Государственный комитет РСФСР
по делам науки и высшей школы

Куйбышевский ордена Трудового Красного Знамени
авиационный институт имени академика С.П.Королева

ГАЗОТУРБИННЫЕ И РЕАКТИВНЫЕ ДВИГАТЕЛИ

Учебные задания
по английскому языку

Самара 1992

Составители: Л.М.Скрябина, О.Я.Степанова

ББК Ш I43.2I.923

Газотурбинные и реактивные двигатели:Учеб.задания по англ.яз./Куйбышев.авиац.ин-т; Сост.Л.М.Скрябина, О.Я. Степанова. Самара, I992. 32 с.

Данные учебные задания составлены в соответствии с требованиями программы по английскому языку для неязыковых специальностей вузов (I986 г.).

Целью учебных заданий является совершенствование навыков чтения и понимания прочитанного по вышеназванной тематике,а также контроль сформированности лексико-грамматических навыков студентов. Выполнены на кафедре "Иностранные языки".

Печатаются по решению редакционно-издательского совета Куйбышевского ордена Трудового Красного Знамени авиационного института имени академика С.П.Королёва

Рецензент Е.И.Безрукова

ГАЗОТУРБИННЫЕ И РЕАКТИВНЫЕ ДВИГАТЕЛИ

Составители: Скрябина Людмила Михайловна
Степанова Ольга Яковлевна

Подписано в печать 20.05.9I.Формат 60x84 I/I6.
Бумага обёрточная. Печать офсетная.
Усл.печ.л.I,86.Усл. кр.-отт. I,98. Уч.-изд.л. I,76.
Тираж 400 экз. Заказ № 2329. Бесплатно.

Куйбышевский ордена Трудового Красного Знамени авиационный институт имени академика С.П.Королёва.
443086 Самара, Московское шоссе, 34.

Типография им.В.П.Мяги Самарского полиграфического объединения
443099 Самара, ул.Венцека, 60.

У Р О К 6

I. Сослагательное наклонение.

2. Придаточное предложение условия.

I. Запомните слова:

1. auxiliary /ɔ:gˈziljəri / - вспомогательный
2. propulsion /prəˈpʌlʃn / - силовая установка, движение вперед
3. rate /ˈreɪt / - скорость, темп, степень
4. to suppose /səˈpouz / - думать, предполагать
5. to burn /bə:n / - гореть, сжигать
6. oxygen /ˈɔksɪdʒən/ - кислород
7. to consume /kənˈsju:m / - потреблять, расходовать
8. to fit /ˈfɪt / - находить, устанавливать, оснащать
9. to convert /kənˈvə:t / - превращать
10. to rise (rose, risen) /ˈraɪzˌrouzˌrɪzn / - поднимать(ся)
11. to decend /dɪˈsend / - опускаться, понижаться
12. out of /ˈaut əv / - из, вне
13. main /meɪn / - главный, основной
14. altitude /ˈæltɪˌtju:d / - высота
15. to occur /əˈkə: / - иметь место, происходить

II. Переведите предложения:

1. Auxiliary engines are often used in aircraft. 2. The main advantage of this design is its little size. 3. The rate of fuel consuming is too high in this aircraft. 4. The fuel is usually burnt with oxygen. 5. Auxiliary installations are necessary in this case. 6. Everybody supposes that no burning can occur under these conditions. 7. Every engine must consume as little fuel as possible. 8. Burning can't occur without oxygen. 9. This type of wings doesn't fit our aim. 10. We suppose that this method completely fits them. 11. It is necessary to convert the energy of chemical reaction into power. 12. The airplane rises and descends at low speed. 13. Such operation rate doesn't fit our program.

III. Найдите слова-синонимы:

A. 1. to convert, 2. altitude, 3. propulsion, 4. main, 5. to consume, 6. to fit, 7. rate, 8. to occur

---

1. to take place, 2. to use, 3. speed, 4. movement, 5. to transform, 6. to install, 7. height, 8. chief

B. Найдите слова-антонимы:

1. auxiliary, 2. descend, 3. out of, 4. above, 5. start, 6. landing

---

1. below, 2. take off, 3. finish, 4. into, 5. rise 6. main

IV. Подберите подходящее по смыслу слово:

1. It is necessary to use new type of (power, altitude, propulsion). 2. This engine consumes fuel at great (propulsion, rate, thrust). 3. The fuel is (descended, risen, burnt) in some minutes. 4. For any burning (oxygen, water, nitrogen) is necessary. 5. The German V-2 rocket (reached, consumed, carried) 9 tons of fuel in one minute . 6. During rising of the aircraft (ballistic, auxiliary, another) power plant is utilized.

V. Поставьте сказуемое в страдательный залог, переведите:

1. Sometimes rocket motors (to use) in aircraft for auxiliary purposes. 2. The energy of fuel (to convert) into the energy of propulsion. 3. The fuel (to burn) in 1 minute. 4. The controls (to fit) on the unit. 5. The distance must (to conver) in 20 minutes. 6. A small turbojet engine may (to install) to ease take off and the landing.

СОСЛАГАТЕЛЬНОЕ НАКЛОНЕНИЕ

should, would, could, might + инфинитив глагола (без to)

VI. Переведите следующие предложения по образцу:

ОБРАЗЕЦ: I should help you. - Я бы помог Вам.

1. The engine should develop its maximum speed in some minutes. 2. They could use the main principle of the project. 3. The problem would not have been solved. 4. Such turbine design would not be installed in our case. 5. The engine would be repaired.

