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**ГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ
ВЫСШЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ
«САМАРСКИЙ ГОСУДАРСТВЕННЫЙ АЭРОКОСМИЧЕСКИЙ
УНИВЕРСИТЕТ имени академика С.П. КОРОЛЕВА
(НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ)»**

**УЧЕБНЫЕ ЗАДАНИЯ
ПО АНГЛИЙСКОМУ ЯЗЫКУ
ДЛЯ СПЕЦИАЛИСТОВ В ОБЛАСТИ
АВИАЦИОННЫХ ДВИГАТЕЛЕЙ
И ЭНЕРГЕТИЧЕСКИХ УСТАНОВОК**

САМАРА 2011

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ

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*Утверждено Редакционно-издательским советом университета
в качестве методических указаний*

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Составители: *С.А. Авдейко, Г.В. Любаева, Н.Э. Кочурова*

Учебные задания по английскому языку для специалистов в области авиационных двигателей и энергетических установок:
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Целью данных учебных заданий является обучение студентов всем видам речевой деятельности на материале текстов, посвященных авиации, двигателестроению и типам авиационных двигателей.

Учебные задания включают грамматический справочник, упражнения для усвоения грамматики, текстовый материал и упражнения на развитие речевых и письменных навыков.

Предназначены для студентов 1-го курса II-го факультета.

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И РАКЕТНЫХ УСТАНОВОК**

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Unit I

A Short History of Flight

Before you Begin

- I. Before you read the text, look at the title of the text and write down 10 words that may be related to the topic.
- II. Work in pairs give your prediction about the content of the text.

Reading

- I. Skim the text and try to explain the meaning of marked words from the content of the text.
- II. While reading the text define which paragraph A, B, C, D, E, F, G tells you about the following:
 1. The disadvantages of balloons.
 2. The attempt to make a balloon a practical transport vehicle.
 3. Two lines of search of the possibility of flight.
 4. The possibility to control gliders.
 5. The first powered flight in an aeroplane.
 6. The first actual flight in the balloon.
 7. Engine invention.

A Short History of Flight

A. The first actual flight man made was that in the **balloon**. At that time man knew that cold air pushed warm air up as warm air was lighter than cold air. That is why the first balloon that rose into the air was a hot-air balloon.

B. The invention of the balloon was the first great **achievement** in regard to flight but free balloons had two main disadvantages. First, the balloon was not a practical **device** for transportation because it was almost entirely dependent on the wind. Secondly, the balloon slowly **dropped** as the air in the bag cooled.

C. Then there came the idea to fill the balloon with hydrogen. Hydrogen was the lightest gas man knew. Still the balloon was not a practical air transport vehicle. There were **attempts** to provide the balloon with controls but they were quite useless as a means of directional control. The problem was how **to propel** the balloon.

D. In the 18-th century man knew that flight was possible on motionless wings with the help of air current. Research began to follow two lines, one, which dealt with lighter-than-air aircraft and the other - with heavier-than-air aircraft.

E. The real history of mechanical flight began with the 19-th century. In the second half of the century there appeared gliders. The glider was a heavier-than-air craft which supported a man who could, to a certain extent, control it. The glider stayed in the air as it took advantage of the air currents that rose upwardly. The glider was not a practical device either. It could not remain in **still** air and could not cover long distances.

F. The invention of the engine opened the way for aerial **navigation**. With the help of it man had control over all directions. The greatest success with the lighter-than-air principle came when there appeared dirigibles. They carried engines as a means of propulsion.

G. The first powered flight in a man-carrying aeroplane was made by A.F. Mozhaisky in 1884. It was 19 years before the Wright brothers flight. The Mozhaisky and Wright aeroplanes **led the way** into the air age. These aeroplanes had all essential features of the modern aeroplane. However it was to take many years before the aeroplane developed into a successful, stable, **controllable**, highly maneuverable and reliable machine.

Post Reading

I. Find the definition of a glider in the text. Render it in Russian.

II. a) Find the English equivalents to the following words and word combinations in the text:

толкать; достижение; относительно; падать; попытка; средство; поток; приводить в движение; движение вперед; до известной степени; вверх; летательные аппараты легче воздуха; иметь дело с; появляться; воздушная навигация; проложить дорогу; основные черты; маневренный и надежный аппарат.

b) Reproduce the context in which they were used.

III. Complete the following sentences using the ideas from the text.

1. The first balloon that rose into the air was ...
2. The balloon was not a practical device because ...
3. The glider took the advantage of ...

4. With the help of engines man had ...
5. The greatest success with the lighter-than-aircraft came when...
6. The aeroplanes developed into ...

IV. Agree or disagree with the statements. Correct the wrong ones.

1. The first actual flight man made was that in the glider.
2. Free balloons had a lot of disadvantages.
3. Then there came the idea to fill the balloon with oxygen.
4. The real history of mechanical flight began with the 20-th century.
5. The glider was a lighter-than-air craft and could cover long distances.
6. The first powered flight in an aeroplane was made by the Wright brothers.

V. Work in pairs. Translate the following questions into English and answer them according to the content of the text. Join another pair, compare the answers.

1. Какие недостатки имели воздушные шары?
2. Почему люди решили заполнять воздушные шары водородом?
3. Что человек узнал о полете в 18 веке?
4. Когда появились планеры?
5. Каковы недостатки планеров?
6. Чему способствовало появление двигателей?
7. Кто совершил полет раньше Можайский или братья Райт?

Language in Use

I. Match the words with their definitions.

1. Transportation	a. A means of transporting people or goods, especially on land.
2. Vehicle	b. Make an effort to do smth, try.
3. To attempt	c. The line along which smth moves.
4. Direction	d. Taking a person, animal or thing from one place to another.
5. Feature	e. A flying machine with wings.
6. Reliable	f. Trustworthy, able to be relied on.
7. Aeroplane	g. An important or noticeable part; a characteristic.

II. Find pairs of antonyms among the words. What prefixes do you know which give an opposite meaning?

A	B
upward	lighter
appear	rise
cold	disadvantage
useful	independent
dependent	disappear
advantage	warm
stable	useless
heavier	downward
drop	unstable

III. a) Fill in the gaps in the sentences using the words in the oval. Watch out! There is an extra word.

Engine, foresaw, helicopter, balloon, vehicle,
powered, aeroplane, machines, appeared, invention

In the 14-th century Leonardo da Vinci ... the possibility of the man-made ... and man-made

Man started with the non-power-driven A hot air ... was the first ... to lift man from the surface of the Earth. Then there ... winged heavier-than-air craft. Yet, the achievement of man-directed flight came with the The first ... flight in a man-carrying aeroplane was made by A.F. Mozhaisky in 1884.

b) Use the words from the oval in the sentences of your own.

IV. a) There is one mistake in each sentence. Find it and correct.

1. That is why the first balloon that rose into the air was a hot-air balloon.
2. Free balloons had two main disadvantage.
3. The balloon wasn't a practical device for transportation.
4. The balloon slow dropped as the air in the bag cooled.
5. There was attempts to-provide the balloon with controls.
6. The greatest success with the lighter-than-air principle came when there dirigibles appeared.
7. The glider stayed in the air as it took advantage of the air currents that rose upwardly.

b) Translate the corrected sentences into Russian.

Grammar in Use

Английское предложение имеет фиксированный (твердый) порядок слов, который можно в приближенном виде представить на схеме.

Схема порядка слов в простом повествовательном предложении в английском языке



Подлежащее и сказуемое являются обязательными членами английского предложения, в то время как другие члены предложения могут отсутствовать. Поэтому при переводе надо в первую очередь найти подлежащее и сказуемое.

Сказуемое – это единственный член предложения, который можно опознать по внешнему виду. Все остальные члены предложения определяются строго по месту, которое они занимают относительно сказуемого.

Сказуемым может быть любая личная форма глагола, т.е. такая форма, которая не начинается с частицы to и не имеет суффикса -ing в первом компоненте.

Например: “having been written” не будет сказуемым, т.к. начинается с компонента, имеющего суффикс “-ing”. “to write” – тоже не будет сказуемым, т.к. начинается с частицы “to”.

Глагол-сказуемое имеет ряд характеристик, так называемых сигнальных признаков, знание которых поможет распознать его.

Таблица однозначных сигнальных признаков сказуемого

shall	am	have	do
will	is	has	does
may (might)	are	had	did
must	was		
can (could)	were		
would			
should			
ought to			
need			

Кроме однозначных сигнальных признаков сказуемого существуют неоднозначные, которые могут сигнализировать либо о сказуемом, либо о других формах.

Это суффиксы “-ed”, “-s”, “-es”.

Форма с “-ed” будет сказуемым в предложении, если в данном предложении нет другой глагольной формы, которая обладает однозначными сигнальными признаками. Если такая форма есть, то она и будет сказуемым.

Например:

1. The text translated at the lesson was interesting.
2. The student translated an interesting text.

В первом предложении “translated” – не будет сказуемым, т.к. есть “was interesting” с однозначным сигнальным признаком сказуемого. Во втором предложении форма “translated” будет сказуемым, т.к. здесь нет других форм, обладающих сигнальными признаками.

Форма с “-s” или “-es” является сказуемым, если:

- 1) в предложении нет другой формы с однозначным сигнальным признаком;
- 2) перед данной формой нет артикля, притяжательного местоимения или определения;
- 3) перед данной формой нет предлога.

Если в предложении нет глагола ни с однозначными, ни с неоднозначными признаками, сказуемое следует искать методом исключения тех слов, которые по разным признакам не могут быть сказуемым. И тогда оставшееся слово, которое не имеет противопоказаний и может выполнять роль сказуемого, следует переводить сказуемым.

