for both the fan and the compressor.
- The propulsive thrust of the engines is derived from the high velocity exhaust of both the ..... and the gas generator.

---

fan, turbine, located, pressure, exhaust nozzle, flight velocity, to convert.

**Задание 6.** Переведите следующие словосочетания:

airplane installations; propulsive thrust; transport type aircraft; high velocity exhaust; gas generator turbine; compared with the turboprop; bypass ratio; performance characteristics.

**Задание 7.** Прочтите и переведите следующие слова:

transport; generator; diffuser; front; compressor; turbine; function; to convert, kinetic energy; static; portion; to locate; efficient; economical.

**Задание 8.** Прослушайте, прочтите и переведите текст.

### Turbofan Engines

The **turbofan engine** combines **features** of both the turbojet and turboprop engines. It has **performance** characteristics somewhere between the other two engines.

The engine **comprises** a diffuser, a fan, a mechanical **duct**, and an exhaust nozzle. The function of the diffuser is **to convert** the kinetic energy of the entering air into a static pressure rise. The diffuser delivers its air to a **fan** which further compresses it. Then the air flow is **split** and a **portion** enters the bypass duct, while the **remainder** continues into the mechanical compressor, combustion chamber and turbine. The **ratio** of the airflow through the **bypass duct** to the air flow through the gas generator **is defined** as the **bypass ratio**. The turbine provides the power for both the fan and the compressor. However, there is still considerable energy in the gases down-stream of the turbine. The exhaust gases are therefore further expanded in the exhaust nozzle to a velocity greater than the flight velocity, producing **thrust** for propulsion. The bypass air is also expanded to a velocity higher than the flight velocity, producing **additional thrust** for propulsion. Thus the turbofan engine **derives** its propulsive thrust from the high velocity exhausts of both the bypass air and the gas generator gases.

The turbofan engine is somewhat more efficient than the turbojet at low speeds. Compared with the turboprop it is lighter, less economical at low speeds and more economical at high speeds. The turbofan engines are practically used for most types of airplane **installations**, especially for transport type aircraft.

**Задание 9.** Согласитесь или опровергните утверждения. Начинайте предложения с фраз: I'm afraid that's wrong. You are quite right/ You are wrong. That's not quite so. I think you are mistaken. As far as I know. I think so/ I don't think so/ According to the text.

1. The turbofan engine has performance characteristics somewhere between air-breathing engines and rocket engines.
2. The function of the diffuser is to provide power for the mechanical compressor.
3. The ratio of the air flow through the bypass duct to the air flow through the gas generator is defined as the pressure ratio.
4. The diffuser delivers its air to a fan, which further compresses it.
5. The turbofan engine is somewhat more efficient than the turbojet at low speeds.

6. Compared with the turboprop it is heavier, more economical at low speeds and less economical at high speeds.

**Задание 10.** Прочтите и переведите предложения.

1. In the turbofan engine the fan may be located either in front of the gas turbine or behind it.
2. The first generation of turbofan designs had a bypass ratio of approximately 1:1, that is, about 50 per cent of the air went through the engine as primary airflow and about 50 per cent went through the fan as secondary airflow.
3. The efficiency of the fan engine is increased over that of the jet by converting more of the fuel energy into pressure energy rather than the kinetic energy of a high-velocity exhaust gas stream.
4. Fan engines show definite advantages over the jet engines at speed below Mach 1, the speed of present-day commercial aircraft.

**Задание 11.** Переведите вопросы на английский язык и ответьте на них.

1. Какие характерные черты объединяет турбовентиляторный двигатель?
2. Каковы его главные компоненты?
3. Куда диффузор подает входящий (поступающий) воздух?
4. Как разделяется воздушный поток в турбовентиляторном двигателе?
5. Создает ли турбина мощность и для вентилятора, и для компрессора?
6. Где дальше расширяются выхлопные газы, создавая, таким образом, тягу для движения вперед?
7. Откуда турбовентиляторный двигатель извлекает эффективную тягу (propulsive thrust)?
8. Является ли турбовентиляторный двигатель более эффективным на малой скорости, чем турбореактивный двигатель?
9. Турбовентиляторный двигатель легче, менее экономичен на малых скоростях и более экономичен на больших скоростях по сравнению с турбовинтовым двигателем, не так ли?
10. На каких самолетах устанавливается турбовентиляторный двигатель?