VII. Переведите предложения, обращая внимание на условные предложения и способы их перевода:

1. If the engine is repaired, it will work for a long time. 2. Unless the design is adopted by our chief, it will not be realized. 3. If this engine didn't consume much fuel, it would be one of the best engines today. 4. Provided the main propellant for this rocket were nitrogen, it would be used for our purpose. 5. Provided the aircraft speed could be increased, the problem would be solved quite easily. 6. Unless the undercarriage had been installed, the landing would not have been so easy. 7. Provided this unit is removed, we shall immediately look for another one. 8. Unless the craft covered 150 miles per hour it could not arrive so quickly.

VIII. Выберите подходящий союз – provided, if, unless.

1. ... the rocket had suitable wings and controls, it would have the required trajectory. 2. ... there were enough atmosphere, the aircraft could operate in cosmos. 3. Manned rockets could not have been launched ... the problem of returning to the Earth had been solved. 4. ... the rocket would have suitable wings, one would be able to change its trajectory.

IX. Переведите предложения:

1. Unless the propulsion consumes much fuel, they will take it for their project. 2. If they didn't fit the auxiliary engine, the operation would be impossible. 3. The process couldn't occur under these conditions. 4. If the rocket were fitted with wings and controls, it would be converted into a high-speed aircraft. 5. The rocket would follow a ballistic trajectory and descend to a height of 100 000 ft.

X. Прочтите и переведите интернациональные слова:

rocket, control, impulse, ballistic, trajectory, atmosphere, horizontal, final, practically, normal, initial, total.

XI. Прочтите текст А.

Т е к с т А. Rocket Motors

At present rocket motors are used in aircraft only for the three auxiliary purposes already mentioned; we have seen that the great difficulty about using them for main propulsion is the enormous rate at which they burn fuel and oxygen. But it must not be supposed that they will never be used for latter purposes. For example, the German V-2 rocket consumed 9 tons of fuel in 1 minite, but it reached a speed of 3,500 m.p.h. If this rocket were fitted with suitable wings and controls and so converted into high-altitude, high-speed aircraft, it could be made to have a flight-path as shown below. The fuel would all be burnt in about 1 minite and the aircraft would rise under the initial impulse to a height of nearly 300,000 feet, after this it would follow a ballistic trajectory until it had descended again to a height of about 100,000 ft., where there would be enough atmosphere for the controls to be used to pull the aircraft out of the dive into gliding altitude.

This would occur about 4 minutes after the start, when a horizontal distance about 150 miles had been covered. From here the craft would glide for nearly another 450 miles, making a total of 600 miles, covered in about 20 minutes. A small turbo-jet engine might be installed to ease the glide and final landing, which might be made under practically normal conditions.

XII. Найдите в тексте предложения, содержащие следующие слова; переведите эти предложения:

1) ... that the great difficulty about using them ... .
2) ... but it reached a speed of 3,500 m.p.h. ... .
3) ... and the aircraft would rise under the initial impulse ... . 4) ... where there would be enough atmosphere.

XIII. Ответьте на следующие вопросы:

1. What engines is this article about?
2. Where were rocket engines used during the World War II?
3. How can you describe the German V-2 rocket?
4. Under what conditions would it be possible to utilize a rocket as a high-speed aircraft?
5. To what height would the aircraft rise under the initial impulse?
6. At what height would there be enough atmosphere for the controls using?
7. What distance would be covered in 4 minutes?
8. What engines might be installed to ease the glide and final landing?

XIV. Верно ли утверждение, что....

1) Rocket motors are traditionally used in ordinary aircraft? 2) German V-2 rocket consumed little fuel, but reached only low speed. 3) If this rocket were fitted with suitable wings, it couldn't be converted into high-altitude, high-speed aircraft. 4) After burning the fuel the aircraft would descend to a height of 2,000 kilometres. 5) In 4 minutes after the start only some miles of horizontal distance would be covered.

XV. Переведите на русский язык:

1. If there were no vacuum in cosmos, ordinary aircraft could operate there. 2. Provided some disadvantages were removed, this propulsion could be utilized not only for auxiliary purposes. 3. Unless the design could be changed, the characteristics would remain the same. 4. Unless they had solved the problem, they would not have been able to complete the experiment. 5. If this rocket were fitted with suitable wings, it could be converted into a high-speed aircraft.

XVI. Поставьте глагол в нужной форме:

1) If this engine (to be) of smaller sizes, it could be used for small helicopters. 2) Unless the new airport (to be completed), the number of airplane routes would have been les-

sened. 3) Provided there were not enough space in the cabin, this unit (to be installed) in it. Provided you didn't change the fuel the rate of burning (not to be improved).

XVII. Переведите предложения:

I. Если бы этот двигатель имел меньший вес, мы бы использовали его. 2. Если бы самолёт уже вернулся, мы бы знали об этом. 3. Если бы тяга была сильнее, скорость аппарата была бы больше. 4. Если бы ракета была оснащена крыльями, она бы превратилась в высокоскоростной самолёт. 5. Это произошло бы через 4 минуты после старта.

XVIII. Образуйте глаголы при помощи данных суффиксов и переведите как исходные, так и полученные слова.

ОБРАЗЕЦ: length - to lengthen

-en : strength, height, light, wide, broad, hard
-ify : simple, intense, electric, quality
-ize : magnet, revolution, crystal, character, special, active

XIX. Найдите исходную форму глагола и переведите:

ОБРАЗЕЦ: building - to build

undertaking, drawing, equipment, designer, accelerator, classification, orientation, compressor, appearance, foundation, existence.

XX. Дополните диалог:

A: Could rocket engines be used as the main airplane power plant unit?
B: .....
A: .....
B: The main disadvantage of the rocket motor is the great rate of consuming fuel and oxygen.
A: What thrust can rocket engine develop?
B: .....
A: .....
B: It would occur in about 4 minutes when a horizontal distance of about 150 miles had been covered.