Сравним:

1. The man held a book in his hand.
Человек держал книгу в руках.
2. They man the crews of the spaceships.
Они комплектуют команды космических кораблей.

I. Find the verbs that:

a) can perform the function of the predicate in the sentences:

to have been translating; will have; being asked; having gone; could be answered; to be designing; are coming; ought to do; to stop.

b) can not perform the function of the predicate in the sentence:

was being done; will have gone; to have been asking; being given; are reading; having spoken; could be stopped; to be building; has been answered; ought to come; is giving.

II. Find the sentences in which the word with – ed is a predicate:

1. The article discussed was interesting.
2. The books recommended can be taken in our library.
3. Yuri Gagarin's first space flight opened a new era in history.
4. Experiments with this new system showed good results.
5. The mentioned book analysed a new method of glass production.

III. Translate the sentences in which the underlined words perform the function of predicate:

1. We usually park the car in the street.
2. People often go to the park for a walk.
3. He looked at the watch.
4. Will you watch the child?
5. They always watch all sports TV programs.
6. There was little light in the room.
7. This hall is very light.
8. Electric lamps light our streets.
9. The development of light and heavy industry depends on electricity.

Границы сказуемого

В английском предложении сказуемое может состоять из одного элемента, двух, а иногда из трех – четырех. Сказуемое бывает 2-х типов:

a) составное глагольное, в состав которого входят только глагольные элементы. Такое сказуемое строится на основе смыслового глагола.

Сказуемое развертывается влево. Чем больше в нем элементов, тем дальше смысловой глагол от начала сказуемого. Итак: начало сказуемого мы ищем по одному из сигнальных признаков, а конец по смысловому глаголу.

б) составное именное, в состав которого наряду с глагольными элементами входят именные, т.е. существительные, прилагательные, числительные.

IV. Form the correct predicates:

- 1) be, designed, could;
- 2) translated, been, had;
- 3) being, was, answered;
- 4) might, doing, be;
- 5) will, developed, been, have;
- 6) discussed, been, have, would;
- 7) have, asked, shall, been;
- 8) done, was;
- 9) is, played, being;
- 10) gone, has.

V. Compose the sentences out of the following words:

1. Discussed, plan, has, the, been, just.
2. At, he, usually, this, is, reading, time.
3. England, she, been, never, have, might, to.
4. Our, not, they, often, do, place, come, to.
5. Ever, I, the, seen, film, is, have, best, it.

Сказуемое в вопросительном предложении

Местоположение сказуемого в вопросительном предложении меняется. В вопросительных предложениях сигнальный признак может стоять в начале предложения (перед подлежащим) или после вопросительных слов: what, which, when, where, why, who, how, how many, how much.

Отсутствие какого-либо однозначного сигнального признака свидетельствует о необходимости использовать глагол “do” (“did”, “does”) при образовании вопросительных и отрицательных форм.

VI. Ask questions to the underlined words.

1. The teacher is drawing on the blackboard now.
2. The examinations will begin on the first of June.
3. The academic year begins on the first of September.
4. The students prepared their lessons at home well.
5. I have just come back from Moscow.
6. Victor Petrov is an engineer at a small plant.
7. We answered our teacher's questions at the lesson.
8. He takes the books from the library.
9. They listen to the news over the radio at 8 o'clock in the morning.
10. This engineer designed a new airplane structural unit.

VII. Ask general questions to the following sentences:

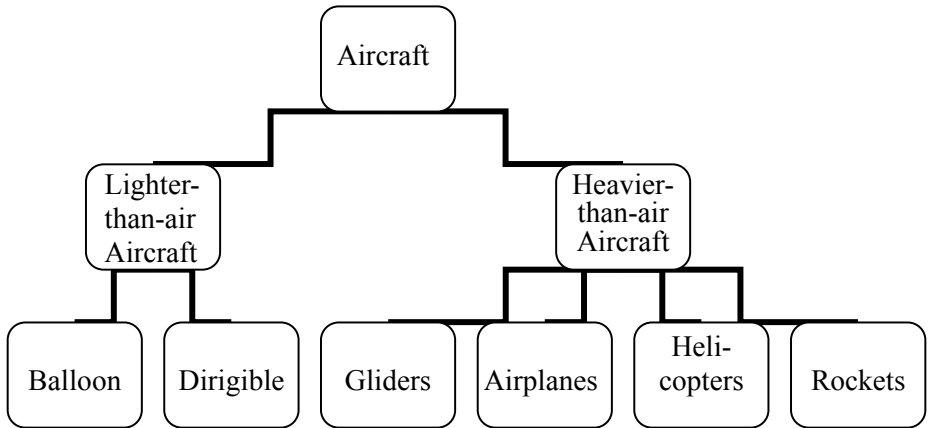
1. She will come here in the evening.
2. They are translating an English newspaper now.
3. My friend is a good sportsman.
4. The boy can read English in the original.
5. These students must go to the dean's office.
6. John speaks French well.
7. He attends lectures on physics regularly.
8. They studied English a year ago.

Speaking

I. What are the most surprising facts you have learnt from the text? Share ideas with your partner, note if you have the same facts mentioned. Use the following expressions:

- ♣ To my mind ...
- ♣ In my opinion ...
- ♣ I could hardly imagine ...
- ♣ I would never believe ...
- ♣ I didn't expect that ...

II. Here is the diagram illustrating the main types of aircraft. Choose one of the types and make a short report for your groupmates could compare the performances and sphere of their application.



Writing

Summarize the information given in the text “A Short History of Flight”.
Use the key-patterns.

As the title implies the article describes...

The article deals with...

The text is of interest to...

It is spoken in detail about...

It should be stressed that...

A mention should be made that...

The text is of great help to...

The difference between the terms ... and... should be stressed.

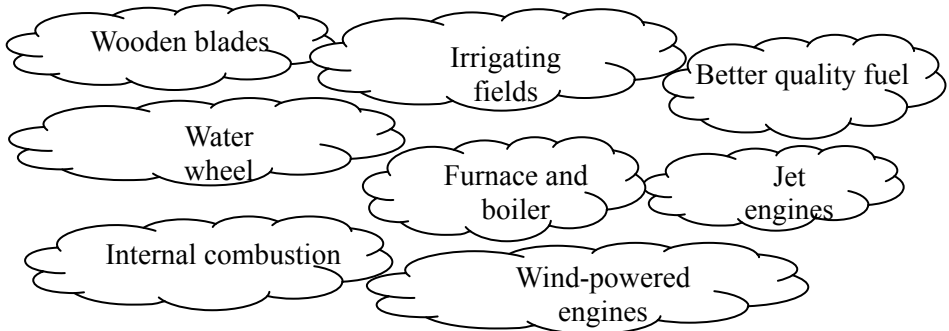
It is noted...

It is discussed...

Unit II Engines

Before you Begin

I. a) Guess which of these items might be mentioned in the text about engines:



b) Compare your list with your partner and explain the reasons why you chose these items.

II. Try to answer the following questions before you read the text.

1. What were the first engines used by people?
2. What are the advantages of present-day engines?

Reading

I. Read the text and write out the words and word combinations you don't know, try to guess their meaning from the context, compare your notes with your partners.

II. Look through the text and give definitions of:

- ⤴ water wheel;
- ⤴ steam engine;
- ⤴ internal combustion engine;
- ⤴ jet engine.

Engines

Do you know what was the first engine like? It was called the “water wheel”. This was an ordinary wheel with blades fixed to it, and the current of a river turned it. These first engines were used for irrigating fields.

Then a wind-powered engine was invented. This was a wheel, but a very small one. Long wide wooden blades were attached to it. The new engine was driven by the wind. Some of these one can still see in the country.

Both of these, the water- and wind-operated engines are very economical. They do not need fuel in order to function. But they are dependent on the weather.

Many years passed and people invented a new engine, one operated by steam. In a steam engine, there is a furnace and a boiler. The furnace is filled with wood or coal and then lit. The fire heats the water in the boiler and when it boils, it turns into steam which does some useful work.

The more coal is put in the furnace, the stronger the fire is burning. The more steam there is the faster a train or a boat is moving.

The steam engine drove all sorts of machines, for example, steam ships and steam locomotives. Indeed, the very first aeroplane built by A.F.Mozhaisky also had a steam engine. However, the steam engine had its disadvantages. It was too large and heavy, and needed too much fuel.

The imperfections of the steam engine led to the design of a new type. It was called the internal combustion engine, because its fuel ignites and burns inside the engine itself and not in a furnace. It is smaller and lighter than a steam engine because it does not have a boiler. It is also more powerful, as it uses better-quality fuel: petrol or kerosene.

The internal combustion engine is now used in cars, diesel locomotives and motor ships. But to enable aeroplanes to fly faster than the speed of sound another, more powerful engine was needed. Eventually, one was invented and it was given the name “jet engine”. The gases in it reach the temperature of over a thousand degrees. It is made of a very resistant metal so that it will not melt.

Post Reading

- I. Divide the text into logical parts. Think of the subtitle to each part. Highlight the topic words of each part.
- II. a) Find English equivalents to the following words and word combinations in the text:

экономичный; для того, чтобы; изобретать; печь и котел; совершать полезную работу; паровой двигатель; слишком много топлива; орошение полей; приводить в действие; несовершенство; топливо воспламеняется и горит; топливо лучшего качества; скорость звука; в конце концов; плавиться; реактивный двигатель.

- b) Reproduce the context in which they were used.

- III. Complete the following sentences using the ideas from the text.
 1. The water wheel was an ordinary wheel with...
 2. The wind-operated engines are very...

3. The steam-engine drove...
4. The imperfections of steam engines...
5. The internal combustion engine enables the aeroplanes...
6. The advantages of internal combustion engines are...
7. The gases in jet engines reach...
8. Water – and wind-operated engines are dependent...