**Задание 12.** Письменно переведите текст без словаря.

In the turbofan, also called the bypass engine, the exhaust gases actually are expelled from the rear nozzle at a slower velocity than a turbojet engine. This decreased velocity would provide less thrust. But the amount of air passing through a turbofan engine is much larger than that passing through a turbojet, and results in a much greater push. Though the turbofan engine takes in much greater quantities of air, only about half of it is pumped into the combustion chamber, while the remainder is ducted, actually with a lower fuel consumption, than the turbojet engine.

## Контрольная работа 11

**Задание 1.** Найдите в предложении ошибку и исправьте её. Предложения переведите.

1. The desire to flying is as old as humanity.
2. Much of the work to discussed here was carried out.

3. This method is known to be used as far back as the 18<sup>th</sup> century (as far back – ещё).
4. We want atomic energy being used for peaceful construction.
5. A material to be useful as a rocket propellant it must be combustible alone or in combination with another materials (other than air from atmosphere).

**Задание 2.** Переведите на английский язык, обращая внимание на неличные формы глагола.

1. Один из способов сделать самолеты как можно более экономичными – это облегчить самолет за счет использования композиционных материалов.
2. Сила, приложенная к телу, заставляет его двигаться по прямой.
3. Дирижабль, вероятно, будет использоваться для путешествий.
4. Считалось, что дирижабли были медленными и ненадежными.
5. Мы знаем, что винтовые самолеты летают медленнее, чем реактивные.
6. Решать тебе, который из двух методов использовать.
7. Известно, что метод записи информации на кристалл с помощью лазера, был создан русскими исследователями.

## Лабораторная работа 12

### Ракетные двигатели

**Задание 1.** Прослушайте, повторите и запомните слова:

- |                |                               |
|----------------|-------------------------------|
| 1. propulsion  | - движение вперед             |
| 2. propellant  | - ракетное топливо            |
| 3. release     | - высвободить                 |
| 4. exhaust     | - истощать                    |
| 5. exhaust gas | - выхлопной газ               |
| 6. guide       | - направлять                  |
| 7. vehicle     | - летательный аппарат         |
| 8. suitable    | - пригодный                   |
| 9. missile     | - снаряд, ракета              |
| 10. primary    | - основной                    |
| 11. auxiliary  | - вспомогательный             |
| 12. solid      | - твердый                     |
| 13. liquid     | - жидкий                      |
| 14. means      | - средство                    |
| 15. remote     | - дистанционный               |
| 16. duration   | - продолжительность           |
| 17. intend     | - намереваться, предназначать |
| 18. valve      | - клапан                      |

**Задание 2.** Подберите синонимы:

- |               |            |
|---------------|------------|
| 1. propellant | 1. direct  |
| 2. rapidly    | 2. wish    |
| 3. guide      | 3. main    |
| 4. velocity   | 4. work    |
| 5. primary    | 5. quickly |
| 6. will       | 6. speed   |
| 7. operation  | 7. fuel    |

**Задание 3.** Подберите антонимы:

- |              |               |
|--------------|---------------|
| 1. rearward  | 1. short      |
| 2. rapidly   | 2. main       |
| 3. start     | 3. impossible |
| 4. auxiliary | 4. slowly     |
| 5. possible  | 5. forward    |
| 6. primary   | 6. finish     |
| 7. long      | 7. secondary  |

**Задание 4.** Прочтите и догадайтесь о значении следующих слов:

jet-propulsion device, a large amount of energy, reactive force of propulsion, propulsive jet, within the vehicle itself, a possible means of propulsion, high-speed missiles, auxiliary power plant, liquid-propellant power plant, remote operation, control valve, long duration.

**Задание 5.** Прочтите предложения, вставляя пропущенные слова.

1. The ..... give a large amount of heat energy.
2. The rocket engine is ..... for our purpose.
3. A rocket is a jet-propelled .....
4. The ..... is ejected with great velocity.
5. These engines are used for long .....
6. The rocket engine provides a possible ..... of propulsion.

---

suitable, means, exhaust gas, propellants, vehicle, durations.