XXI. Обратите внимание на перевод данных слов. Это поможет Вам понять текст В.

to prevent - мешать
reason - причина
unlike - в отличие
supply - запас
hydrocarbon - гидроуглеродистый
value - значение
adoption - принятие
ratio - коэффициент, отношение
in spite of - несмотря на...
climb - набор высоты
amount - величина, количество

XXII. Просмотрите текст, найдите предложения, в которых говорится о том,

I) что мешает использовать ракетный двигатель как основную силовую установку;
2) какие преимущества имеет ракетный двигатель;
3) для каких целей используется ракетный двигатель в наши дни.

Т е к с т В.

1. The simplest form of jet-propulsion power units is the rocket engine, but enormous rate at which it consumes fuel has prevented its adoption as a power plant for continuous operation over periods as long as one hour.

The main reason for this is that, unlike other types of engines the rocket does not take the oxygen required to burn the fuel from the atmosphere, but carries its own supply. A hydrocarbon fuel, such as petrol, requires oxygen more than its own weight to burn it completely; so the weight of fuel that a rocket-propelled aircraft has to carry is much more than for other air-consuming engines. Another reason for the high fuel consumption is that the speed of the jet is much higher than that of the turbojet engines.

2. The rocket engine is on the whole rather simpler than the turbojet, but the outstanding points in its favour are thrust-weight and thrust-frontal area ratios and also the fact that the thrust does not fall off at heights as does that of the turbojet.

3. In spite of the high fuel consumption of the rocket engine, the large thrust which it develops, makes it suitable for three applications. These applications are at present mainly of mili-

tary value, namely assisted take off, increasing the rate of climb and increasing the speed in level flight.

The last two operations can, of course, only be performed for short periods limited by the amount of rocket fuel that can be carried. For assisted take off the required period of operation is short. Briefly the present duty of the rocket is to provide very large thrust for short periods.

NOTE : in its favour - в его пользу

XXIII. Просмотрите текст еще раз и ответьте на вопросы:

1. What is the simplest form of jet-propulsion power units?
2. Why is it impossible to use a rocket engine as a main power plant?
3. What are the main advantages and disadvantages of rocket engines?
4. For what purposes are rocket engines used today?
5. How long can rocket engines operate?

XXIV. Письменно переведите текст С.

T e x t C.

The rate of climb of military aircraft can be appreciably increased by rockets. The rates of climb of present-day fighters have not been disclosed, but it is fairly certain that the rate is at least 10000 ft per minute if not more. With a rocket thrust equal to the static thrust of jet engine at sea level it has been estimated that a height of 45000 ft could be reached in one minute.

Acceleration in level flight depends on the excess thrust available. The thrust of turbojet engine falls off at altitude. This may be serious for a fighter for which high manoeuvrability, which implies rapid changes of speed, is essential. Hence rocket engines may play an important part in the equipment of high-speed interceptor aircraft operating at high altitudes.

УРОКИ 7-8

I. ing-form глаголов

2. Глаголы с ed

I. Запомните слова:

1. to discharge /dɪs'tʃɑ:dʒ / - выбрасывать, разряжать
2. h.p. = horsepower /'eɪtʃ.pi:/ - лошадиная сила, мощность в л.с.
3. rear /rɪə / - задняя часть
4. front /frʌnt/ - передняя часть
5. to meet requirement /rɪ'kwaɪəmənt/ - отвечать требованиям
6. to push /puʃ / - толкать
7. sufficient /sə'fɪʃənt / - достаточный
8. consumption /kən'sʌmpʃn/ - расход, потребление
9. to create /krɪ:'eɪt / - создавать, творить
10. to differ / dɪfə / - отличаться
11. efficiency /ɪ'fɪʃənsɪ / - эффективность
12. gasoline /'gæsəli:n / - газолин, бензин
13. to arrange /ə'reɪndʒ / - располагать, монтировать
14. prime mover /'praɪm 'mu:və/ - основной источник движения, двигатель
15. blade /bleɪd / - лопатка, лопасть
16. weight /weɪt / - вес
17. stroke /strouk / - такт, ход
18. to raise /reɪz / - поднимать
19. to solve / sɔlv / - решать
20. lightness /'laɪtnɪs / - легкость (о весе)
21. airscrew /'ɛəskru: / - воздушный винт

II. Переведите предложения на русский язык:

1. The Russian mechanic Zagodzinsky created the first four stroke gasoline engine.
2. The designers must combine efficiency and lightness in an engine.
3. The engine is to have reduced weight per horsepower of the engine.
4. In the turbojet engines the jet of air and gases is dis-

charged at high velocity and temperature.

5. Modern turbojet engines can meet all the requirements of today's aviation.
6. Engine development raises many problems which designers have to solve.
7. The fuel consumption must be as low as possible.

III. Найдите: а) слова-синонимы:

1. to discharge, 2. rear, 3. efficiency, 4. mover, 5. to create, 6. to meet requirements, 7. propeller

---

1. effectiveness, 2. engine, 3. to satisfy requirements, 4. to develop, 5. airscrew, 6. back, 7. exhaust

б) слова-антонимы:

1. to discharge, 2. rear, 3.to push, 4. prime, 5. sufficient, 6. to raise

---

1. to charge, 2. front, 3. to drop, 4. auxiliary, 5. to pull, 6. insufficient.

IV. Выберите нужное по смыслу слово и поставьте его в данное предложение:

1. One of the problems is to lighten the weight and to increase the (size, area, efficiency) of the engine. 2. Steam engine can produce only low (weight, fuel, power). 3. All types of engines receive their energy from chemical compounds which are called (power, fuel, efficiency). 4. Fuel (invention, increase, consumption) of steam engines was very high. 5. Turbojet engine has no (propeller, turbine, body).