IV. Explain the difference between external and internal combustion engines.

V. Work in pairs. Translate the following sentences into English and answer them according to the content of the text.

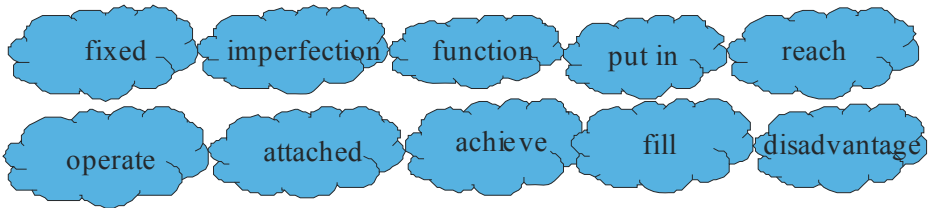
1. Что представляли собой первые двигатели?
2. В чём были достоинства и недостатки первых двигателей?
3. Из чего состоит паровой двигатель?
4. В чём заключается принцип работы парового двигателя?
5. Где используют паровой двигатель?
6. Что такое “двигатель внутреннего сгорания”?
7. В чём его преимущества перед паровыми двигателями?
8. Где используются двигатели внутреннего сгорания?

Language in Use

I. Match the equivalents:

А	В
1. прикреплённый	a. too
2. колесо	b. blades
3. внутри	c. still
4. лопатки	d. turn into
5. изобретать	e. both
6. однако	f. however
7. слишком	g. inside
8. все еще	h. eventually
9. наконец	i. fixed
10. оба	j. melt
11. превращаться в	k. wheel
12. плавиться	l. invent

II. Find pairs of synonyms among the words:



III. Find pairs of antonyms among the words:

A	B
external	disadvantage
dependent	less
useful	useless
advantage	old
wide	independent
new	internal
long	short
more	narrow

IV. Use the prepositions in the box to complete the sentences in the text. Translate the text with the help of a dictionary in a written form.

in, for, of, from, inside, at, into, per, with, without, toward

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

The conventional piston engines are not suitable ... speeds in excess of 500 miles ... hour, because of propeller limitations. It was necessary to develop power plants ... propellers in order to drive airplanes ... sonic and supersonic speeds.

The modern trend ... aircraft power plants is ... jet propulsion primarily because ... the increased speeds and great heights possible ... jet engines.

V. Match words in column A with their definitions in column B and use them in your own sentences.

A	B
1. current	a. fix or join to smth else
2. irrigate	b. make smth or someone move
3. invent	c. the gas or vapour that comes from boiling water, used to drive machinery
4. attach	d. supply land with water so that crops can grow
5. drive	e. smth that is burnt to produce heat or power
6. fuel	f. a hard black mineral substance used for burning to supply heat
7. furnace	g. make or become liquid by heating
8. coal	h. water or air etc. moving in one direction
9. steam	i. be the first person to make or think of a particular thing
10. melt	j. a device in which great heat can be produced

Grammar In Use

Времена действительного залога

В английском языке имеется четыре группы глагольных времен: Indefinite, Continuous, Perfect, Perfect Continuous, которые образуются с помощью трех основных глагольных форм.

Основные формы глагола

Infinitive	Past Indefinite	Participle II
<i>Неопределенная форма глагола</i>	<i>Прошедшее неопределенное время</i>	<i>Причастие страдательного залога</i>
to change – <i>менять</i>	changed – <i>изменил</i>	changed – <i>измененный</i>
to make – <i>делать</i>	made – <i>сделал</i>	made – <i>сделанный</i>

Времена группы Indefinite

Времена группы Indefinite употребляются:

- ♣ для констатации факта совершения действия;
- ♣ для выражения обычно совершаемого действия в настоящем, прошедшем или будущем. В эту группу входят три времени: Present, Past и Future Indefinite.

Времена группы Indefinite употребляются, как правило, с обстоятельствами:

- ▲ Present Indefinite – always, usually, often, every day/week, on Mondays/Sundays, in the morning/evening, at night/at the weekend, etc.
- ▲ Past Indefinite – yesterday, last month/week, in 1960, etc.
- ▲ Future Indefinite – tomorrow, next month/week, in ... days, in 2020, etc.

Формы Present Indefinite совпадают с инфинитивом без частицы to для всех лиц, кроме 3го лица единственного числа, которая принимает окончание -s, -es.

- ▲ We begin our studies in September.
- ▲ He begins his studies in September.

По способу образования Past Indefinite все глаголы делятся на 2 группы:

- ▲ стандартные, которые образуют Past Indefinite прибавлением к основе глагола окончания –ed:
to work – I worked, to play – he played.
- ▲ нестандартные, которые образуют Past Indefinite путем изменения корневой гласной, прибавлением окончания или другими способами.

Future Indefinite образуется при помощи вспомогательных глаголов shall для первого лица единственного и множественного числа (только в британском варианте языка) и will для всех остальных лиц и инфинитива смыслового глагола без частицы to.

Shall } + Infinitive без to
Will }

He will make a report next week.

Он сделает доклад на следующей неделе.

Единственным глаголом, который изменяется не только по временам, но и по лицам и числам является глагол to be.

Спряжение глагола to be

Лицо	Present Indefinite	Past Indefinite	Future Indefinite
1 I	Am	Was	Shall be
3 he, she, it	Is	Was	Will be
1 we	Are	Were	Shall be
2 you	Are	Were	Will be
3 they	Are	Were	Will be

- I. Insert the verb “to be” in the proper form.
1. The new field of electronics ... very promising.
 2. Gamma rays ... invisible electromagnetic waves.
 3. Electrons ... extremely light.
 4. This device ... made twenty years ago in the USSR.
 5. Yury Gagarin ... the first to penetrate into cosmic space.
 6. The new types of engines ... more advanced.
 7. The characteristics of this unit ... bad.
 8. There ... no difference between these two designs.
 9. The compass needle points to the North. It's direction ... always the same.
 10. ... there new instruments in your laboratory?
 11. Mathematics ... of great importance for engineers.
 12. This ... a square. All it's angles ... right.
 13. My friends ... engineers.
 14. How ... she now? – She ... fine.

II. Compose the sentences using the proper form of the verb “to be”:

1. (atom a great force).
2. (the students not at the laboratory).
3. (all the students present today).
4. (mr. Black a professor of mathematics).
5. (the length of a line 1.5 meters).
6. (now he at the lecture).
7. (there any figures on the blackboard)?
8. (there a picture over the bookcase)?
9. (everything in constant motion).
10. (aeronautics a new science).

III. Translate the sentences into English:

1. Он – летчик.
2. Альберт Эйнштейн был великим физиком двадцатого века.
3. Он был очень способным и школу закончил в 16 лет.
4. Мой дедушка – ученый.
5. Моя мама – не учительница. Она – врач.
6. Моя мама не была вчера на работе. Она была дома.
7. Мы не были на юге прошлым летом. Мы были в Москве.
8. Моя сестра была студенткой в прошлом году, а сейчас она – инженер.

Времена группы Continuous

Времена группы Continuous выражают длительные, незаконченные действия в процессе их совершения и переводятся на русский язык глаголами только несовершенного вида.

Времена группы Continuous образуются при помощи вспомогательного глагола to be в соответствующем времени, лице и числе и Participle I (причастия действительного залога) смыслового глагола.

Present Cont	Past Cont	Future Cont
Am } Is } + Part. I Are }	Was } Were } + Part. I	Shall } Will } + be + Part. I
The students, <u>are</u> <u>making</u> experiments, now. <i>Студенты проводят опыты сейчас.</i>	The students, <u>were</u> <u>making</u> experiments, at that time. <i>Студенты проводили опыты в то время.</i>	The students, <u>will be</u> <u>making</u> experiments, at that time tomorrow. <i>Студенты будут проводить опыты в это время завтра.</i>

IV. Choose the correct tense.

Present Simple (Indefinite) or Present Continuous

1. Current (flow) in a metallic conductor.
2. The professor (speak) five foreign languages. Right now he (speak) Dutch.
3. The rocket (have) the highest speed possibilities.
4. I (not recognize) the man who (give) a talk.
5. My friend always (tell) me the truth, but I see that she (tell) a lie now.
6. I (do) a lot of work every day. Don't worry! I (know) what I (do).
7. At the age of seventy Einstein (look) for the answers to new secrets of time and space.

Future Simple or Present Simple

1. In future the computers (regulate) the production process.
2. He (become) a doctor when he (grow up).
3. If you (leave) school so soon, you (forget) what you have learned.
4. Tell me if you (finish) your article in May and when exactly you (finish) it.
5. I (be) glad if some of these hopes (be) realized.
6. Tomorrow we (provide) you with all the necessary data.
7. He (complete) the experiment when they (come).
8. I (not rest) until I (prepare) my report for the conference.

Future Simple or Present Continuous

1. Look! The water in the tube (boil)!
2. I (give) you a lift tomorrow.
3. I'm afraid I'm not quite ready. – Never mind, I (wait).
4. Do you know Ann (come) at the end of the week?
5. He (leave) for London tomorrow night.
6. He says he (meet) us at the bus stop, but I'm sure he (forget).
7. Note the direction in which the piston (move) at a given moment.
8. We (have) a conference tomorrow. You (be present)?

Past Simple or Past Continuous

1. I (sit) on the bench for half an hour and then (begin) reading a book.
2. This copper became separated from the solution while the current (pass) through it.
3. The scientist was making a very interesting experiment when they (enter) the lab.
4. He (come) in and (see) Nelly who (draw) a strange picture.
5. We (walk) in silence for 5 minutes, then he (speak).
6. The businessman (fly) to England yesterday.
7. I (not hear) what he (say), I (type) at the moment.
8. We (look for) a more simple method of solution but could not find it.
9. My friends (work) here at that time.