**Задание 6.** Прочтите и переведите предложения.

1. An engine is a means of propulsion.
2. The exhaust gas is guided rearwards.
3. The propellants release much energy.
4. Rocket engines are suitable for interplanetary flight.
5. The auxiliary power plant is necessary in this case.
6. The propellants used in a rocket engine may be solid or liquid.
7. It is possible to use the remote control with this kind of engine.

**Задание 7.** Прочтите и переведите текст "Rocket Engines".

### Rocket Engines

A rocket is a jet-propulsion device, in which all the propellants are burned rapidly at great pressure and release a large amount of energy. The exhaust gas is guided rearward at great velocity and produces the reactive force of propulsion.

In the rocket power plant all the propellants, as well as oxygen, which form the propulsive jet are within the **vehicle** itself, while other engines get oxygen from the atmosphere. Thus the rocket engine can be used in a vacuum and is able to provide a possible **means** of propulsion for interplanetary vehicles.

Besides, it is **suitable** for high-flying, high-speed **missiles** and as a **primary** or an **auxiliary** power plant of an aircraft.

Rocket engines are divided into two categories: **solid** and **liquid**.

The liquid-propellant rocket power plants can be started and stopped at will by the remote operation of the propellant control valves. This cannot be done with solid-propellant systems, because when they have once started, the fuel in the combustion chamber must continue to burn until it is exhausted.

Therefore the liquid-propellant rocket engines are used mostly for long durations and the solid-propellant rocket power plants are intended for short flights.

**Задание 8.** Дайте английские эквиваленты:

высвобождать энергию; выхлопной газ; назад; ракетная силовая установка; межпланетные летательные аппараты; кроме того; основная силовая установка; твердотопливные системы; предназначены для коротких полетов; по желанию.

**Задание 9.** Согласитесь или опровергните утверждение. Начинайте предложения с фраз: I'm afraid that's wrong; you are quite right/ you are not quite right; that's not quite so; I think you are mistaken; as far as I know; I think so; according to the text.

1. Rocket engines get oxygen from the atmosphere.
2. Rocket engines are suitable for high-flying high-speed missiles.
3. Rocket engines are divided into three categories.
4. Solid-propellant rocket power plants can be started and stopped at will.
5. Liquid propellant rocket engines are used for short flights.

**Задание 10.** Не глядя в текст, дополните предложения.

1. An engine is a means .....
2. The exhaust gas is guided .....
3. The propellants release .....
4. Rocket engines are suitable .....
5. The propellants used in a rocket engine may be .....
6. Liquid-propellant power plants can be .....
7. Once started the solid fuel must .....

**Задание 11.** Расскажите по-английски тему "Rocket Engines".

**Задание 12.** Письменно переведите текст:

Undoubtedly the simplest form of jet-propulsion power units is the rocket engine, but the rate at which it consumes fuel has prevented its adoption as a power plant for continuous operation over periods even as long as one hour. The main reason for this is that, unlike other types of engine, the rocket does not take the oxygen required to burn the fuel from its surroundings, but carries its own supply. A hydrocarbon fuel, such as petrol, requires about 3.5 times its own weight of oxygen to burn it completely; hence the weight of fuel that a rocket-propelled aircraft using fuel of

this type would have to carry would be at least 4.5 times that for the equivalent air-consuming engine.

## Контрольная работа 12

### I. Чтение

**Задание 1.** Прочтите текст и поймите его содержание. Заполните пропуски словами из рамочки:

rocket, vehicles, means, exhaust, thrust, propellants, auxiliary, combustion, atmosphere
--

The rocket produces ...1... by means of the expansion of ...2... gases resulting from the ...3... of fuel. At present rocket engines can operate independently of the surrounding ...4... . When used in a vacuum the ...5... engine can maintain its ...6... to provide a possible ...7... of propulsion for interplanetary ...8... . Rocket fuels and oxidizers are called ...9... .

**Задание 2.** Вам даны ответы. Задайте к ним вопросы.

1. By means of the expansion of exhaust gases.
2. They are called propellants.
3. Only for the auxiliary purposes.

**Задание 3.** Закончите предложения в соответствии с содержанием текста:

1. Rocket engines can operate ... (independently of the surrounding atmosphere, in vacuum, in atmosphere).
2. The rocket produces thrust by means of (oxidizers, compression of air, expansion of exhaust gases).
3. When used in a vacuum the rocket engine can (accelerate the aircraft, maintain its thrust, expand the energy).