V. Переведите следующие словосочетания:

four-bladed airscrew, high fuel consumption, four-stroke cycle principle, as compared with, the engine couldn't meet all the requirements, low power developed.

VI. Прочтите и переведите следующие интернациональные слова:

propeller, gas, temperature, plane, problem, cycle, principle, combine.

VII. Найдите в предложениях глаголы с ing-окончанием, определите их функцию, переведите предложения:

1. The fan accelerates the air passing through it. 2. The turboprop engine is very similar to the turbojet engine differing only in the use of a propeller. 3. The air is heated in passing through the compressor. 4. Landing on a planet and getting home again is a problem which scientists and designers had to solve. 5. The rocket needs no air for flying. 6. The idea of creating a multi-stage rocket belongs to Tsiolkovsky. 7. The experimentor goes on pumping coolant through the installation. 8. There are two types of chemical rocket engines: those using liquid propellants and those using solid propellants.

VIII. Найдите предложения, в которых обстоятельство выражено глаголом с ing -окончанием, переведите их.

1. The hot gases generated by any heating process can be applied for propelling a body in a fluid. 2. The engine is used in moving aircraft. 3. The principle of the work consists in increasing the air pressure in the engine. 4. A coolant is used for preventing excessive temperature. 5. We have learned of his starting a series of new experiments on engines. 6. Before starting the engine you must carefully test it. 7. He began conducting the experiment last year.

IX. Найдите глаголы с оконч. ed, определите их функцию, переведите эти предложения.

1. The technique described received general approval. 2. The hot gases generated produced increasing of general temperature. 3. The propeller mentioned converted the energy of the engine into thrust. 4. A force required propelled an airplane through the air. 5. Although applied for many purposes disel engines have certain disadvantages. 6. When used, a jet engine produces high-pressure, high-temperature gas. 7. If required, the pressure will be increased. 8. As proved by engineers the devices must be changed. 9. Though finished, the work was not a success. 10. The power plant supplied much energy. 11. The air accelerated passed through the fan.

X. Переведите предложения, обращая внимание на перевод независимого причастного оборота в зависимости от его места в предложении:

1. так как;поскольку,когда;если;после того,как.

МОДЕЛЬ: Everything being ready, we can start making experiments. – Так как(если,когда) всё готово, мы можем приступить к экспериментам.

1. The mechanic repairing the engine, I went to the chief engineer instead of him. 2. The engine being repaired, we shall be able to use it in our work. 3. The mechanic having repaired the engine, the engineer examined it. 4. The engine having been repaired, we could use it in our work.

2. а, и, но, причём или бессоюзно.

МОДЕЛЬ: We have three lectures today, the last being on physics. – У нас сегодня три лекции, причём (и, а) последняя по физике.

1. New engines were brought to the plant, all of them being in good order. 2. The professor entered the lecture hall, the assistant following him. 3. The plan was discussed in detail, many workers taking part in the discussion. 4. The lecturer spoke on the problem of space research, his lecture (being) illustrated by diagrams.

XI. Прочтите текст А.

Т е к с т А.

Aircraft Powerplant

A radically different power plant is a turbojet engine. This has no propeller, but instead discharges backward a jet of air and gases at high velocity and temperature, thus creating the forward thrust.

Today's engines developing several thousand h.p. greatly differ from those used 50 years ago. Thus the plane tested by Mozhaisky in 1884 was a monoplane provided with two engines developing 50 h.p., those being steam engines. Three four-bladed airscrews provided thrust, the main one being installed in the nose part. It was of a tractor type, the two others arranged in the rear being a pusher type.

Although tried as a prime mover, the steam engine could not meet all the requirements. The steam engine was not sufficiently

light and powerful for propelling an airplane. Its heavy weight, high fuel consumption and low power developed raised many problems the designer had to solve.

One of the problems worked at by the designers was lightening the weight of the engine and increasing its efficiency. In 1880 the Russian mechanic Yagodzinsky designed and constructed a new engine type. The engine designed by him was the first gasoline engine working on the four-stroke cycle principle.

The engine attracted the attention of many designers as it was lighter and more powerful as compared with the steam engine. Still there remained an important but unsolved problem: combining efficiency and lightness in an engine. Even nowadays aircraft engine designers are striving for more horsepower output and less engine weight.

XII. Прочтите текст еще раз. Найдите предложения, в которых употребляются следующие слова:

1) самолёт, испытывать, снабженный, паровые двигатели;
2) приводить в движение самолет, недостаточно легкий и мощный;
3) первый бензиновый двигатель, принцип четырехтактного цикла.

XIII. Ответьте на вопросы по содержанию текста.

1. What is the main characteristic of a turbojet engine?
2. How does a turbojet engine create a forward thrust?
3. How many engines were installed in the Mozhaisky aircraft?
4. What kind of engines were installed in the Mozhaisky aircraft?
5. What are the disadvantages of steam engines?
6. What engine was designed by Yagodzinsky?
7. On what principle did this engine work?

IV. Заполните пропуски словами из активного словаря.

1. A turbojet engine ... backward a jet of air and gases.
2. A monoplane was provided with two engines developing 50 ... .
3. One airscrew of tractor type was installed in the ... part, the two others were ... in the ... .

4. The steam engine could not meet all the ... .
5. The engine was not ... light and powerful.
6. Its heavy ... , high fuel ... and low power developed ... many problems the designer had to ... .
7. One of the problems was to increase the engine ... .