Времена группы Perfect

Времена группы Perfect выражают действия, законченные к определенному моменту в настоящем, прошедшем и будущем и переводятся на русский язык только глаголами совершенного вида.

Времена группы Perfect образуются при помощи вспомогательного глагола to have в соответствующем времени, лице и числе и Participle II (причастия страдательного залога) смыслового глагола.

Present Perfect	Past Perfect	Future Perfect
Have } Has } + Part. II	Had + Part. II	Shall } Will } have + Part. II
We <u>have finished</u> our experiment.	We <u>had finished</u> our experiment by 5 o'clock. We <u>had finished</u> our experiment before he came.	They <u>will have completed</u> their experiment by the end of the week.

Present Perfect употребляется:

- ▲ со словами, выражающими период времени, не закончившийся к настоящему моменту: this week/month/year, today;
- ▲ с наречиями неопределенного времени, которые обычно стоят между вспомогательным и смысловым глаголом: often, seldom, always, never, ever, just, not yet, sometimes;
- ▲ с предлогом “since” “с” и с союзом ‘since’ ‘с тех пор, как’, а также с предлогом “for” “в течение”: I haven't seen him for 2 years. Я не видел его в течение двух лет.

Past Perfect употребляется, когда действие было закончено к какому-то моменту в прошлом (момент выражен обстоятельством с предлогом ‘by’ ‘к’) или одно действие совершилось раньше другого в прошлом.

V. Choose the correct tense.

Past Simple or Present Perfect

1. He (forget) his French since he (leave) Paris.
2. I can reach my work easily now, as I (buy) a new car.
3. What you (do) last night?
4. We (get) a fax from Boston an hour ago, but we (not answer) it yet.
5. Electronics (undergo) more revolutionary steps than any other industry.
6. How's Jack? When you (see) him? – Oh, I (not meet) him for ages.
7. By the time we (arrive) they (complete) their experiment.
8. He (graduate) from the University by 2009.

Present Perfect or Past Perfect

1. You ever (see) a flying saucer?
2. He looked at the girl and understood he (see) her somewhere before.
3. We (translate) all the articles by 6 o'clock yesterday.
4. She said they (walk) 3 miles.
5. She came to our town three years ago. By then she already (graduate) from the institute.
6. I (work) at this problem for two days for that time.
7. I (work) at this problem since 1996.
8. There (be) no post all this week.

Past Simple or Past Perfect

1. At six o'clock he (know) they were not coming.
2. We (finish) our experiment before he (come).
3. Tom wasn't at home when I (arrive). He just (go).
4. There was nobody in the sitting-room when I (get) home. Everybody (go) to bed.

5. Before we (take) Paul to the theater, he never (see) a play on the stage.
6. We felt happier when they (leave).
7. Margaret was late for work. Her friend (be) very surprised. She never (be) late before.
8. They (complete) their research by the beginning of the conference.

Времена группы Perfect Continuous

Времена группы Perfect Continuous выражают длительное действие и переводятся на русский язык глаголом несовершенного вида в настоящем, прошедшем и будущем времени соответственно.

Времена группы Perfect Continuous образуются при помощи вспомогательного глагола to be в соответствующей форме Present, Past или Future Perfect и Participle I смыслового глагола.

Present Perfect Cont.	Past Perfect Cont.	Future Perfect Cont.
Have } Has } been + Part. I	Had been + Part. I	Shall } Will } have been + } Part. I
He <u>has been working</u> at this problem for 2 years. <i>Он работает над этой проблемой уже 2 года.</i>	He <u>had been</u> <u>conducting</u> this experiment for 2 hours before you came. <i>Он проводил этот опыт в течении 2-х часов до того как вы пришли.</i>	When I return to the laboratory, my friends <u>will have been working</u> there for several hours. <i>Когда я вернусь в лабораторию, мои друзья уже будут работать там в течение нескольких часов.</i>

VI. Choose the correct tense.

Present Perfect or Present Perfect Continuous.

1. They (investigate) the problem for two years.
2. The students (study) the property of metals for two days.
3. The astronomers (determine) the distance between the sun and the Earth.
4. Science (achieve) great success in space research.
5. We (enter) the age of thinking machines.
6. What (happen) to the fridge?
7. I know him well. I (know) him since our childhood.
8. Ann (fail) her exam three times because she is so bad at doing sums.
 But she (practice) for a week now, I hope she will pass it in the end.

VII. Translate from Russian into English.

1. Вы сделали очень мало ошибок в вашем сочинении.
2. В этой библиотеке мало французских книг.
3. Вы когда-либо работали с компьютером? – Да.
4. Сегодня я не выходил из дома, т.к. идет дождь и у меня много дел.
5. Они иногда присылают мне английские книги.
6. В будущем году я собираюсь переводить эту книгу.
7. Я уже говорил Вам об этом два раза.
8. Я пойду домой после того, как закончу работу.
9. За последнее время я выучил много новых английских слов.
10. Не звоните мне вечером. Я буду занята.
11. Я не видел ее с тех пор, как уехал в Москву.
12. Здесь часто идут дожди.
13. Наконец почтальон принес письмо. Я жду это письмо уже несколько недель. Обычно мои родители пишут мне 2-3 письма в месяц. В этом месяце я получил только одно письмо.
14. Я все еще буду работать, когда ты приедешь.
15. К двум часам мы уже проведем испытание.
16. Они обсуждали этот вопрос с двух до трех часов.
17. Мы уже сделали это.
18. Мы используем этот метод с 1990 года.
19. Когда эксперимент завершается, мы изучаем полученные результаты.

Speaking

Work in pairs and make up a dialogue discussing advantages and disadvantages of different types of engines. Touch upon such questions as:

- ▲ Construction
- ▲ Characteristics
- ▲ Application

Use phrases in the box

You are right That's true Absolutely No doubt about it I'm not sure about it I wouldn't say that What else I'd like to...

Writing

I. Match the beginnings and the endings of the sentences.

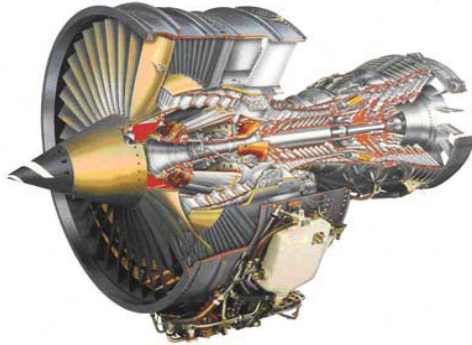
A	B
The first engine was...	... used in cars, diesel locomotives and motor ships.
The internal combustion engine is dependent on weather.
The wind-operated engine was a steam engine.
The very first aeroplane built by Mozhaisky also had the design of a new type.
The imperfections of the steam engine led to ignites and burns inside the engine itself.
In the internal combustion engines fuel an ordinary wheel with blades fixed to it.

II. Summarize the information given in the text “Engines”. Use the key-patterns.

1. As the title implies the article describes ...
2. The article consists of (contains, includes, falls into) ... (1, 2, 3 ...) parts, sections.
3. ... is spoken about in detail.
4. The article gives a detailed analysis of ...
5. Much attention is given to ...
6. It is specially noted that ...
7. The text is of interest to ...
8. The article provides the reader with some data (material/information) on ...
9. It is discussed ...

Unit III

JET ENGINE

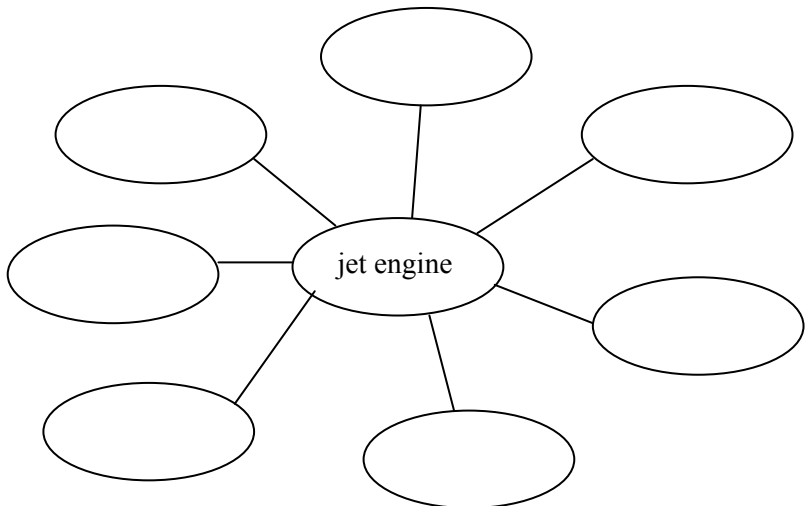


Before you Begin

I. Discuss the following questions with your peer.

1. How are the most of the engines used today called?
2. Why are they called so?
3. What types of such engines do you know?
4. Which one is the most advanced type?