**Задание 4.** Укажите вопрос, на который нельзя найти ответ в тексте:

1. Are rocket engines used in aircraft only for auxiliary purposes?
2. Are there possibilities of using rocket propulsion in aircraft?
3. What are the disadvantages of rocket engines?
4. Can rocket engines be used in vacuum?
5. What engines can operate independently of surrounding atmosphere?

### II. Грамматика

**Задание 1.** Укажите предложение, которое точнее передает смысл данного.

1. Pronin is said to be working at his new design.  
a) They say that Pronin is working at his new design.  
b) Pronin said that he was working at his new design.  
c) They say that Pronin is to start working at his new design.
2. My chief is said to have finished his experiment last week.  
a) My chief said that he had finished his experiment last week.



- b) They say that my chief finished his experiment last week.  
c) They say my chief is planning to finish his experiment next week.

**Задание 2.** Переведите на английский язык:

1. Известно, что радио было изобретено Поповым.
2. Мы знаем, что ракеты нашли применение в исследовании Вселенной.
3. Это вещество оказалось (to prove) элементом.
4. Известно, что в настоящее время строят (to be under construction) много электростанций.
5. Обнаружили (to find), что этот металл вступает в реакцию (to react) с кислородом и азотом.
6. Работу, которую предстояло выполнить (to perform), считали (to consider) очень сложной.
7. Мы знаем, что он разрабатывает новый тренировочный самолет.
8. Писатель сообщил, что он опубликовал свою новую книгу.

### Supplementary Reading

**Задание:** Прочтите и переведите тексты. Составьте аннотации на базе полученной информации. Используйте ключевые фразы.

#### The Petrol Engine

In the internal combustion engine, heat is generated by combustion of an inflammable charge inside a cylinder, and the heat energy is immediately converted into mechanical energy. Some heavy internal combustion engines use a gas fuel or else Diesel oil, and the fuel/air mixture may be ignited either by a spark or by compression of the mixture. However, for small i.c. engines, such as those which are used in motor-cars, the charge is a mixture of petrol and air, and is ignited by a spark from the distributor.

When the mixture is ignited, the products of combustion expand down the cylinder, which is fitted with a reciprocating piston. The downward movement of the piston is converted into a rotational movement of the crankshaft by means of a connecting rod. As the crankshaft rotates, the piston is driven upwards again, and the exhaust gases are expelled through the exhaust valve in the cylinder head. When the piston nears the top of this stroke, the inlet valve is opened and the exhaust valve closed. The piston then descends on the induction stroke, and draws a fresh charge into the cylinder. As the piston rises again on the compression stroke, the charge is compressed and ignited, and the cycle begins again. This is the four-stroke cycle which is in common use. An alternative cycle is the two-stroke cycle, which combines the exhaust and compression strokes into one.

The combustion of the mixture does not take place instantaneously. The spark is therefore timed to occur before the piston reaches top dead centre, otherwise maximum pressure would not be reached in time. By the time the piston is at top dead centre, combustion is well under way and the expansion of the gases is beginning. Once combustion starts, it should be carried through the mixture very rapidly, and this is assisted by making the clearance space above the piston as small as possi-

ble, and by careful design of the cylinder head. Rapid propagation of the flame through the compressed gas is also assisted by creating turbulence in the gas.

Most small i.c. engines in common use have four cylinders, which fire in a definite and regular sequence. This is necessary, otherwise the torque which the pistons impart to the crankshaft will be irregular and uneven. The torque is liable to be uneven in any case when the engine is running slowly, and a flywheel is fitted to the crankshaft to damp out these variations.

It is essential for the inlet and exhaust valves to open and close at exactly the appropriate moment in relation to the position of the piston. Therefore they are actuated by a cam-shaft running in phase with the crankshaft.

### **The Turbo-prop Engine**

The efficiency of a turbo-jet engine varies with the speed and altitude at which it operates. Whilst it is very efficient at supersonic speeds and high altitudes, it is not suited to the low speeds involved in taking-off and landing. Under these conditions, thrust augmentors or after-burners are often required to boost the power, and this entails heavy fuel consumption and restricts the range of the aircraft. On the other hand, propeller-driven aircraft cannot attain speeds much in excess of 500 m.p.h., whereas at low speeds they have a much better performance. Since subsonic speeds are still acceptable for most civilian airliners, a type of engine known as the turbo-prop was developed, which combined some of the advantages of both jet and piston-driven engines.