---

h.p. rear, requirements, consumption, efficiency, to discharge, to arrange, weight, to solve, front, sufficiently, to raise

XV. Поговорите по содержанию текста, используя следующие вопросы и ответы:

A. What are the disadvantages of steam engines?
B. .....
A. .....
B. The designers were to lighten the weight of the engine.
A. What kind of engines was designed by Russian mechanic Yagodzinsky?
B. .....
A. .....
B. The gasoline engine attracted the attention of many designers.
A. What important problems remain unsolved?
B. .....
A. .....
B. All well known types of engines derive their energy from fuel combined with oxygen.

XVI. Переведите предложения с независимым причастным оборотом:

1. Other things being equal, the higher the temperature of a heat engine, the more efficient the machine.
2. A combustion chamber of a given size containing only a certain weight of a propellant, the thrust may be made large for a short time by providing a large burning surface.
3. Several servo systems are required, the signals being fed electrically to the control systems.
4. Certain other conditions affect the operation of the engine, the principal condition being air density.

5. All four variables being known, the gross thrust at nozzle can be calculated.

XVII. Переведите предложения, обращая внимание на сложный герундивный оборот:

1. Tsiolkovsky's having laid the foundation of a new science - theory of rocket flying is a well-known fact.
2. These turbofan engines couldn't be used in this design because of their being too heavy.
3. Due to the coolant being pumped through the reactor excessive temperatures are prevented.
4. Successful travelling of satellite depends on their having been set on a proper orbit.
5. Their heating the gas changed the results of their experiments.
6. He insisted on his machine being tested at once.

XVIII. Переведите текст письменно.

Т е к с т В.

Jet Engines

Jet engines use the reaction force. It is worth mentioning that the jet engine is not a modern development. It utilizes air from the atmosphere together with the combustion of a fuel.

When used, a jet engine produces high-pressure, high-temperature gas, which is ejected rearwards with great force named thrust. The thrust is the reaction of the stream or the jet of hot gases ejected from the rear. The jet is produced by combustion of the fuel in the compressed air which is supplied by the atmospheric air that enters through the front opening.

For getting the required air into the combustion chamber a compressor is mounted in the front opening. Air is sucked, compressed and then used to burn a fuel.

У Р О К И 9-10

Инфинитив и инфинитивные обороты

I. Запомните следующие слова и выражения:

1. to bypass /'baipɑ:s / - обходить обходным путем
2. bypass turbojet engine /'tə:bədʒet ˌendʒin / - двухконтурный турбореактивный двигатель
3. to operate /'ɔpəreit / - работать
4. subsonic /sʌb'sɔnik/ - дозвуковой
5. to seem / si:m / - казаться
6. to be well suited /'sju:tid/ - хорошо подходить, соответствовать
7. to utilize /'ju:tilaiz/ - использовать
8. tailpipe /'teilpaip/ - выхлопная труба
9. reheat /ri'hi:t / - подогрев
10. augmentor /ɔ:g'mentə / - форсажная камера
11. propulsion /prə'pʌlʃn / - двигатель, силовая установка
12. excess / ik'ses / - избыток, излишек

II. Переведите предложения:

1. The bypass turbojet engines are utilized for subsonic speed airplanes.
2. The subsonic engines are well suited for civil aircraft.
3. The length of the tailpipe varies with each airplane.
4. Any aircraft propulsion system must meet certain requirements.
5. The excess air enters the tailpipe.
6. Augmentor is an installation increasing thrust.

III. Прочтите и переведите интернациональные слова:

diagram, type, propeller, characteristic, effective, modern, principle, concentrate

IV. Найдите слова с одинаковым значением:

1. operate, 2. utilize, 3. propulsion, 4. propellant, 5. force, 6. significant, 7. aim, 8. attain

---

1. power plant, 2. fuel, 3. power, 4. important, 5. use, 6. get, 7. work, 8. task

V. Найдите слова с противоположным значением:

1. subsonic, 2. solid, 3. civil, 4. excess, 5. various, 6. initiate, 7. accelerate

---

1. military, 2. lack, 3. the same, 4. liquid, 5. finish, 6. slow-down, 7. supersonic

VI. Переведите предложения, обратите внимание на место и перевод инфинитива в функции обстоятельства:

ОБРАЗЕЦ: To find more information about the flow in the compressor we must determine its angle velocity. - Для того, чтобы получить дополнительные сведения о потоке в компрессоре, мы должны измерить его угловую скорость.

1. To propel an airplane through the air a certain force is required.
2. Both solid and liquid fuel rockets are used to attain a highly concentrated power.
3. To drive the fan a turbofan has additional turbine stages.
4. In the turbojet engine the turbine is designed to drive the compressor.
5. In order to generate thrust of its own the fan accelerates the air passing through it.

VII. Переведите предложения, обращая внимание на место и перевод инфинитива в функции подлежащего:

ОБРАЗЕЦ: To utilize bypass engines for civil and military aircraft is desirable. - Желательно использовать двухконтурный турбореактивный двигатель для гражданских и военных самолетов.

1. To know jet propulsion principle is necessary for every pilot.
2. To predict the behaviour of the engine is significant for our future work.
3. To ensure high propulsion efficiency is our aim.

VIII. Переведите предложения, обращая внимание на перевод инфинитива в функции определения:

ОБРАЗЕЦ: The engines to be used in space are very powerful - Двигатели, которые должны применяться в космосе, очень мощные.

1. Tests to determine properties of propellants are currently in preparation at the laboratory.
2. Propellant properties are the main factors to be considered.
3. The reciprocating engine probably will be retained for many years to come for use in low-speed airplanes.

IX. Переведите предложения, обращая внимание на перевод инфинитива в составном именном сказуемом:

ОБРАЗЕЦ: The main function of the turbine is to provide power for the mechanical compressor. - Основная функция турбины - давать энергию для механического компрессора.