II. Brainstorm all possible terms related to the topic.



Reading

While reading the text match the keywords with their Russian counterparts:

- 1) jet
- 2) combustion
- 3) internal combustion engine
- 4) burn (burnt, burnt)
- 5) refer to
- 6) utilize
- 7) propulsion
- 8) reaction
- 9) produce
- 10) eject
- 11) thrust
- 12) supply
- 13) mount
- 14) suck
- 15) application

- a) реактивный; струя
- b) горение
- c) двигатель внутреннего сгорания
- d) сжигать, гореть
- e) относиться, ссылаться
- f) использовать
- g) движение вперед
- h) противодействие, действие
- i) вырабатывать, производить
- j) выбрасывать, извергать
- k) тяга
- l) обеспечивать
- m) устанавливать
- n) всасывать
- o) использование, применение

Jet Engines

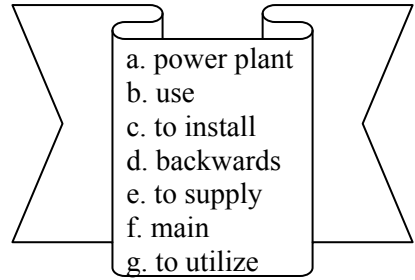
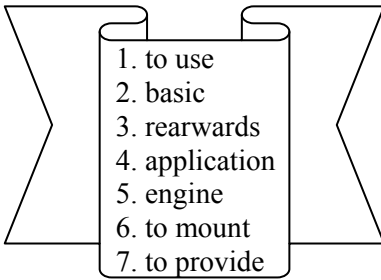
Most of the engines used today are called internal-combustion engines. They are called so because the fuel is burnt inside the engine. There exist several types of internal-combustion engines: gasoline and diesel piston types, gas turbines and jet types. The jet engine is an advance on the other types 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.

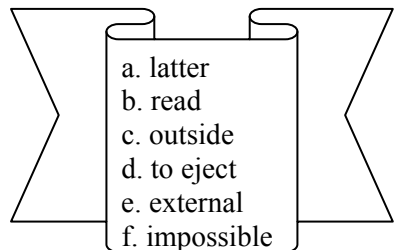
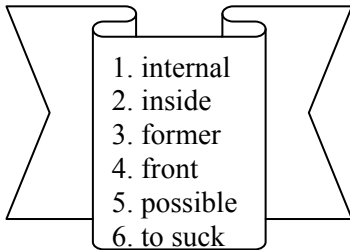
The basic idea of a jet engine is to produce the high pressure and high temperature gas jet. The jet is ejected rearwards with great force named thrust. The thrust is the reaction of the jet of hot gases ejected from the rear. The jet is produced by combustion of the fuel in the compressed air. The latter 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.

Post-Reading

I. Find pairs of synonyms among the words.



I. Find pairs of antonyms among the words.



III. Say if the statement is true or false. Correct the false one.

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.

IV. Complete the sentences using the ideas from the text.

1. Internal-combustion engines are those ...
2. The basic idea of a jet engine is ...
3. The term jet engine means ...
4. The thrust is ...
5. Jet engines work on ...

V. Answer the questions.

1. What is a jet engine?
2. What is the main function of a jet engine?
3. What is the thrust in a jet engine?
4. How is the jet produced?
5. Why is the compressor installed in a jet engine?

VI. Give English equivalents:

- топливо сжигается внутри двигателя;
- струя выбрасывается назад;
- струя выбрасывается сжиганием топлива в сжатом воздухе;
- воздух всасывается и сжимается;
- реактивные двигатели широко используются.

VII. Retell the text. Use the plan:

- internal-combustion engines;
- the term 'jet engine';
- work of a jet engine.

Grammar in Use

Страдательный залог

Страдательный залог (The Passive Voice) в английском языке употребляется тогда, когда внимание говорящего сосредоточено не на субъекте, а на объекте действия. Глагол в страдательном залоге показывает, что подлежащее подвергается действию, а не само его выполняет.

Сравните: He asks. – Он спрашивает.

He is asked. – Его спрашивают.

Страдательный залог образуется с помощью вспомогательного глагола **to be** в соответствующем времени, лице и числе и **причастия II** смыслового глагола, т.е. по формуле:

to be + PII

	Active Voice	Passive Voice
Present Simple	They <u>test</u> new engines.	The new engines <u>are tested</u> .
Present Continuous	They <u>are testing</u> the new engine.	The new engine <u>is being tested</u> .
Past Simple	They <u>tested</u> the new engine.	The new engine <u>was tested</u> .
Past Continuous	They <u>were testing</u> the new engine.	The new engine <u>was being tested</u> .
Future Simple	They <u>will test</u> the new engine.	The new engine <u>will be tested</u> .
Present Perfect	They <u>have tested</u> the new engine.	The new engines <u>have been tested</u> .
Future Perfect	They <u>will have tested</u> the new engine.	The new engine <u>will have been tested</u> .

Способы перевода страдательного залога

Страдательный залог может переводиться на русский язык:

1) глаголом с окончанием -ся, -сь.

All new engines are first tested.

Все новые двигатели сначала тестируются.

2) глаголом “быть” (в прошедшем и будущем времени) и краткой формой причастия.

Engines were tested.

Двигатели были протестированы (тестировались).

3) неопределенно-личной формой глагола.

All new engines were tested.

Все новые двигатели тестировали.

I. Choose the predicates in the Passive Voice.

1. Have worked
2. Were written
3. Has been done
4. Are to negotiate
5. Was being run
6. Had finished
7. Am asked
8. Is to send
9. Had been stated
10. Were followed by

II. Define the tense-form and the aspect of the predicate.

1. Is being discussed
2. Will be increased
3. Has had
4. Am working
5. Have
6. Has been provided
7. Had equipped
8. Was subjected to
9. Left
10. Had been overcome

III. Match the predicates in column A with their Russian equivalents in column B.

А	В
1. will be designed were designed are being designed	a) проектируются b) будут проектироваться c) спроектированы
2. were being created had been created will be created	a) будет создан b) был создан c) создавались
3. was changed is being changed has been changed	a) изменена b) была изменена c) изменяется
4. is achieved were achieved will be achieved	a) будет достигнут b) достигнут c) были достигнуты
5. will be discussed has been discussed was discussed	a) обсудили b) будут обсуждать c) обсуждали

IV. Use the verbs given in brackets in the proper tense and voice forms.

1. The uncomplicated turbojets (to call) straight jets.
2. The turbojets (to suit) to high altitude operation.
3. All the contracts on engines delivery (to sign) by 3 o'clock yesterday.
4. You'll have your copy soon, the contract (to type) now.
5. The helicopter (to test) next year.
6. (To discuss) the plan?
7. Our planes (to provide with) the new engine by the end of this month.
8. The pulse-jet engine (to scrutinize) first seriously by American military and technical men in the late spring of 1944.
9. Disk and rim failures in turbo-jet engines (to overcome) now by the application of such methods as improved gas seals, the incorporation of methods for cooling the disk, and improved metallurgy.

V. Comment on the use of tenses and voice in the following sentences. Translate them.

1. The pulse-jet engine has been given several names.
2. Air will be drawn in through the tail pipe, since the pressure within the tail pipe is low and has nothing to prevent the entry of air.
3. Once engine operation has become established, the spark plug is no longer necessary.
4. In most designs the blades are twisted to maintain a favorable angle of attack for the fluid throughout its length.

5. It is essentially a turbojet in which rotating machinery has been omitted.

6. It should be noted that in general, gas turbine- propeller engines are designed to deliver auxiliary jet thrust from the exhaust gases in addition to the propeller thrust.

7. PS-90A2 has been designed for passenger and cargo transportation by long-haul and mid-haul airplanes.

8. The F100-PW-22 engines are out of production and are being obtained from storage at the Aerospace Maintenance and Regeneration Center.

9. This number of planes does not include another 15A380 commitments from China made earlier this year where firm contracts are being negotiated.

10. While Kiwi was being run, NASA joined the effort with their NERVA (Nuclear Engine for Rocket Vehicle Application).

Глаголы с предлогами в пассиве

В английском языке существуют предложения, в которых после сказуемого в пассивном залоге следует предлог. Запомните, перевод такого предложения начинается с предлога.

English verbs	Russian verbs
1) insist <u>on</u>	настаивать на
2) refer <u>to</u>	ссылаться на
3) to rely <u>on/upon</u>	полагаться на
4) to send <u>for</u>	послать за
5) to speak <u>of</u>	говорить о
6) to work <u>at</u> and some others	работать над

Examples.

English sentences	Russian sentences
1. These results were insisted <u>on</u> by many scientists.	<u>На</u> этих результатах настаивали многие ученые.
2. Professor Smith's article is often referred <u>to</u> .	<u>На</u> статью профессора Смита часто ссылаются.
3. This new device can be relied <u>on/upon</u> .	<u>На</u> это новое устройство можно положиться.
4. The engineer was sent <u>for</u> .	<u>За</u> инженером послали.
5. The new experiment will be spoken <u>of</u> .	<u>О</u> новом эксперименте будут говорить.
6. This problem is being worked <u>on</u> .	<u>Над</u> этим вопросом работают.

Кроме того, в английском языке есть такие глаголы, которые хотя и не имеют после себя предлога, на русский язык переводится с предлогом.

English verbs	Russian verbs	Example
to attend to follow to influence to affect to watch to join etc	присутствовать на следовать на влиять за действовать на наблюдать за присоединиться к	The question was answered immediately. На вопрос сразу же ответили.

Часто после этих глаголов в пассиве мы видим предлог 'by'. Он относится не к глаголу, а следующему за ним существительному, поэтому в подобных случаях мы можем начинать перевод с существительного, стоящего после 'by', сделав его подлежащим русского предложения.

The lecture has been attended by all the students.

На лекции присутствовали все студенты.

Все студенты присутствовали на лекции.

I. Choose the sentences the translation of which should be started with the preposition. Translate them:

1. Until World War II very little was heard of the jet engine and the piston engine was the only type used in aircraft.
2. The discovery of nano-materials was followed by a number of important inventions in science.
3. Four-bladed propellers are often used in aircraft.
4. After the installation failed, the detailed description of apparatus was sent for.
5. The AI-450 turboprop engine is now being developed at our design bureau.
6. These power plants are looked after by a new mechanic.
7. The visitors were shown new types of machines.
8. The students have been asked to take part in the discussion.
9. He has always been interested in aviation.
10. The new project was much spoken of.
11. Why don't you answer when you are spoken to?
12. The subject will be dealt with in the next chapter.
13. The bucket of the wheel are subjected to high centrifugal stresses.