In the turbo-jet, then turbine is required to develop enough power to drive the compressor only, whereas in the turbo-prop engine, it must supply power also for the propeller, to which it is coupled by means of reduction gearing. As the propeller rotates, it drives rearwards a much larger column of air than that which is expelled from the jet-tube of the turbo-jet, but at a much lower velocity. Consequently it is quieter than the turbo-jet, since the volume of noise produced by an aircraft engine increases with the velocity of the air column. Most airports are situated in or near large centers of population, with the result that any reduction in the noise level is a decided advantage. Furthermore, a large proportion of the energy of the products of combustion is needed to drive the compressor and the airscrew. As this proportion increases, so the amount of thrust developed in the jet-pipe diminishes. In consequence, the destructive blasts of hot gases which emanate from the jet-pipe of the turbo-jet while taxiing on runways or taking-off are greatly reduced.

The main disadvantage of the turbo-prop engine is of course the limitation imposed on speed by airscrew, as a result of which it is likely to become obsolete on all except short-haul aircraft.

A more recent development in jet propulsion is the ducted-fan jet, in which the turbine drives a multi-bladed fan in a duct. A certain proportion of the air which enters the engine by-passes the compressor and combustion chambers, and is impelled by the fan down the outside of the duct, so that it is expelled at considerable velocity from the rear of the engine. It amplifies the mass of hot exhaust gases, and thus serves to augment the thrust derived from them. Consequent on the more moderate speed of this ducted air, the noise level is kept reasonably low. In addition, this

type of engine performs well both below and above the speed of sound, whereas the other types of engine are efficient only at certain speeds.

### **What are Sounding Rockets?**

Sounding rockets take their name from the nautical term “to sound” which means to take measurements. They are basically divided into two parts – a solid fueled rocket motor and the payload. The payload is the section which carries the instruments to conduct the experiment and send the data back to Earth.

The National Aeronautics and Space Administration (NASA) currently uses 15 different sounding rockets. The rockets come in a variety of sizes from the single-stage Super Arcas which stands 7-feet (3 meters) high to the four-stage Black Brant XII which stands at 65-feet (20 meters) tall. These rockets can carry scientific payloads of various weights to altitudes from 30 miles (48 km) to more than 8000 miles (1,287 km).

Sounding rockets are low cost and the payload can be developed as quickly as six months. These rockets allow scientists to conduct investigations at specified times and altitudes. The experiments provide a variety of information on the upper atmosphere, the Sun, stars, galaxies and other planets.

NASA launches an average of 35 sounding rockets each year with a success rate of about 98%. They are launched routinely from established sites such as Wallops Island, Poker Flat Research Range as well as sites in Canada, Norway and Sweden.

Sounding rockets can also be launched from temporary launch ranges. In the past, launch programmes have been conducted from Peru, Puerto Rico, Greenland, Australia, and even from an aircraft carrier in the Pacific Ocean.

The flight profile of a sounding rocket follows a parabolic trajectory – it goes up and comes back down. Flight time is less than 30 minutes.

Following launch, as a rocket motor uses its fuel it separates from the vehicle and falls back to Earth. The payload continues into space after separating from the motor(s) and begins conducting the experiment. When the experiment is completed, the payload reenters the atmosphere and a parachute is deployed, bringing the payload gently back to Earth. The payload is then retrieved. By retrieving the payload, a tremendous savings can be achieved because the payload or parts of the payload can be refurbished and flown again.

Учебное издание

**ДВИГАТЕЛИ ЛЕТАТЕЛЬНЫХ АППАРАТОВ  
РАЗВИТИЕ НАВЫКОВ УСТНОЙ РЕЧИ**

*Методические указания к лабораторным работам  
по английскому языку*

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Компьютерная верстка Т. Е. П о л о в н е в а

Подписано в печать 27.12. 07. Формат 60x84 1/16.

Бумага офсетная. Печать офсетная.

Усл. печ. л. 3,75.

Тираж 300 экз. Заказ 302 . Арт. С-73/2007

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