1. The function of a diffuser is to convert the kinetic energy of the entering air into a pressure rise.
2. The function of the injector is to receive the liquid propellants and direct them in the liquid streams.
3. The aim of the igniter is to initiate combustion.

X. Переведите предложения, обращая внимание на перевод инфинитива в функции части составного глагольного сказуемого и дополнения:

ОБРАЗЕЦ: The weight of the propulsion system is to be divided between fuel and engine. -

1. The total weight of the airplane can be divided among the airplane, the propulsion system and payload.
2. The engineer wanted to ensure the successful operation of bypass turbojet engine.
3. We should like to utilize the subsonic engines for civil aircraft.

XI. Переведите предложения, определив функцию инфинитива:

1. To build a new engine in time is essential.
2. To build a new engine it is necessary to make various calculations.
3. The engine to be built is of great importance.
4. Our aim is to built a new engine.
5. The engine has to be built as soon as possible.

ОБЪЕКТНЫЙ ИНФИНИТИВНЫЙ ОБОРОТ

We know him to be an aircraft engine designer.
- Мы знаем, что он - конструктор авиационных двигателей.

XII. Переведите предложения, обращая внимание на перевод объектного инфинитивного оборота:

1. We know the bypass engine to operate at high subsonic speeds.
2. The scientists consider subsonic engines to be well suited for aircraft.
3. The designers suppose the bypass engines to approach the favourable jet characteristics of the propeller.
4. We suppose this engine to be a thrust-augmentor.

СУБЪЕКТНЫЙ ИНФИНИТИВНЫЙ ОБОРОТ

This machine is known to operate with great speed.
- Известно, что эта машина работает с высокой скоростью.

XIII. Переведите предложения с субъектным инфинитивом:

1. Bypass engines are known to operate at high subsonic speeds.

2. Such engines are certain to be well suited for civil aircraft.
3. The subsonic engines seem to be well suited for civil aircraft.
4. Bypass engines are also supposed to be utilized for military aircraft.
5. The bypass engine is considered to approach the favourable jet characteristics of the propeller.
6. Such engine is regarded to be a thrust-augmentor.

XIV. Прочтите и переведите текст:

Т е к с т А.

The Bypass Turbojet Engines

Bypass turbojet engines are designed to operate at high subsonic speeds. Therefore the subsonic engines seem to be well suited for civil aircraft. Sometimes these engines may be utilized for military aircraft, particularly for airplanes intended to operate at these speeds. To enable them to achieve higher speed, the large amount of excess air in the tailpipe is used for reheat. It means to burn extra fuel to increase the thrust to a greater extent. Usually the propeller becomes less efficient at speeds higher than 450-500 m.p.h. But the bypass is considered to approach the favourable jet characteristics of the propeller. Therefore we suppose the bypass engine to be a thrust augmentor and effective means for propulsion of modern aircraft vehicles.

XV. Ответьте на вопросы по содержанию текста:

1. What do you know of bypass turbojet engines?
2. What advantages have the bypass engines over the other types of turbojets?
3. Why are they well suited for civil aircraft?

XVI. Заполните пропуски словами из активного словаря:

1. Most turbojets ... best at relatively high altitude. There is no simple explanation for the fact that they are so ... to high-altitude ... .

2. Bypass engines may be ... both for civil and military aircraft.
3. The cold temperature of the air at high altitude gives an engine extra ... .
4. A large amount of ... air in the ... is used for reheat.
5. The bypass engine is supposed to be a ... .

XVII. Найдите в тексте два случая употребления слова "means". Объясните, какой частью речи оно является в том и другом случае.

XVIII. Обратите внимание на перевод следующих слов. Это поможет Вам понять текст:

fluid - жидкость
acquire - получать
heat exchanger - теплообменник
impulse turbine - активная турбина
reaction turbine - реактивная турбина
shaft - вал
smooth - ровный, гладкий
streamlined - обтекаемый
consideration - соображение

XIX. Прочитайте и переведите текст В.

Т е к с т В.

The Turbine Nozzle

The turbine nozzle performs two functions:

1. It transforms a portion of the energy of the fluid, acquired in the heat exchanger, into kinetic energy.
2. a) In the impulse turbine it directs the high-velocity fluid jet against blades which are free to move in order to convert the kinetic energy into shaft work;
   b) in the reaction turbine the nozzles, which are free to move, discharge high-velocity fluid. The reaction force of the fluid against the nozzles produces motion, and the work is done.

For the first function to be performed efficiently, the nozzle walls must be smooth, streamlined and so proportioned as to satisfy the changing conditions of the stream of gas flowing through the nozzle.

For the second function the nozzle should discharge the fluid at the correct angle with the direction of blade motion to allow a maximum conversion of kinetic energy into work.

The main consideration in nozzle design is expected to provide a nozzle of proper wall contour. For nozzle design the engineer is sure to have at his disposal four fundamental tools or relations: 1) the 1-st law of thermodynamics; 2) the equation of continuity of flow; 3) the characteristic equation of state of the fluid; 4) the equation of process.

XX. Просмотрите текст, правильно переведите и объясните употребление:

a) слова "against" - во 2-м абзаце текста.

b) различие в переводе слова "for" во 2-м и 3-м абзацах текста.

в) черточки между словами в словосочетании "high-velocity fluid".

XXI. Найдите в тексте:

а) синонимы к словам:
to convert, part, to get, speed, movement, flow, chief, necessary, main;

б) антонимы к словам:
give, low, occupied, minimum, rough, constant, to forbid.

XXII. Найдите в тексте все случаи употребления инфинитива. Определите его функции и правильно переведите предложения с ним.

XXIII. Найдите в тексте предложения, в которых говорится о том,

I) какова функция лопаток в активной турбине;
2) какова функция сопла в реактивной турбине;
3) какими должны быть стенки сопла в активной турбине.