II. Fill in the gaps using the prepositions from the oval.

upon, by, to, on, of, at, with, for

1. The problem of space exploration have just been spoken ...
2. The results were affected ... the presence of magnetic field.
3. This reference book have been often referred ...
4. Such difficulties are met ... in engine production.
5. This type of vehicle may be certainly relied ...
6. The problem of aircraft noise reduction is still being worked ...
7. The workers have been sent ... some instruments.
8. The body is being acted ... by any number of external forces.

III. Substitute the words in brackets for their English equivalents. Use the proper tense and passive voice forms.

1. The four-stroke engine (используется) in our last construction.
2. Such a distance (будет покрыта) in 4 hours next year.
3. The plane (оснащен) a powerful engine.
4. His warning (не придали значение).
5. Various attempts now (предпринимаются) to improve the hydrogen-boosted gasoline engine.
6. The instruction (была переведена) before the engineer (послали за).
7. Several different methods (предложены) to utilize nuclear energy for rocket propulsions.
8. The stationary vanes assembly (называется) as the turbine nozzle.
9. My friend always (интересовался) aviation.
10. The investigation of this phenomenon (будет завершено) by winter.

IV. Translate the sentences into English.

1. Докладчиков слушали с большим интересом.
2. На решение многих вопросов повлияли практические требования и ограничения, предъявляемые современные рынком.
3. Меня никогда не спрашивали об этом.
4. После доклада вам будут задавать вопросы.
5. На эти данные уже ссылались.
6. Оборудование уже устанавливают? Как вы думаете, его установят к полудню?
7. Над проектом этой установки работали 2 года.

8. Трудности были преодолены благодаря более тщательному анализу проблем, связанных с вибрацией.
9. Работа будет завершена вовремя.
10. Новый тип форсунки был разработан совсем недавно группой инженеров.

Writing:

- I. Translate the text from English into Russian.

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 diesel oil. The fuel/air mixture may be ignited either by a spark or by compression of the mixture. However, for small engines, such as those which are used in motor-cars, the charge is a mixture of petrol and air, and it is ignited by a spark from the distributor.

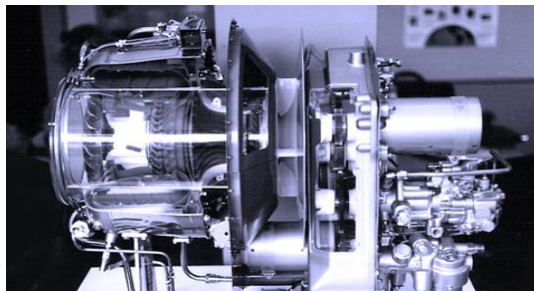
When the mixture is ignited, the products of combustion expand down the cylinder, which is fitted with a reciprocating piston. The downward movement of the piston is converted into a rotational movement of the crankshaft by means of a connecting rod. As the crankshaft rotates, the piston is driven upwards 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.

- II. Rearrange the sentences to make a meaningful text. Write them down.

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 war ready laboratory testing in 1937.
6. Its theory began in 1908.
7. He had no financial support.

Unit IV

Engine Designing



Before you Begin

I. Discuss the following questions with your peer.

1. What does the aviation success mostly depend on?
2. What is the main purpose of the engine?

II. Choose from the list below the most important things engineers take into account while designing engines. Explain your choice.

- Type of an aircraft for which the engine is being constructed
 - Size
 - Speed
 - Life
 - Strength
 - Complexity
 - Melting point of metals the engine is made of
 - If the engine is environmentally friendly
 - Determination of most optimum parameters.
- of an engine

Reading

While reading the text match the keywords with their Russian counterparts:

1) performance	a) совершать, выполнять
2) wide-body airliner	b) точка плавления
3) surpass	c) загрязнять
4) create	d) оказывать влияние

5) convert	е) летные характеристики
6) accomplish	ф) превосходить
7) strength	г) превращать
8) loss	h) вспомогательные средства
9) facility	и) усовершенствование
10) influence	j) достижение
11) advancement	к) широкофюзеляжный авиалайнер
12) melting point	l) создавать
13) development	м) прочность
14) achievement	н) развитие
15) contaminate	о) потери

Engine Designing

A. 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.

B. 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.

C. 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.

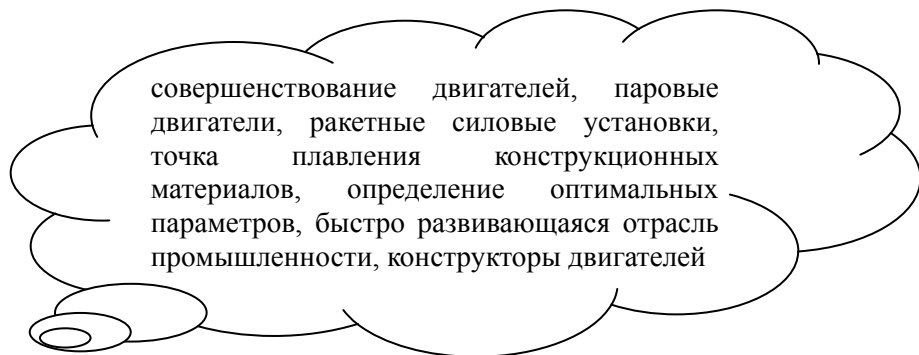
D. The main purpose of every engine is to convert the fuel energy into the propulsion one. The higher the temperature, the more effective this process is. And the temperature to be reached in the operation is much higher than the melting point of the constructional material. Therefore creating engines 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.

E. 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.

F. 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.

Post-Reading

I. Give English equivalents to the word combinations below:



II. a) Match the nouns with their definitions:

1.	aircraft	a.	smth successfully finished
2.	advancement	b.	the use of physical strength or power of the mind
3.	achievement	c.	a method of doing smth that needs skill
4.	effort	d.	improvement, development or movement to a higher rank facility
5.	facility	e.	an arrangement or system that makes a particular activity possible
6.	loss	f.	inability to keep smth
7.	techniques	g.	a flying machine of any type, with or without an engine

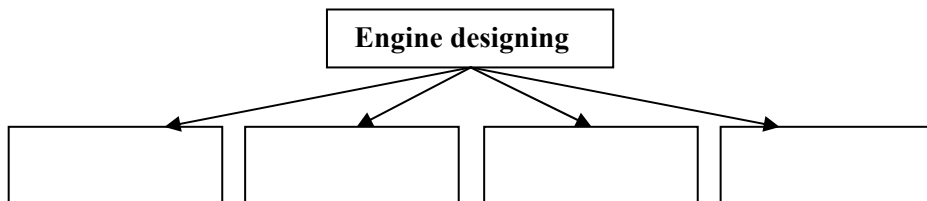
b) Now, it's your turn to define the words:

1.	movement	a.	
2.	performance	b.	
3.	requirement	d.	
4.	strength	e.	
5.	specialist	f.	

III. Say which paragraph, A-F, tells you about:

1. Basic things for engine designing.
2. Environmentally friendly power plants.
3. A machine for generating mechanical power.
4. Expert involved in the process of engine construction.
5. From steam units to rocket propulsion units.
6. Requirements aircraft engine designers should meet.
7. Aviation success.

IV. Fill in the diagram according to the content of the text.



V. Speak on the topic using the diagram above.

Grammar in Use

Степени сравнения прилагательных и наречий

В английском языке есть три степени сравнения прилагательных и наречий: положительная, сравнительная, превосходная.

1. Односложные и часть двусложных прилагательных, оканчивающихся на -y, образуют сравнительную степень при помощи суффиксов -er, -est.

high - higher - highest

fast - faster - fastest

heavy - heavier - heaviest

2. Многосложные и большинство двусложных прилагательных и наречий, оканчивающихся на -ly, образуют степени сравнения с помощью more (больше), less (меньше), most (наиболее), least (наименее).

interesting - more interesting - the most interesting
beautiful - less beautiful - the least beautiful

3. Некоторые прилагательные образуют степени сравнения от других корней.

good - better - (the) best
bad - worse - (the) worst
little - less - (the) least
many (much) - more - (the) most
far - farther - (the) farthest (далекий, дальний)
far - further - (the) furthest (дальнейший, добавочный)

4. Сравнительные конструкции:

- 1) as...as (такой же как)
- 2) not so...as (не такой же как)
- 3) more...than (более чем)
- 4) less...than (менее чем)
- 5) the more...the better

This text is as big as the previous one.

My report is not so long as yours.

We had more classes yesterday than you.

The more you know, the better.

5. Превосходная степень может быть усилена употреблением перед нею by far или far, а сравнительная степень усиливается при помощи слова much.

The deposits of oil in Russia are by far the richest in the world.

Залежи нефти в России гораздо богаче всех других в мире.

Gas weighs much more than air.

Газ весит намного больше, чем воздух.

I. Choose a comparative form of adjectives among the following words: larger, wider, winter, other, lighter, colder, spider, over, heavier, driver, more, further.

II. Fill in the table according to the example.

a)	high	higher	the highest
	small great simple cheap strong		
b)	modern	more modern	the most modern
	efficient lightweight attractive popular significant		

III. Speak about the advantages of a jet engines over a piston engines on the items:

- weight (light);
- power (great);
- construction (simple);
- moving parts (few);
- cost (cheap).