XXIУ. Письменно переведите последний абзац текста В.

XXУ. Переведите текст С без словаря.

Text C.

The Ramjet

The ramjet engine is an air-breathing engine which operates on the same principle as the turbojet engine. Its basis operating cycle is similar to that of the turbojet. It compresses the incoming air by ram pressure, adds heat energy at a high pressure, converts the heat energy to velocity, and produces thrust. By converting the kinetic energy of incoming air into pressure, the ramjet is able to operate without a mechanical compressor. Therefore, the engine requires no moving parts and is mechanically the simplest type of jet engine which has been devised. Since it depends on the velocity of the incoming air for the needed compressor the ramjet will not operate statically, that is when it is not moving. For this reason, it requires a turbojet or rocket assist to accelerate it to operating speed.

УРОК II

Обзор пройденного грамматического материала.

I. Запомните следующие слова и выражения:

1. due to /ˈdju: / - из-за, вследствие, обусловленный
2. essentially /ɪˈsenʃ(ə)lɪ / - по существу
3. to store /stɔ: / - хранить
4. tank / tæŋk / - бак
5. advantage /ədˈvɑ:ntɪdʒ/ - преимущество
6. extremely /ɪksˈtri:mlɪ / - крайне, чрезвычайно
7. altitude /ˈæltɪtju:d / - высота
8. extensive /ɪksˈtensɪv / - обширный, большой
9. booster /ˈbu:stə / - ускоритель
10. guided /ˈgaɪdɪd / - управляемый
11. auxiliary /ɔ:gˈzɪljərɪ / - вспомогательный
12. to enable /ɪˈneɪbl / - давать возможность

II. Переведите предложения:

1. Its great velocity is due to high power.
2. A rocket engine is essentially a tube.
3. Oxygen is stored in a separate tank.
4. The rocket engine can be used at extremely high altitudes.
5. Rockets find extensive use.
6. They are used as boosters for missiles.

III. Найдите слова с одинаковым значением:

1. motion, 2. essentially, 3. rapidly, 4. velocity,
5. extensive, 6. primary, 7. auxiliary

---

1. secondary, 2. quickly, 3. great, 4. main,
5. movement, 6. mainly, 7. speed

IV. Найдите слова с противоположным значением:

1. forward, auxiliary, 3. primary, 4. solid, 5. rapid,
6. high, 7. separate

---

1. secondary, 2. liquid, 3. slow, 4. low, 5. mutual,
6. main, 7. backward

V. Просмотрите текст А и объясните:

I) что означает черточка между словами в выражении "jet - propelled vehicle";
2) как переводится слово "means" в 4-м абзаце текста;
3) как перевести выражение "a rocket driven venicle" (4 абз.). К чему относится слово "driven" в этом выражении?

VI. Просмотрите текст еще раз. Найдите и переведите :

а) предложения в страдательном залоге;
б) 2 предложения с инфинитивом в функции обстоятельства;
в) I предложение с инфинитивом в функции определения.

VII. Переведите текст А.

Text A.

The Rocket Engine

A rocket is a jet-propelled vehicle. Its motion forward is due to the reaction of the motion of the gases backward.

A rocket engine is essentially a tube in which propellants are burned rapidly at great pressure. The propellants give large amounts of heat energy, so that the resulting gases are directed rearward at great velocities to produce the reactive force of propulsion.

In order to burn, fuel requires oxygen. The rocket carries its own oxygen supply. It is stored in a separate tank or combined with the fuel itself. This fact is an advantage. The rocket engine can be used at extremely high altitudes where there is no oxygen.

Rockets find extensive use. They are used as boosters for missiles and research rockets, and as main power plants of guided missiles. A rocket propulsion system may be used as a primary or as an auxiliary power plant of an airplane. The rocket engine provides a possible means of propulsion for interplanetary vehicles. Ih 1903 K.Tsiolkovsky described a rocket driven vehicle for space travel. Today his dream has become a reality. The rocket develops high velocity. The stem principle enables them much higher velocities to be achieved.

There are two basic types of rocket engines: the solid propellant and the liquid propellant types.

VIII. Найдите в тексте предложения, в которых говорится о том,

а) где хранится топливо;
б) где используются ракетные двигатели.

IX. Охарактеризуйте ракетный летательный аппарат, отвечая на следующие вопросы по-английски:

1) Что представляет собой ракета?
2) С чем связано ее движение вперед?
3) Почему ракетный двигатель может работать без атмосферы?
4) В качестве чего могут использоваться ракеты?

X. Переведите данные предложения на английский язык:

1) Ракетный двигатель представляет собой трубку, в которой быстро сгорает топливо при высоком давлении.
2) Для сгорания топлива нужен кислород.
3) Кислород хранится в отдельном баке или вместе с топливом.
4) Ракеты находят широкое применение.
5) В 1903 году К.Циолковский описал ракетный летательный аппарат.
6) В настоящее время мечта его осуществилась.

XI. Переведите предложения, обращая внимание на перевод слова "for".

ПРЕДЛОГ "FOR" переводят словами: для, ради, за, по, в течение.

СОЮЗ "FOR" переводят: так как, потому что, ибо.

1. All the necessities of life for the crew must be considered in the design of a spacecraft. 2. Space engines of definite types should operate for periods up to three years. 3. The pilot-static system is very important for it drives primary flight instruments. 4. Liquid propellant types of engines are also used for this purpose. 5. The controllable flight by air is really possible only by means of heavier--than-air crafts, for without engines it is rather difficult to control the flight.

XII. Переведите предложения, обращая внимание на перевод слова "both".

1. Both types of engines are used on training aircraft. 2. Both piston and turbine engines are internal combustion engines. 3. The Moon is the major objective of both unmanned and manned astronomical exploration. 4. Both compressors have been used in turbojet engines.

XIII. Переведите предложения, обращая внимание на перевод слова "after".

a) 1. After take-off, we should attempt to follow the extended centerline of the runway. 2. After several hours of manoeuvring in orbit, the two spacecraft docked. 3. The temperature of the gases after combustion must not be too high.

b) 1. After the spacecraft is placed into orbit the astronauts start carrying out the flight programme. 2. After the air enters the intake of the compressor it is heated in passing through compressor and expands into the combustion chamber.

XIII. Переведите предложения, обращая внимание на слово "before".

ПРЕДЛОГ "BEFORE" переводят словами: до, перед, прежде чем.

СОЮЗ "BEFORE" переводят: прежде чем, до того как.

a) 1. Before the landing of a spacecraft the landing retrorockets are switched on. 2. Before the invention of radio flying was only a dream of inventors.

b) 1. Before we activate the stator we must be absolutely sure that no person is within the range of the propeller. 2. Until the designers thoroughly check the project the engine can't be constructed.

XIV. Переведите предложения, обращая внимание на перевод слова "because".

ПРЕДЛОГ "BECAUSE" переводят словами: из-за, вследствие

СОЮЗ "BECAUSE" переводится: потому что, так как.

1. The burning of fuel is really a chemical process because it changes the fuel into heat, light, gases. 2. The temperature is greatly increased because of the burning of the fuel. 3. Because all the valves are closed, the air charge cannot escape. 4. Because of the many types of turbine engines, it is not possible to list all the major components.

XV. Задайте вопросы к подчеркнутым словам:

1. The rocket engine can be used at extremely high altitudes where there is no oxygen. 2. The rocket engine provides a possible means of propulsion for interplanetary vehicles. 3. A rocket engine is essentially a tube in which propellants are burned rapidly at great pressures. 4. In 1903 K.Tsiolkovsky described a rocket driven vehicle for space travel.

XVI. Следующие слова помогут Вам понять текст В.

to derive /dɪ'raɪv/ - получать, извлекать
pulse jet /'pʌls dʒet/ - пульсирующий воздушно-реактивный двигатель (ПуВРД)
in view of /'vju:/ - вниду того, что; в связи; из-за
to overcome /ˌəuvə'kʌm/ - преодолевать
sufficient /sə'fɪʃənt/ - достаточный
divergent inlet duct /daɪ'və:dʒənt/ - расходящийся входной канал
to some extent /ɪks'tent/ - до некоторой степени
residual /rɪ'zɪdjuəl/ - остаточный
whereby /weə'baɪ/ - посредством чего
expansion /ɪks'pænʃn/ - расширение
exit velocity /'eksɪt/ - скорость на выходе

XVII. Просмотрите текст В. Найдите предложения, в которых говорится следующее:

I. Как извлекается авиационная сила в реактивном и турбовинтовом двигателях. 2. Куда направлен воздух в реактивном двигателе. 3. Какую проблему преодолело введение турбореактивного двигателя.

Text B.

The Turbo-Prop Engine

Jet engines with which most modern high-speed aircraft are equipped develop thrust on the same principle as the propellers of conventional aero-engines. In both, the propulsive force is derived from the reaction produced by a stream of air driven rearwards at high velocity. However in jet-propulsion the air is directed rearwards in a jet from the engine itself. The earliest forms of jet-propulsion such as pulse jet utilized

in the Flying Bomb, were incapable of functioning at rest, in view of the absence of any means of air-compression. But the introduction of the turbo-jet overcame this problem, since then the turbine developed sufficient power to drive a compressor.

Air enters the engine through a divergent inlet duct in which its pressure is raised to some extent. It then passes to a compressor, where it is compressed, and from which it is delivered to the combustion chambers. They are arranged radially round the axis of the turbine, into which the products of combustion pass on leaving the combustion chambers. A proportion of the power developed by these gases is utilized by the turbine to drive the air compressor, and the residual energy provides the thrust whereby the aircraft is propelled. Due to the expansion of the exhaust gases in the jet-pipe behind the turbine, their exit velocity is very high.

XIX. Просмотрите текст еще раз и ответьте на вопросы:

1. On what principle do jet engines develop thrust?
2. What does this principle consist in?
3. Where is the air directed in jet propulsion?
4. Why were the earliest forms of jet propulsion uncapable of functioning at rest?
5. How does air enter the engine?
6. How are the combustion chambers arranged?
7. Why is the exit velocity very high?

XX. Переведите текст с помощью словаря.

Т е к с т С.

Characteristics of Liquid Cooled Engines

Liquid-cooled engines offer many decided advantages over the air-cooled type. They have been developed extensively through the Allison division of the General Motors Corporation and are being used with great success as a leading engine among fast pursuit and fighter group of aircraft.

1. The use of liquid-cooled engines of the allison type permits a great reduction in frontal area and a resultant reduction in drag, which in turn permits a considerable increase in speed without necessarily increasing the power output.

2. By using liquid-cooled engines, in addition to the reduction in drag as indicated, the visibility of the pilot is considerably improved and a much more compact arrangement of the fuselage is possible.

3. The use of a liquid cooling system permits a more uniform cooling of the cylinders and makes possible the use of higher compression ratios.

4. The use of liquid to cool an engine also permits the use of smaller tolerances in the cylinder and piston assemblies and reduces considerably the tendency of an engine to foul the spark plugs at lower operating and idling speeds through overoiling. Use of this type of engine also permits smoother operation.

A few disadvantages of this engine as compared to air-cooled engines are minor when compared to the over-all advantages gained.