IV. Translate from English into Russian. Pay attention to different comparative and superlative forms.

1. CF 34-10 A power plant is a more compact, shorter engine with fewer stages and has completely different mounting structure.
2. Plasma propulsion system, in contrast to chemical ones, offer much greater exhaust speeds.
3. The more powerful the engine, the greater the distance the plane can cover.
4. Commercial and government best practices were evaluated and modified to fit the needs of the F100 engine program.
5. Following the financial crises in August 1998, the PS-90A engine became far more attractive for Russian operators than its Western counterparts.
6. A small amount of hydrogen added to the normal intake air and gasoline mixture greatly improves overall combustion quality by

- allowing nearly twice as much air for a given amount of fuel introduced into the combustion chamber.
7. This is more energy efficient because it saves energy by reducing the amount of engine pumping needed.
 8. Airbus and Boeing could have no fewer than four new wide body aircraft on sale between them.
 9. The Airbus decision to develop an aircraft significantly larger than the 747-400 clearly helped to differentiate the new A380 in terms of both size and unit cost.
 10. Experiment shave shown that the amount of air which flows into the tail pipe can be several times as much as that which flows into the inlet.
 11. Diesel engines tend to have their torque peak quit low in their speed range.
 12. This provides smoother control over heavy loads when starting from rest, and, crucially, allows the diesel engine to be given higher loads at low speeds than a gasoline engine, making them much more economical for these applications.
 13. Deep-space vehicles going past Mars must rely on nuclear power sources, because solar energy gets too weak at long distance from the sun.

V. Use adjectives in brackets either in a comparative or superlative form.

1. Most airplane materials are now made out of composite materials that are (strong) and (lightweight) than most metals.
2. Modern turboprop engines are equipped with propellers that have a (small) diameter but a (large) number of blades for efficient operation at much (high) flight.
3. It became readily apparent that a (good) job has to be done in supporting the F-100 engine fleet.
4. The Airbus A 350, a derivate of the A330, and Boeing is 747 Advanced, the (last) version of the venerable jumbo, may both be launched at Paris.
5. The rocket equation states the intuitive fact that the (fast) you throw propellant out from a spacecraft, the (little) you need to execute a rocket-born maneuver.
6. Air transport can and will make (far) progress.
7. Airplane can fly at (high) speed than helicopter.

VI. Translate from Russian into English.

1. Благодаря своим характеристикам, данный тип двигателя способен конкурировать с самыми лучшими мировыми двигателями этого класса.
2. Эта конструкция является более эффективной, но она и более дорогая.
3. Более холодный воздух смешивается с горячим воздухом на входе в двигатель.
4. Фронтальная область турбины намного меньше, чем фронтальная область компрессора и камеры сгорания.
5. Результатом увеличения объёма является более высокая скорость.
6. Двигатель F 100 - это самый безопасный и самый надёжный двигатель, выпускаемый для самолётов-бомбардировщиков.
7. Поскольку двигатель J 73 снабжен входными направляющими лопатками с изменяемым углом, он может разогнаться гораздо быстрее, чем раньше.
8. Последнее время самолеты-перевозчики стали пользоваться большим спросом особенно среди азиатских компаний, выполняющих грузоперевозки.
9. Чем больше энергии вырабатывает турбина, тем меньше становится скорость выхлопных газов турбовентиляторного двигателя.
10. В некоторых случаях самолёты не так эффективны, как вертолёты.

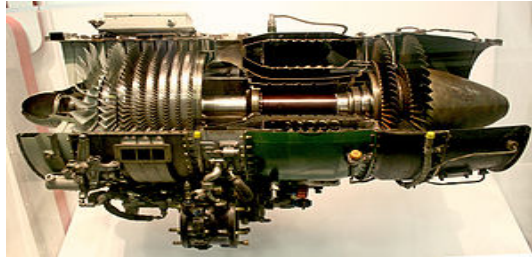
Writing:

Rearrange the words to get true sentences. Write them down.

1. Be / propulsion / unit / a / engine / any / called / can
2. Plants / first / units / the / were / steam / power
3. Suitable / the / speeds / turbojet / high / engine / for / most / forward / is
4. Rocket / a / means / into / is / forcing / these / the / chemical / for / the
5. Chamber / fuel / in / be / the / combustion / must / a / burnt
6. Of / jet / hot / reaction / result / jet / gas / is / a / propulsion / the / of / the
7. Engine / with / remote / it / use / to / is / kind / the / possible / this / of / control

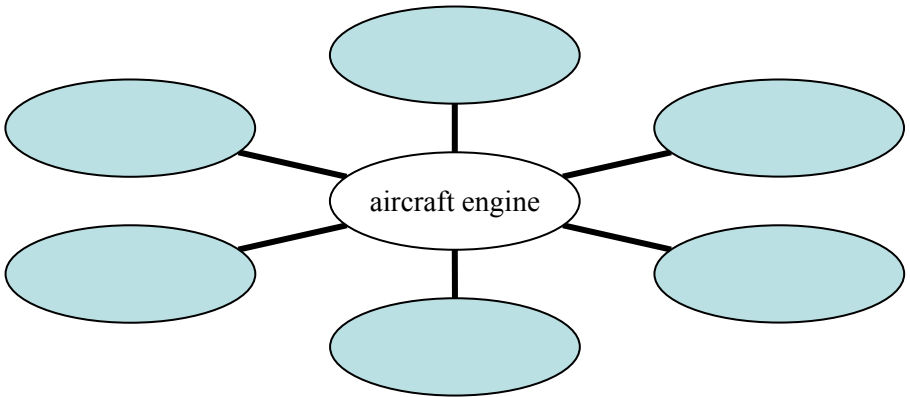
Unit V

Power Plant



Before You Begin

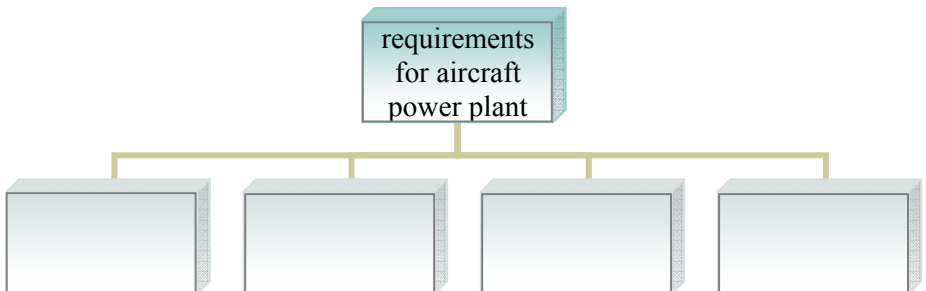
- I. a) What is a propulsion system in an aircraft for?
b) What attributes should engineers design into engines to achieve specific goals? What should an aircraft engine be?



II. Read the text and find out if your predictions are correct.

Reading

While reading fill in the diagram according to the context of the text.



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 engines 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 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, jet engines and rocket engines. Each of them has certain advantages and disadvantages over other forms of power plant.

Post-Reading

I. a) Find the English equivalents for the following Russian words and word combinations.

Силовая установка; вид; аппарат для движения; величина; способность; требовать; двигатель; тяга; вес; отношение; определять; фунт; выход, продукция; важный; топливо; потребление; пытаться; увеличивать; излишек; движение; ремонт; манёвренность, приспособляемость

b) Make up sentences using the words from a).

II. Match the words with their definitions.

1) engine	a) a measure of the rate of doing work expressed as the work done per unit time
2) requirement	b) the amount produced, as in a given period
3) power	c) the ability to run smoothly and perform properly at all conditions
4) output	d) the state or act of going beyond normal, sufficient, or permitted limits
5) flexibility	e) a machine that produces mechanical power or energy
6) overhaul period	f) a period of time to make repairs or adjustments to a machine
7) excess	g) something demanded or imposed as an obligation

III. a) Match the following words to make meaningful collocations. Translate the word combinations into Russian.

1) mechanical	consumption
2) reduced	conditions
3) fuel	requirement
4) engine	weight
5) atmospheric	period
6) important	power
7) overhaul	flexibility

b) Make up sentences with these collocations.

IV. a) Read the text. Substitute the underlined words with the words from the box below.

reliability (2); to support; failure; design; requirement; fuel

The _____ of aircraft engines tends to favor _____ over performance. Long engine operation times and high power settings, combined with the _____ for high-reliability means that engines must be constructed _____ this type of operation with ease. Aircraft engines tend to use the simplest parts possible and include two sets of anything needed for _____. Independence of

function lessens the likelihood of a single malfunction causing an entire engine _____. For example, reciprocating engines have two independent magneto ignition systems, and the engine's mechanical engine-driven _____ pump is always backed-up by an electric pump.

b) Translate the text into Russian.

V. Match the beginning of the sentences with their endings.

1. All engines must have	a) may be defined as weight/power ratio.
2. Every engine is to have	b) be as low as possible.
3. The weight in pounds per horse power output	c) with maximum of time between overhaul periods.
4. The fuel consumption must	d) the maximum power (or thrust) for minimum weight.
5. The engine is to have a long life	e) the reduced weight per horse power of the engine.

VI. Answer the questions.

1. What machine produces thrust?
2. What must the weight of any engine be?
3. What is the engine flexibility?
4. What must the period between engine overhauls be?
5. What necessity arises due to excess heat of the power plant?
6. How can you characterise the aviation power plant?
7. What types of engines do there exist nowadays?

Grammar in Use

Модальными глаголами являются глаголы must, may, can, ought (to), need, should.

Модальные глаголы обозначают не действие, а способность, допустимость, возможность, вероятность, необходимость совершения действия.

В сравнении со смысловыми глаголами модальные глаголы имеют ряд особенностей:

а. Модальные глаголы не употребляются без смыслового глагола. Смысловый глагол после модальных глаголов стоит в инфинитиве без частицы to. Модальные глаголы в сочетании со смысловыми образуют сложное глагольное сказуемое:

The wight of every engine must be as low as possible.

b. Модальные глаголы не изменяются по лицам и числам, т. е. в третьем лице единственного числа не имеют окончания -s (-es):

Fuel consumption shoul be low.

с. Вопросительную и отрицательную формы модальные глаголы образуют без помощи других вспомогательных глаголов:

Can scientists creat an engine with inexhaustible power?

d. Модальные глаголы не имеют форм инфинитива, причастия, герундия.

e. Модальные глаголы не имеют форм будущего времени.

f. Глаголы can, may имеют форму прошедшего времени (could, might), а глагол must формы прошедшего времени не имеет.

MUST

Модальный глагол must выражает обязанность, необходимость совершения действия в силу определенных обстоятельств, а также приказание или совет. На русский язык обычно переводится словами должен, нужно, обязан.

Он имеет только форму настоящего неопределенного времени must, т. е. форм прошедшего неопределенного и будущего неопределенного времени не имеет и заменяется эквивалентами:

Have to - должен в зависимости от обстоятельств;

Be to – должен в зависимости от плана, договорённости.

Designers had to take into consideration all the questiosns mentioned in the meeting.

Pilots were to examine the engine before the flight but they didn't do it.

Глагол must употребляется также для выражения предположения (с оттенком вероятности):

Must + V (present actions)

Must + have V3 (past actions)

Engine desighners of this buro must have risen the power of this engine. - Конструкторы этого бюро должно быть увеличили мощность этого двигателя.

CAN

Модальный глагол can выражает возможность или способность совершить действие. На русский язык обычно переводится словами могу, умею. В прошедшем неопределенном времени он имеет форму could. Не имеет формы будущего неопределенного времени и заменяется эквивалентом to be able to:

It is generally acknowledged that nuclear war can lead only to the suicide of the human race.

Общепризнанно, что ядерная война может привести только к самоуничтожению человечества.

Глагол can употребляется также для выражения реальной или предполагаемой возможности:

Can + V (present action)

Can + have V3 (past action)

This aircraft can be powered with this kind of engine.

This aircraft can have been powered with this kind of engine.

Exercises

I. In the text find out sentences with modal verbs or with their equivalents and translate them.

II. Translate the sentences paying attention to the modal verb **must** and its equivalents.

1. Aircraft engines must perform reliably and safely under all reasonable conditions.
2. Aircraft engines have to operate at high power settings for extended periods of time.
3. In general, the engine must run at maximum power for a few minutes during taking off.
4. An aircraft engine must be capable of operating at sufficient altitude for the aircraft.
5. An aircraft power plant must be small and easily streamlined; large engines with substantial surface area, when installed, create too much drag.

III. Translate the following sentences paying attention to the modal verb **can**.

1. With the absence of a radiator, aircraft engines can boast lower weight and less complexity.

2. Aircraft can operate at higher altitudes where the air is less dense than at ground level.
3. Early in World War I, only rotor engine could meet the goals of lightness, power and price.
4. Early engines could not consume small amount of fuel.
5. This kind of power plant can be used in this engine.

IV. Open the brackets translating the word combinations from Russian into English.

1. Different types of engines (должно быть имеют) advantages and disadvantages over other forms of power plant.
2. Most small airplanes (должны были быть разработаны) with reciprocating engines.
3. Radial engines (должно быть использовались) widely during World War II.
4. The majority of reciprocating engines (возможно являются) air cooled.
5. The compact cylinder arrangement reduced the engine's frontal area and so (возможно свели к минимуму) aerodynamic drag.
6. Segers Aero Corporation (SAC) (должно быть была основана) in 1976.

Writing

Rearrange the words to make a meaningful sentence:

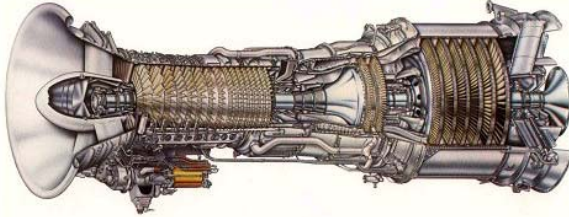
- 1) an engine / power/ produces/the machine/ called/ is/ that.
- 2) propulsion/ a means/ a power/ is /plant/ of.
- 3) consumption/ the designers/ to solve/ fuel/ want/ the problem/ of.
- 4) the / provides / company / repair / aircraft / turbine / overhaul / worldwide / engine / and.
- 5) engine / you / know / the / what / do / first / like / was?

Unit VI

Gas Turbine Engine Components

Before You Begin

I. a) This is a gas-turbine engine. Try to identify its parts.



b) Read the text and check if your predictions were correct.

Reading

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 principle, 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.

Post-Reading

I. a) Find Russian equivalents for the following English words and word combinations.

роторный компрессор; воздухозаборник компрессора; выходное отверстие; центробежный компрессор; осевой компрессор; рабочее колесо; диффузор; переменные ряды; трубчатая конструкция камеры сгорания; кольцевая камера сгорания; вспомогательные агрегаты двигателя; выхлопное устройство; выхлопные газы; результирующая тяга

b) Make up sentences using these words.

II. Present the information from the text in the form of a table, marking the parts of the gas turbine engine and their functions.

Part	Function

III. Fill in the gaps using the words from the box.

Moving; pressure; axial; energy; row; impeller; combustion; stages; stream; fuel; air; engine; expand

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.

IV. Match the words with their definitions.

1) to accelerate	a) to gain possession of; acquire; get
2) to diffuse	b) to make or become greater in extent, volume, size, or scope; increase
3) to obtain	c) to free (something) from (one's grip); let go or fall
4) to expand	d) to withdraw, pull out, or uproot by force
5) to provide	e) to increase the velocity
6) to extract	f) to put at the disposal of; furnish or supply
7) to release	g) to spread in all directions

V. a) Read the text. Substitute the underlined words with the words from the box below.

powerful; geometry; appropriate; power; components

The gas turbine engine takes air from the atmosphere and, after compressing and heating, it uses some of its energy to drive the turbine. The mechanical arrangement of the gas turbine engine is simple. It consists of two main rotating parts, a compressor, a turbine and a combustion chamber. 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.

VI. a) Answer the questions according to the text.

1. What components does a gas turbine engine consist of?
2. How many basic types of rotary air compressor do you know?
3. What is the function of the diffuser?
4. What types of blades are there in the axial flow compressor?
5. Where is the fuel burnt?

b) Make up 3 more questions to the text.

Grammar in Use

MAY

Модальный глагол *may* выражает разрешение или возможность совершить действие. На русский язык обычно переводится словами *могу, можно*. В *Past Simple* он имеет форму *might*. Формы будущего неопределенного времени не имеет:

Engineers having taken an active part in this project may take their seats in the first row.

Глагол *may* употребляется также для выражения предположения (с оттенком сомнения):

He may not know about it.

Он может и не знать об этом. (Возможно, он не знает об этом.)

SHOULD

В качестве модального глагола употребляется также глагол *should*.

Глагол *should* выражает совет, субъективную необходимость совершения действия. На русский язык обычно переводится словами *должен, следует*. Имеет только одну форму *should*:

The instructions should be written in clear language.

Инструкции нужно писать (должны писать) ясным языком.

NEED

Модальный глагол *need* выражает необходимость совершения действия. На русский язык обычно переводится словами *нужно, надо*.

Он имеет только форму настоящего неопределенного времени *need*, т. е. форм прошедшего и будущего неопределенного времени не имеет:

We need have this device no more.

Нам больше не нужно это оборудование.

В отличие от других модальных глаголов вопросительная и отрицательная формы модального глагола *need* могут образовываться также и при помощи вспомогательного глагола *to do* в соответствующей форме, причем смысловой глагол в этом случае употребляется с частицей *to*:

Need we make this report?
Do we need to answer this letter?
Нам нужно сделать этот доклад?
You need not make this report.
You do not need to make this report.
На это письмо вам не нужно отвечать.

Exersices

I. Translate from Russian into English paying attention to modal verbs.

1. While designing an engine designers should take into consideration a lot of requirements.
2. This engine needs to be examined.
3. The engineers of this department may have had the job training.
4. May I have a look at this circuit?
5. This aircraft needs no refueling.

II. Translate the text, find out all forms of modal verbs.

Mechanically, gas turbines can be considerably less complex than internal combustion piston engines. Simple turbines might have one moving part: the shaft/compressor/turbine/alternative-rotor assembly, not counting the fuel system.

More sophisticated turbines (such as those found in modern jet engines) may have multiple shafts (spools), hundreds of turbine blades, movable stator blades, and a vast system of complex piping, combustors and heat exchangers.

As a general rule, the smaller the engine the higher the rotation rate of the shaft(s) needs to be to maintain top speed. Turbine blade top speed determines the maximum pressure that can be gained. This produces the maximum power possible independent of the size of the engine. Jet engines operate around 10,000 rpm and micro turbines around 100,000 rpm.

III. Translate from Russian into English.

1. Этот двигатель возможно будет установлен на новый самолёт.
2. Следует рассмотреть предложения этой конструкторской группы.

3. Нужно провести тщательный осмотр компрессора в этой силовой установке.
4. Следует проверить показатели работы этой установки.
5. Возможно, отчёт будет завершён в срок.

Writing

Write a short description of the gas turbine engine using ideas from the text. Use the following descriptions:

- The engine consists of ...
- The main parts are ...
- The principle of operation is ...
- The function of this part is ...
- The geometry of this device is ...